CHAPTER V

CONCLUSION AND SUGGESTIONS

5.1 Conclusion

The various compositions of chitosan/poly(acrylic acid) hydrogel films were prepared by blending together. Their swelling and bending behaviors were studied. In the experiments, the 0.3% (w/w) barakol-CS/PAA hydrogel film with 1% glutaraldehyde exhibited a high swelling ratio in the range of 46–52%. When the hydrogel films in NaCl electrolyte solution were subjected to an electric field, the hydrogel films showed the highest equilibrium bending angle of 90°, the fastest bending time of 8 seconds, fastest reverse bending time of 27 seconds and the number of repeated bendings up to 46 times toward the negative electrode (cathode). When the electric stimulus was removed, the hydrogel film returned to its original position. The bending angle of the hydrogel film was measured in NaCl solutions of various concentrations. The bending angle and the bending speed of the hydrogel film increased accordingly to the increase concentration of the NaCl solution, reached the maximum in 0.9 wt % aqueous NaCl and also increased accordingly to the increasing voltage and reached the maximum at 25 V. The hydrogel film also showed stepwise bending behavior depending on the electric stimulus.

For this experiment, it revealed that barakol could improve the bending speed and glutaraldehyde could help increase the number of repeated bendings. Additionally, 0.3% (w/w) barakol-CS/PAA hydrogel film with 1% glutaraldehyde of this work has superior performance in the light of the preparing methods, equilibrium bending angle, bending time, reverse bending and number of repeated bending as well as in terms of economic and environment.

Therefore, the present chitosan/poly(acrylic acid) hydrogel film system has a potential to be used for developing an artificial organ components such as muscle-like soft linear actuators, robotics, sensors, biomimetic energy transducing devices.

5.2 Suggestions for Future Work

The chitosan/poly(acrylic acid) hydrogel films should be further studied as follows:

- Study of specific mixing techniques that can increase homogeneity of hydrogel films.

- The mechanical properties testing in wet state are necessary to verify the final properties of the hydrogel films.

- Modification of large scale process to prepare bigger specimens should be investigated.