

## REFERENCES

1. Gutche, C. D. *Acc. Chem. Res.* **1983**, *16*, 161.
2. Vicens, J. and Bohmer, V. *Calixarenes; a Versatile Class of Macrocyclic Compounds*. Dordrecht: Kluwer Academic Publisher, 1991.
3. Gutche, C. D. *Synthesis of macrocyclic : Design of Selective Complexing Agents*. New York: John Wiley & Son, **1986**, pp 95.
4. Asfari, Z. and Vicens, J. *Janssen Chimica Acta*, **1992**, *10*, 3.
5. Cobben, P. L. H. M., Egberink, R. J. M., Bomer, J. G., Bergveld, P., Verboom, W. and Reinhoudt, D.N. *J. Am. Chem. Soc.*, **1992**, *114*, 10573.
6. Roundhill, D. M. and Yordanov, A. T. *Inorg. Chem. Acta*, **1997**, *264*, 309.
7. Roundhill, D. M., Yordanov, A. T. and Whittlesey, B. R. *Supramolecular Chem.*, **1998**, *9*, 13.
8. Roundhill, D. M., Yordanov, A. T. and Whittlesey, B. R. *Inorg. Chem.*, **1998**, *37*, 3526.
9. Arnaud-Neu, F., Collins, E. M., Deasy, M., Fergusen, G., Harris, S. J., Kaitner, B., Lough, A. J., McKervey, M. A., Margues, E., Ruhl, B. L., Schwing-Weil, M. J. and Seward, E. M., *J. Am. Chem. Soc.*, **1989**, *111*, 8681.
10. Gutsche, C. D., Dhawan, B., Hyun, K. and Muthukrisbara, R. *J. Am. Chem. Soc.*, **1981**, *103*, 3782.
11. Koh, K. N., Imada, T., Nagasaki, T. and Shinkai, S., *Tetrahedron Letters*, **1994**, *35*, 4157.
12. Alfieri, C., Dradi, E., Pocchini, A., Ungara, R. and Andreetti, G. D. *J. Chem. Soc., Chem. Commun.*, **1983**, 1075.

13. Pothsree, T., Seangprasertkij-Magee, R. and Tuntulani, T. *J. Incl. Phenom.*, 1997, 29, 99.; Pothsree, T. *Synthesis and inclusion study of diaza-benzo crown-*p*-tert-butylcalix[4]arene*. Master's Thesis, Department of Chemistry, Graduate School, Chulalongkorn University, 1995, pp 146.
14. Seangprasertkij, R., Asfari, Z. and Vicens, J. *J. Inclu. Phenom.*, 1994, 17, 111.
15. Ruangpornvisuti, V., Seangprasertkij-Magee, R. and Arnaud-Neu, F. *J. Sci. Res. Univ.*, 1993, 18(2), 89.
16. Seangprasertkij, R., Asfari, Z., Arnaud, F. and Vicens, J. *J.Org. Chem.*, 1994, 59, 1741.; Seangprasertkij, R., Asfari, Z., Arnaud, F., Weiss, J. and Vicens, J. *J. Incl. Phenom.*, 1992, 14, 141.
17. Gutsche, C. D. and Gibbs, C. G. *J. Am. Chem. Soc.*, 1993, 155, 5338.
18. Delaigue, X., Harrowfield, J. M., Hosseini, M. W., Cian, A. D., Fischer, J. and Kyritsakas, N. *J. Chem. Soc., Chem. Commun.*, 1994, 1579.
19. Delaigue, X., Harrowfield, J. M., Hosseini, M. W., Cian, A. D., Fischer, J. and Kyritsakas, N. *J. Chem. Soc., Chem. Commun.*, 1995, 609.
20. Roundhill, D. M., Yordanov, A. T. and Mague, J. T. *Inorg. Chem.*, 1995, 34, 5084.
21. Roundhill, D. M., Yordanov, A. T. and Mague, J. T. *New J. Chem.*, 1996, 20, 447.
22. Pearson, R. G., *J. Am. Chem. Soc.*, 1963, 85, 3539.
23. Gan, P., Sabatini, A. and Vacca, A. *J. Chem. Soc., Dalton Trans.*, 1985, 1195.
24. Bjerrum, N. *Z. Anorg. Allgem. Chem.*, 1921, 119, 179.
25. Bjerrum, J. *Metal Ammine Formation in Aqueous Solution.*, Copenhagen : P. Haase and Son, 2 ed, 1957.
26. Hay, R. W., Gidney, P. M. and Lawrence, G. A. *J. Chem. Soc., Dalton Trans.*, 1974, 779.

27. Choudlury, S. B., Ray, D. and Chakeavorty, A. *Inorg. Chem.*, 1991, 30, 4354.
28. Arnaud-Neu, F., Barrett, G., Harris, S. J., Owens, M., McKervey, M. A., Schwing-Weill, M.-J. and Schwinte, P. *Inorg. Chem.*, 1993, 32, 2644.
29. Dietich, B., Viout, P. and Lehn, J.-M. *Macrocyclic Chemistry Aspects of Organic and Inorganic Supramolecular Chemistry*. New York: VCH Publishers, 1993, pp 384.
30. March, J. *Advanced Organic Chemistry: reaction, mechanisms, and structure*. 4<sup>th</sup> ed, New York: John Wiley & Sons, Inc., 1992, pp 1495.
31. Mills, D. K., Fnt, I., Farmer, P. J., Hsiao, Y.-M., Tuntulani, T., Buonomo, R. M., Goodman, D. C., Musie, G., Grapperhaus, C. A., Magerne, M. J., Lai, C.-H., Hatley, M. L., Smee, J. J., Bellefeuille, J. A. and Darenbourg, M. Y. *Inorg. Syn.*, 1998, 32, 89.
32. Tuntulani, T., Reibenspies, J. H., Farmer, P. J. and Darenbourg, M. Y. *Inorg. Chem.*, 1992, 31, 3497.
33. Houser, R. P. and Tolman, W. B. *Inorg. Chem.*, 1995, 34, 1632.
34. Cotton, F. A. and Willkilson, G. *Advanced Inorganic Chemistry:A Comprehensive Text*. 5<sup>th</sup> ed, New York: John Wiley & Sons, Inc., 1988, pp 1455.
35. Kumagai, H., Hasegawa, M., Miyanari, S., Sugawa, Y., Sato, Y., Hori, T., Ueda, S., Kamiyama, H. and Miyano, S. *Tetrahedron Let.*, 1997, 35, 3971.
36. L'hotak, P. and Shinkai, S. *J. Synth. Org. Chem., Jpn.*, 1995, 53, 963.
37. Wang, B. and Chung, C. -S. *J. Chem. Soc Dalton Trans.*, 1982, 2565.
38. Rojsajjakul, T., Veravong, S., Tumcharern, G., Seangprasertkij-Magee, R. and Tuntulani, T. *Tetrahedron*, 1997, 53(13), 4669.

39. Rojsajjakul, T. *Synthesis of calix[4]arene for anion separations*. Master's Thesis, Department of Chemistry, Graduate School, Chulalongkorn University, 1996, pp 147.
40. Suwattanamala, E. *Basicity of Triaza benzo crown-p-tert-butylcalix[4]arene and stability of its metal complexes in methanol*. Master's Thesis Department of Chemistry, Graduate School, Chulalongkorn University, 1997, pp 81.
41. Hartley, F. R., Burgess, C. and Alock, R. M. *Solution Equilibria*. England: Ellis Horwood Ltd., 1980, pp 361.
42. Beck, M. T., Nagypa'l, T. and Williams, D. R. *Chemistry of Complex Equilibria*. England: Ellis Horwood Ltd, 1990, pp 402.
43. Martell, A. E. and Motekaitis, R. J. *Determination and Use of Stability Constants*. New York: VCH Publishers Inc., 1992, pp 200.
44. Colin, F. B. *Principles and application of metal chelation*. Oxford University Press, 1977, pp 147.
45. Lehn, J.-M. *Supramolecular Chemistry : Concepts and Perspectives*. Weinheim: VCH Publishers, 1995, pp 271.
46. Vögtle, F. *Supramolecular Chemistry : An Introduction*. Chichester: John Wiley & Sons, Inc., 1991, pp 337.
47. Lindoy, L. F. *The Chemistry of macrocyclic ligand complexes*, Cambridge University Press, 1989, pp 269.



## APPENDIX

สถาบันวิทยบริการ  
จุฬาลงกรณ์มหาวิทยาลัย

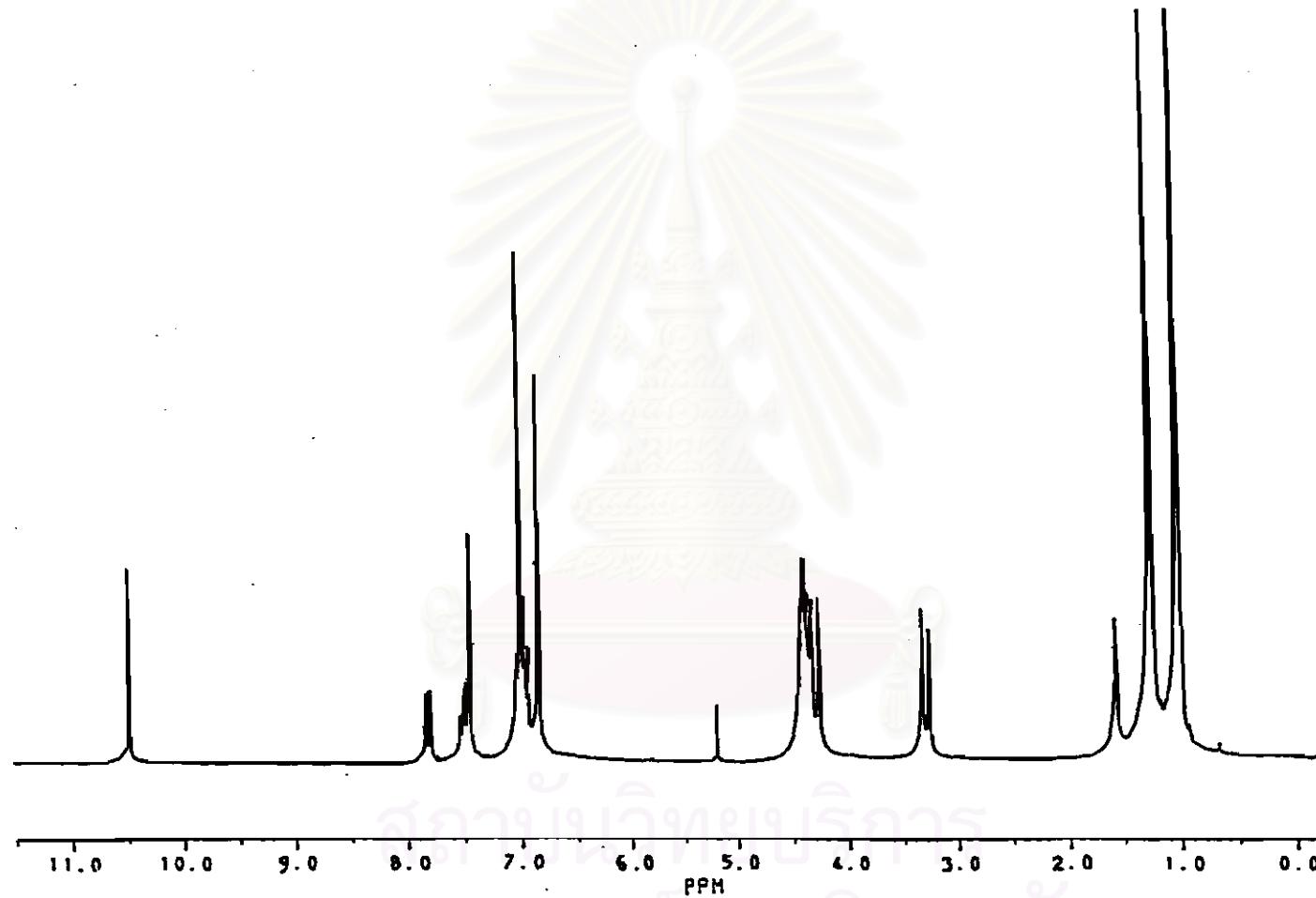


Figure A.1  $^1\text{H}$  NMR (CDCl<sub>3</sub>) spectrum of 25,27-((2,2'-diethoxy)benzaldehyde)-*p*-tert-butylcalix[4]arene, 1.

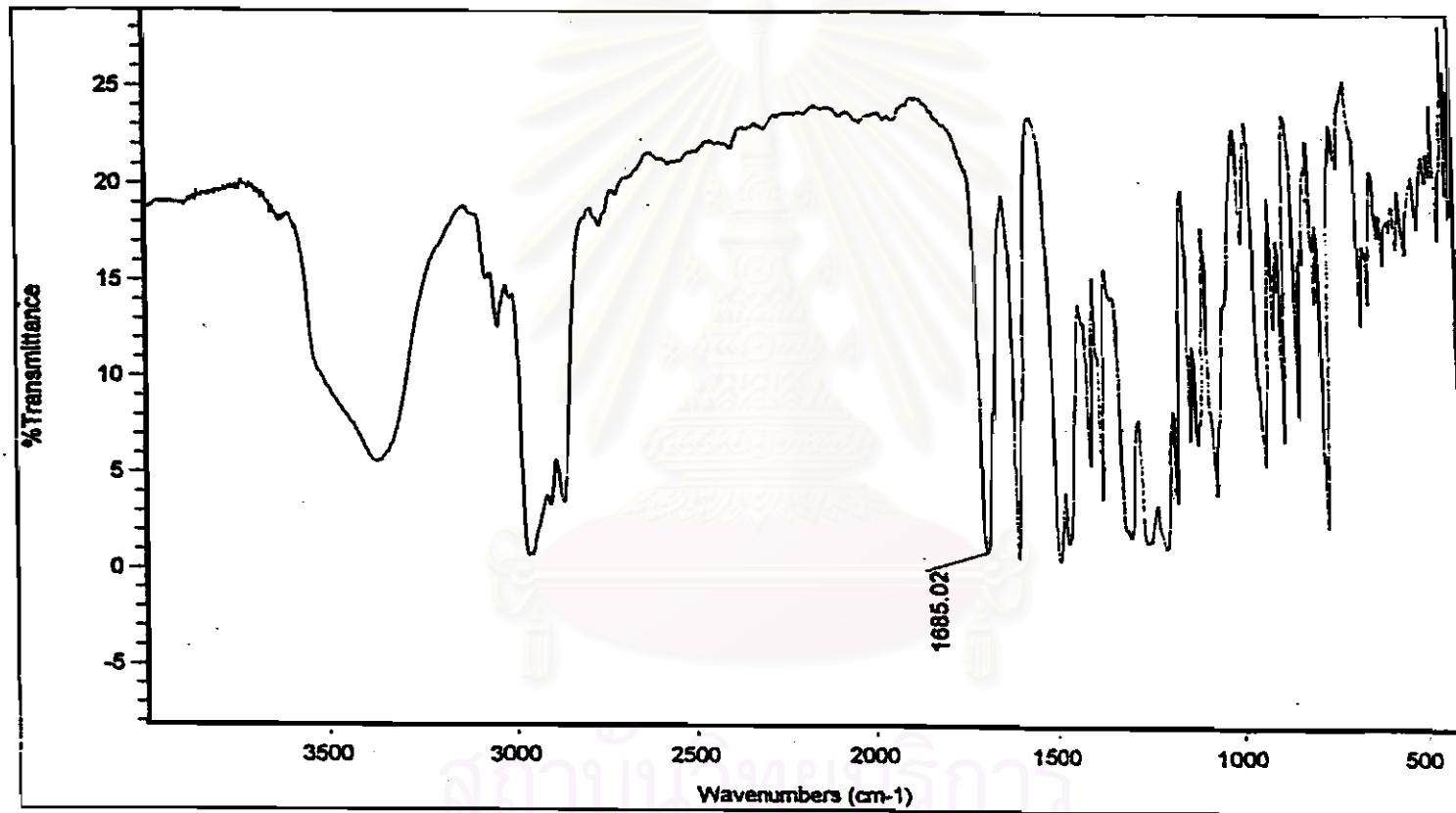


Figure A.2 IR (KBr pellet) spectrum of 25,27-((2,2'-diethoxy)benzaldehyde)-*p*-*tert*-butylcalix[4]arene, 1.

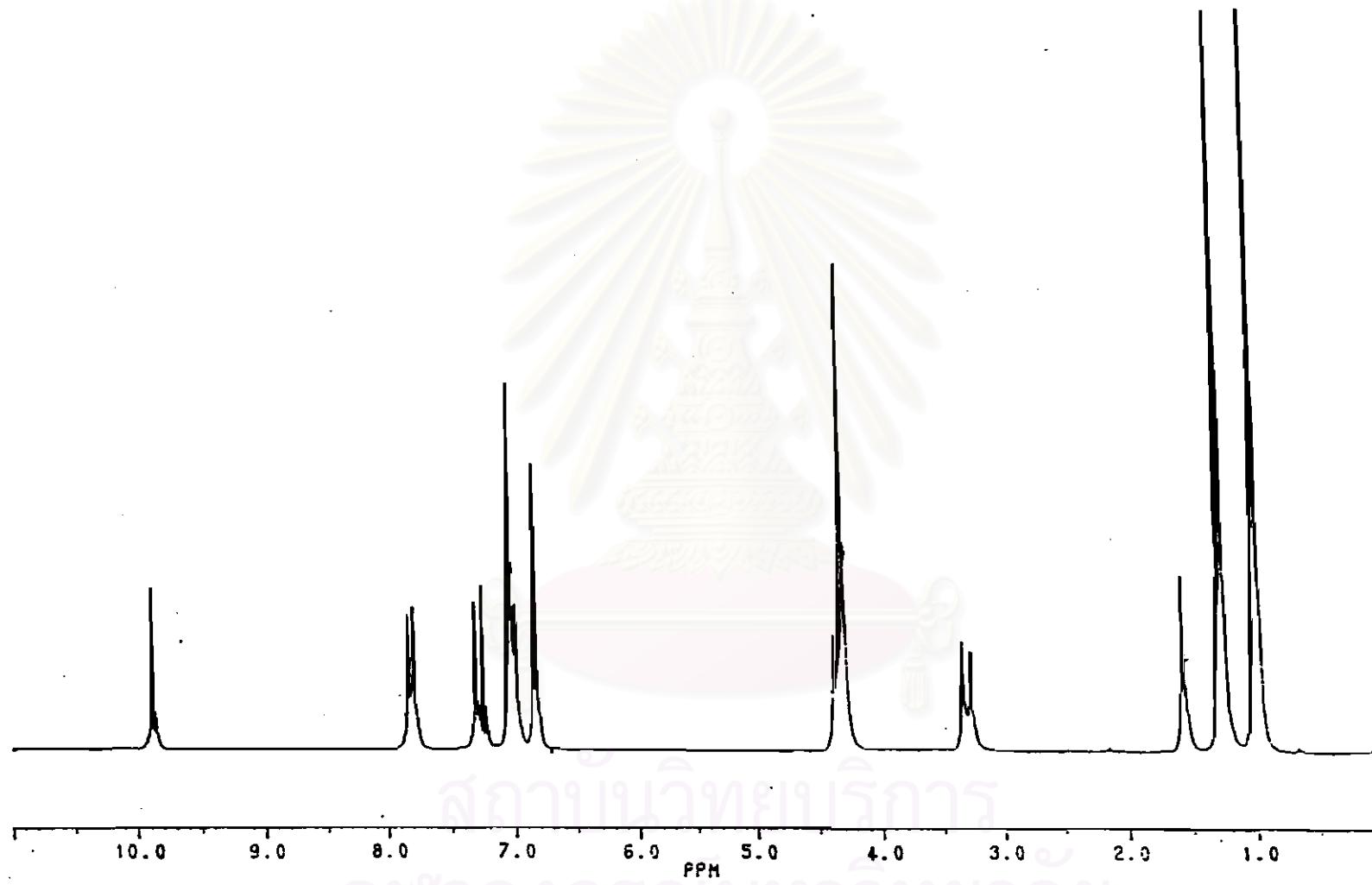


Figure A.3  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((4,4'-diethoxy)benzaldehyde)-*p*-*tert*-butylcalix[4]arene, 2.

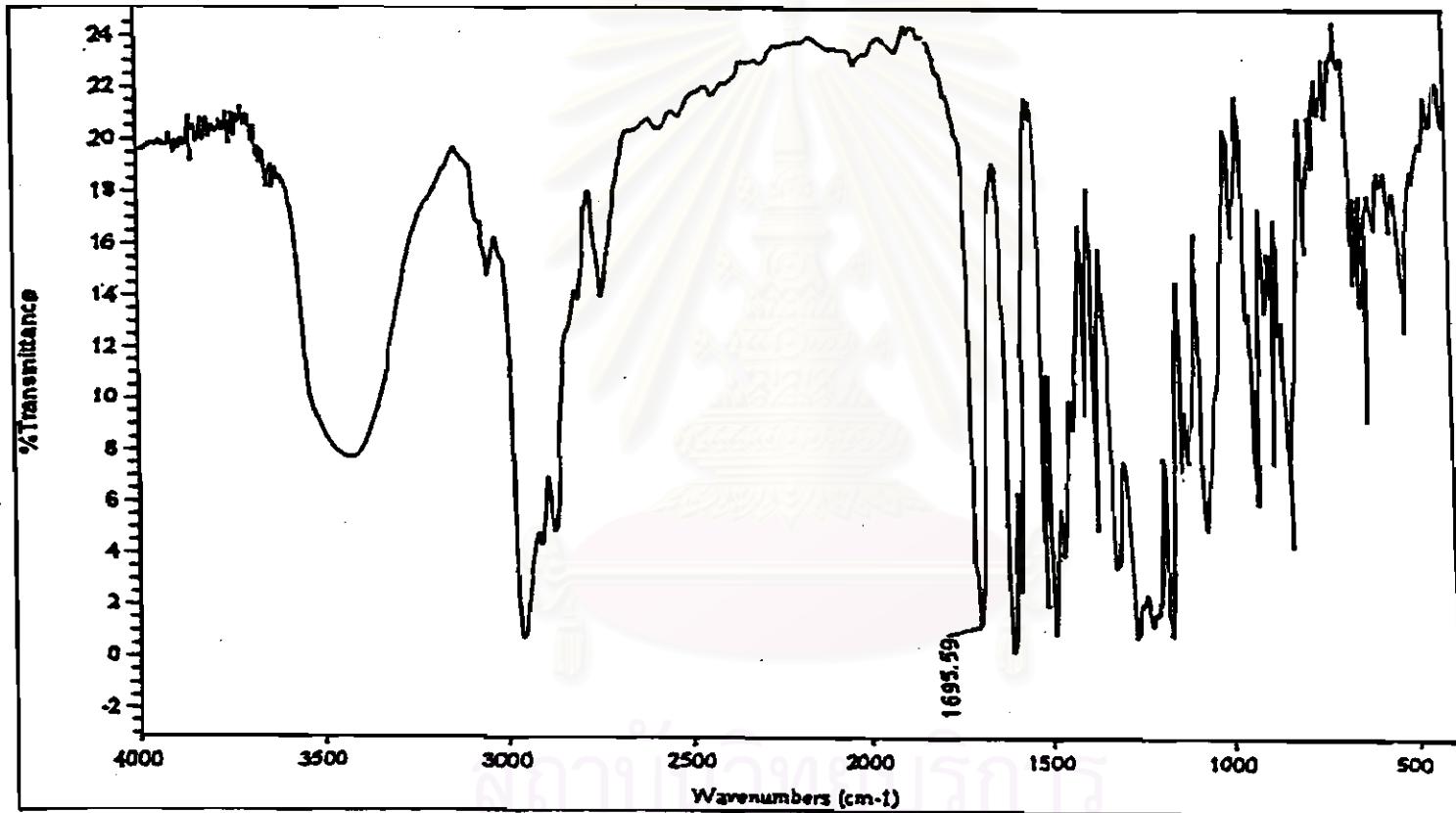


Figure A.4 IR (KBr pellet) spectrum of 25,27-((4,4'-diethoxy)benzaldehyde)-*p*-*tert*-butylcalix[4]arene, 2.

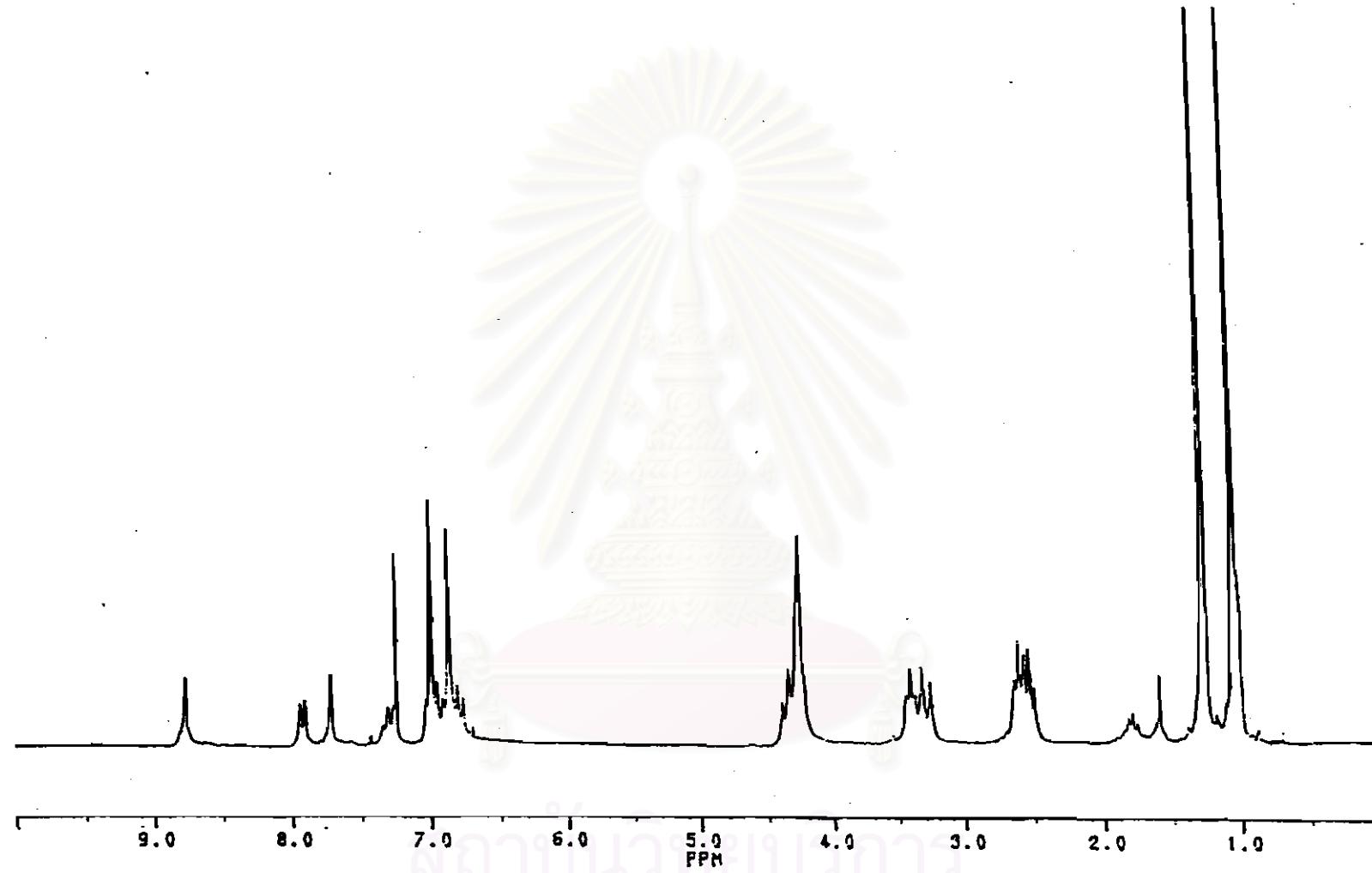


Figure A.5  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((2,2'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-*tert*-butylcalix[4]arene,

3.

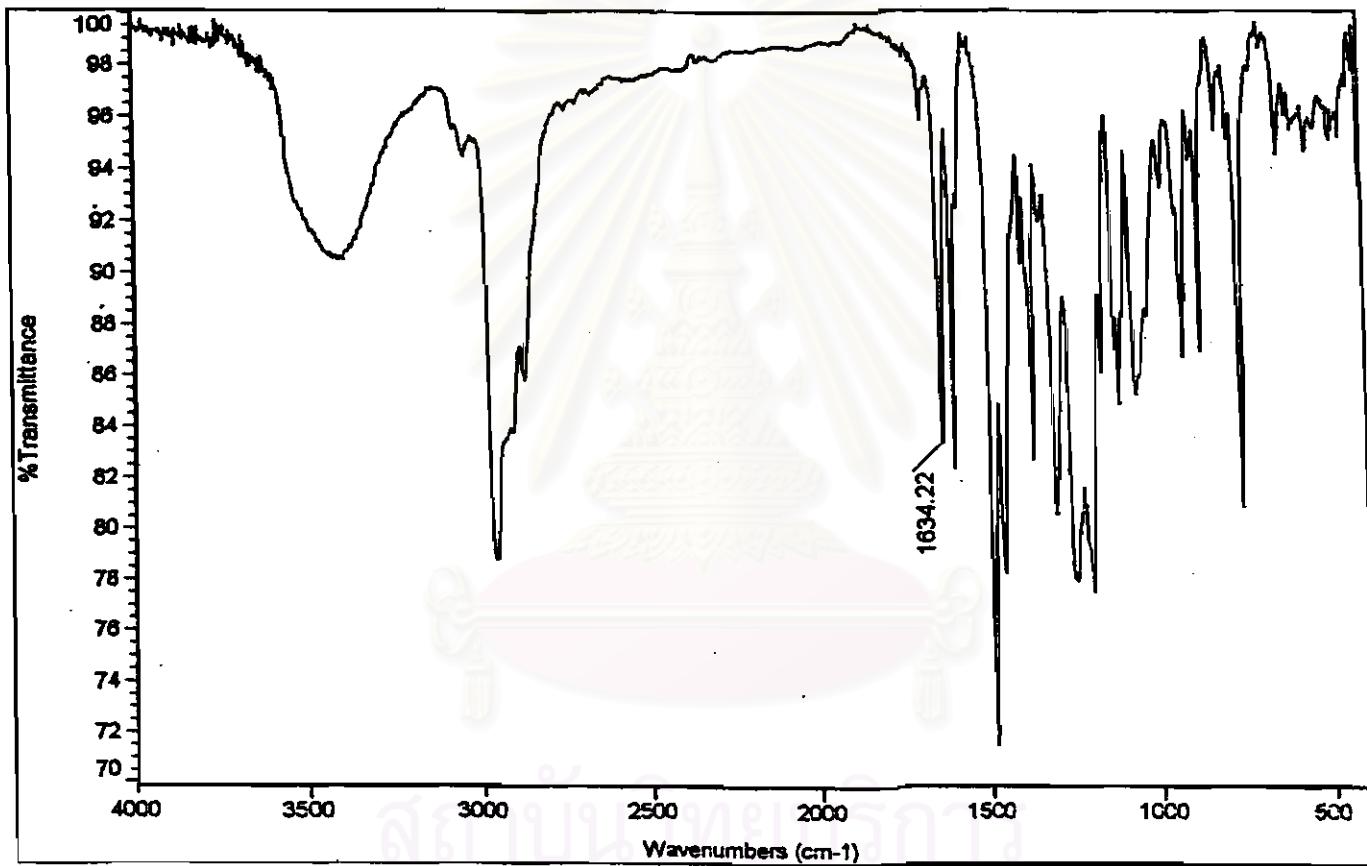


Figure A.6 IR (KBr pellet) spectrum of 25,27-((2,2'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-*tert*-butylcalix[4]arene, 3.

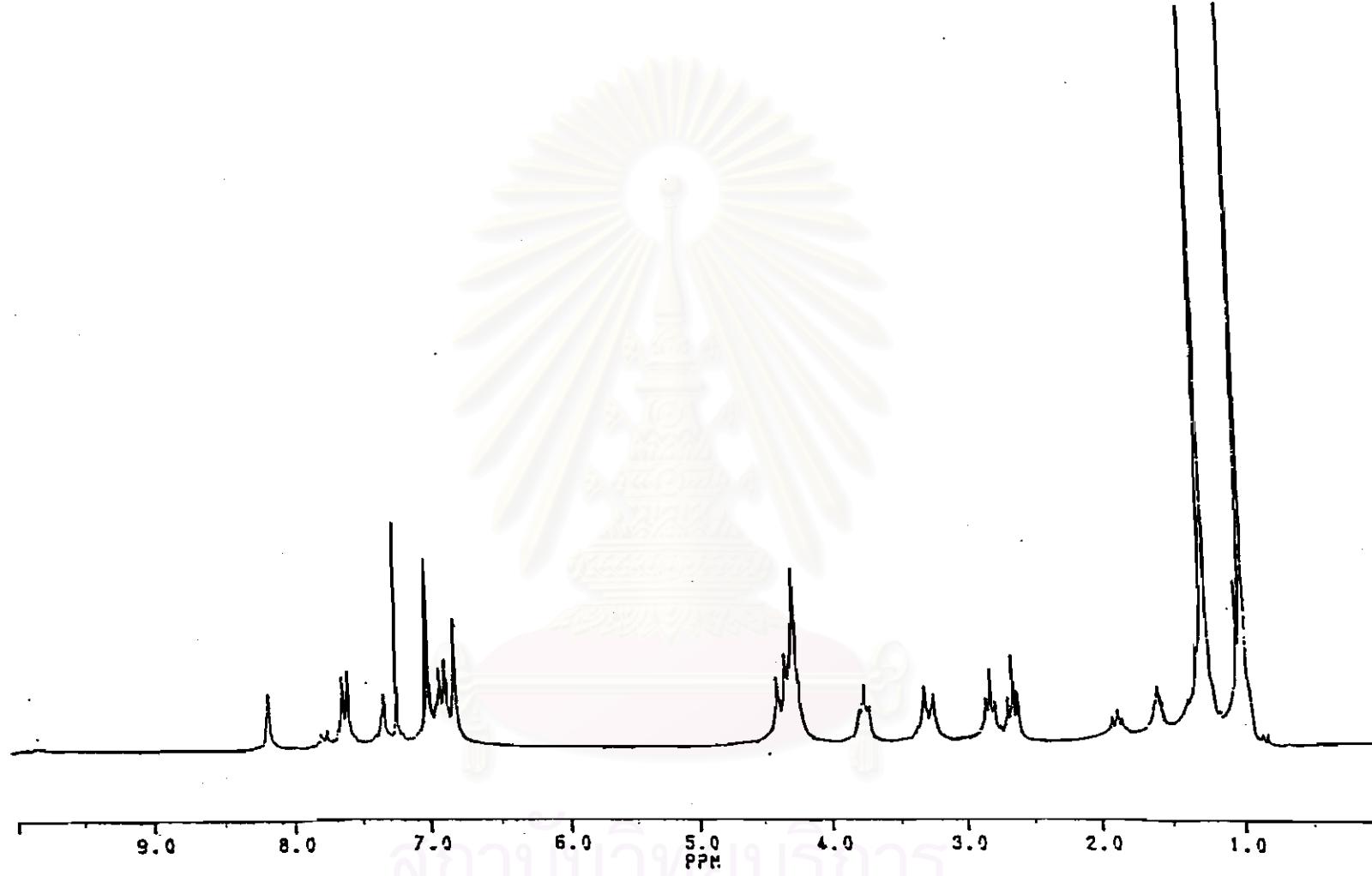


Figure A.7  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((4,4'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-tert-butylcalix[4]arene,

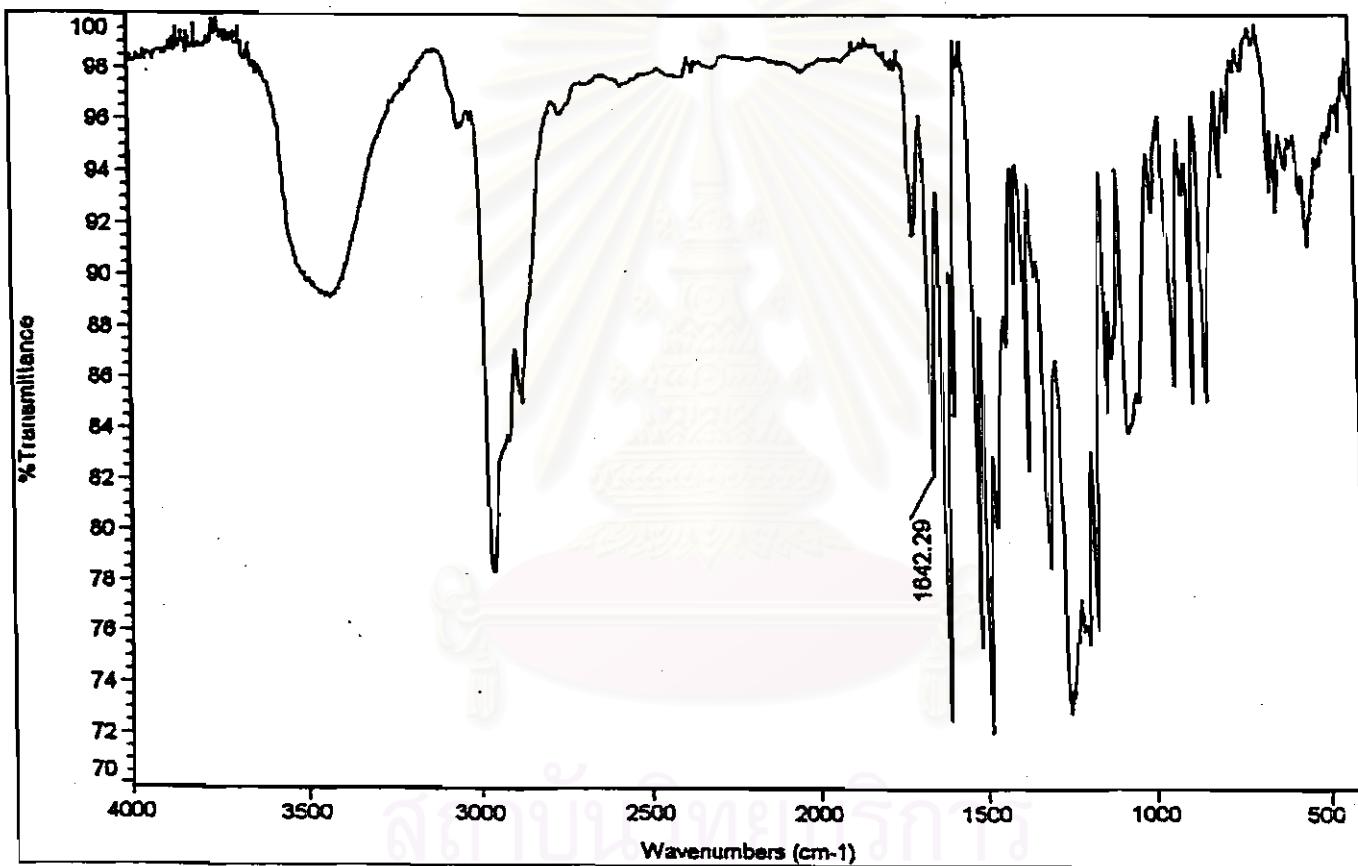
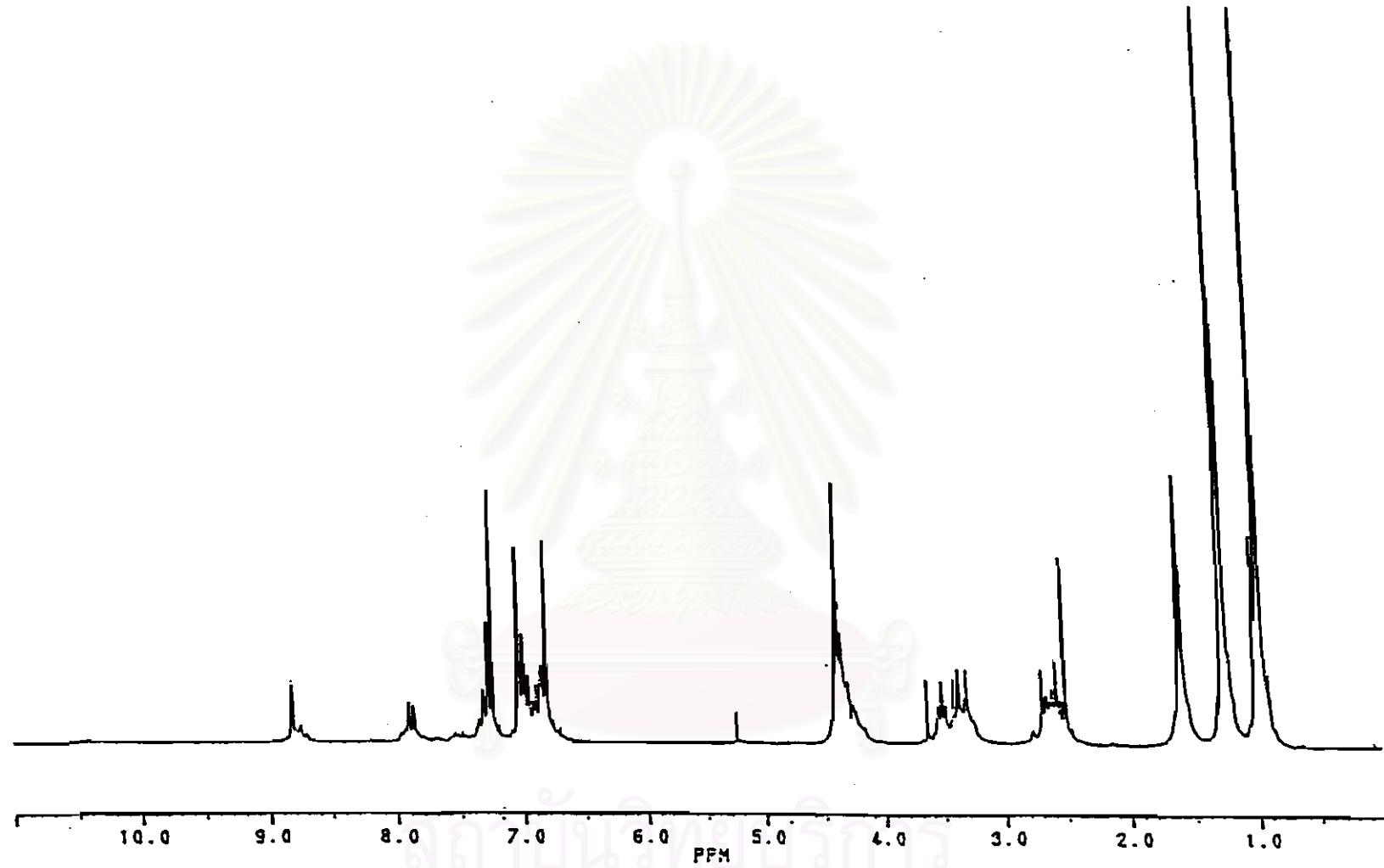


Figure A.8 IR (KBr pellet) spectrum of 25,27-((4,4'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-*tert*-butylcalix[4]arene, 4.



**Figure A.9** <sup>1</sup>H NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((2,2'-diethoxy)benzyl)-3,6-dithiaoctane-1,8-diimine-*p*-tert-butylcalix[4]arene,  
5.

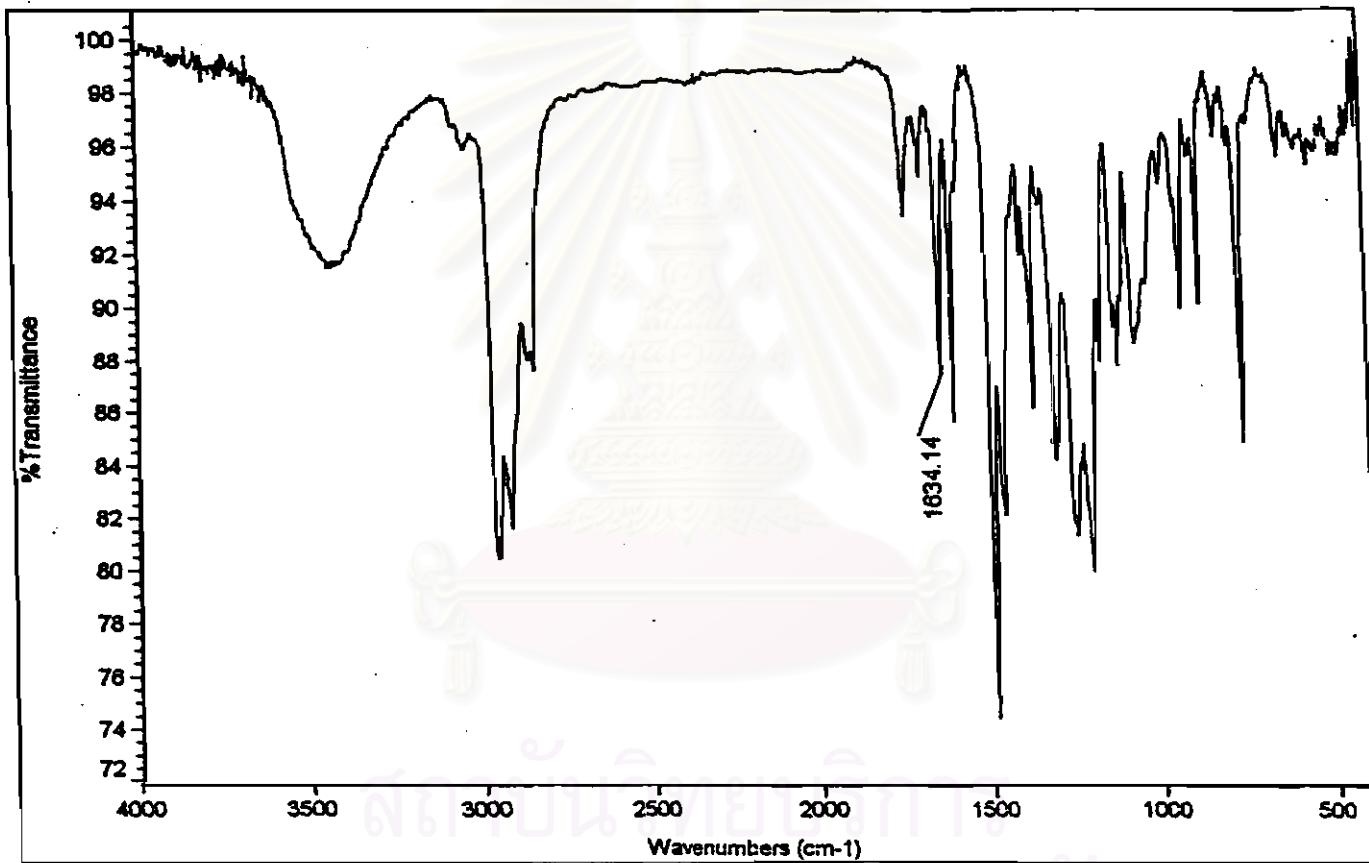
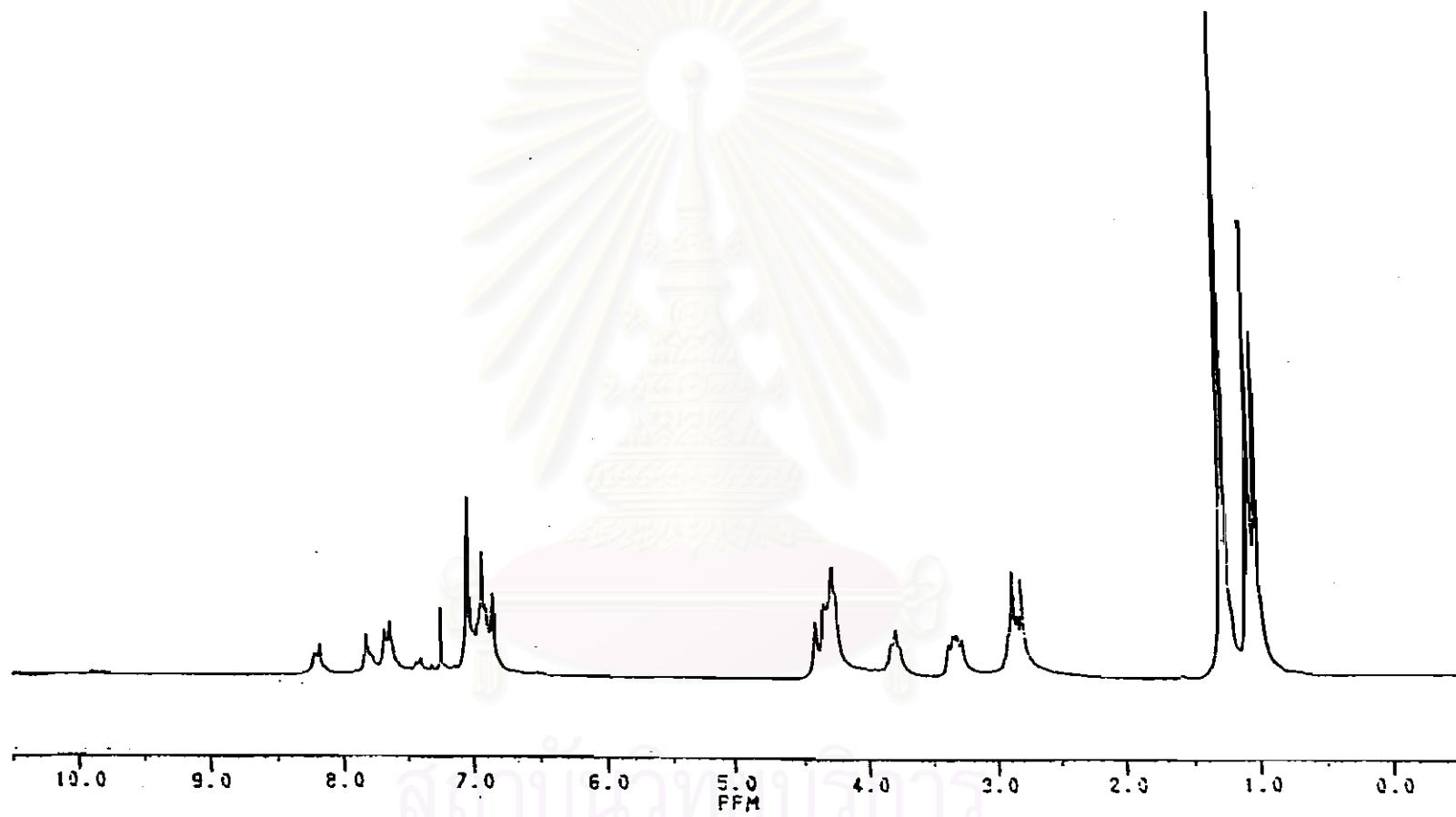


Figure A.10 IR (KBr pellet) spectrum of 25,27-((2,2'-diethoxy)benzyl)-3,6-dithiaoctane-1,8-diimine-*p*-*tert*-butylcalix[4]arene, 5.



**Figure A.11**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((4,4'-diethoxy)benzyl)-3,6-dithiaoctane-1,8-diimine-*p*-*tert*-butylcalix[4]arene,  
6.

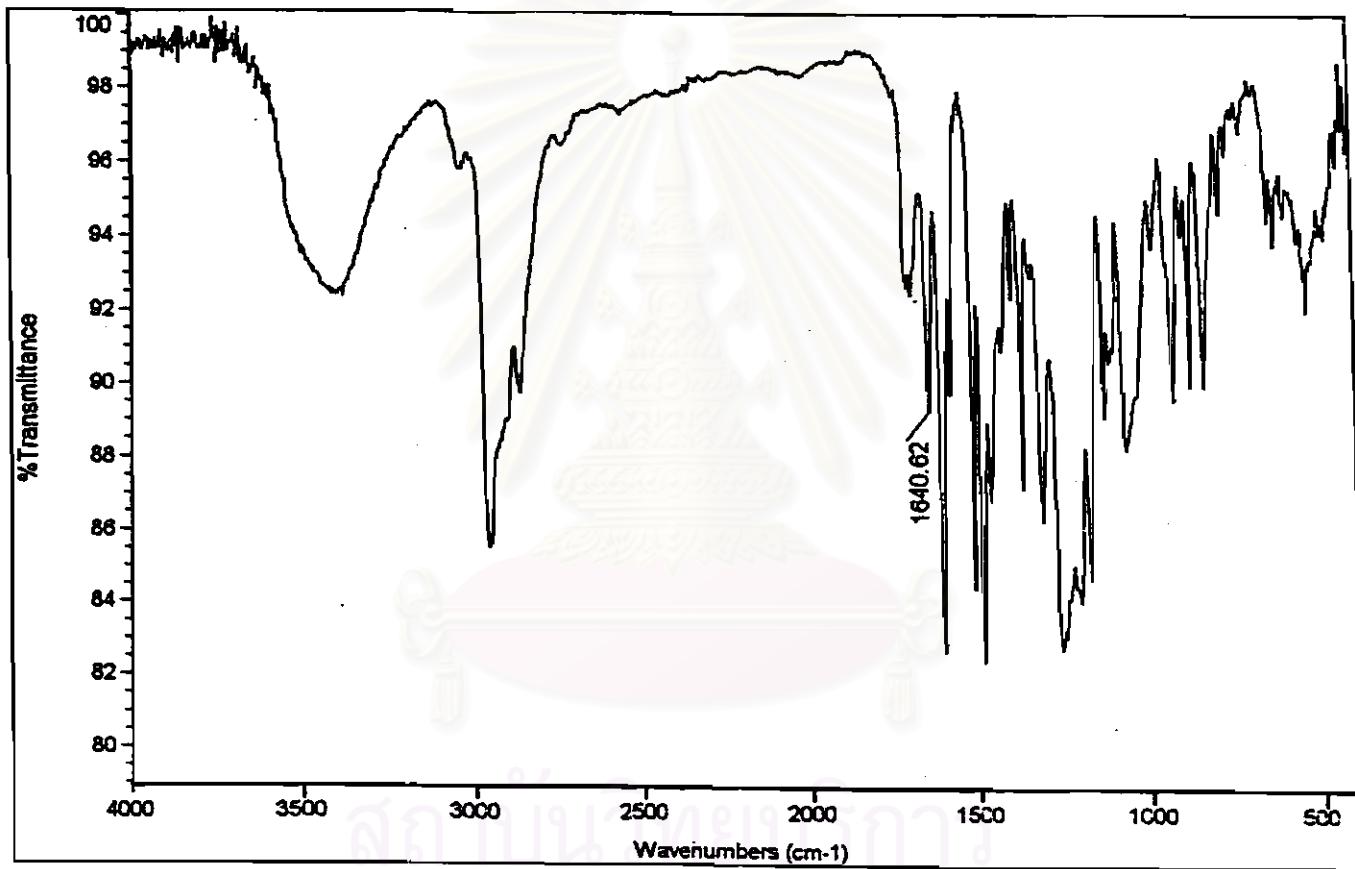
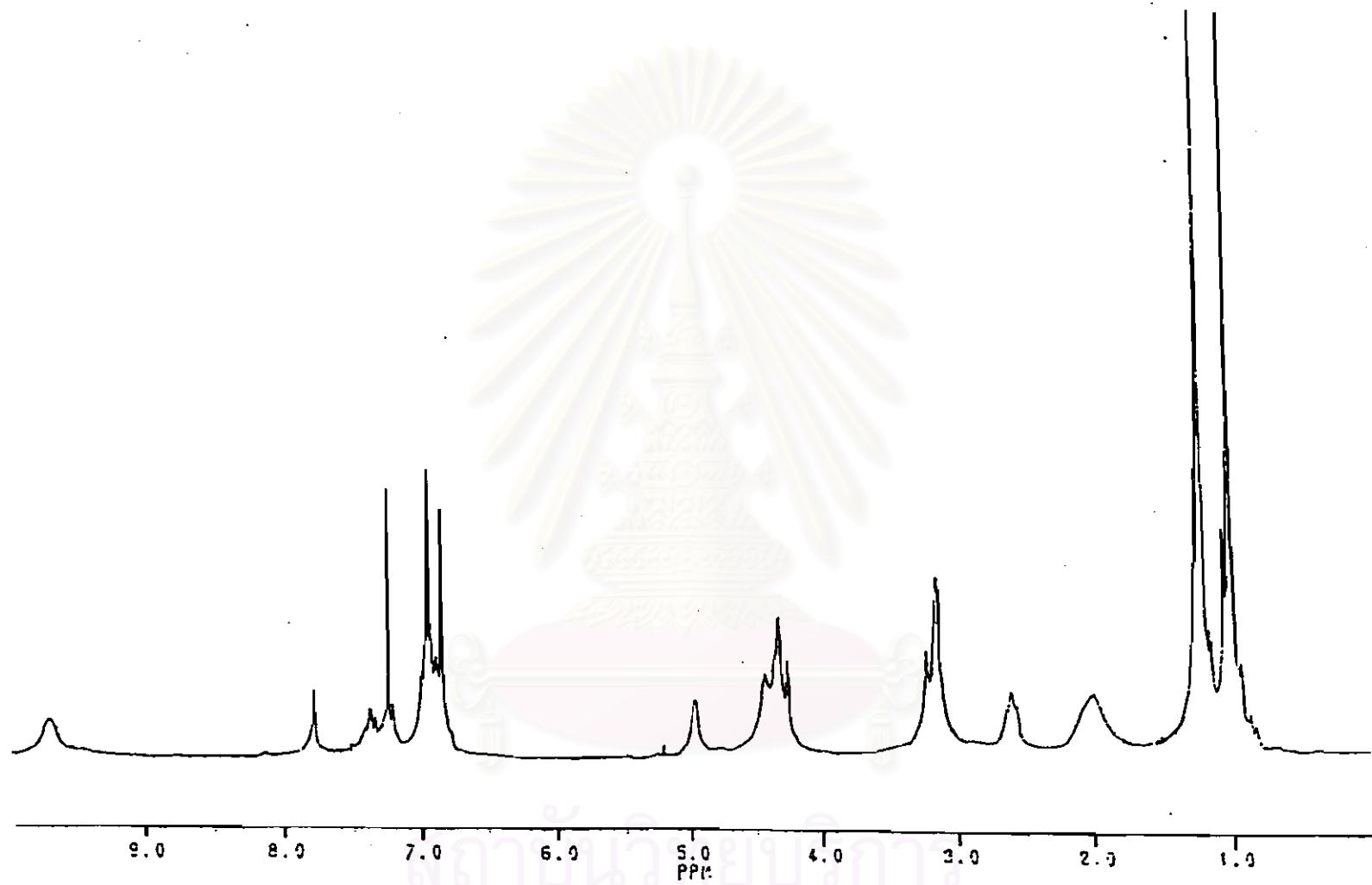
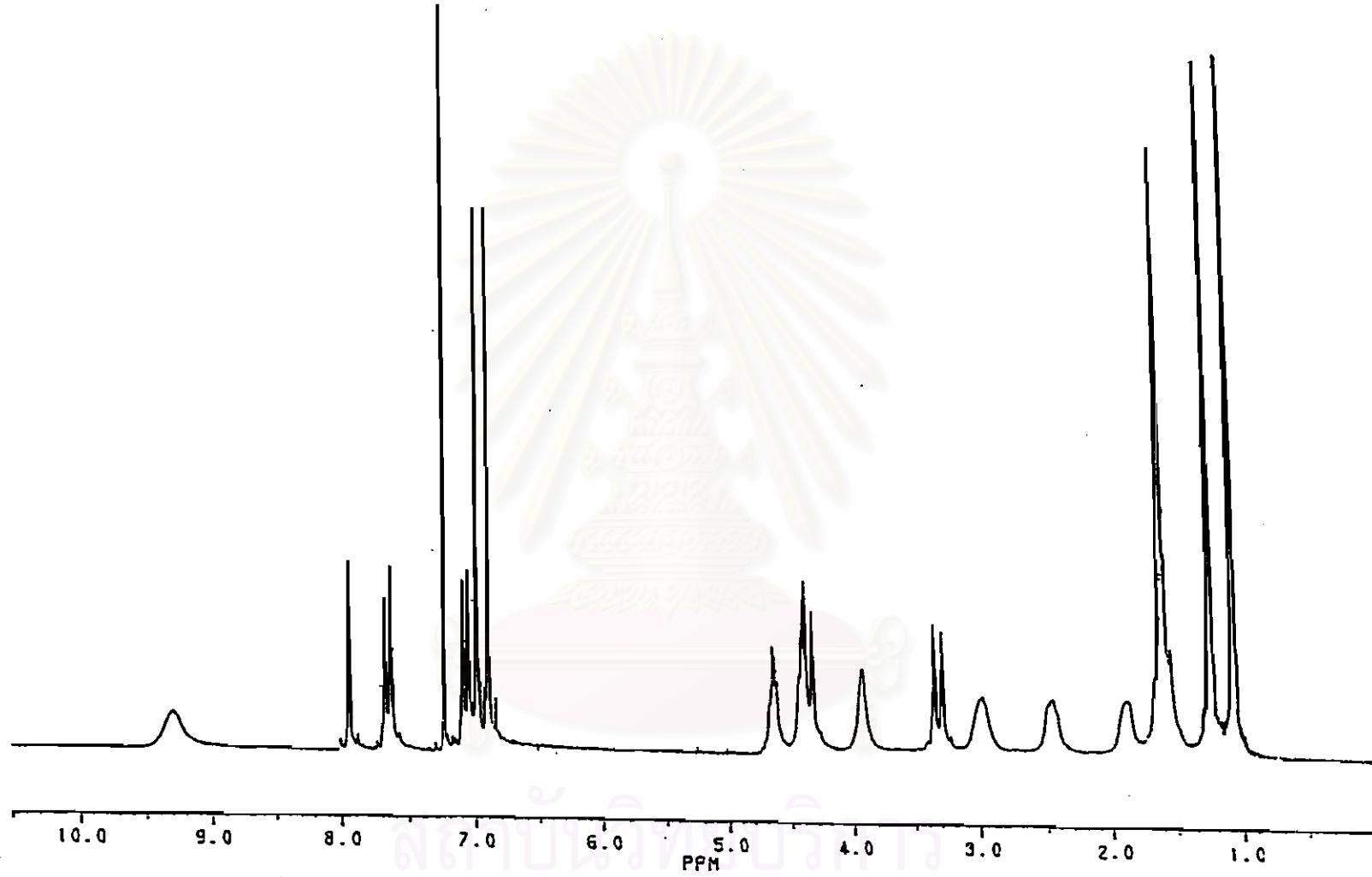


Figure A.12 IR (KBr pellet) spectrum of 25,27-((4,4'-diethoxy)benzyl)-3,6-dithiaoctane-1,8-diimine-*p*-*tert*-butylcalix[4]arene, 6.



**Figure A.13**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((2,2'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-*tert*-butylcalix[4]arene dihydrogenchloride, 7.



**Figure A.14**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 25,27-((4,4'-diethoxy)benzyl)-3,7-dithianonane-1,9-diimine-*p*-*tert*-butylcalix[4]arene dihydrogenchloride, **8**.

## VITA

Korakot Navakhun was born on August 5, 1974 in Chantaburi, Thailand. He received a Bachelor Degree of Science in Chemistry from Chulalongkorn University in 1996. Since June 1996, he has been a graduate student at the Department of Chemistry, Chulalongkorn University and studied in the field of Inorganic Chemistry. He graduated with Master Degree of Science in chemistry in March 1999.



สถาบันวิทยบริการ  
จุฬาลงกรณ์มหาวิทยาลัย