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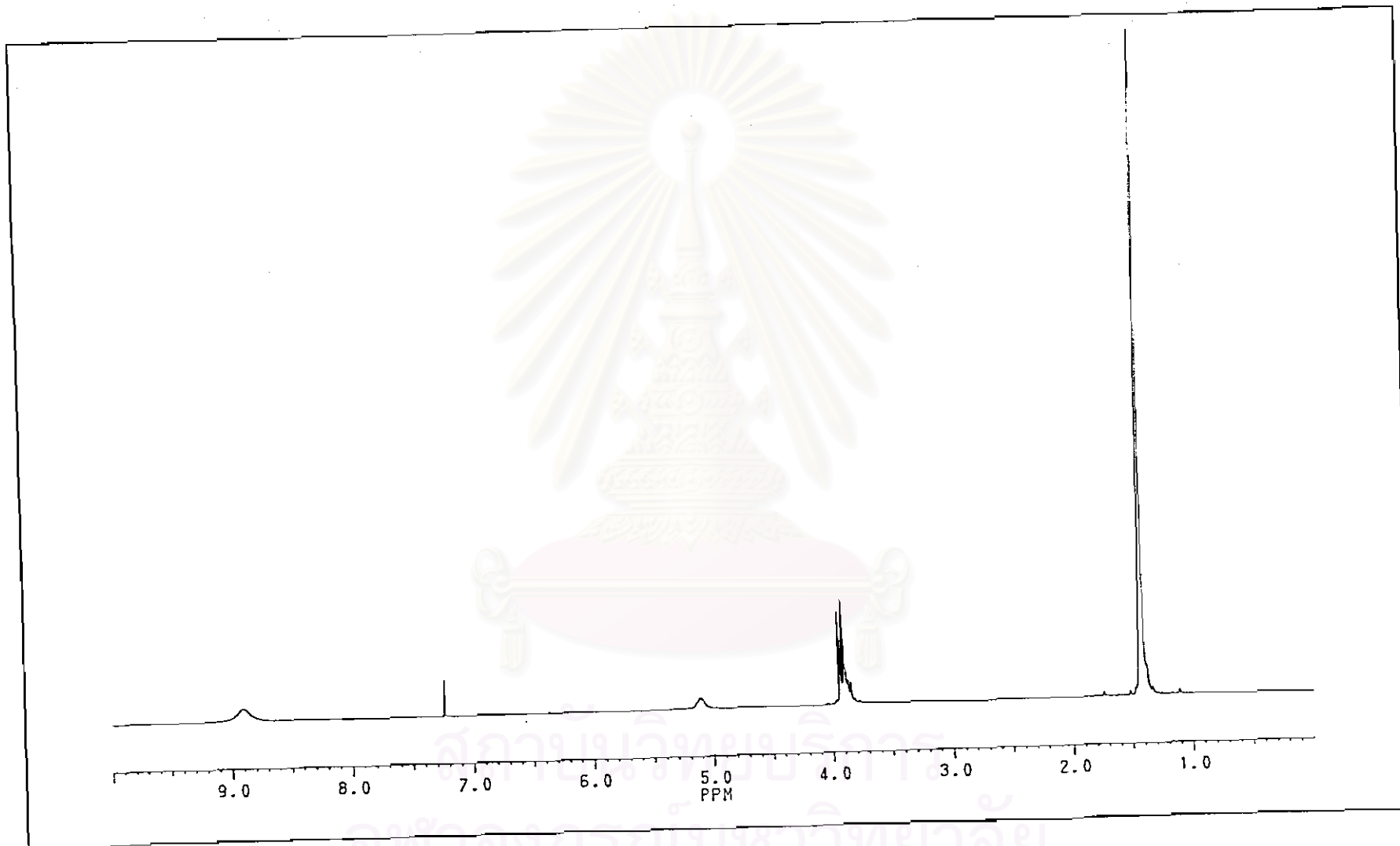
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**APPENDIX**

สถาบันวิทยบริการ  
จุฬาลงกรณ์มหาวิทยาลัย



**Figure 1:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine (Boc-Gly-OH)

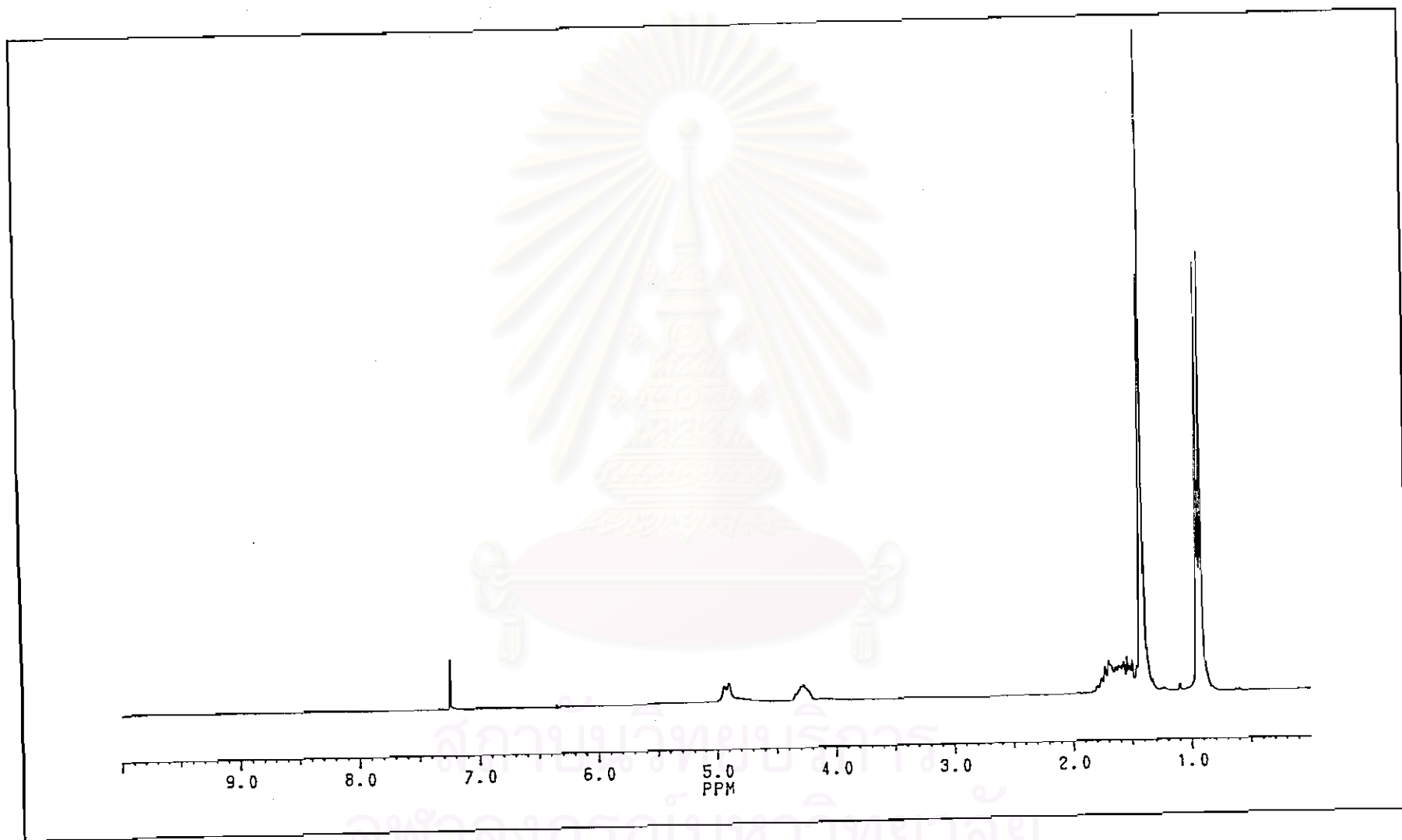
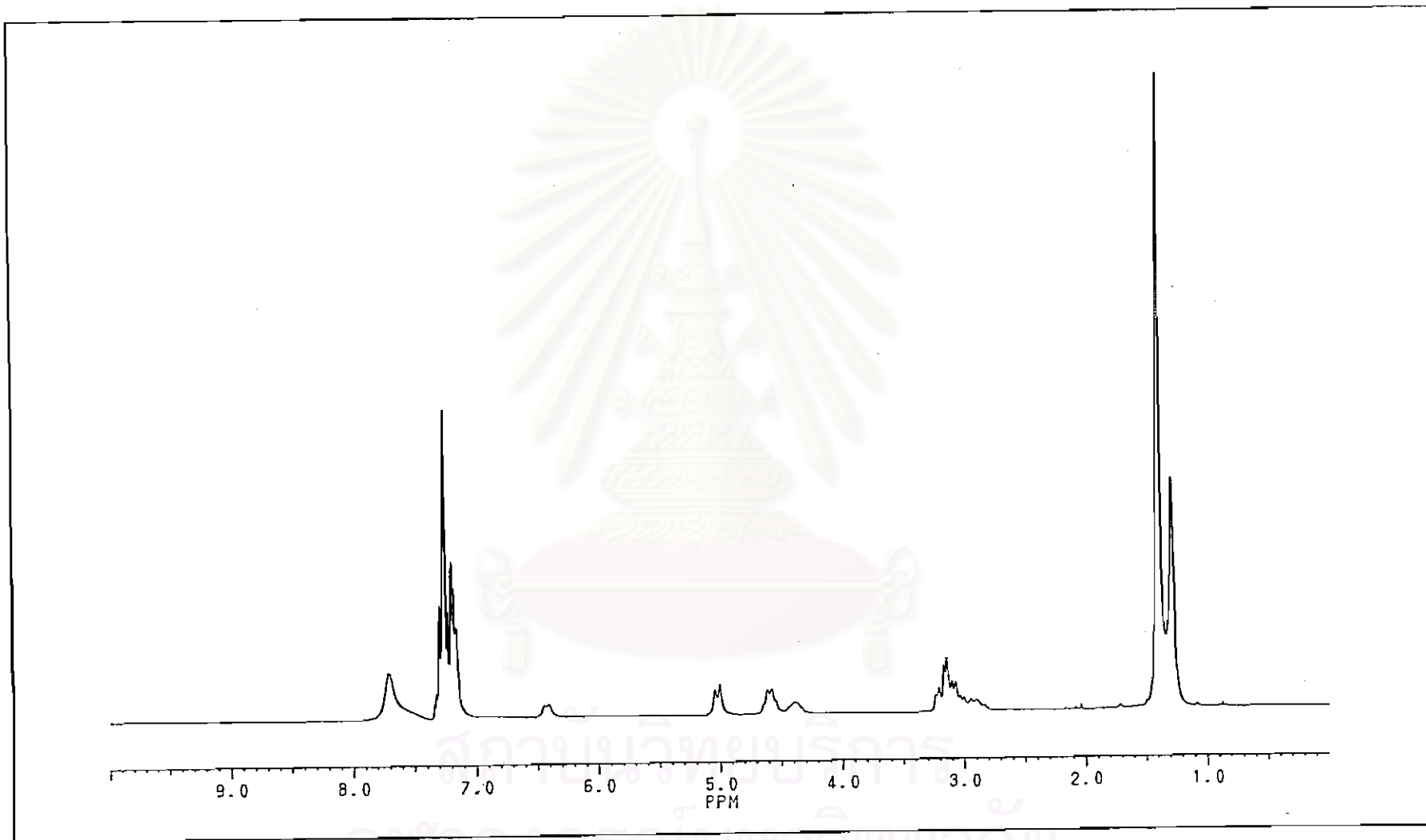
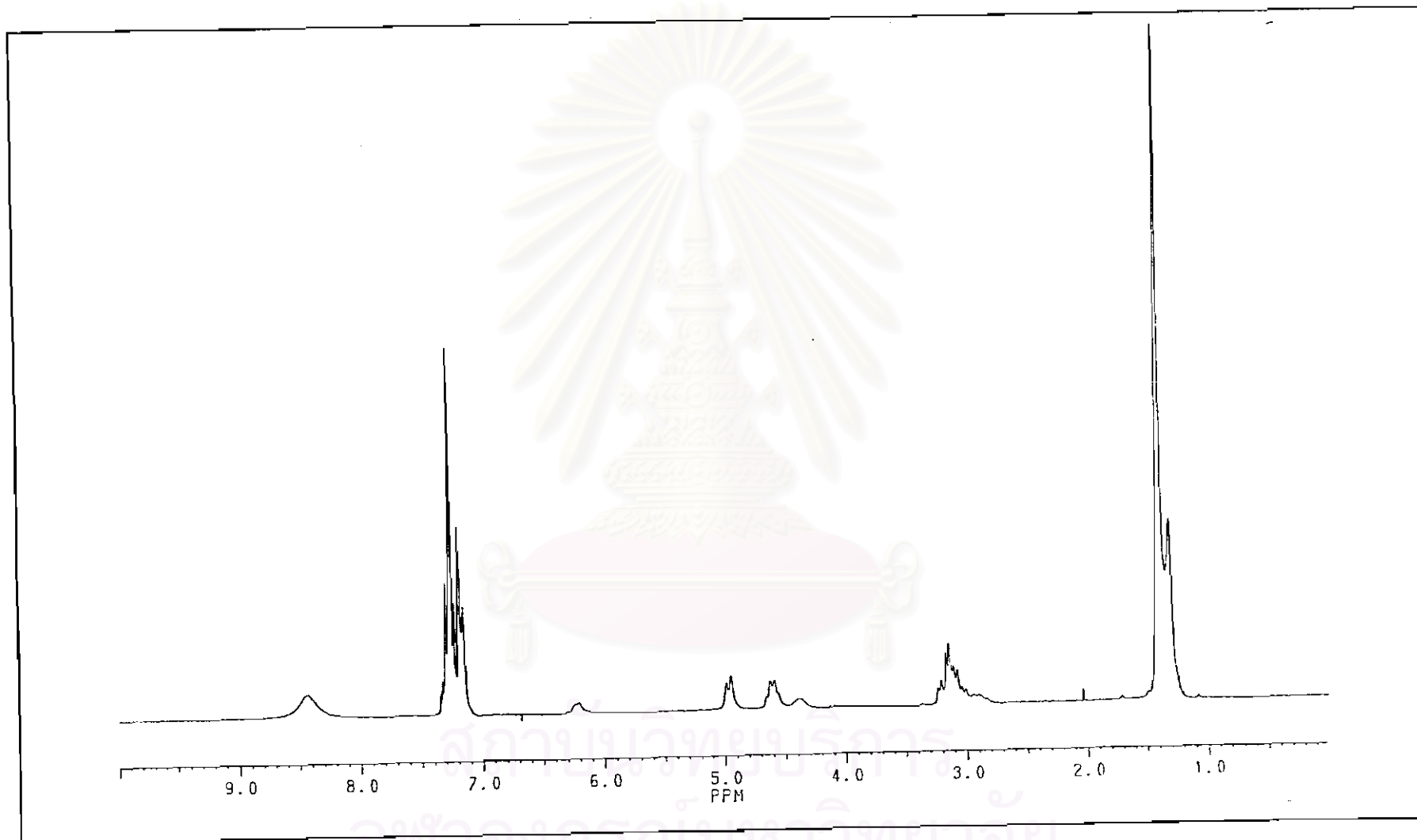


Figure 2:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucine (Boc-L-Leu-OH)

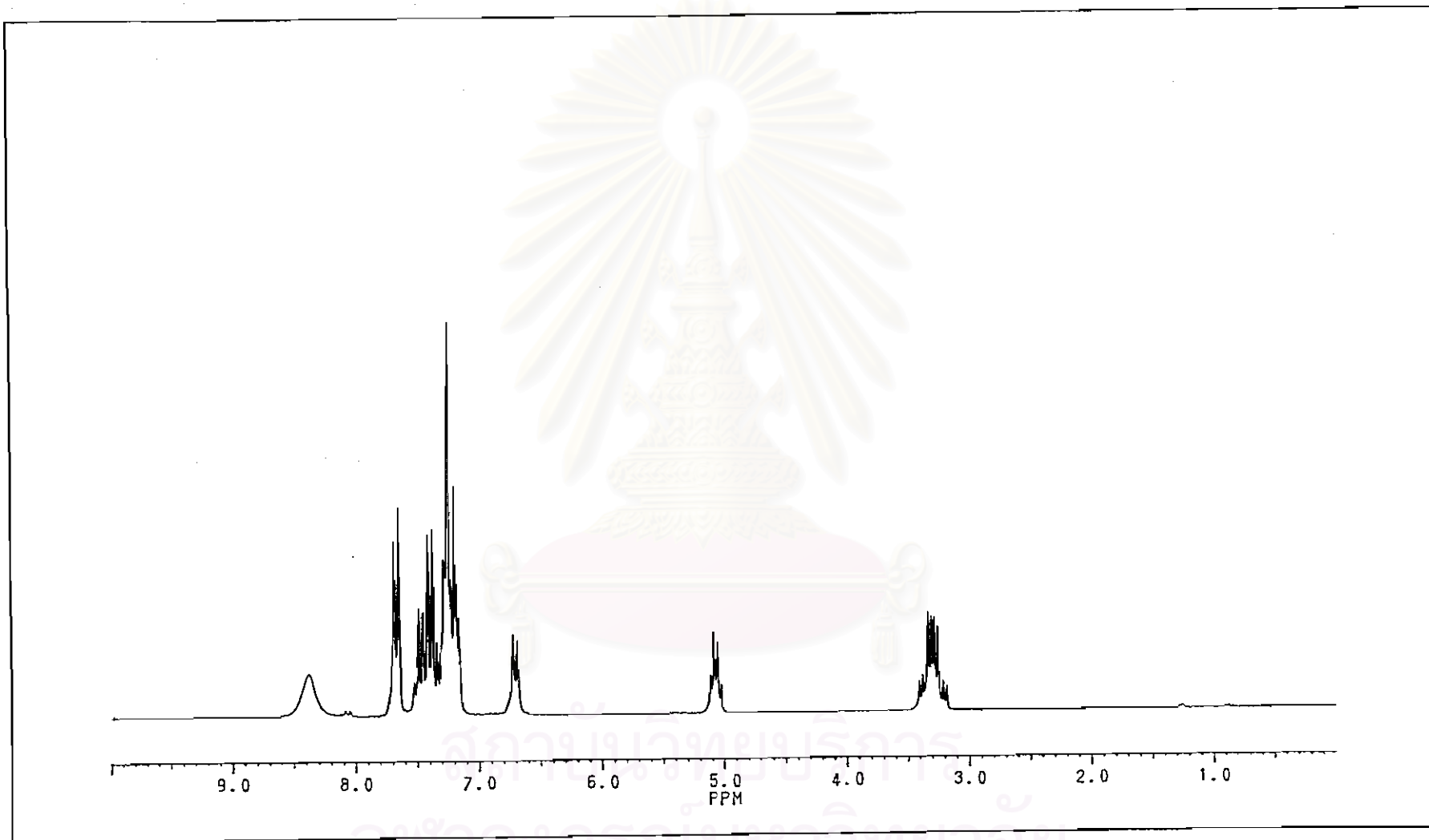




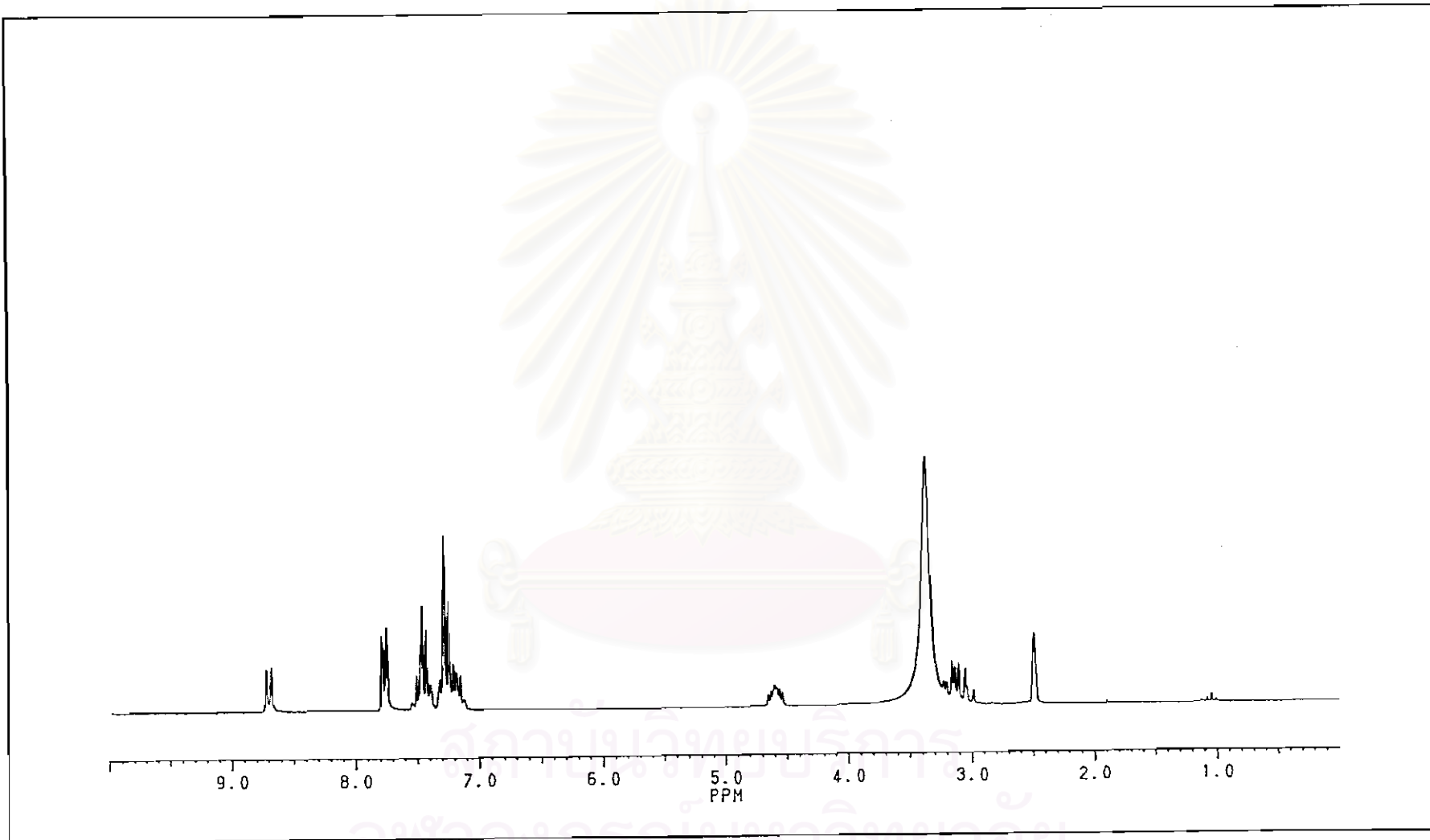
**Figure 3:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-phenylalanine (Boc-L-Phe-OH)



**Figure 4:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-DL-phenylalanine (Boc-DL-Phe-OH)



**Figure 5:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-benzoyl-L-phenylalanine (Bz-L-Phe-OH)



**Figure 6:**  $^1\text{H}$  NMR ( $\text{DMSO-d}_6$ ) spectrum of *N*-benzoyl-DL-phenylalanine (Bz-DL-Phe-OH)

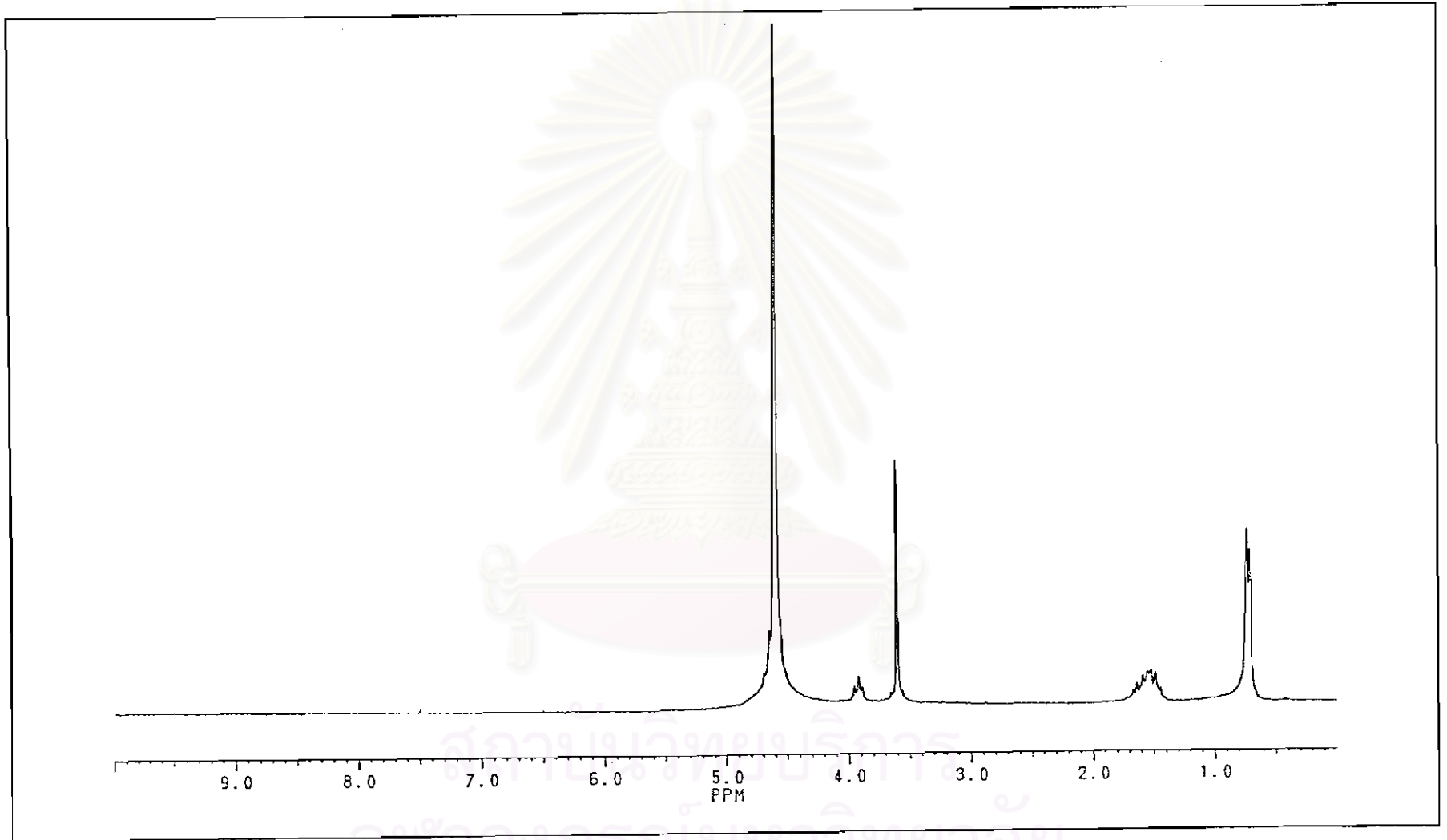
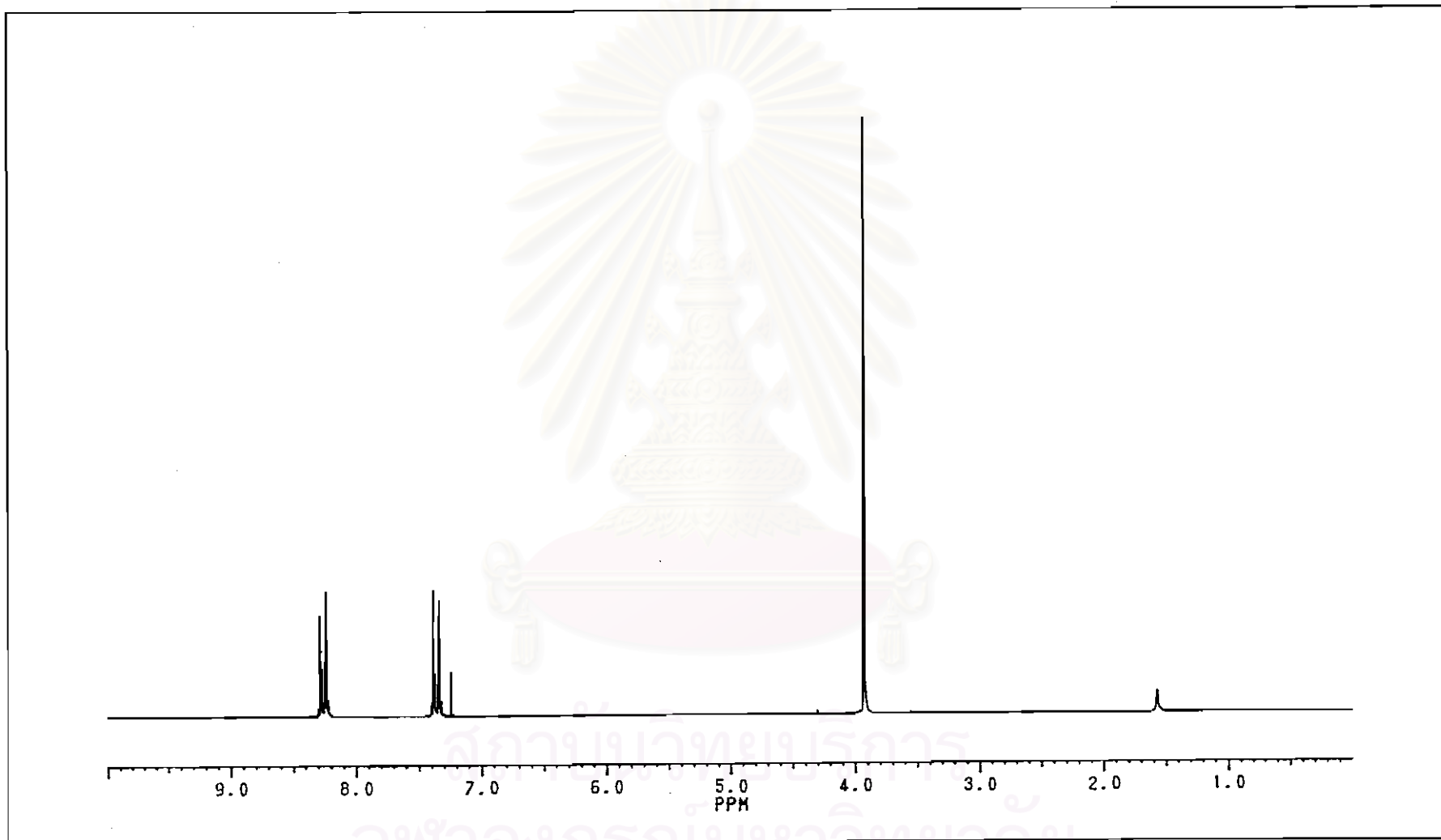
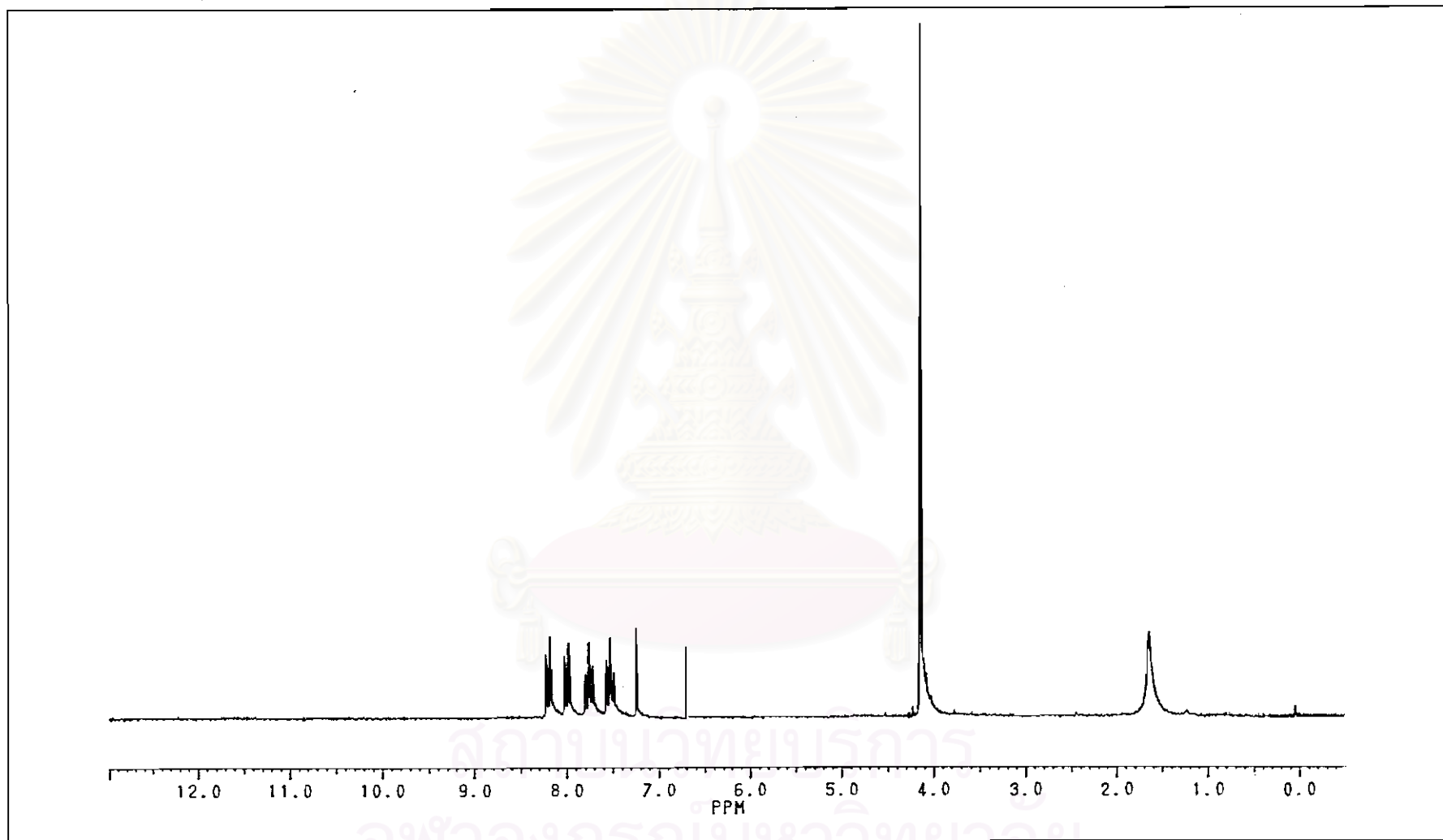


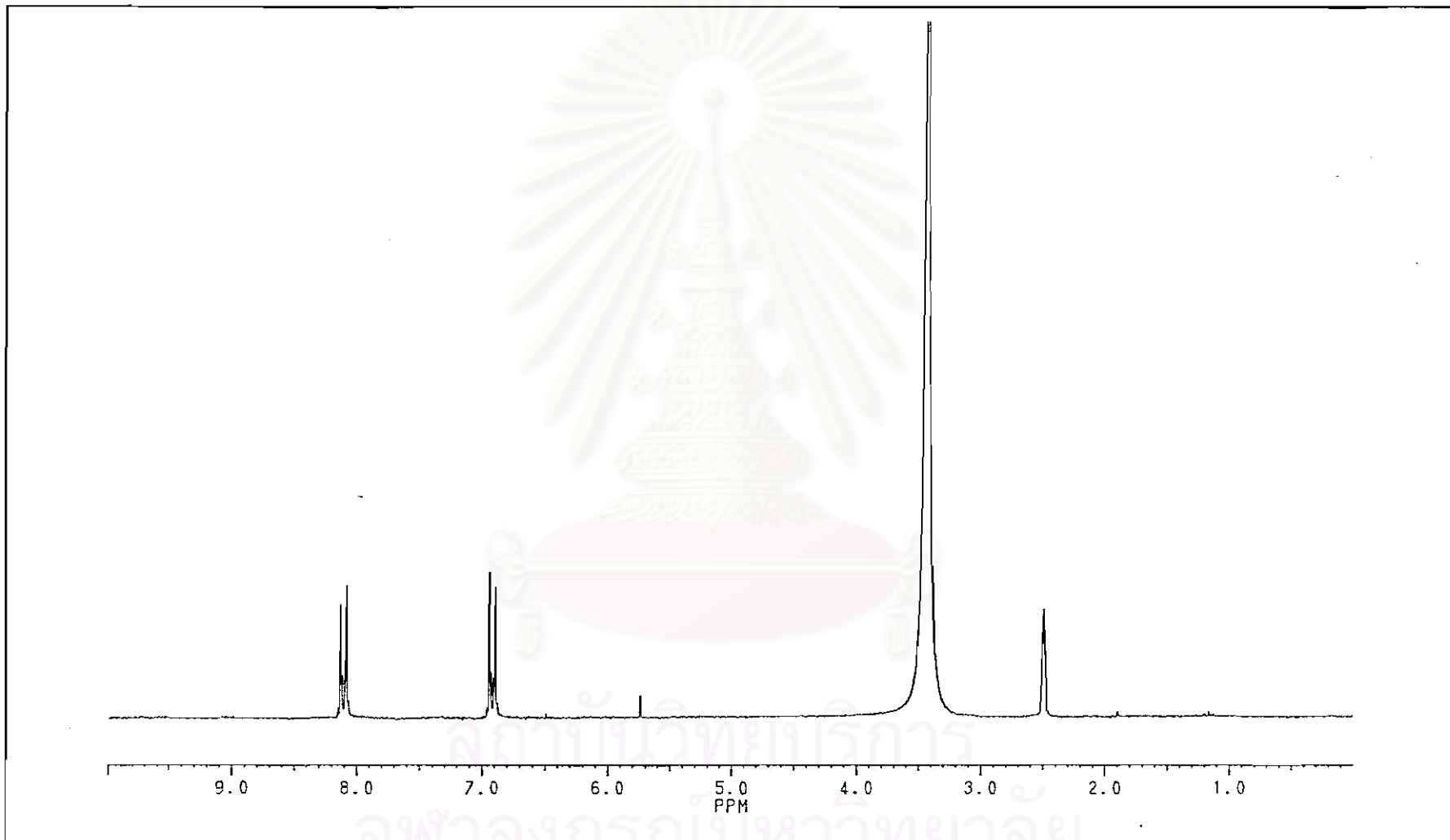
Figure 7:  $^1\text{H}$  NMR ( $\text{D}_2\text{O}$ ) spectrum of L-leucine methyl ester hydrochloride



**Figure 8:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrophenyl methyl carbonate (**1a**)



**Figure 9:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of benzotriazolyl methyl carbonate (**1b**)



**Figure 10:**  $^1\text{H}$  NMR ( $\text{DMSO-d}_6$ ) spectrum of bis(4-nitrophenyl) oxalate (2a)



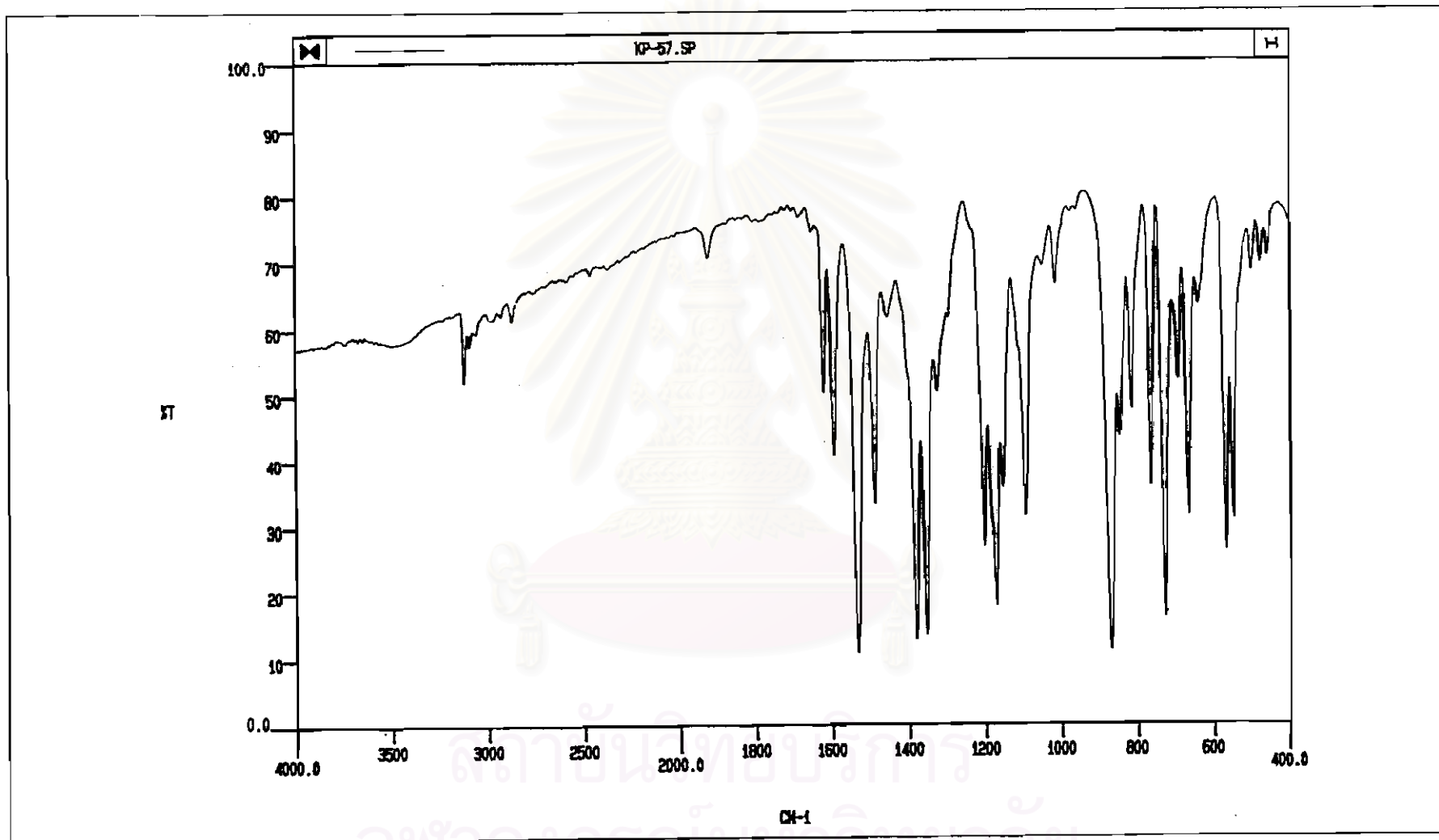


Figure 11: IR spectrum (KBr) of 4-nitrophenyl *p*-toluenesulfonate (3a)

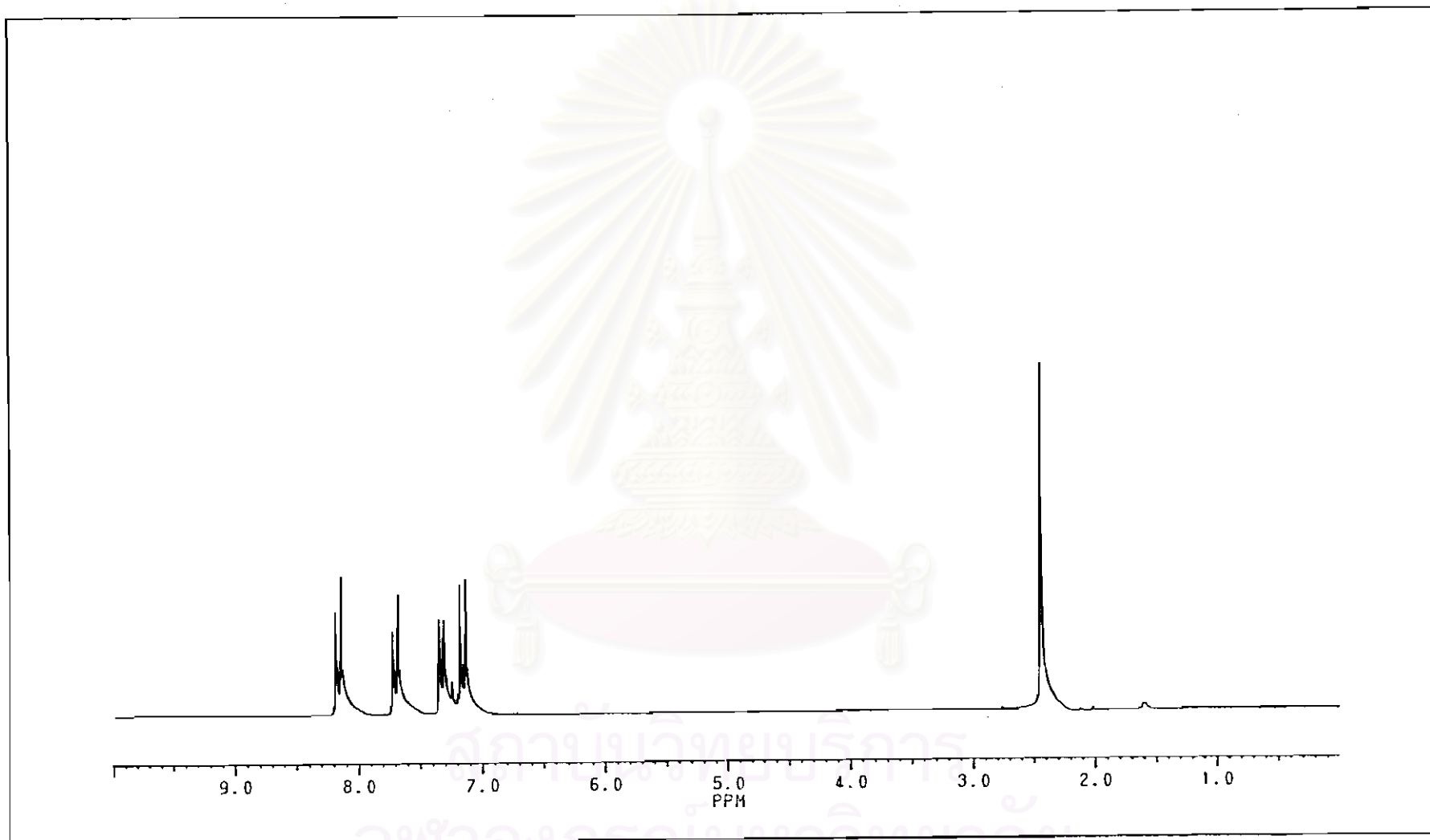


Figure 12:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrophenyl *p*-toluenesulfonate (3a)

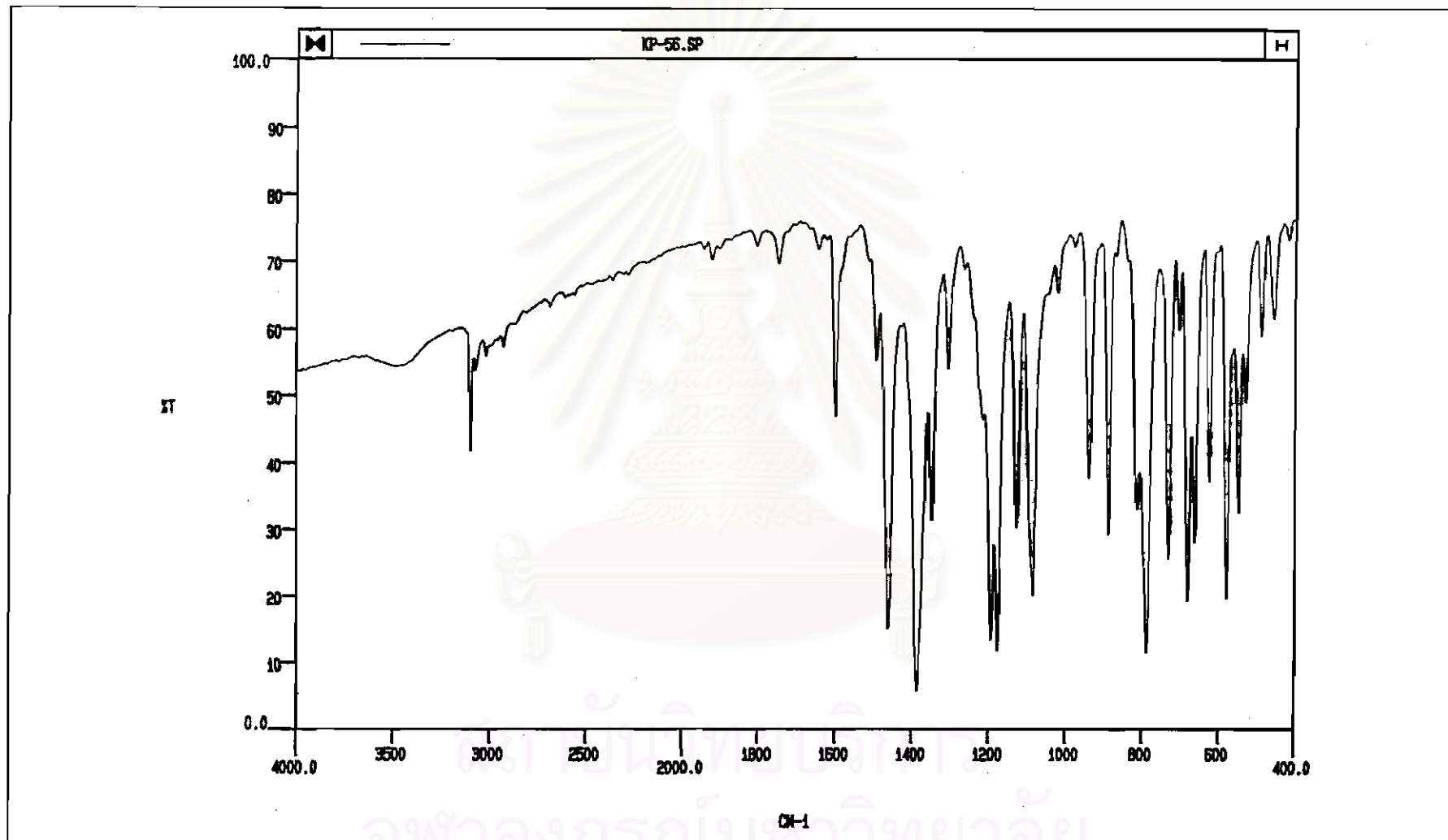
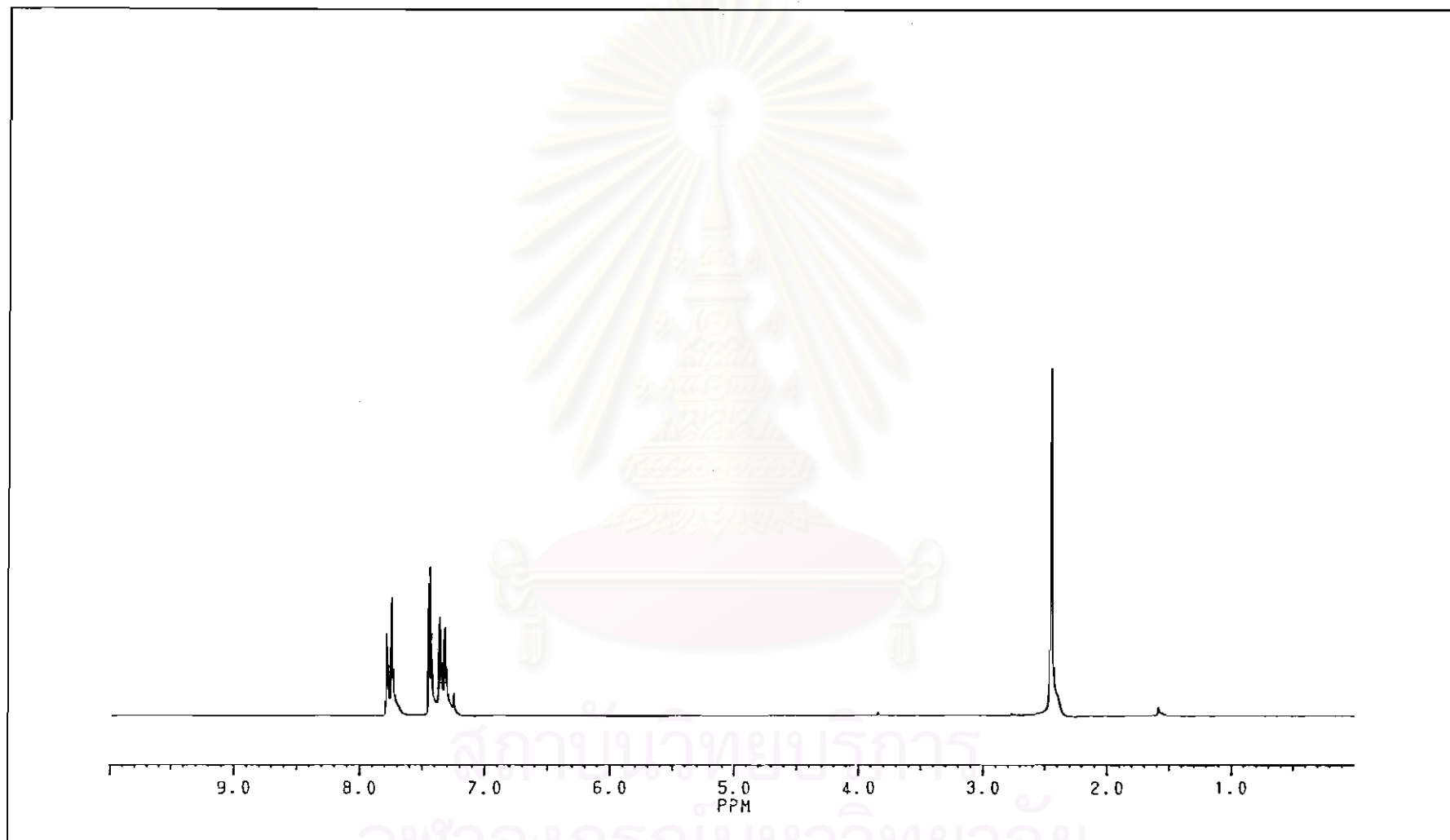


Figure 13: IR spectrum (KBr) of 2,4,5-trichlorophenyl *p*-toluenesulfonate (3b)



**Figure 14:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 2,4,5-trichlorophenyl *p*-toluenesulfonate (**3b**)

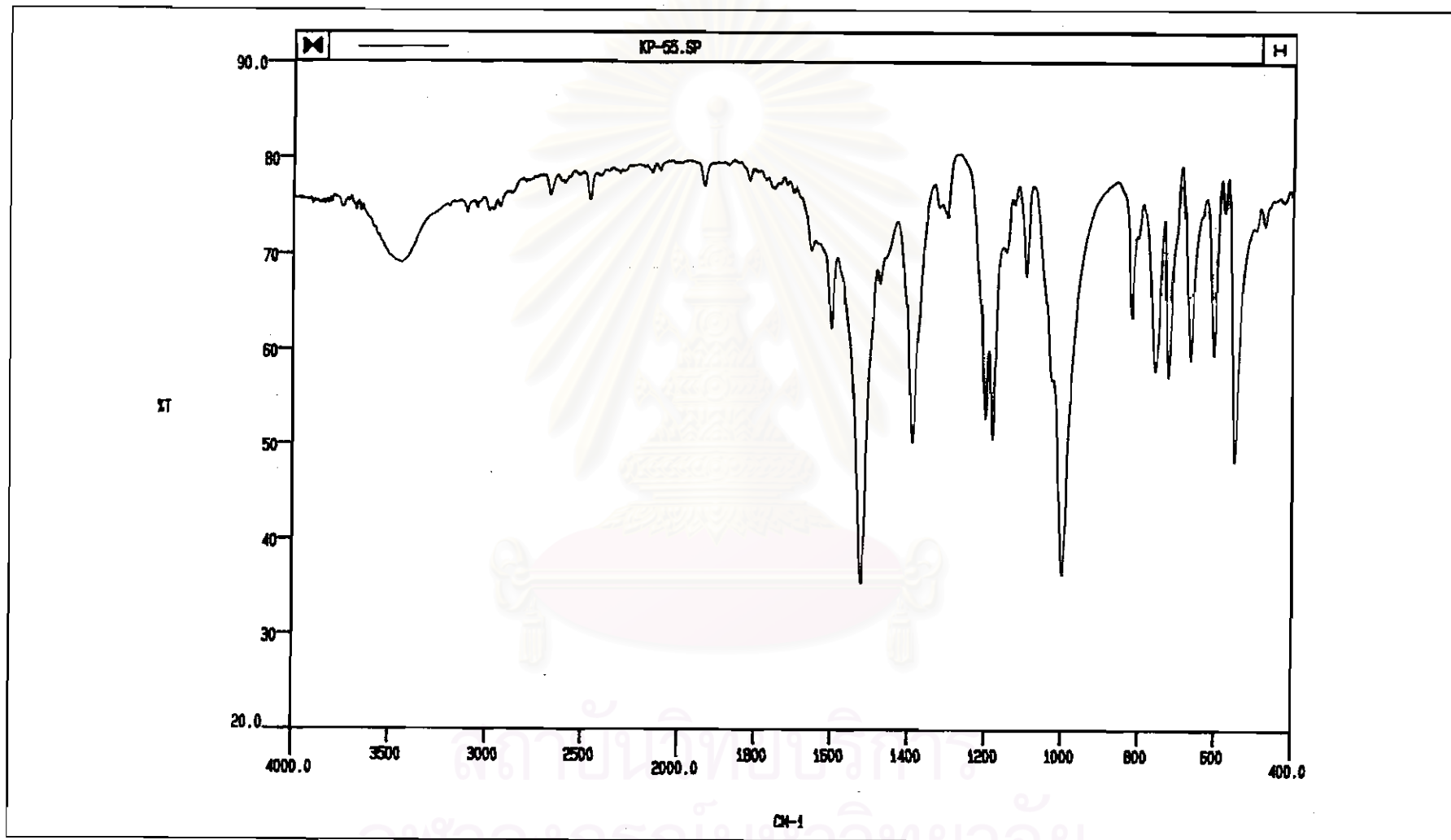
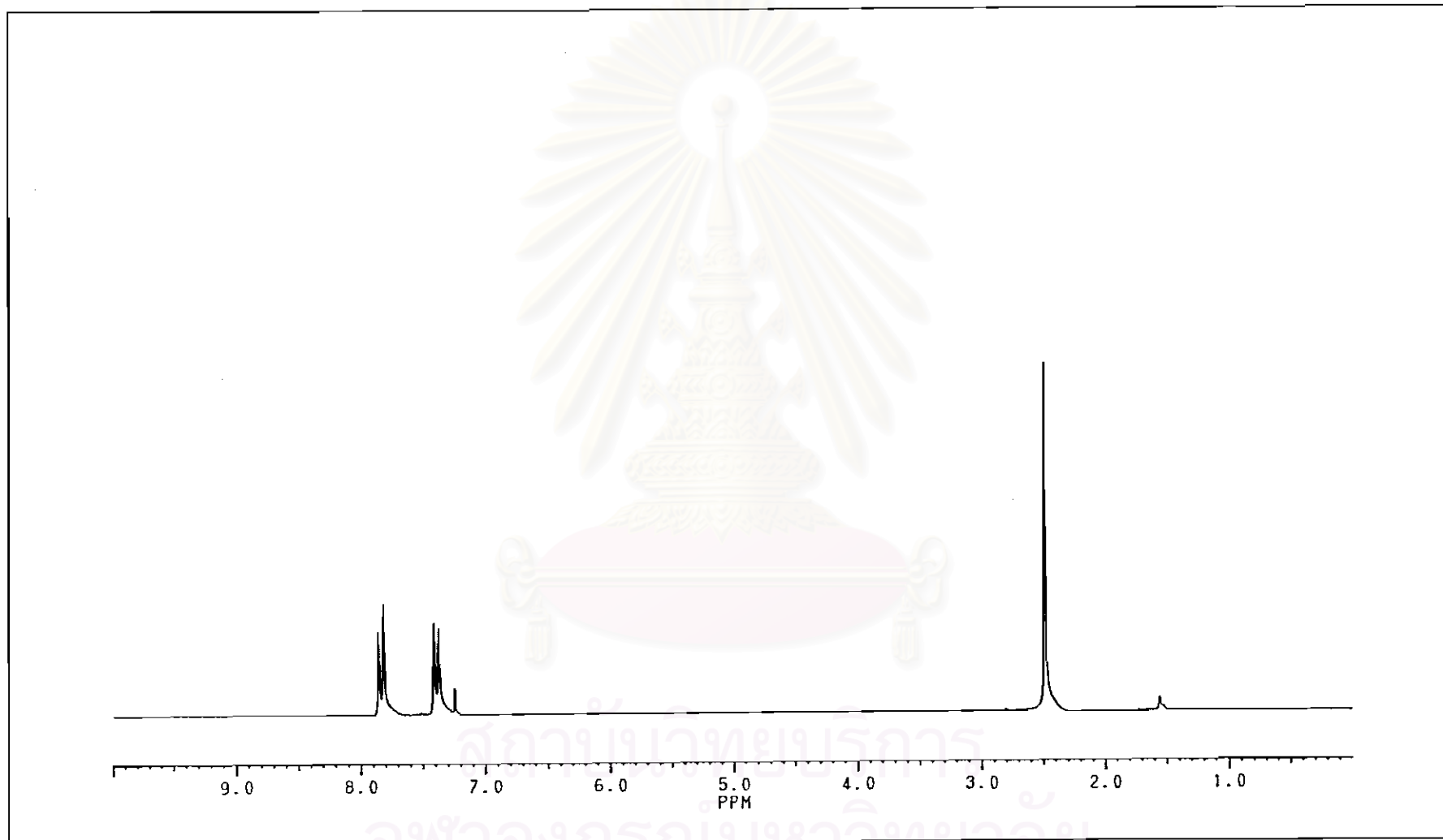


Figure 15: IR spectrum (KBr) of pentafluorophenyl *p*-toluenesulfonate (3c)



**Figure 16:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentafluorophenyl *p*-toluenesulfonate (3c)

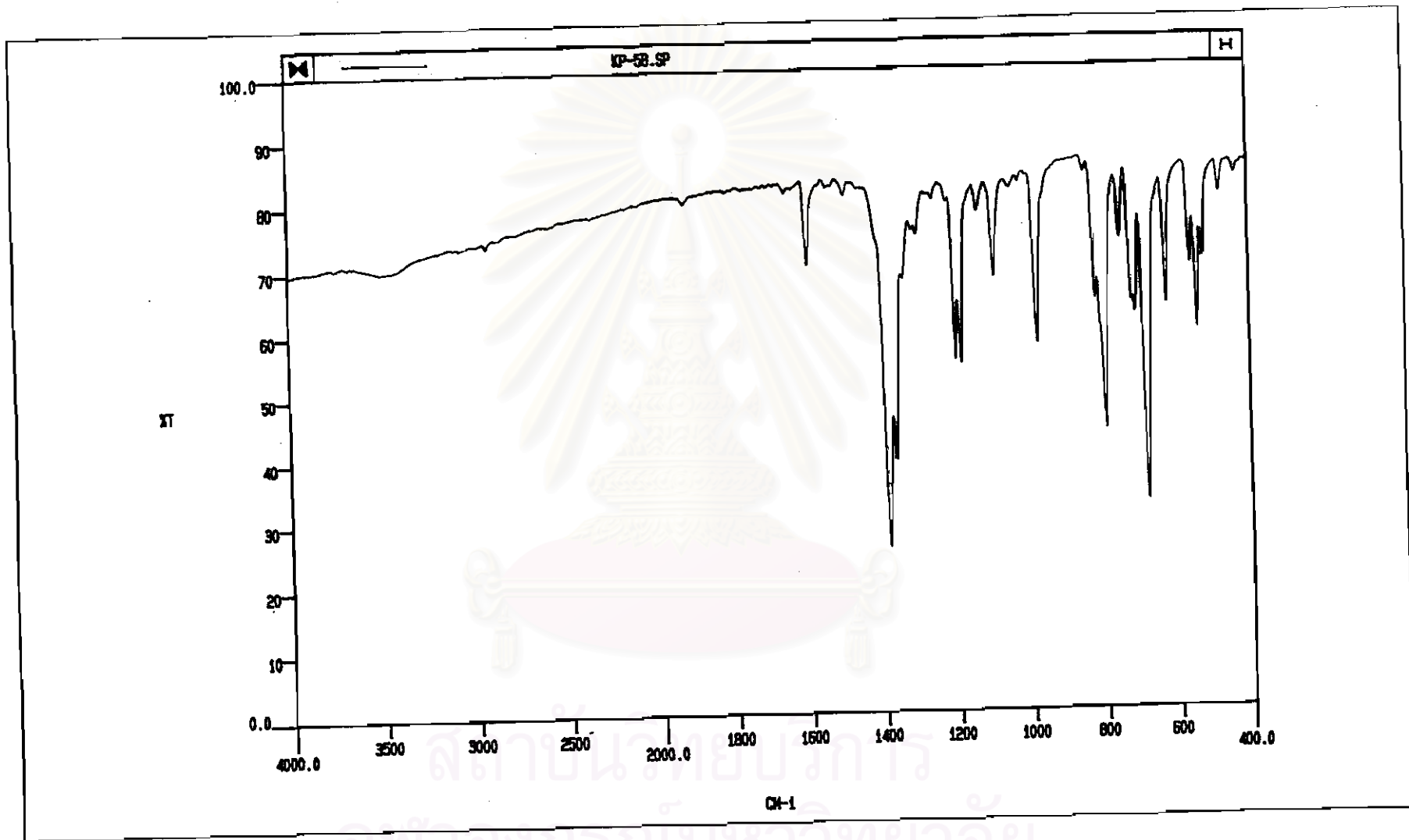
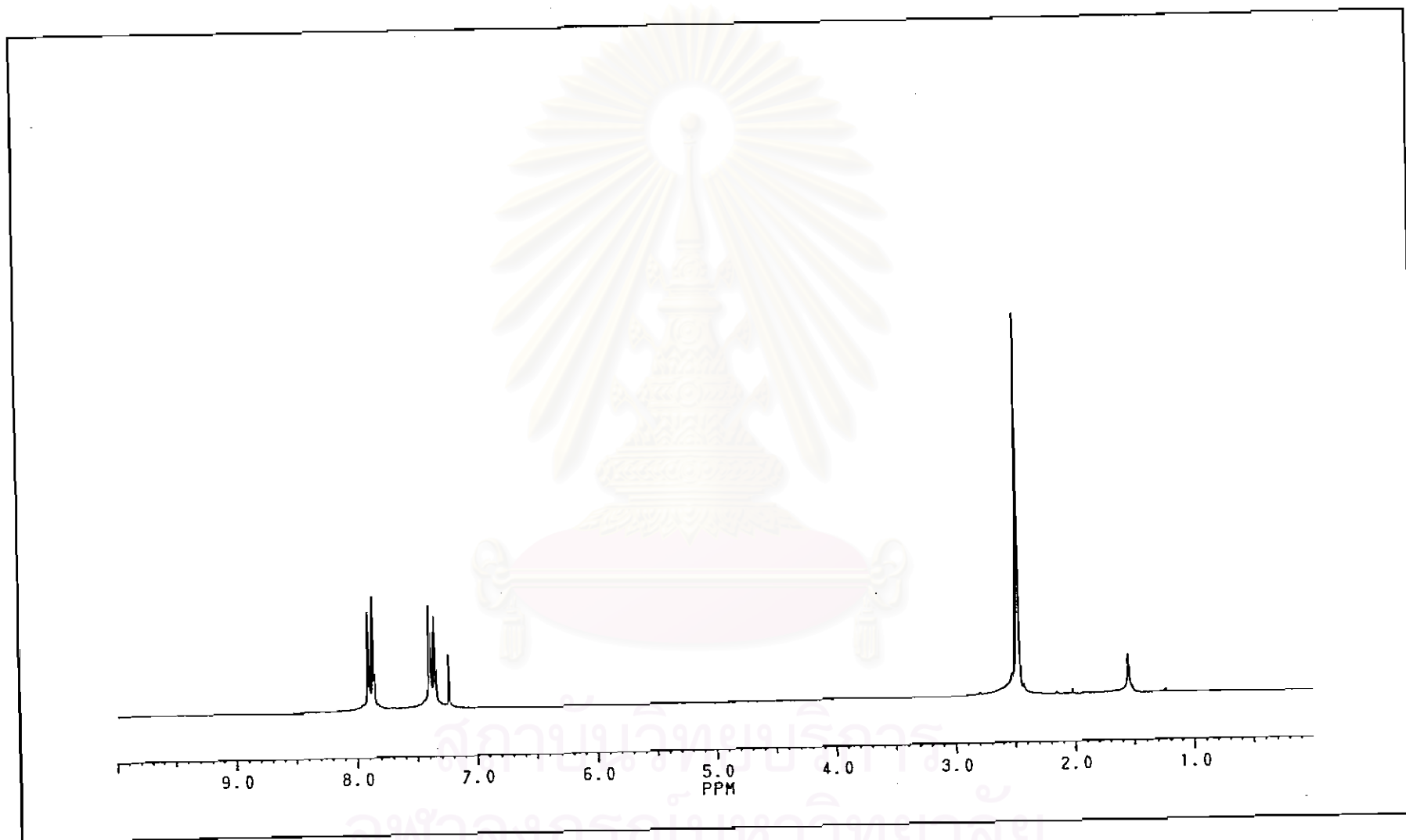


Figure 17: IR spectrum (KBr) of pentachlorophenyl *p*-toluenesulfonate (3d)



**Figure 18:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentachlorophenyl *p*-toluenesulfonate (3d)



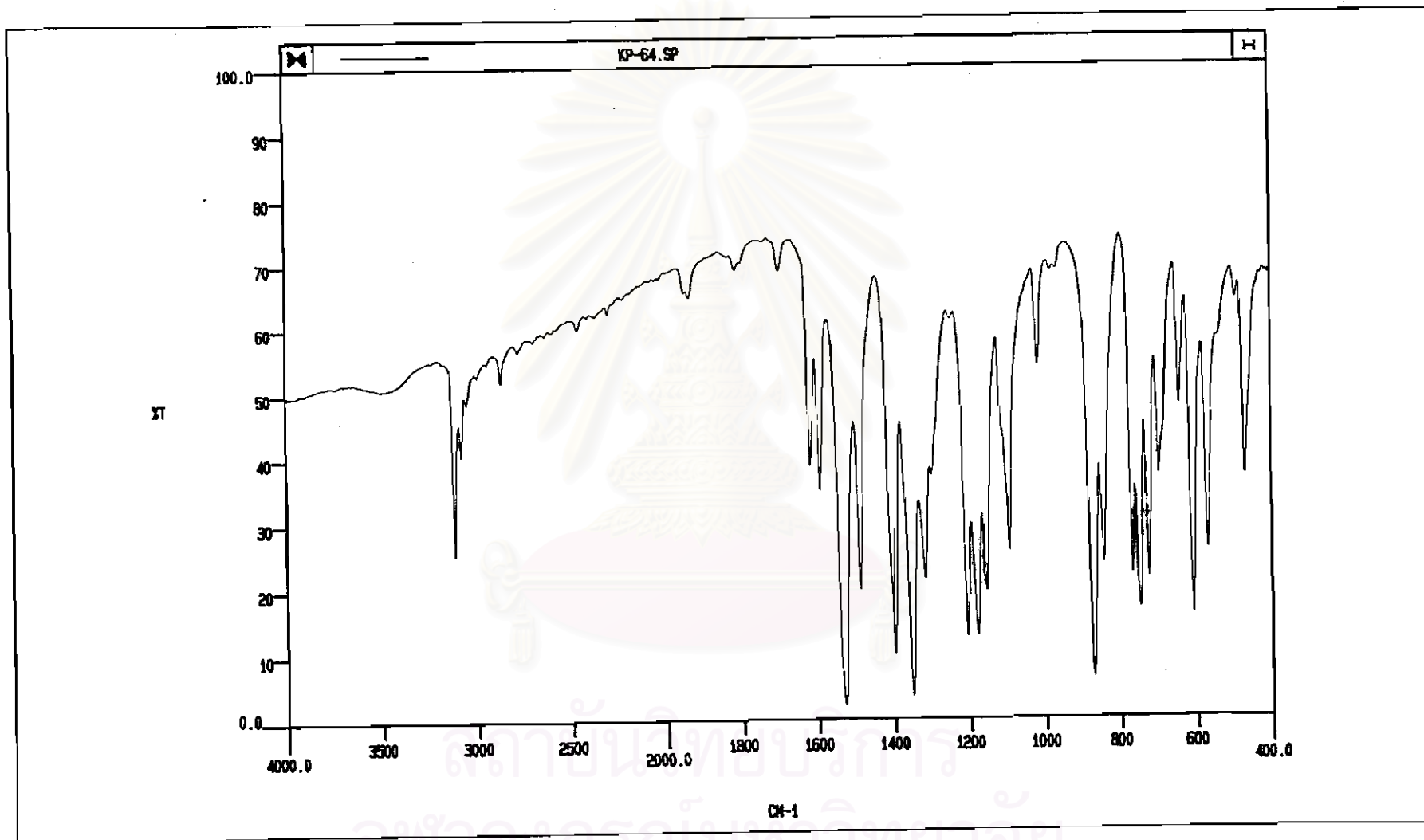


Figure 19: IR spectrum (KBr) of 4-nitrophenyl 4-nitrobenzenesulfonate (4a)

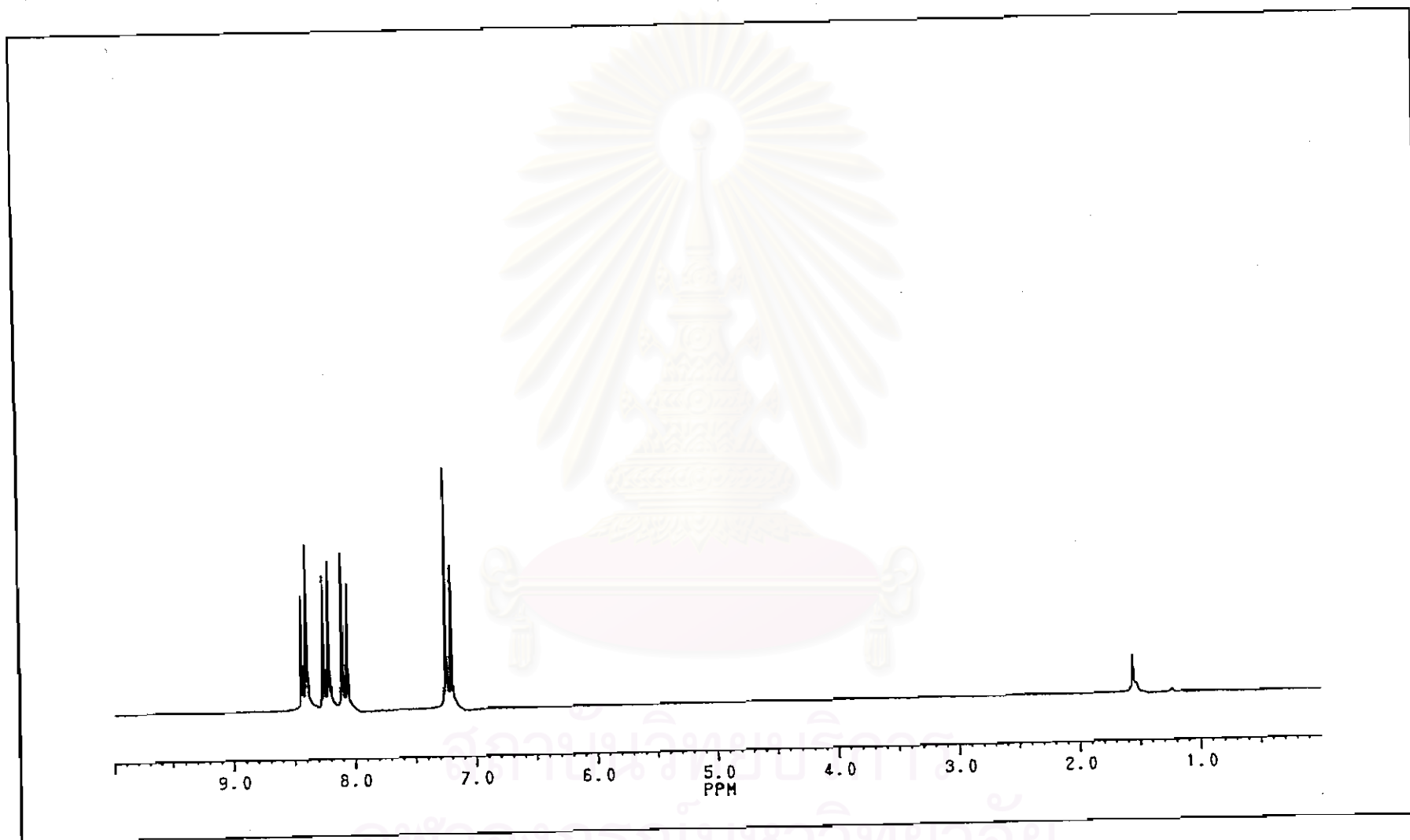


Figure 20:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrophenyl 4-nitrobenzenesulfonate (4a)

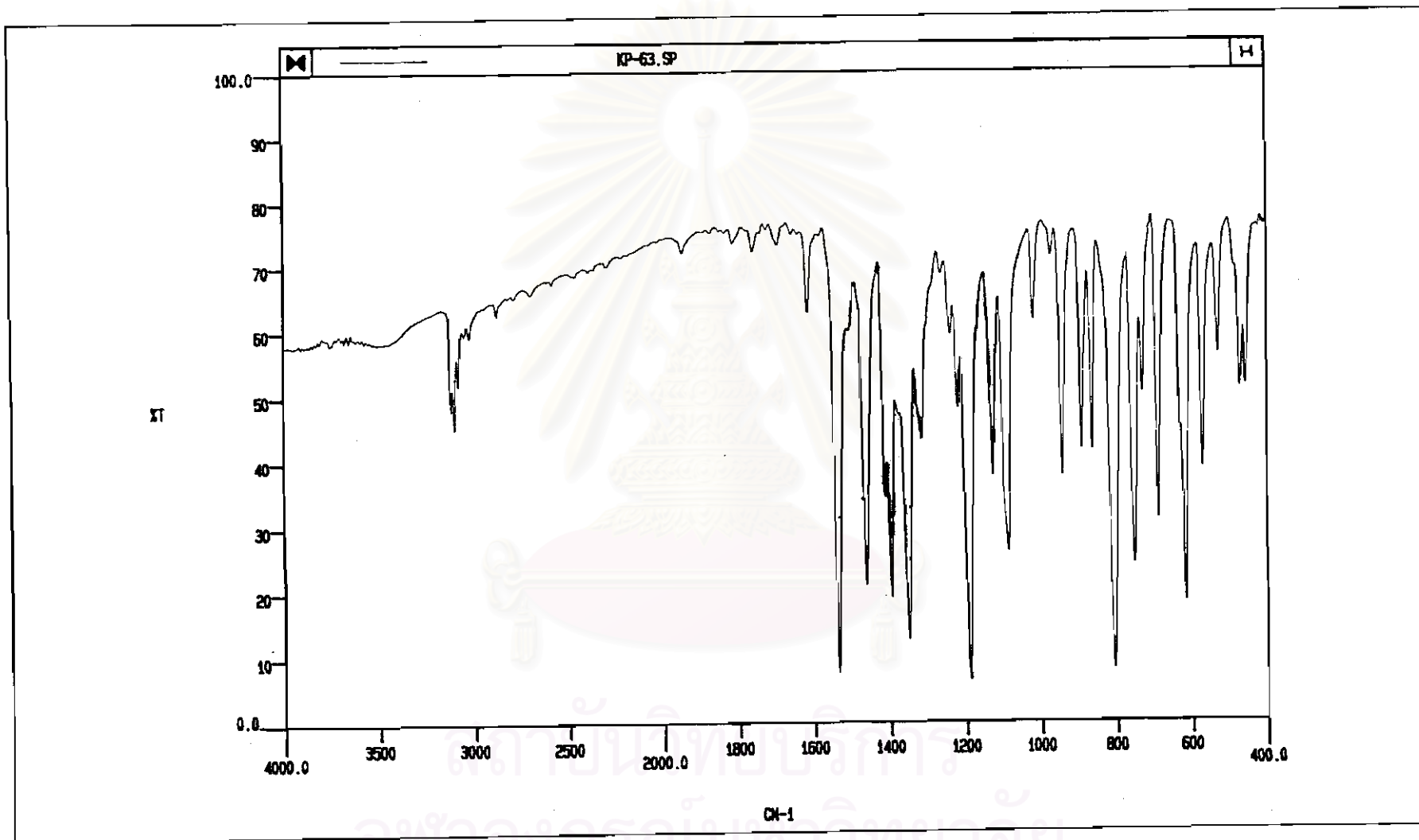


Figure 21: IR spectrum (KBr) of 2,4,5-trichlorophenyl 4-nitrobenzenesulfonate (4b)

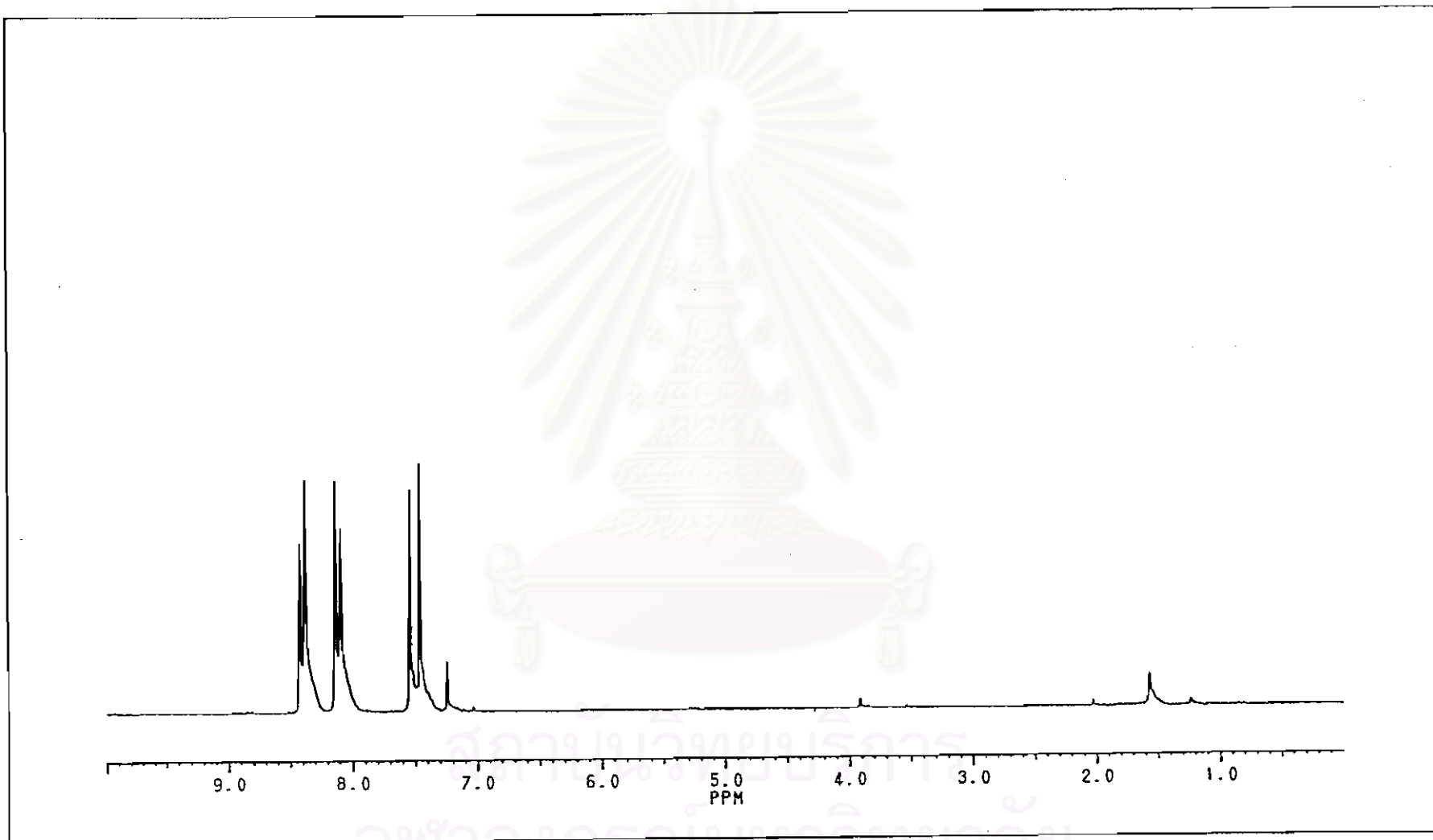


Figure 22:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 2,4,5-trichlorophenyl 4-nitrobenzenesulfonate (**4b**)

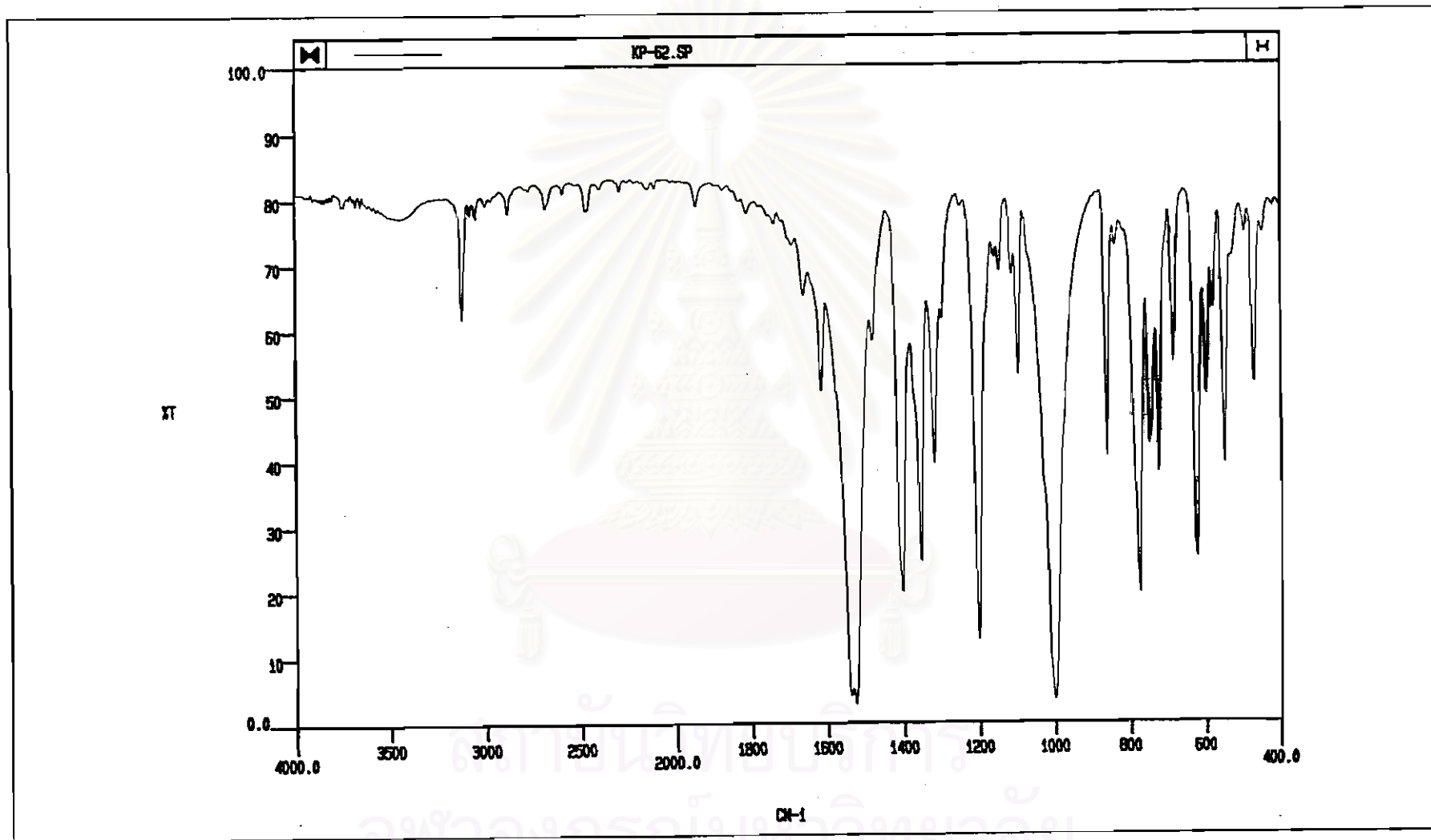
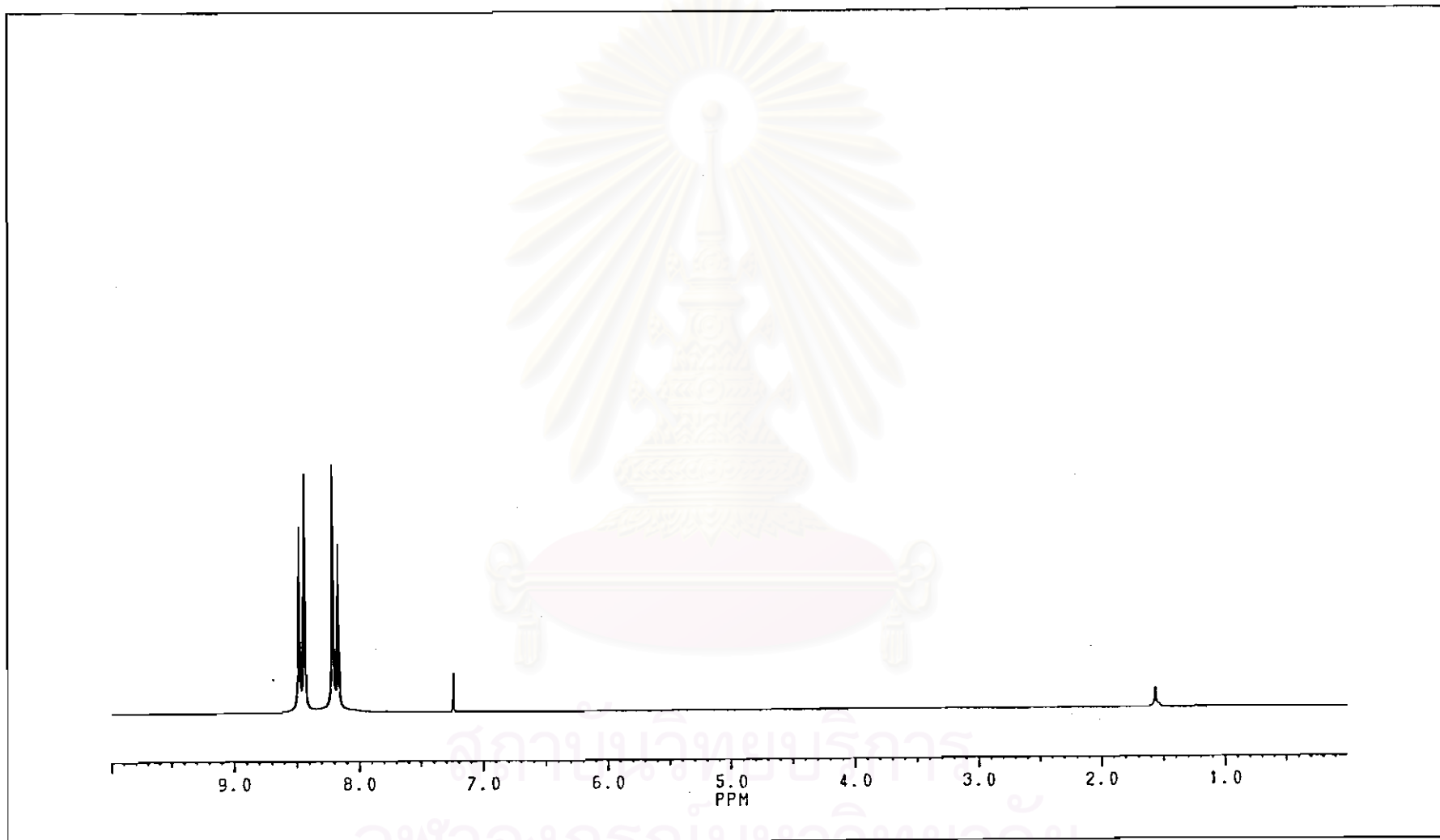


Figure 23: IR spectrum (KBr) of pentafluorophenyl 4-nitrobenzenesulfonate (4c)



**Figure 24:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentafluorophenyl 4-nitrobenzenesulfonate (4c)

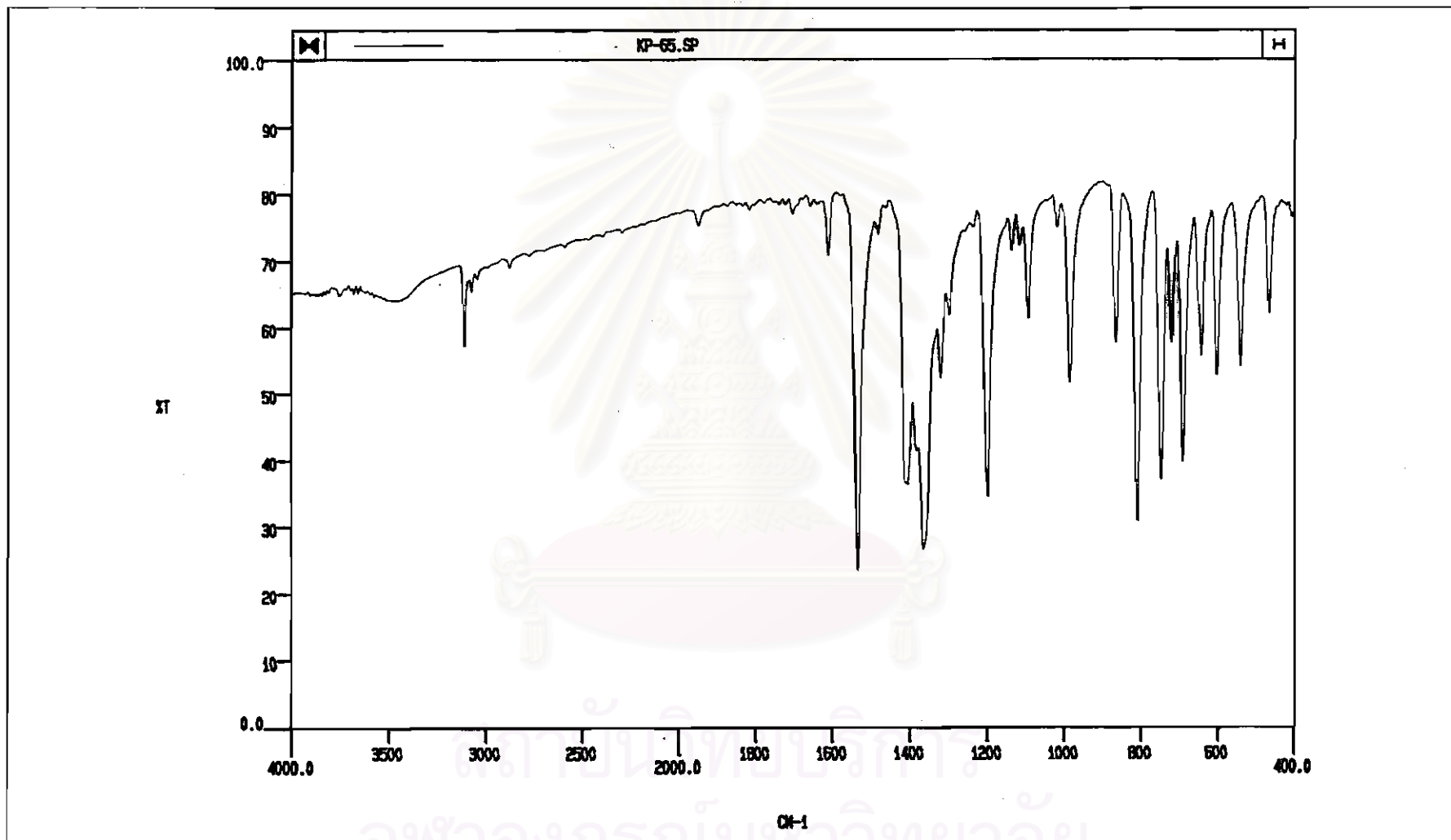


Figure 25: IR spectrum (KBr) of pentachlorophenyl 4-nitrobenzenesulfonate (4d)

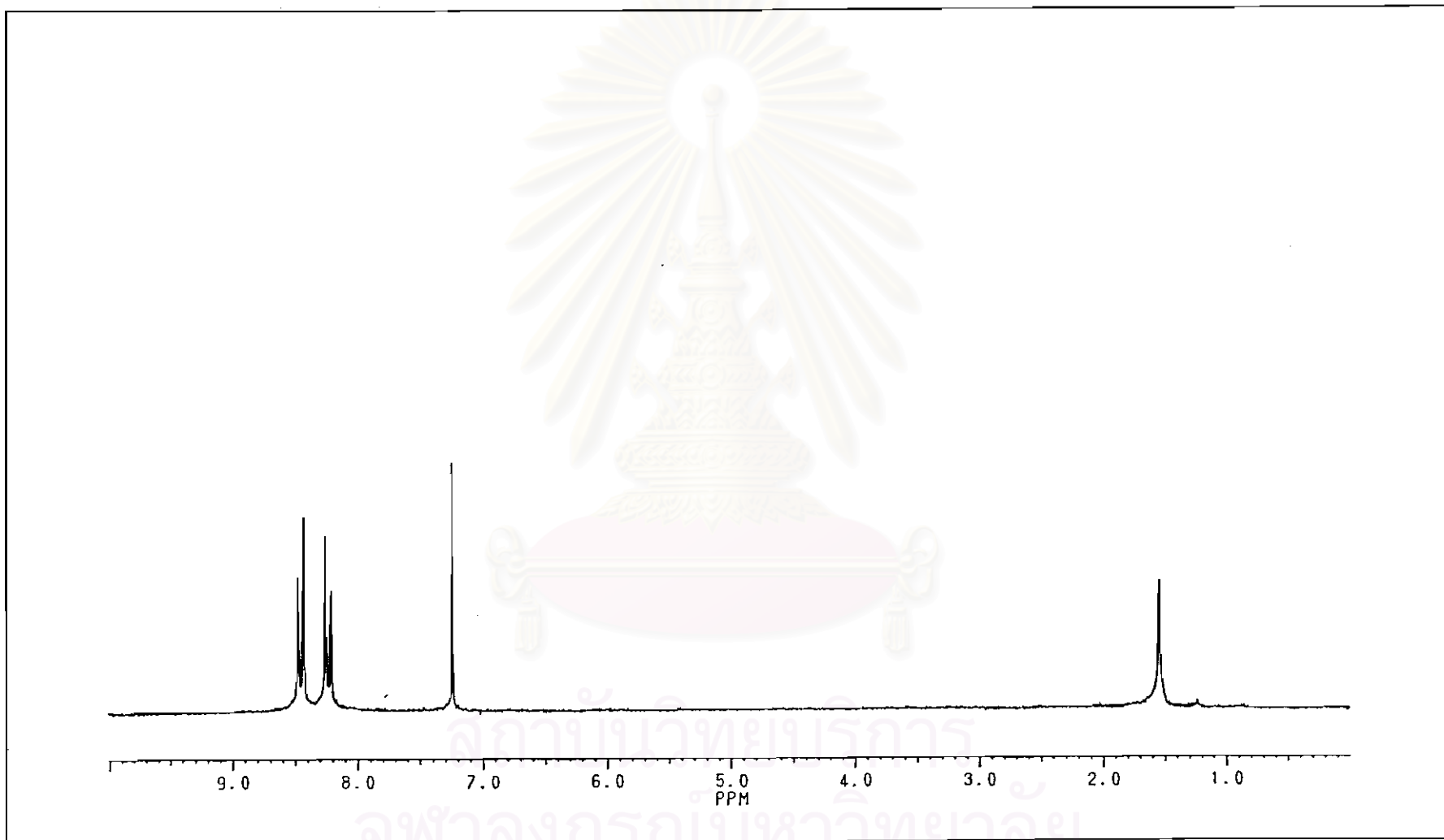


Figure 26:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentachlorophenyl 4-nitrobenzenesulfonate (4d)



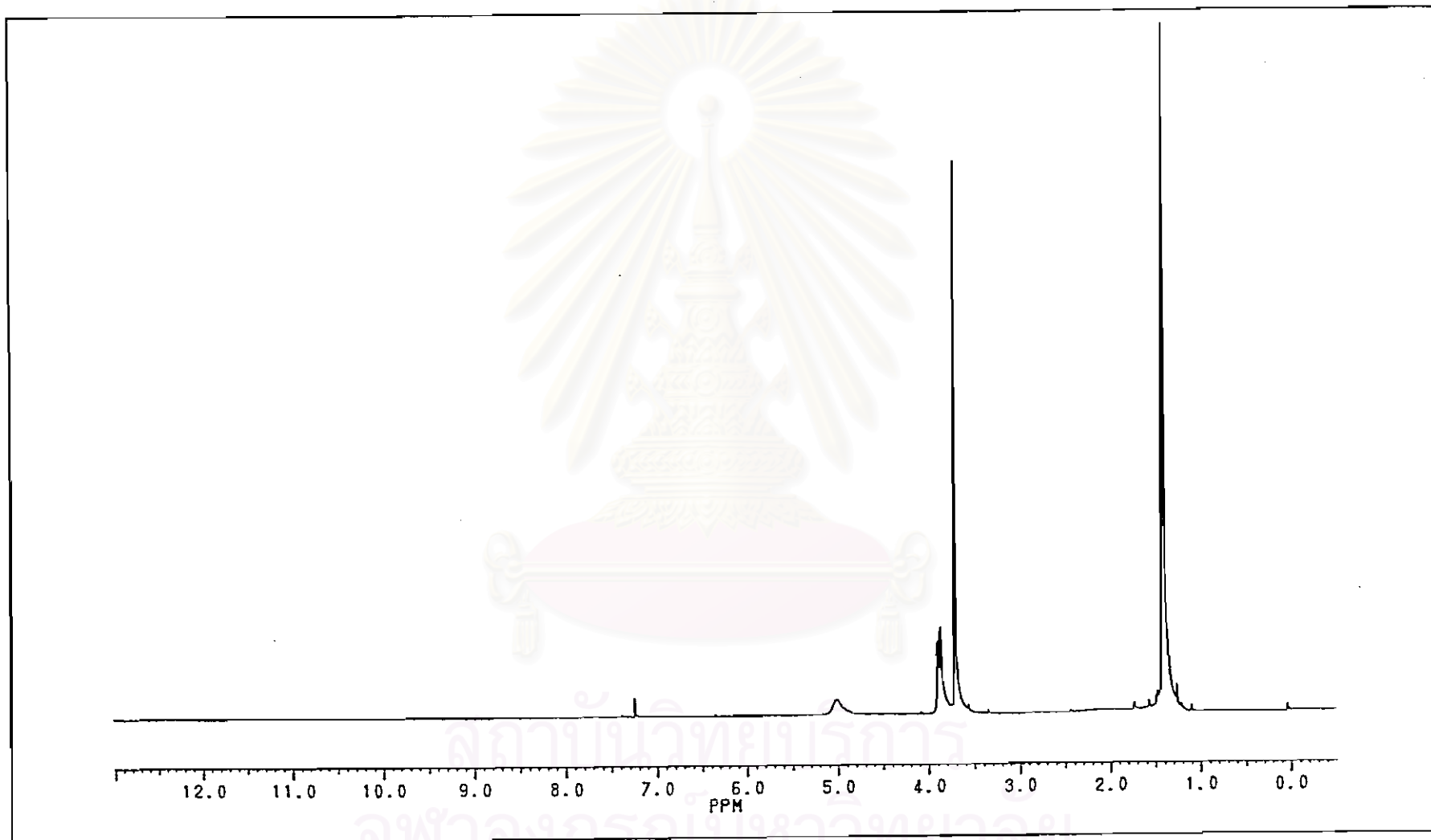


Figure 27:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine methyl ester (Boc-Gly-OMe)

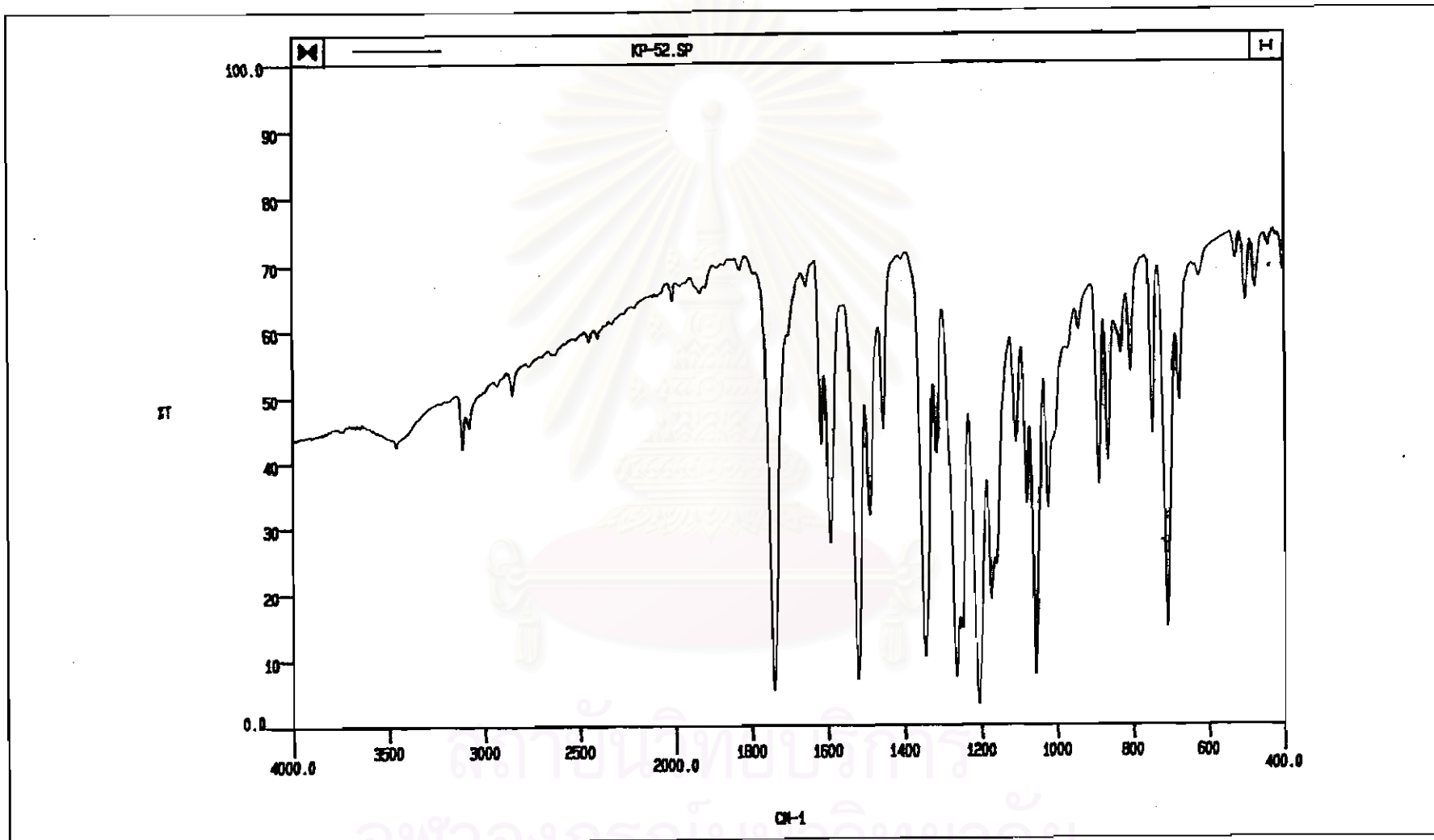


Figure 28: IR spectrum (KBr) of 4-nitrophenyl benzoate

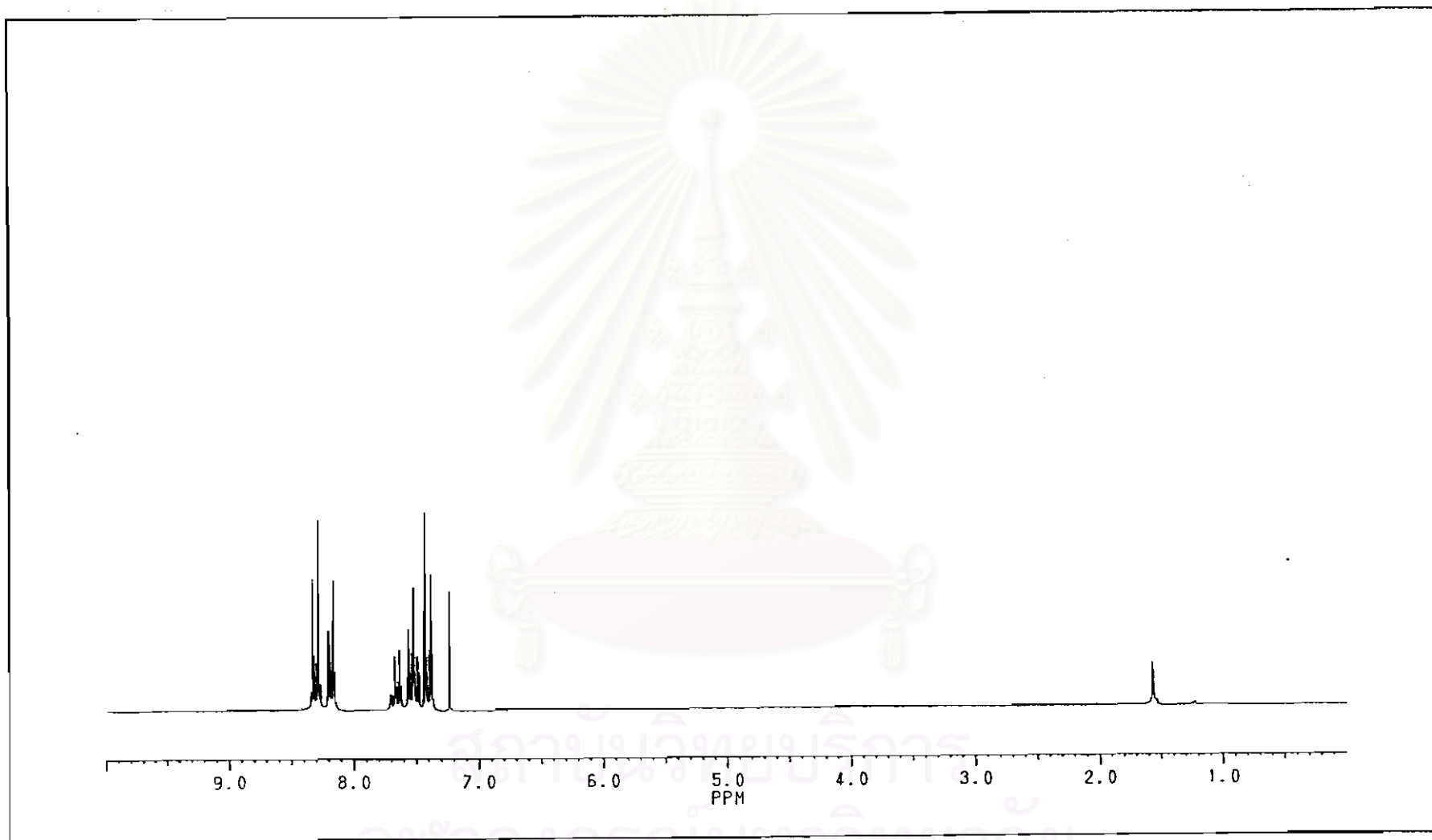


Figure 29:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrophenyl benzoate

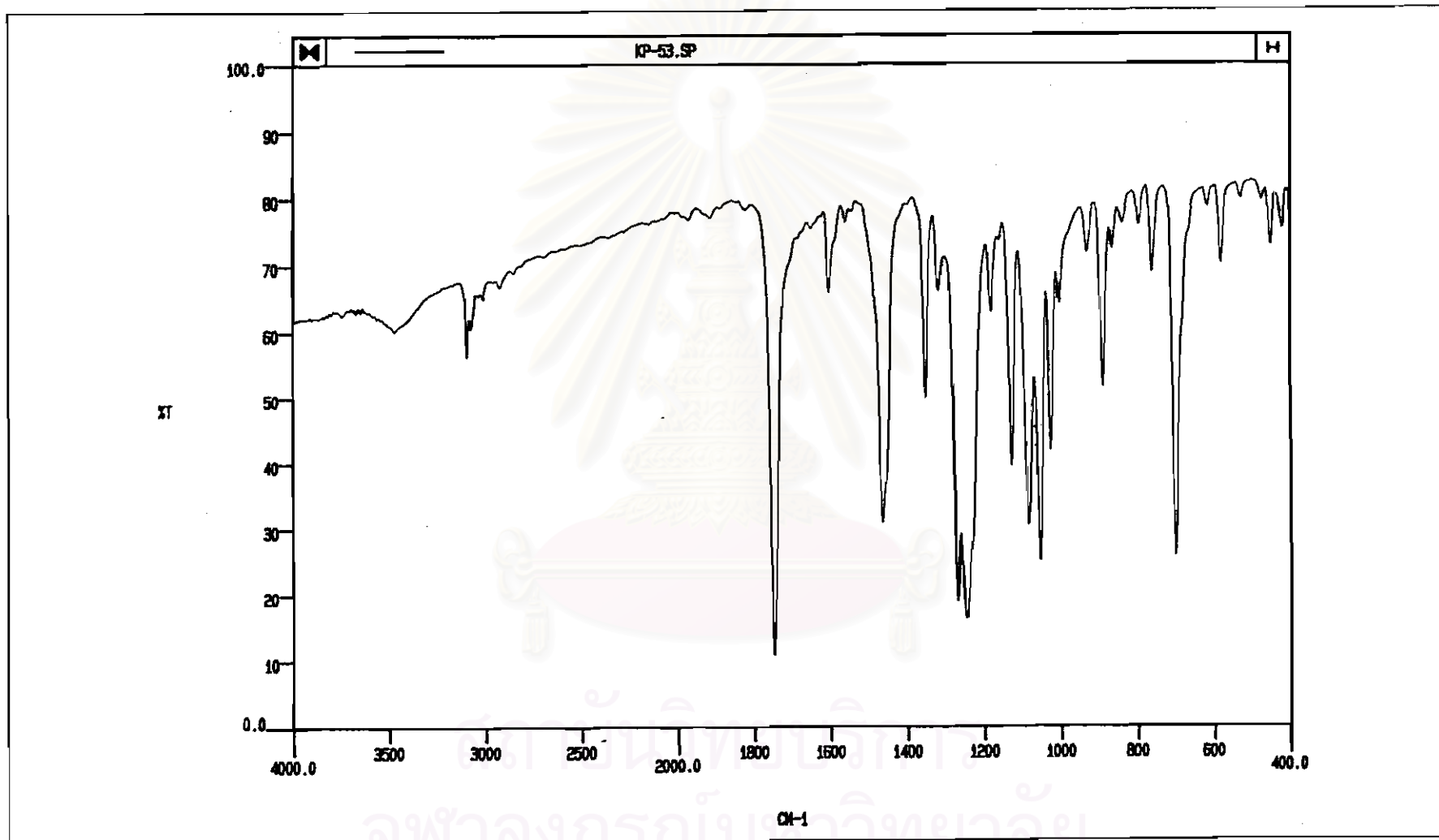
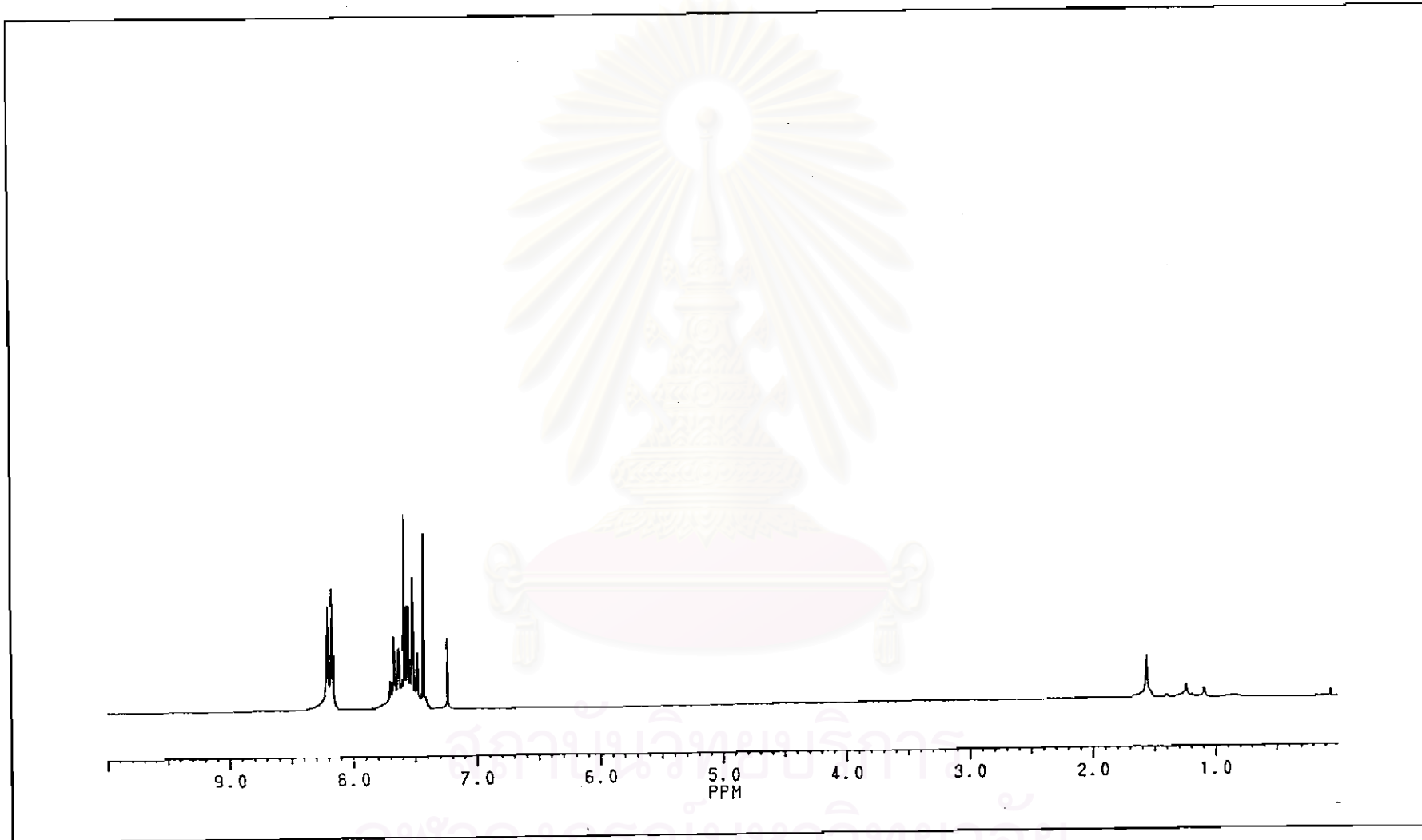


Figure 30: IR spectrum (KBr) of 2,4,5-trichlorophenyl benzoate



**Figure 31:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 2,4,5-trichlorophenyl benzoate

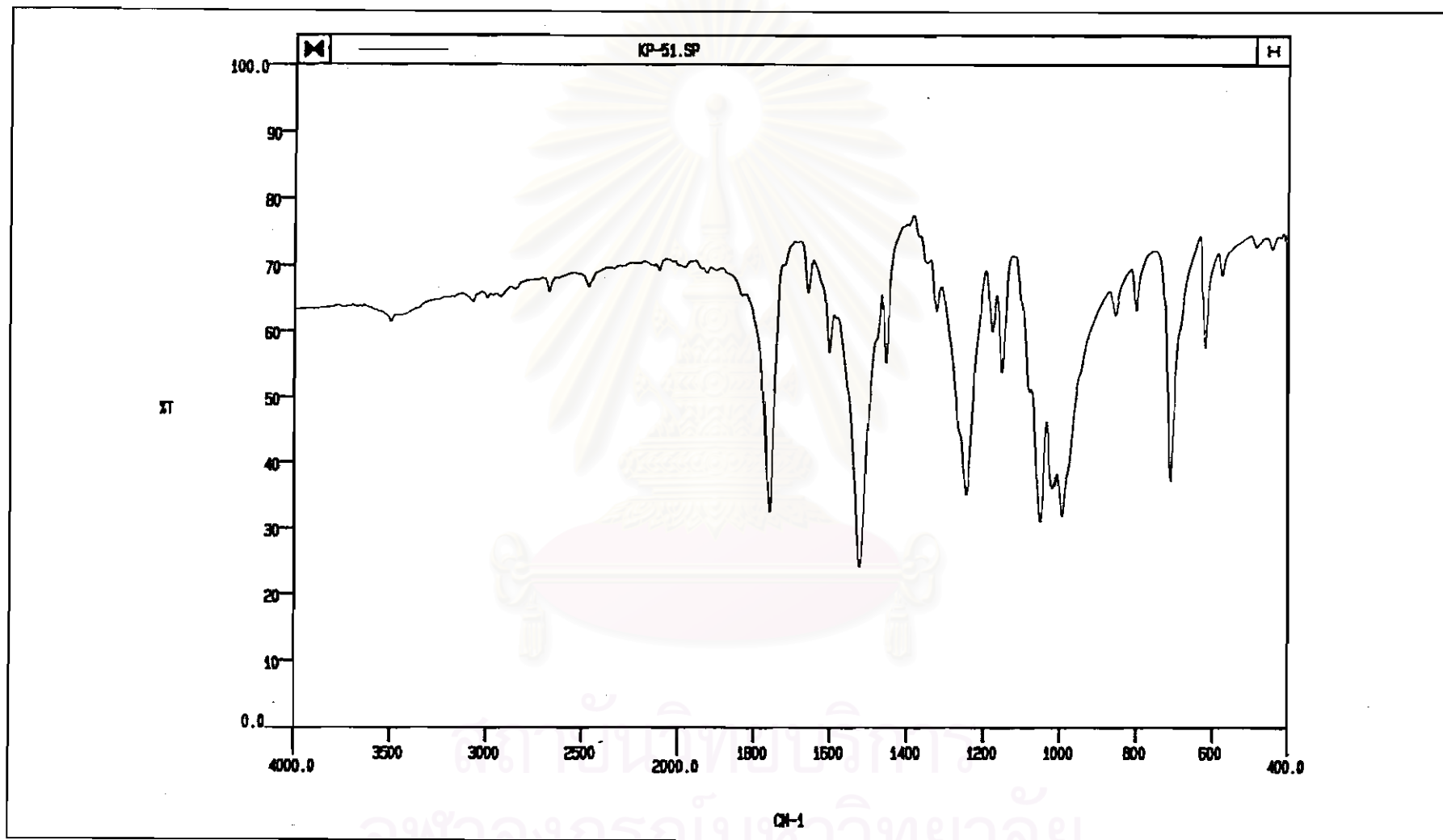


Figure 32: IR spectrum (KBr) of pentafluorophenyl benzoate

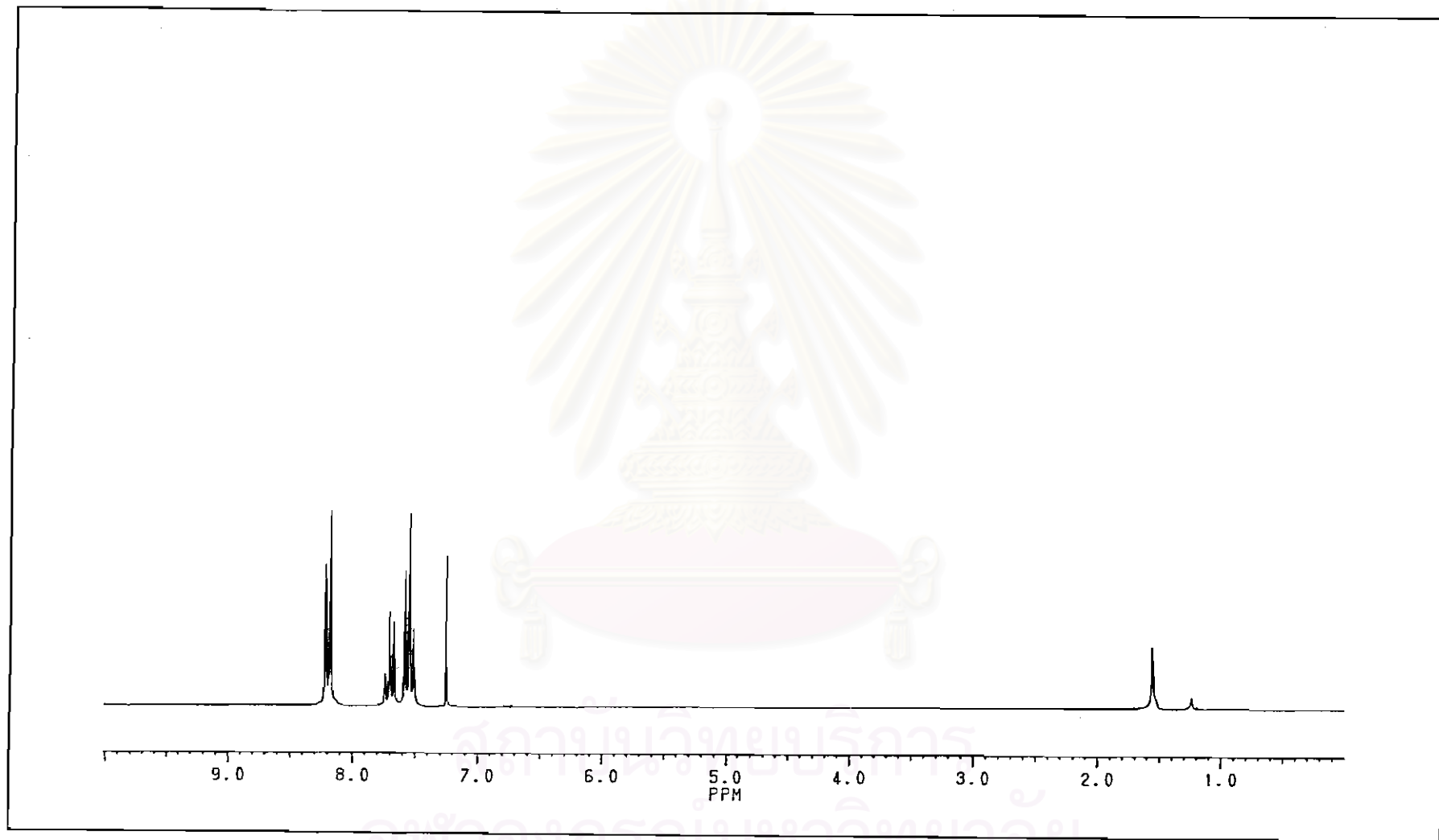


Figure 33:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentafluorophenyl benzoate

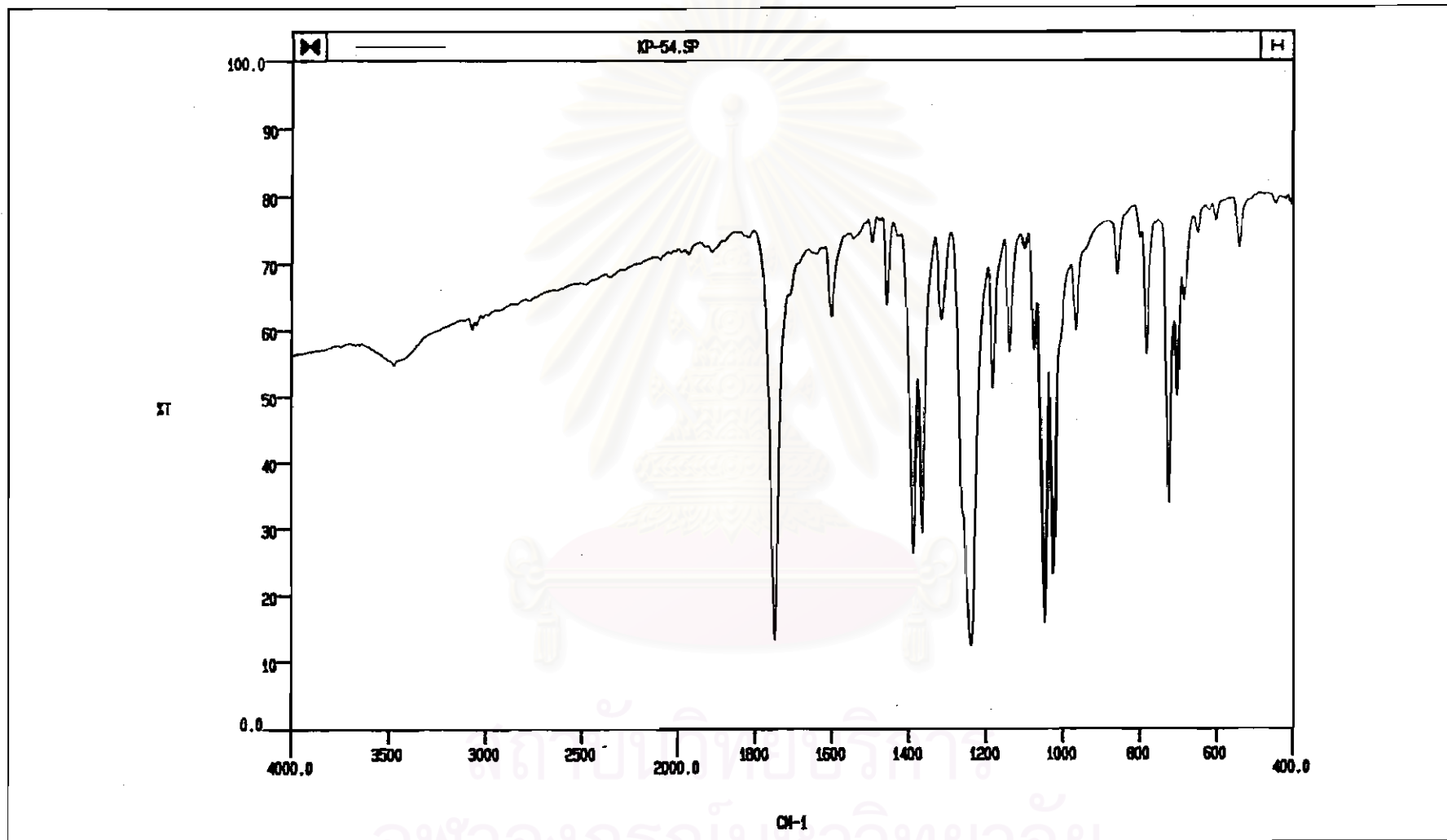


Figure 34: IR spectrum (KBr) of pentachlorophenyl benzoate



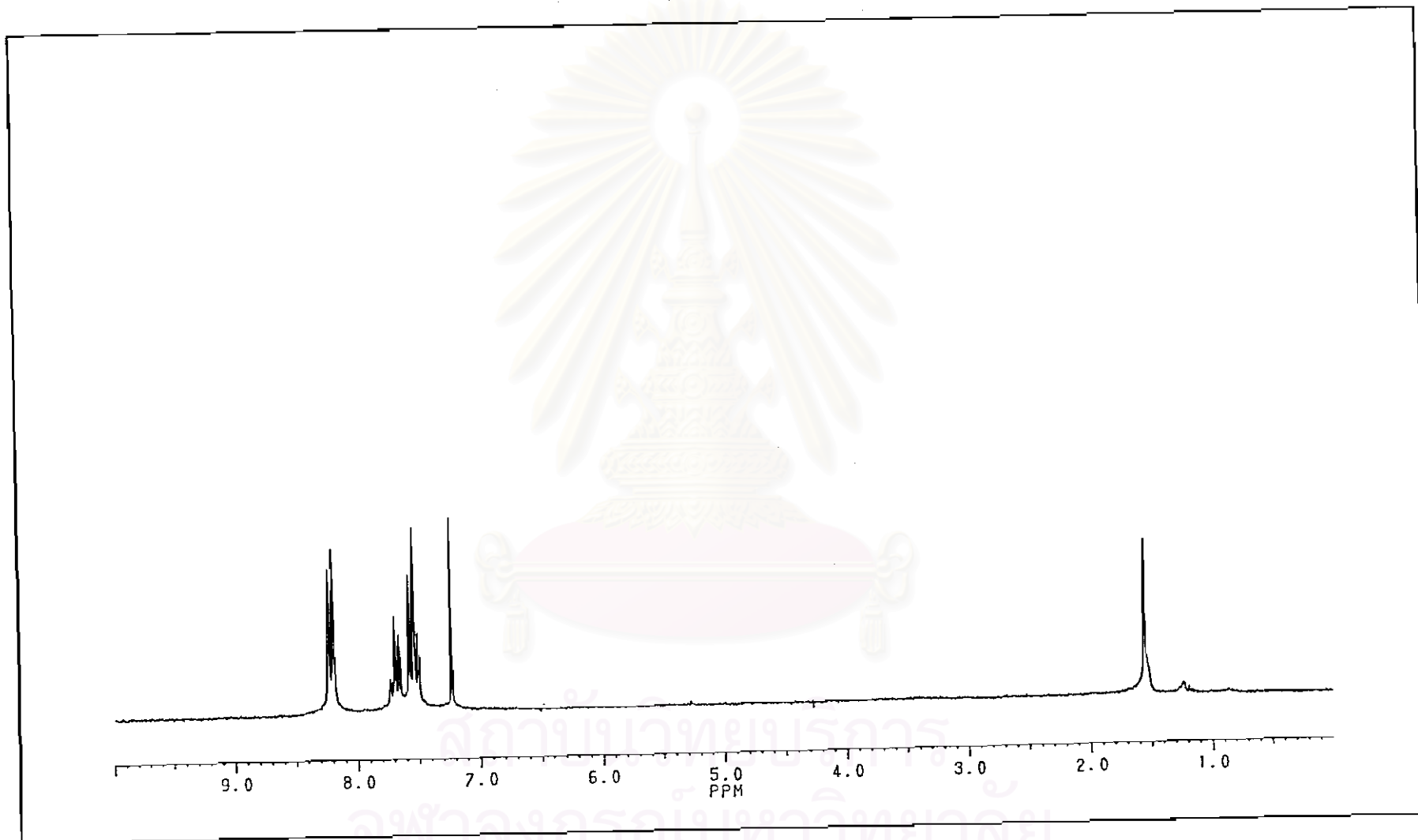


Figure 35:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of pentachlorophenyl benzoate

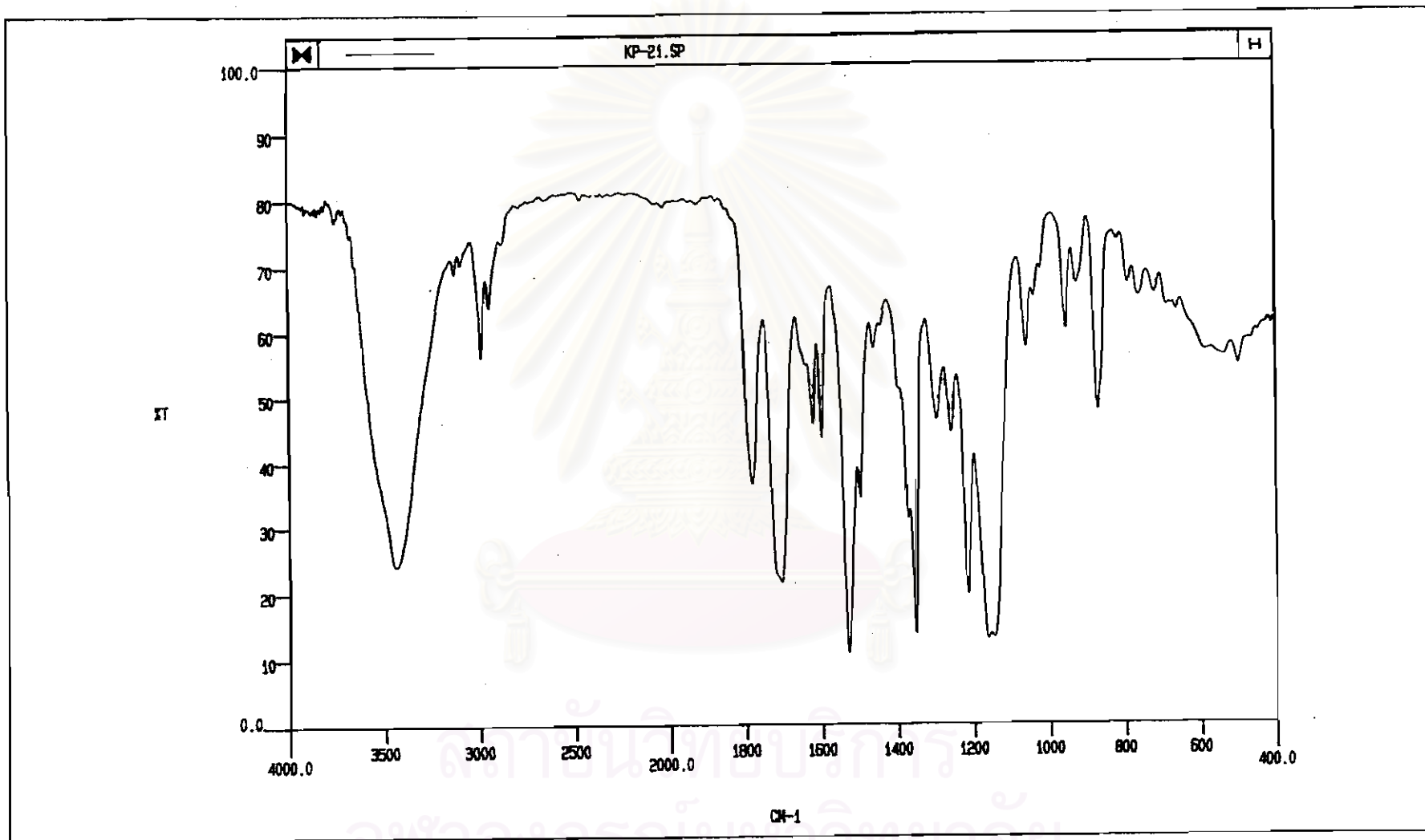


Figure 36: IR spectrum (KBr) of *N*-tert-butoxycarbonylglycine 4-nitrophenyl ester (Boc-Gly-OPnp)

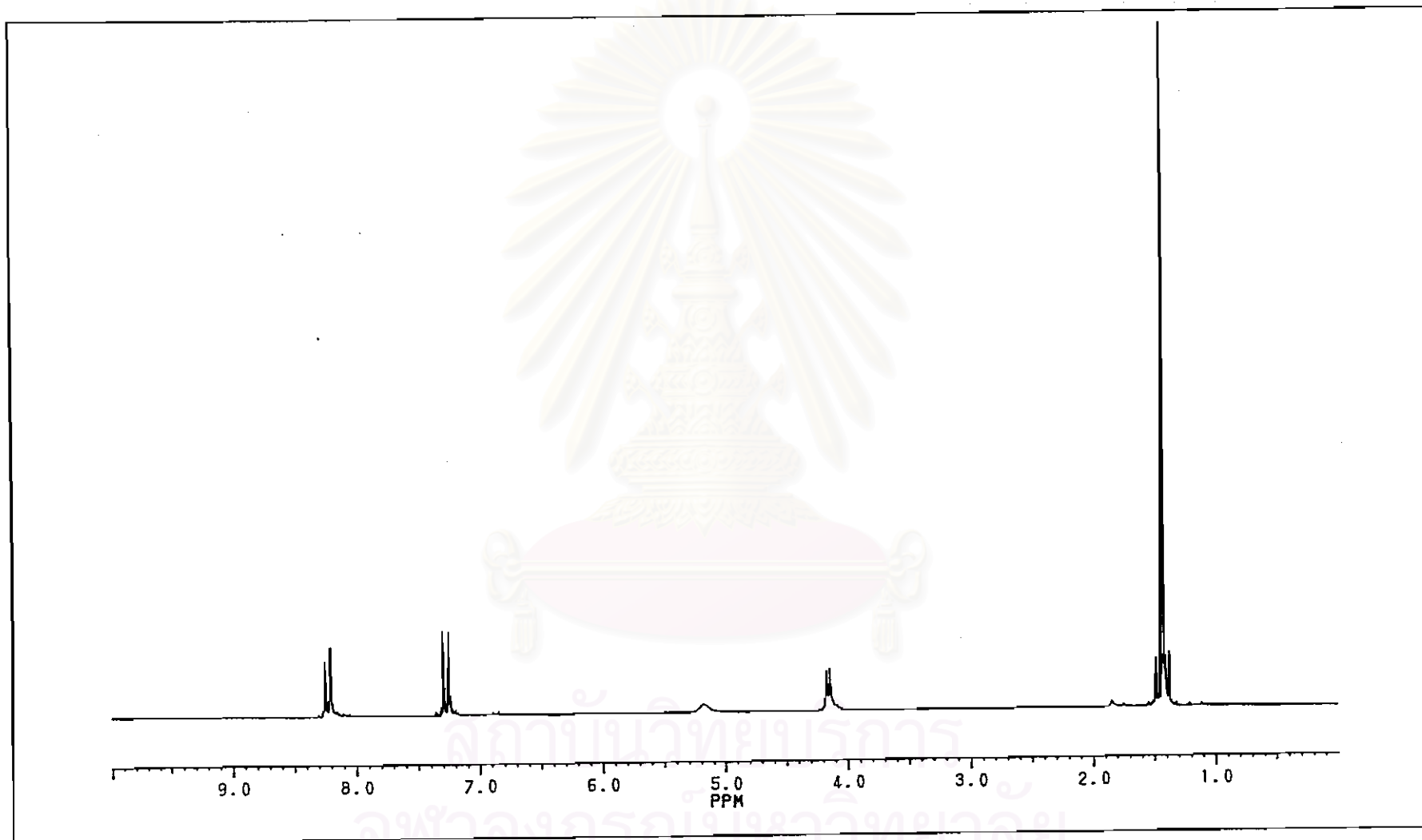


Figure 37:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine 4-nitrophenyl ester (Boc-Gly-OPnp)

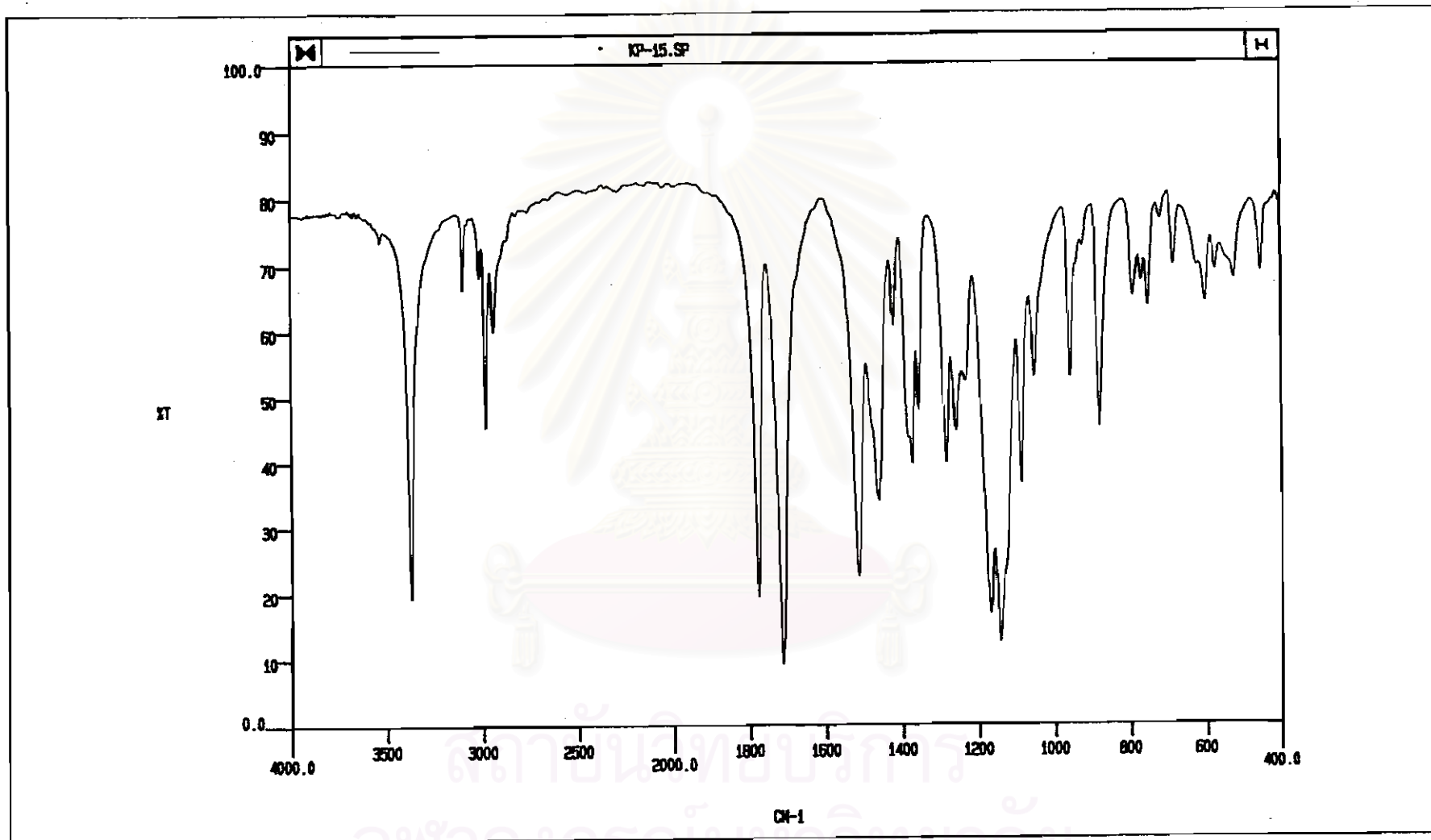
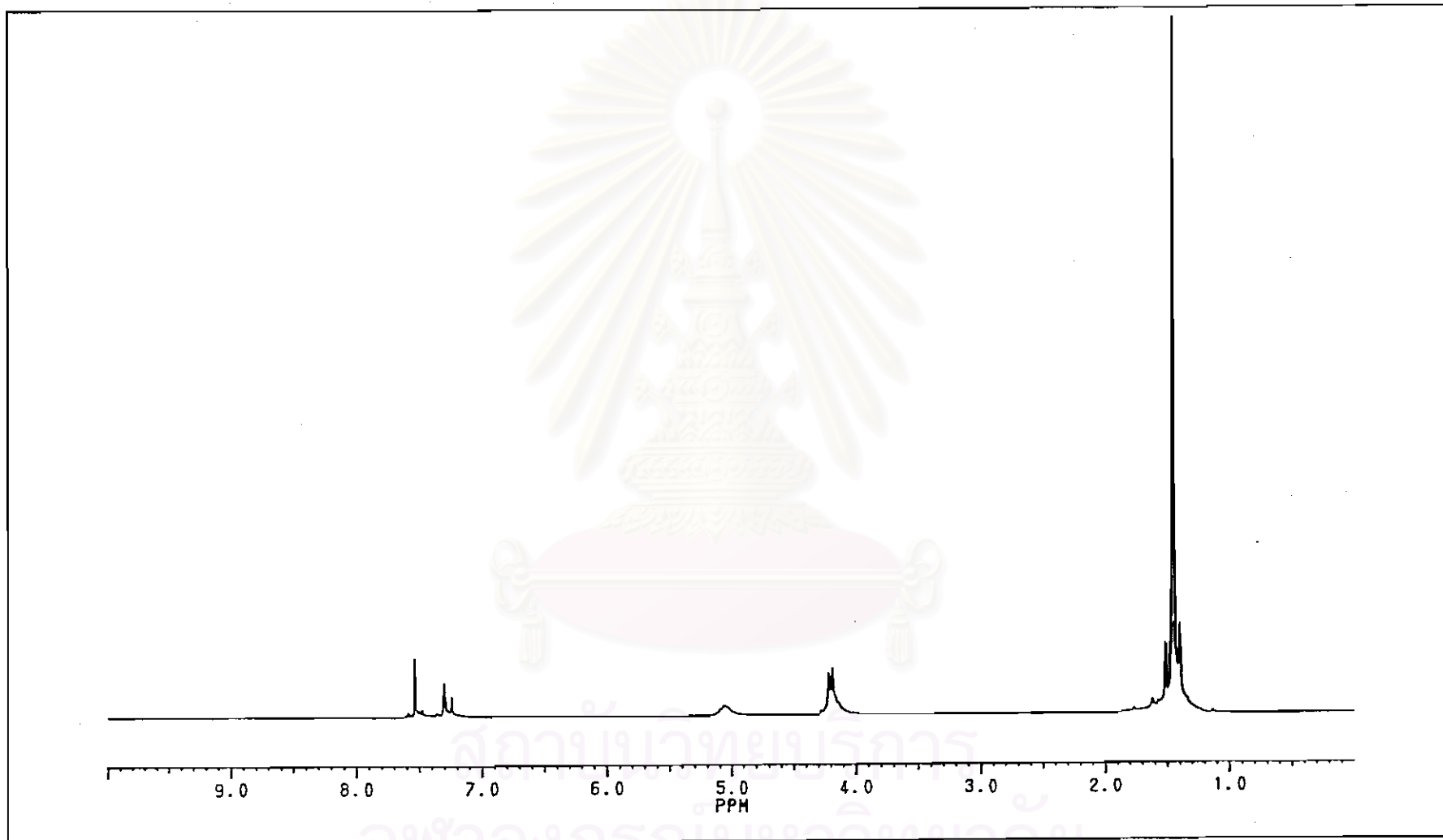


Figure 38: IR spectrum (KBr) of *N*-*tert*-butoxycarbonylglycine 2,4,5-trichlorophenyl ester (Boc-Gly-OTcp)



**Figure 39:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine 2,4,5-trichlorophenyl ester (Boc-Gly-OTcp)

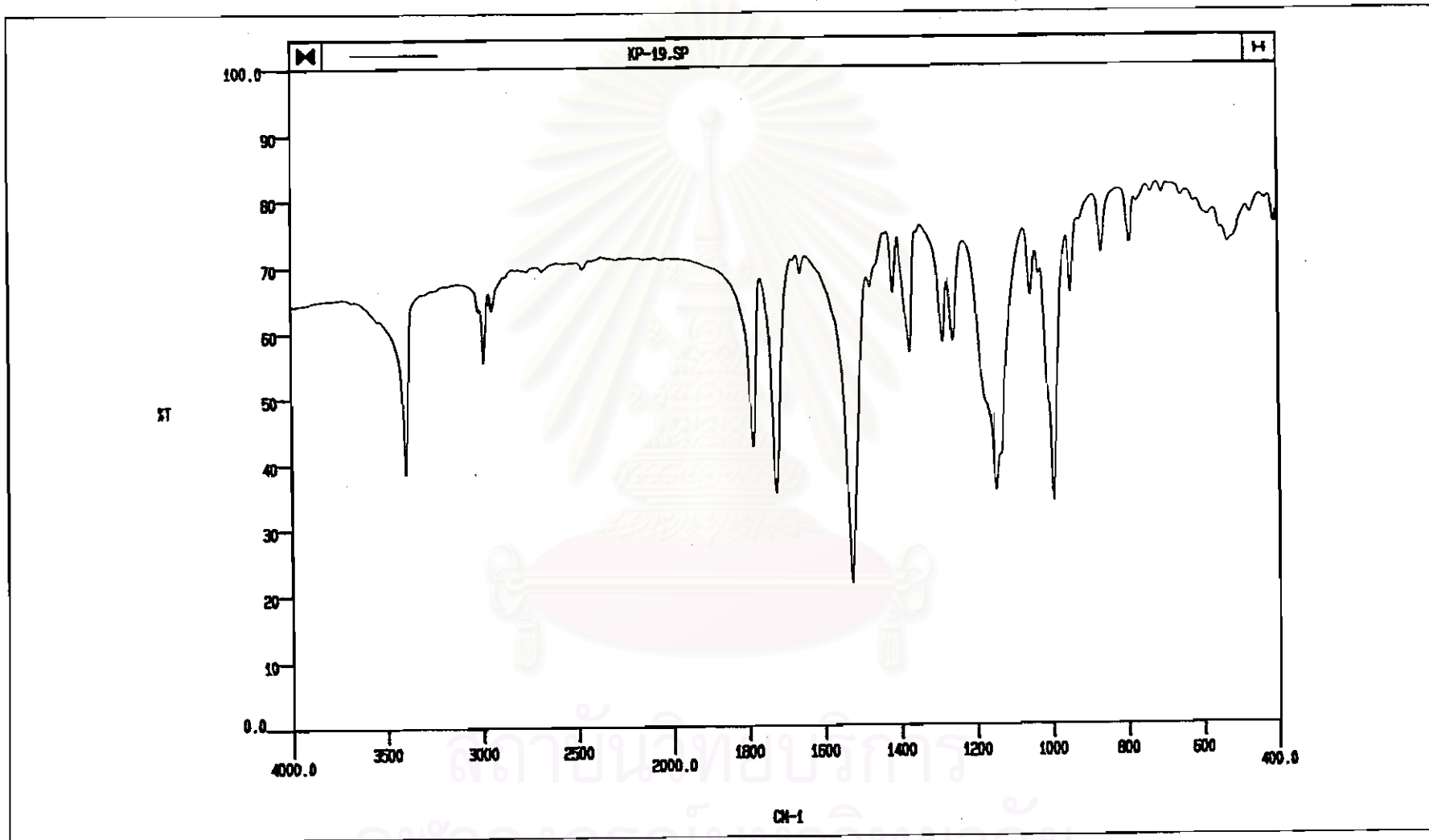


Figure 40: IR spectrum (KBr) of *N*-*tert*-butoxycarbonylglycine pentafluorophenyl ester (Boc-Gly-OPfp)

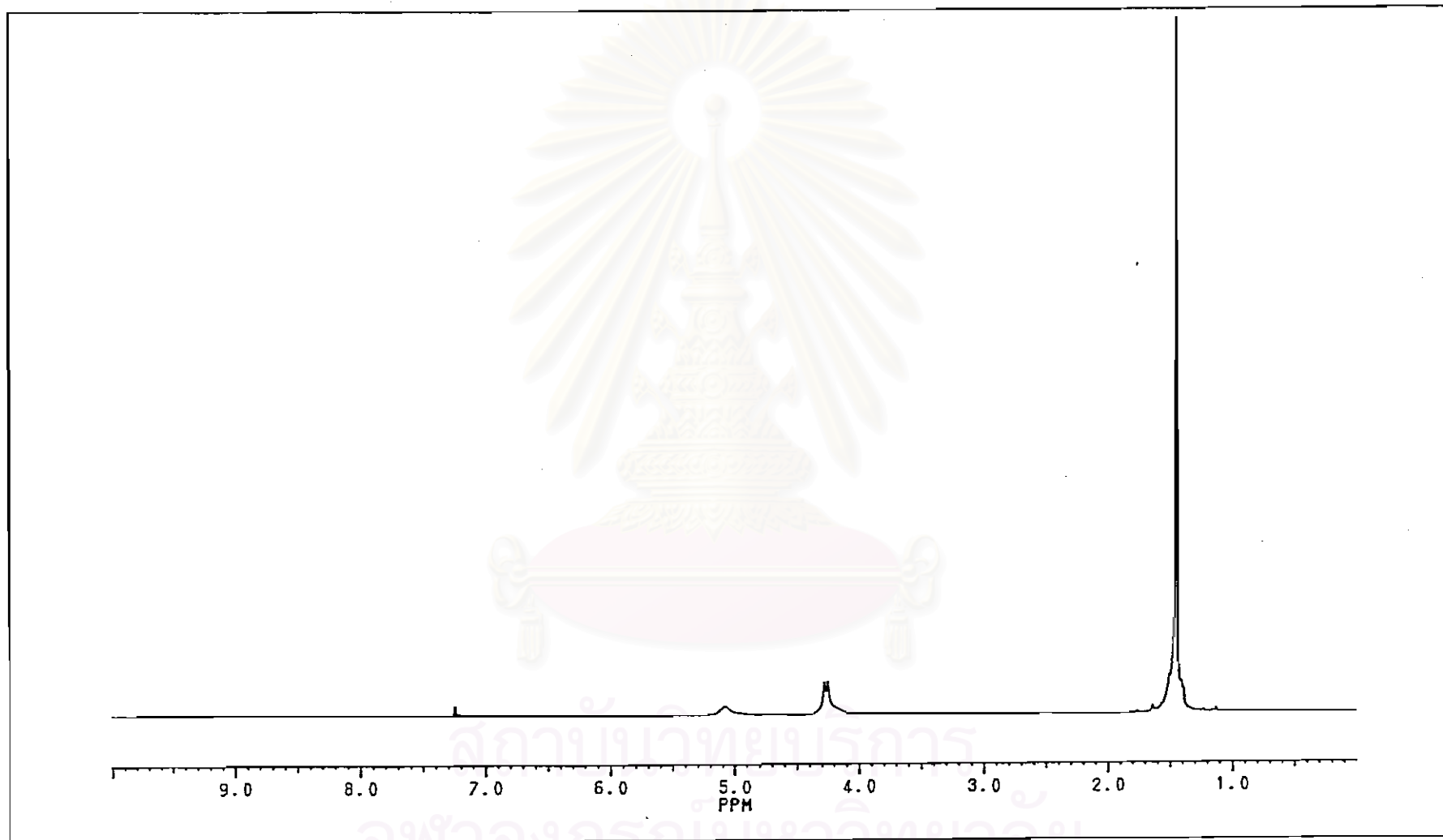


Figure 41:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine pentafluorophenyl ester (Boc-Gly-OPfp)

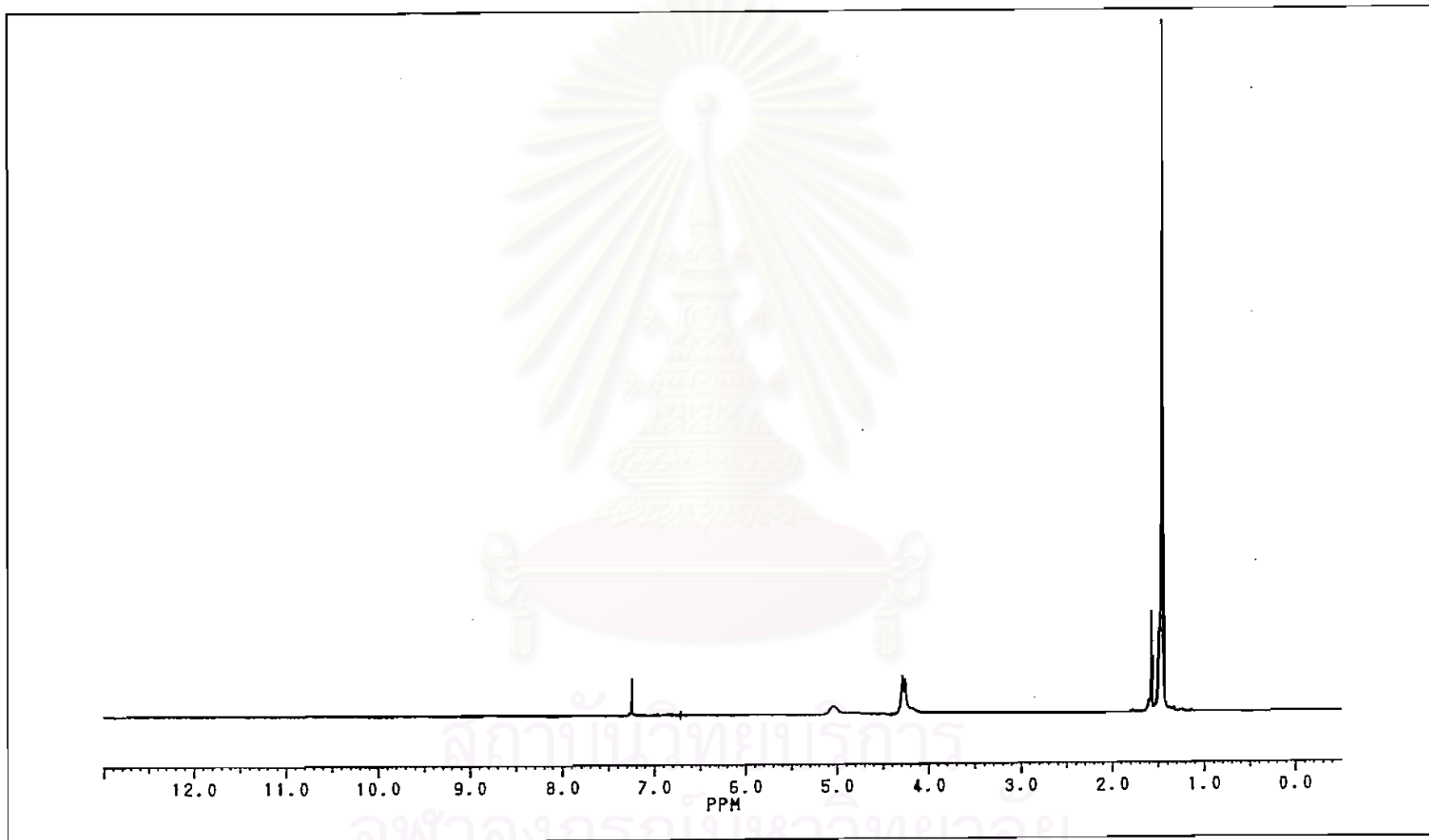


Figure 42:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycine pentachlorophenyl ester (Boc-Gly-OPcp)



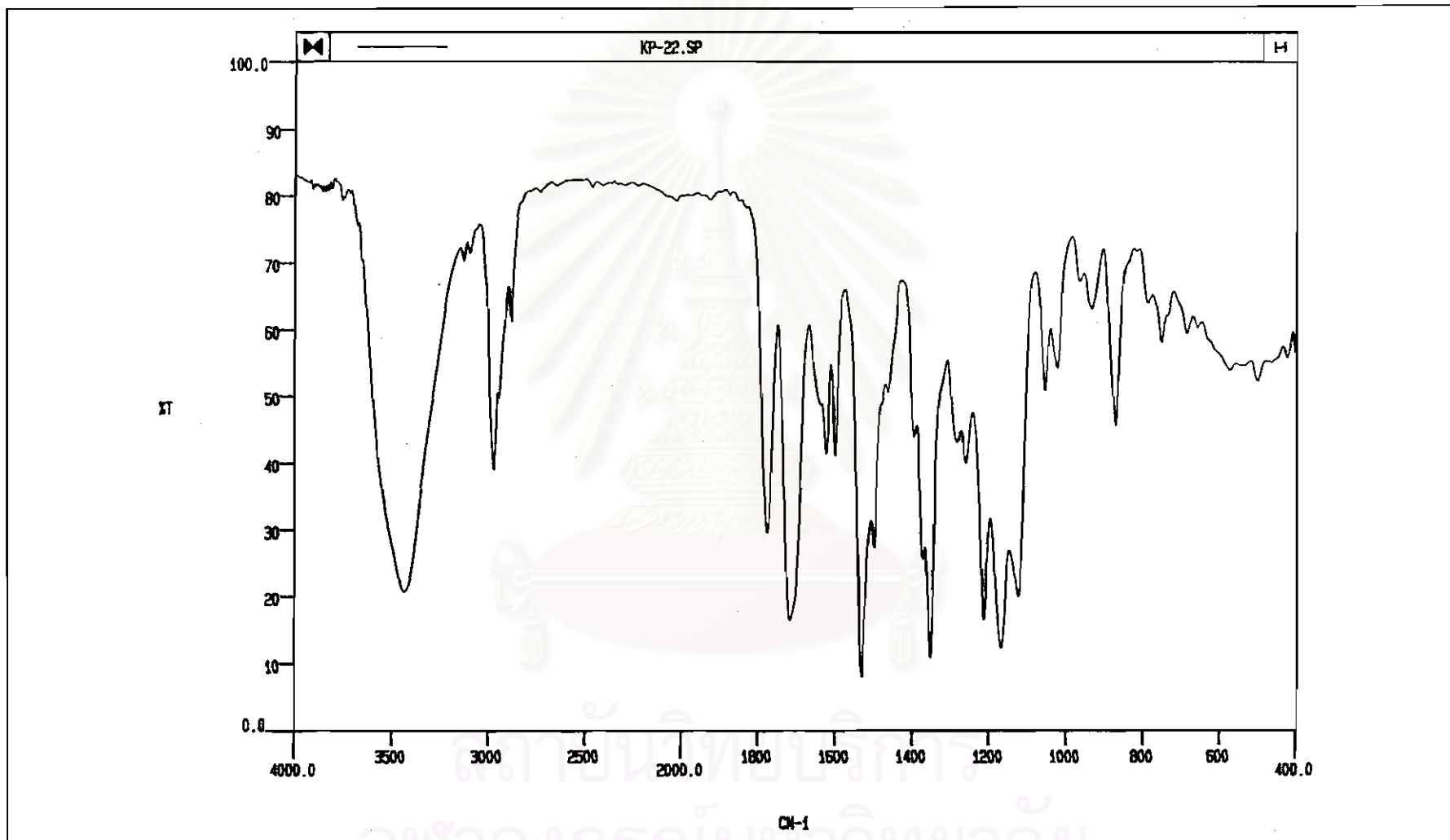


Figure 43: IR spectrum (KBr) of *N*-tert-butoxycarbonyl-L-leucine 4-nitrophenyl ester (Boc-L-Leu-OPnp)

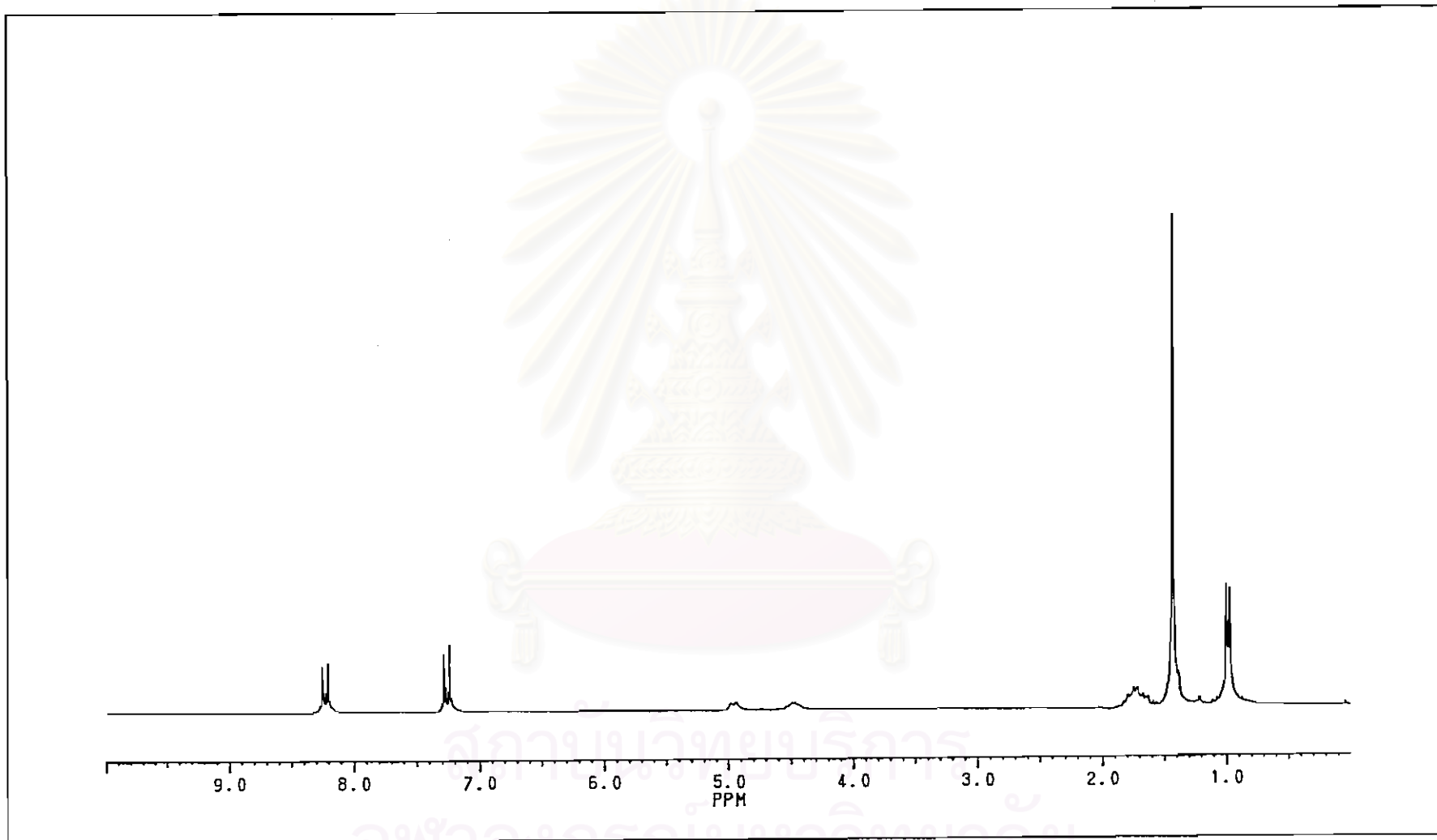
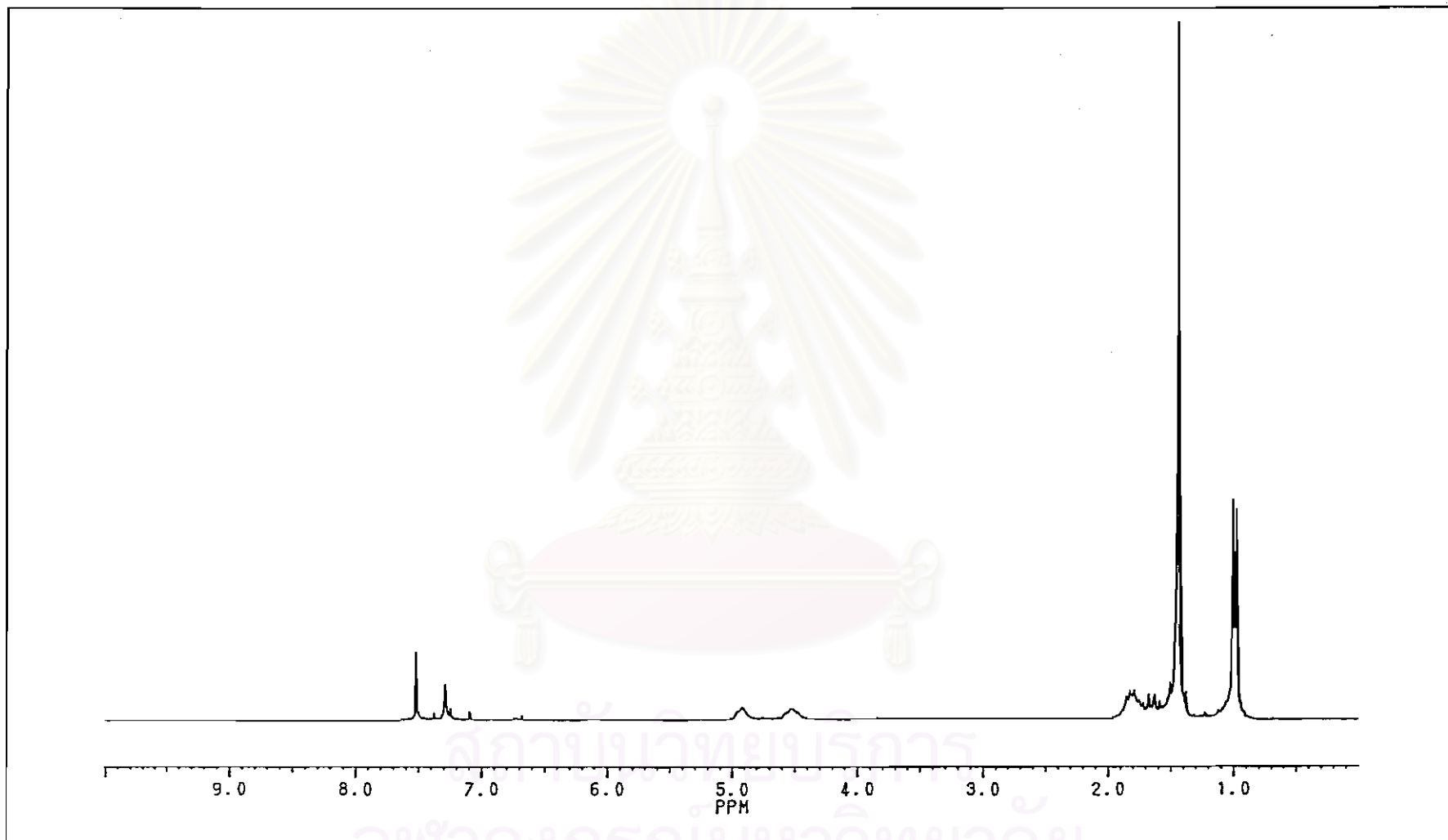
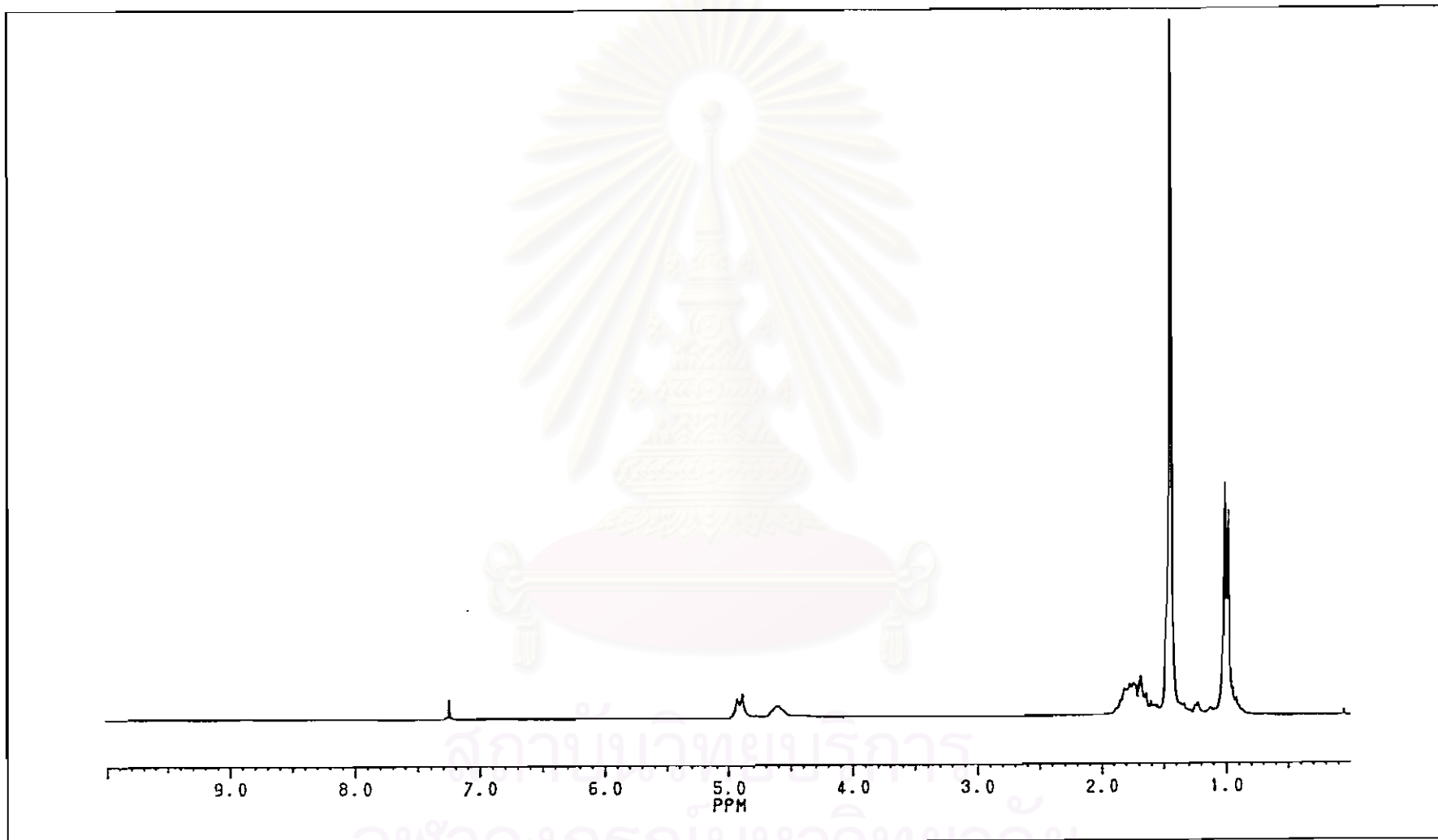


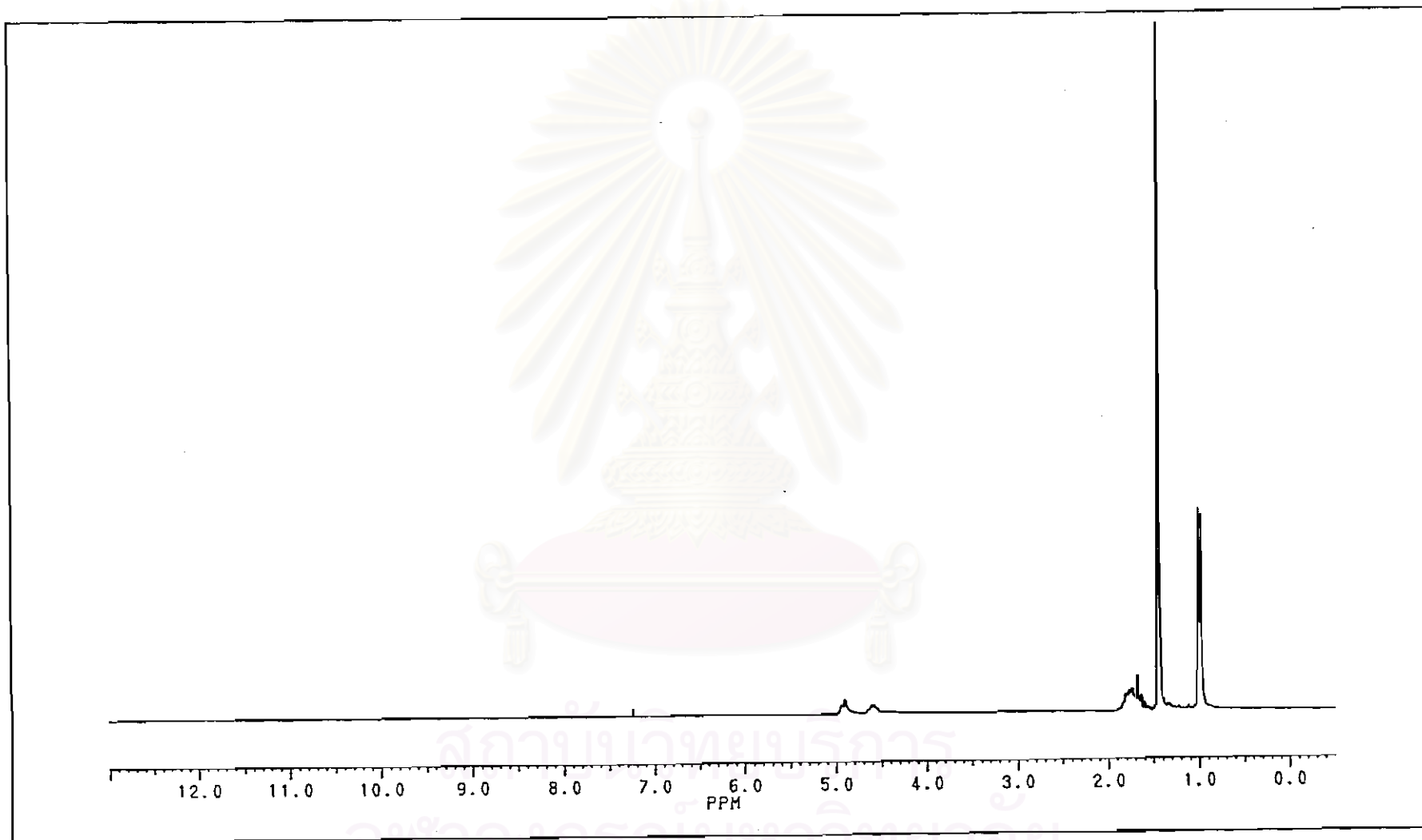
Figure 44:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucine 4-nitrophenyl ester (Boc-L-Leu-OPnp)



**Figure 45:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucine 2,4,5-trichlorophenyl ester (Boc-L-Leu-OTcp)



**Figure 46:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucine pentafluorophenyl ester (Boc-L-Leu-OPfp)



**Figure 47:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucine pentachlorophenyl ester (Boc-L-Leu-OPcp)

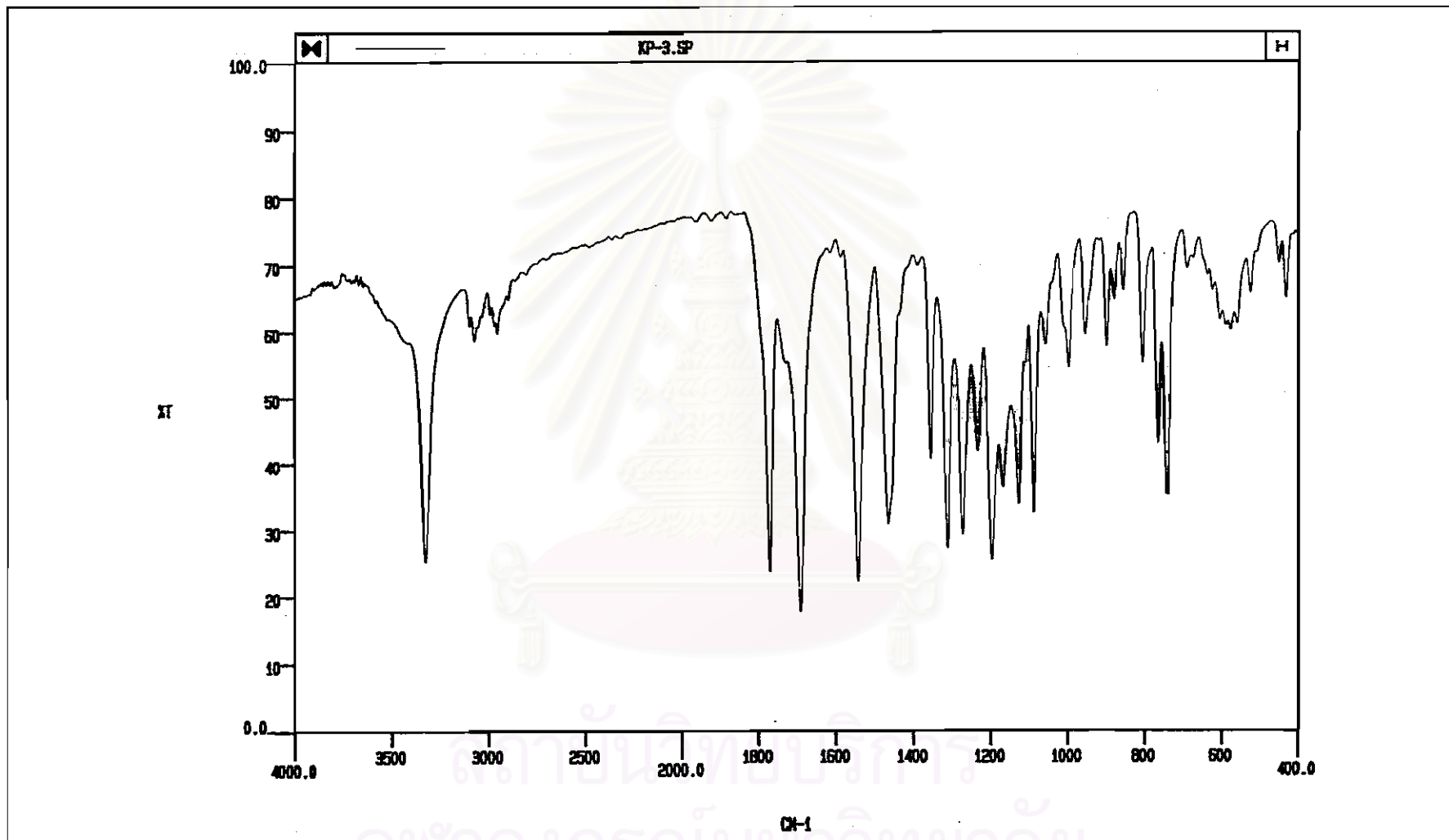
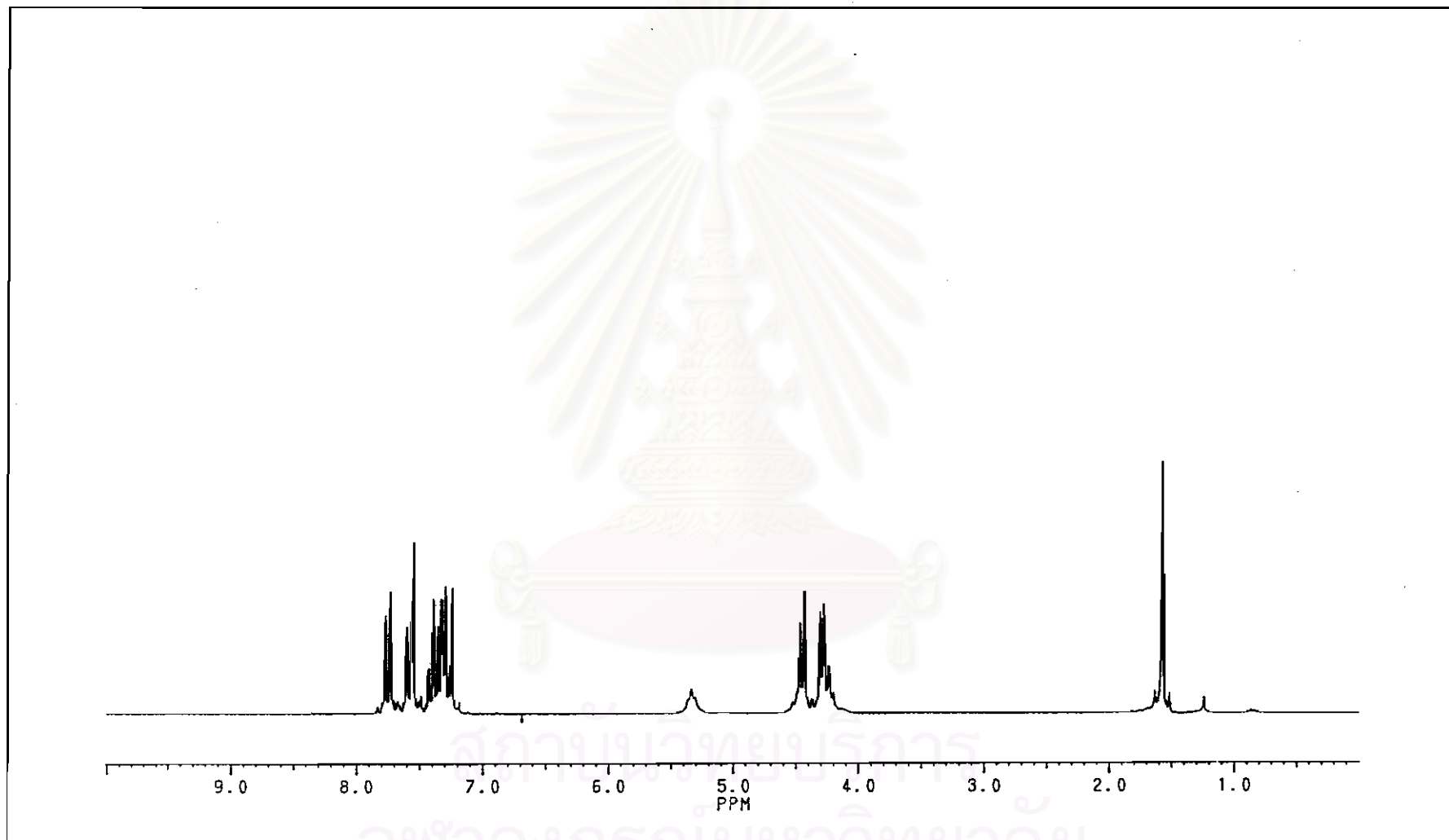


Figure 48: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonylglycine 2,4,5-trichlorophenyl ester (Fmoc-Gly-OTcp)



**Figure 49:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl glycine 2,4,5-trichlorophenyl ester (Fmoc-Gly-OTcp)

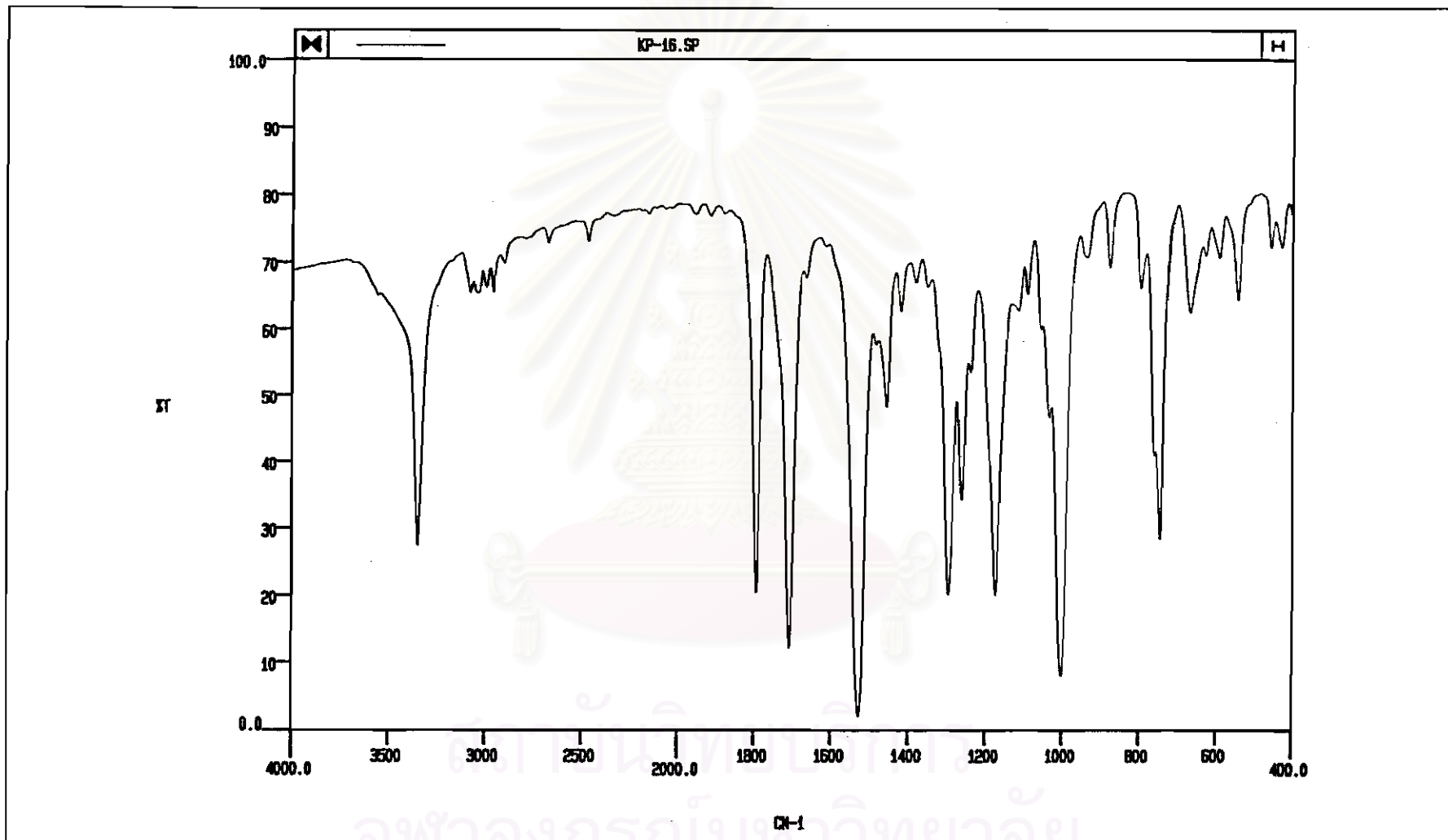
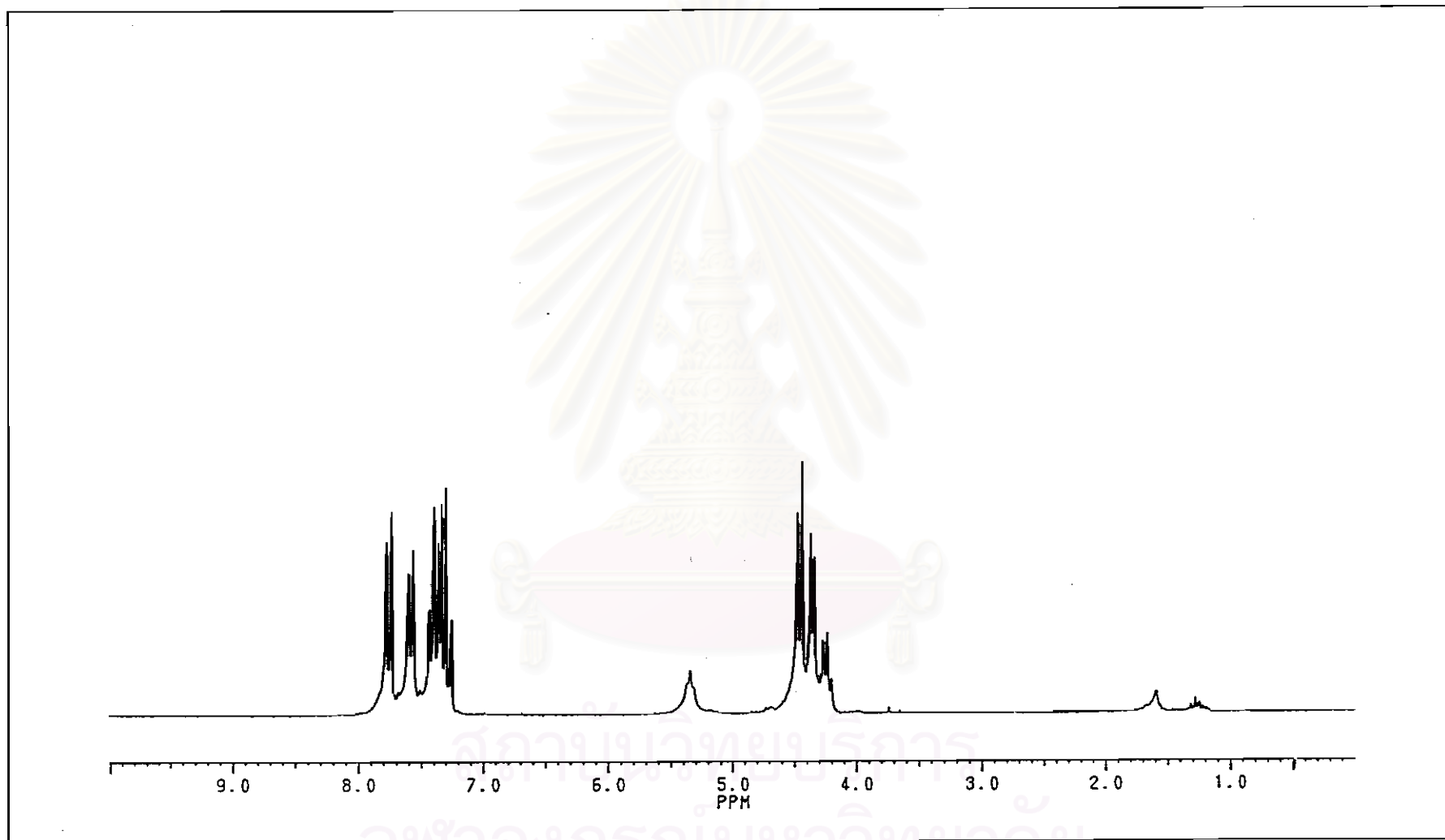


Figure 50: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonylglycine pentafluorophenyl ester (Fmoc-Gly-OPfp)





**Figure 51:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl glycine pentafluorophenyl ester (Fmoc-Gly-OPfp)

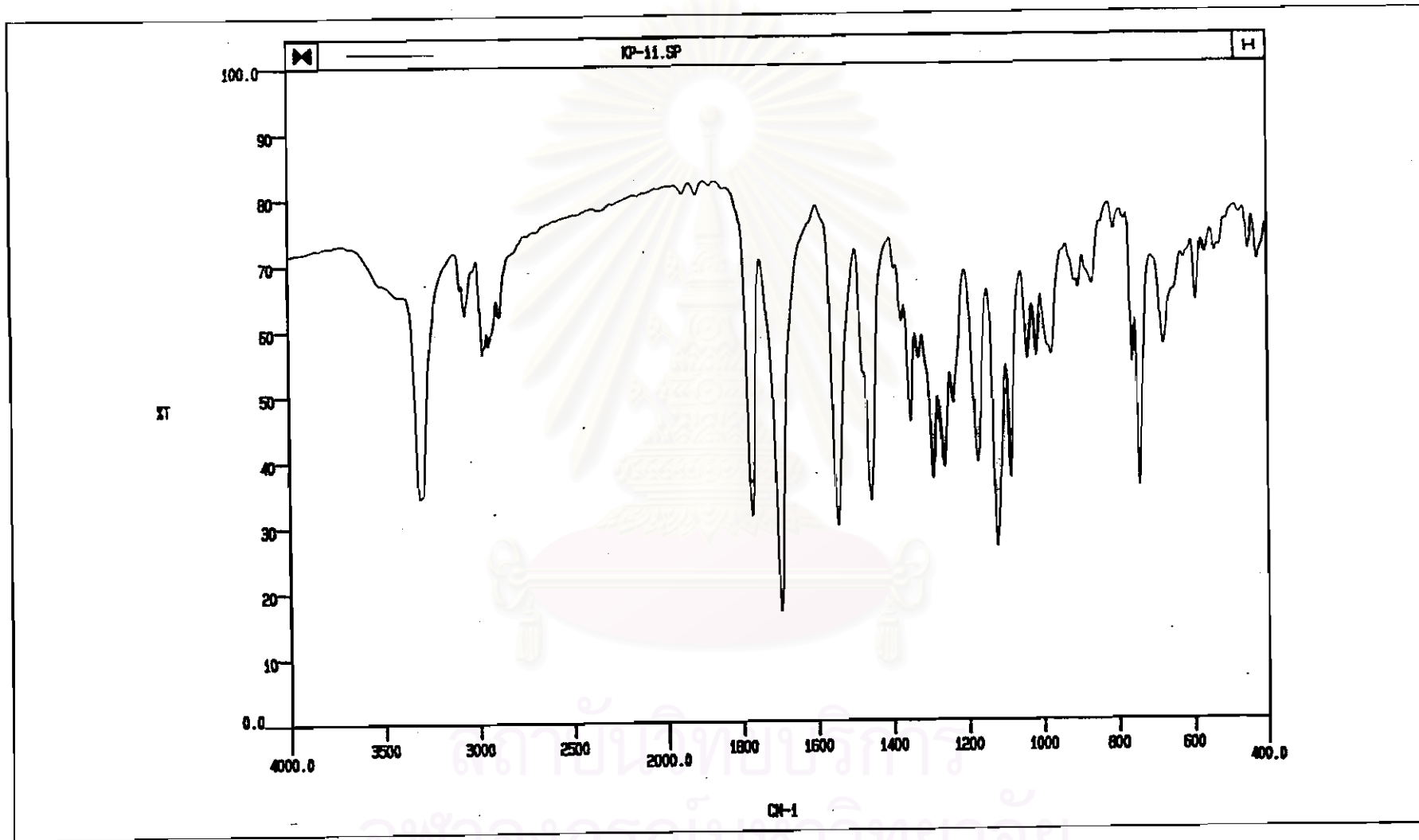
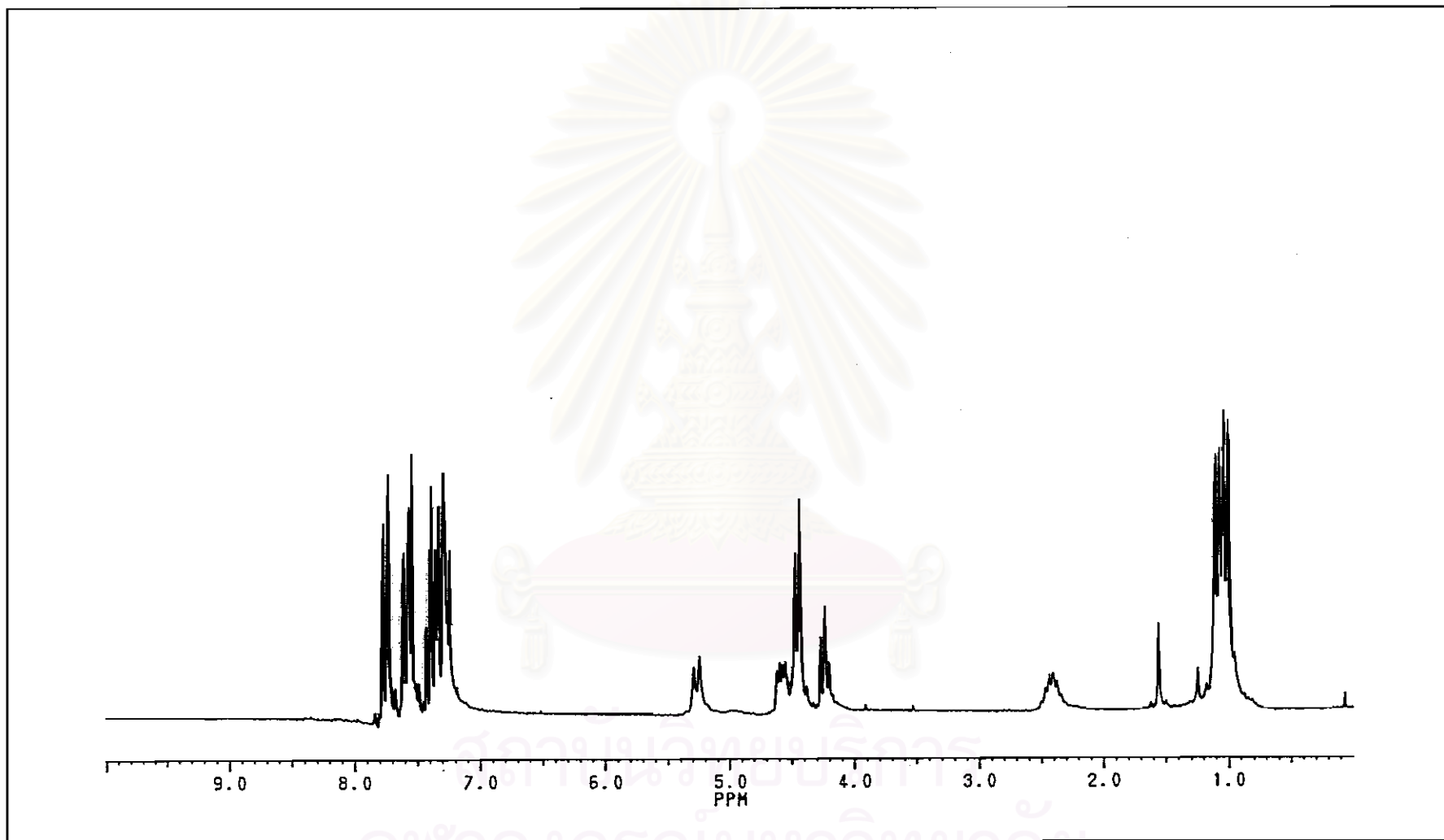


Figure 52: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-valine 2,4,5-trichlorophenyl ester (Fmoc-L-Val-OTcp)



**Figure 53:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-valine 2,4,5-trichlorophenyl ester (Fmoc-L-Val-OTcp)

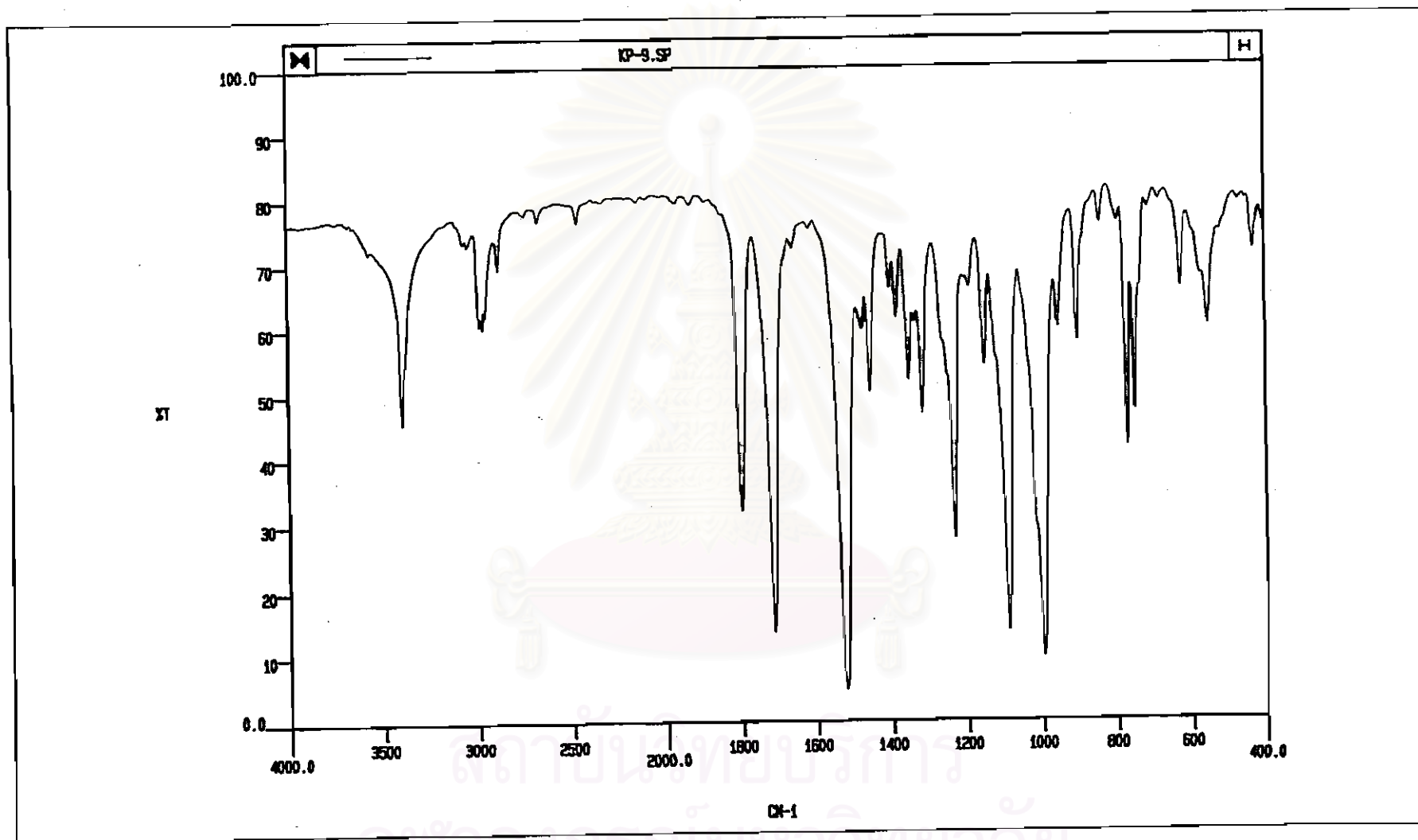
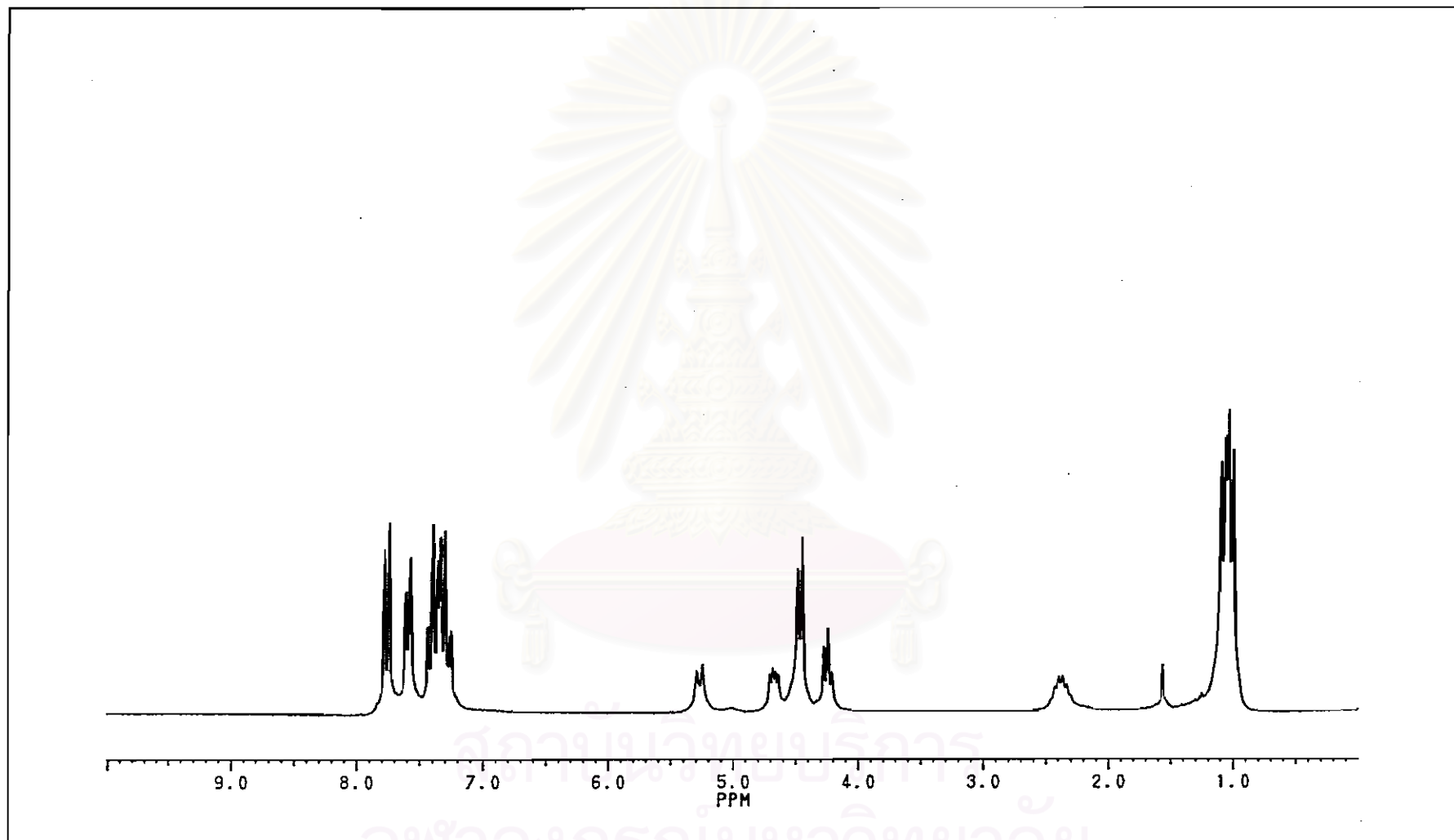


Figure 54: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-valine pentafluorophenyl ester (Fmoc-L-Val-OPfp)



**Figure 55:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-valine pentafluorophenyl ester (Fmoc-L-Val-OPfp)

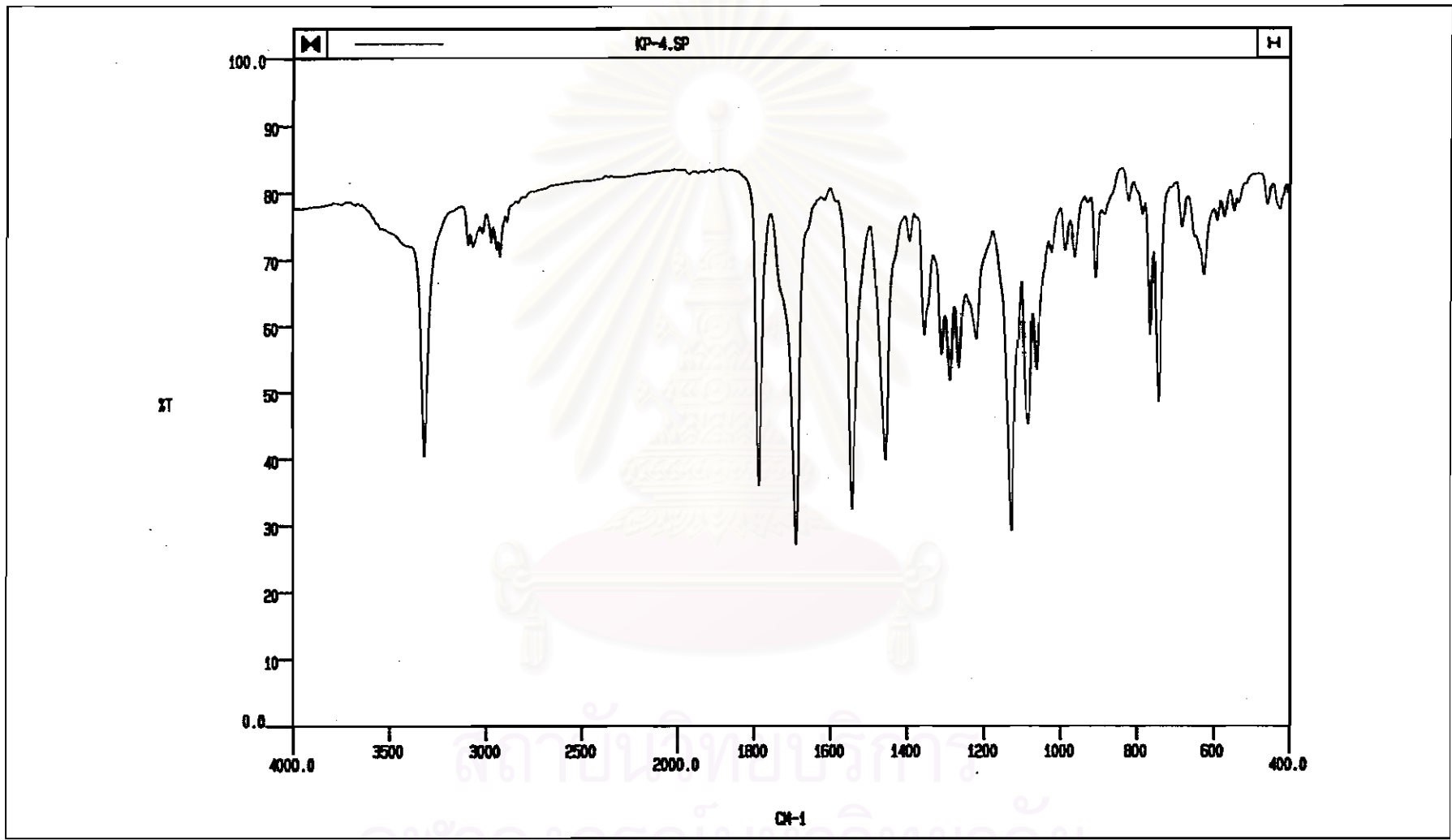
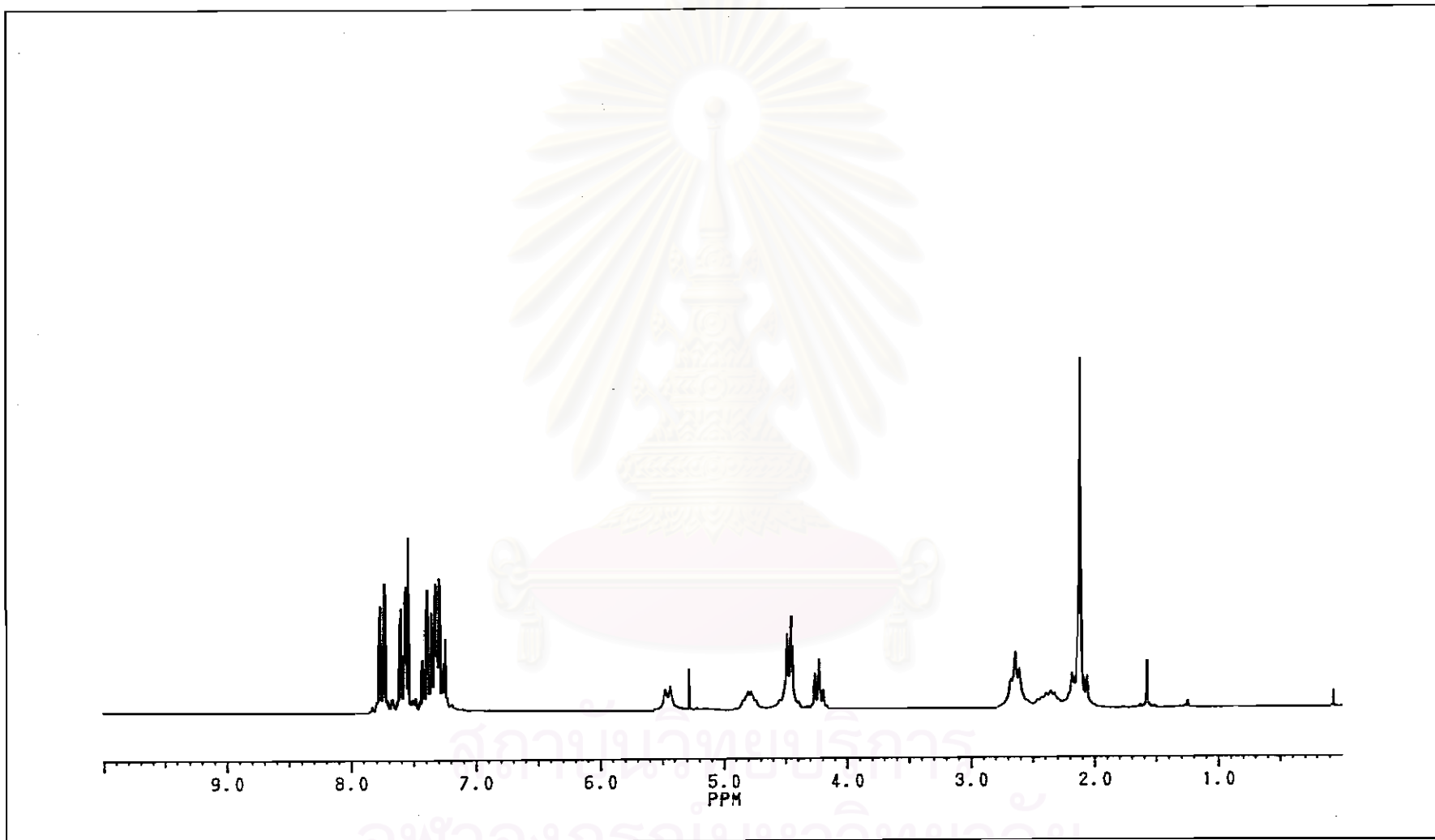


Figure 56: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-methionine 2,4,5-trichlorophenyl ester (Fmoc-L-Met-OTcp)



**Figure 57:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-methionine 2,4,5-trichlorophenyl ester (Fmoc-L-Met-OTcp)

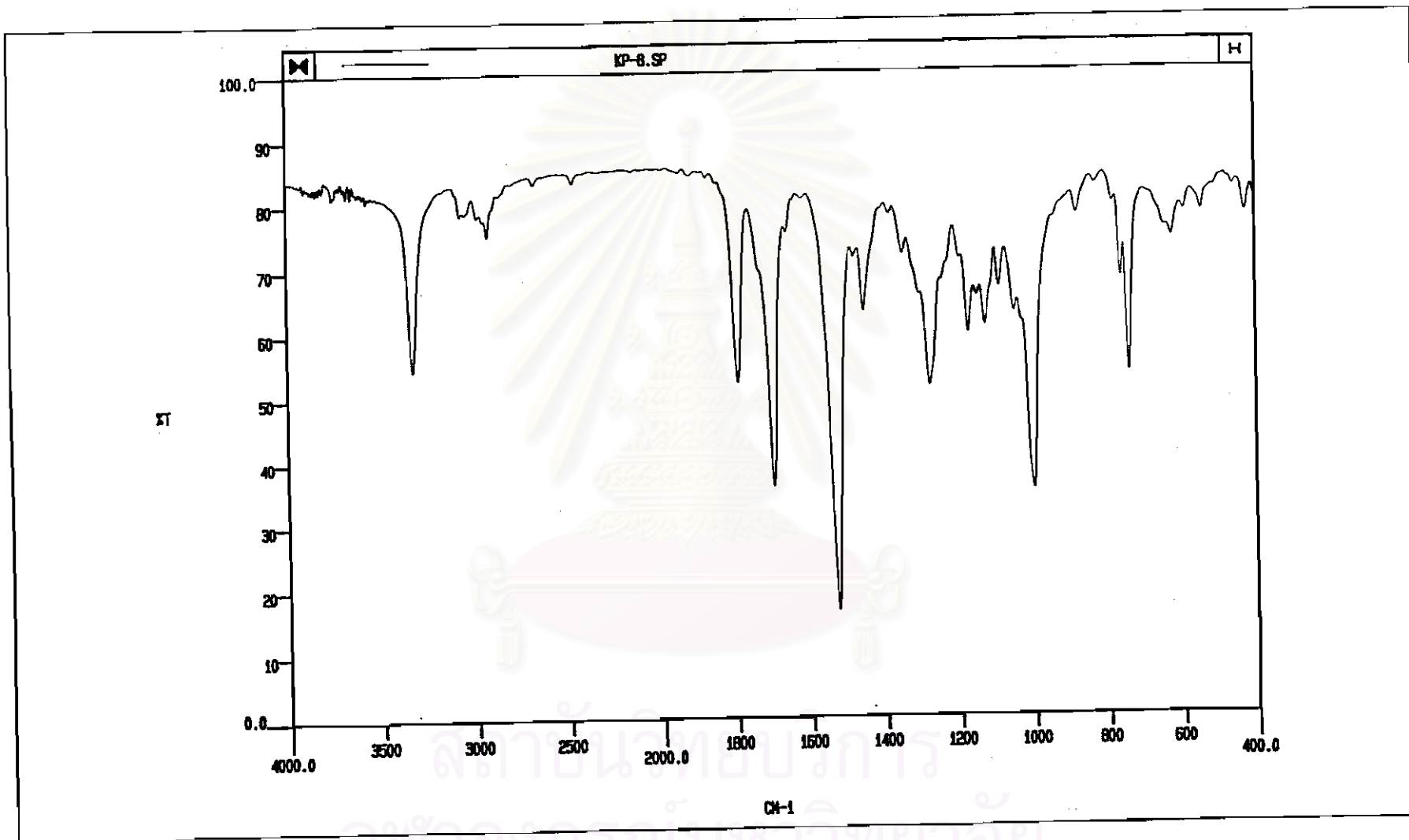


Figure 58: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-methionine pentafluorophenyl ester (Fmoc-L-Met-OPfp)



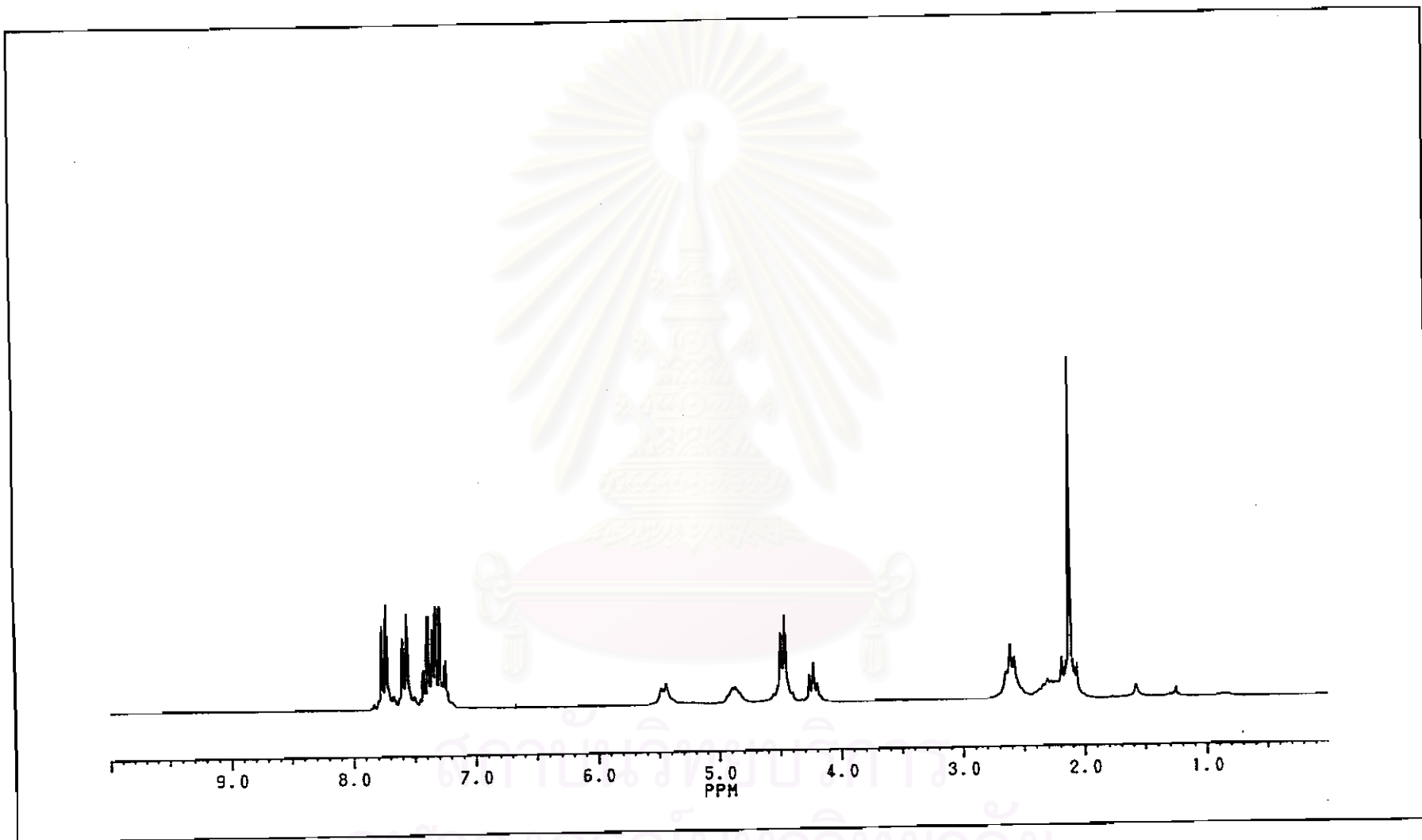


Figure 59:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-methionine pentafluorophenyl ester (Fmoc-L-Met-OPfp)

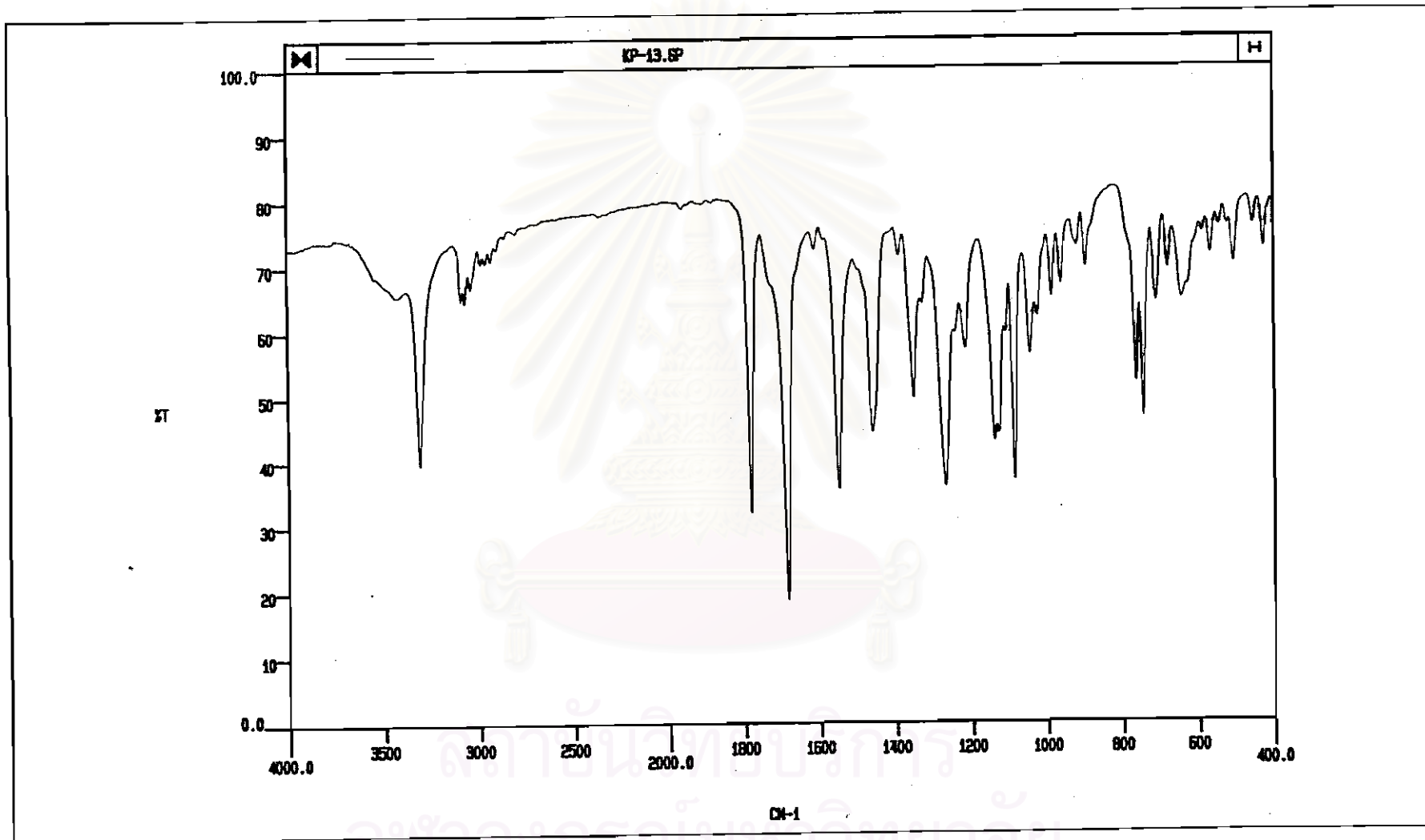
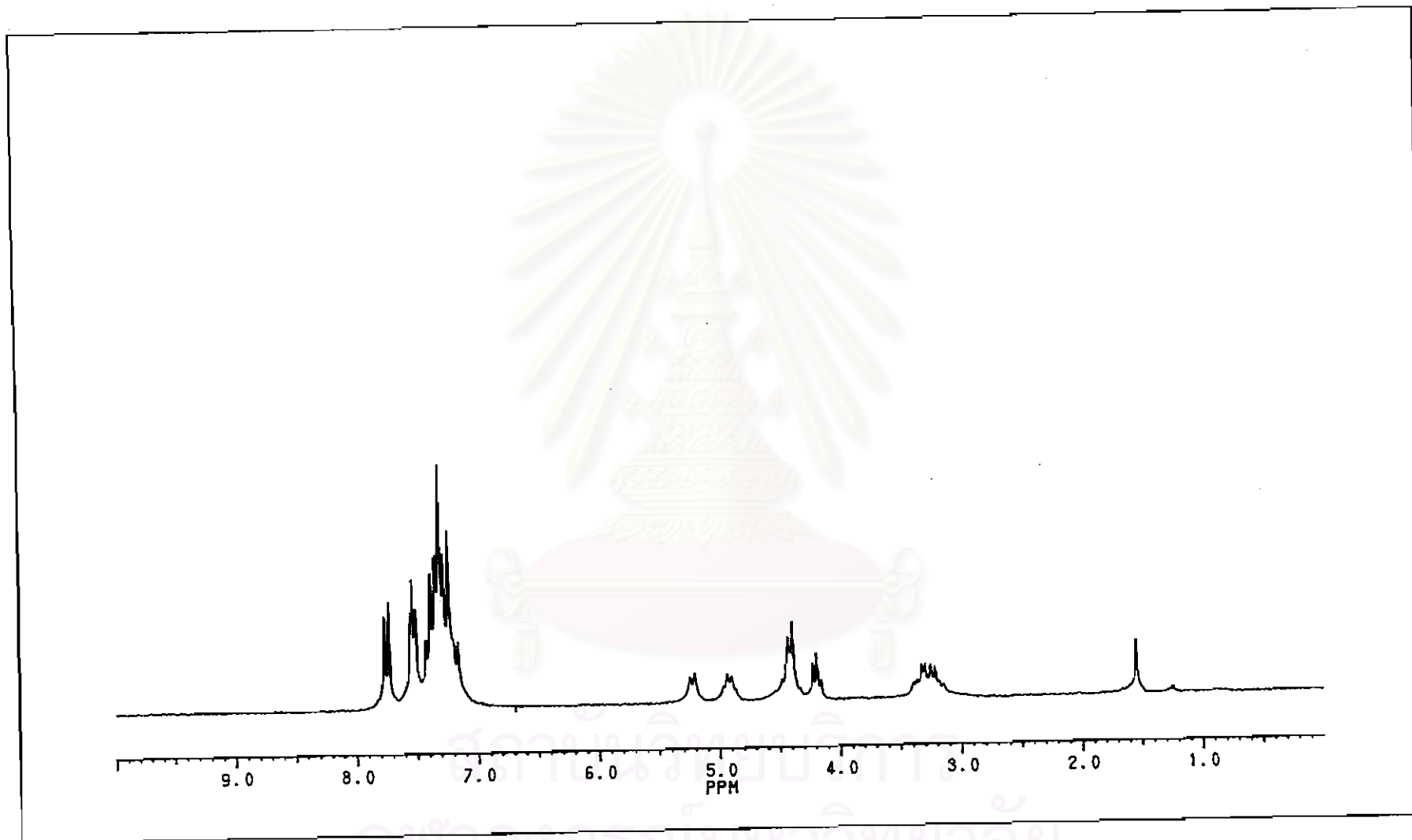


Figure 60: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-*L*-phenylalanine 2,4,5-trichlorophenyl ester (Fmoc-*L*-Phe-OTcp)



**Figure 61:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-phenylalanine 2,4,5-trichlorophenyl ester (Fmoc-L-Phe-OTcp)

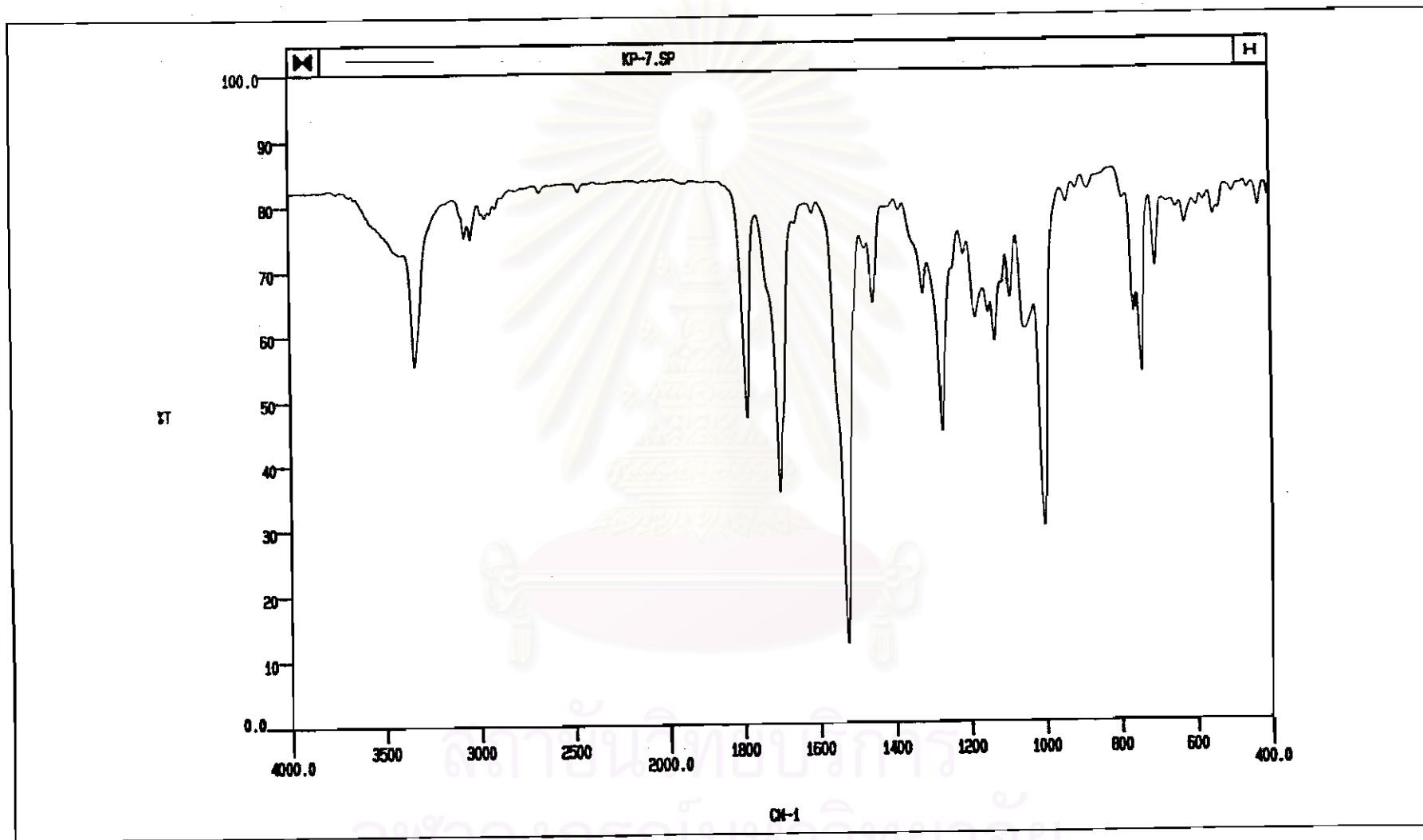


Figure 62: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-phenylalanine pentafluorophenyl ester (Fmoc-L-Phe-OPfp)

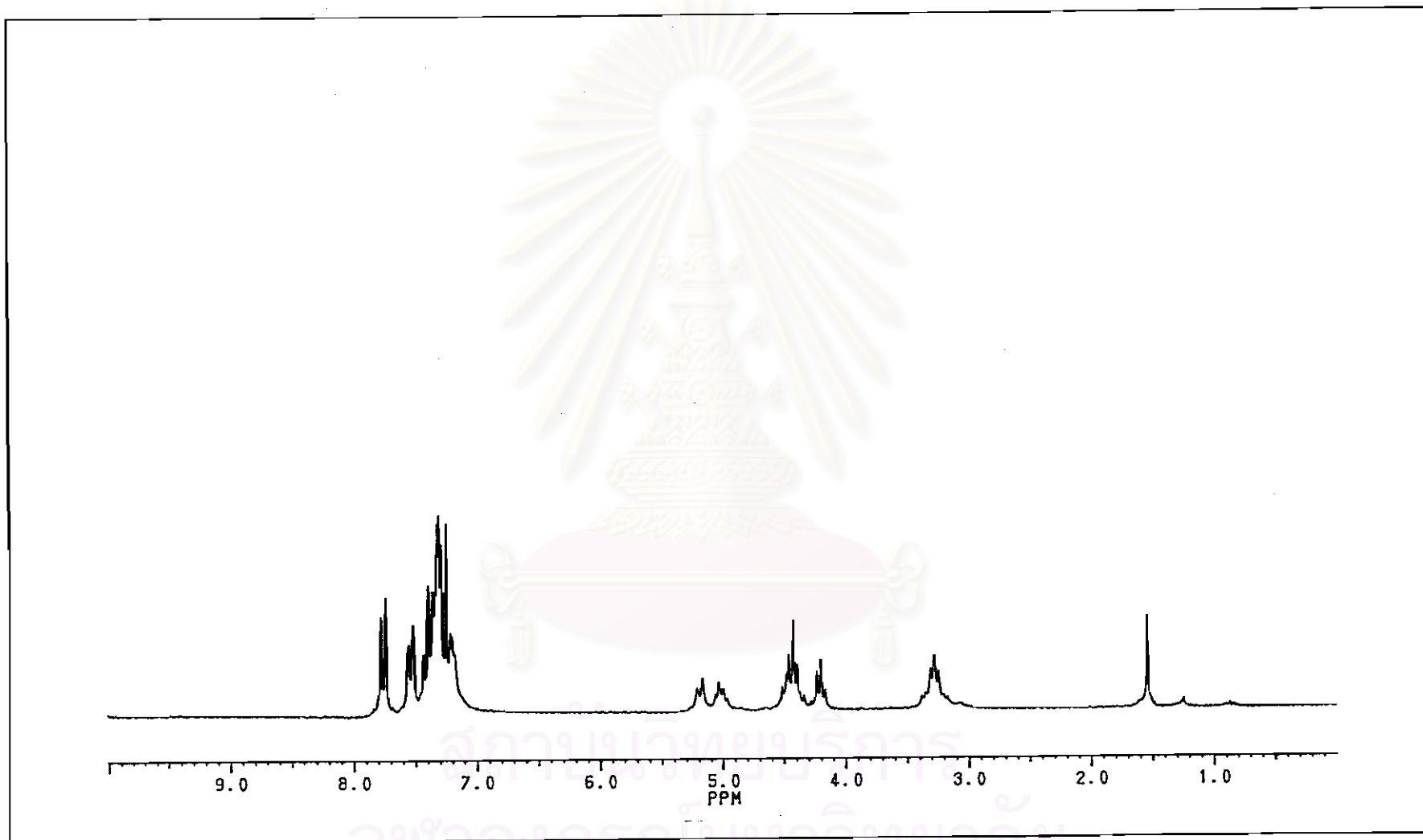
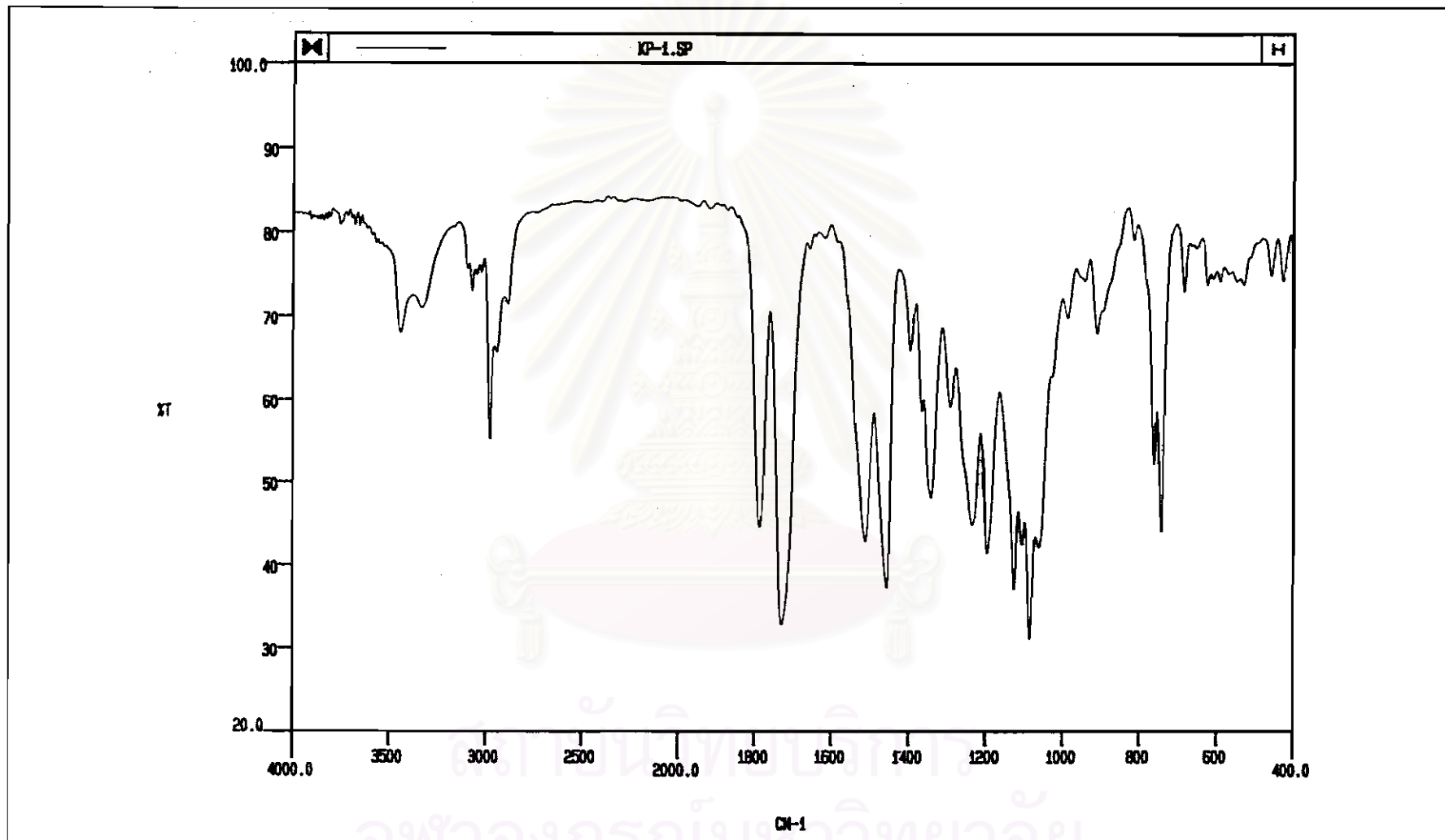
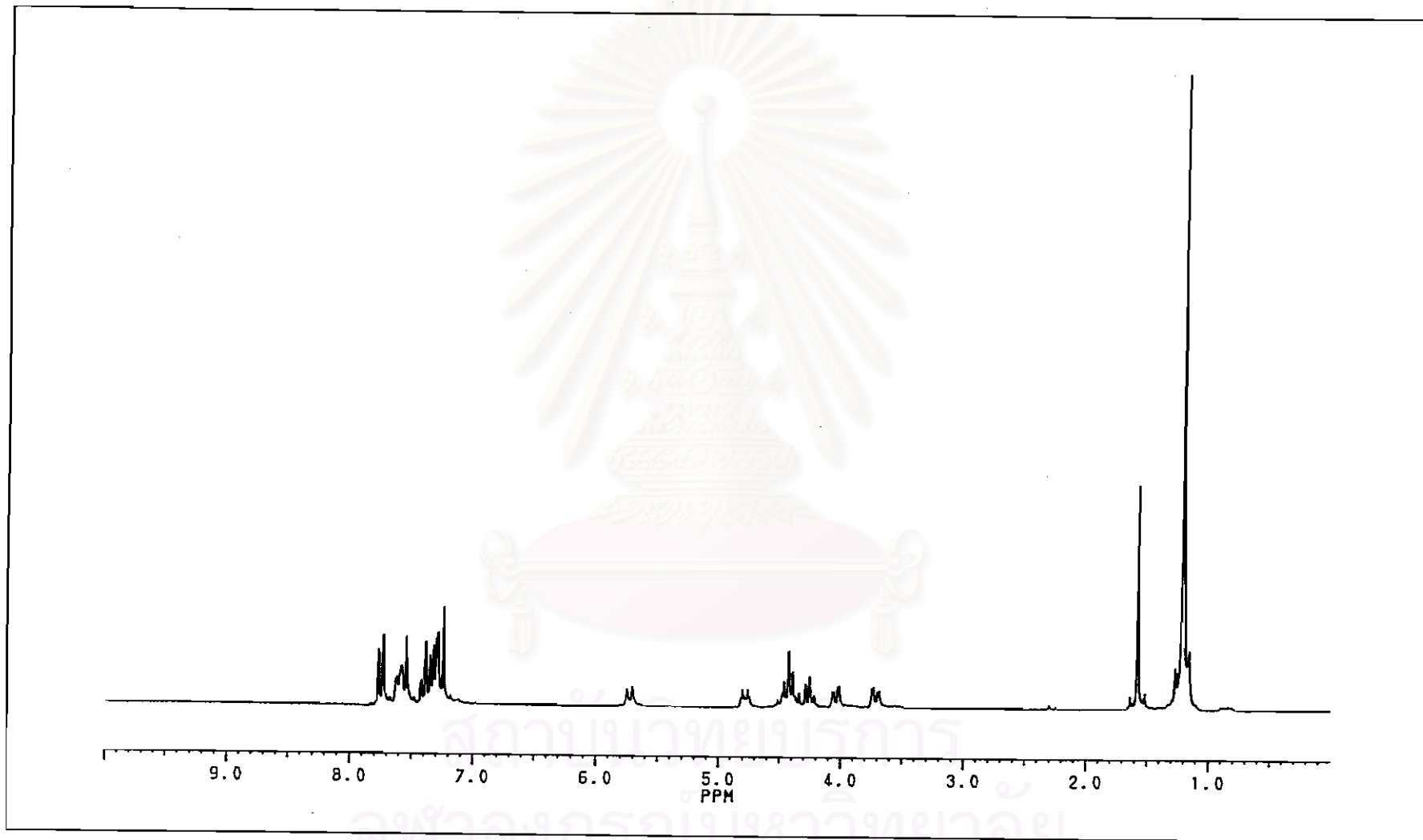


Figure 63:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-phenylalanine pentafluorophenyl ester (Fmoc-L-Phe-OPfp)



**Figure 64:** IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*D*-serine 2,4,5-trichlorophenyl ester (Fmoc-*D*-Ser(*O*<sup>*t*</sup>Bu)-OTcp)



**Figure 65:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*D*-serine 2,4,5-trichlorophenyl ester (Fmoc-*D*-Ser(*O*<sup>*t*</sup>Bu)-OTcp)

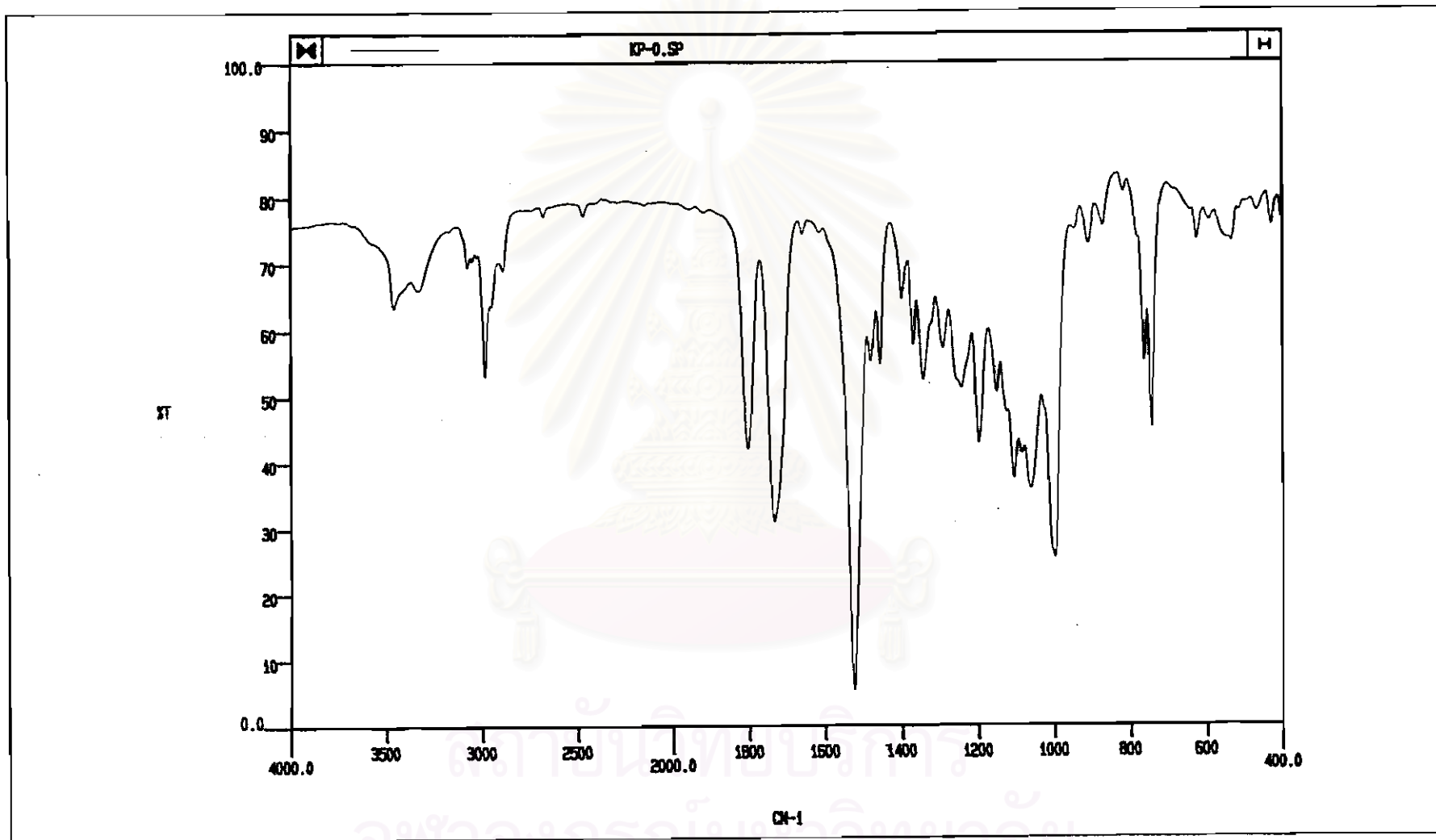
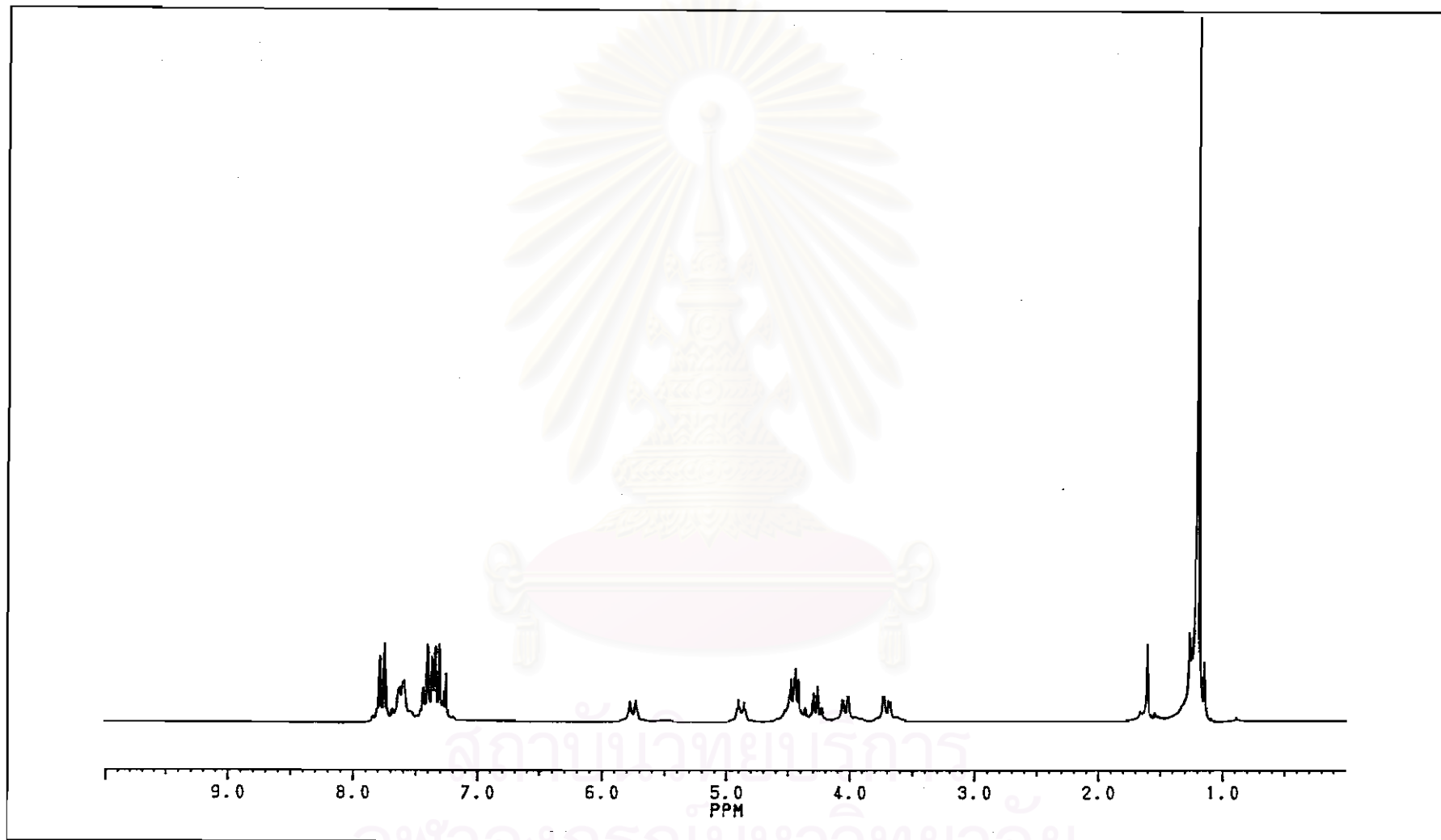
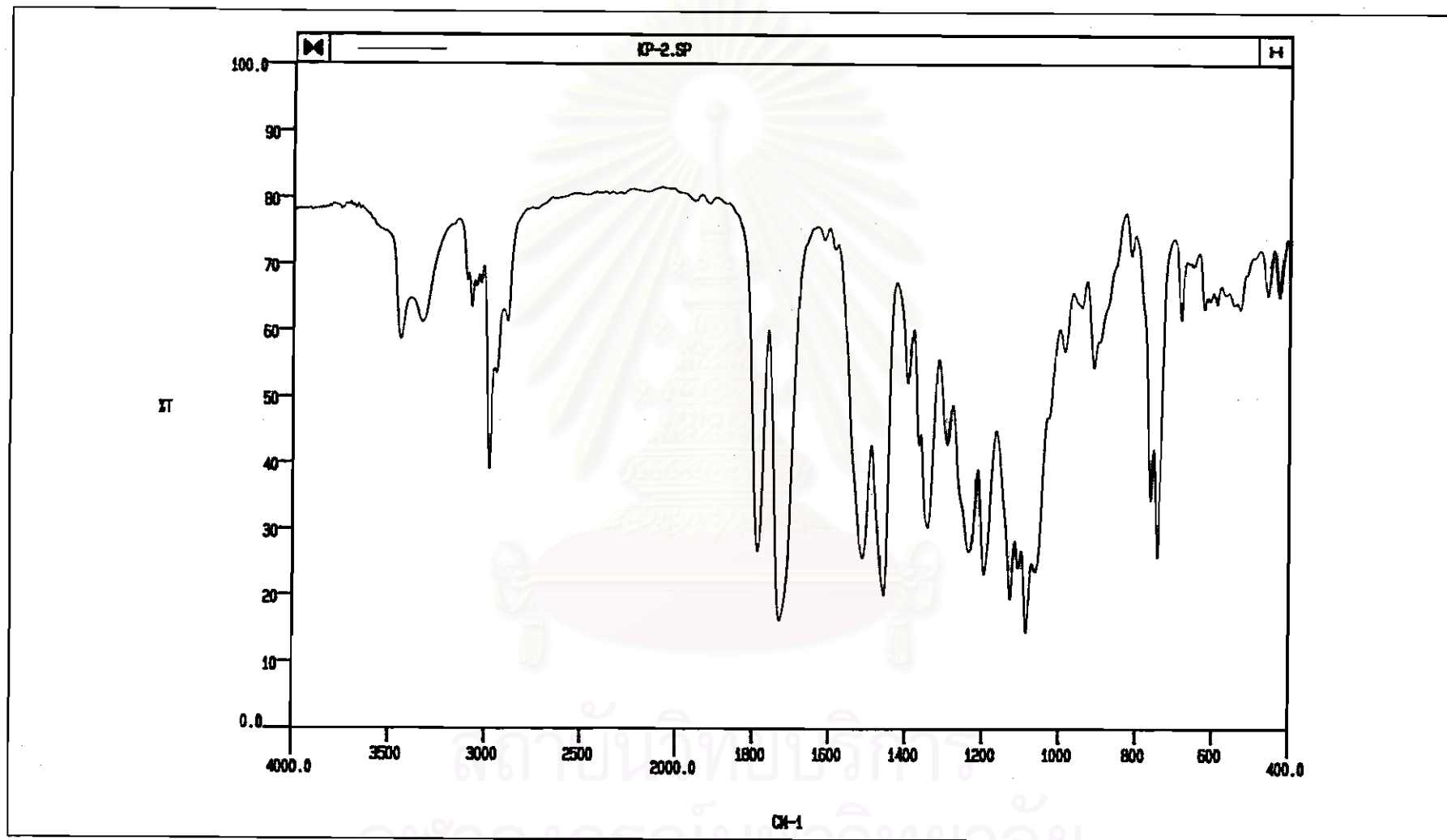


Figure 66: IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*D*-serine pentafluorophenyl ester (Fmoc-*D*-Ser(*O*<sup>*t*</sup>Bu)-OPfp)

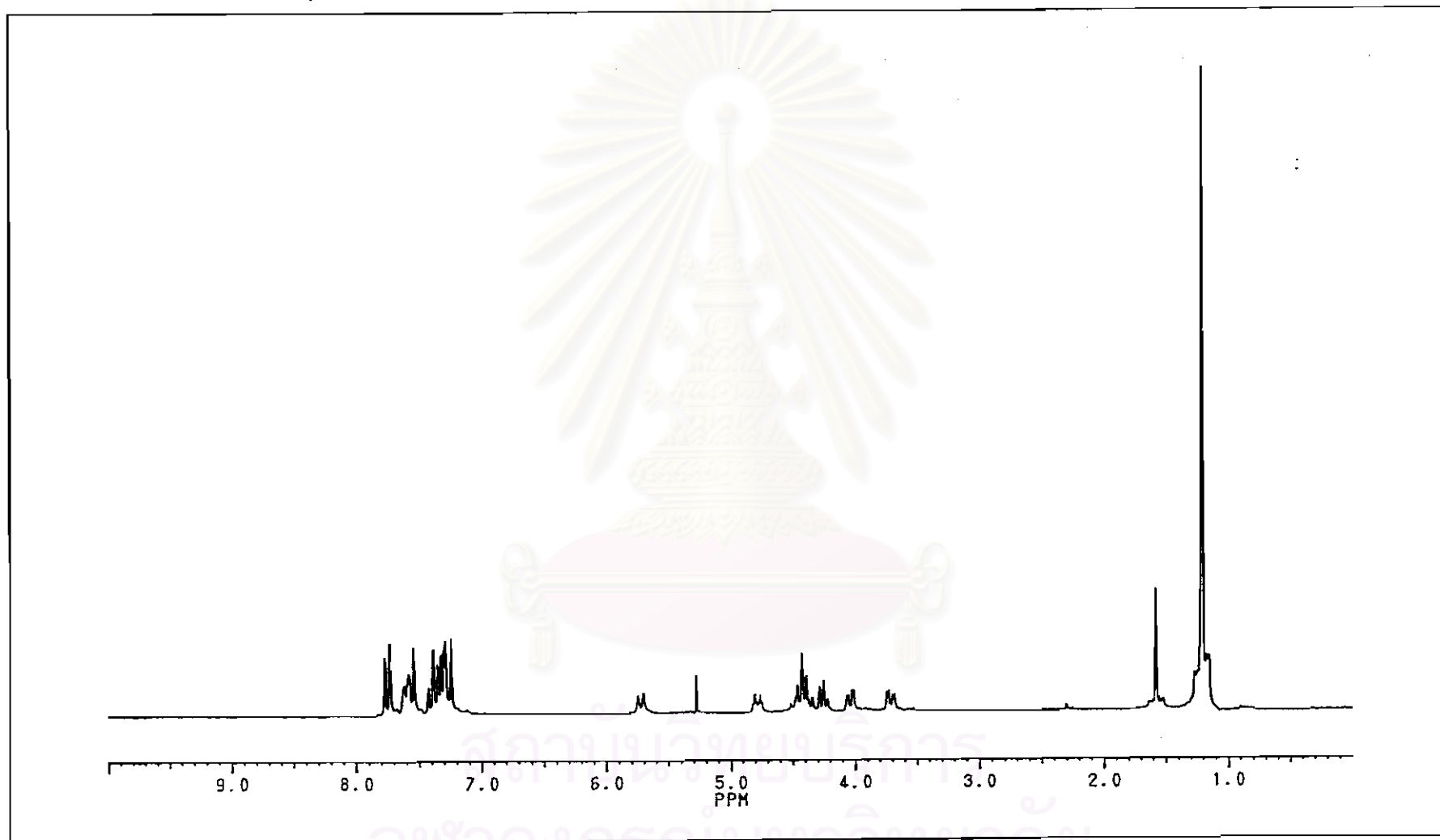




**Figure 67:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*D*-serine pentafluorophenyl ester (Fmoc-D-Ser(O<sup>*t*</sup>Bu)-OPfp)



**Figure 68:** IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*L*-serine 2,4,5-trichlorophenyl ester (Fmoc-*L*-Ser(*O*<sup>*t*</sup>Bu)-OTcp)



**Figure 69:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-L-serine 2,4,5-trichlorophenyl ester (Fmoc-L-Ser(*O*<sup>*t*</sup>Bu)-OTcp)

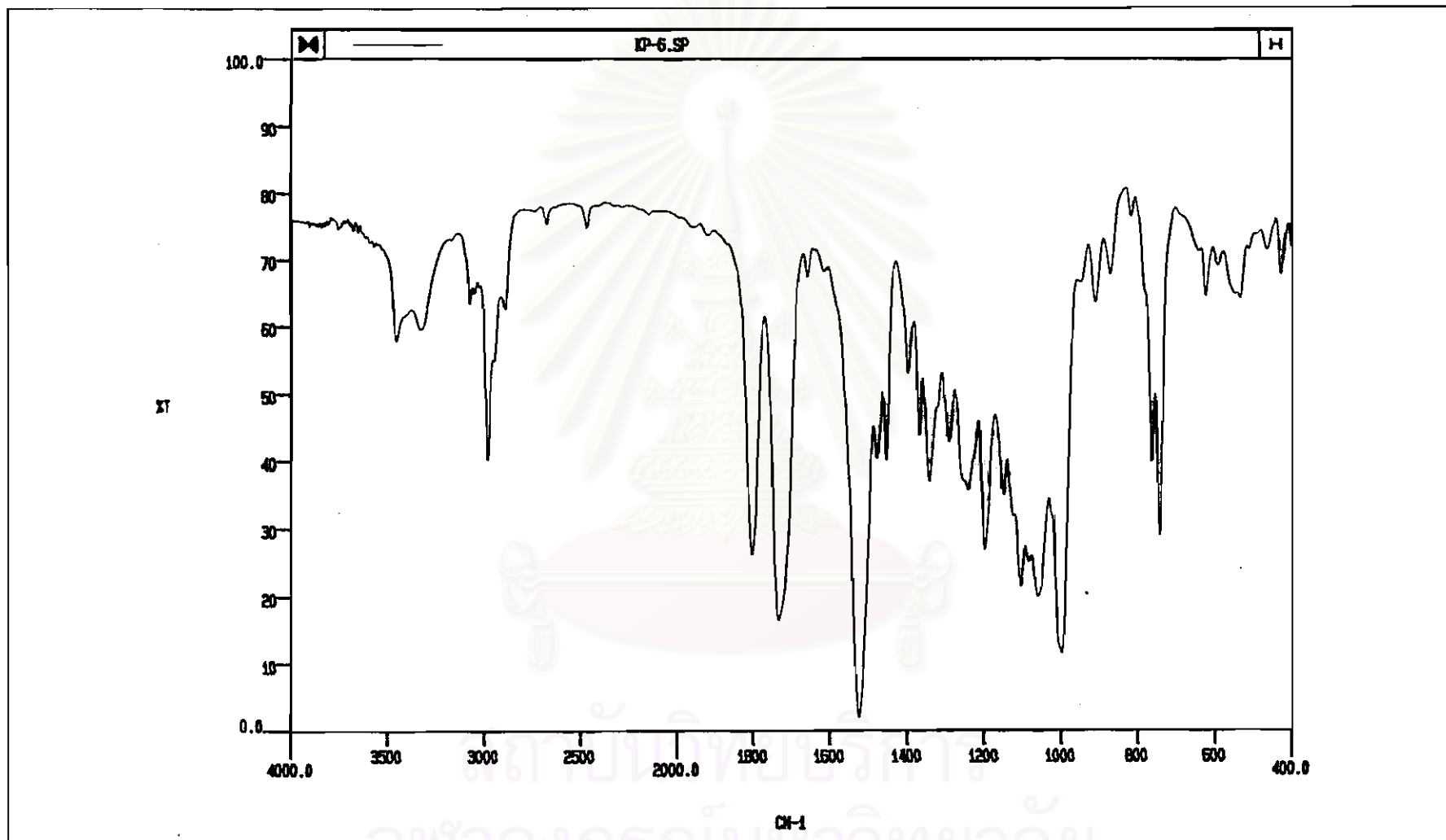
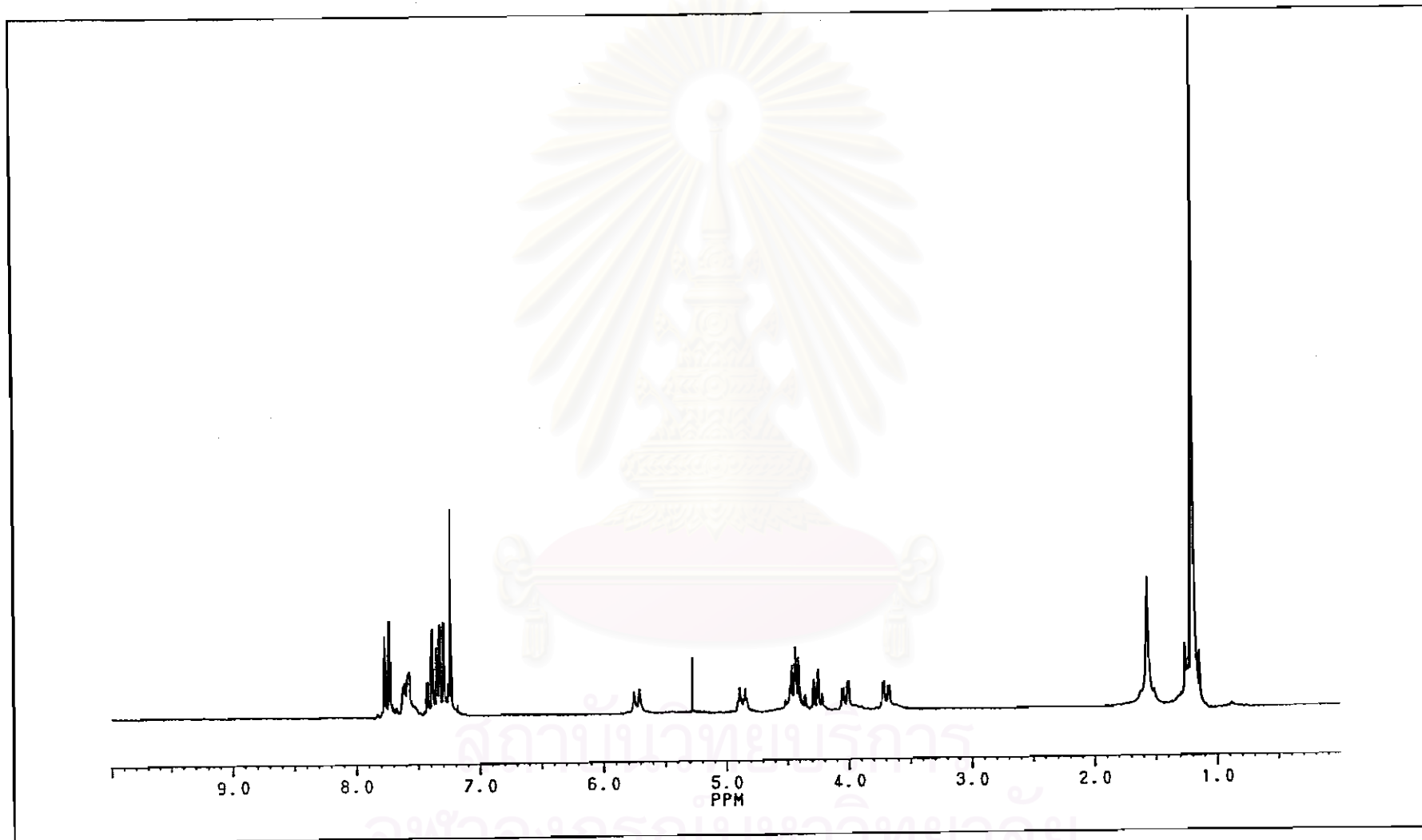
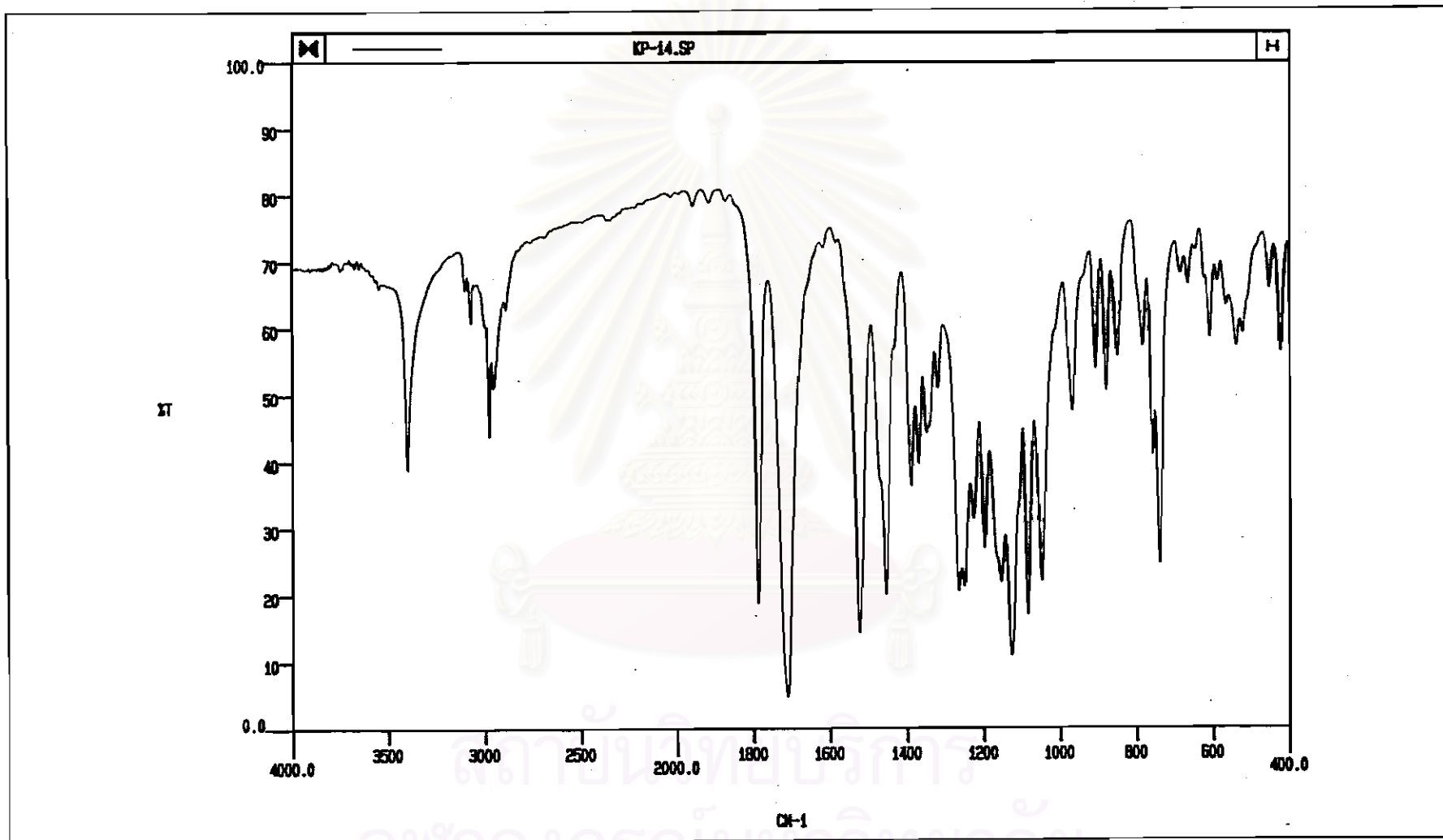


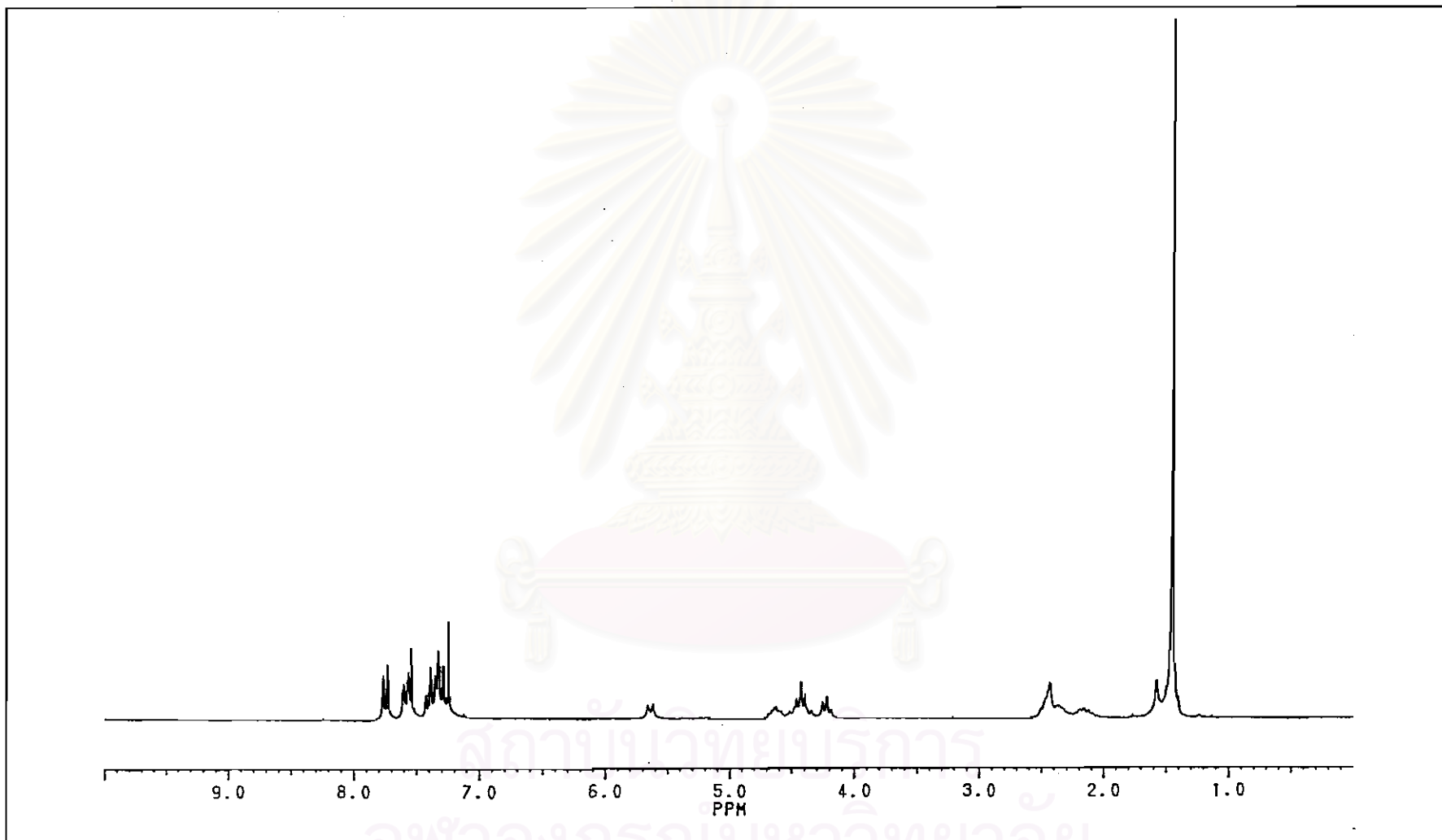
Figure 70: IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*L*-serine pentafluorophenyl ester (Fmoc-*L*-Ser(*O*<sup>*t*</sup>Bu)-OPfp)



**Figure 71:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*L*-serine pentafluorophenyl ester  
(Fmoc-*L*-Ser(*O*<sup>*t*</sup>Bu)-OPfp)



**Figure 72:** IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-(*tert*-butyl ester)-*L*-glutamic acid 2,4,5-trichlorophenyl ester (Fmoc-*L*-Glu(O<sup>t</sup>Bu)-OTcp)



**Figure 73:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*tert*-butyl ester)-L-glutamic acid 2,4,5-trichlorophenyl ester (Fmoc-L-Glu(O<sup>*t*</sup>Bu)-OTcp)

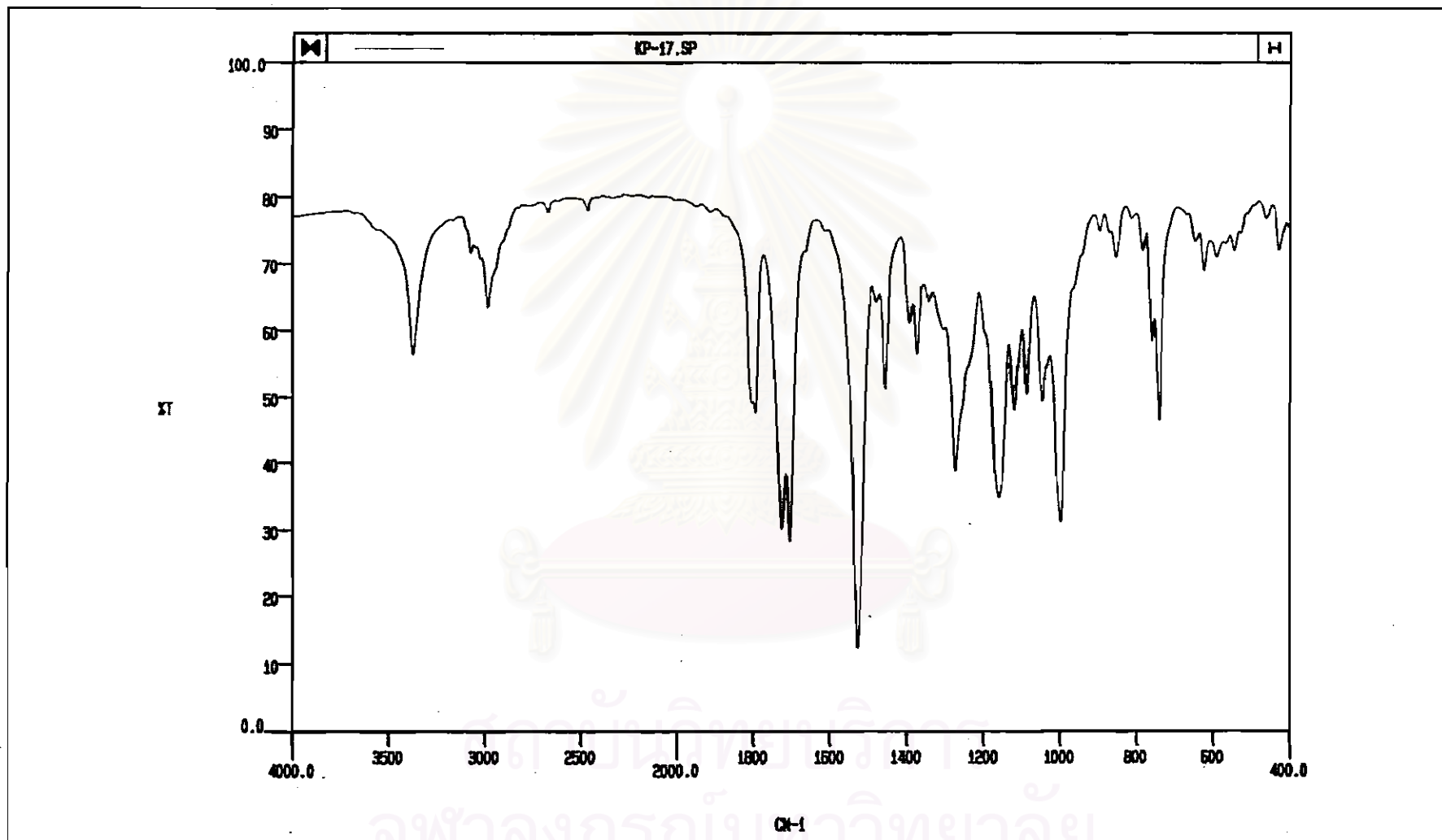
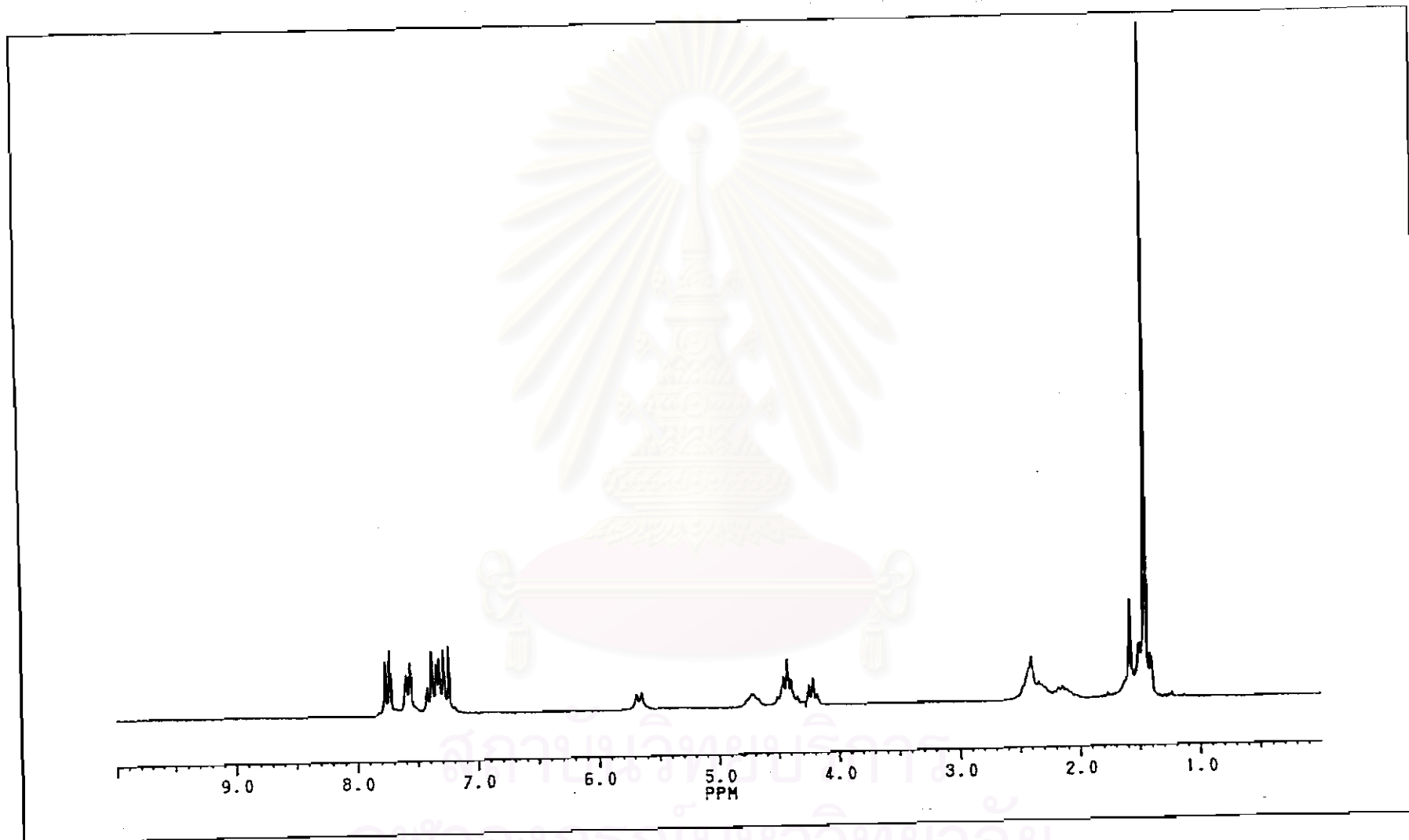


Figure 74: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-(*tert*-butyl ester)-*L*-glutamic acid pentafluorophenyl ester (Fmoc-*L*-Glu(*O*<sup>*t*</sup>Bu)-OPfp)





**Figure 75:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*tert*-butyl ester)-*L*-glutamic acid pentafluorophenyl ester (Fmoc-*L*-Glu(*O*<sup>*t*</sup>Bu)-OPfp)

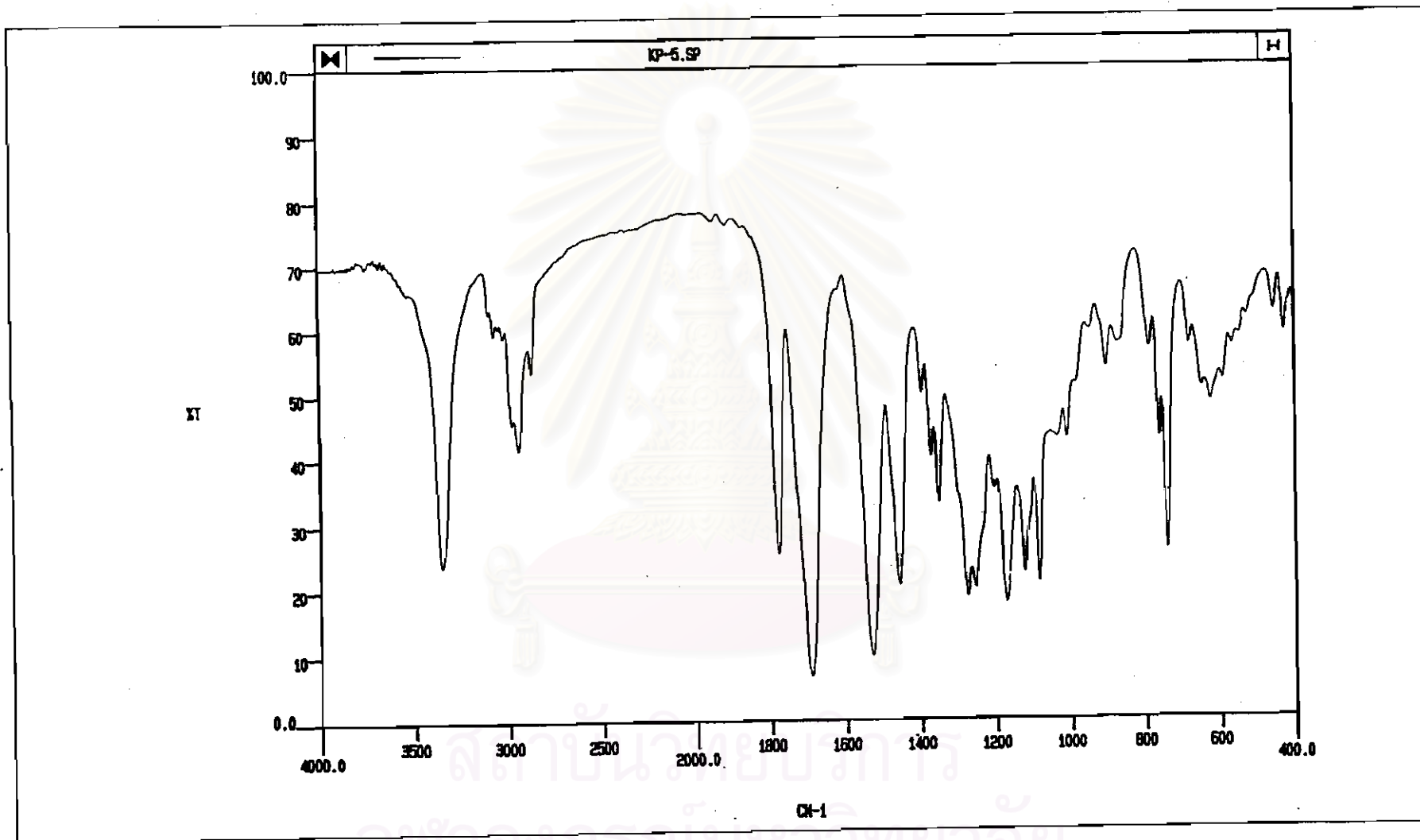
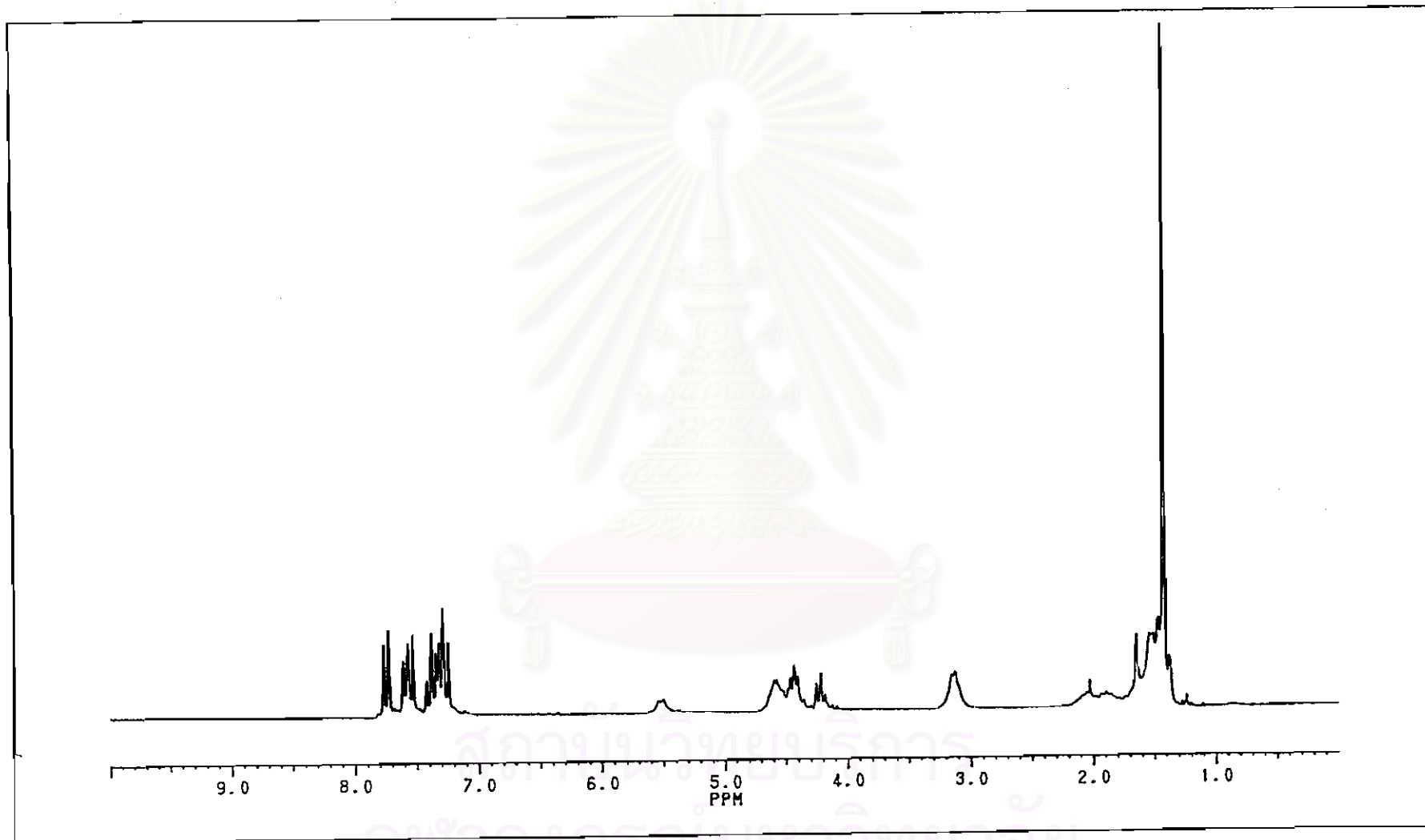


Figure 76: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-L-lysine 2,4,5-trichlorophenyl ester (Fmoc-L-Lys(Boc)-OTcp).



**Figure 77:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-L-lysine 2,4,5-trichlorophenyl ester (Fmoc-L-Lys(Boc)-OTcp)

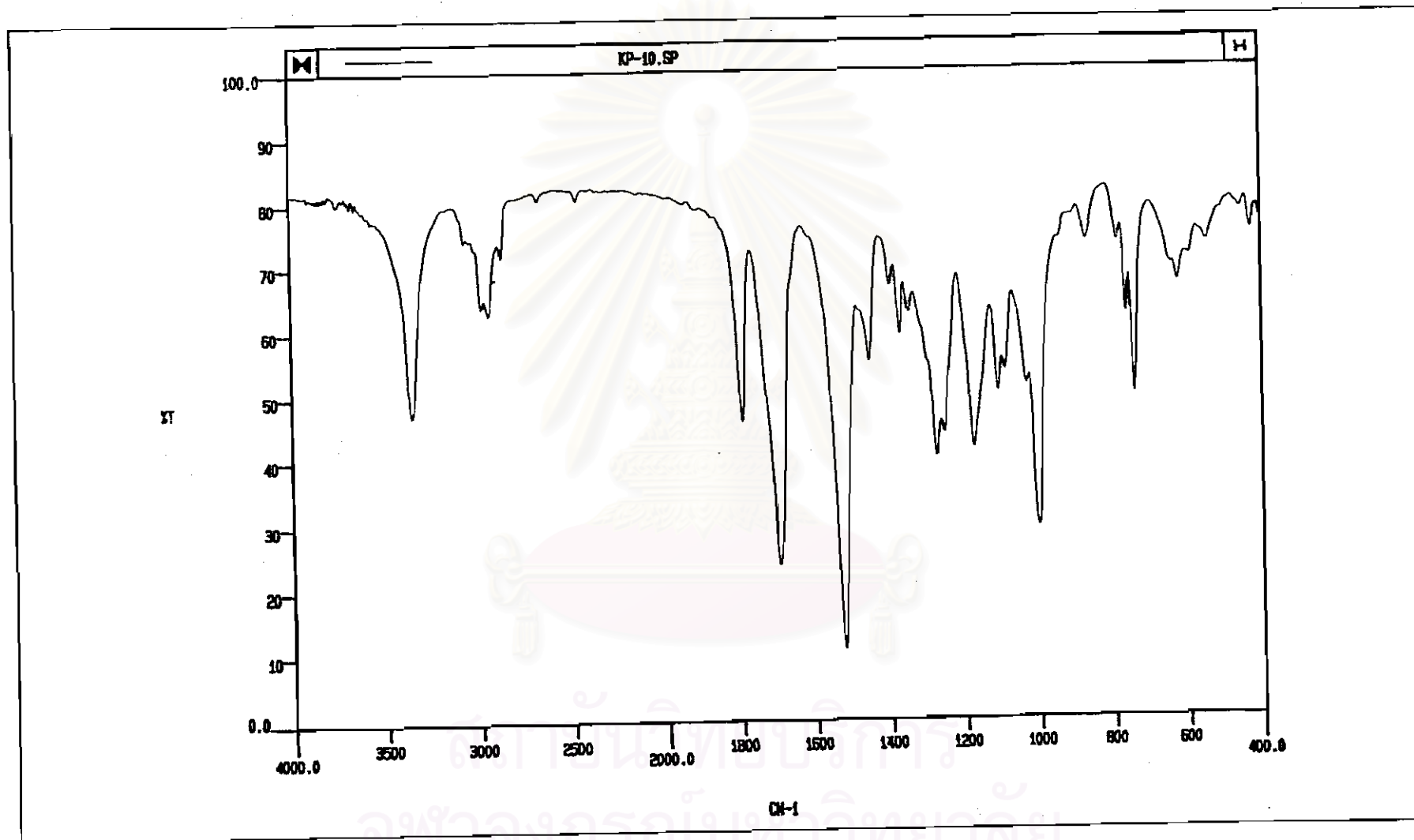
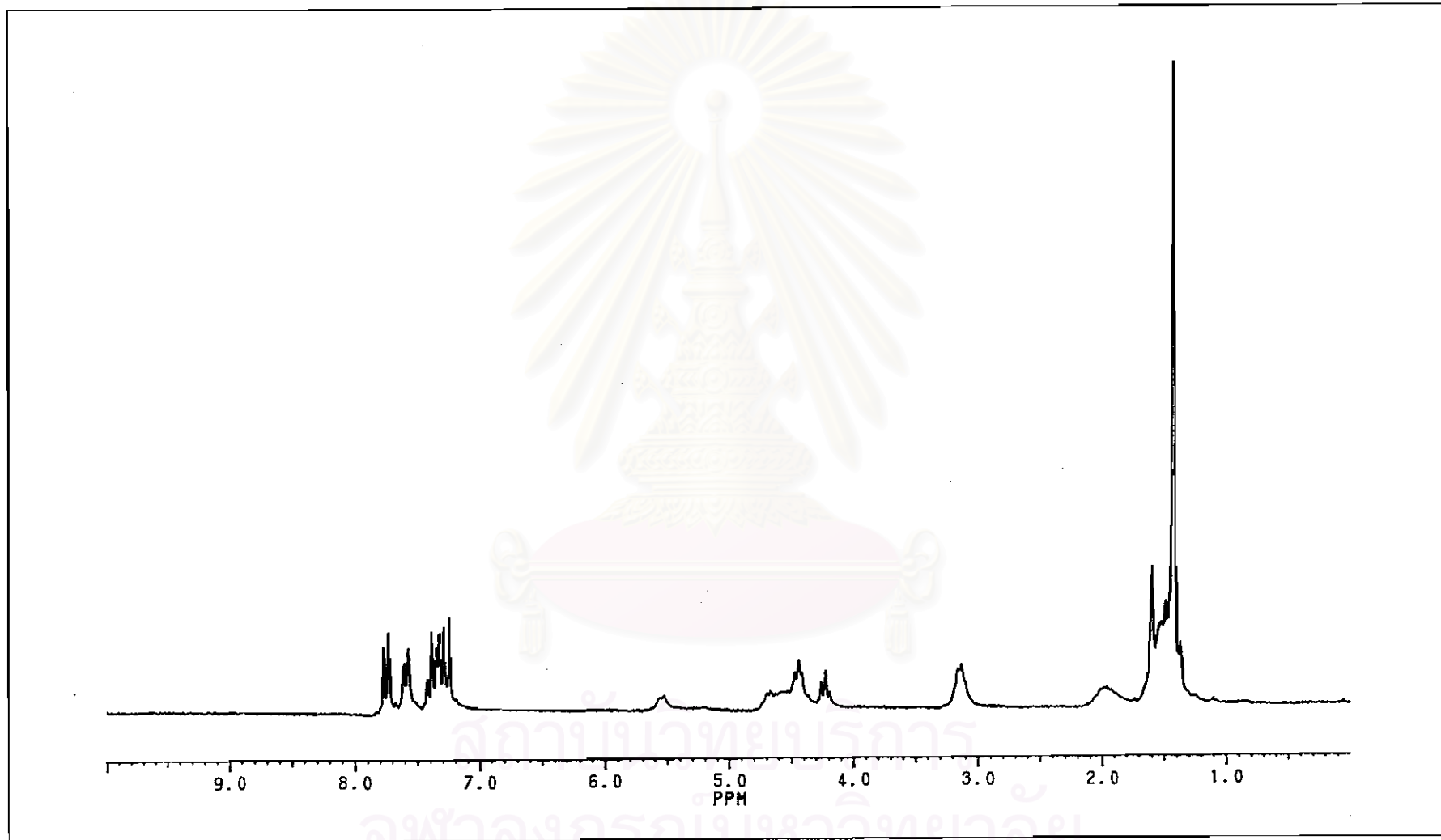


Figure 78: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-L-lysine pentafluorophenyl ester (Fmoc-L-Lys(Boc)-OPfp)



**Figure 79:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-L-lysine pentafluorophenyl ester (Fmoc-L-Lys(Boc)-OPfp)

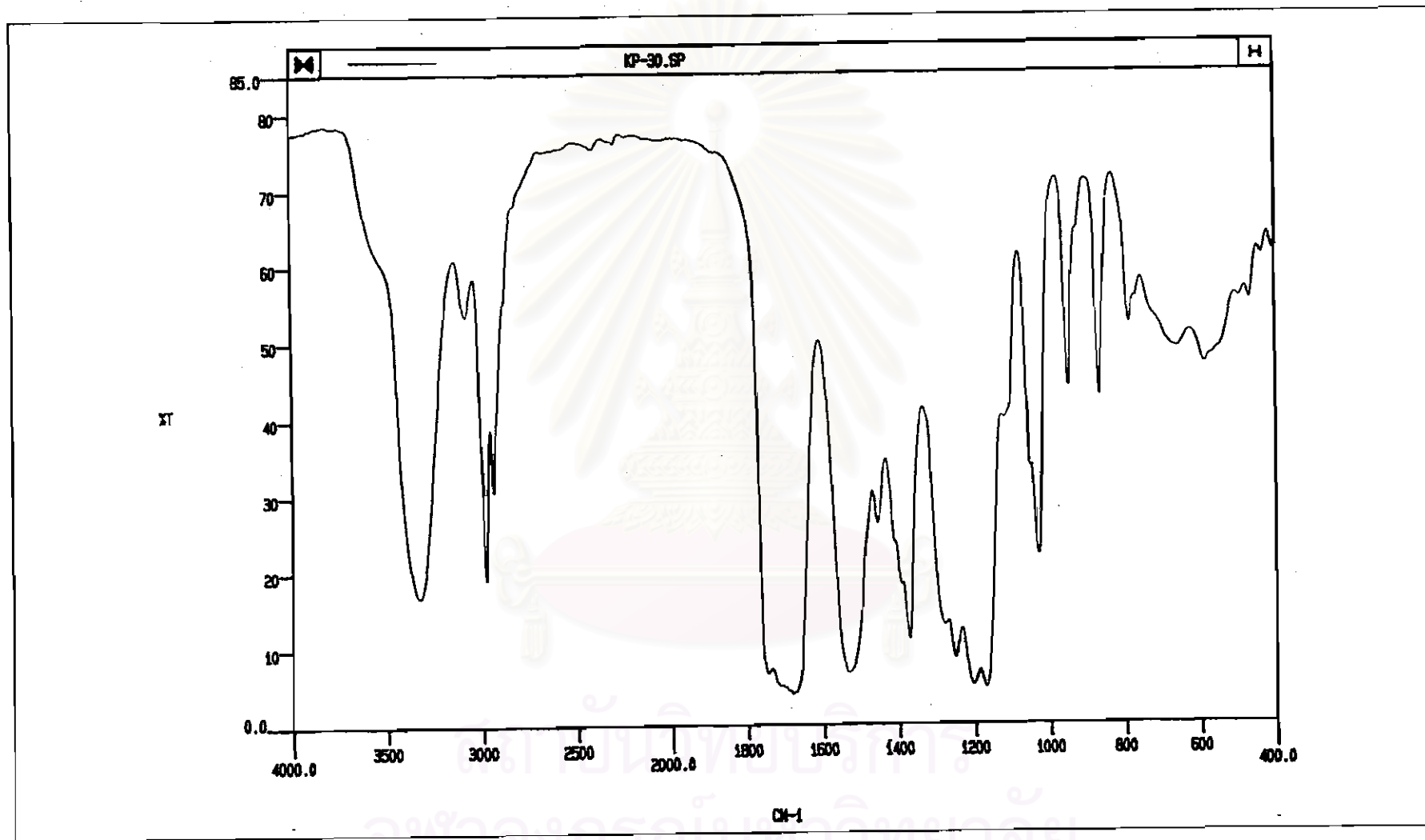
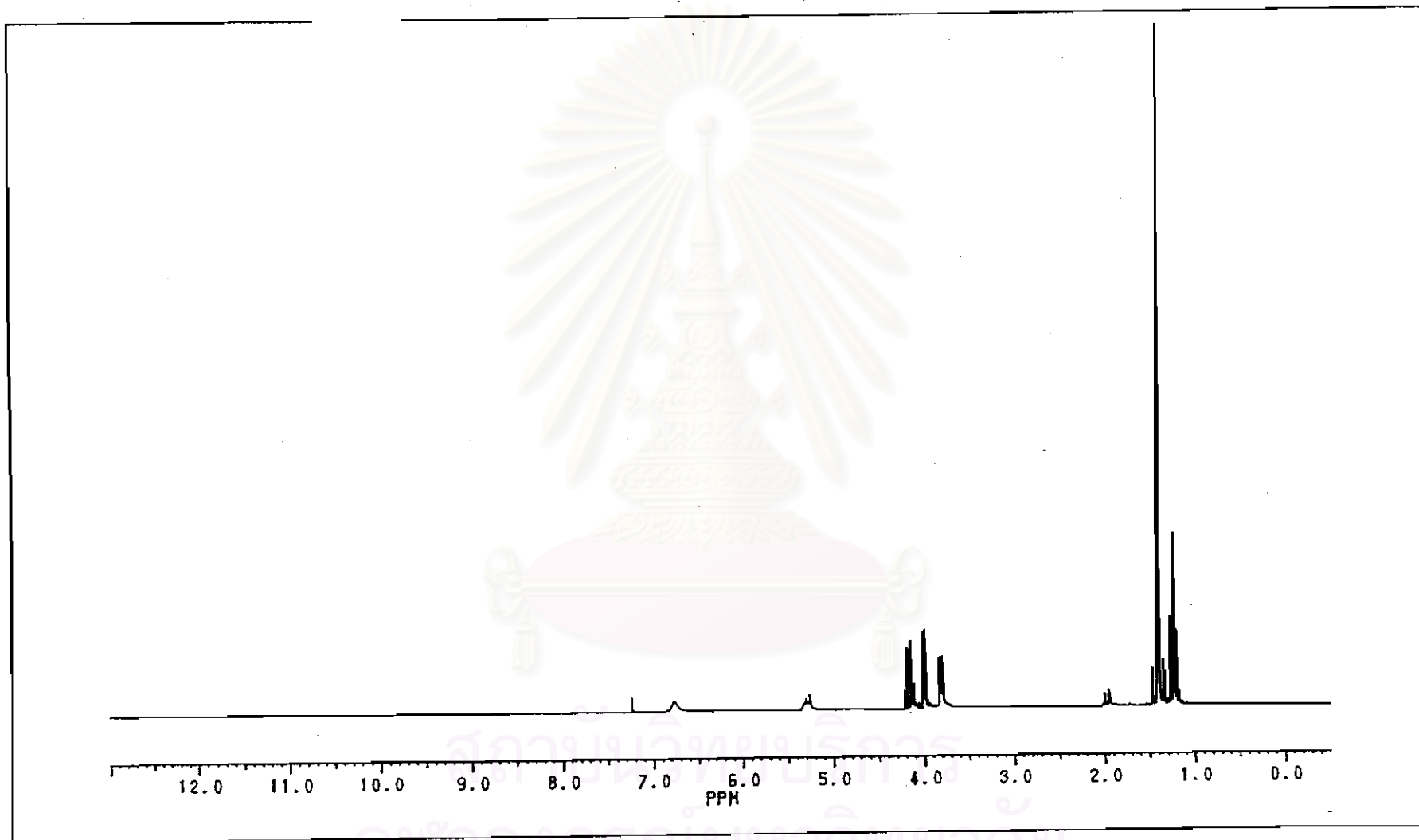


Figure 80: IR spectrum (neat) of *N*-tert-butoxycarbonylglycylglycine ethyl ester (Boc-Gly-Gly-OEt)



**Figure 81:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycylglycine ethyl ester (Boc-Gly-Gly-OEt)

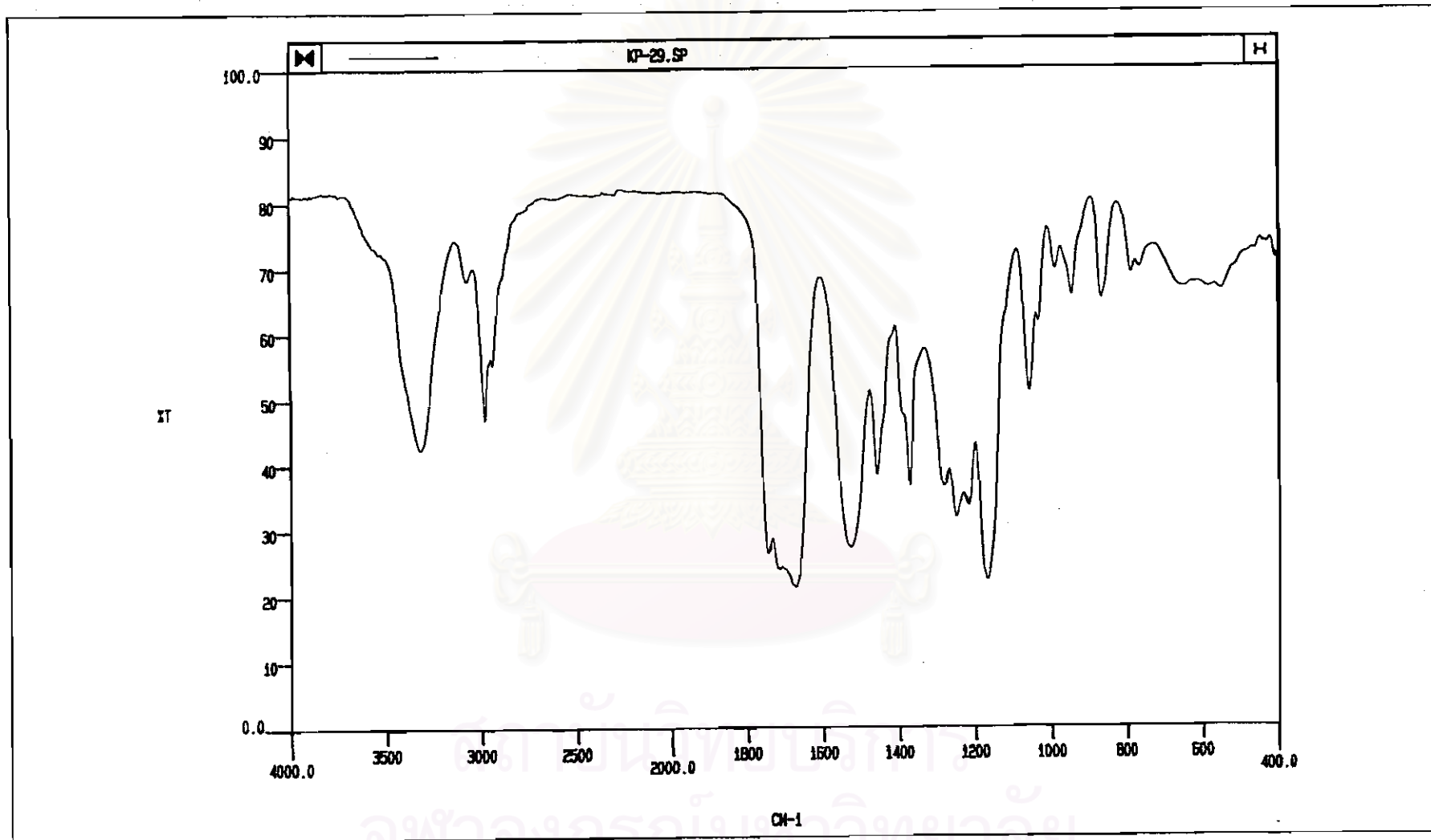
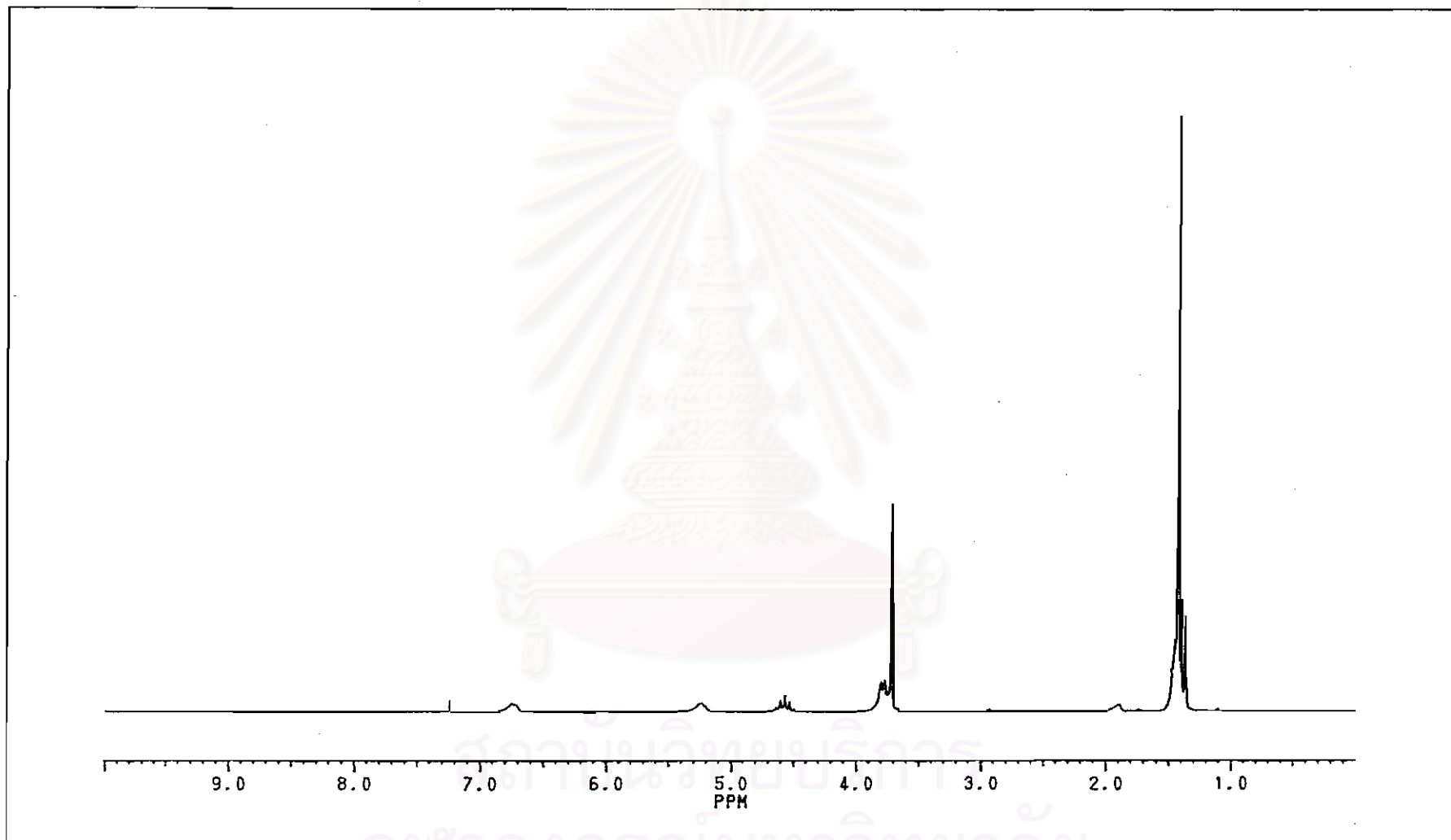


Figure 82: IR spectrum (neat) of *N*-tert-butoxycarbonylglycylalanine methyl ester (Boc-Gly-Ala-OMe)





**Figure 83:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-alanine methyl ester (Boc-Gly-Ala-OMe)

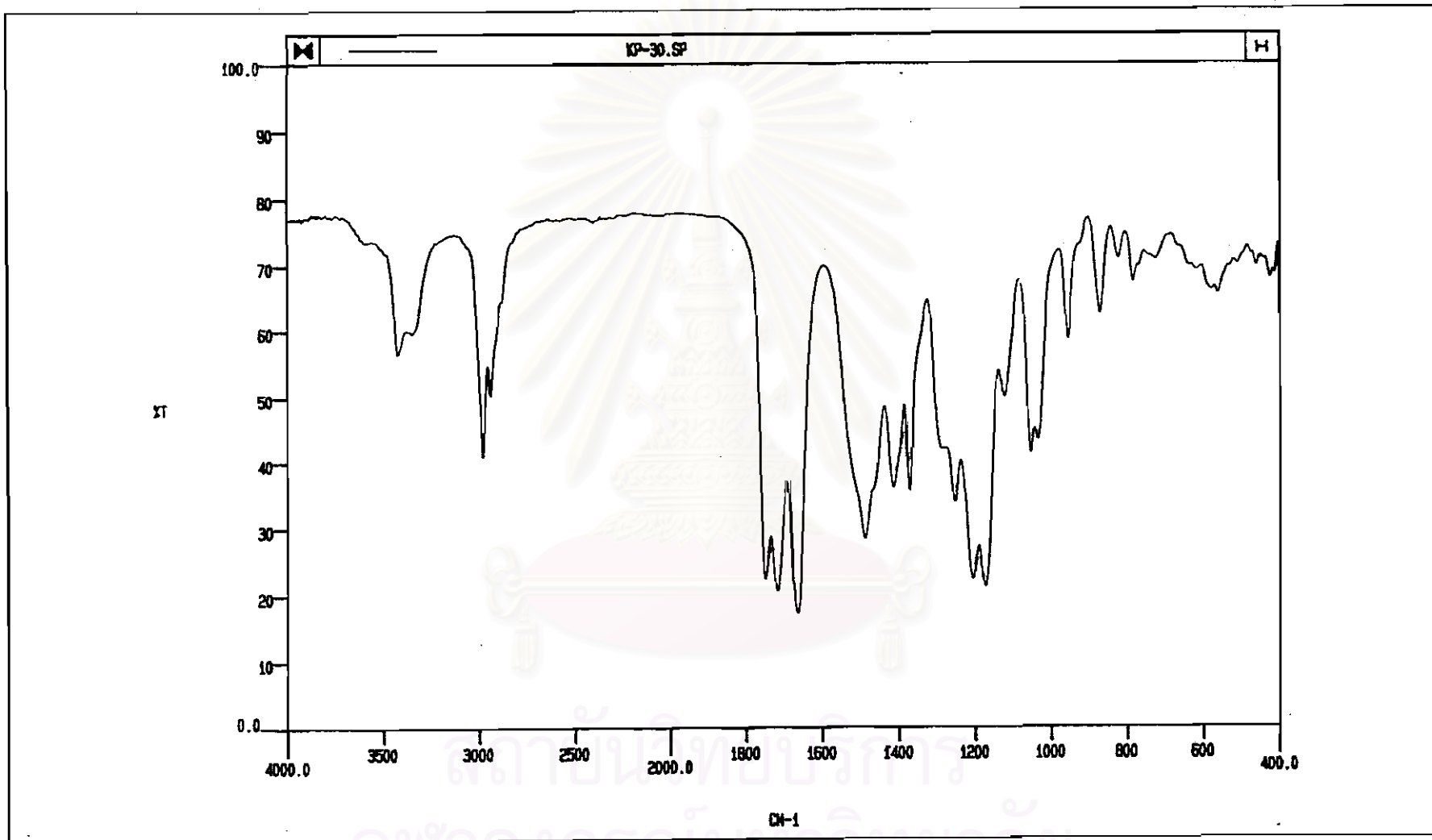
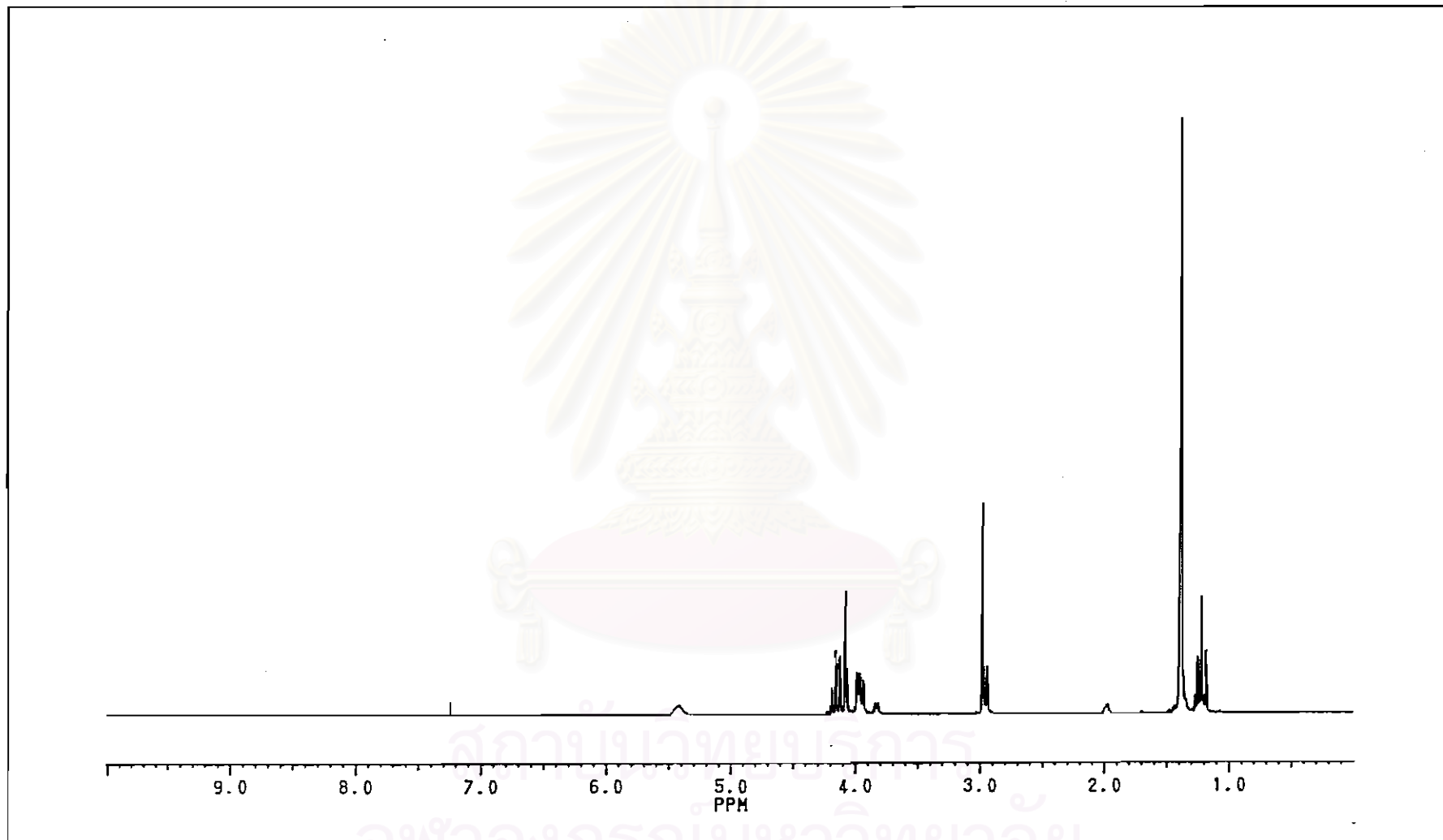


Figure 84: IR spectrum (neat) of *N*-*tert*-butoxycarbonylglycylsarcosine ethyl ester (Boc-Gly-Sar-OEt)



**Figure 85:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonylglycylsarcosine ethyl ester (Boc-Gly-Sar-OEt)

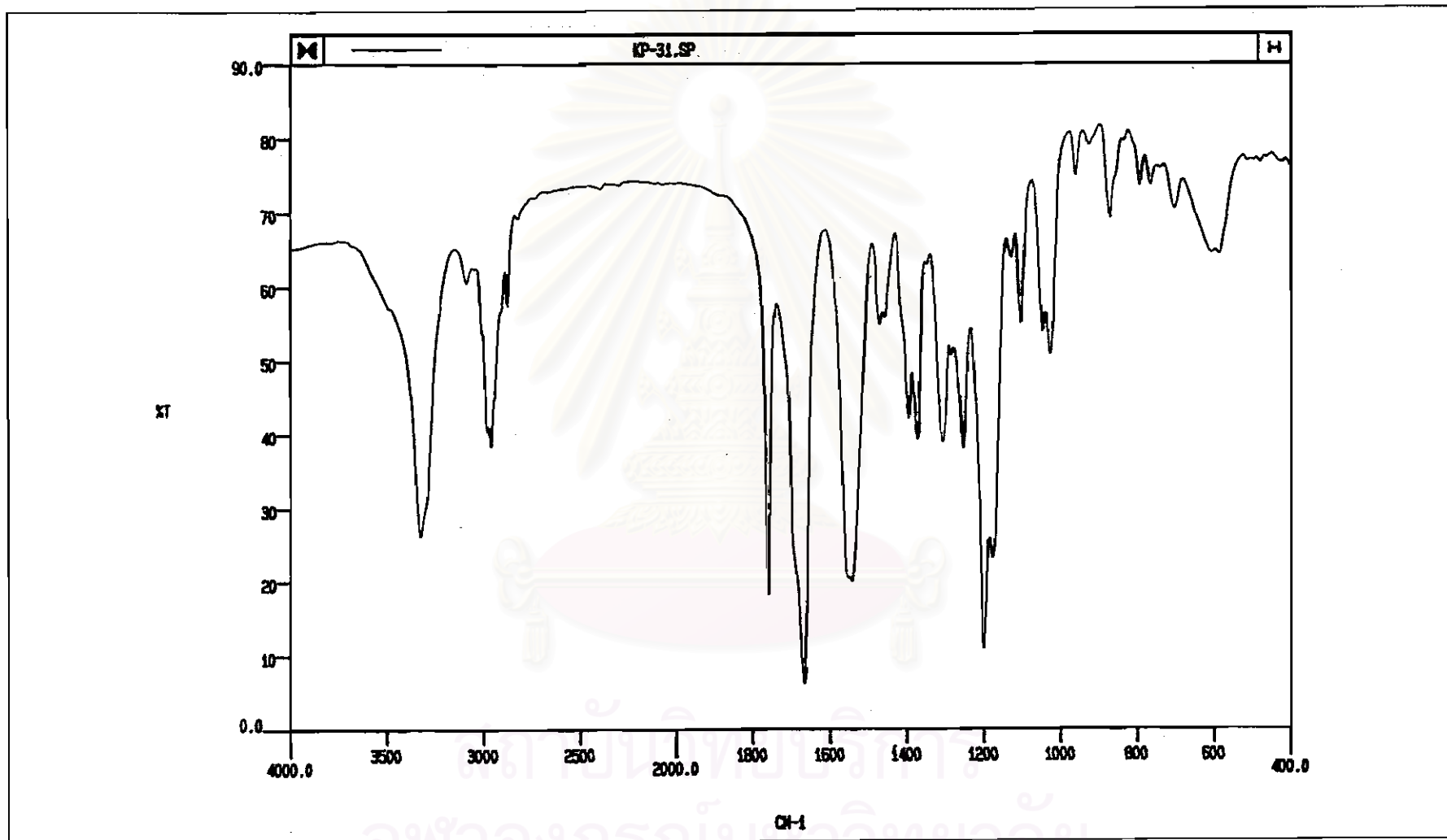
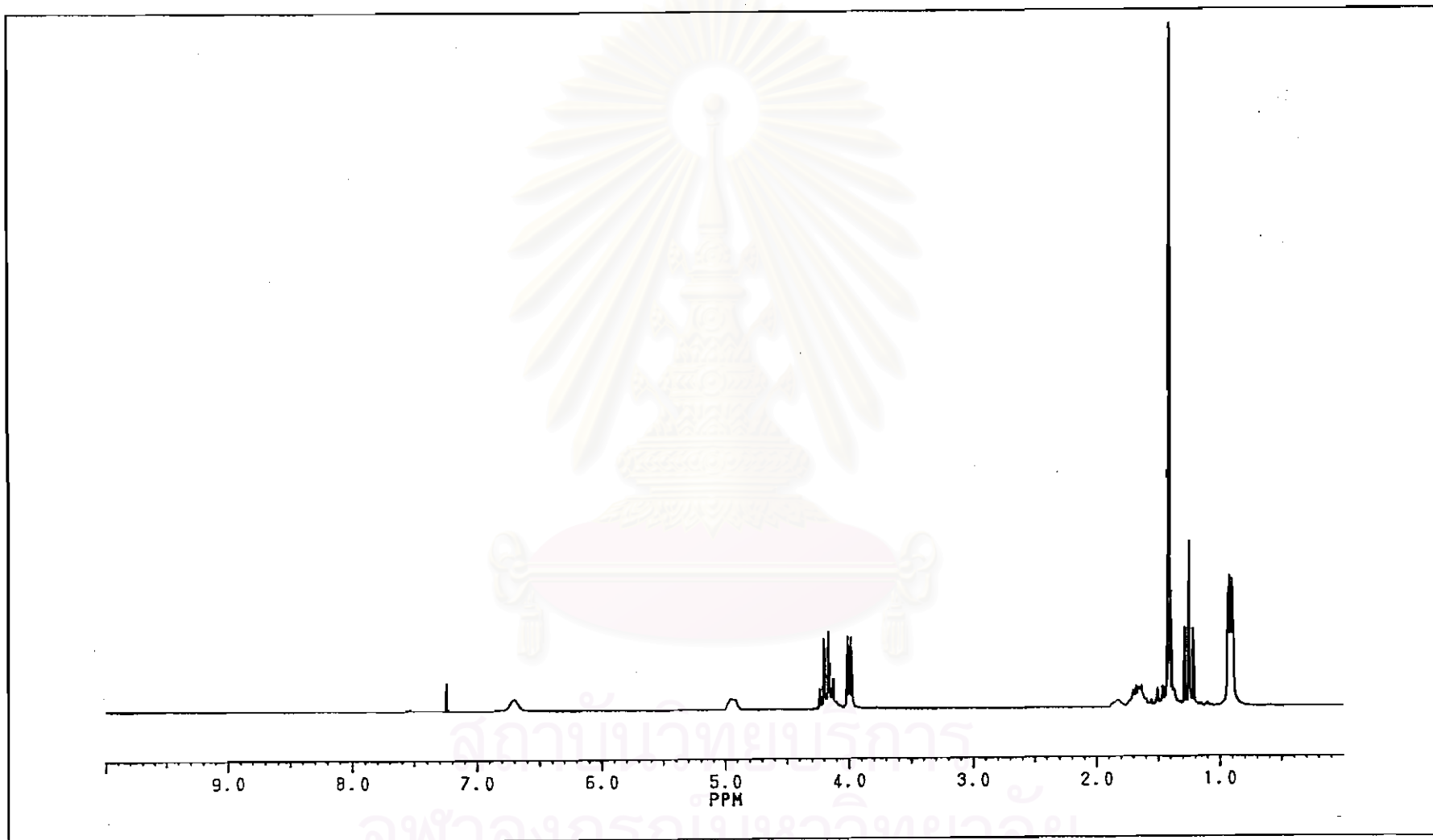


Figure 86: IR spectrum (KBr) of *N*-tert-butoxycarbonyl-L-leucylglycine ethyl ester (Boc-L-Leu-Gly-OEt)



**Figure 87:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucylglycine ethyl ester (Boc-L-Leu-Gly-OEt)

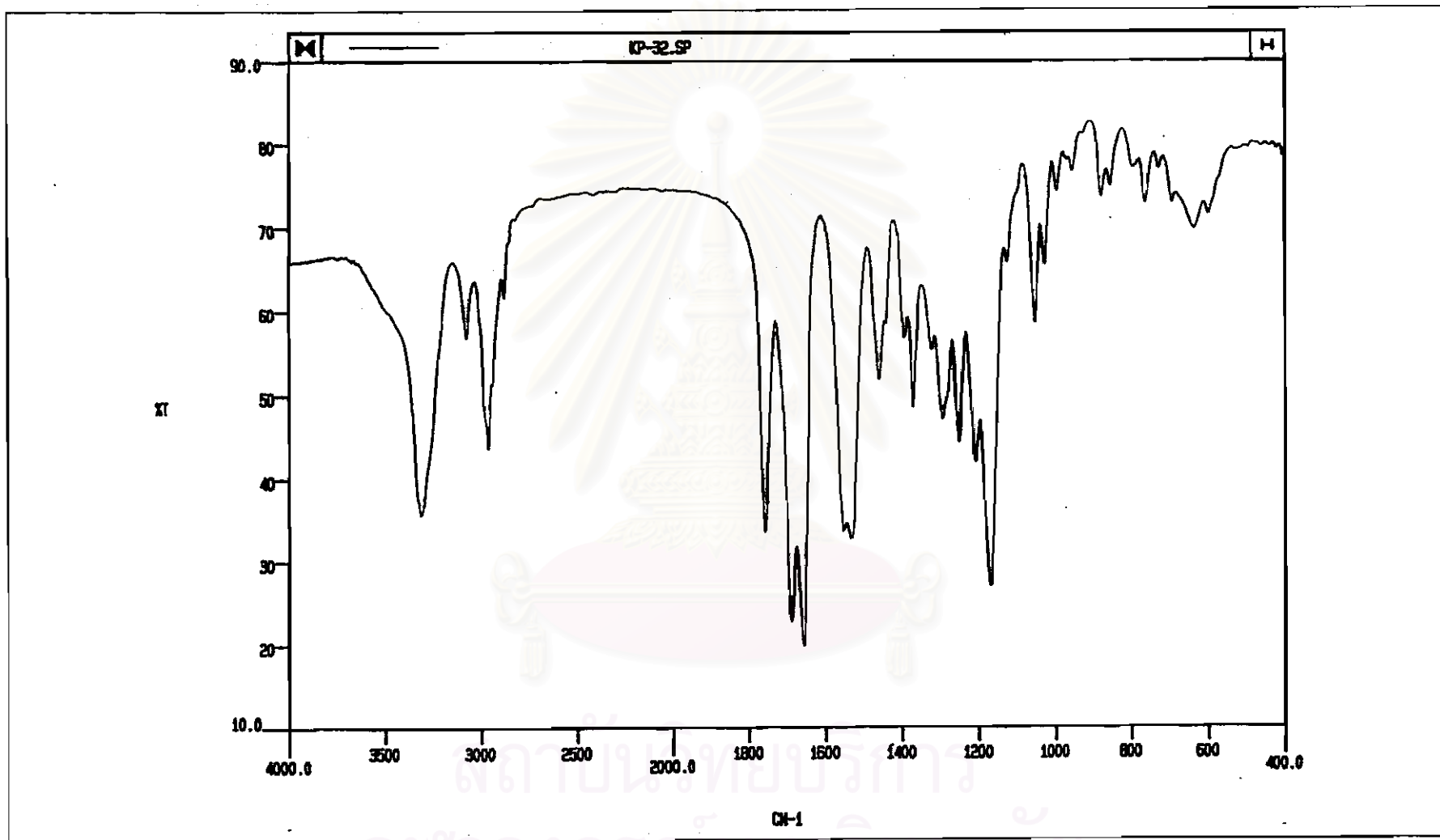
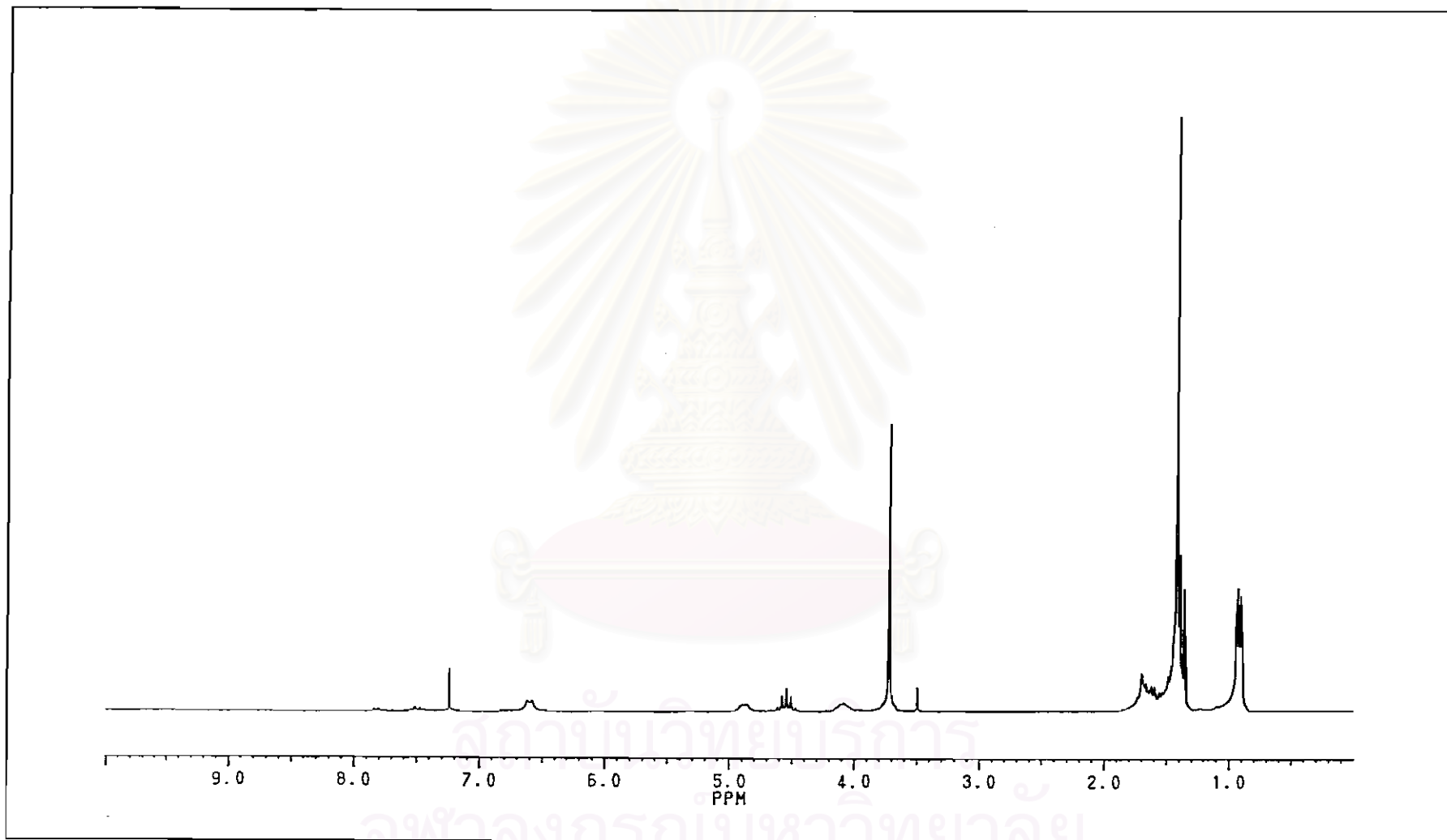


Figure 88: IR spectrum (KBr) of *N*-*tert*-butoxycarbonyl-L-leucylalanine methyl ester (Boc-L-Leu-Ala-OMe)



**Figure 89:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-*tert*-butoxycarbonyl-L-leucylalanine methyl ester (Boc-L-Leu-Ala-OMe)

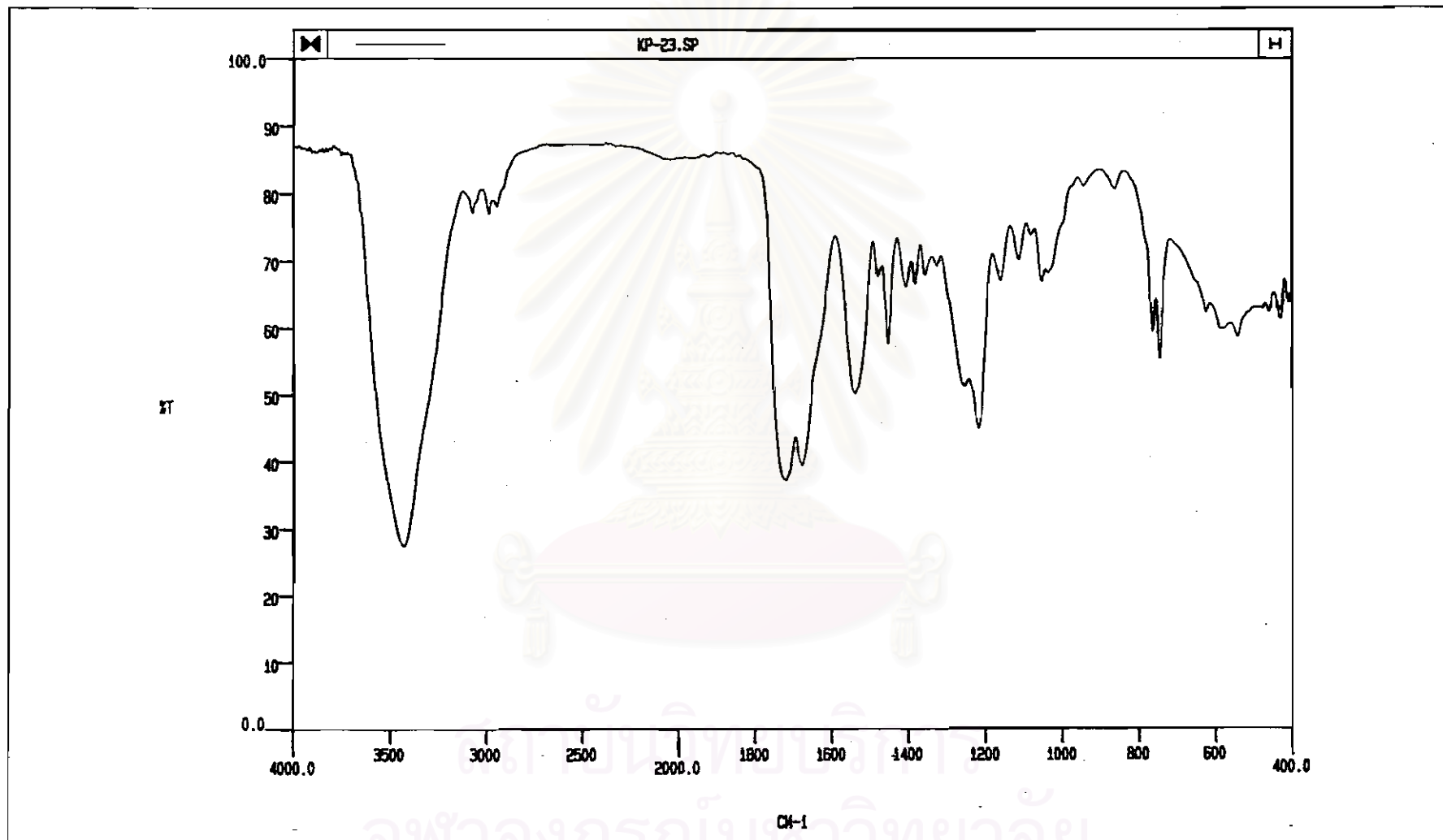
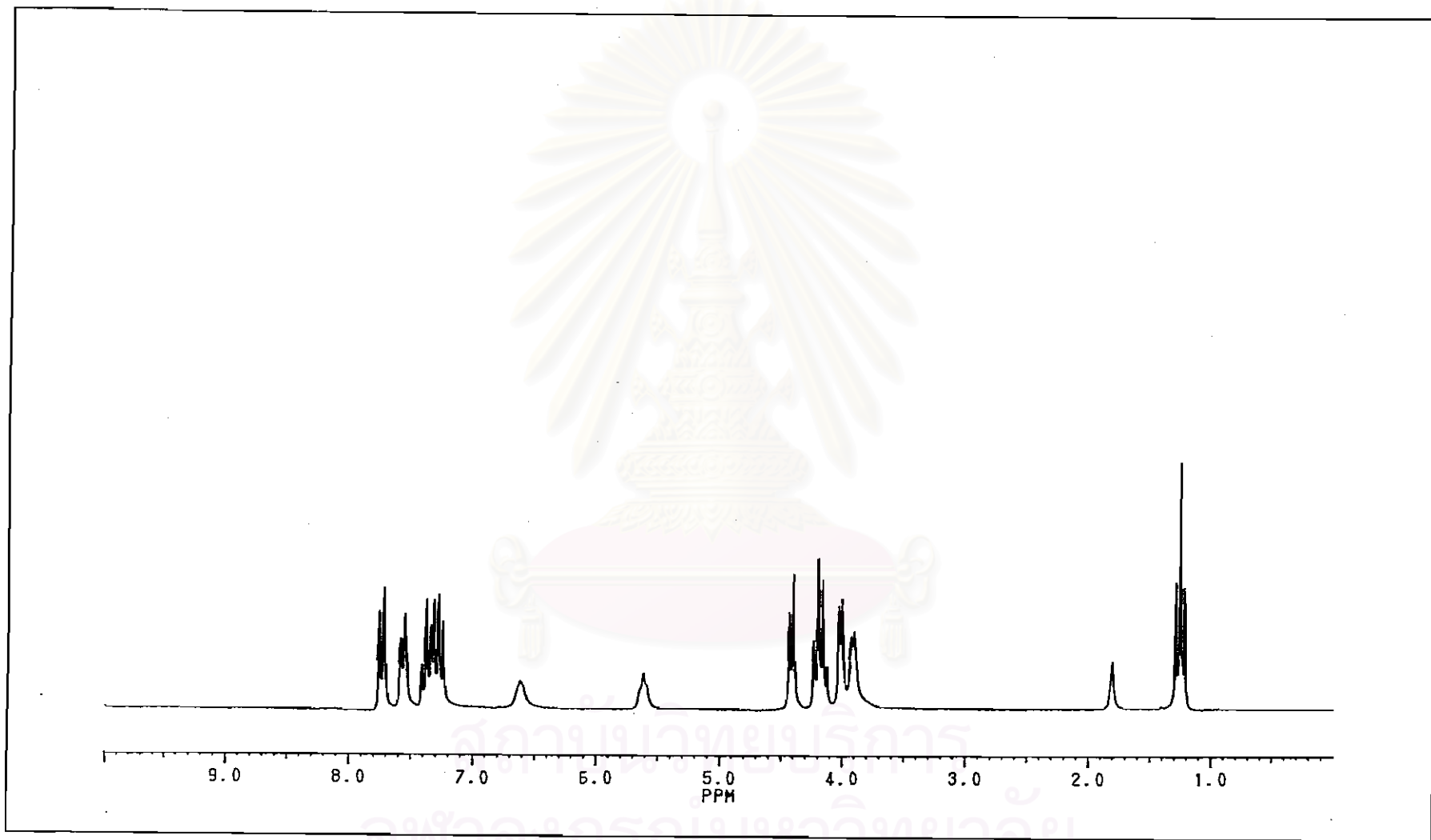


Figure 90: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonylglycylglycine ethyl ester (Fmoc-Gly-Gly-OEt)





**Figure 91:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonylglycylglycine ethyl ester (Fmoc-Gly-Gly-OEt)

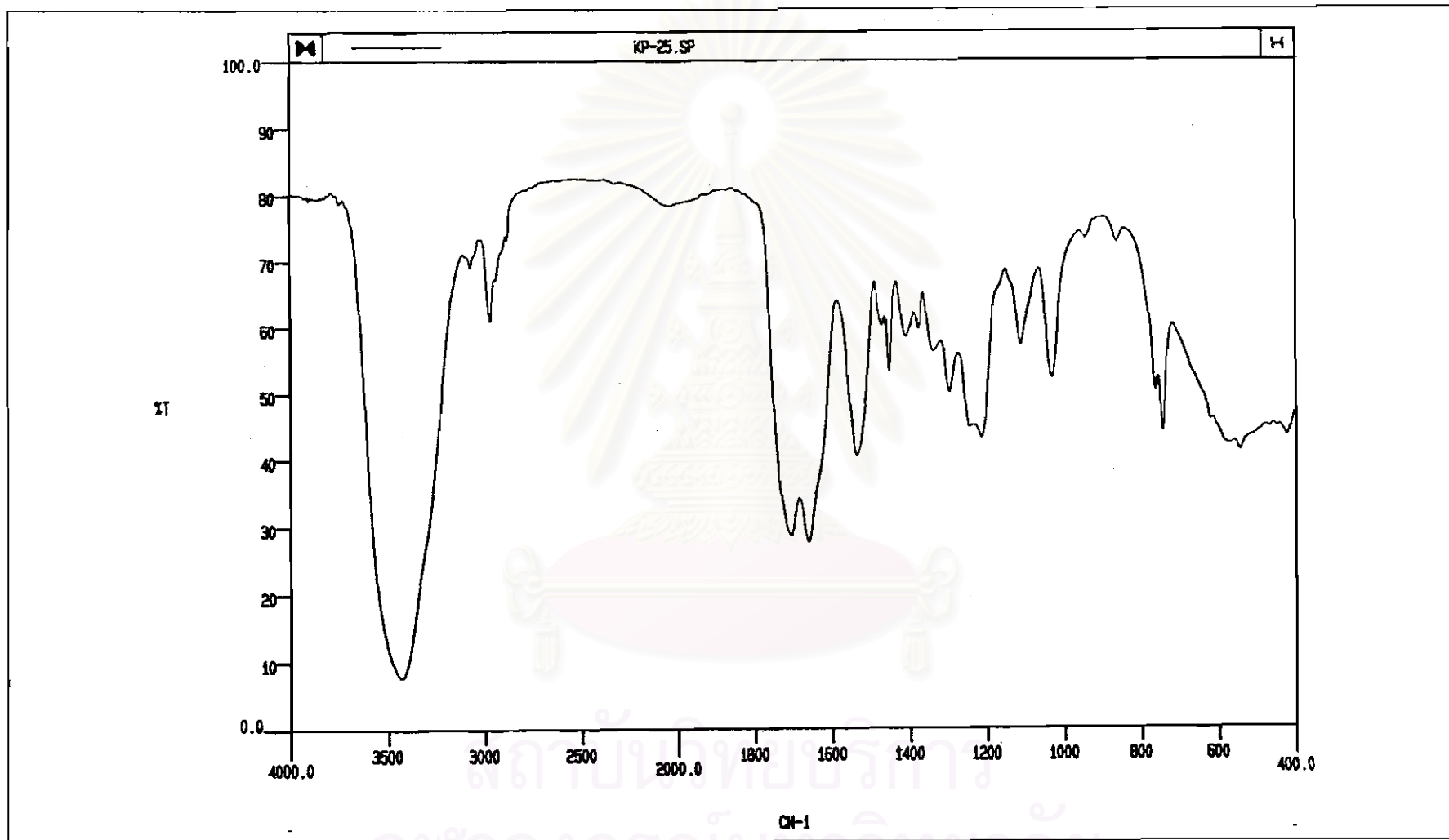


Figure 92: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-valylglycine ethyl ester (Fmoc-L-Val-Gly-OEt)

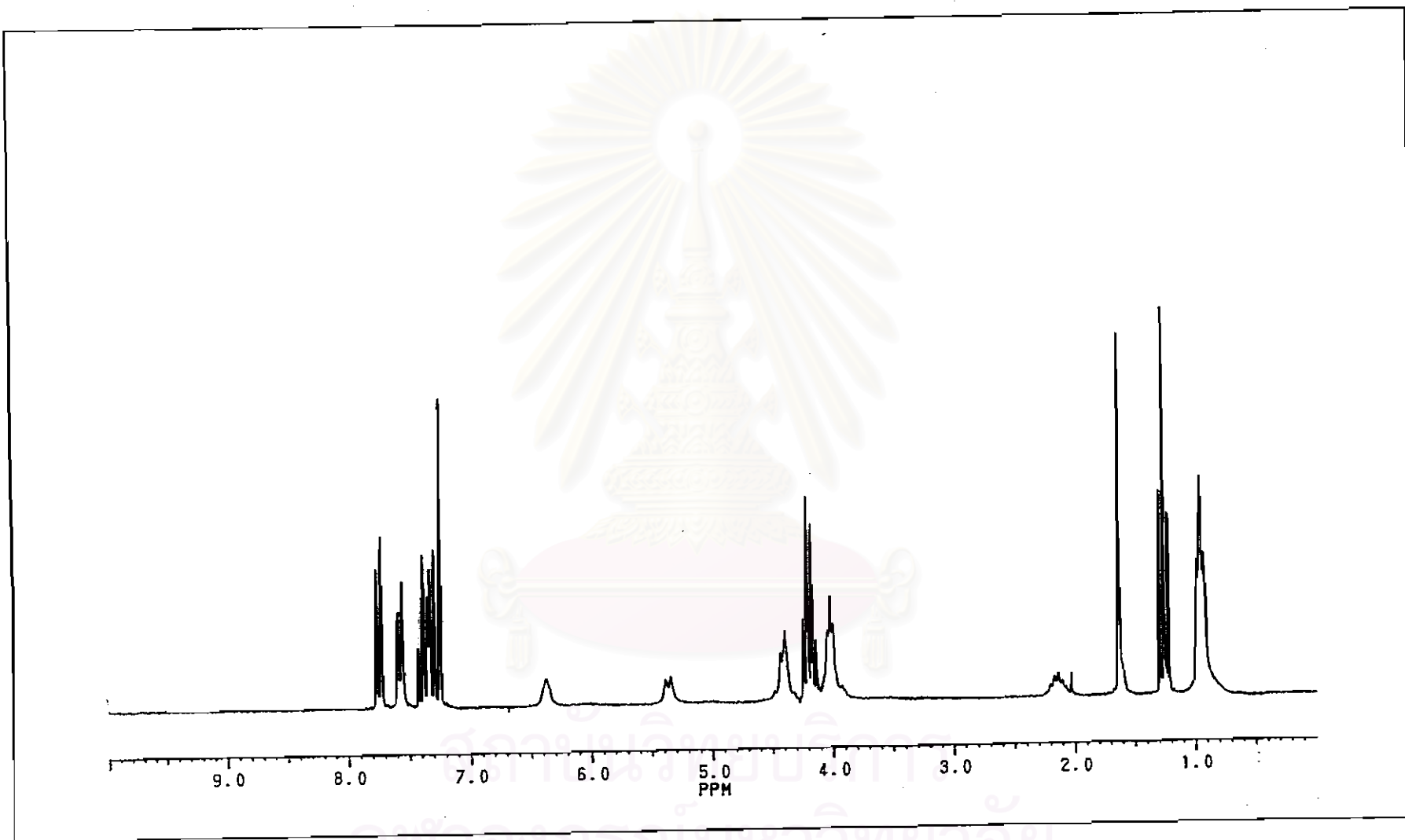


Figure 93:  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-valylglycine ethyl ester (Fmoc-L-Val-Gly-OEt)

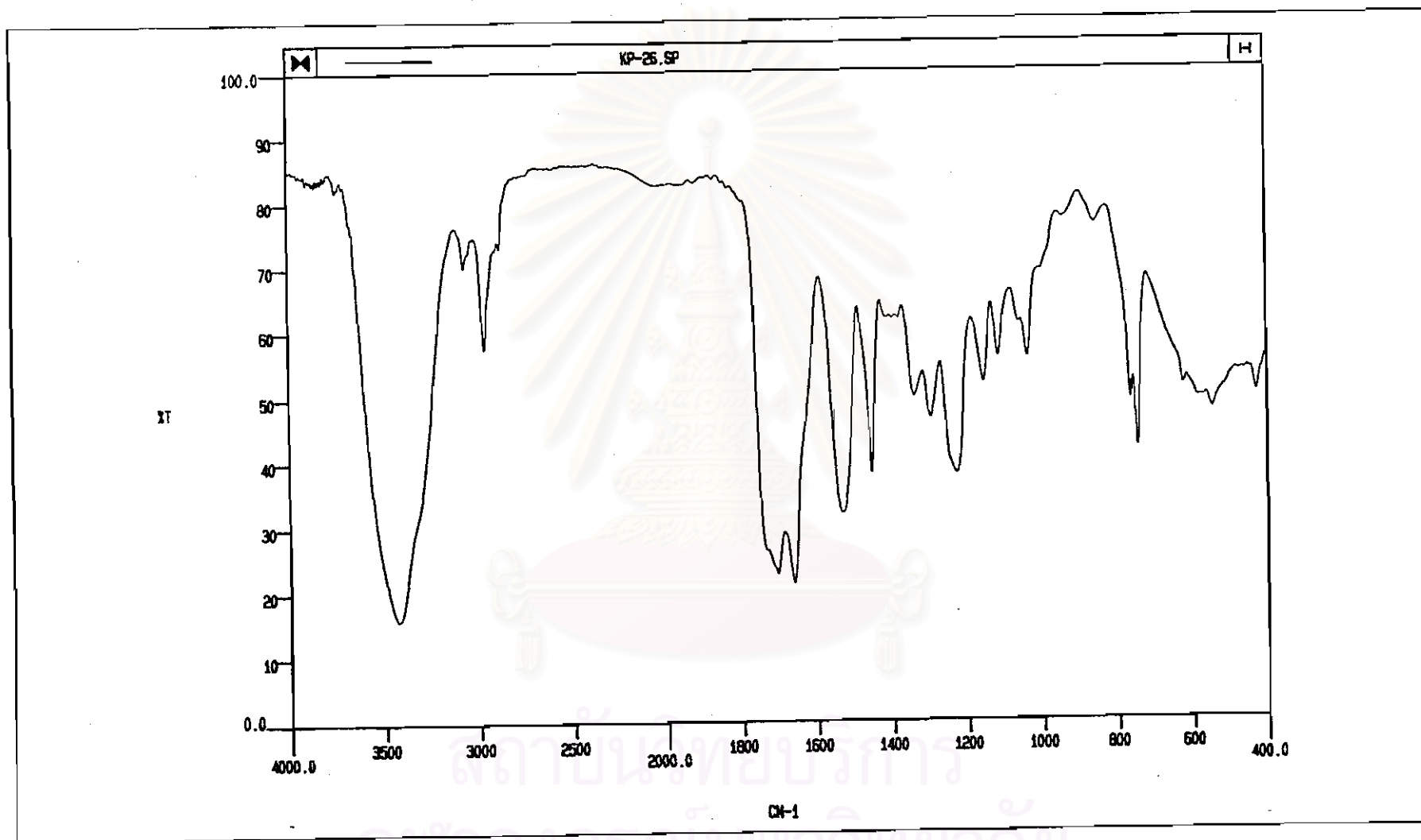
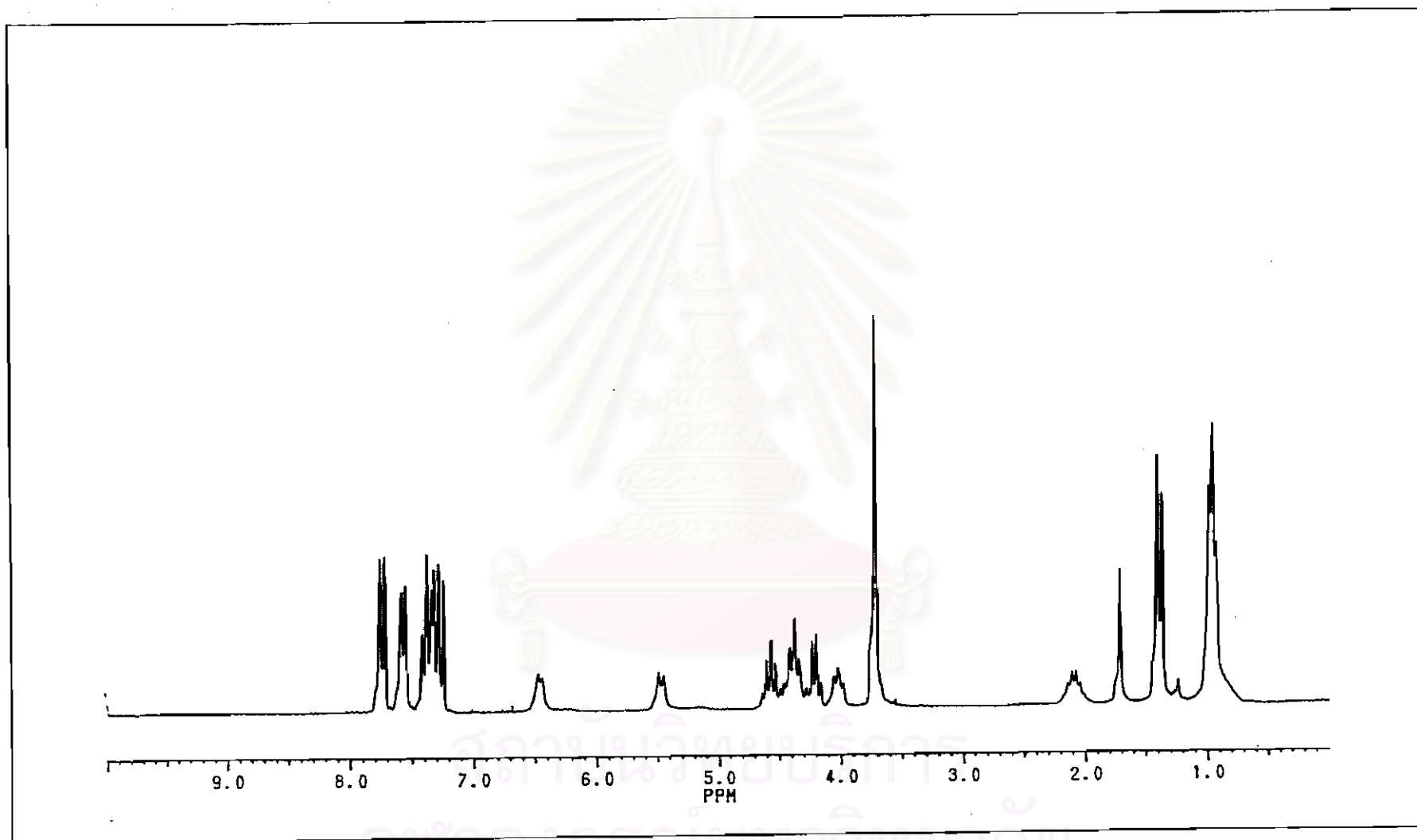


Figure 94: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-valylalanine methyl ester (Fmoc-L-Val-Ala-OMe)



**Figure 95:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-valylalanine methyl ester (Fmoc-L-Val-Ala-OMe)

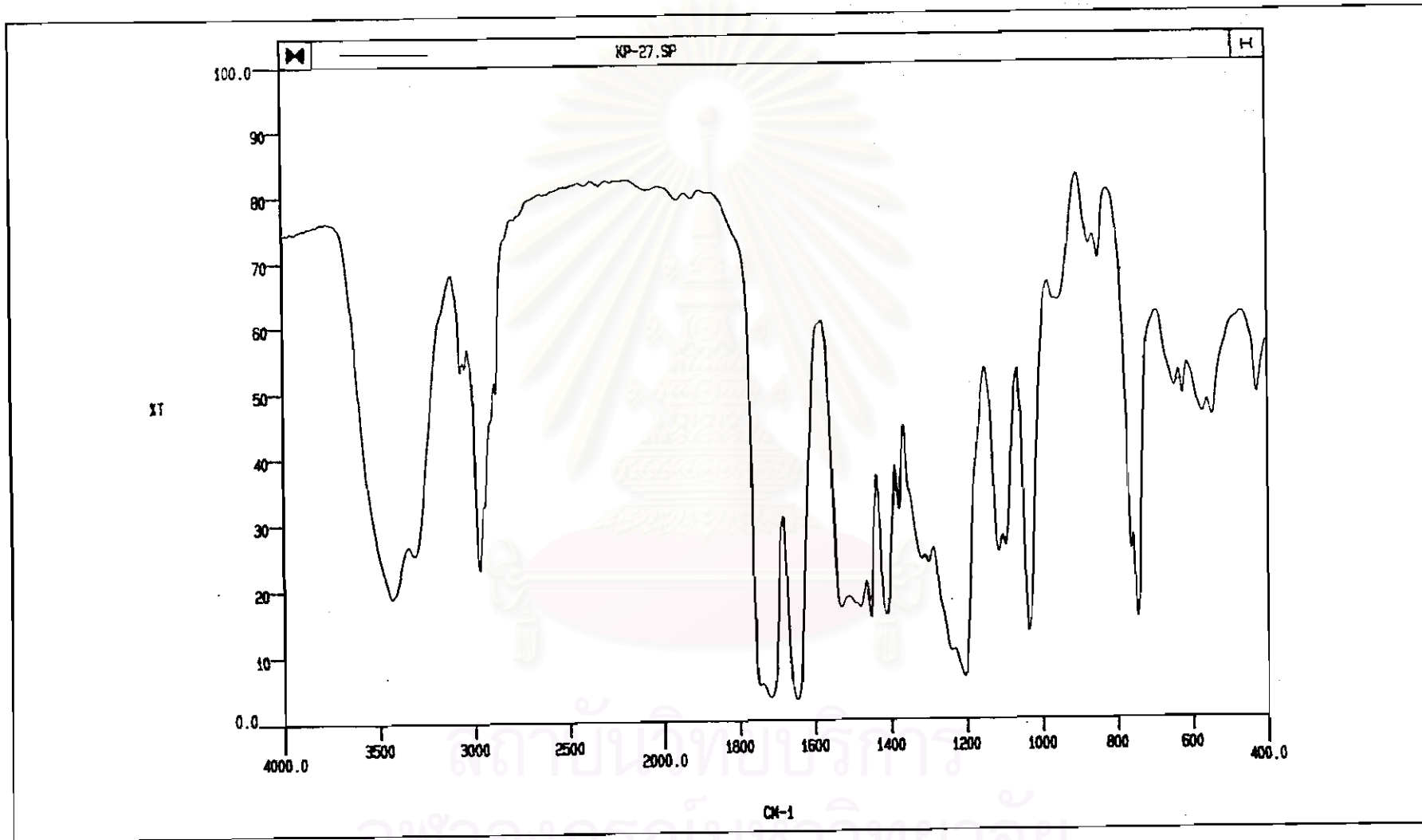
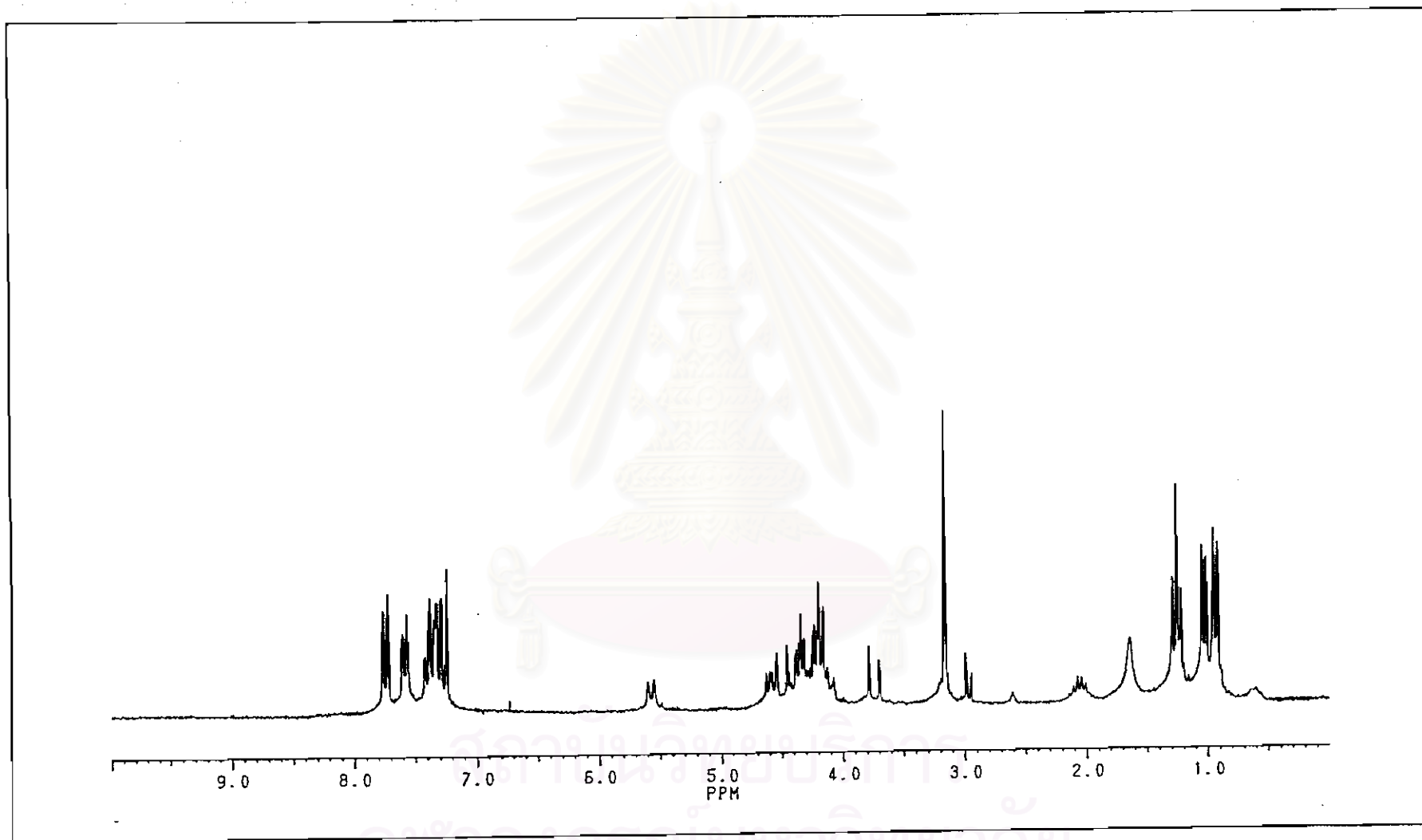
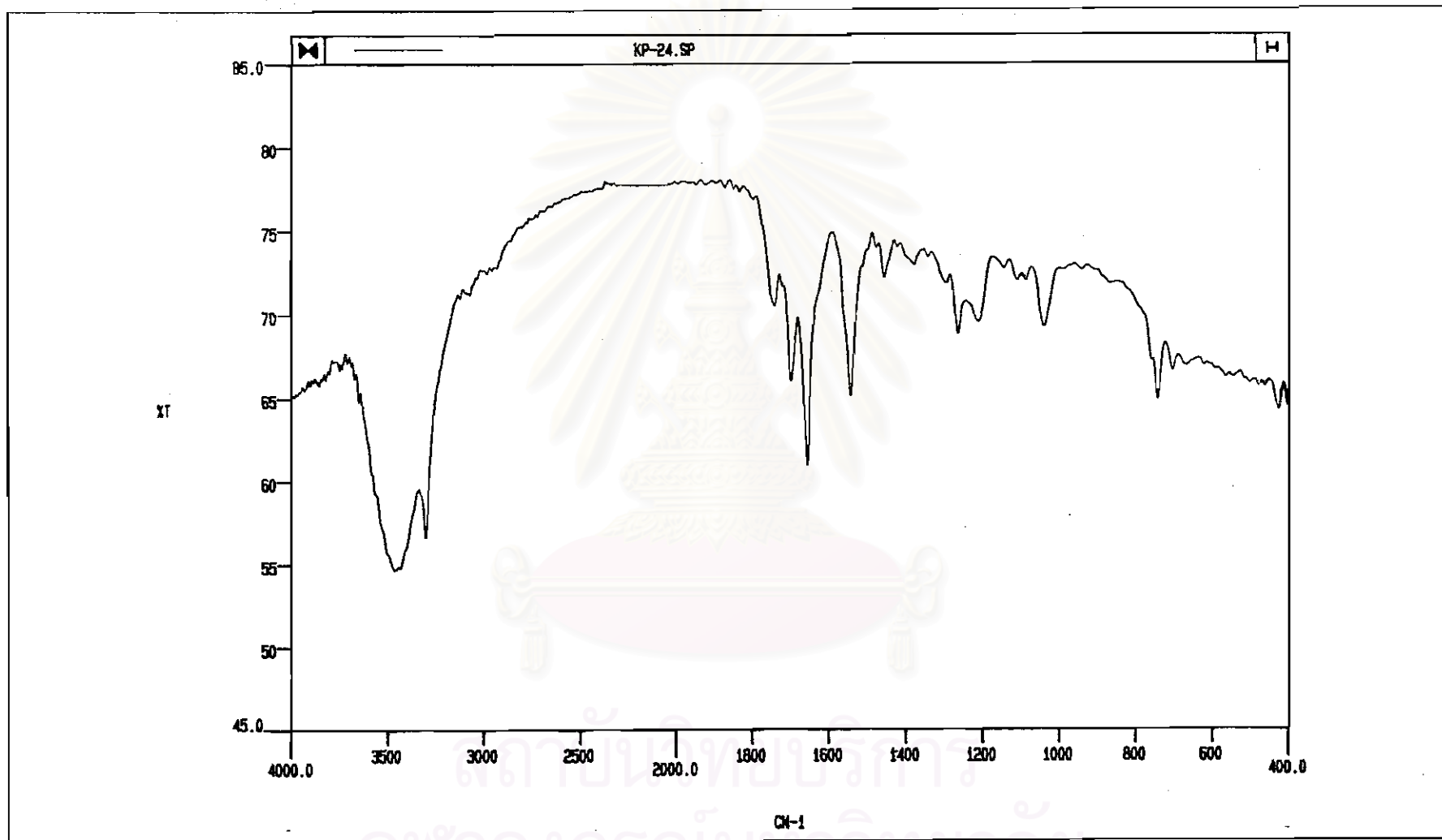


Figure 96: IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-L-valylsarcosine ethyl ester (Fmoc-L-Val-Sar-OEt)

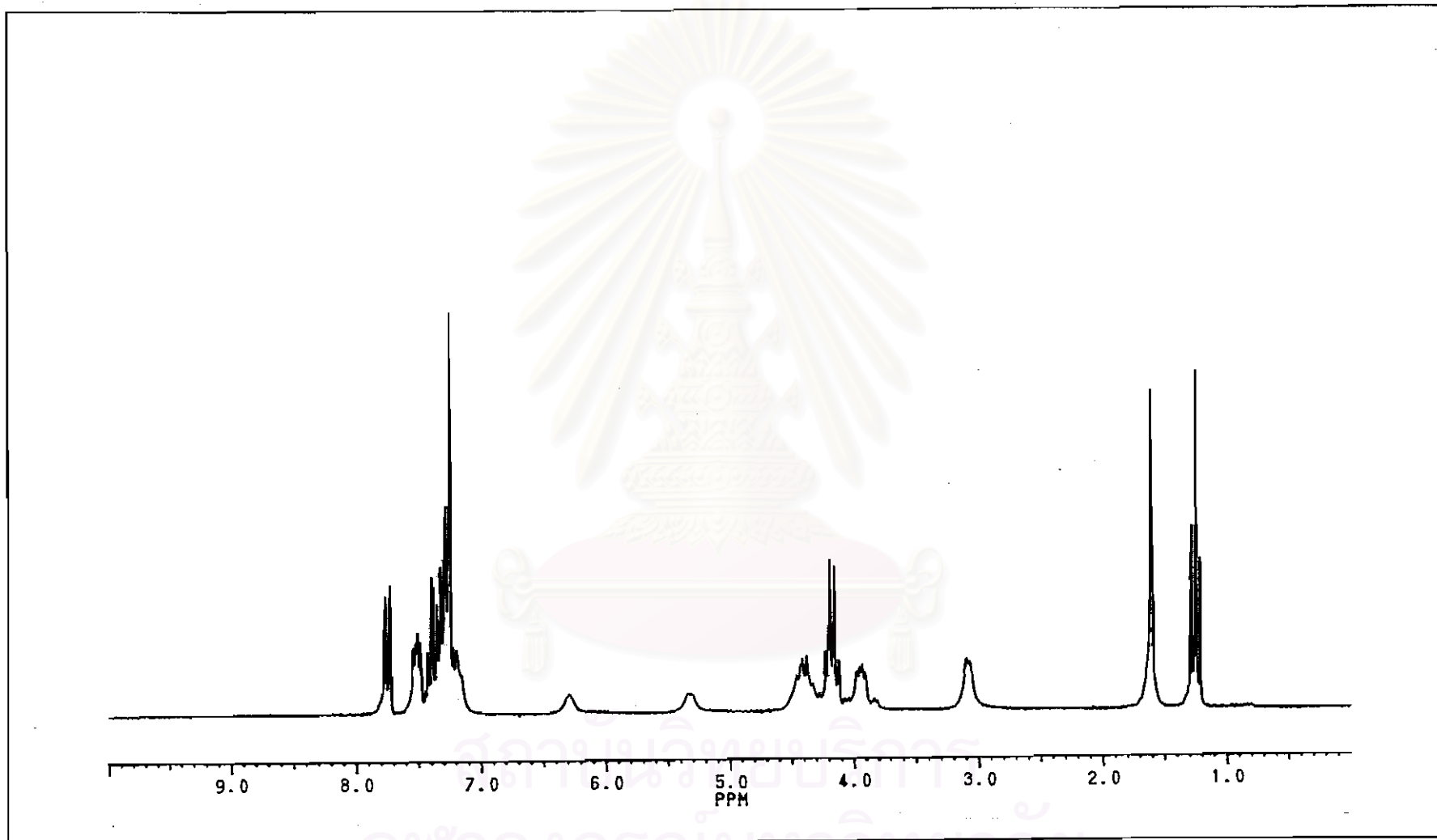


**Figure 97:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-valylsarcosine ethyl ester (Fmoc-L-Val-Sar-OEt)

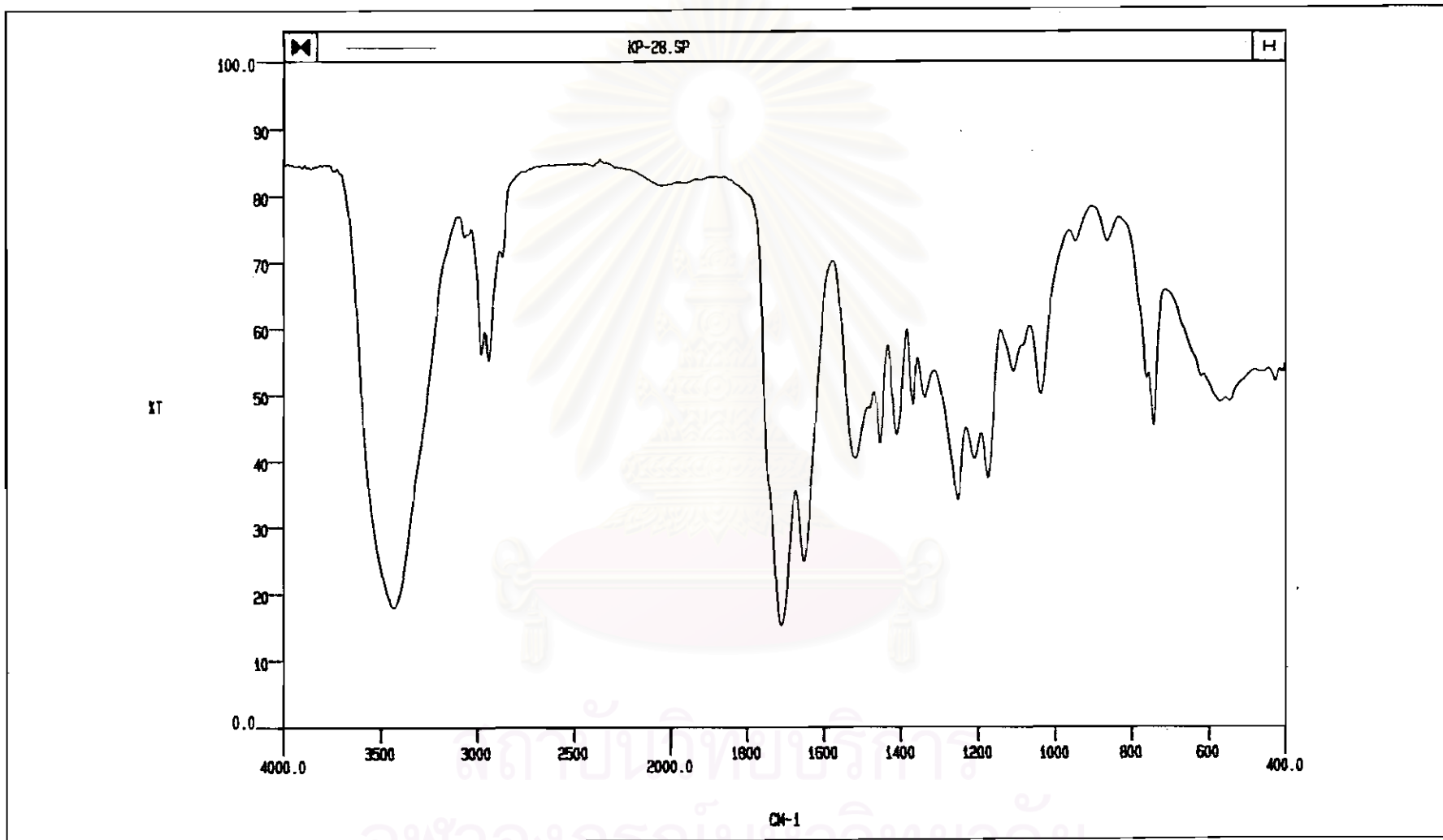


**Figure 98:** IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-L-phenylalanyl-glycine ethyl ester (Fmoc-L-Phe-Gly-OEt)

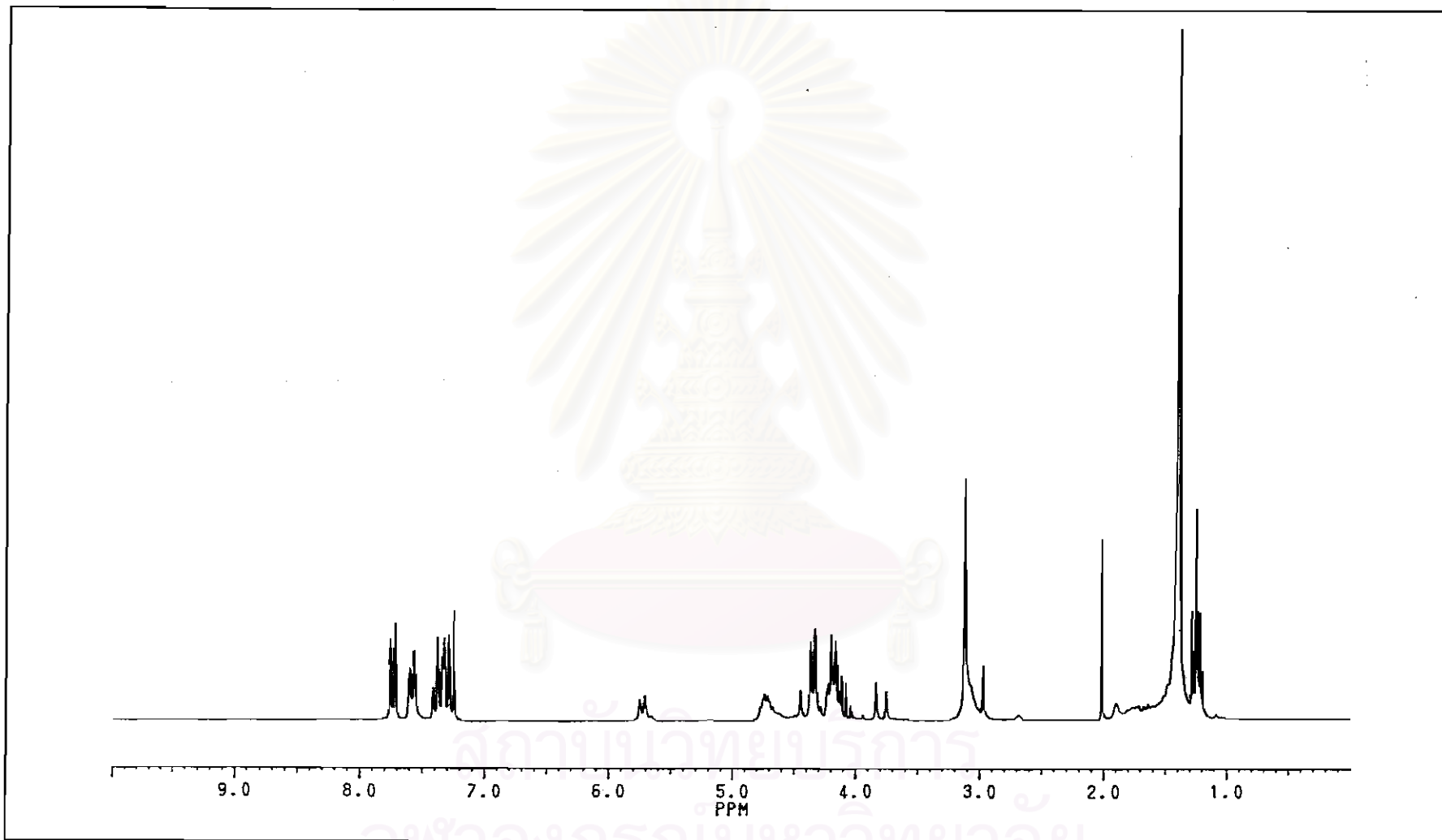




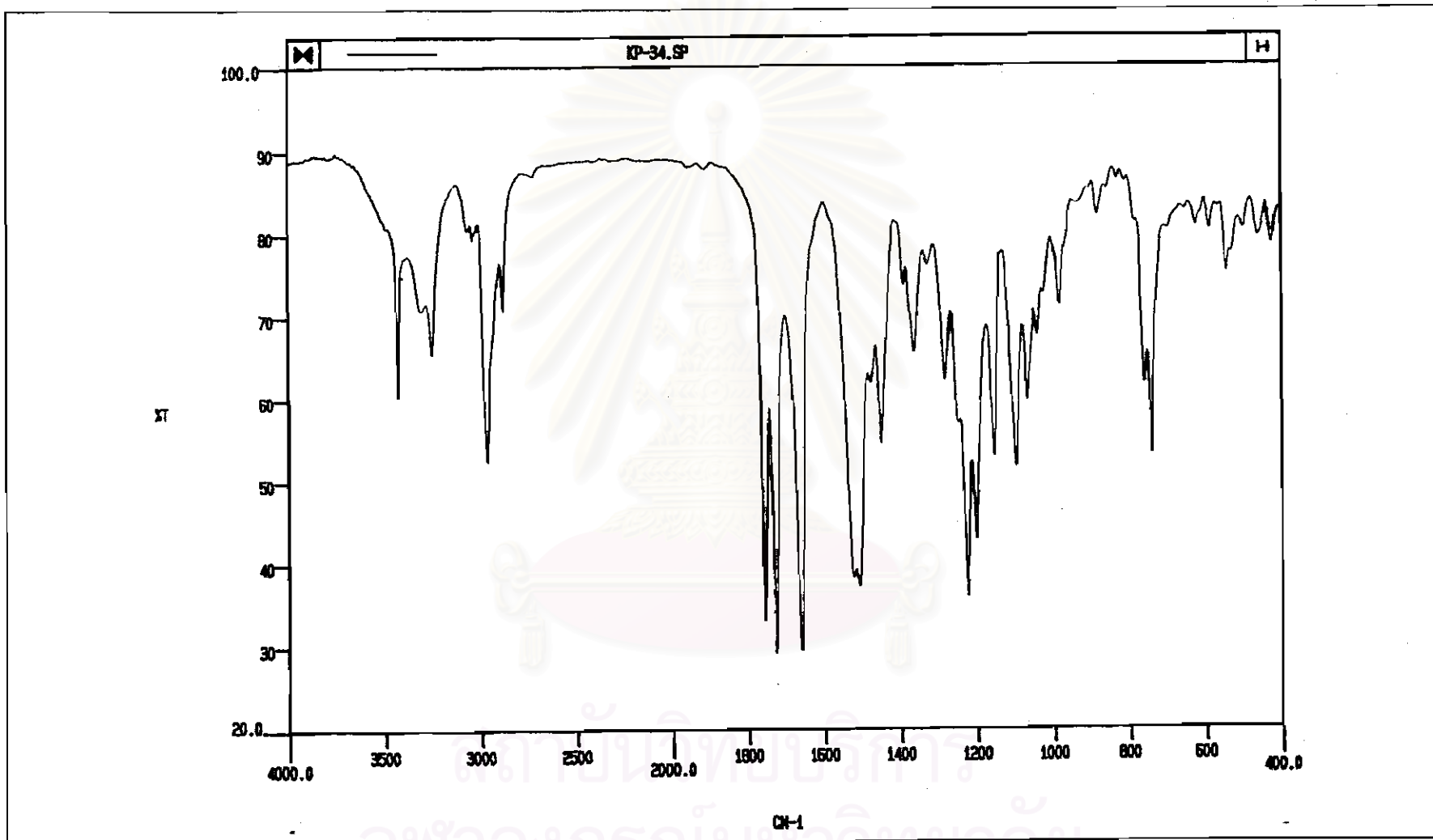
**Figure 99:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-L-phenylalanyl-glycine ethyl ester (Fmoc-L-Phe-Gly-OEt)



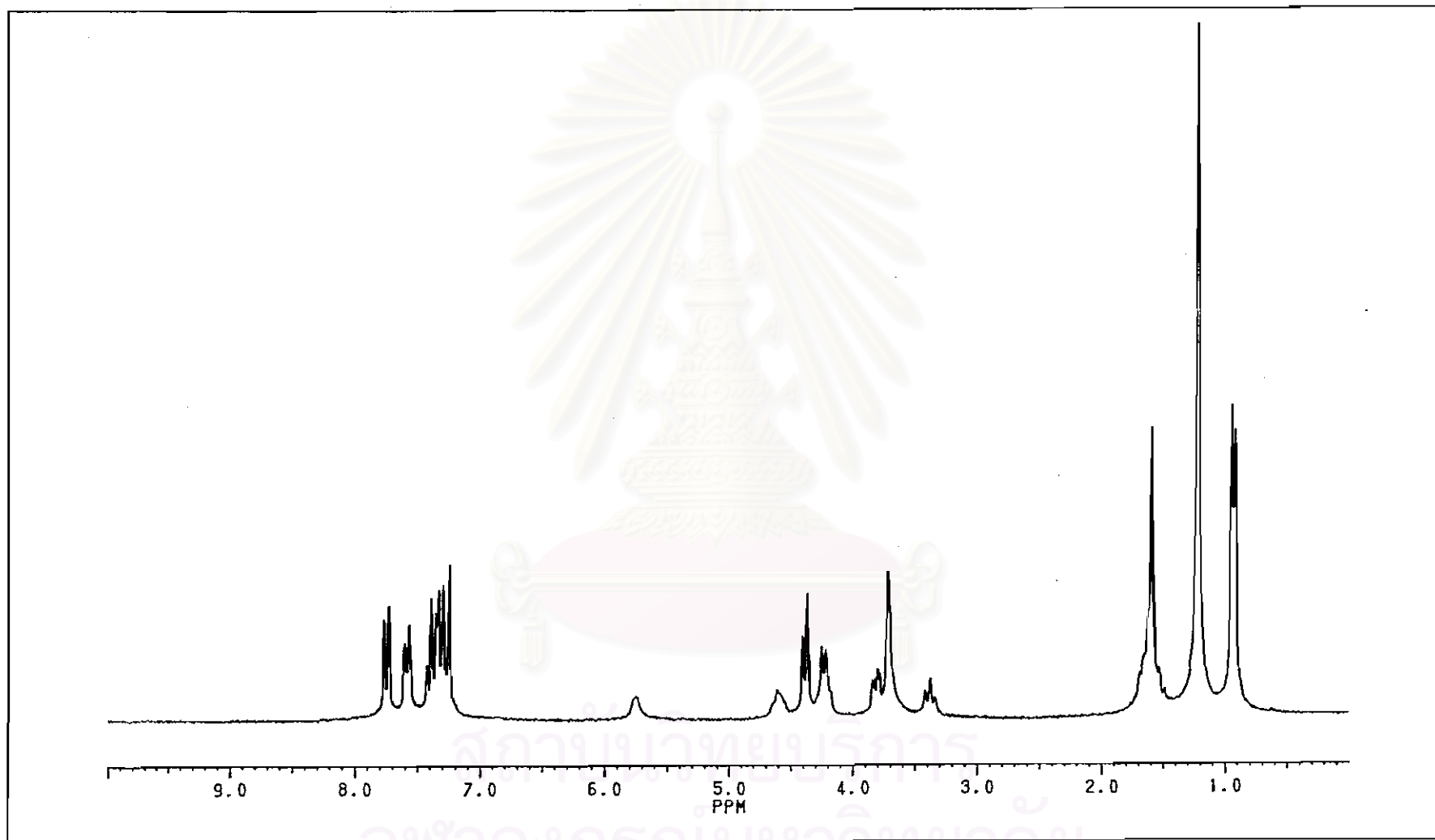
**Figure 100:** IR spectrum (neat) of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-L-lysylsarcosine ethyl ester (Fmoc-L-Lys(Boc)-Sar-OEt)



**Figure 101:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-*N*- $\epsilon$ -*tert*-butoxycarbonyl-*L*-lysylsarcosine ethyl ester (Fmoc-*L*-Lys(Boc)-Sar-OEt)



**Figure 102:** IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*L*-seryl-*L*-leucine methyl ester  
(Fmoc-*L*-Ser(*O*<sup>t</sup>Bu)-*L*-Leu-OMe)



**Figure 103:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-(*O*-*t*-butyl)-*L*-seryl-*L*-leucine methyl ester  
(Fmoc-*L*-Ser(*O*<sup>*t*</sup>Bu)-*L*-Leu-OMe)

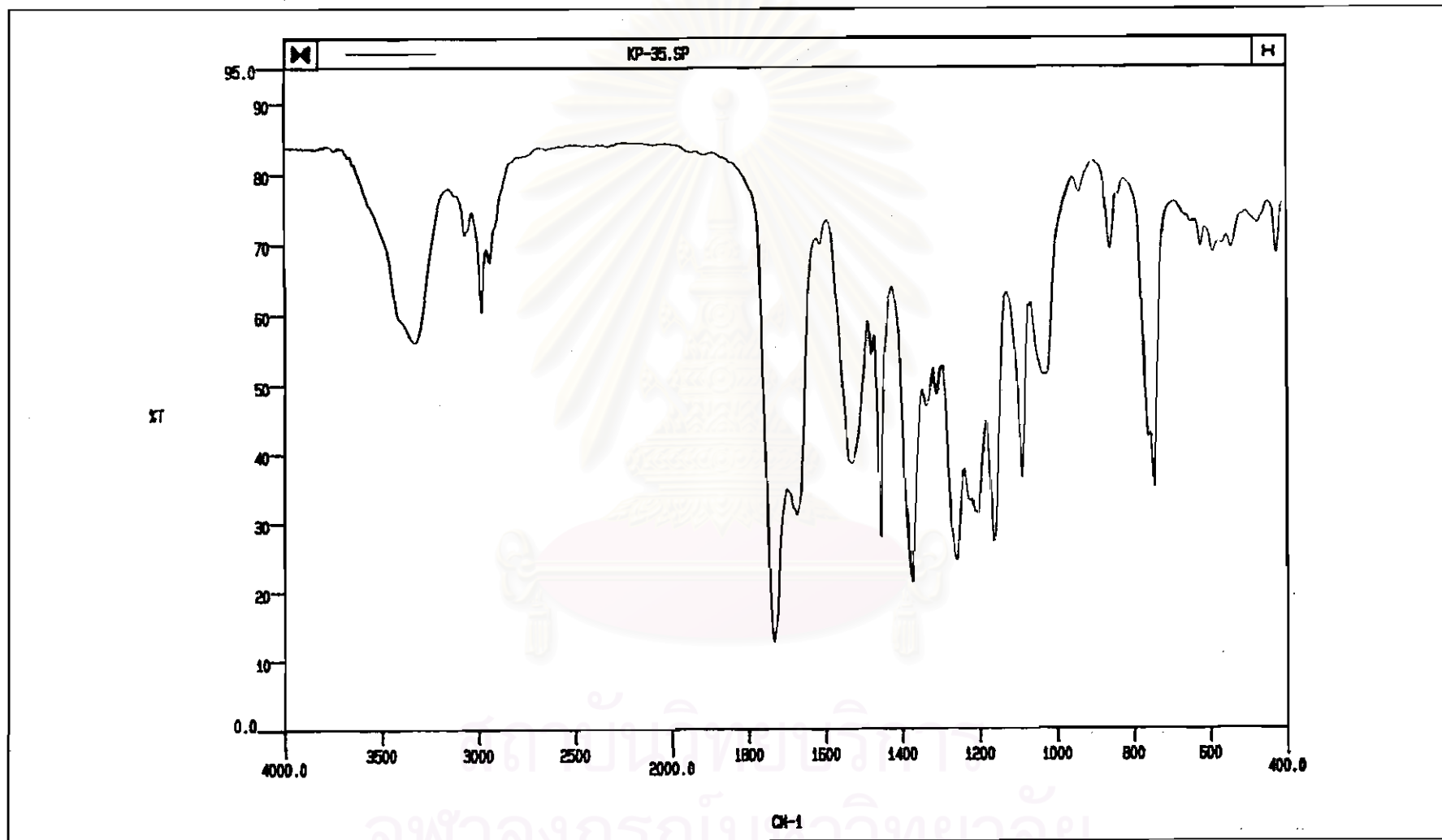
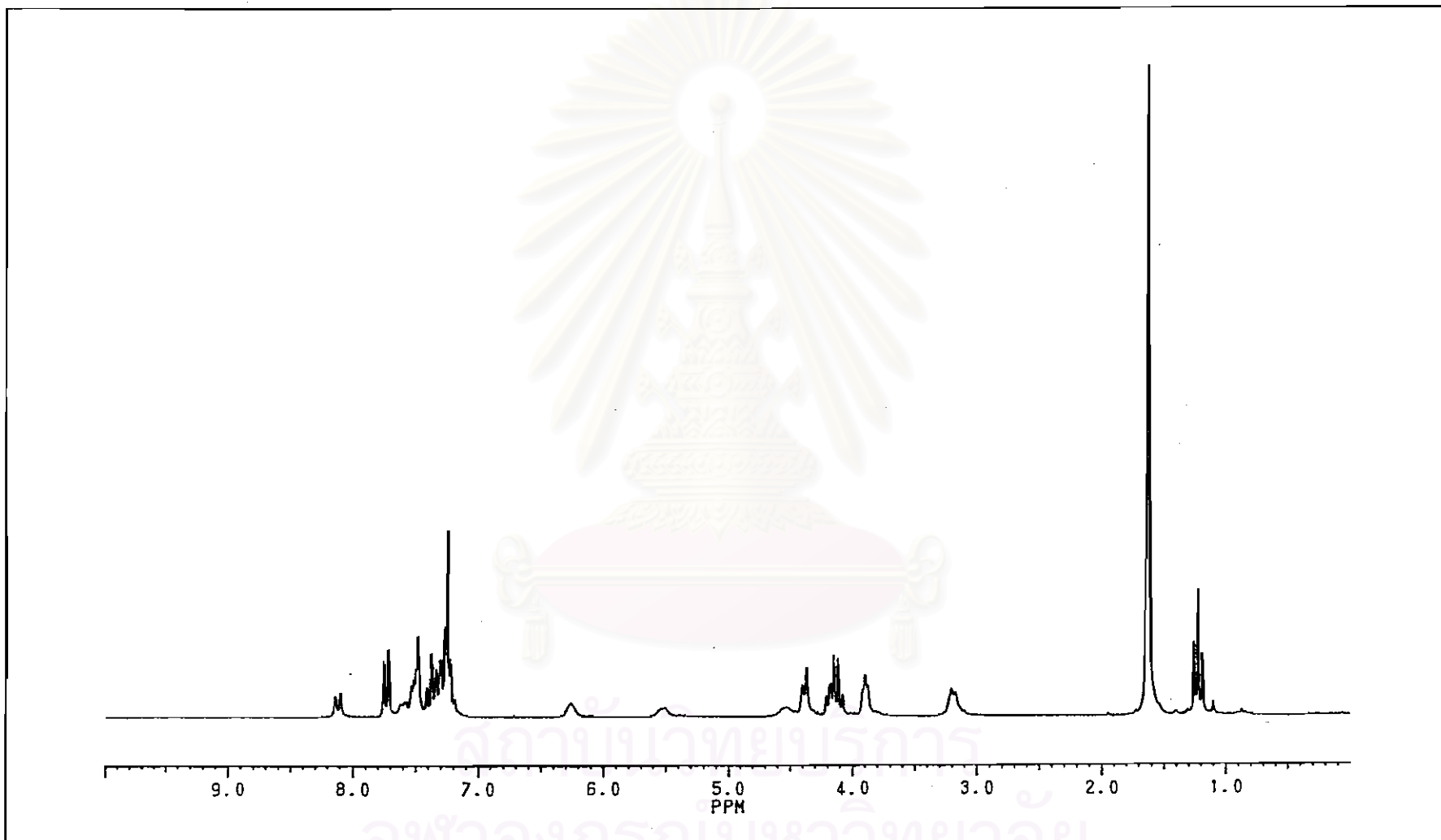
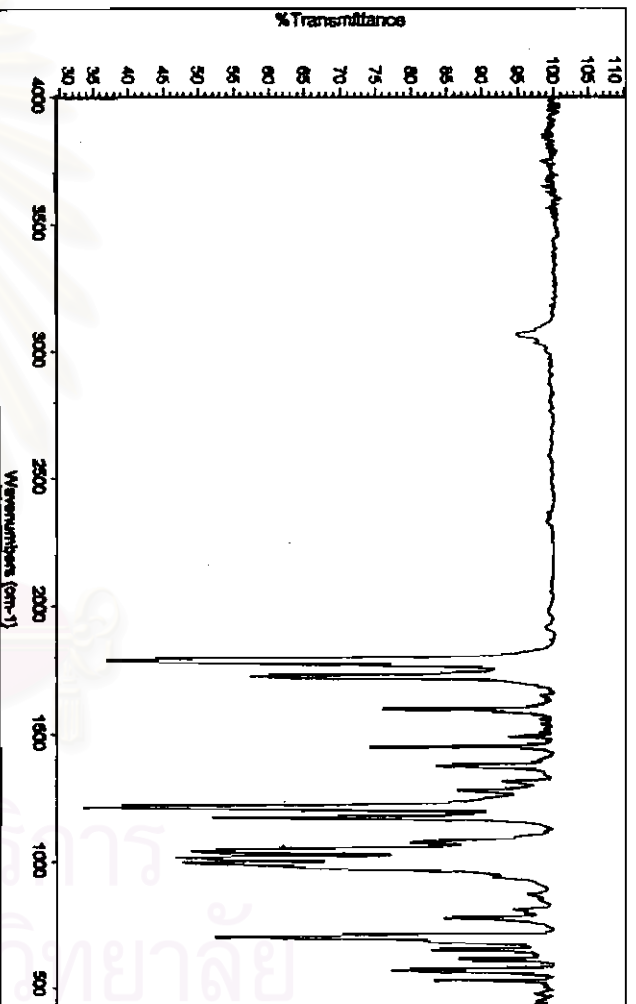


Figure 104: IR spectrum (KBr) of *N*-9-fluorenylmethoxycarbonyl-*N*<sup>tert</sup>-butoxycarbonyltryptophanylglycine ethyl ester (Fmoc-Trp(Boc)-Gly-OEt)

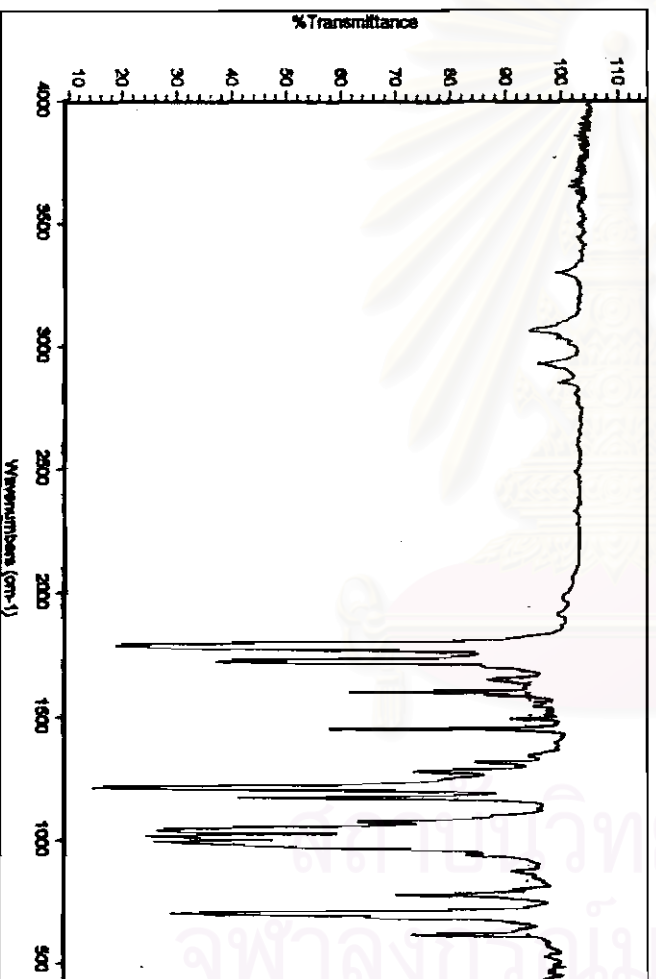


**Figure 105:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of *N*-9-fluorenylmethoxycarbonyl-*N*<sup>trt</sup>-*tert*-butoxycarbonyltryptophanyl-glycine ethyl ester (Fmoc-Trp(Boc)-Gly-OEt)

a) benzoic anhydride obtained from reaction of tosyl chloride with benzoic acid

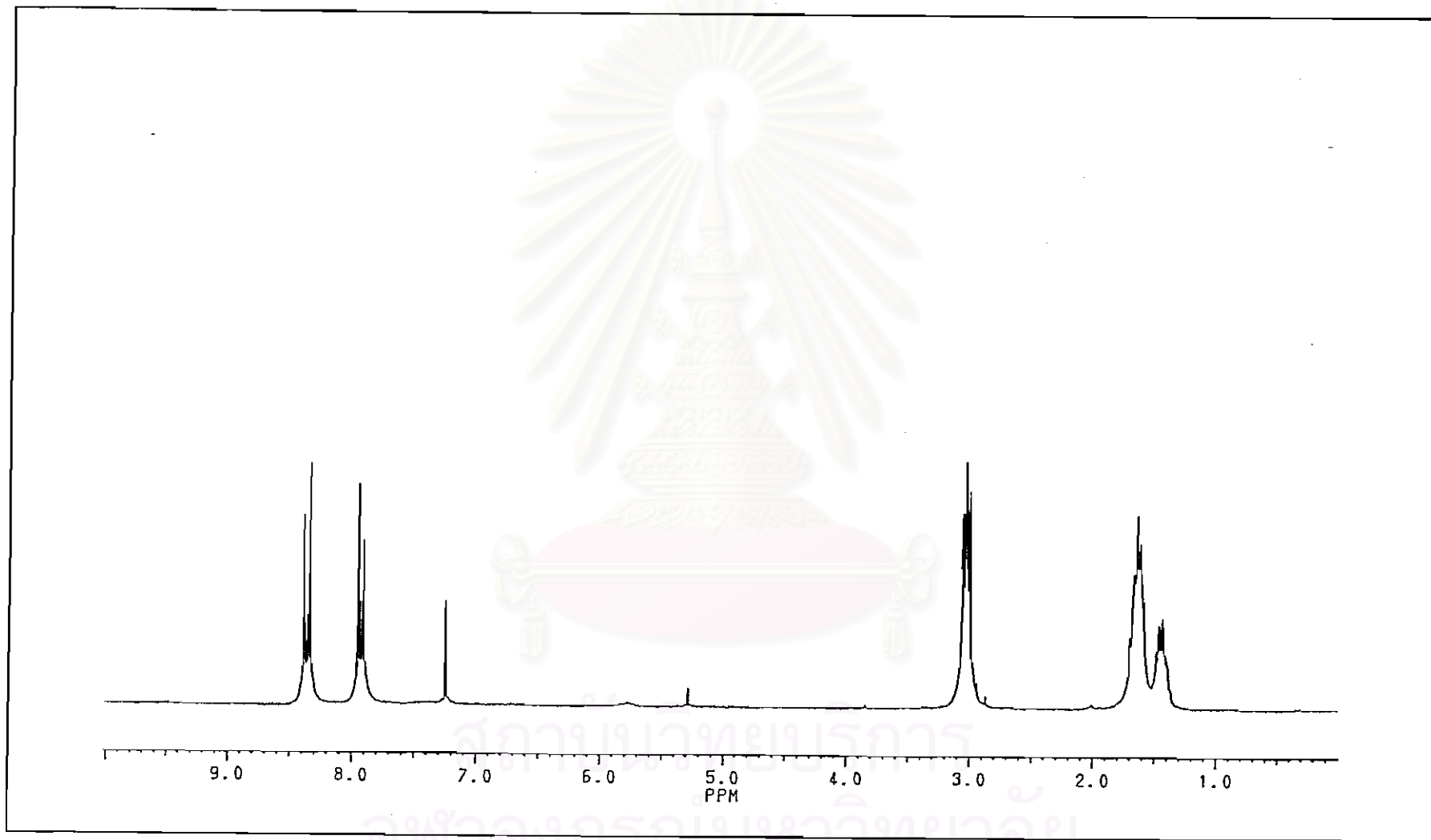


b) benzoic anhydride obtained from DCC-mediated coupling of benzoic acid

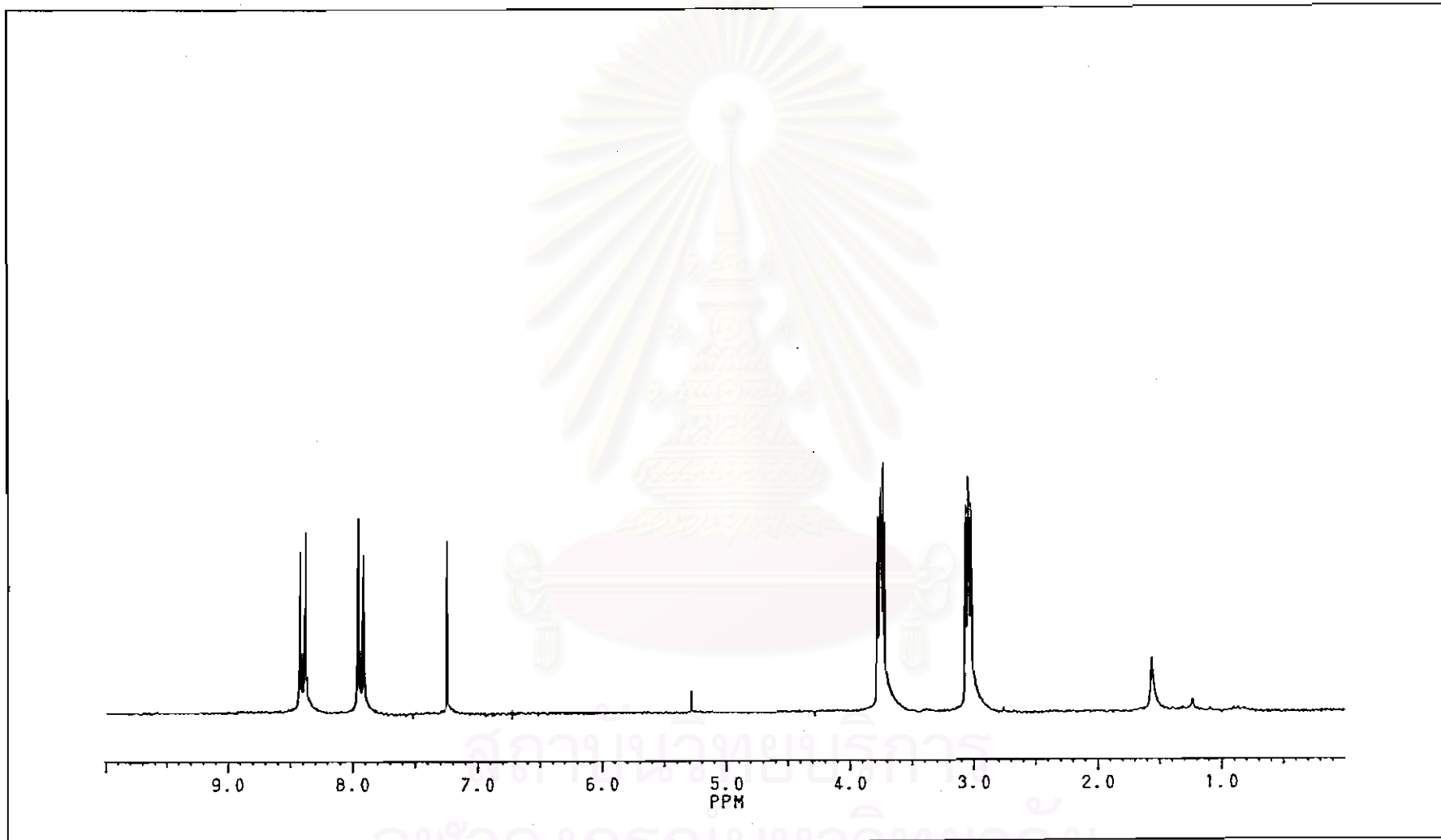


**Figure 106:** IR spectrum (neat) of benzoic anhydride obtained from reaction of tosyl chloride with benzoic acid (a) and from DCC-mediated coupling of benzoic acid (b)

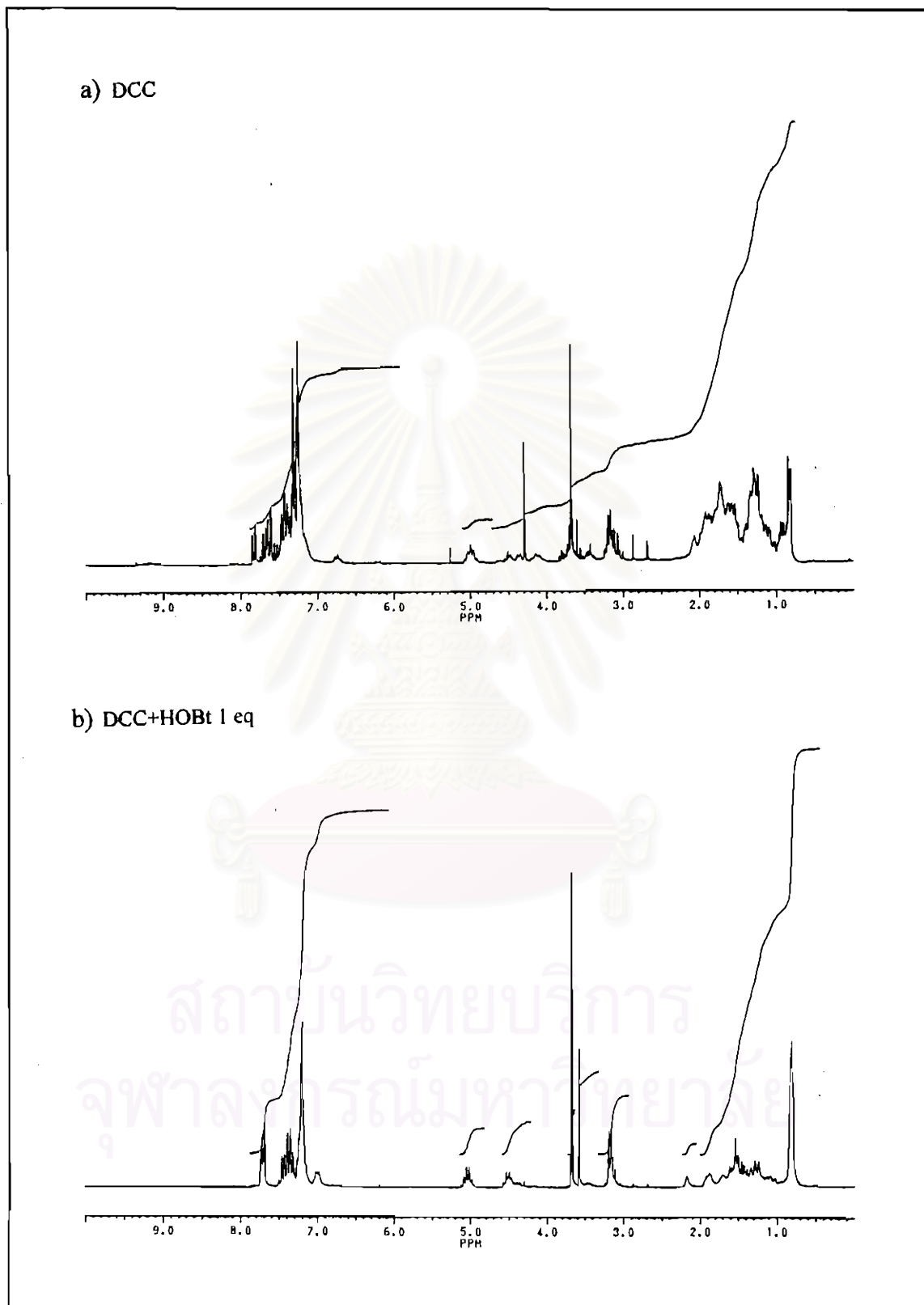




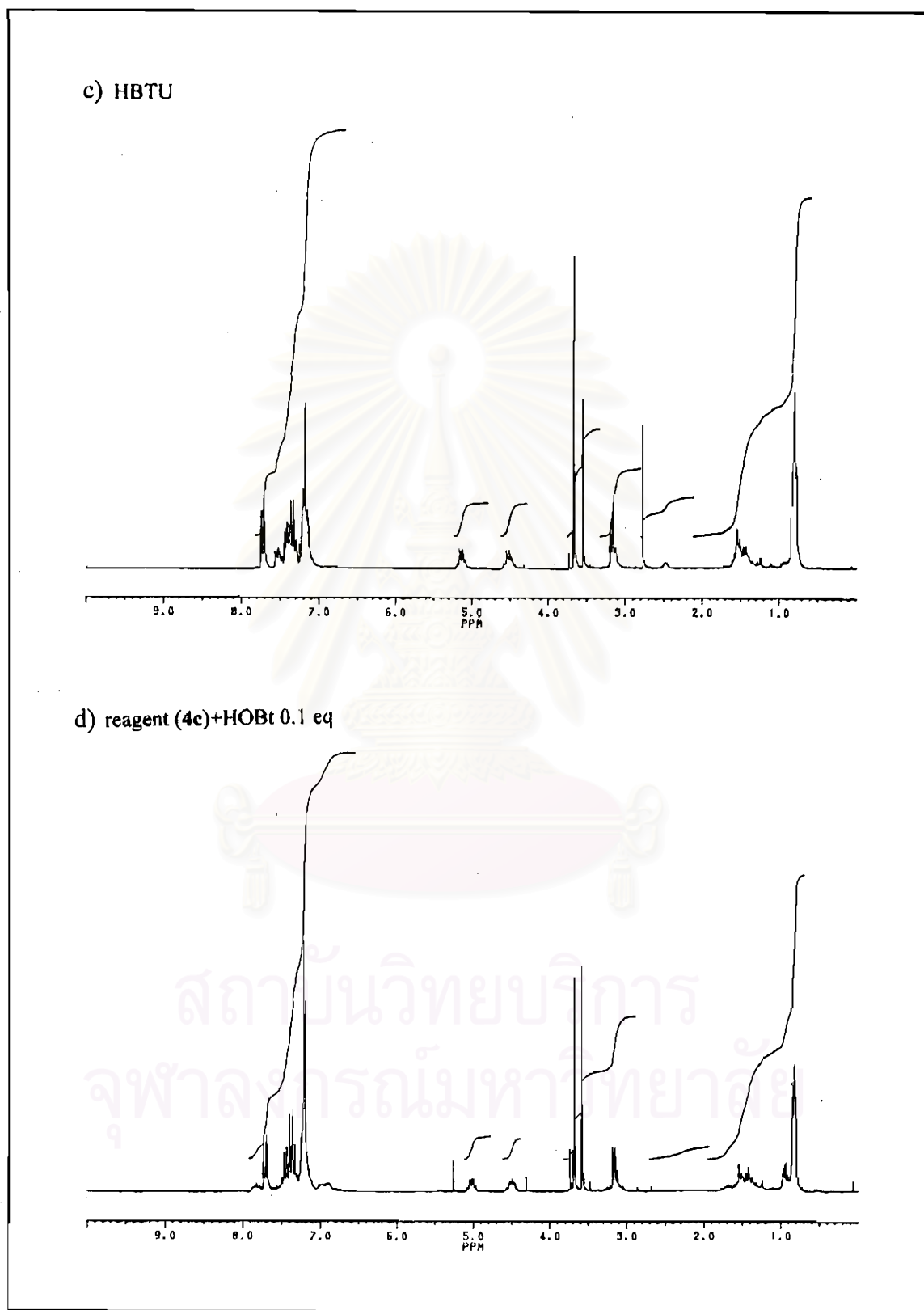
**Figure 107:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrobenzenesulfonyl piperidine



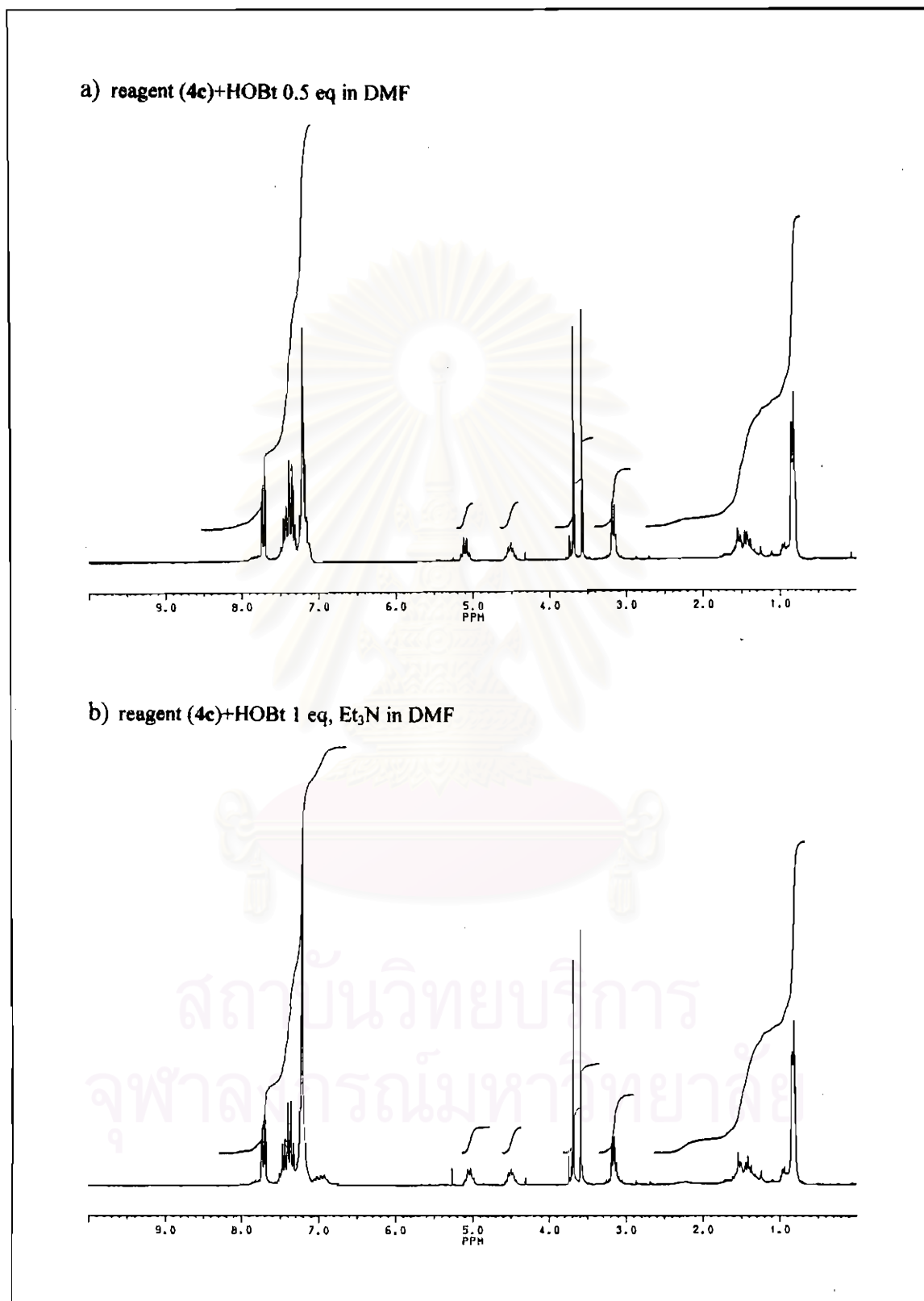
**Figure 108:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) spectrum of 4-nitrobenzenesulfonyl morpholine



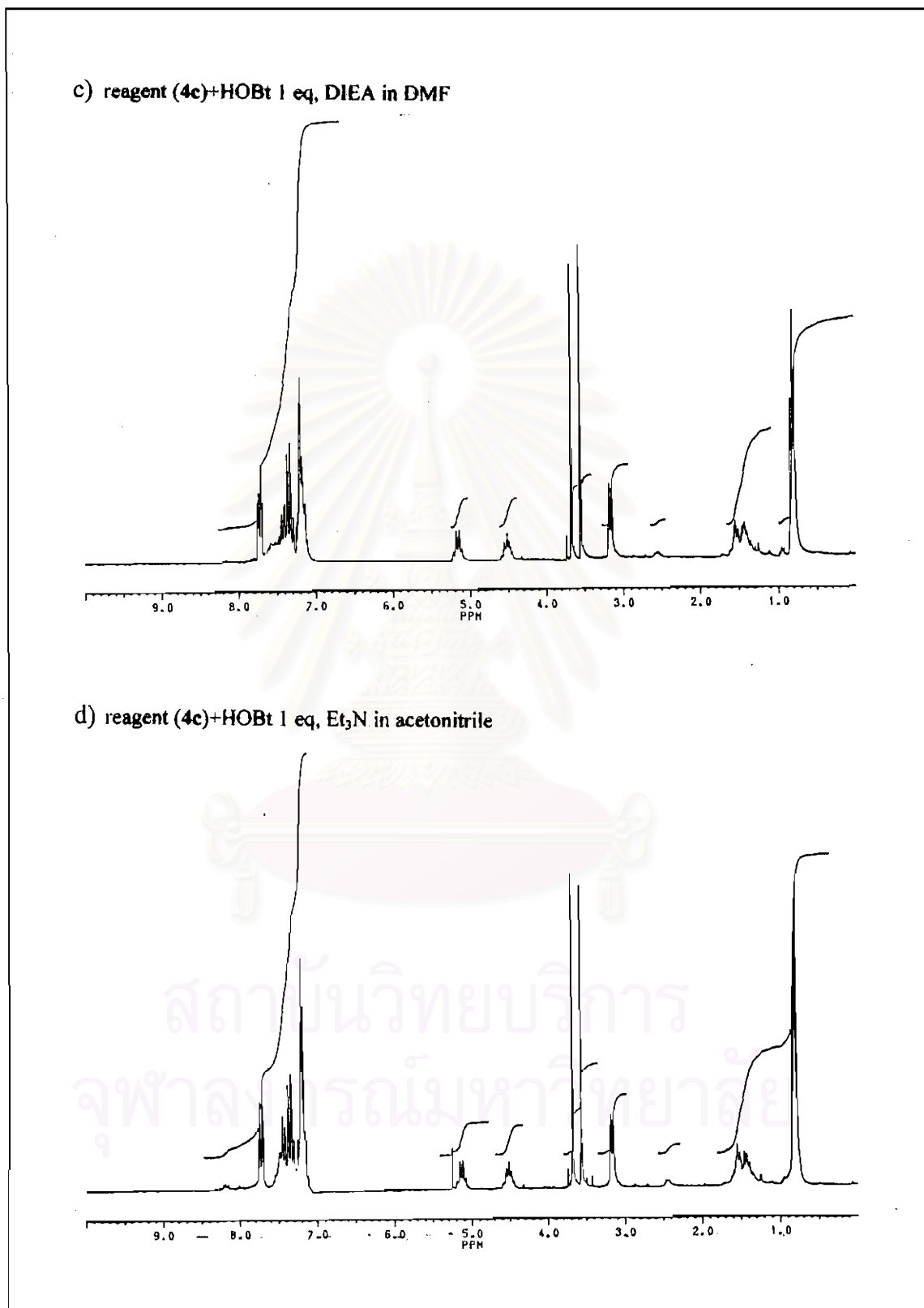
**Figure 109:**  $^1\text{H}$  NMR (CDCl<sub>3</sub>) of Bz-Phe-Leu-OMe obtained from different peptide coupling reagents



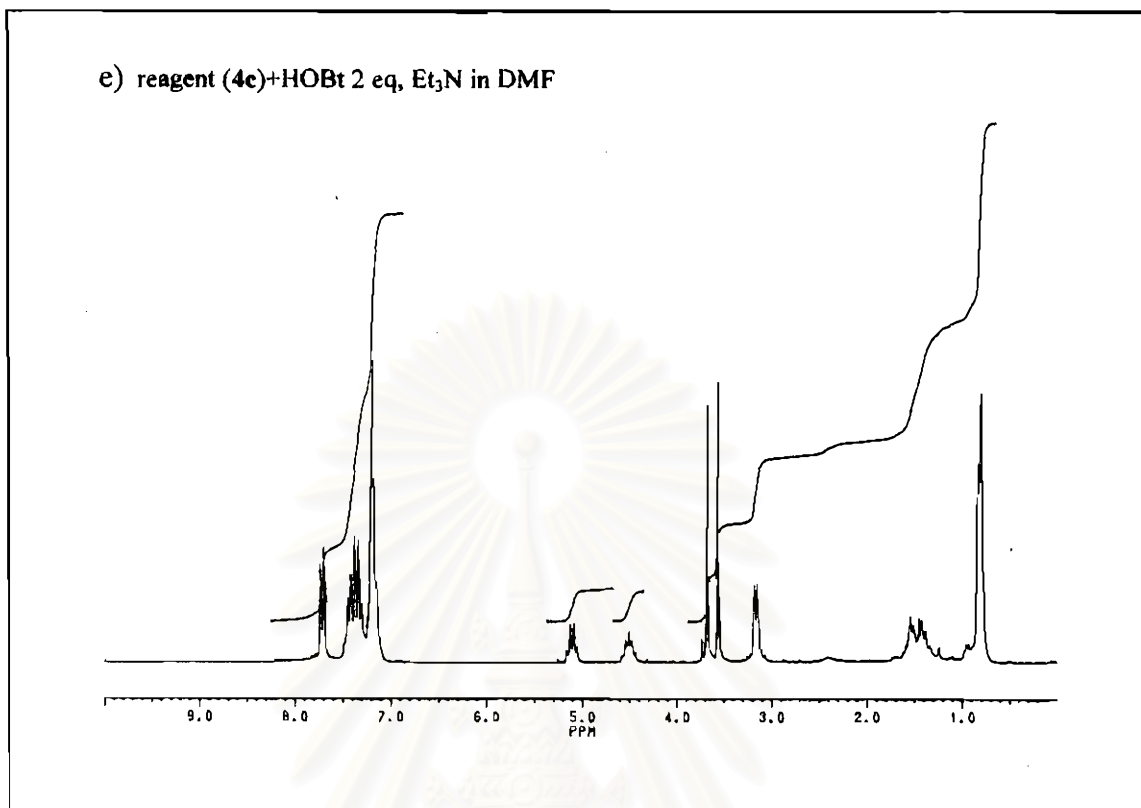
**Figure 109:** <sup>1</sup>H NMR (CDCl<sub>3</sub>) of Bz-Phe-Leu-OMe obtained from different peptide coupling reagents (continued)



**Figure 110:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) of Bz-Phe-Leu-OME obtained from reagent (4c)+ HOBt as coupling reagent under various conditions

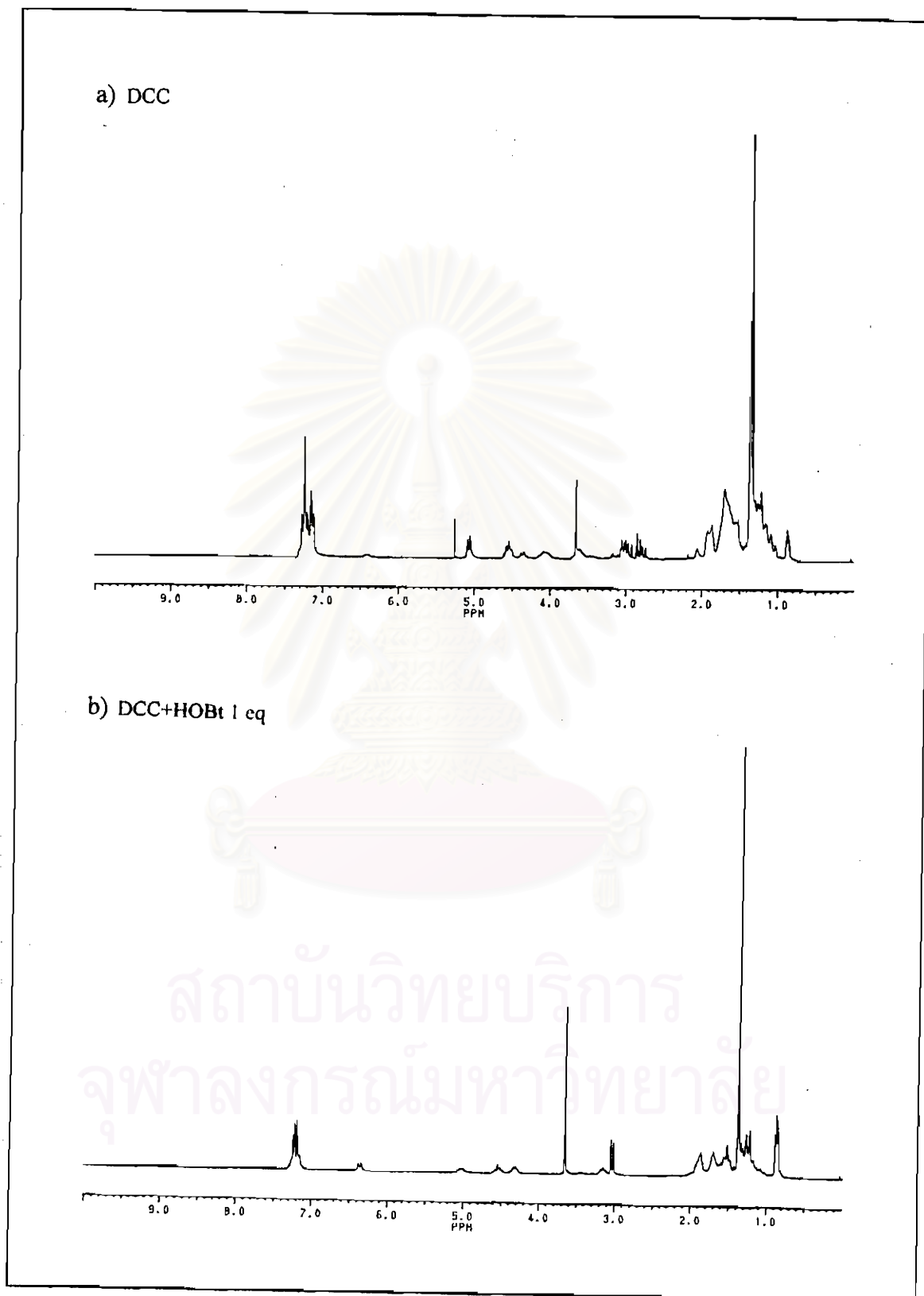


**Figure 110:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) of Bz-Phe-Leu-OMe obtained from reagent (4c)+HOBt as coupling reagent under various conditions (continued)



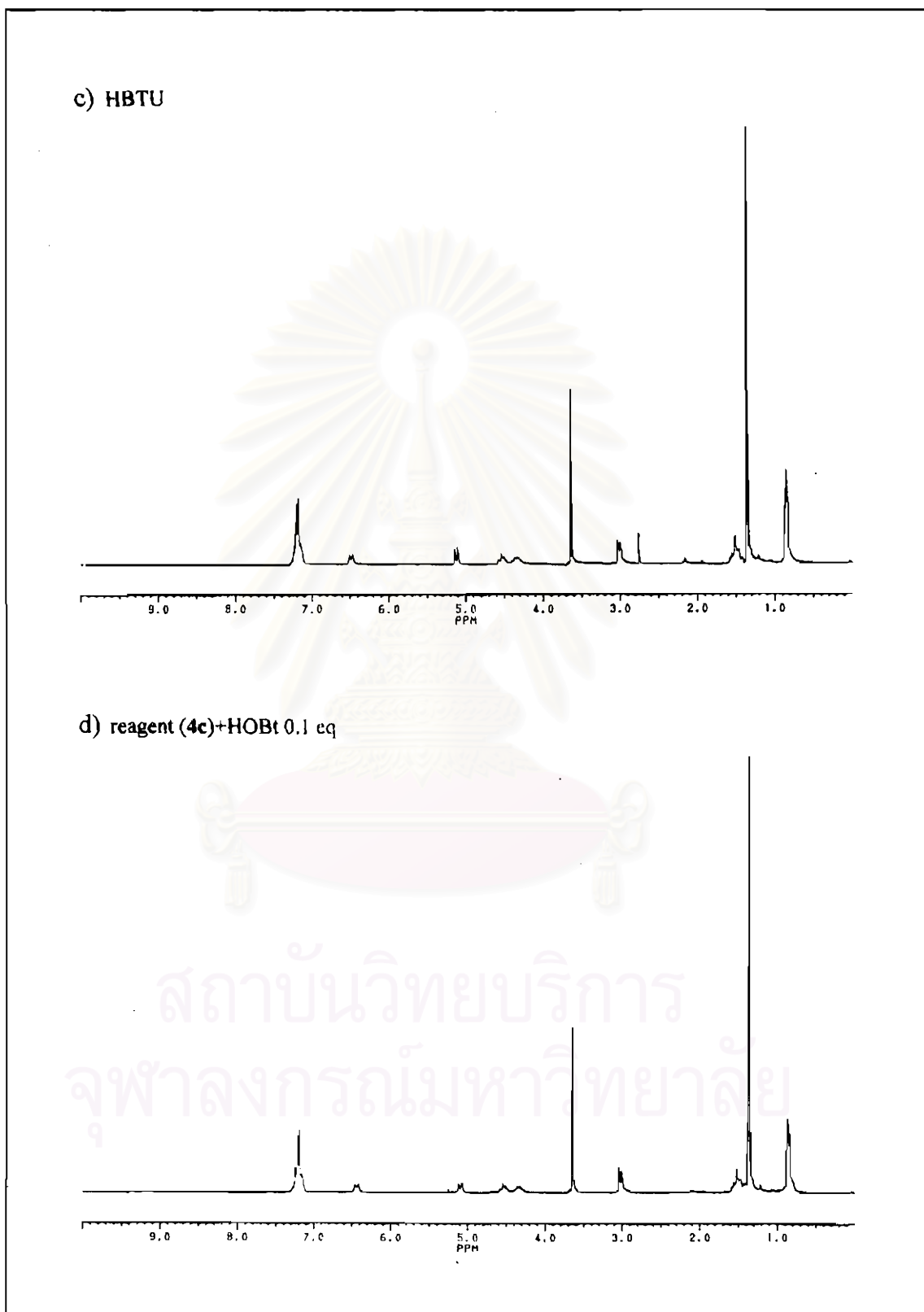
**Figure 110:** <sup>1</sup>H NMR (CDCl<sub>3</sub>) of Bz-Phe-Leu-OMe obtained from reagent (4c)+ HOBt as coupling reagent under various conditions (continued)

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**Figure 111:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) of Boc-Phe-Leu-OMe obtained from different peptide coupling reagents





**Figure 111:**  $^1\text{H}$  NMR ( $\text{CDCl}_3$ ) of Boc-Phe-Leu-OMe obtained from different peptide coupling reagents (continued)

## VITA

Khanitha Pudhom was born on February 4, 1974 in Bangkok, Thailand. She received the Bachelor Degree of Science in Chemistry from Chulalongkorn University in 1995. In the same year, she became a staff at Department of Chemistry, Faculty of Science, Chulalongkorn University. In 1998 she became a student in graduate school at Chulalongkorn University studying in Chemistry and has been studying since then. She graduated with the Master Degree of Science in 1999.



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