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APPENDICES

Appendix A Chitosan functionalization with cholic acid (CS-CA)

High molecular weight chitosan (Mw 227,000) was conjugated with CA at 1:1 mole ratio of CS:CA. Chitosan-HOBt solution (10 ml, 0.61 mmol) was mixed with CA (0.2452 g, 0.6 mmol) in methanol 6 ml. Then, WSC·HCl (0.1178 g, 0.6 mmol) in ethanol (5 ml) was added into the solution. The reaction was allowed room temperature for 24 hours. The colloidal product obtained was dialyzed against water:methanol (3:7) and freeze-dried. The product is pale-yellow particles.

The obtained product is insoluble in any solvent which might be due to the hydrogen bonding between chitosan and chitosan chains. The reasons are also related to hydrophobic-hydrophobic interaction between cholic and cholic groups resulting in the precipitation. CS-CA with high molecular weight chitosan was also prepared. The product obtained is also insoluble in any solvent.

FTIR spectra (Figure A1) shows the characteristic peaks at 3368 (OH), 2881 (CH stretching), 1644 (amide I), 1597 (amide II), 1153-895 (pyranose ring). After reacting a day, an increase of the peak at 2935 cm^{-1} for CH stretching, 1650 cm^{-1} for amide I and 1548 cm^{-1} for amide II including the new peak at 1450 cm^{-1} for cyclohexane is identified implying the success of the reaction.

TGA diagram (Figure A2) shows the weight loss for 10% starting from 60 ^{o}C to 100 ^{o}C refered to the moisture and water content. CS-CA started to degrade at 225-240 ^{o}C until 450 ^{o}C whereas chitosan shows the degradation in the range of 290-310 ^{o}C. This might be due to the introduction of functional group onto chitosan disturb the packing structure resulting an increase in the degradation. After 240 ^{o}C, CS-CA slowly degraded; this may come from the fact that the cholic and cholic acid groups are packed in between the chitosan chain.

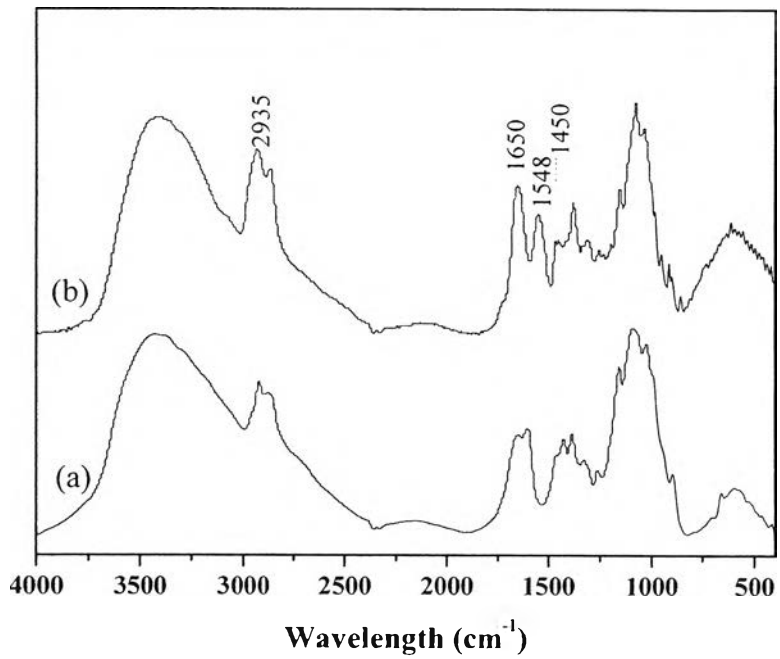

Figure A1. FTIR spectra of (a) CS and (b) CS-CA.

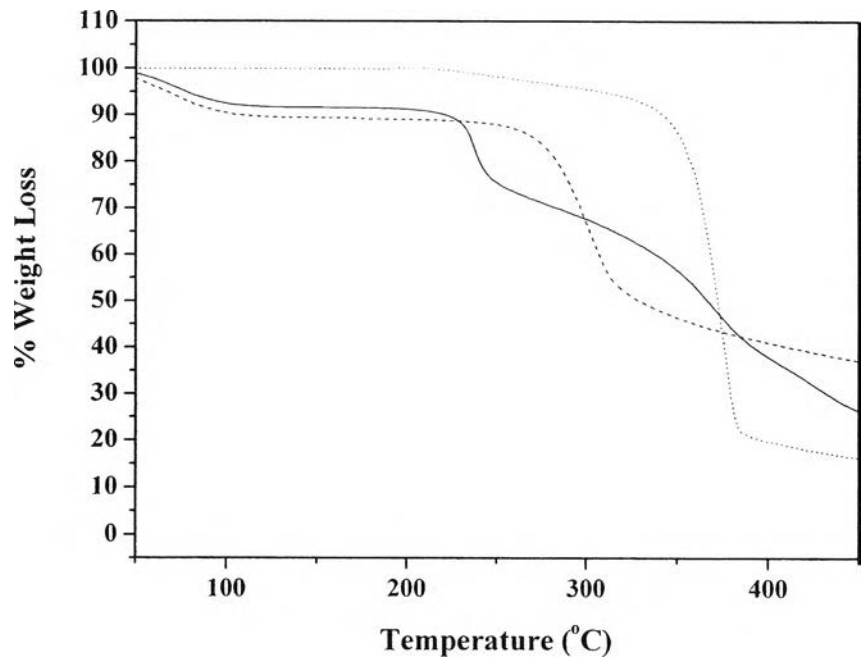

Figure A2. TGA diagrams of: (····)CS, (····) CA, (—)CS-CA.

Appendix B Chitosan functionalization with deoxycholic acid (CS-DCA)

The preparation of CS-DCS is similar to that of CS-CA. The product obtained is not soluble in any solvents.

FTIR spectra (Figure B1) shows a significant increase of the peak at 2936 cm^{-1} for CH stretching, 1652 cm^{-1} for amide I and 1549 cm^{-1} for amide II including the new peak at 1449 cm^{-1} for cyclohexane is identified. This implied that the reaction is successful.

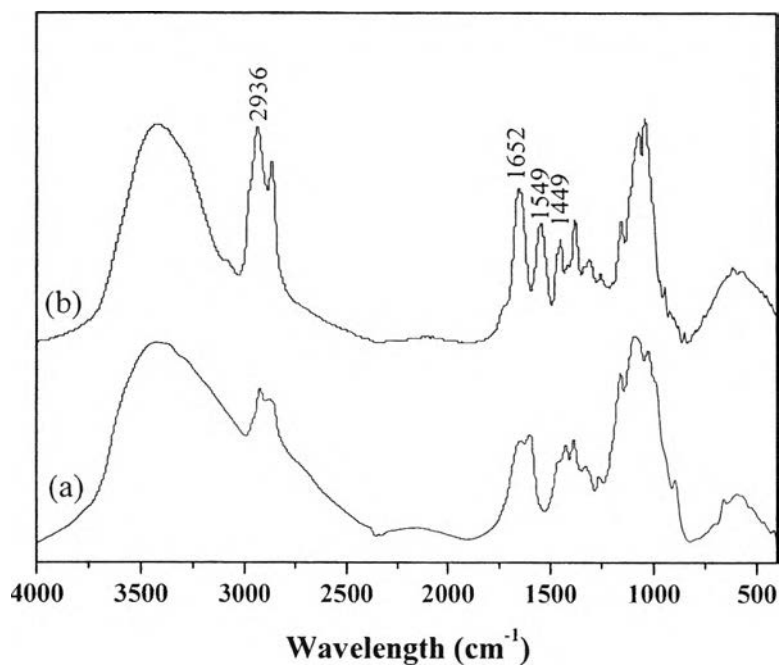

Figure B1. FTIR spectra of (a) CS and (b) CS-DCA.

Appendix C Chitosan functionalization with mPEG and deoxycholic acid (CS-mPEG-DCA)

The preparation of CS-mPEG-DCA is similar to that of CS-mPEG-CA under the condition of 1:0.5:0.5 mole ratio (CS:mPEG:CA). The product obtained is not soluble in any solvents.

FTIR spectra (Figure C1) shows a significant increase of the peak at 2936 cm^{-1} for CH stretching, 1652 cm^{-1} for amide I and 1549 cm^{-1} for amide II including the new peak at 1733 and 1449 cm^{-1} for ester and cyclohexane is identified.

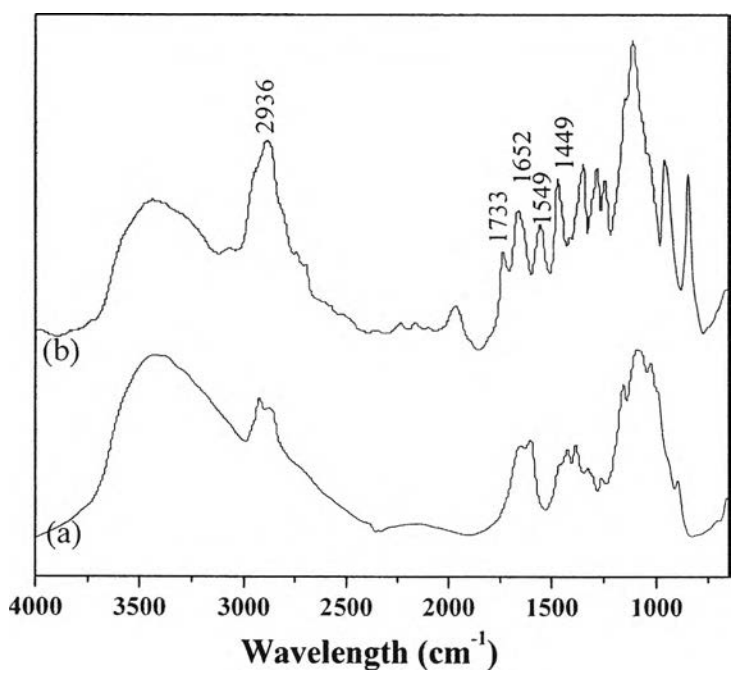

Figure C1. FTIR spectra of (a) CS and (b) CS-mPEG-DCA.

CURRICULUM VITAE

Name: Ms. Kaewkan Wasanasuk

Date of Birth: October 1, 1983

Nationality: Thai

University Education:

2001-2005 Bachelor Degree of Science in Chemistry, Faculty of Science and Technology, Thammasat University, Pathumthani, Thailand

Presentation:

1. Wasanasuk, K., Kamchaisatian, W., and Chirachanchai, S. (2007, July 1-6) Chitosan Functionalization in Water: A Novel Approach to Develop Chitosan-Allergen Delivery System. Paper presented at International Conference on Materials for Advanced Technologies 2007, Suntec Singapore International Convention&Exibition Centre, Sungapore.