CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusions

The synthesized biodegradable superabsorbent polymers were made by the grafting copolymerization between the gelatinized starch and acrylamide/itaconic acid via foamed solution polymerization using APS and TMED as an initiator and cointiator, respectively, and N-MBA as an crosslinking agent. The parameter study of the research consisted of the mole percent of itaconic acid, starch-to-monomer ratio, and concentrations of the redox initiator system and crosslinker (N-MBA). In addition, the water absorbency of newly synthesized polymers in several solution with various ionic strength and enzymatic hydrolysis were studied. This research can conclude the findings as follows:

1. The functional groups of the synthesized copolymer were characterized by FTIR. The result shows that the IR spectrum of polyacrylamide give the characteristic absorption peaks of the $-COONH_2$ at 3443 cm^{-1} (NH_2 stretching) and 1655 cm^{-1} (C=O stretching).

2. The presence of both acrylamide and itaconic acid is essential for the grafting reaction on the gelatinized cassava starch. The graft copolymer giving the highest water absorption of 379±10 g g^{-1} could be prepared from the optimum mole

ratio of acrylamide to itaconic acid of 90:10. The high percentage of add-on was accomplished with this optimal condition.

3. The optimum weight ratio of starch to monomer of 1:2 produced the highest water absorption. The higher amount of monomer was to provide the grafting opportunity to the grafting substrate in another phase.

4. The concentration of the redox initiator APS (1 %wt.):TMED (2 %wt.) gave the optinum result to acheive the highest water absorption.

5. Increasing the crosslinking agent concentration in the graft copolymerization enhanced the percentages of grafting efficiency, add-on, and grafting ratio. The optimum condition of the crosslinking agent N-MBA of 2.0%wt gave the highest water absorption.

6. Increasing the ionic strength of the saline solutions decreased significantly the water absorption of the graft copolymer.

7. The buffer pH solution with the high ionic strength decreased the water absorption of the graft copolymers. The high pH buffered solution gave a constant water absorption when the anionic superabsorbent polymer was immersed.

8. The surface morphology of the graft copolymers studied by SEM reveals that graft copolymers having the higher absorbency are more porous.

9. Thermogravimetric analysis (TGA) technique was employed to characterize the thermal properties of the obtained graft copolymers. The results revealed that weight loss at the decomposition temperature of the graft copolymer shown in thermogram was used in the calculation of grafting characteristics of a graft copolymer in terms of the percentages of the grating ratio and add-on. In comparison with the results from the gravimetric method, they are agreeable.

10. The starch grafted copolymers can be biodegraded by α-amylase enzyme, which was monitored by measuring the amount of reducing sugar using DNS method. In addition, Benedict's test and iodine test after the enzymatic hydrolysis confirmed the degraded product of glucose, which indicates the biodegradation of starch and leave the acrylamide-itaconic acid portion undegraded.

5.2 Suggestions for Future Work

Synthesis of superabsorbent polymers of cassava starch-acrylamide/itaconic acid graft copolymers by solution polymerization would be further investigated as follows:

1) Other type of the redox initiator system on grafting reaction and water absorption should be investigated.

2) Other type of crosslinking agent should be investigated to produce a new type of superabsorbent polymer that may absorb even a larger amount of water.

3) The absorption capacity under pressure and stability test should be investigated

4) The water absorption and weight loss of the enzyme-hydrolyzed superabsorbent polymer should be investigated.