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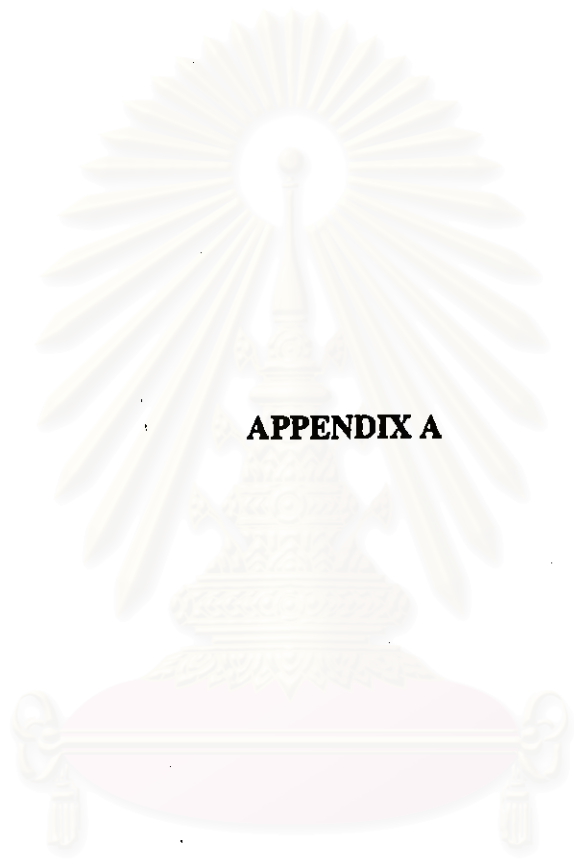
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APPENDIX A

สถาบันวิทยบริการ
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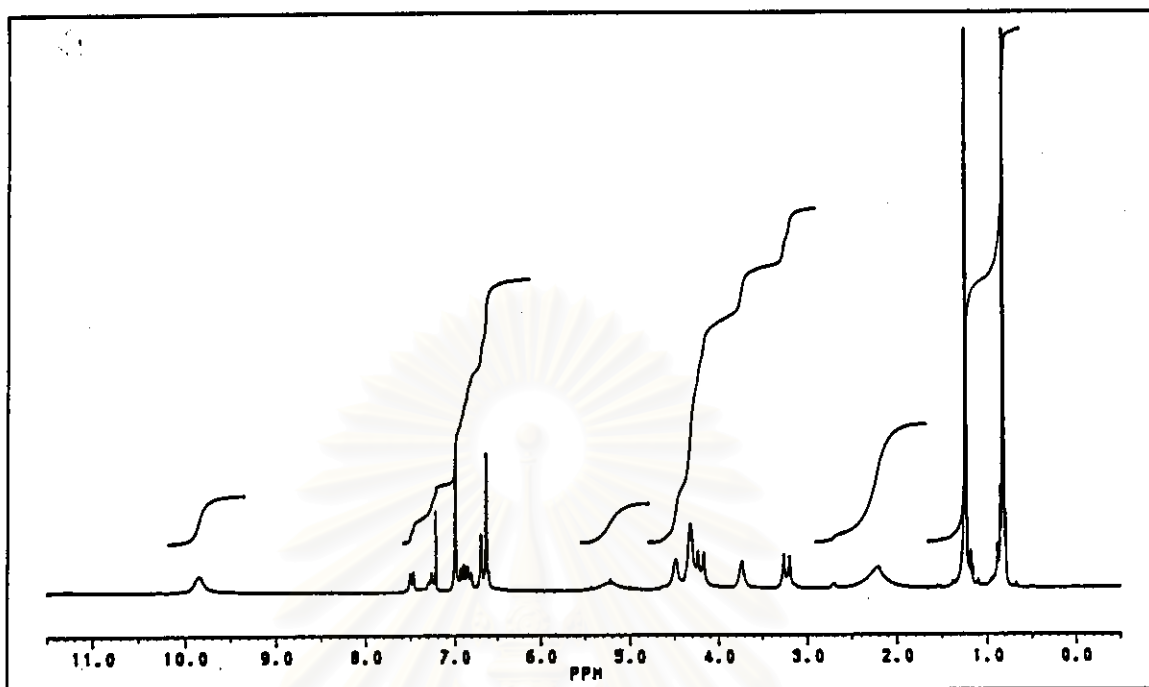


Figure A.1. $^1\text{H-NMR}$ (CDCl_3) spectrum of 25,27-*N,N'*-di-((2-ethoxy)benzyl) ethylenediamine-*p-tert*-butylcalix[4]arene-2HCl (4a).

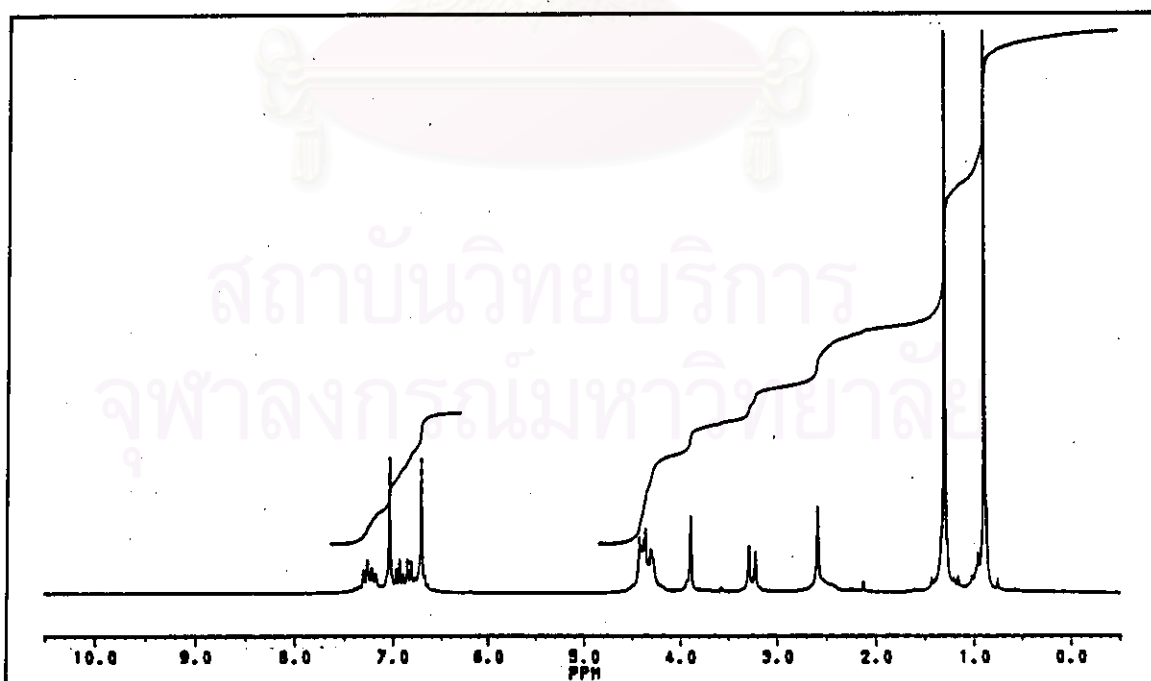


Figure A.2. $^1\text{H-NMR}$ (CDCl_3) spectrum of 25,27-*N,N'*-di-((2-ethoxy)benzyl) ethylenediamine-*p-tert*-butylcalix[4]arene (5a).

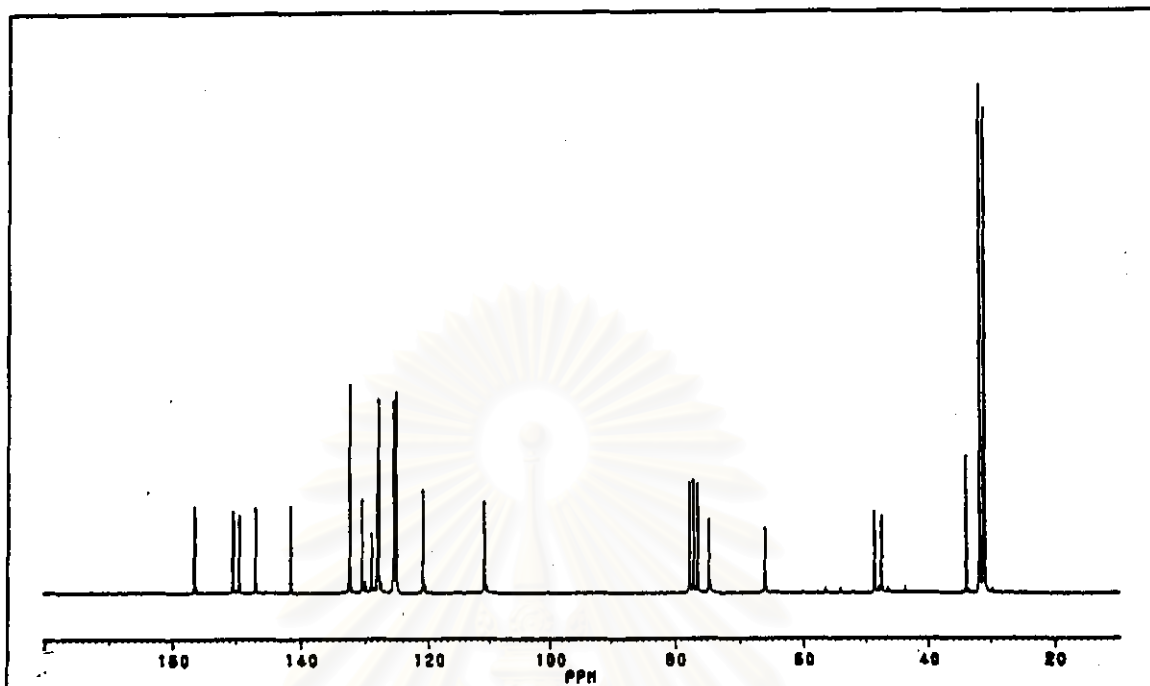


Figure A.3. ^{13}C -NMR (CDCl_3) spectrum of 25,27-*N,N'*-di-((2-ethoxy)benzyl) ethylenediamine-*p*-*tert*-butylcalix[4]arene (5a).

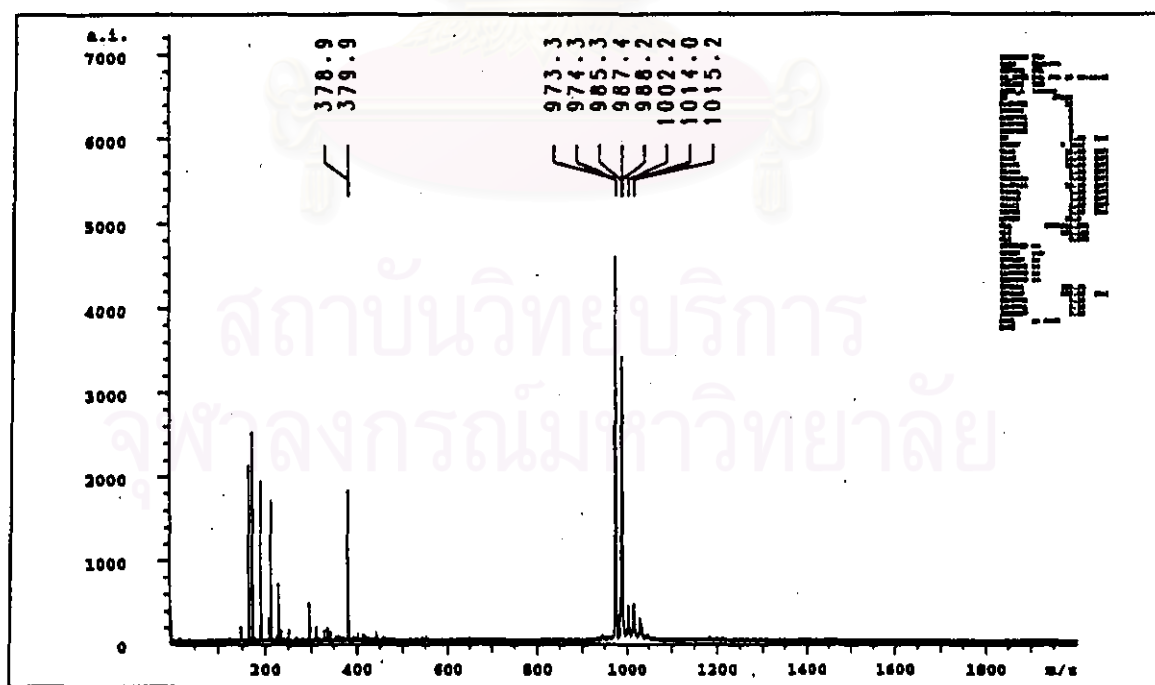


Figure A.4. FAB-MS (positive) spectrum of 25,27-*N,N'*-di-((2-ethoxy)benzyl) ethylenediamine-*p*-*tert*-butylcalix[4]arene (5a).

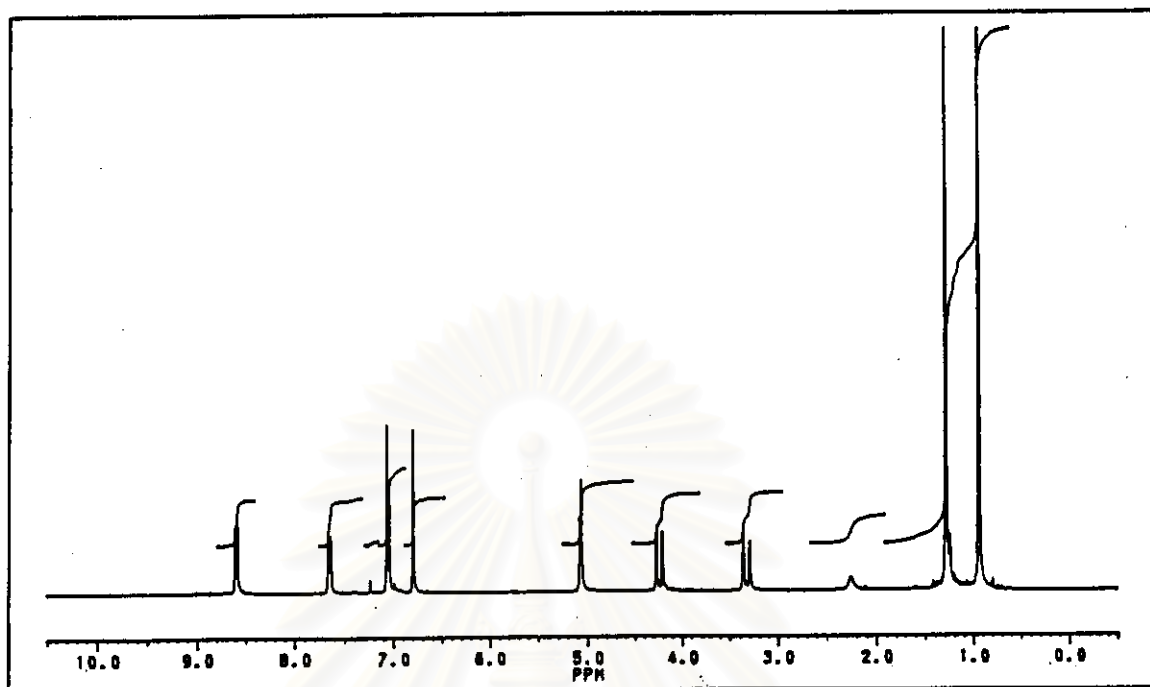


Figure A.5. $^1\text{H-NMR}$ (CDCl_3) spectrum of 25,27-di-(4-pyridylmethoxy)-*p*-*tert*-butylcalix[4]arene (6).

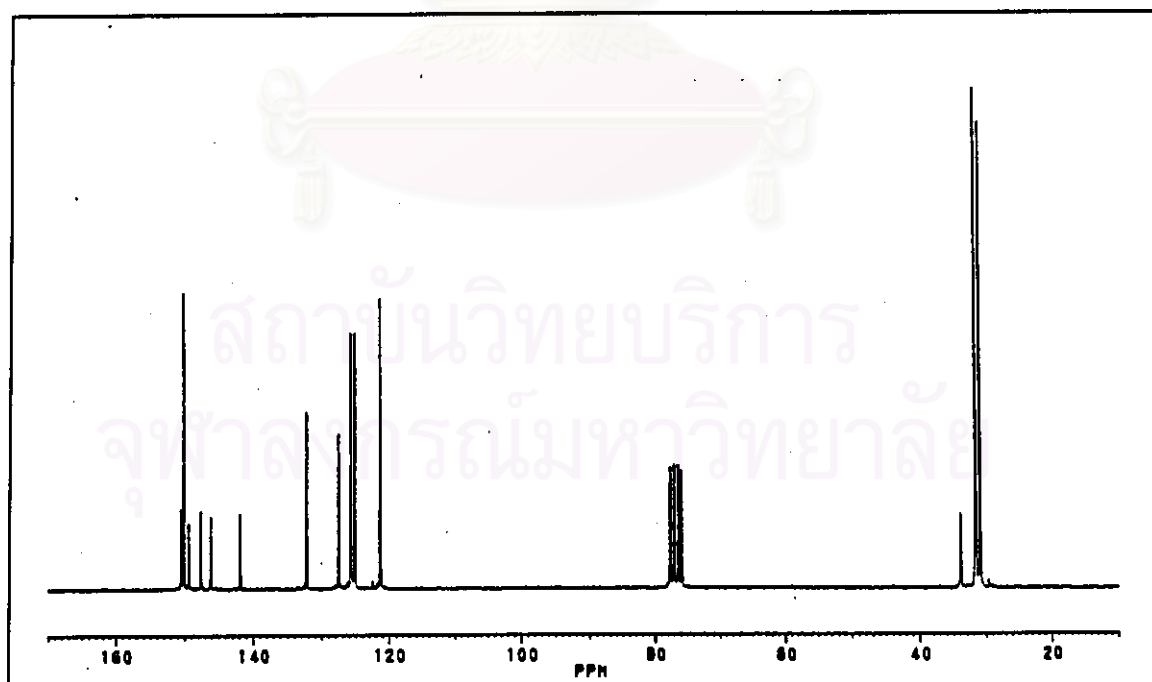


Figure A.6. $^{13}\text{C-NMR}$ (CDCl_3) spectrum of 25,27-di-(4-pyridylmethoxy)-*p*-*tert*-butylcalix[4]arene (6).

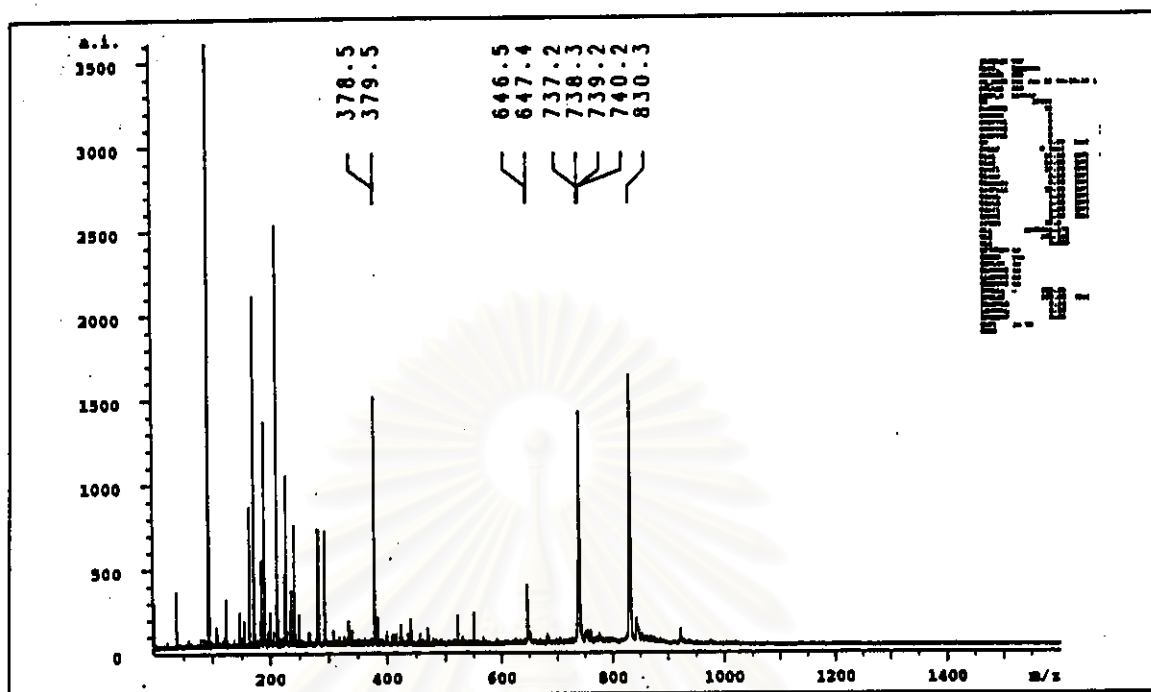
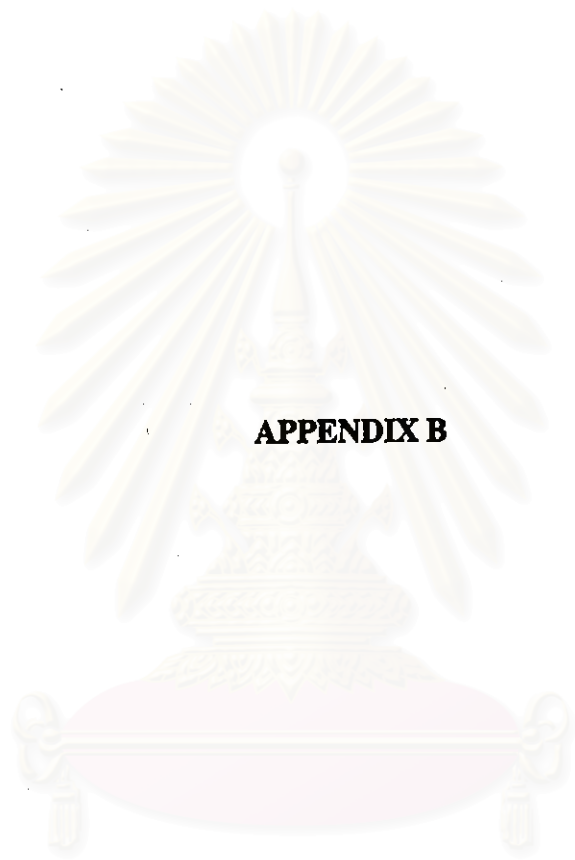


Figure A.7. FAB-MS (positive) spectrum of 25,27-di-(4-pyridylmethoxy)-*p*-*tert*-butylcalix[4]arene (6).

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APPENDIX B

สถาบันวิทยบริการ
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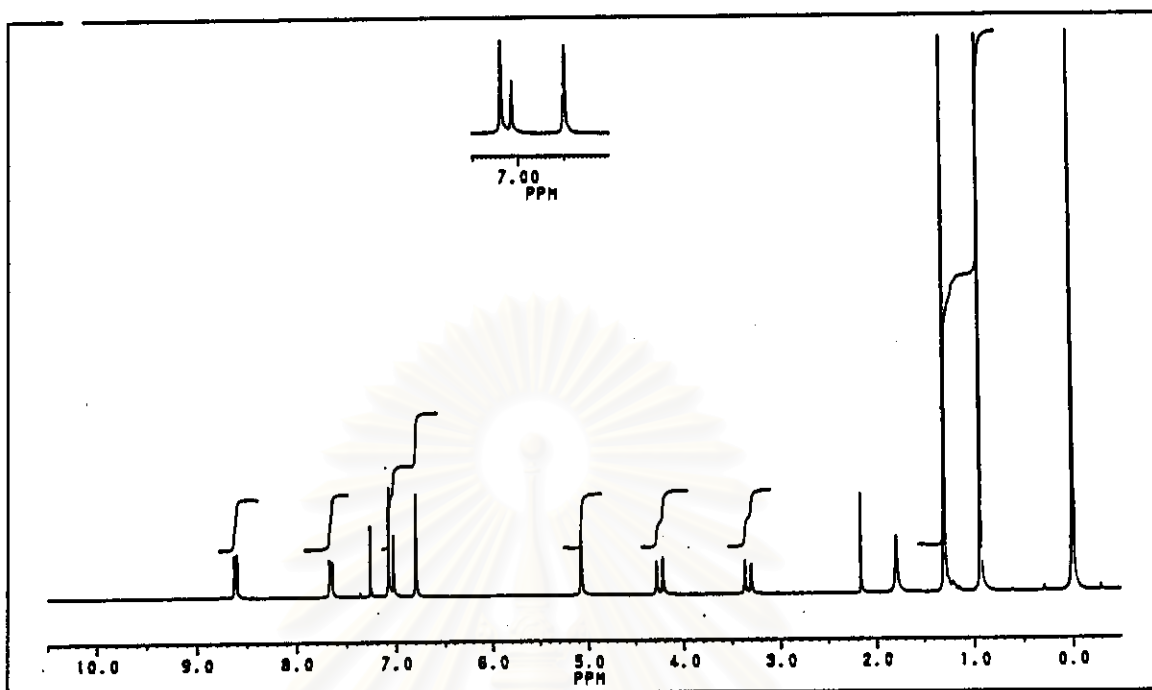


Figure B.1. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 0.0 : 1.0 ratio.

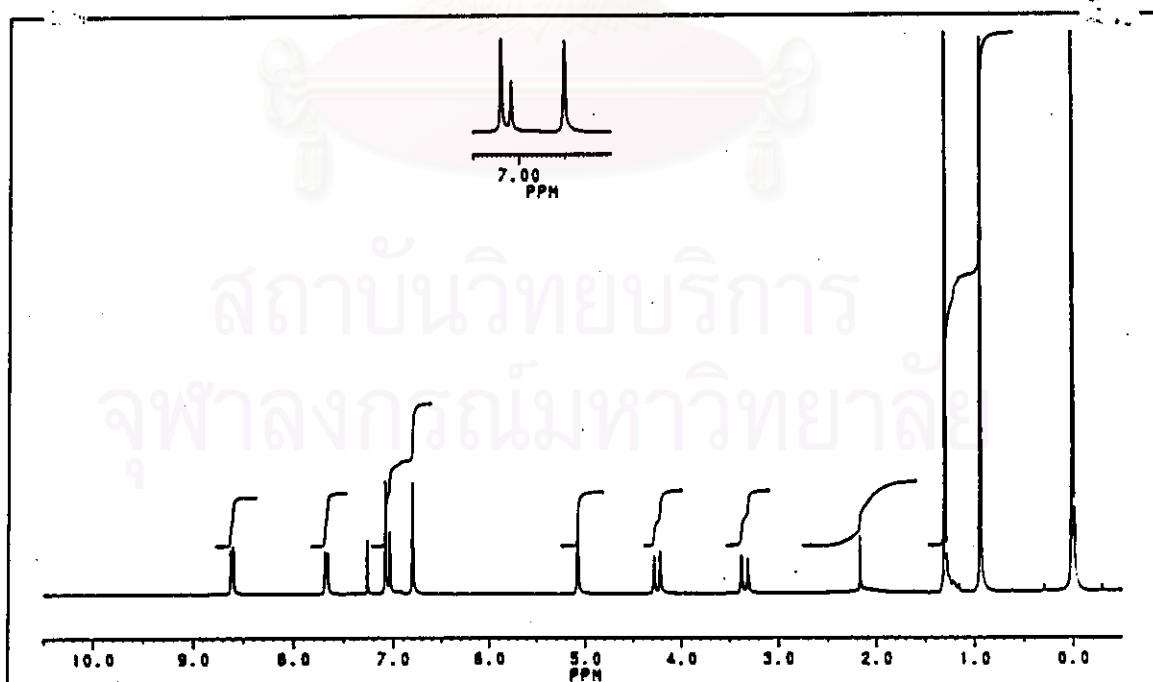


Figure B.2. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 0.2 : 1.0 ratio.

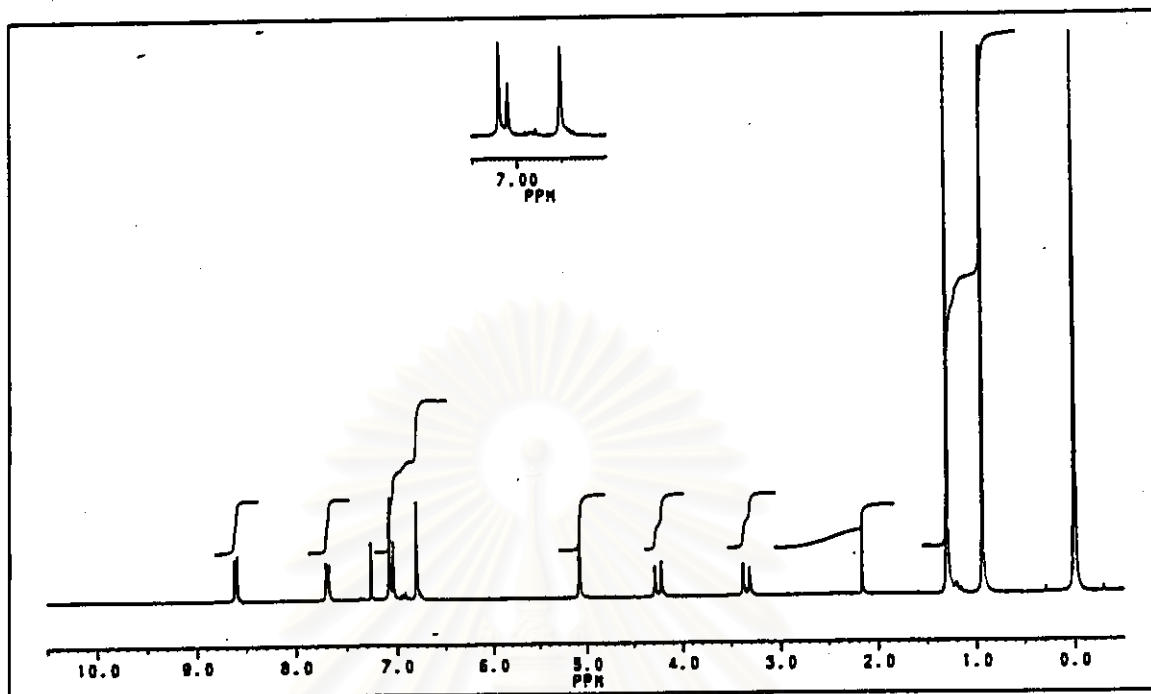


Figure B.3. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 0.4 : 1.0 ratio.

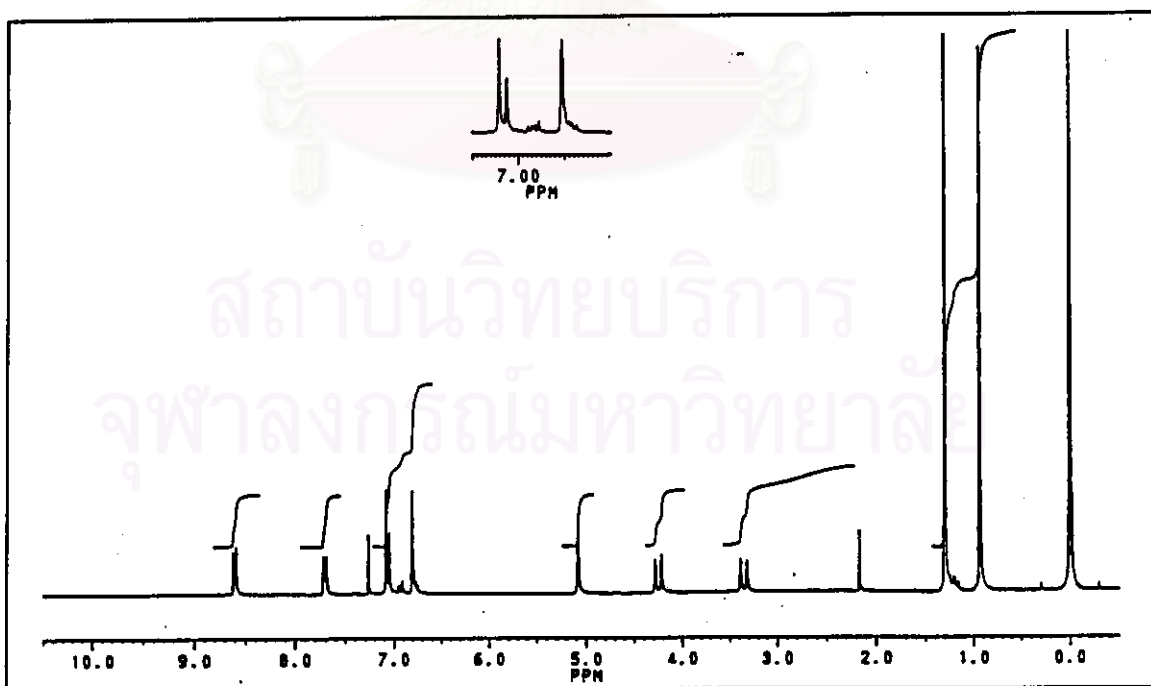


Figure B.4. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 0.6 : 1.0 ratio.

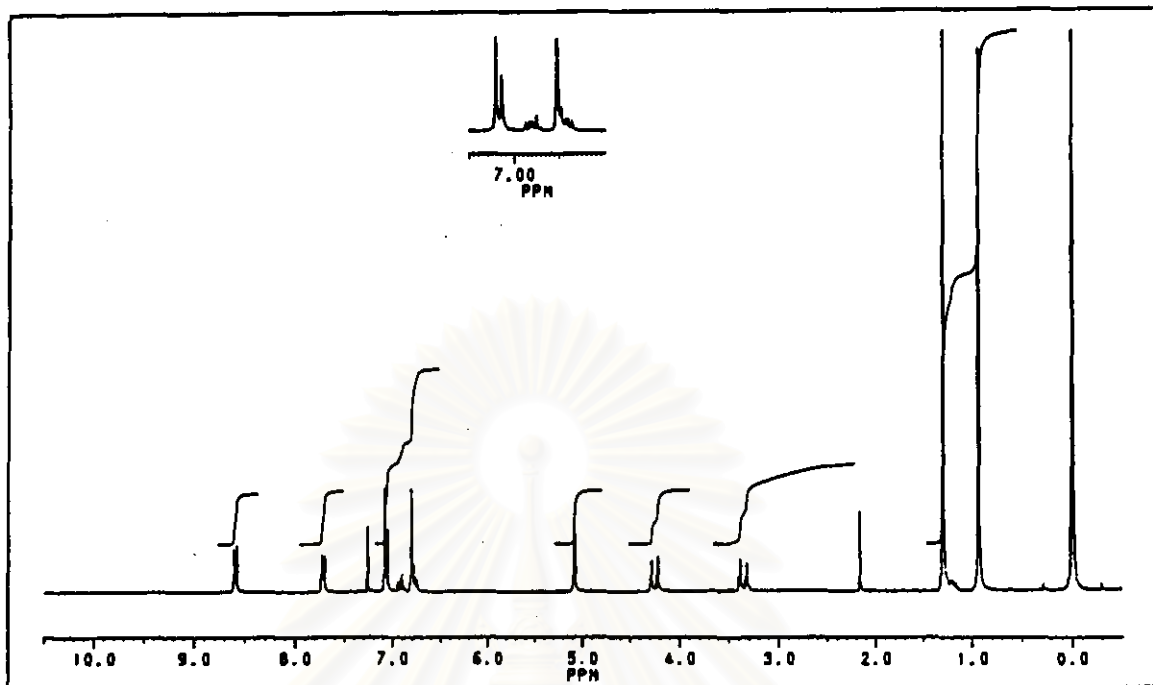


Figure B.5. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 0.8 : 1.0 ratio.

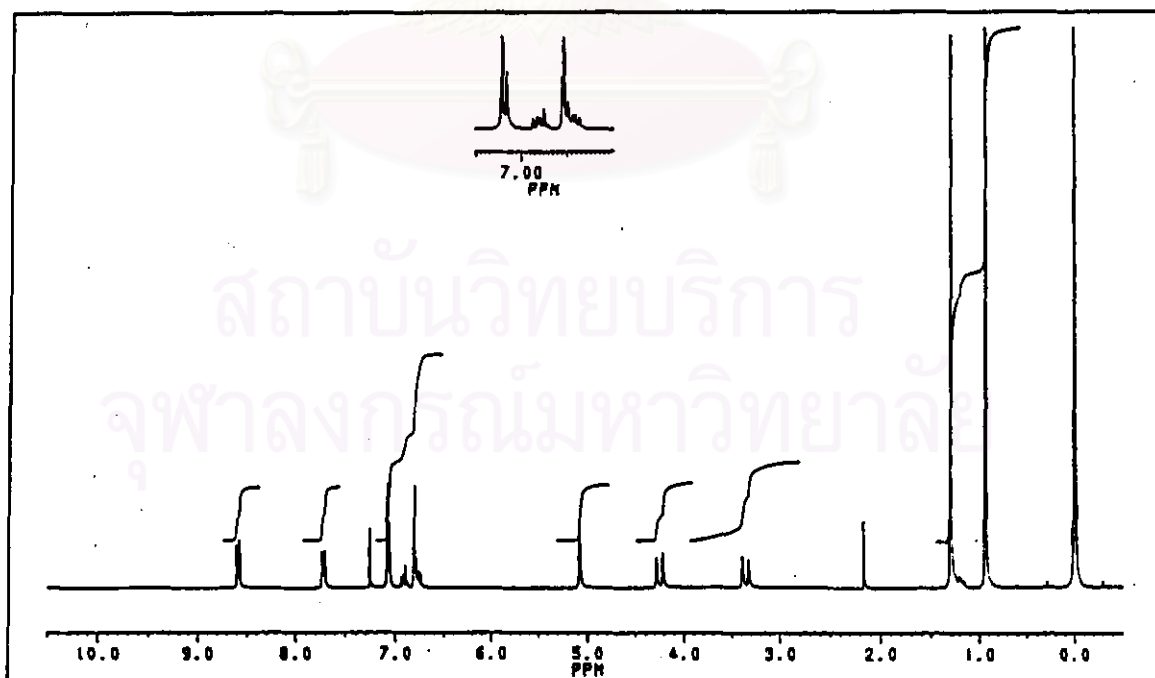


Figure B.6. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 1.0 : 1.0 ratio.

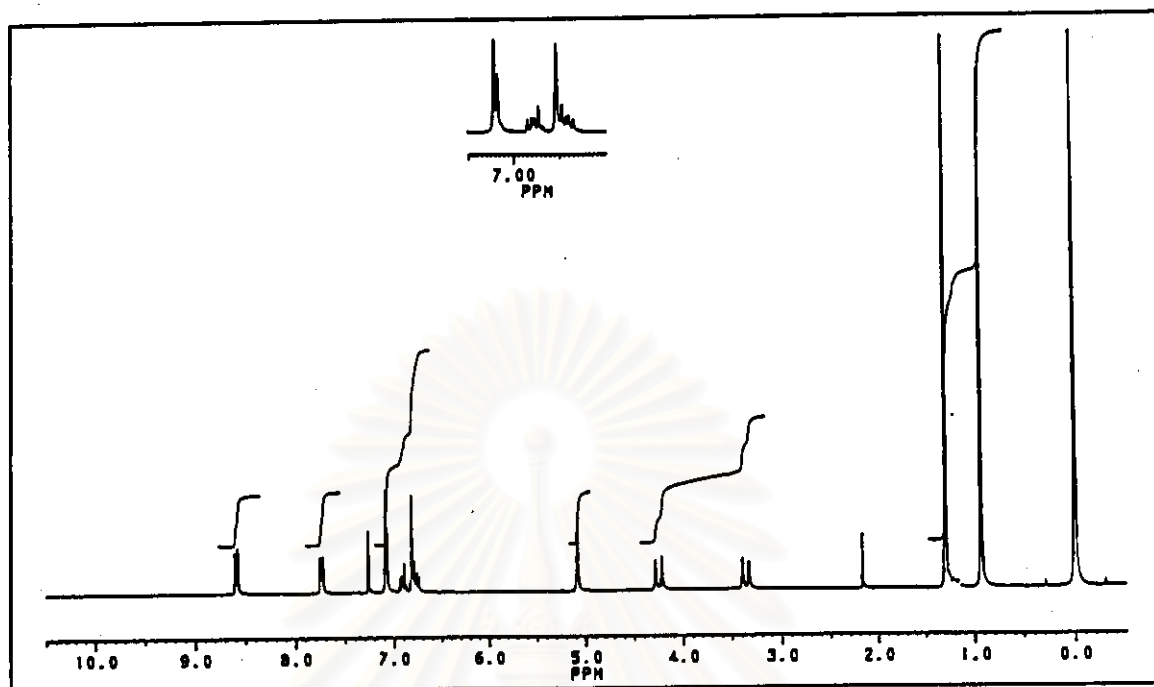


Figure B.7. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 1.2 : 1.0 ratio.

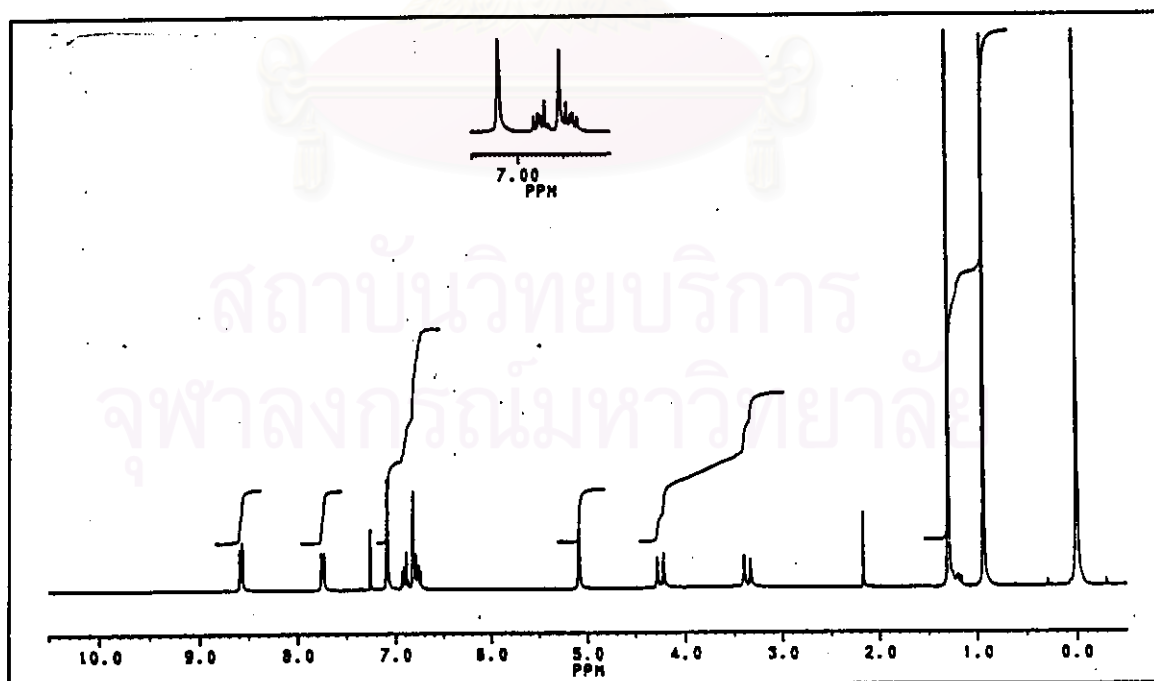


Figure B.8. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 1.5 : 1.0 ratio.

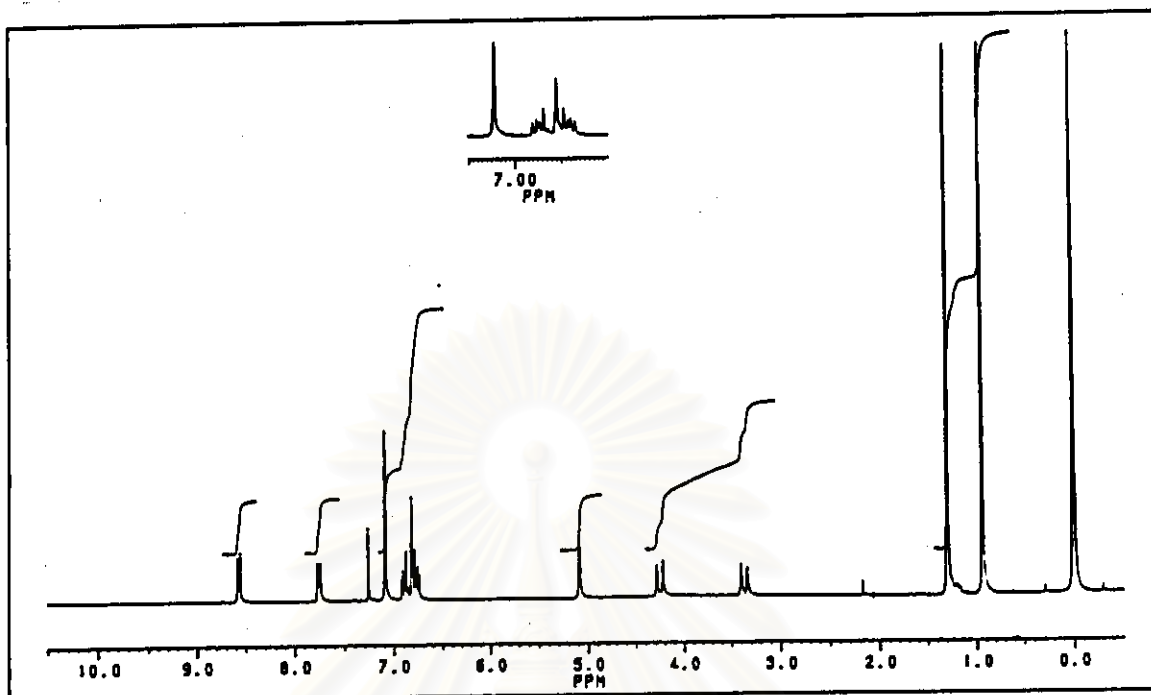


Figure B.9. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 1.8 : 1.0 ratio.

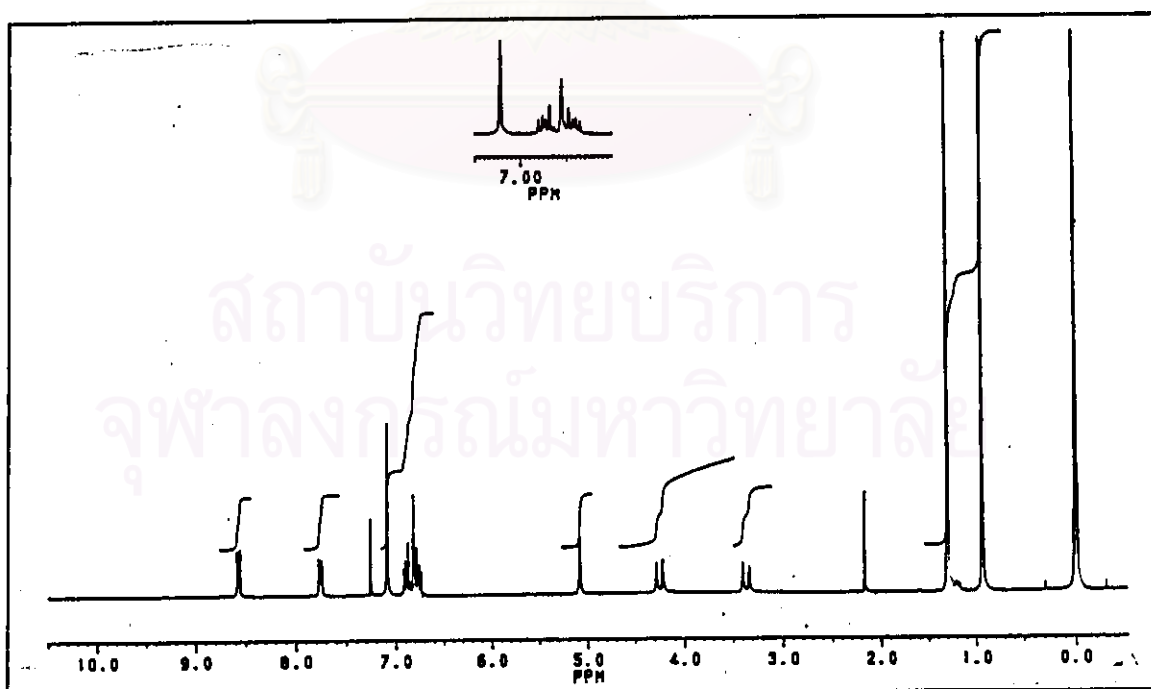


Figure B.10. ¹H-NMR (CDCl₃) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.0 : 1.0 ratio.

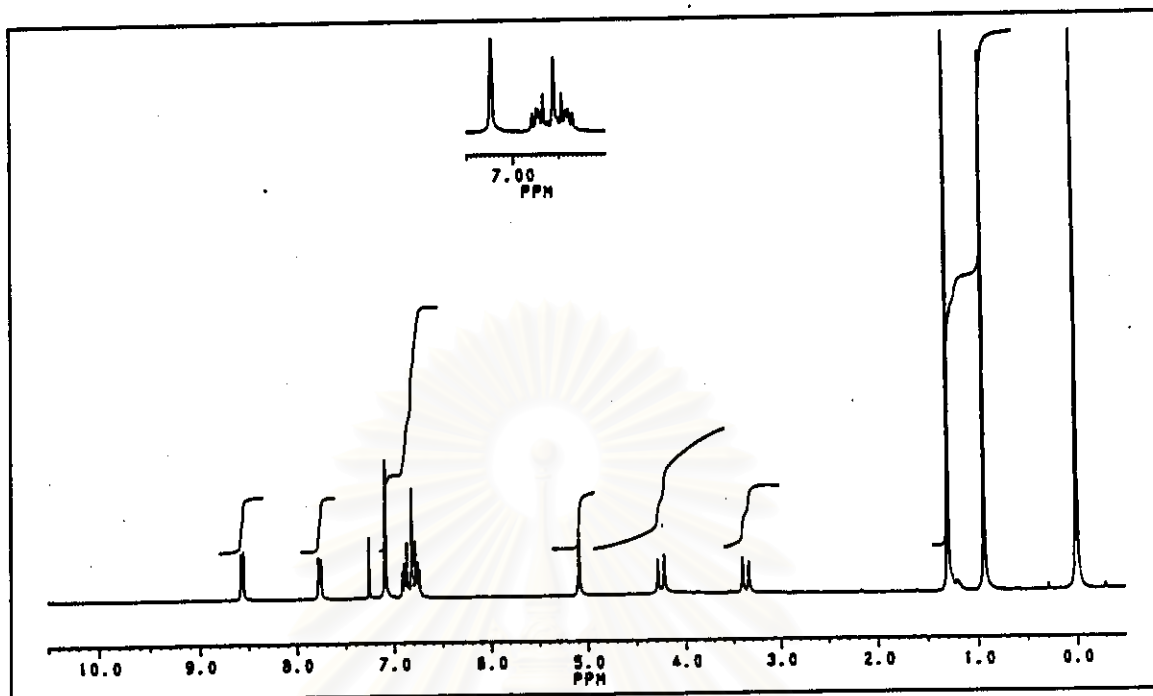


Figure B.11. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.2 : 1.0 ratio.

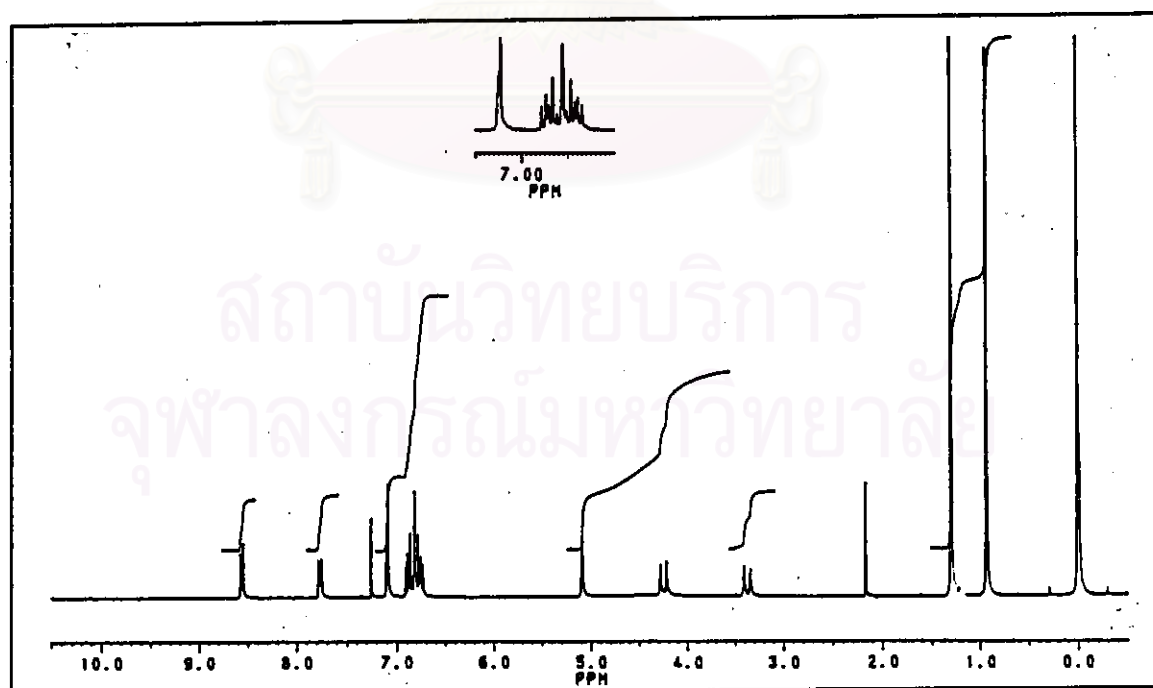


Figure B.12. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.5 : 1.0 ratio.

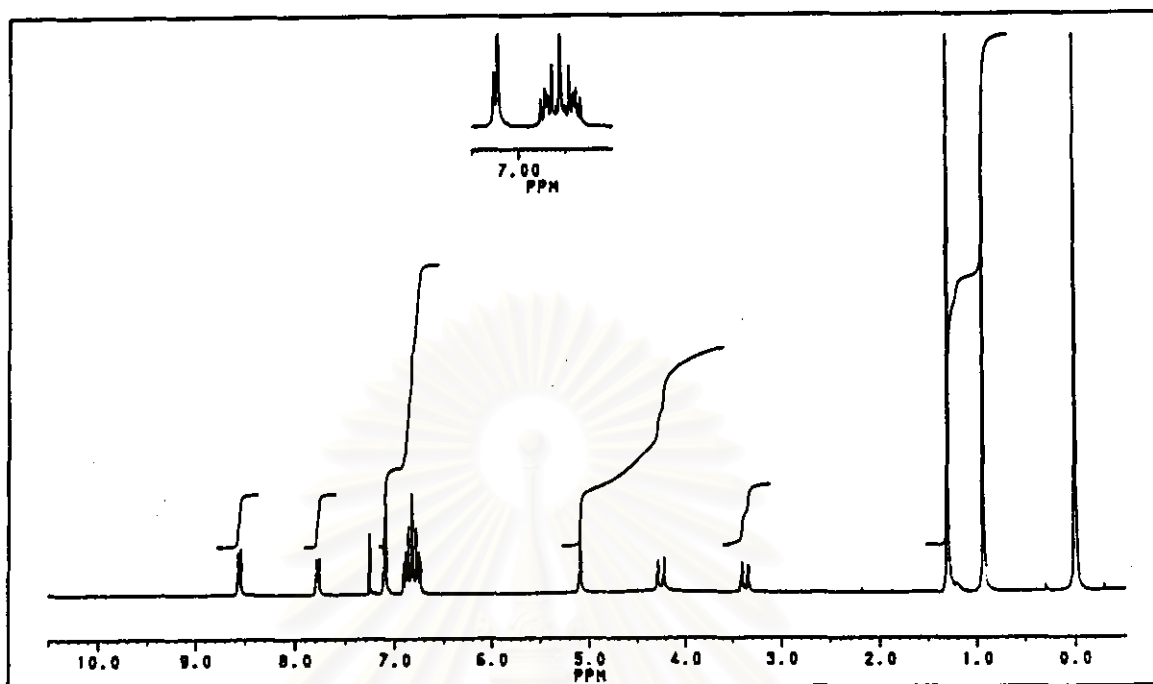


Figure B.13. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.8 : 1.0 ratio.

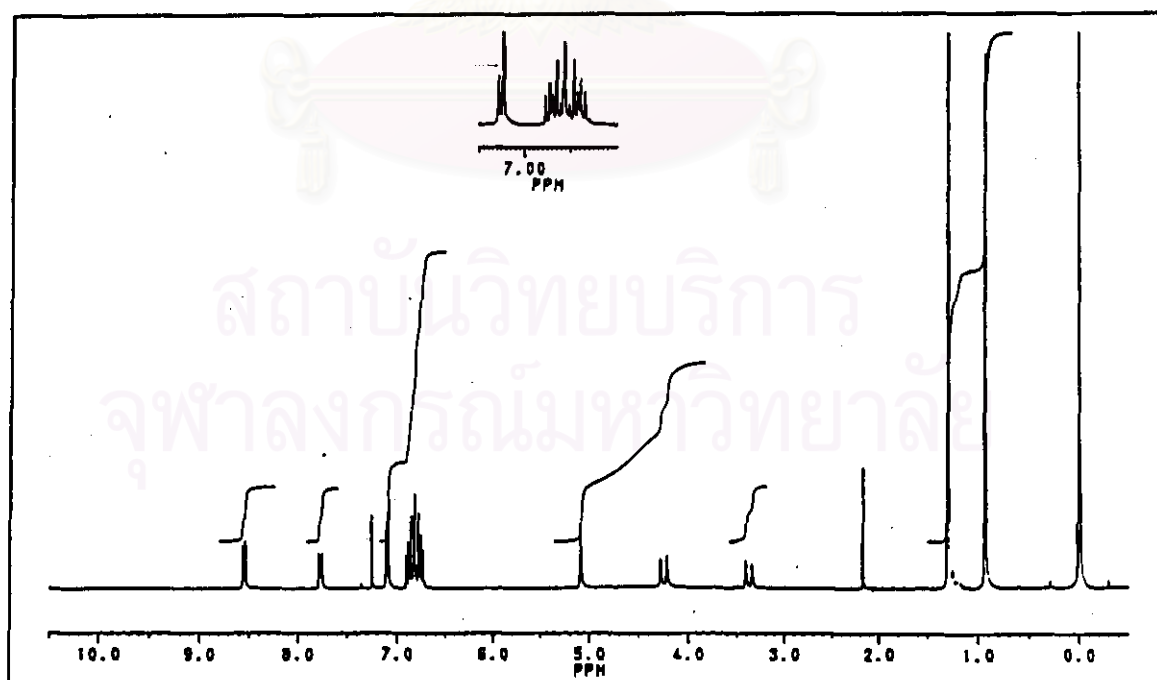


Figure B.14. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 3.0 : 1.0 ratio.

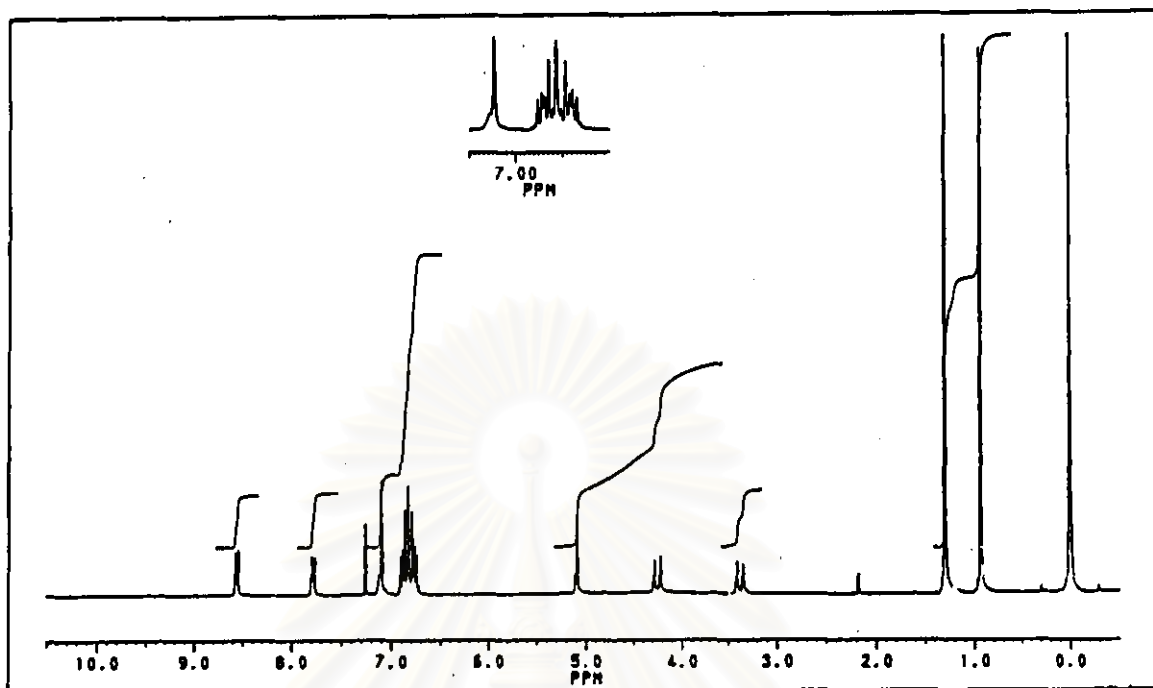


Figure B.15. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 3.2 : 1.0 ratio.

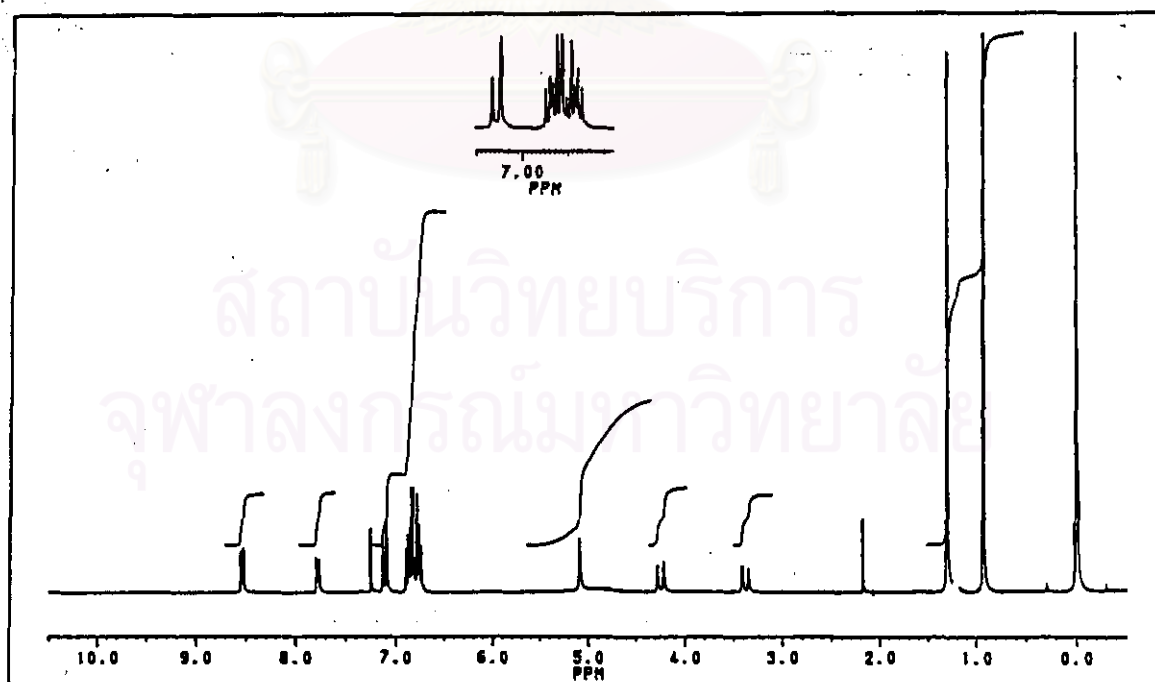


Figure B.16. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 4.0 : 1.0 ratio.

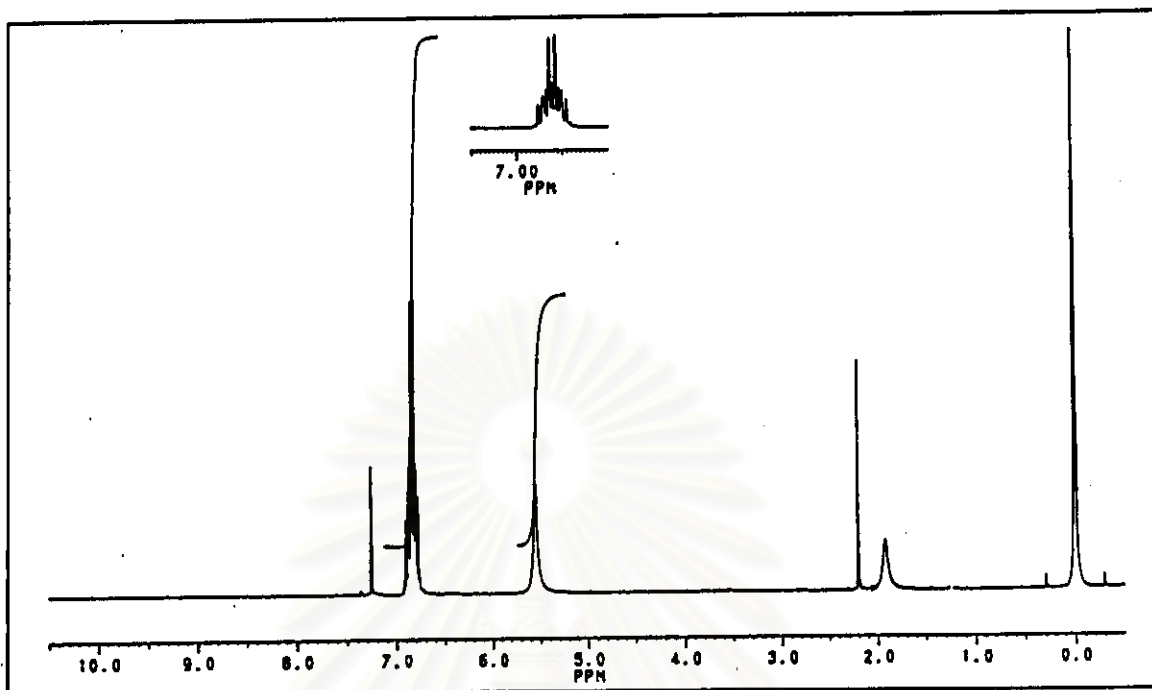


Figure B.17. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 4.0 : 0.0 ratio.

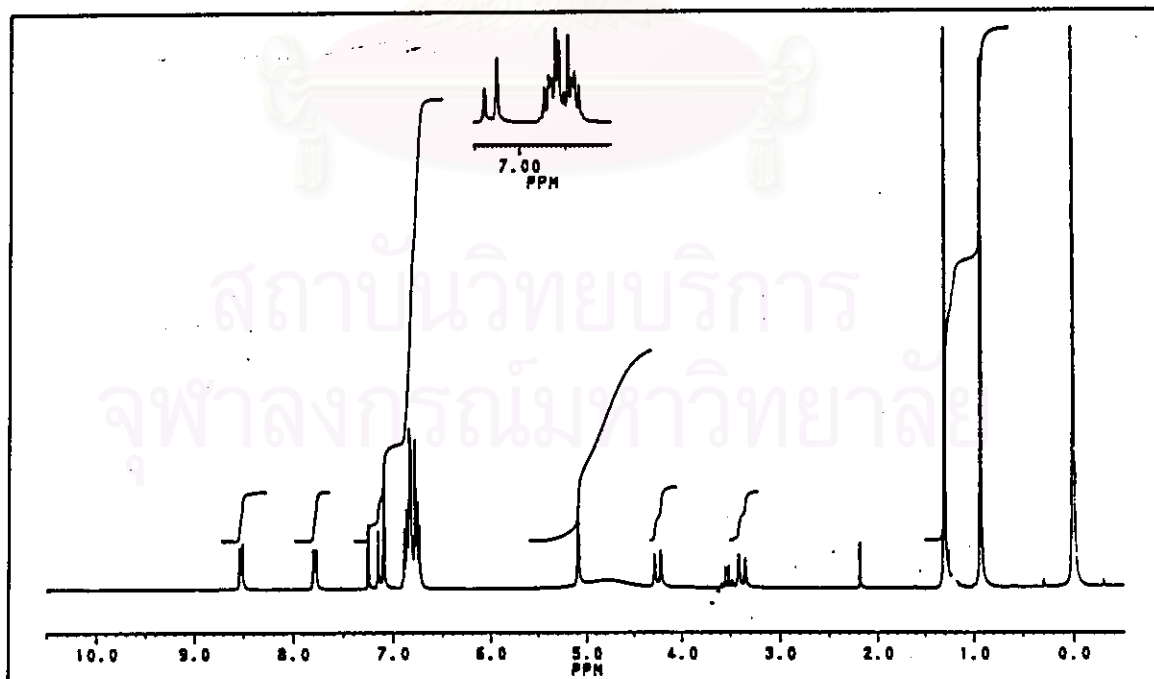


Figure B.18. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 5.0 : 1.0 ratio.

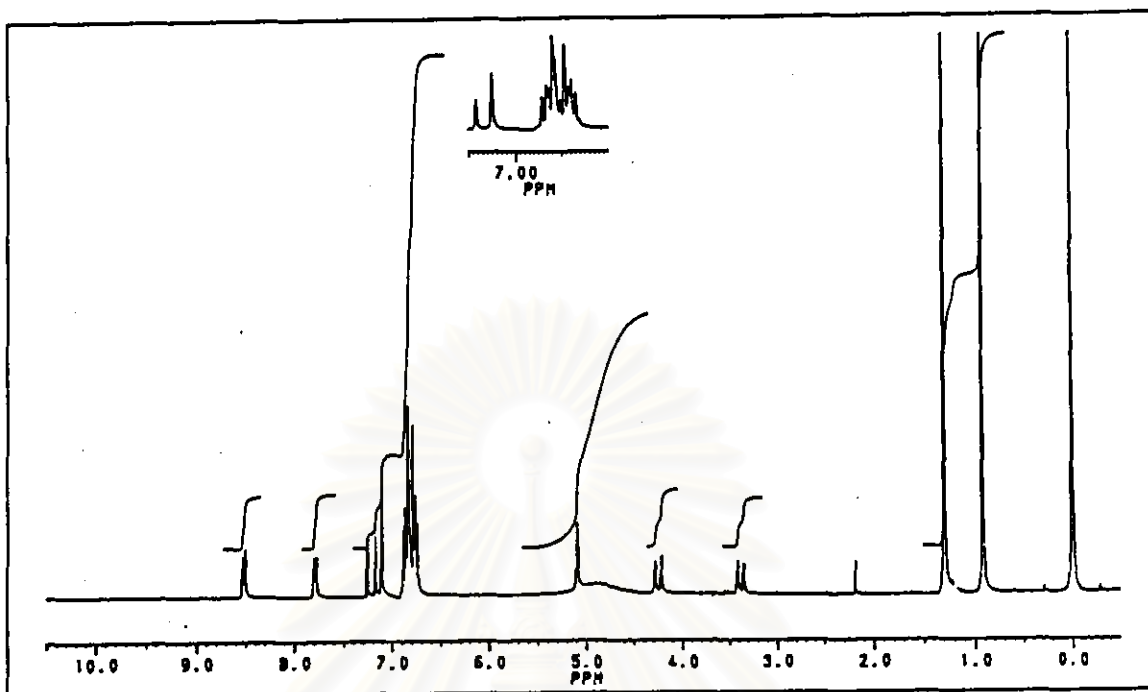


Figure B.19. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 6.0 : 1.0 ratio.

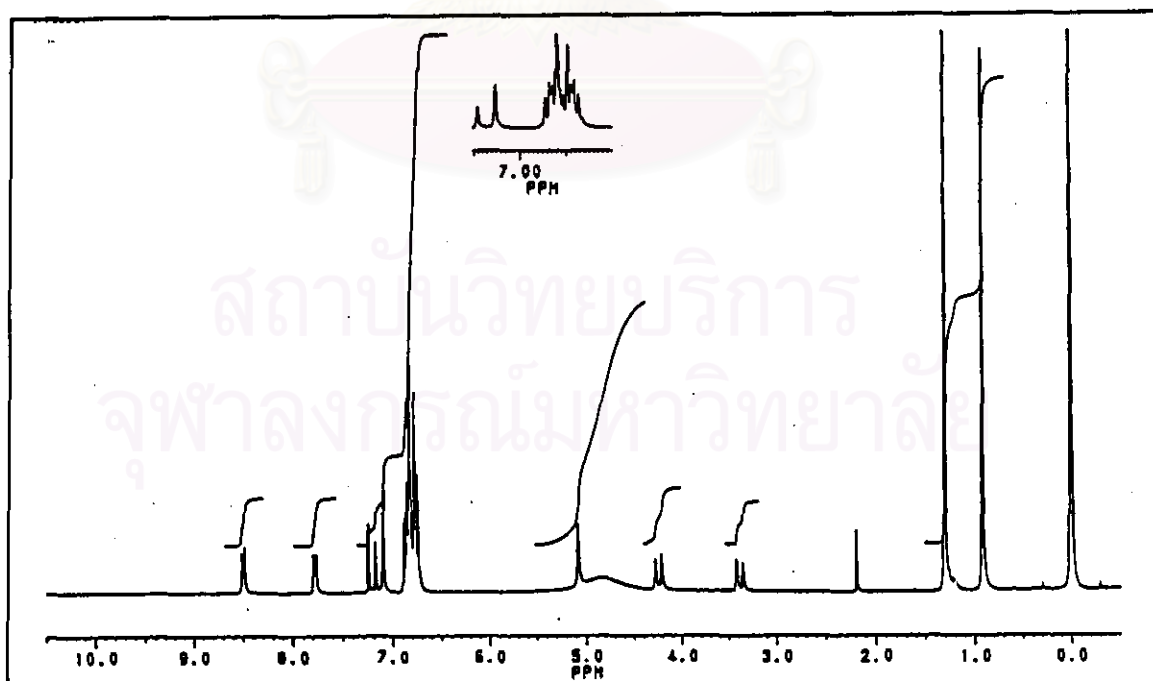


Figure B.20. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 7.0 : 1.0 ratio.

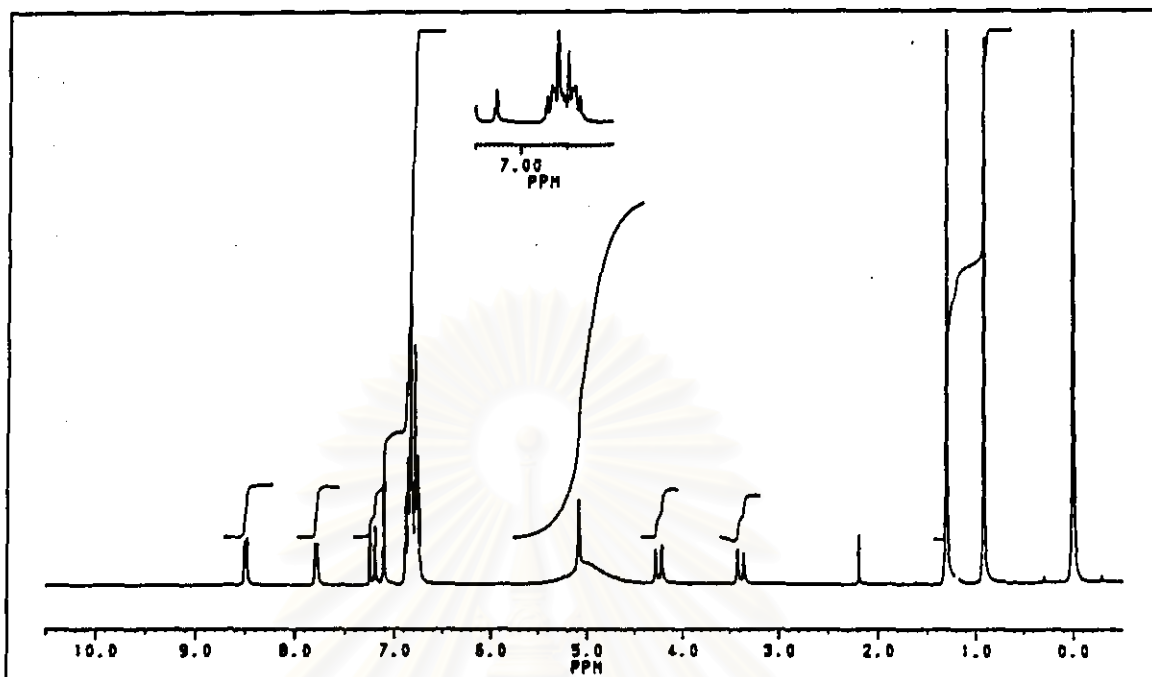


Figure B.21. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 8.0 : 1.0 ratio.

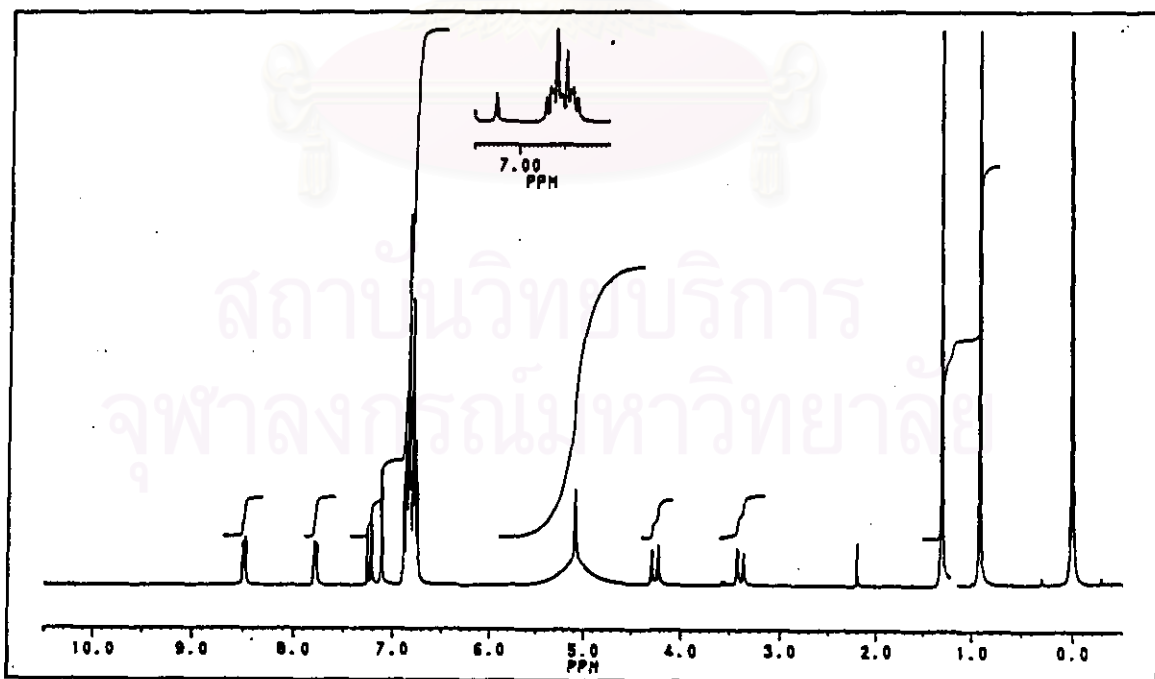


Figure B.22. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 9.0 : 1.0 ratio.

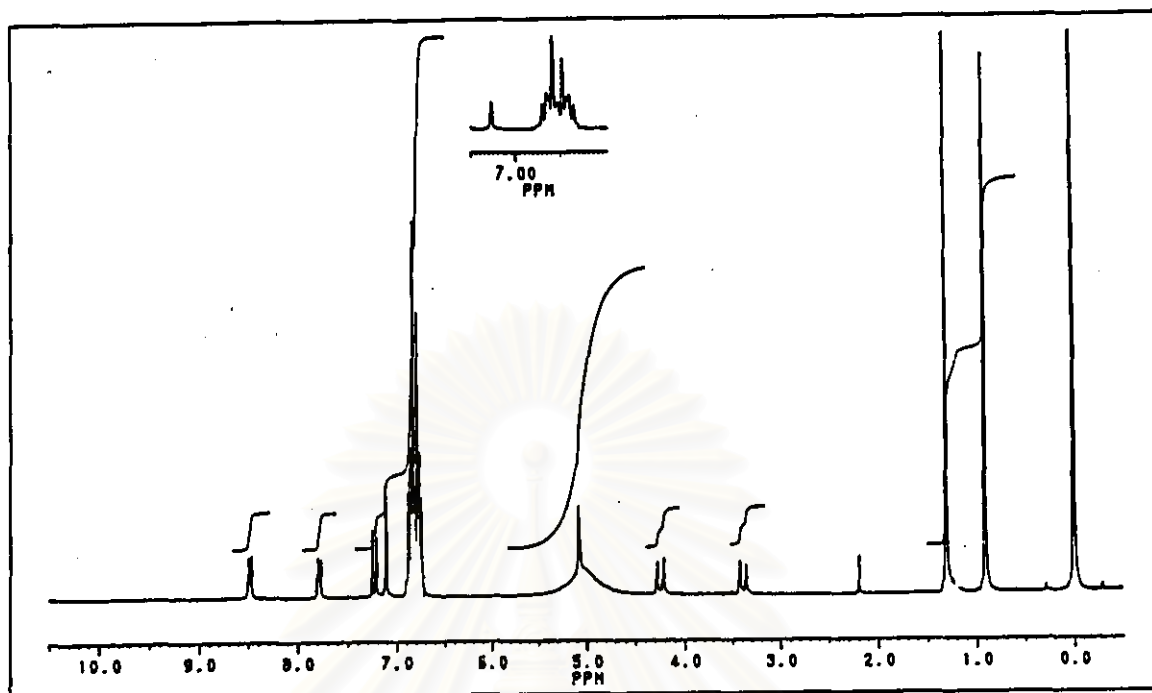


Figure B.23. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,2-dihydroxybenzene and ligand (6) at 10.0 : 1.0 ratio.

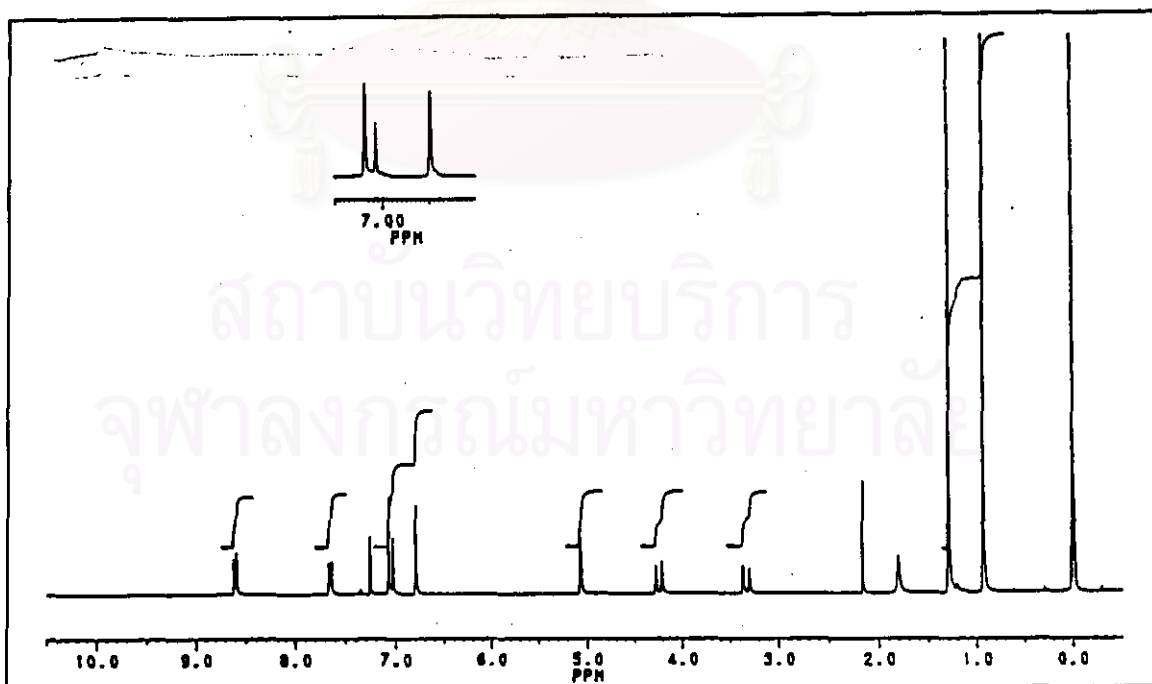


Figure B.24. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 0.0 : 1.0 ratio.

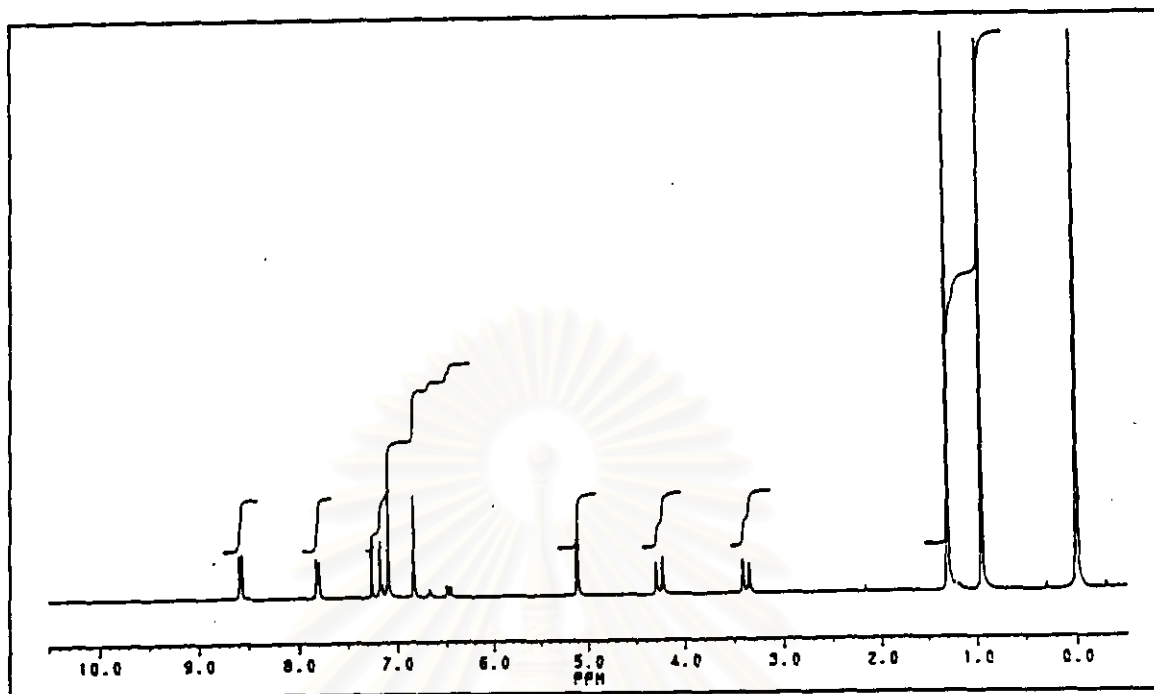


Figure B.25. ¹H-NMR (CDCl₃) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 0.5 : 1.0 ratio.

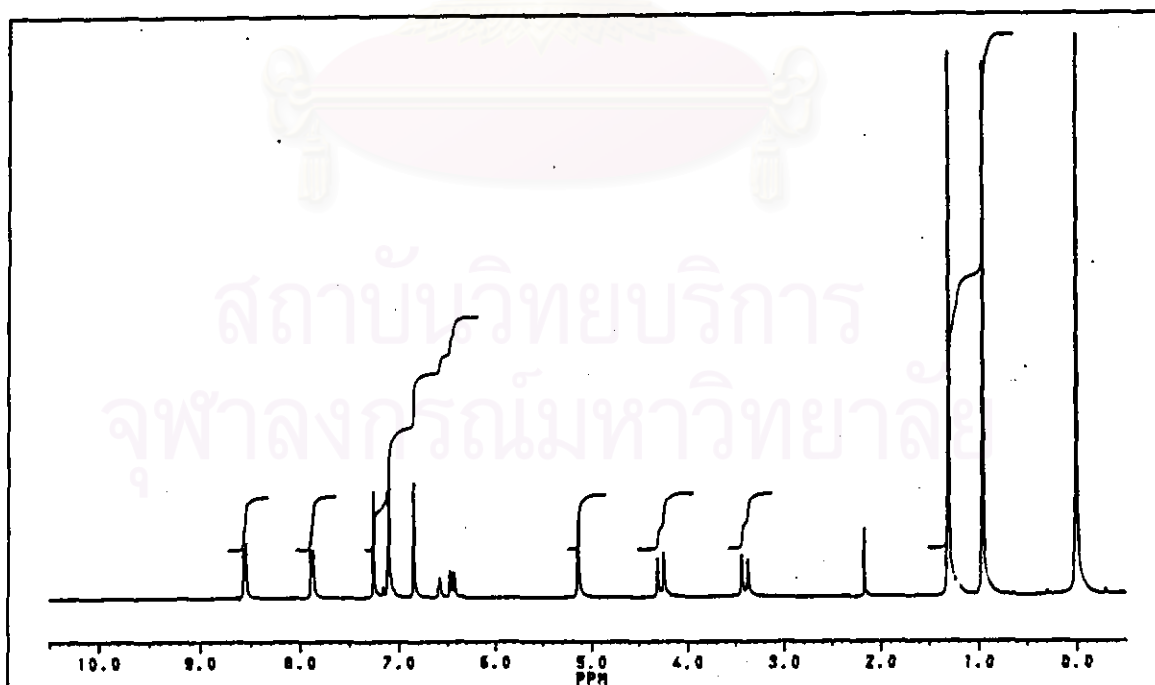


Figure B.26. ¹H-NMR (CDCl₃) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 1.0 : 1.0 ratio.

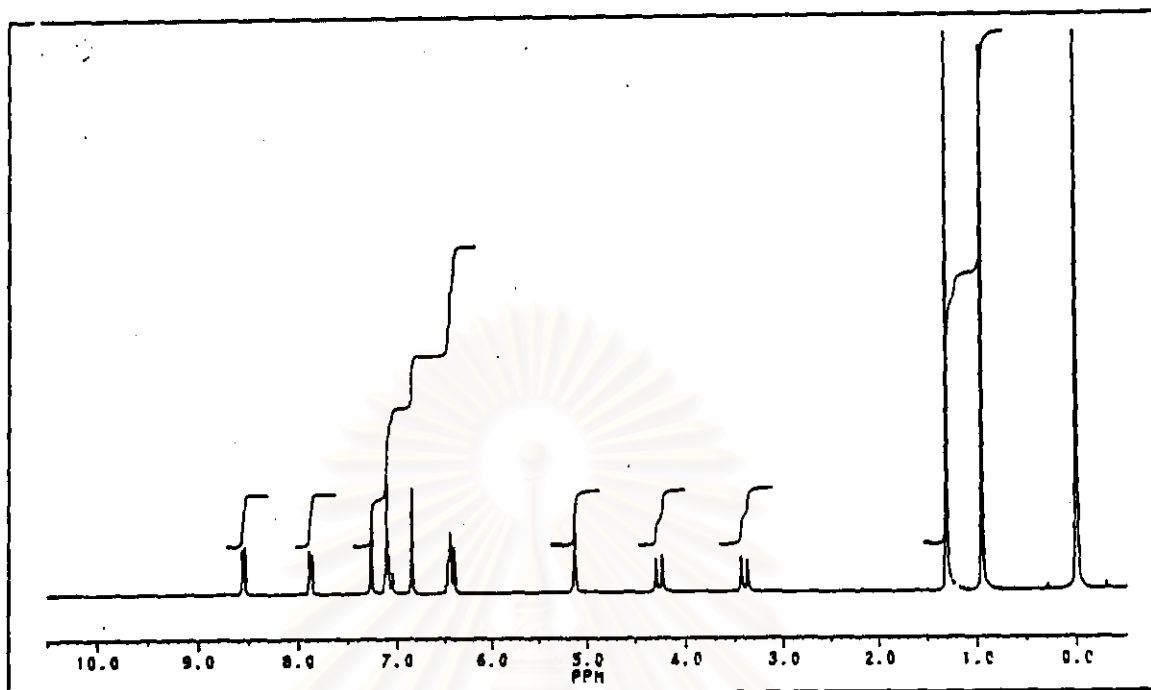


Figure B.27. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 1.5 : 1.0 ratio.

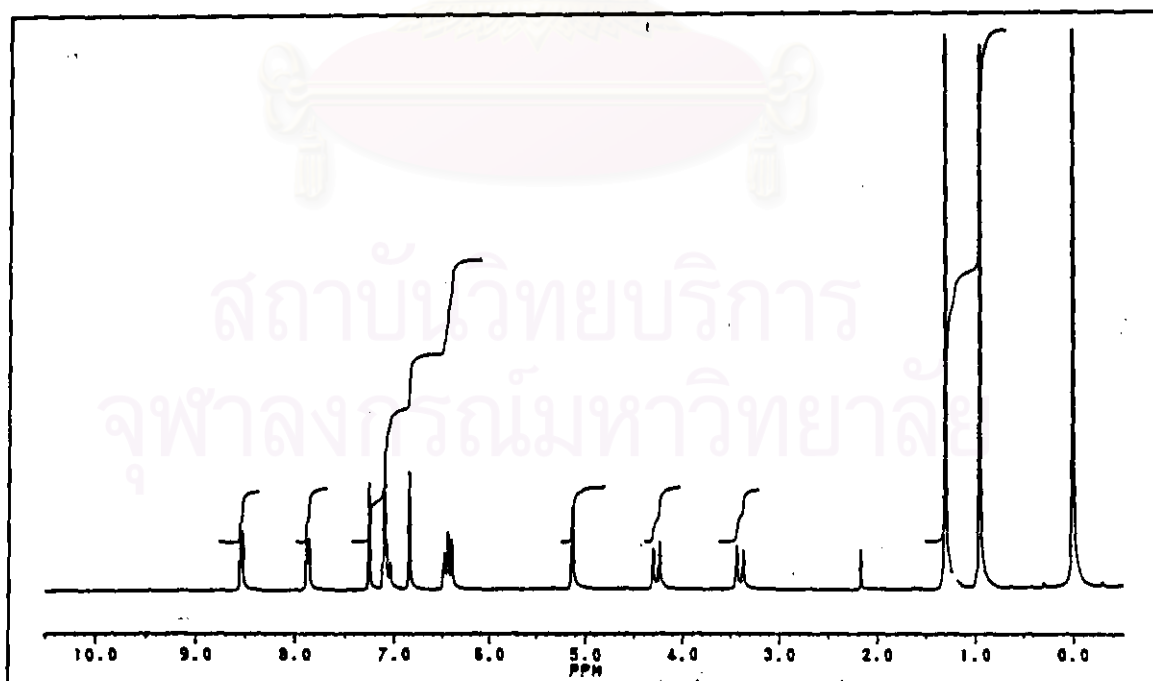


Figure B.28. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 2.0 : 1.0 ratio.

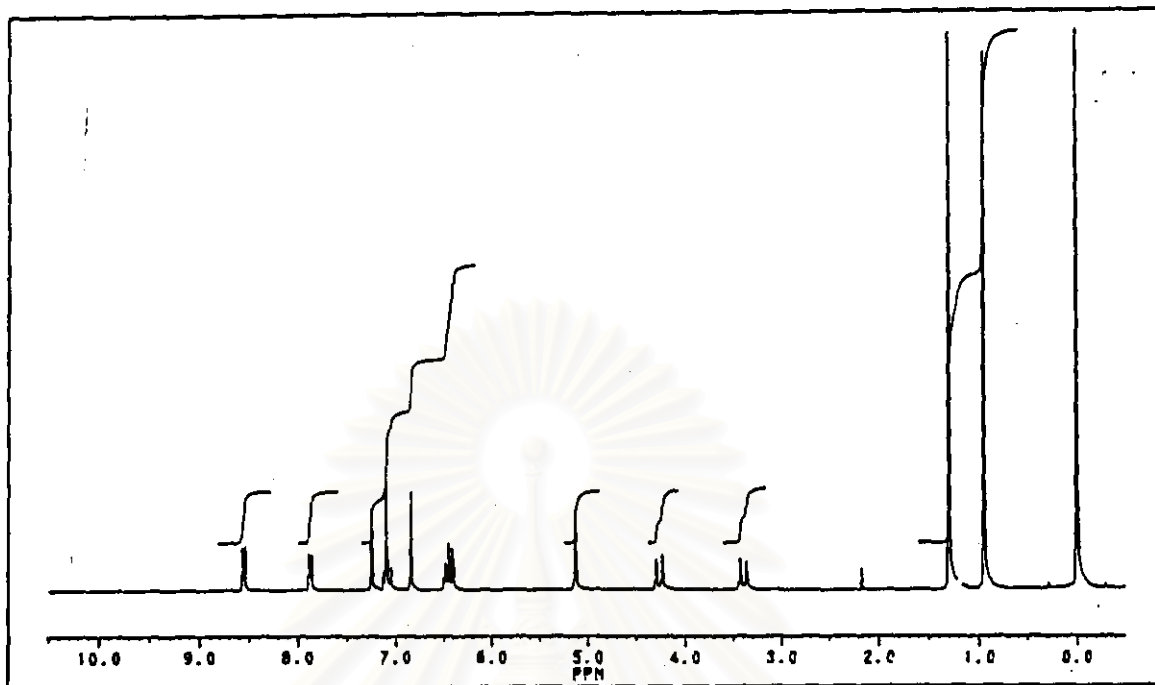


Figure B.29. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 2.5 : 1.0 ratio.

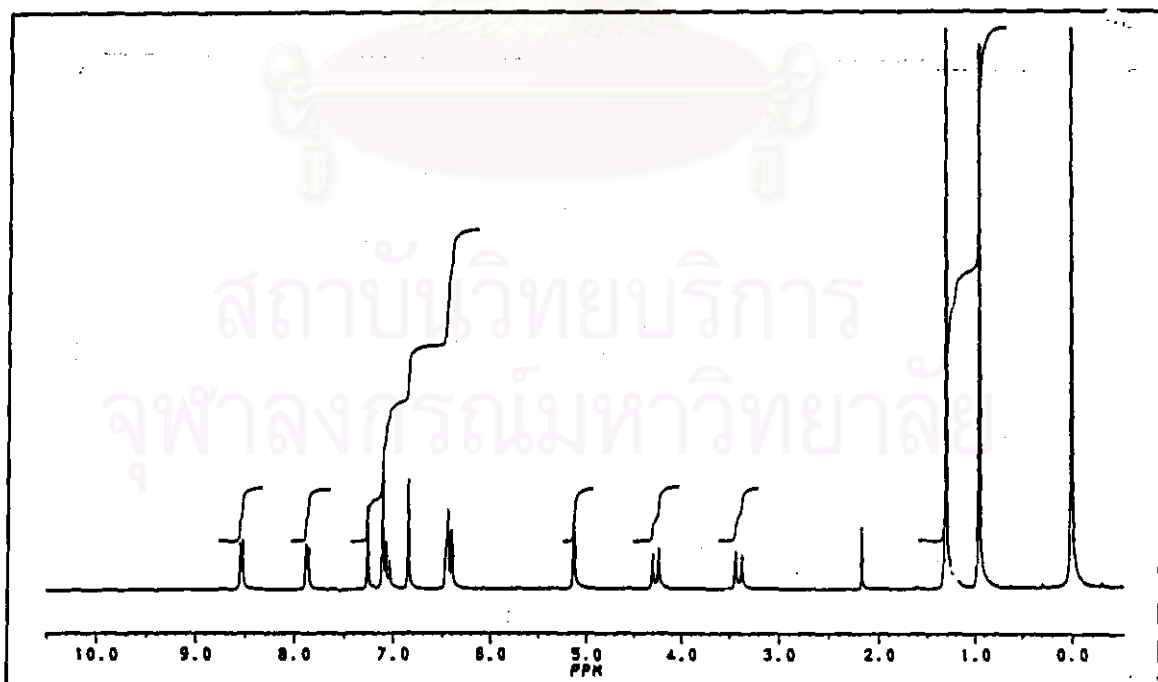


Figure B.30. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 3.0 : 1.0 ratio.

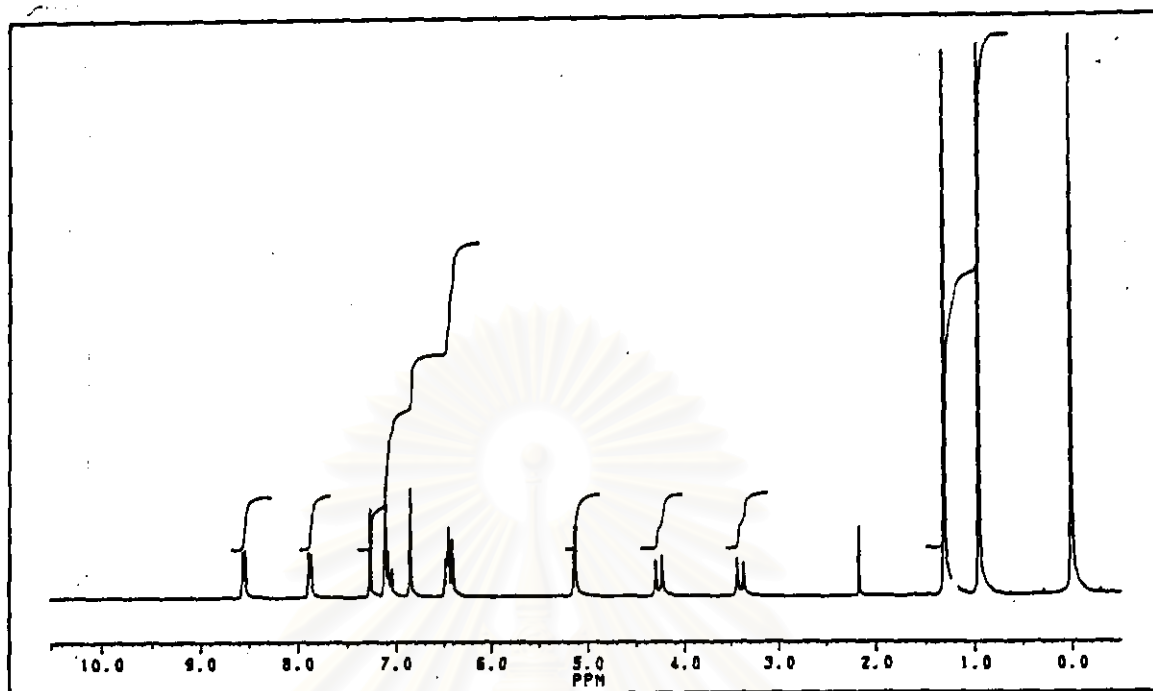


Figure B.31. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 4.0 : 1.0 ratio.

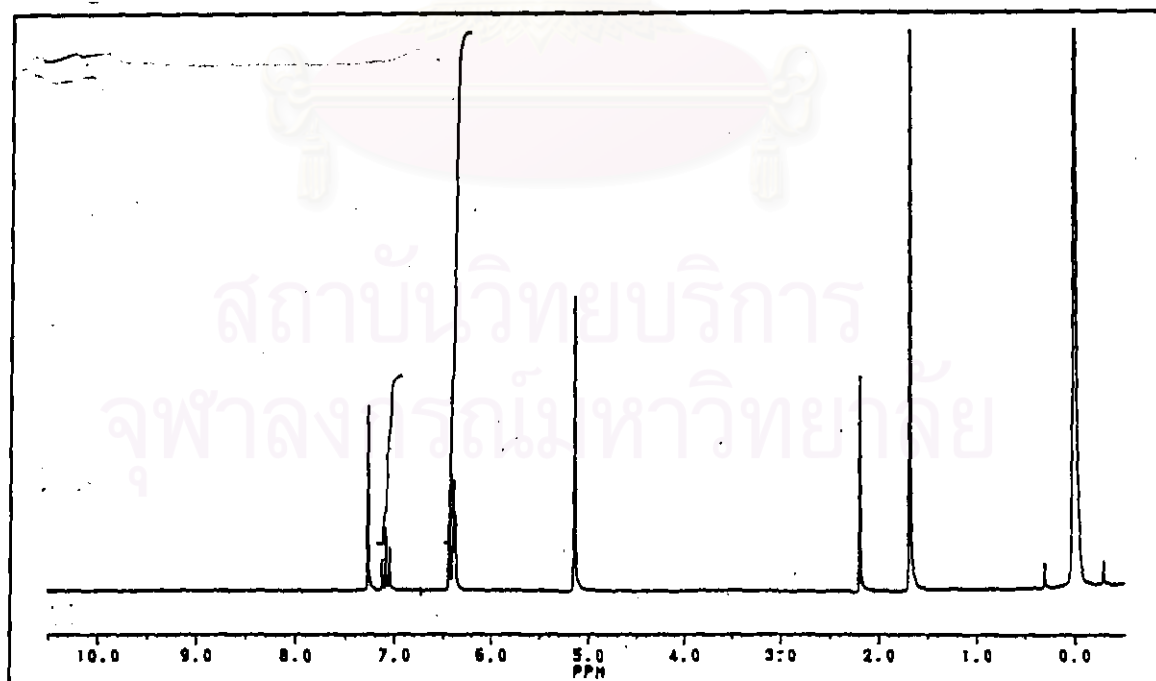


Figure B.32. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between 1,3-dihydroxybenzene and ligand (6) at 4.0 : 0.0 ratio.

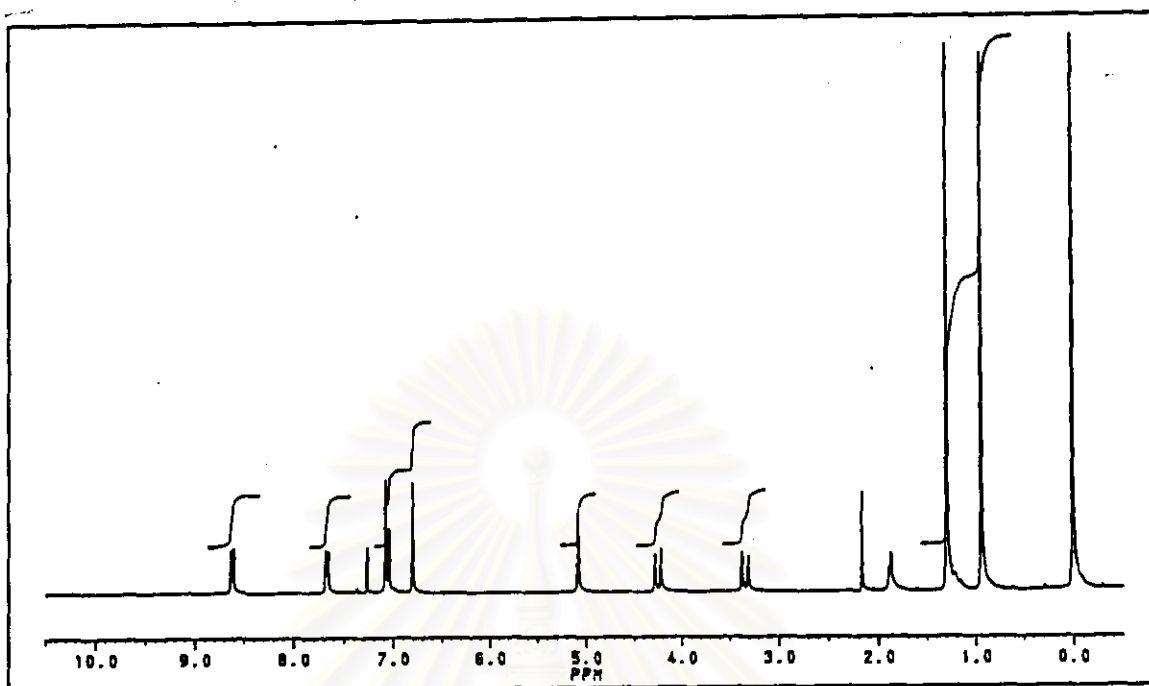


Figure B.33. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 0.0 : 1.0 ratio.

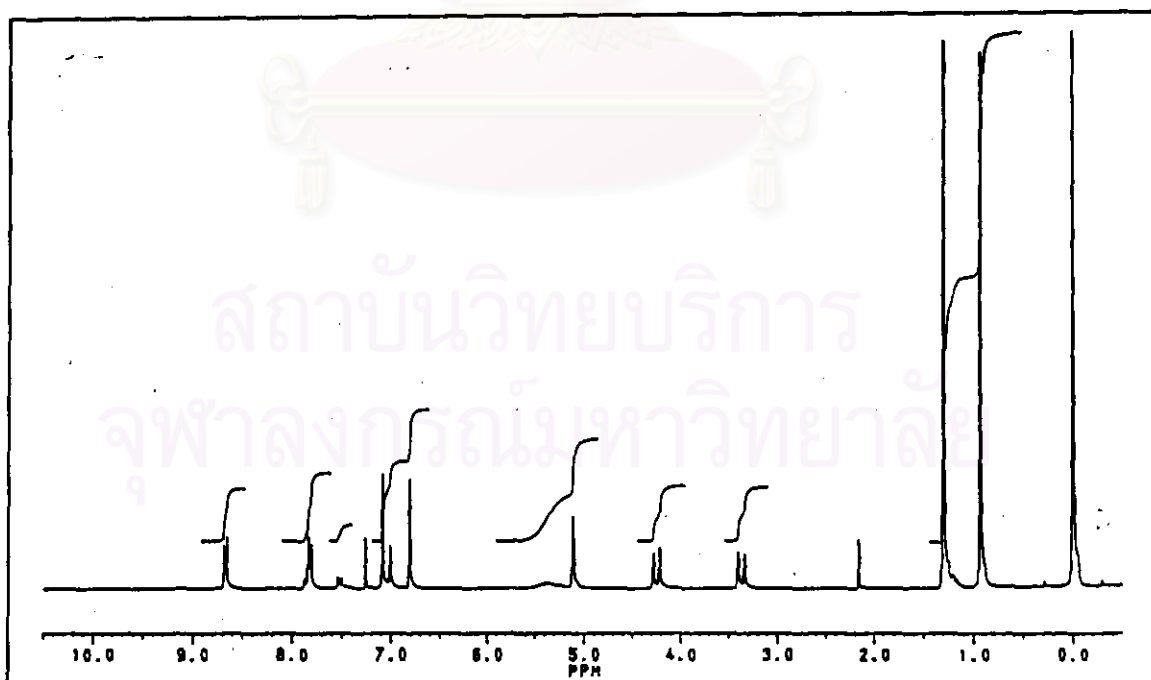


Figure B.34. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 0.5 : 1.0 ratio.

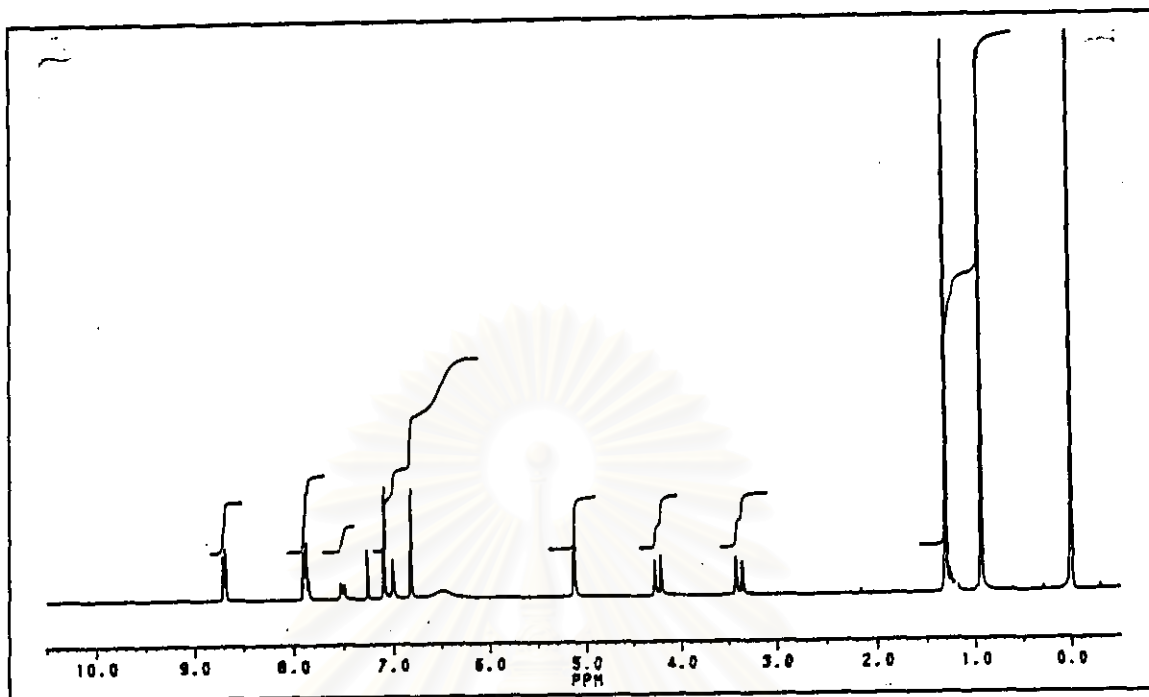


Figure B.35. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 1.0 : 1.0 ratio.

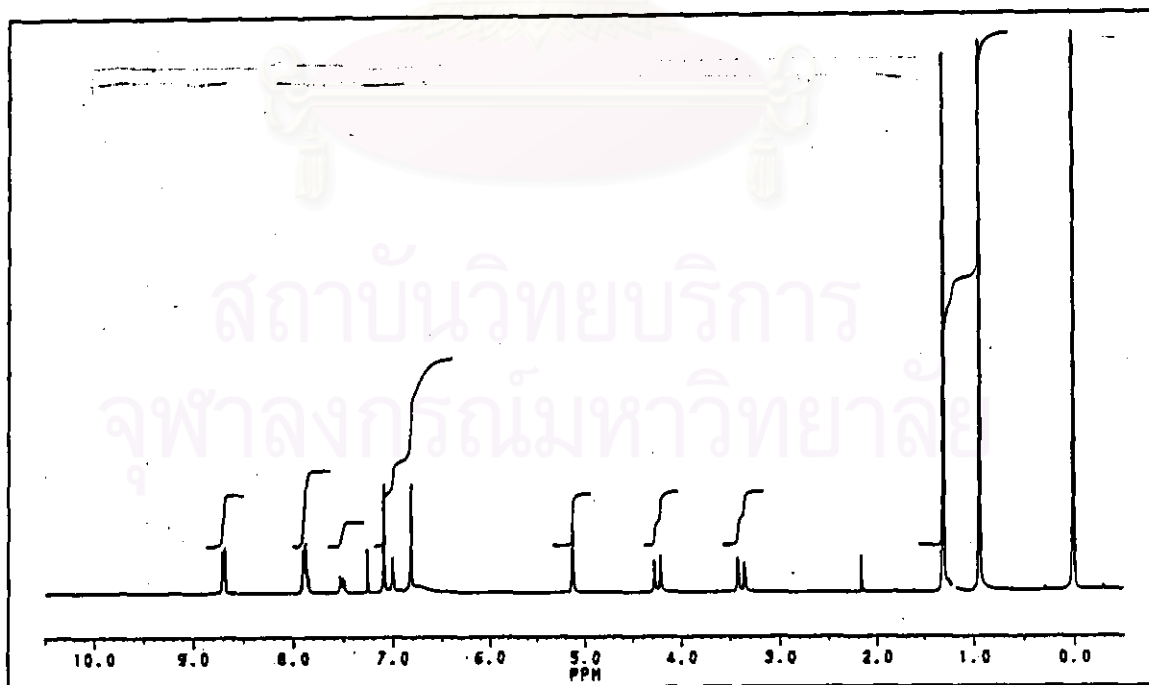


Figure B.36. $^1\text{H-NMR}$ (CDCl_3) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 1.5 : 1.0 ratio.

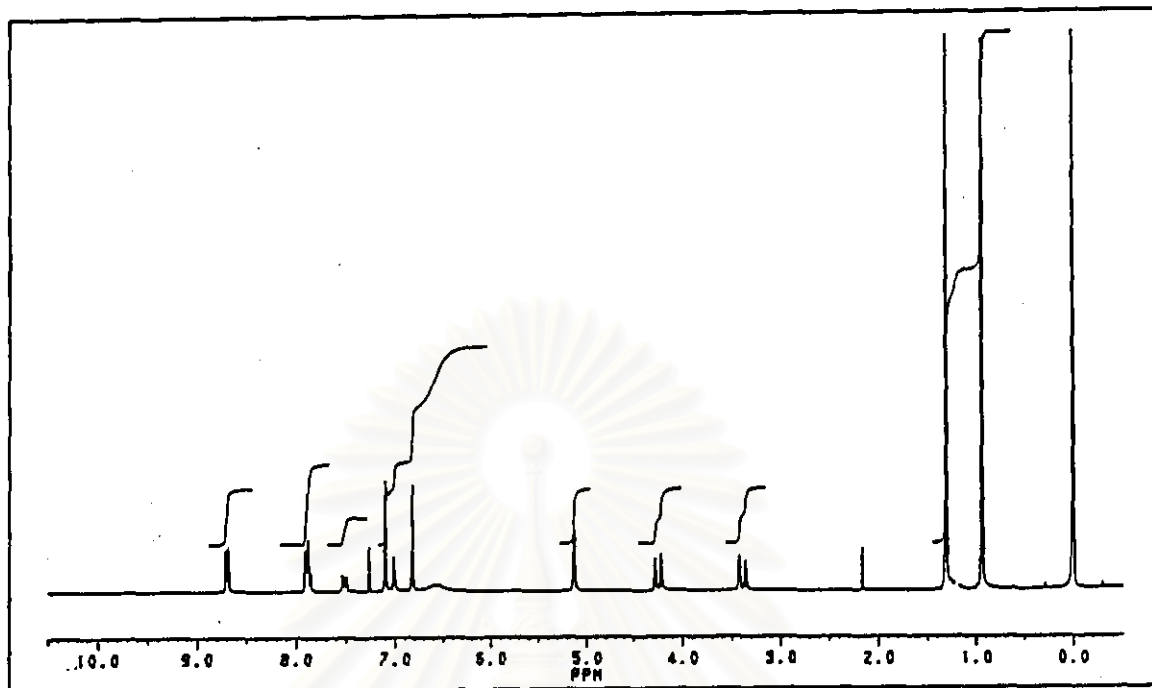


Figure B.37. ¹H-NMR (CDCl₃) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 2.0 : 1.0 ratio.

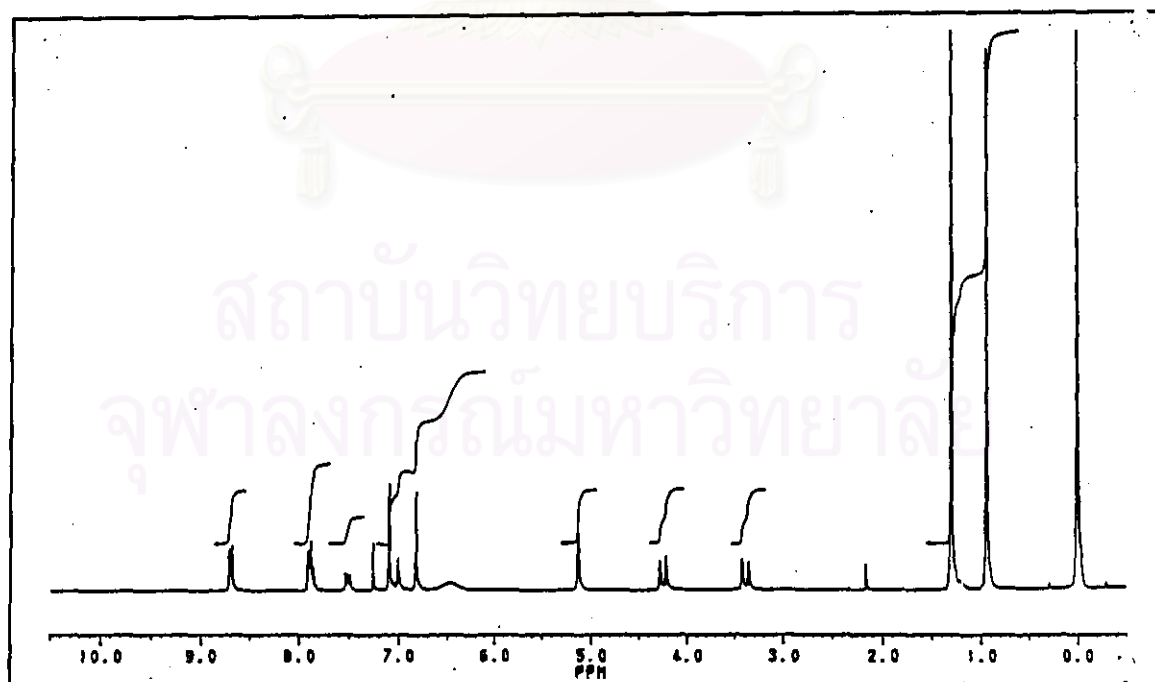


Figure B.38. ¹H-NMR (CDCl₃) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 2.5 : 1.0 ratio.

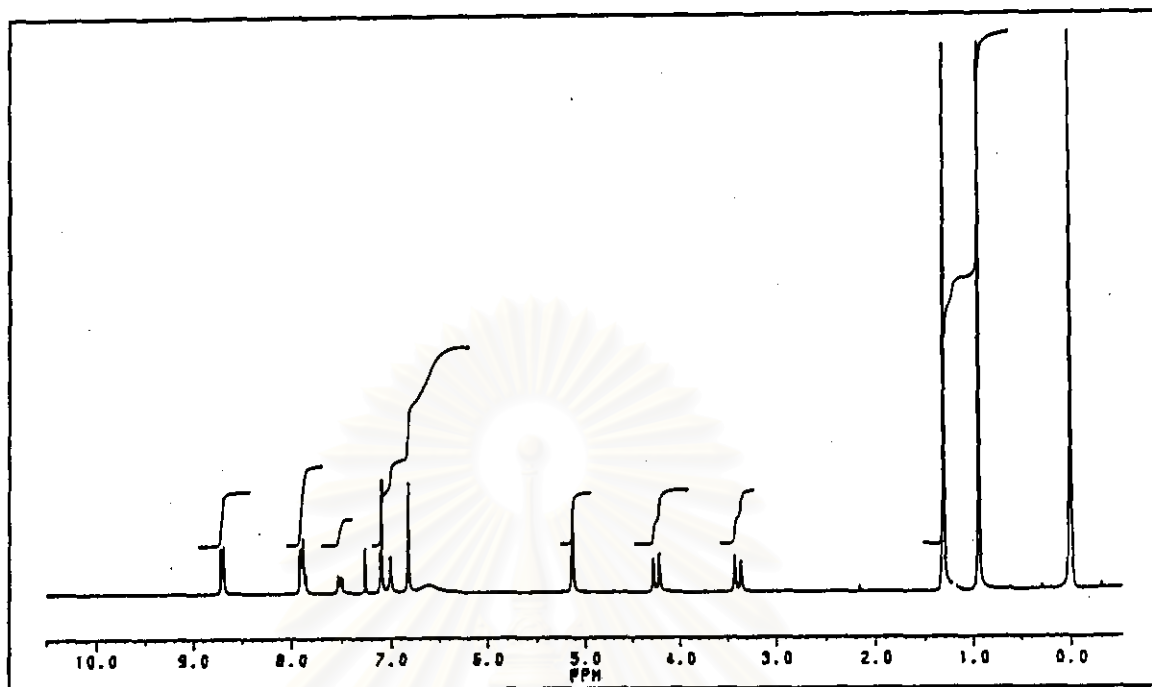


Figure B.39. ¹H-NMR (CDCl₃) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 3.0 : 1.0 ratio.

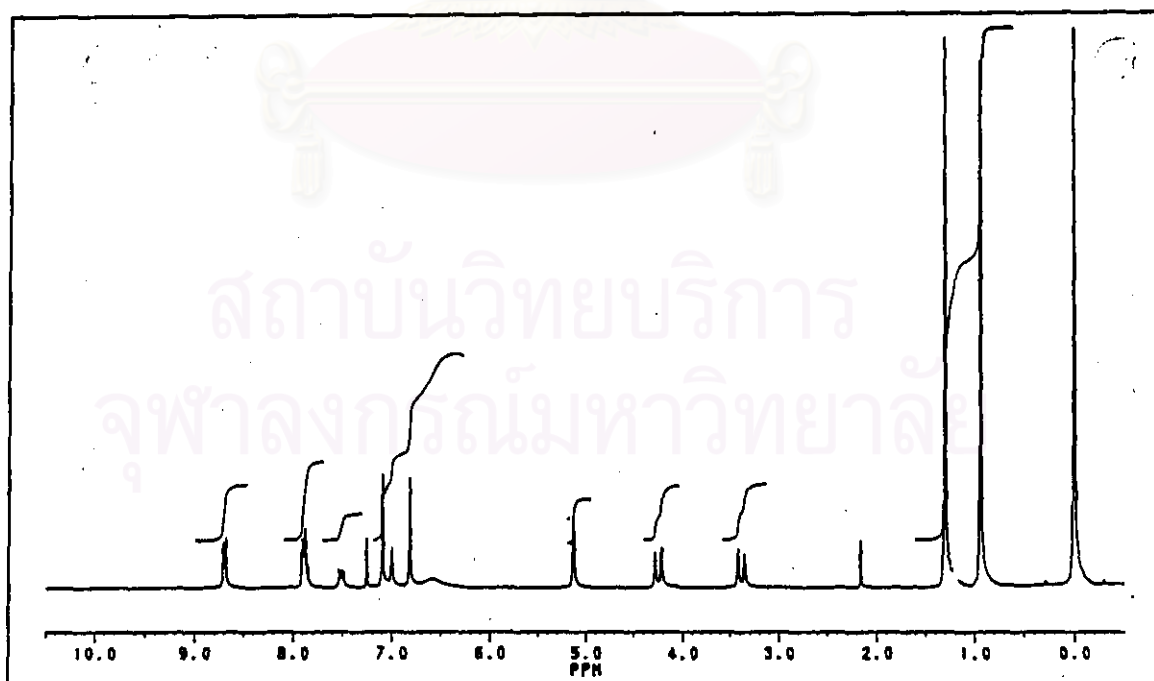


Figure B.40. ¹H-NMR (CDCl₃) spectrum of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 4.0 : 1.0 ratio.

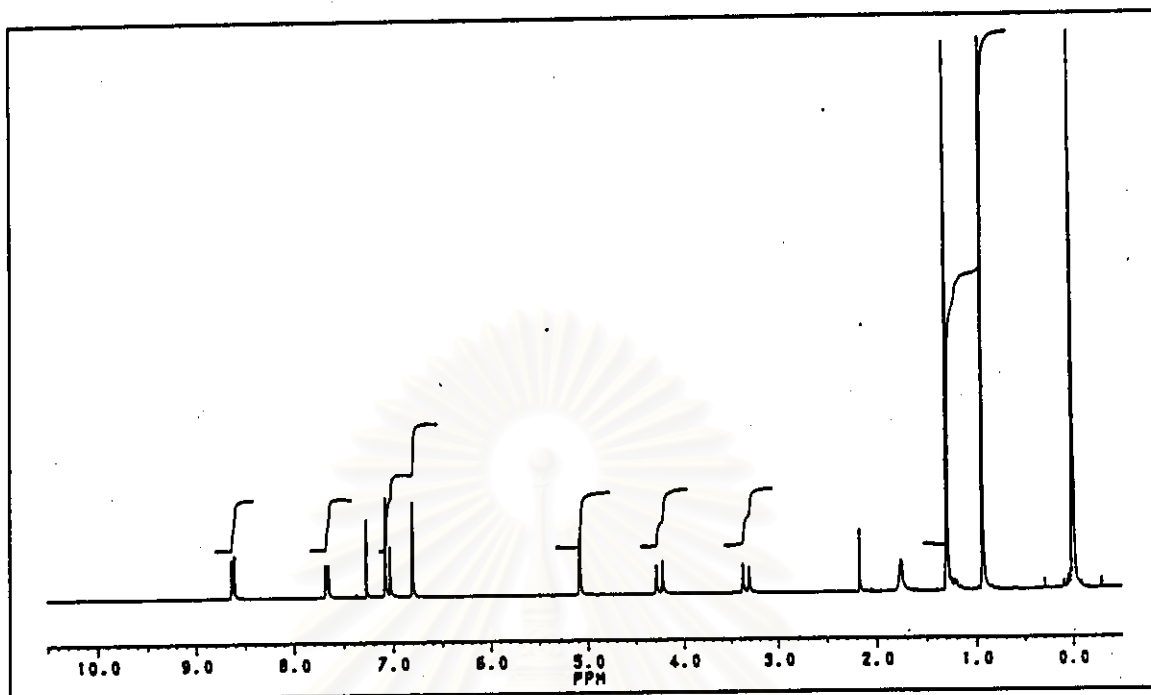


Figure B.41. ¹H-NMR (CDCl₃) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 0.0 : 0.0 : 1.0 ratio.

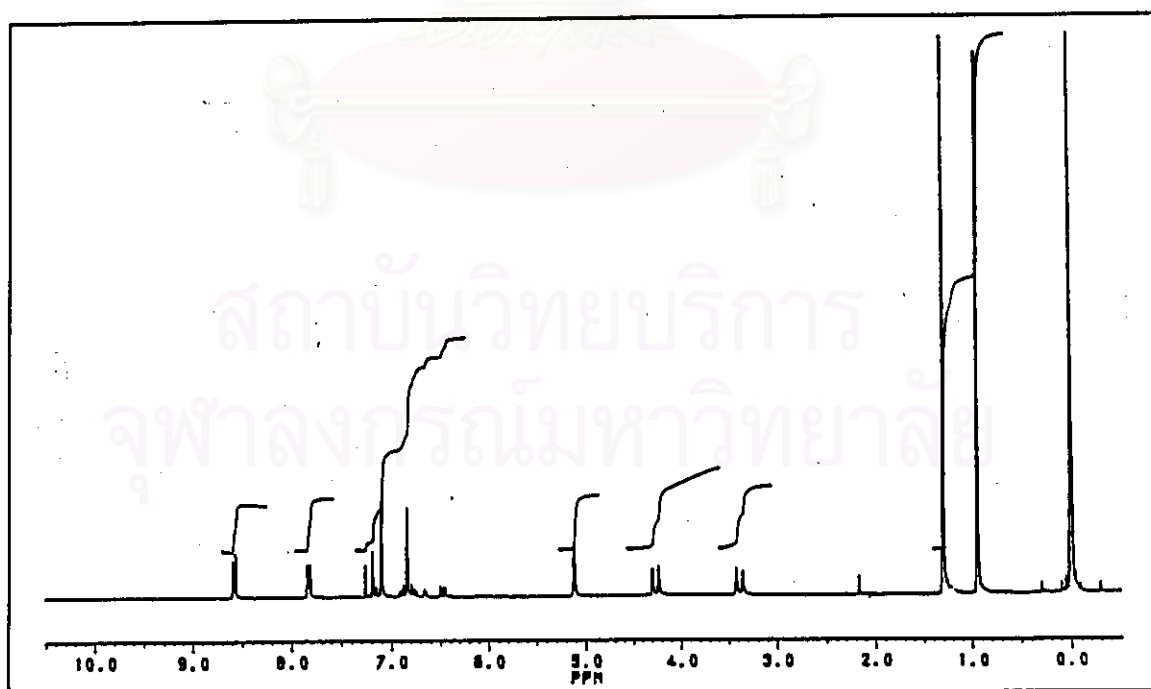


Figure B.42. ¹H-NMR (CDCl₃) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 0.5 : 0.5 : 1.0 ratio.

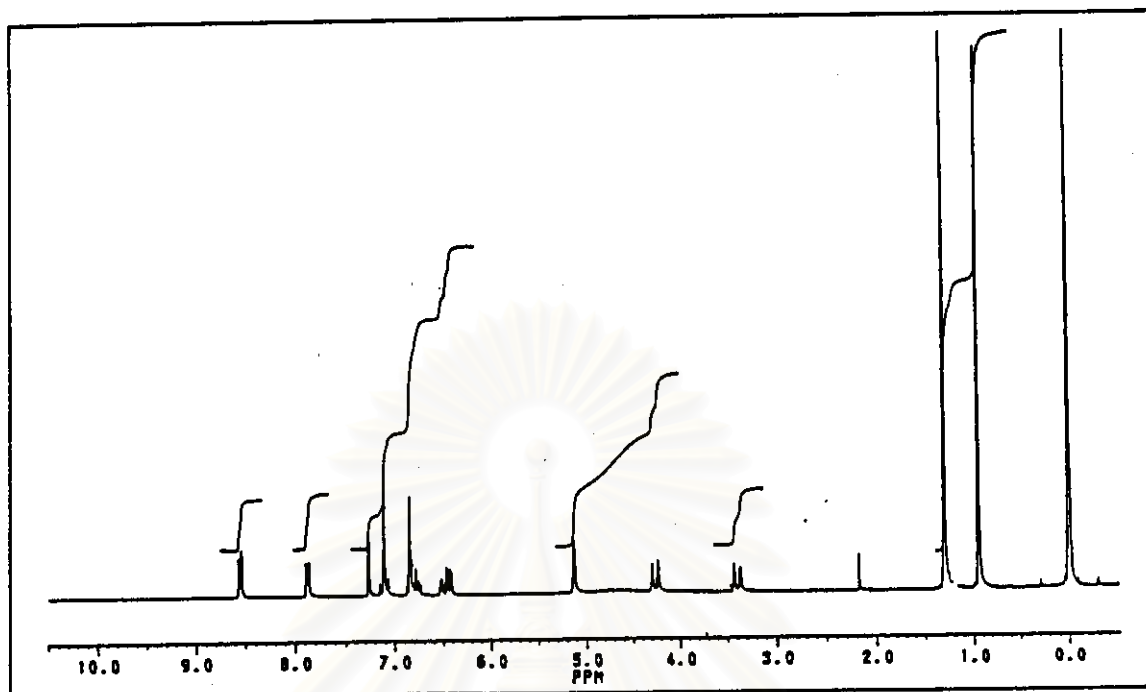


Figure B.43. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 1.0 : 1.0 : 1.0 ratio.

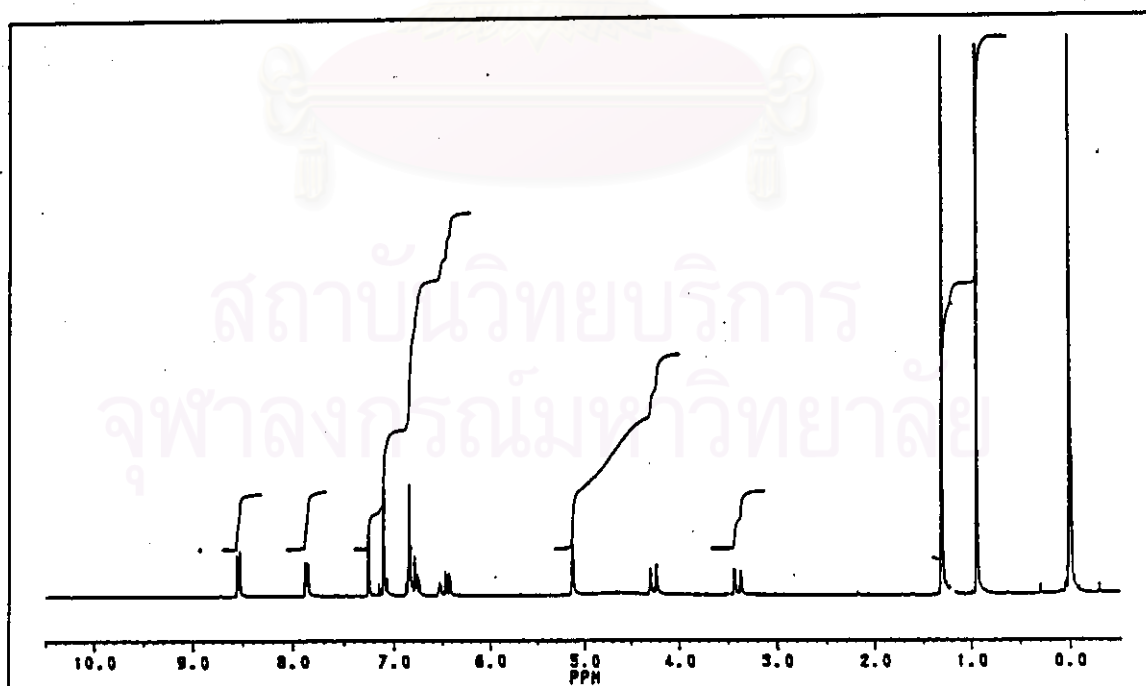


Figure B.44. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 1.5 : 1.5 : 1.0 ratio.

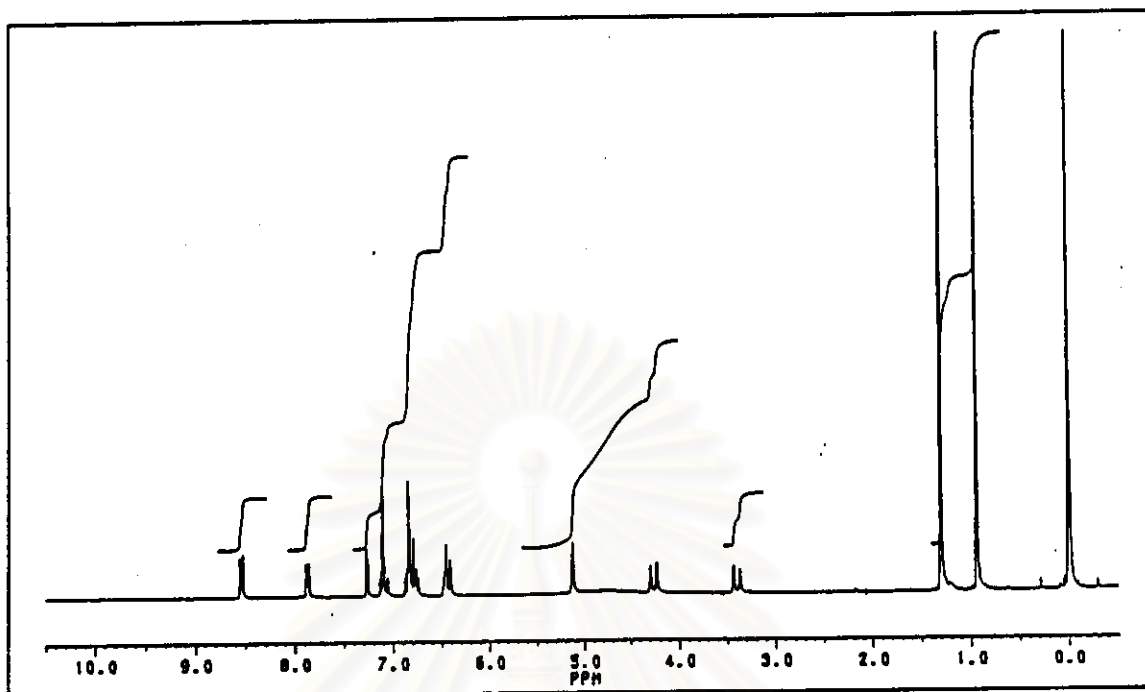


Figure B.45. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 2.0 : 2.0 : 1.0 ratio.

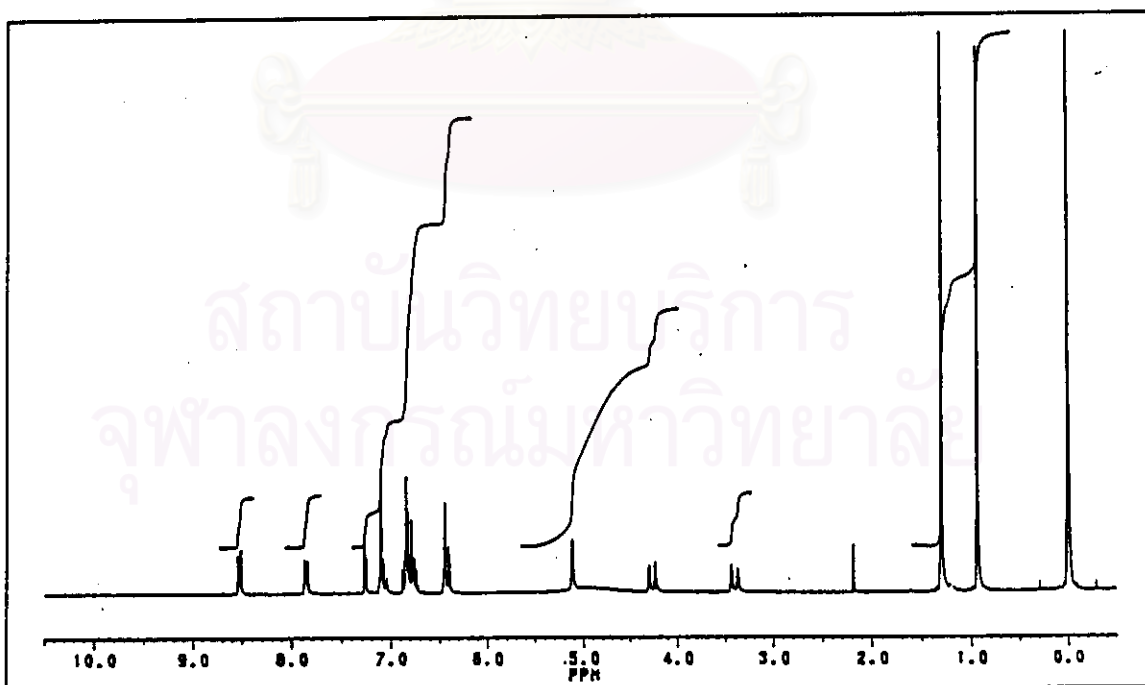


Figure B.46. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 2.5 : 2.5 : 1.0 ratio.

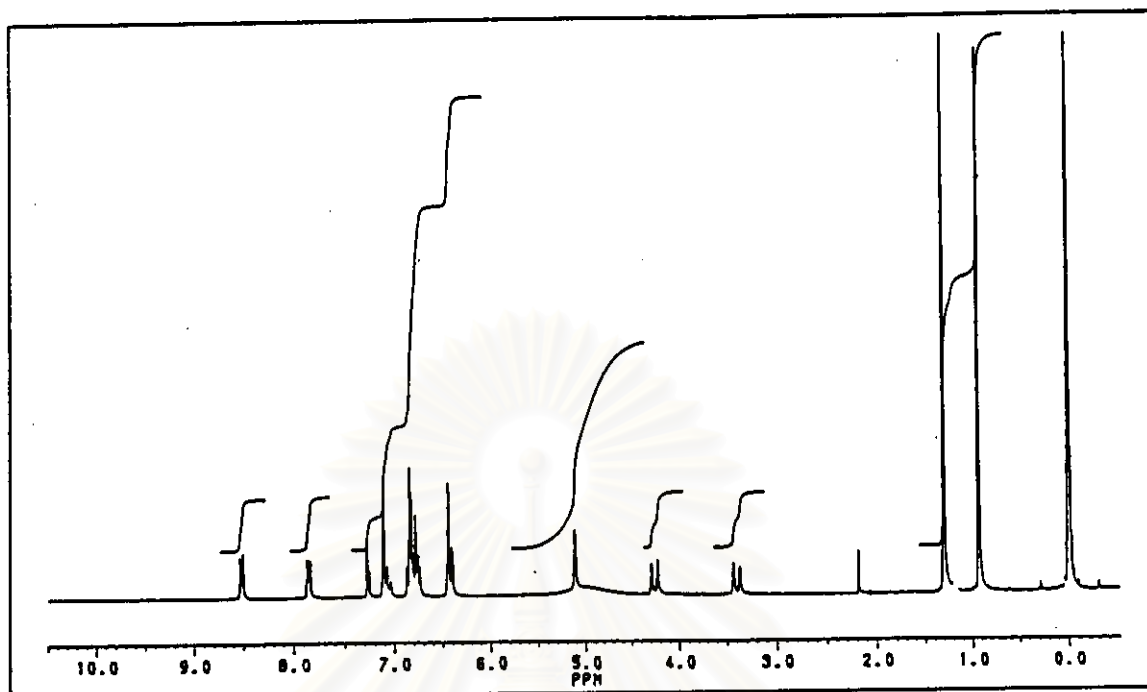


Figure B.47. ¹H-NMR (CDCl₃) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 3.0 : 3.0 : 1.0 ratio.

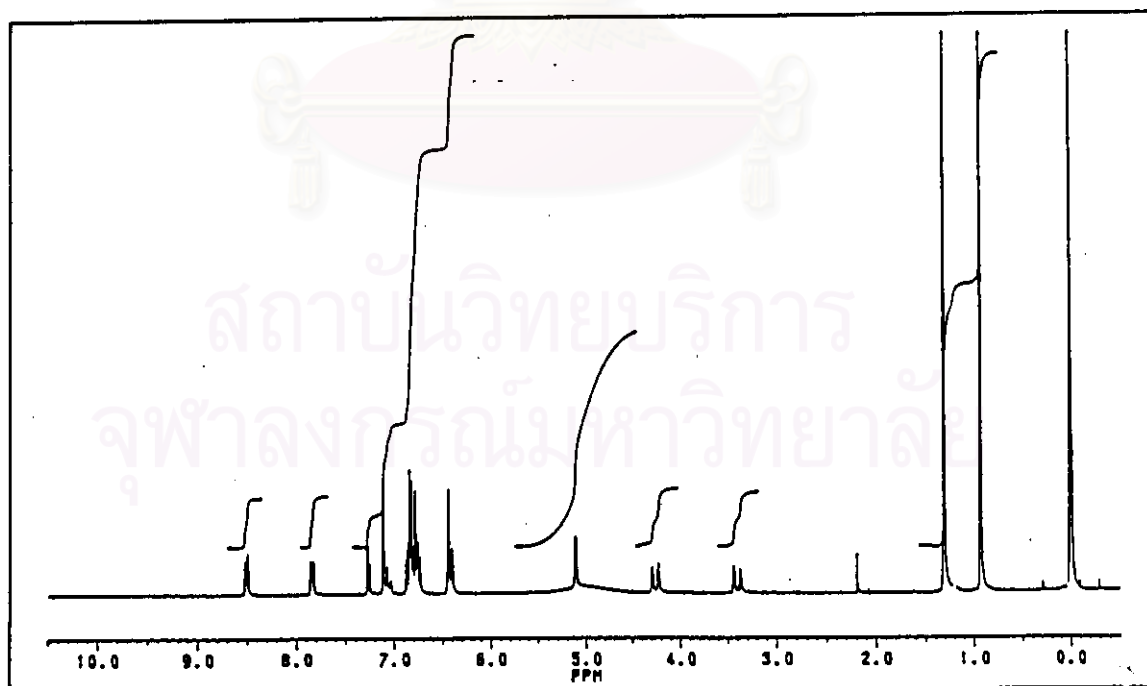


Figure B.48. ¹H-NMR (CDCl₃) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 4.0 : 4.0 : 1.0 ratio.

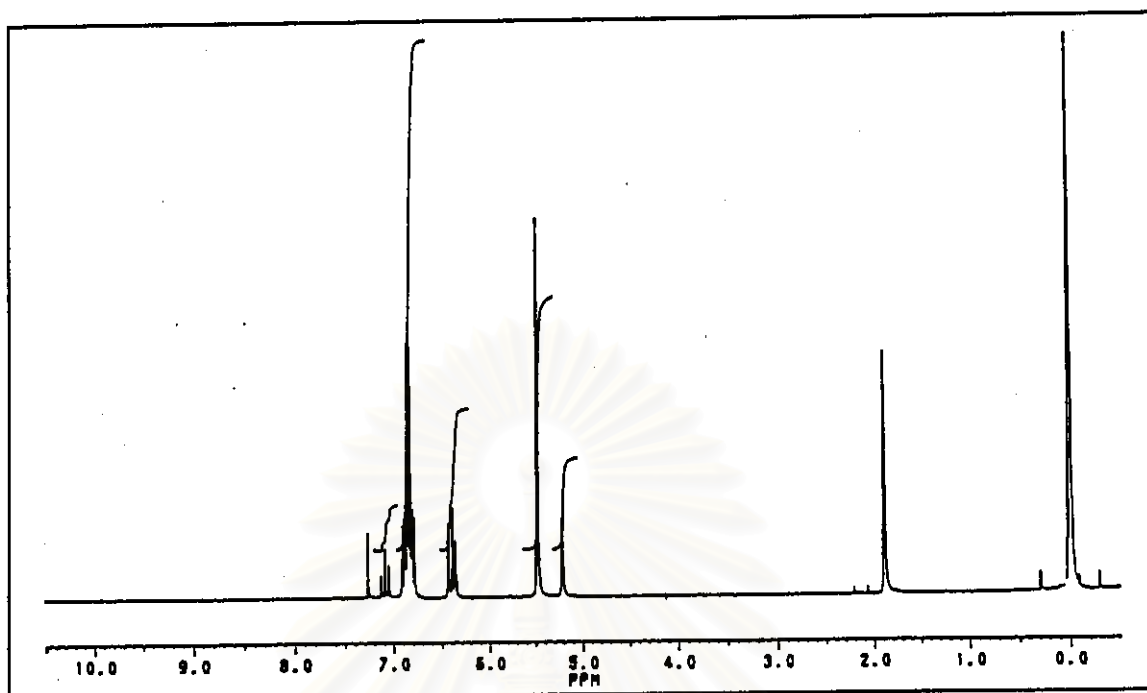


Figure B.49. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and 1,3-dihydroxybenzene to ligand (6) at 4.0 : 4.0 : 0.0 ratio.

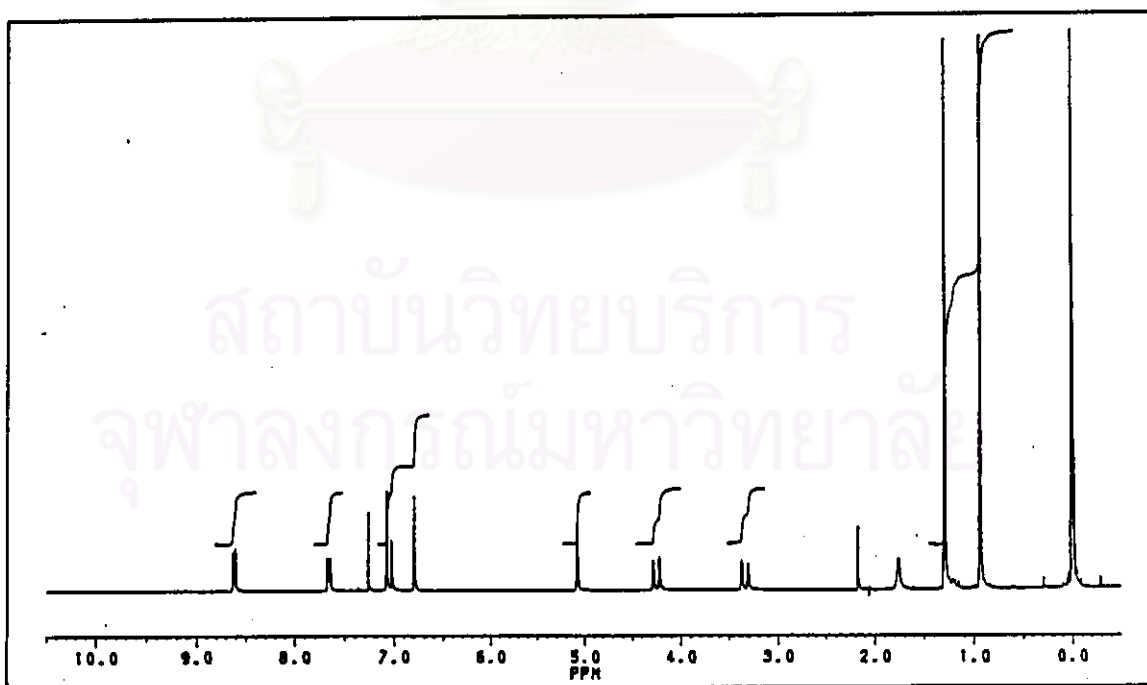


Figure B.50. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 0.0 : 0.0 : 1.0 ratio.

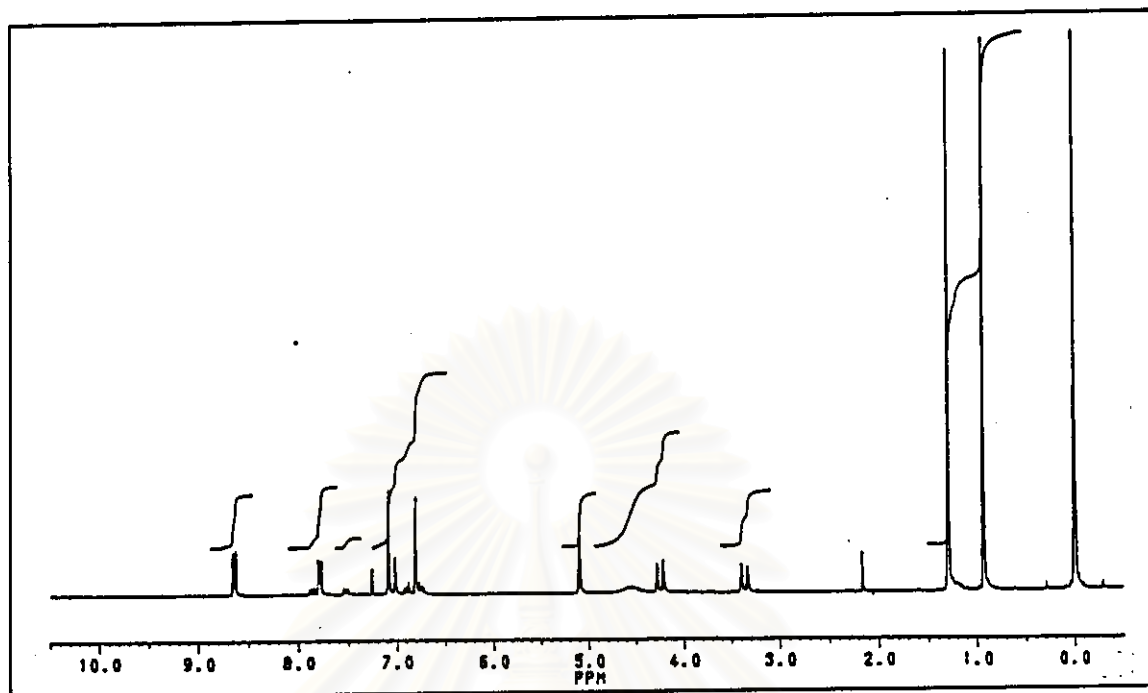


Figure B.51. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 0.5 : 0.5 : 1.0 ratio.

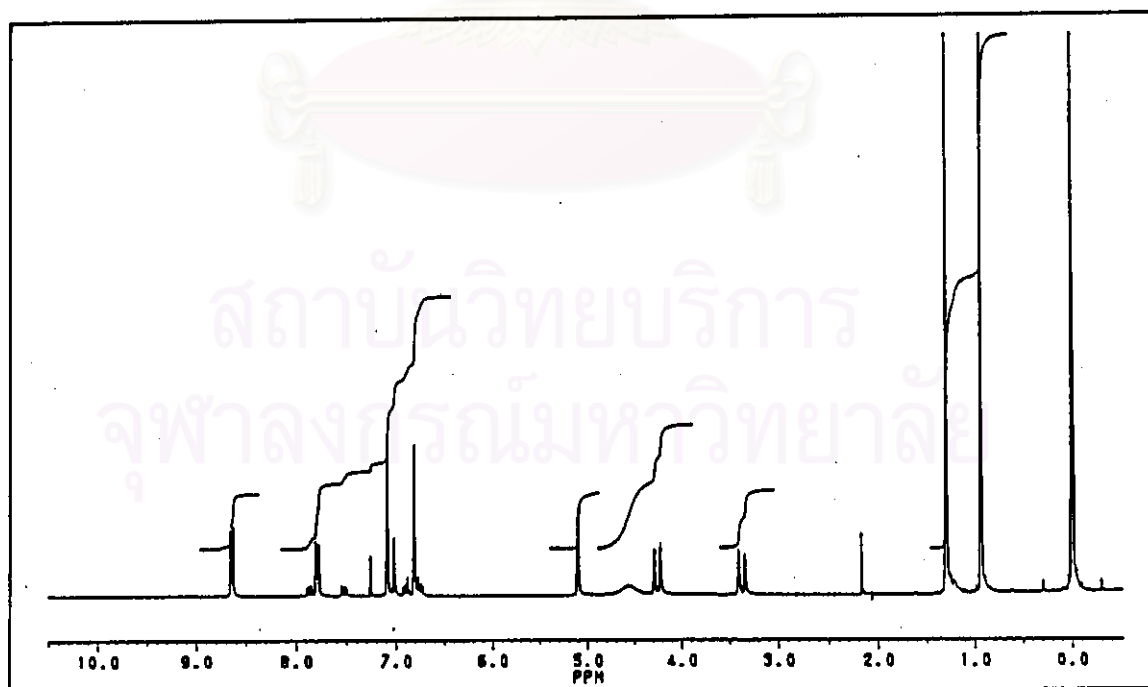


Figure B.52. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 1.0 : 1.0 : 1.0 ratio.

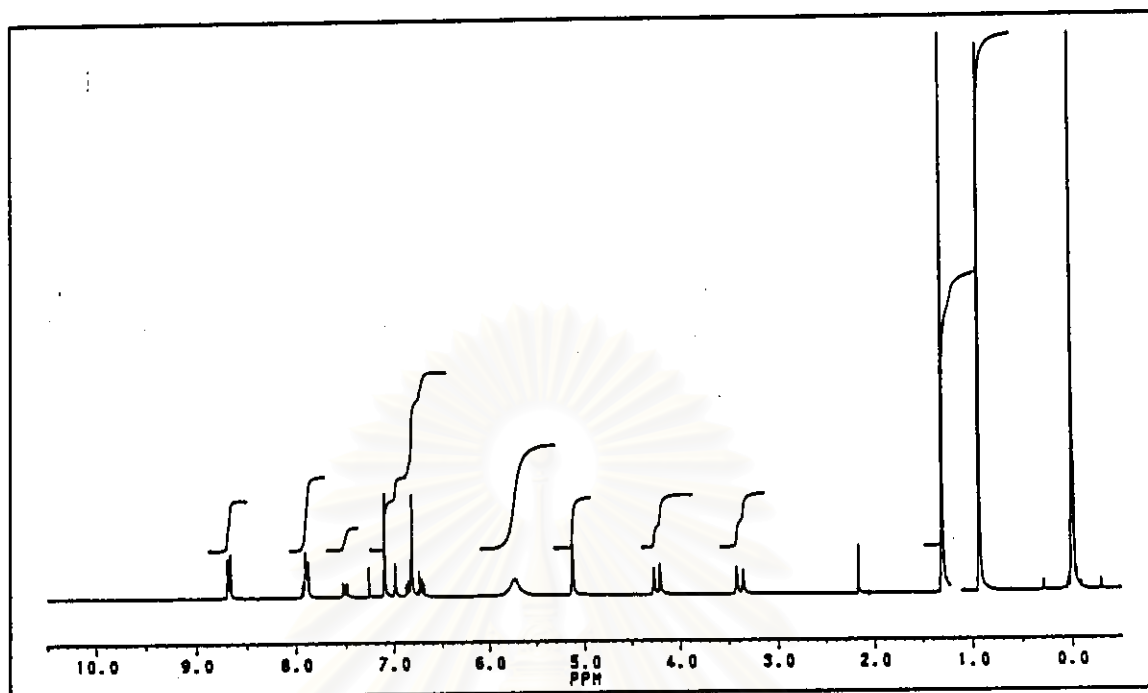


Figure B.53. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 1.5 : 1.5 : 1.0 ratio.

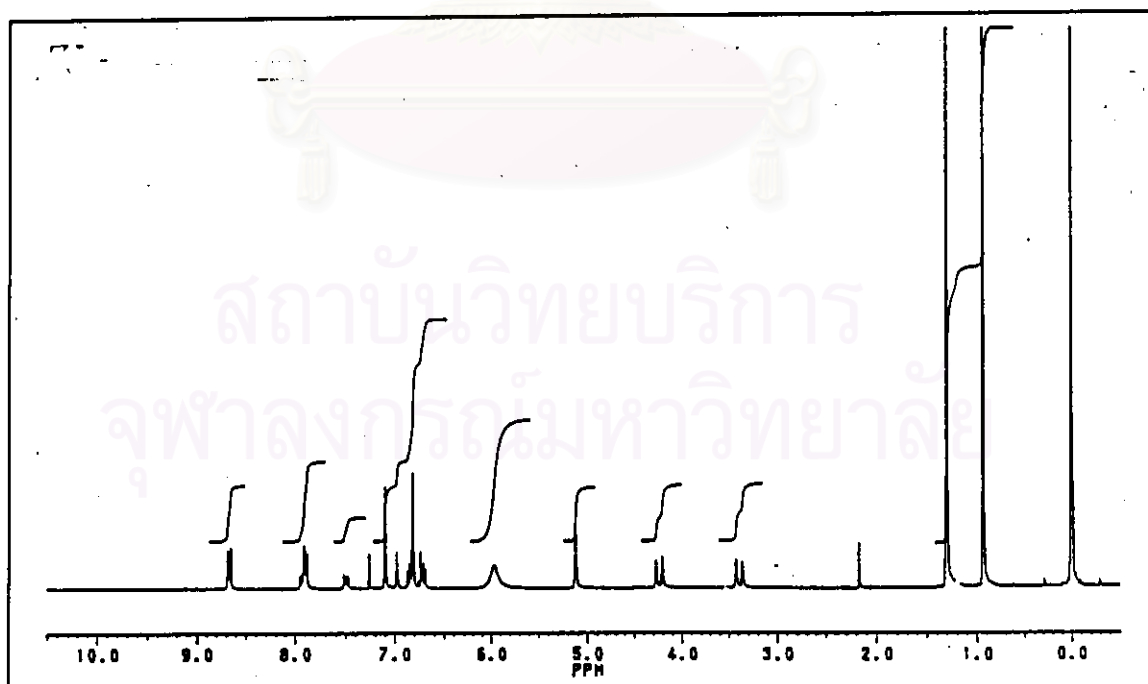


Figure B.54. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 2.0 : 2.0 : 1.0 ratio.

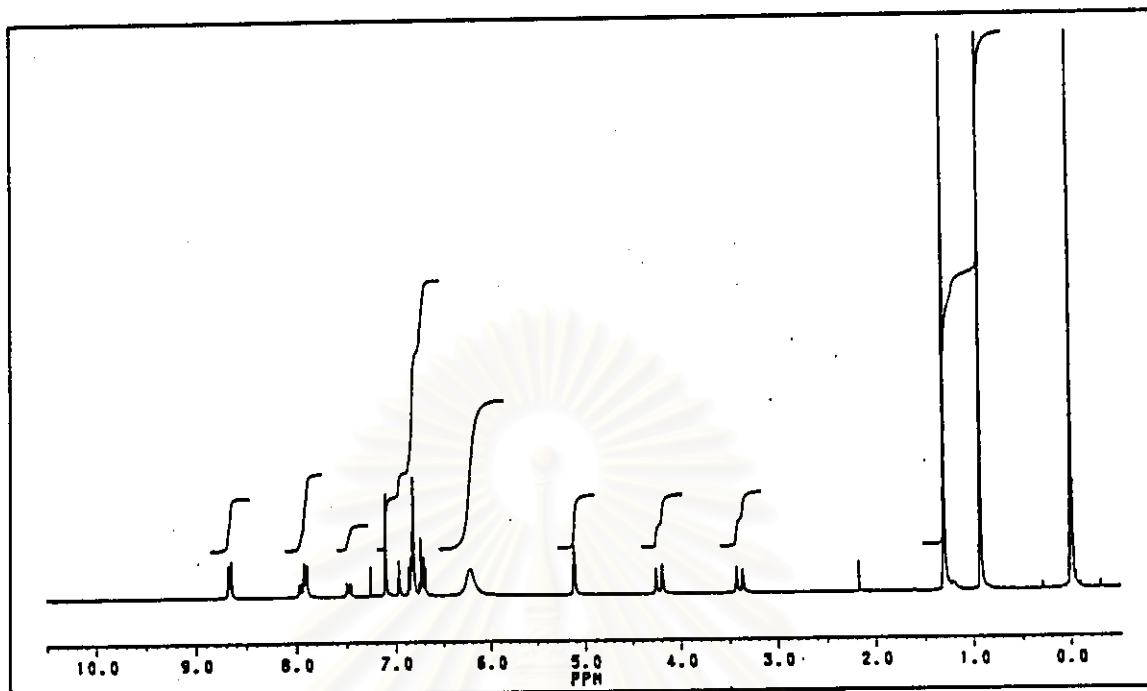


Figure B.55. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 2.5 : 2.5 : 1.0 ratio.

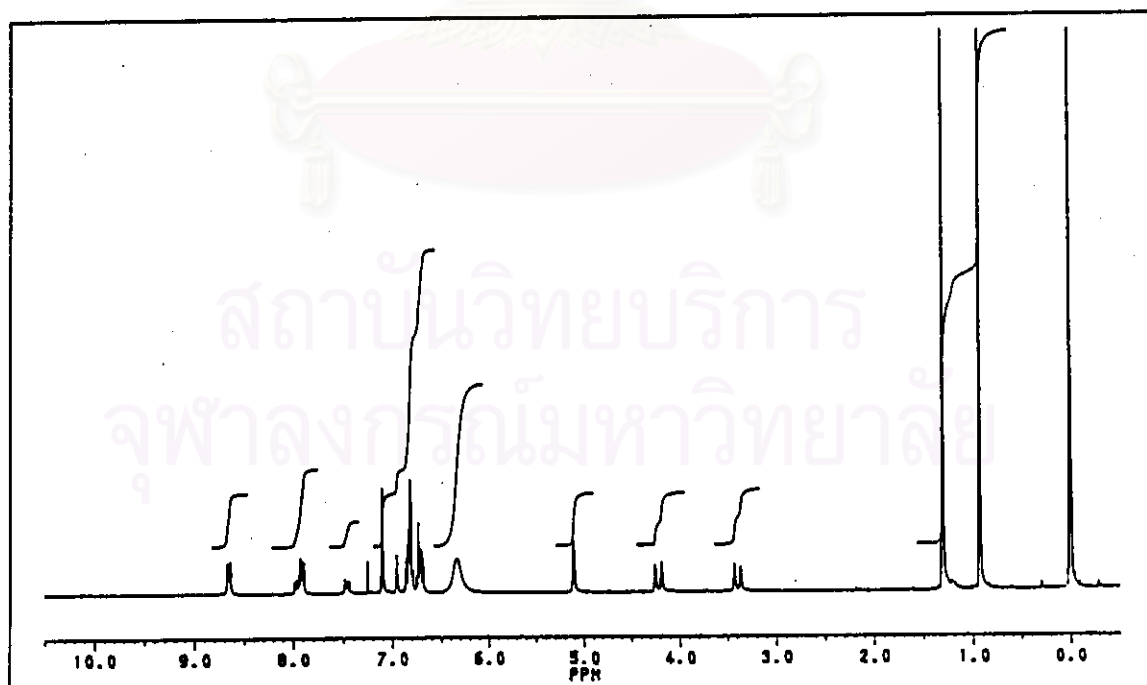


Figure B.56. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 3.0 : 3.0 : 1.0 ratio.

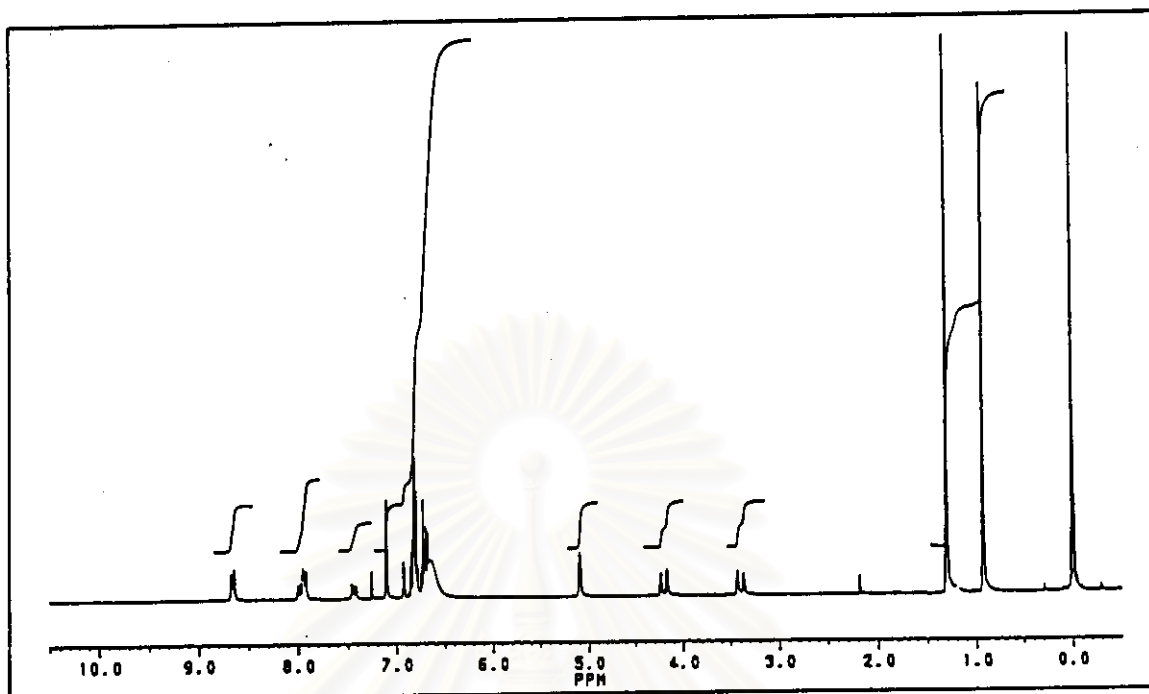


Figure B.57. $^1\text{H-NMR}$ (CDCl_3) spectrum of competition between 1,2-dihydroxybenzene and benzene-1,2-dicarboxylic acid to ligand (6) at 4.0 : 4.0 : 1.0 ratio.

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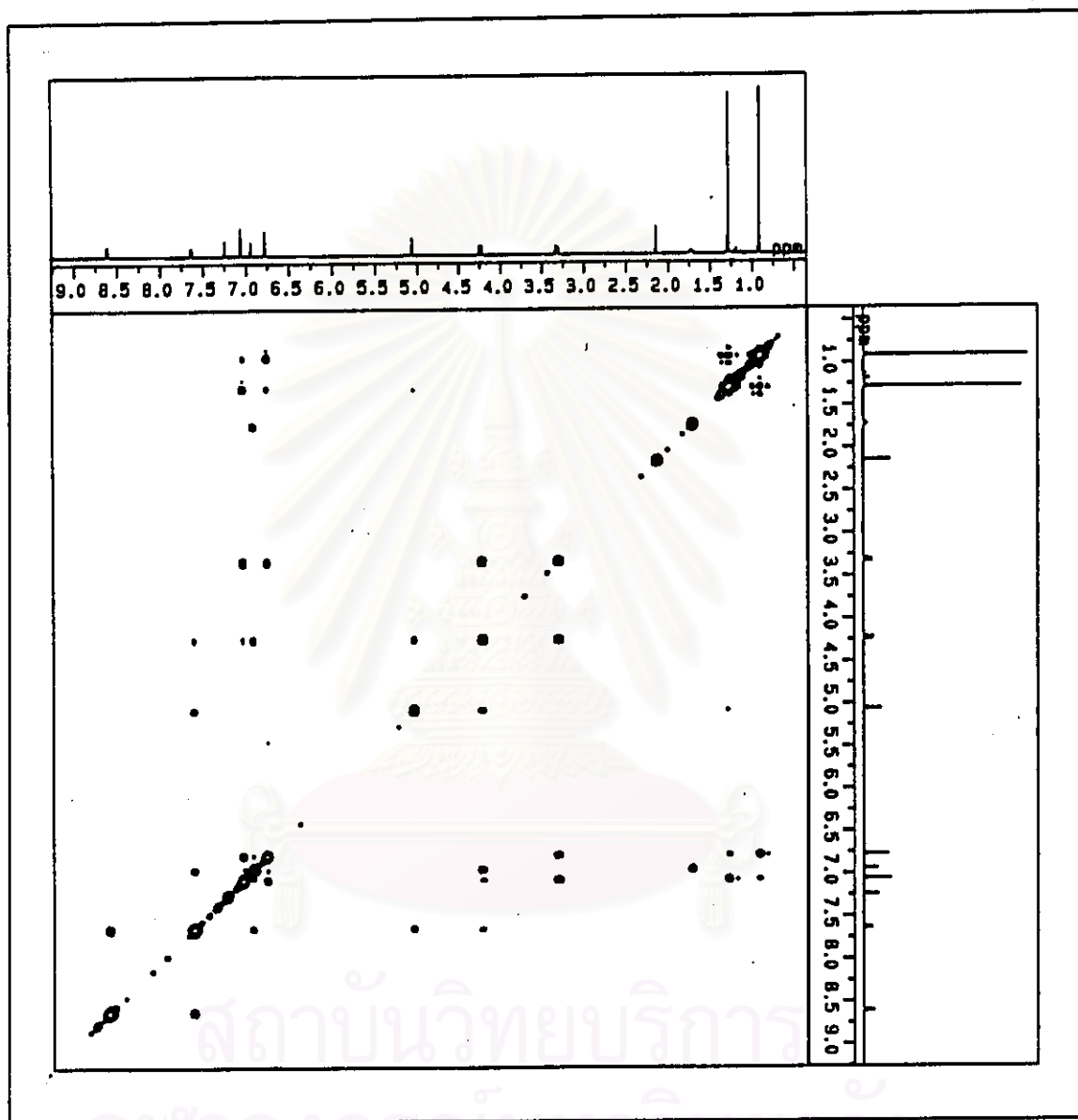


Figure B.58. NOESY of 25,27-di-(4-pyridylmethoxy)-*p*-*tert*-butylcalix[4]arene (6).

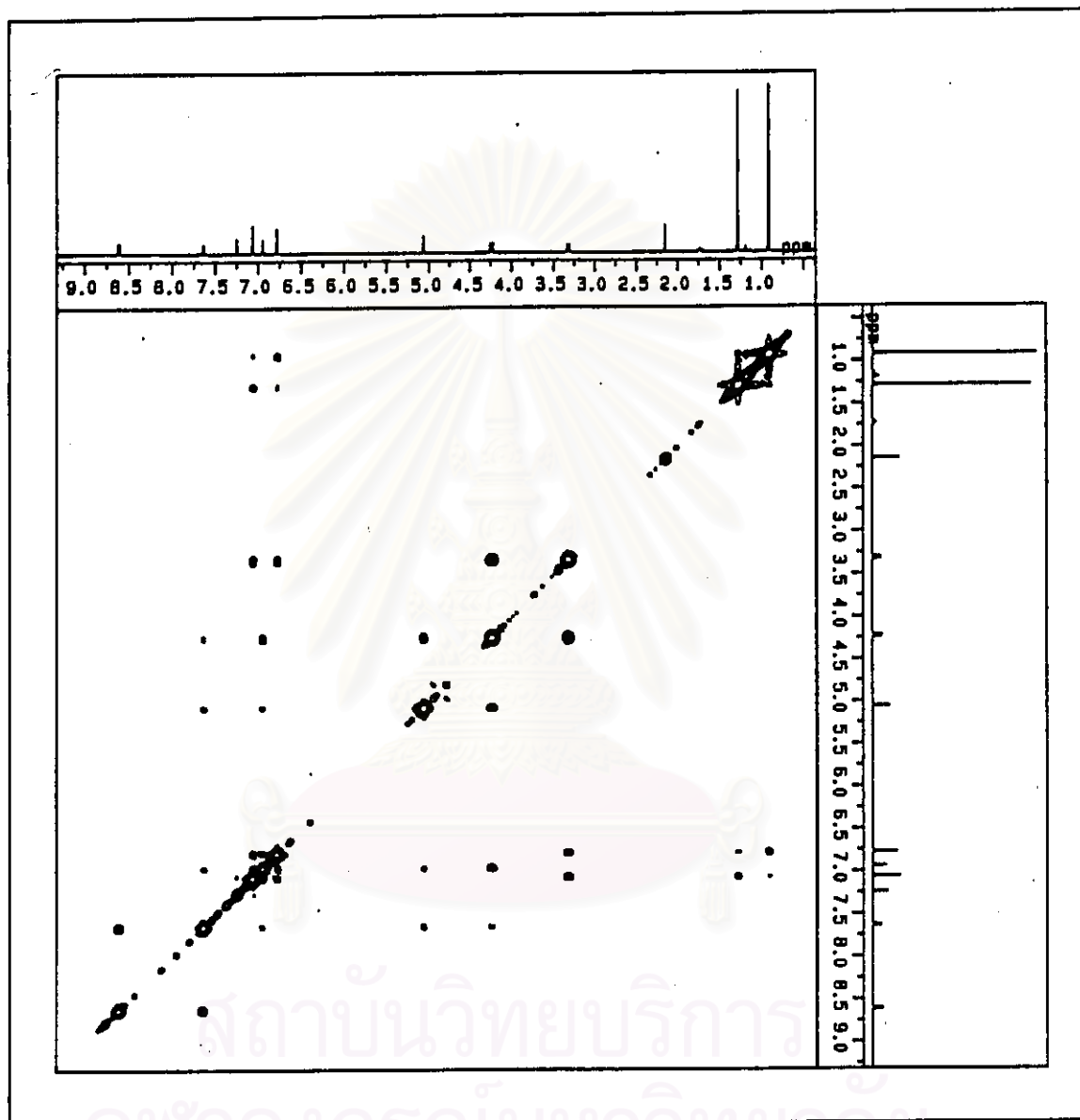


Figure B.59. ROESY of 25,27-di-(4-pyridylmethoxy)-*p*-*tert*-butylcalix[4]arene (6).

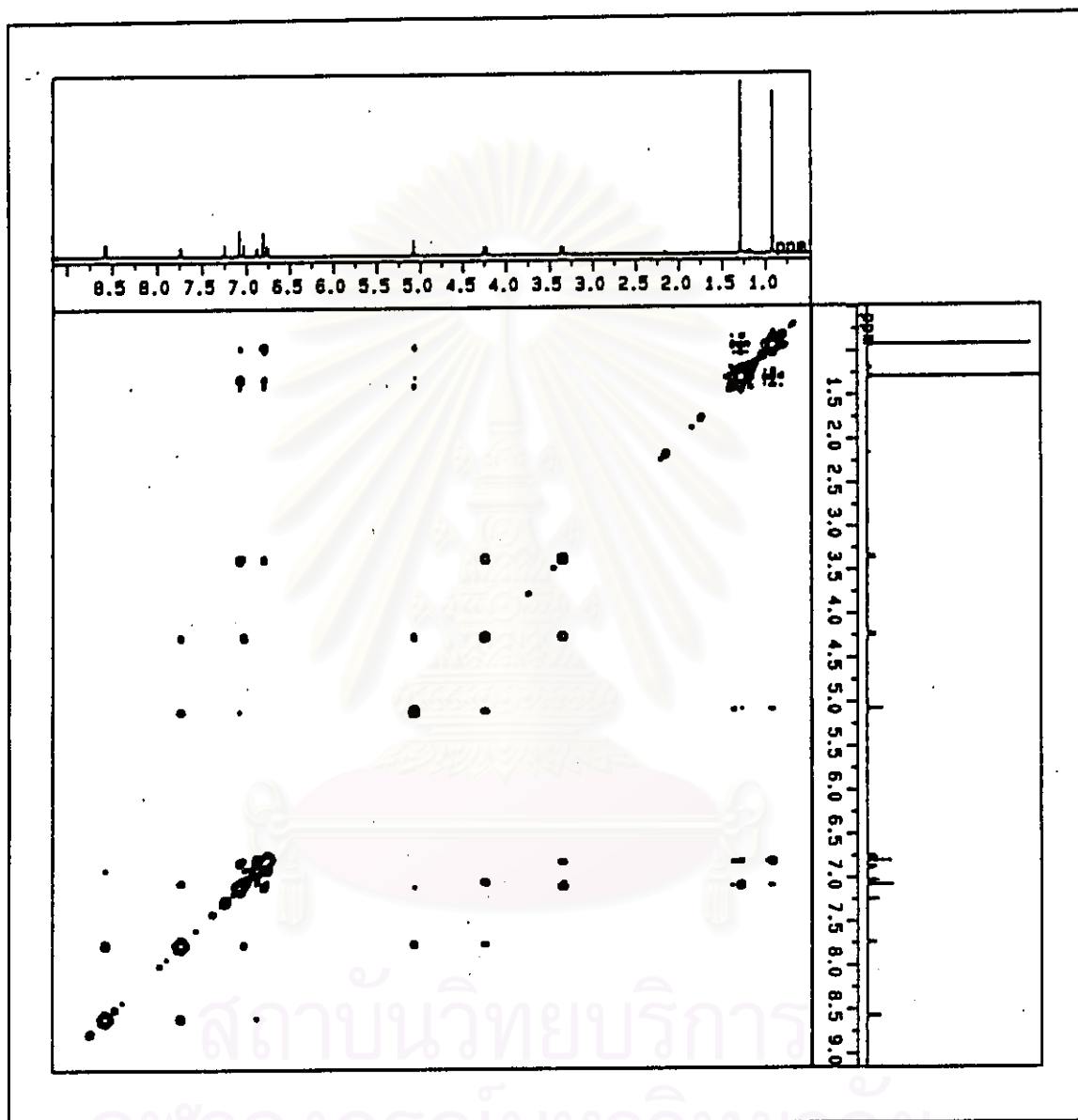


Figure B.60. NOESY of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.0 : 1.0 ratio.

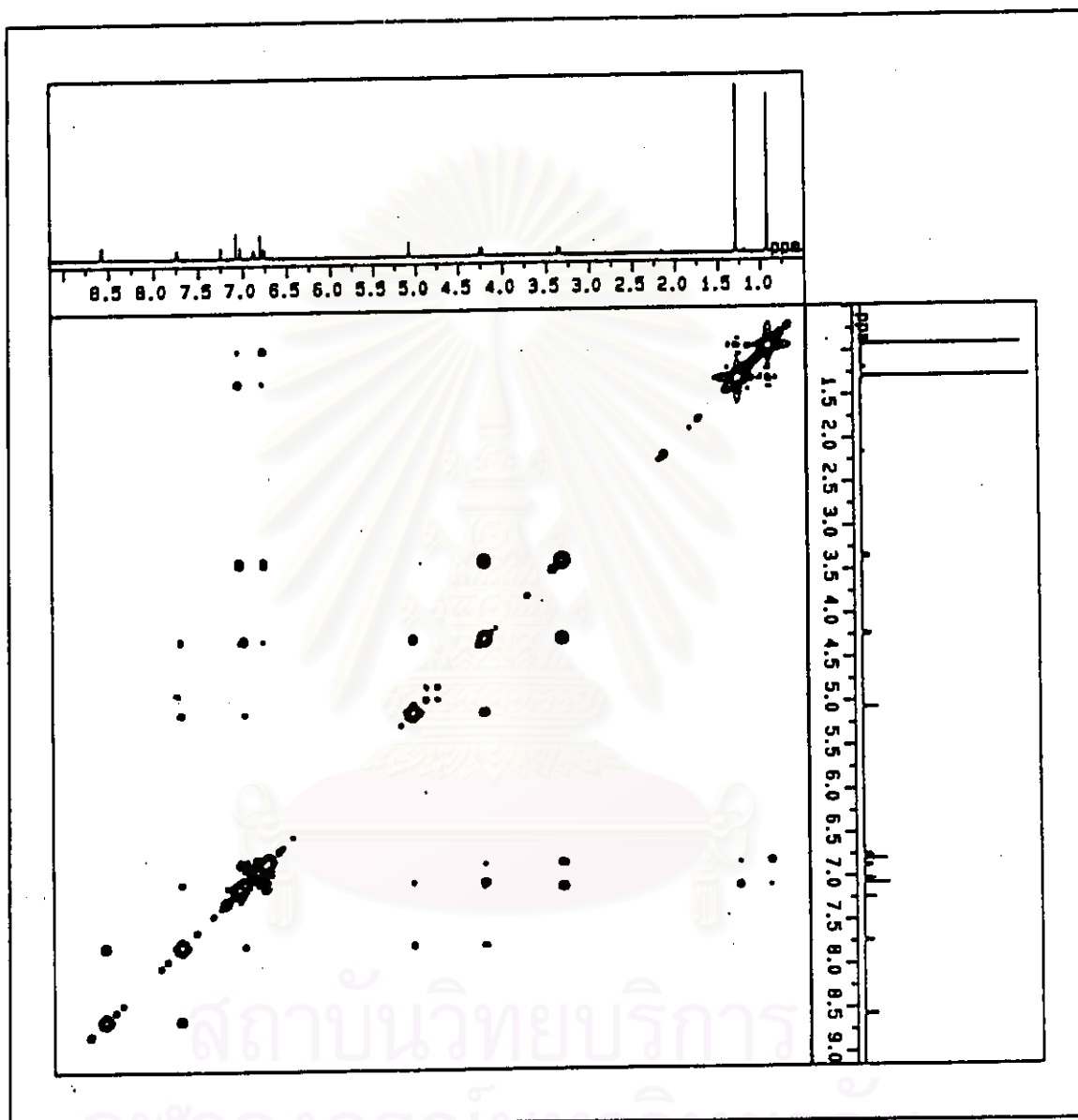


Figure B.61. ROESY of complexation between 1,2-dihydroxybenzene and ligand (6) at 2.0 : 1.0 ratio.

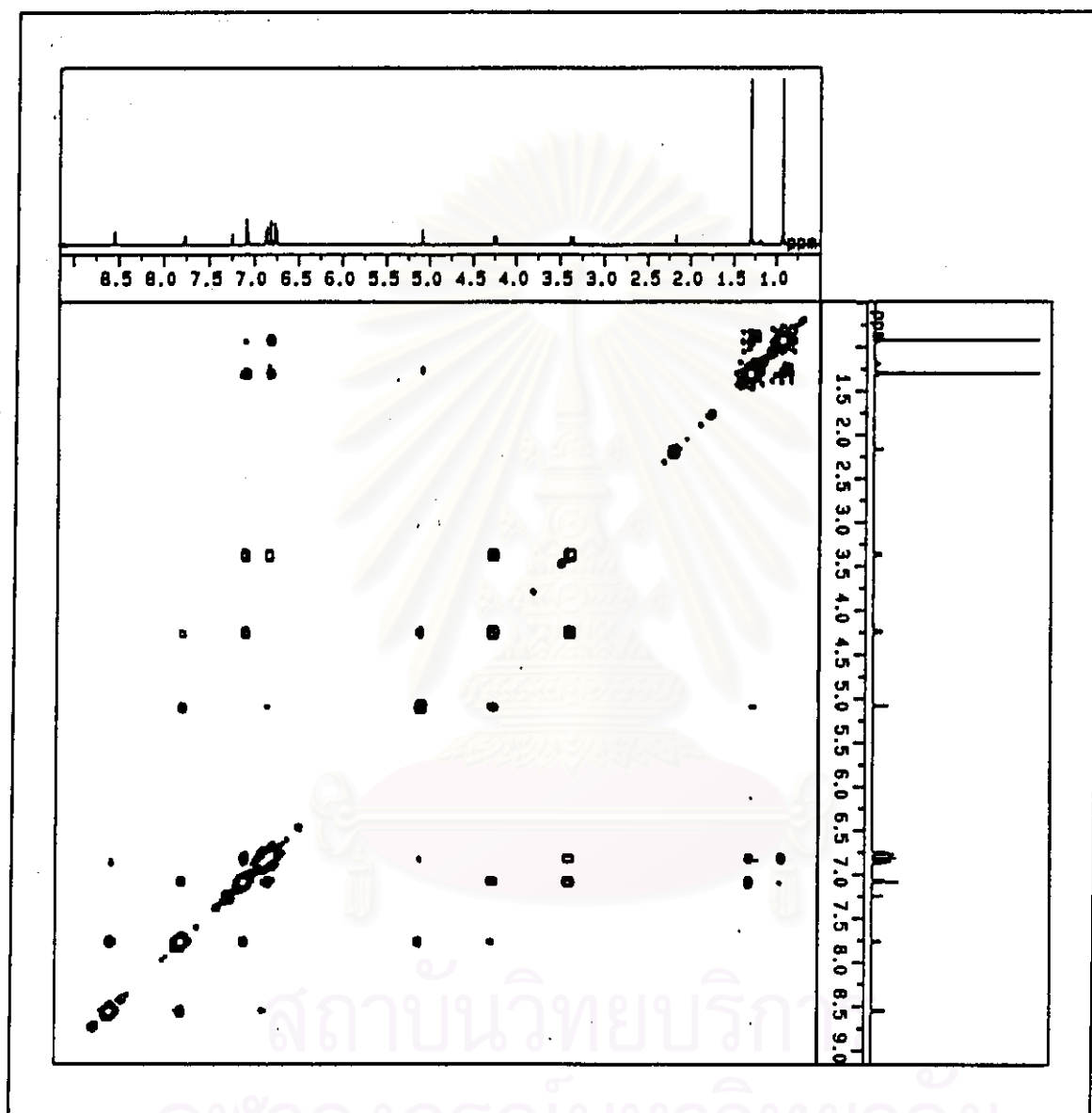


Figure B.62. NOESY of complexation between 1,2-dihydroxybenzene and ligand (6) at 4.0 : 1.0 ratio.

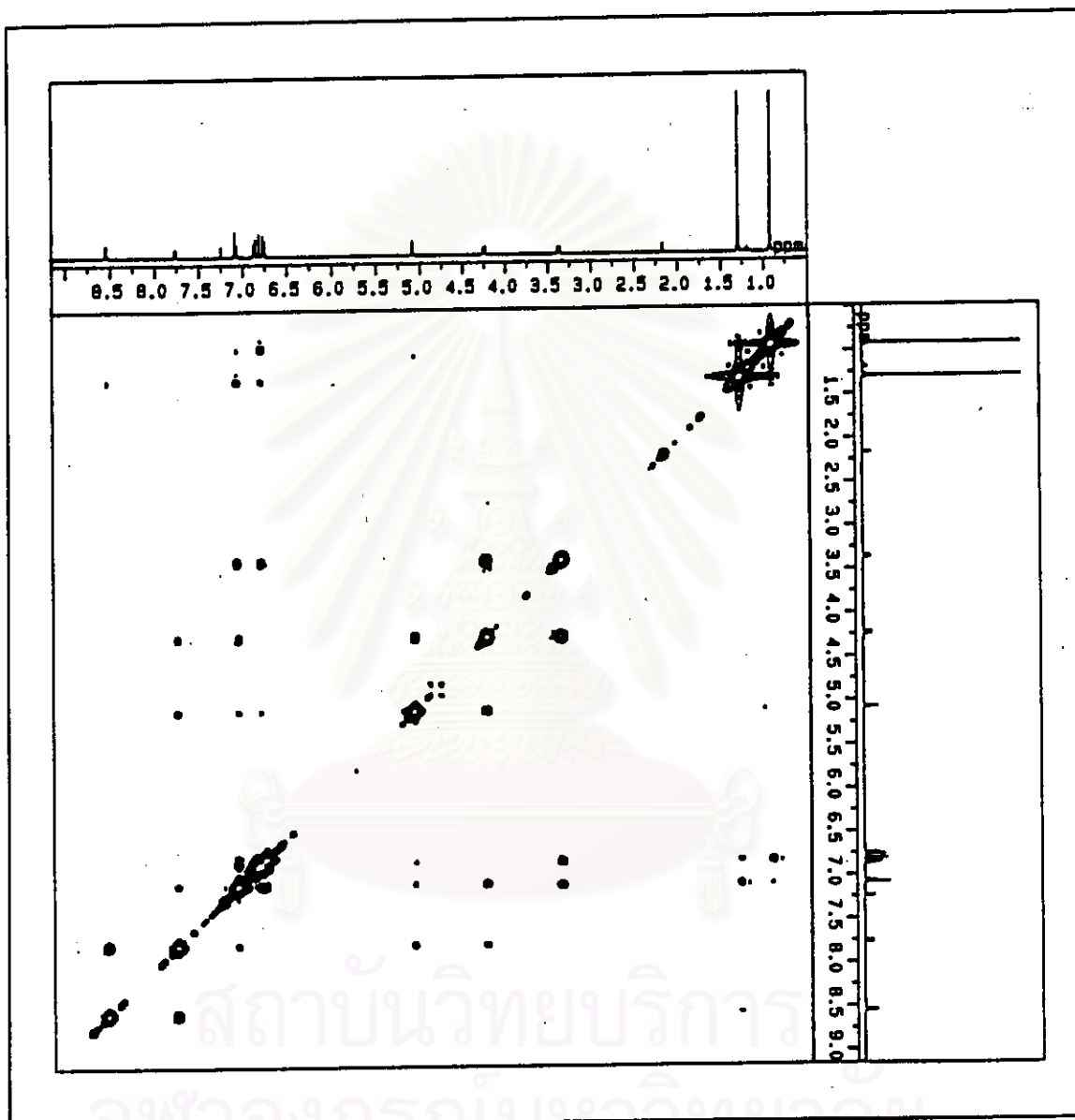


Figure B.63. ROESY of complexation between 1,2-dihydroxybenzene and ligand (6) at 4.0 : 1.0 ratio.

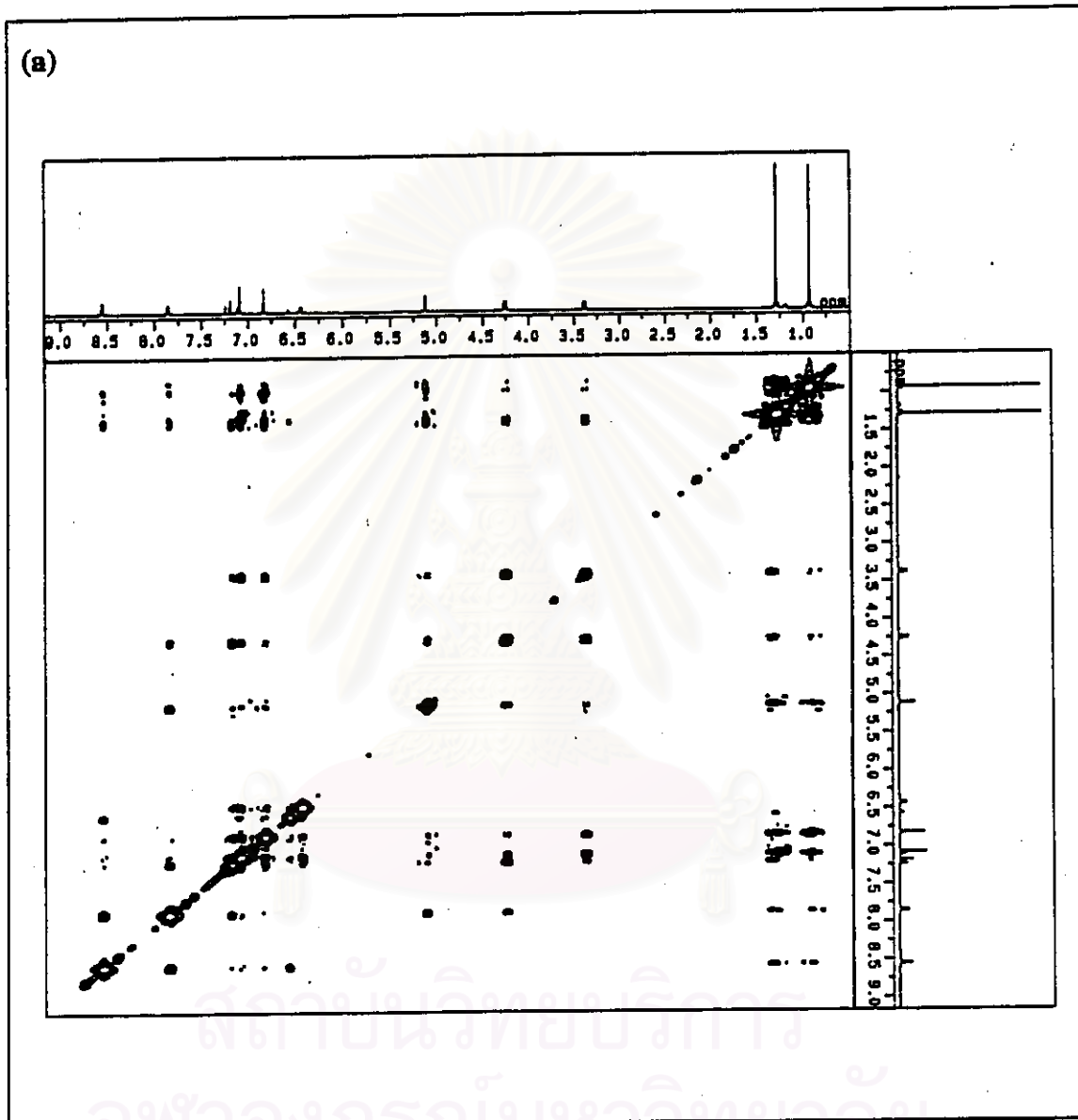


Figure B.64. NOESY of complexation between 1,3-dihydroxybenzene and ligand (6) at 1.0 : 1.0 ratio (a) 0.0–9.5 ppm (b) 3.0–9.5 ppm.

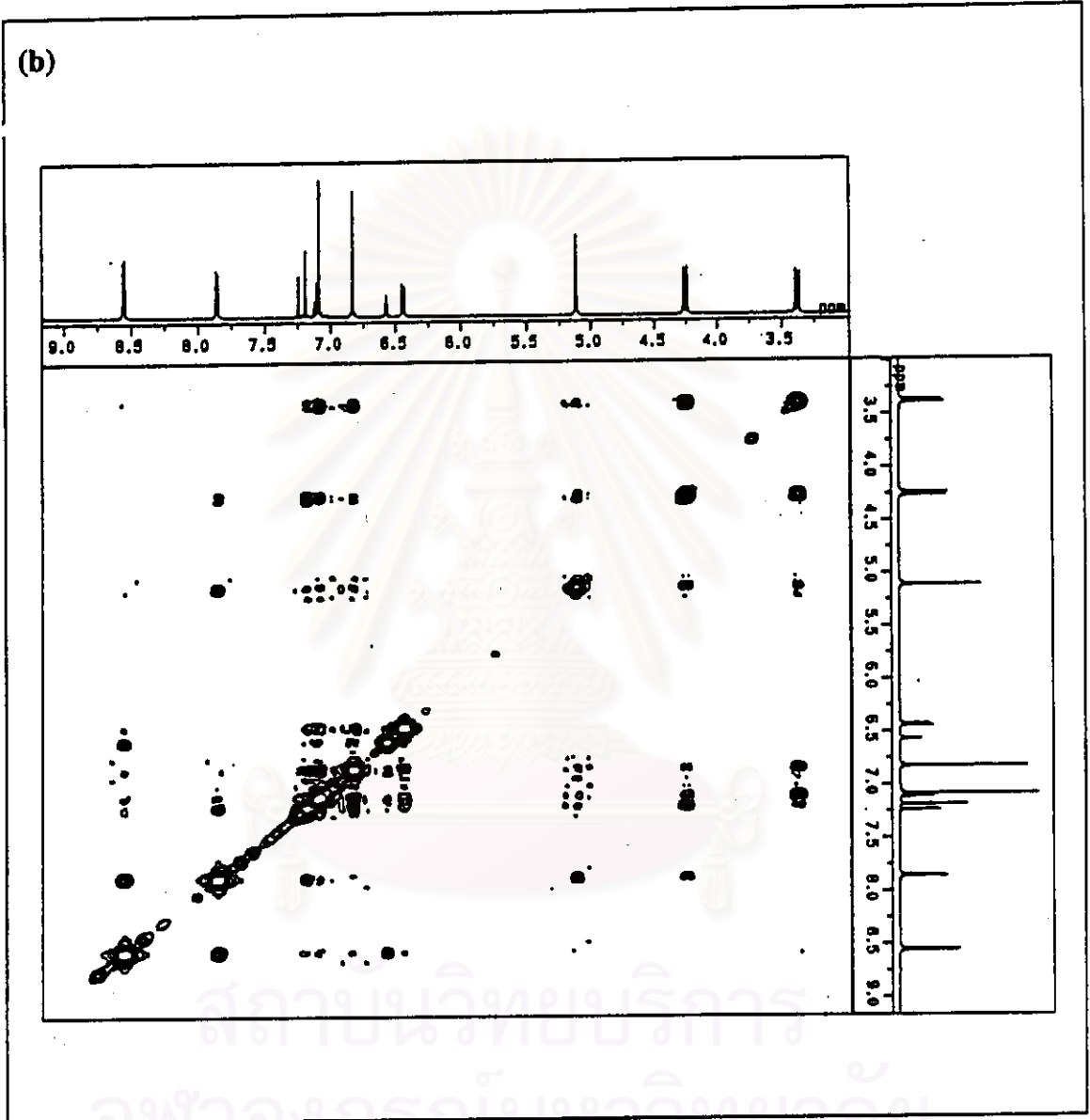


Figure B.64. *Continue.*

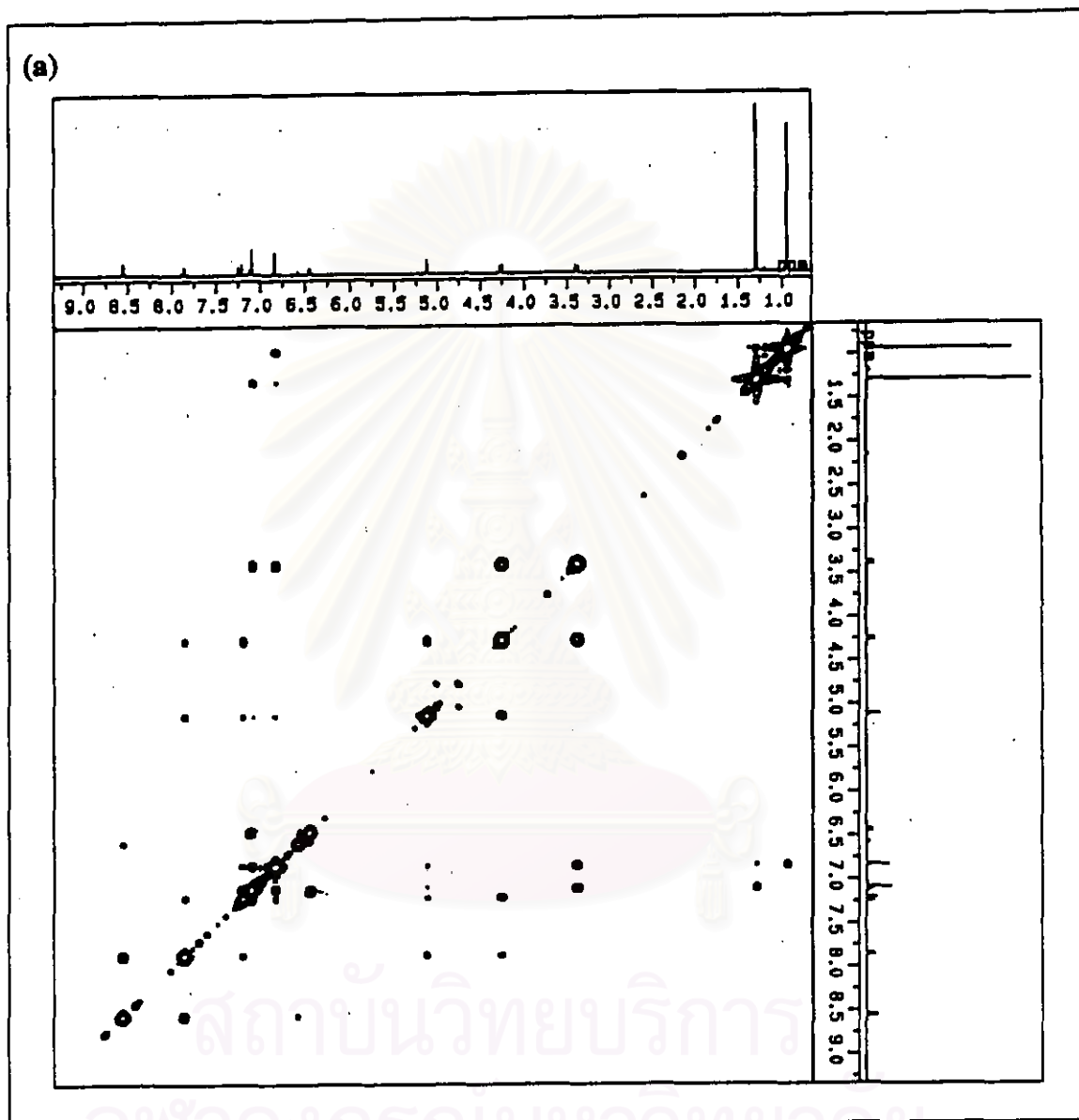


Figure B.65. ROESY of complexation between 1,3-dihydroxybenzene and ligand (6) at 1.0 : 1.0 ratio (a) 0.0-9.3 ppm (b) 0.5-7.7 ppm (c) 3.1-9.3 ppm (d) 6.3-8.8 ppm (e) 6.3-7.4 ppm.

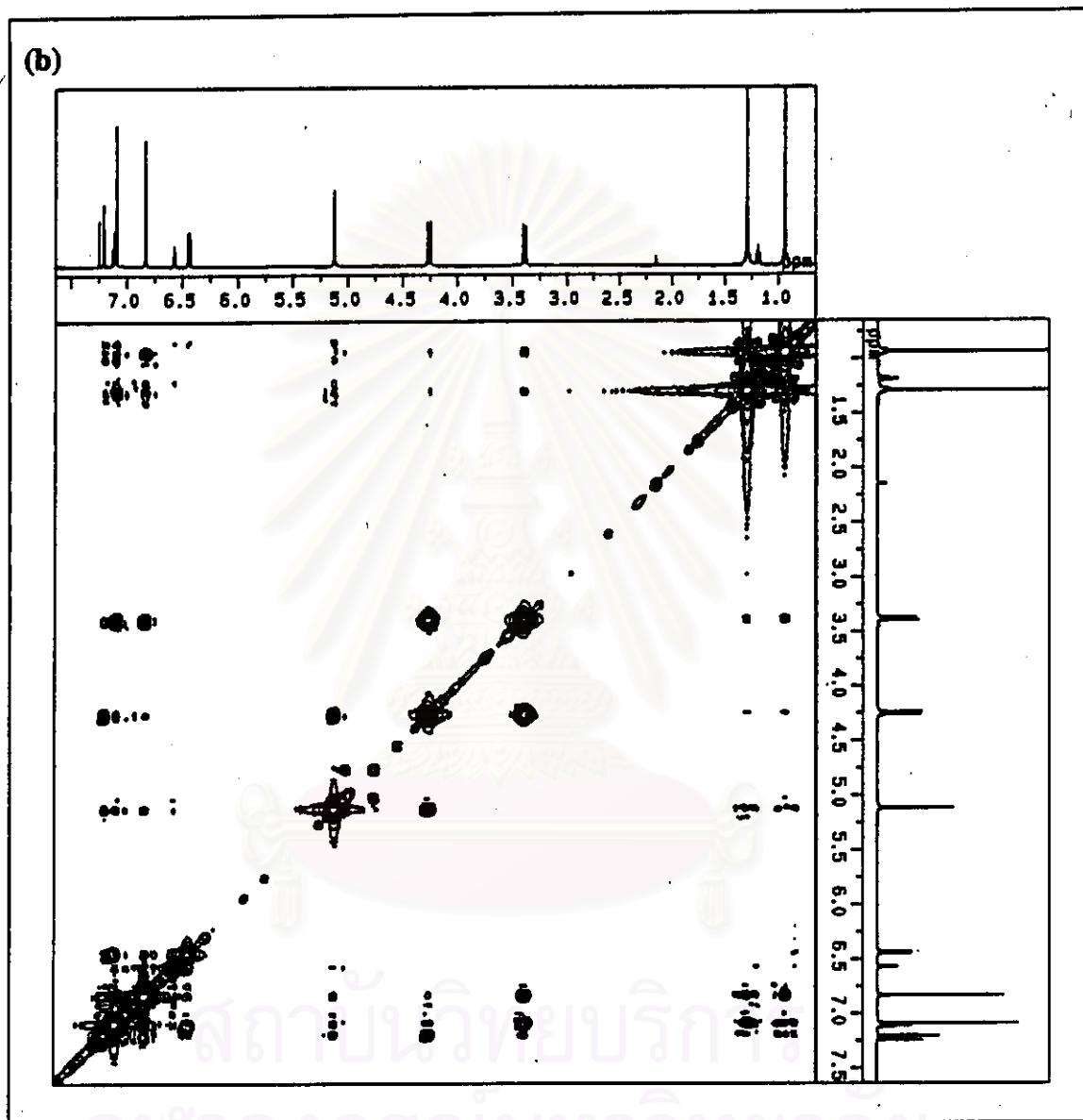


Figure B.65. *Continue.*

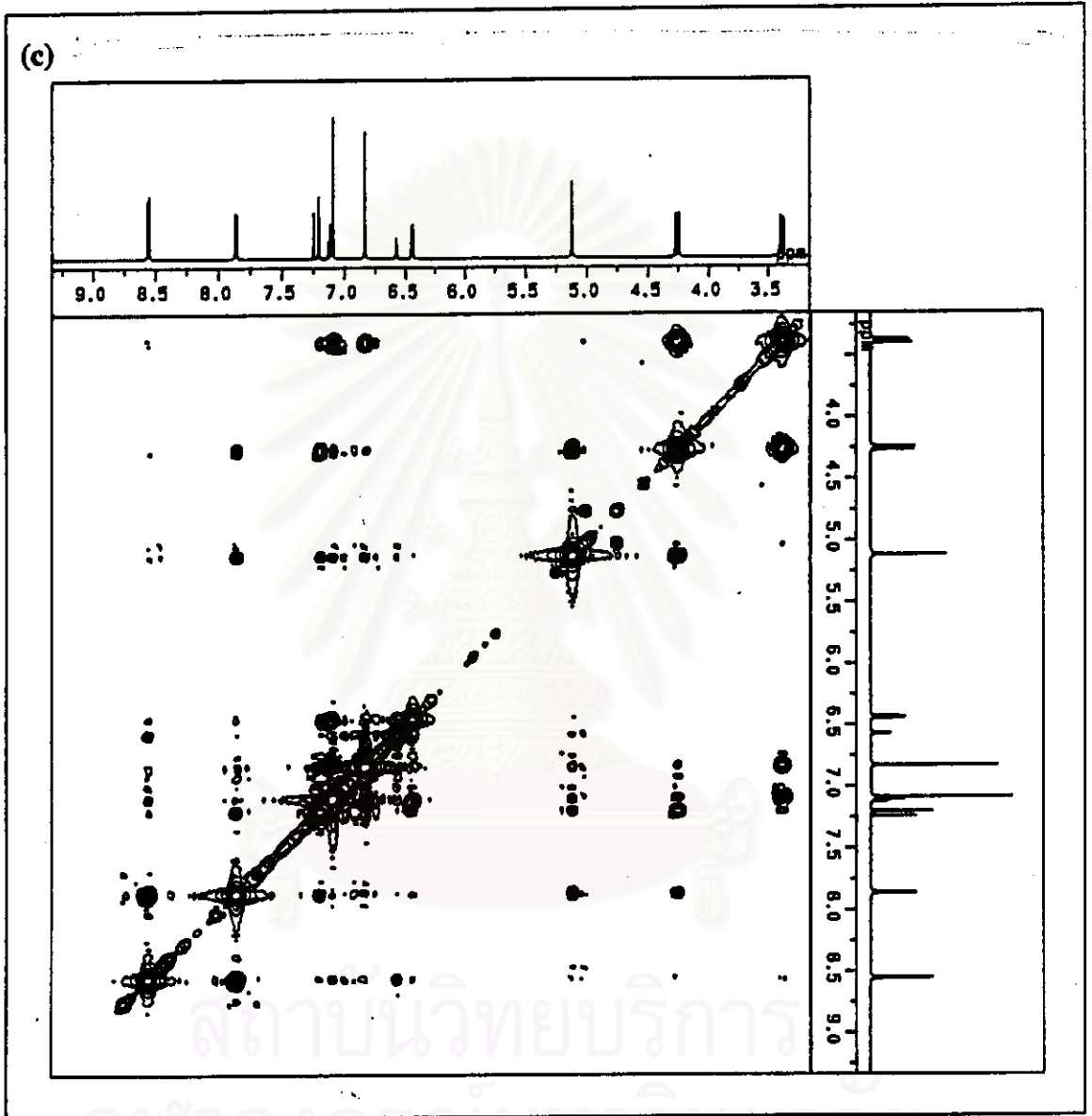


Figure B.65. *Continue.*

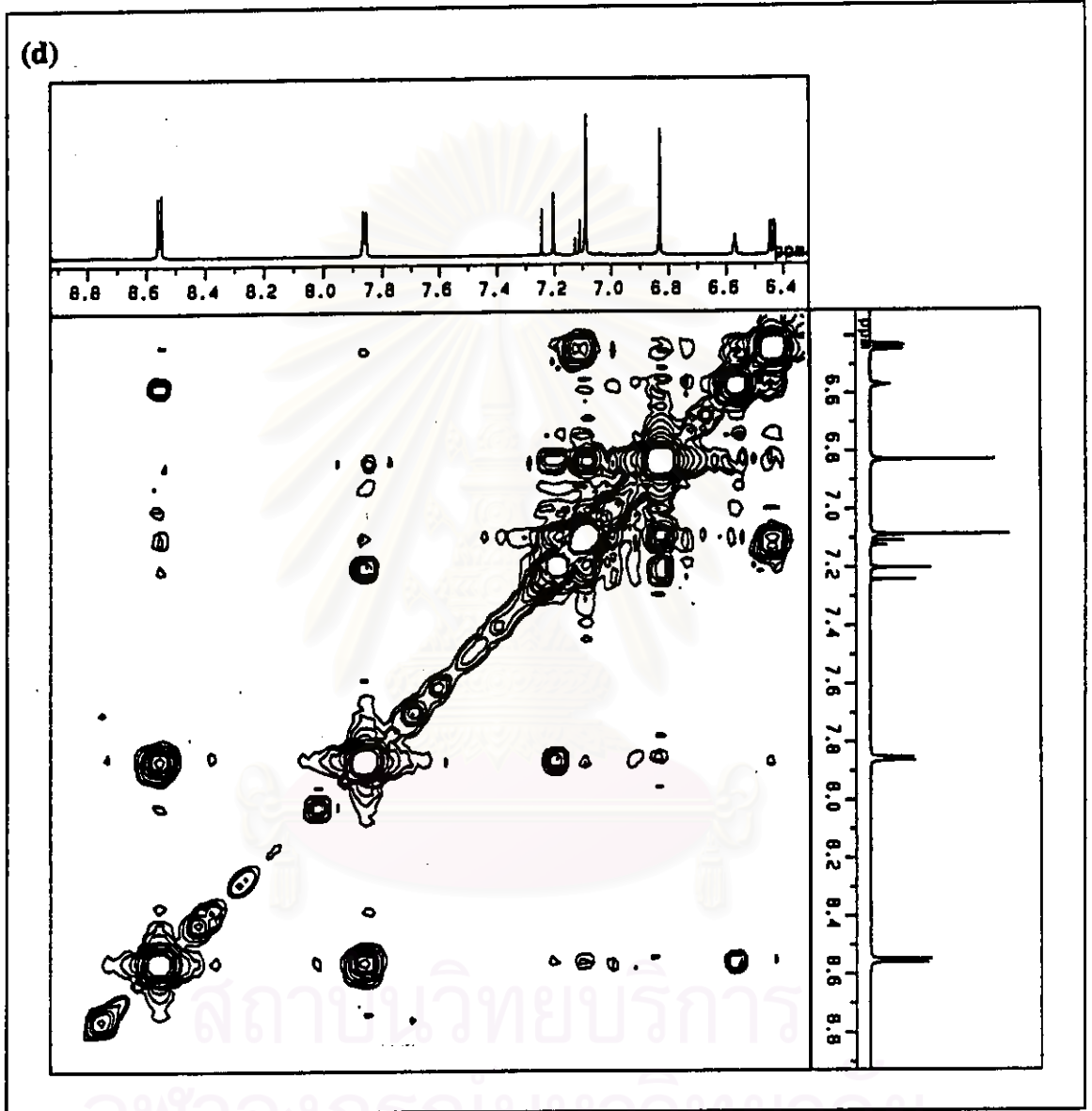


Figure B.65. *Continue.*

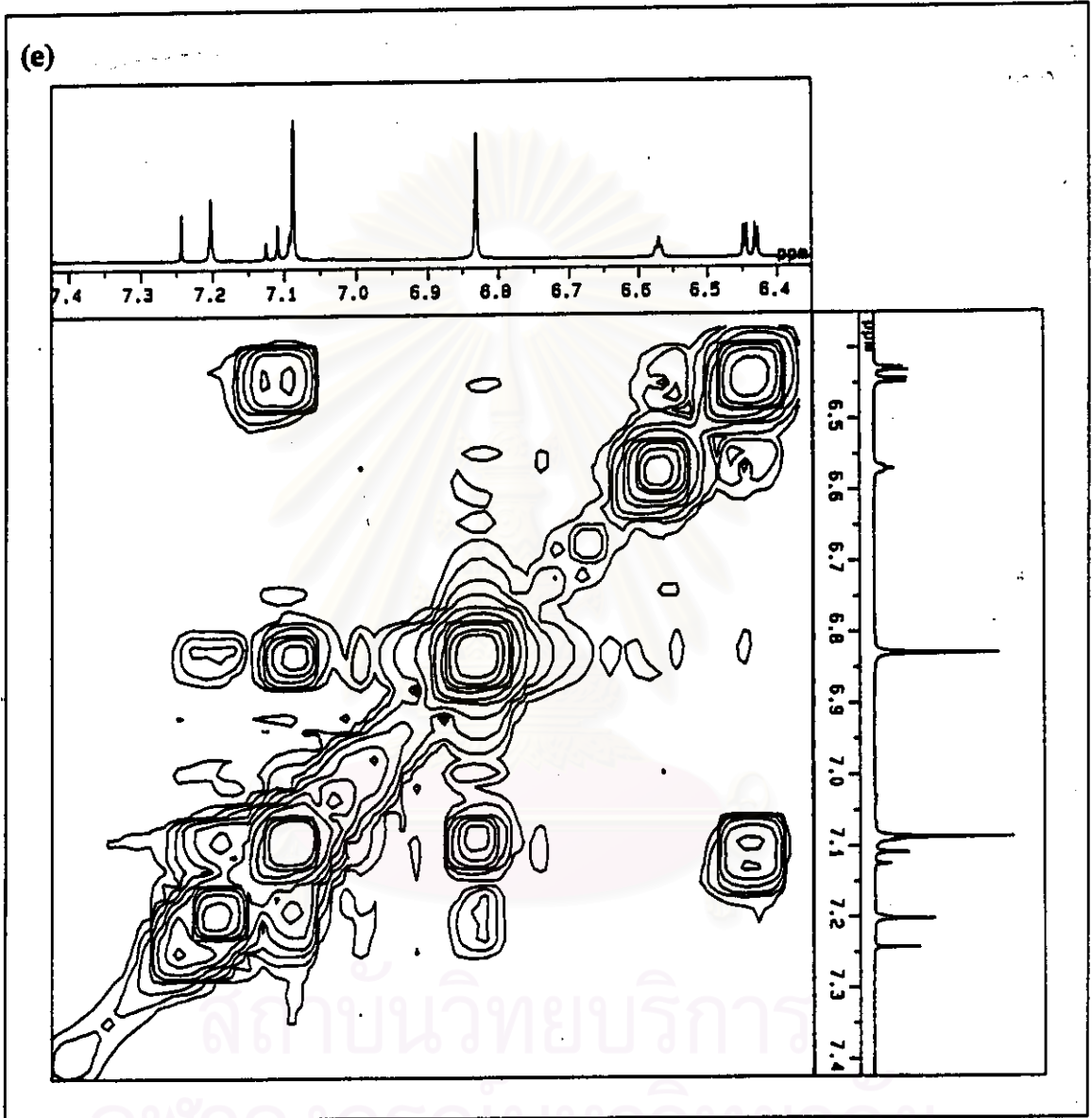


Figure B.65. *Continue.*

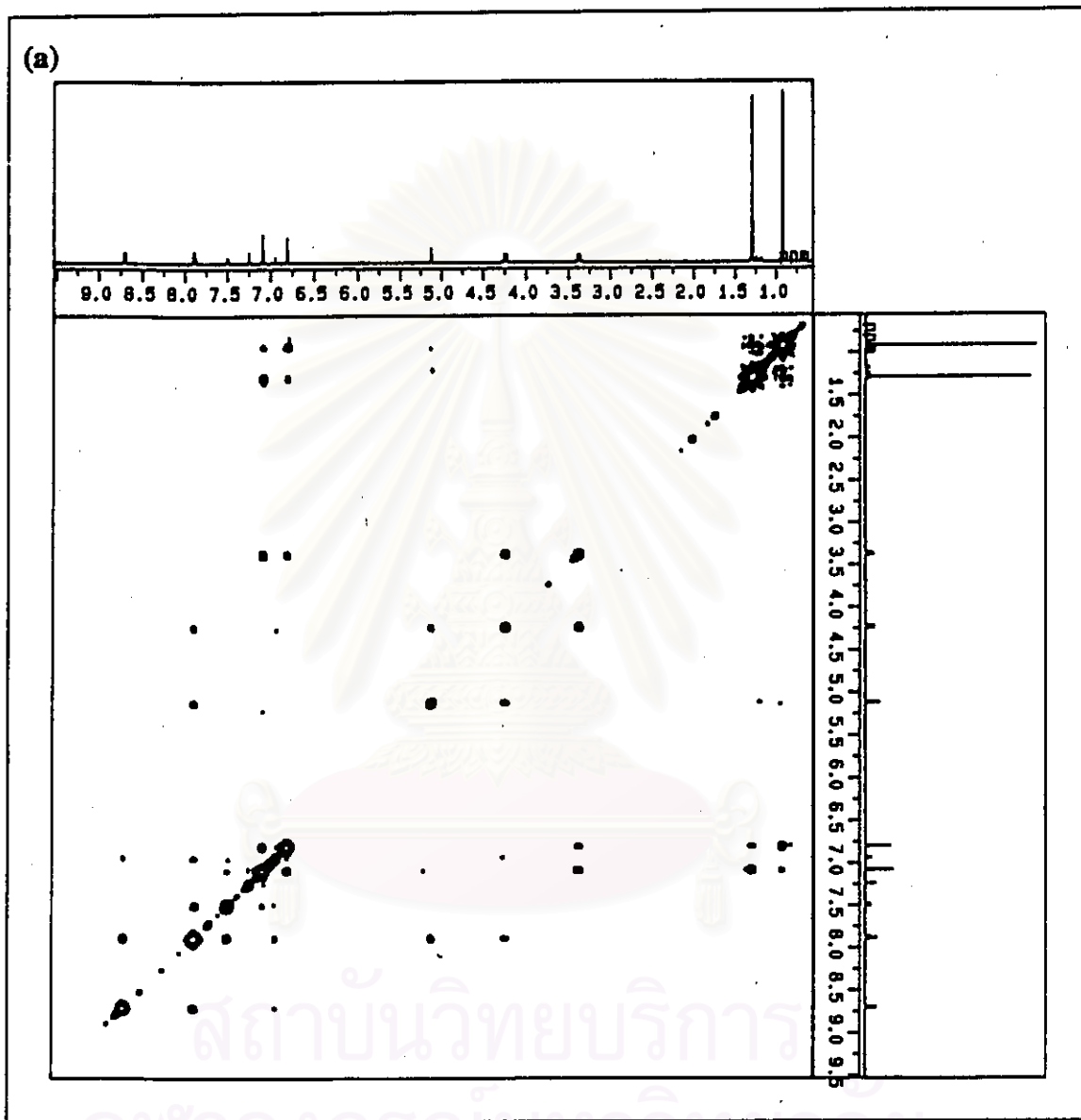
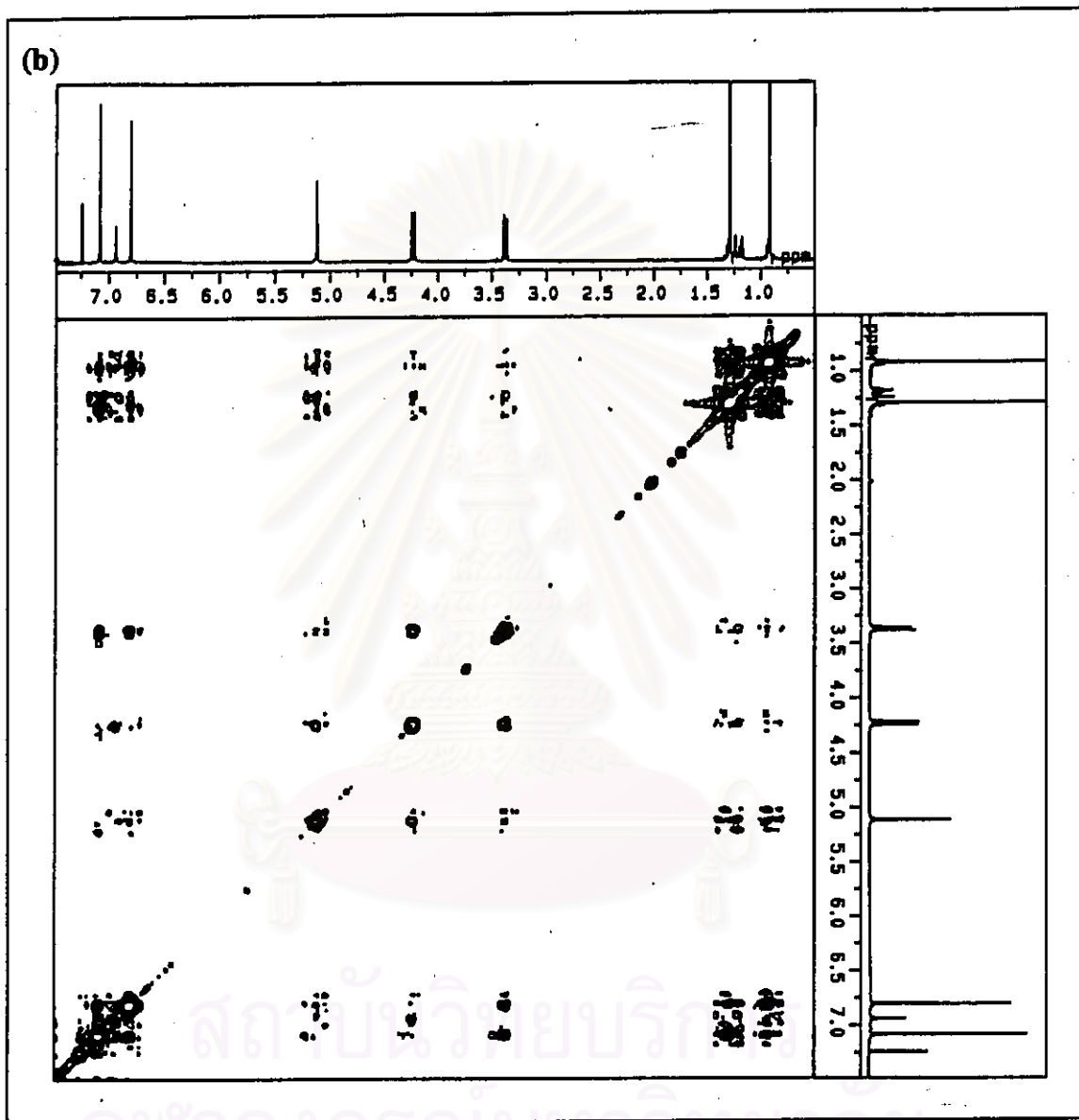


Figure B.66. NOESY of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 1.0 : 1.0 ratio (a) 0.0-9.5 ppm (b) 0.5-7.5 ppm (c) 3.0-9.2 ppm.



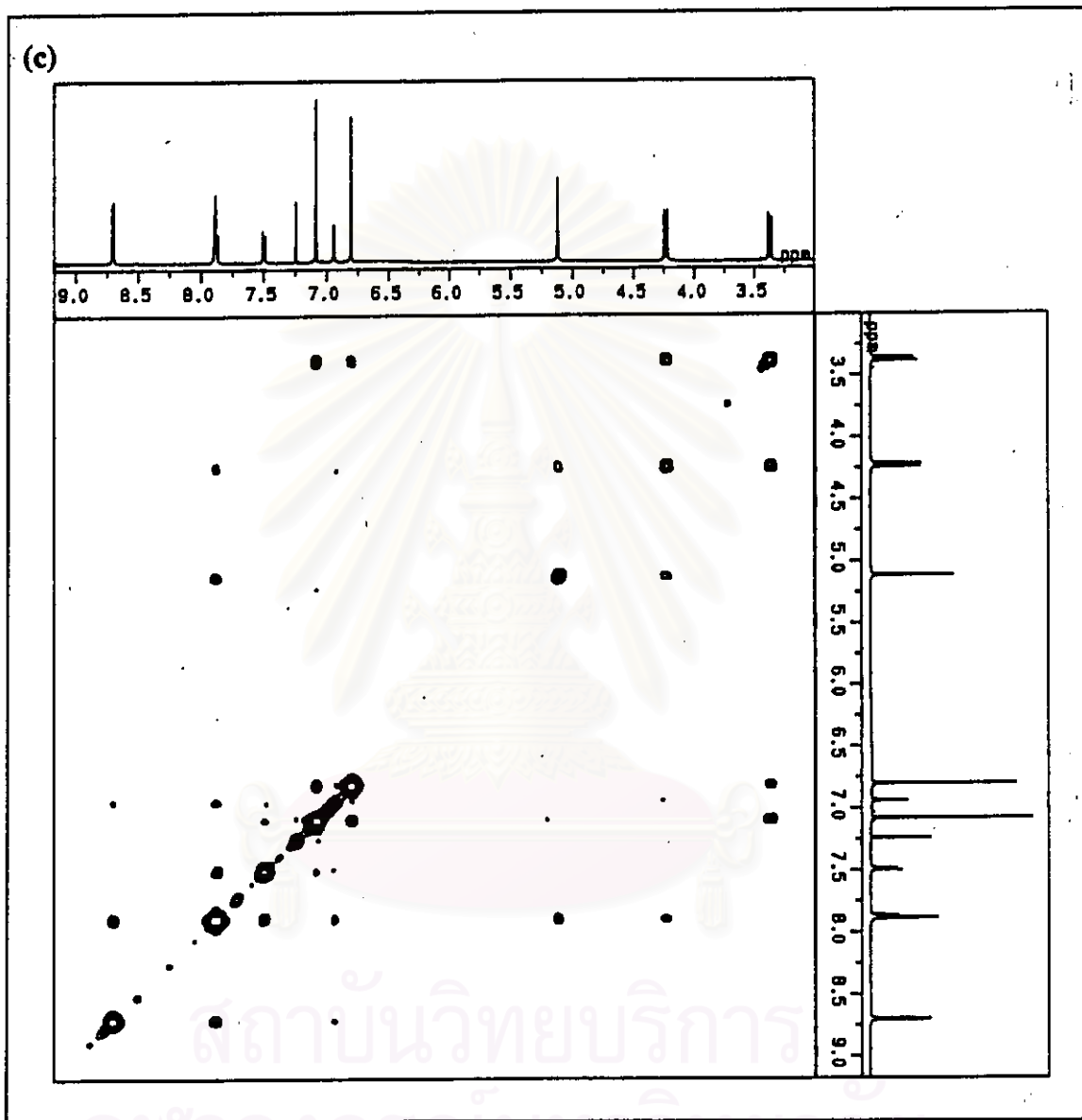


Figure B.66. *Continue.*

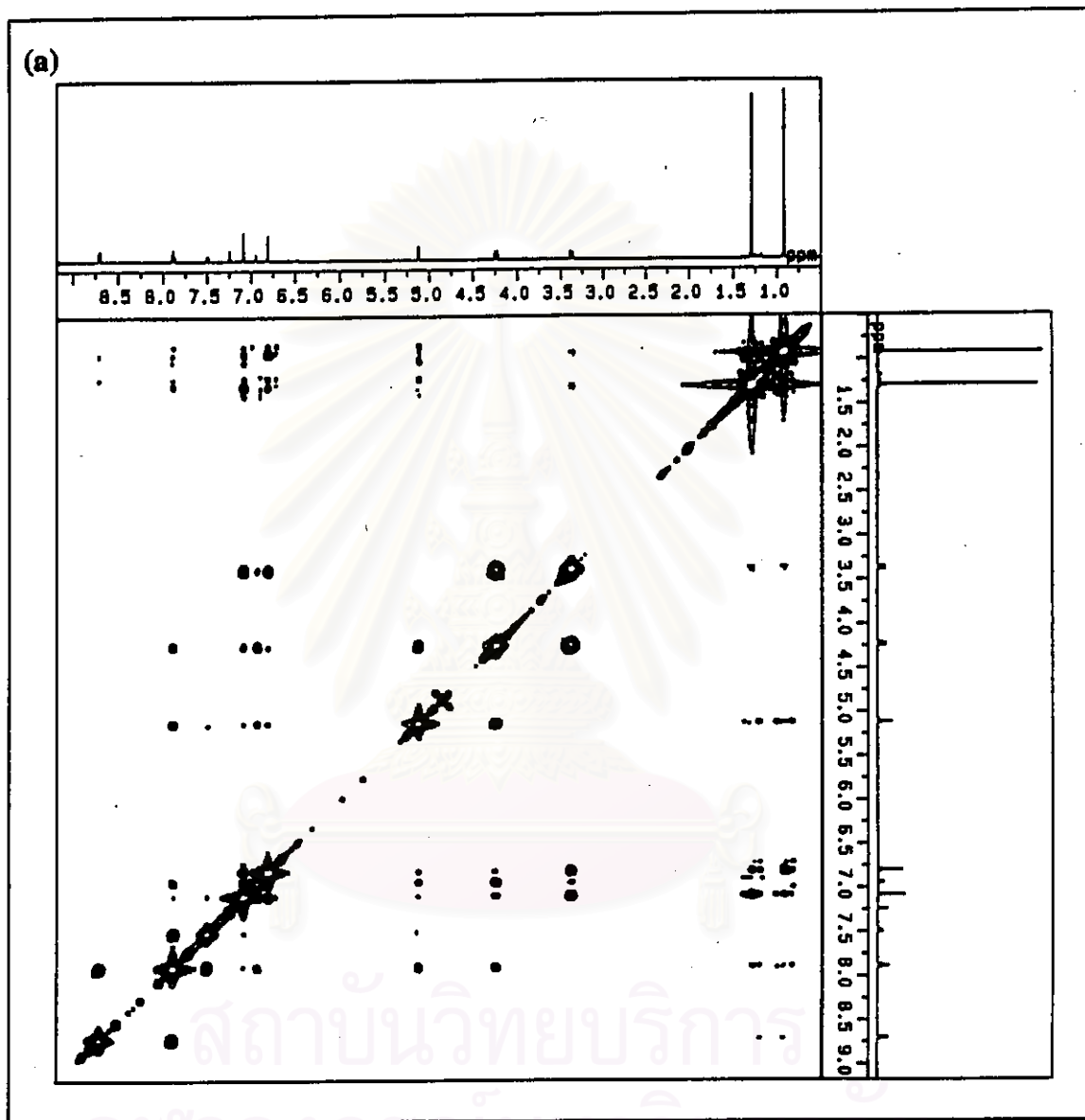


Figure B.67. ROESY of complexation between benzene-1,2-dicarboxylic acid and ligand (6) at 1.0 : 1.0 ratio (a) 0.5-9.2 ppm (b) 0.5-7.5 ppm (c) 6.5-8.9 ppm.

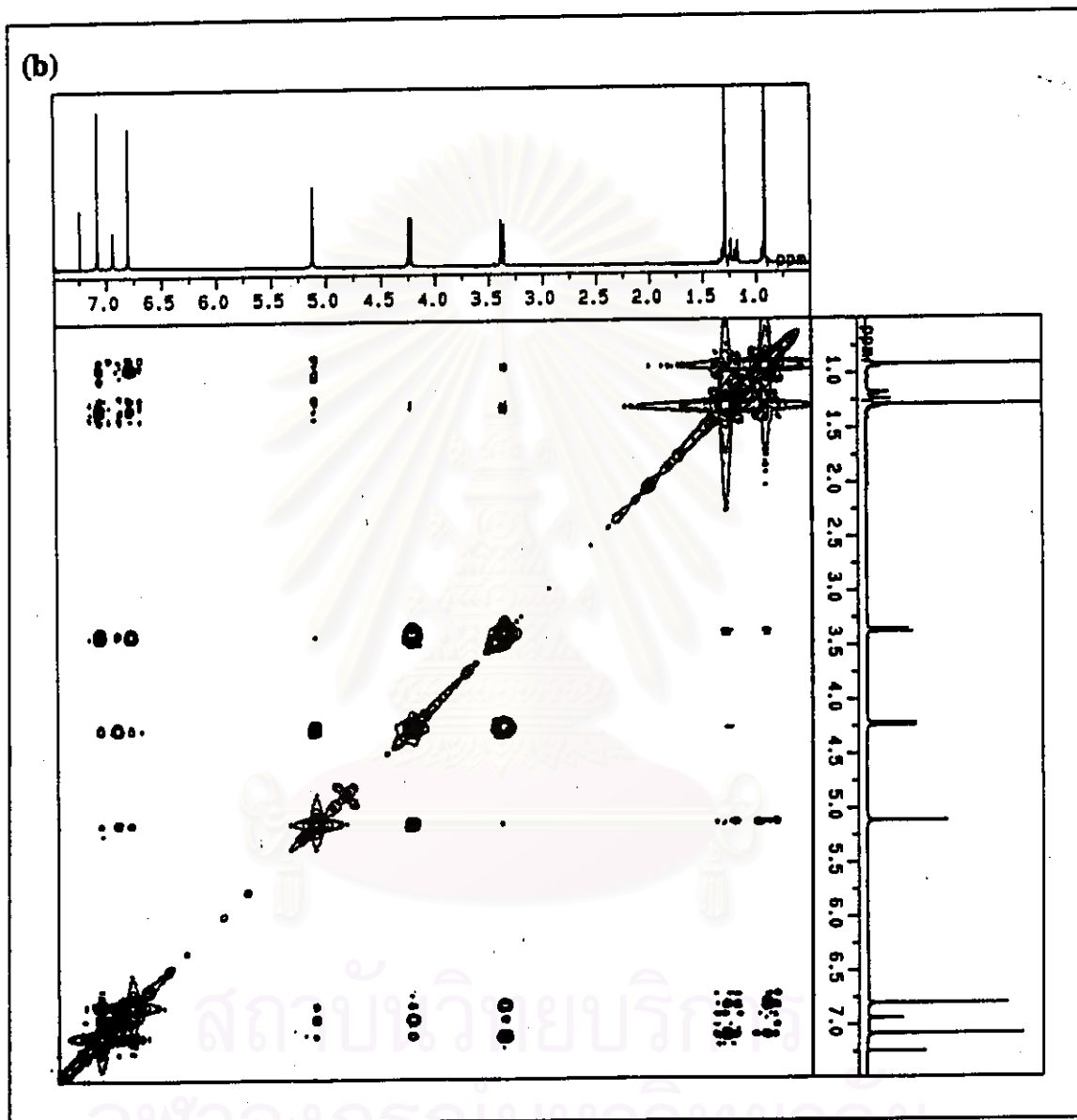


Figure B.67. *Continue.*

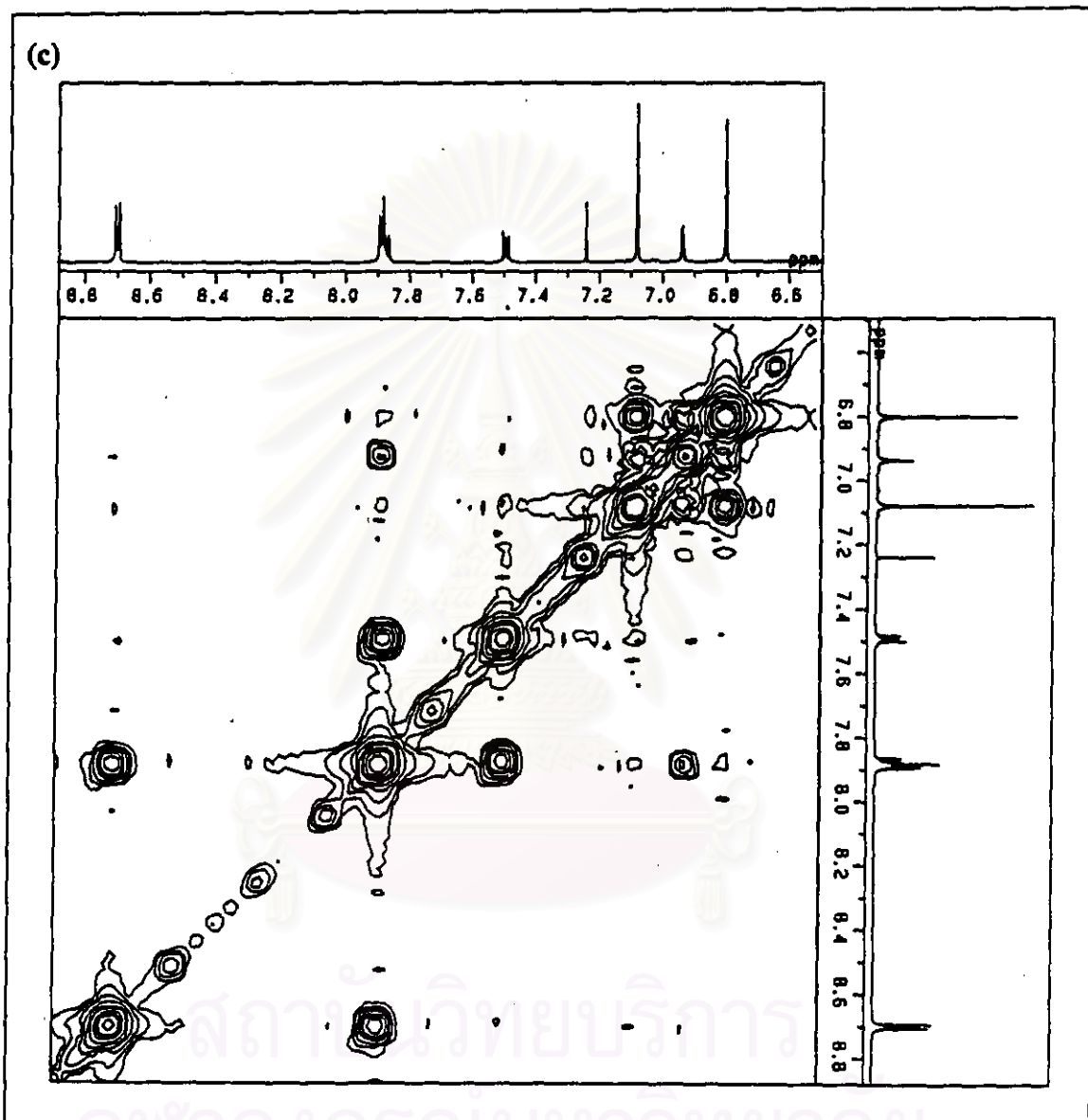


Figure B.67. *Continue.*

VITA

Miss Gamolwan Tumchareem was born on January 2, 1975 in Udonthanee, Thailand. She has been a student under support of the Development and Promotion of Science and Technology Talent Project since 1989. She received the Bachelor Degree of Science in Chemistry at Chulalongkorn University in 1996. Since then, she has been a graduate student studying Inorganic Chemistry at Chulalongkorn University. She graduated with a Master Degree of science in Chemistry in April, 1999.



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