

Synthesis of unsymmetrically substituted biaryls via sequential lithiation of dibromobiaryls using integrated microflow systems

Aiichiro Nagaki, Naofumi Takabayashi, Yutaka Tomida, and Jun-ichi Yoshida*

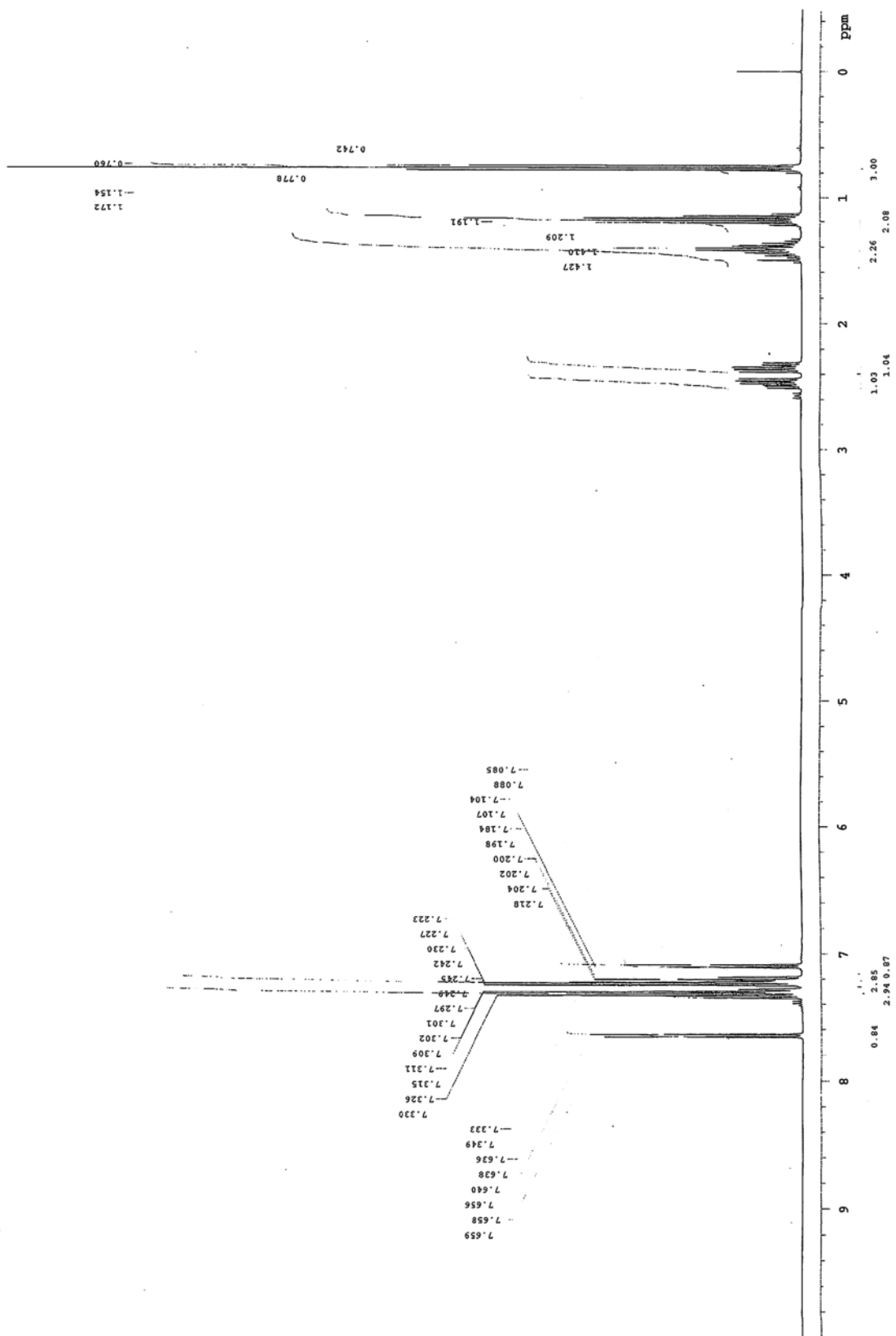
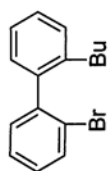
Address: Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering, Kyoto University, Kyotodaigakukatsura, Nishikyo-ku, Kyoto, 615-8510, Japan

Email: Jun-ichi Yoshida - yoshida@sbchem.kyoto-u.ac.jp

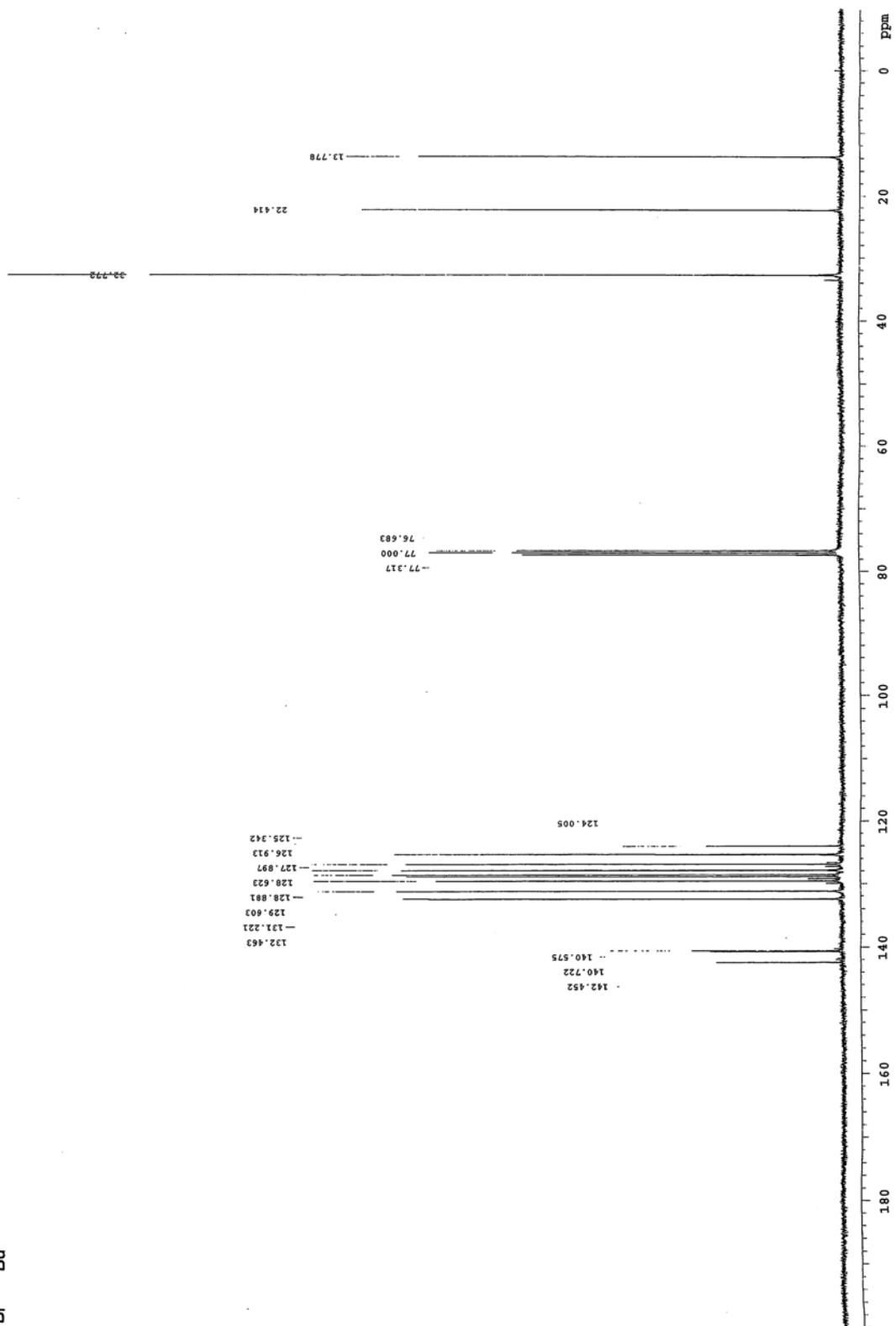
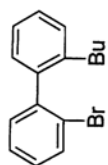
* Corresponding author

Supporting Information

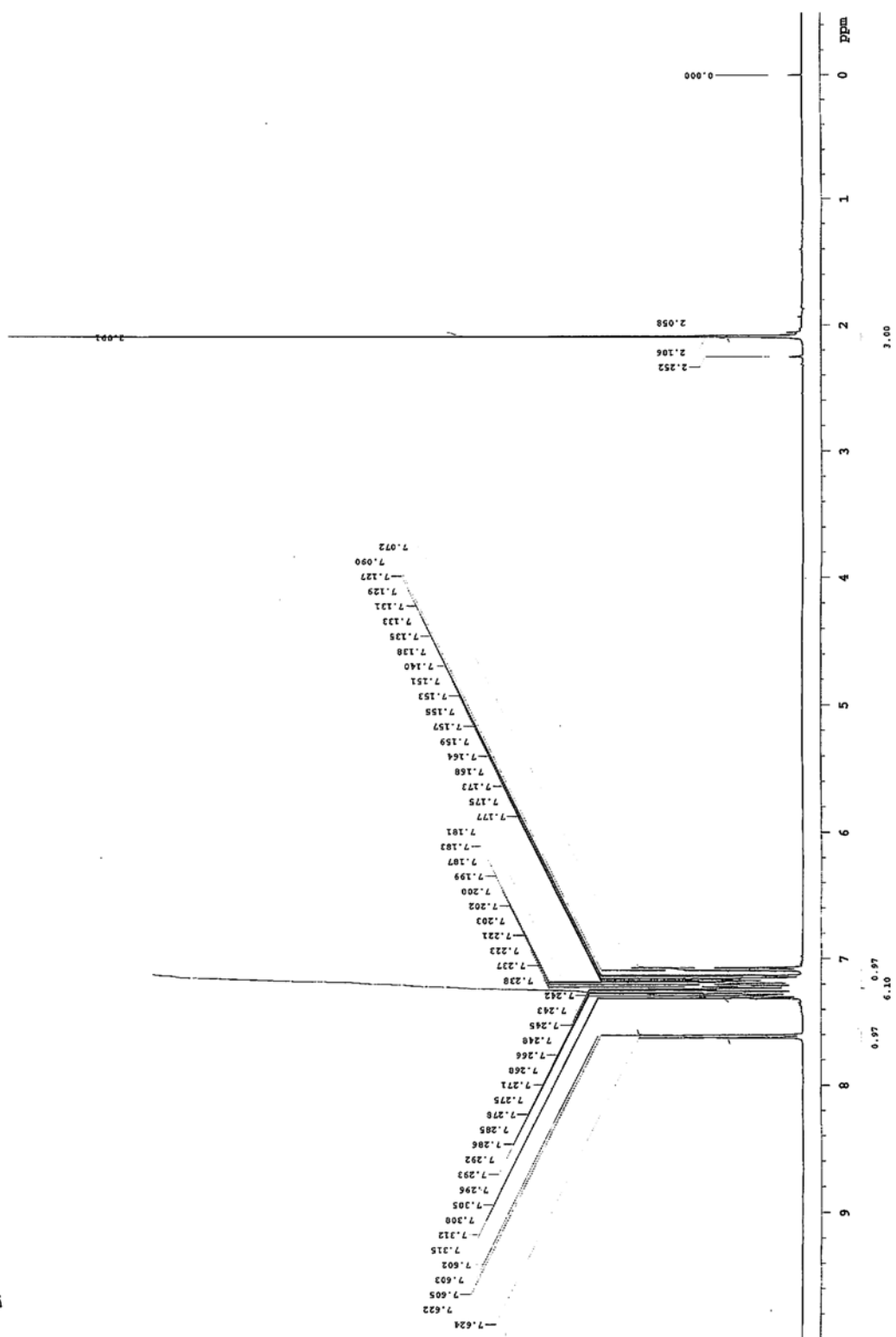
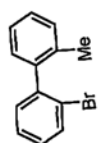
**^1H NMR spectra and ^{13}C NMR spectra of compounds
4,5,9–16,19,22–26,31–35,39**



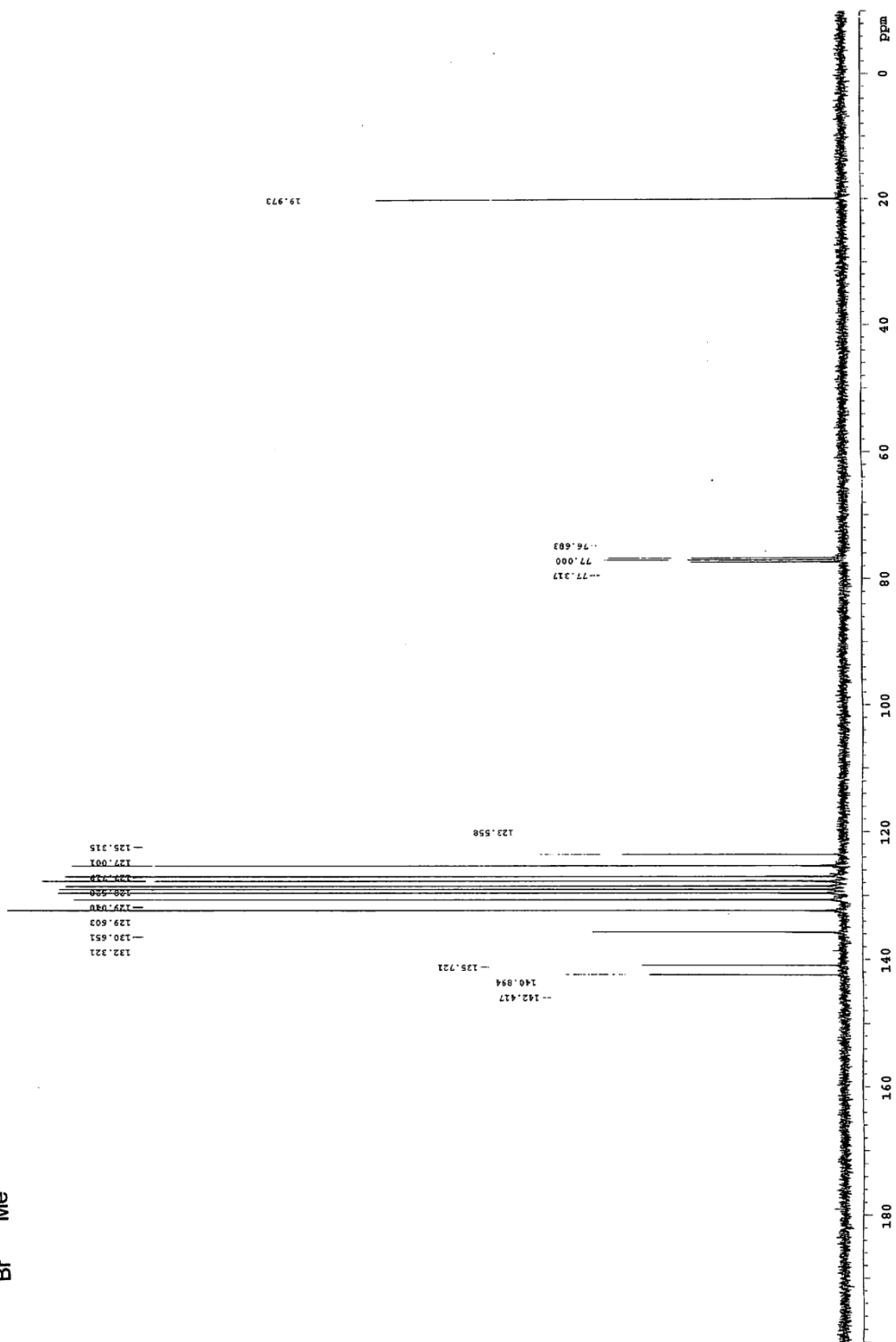
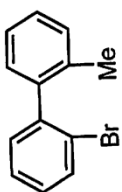
¹H NMR spectrum of 2-bromo-2'-butylbiphenyl (4)



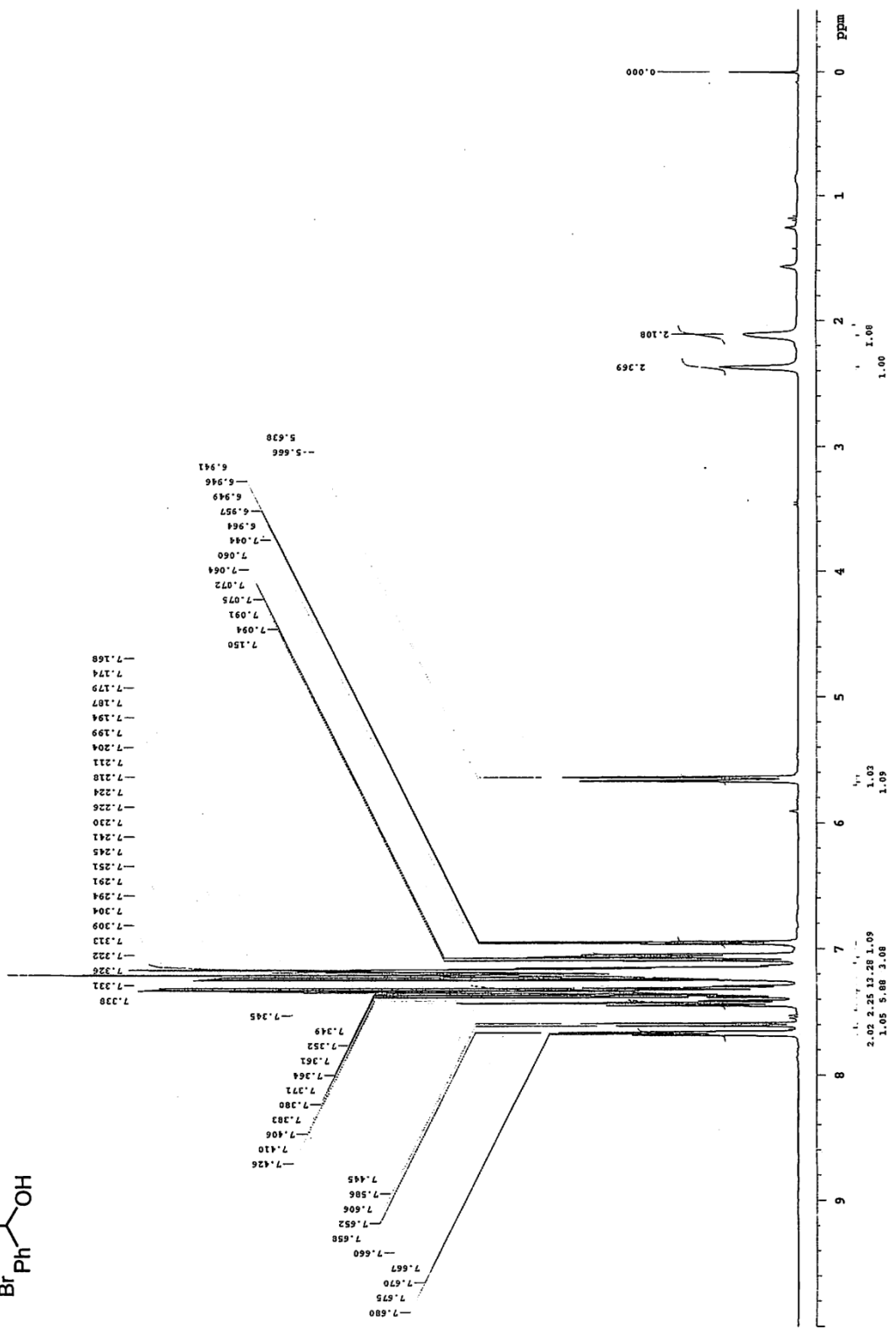
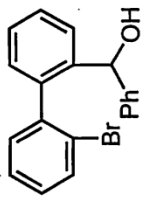
¹³C NMR spectrum of 2-bromo-2'-butylbiphenyl (4)



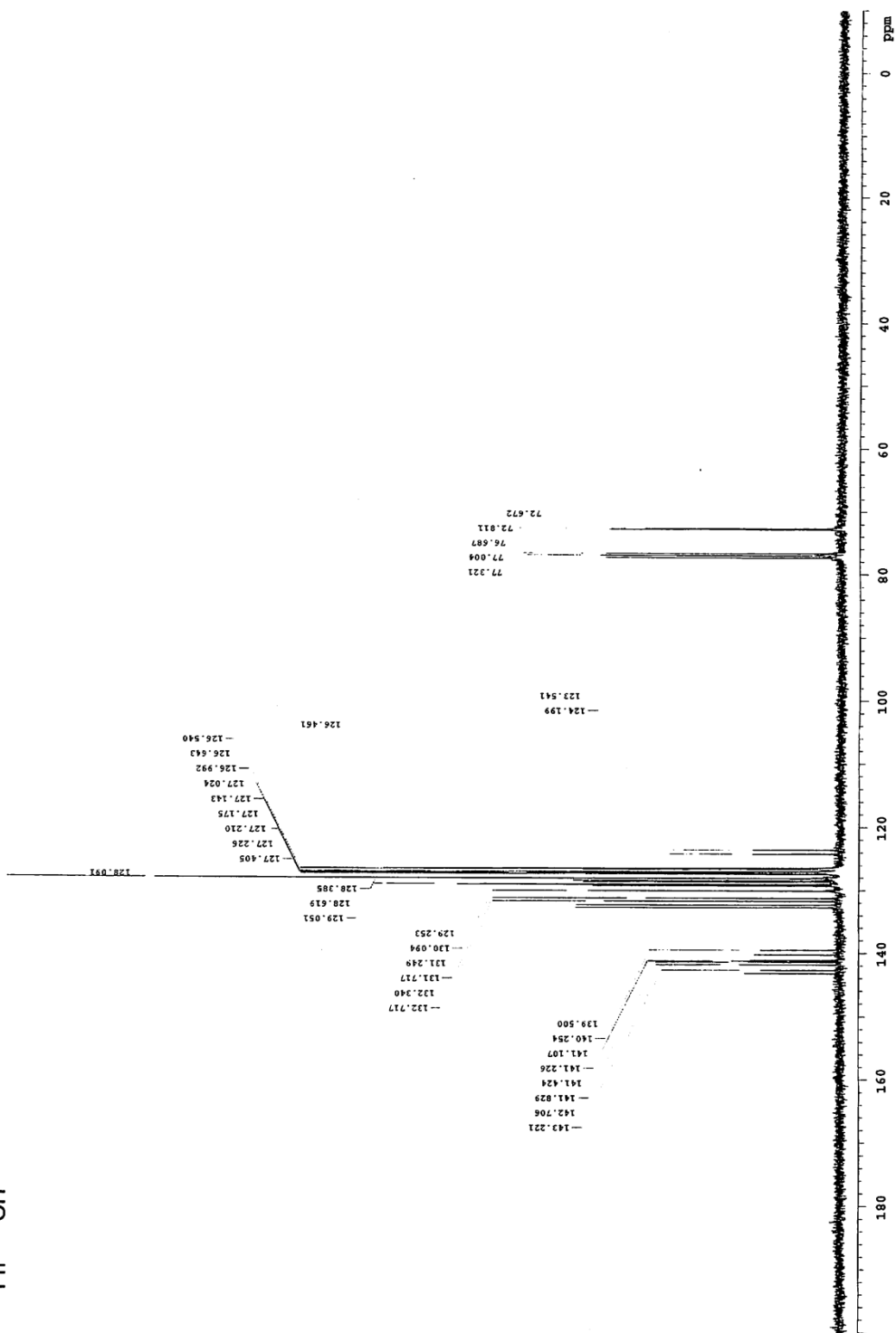
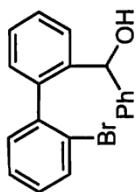
^1H NMR spectrum of 2-bromo-2'-methylbiphenyl (5)



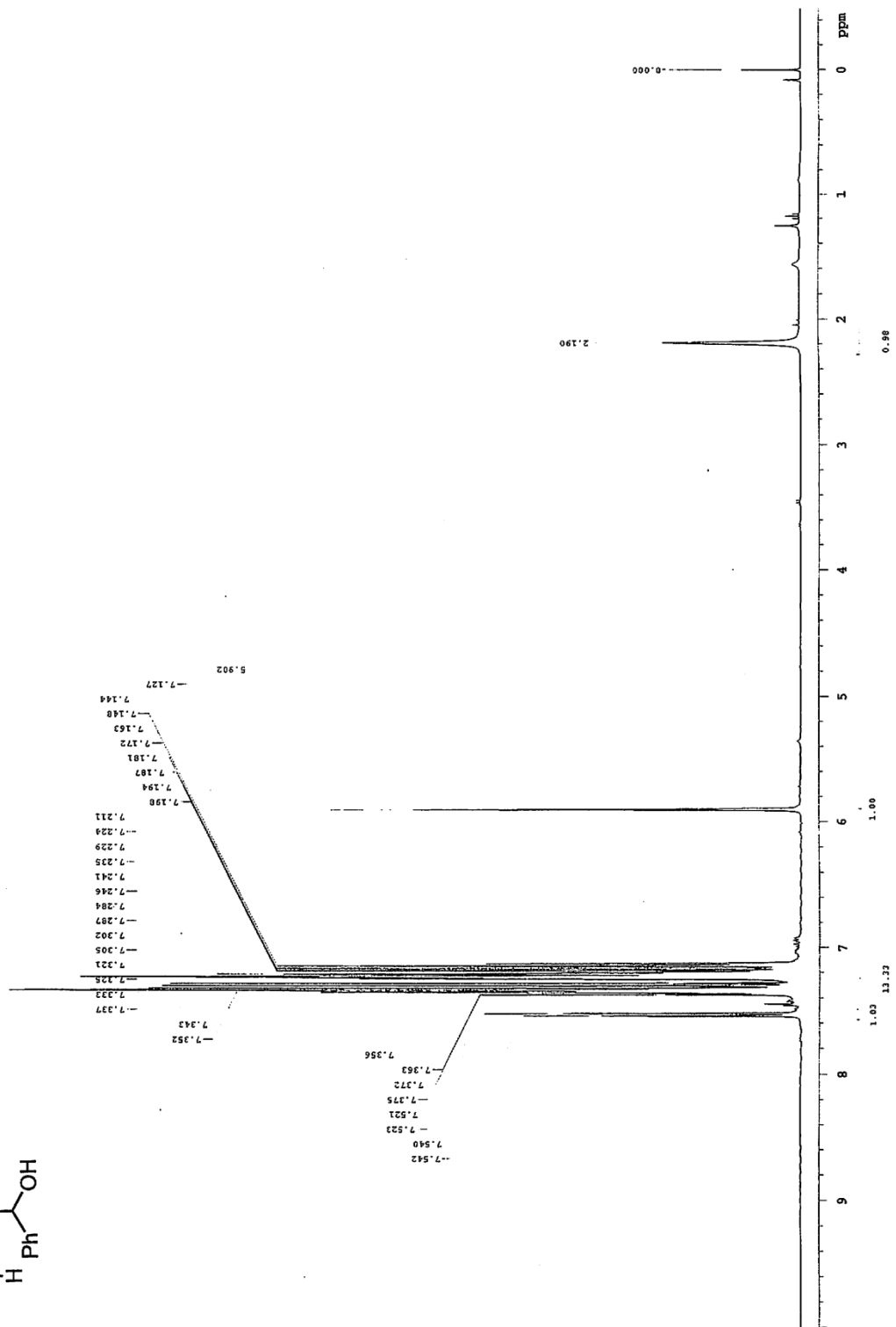
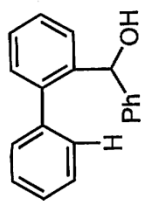
^{13}C NMR spectrum of 2-bromo-2'-methylbiphenyl (5)



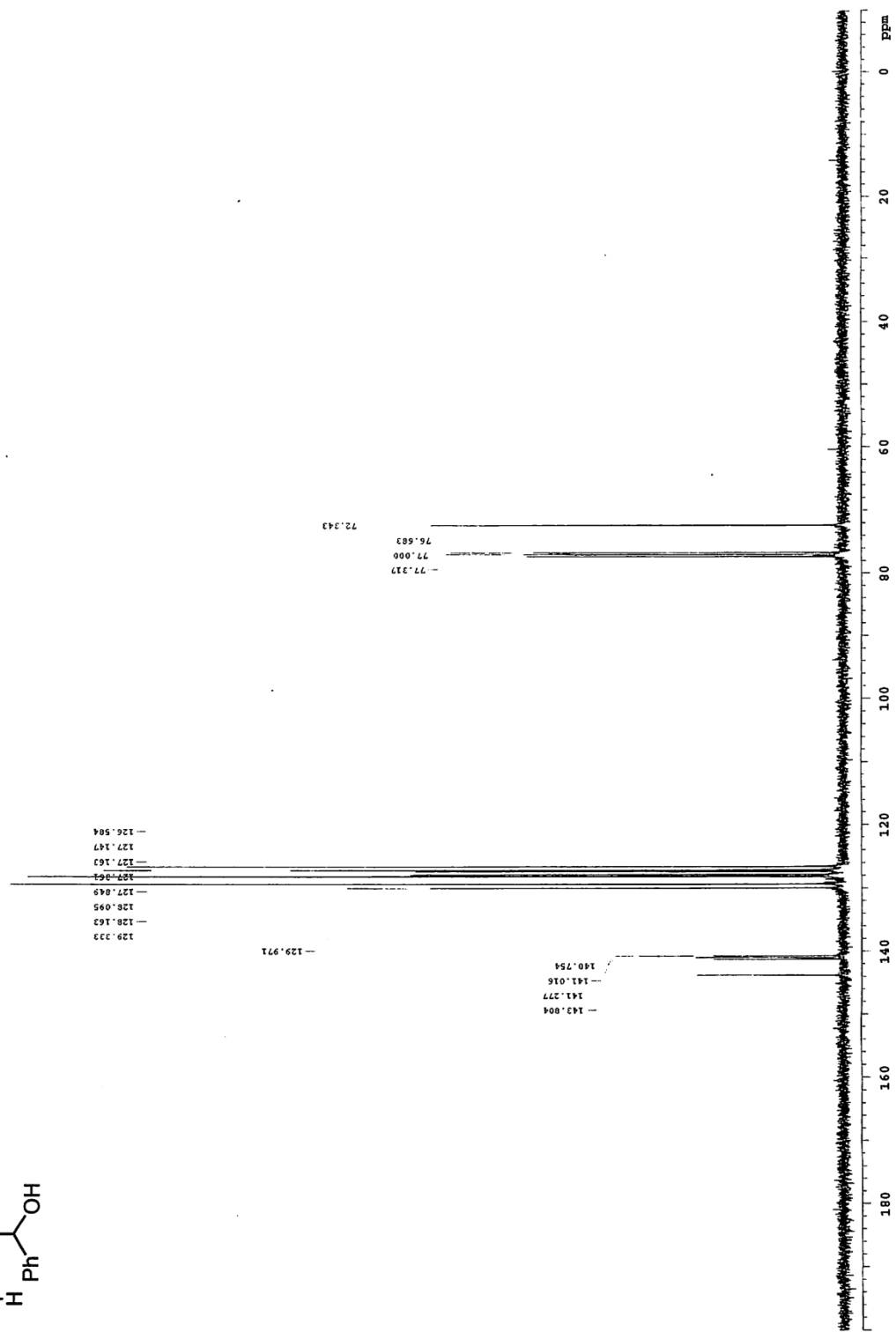
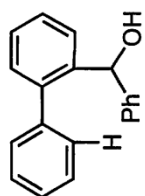
¹H NMR spectrum of 2-bromo-2'-[hydroxyl(phenyl)methyl]biphenyl (9)



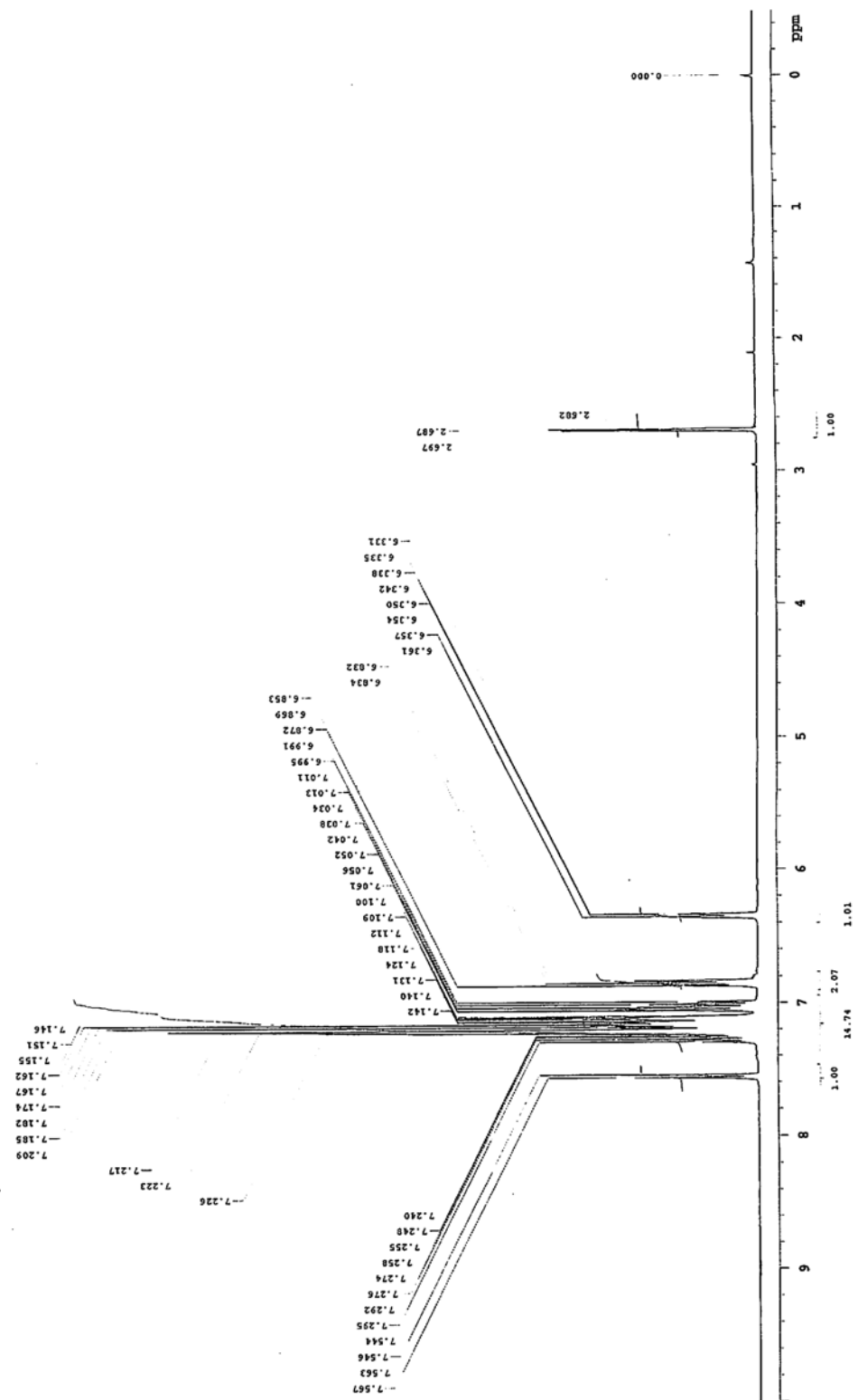
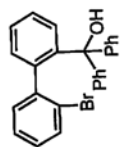
^{13}C NMR spectrum of 2-bromo-2'-[hydroxyl(phenyl)methyl]biphenyl (9)



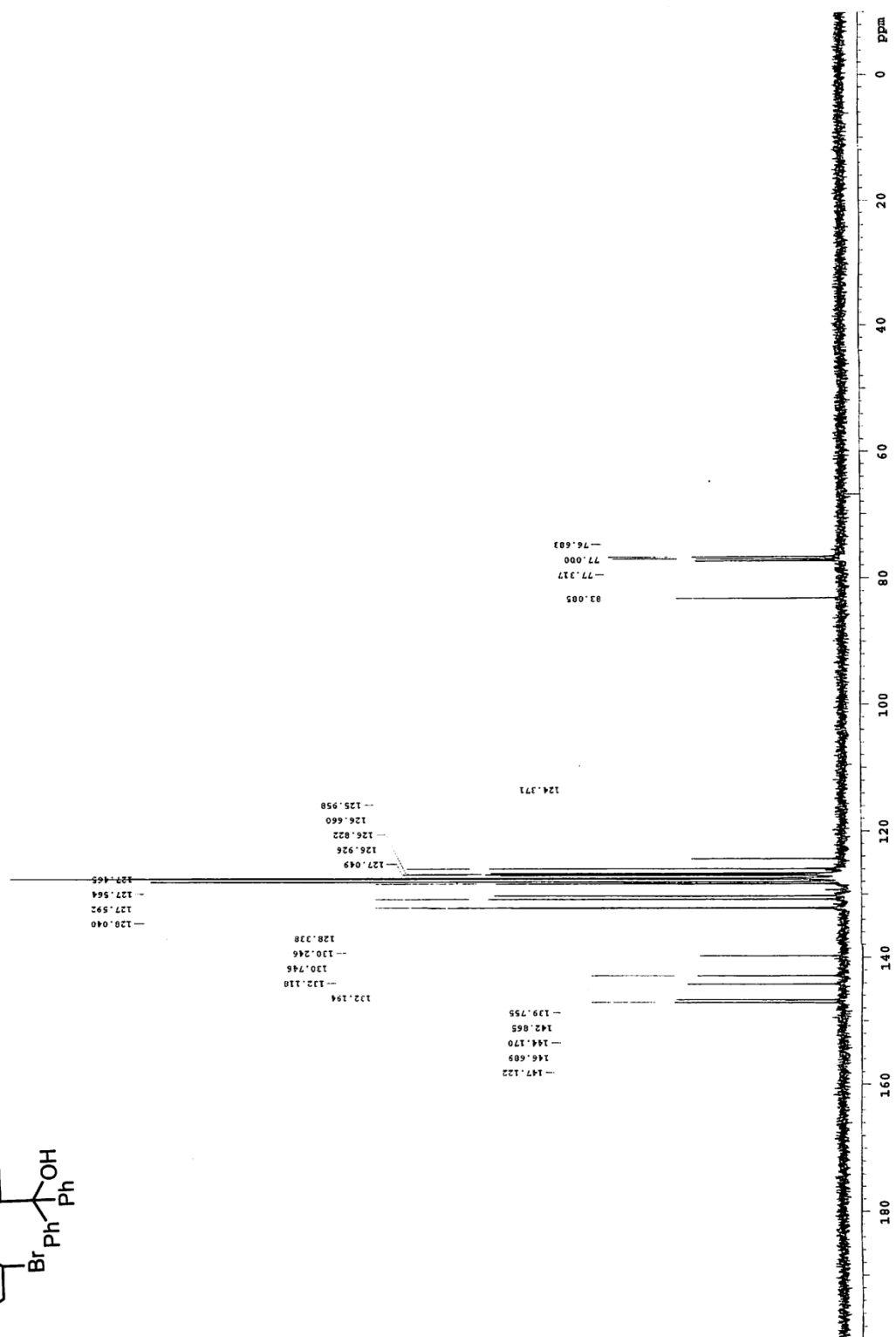
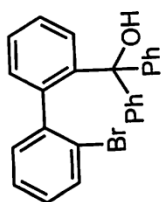
¹H NMR spectrum of 2-[hydroxyl(phenyl)methyl]biphenyl (10)



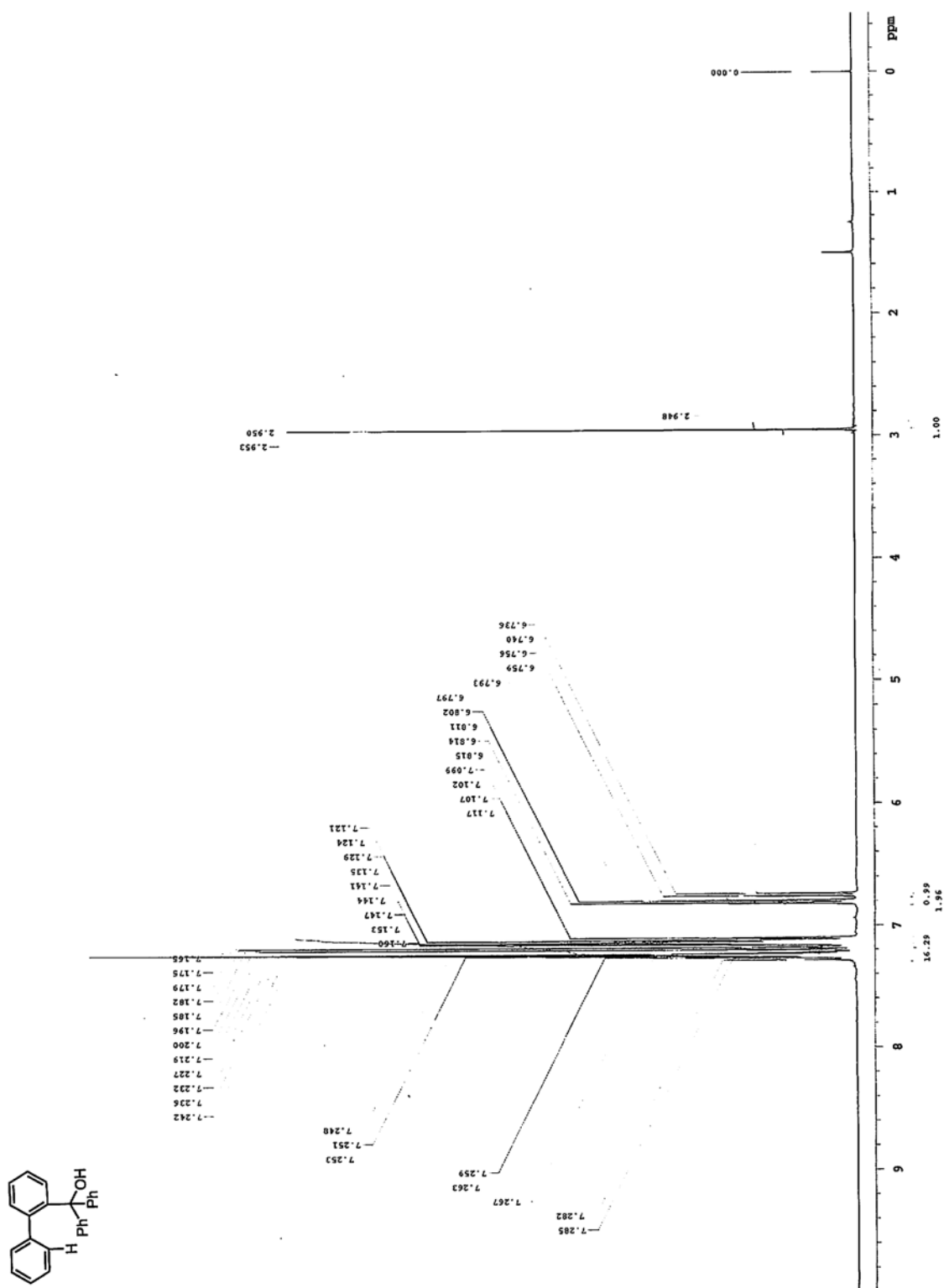
¹³C NMR spectrum of 2-[hydroxyl(phenyl)methyl]biphenyl (10)



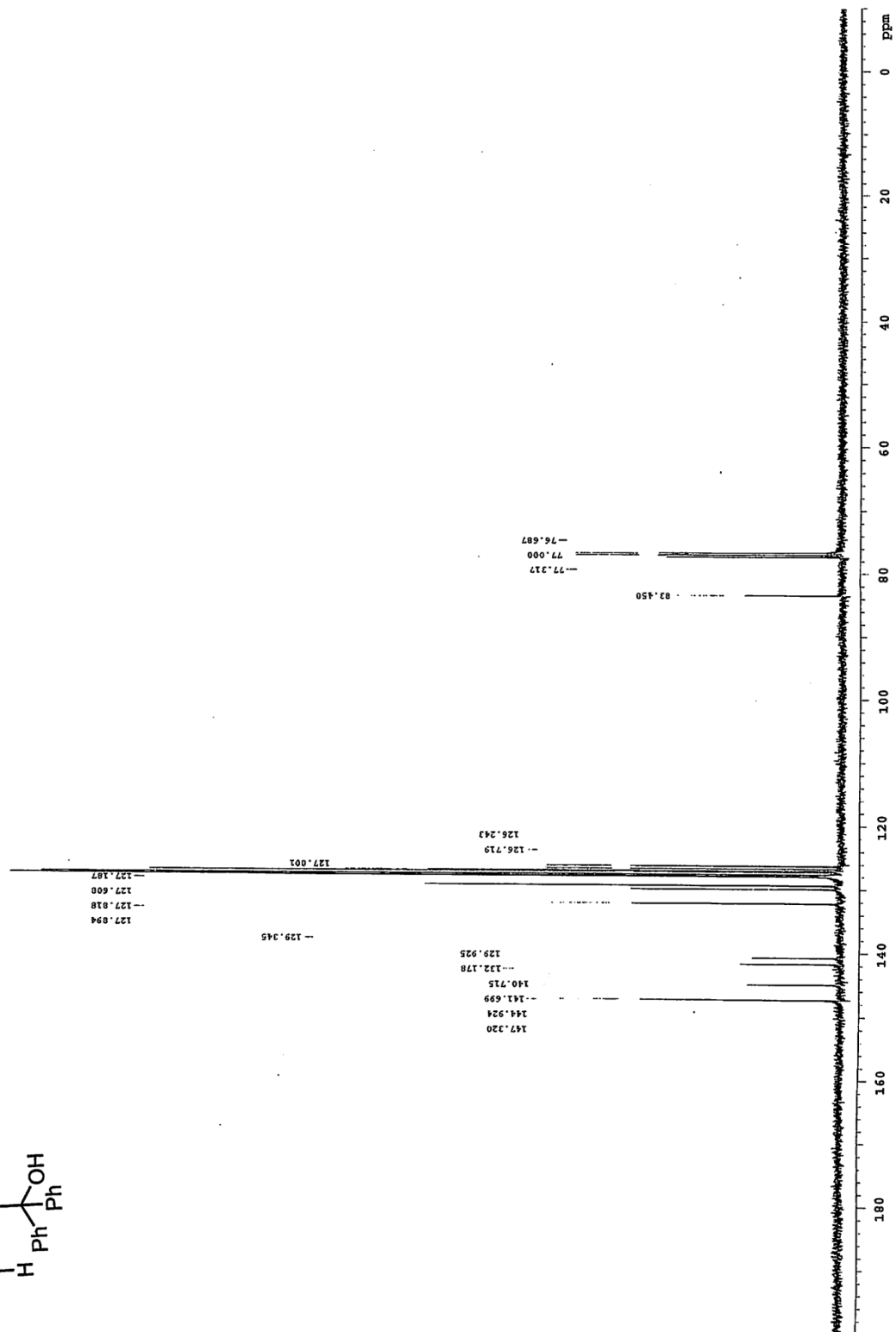
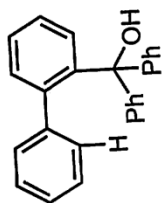
¹H NMR spectrum of 2-bromo-2'-[hydroxyl(diphenyl)methyl]biphenyl (11)



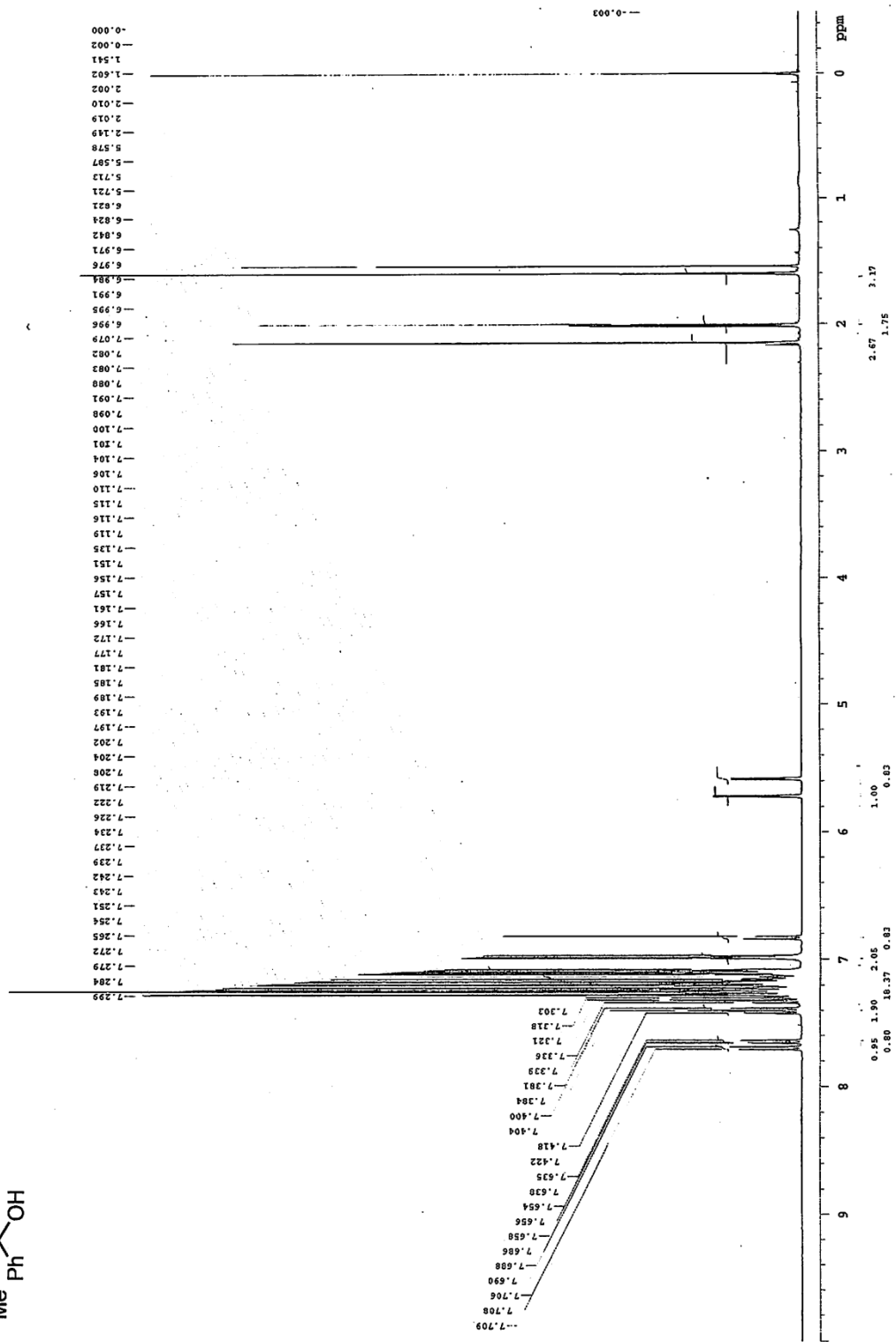
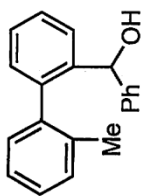
¹³C NMR spectrum of 2-bromo-2'-[hydroxyl(diphenyl)methyl]biphenyl (11)



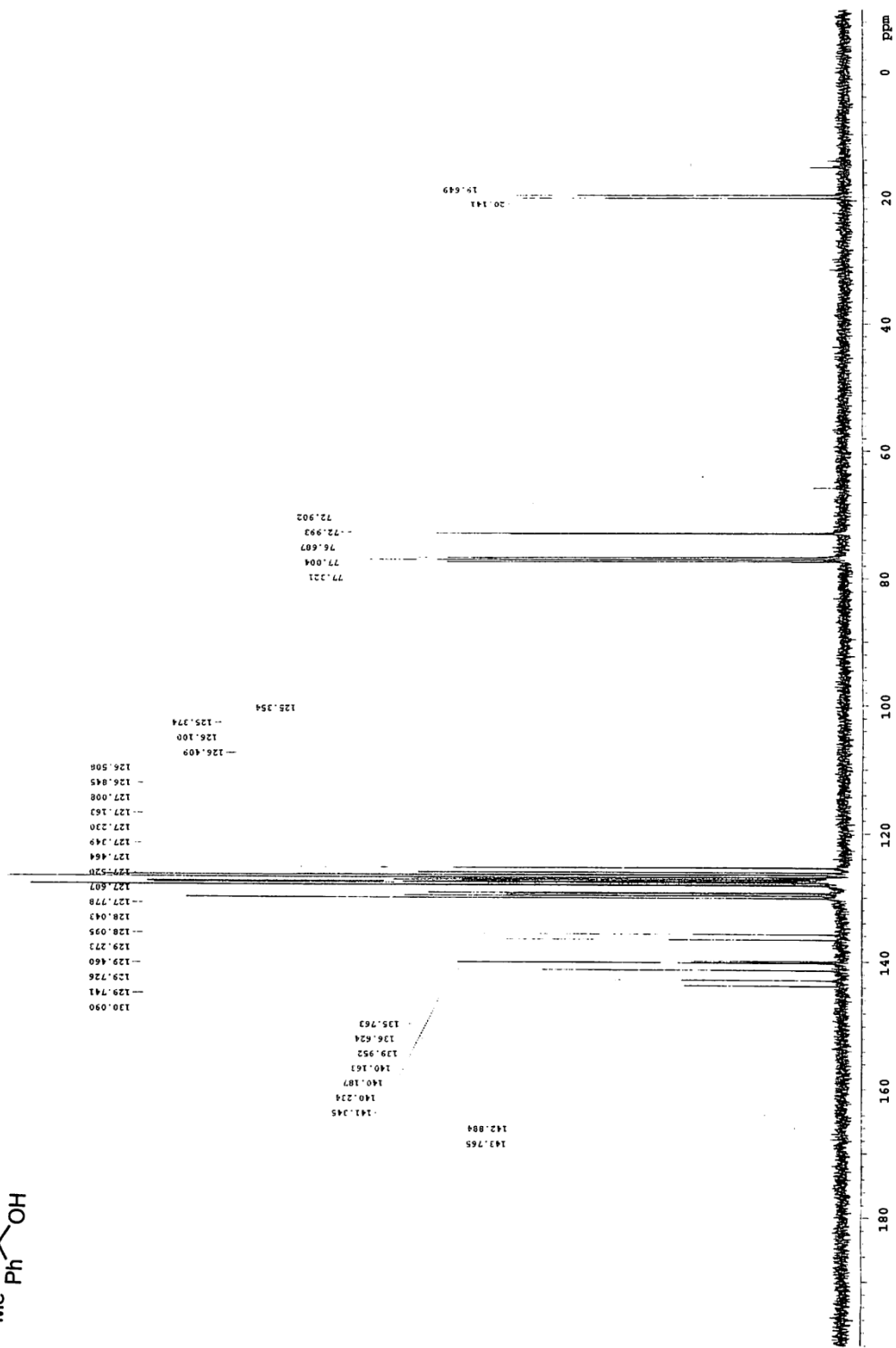
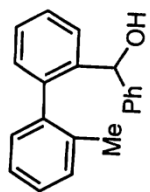
¹H NMR spectrum of 2-[hydroxyl(diphenyl)methyl]biphenyl (12)



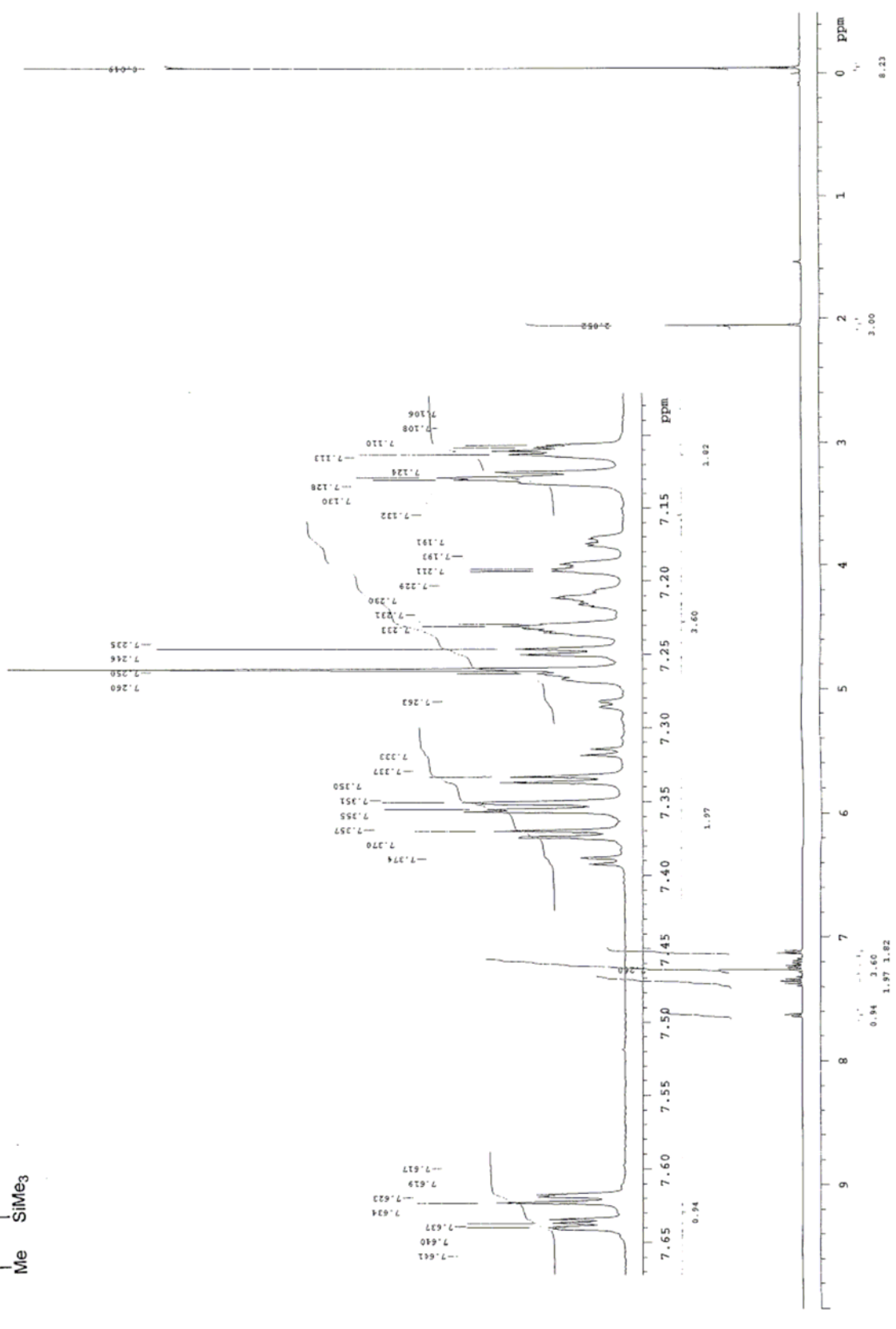
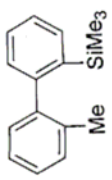
¹³C NMR spectrum of 2-[hydroxyl(diphenyl)methyl]biphenyl (12)



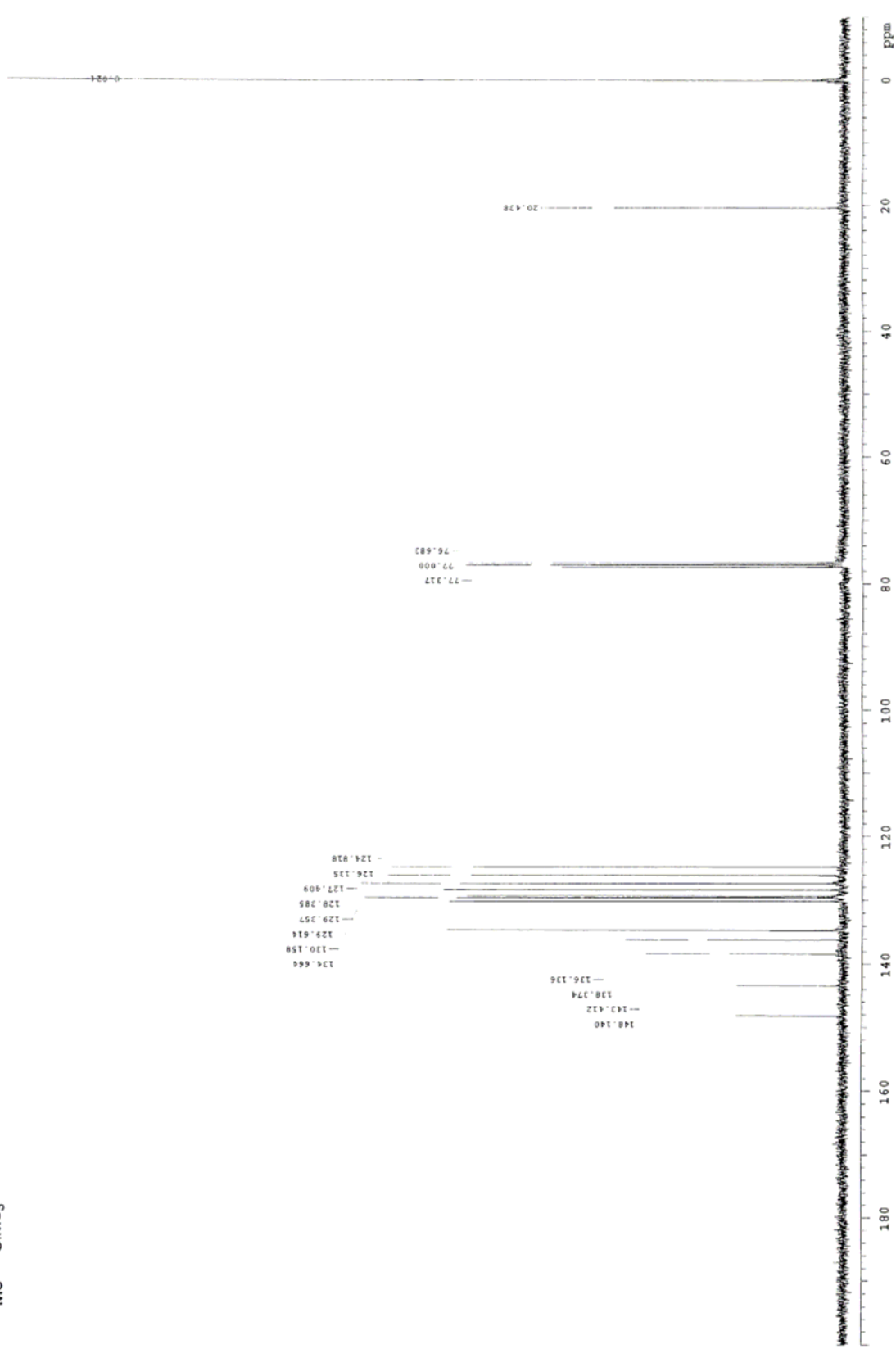
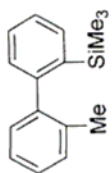
¹H NMR spectrum of 2-methyl-2'-[hydroxyl(phenyl)methyl]biphenyl (13)



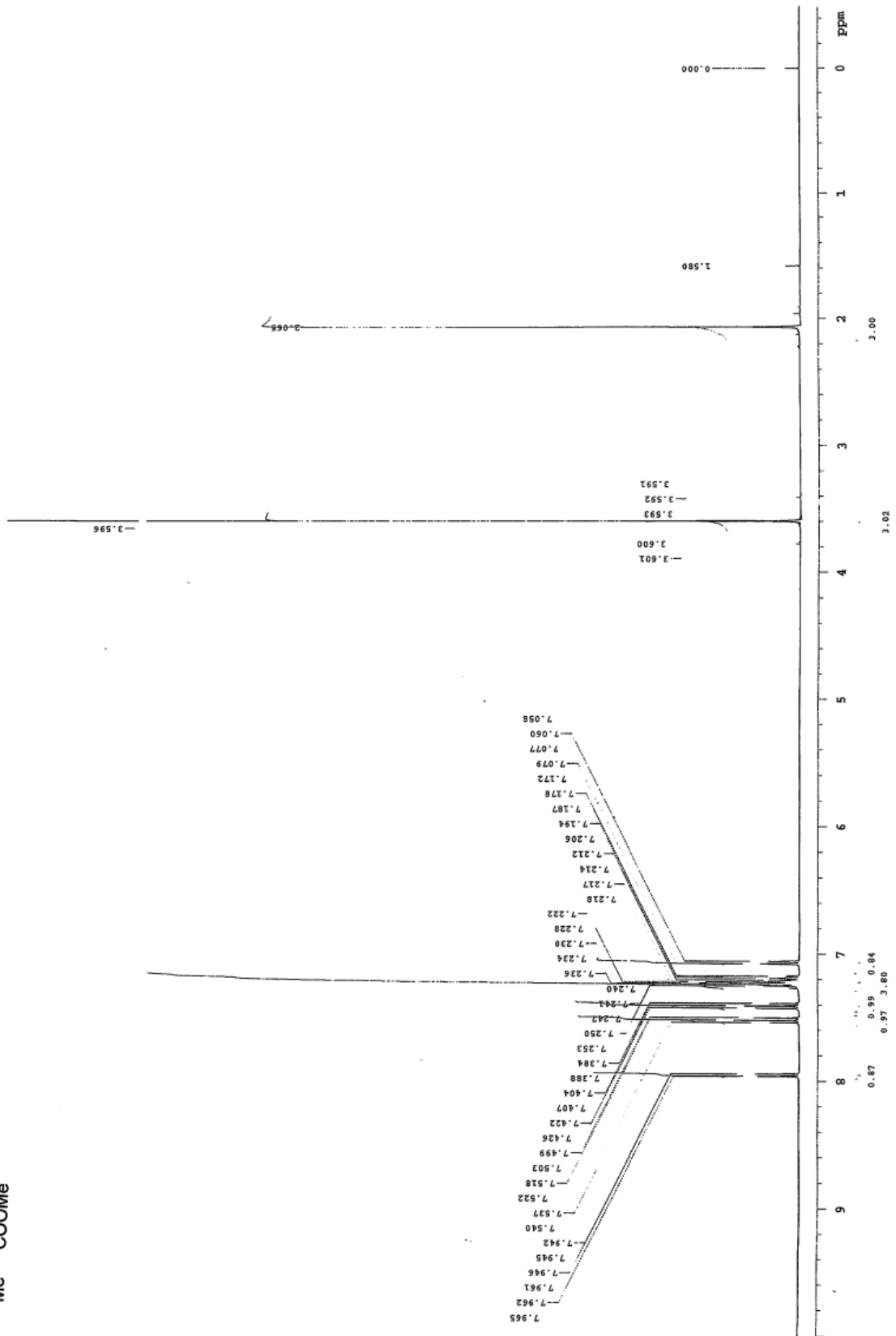
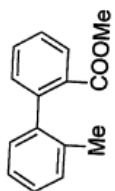
¹³C NMR spectrum of 2-methyl-2'-[hydroxyl(phenyl)methyl]biphenyl (13)



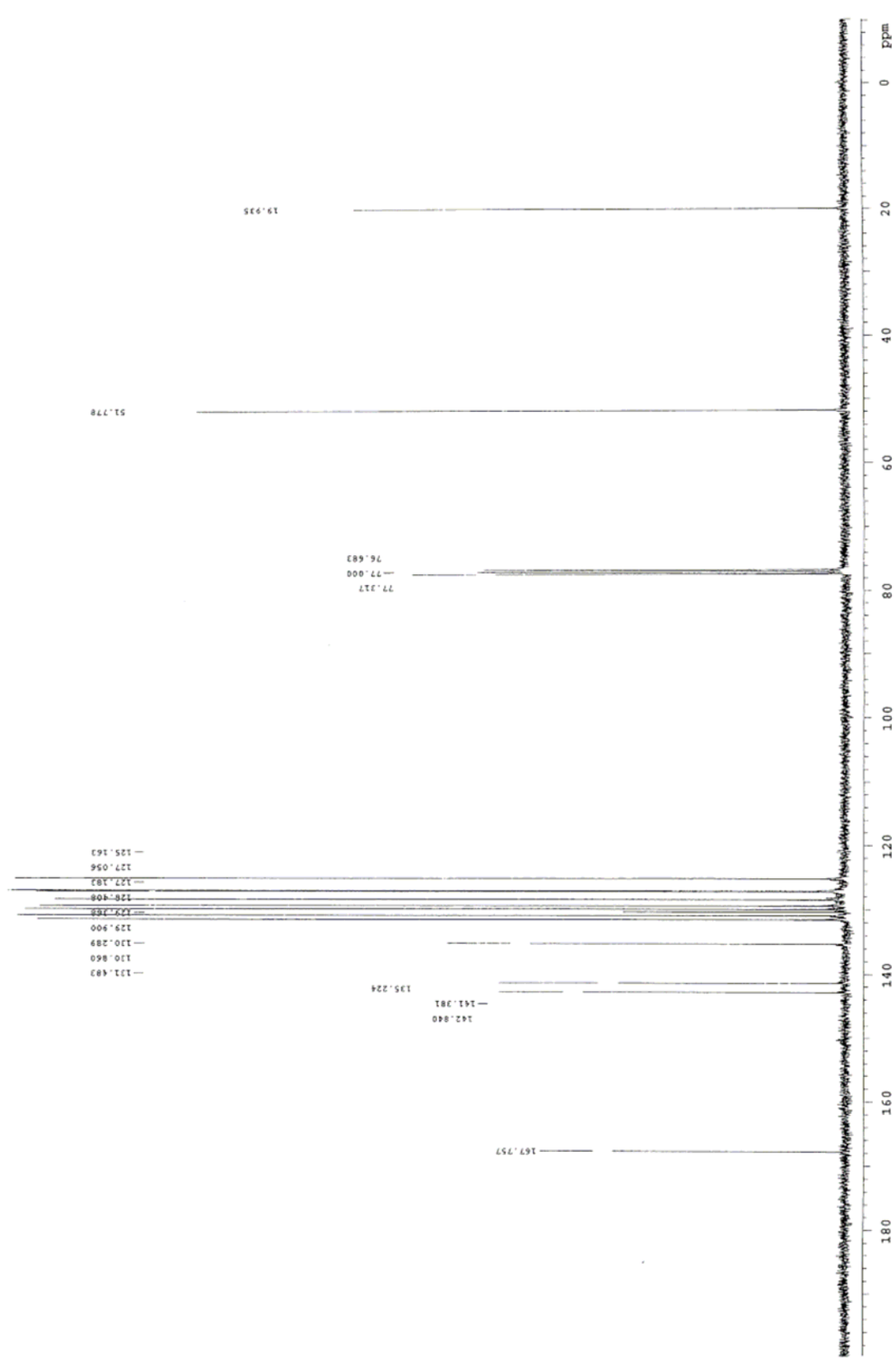
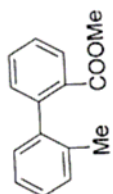
¹H NMR spectrum of 2-methyl-2'-trimethylsilylbiphenyl (14)



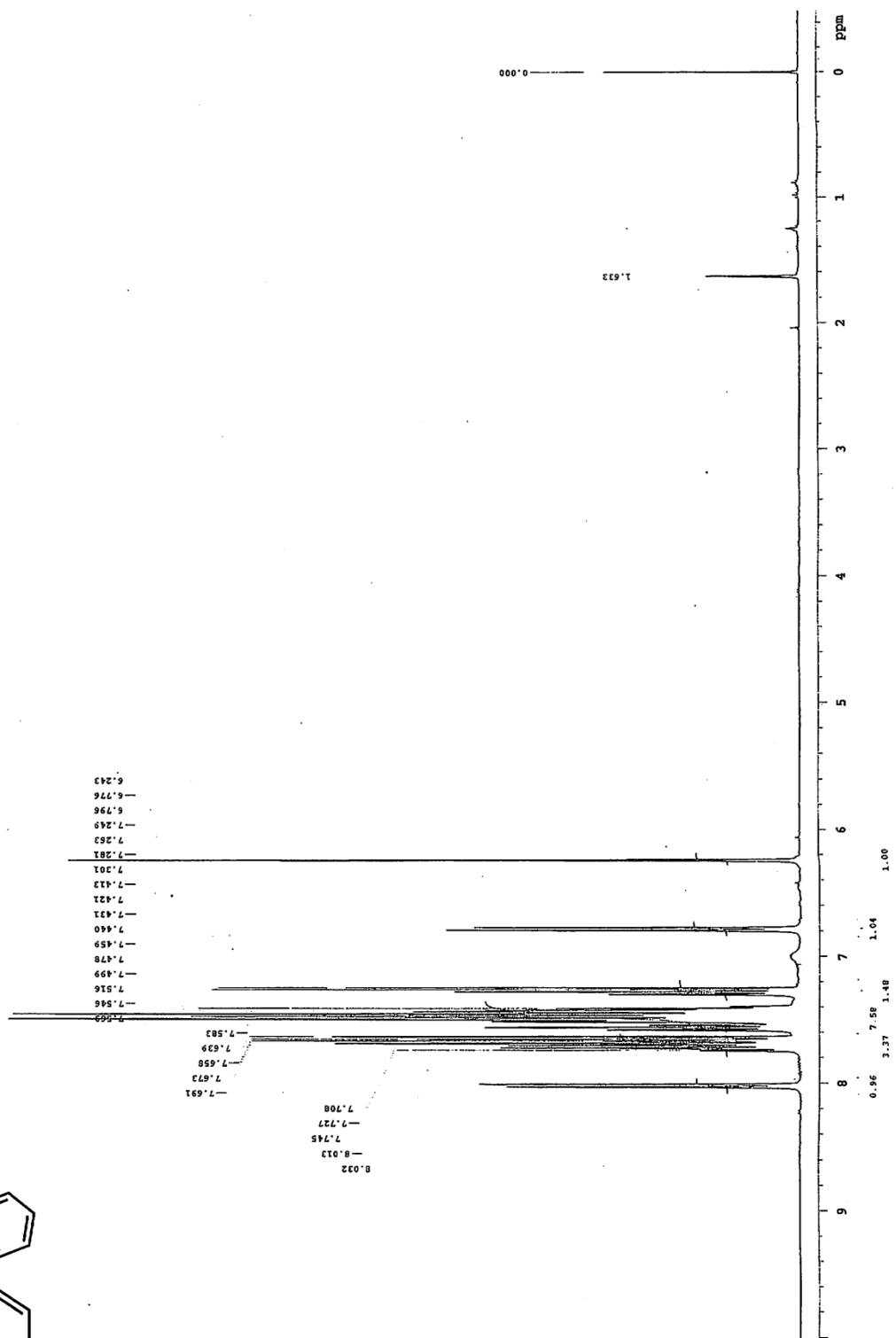
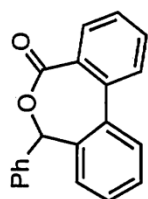
¹³C NMR spectrum of 2-methyl-2'-trimethylsilylbiphenyl (14)



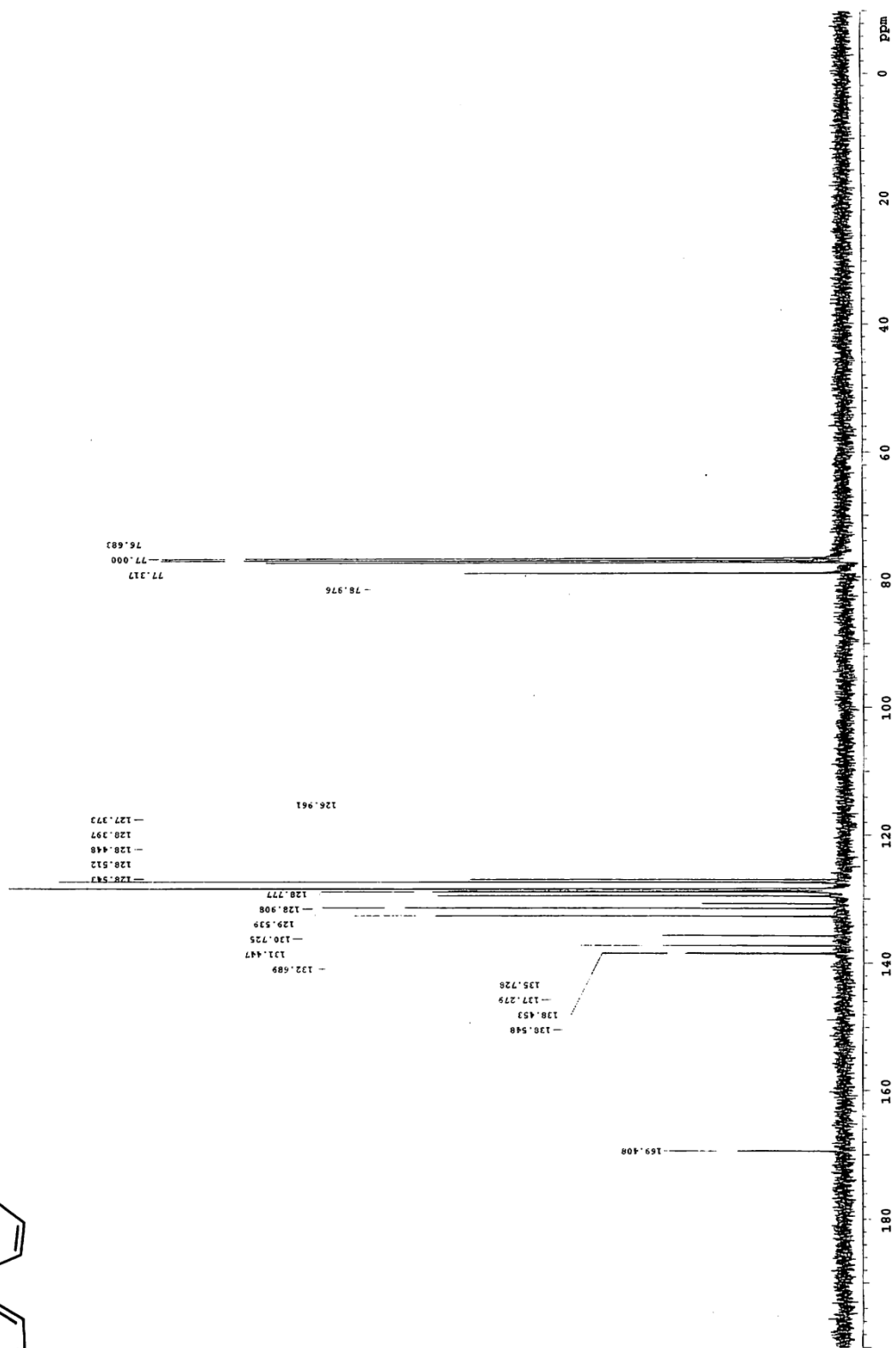
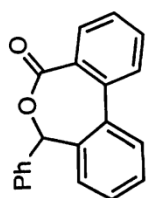
^1H NMR spectrum of 2-methyl-2'-methoxycarbonylbiphenyl (15)



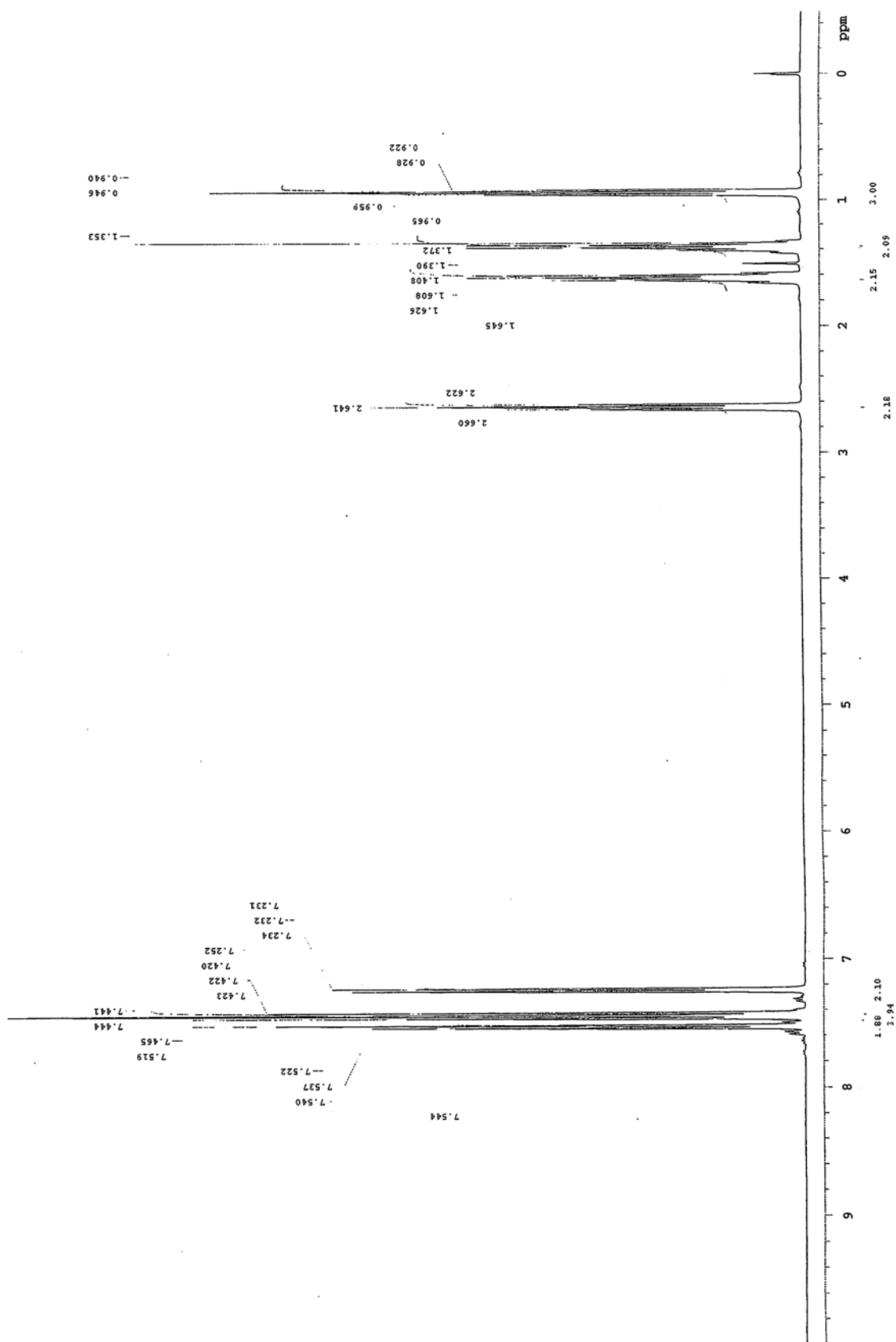
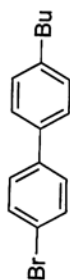
^{13}C NMR spectrum of 2-methyl-2'-methoxycarbonylbiphenyl (15)



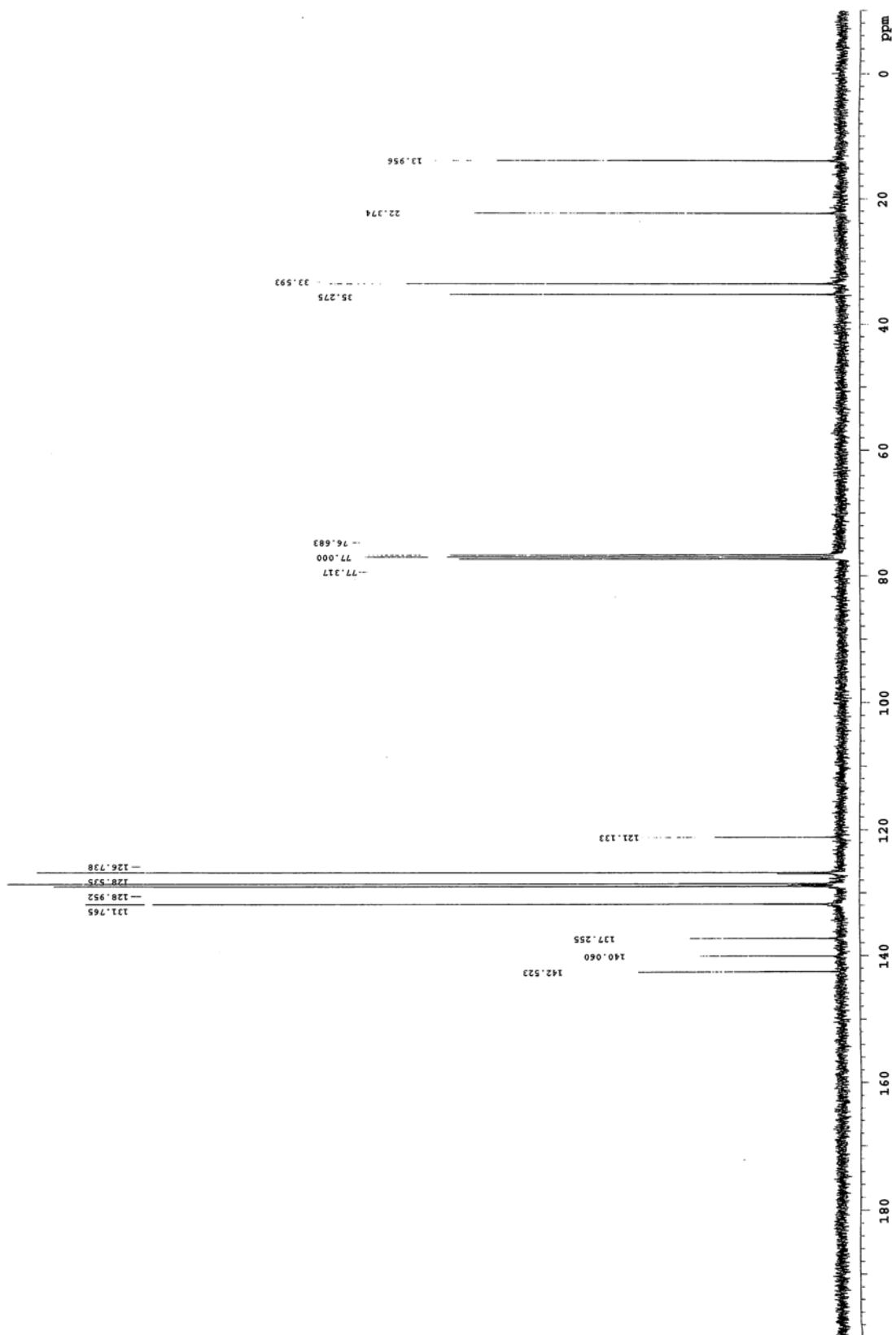
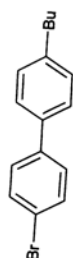
^1H NMR spectrum of 7-phenyl-5,7-dihydrodibenz[c,e]oxepin-5-one (16)



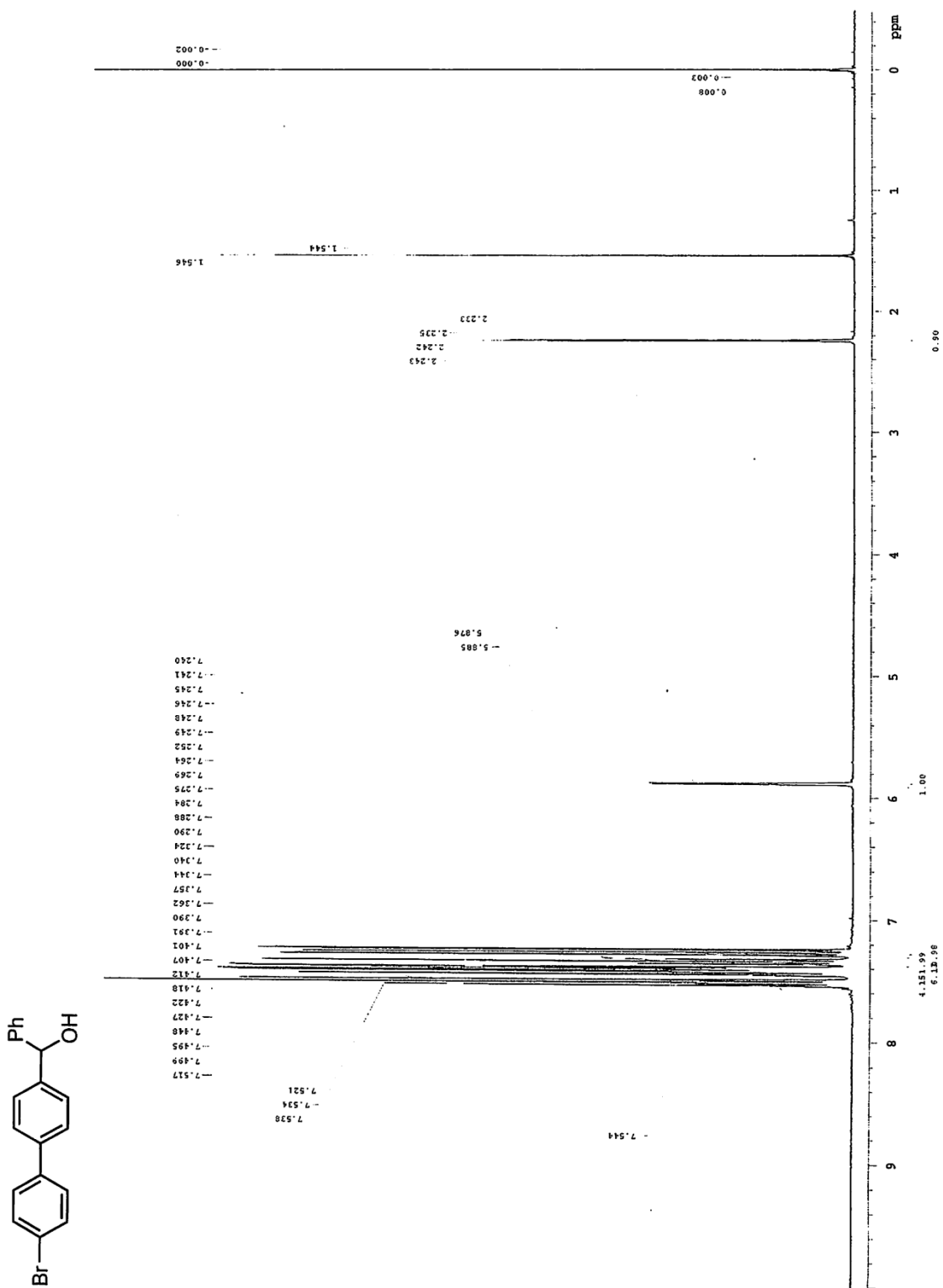
¹³C NMR spectrum of 7-phenyl-5,7-dihydrodibenz[c,e]oxepin-5-one (16)



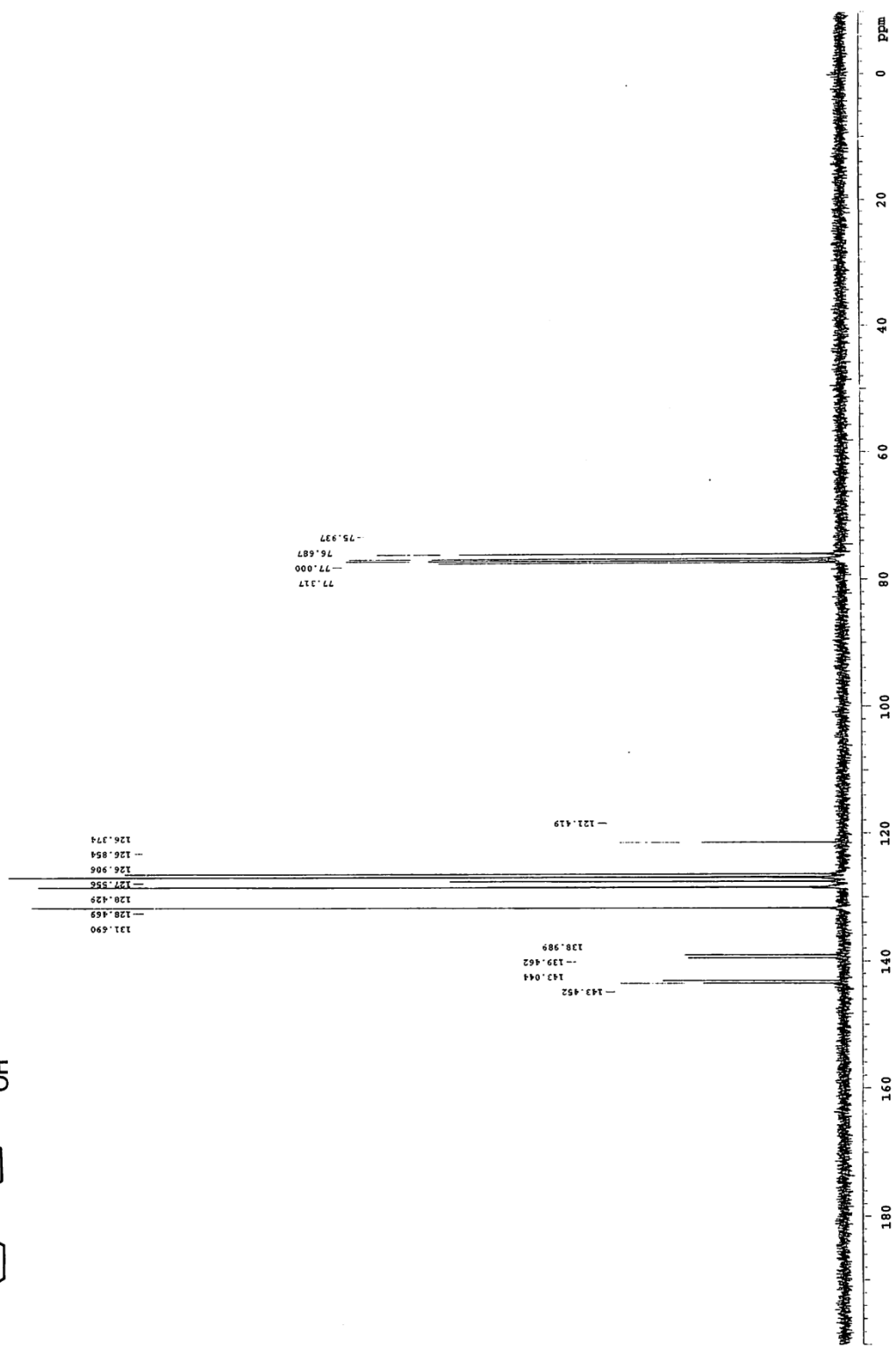
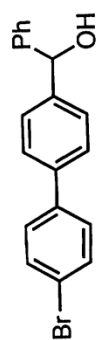
^1H NMR spectrum of 4-bromo-4'-butylbiphenyl (19)



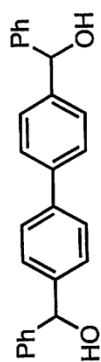
¹³C NMR spectrum of 4-bromo-4'-butylbiphenyl (19)



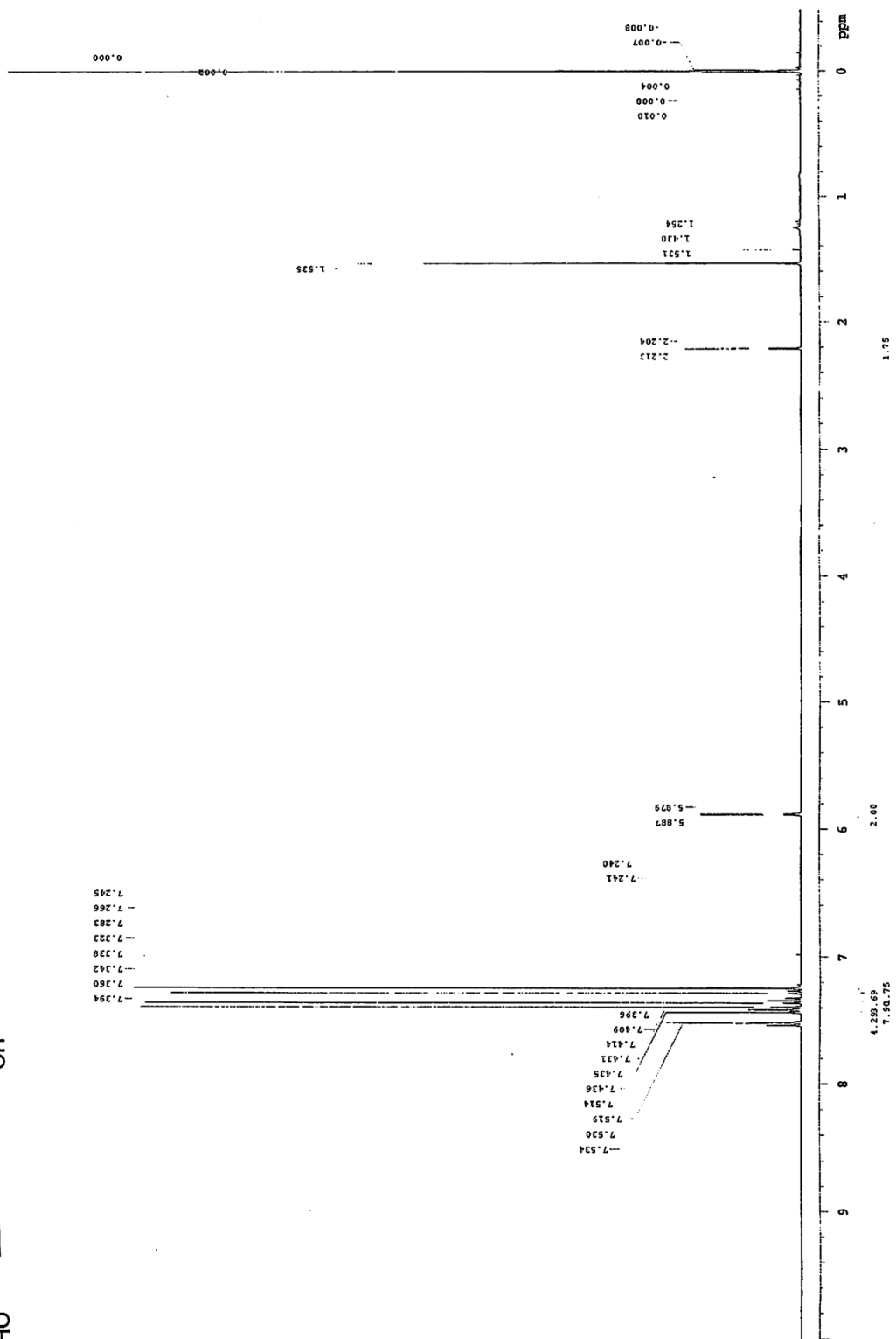
¹H NMR spectrum of 4-bromo-4'-[hydroxyl(phenyl)methyl]biphenyl (22)

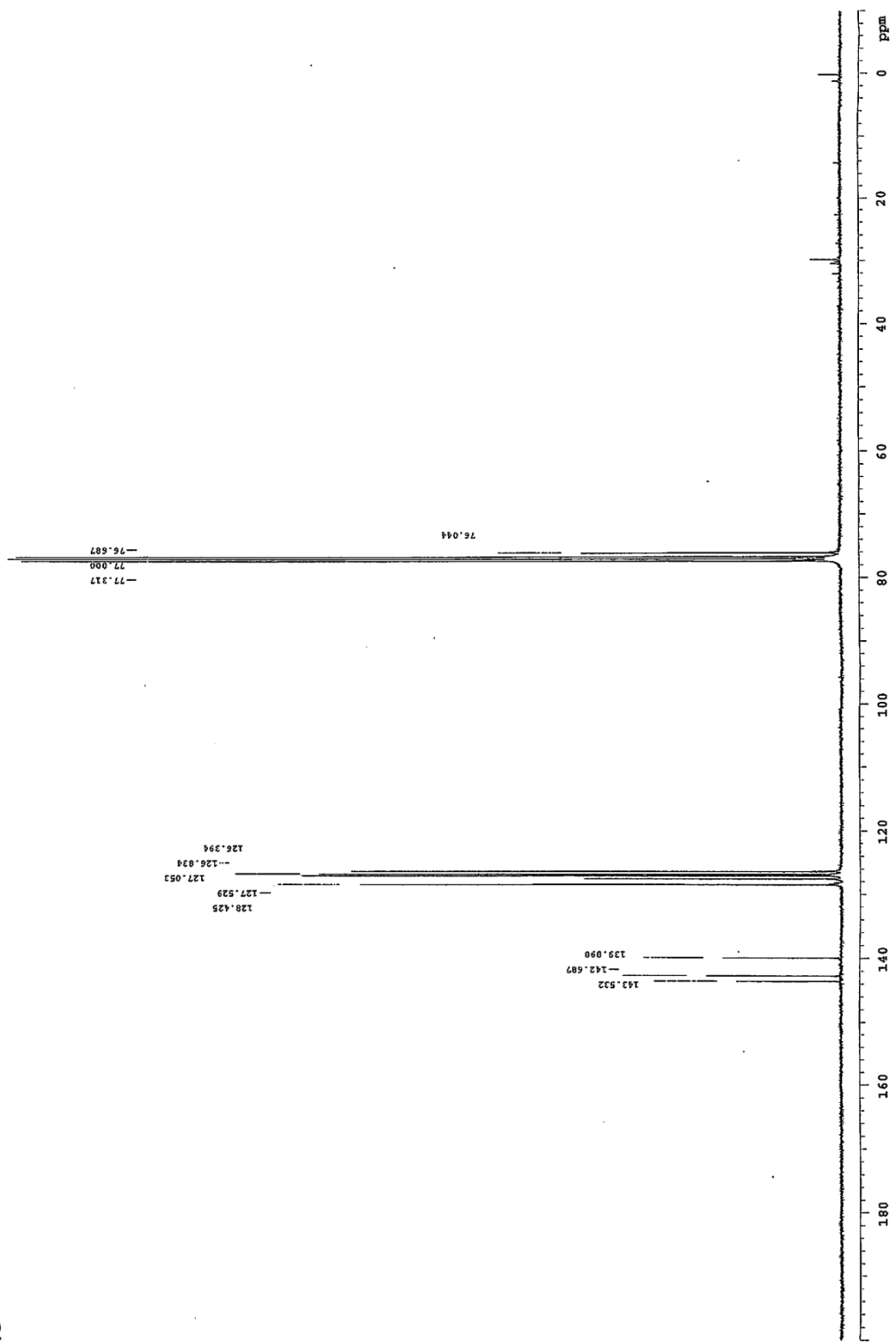
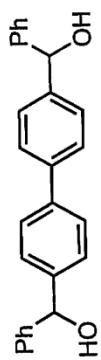


¹³C NMR spectrum of 4-bromo-4'-[hydroxyl(phenyl)methyl]biphenyl (22)

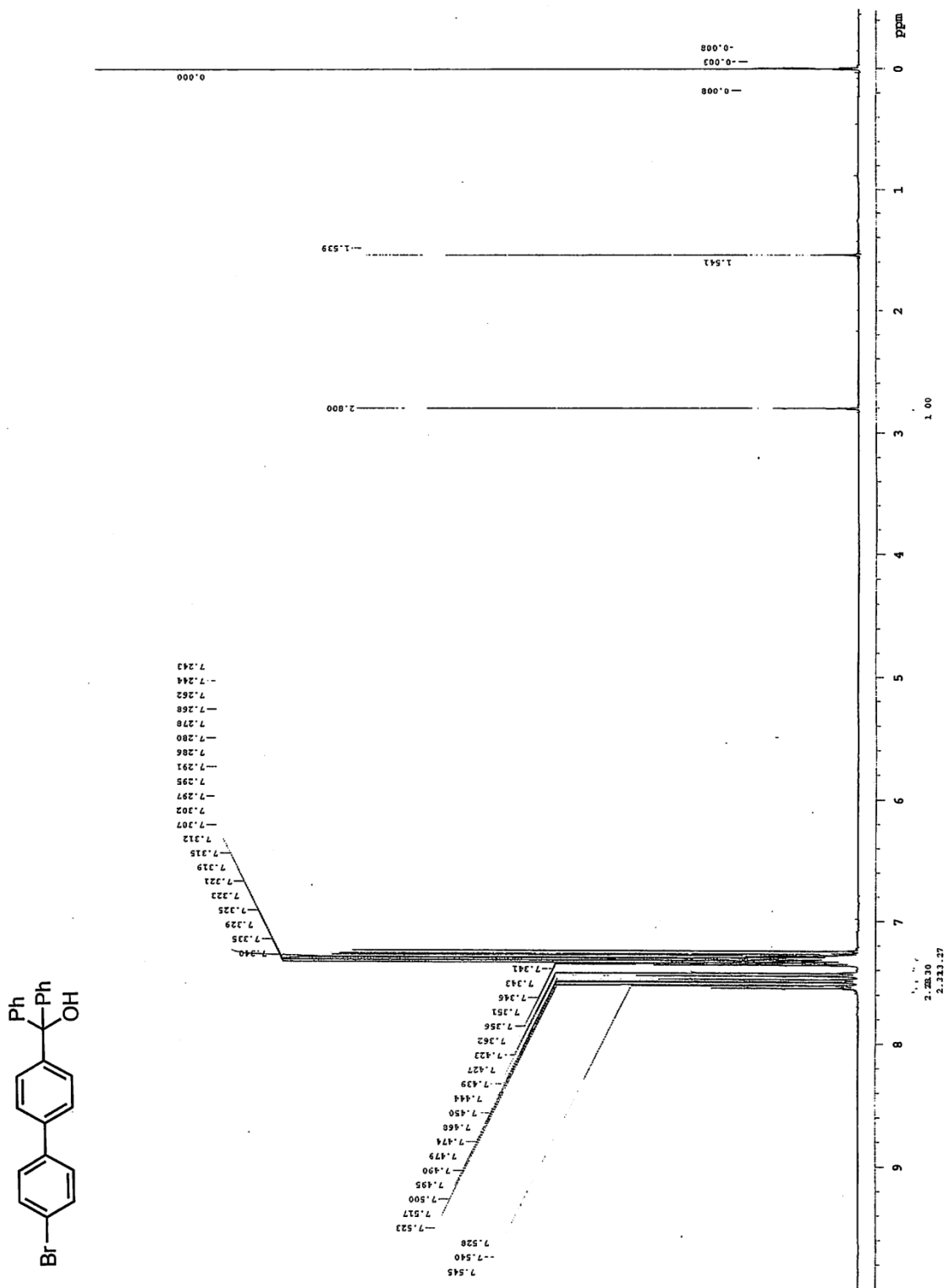


¹H NMR spectrum of 4,4'-di[hydroxyl(phenyl)methyl]biphenyl (23)

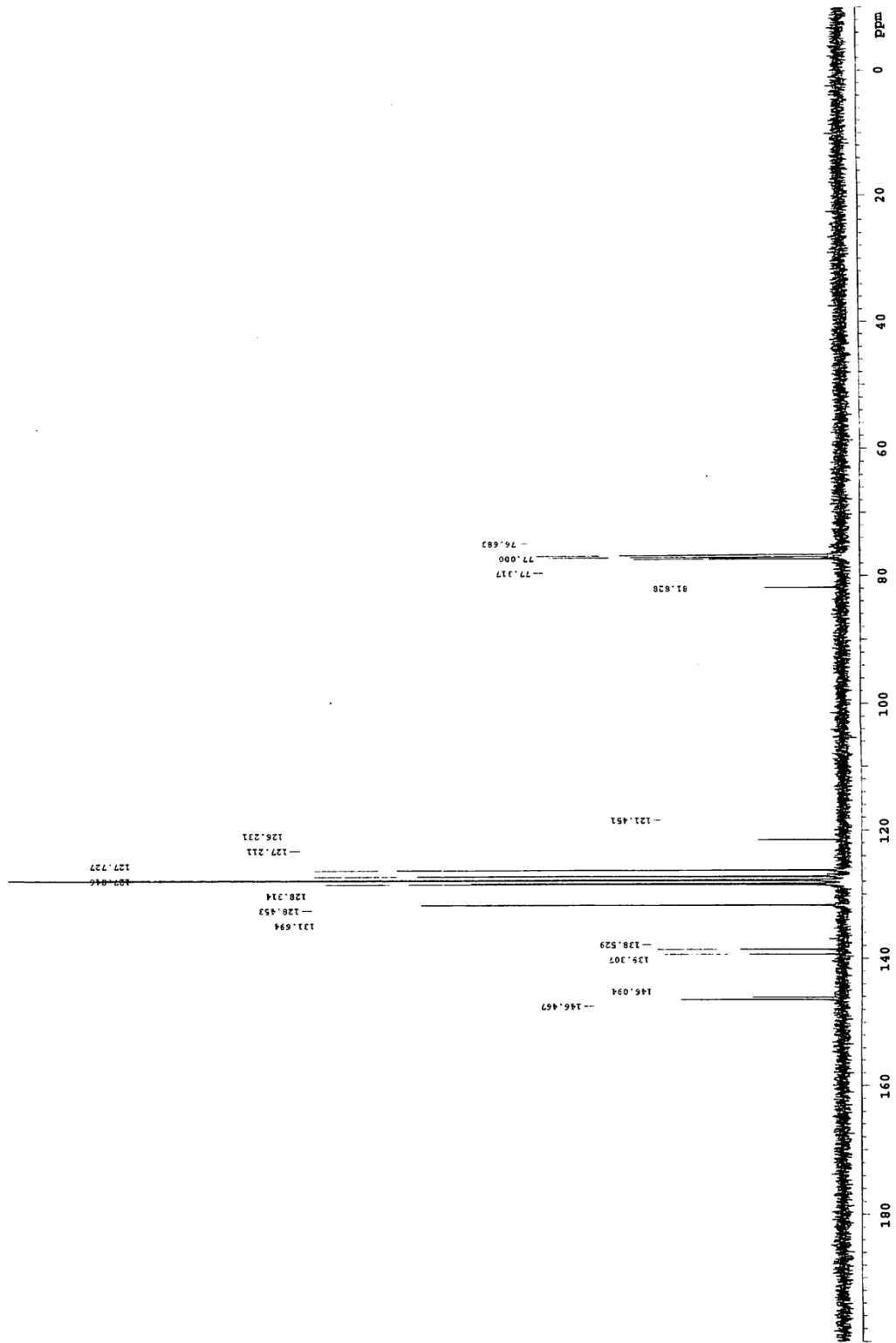




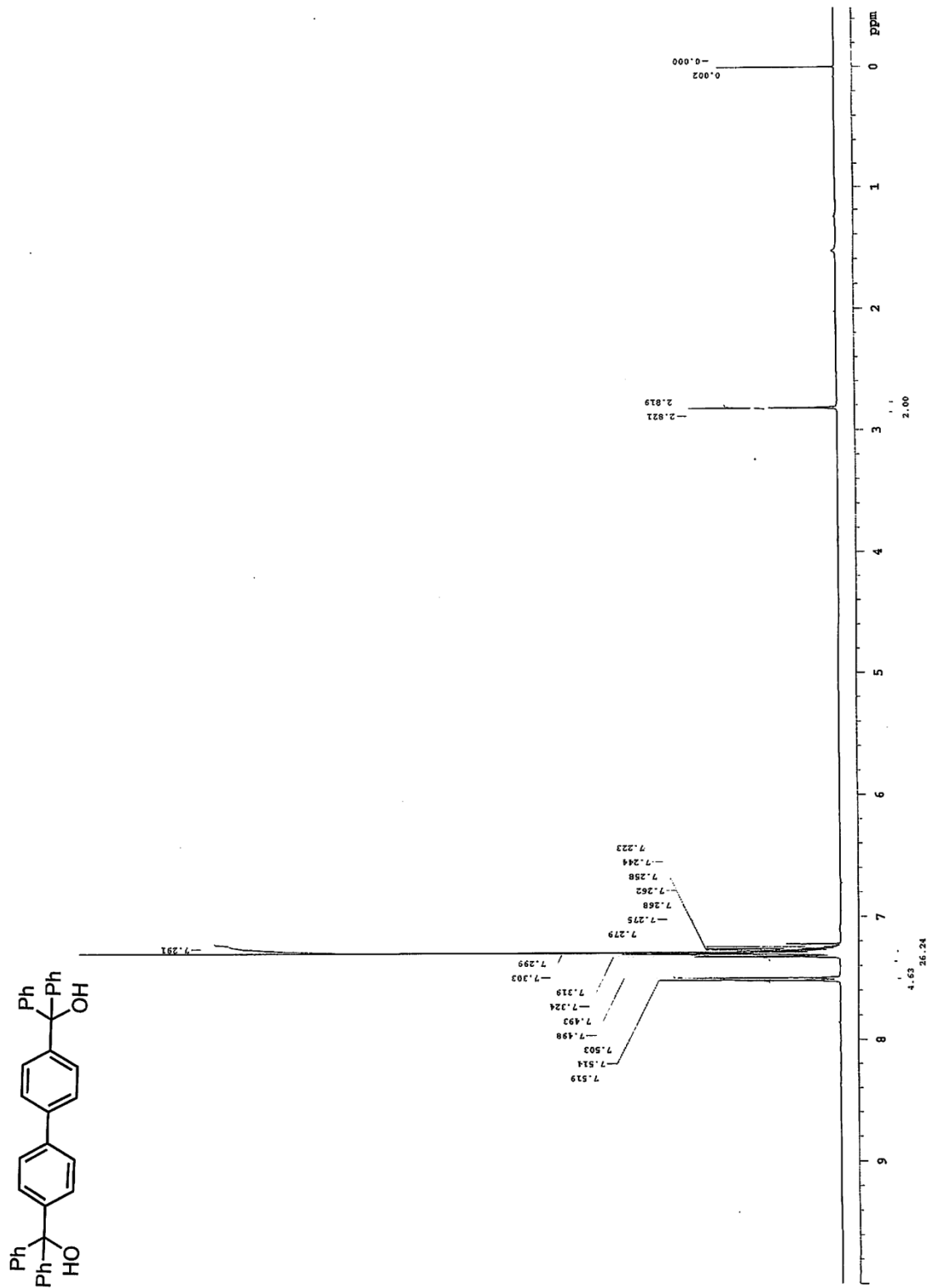
¹³C NMR spectrum of 4,4'-di[hydroxyl(phenyl)methyl]biphenyl (23)



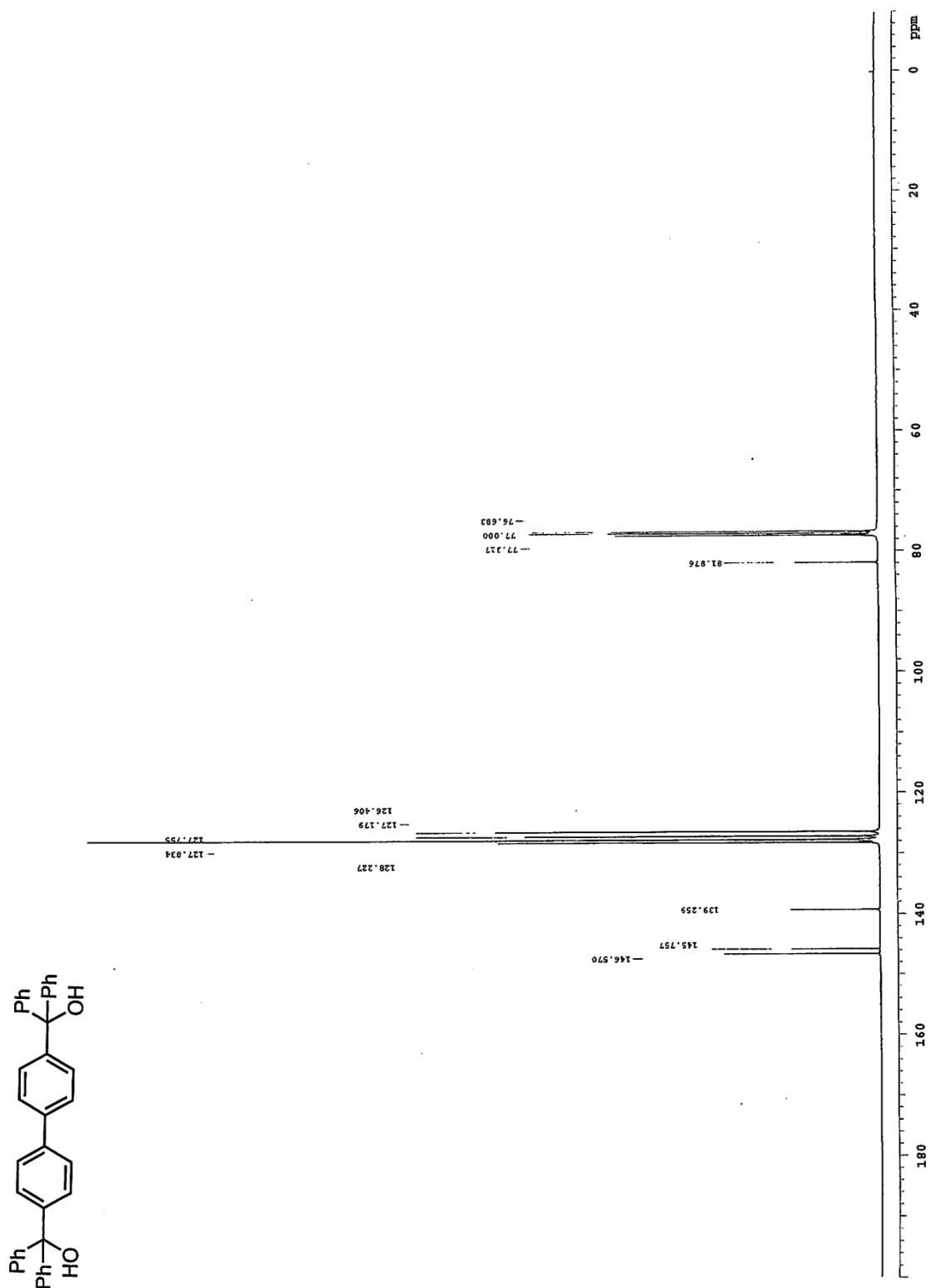
¹H NMR spectrum of 4-bromo-4'-[hydroxyl(diphenyl)methyl]biphenyl (24)



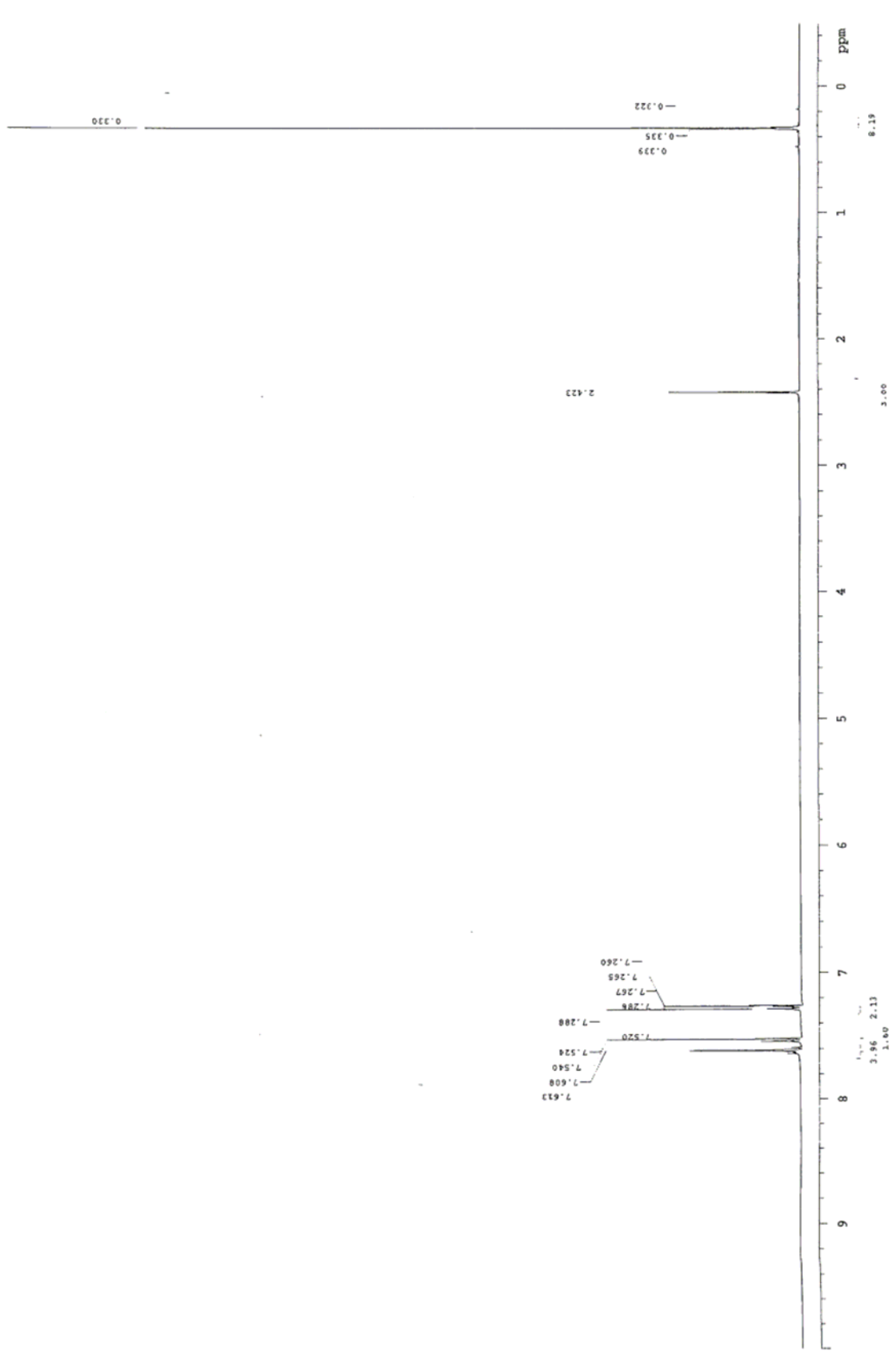
¹³C NMR spectrum of 4-bromo-4'-[hydroxyl(diphenyl)methyl]biphenyl (24)



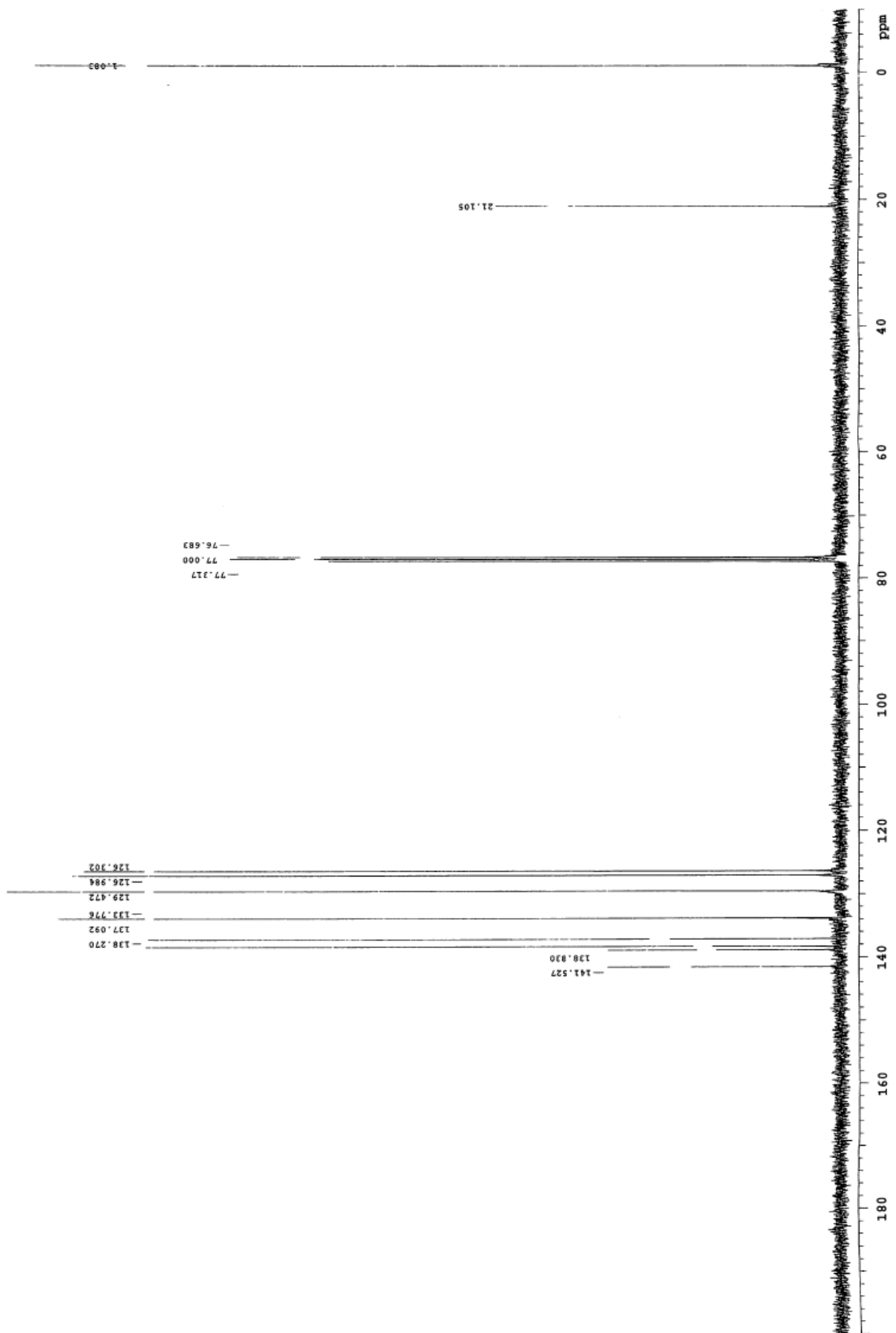
¹H NMR spectrum of 4,4'-bis[hydroxyl(diphenyl)methyl]biphenyl (25)



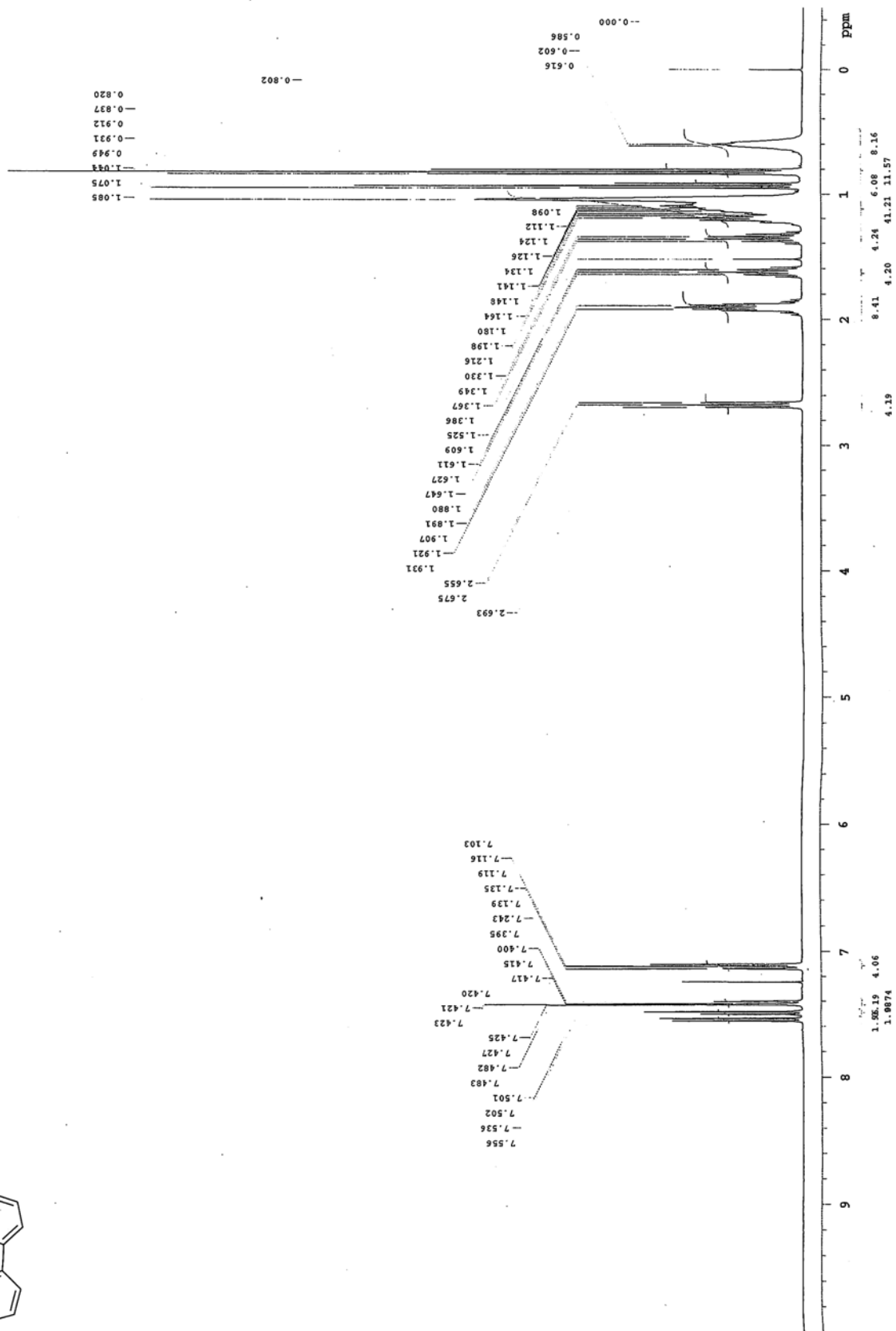
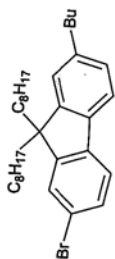
¹³C NMR spectrum of 4,4'-bis[hydroxyl(diphenyl)methyl]biphenyl (25)



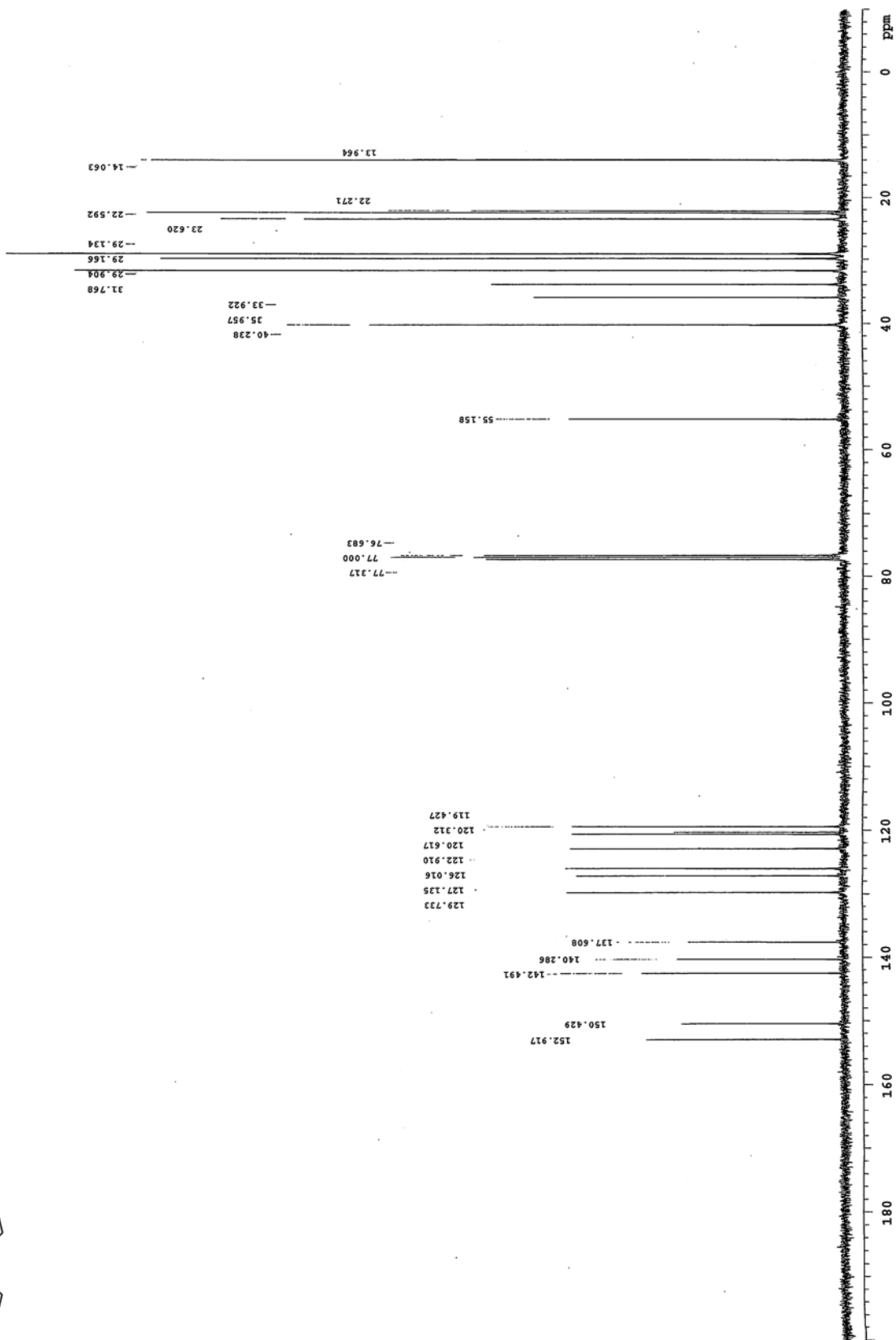
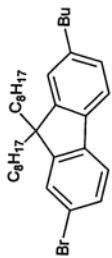
¹H NMR spectrum of 4-methyl-4'-trimethylsilylbiphenyl (26)



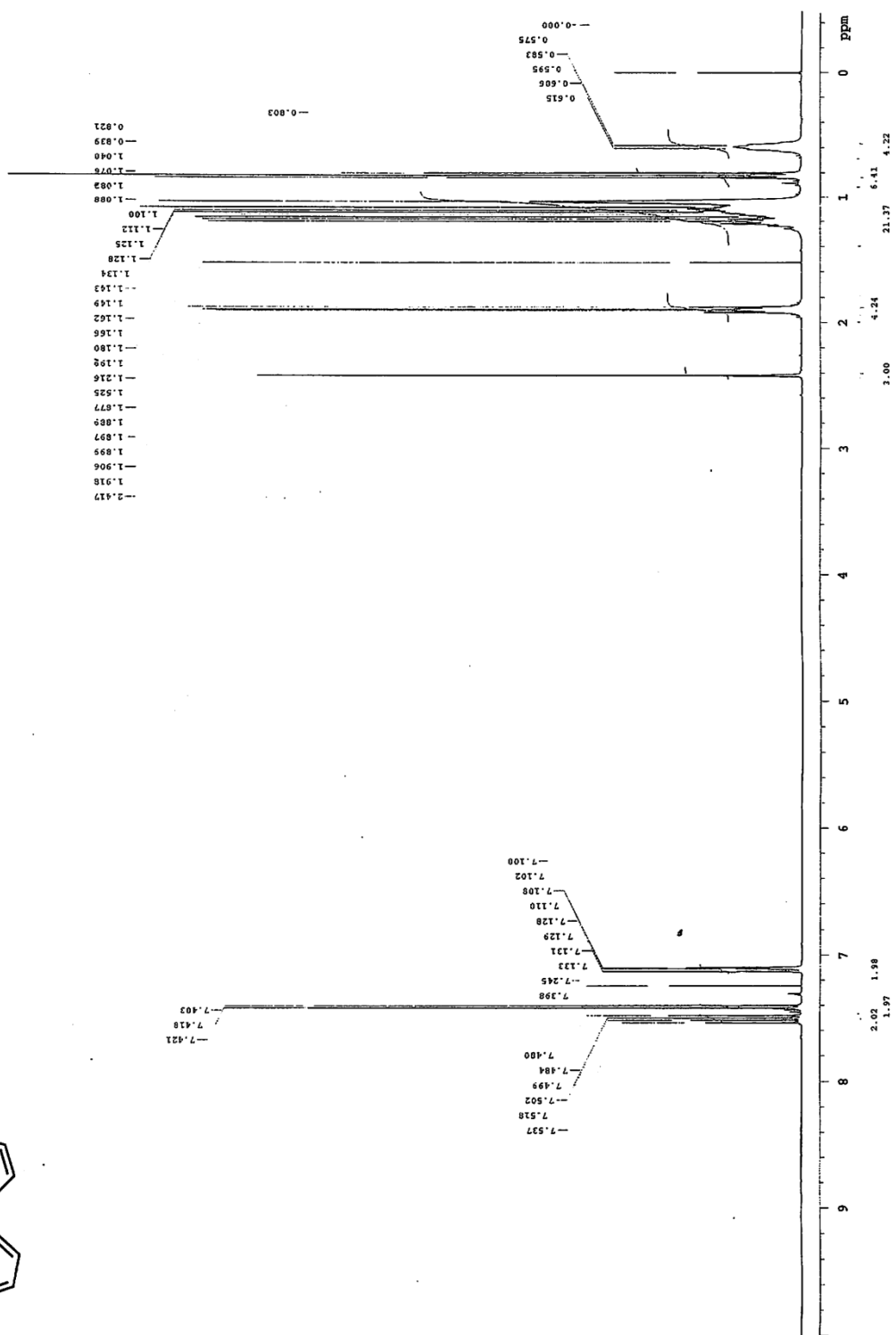
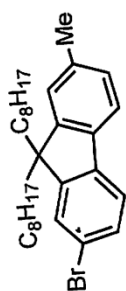
¹³C NMR spectrum of 4-methyl-4'-trimethylsilylbiphenyl (26)



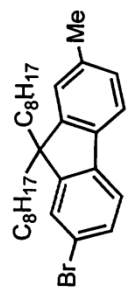
¹H NMR spectrum of 2-bromo-7-butyl-9,9-dioctylfluorene (31)



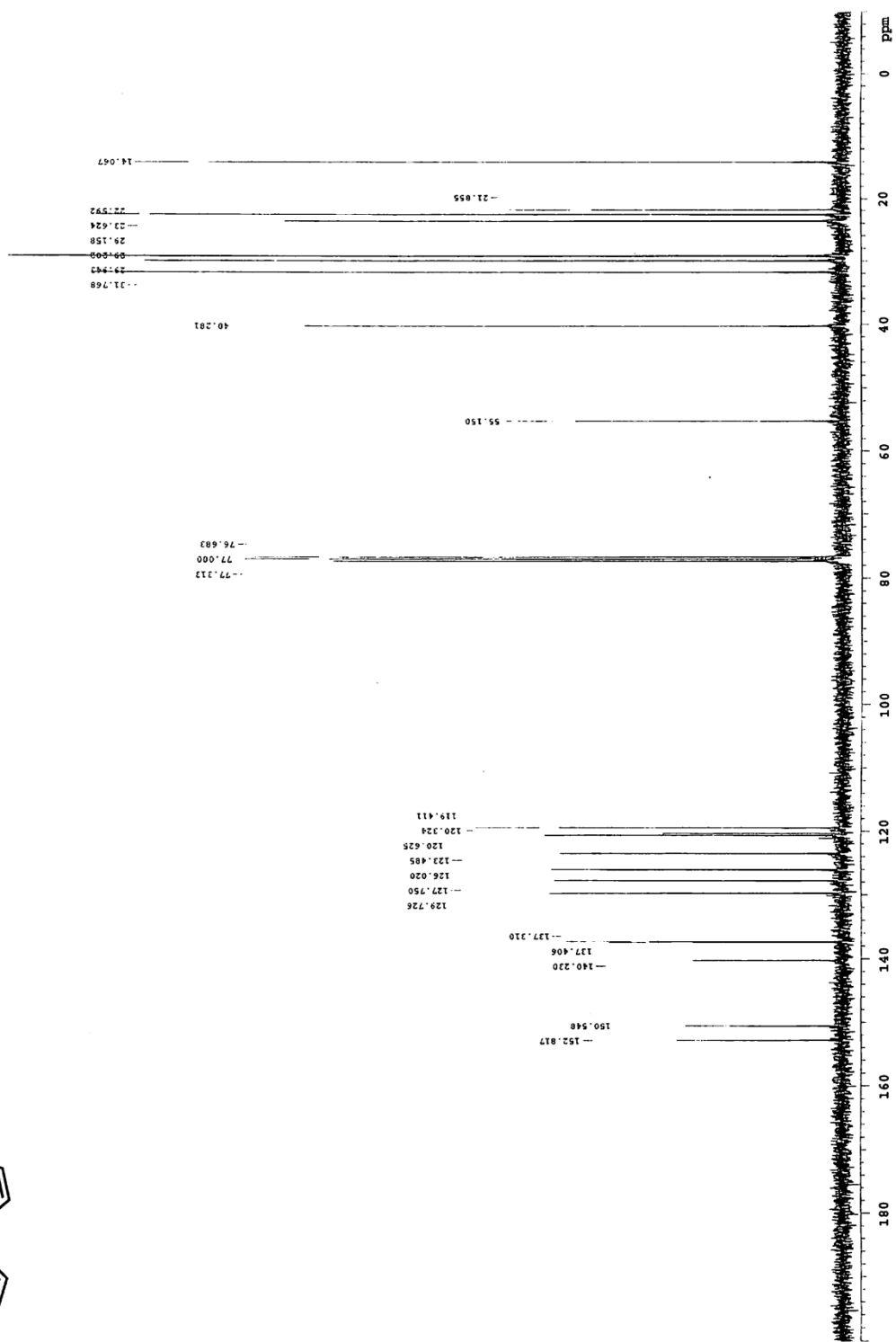
^{13}C NMR spectrum of 2-bromo-7-butyl-9,9-dioctylfluorene (31)

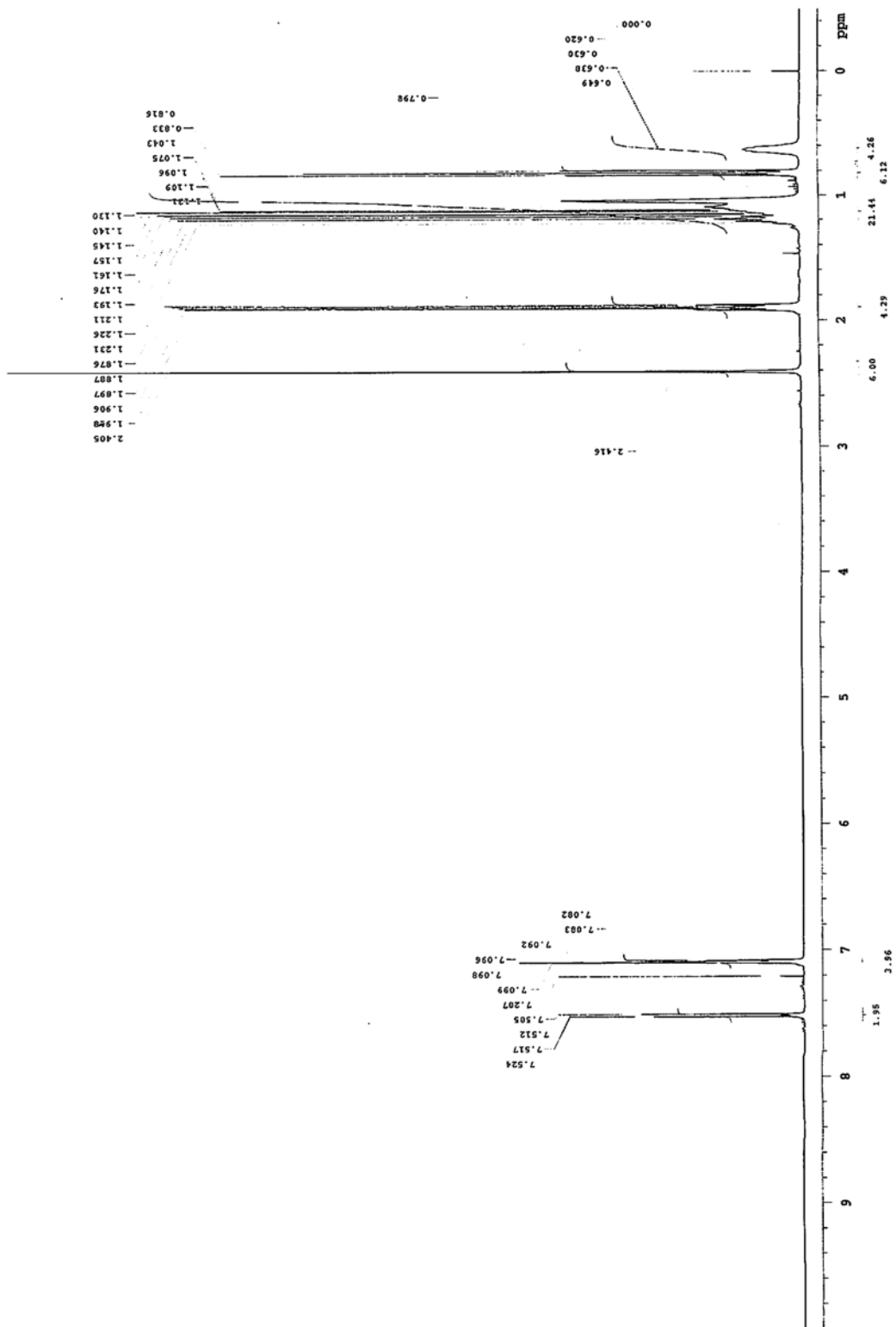
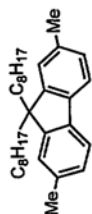


^1H NMR spectrum of 2-bromo-7-methyl-9,9-dioctylfluorene (32)

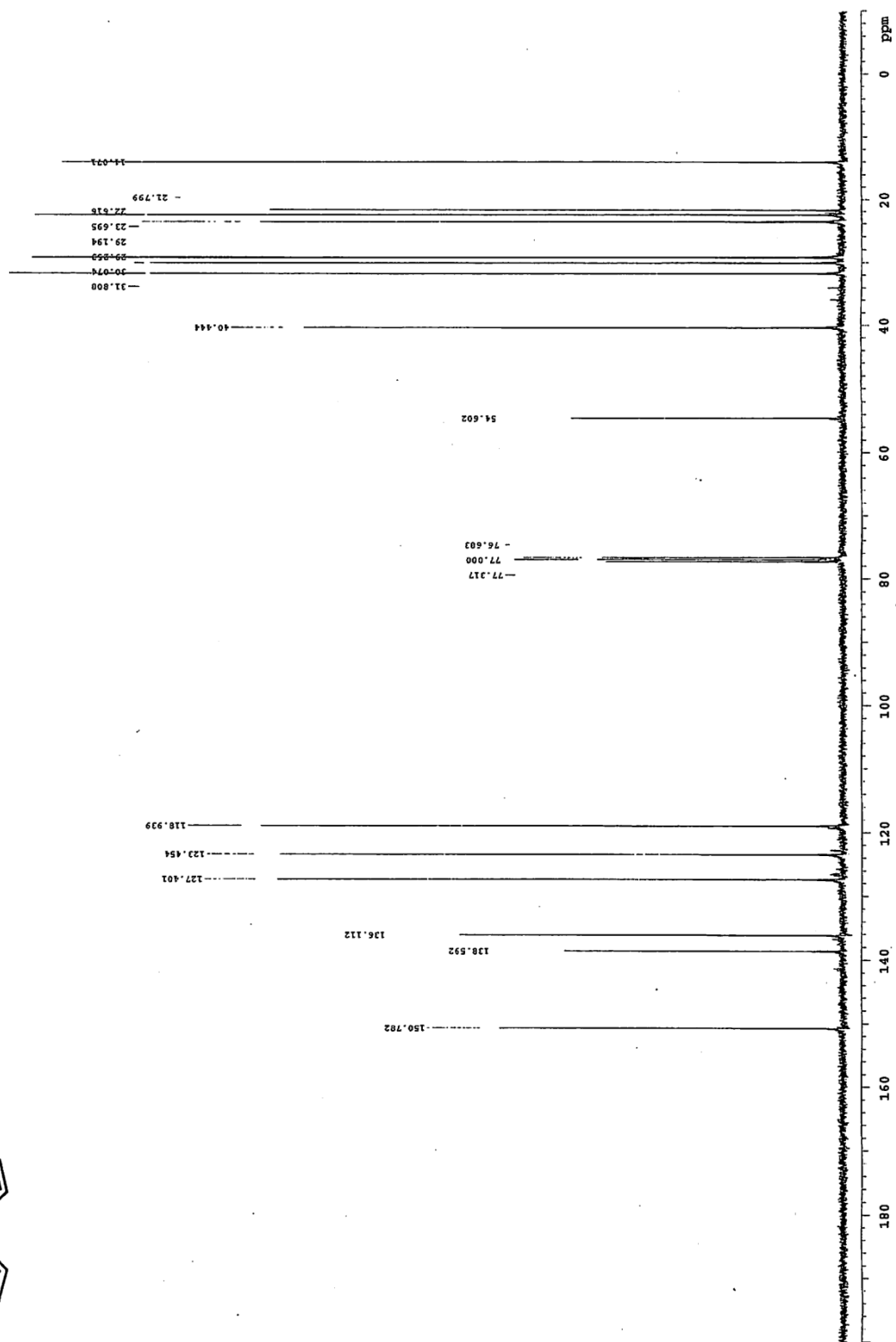
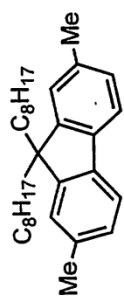


^{13}C NMR spectrum of 2-bromo-7-methyl-9,9-dioctylfluorene (32)

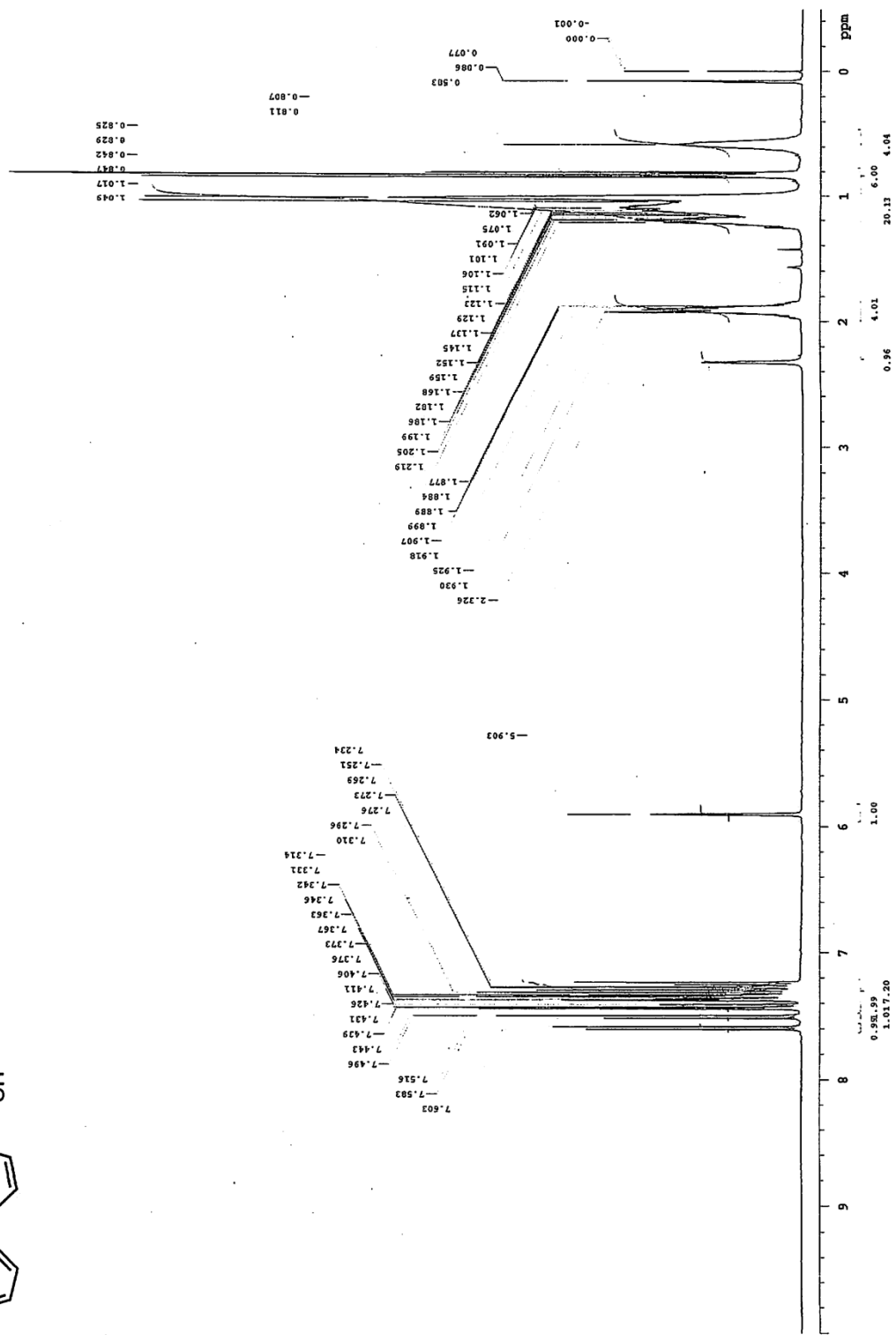
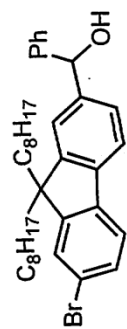




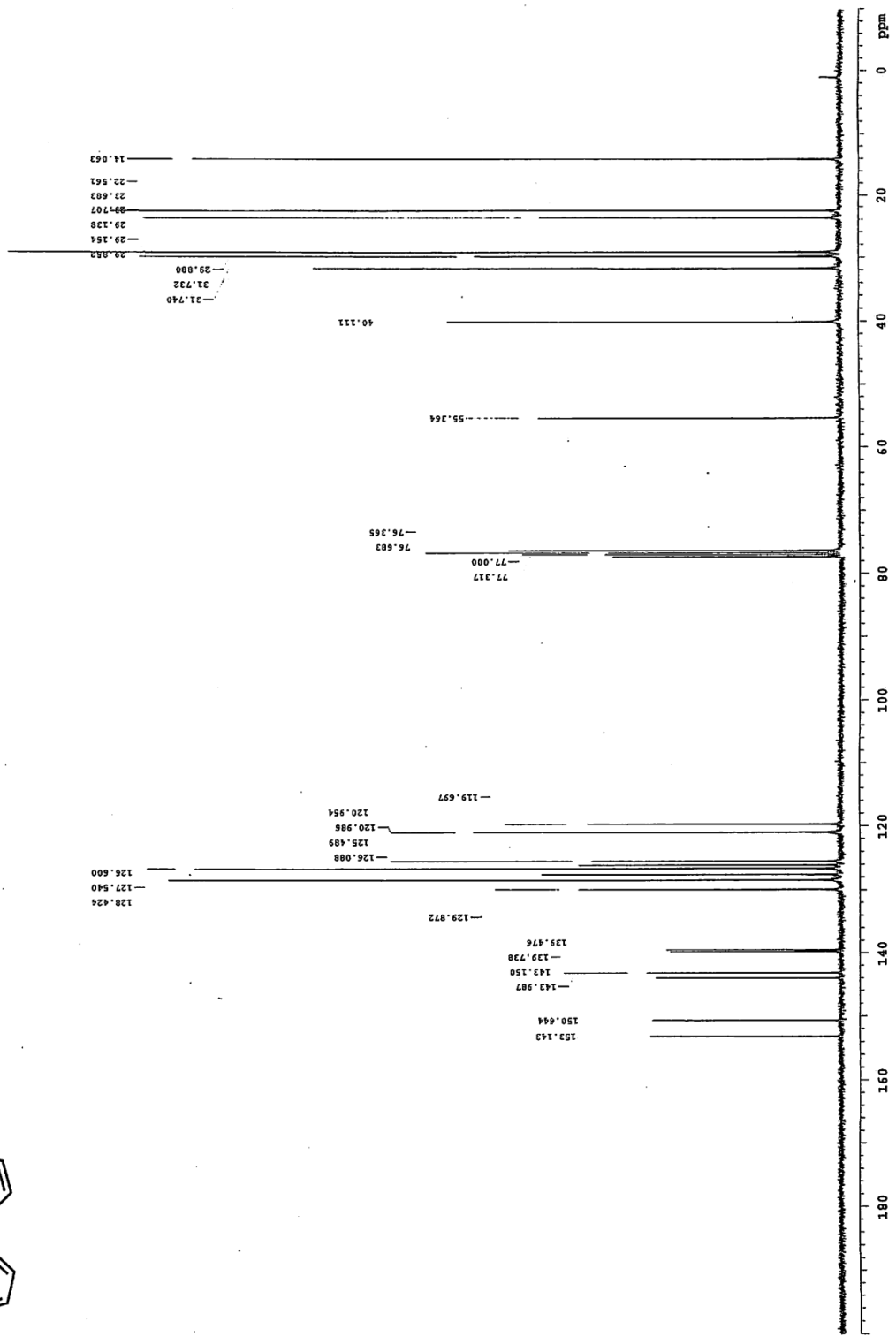
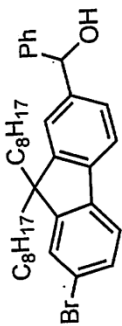
^1H NMR spectrum of 2,7-dimethyl-9,9-dioctylfluorene (33)



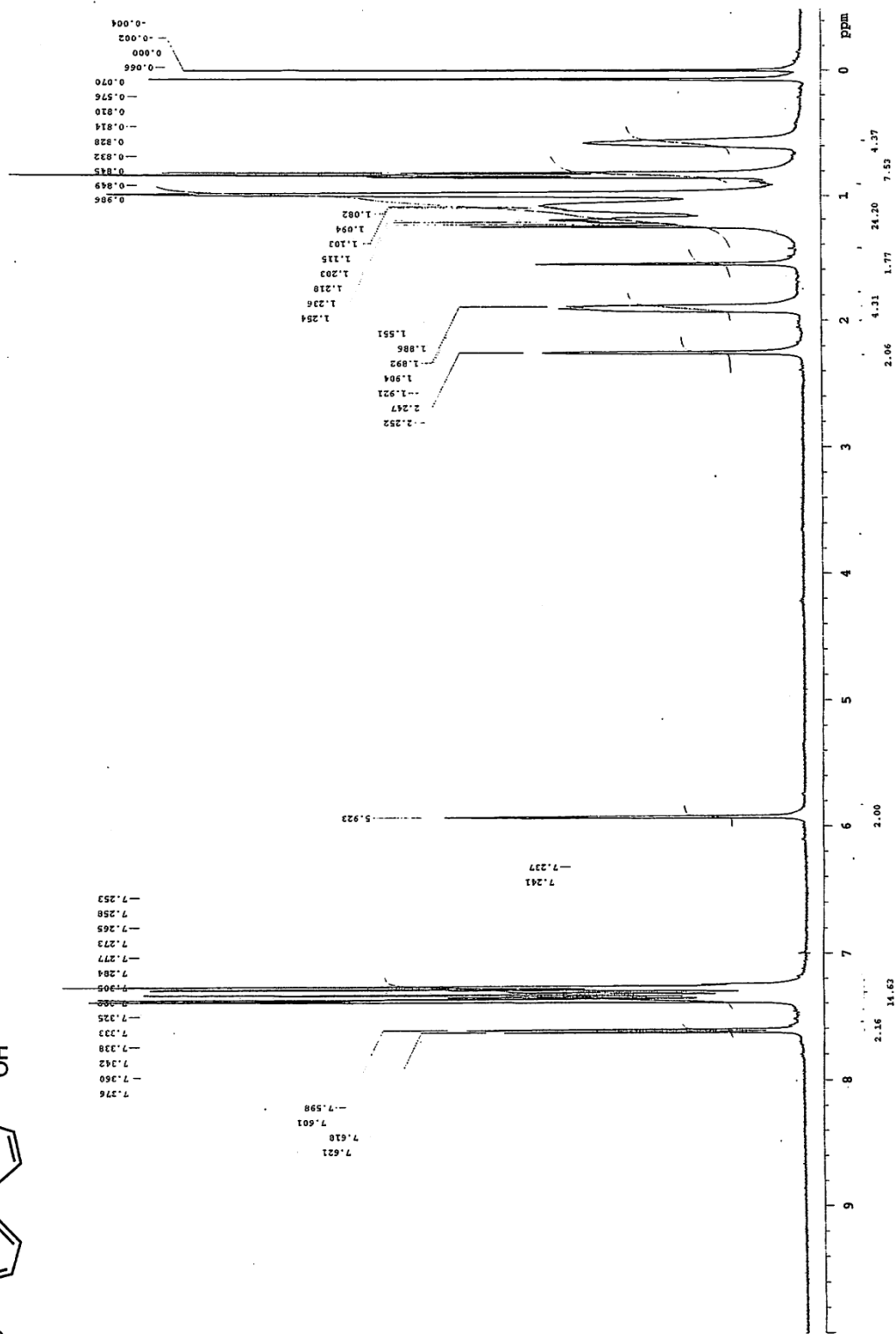
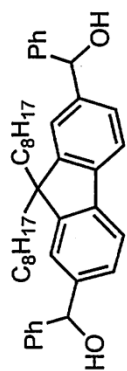
^{13}C NMR spectrum of 2,7-dimethyl-9,9-dioctylfluorene (33)



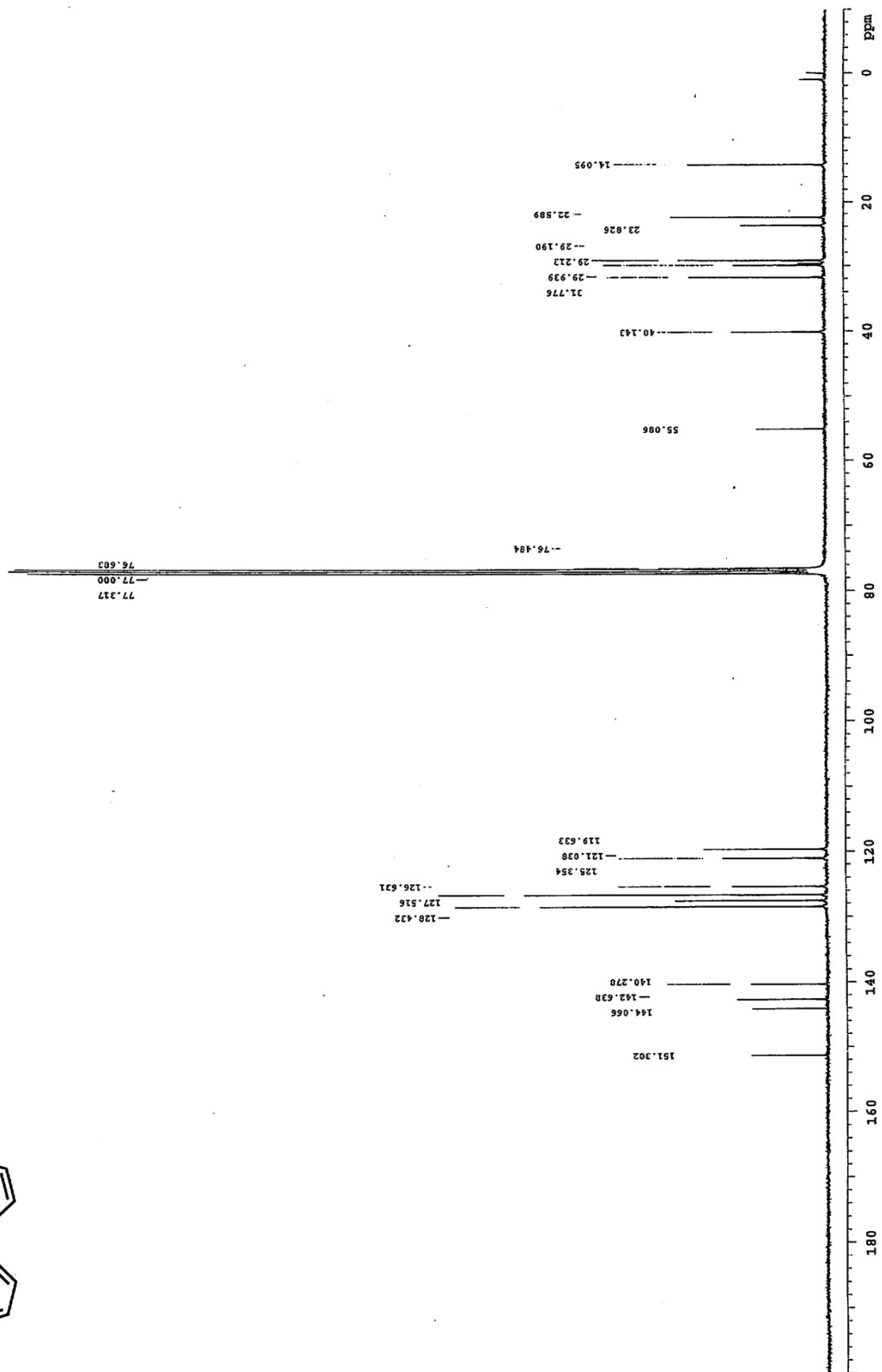
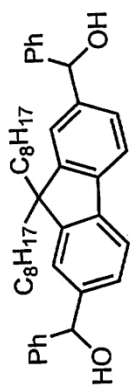
¹H NMR spectrum of 2-bromo-7-[hydroxyl(phenyl)methyl]-9,9-dioctylfluorene (34)



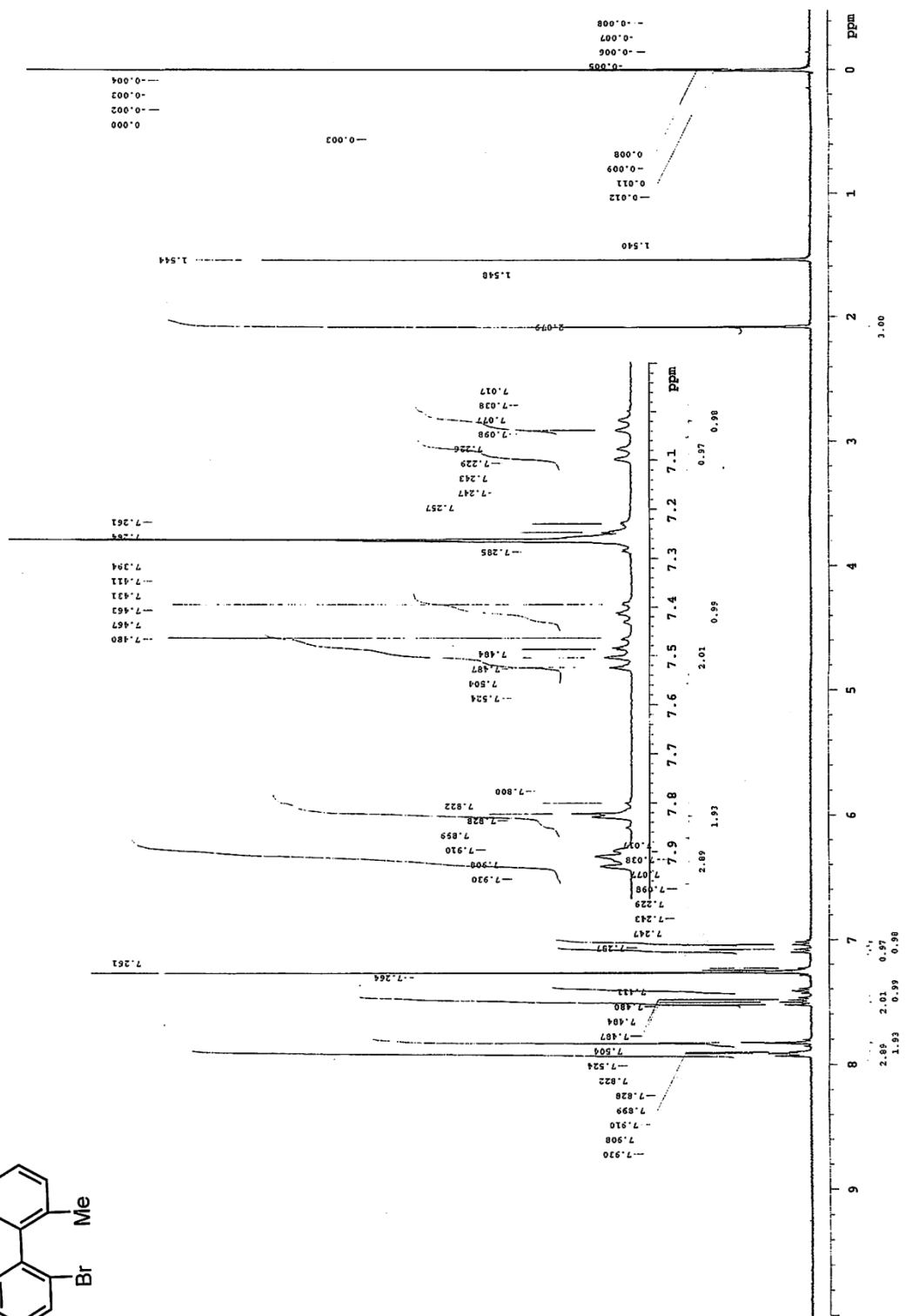
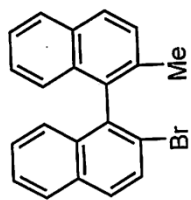
¹³C NMR spectrum of 2-bromo-7-[hydroxyl(phenyl)methyl]-9,9-dioctylfluorene (34)



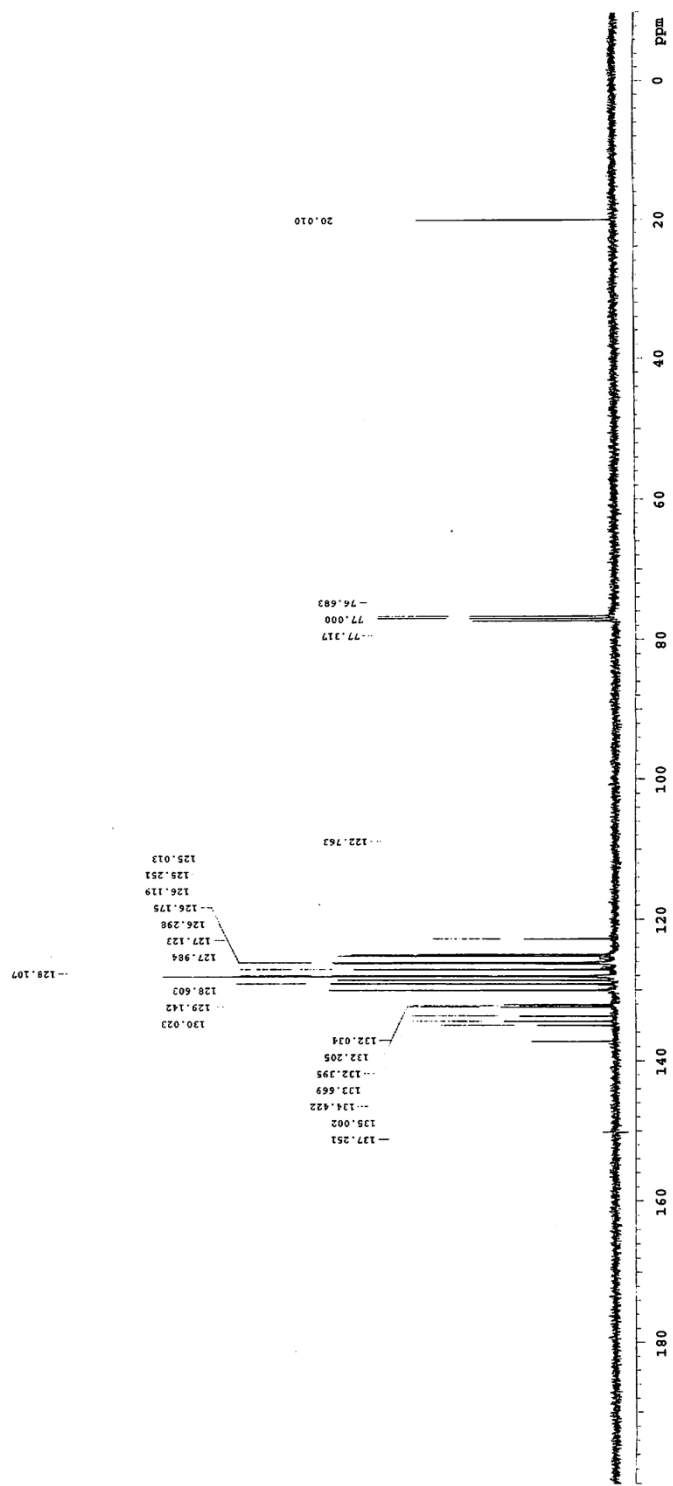
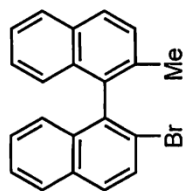
¹H NMR spectrum of 2,7'-di[hydroxyl(phenyl)methyl]-9,9-dioctylfluorene (35)



^{13}C NMR spectrum of 2,7'-di[hydroxyl(phenyl)methyl]-9,9-dioctylfluorene (35)



¹H NMR spectrum of 2-bromo-2'-methyl-1,1'-binaphthyl (39)



^{13}C NMR spectrum of 2-bromo-2'-methyl-1,1'-binaphthyl (39)