

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Citrate-crosslinked chitosan fiber was successfully prepared by the addition of citric acid either to the spinning solution or the coagulation bath with the use of 1 *N* NaOH solution as a coagulant. Clear and viscous chitosan solution could not be achieved unless citric acid concentration was higher than 10%, but such high citric acid content brought about a very brittle fiber. According to this, chitosan dope containing citric acid concentration less than 10% is preferred, and it is recommended that chitosan should be completely dissolved in aqueous acetic acid solution before adding aqueous citric acid solution. By this method, the citric acid concentration that gave a spinnable chitosan dope was in the range of 0–0.5%, which gave fibers with tensile strength of about 9–10 cN/tex and elongation at break of about 11–13%. In the case of adding citric acid in coagulation bath, the maximum amount of citric acid added should not be higher than 5%; otherwise, the coagulant which was an alkaline solution would be neutralized by citric acid and not suitable for the spinning. Elongation at break of the chitosan fibers was obviously improved by the addition of citric acid. A slight increment in tensile strength was also observed followed by a reduction in tensile strength at higher citric acid content. Maximum tensile strength of about 11 cN/tex together with maximum elongation at break of about 14% were obtained at citric acid concentration of 1.25%. On a contrary, knot strength of the fiber was decreased with the addition of citric acid. The SEM micrographs showed that chitosan fibers produced in the presence of high citric acid content (5% in bath or 15% in dope) were found to have a rough surface instead of the smooth surface found on the other chitosan fibers. For glutaraldehyde-crosslinked chitosan fiber, similar trend of properties was observed with maximum tensile strength of about 11 cN/tex and maximum elongation at break of about 15% obtained at 0.001% and 0.0005% glutaraldehyde in chitosan dope, respectively.

5.2 Recommendations

The results indicated that citrate- and glutaraldehyde-crosslinked chitosan fibers could be prepared by the addition of the crosslinker to either part of the spinning process, the spinning solution or the first coagulation bath, instead of the use of post-spinning treatment. However, further studies on the variation in other spinning conditions, like the size of nozzle, bath length, take-up speed, etc. should be conducted, together with the application of other types of crosslinker and coagulating system in order to obtain the optimal spinning condition that would give crosslinked fiber with the best properties.