

CHAPTER V

CONCLUSION

5.1 Conclusions

Two positively charged derivatives of chitosan, *N,N,N*-trimethylammonium chitosan chloride (TMC) and *N*-[(2-hydroxyl-3-trimethylammonium)propyl]chitosan chloride (HTACC), were prepared from chitosan with MW of 45,000 g/mol. TMC with 17-22%*DQ* and HTACC with 24-139%*DQ* were obtained. The %*DQ* of HTACC could be varied by varying GTMAC mole equivalent in the synthesis reaction. For TMC, varying the methylating agent amount did not affect the %*DQ* of TMC. Instead, when replacing the solvent used for the reaction from NMP by DMF-H₂O (1:1), the %*DQ* was increased by upto 15%. TMC was able to dissolve in aqueous solution with pH<6.5, while HTACC dissolved in the pH of 1 to 14. %*DQ*-dependent cytotoxicity against human keratinocyte cells was observed for both TMC and HTACC.

A homemade ATR accessory with a slide-on miniature Ge μ IRE equipped in an FTIR microspectrometer was used to analyze the chemical functional groups on hair surfaces. All prepared conditioners was successfully coated on the hair, as evidenced from the ATR-FTIR and SEM analyses. The leave-on conditioner could flatten the lifted cuticle scales of damaged hairs. It is thus believed that the leave-on conditioner provides a protective coating to the hair surfaces for prevention of future damage. In the tensile test, all prepared and commercially-available conditioners were able to significantly increase the breaking load of conditioner-coated waved and straightened hairs. In wet combing test, chitosan and its derivatives potentially reduced the friction during wet combing more effectively than the commercial-grade conditioner did.

5.2 Future Direction

The future plan should cover the study of antibacterial activity of the prepared leave-on conditioner. This is because chitosan and its derivatives possess antibacterial activity which should find extensive application in hair-care products. Moreover, the use of chitosan-filled conditioners should be tested for skin allergy, which is a method for medical diagnosis of allergies with human before being used commercially. These studies should help broaden applications of chitosan and its derivatives, especially in cosmetic products.

