



## References

1. Smitinand, T., *Chaew Phan Mai Hang Pra Tet Thai*, Fansy Press, Bangkok, 1980,265.
2. Hooker, J. D. *Flora of British India, vol .V*. L. Reeva and Co., Oxford., 1954 p. 78.
3. Likitwitayawut, K., *Thai Journal of pharmaceutical sciences*, , 1988,(1) , 47.
4. Norman, R. F and Nuntavan Bunyapraphatsara *Thai Medicinal Plants*, 1992. : 193-196.
5. Montien-Art, P. *Structure and insect controlling activity of substance from Piper pediclellatum and selection of plants with insect antifeedant properties from genus Aglaia*. Master 's Thesis, Department of Chemistry, Chiangmai University. 1995.
6. Duh, C. Y.; Wu, Y. C.; and Wang, S. K. *J. Nat. Prod.*, 1990, 53(6) : 1575-1577.
7. Duh, C. Y.; Wu, Y. C.; and Wang, S. K. *Phytochemistry*, 1990, 29(8) : 2689-2691.
8. Russell, G. B. and Fenemore, P. G. *Phytochemistry*, 1973, 12: 1799-1803.
- 9 Mahmood, K.; Chan, K. C.; and Park, M. H.; Han, Y. N. and Han, B. H. *Phytochemistry*, 1986, 25(6) : 1509-1510.
10. Orjala, J.; Erdelmeier, C. A. J.; Wright, A. D.; Baumgartmer, B.; Rali, T. and Sticher, *Planta Med.*, 1989, 55 : 619-620.
11. Orjala, J.; Erdelmeier, C. A. J.; Wright, A. D.; Baumgartmer, B.; Rali, T. and Sticher, *Planta Med.*, 1990, 56 : 568.
12. Orjala, J.; Erdelmeier, C. A. .; Wright, A. D.; Baumgartmer, B.; Rali, T. and Sticher, *Planta Med.*, 1991, 57 : A79.
13. Orjala,J.; Erdelmeier, C. A. J.; Wright, A. D.; Baumgartmer, B.; Rali, T. and Sticher, *Phytochemistry*, 1993, 34(3) : 813-818.
14. Orjala, J.; Erdelmeier, C. A. J.; Wright, A.D.; Baumgartmer, B.; Rali, T. and Sticher, *Helv. Chim. Act.*, 1993, 76 : 1481-1488.
15. Achenbach, H.; Grob, T. and Protecop, J.; *Planta Med.*, 1984, 50(6) : 528-529.
16. Dominguez, X. A.; Verde S.; Sucar, S.; and Trevino, R. *Phytochemistry*, 1986, 25(1) : 239-240.

17. Duh, C. Y.; Wu, Y. C.; and Wang, S. K. *Planta Med.*, 1990, 56 : 524.
18. Dasgupta, S.; and Ray, A. B. *Indian J. Chem.* 1979, 17B : 538-540.
19. Junprasurt, J., Master's Thesis, Department of Chemistry, Chiangmai University. 1992.
20. Desai, S. T.; Chaturvedi, R. and Mulchandani, N.B. *J. Nat. Prod.*, 1990, 53(2) :
21. Sumathykutti, M. A. and Rao, J. M. *Phytochemistry*, 1991, 30(6) : 2075-2076.
22. Stevenson, R. and Williams, J. R. *Tetrahedron*, 1977, 33 : 285-288.
23. Banerji, A. and Ray, R. *Phytochemistry*, 1981, 20(9) : 2217-2220.
24. Banerji, A.; Ray, R.; Siddhanta, A. and Pal, S. *Indian J. Chem.*, 1979, 17B : 538.
25. Gupta, M. P.; Arias, T. D.; Williams, N. H.; Bos, R.; and Tattje, D. H. E. *J. Nat. Prod.*, 48(2) : 330-343.
26. Nair, M. G.; Sommerville, J. and Burke, B. A. *Phytochemistry*, 1989, 28(2) : 654-655.
27. Ampofo, S. A.; Roussis, V. and Wiemer, D. F. *Phytochemistry*, 1987, 26(8) : 2367-2370.
28. Likhitwitayawuid, K. *Th. J. Pharm. Sci.*, 1988, 13(1), : 47-68.
29. Likhitwitayawuid, K. *Th. J. Pharm. Sci.*, 1988, 13(1), : 168-169.
30. Koul, S. K.; Taneja, S. C.; Agarwal, V. K. and Dhar, W. L. *Phytochemistry*, 1988, 27(11) :
31. Yin, M. L.; Liu, J.; Chen, Z.L.; Long, K.; and Zeng, H.W. *Planta Med.*, 1991, 57 : A66.
32. Loder, J. W. and Nearn, R. H. *Phytochemistry*, 1972, 11 : 2645-2646.
33. Tepatipat, S., MS. Thesis, Chemistry Department, Graduate School, Chulalongkorn University., 1984, 1-62.
34. Green, T. P.; Galinis, D. L. and Wiemer, D. F. *Phytochemistry*, 1991, 30(5) : 1649-1652.
35. Green, T. P. and Wiemer, D. F. *Phytochemistry*, 1991, 30(11) : 3759-3762.
36. Mishra, S. S. and Tewari, J. P. *J. Pharm. Sci.*, 1964, 53 : 1423.
37. Patra, A. and Ghosh, A. *Phytochemistry*, 1974, 13 : 2889-2890.

38. Taneja, S. C.; Koul, S. K.; Pushpangadan, P.; Dhar, K. L., Daniewski, W. M. and Schilf, W. *Phytochemistry*, 1991, 30(3) : 871-874.
39. Boll, P.M.; Hald, M.; Parmar, V. S.; Tyagi, O. D.; BishT, K. D.; Sharma, N. K. and Hansen, S. *Phytochemistry*, 1992, 31(3) : 1035-1037.
40. Koul, S. K.; Taneja, S. C.; Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1983, 22(4) : 999-1000.
41. Koul, S. K.; Taneja, S. C.; Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1984, 23(9) : 2099-2101.
42. Koul, S. K.; Taneja, S. C.; Dhar, K. L. and Malhotra, S., *Phytochemistry*, 1993, 32(2) : 478-480.
43. Terhune, S. J.; Hogg, J. W. and Lawrence, B. M. *Phytochemistry*, 1974, 13 : 1183-1185.
44. Parbhu, B. R. and Mulchandani, N. B. *Phytochemistry*, 1985, 24(2) : 329-331.
45. Badheka, L. P; Parbhu, B. R. and Mulchandani, N.B. *Phytochemistry*, 1986, 25(2) : 487-489.
46. Badheka, L. P; Parbhu, B. R. and Mulchandani, N.B. *Phytochemistry*, 1987,26(7): 2033-2036.
47. Pelter, A.; Al-Rayati, R.; Hansel, R. and Dinter, H. *Tetrahedron Lett.*, 1981, 22(16) : 1545-1548.
48. Takahashi, S. *Phytochemistry*, 1969, 8 : 321-322.
49. Ogiso, A.; Kurabayashi, S.; Takahashi, S.; Mishima, H. and Woods, M. C. *Chem Pharm. Bull.* 1970, 18(1) : 105-114.
50. Matsui, K. and Munakata, K. *Tetrahedron Lett.*, 1976, 48 : 4371-4374.
51. Matsui, K. and Munakata, K. *Tetrahedron Lett.*, 1975, 24 : 1905-1908.
52. Chang, M. N.; Han, G. Q.; Arison, B. H.; Springer, J. P.; Hwang, S. B. and Shen, T. Y. *Phytochemistry*, 1985, 24(9) : 2079-2082.
53. Matsui, K. and Munakata, K. *Agric. Biol. Chem.*, 1976, 40(6) : 1113-1118.
54. Matsui, K.; Wada, . and Munakata, K. *Agric. Biol. Chem.*, 1976, 40(5) : 1045-1046.
55. Parmer, V. S.; Sinha, R.; Shakil, N. A.; Tyagi, O. D; Boll, P.M. and Wengel, A. *Indian J. Chem.*, 1993 32B : 392-393.

56. Maxwell, A. and Rampersad, D. *J. Nat. Prod.*, 1989, 52(2) : 411-414.
57. Okogun, J. I. and Ekong, D. E. U. *J. Chem. Soc. Perkin Trans I*, 1974, 45(32) : 2195-2198.
58. Dwuma-Badu, D.; Ayim, J. S. K.; Dabra, T. T.; Elsohly, H. N.; Kanapp, J. E.; Slatkin, D. J. and Schiff, P. L. *Lloydia.*, 1976, 38(4) : 343-345.
59. Dwuma-Badu, D.; Ayim, J. S. K.; Dabra, T. T.; *Lloydia.*, 1976, 39(1) : 60-64.
60. Addae-Mensah, I.; Torto, F. G. and Baxter, I. *Tetrahedron Lett.*, 1976, 35 : 3049-3050.
61. Ruangrungsi, N.; Prathanturarug, S.; Lange, G. L. and Organ, M. G. *Phytogram.*, 31(7) : 2397-2400.
62. Kijjoa, A.; Pinto, M. M. M.; Tantisewie, B. and Herz, W. *Planta med.*, 1989, 55 : 193-194.
63. Sondengam, B. L. and Kimbu, S. F. *Tetrahedron Lett.*, 1977, 1 : 69-70.
64. Atal, C. K.; Dhar, K. L. and Singh, J. *Lloydia.*, 1975, 83(3) : 256.
65. Sondengam, B. L.; Kimbu, S. F. and Connolly, J. D. *Phytochemistry*, 1977, 16 : 1121-1122.
66. Addae-Mensah, I.; Torto, F. G.; Torto, B. and Achenbach, H. *Planta Med.*, 1981, 41 : 200.
67. Addae-Mensah, I. And Achieng, G. *Planta Med.*, 1986, 52 : 432.
68. Gbewonyo, W. S. K. and Candy, D. J. *Planta Med.*, 1990, 56 : 525-526.
69. Crombie, L.; Pattenden, G. and Stemp, G. *Phytochemistry*, 1977, 16 : 1437-1438.
70. Addae-Mensah, I.; Gibbs, F.; Torto, F. G.; Dimonyeka, C. I.; Baxter, I. And Sanders, J. K. M. *Phytochemistry*, 1977, 16 : 757-759.
71. Addae-Mensah, I.; Torto, F. G.; Oppong, I. V. Baxter, I. And Sanders, J. K. M. *Phytochemistry*, 1977, 16 : 483-485.
72. Vieira, P.C.; DE Alvarenga, M. A.; Gottlieb, O. R. and Gottlieb, H. E. *Planta Med.*, 1980, 53 : 153-156.
73. Burke, B. and Nair, M. *phytochem.*, 1969, 25(6) : 1427-1430.
74. Singh, J. and Atal, C. K. *Phytochemistry*, 1969, 8 : 2253-2254.
75. Joshi, B. S.; Gawad, D. H. and Fuhrer, H. *Tetrahedron Lett.*, 1979, 26 : 2427-2430.

76. Diaz, P. P. D.; Arias, T. C. and Joseph-Nathan, P. *Phytochemistry*, 1987, 26(3) : 809-811.
77. Han, G. Q.; Dai, P.; Xu, L.; Ma, J.; Li, C. L. and Zheng, Q. T. *Planta Med.*, 1990, 56 : 583-584.
78. Atal, C. K.; Banga, S. S. *Curr.Sci.*, 1963, 8 : 354-355.
79. Chatterjee, A. and Dutta, C. P. *Tetrahedron.*, 1967, 23 : 1769-1781.
80. Tabuneng, W.; Bando, H. and Amiya, T. *Chem. Pharm. Bull.*, 1983, 31(10) :
81. Desai, S. J.; Prabhu, B. R. and Mulchandani, N.B. *Phytochemistry*, 1988, 27(5) : 1511
82. Talapatra, S. K.; Basu, D.; Chattopadhyay, P. and Talapatra, B. *Phytochemistry*, 1988, : 903-906.
83. Priestap, H. A. *Phytochemistry*, 1985, 24(4) : 849-852.
84. Dutta, C. P.; Banerjee, N. and Roy, D. N. *Phytochemistry*, 1975, 14 : 2090-2091.
85. Tillequin, F.; Paris, M.; Jacquemin, H. and Paris, R. R. *Planta Med.*, 1978, 33: 46-52.
86. De Diaz, A.M.P. and Gottlieb, O.R. *Planta med.*, 1979, 35 : 190-191.
87. Maxwell, A and Rampersad, D. *J.Nat. Prod.*, 1988, 51(2) : 370-373.
88. Banerji, A.; Sarkar, M.; Ghosal, T. and Pal, S. C. *Tetrahedron*, 1984, 40(24) : 5047-5052.
89. Jossang, P. and Molho, D. *J.Chromatog.*, 1967, 31 : 375-383.
90. Kretzschmar, R.; Meyer, H. J. and Teschendorf, *Experient.*, 1970, 26(3) : 283-284
91. Achenbach, H.; Karl, W. and Smith, S. *Chem. Ber.*, 1971, 104 : 2688-2693.
92. Achenbach, H.; Karl, W. and Smith, S. *Chem. Ber.*, 1971, 105 : 2182-2187.
93. Dutta, C. P.; Ray, L. R. K. and Chatterjee, A. *Phytochemistry*, 1972, 11 : 2891-2892.
94. Singh, J.; Dhar, K. L. and Atal, C. K. *Tetrahedron Lett.*, 1969, 56 : 4975-4978.
95. Smith, R. M. *Phytochemistry*, 1983, 22(4) : 1055-1056.
96. Smith, R. M.; Thakrar, H.; Arowolo, T. A. and Shaft, A. A. *J. Chromatog.*, 1984, 283 : 303-308.

97. Jaggy, H. and Achenbach, H. *Plant Med.*, 1992, 58 :111.
98. Gupta, O. P.; atal, C. K. and Gaiind, K. N. *Phytochemistry*, 1972, 11 : 2646.
99. Terhune, S. J.; Hogg, J. W.; Bromstein, A. C. and Lawrence, B. M. *Can. J. Chem.*, 53 : 3285-3293.
100. Raina, M. L.; Dhar, K. L. and Atal, C. K. *Planta Med.*, 1976, 30 : 198-200.
101. Miyakado, M.; Nakayama, I. And Yoshioka, H. *Agric. Biol., Chem.*, 1980, 44(7) : 1701-1703.
102. Nakatani, N.; Inatani, R. and Fuwa H. *Agric. Biol., Chem.*, 1980, 44(12): 2831-2836.
103. Inatani, R.; Nakatani, N. and Fuwa, H. *Agric. Biol., Chem.*,1981, 45(3) : 667-673.
104. Inatani, R.; and Nakatani, N. *Agric. Biol., Chem.*, 1981, 45(6) : 1473-1476.
105. Alencar, J. W.; Craveiro, A. A. and Matos, F. J. A. *J. Nat. Prod.*, 1984, 47(5) : 890-892.
106. Miyakado, M.; Nakayama, I.; Inoue, A.; Hatakoshi, M. and Ohno, N. *J. Pesticide Sci.*, 1985, 10 : 25-30.
107. Miyakado, M.; Nakayama, I.; Inoue, A.; Hatakoshi, M. and Ohno, N. *J. Pesticide Sci.*, 1985, 10 : 11-17.
108. Dhar, K. L. and Raina, M. L. *Planta Med.*, 1973, 23 : 295-297.
109. Gupta, O. P.; Gupta, S. C.; Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1978, 17 : 601- 602.
110. Sehgal, C. K.; Kachroo, P. L.; Sharma, R. L.; Taneja, S. C.; Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1979, 18 : 1865-1867.
111. Shah, S.; Kalla, A. K. and Dhar, K. L. *Phytochemistry*, 1986, 25(8) : 1997-1998.
112. Dhar, K. L.; Atal, C. K. and Pelter, A. *Planta Med.*, 1970, 18 : 332-335.
113. Gupta, O. P. and Atal, C. K. *Indian J. Chem.*, 1972, 10 : 874.
114. Gupta, O. P.; Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1976, 15 : 452.
115. Gupta, O. P.; Gupta, S. C. Dhar, K. L. and Atal, C. K. *Indian J. Chem.*, 1976, 14B : 912-913.
116. Gupta, O. P.; Gupta, S. C. Dhar, K. L. and Atal, C. K. *Phytochemistry*, 1977, 16 : 1436-1437.



117. Banerji, A.; Bandyopadhyay, D.; Sarkar, M.; Siddhanta, A. K.; Pal, S. C.; Ghosh, S.; Abraham, K. and Shoolery, J. N. *Phytochemistry*, **1985**, *24(2)* : 279-284.
118. Ahn, J. W.; Ahn, M. J.; Zee, O. P.; Kim, E. J.; Lee, S. G.; Kim, H. J. and Kubo, I. *Phytochemistry*, **1992**, *31(10)* : 3609-3612.
119. Triaccontanol, *Nerotoxicology*, **1985**, *6,63* through C.H. 103 : 66636p.
120. Takahashi, S.; Kurabayashi, M.; Ogiso, A. and Mishima, H. *Chem. Pharm. Bull.*, **1969**, *17(6)* : 1225-1228.
121. Maxwell, A. and Rampersad, D. *J. Nat. Prod.*, **1991**, *54(4)* : 1150-1152.
122. Maxwell, A. and Rampersad, D. *J. Nat. Prod.*, **1989**, *52(3)* : 614-618.
123. Hansel, R. and Pelter, A. *Phytochem.*, **1971**, *10* : 1627-1634.
124. Pelter, A.; Ayoub, M. T. Schultz, J. Hansel, R. and Reinhardt, D. *Tetrahedron lett.*, **1979**, *18* : 1627-1630.
125. Hensel, R. and Leuschke, A. *Phytochem.*, **1976**, *15* : 1323.
126. Masuda, T.; Inazuni, A. ; Yamada, Y.; Padolina, W. G.; Kikuzaki, H. and akatani, N. *Phytochem.*, **1991**, *30(10)* : 3227-3228.
127. Greca, M. D.; Monaco, P. Previtera, L.; Aliotta, G.; Pinto, G. and Pollio, A. *Phytochem.*, **1989**, *28(9)* : 2319-2321.
128. Likhitwitayawuid, K. and Ruangrunsi, N. *Tetrahedron*, **1987**, *43(16)* : 3689-3694.
129. Tyagi, O. D.; Jensen, S.; Boll, P.M.; Sharma, N. K.; Bisht, K. S. and Parmar, V. S. *Phytochem.*, **1993**, *32(2)* : 445-448.
130. Joshi, N.; Garg, H. S. and Bhakuni, B. S. *J. Nat. Prod.*, **1990**, *53(2)* : 479-482.
131. Boonyaratavej, S.; Tantayanontha, S. Kitchanachai, P. Chaichantipyuth, Chittawong, V. and Miles, D. H. *J. Nat. Prod.*, **1992**, *52(12)* : 1761-1763.
132. Urzua, A.; Freyer, A. J. and Shamma, M. *Phytochem.*, **1987**, *26(50)* : 1509-1511.
133. Shimonura, H.; Sashida, Y. and Oohara, M. *Phytochem.*, **1988**, *27(2)* : 634-636.
134. Malhotra, S.; Koul, S. K.; Taneja, S. C.; Pushpangadan, P. and Dhar, K. L. *Phytochem.*, **1990**, *29(8)* : 2733-2734.
135. Banerji, A. Banerji, J. Chatterjee and Shoolery, J.N. *Indian J. Chem.*, **1980**, *19B* :
136. Banerji, J. and Dhara, K. P. *Phytochem.*, **1974**, *13* : 2327-2328.

137. Banerji, A. and Pal, S. C. *Phytochem.*, 1982, 21(6) : 1321-1323.
138. Banerji, A. and Pal, S. C. *Phytochem.*, 1983, 22(4) : 1028-1030.
139. Banerji, A. and Pal, S. C. *J. Nat. Prod.*, 1982, 45(6) : 672-675.
140. Gisvold, O. and Roger, C. H. *The Chemistry of Plant Constituents*, Burgren Publishing Company, USA, 1st ed.; 1938, 53
141. Filho, R. B.; De Souza, M. P. and Mattos, M. E. O. *Phytochemistry*, 1981, 20 : 345- 346.
142. Galinis, D. L. and Wiemer, D. F. *J. Org. Chem.*, 1993, 53 : 7804-7807.
143. Viswanathan, N.; Balakrishnan, V.; Joshi, B. S. and Philipsborn, W. V.; *Helv. Chem. Act.*, 1975, 58(8) : 2295-2305.
144. Joshi, B. S.; Viswanathan, N.; Gawad, D. H.; Balakrishnan, V. and Philipsborn W. V. *Helv. Chem. Act.*, 1975, 58(8) : 2295-2305.
145. Joshi, B. S.; Viswanathan, N.; Gawad, D. H.; Balakrishnan, V. and Philipsborn W. V. and Quick, A. *Experientia.*, 1975, 15(8) : 880-881.
146. Joshi, B. S.; Viswanathan, N.; Gawad, D. H.; and Philipsborn, W. V. *Helv. Chem. Act.*, 1975, 58(6) : 1551-1559.
147. Singh, J.; Potdar, M. A.; Atal, C. K. and Dhar, K. L. *Phytochemistry*, 1974, 13 : 677-
148. Chavasiri, W., MS. Thesis, Chemistry Department, Graduate School, Chulalongkorn Univ., 1988. and Kokpol, U., Chavasiri, W., Chittawong, V., Cunningham, C.N. and Miles, , Long chain Aliphatic Alcohols and Saturated Carboxylic Acids from Heartwood of *Rhizophora apiculata*, *phytochemistry*, 1993, 33, 1129
149. Airan, J. W. and Sheth, A. R. *J. Univ. Bombay* 26A, 1957, : 1-6.
150. Nigram, S. S. and Purohit, R. M. *Reich stoffe Aromen* 12, 1962, : 185-190.
151. Deshpande, S. M. *Curr. Sci.* 1970, 39(16) : 372.
152. Ali, S. M. and Mehta, R. K. *INDIAN J PHARM*, 1970, 32(5) : 132-133.
153. Khosa, R. L. and Dixit, S. N. *Indian J. Pharm.* 1971, 33(6) : 118.
154. Nanda, Ram S. and Krishna Kapoor. *INDIAN J MED RES.*, 1972, 59(12) ; 1968-1970.



157. Evans, P. H.; Bowers, W. S. and Funk, E. J. *J. Agric. Food Chem.* **1984**, *32* : 1254-
158. Huang, S. L. and Chang, W. H. *Chung-kuo Nung Yeh Hua Hsueh Hui Chih* **1986**, 199-210.
159. Rawat, A. K. S.; Tripathi, R. P.; Khan, A. J.; and Balasubrahmanyam, V. R. *Biochem. Syst. Ecol.* **1989**, *17(1)* : 35-38.
160. Said, I. M.; Dim, L. B.; Lajis, W. H. and Ruln Kiew *The Malaysian Nat. Prod. Society.* **1996**, 237-241.
161. Fessenden, R. J. and Fessenden, J. S. *Techniques and Experiments for Organic Chemistry.* Willard Grant Press, **1983**, 227.
162. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G. and Tatchell, A. R. *Vogel's Textbook of Practical Organic Chemistry.* 5<sup>th</sup> ed. Great Britain : English Language Book Society. Longman, **1980**, 264.
163. These experiments were carried out in the collaboration with Beijing Medical School, Republic of China.
164. Calegate, S. M. and Molyneux, R. T. *Bioactive Natural Products* CRC Press, : 441.
165. Dudley, H. and Lan, F., *Spectroscopic Method Organic Chemistry*, **1995**, 46.
166. Despande, S. M. and Upadhyay, R. R., *Experientia*, **1970**, *26*, 10,
167. Chavasiri, W., MS. Thesis, Chemistry Department, Graduate School, Chulalongkorn Univ., **1988**. 214.
168. Thongkorn, N., MS. Thesis, Chemistry Department, Graduate School. Chulalongkorn Univ., **1988**, 62.
169. Evan, P., Bower, W. and Funk, J. *J. Agric. Food Chem.* **1984**, *32*, 1255.
170. Fransworth, N. *J. Pharm. Sci.*, **55**, **1966**, 260.
171. Breitmaier, E., and Velter, W. Carbon-13 NMR spectroscopy 3<sup>rd</sup> .ed , VCH Publishers, New York, NY, **1987**, 384.
172. Mizutani, T; Satoh, K.; Nomura, H; *Rea Commun Chem Pathol Pharmacol.* **1991**, 87-95.
173. Liu, J. K.; Zuo, C. X.; *Chih Wu Hsueh Pao.* **1987**, *291* : 84-87.

174. Soedigdo, S.; Manjang, J., Cholies, N. and Soedigdo, P. *ABSTR 4<sup>TH</sup> ASIAN SYMP MED PLANTS SPICES BANGKOK THAILAND SEPTEMBER 15-19 1980*: 112.
175. *The role of triterpenoids in the topical anti-inflammatory activity of calendula officinalis flowers.*
176. Davis, R. H.; Di Donato, J. J.; Johnson, R. W. and Stewart, C. B. *J Amer Pod Med Ass.* 8412, 1994 : 614-621.
177. Recio, M. C.; Giner, R. M.; Manex, S. and Rios, J. L. *Planta med.* 1995 612 : 182-185.
178. Kweifio-Okai, G.; Field, B.; Rumble, B. A.; Macrides, T. A. and De Munk, F. *Drug Dev Res.* 1995, 137-141.
179. Fournet, A.; Angelo, A.; Monoz, V.; Roblot, F.; Hocquemiller, R.; and Cave, A. *J Ethnopharmacol.* 1992, 372 : 159-164.
180. Khalid, S. A.; Farouk, A.; Geary, T. G. and Jensen, J. B. *J Ethnopharmacol.* 1986, 152 201-209.
181. Baskar, R.; Malini, M. N. and Varalakshimi, P. *Fitoterapia.* 1996, 472 : 121-125.
182. Sheth, K.; Bianchi, E.; Wiedhopf, R. and Cole, J. R. *J Pharm Sci.* 1973, 62 : 139-
183. Wang, J. H.; Huang, W.; Zhang, Z. H. and Yu, C.G. *Zhonghua Yaoxue Zashi* 1994, :268-271.
184. Anand, R.; Patnaik, G. K.; Kulshreshtha, D. K. and Dhawan, B. N. *Phytother Res.* 87 : 417-421.
185. Effect of LUPEOL, A Pentacyclic Triterpene, On Urinary Enzymes In Hyperoxaluric Rats.
186. Kakiuchi, N.; Senaratne, L. R. E.; Huang, S. L.; Yang, X. W.; Hattori, M.; Pilapitya, U. and Namba, T. *Planta. Med.* 1991, 571 : 43-46.
187. Kweifio-Okai, G.; Munk, F.; Macrides, T. A.; Smith, P; and Rumble, B. A. *Drug Des Res.* 1995, 361 : 20-24.
188. Kubo, I.; and Fukuhara, K. *J. Nat. Prod.* 1990, 534 : 968-971.
189. Farnsworth, N. R.; Cordell, G. A.; Pezzuto, J. M. and Kinghorn, A. D. . *J. Nat. Prod.* 1996, 597 : 658-663.

190. Buhler, H.; Perschel, F. H. and Hierholzer, K. *Biochem Biophys Acta*. 1991, 10753 ; 206-212.
191. Park, H. J.; Lee, M. S.; Lee, E.; Choi, M. Y.; Ch A, B. C.; Jung, W. T. and Young, H. S. *Korean J Phamacog* 1995, 261 : 40-46.
192. Da Rocha,R.F.; Lapa,A.J.; Ribeiro Do Vale,J.; Braz,R.F.;and Barbosa Da Silva,S. *Cienc Cult (Sao Paulo)* 1981, 33 : 158-162.
193. Yasukawa, k.; Takido, M.; Matsumoto, T.; Takeuchi, M. and Nakagawa, S. *Oncology* 1991, 481 : 72-76.
194. Yasukawa, K.; Yu,S.Y.; Yamanouchi, S.; Takido, M.; Akihisa, T. and Tamura, T. *Phytomedicine*. 1995, 14 : 309-313.
195. MaLini, M. M.; Baskar, R. and Varalakshmi, P. *Jap. J. Med. Sci. Biol.* 1995, 485/6 ;
196. Gorgj, N.B.; and Thakur, M. S. *Plant Growth Promotor and Brit UK.Pat. Appl GB. 2, 144, 728, March, 1985, 13.*

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## Appendices

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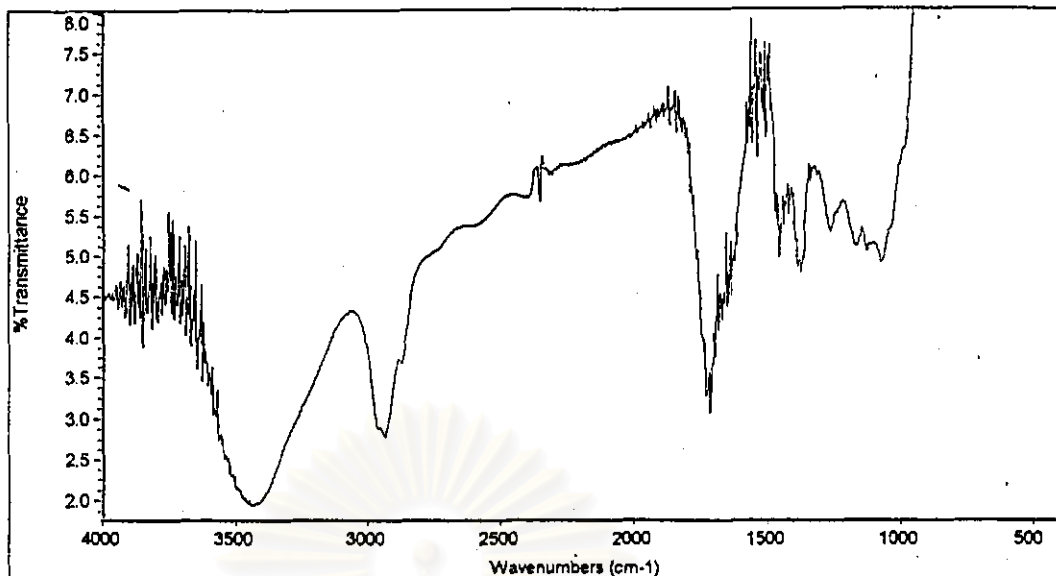


Figure 4 The IR spectrum of Mixture 1

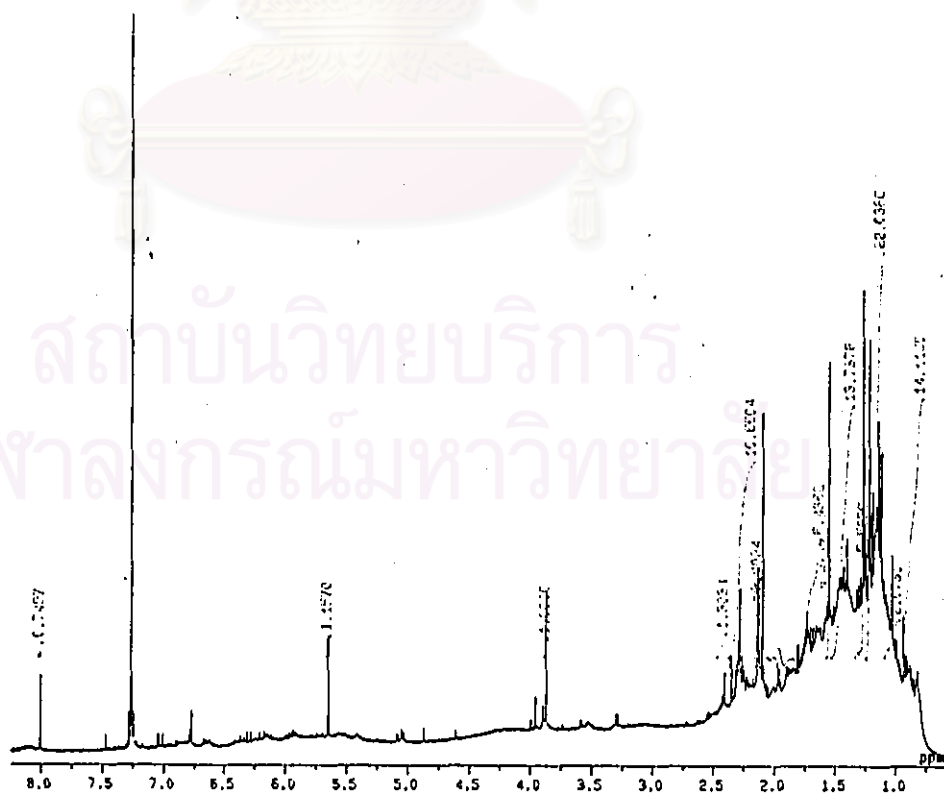


Figure 5 The <sup>1</sup>H NMR spectrum of Mixture 1



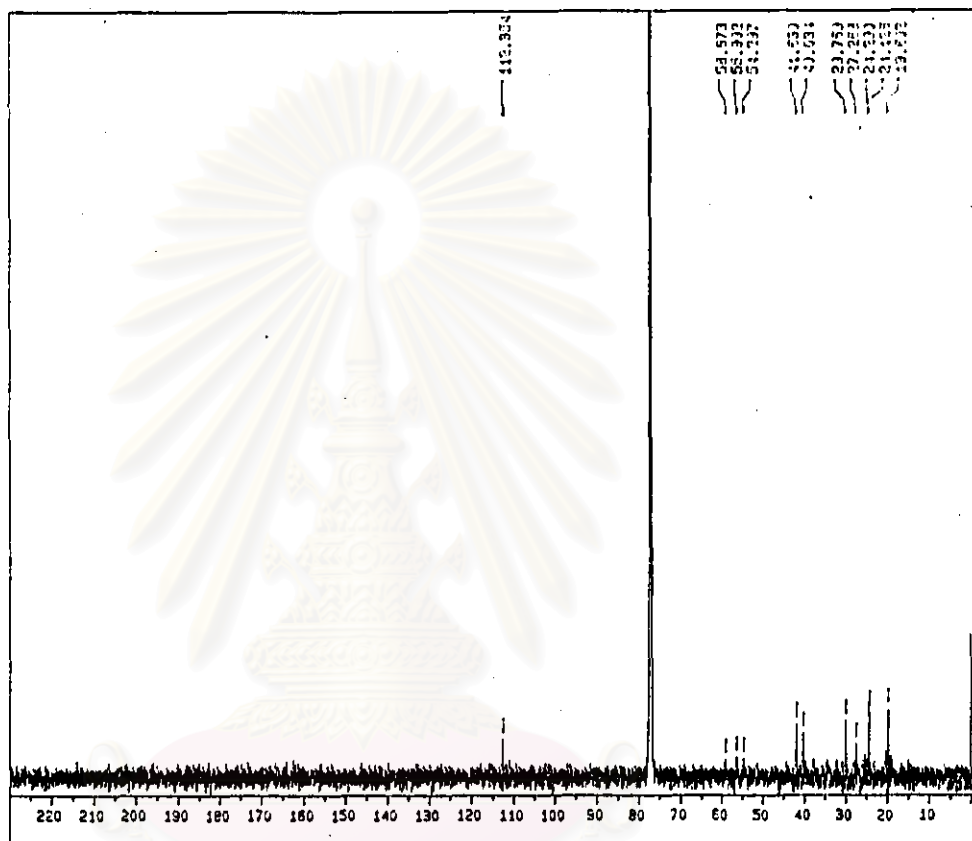


Figure 6 The  $^{13}\text{C}$  NMR spectrum of Mixture 1

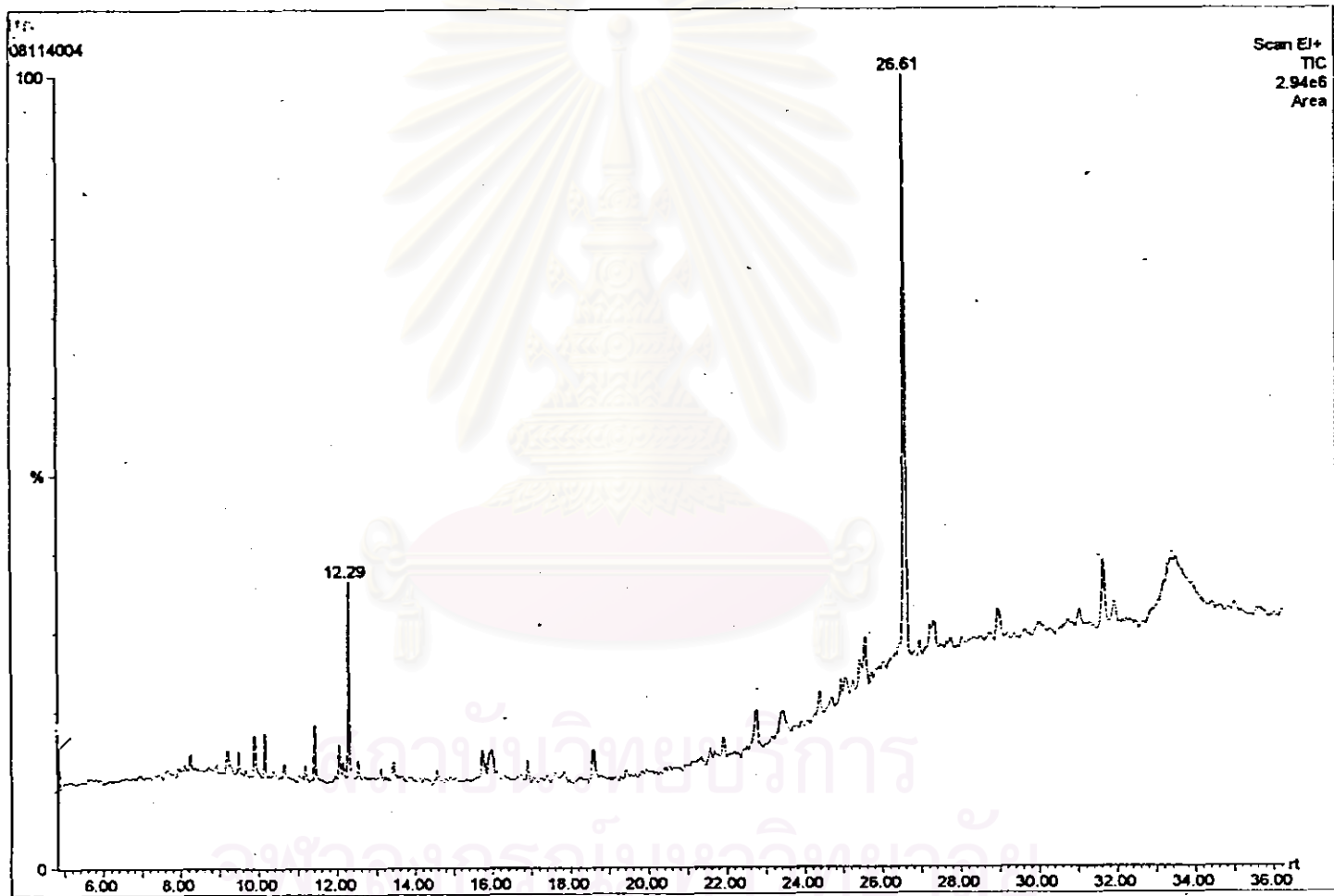


Figure 7 The GLC analysis results of Mixture 1

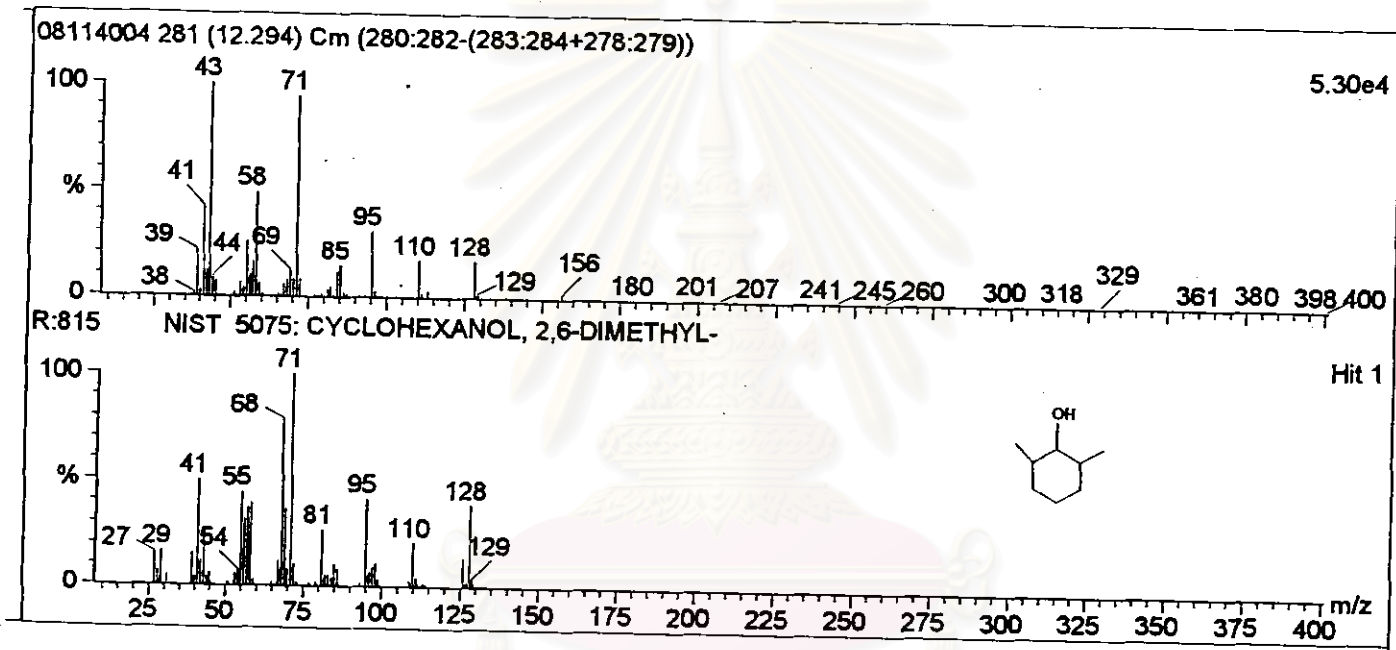


Figure 8 The mass spectrum of Mixture 1 at Rt 12.29 min

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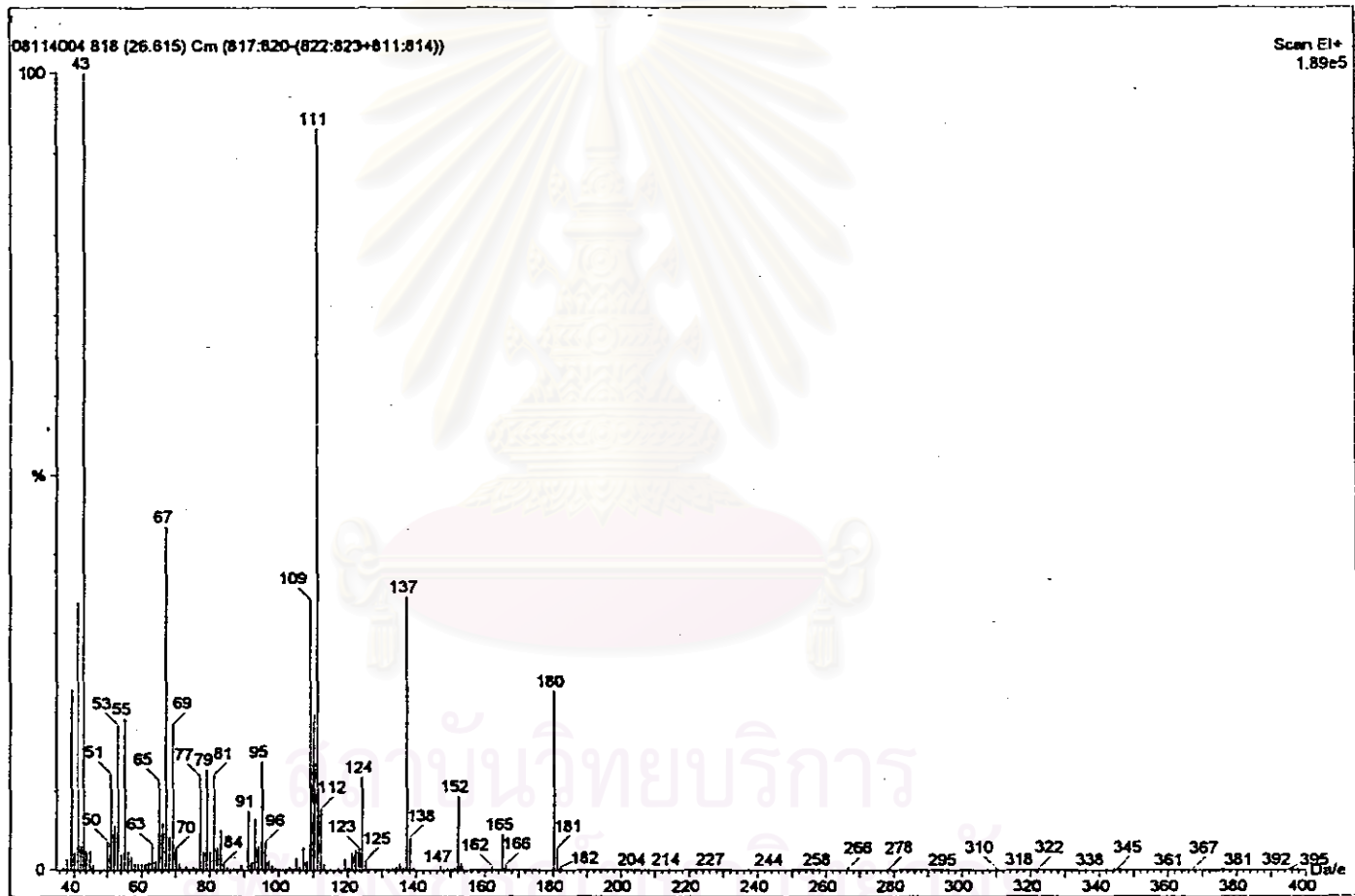


Figure 9

The mass spectrum of Mixture 1 at Rt 26.62 min

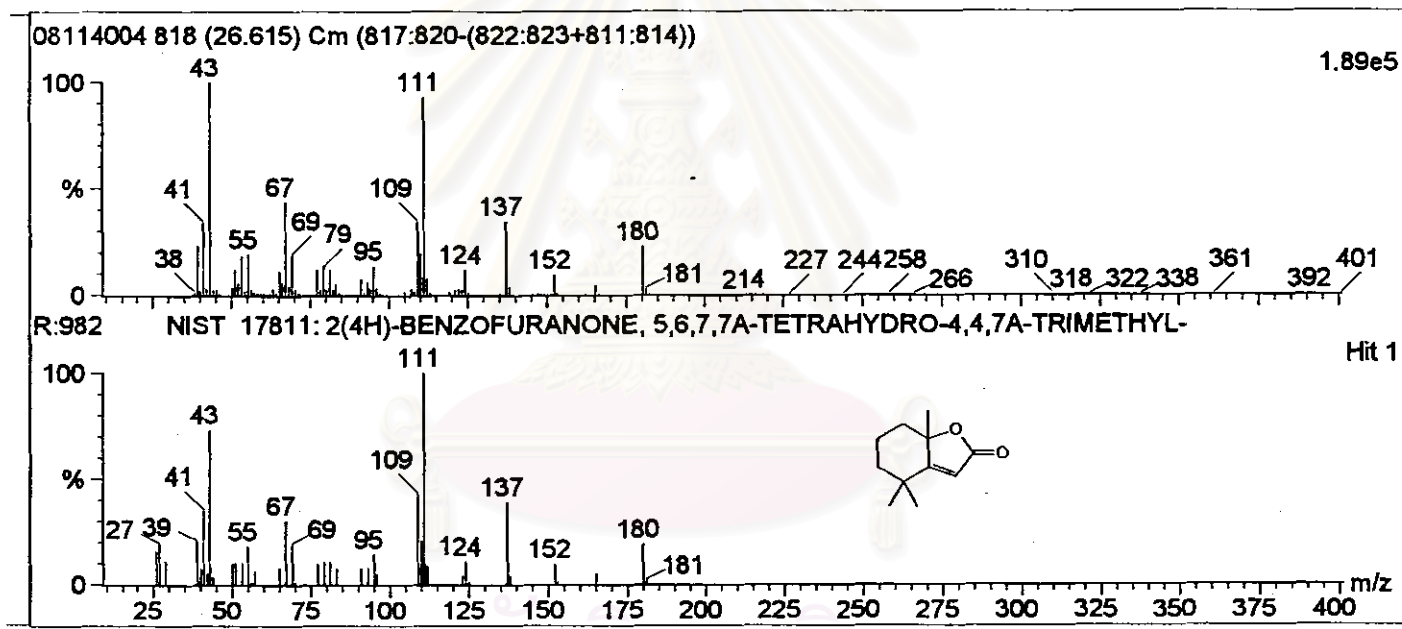


Figure 10 The mass spectrum of Mixture 1 at Rt 26.62 min



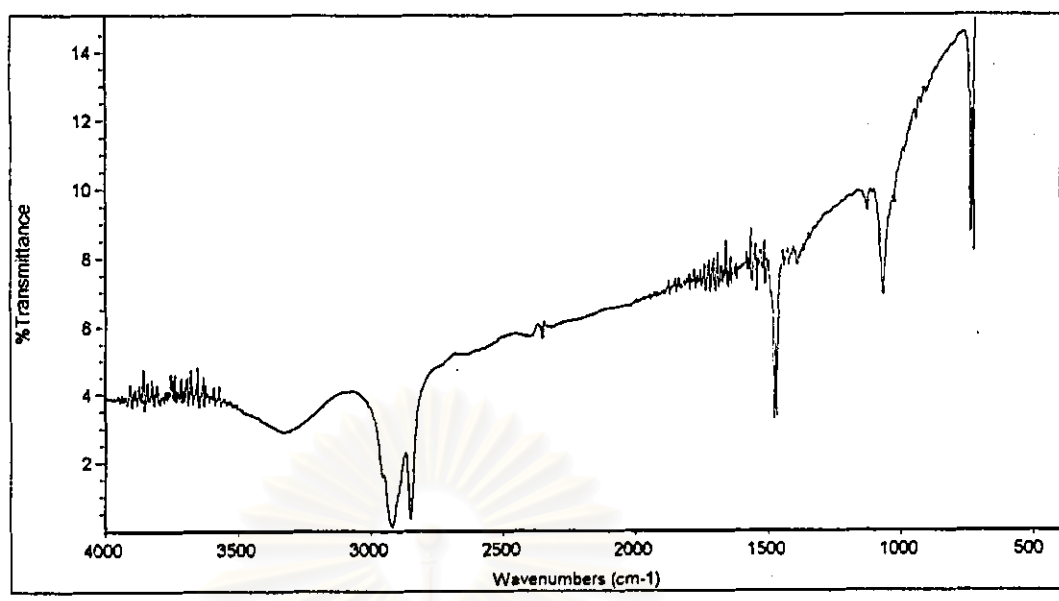


Figure 11 The IR spectrum of Mixture 2

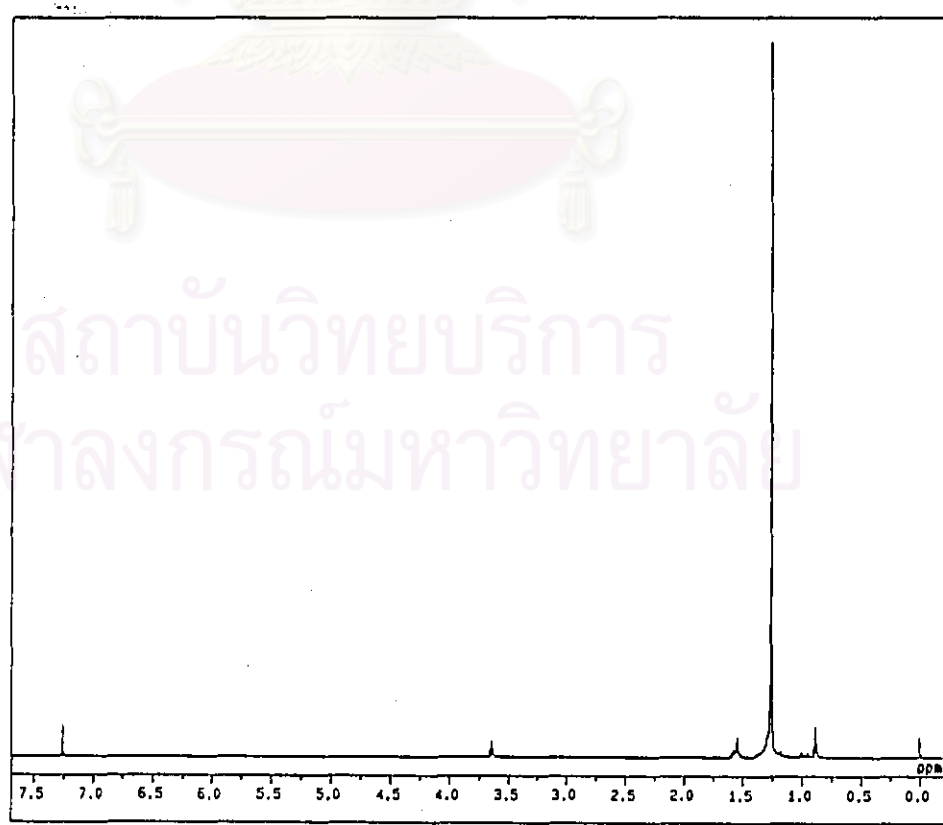


Figure12 The <sup>1</sup>H NMR spectrum of Mixture 2

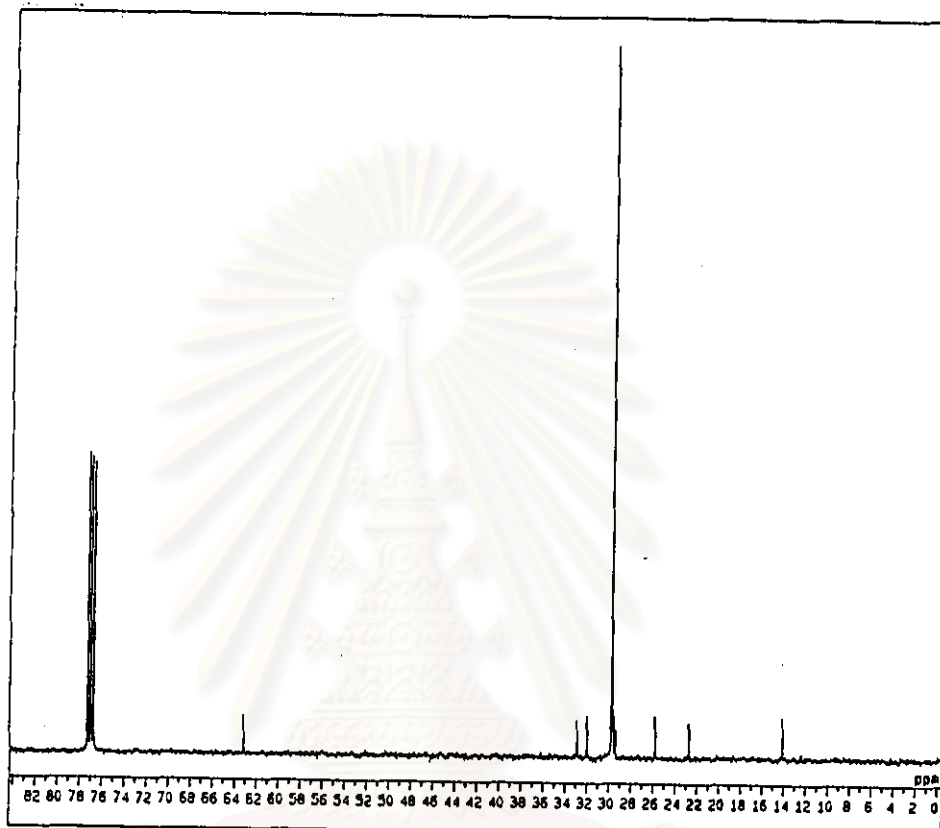


Figure 13 The  $^{13}\text{C}$  NMR spectrum of Mixture 2

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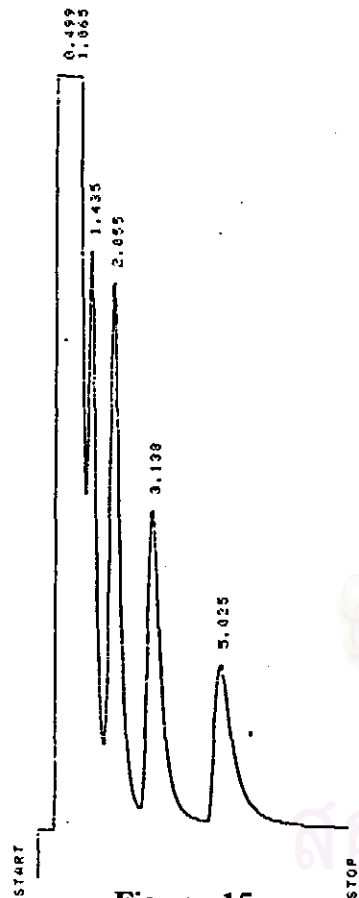


Figure 15

Figure 14 The GLC analysis results of Mixture 2

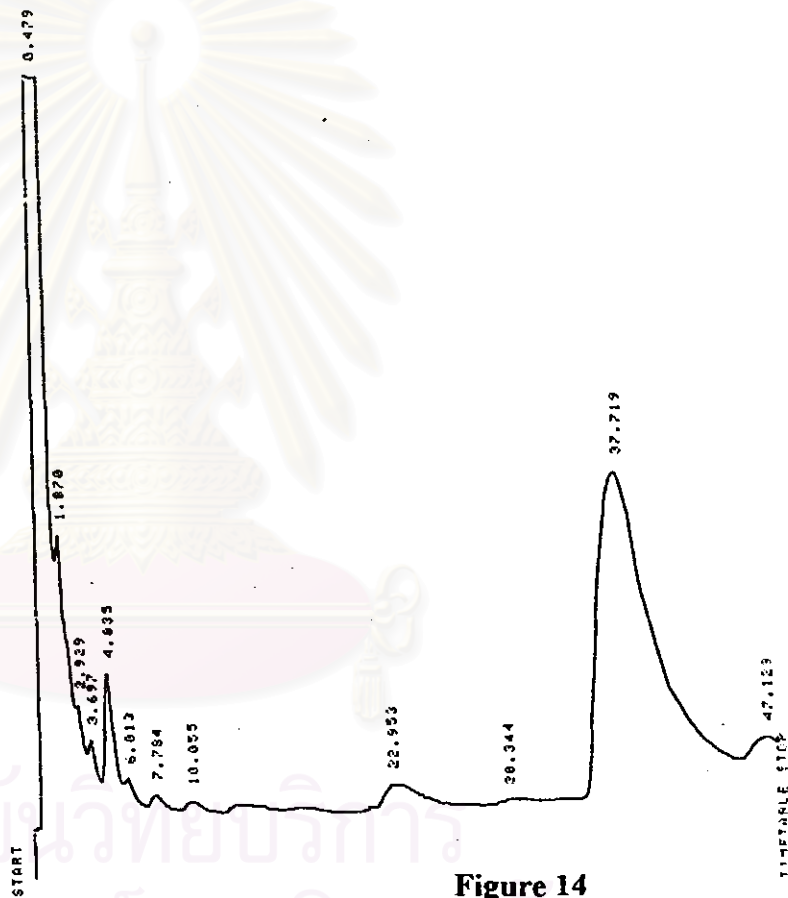


Figure 14

Figure 15 The GLC analysis results of standard long chain aliphatic alcohol

(C= 14, 16, 18, 20 and 22)

Calibration curve of standard long chain alcohol

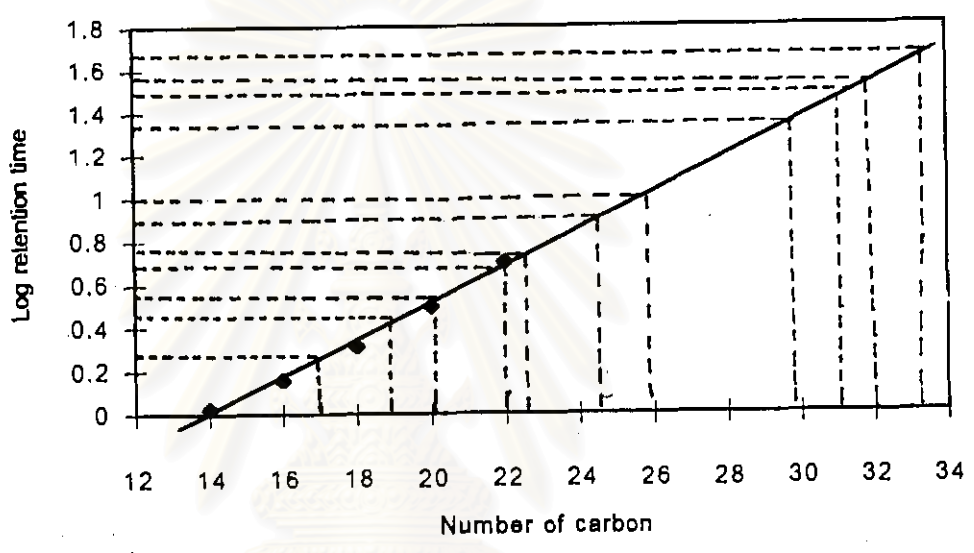


Figure 16 The calibration curve of standard long chain aliphatic alcohol

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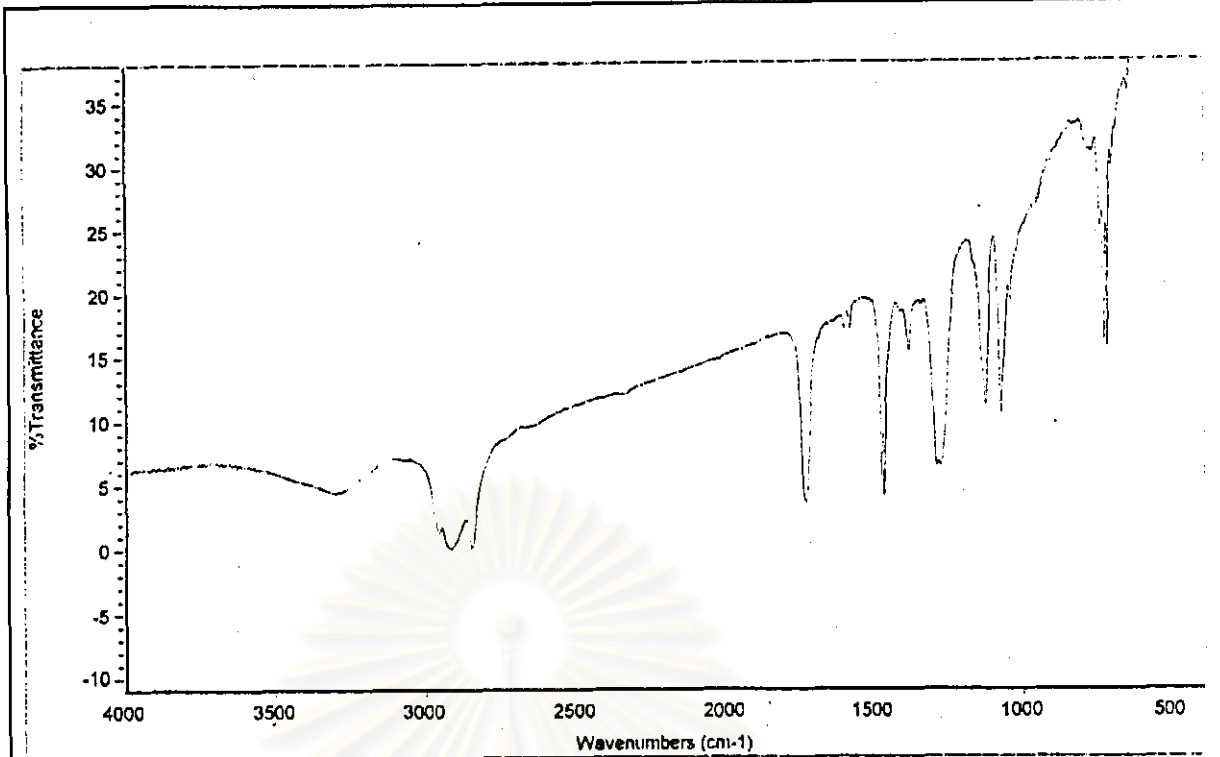


Figure 17 The IR spectrum of Mixture 3

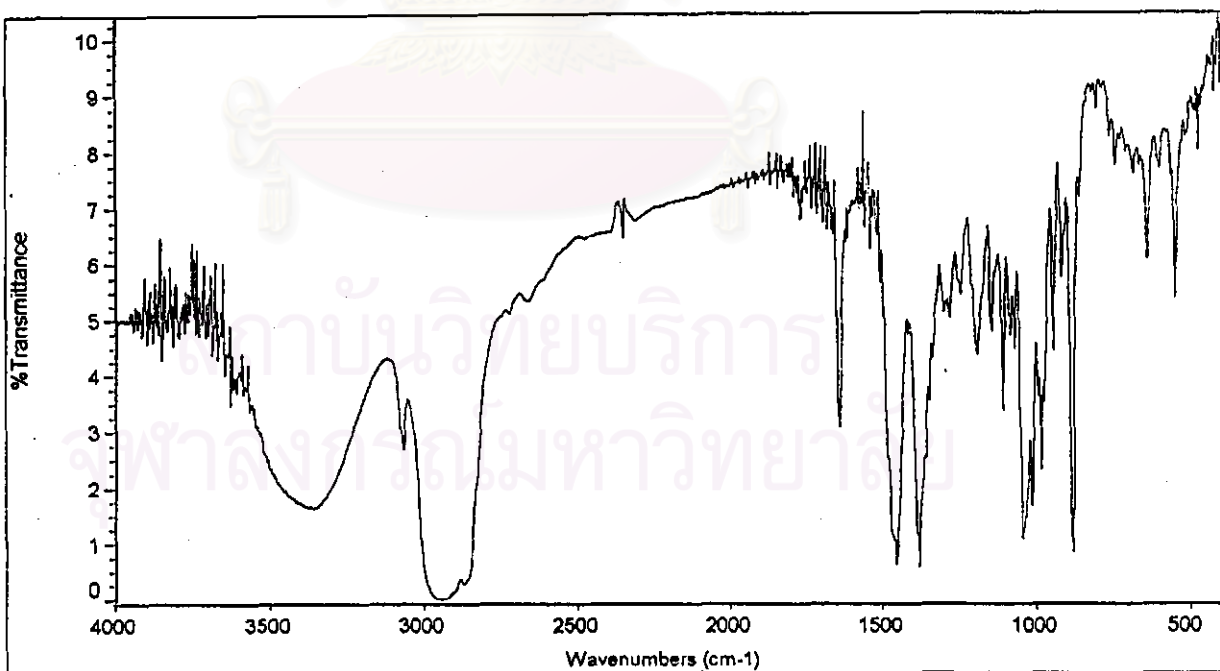


Figure 18 The IR spectrum of Compound 4



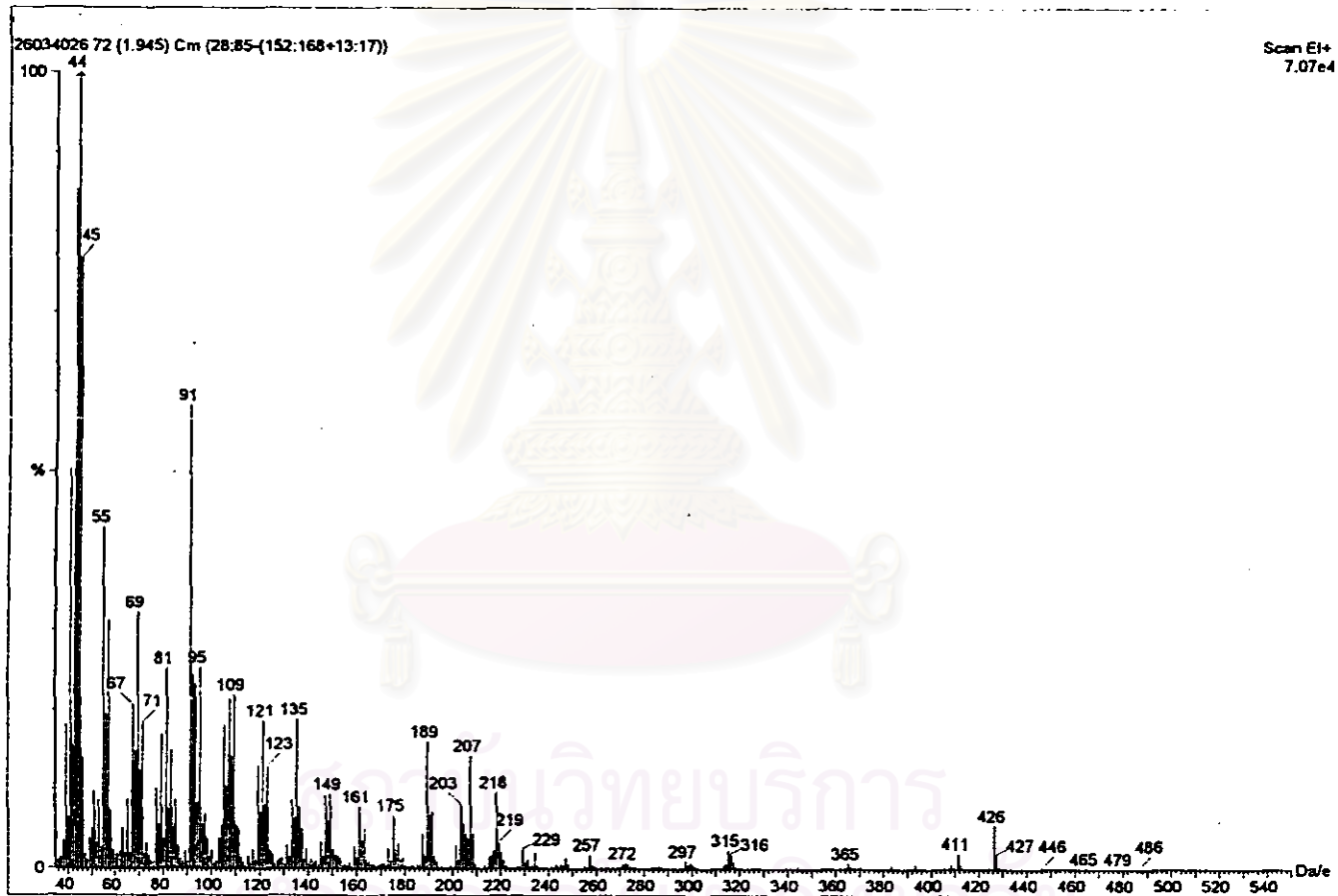


Figure19 The mass spectrum of Compound 4

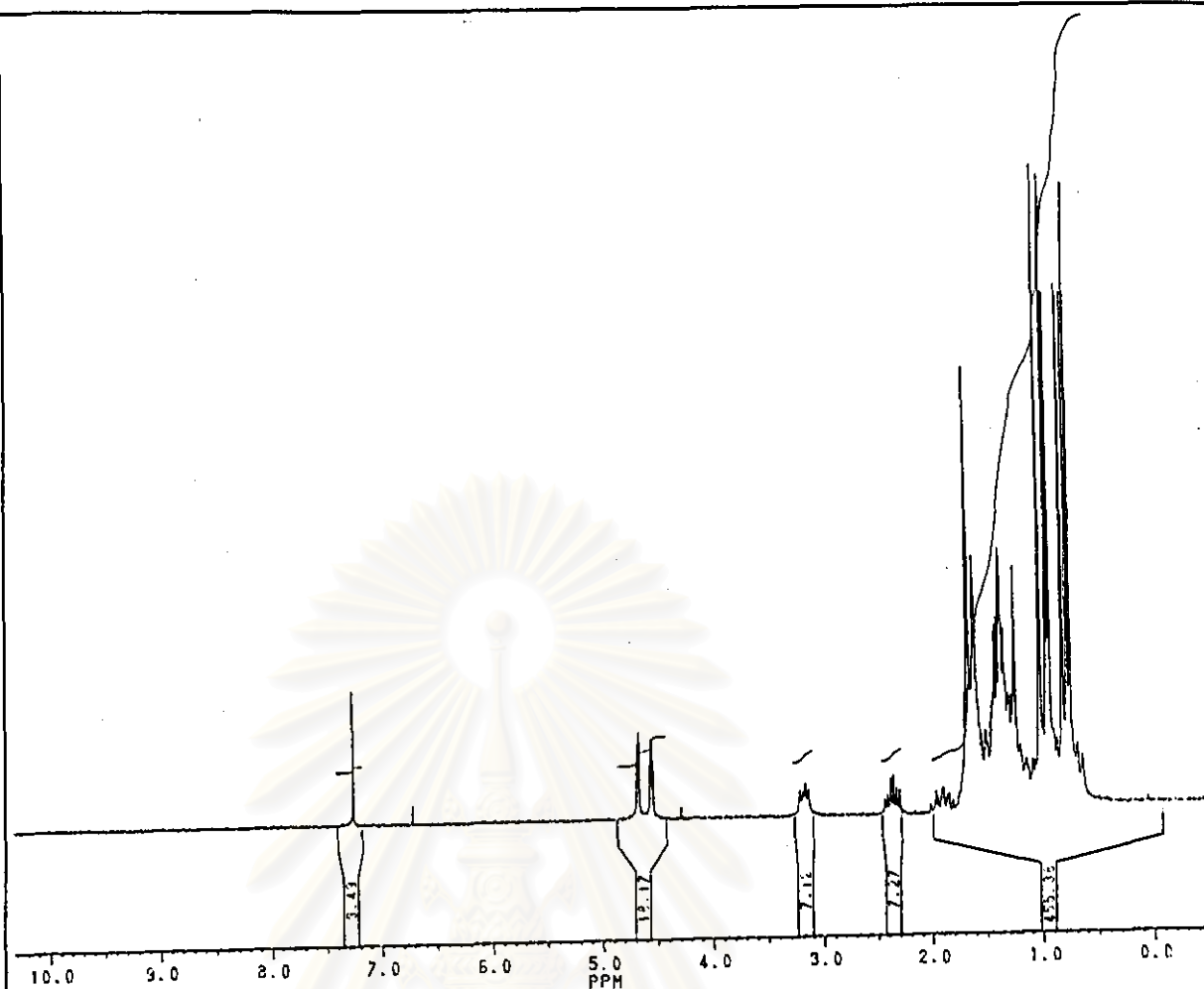


Figure 20 The <sup>1</sup>H NMR spectrum of Compound 4

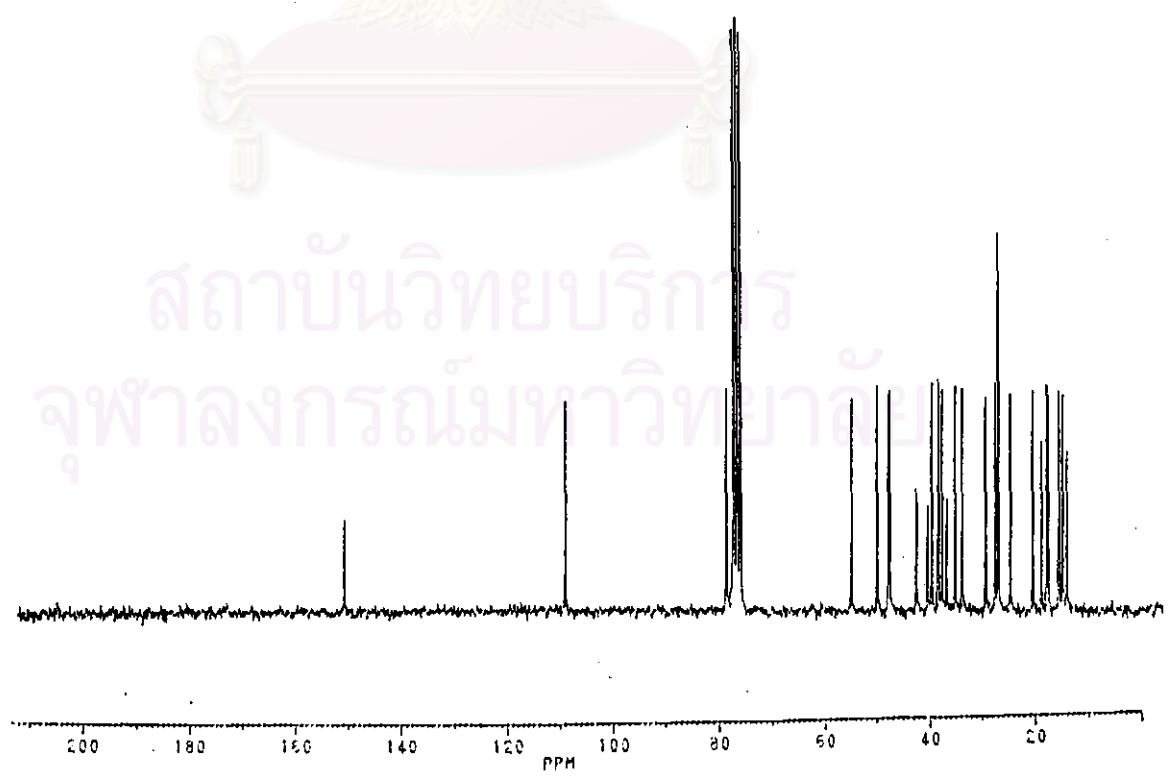


Figure 21 The <sup>13</sup>C NMR spectrum of Compound 4

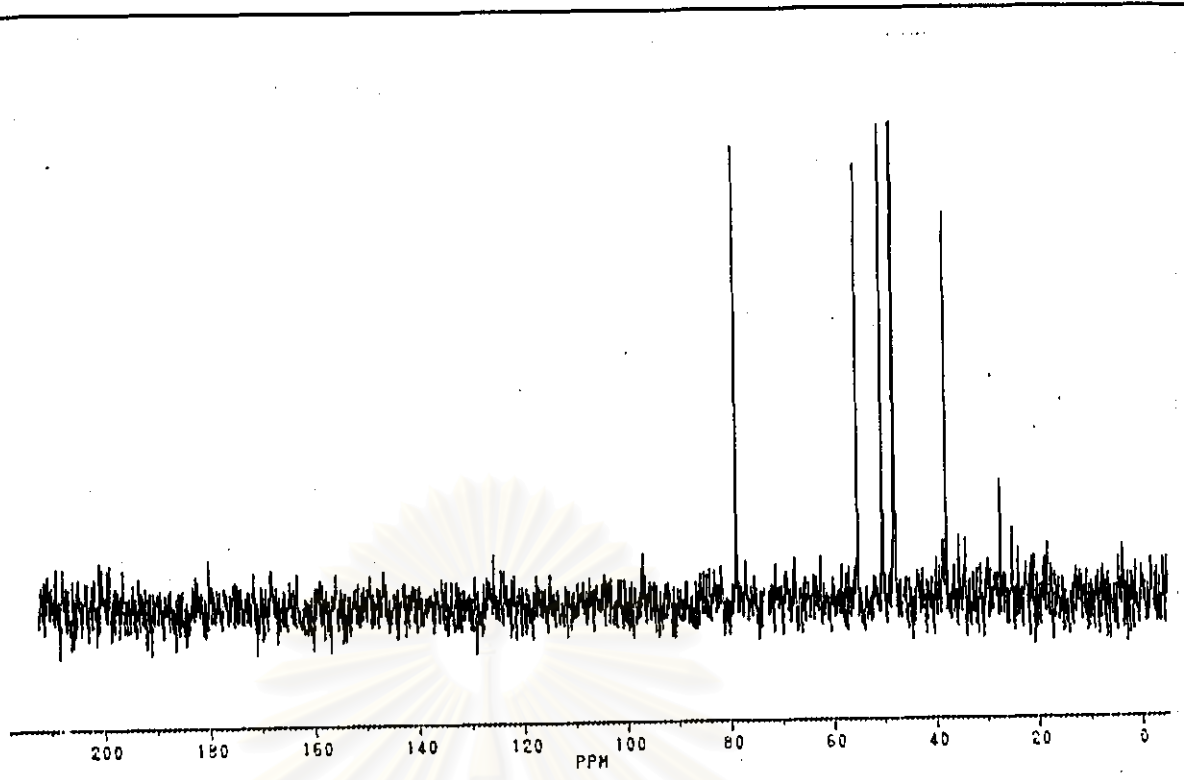


Figure 22 The DEPT 90 <sup>13</sup>C NMR spectrum of Compound 4

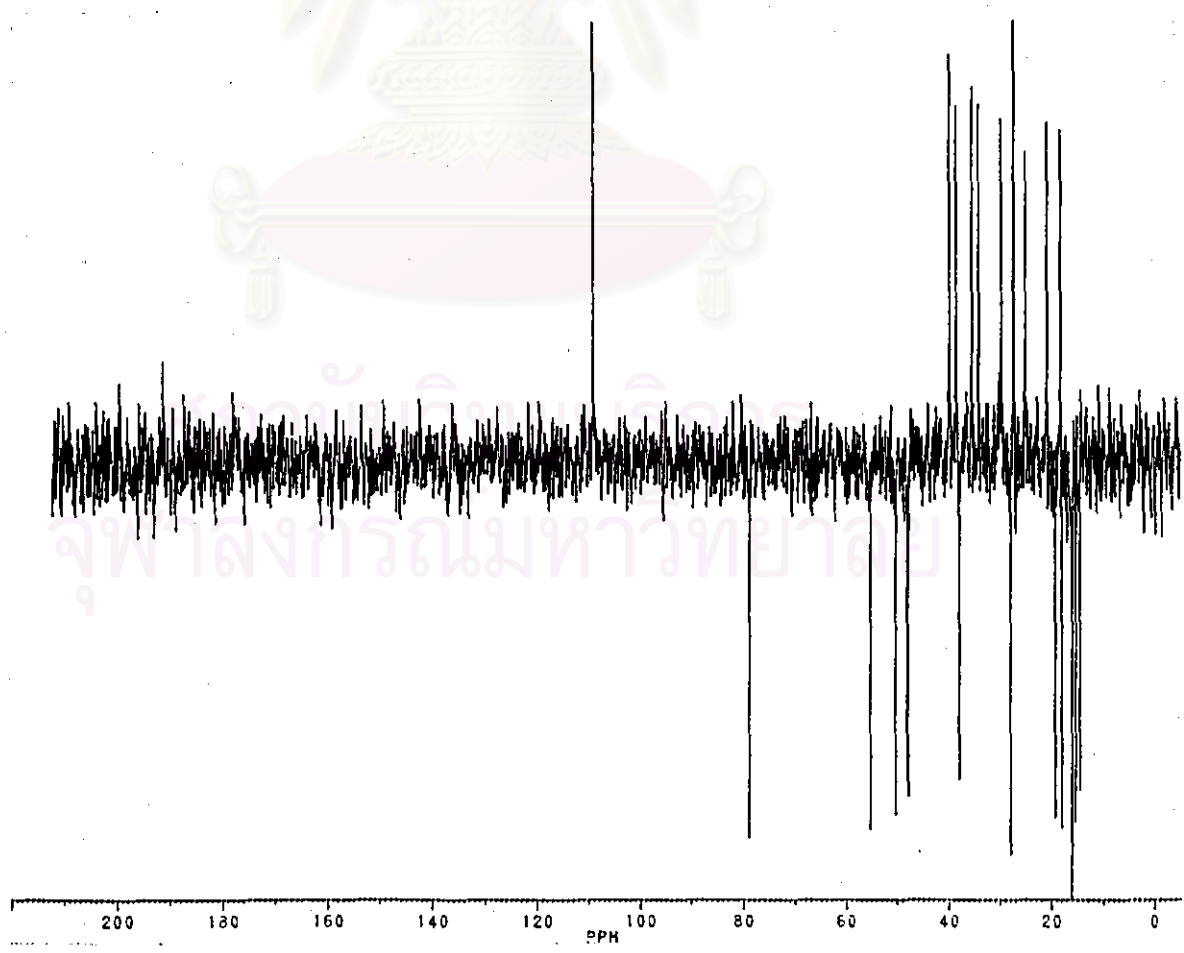
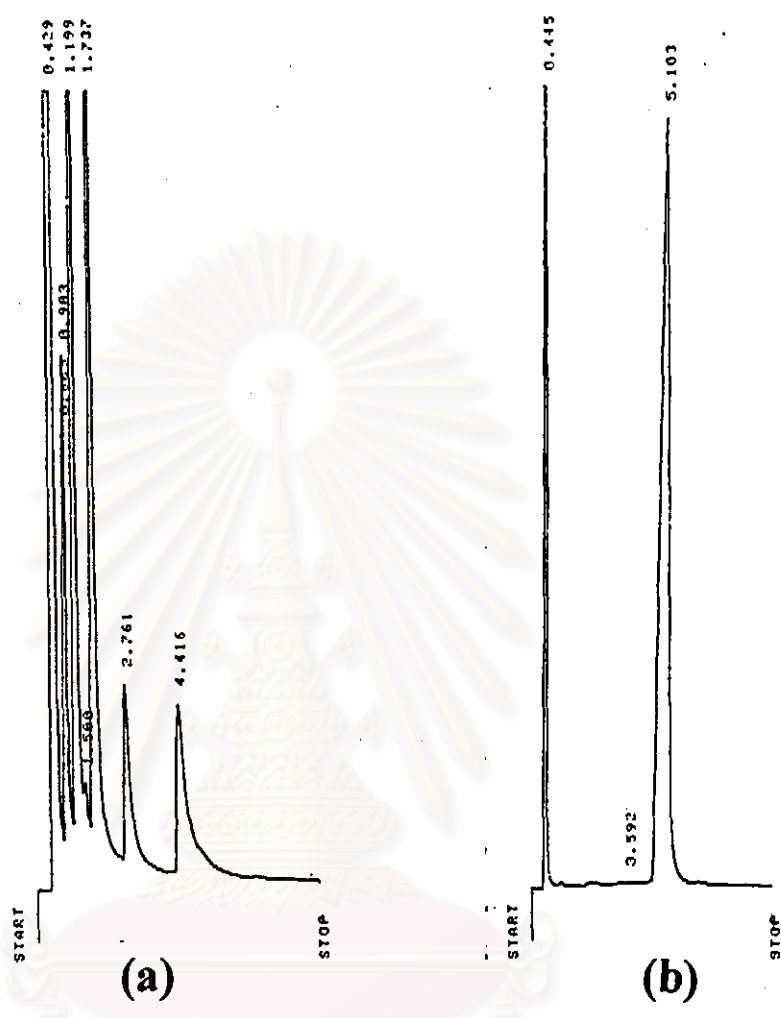


Figure 23 The DEPT 135 <sup>13</sup>C NMR spectrum of Compound 4



**Figure 24** The GLC analysis results of Mixture 5 and standard long chain alcohol

(a) The GLC analysis results of Mixture 5

(b) The GLC analysis results of standard long chain alcohol

Calibration curve of standard long chain alcohol

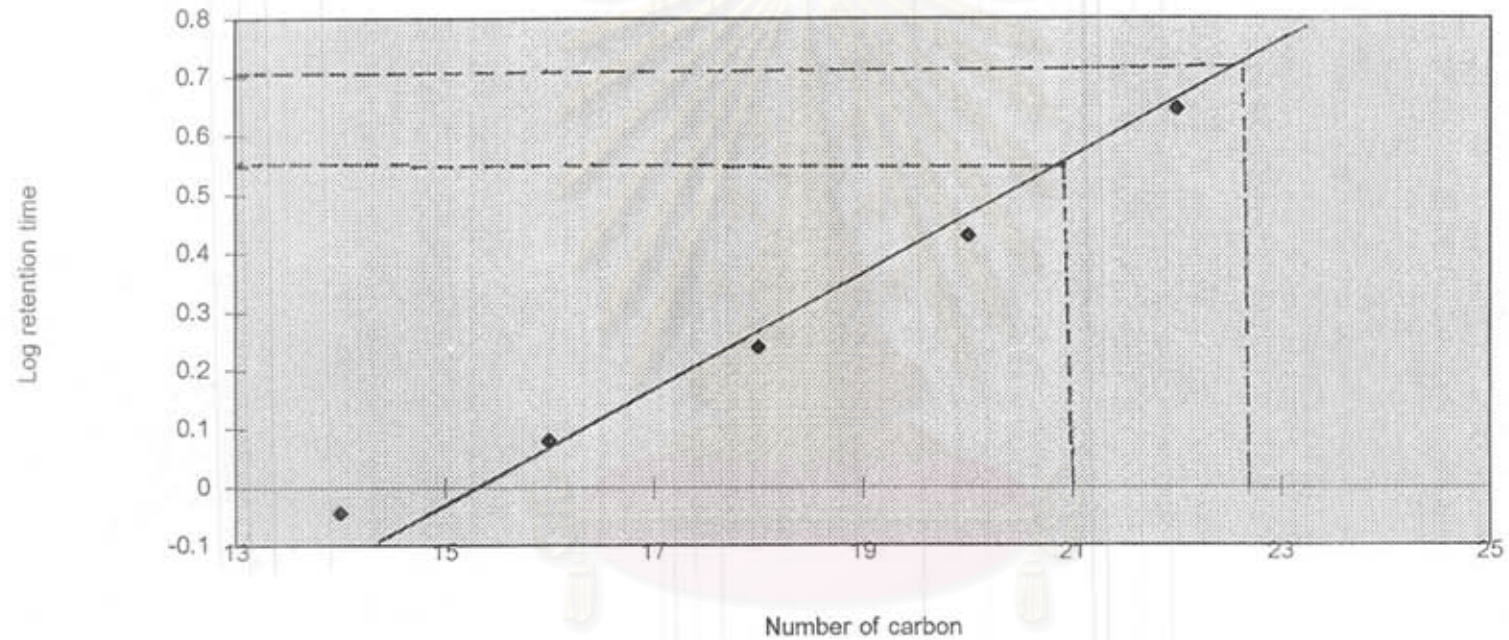


Figure 25 The calibration curve of standard long chain aliphatic alcohol

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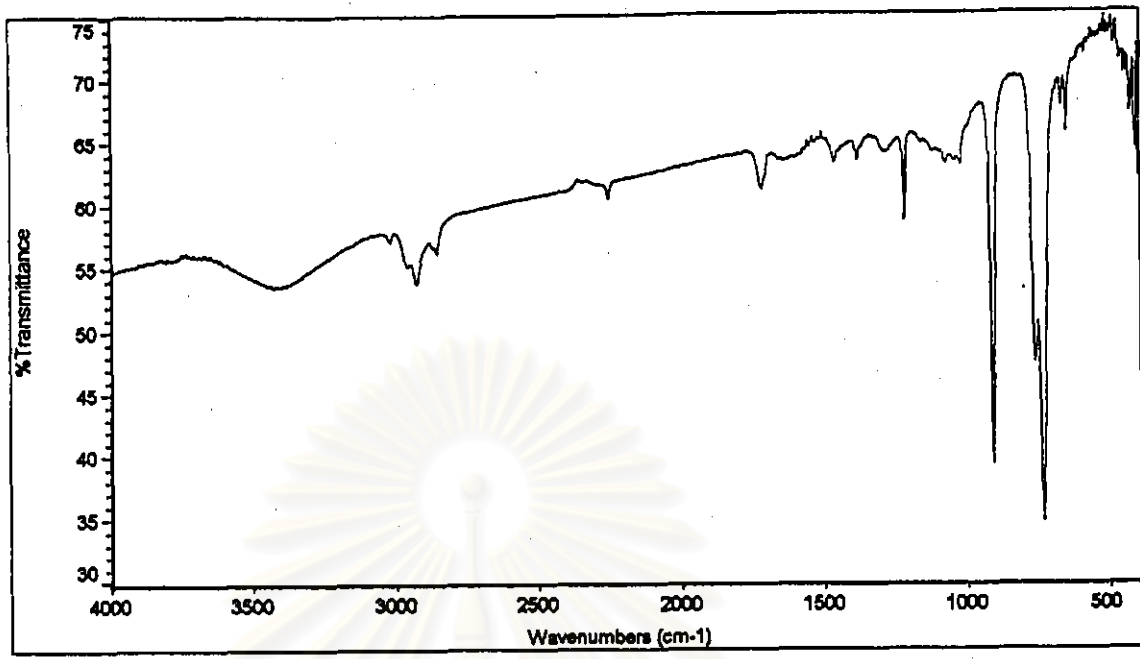


Figure 26 The IR spectrum of Mixture 5

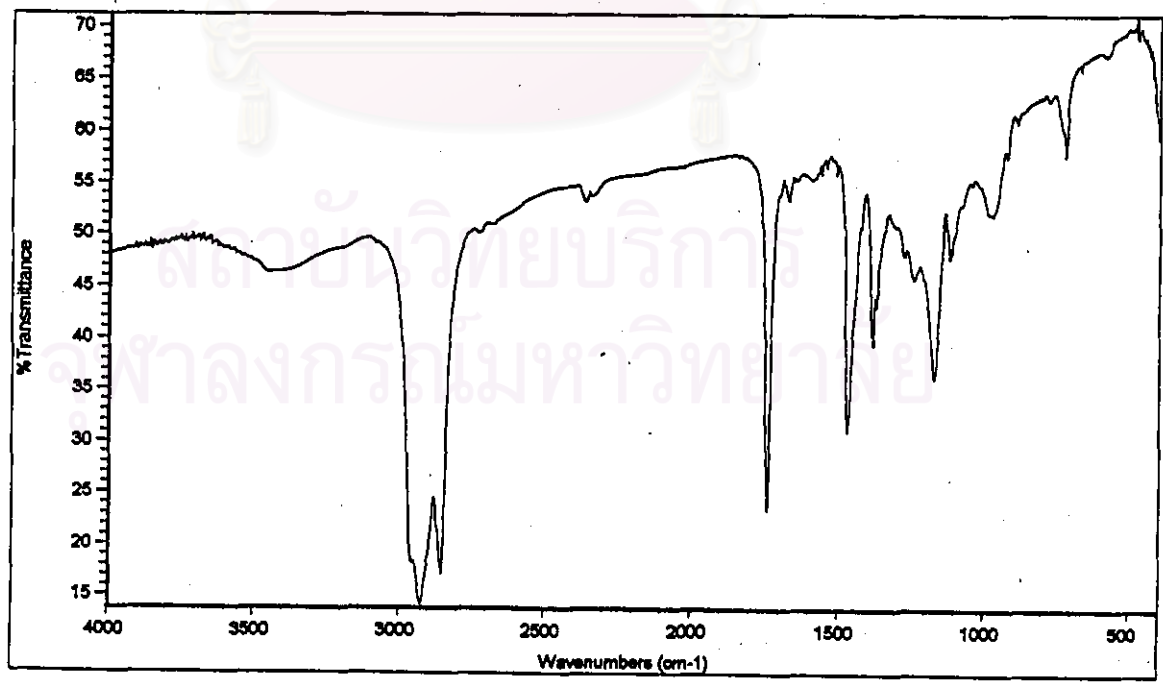


Figure 27 The IR spectrum of Compound 6

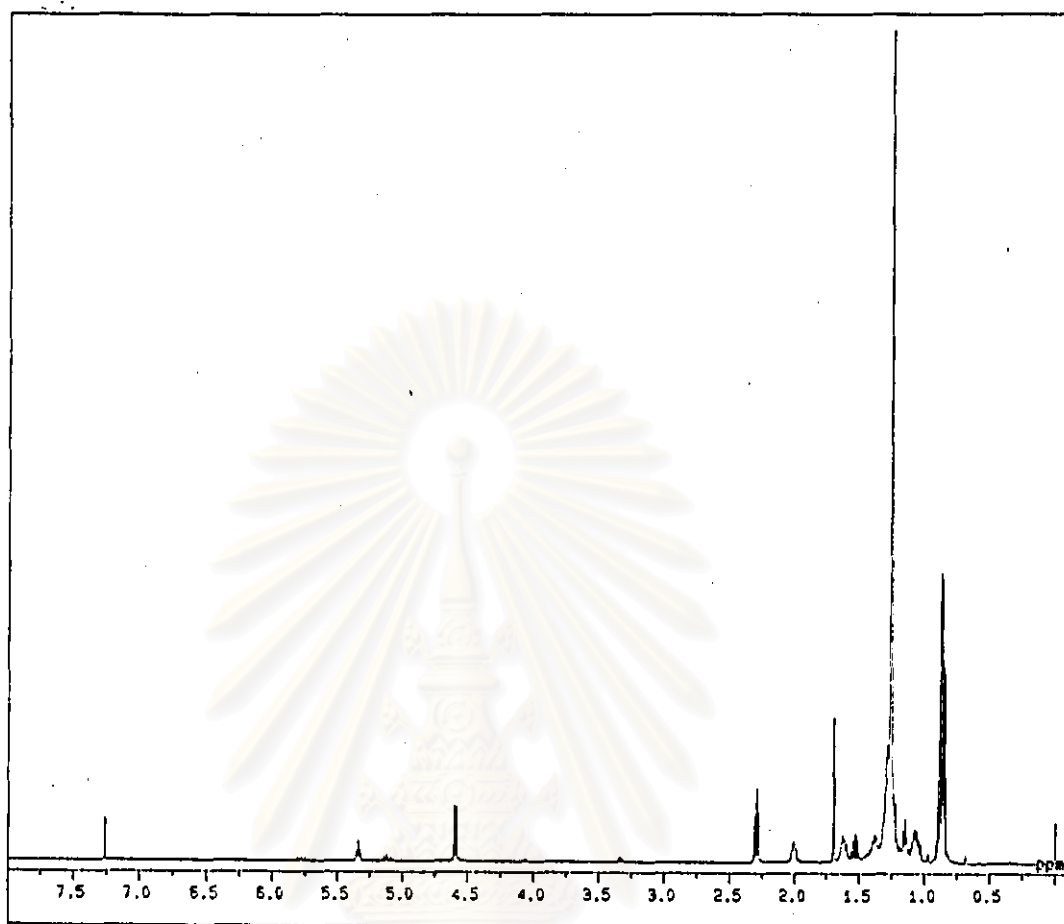


Figure 28 The  $^1\text{H}$  NMR spectrum of Compound 6

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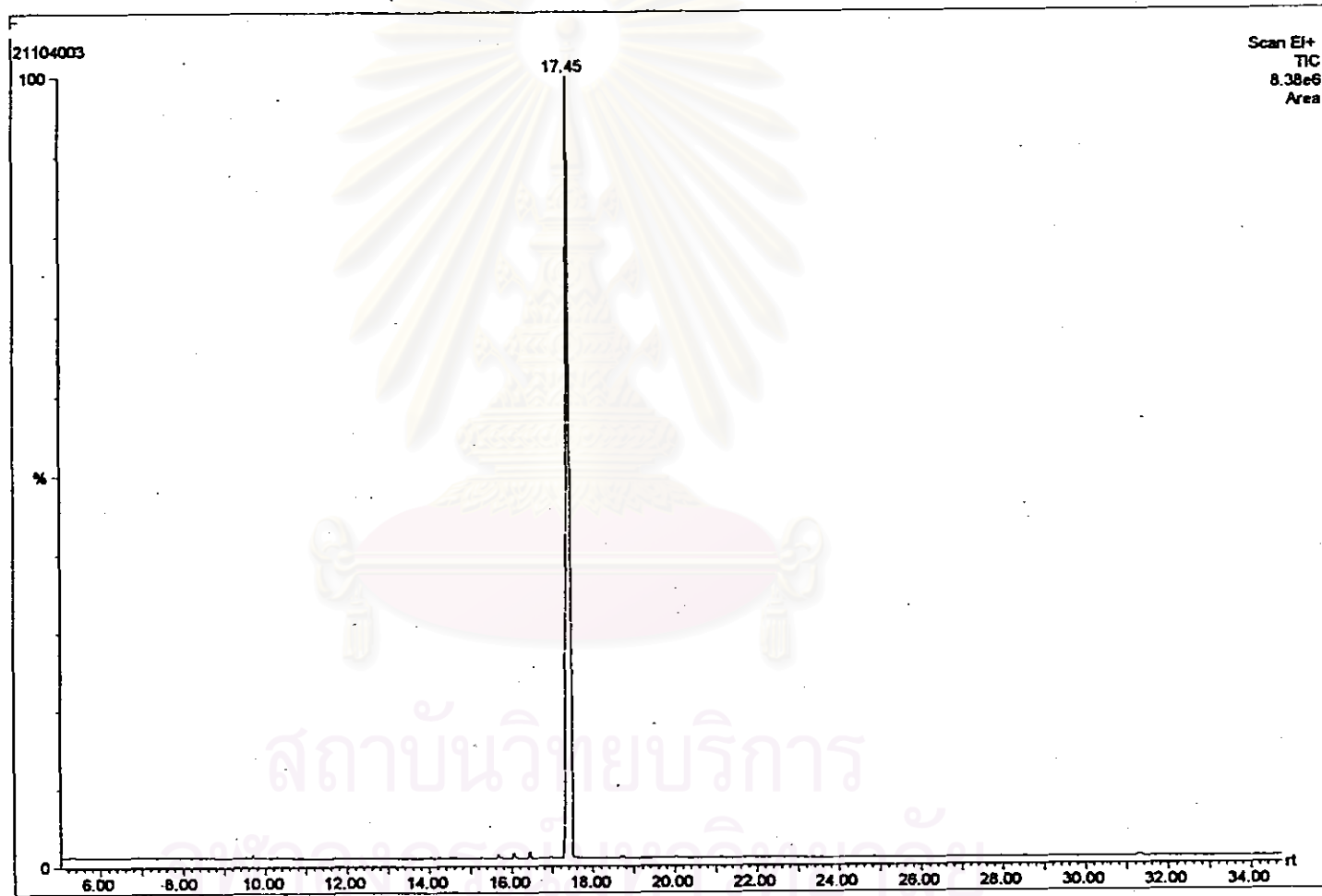


Figure 29

The GC-MS analysis results of Compound 7

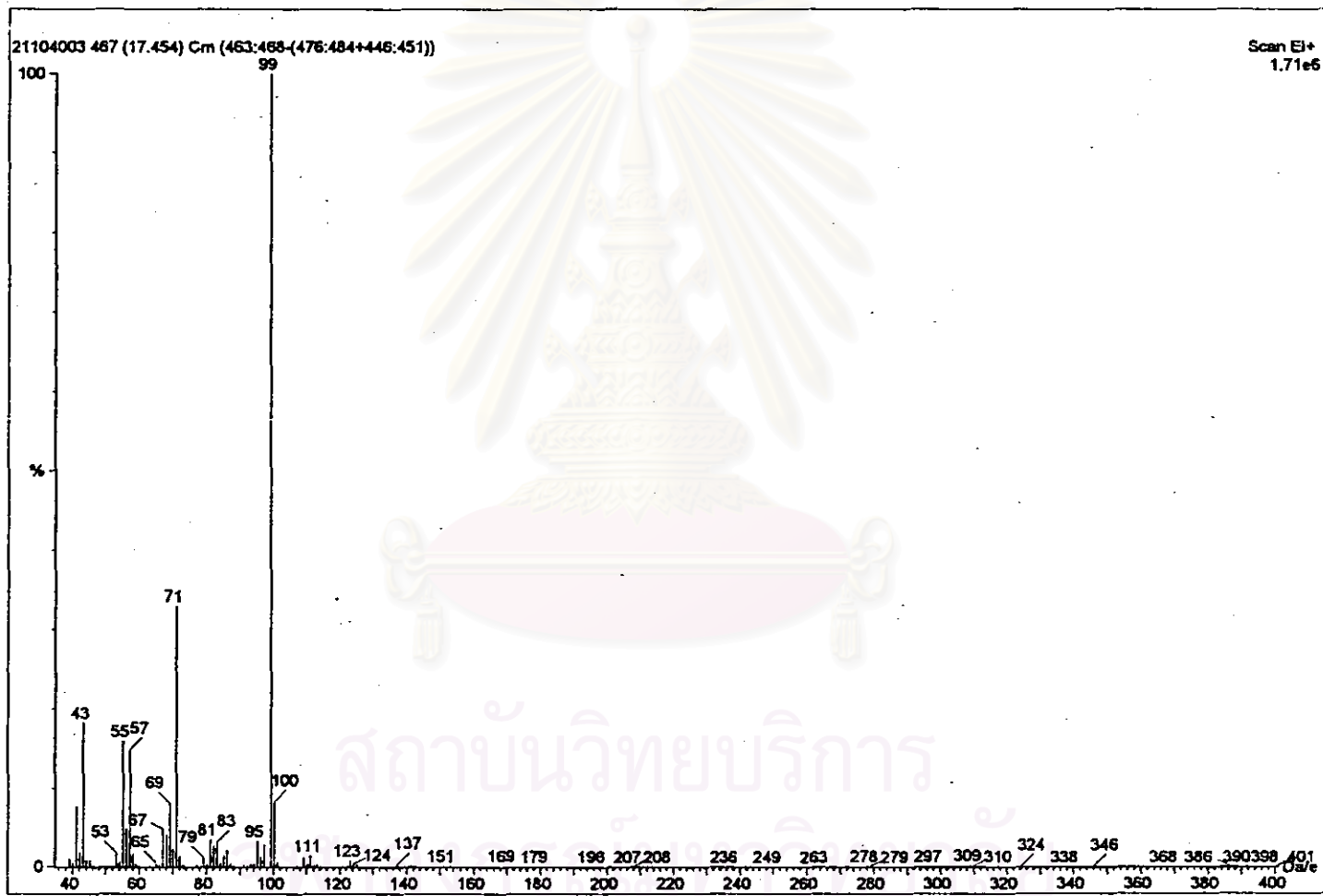


Figure 30

The mass spectrum of Compound 7

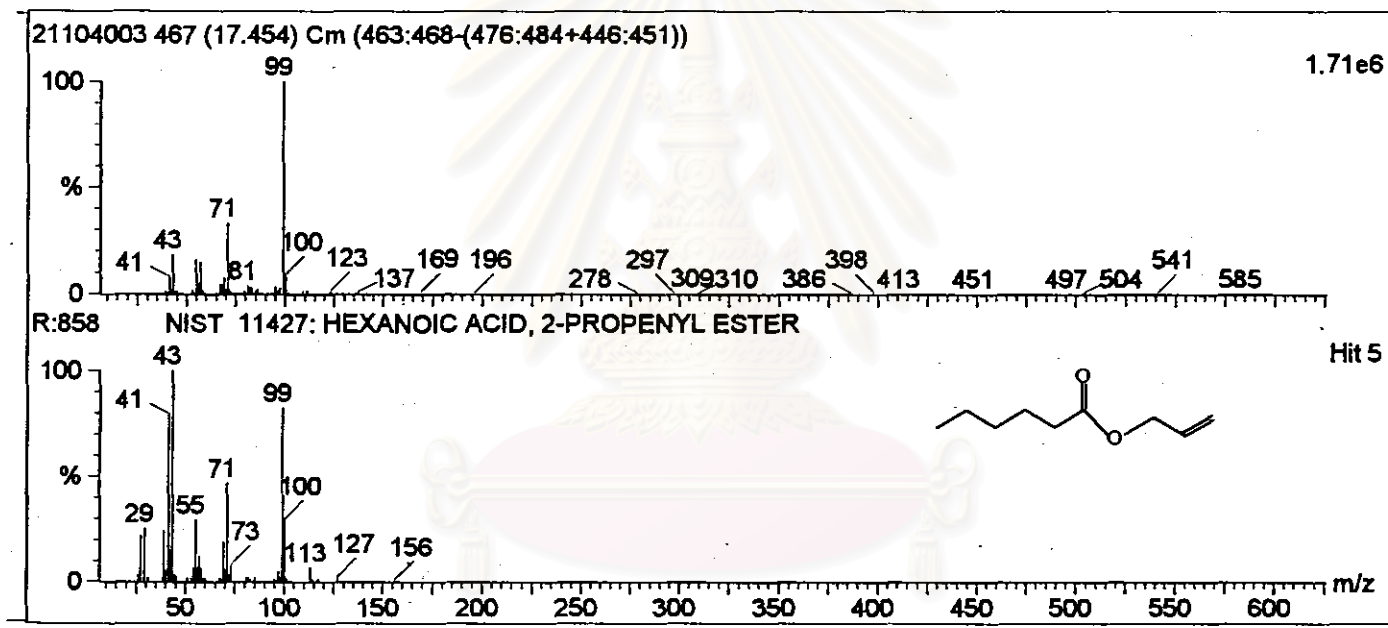


Figure 31 The mass spectrum of Compound 7

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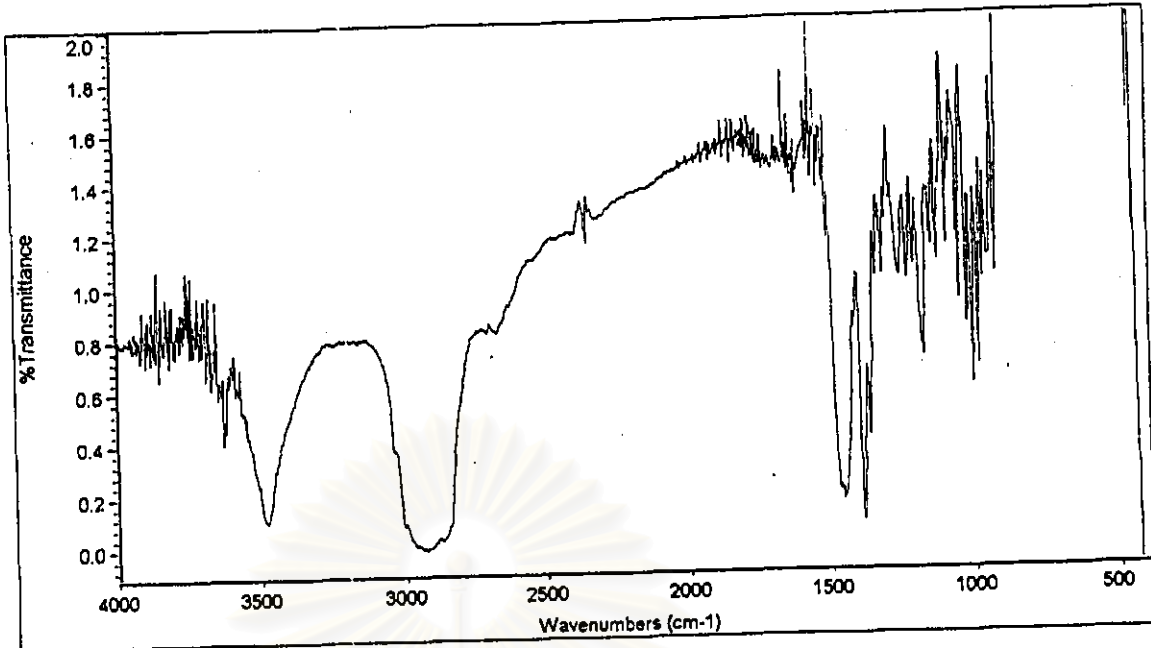


Figure 32 The IR spectrum of Compound 7

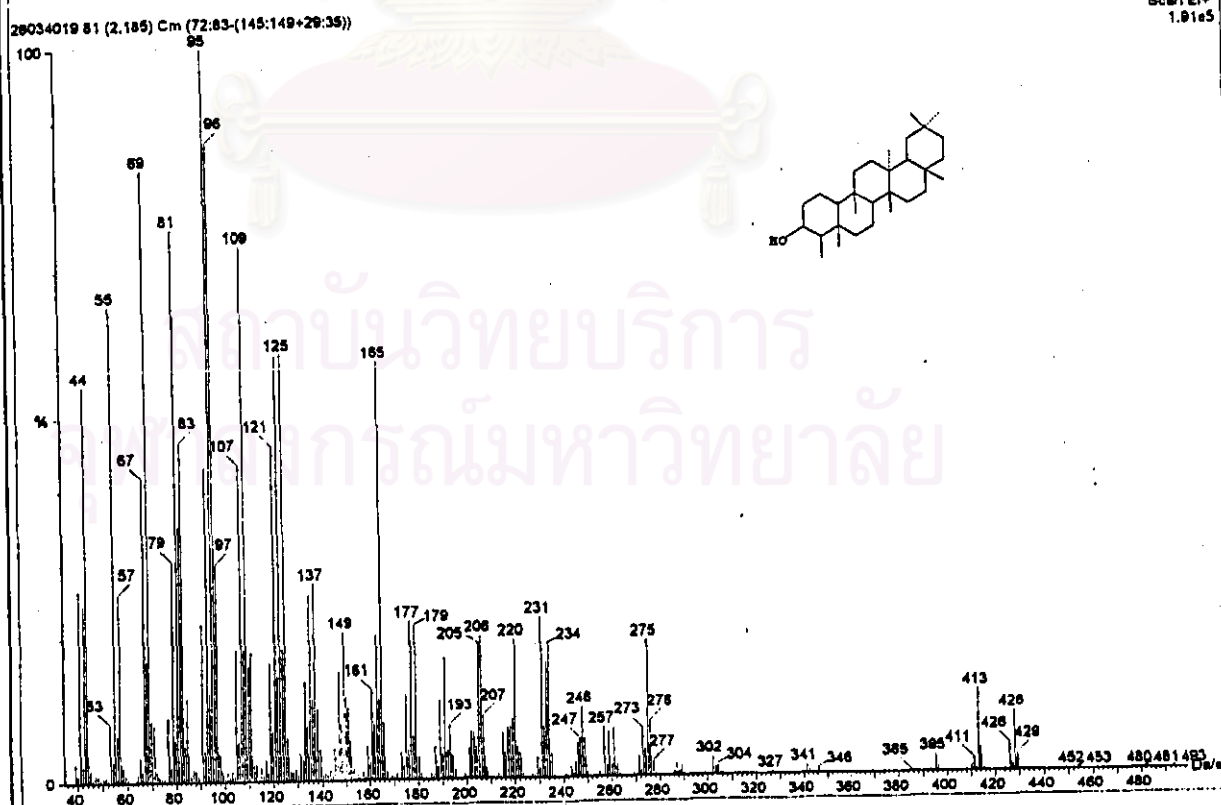


Figure 33 The mass spectrum of Compound 7

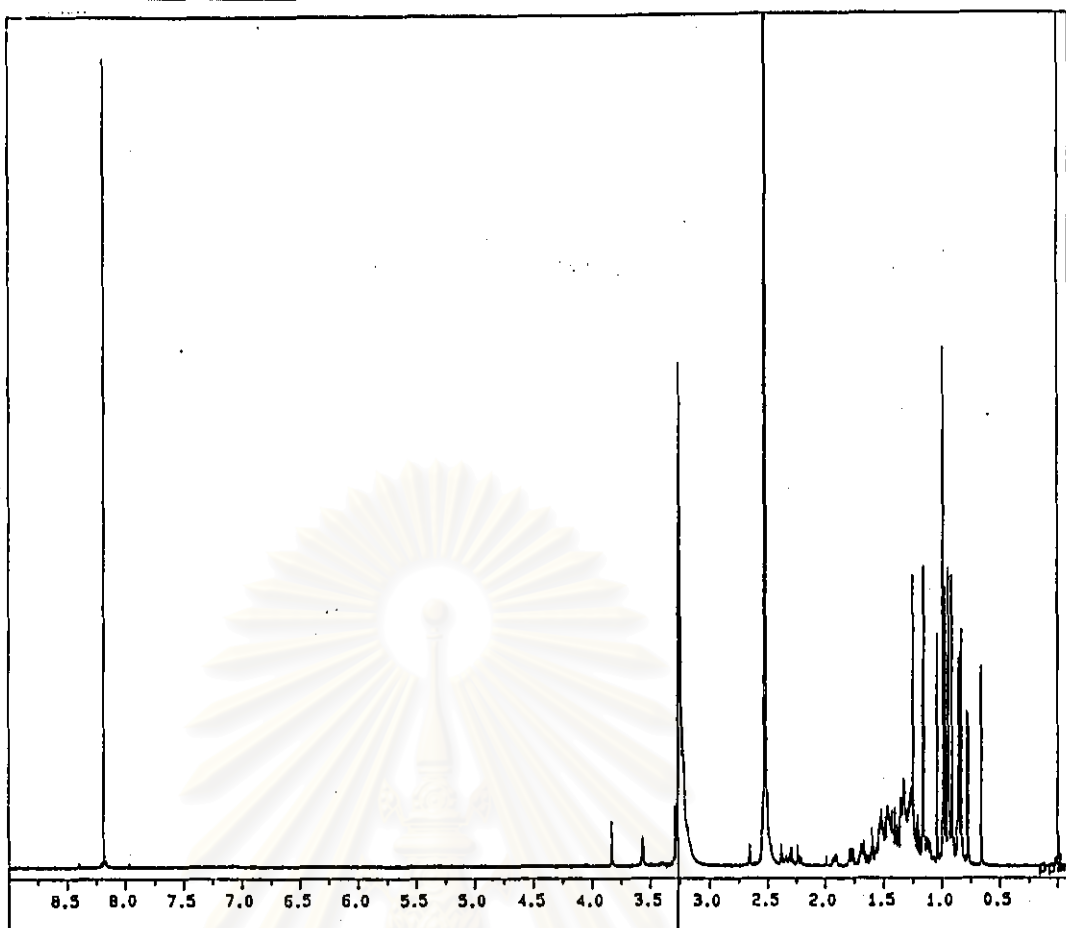


Figure 34 The  $^1\text{H}$  NMR spectrum of Compound 7

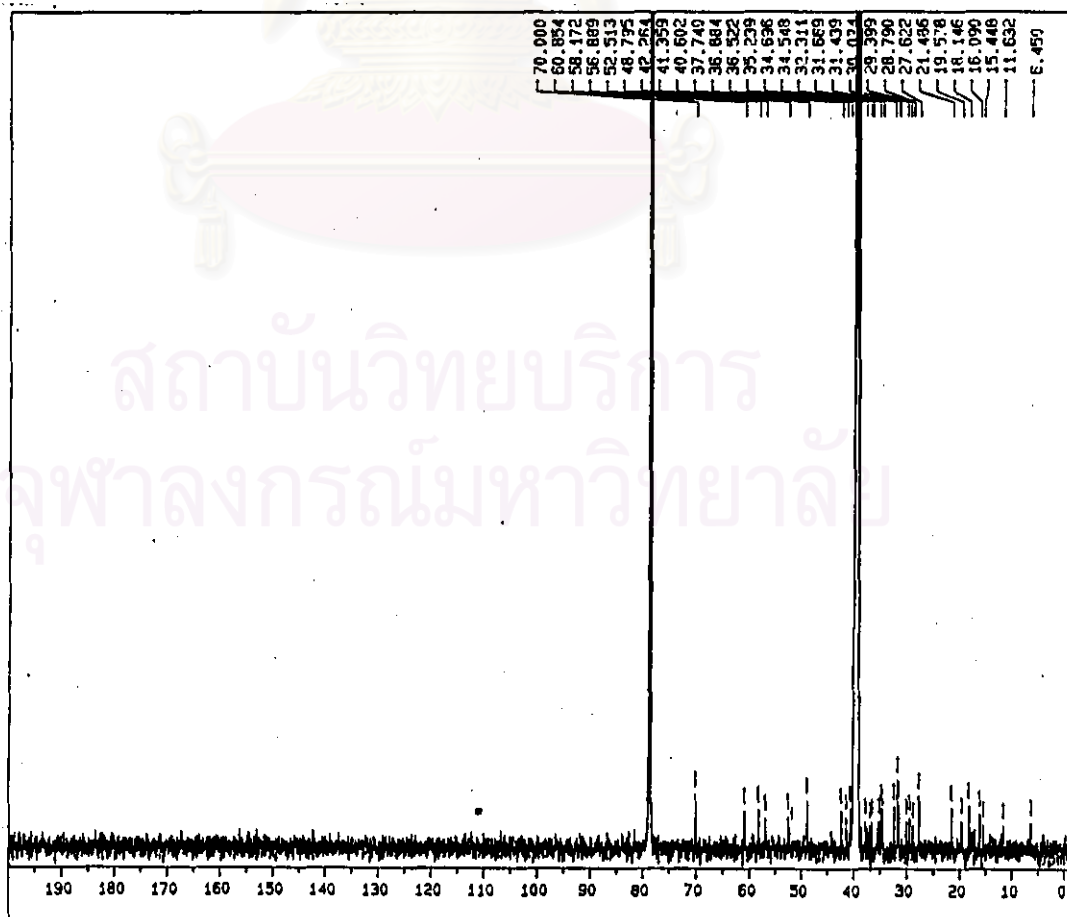


Figure 35 The  $^{13}\text{C}$  NMR spectrum of Compound 7

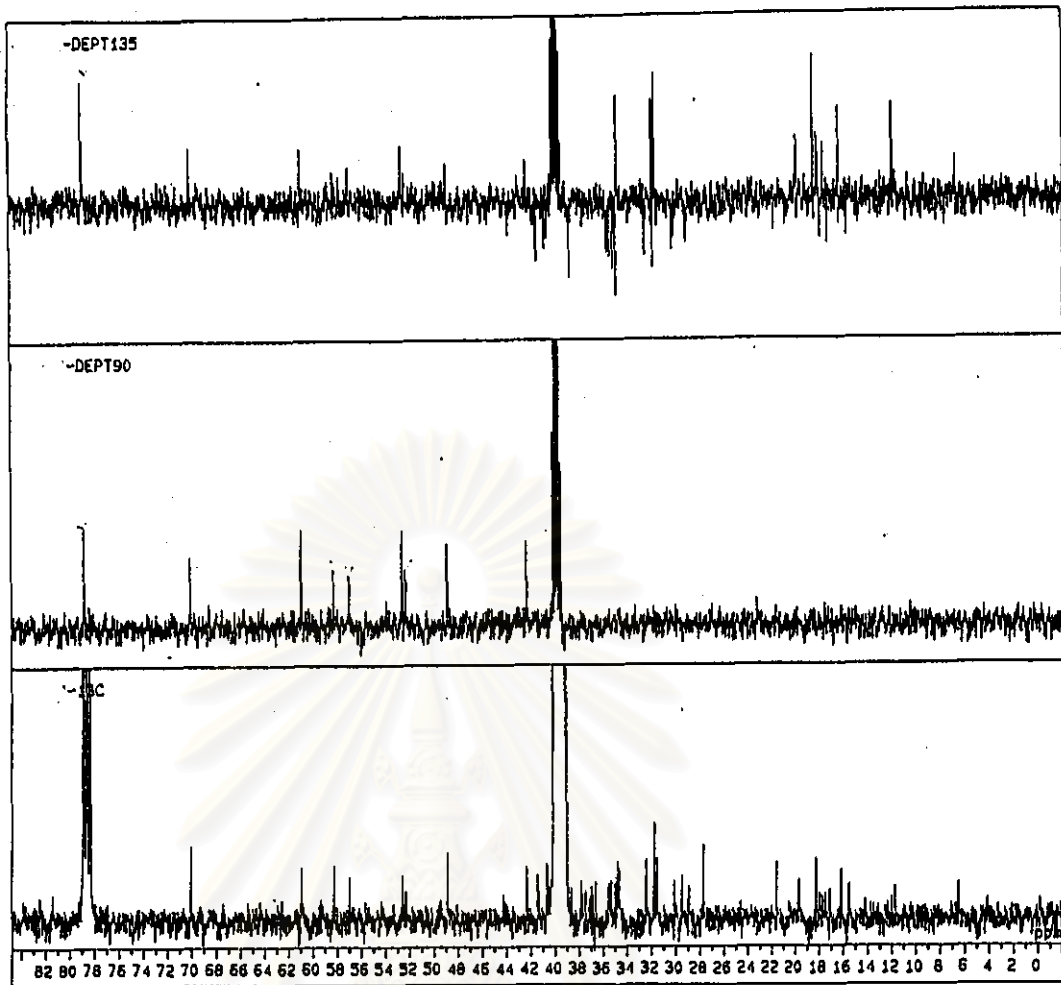


Figure 36 The DEPT 90 and DEPT 135  $^{13}\text{C}$  MNR spectrum of Compound 7

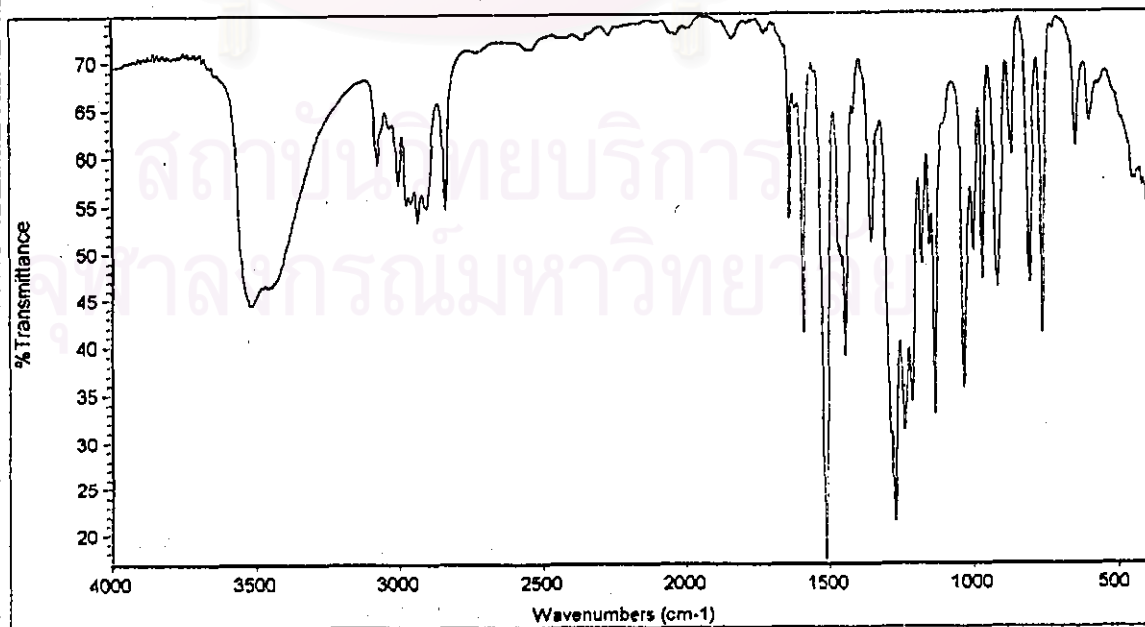


Figure 37 The IR spectrum of Compound 8



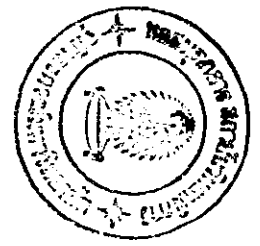
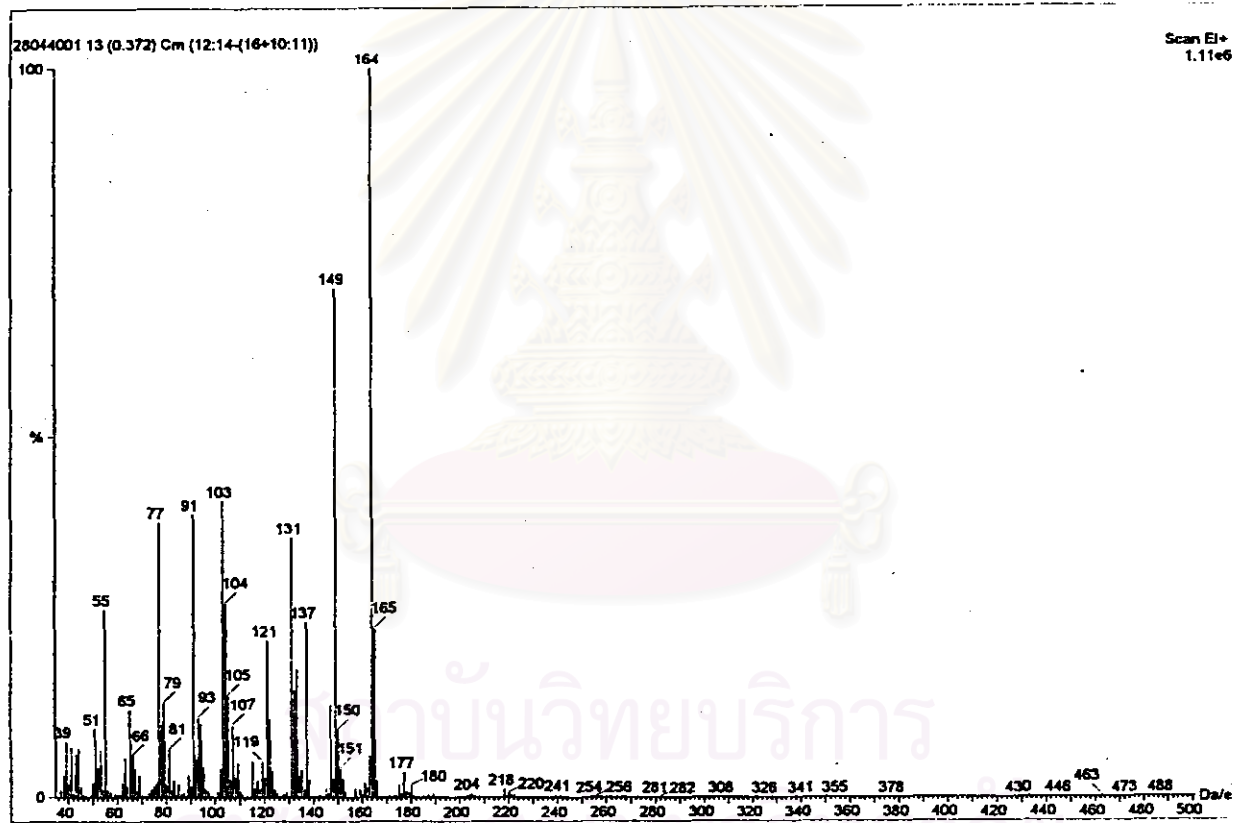


Figure 38 The mass spectrum of Compound 8

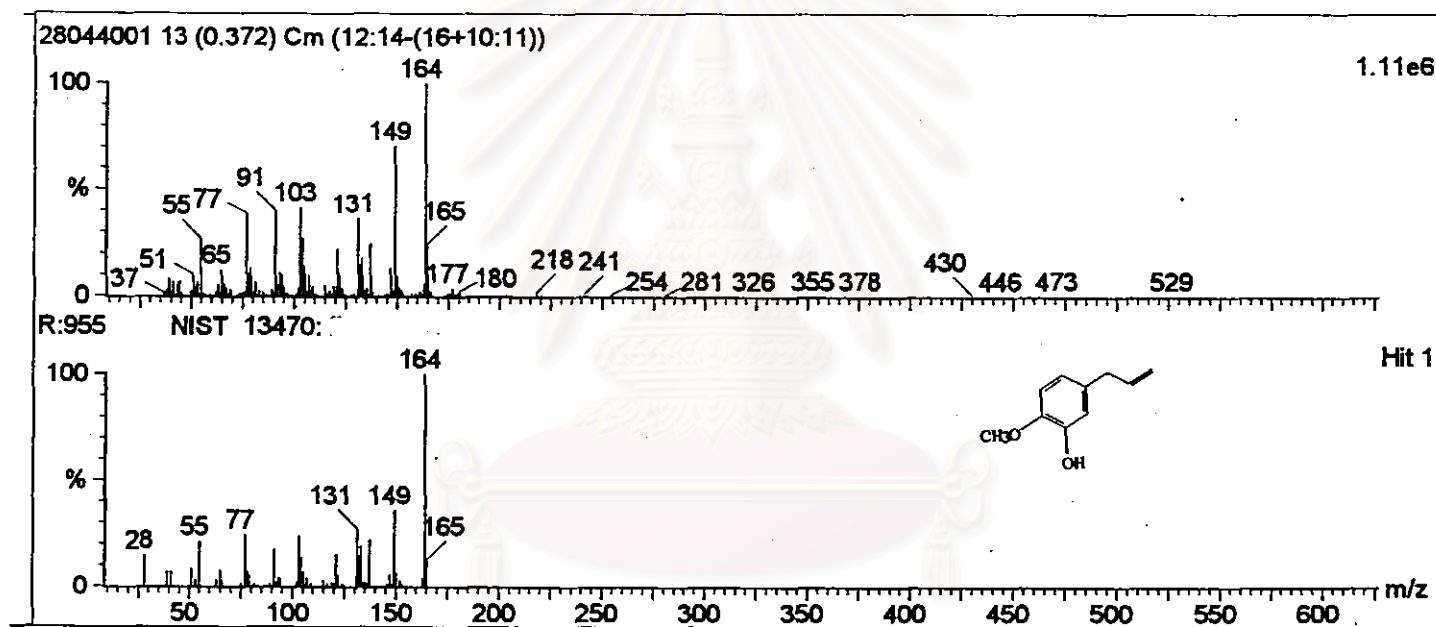


Figure 38b The mass spectrum of Compound 8

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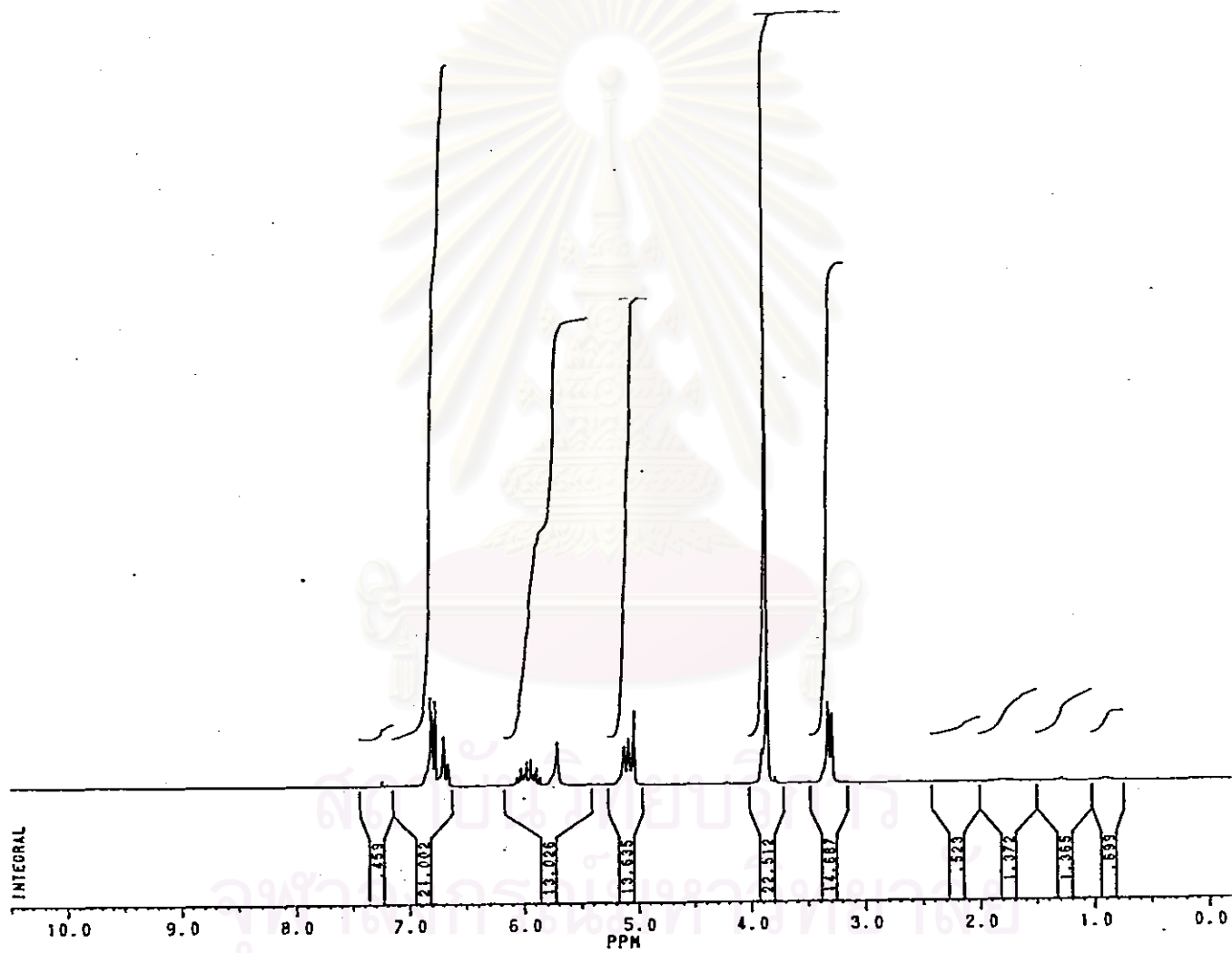
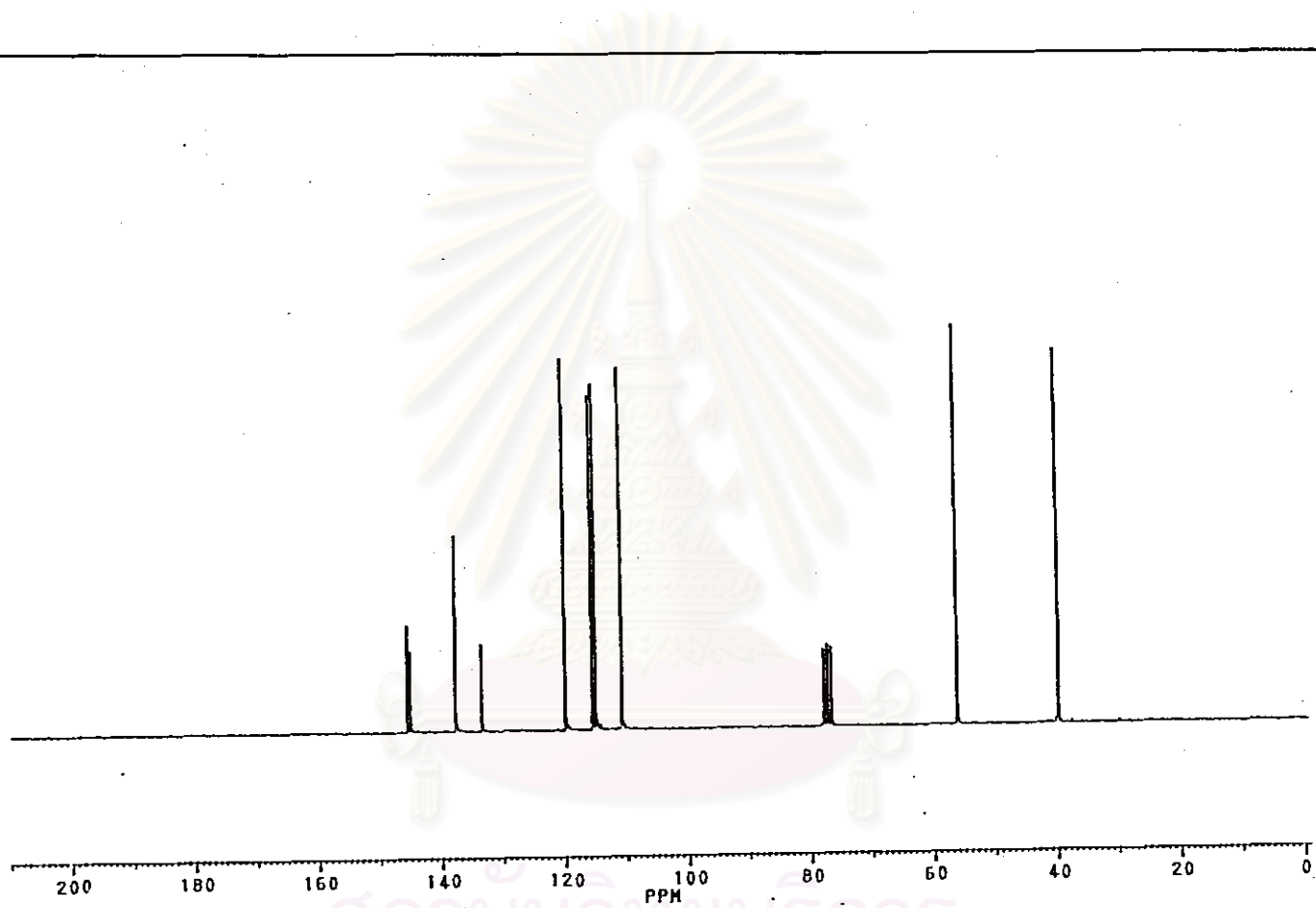


Figure 39 The <sup>1</sup>H NMR spectrum of Compound 8



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Figure 40 The  $^{13}\text{C}$  NMR spectrum of Compound 8

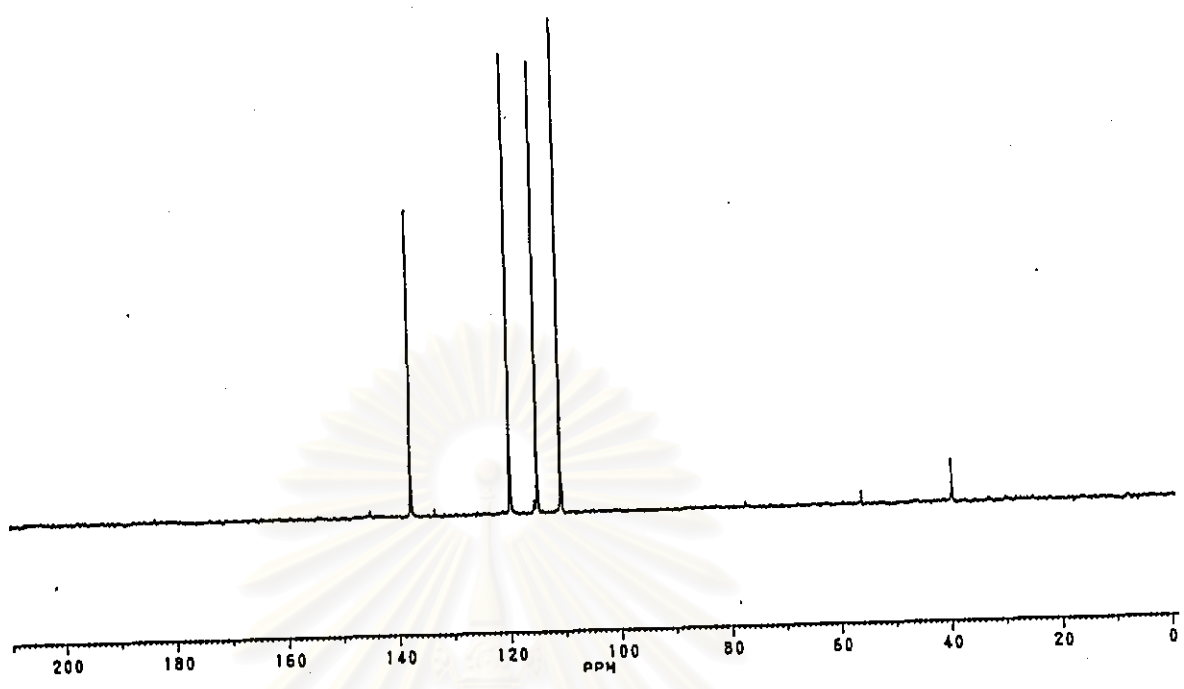


Figure 41 (a) The Dept 90 <sup>13</sup>C-NMR spectrum of Compound 8

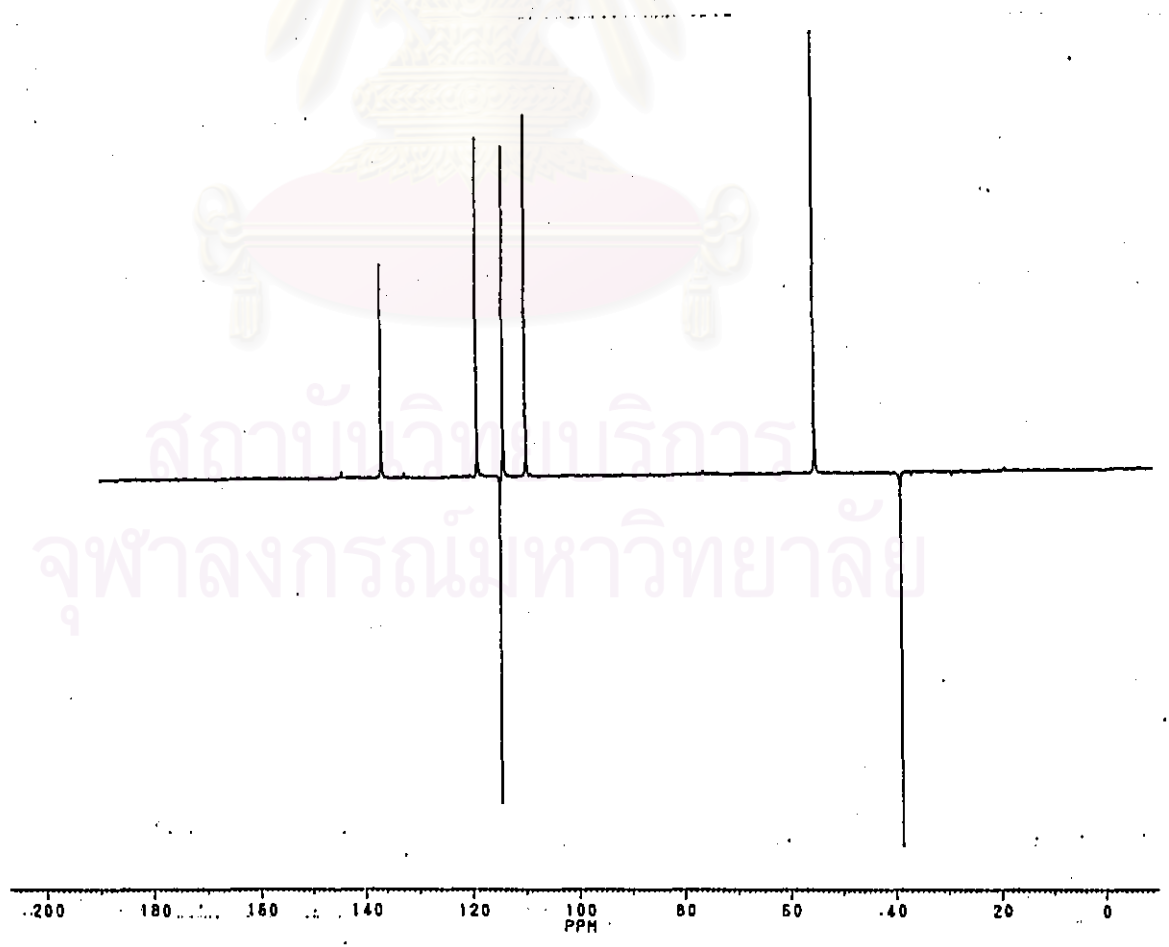


Figure 41 (b) DEPT 135 <sup>13</sup>C MNR spectrum of Compound 8

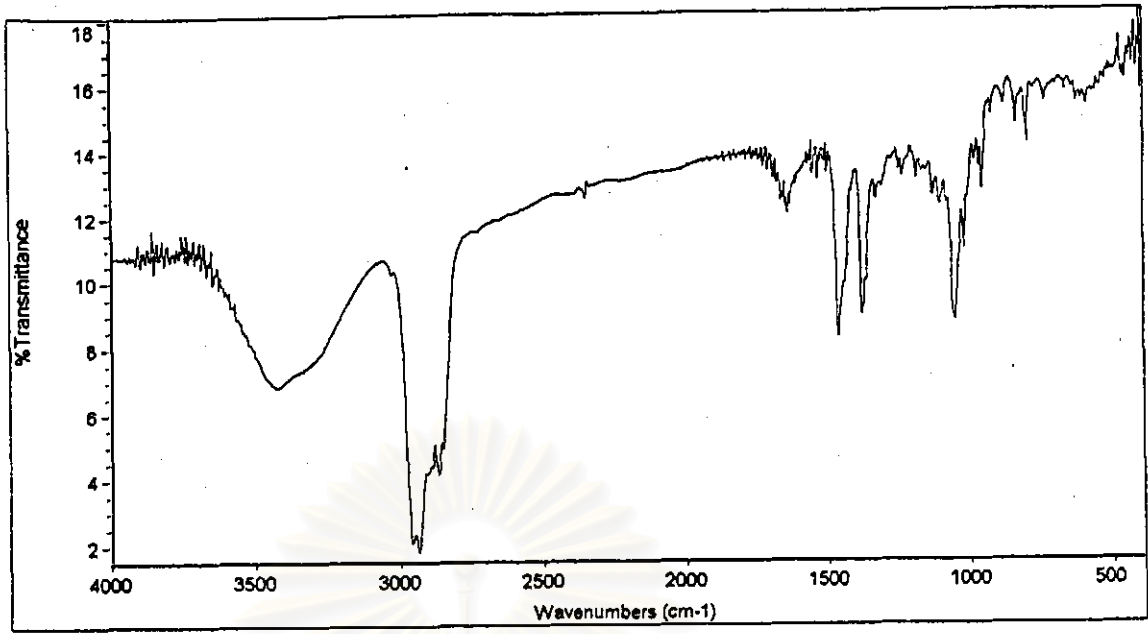


Figure 42 The IR spectrum of Mixture 9

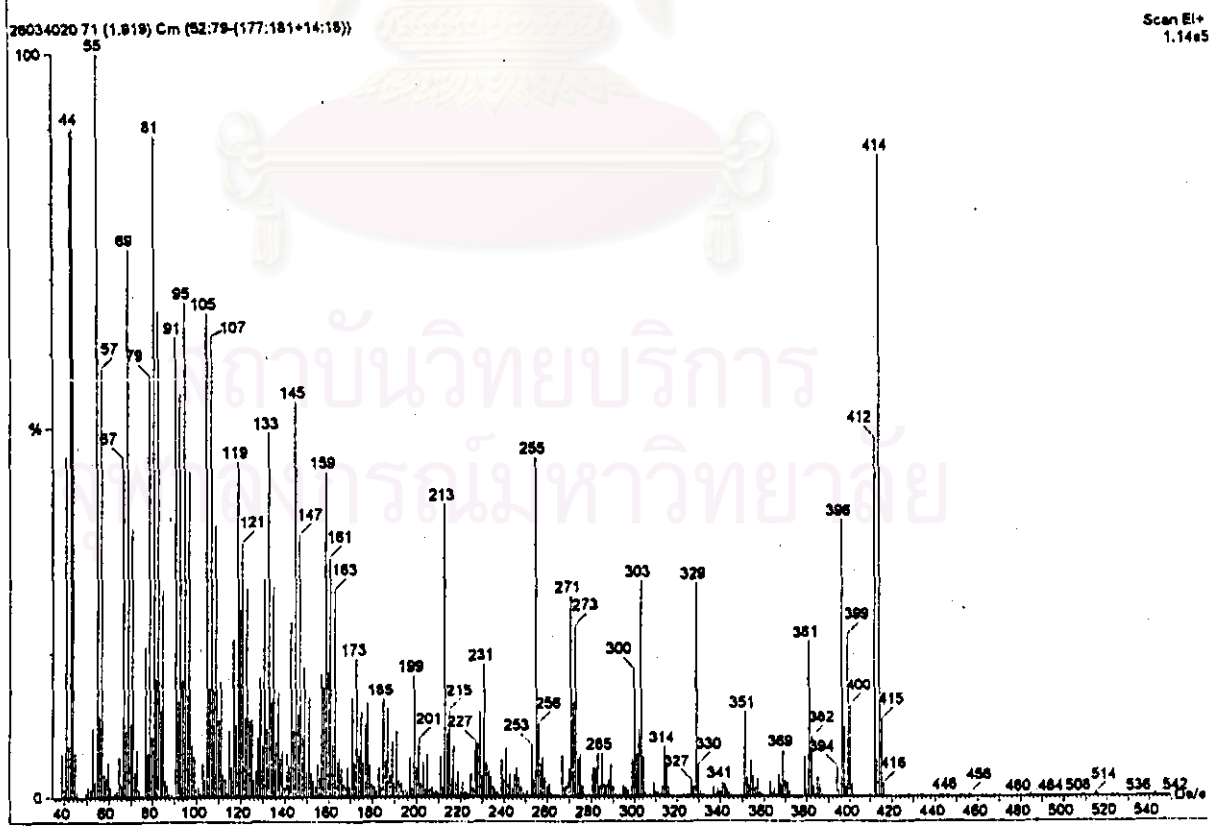


Figure 43 The mass spectrum of Mixture 9

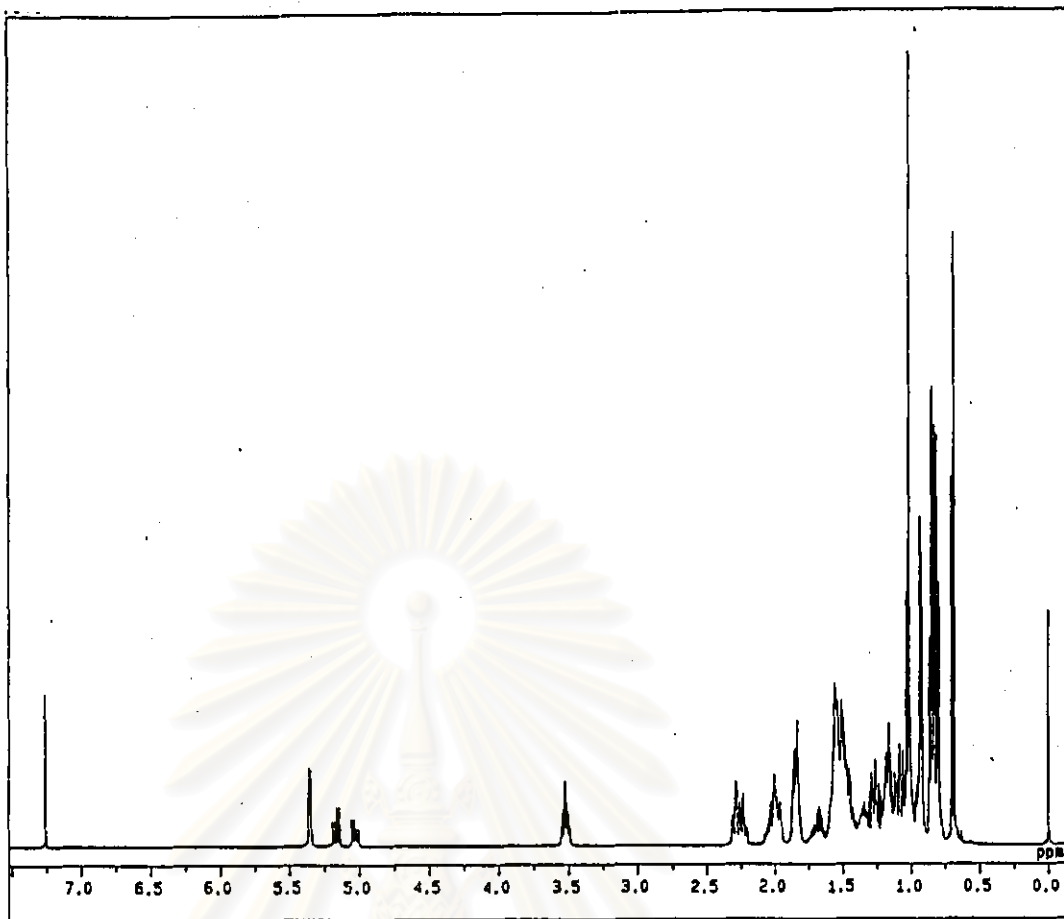


Figure 44 The <sup>1</sup>H NMR spectrum of Mixture 9

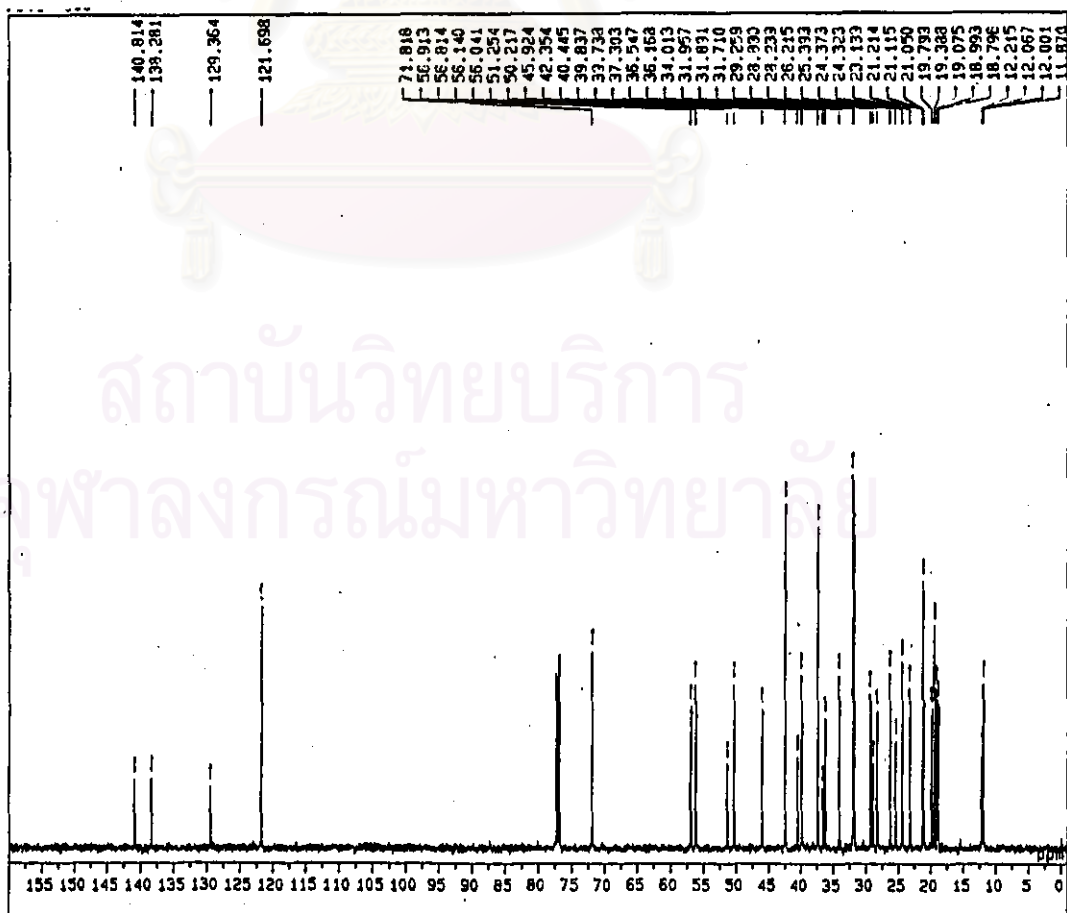
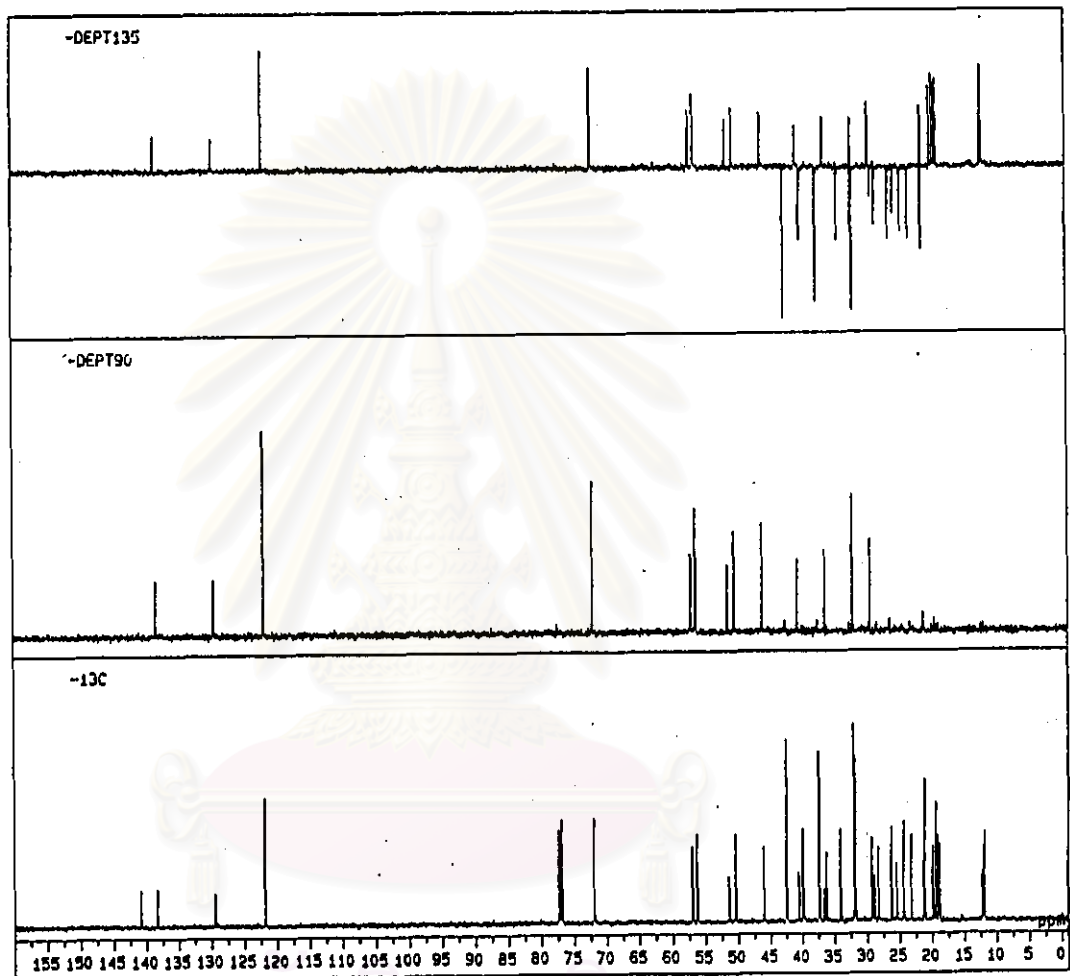


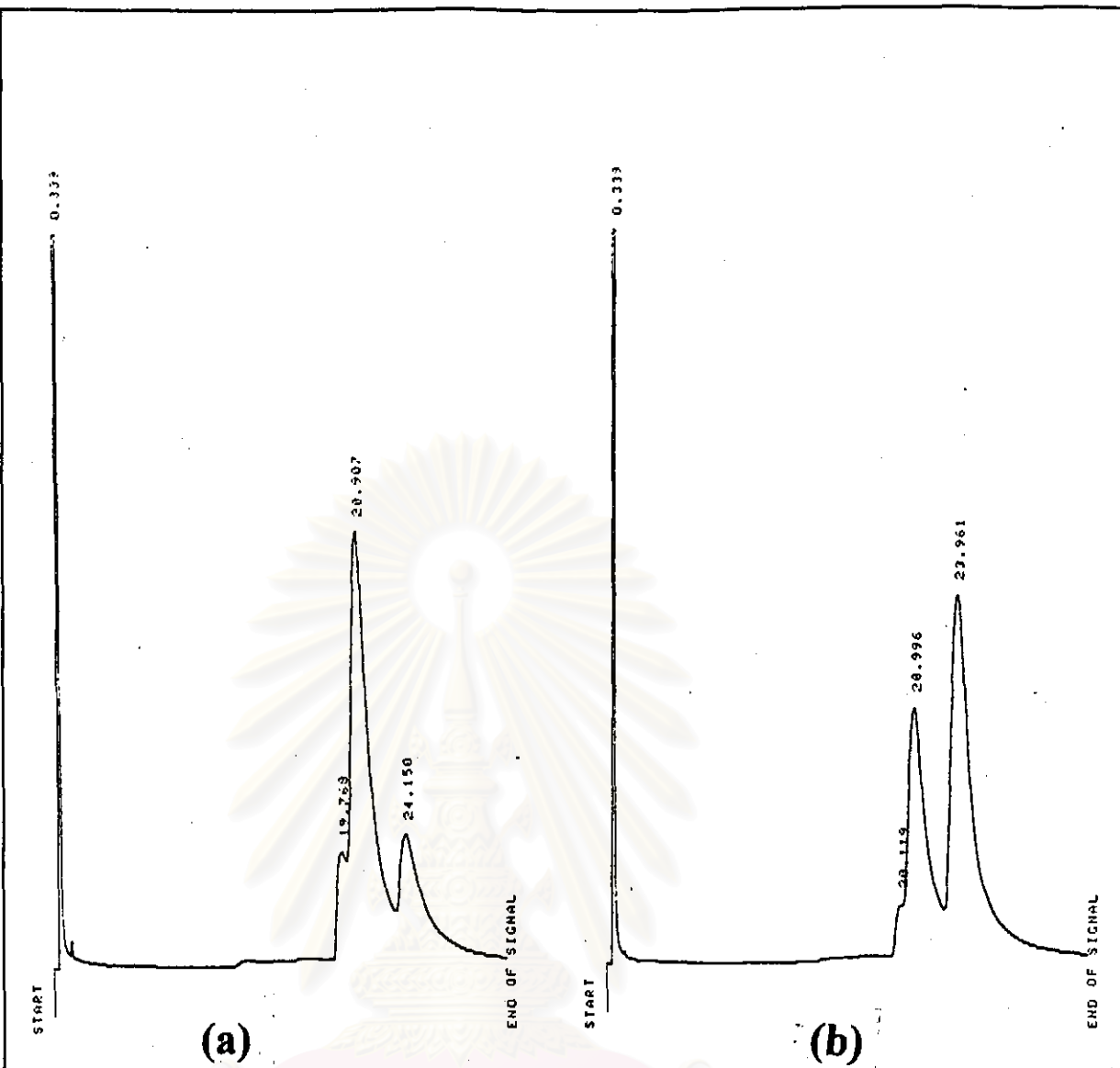
Figure 45 The <sup>13</sup>C NMR spectrum of Mixture 9



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Figure 46 The DEPT 90 and DEPT 135  $^{13}\text{C}$  MNR spectrum of Mixture 9





(a)

(b)

Figure 47 The GLC analysis results of Mixture 9 and standard steroid (campesterol,  $\beta$ -sitosterol and stigmasterol)

(a) The GLC analysis results of standard steroid

(b) The GLC analysis results of Mixture 9

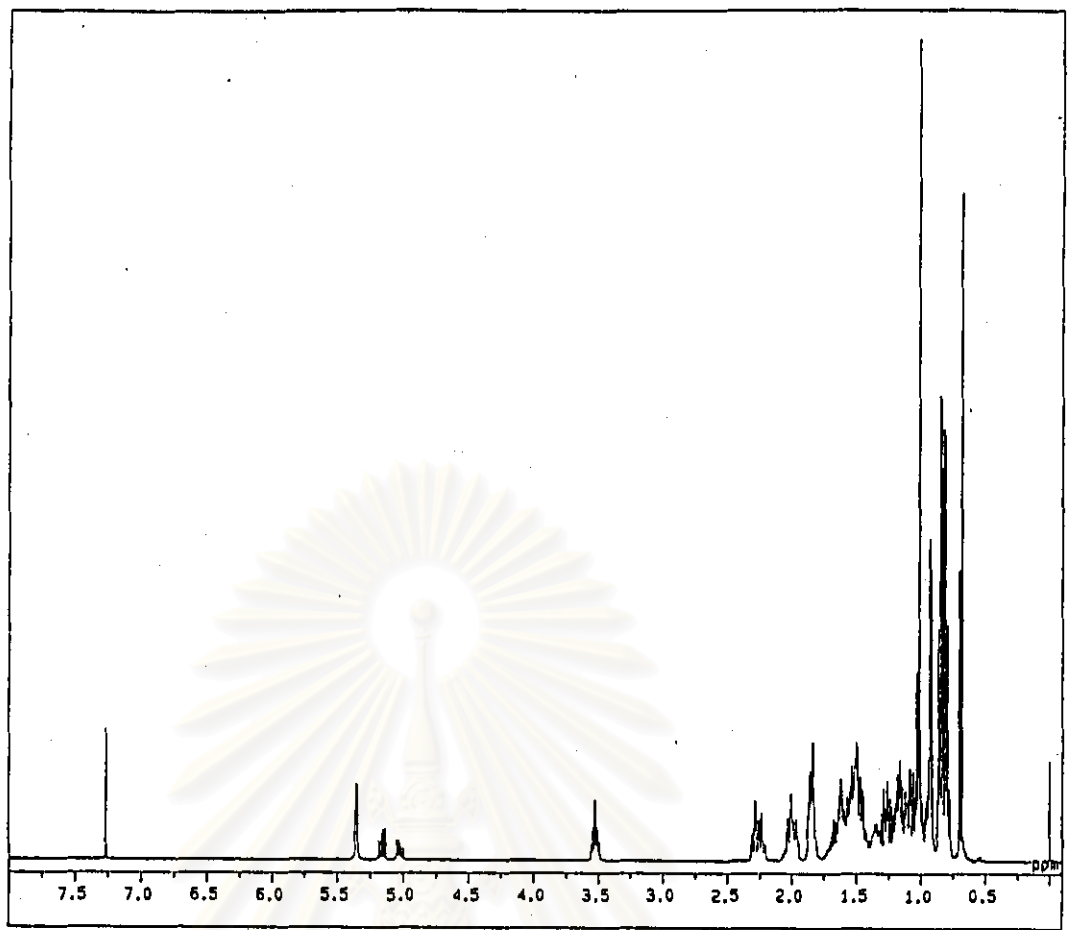


Figure 48 The  $^1\text{H}$  NMR spectrum of Mixture 10

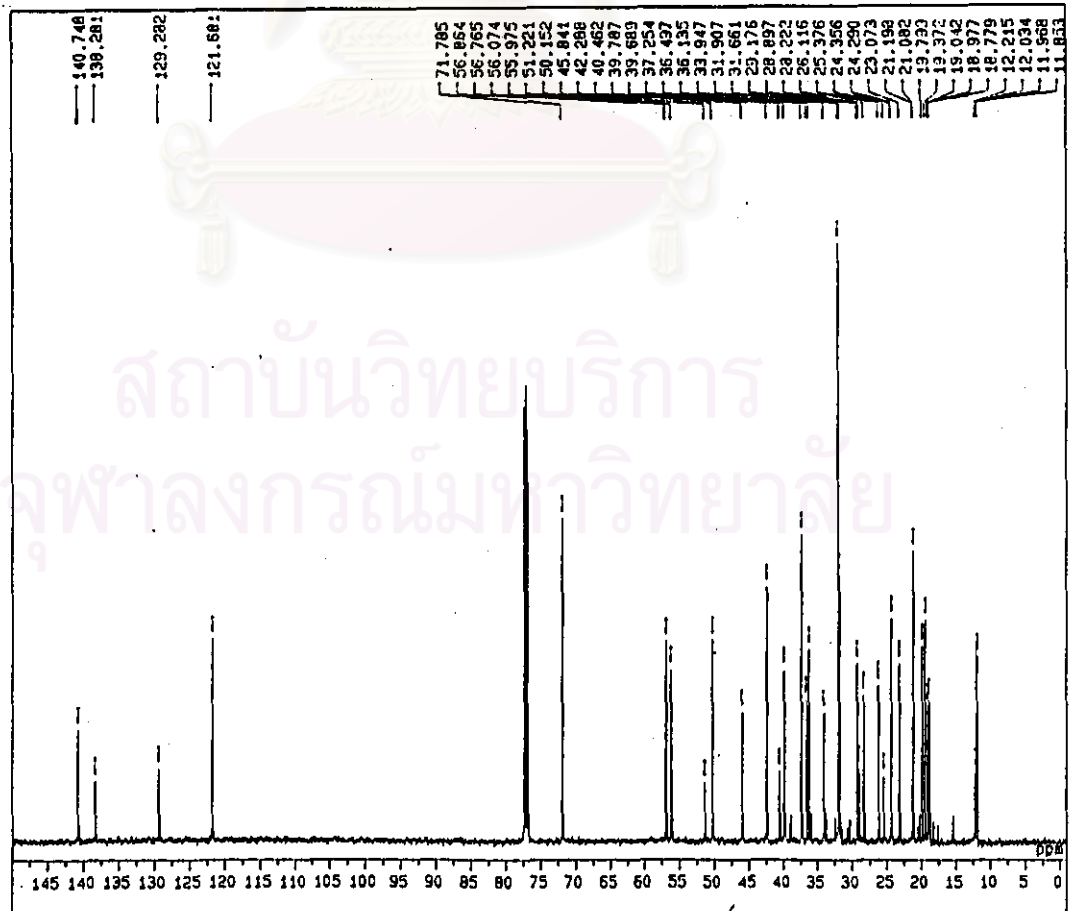


Figure 49 The  $^{13}\text{C}$  NMR spectrum of Mixture 10

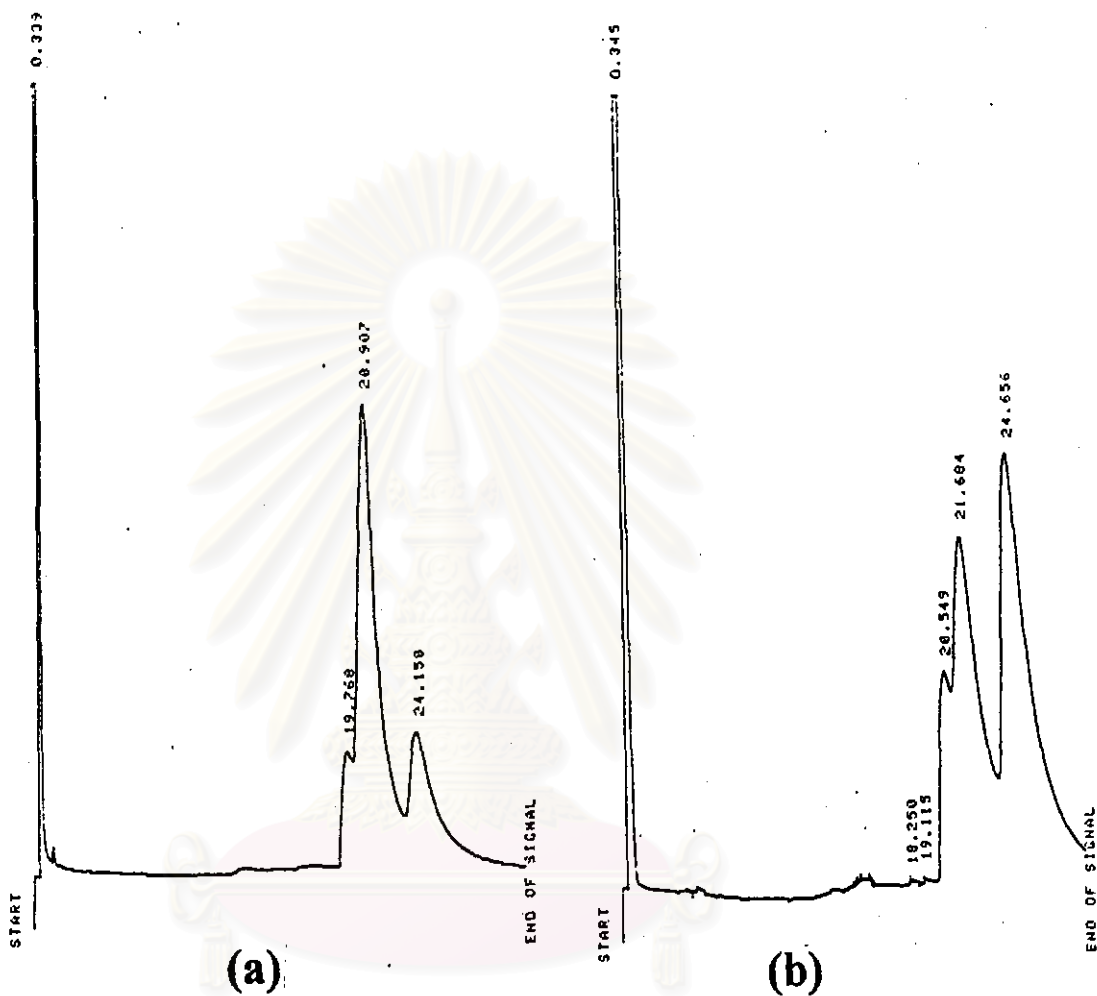


Figure 50 The GLC analysis results of Mixture 10 and standard steroid (campesterol,  $\beta$ -sitosterol and stigmasterol)

(a) The GLC analysis results of standard steroid

(b) The GLC analysis results of Mixture 10

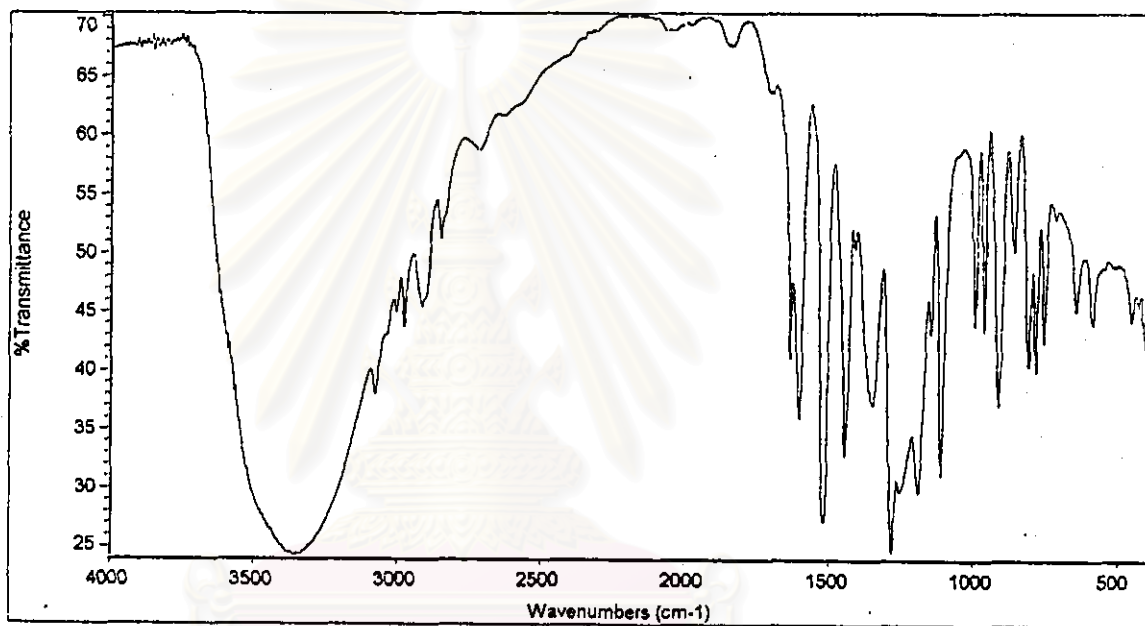


Figure 51 The IR spectrum of Compound 11

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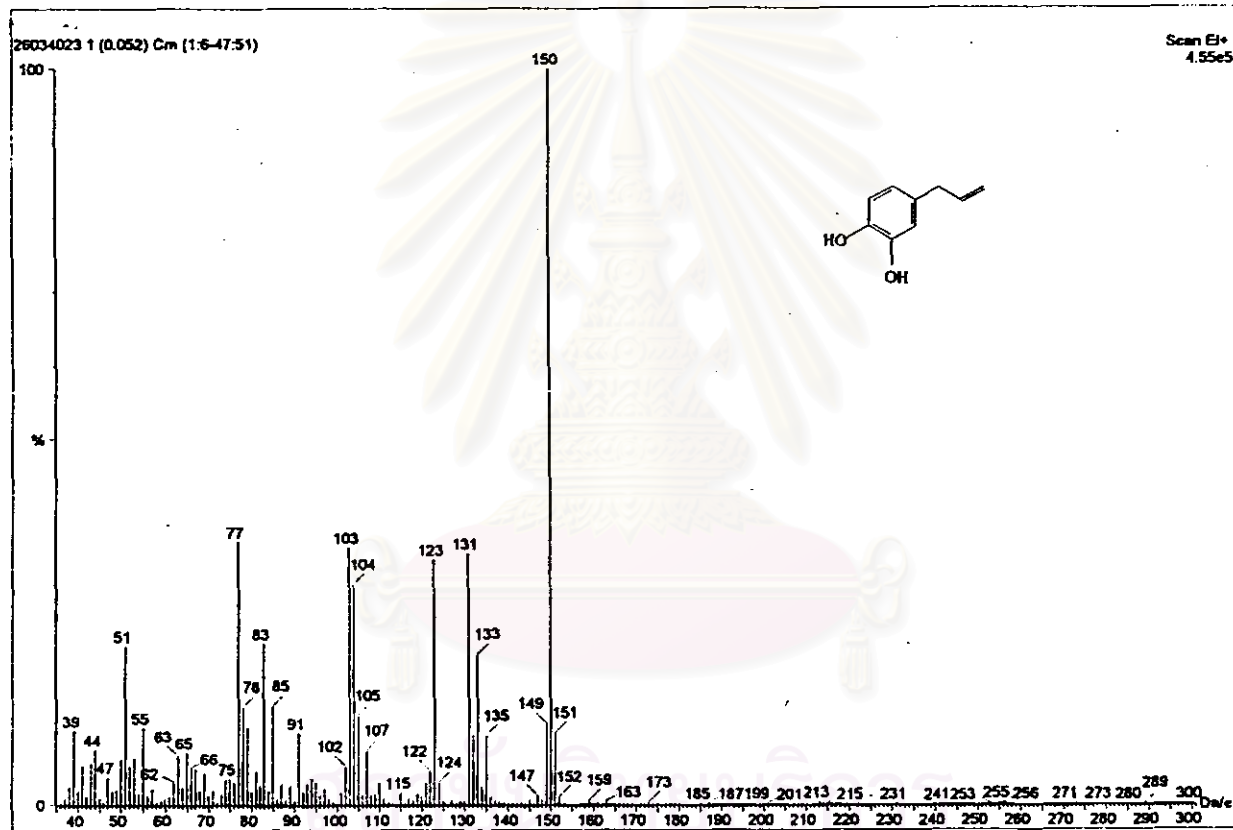


Figure 52 The mass spectrum of Compound 11

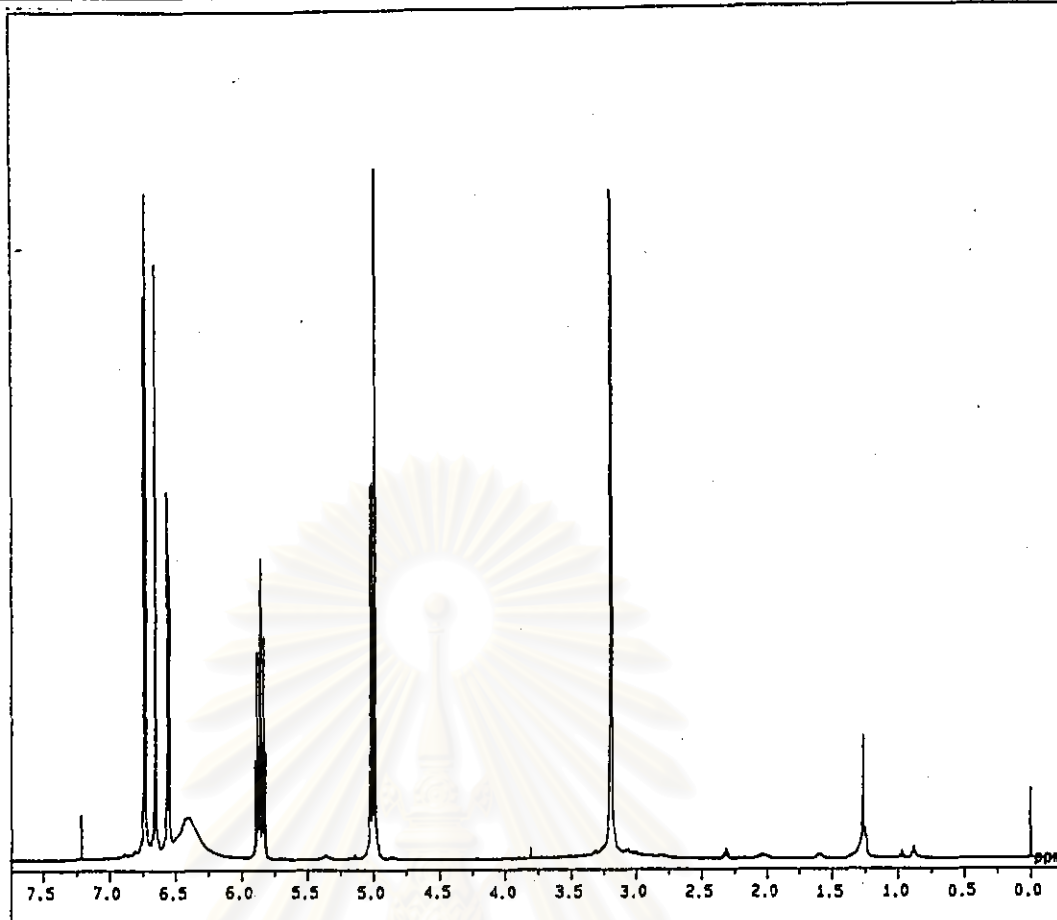


Figure 53 The  $^1\text{H}$  NMR spectrum of Compound 11

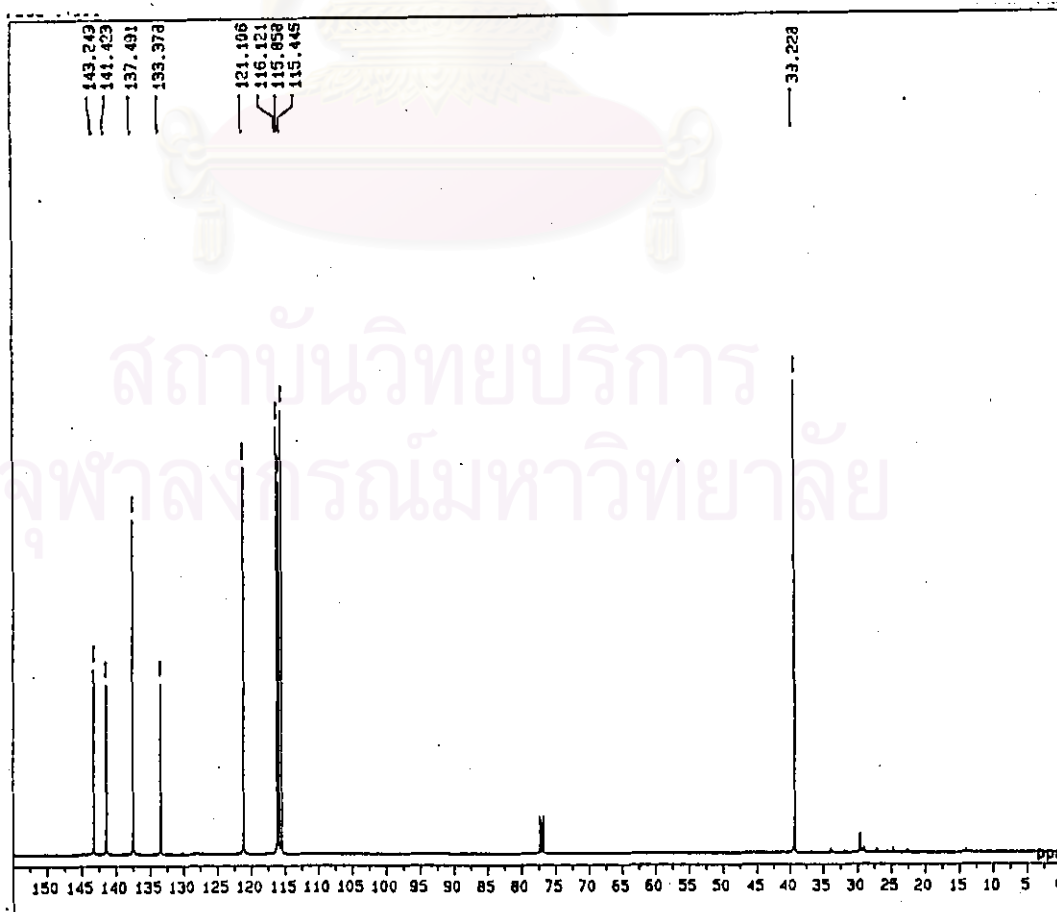


Figure 54 The  $^{13}\text{C}$  NMR spectrum of Compound 11

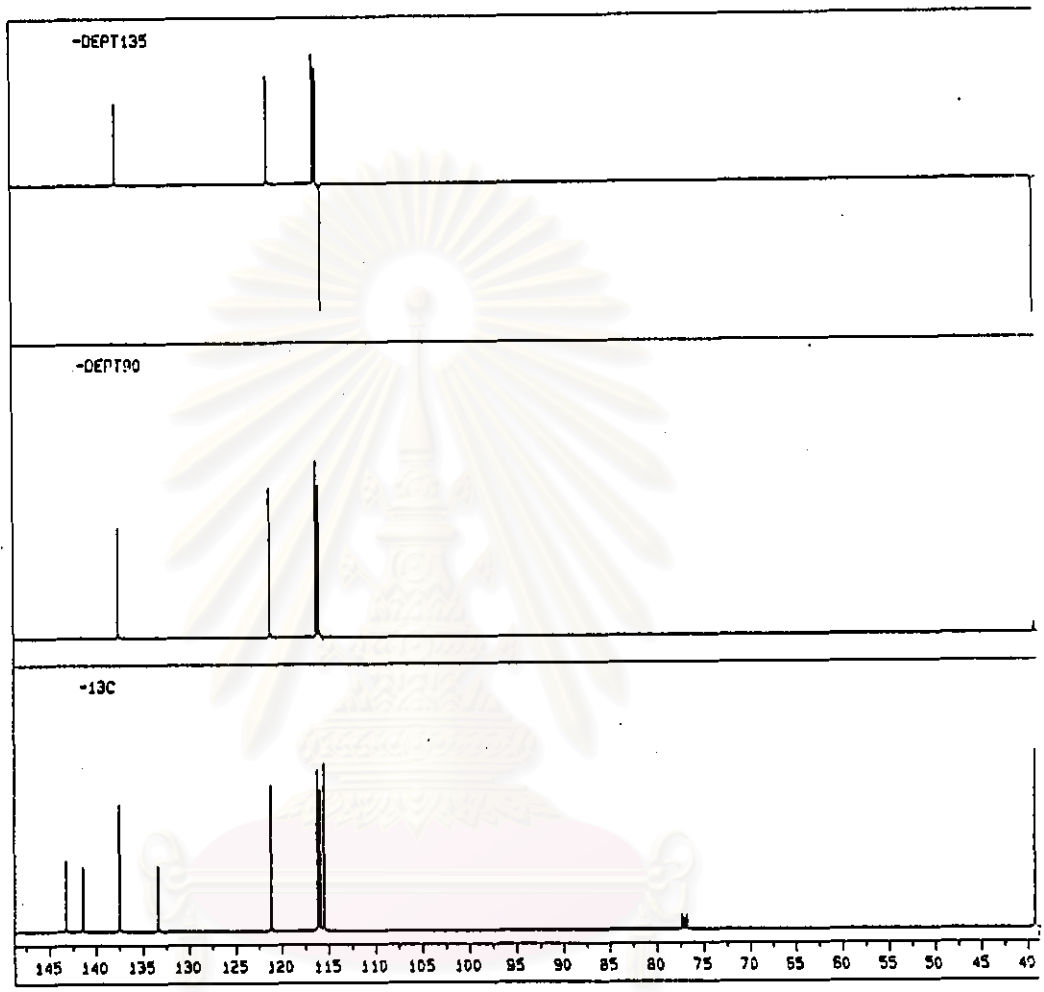


Figure 55 The DEPT 90 and DEPT 135 <sup>13</sup>C MNR spectrum of Compound 11

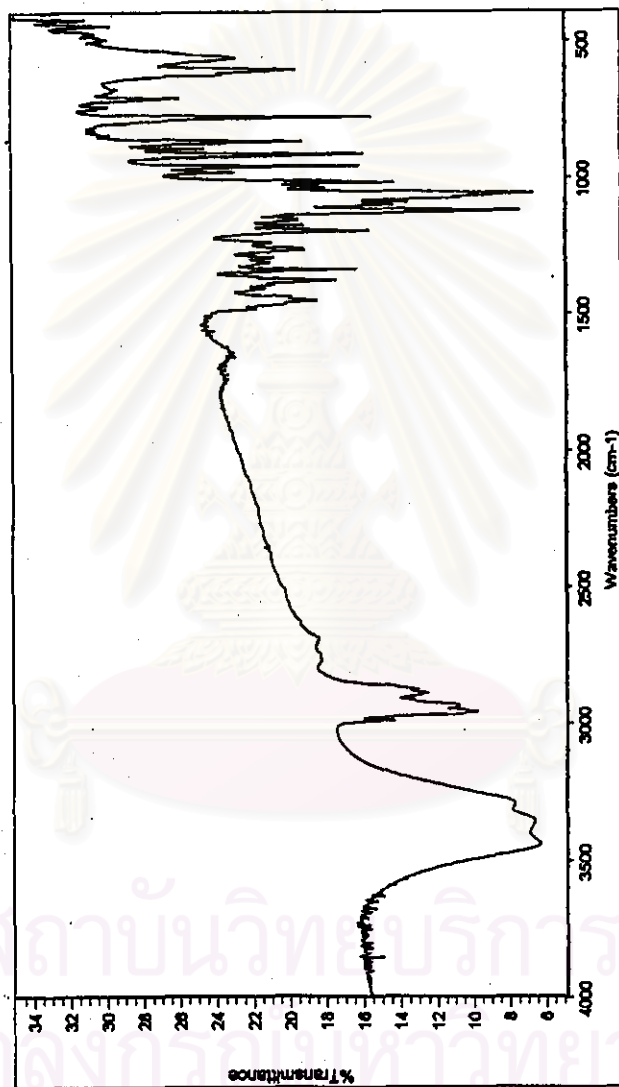


Figure 56 The IR spectrum of PBBu 1



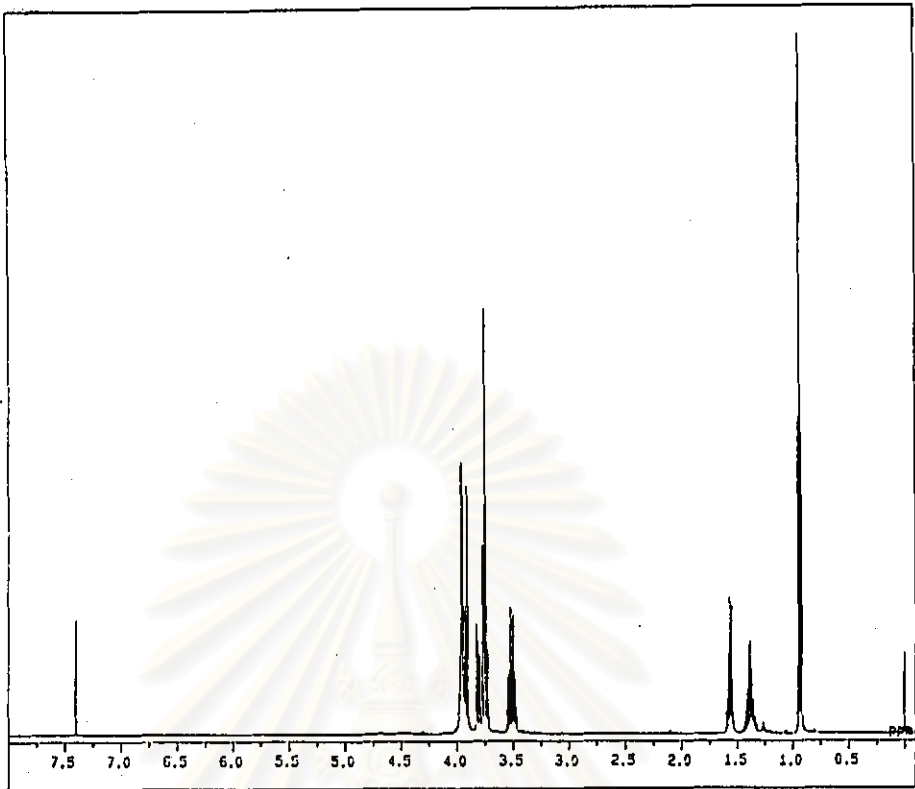


Figure 57 The  $^1\text{H}$  NMR spectrum of PBBu 1

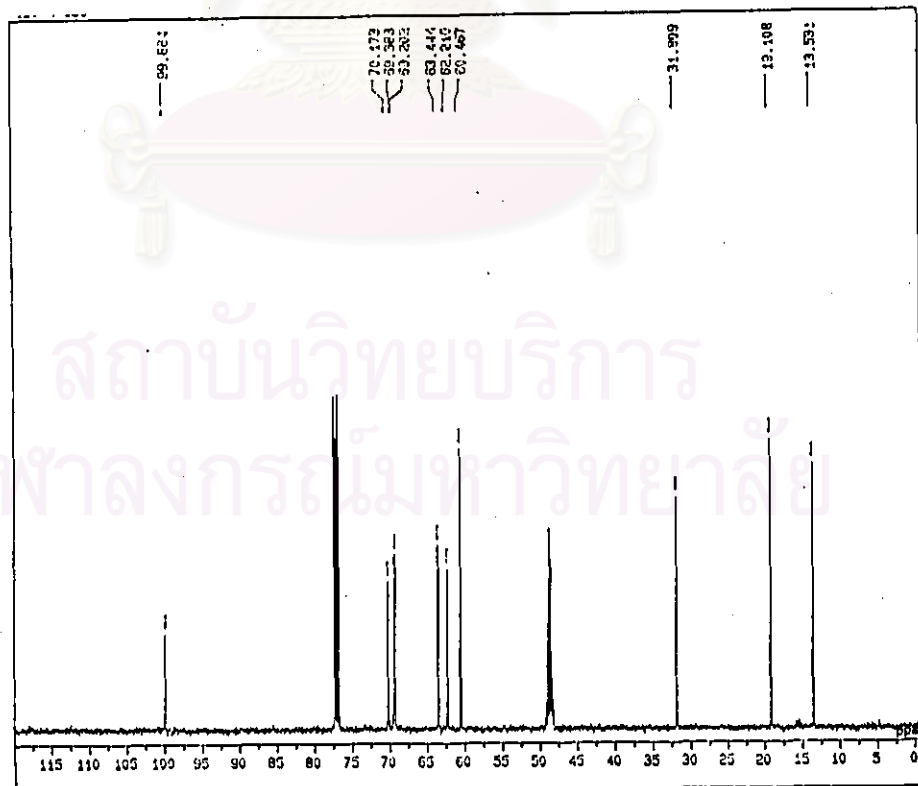


Figure 58 The  $^{13}\text{C}$  NMR spectrum of PBBu 1

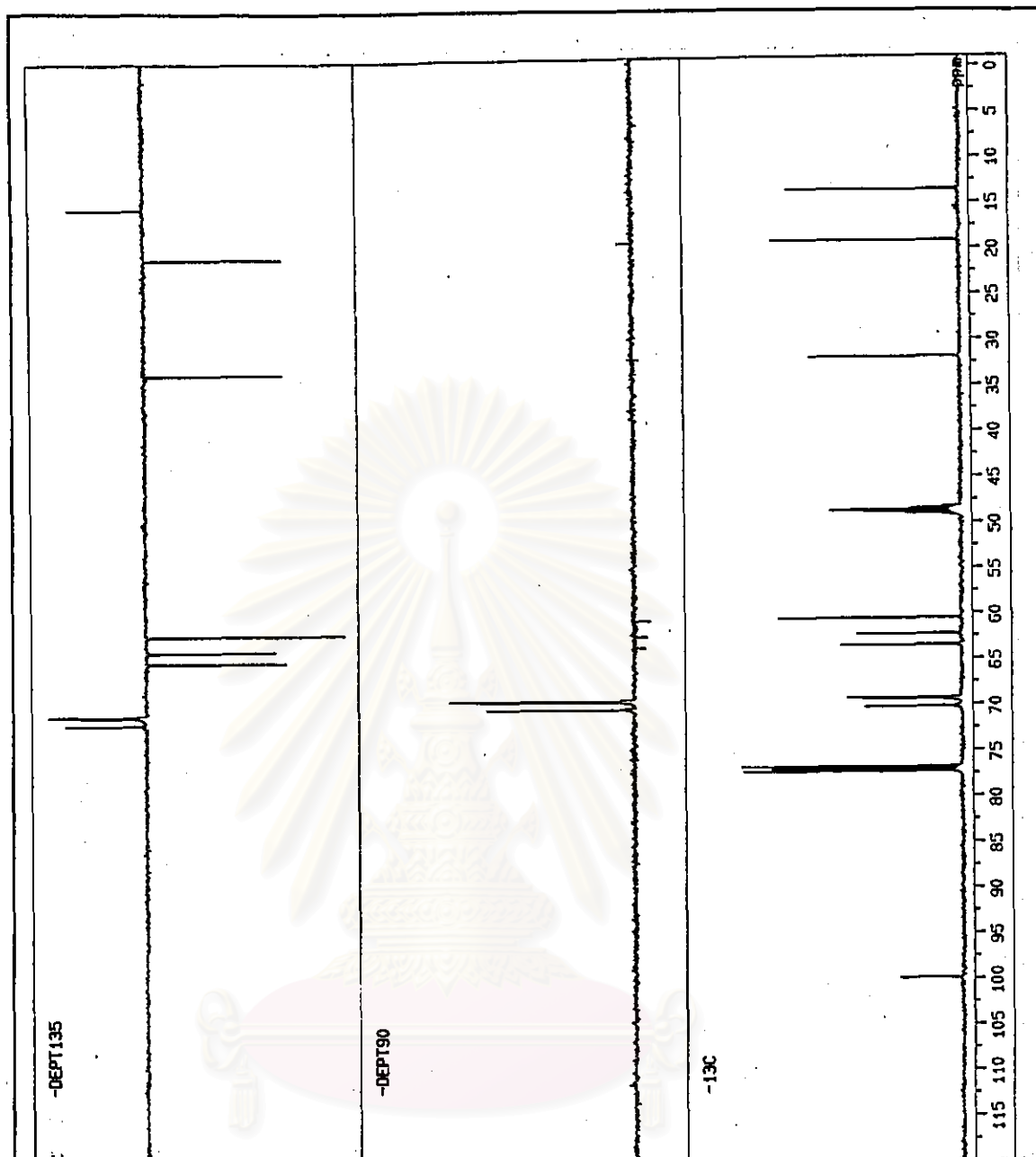


Figure 59 The DEPT 90 and DEPT 135  $^{13}\text{C}$  MNR spectrum of PBBu 1

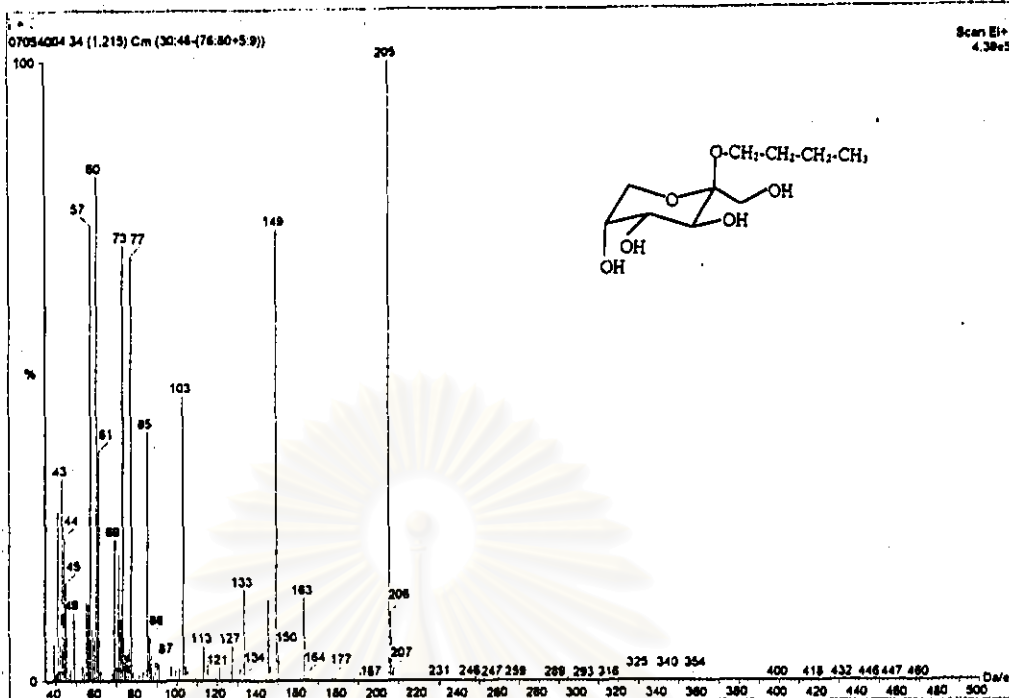


Figure 60 The mass spectrum of PBBu 1

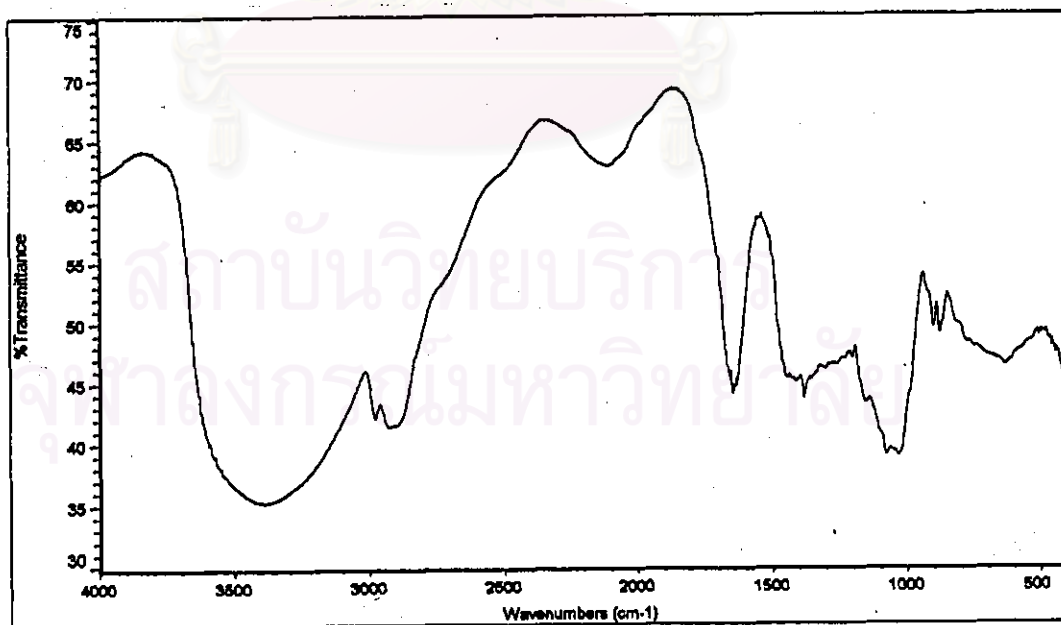


Figure 61 The IR spectrum of PBBu 2

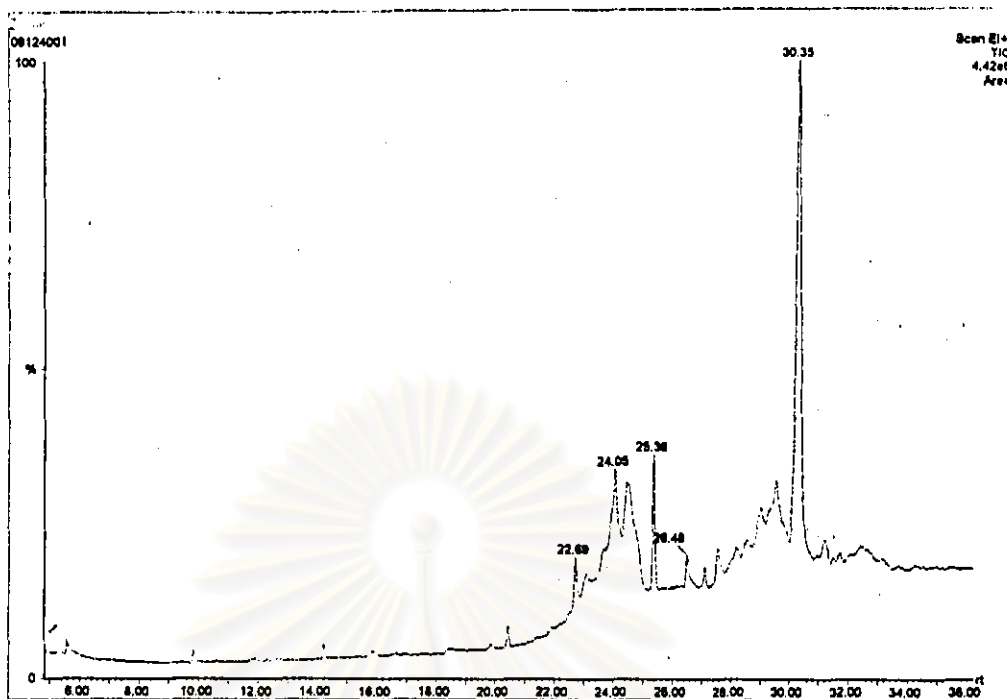


Figure 62 The GC-MS analysis results of PBBu 2

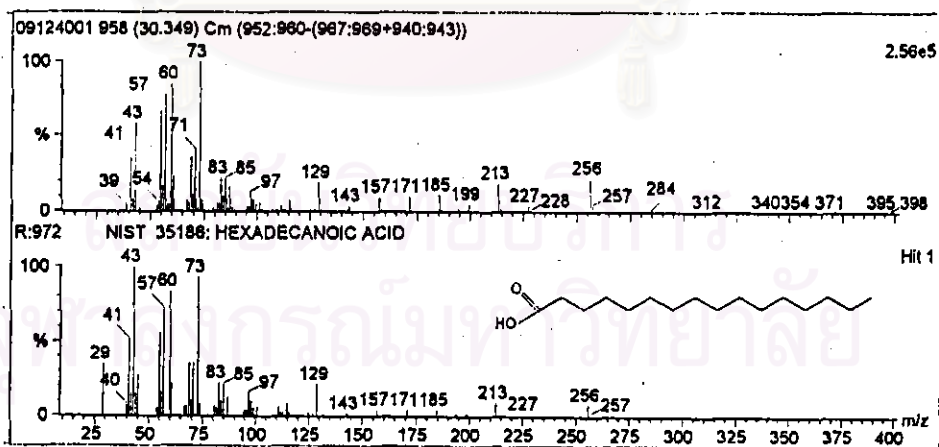


Figure 63 The mass spectrum of PBBu 2

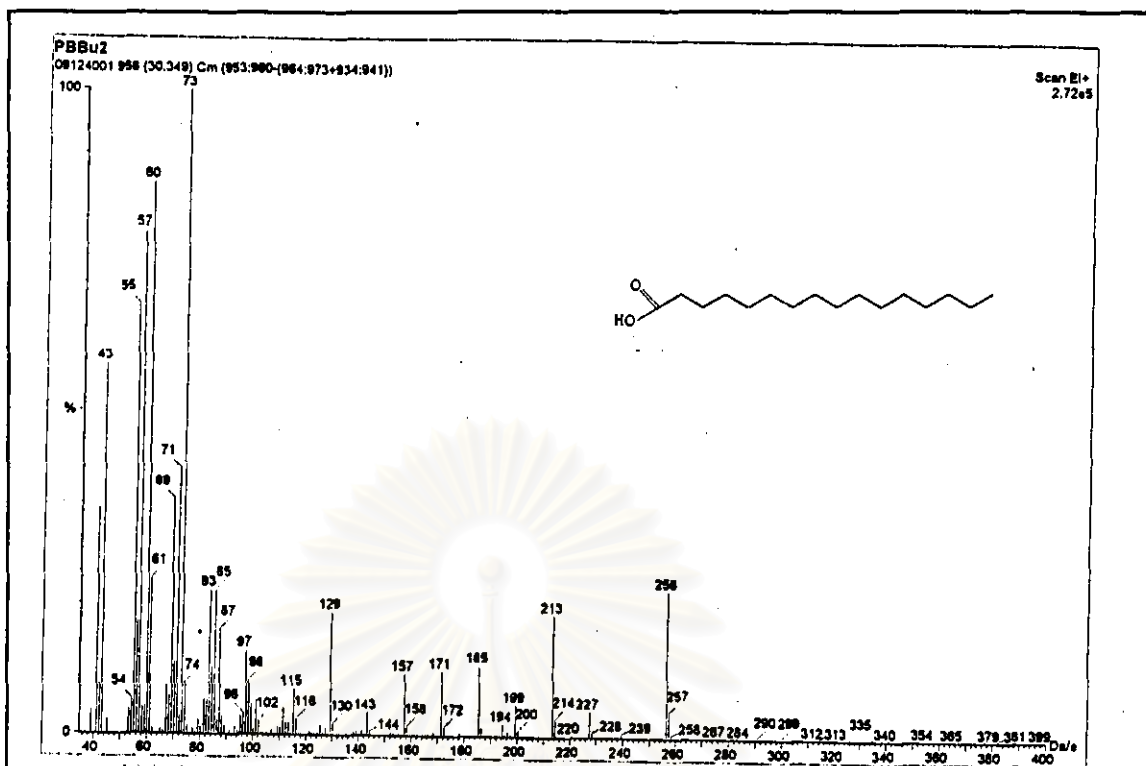


Figure 64 The mass spectrum of PBBu 2

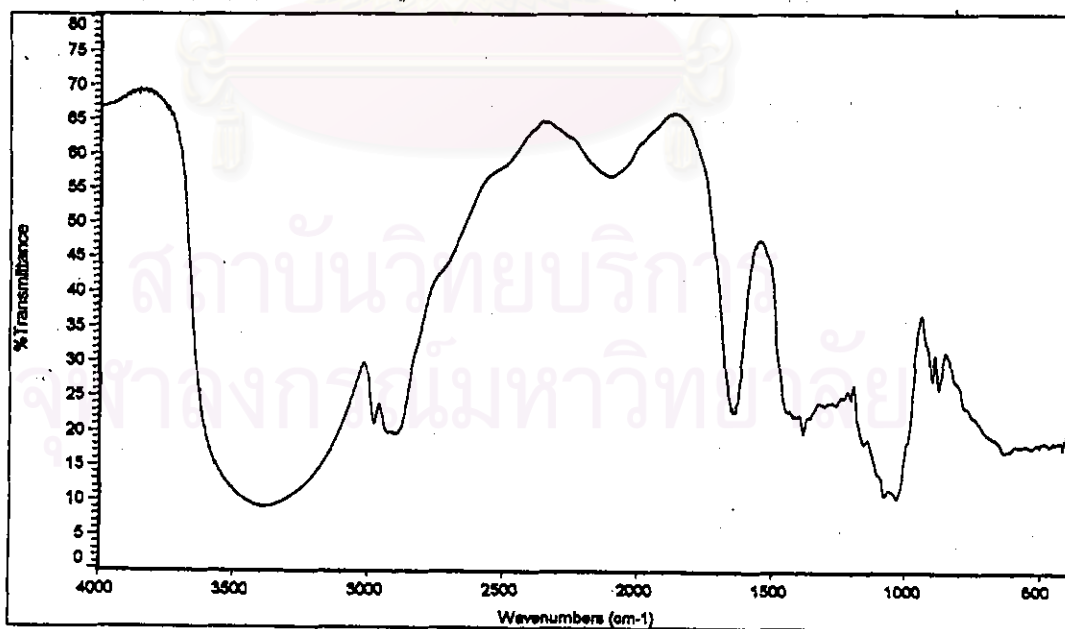


Figure 65 The IR spectrum of PBBu 3

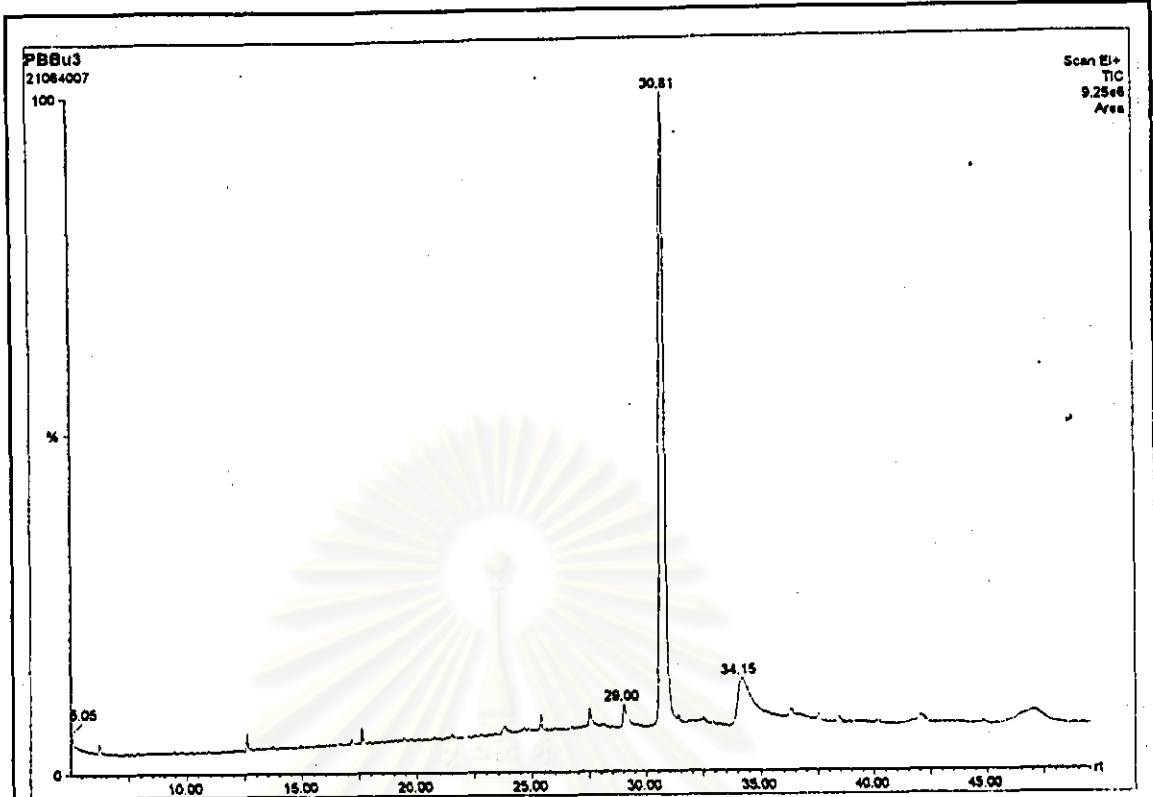


Figure 66 The GC-MS analysis results of PBBu 3



Figure 67 The mass spectrum of a component in PBBu 3

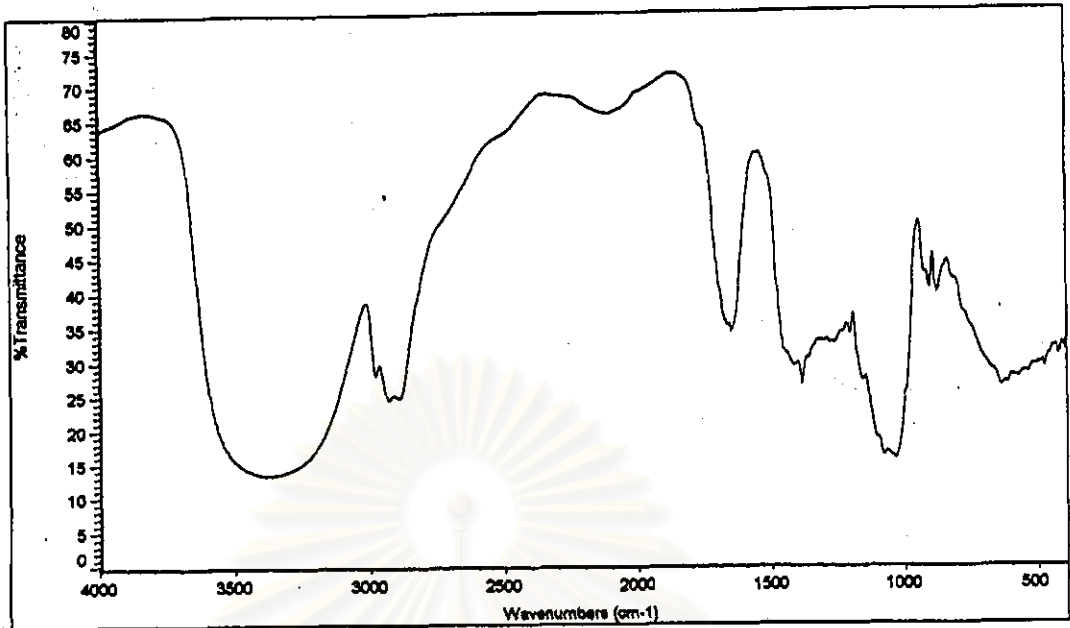


Figure 68 The IR spectrum of PBBu 4

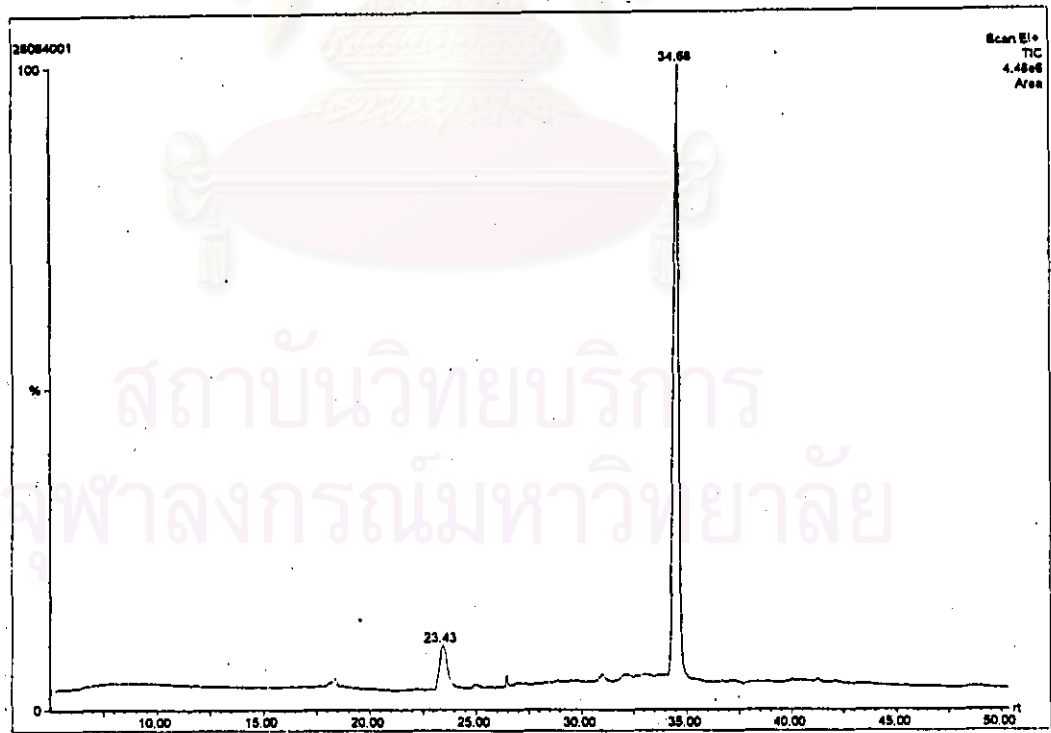


Figure 69 The GC-MS analysis results of PBBu 4



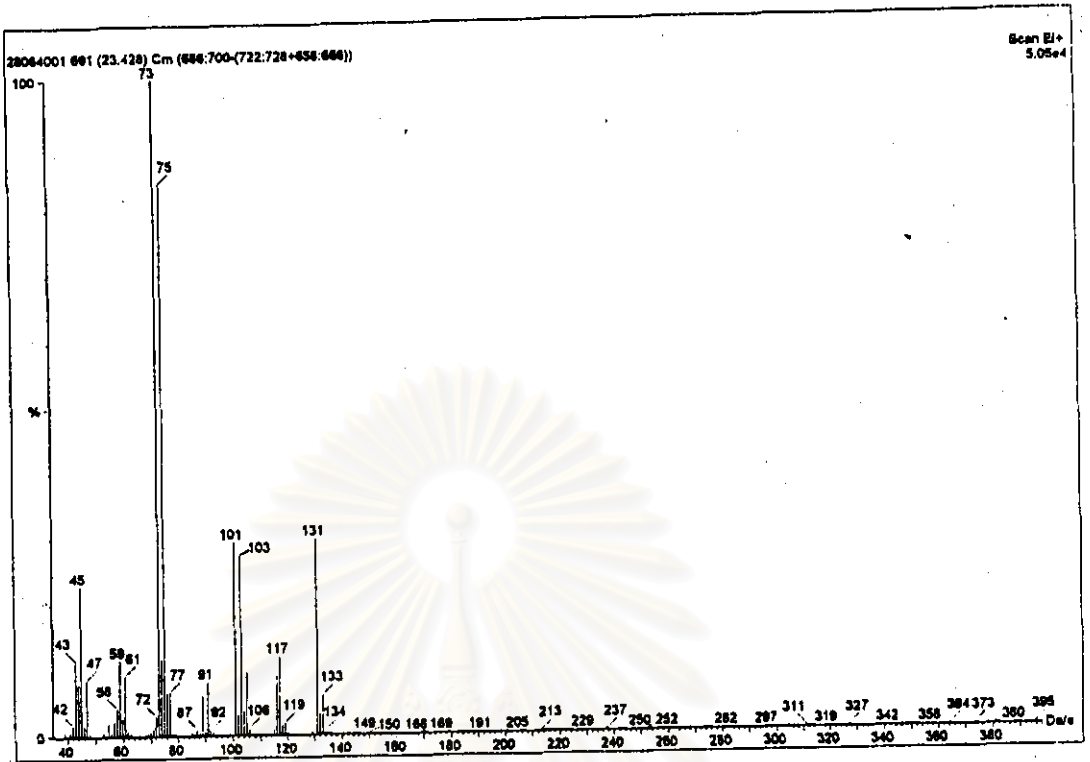


Figure 70 The mass spectrum of a component in PBBu 4 at Rt 23.43 min

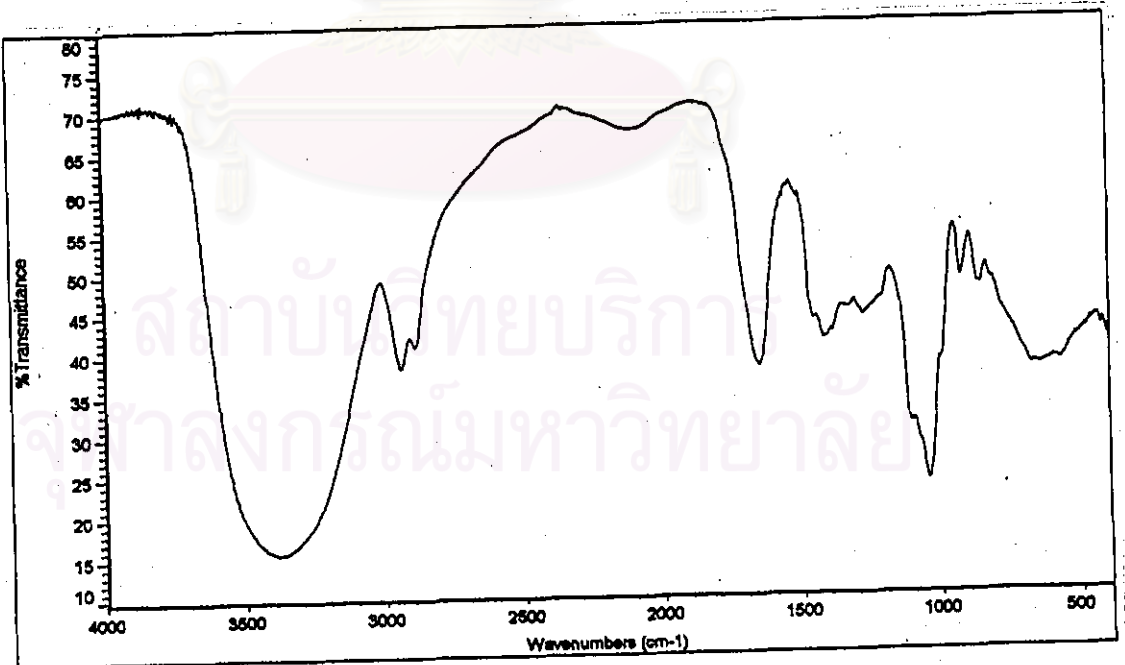


Figure 71 The IR spectrum of PBBu 5

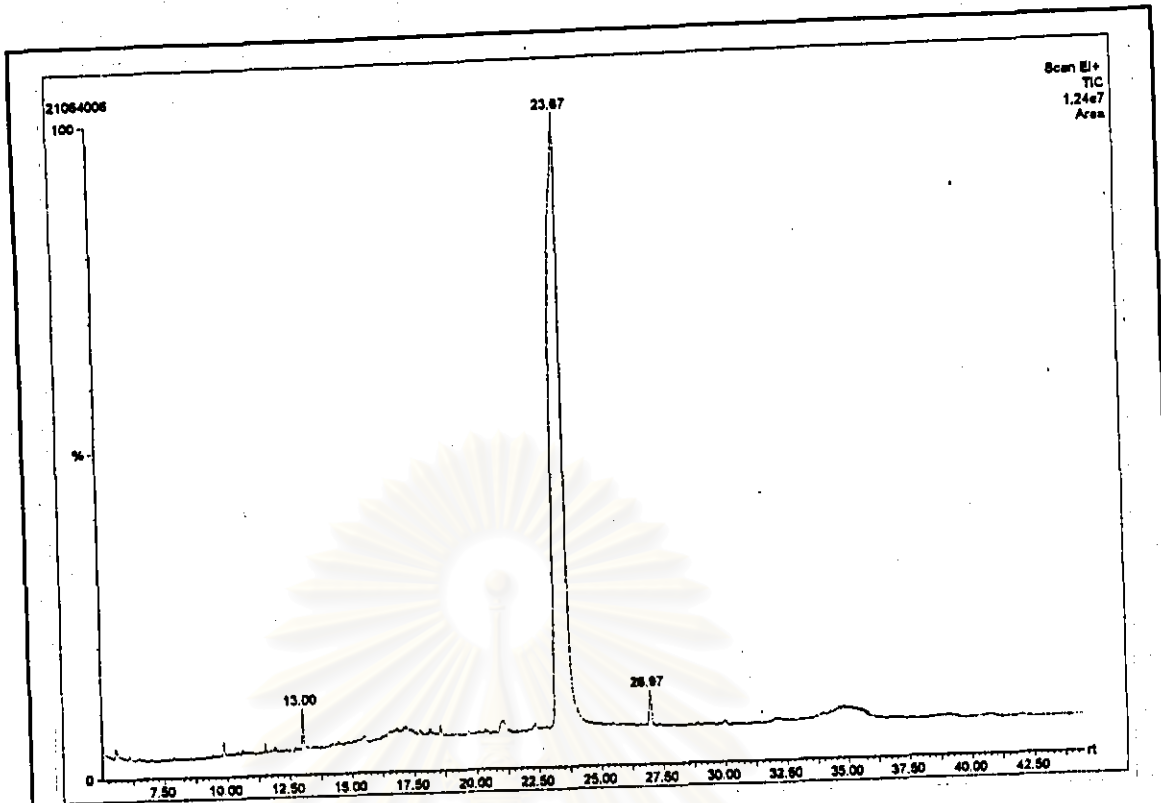


Figure 72 The GC-MS analysis results of PBBu 5

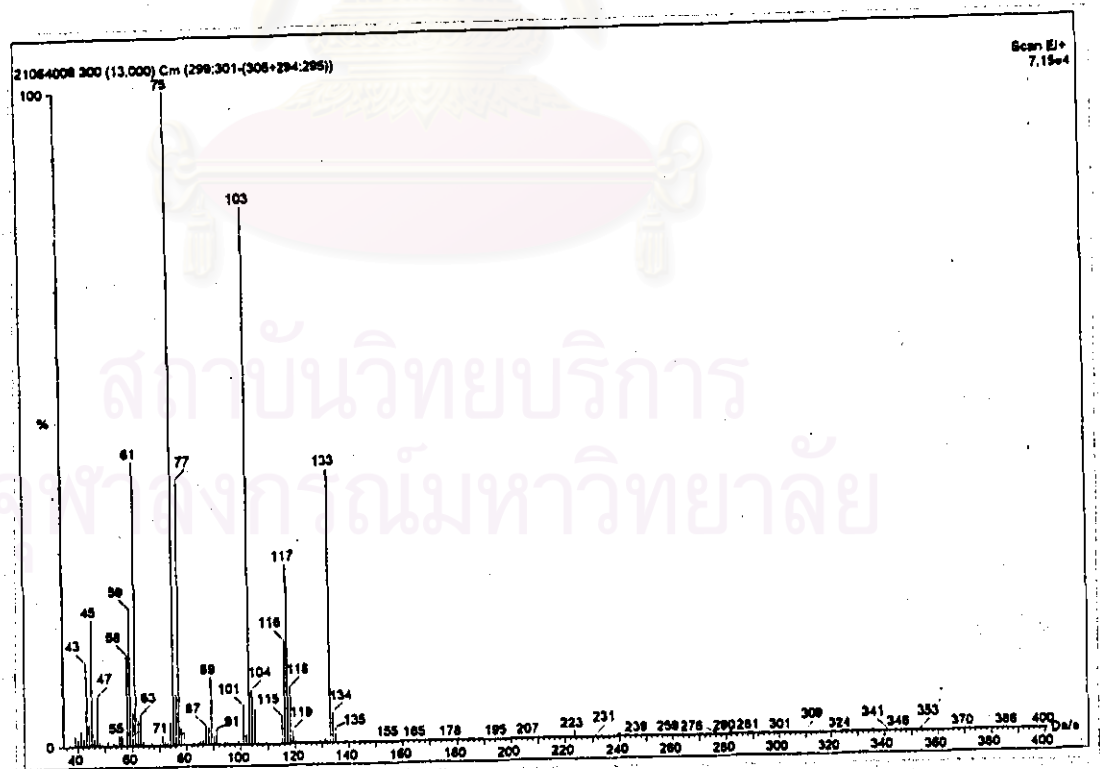


Figure 73 The mass spectrum of a component in PBBu 5 at Rt 13.00 min

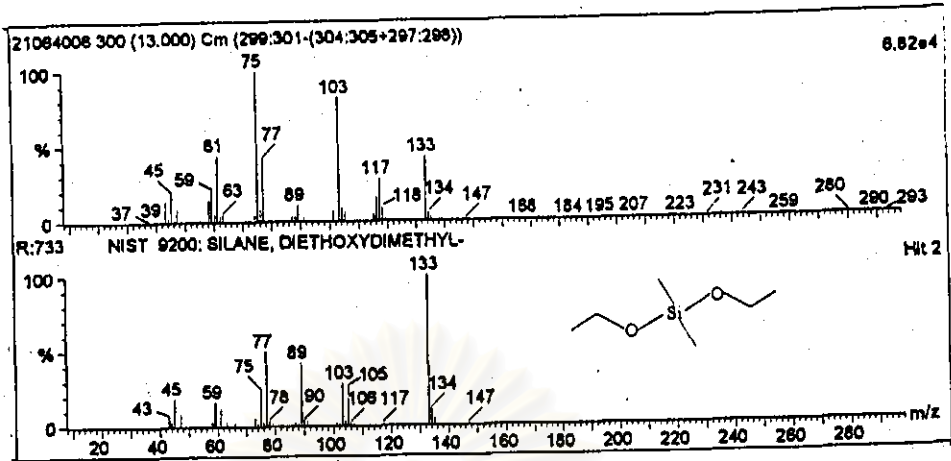


Figure 74 The mass spectrum of a component in PBBu 5 at Rt 13.00 min and diethoxydimethyl silane

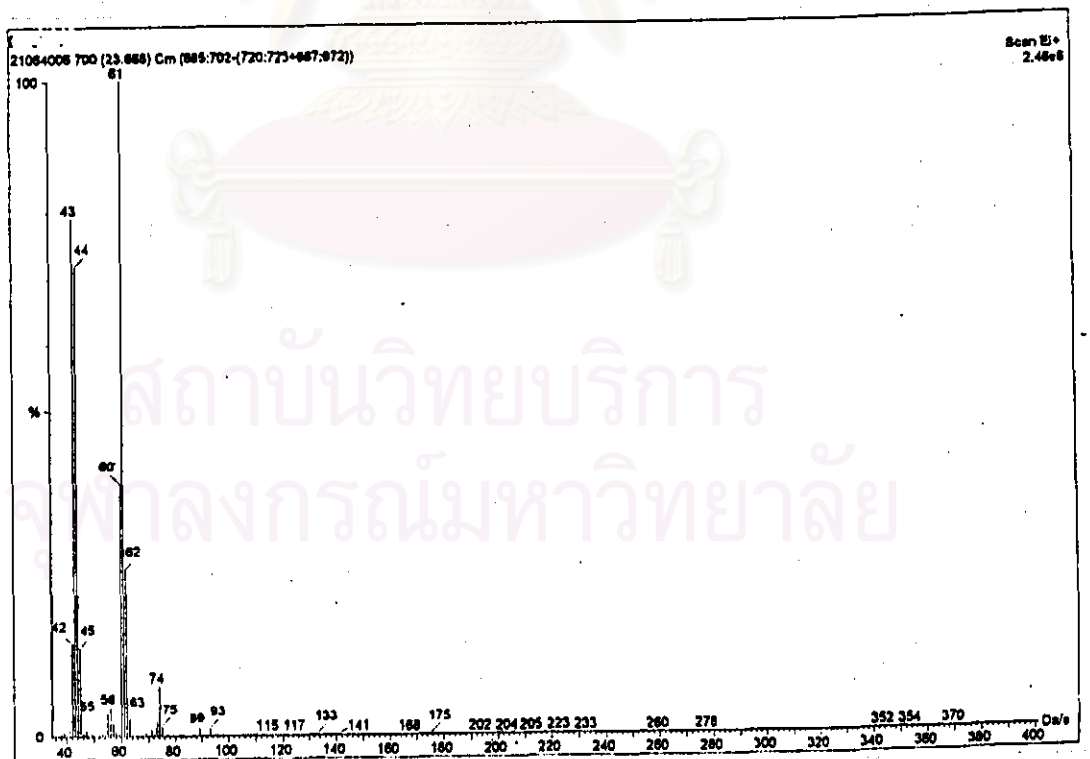


Figure 75 The mass spectrum of a component in PBBu 5 at Rt 23.67 min

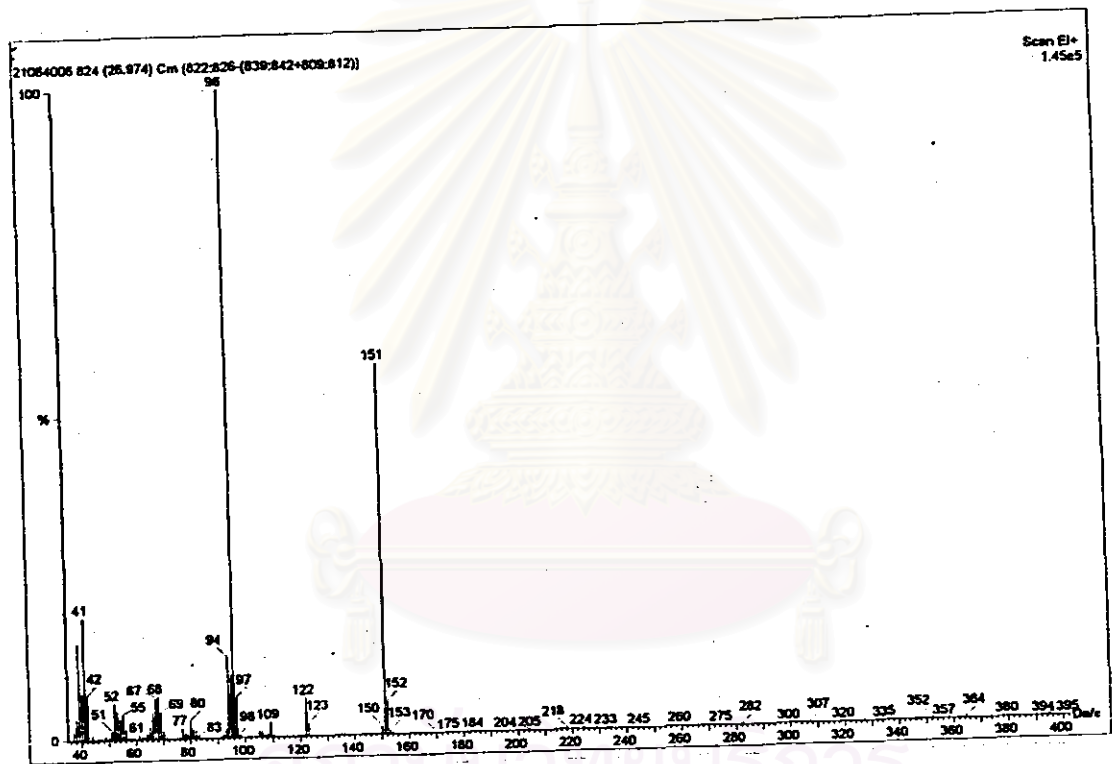


Figure 76 The mass spectrum of a component in PBBu 5 at Rt 26.97 min

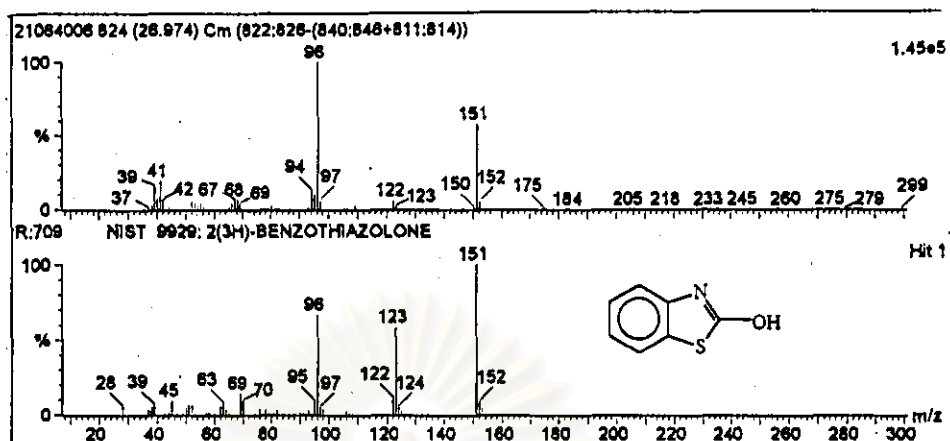


Figure 77 The mass spectrum of a component in PBBu 5 at Rt 26.97 min and 2(3H)-benzothiazolone

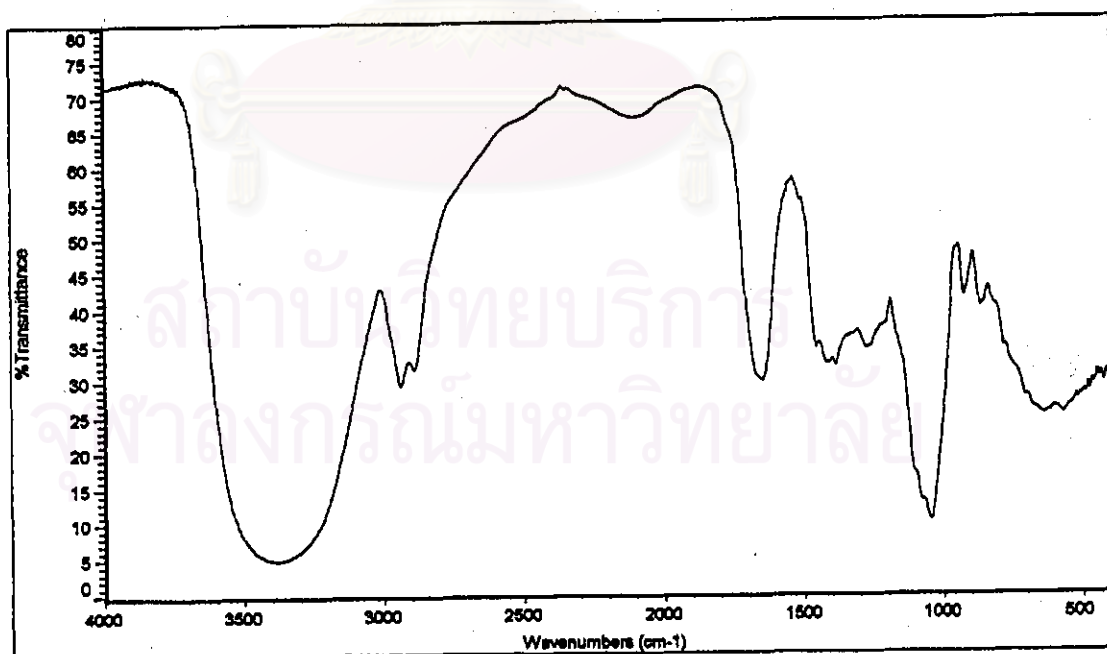


Figure 78 The IR spectrum of PBBu 6

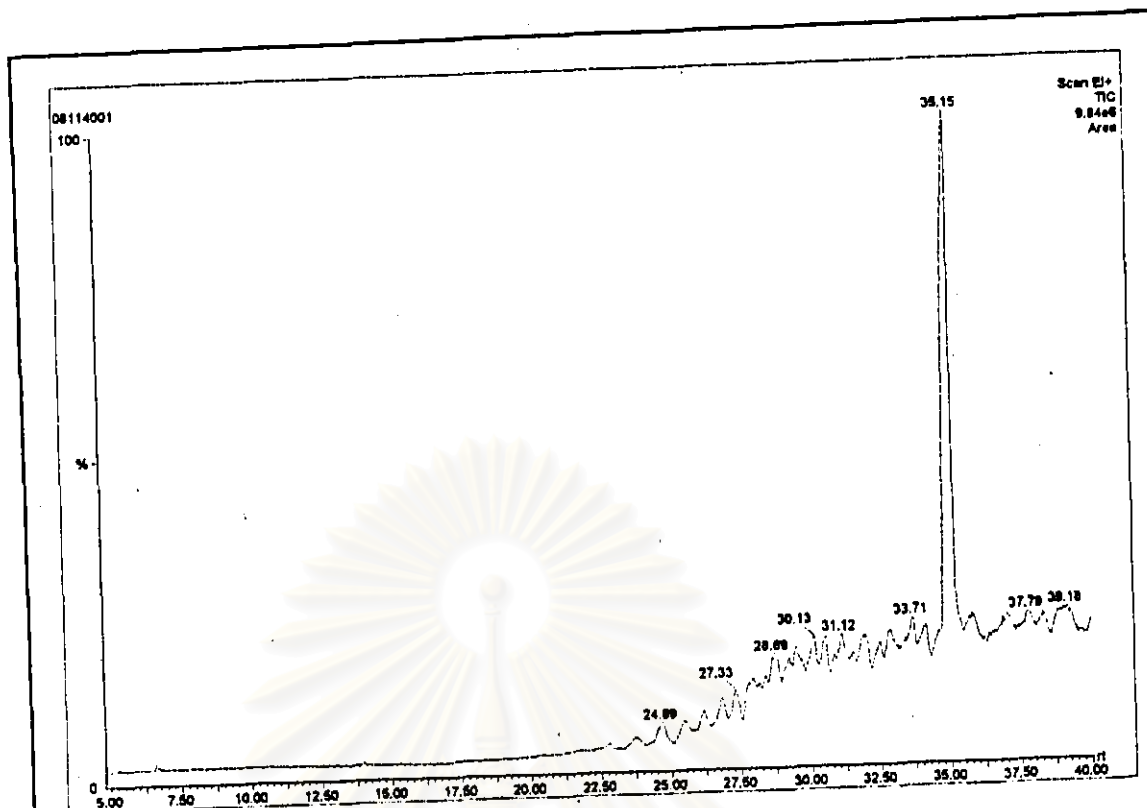


Figure 79 The GC-MS analysis results of PBBu 6

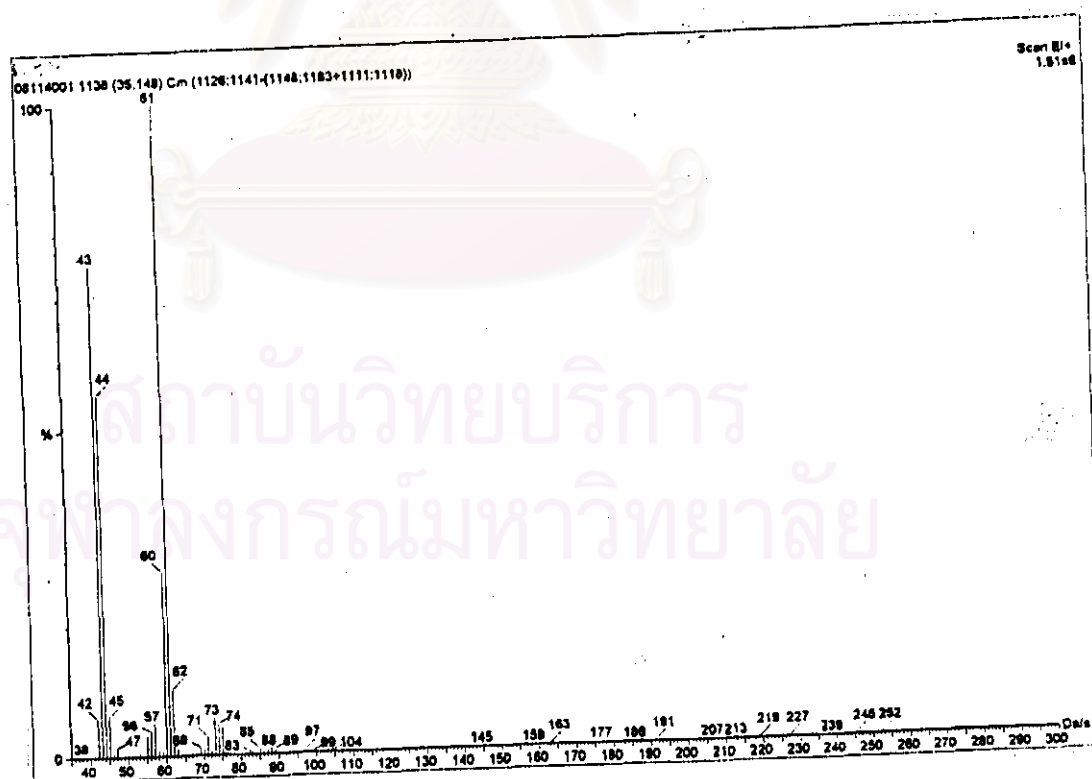


Figure 80 The mass spectrum of a component in PBBu 6 at Rt 35.15 min



## VITA

Miss Numphon Koocharoenpibal was born on November 21, 1972 in Samut sakorn province, Thailand. She graduated with a Bachelor of Science in chemistry from Chulalongkorn University in 1995. Since 1995, she has been a graduate student studying Organic Chemistry at Chulalongkorn University. During her study towards the Master 's degree, she received financial support from DPST, Thailand, supported a research grant for this Master Degree ' s thesis from the Graduate School, Chulalongkorn University and supported a research grant from the Natural Products Research Unit, Chemistry Department, Chulalongkorn University.

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