APPENDICES

APPENDIX A

Chemical and physical properties of compounds used in this study

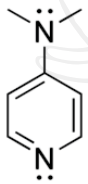
1. 4-(N,N-dimethylamino)pyridine

Name 4-(N,N-dimethylamino)pyridine

Chemical name 4-dimethylaminopyridine

Synonyms DMAP

Chemical structure



Empirical formula $C_7H_{10}N_2$

Molecular weight 122.17

Physical appearance white powder

Melting point 110-113 ^{o} C

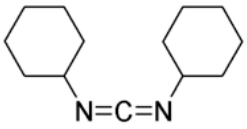
2. N,N'-dicyclohexylcarbodiimide

Name N,N'-dicyclohexylcarbodiimide

Chemical name N,N'-dicyclohexylcarbodiimide

Synonyms DCC

Chemical structure



Empirical formula $C_{13}H_{22}N_2$

Molecular weight 206.33

Physical appearance white powder

Melting point 34 ^{o} C

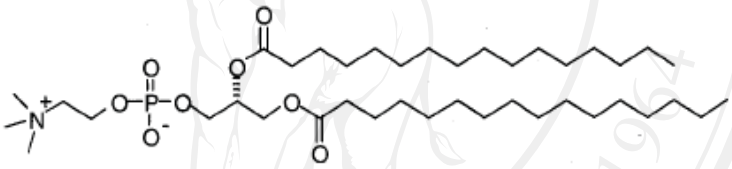
3. L- alpha dipalmitoyl phosphatidylcholine

Name L- alpha dipalmitoyl phosphatidylcholine

Chemical name 1,2-palmitoyl-sn-glycero-3-phosphocholine

Synonyms DPPC, lecithin

Chemical structure



Empirical formula $C_{40}H_{80}NO_8P$

Molecular weight 734.05

Physical appearance white powder

Melting point 41 ^{o}C

Solubility soluble in most organic solvents, insoluble but dispersible in water

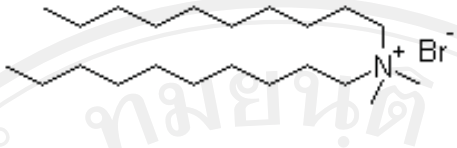
4. didecyldimethylammonium bromide

Name didecyldimethylammonium bromide

Chemical name didecyldimethylammonium bromide

Synonyms DDAB, Di-n-decyldimethylammonium bromide

Chemical structure



Empirical formula	$C_{22}H_{48}NBr$
Molecular weight	406.53
Physical appearance	white powder
Melting point	149 - 151 °C

APPENDIX B

Table B1 Physical appearances of various molar ratios of insulin to total lipids to determine the suitable ratio

Liposomal formulations	**Molar ratios of human insulin/total liposomal lipids**	**Physical appearances**
DPPC/chol 7:3	1:1	translucent, white dispersion, sedimentation +2
	1:6	translucent, white dispersion, sedimentation +3
	1:10	translucent, white dispersion, sedimentation +3
	1:50	translucent, white dispersion, sedimentation +2
	1:100	translucent, white dispersion, sedimentation +2
	1:200	translucent, white dispersion, sedimentation +1
	1:500	translucent, white dispersion, sedimentation +1
	1:1000	translucent, white dispersion, sedimentation +1

Note: +1 to +5 = degree of sedimentation from low to high

Table B1 Physical appearances of various molar ratios of insulin to total lipids to determine the suitable ratio (continued)

Liposomal formulations	**Molar ratio of insulin/total liposomal lipid**	**Physical appearances**
DPPC/chol/DDAB 7:2:1	1:1	translucent, white dispersion, sedimentation +1
	1:6	translucent, white dispersion, sedimentation +2
	1:10	translucent, white dispersion, sedimentation +3
	1:50	translucent, white dispersion, sedimentation +5
	1:100	translucent, white dispersion, sedimentation +4
	1:200	translucent, white dispersion, no sedimentation
	1:500	translucent, white dispersion, no sedimentation
	1:1000	translucent, white dispersion, no sedimentation

Note: +1 to +5 = degree of sedimentation from low to high

Table B1 Physical appearances of various molar ratios of insulin to total lipids to determine the suitable ratio (continued)

Liposomal formulations	**Molar ratio of insulin/total liposomal lipid**	**Physical appearances**
DPPC/chol/CTA 7:2:1	1:1	translucent, white dispersion, sedimentation +1
	1:6	translucent, white dispersion, sedimentation +2
	1:10	translucent, white dispersion, sedimentation +1
	1:50	translucent, white dispersion, no sedimentation
	1:100	translucent, white dispersion, no sedimentation
	1:200	translucent, white dispersion, no sedimentation
	1:500	translucent, white dispersion, no sedimentation
	1:1000	translucent, white dispersion, no sedimentation

Note: +1 to +5 = degree of sedimentation from low to high

Table B1 Physical appearances of various molar ratios of insulin to total lipids to determine the suitable ratio (continued)

Liposomal formulations	**Molar ratio of insulin/total liposomal lipid**	**Physical appearances**
DPPC/CTA/DDAB 7:2:1	1:1	translucent, white dispersion, no sedimentation
	1:6	translucent, white dispersion, no sedimentation
	1:10	translucent, white dispersion, no sedimentation
	1:50	translucent, white dispersion, sedimentation +1
	1:100	translucent, white dispersion, sedimentation +1
	1:200	translucent, white dispersion, no sedimentation
	1:500	translucent, white dispersion, no sedimentation
	1:1000	translucent, white dispersion, no sedimentation

Note: +1 to +5 = degree of sedimentation from low to high

APPENDIX C

Calculation for the production cost of CTA from cholesterol

Table C1 Chemical cost for production of CTA (cholesterol = 2.0 g→CTA 0.7248 g)

Chemical	Net content	Cost/Unit (Baht)	Amount of reagent	Cost/Unit (Baht)
1. Cholesterol	100 g	3,500	2.0 g	13.3
2. betaine HCl	100 g	780	0.8 g	6.24
3. dichloromethane	2500 ml	664	100 ml	26.56
4. DCC	100 g	1200	1.6 g	19.2
5. DMAP	10 g	1400	1.2 g	168
6. silica gel	1000 g	4500	35 g	157.5
7. petroleum ether	2500 ml	749	180 ml	53.92
8. ethyl acetate	2500 ml	664	20 ml	5.31
			Total chemical cost	450.03

Table C2 Power cost for production of CTA

Electronic	Power (Watt)	Time (hour)	Cost/Unit (baht)	Baht
1. heating mantle	40 w	48	2.5	48
			Total power cost	48

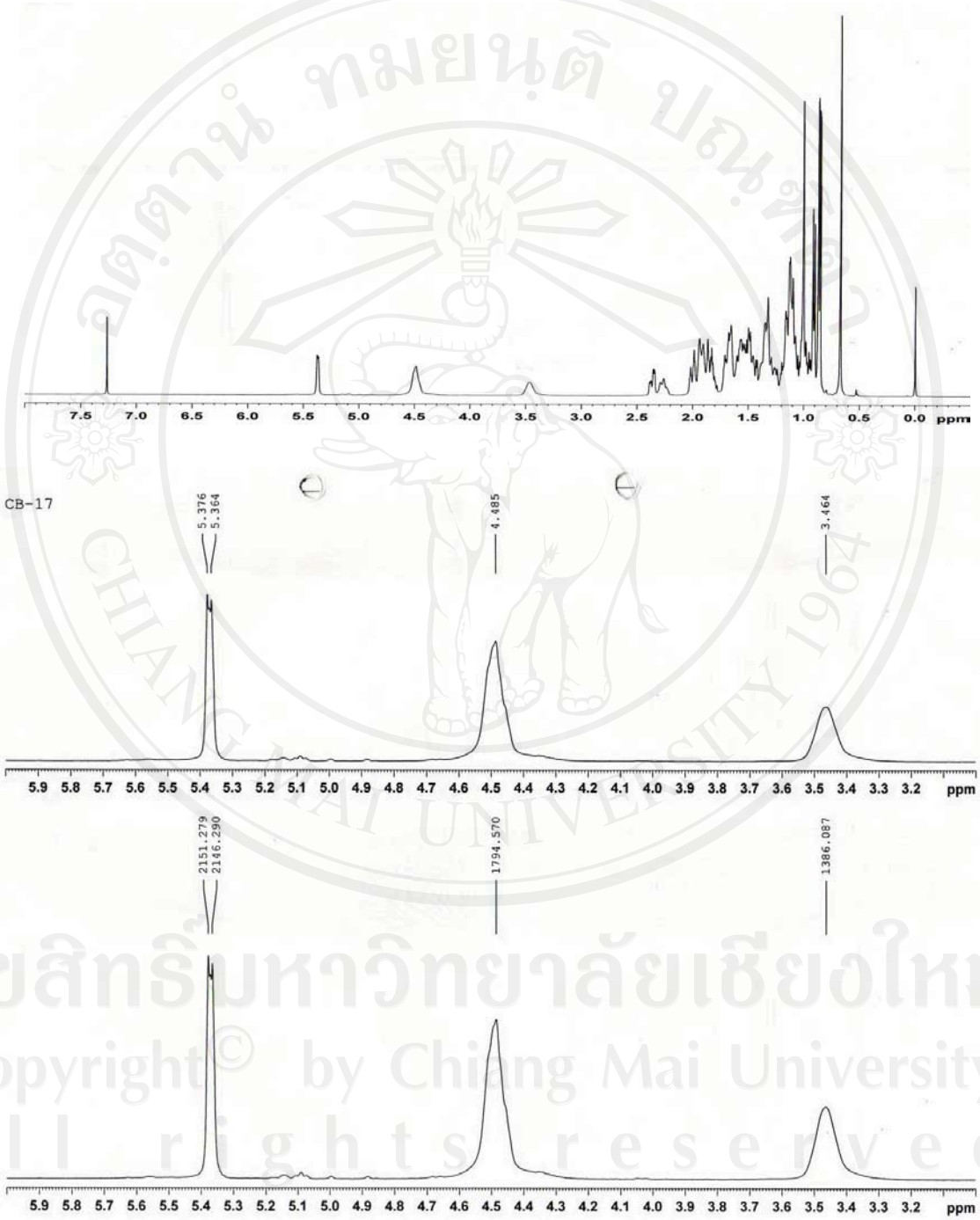
Total cost (chemical + power) = 498.03 baht

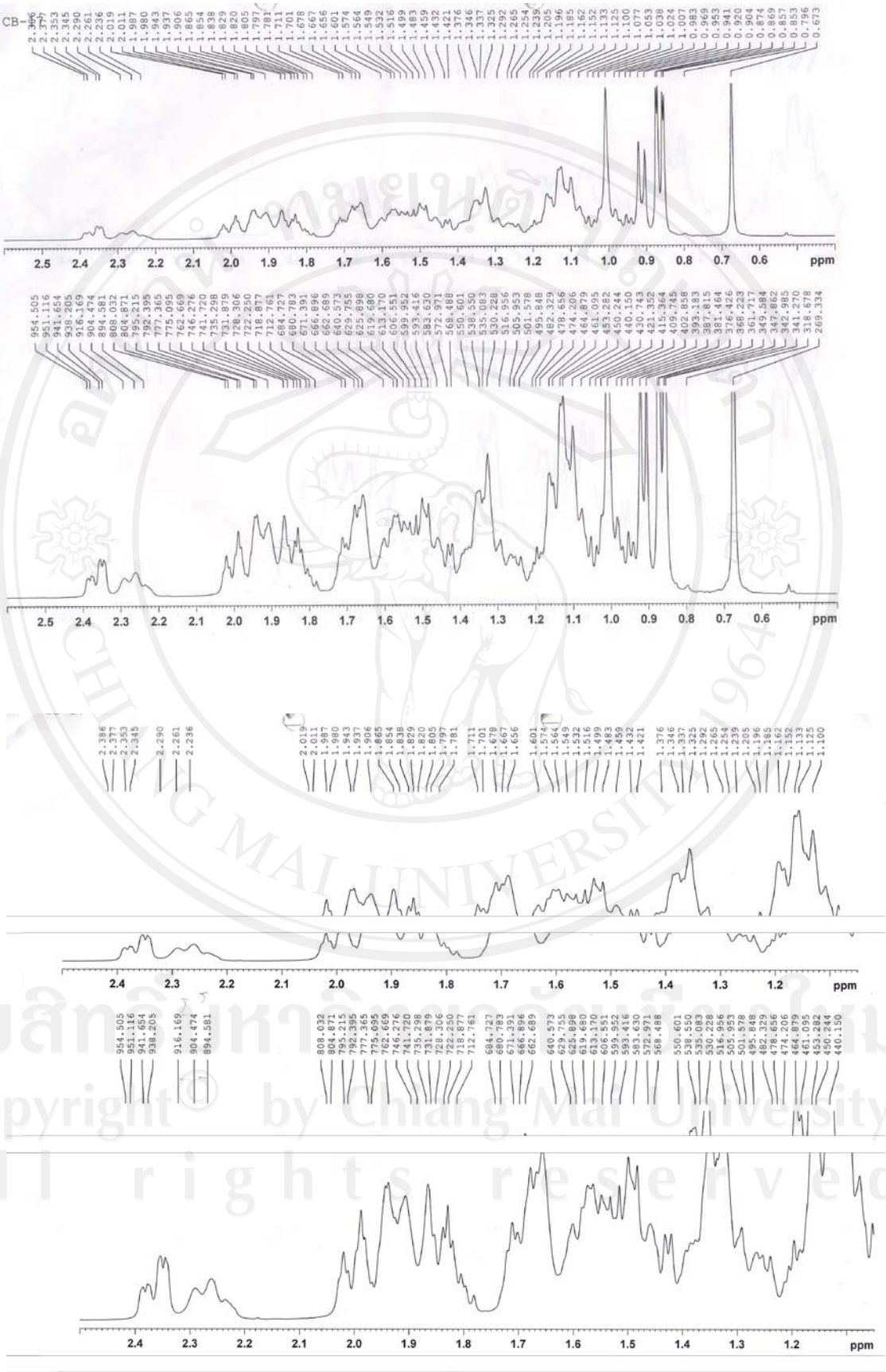
Cost/Unit = 687.13 baht/g

Note: Cost/Unit = chemical cost + power cost / weight of product

APPENDIX D

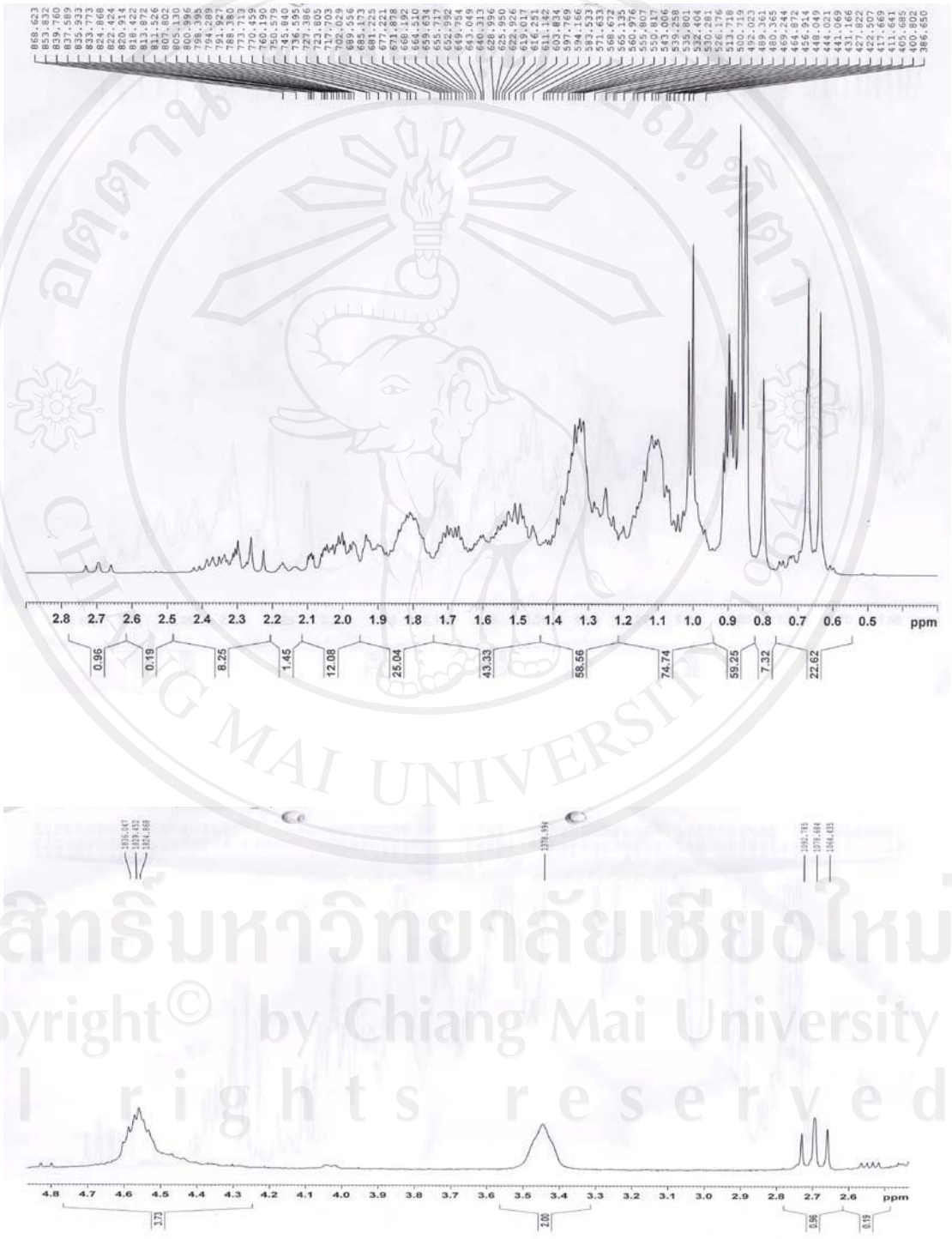
^{1}H-NMR spectrum of CTA

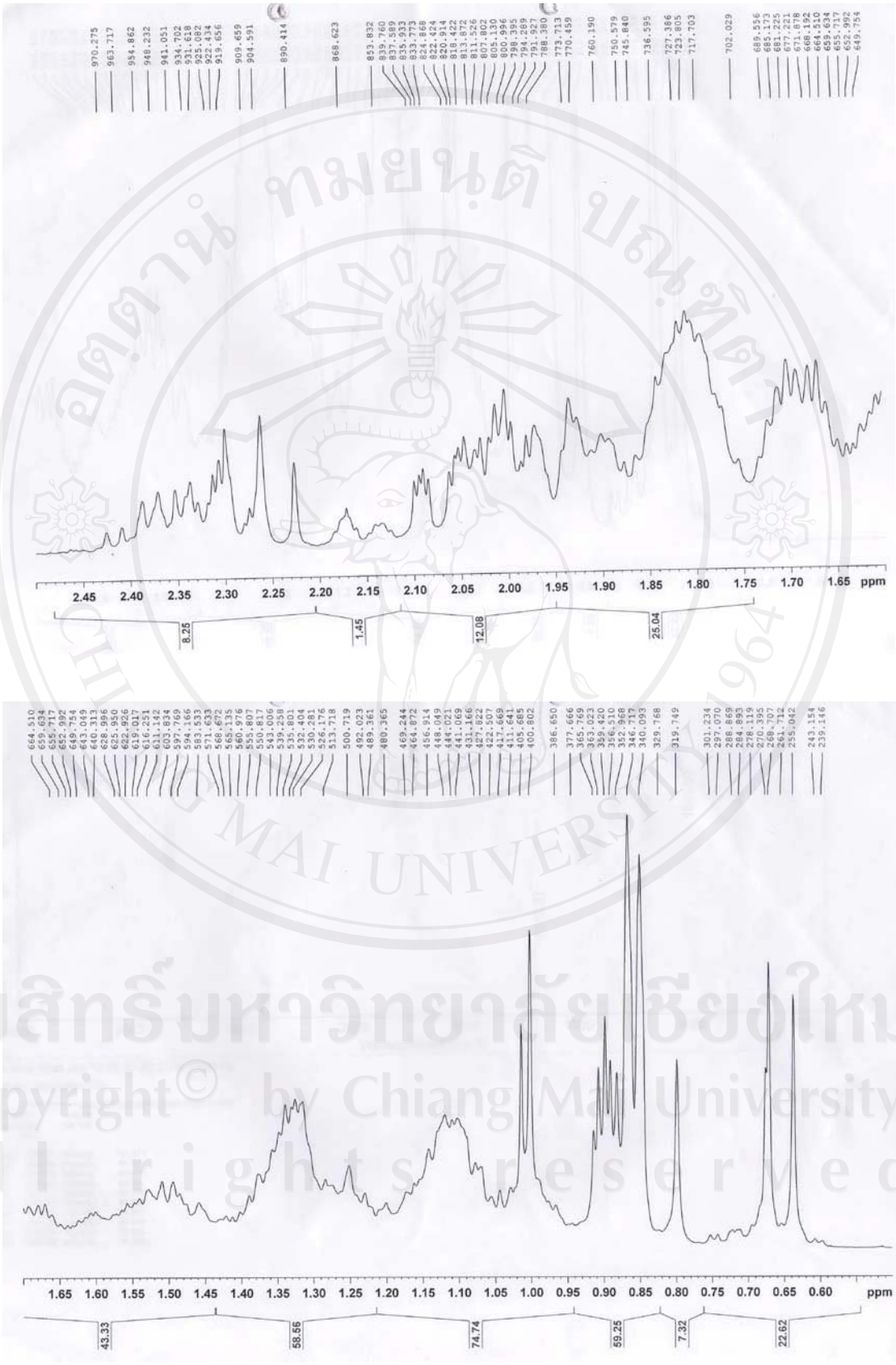




APPENDIX E

^{1}H-NMR spectrum of HCTA





CURRICULUM VITAE

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Birth place: Chiang Mai, Thailand

Education:

1991-1996	High school degree Wattanothaipayap School, Chiang Mai, Thailand
1997-2000	B.Sc. in Chemistry Chiang Mai University, Chiang Mai, Thailand
2005-2008	Master degree candidate at Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand

Poster presentation awards:

- The second award of the poster presentation title "Development of shampoo containing extract from Bai Mee (*Litsea glutinosa* (Lour.) C.B. Rob.) entrapped in niosomes" The Fifth National Thai Medicinal plants Expo: Traditional Thai medicine, in digenous medicine and alternative medicine , September 3-7, 2008, Impact Muang Thong Thani, Nonthaburi, Thailand

Scientific presentations:

1. Manosroi, A., **Komno, C.,** Werner, R. G. and Manosroi, J. The preparation of a cholesterol derivative for liposome formulations.

- The Second International Conference on Natural Products for Health and Beauty (NATPRO), December 17-19, 2008, Naresuan University at Phayao, Phayao, Thailand
- The Eighth National Seminar on Pharmaceutical Biotechnology, "Practical Seminar: Entrapment of aromatic volatile oil in nanoparticles for cosmetic and preparation of aromatic volatile oil from Thai medicinal plants for massage oil in SPA business", August 13-15, 2008, Lotus Pang Suan Kaew Hotel, Chiang Mai Thailand.

2. Manosroi, A., **Komno, C.,** Jainothee, P. and Manosroi, J. Development of shampoo containing extracts from Bai Mee (*Litsea glutinosa* (Lour.)C.B. Rob) entrapped in niosomes**.**
   - The Eighth National Seminar on Pharmaceutical Biotechnology, "Practical Seminar: Entrapment of aromatic volatile oil in nanoparticles for cosmetic and preparation of aromatic volatile oil from Thai medicinal plants for massage oil in SPA business", August 13-15, 2008, Lotus Pang Suan Kaew Hotel, Chiang Mai Thailand.
3. Manosroi, A., **Komno, C.** and Manosroi, J. Production of Cationic Lipids for Nanovesicle Preparation in Gene Therapy.
   - The First Thailand National Nanotechnology Conference: Pharmaceutical, Nanomaterials, Devices and Applications, August 14-16, 2007, The Central Duangtawan, Chiang Mai, Thailand ./ Academic Day 2007, November 10-12, 2007, Chiangmai University, Chiang Mai, Thailand.

4. Manosroi, J., Rounto, K., **Komno, C.**, Khanrin, P., Teerawutgulrag, A., Buddhasukh, D. and Manosroi, A. Ketone group blocking at the C-20 position of steroidal intermediates by acetalization reaction
   - The Seventh National Seminar on Pharmaceutical Biotechnology "Innovation : Applications of Nanotechnology in Pharmaceuticals, Cosmetics and Natural Products", August 9-11, 2006, Lotus Pang Suan Kaew Hotel, Chiang Mai Thailand.
   - The 32nd Congress on Science and Technology of Thailand (STT 2006), "Science and Technology for self-sufficient economy", October 10-12, 2006, Queen Sirikit National Convention Center (QSNCC), Bangkok, Thailand.
   - Academic Day 2006, December 8-10, 2006, Chiangmai University, Chiang Mai, Thailand.
5. Manosroi, A., Khanrin, P., **Komno, C**., Teerawutgulrag, A., Buddhasukh, D. and Manosroi, J. Synthesis of androstenedione from androsterone by Jone's reaction.
   - The Seventh National Seminar on Pharmaceutical Biotechnology "Innovation : Applications of Nanotechnology in Pharmaceuticals, Cosmetics and Natural Products", August 9-11, 2006, Lotus Pang Suan Kaew Hotel, Chiang Mai Thailand.
6. Manosroi, A., **Komno, C**., Teerawutgulrag, A., Buddhasukh, D. and Manosroi, J. A novel synthesis process of 5,6-epoxy-3β-hydroxy-5β-androstan-17-one from trans-dehydroandrosterone acetate by epoxidation reaction.

- The Seventh National Seminar on Pharmaceutical Biotechnology "Innovation: Applications of Nanotechnology in Pharmaceuticals, Cosmetics and Natural Products", August 9-11, 2006, Lotus Pang Suan Kaew Hotel, Chiang Mai Thailand.
- Academic Day 2006, December 8-10, 2006, Chiangmai University, Chiang Mai, Thailand.

Publication:

- Manosroi, A., **Komno, C**., Werner, R.G. and Manosroi, J., "The entrapment of human insulin in liposomes containing cationic lipids (CTA and DDAB)", in the process of manuscript preparation, 2009.