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APPENDIX

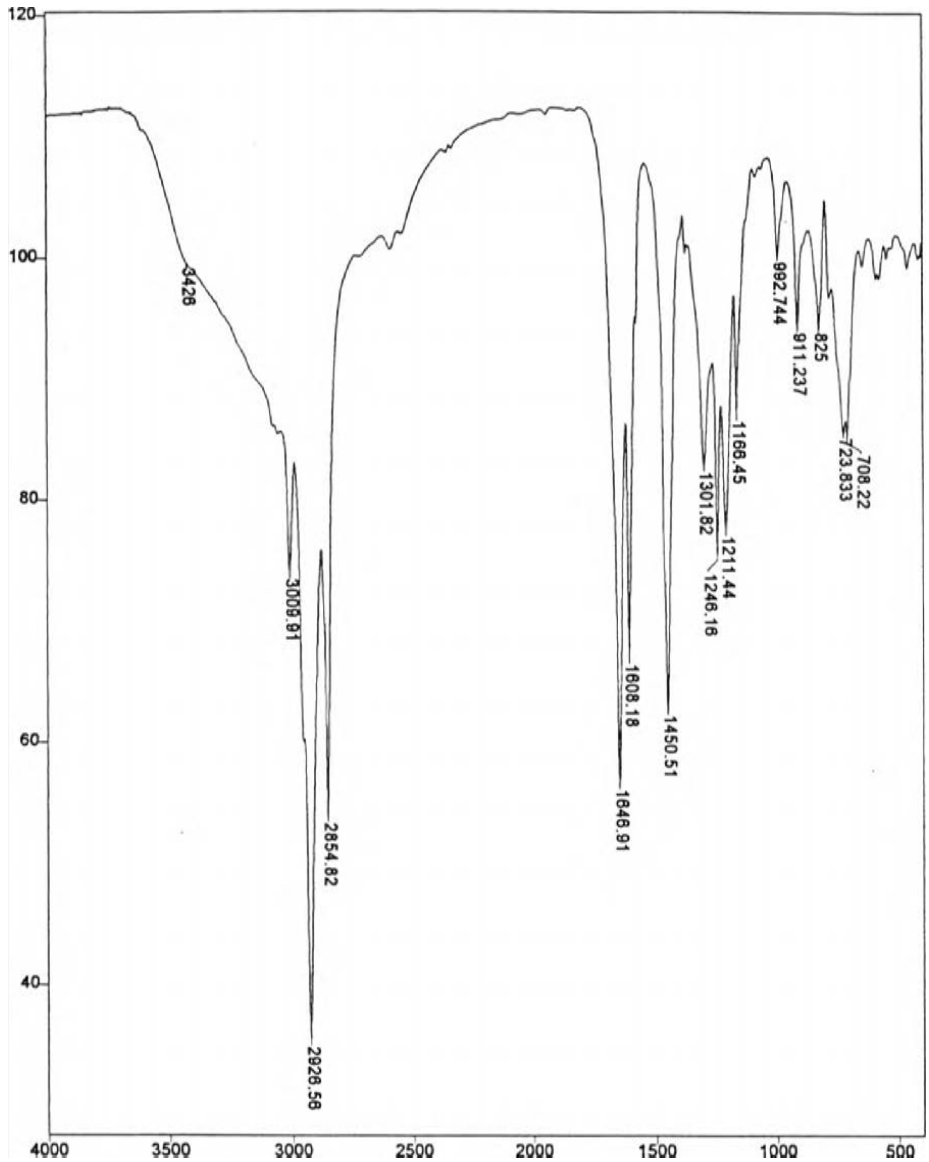

Figure 1 : FT-IR spectrnm of CNSL.

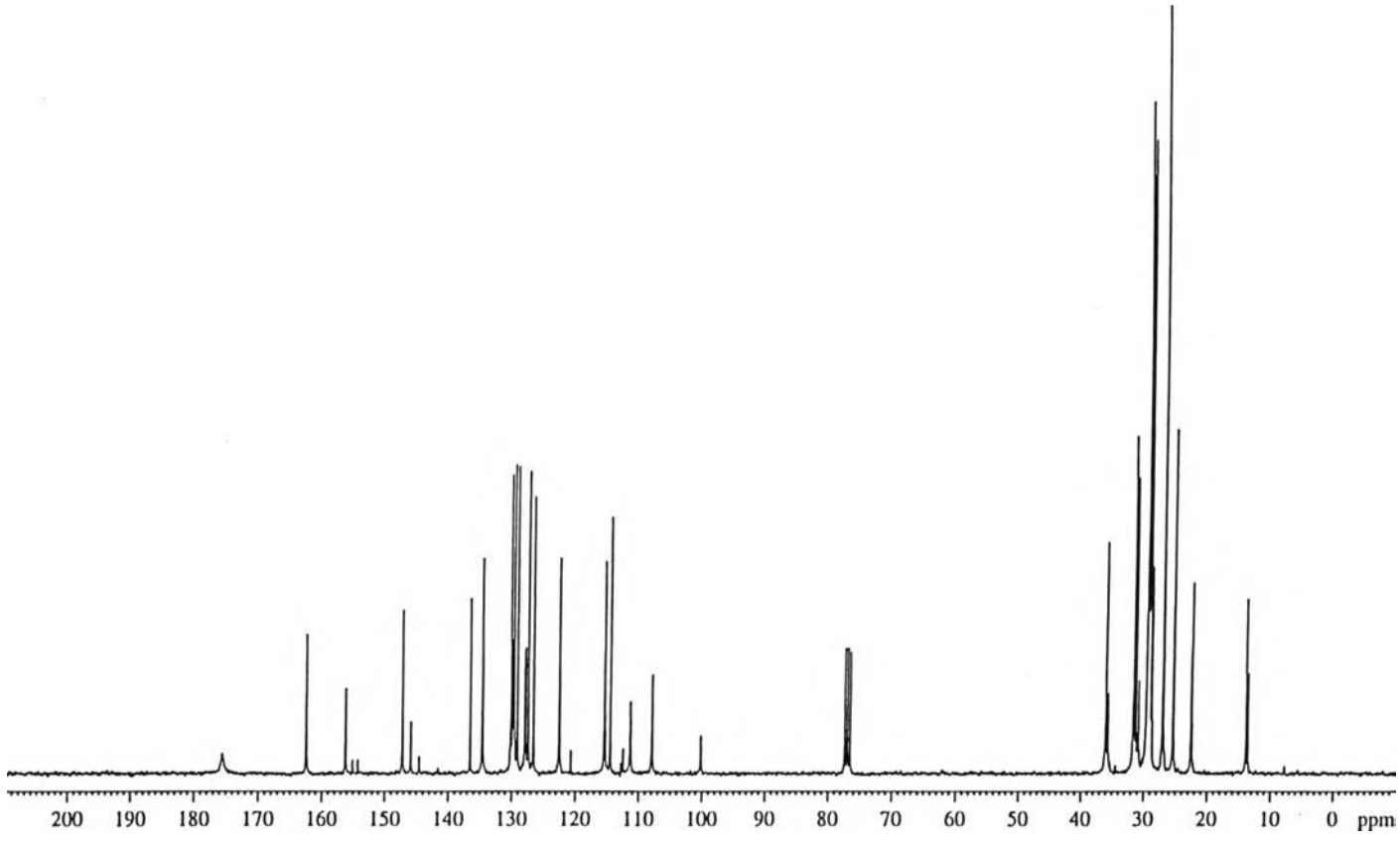

Figure 2 : ^{13}C-NMR spectrnm of CNSL.

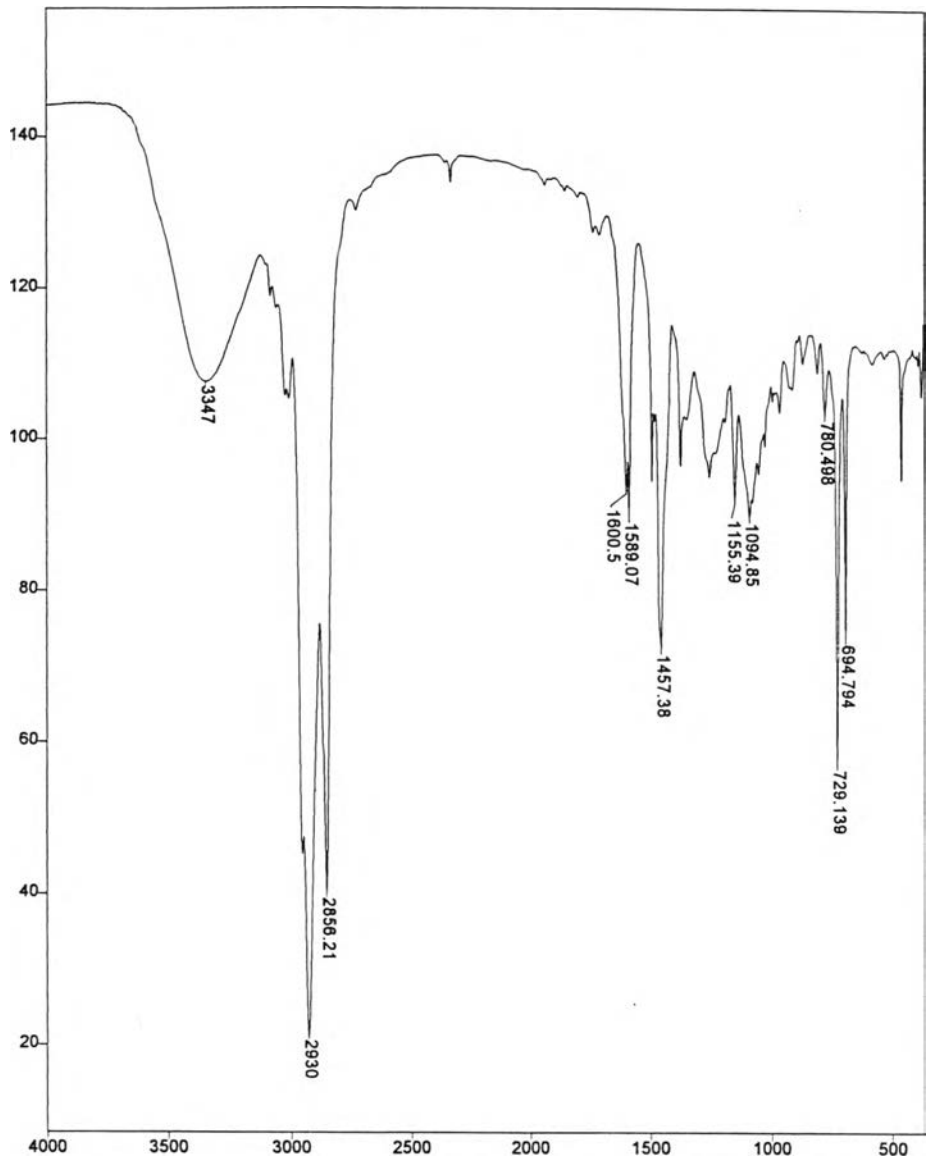

Figure 3 : FT-IR spectrum of esterified-CNSL.

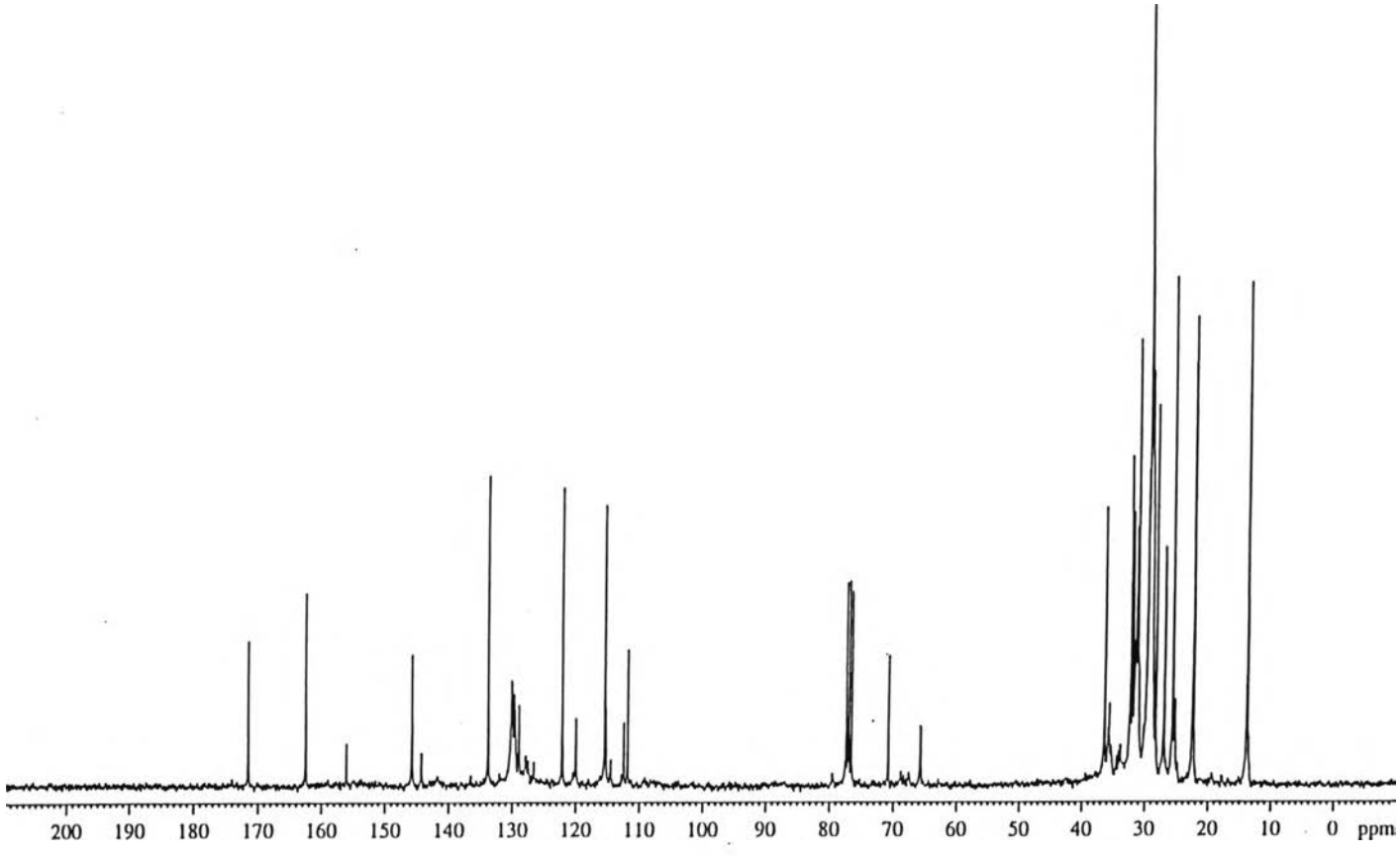

Figure 4 : ^{13}C-NMR spectrum of esterified-CNSL.

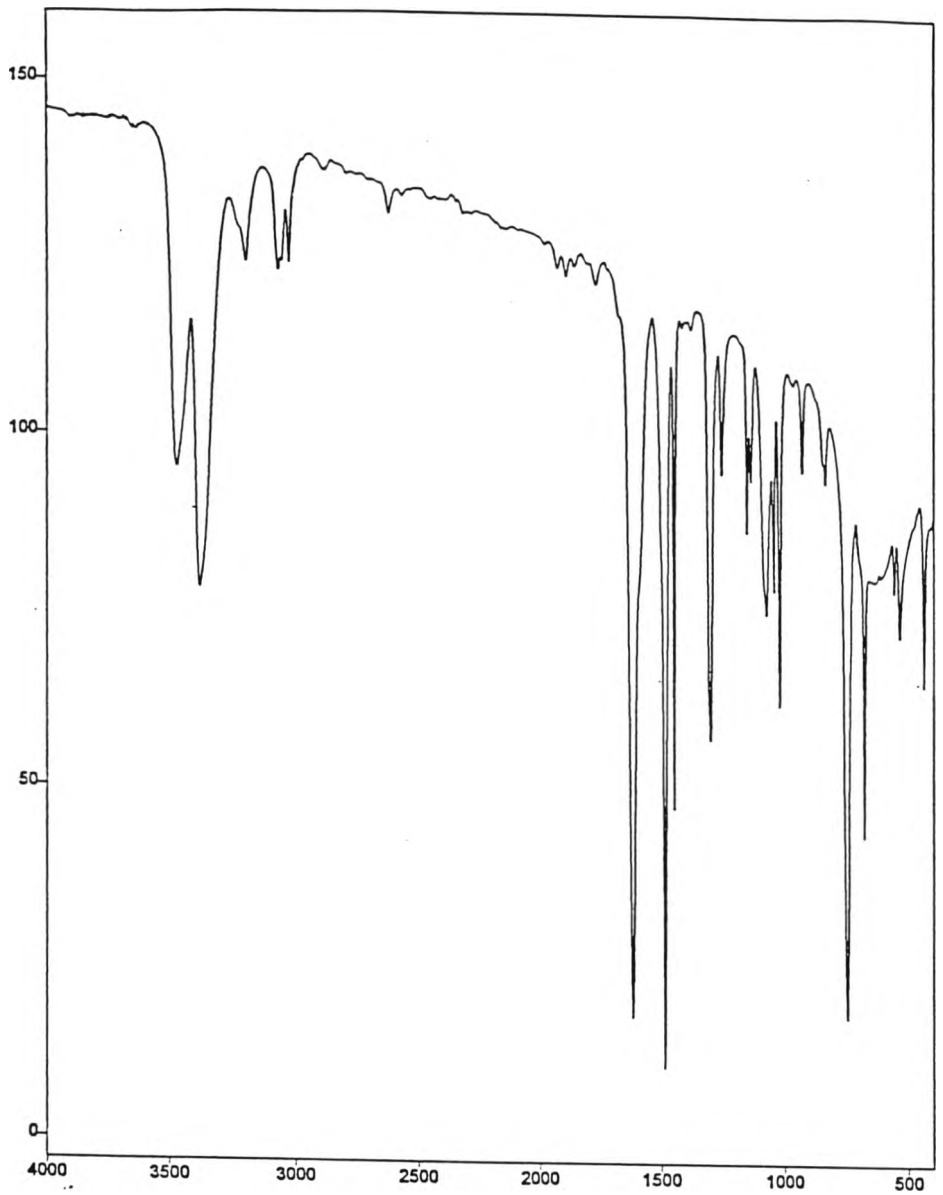

Figure 5 : FT-IR spectrum of Compound 1.

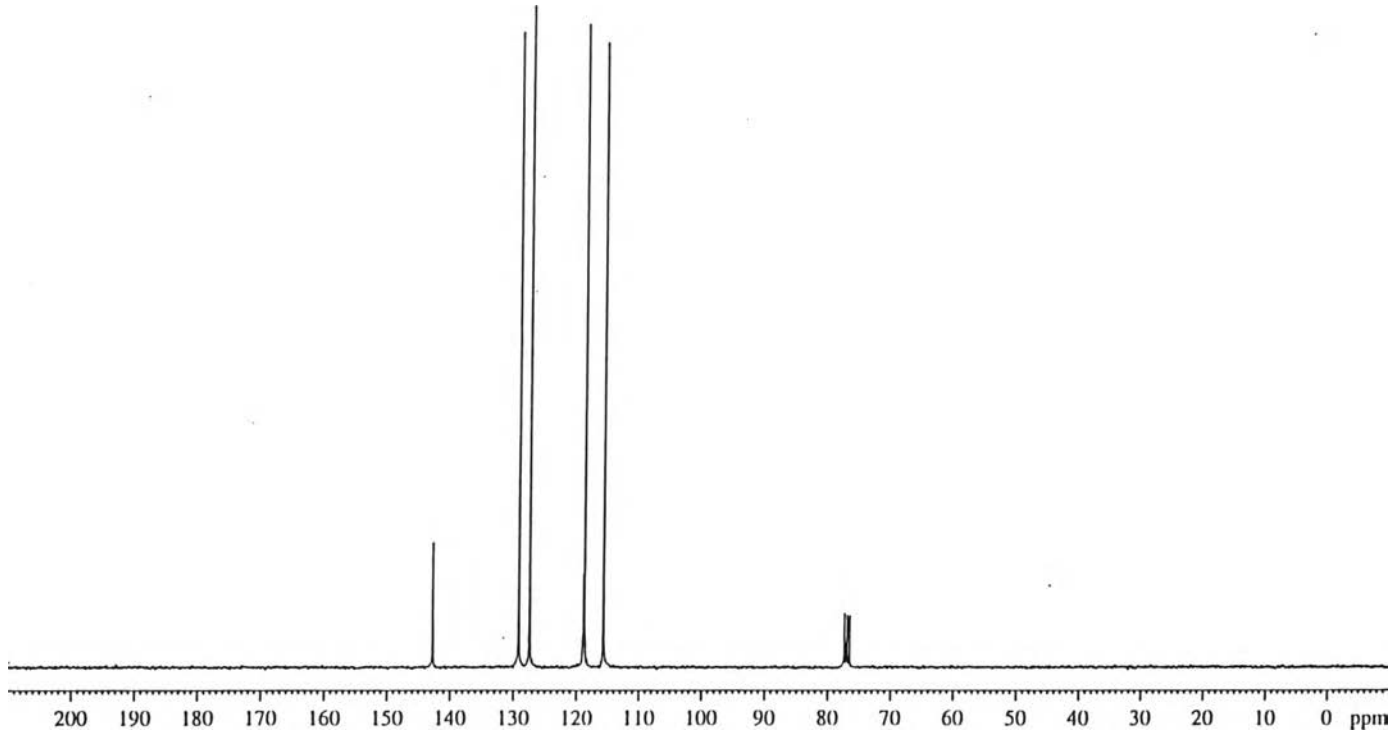

Figure 6 : ^{13}C-NMR spectrum of Compound 1.

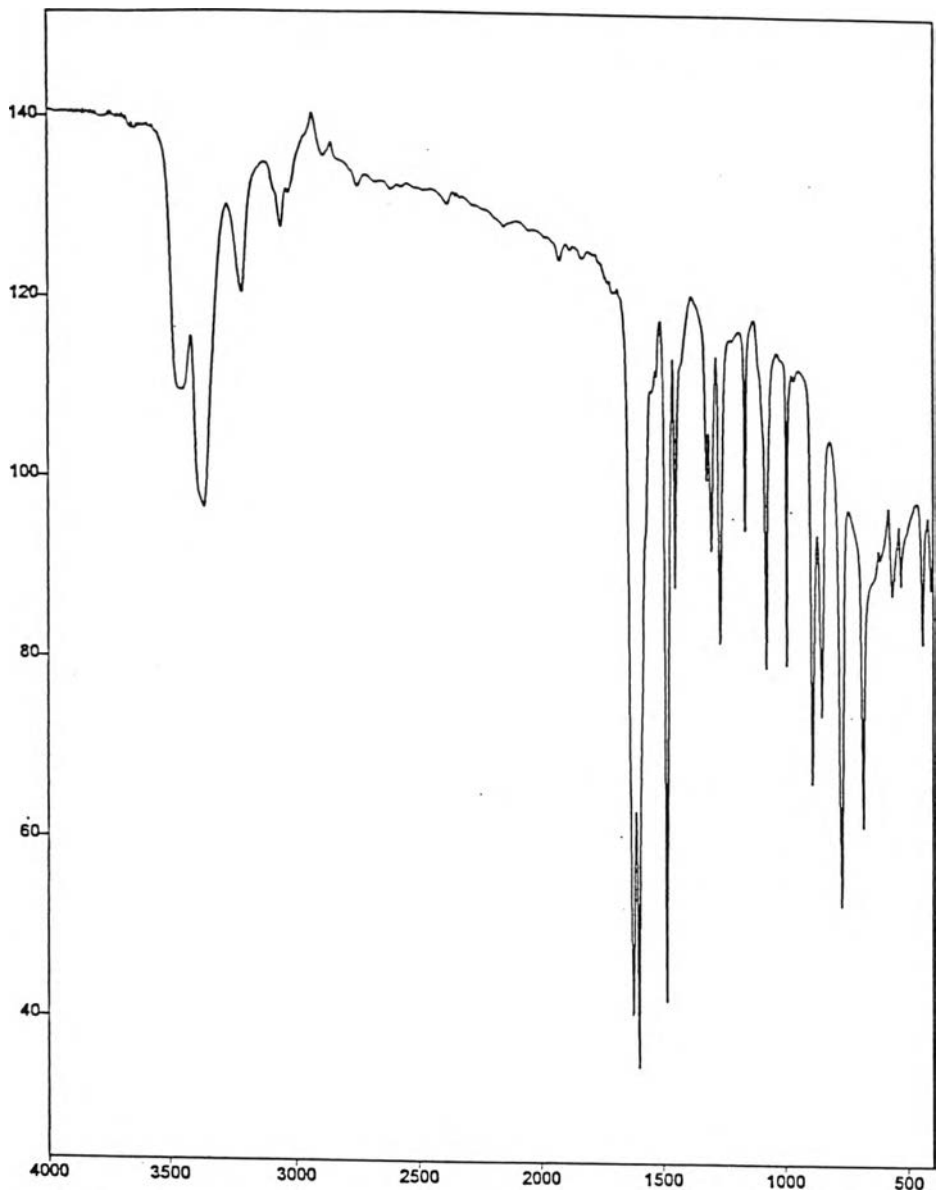

Figure 7 : FT-IR spectrum of Compound 2.

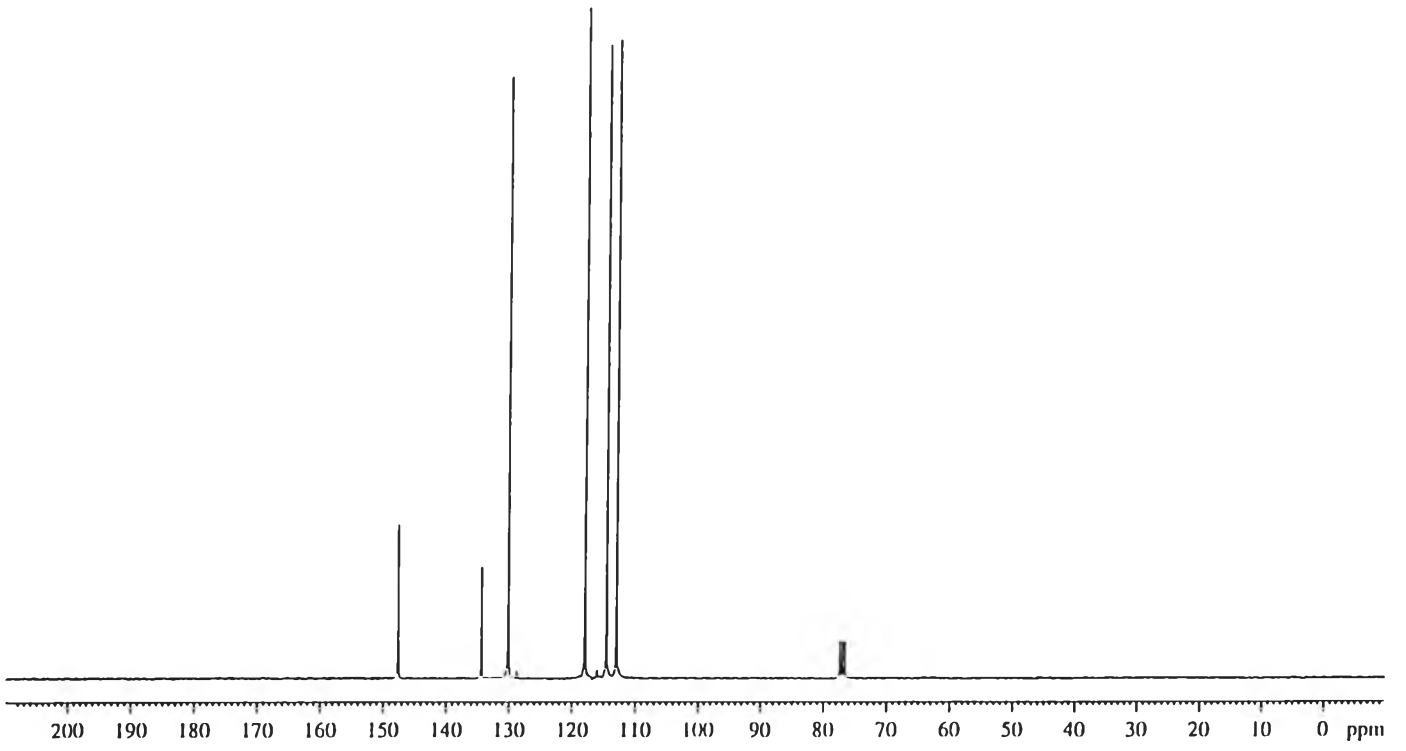

Figure 8 : ^{13}C-NMR spectrum of Compound 2.

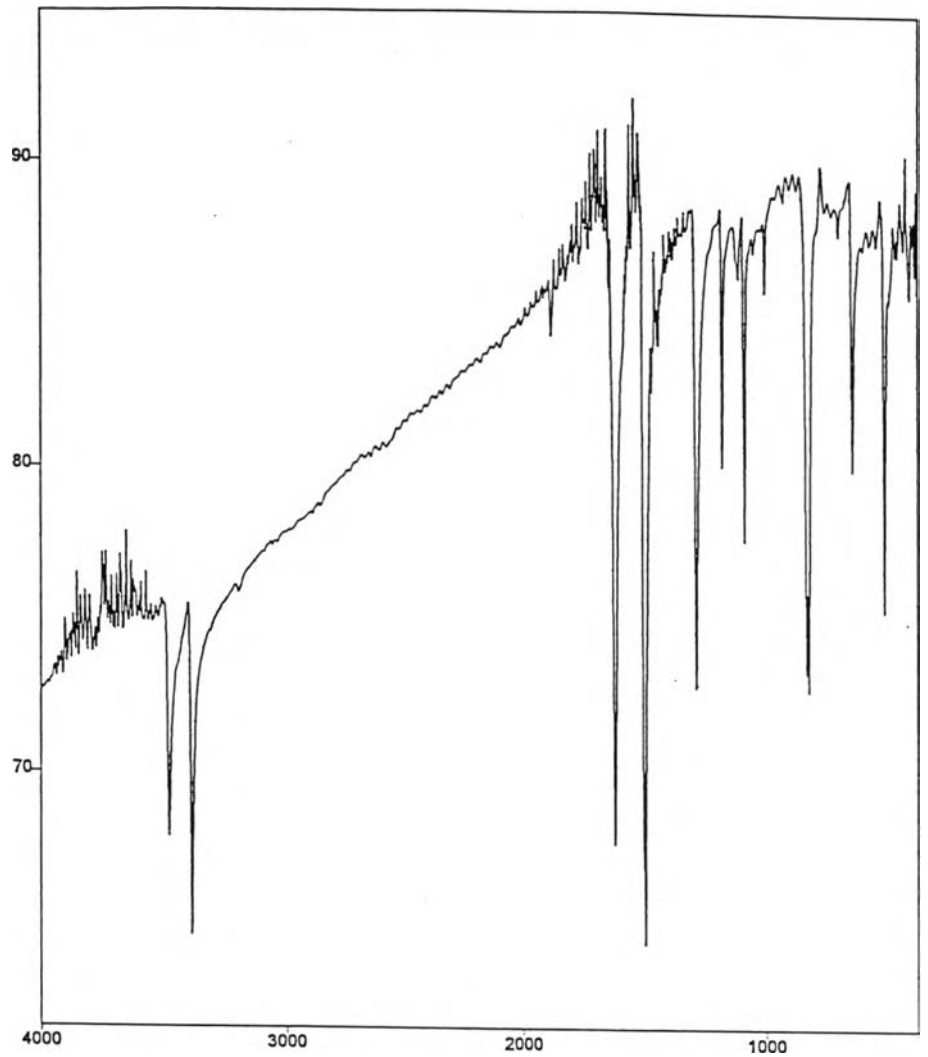

Figure 9 : FT-IR spectrum of Compound 3.

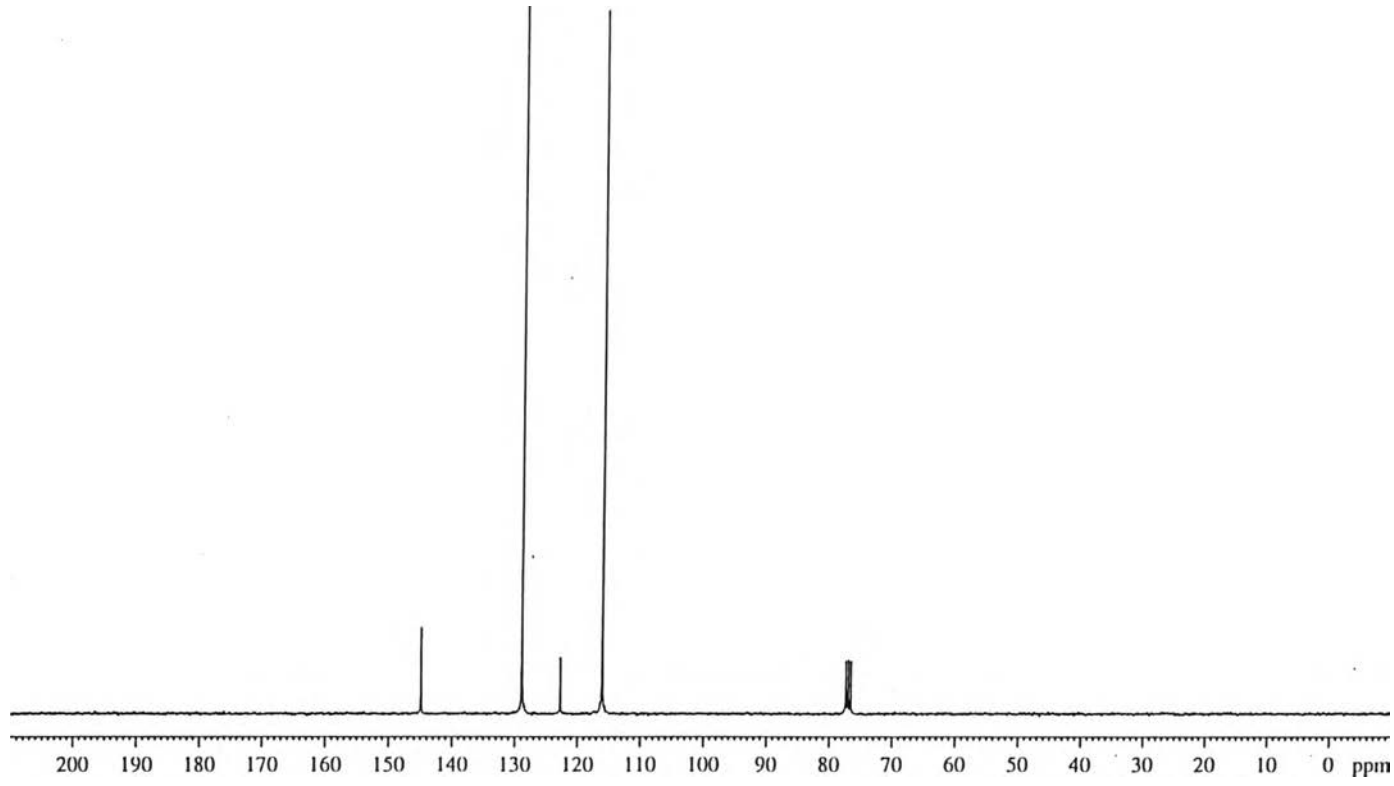

Figure 10 : ^{13}C-NMR spectrum of Compound 3

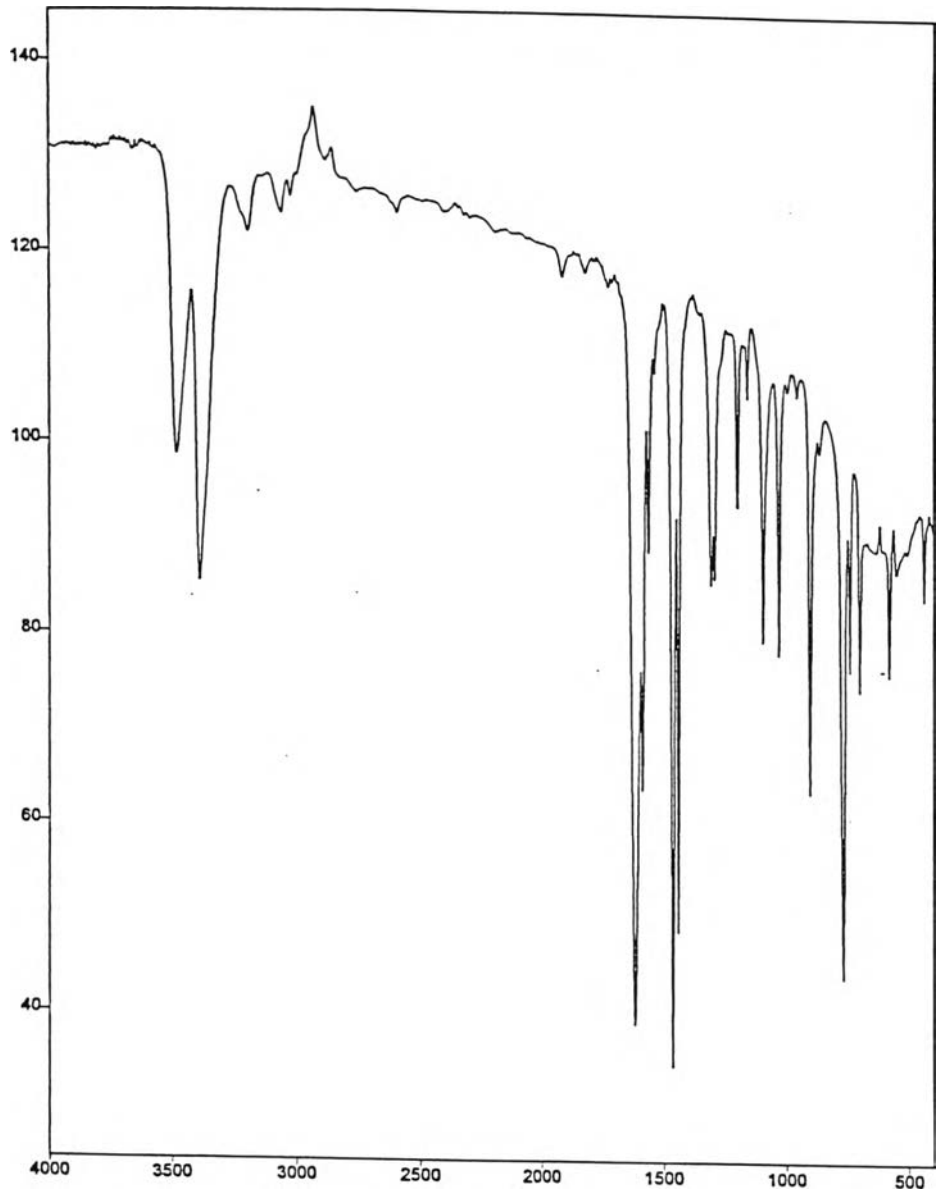

Figure 11 : FT-IR spectrum of Compound 4

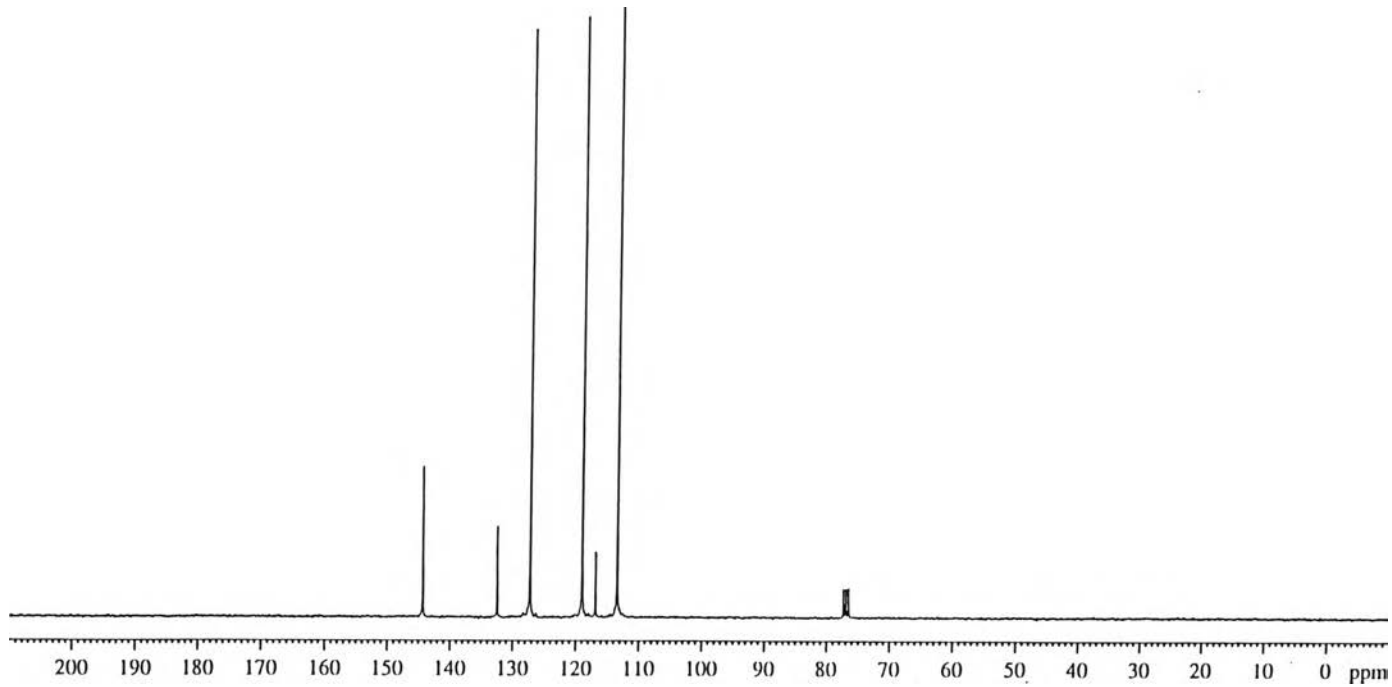

Figure 12 : ^{13}C-NMR spectrum of Compound 4

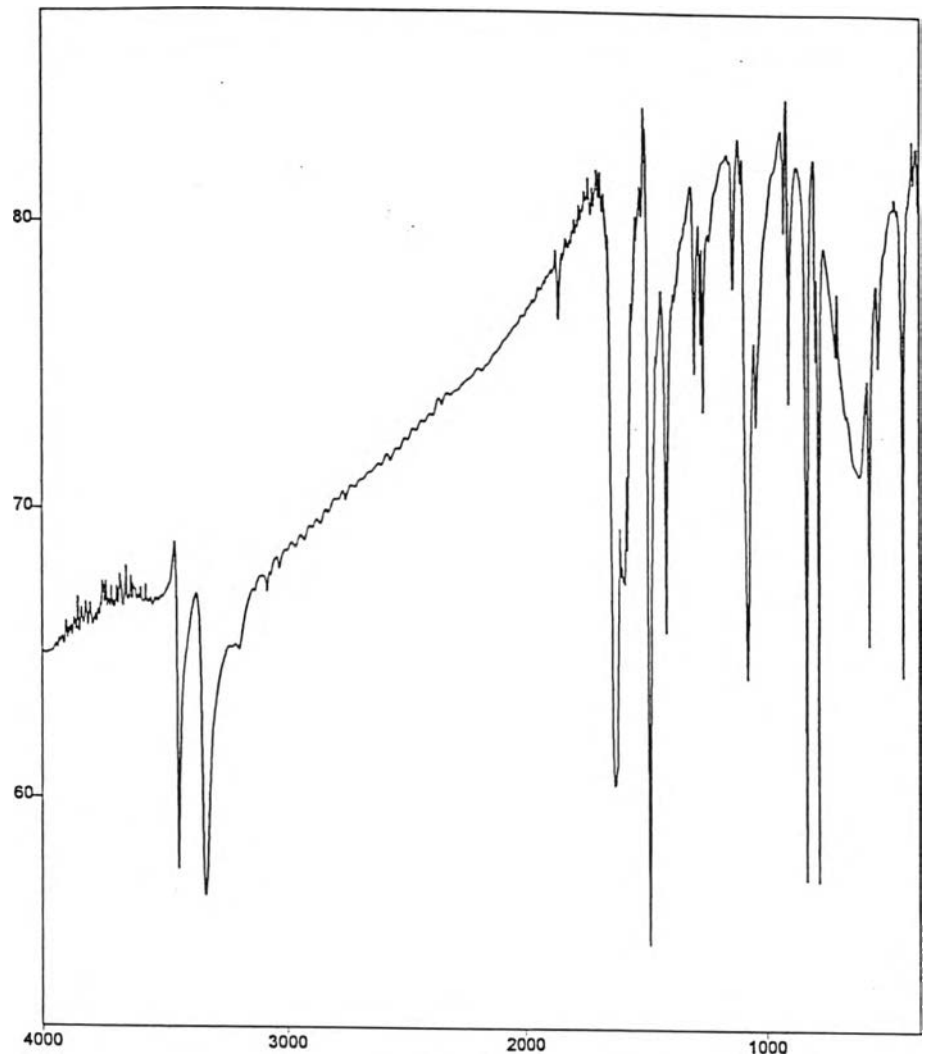

Figure 13 : FT-IR spectrum of Compound 5

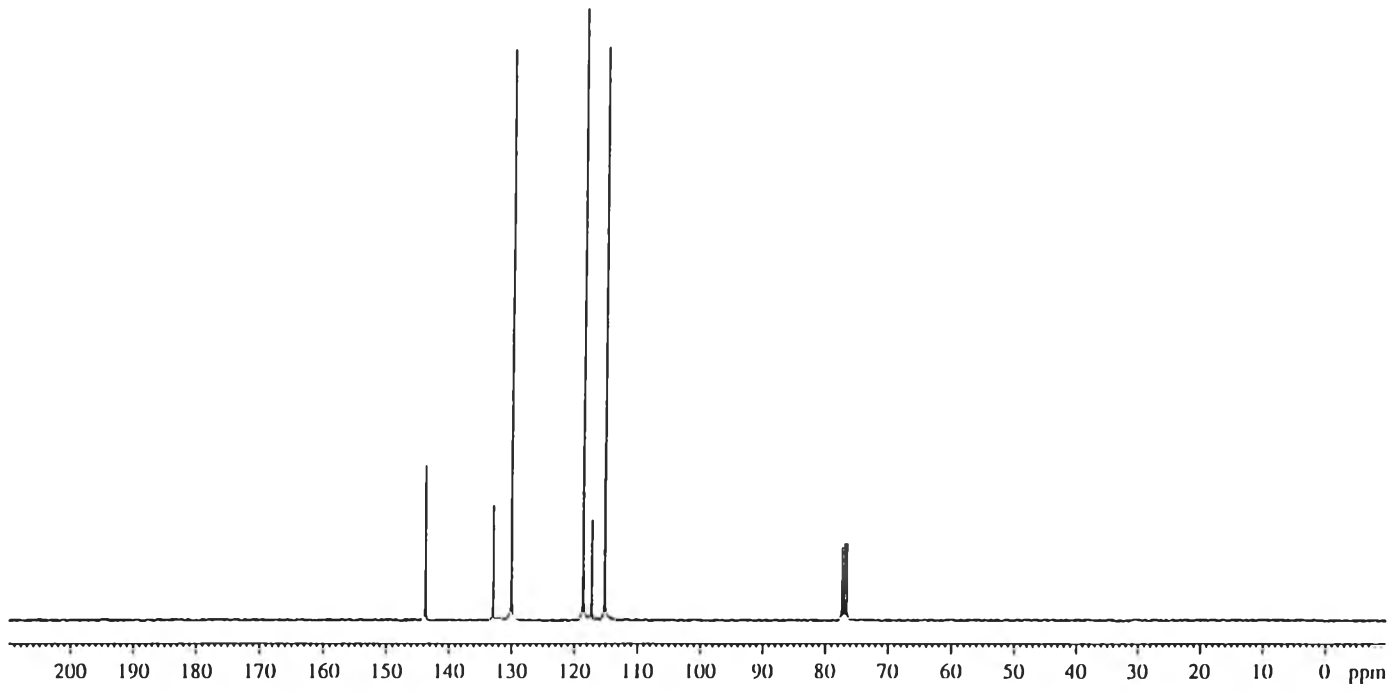

Figure 14 : ^{13}C-NMR spectrum of Compound 5

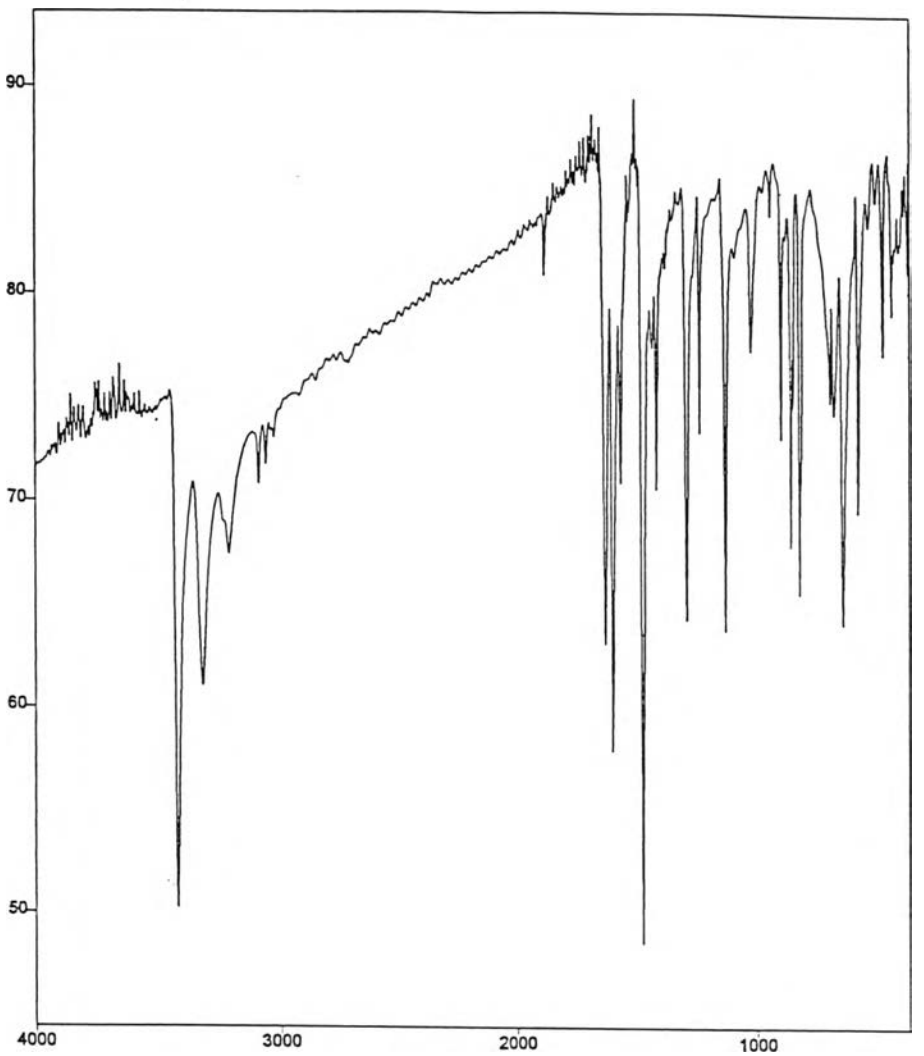

Figure 15 : FT-IR spectrum of Compound 6

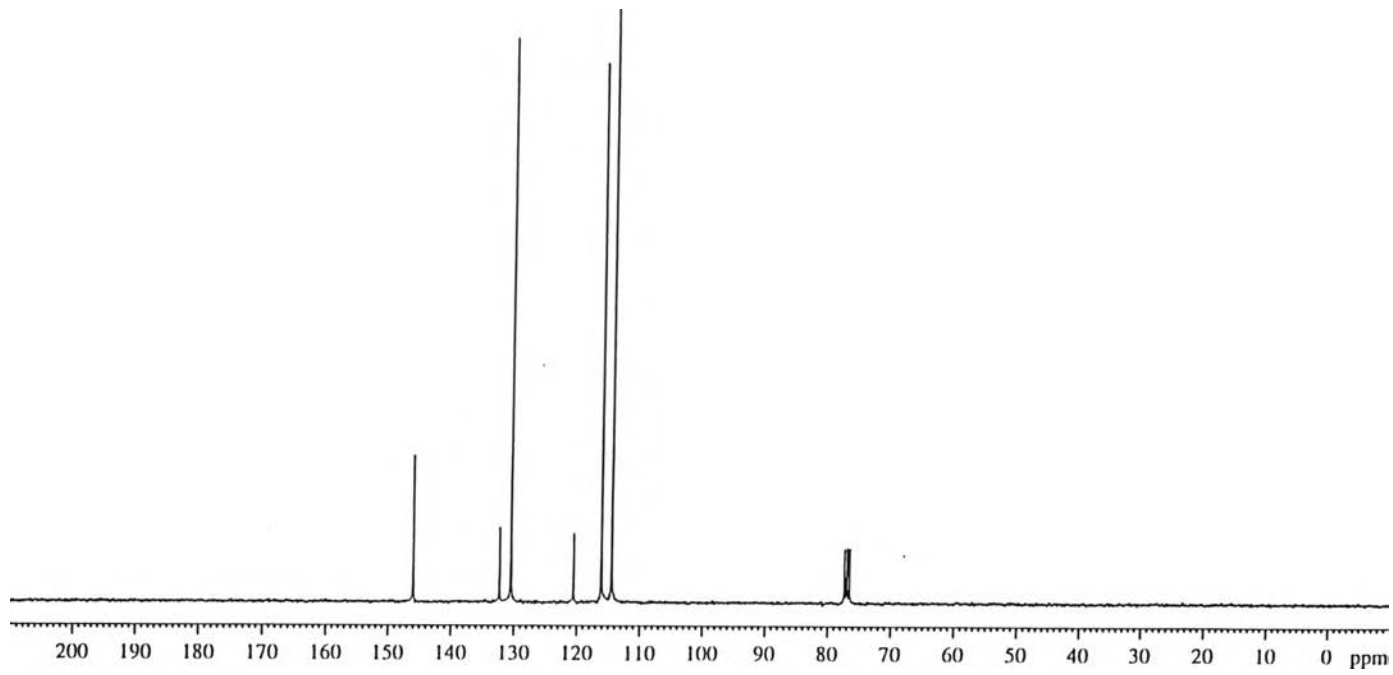

Figure 16 : ^{13}C-NMR spectrum of Compound 6

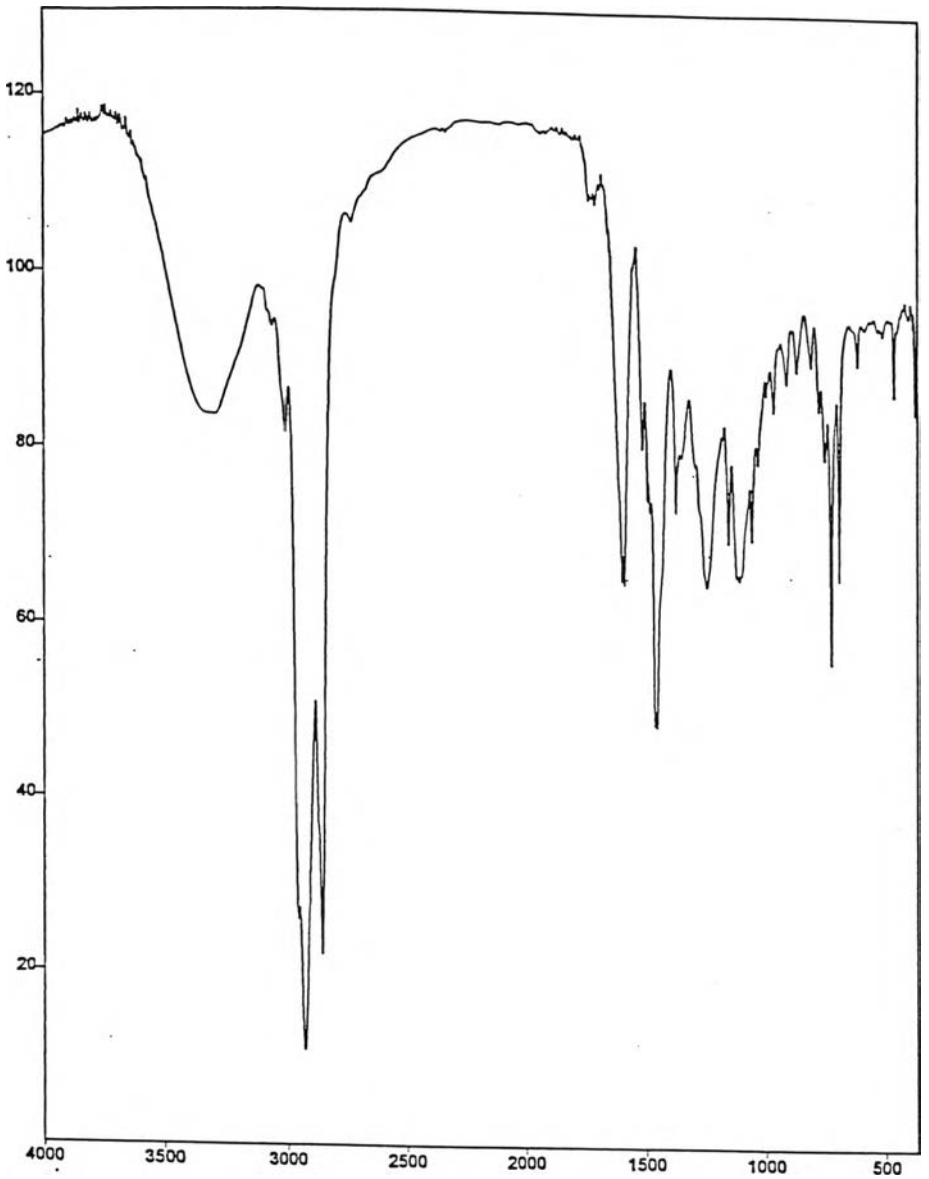

Figure 17 : FT-IR spectrum of Compound 7

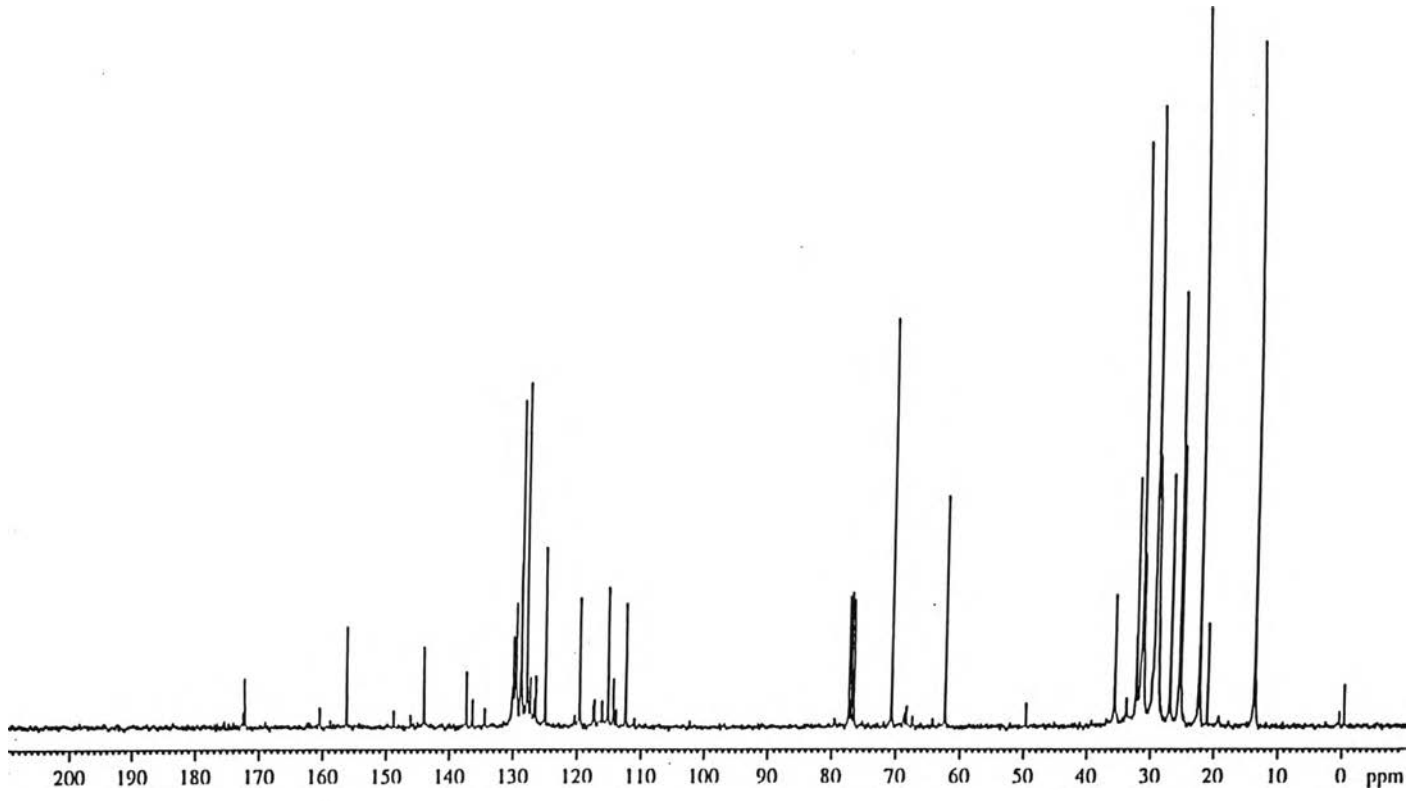

Figure 18 : ^{13}C-NMR spectrum of Compound 7

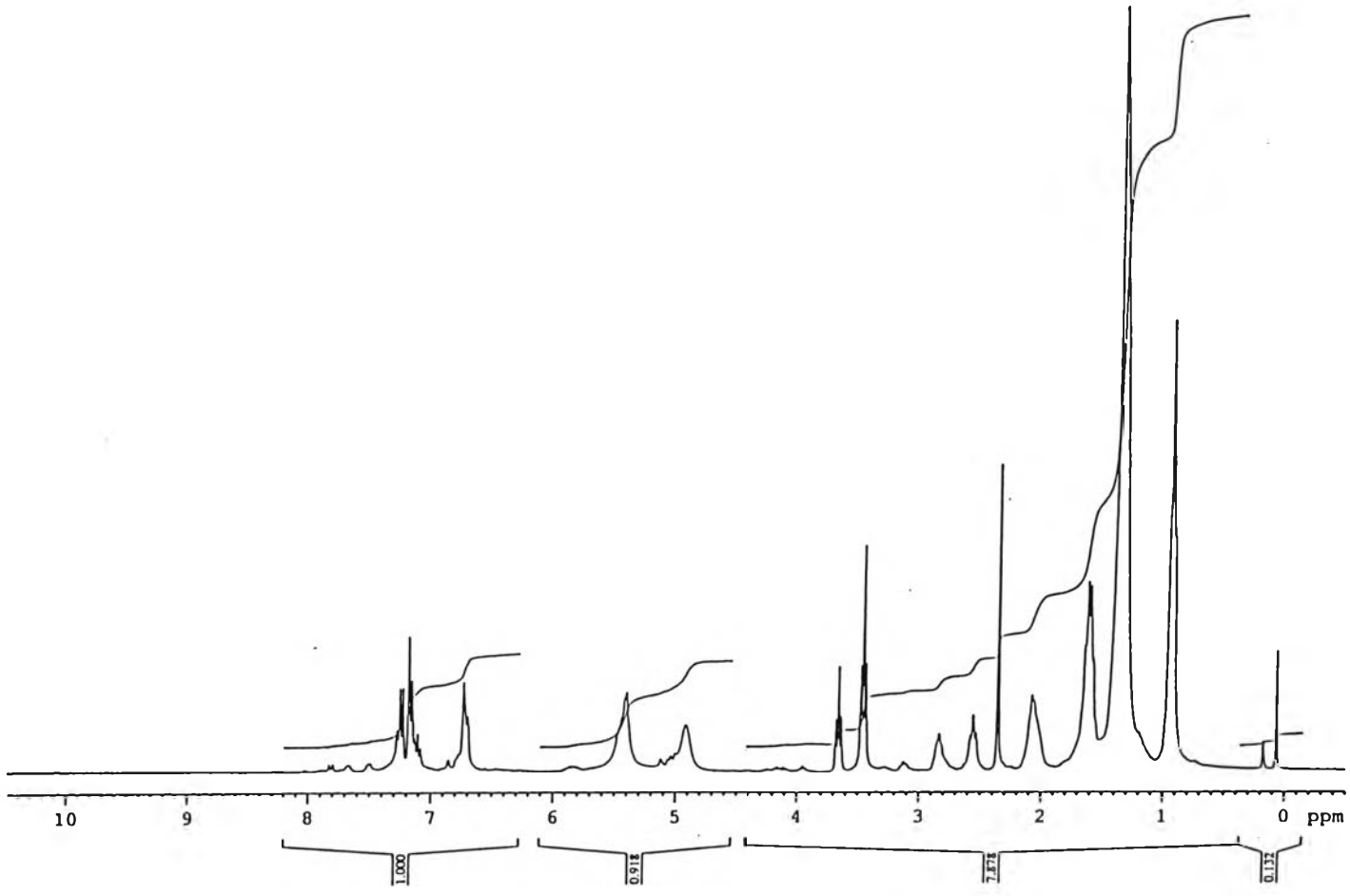

Figure 19 : ^{1}H-NMR spectrum of Compound 7

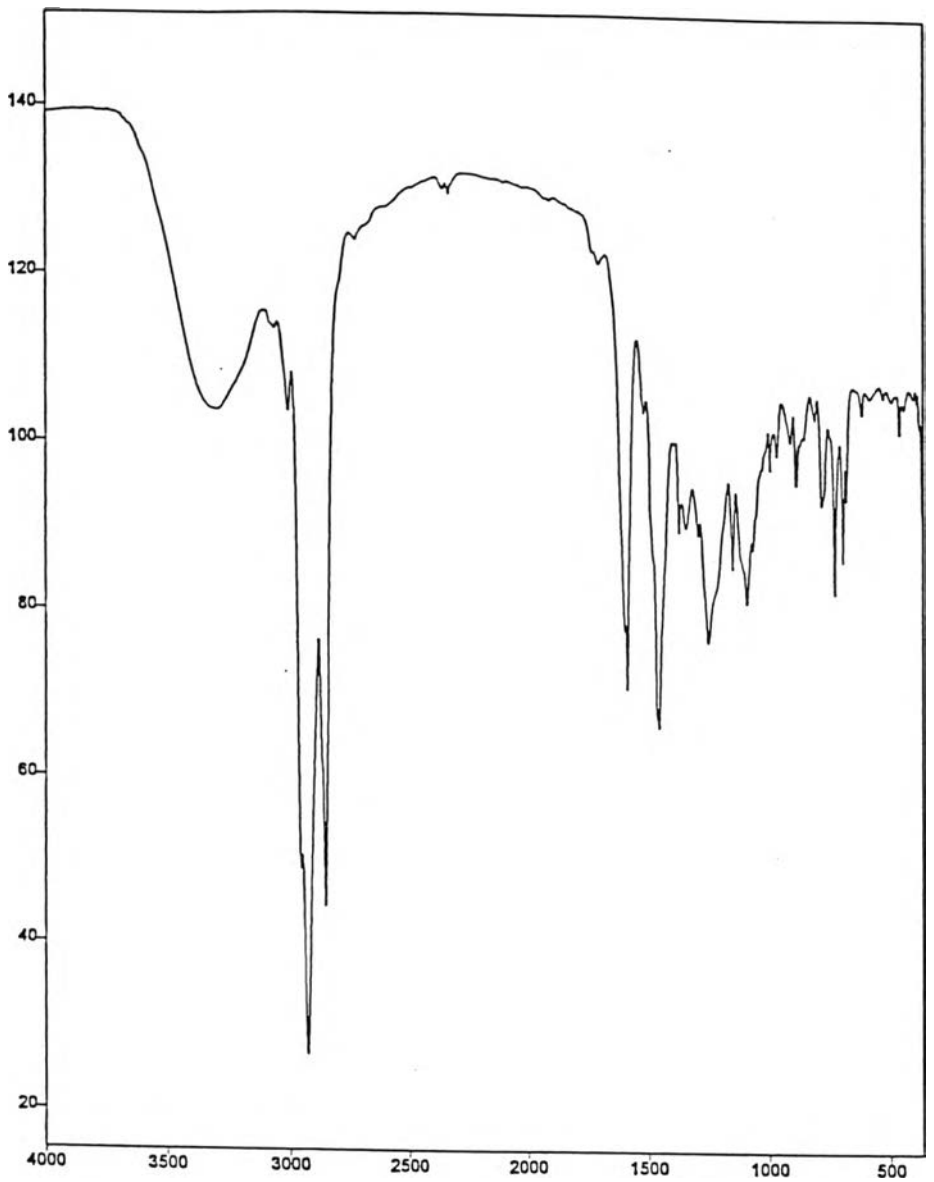

Figure 20 : FT-IR spectrum of Compound 8

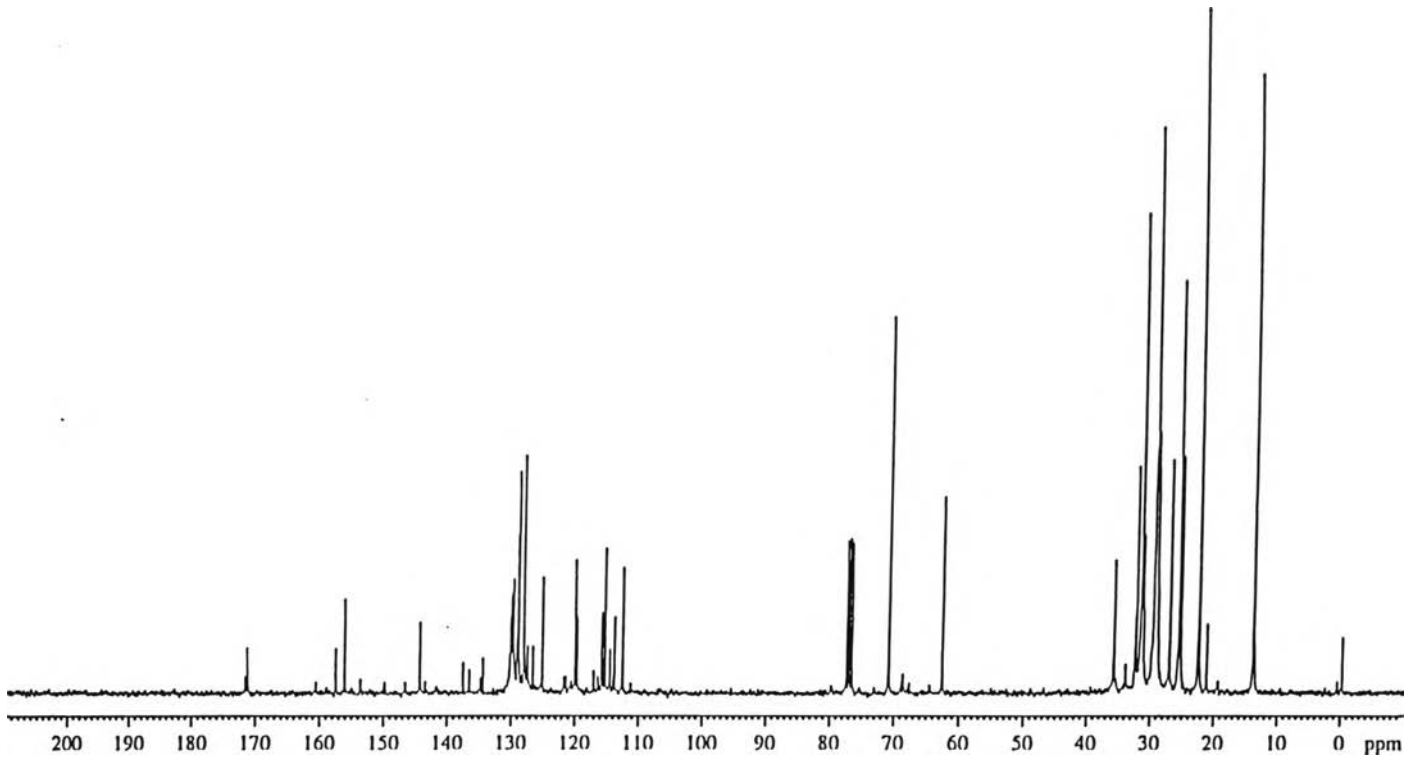

Figure 21 : ^{13}C-NMR spectrum of Compound 8

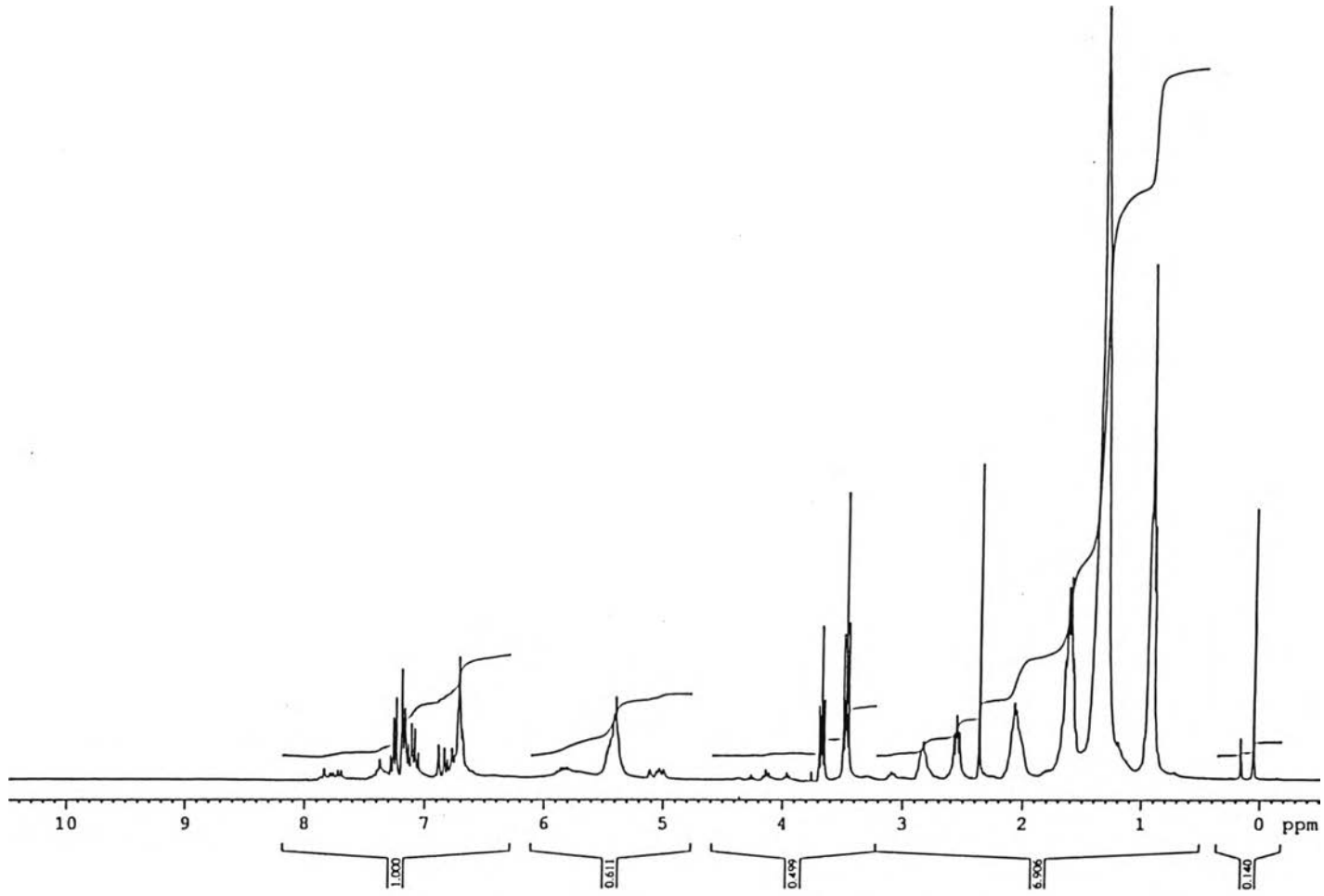

Figure 22 : ^{1}H-NMR spectrum of Compound 8

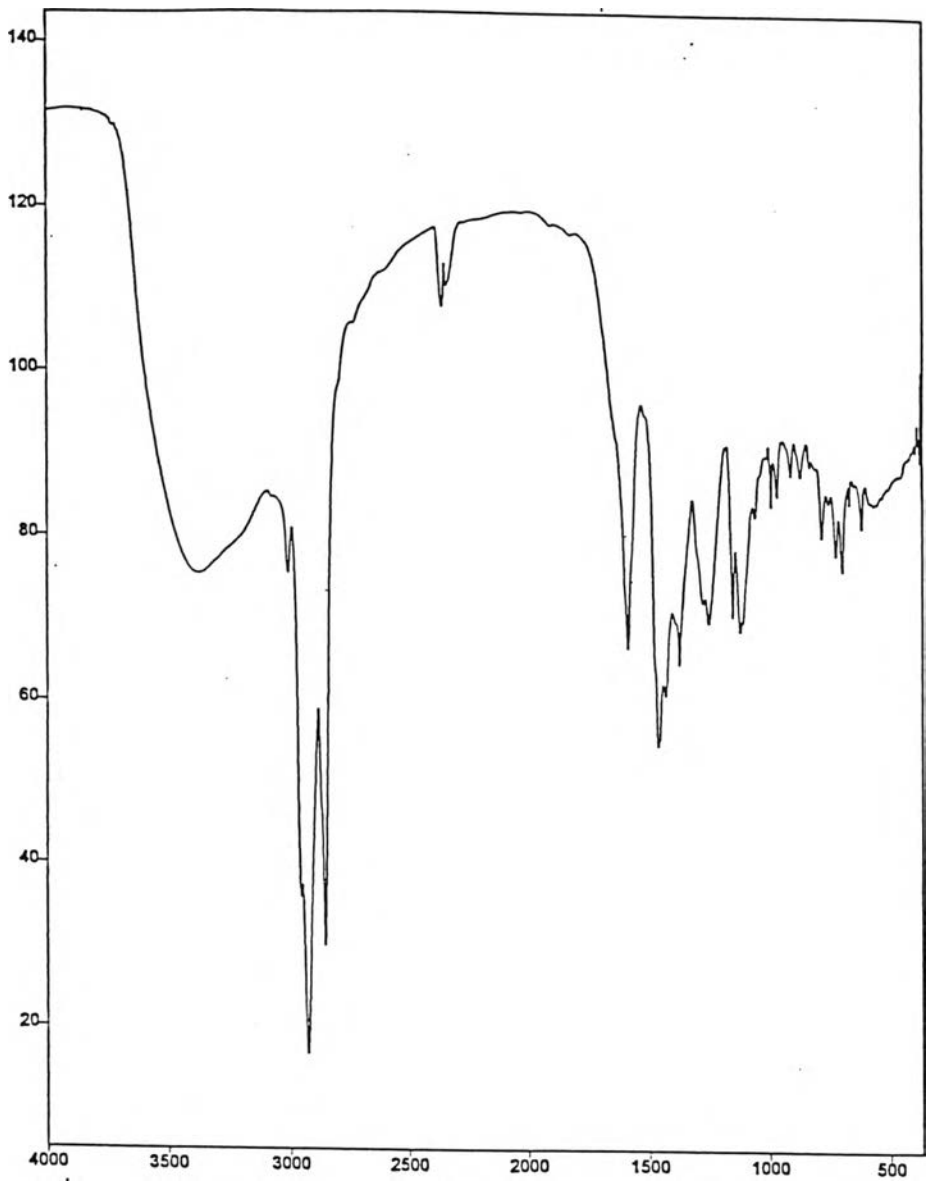

Figure 23 : FT-IR spectrum of Compound 9

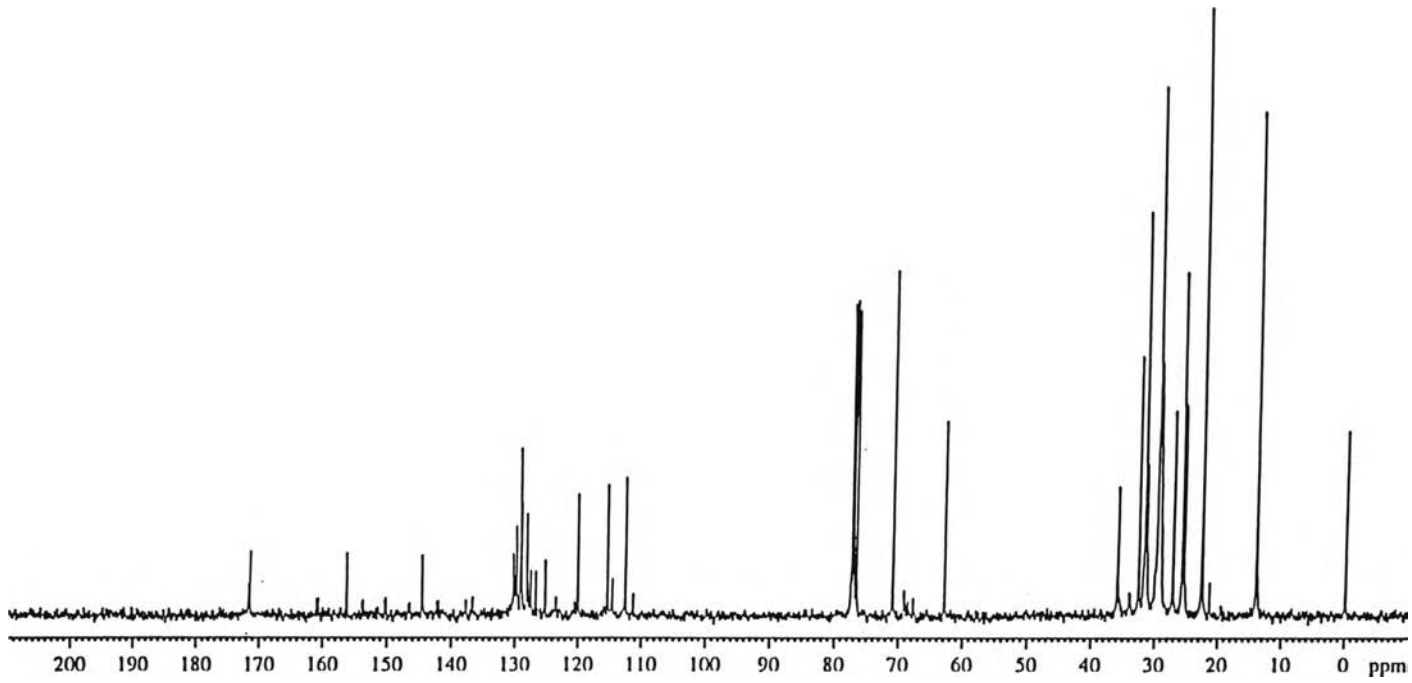

Figure 24 : ^{13}C-NMR spectrum of Compound 9

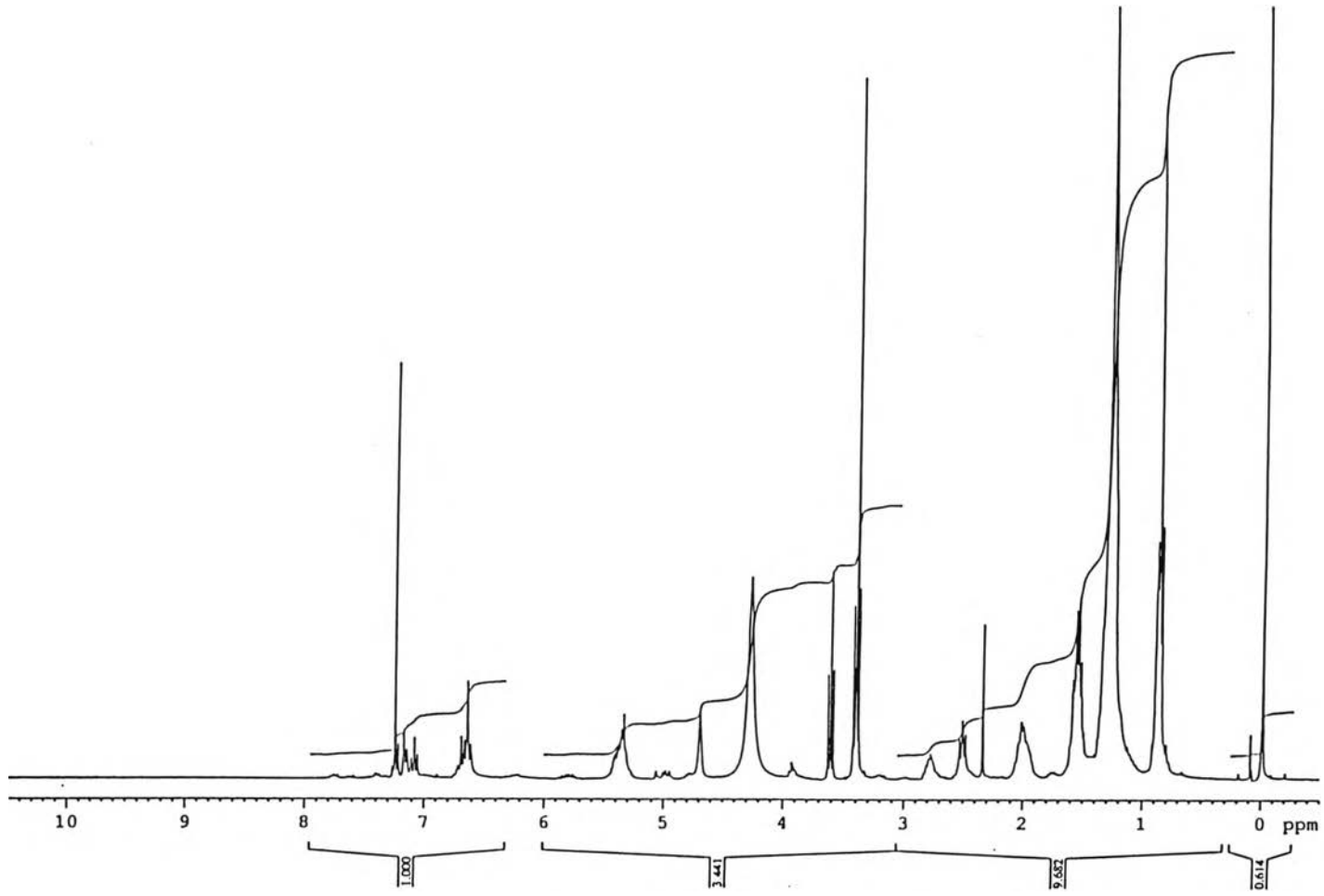

Figure 25 : ^{1}H-NMR spectrum of Compound 9

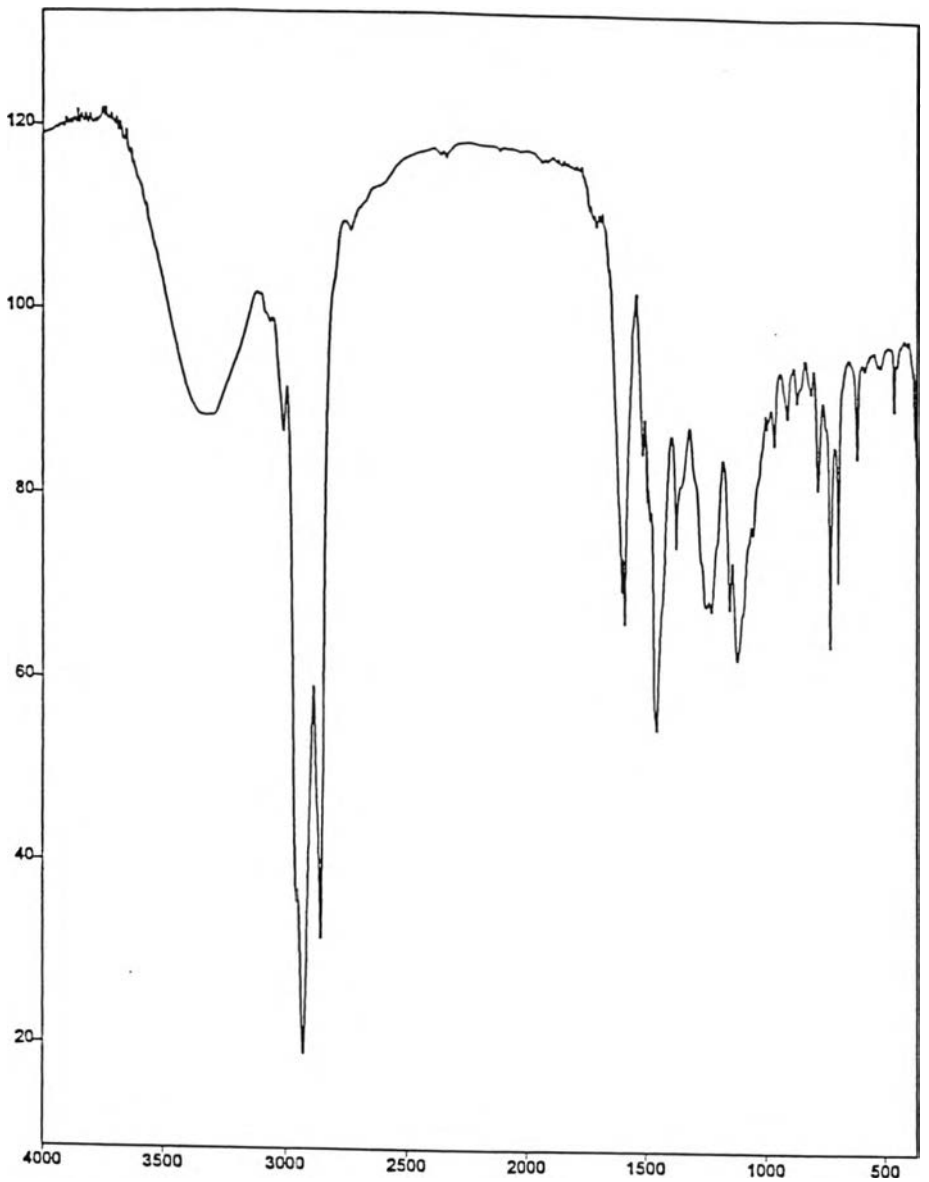

Figure 26 : FT-IR spectrum of Compound 10

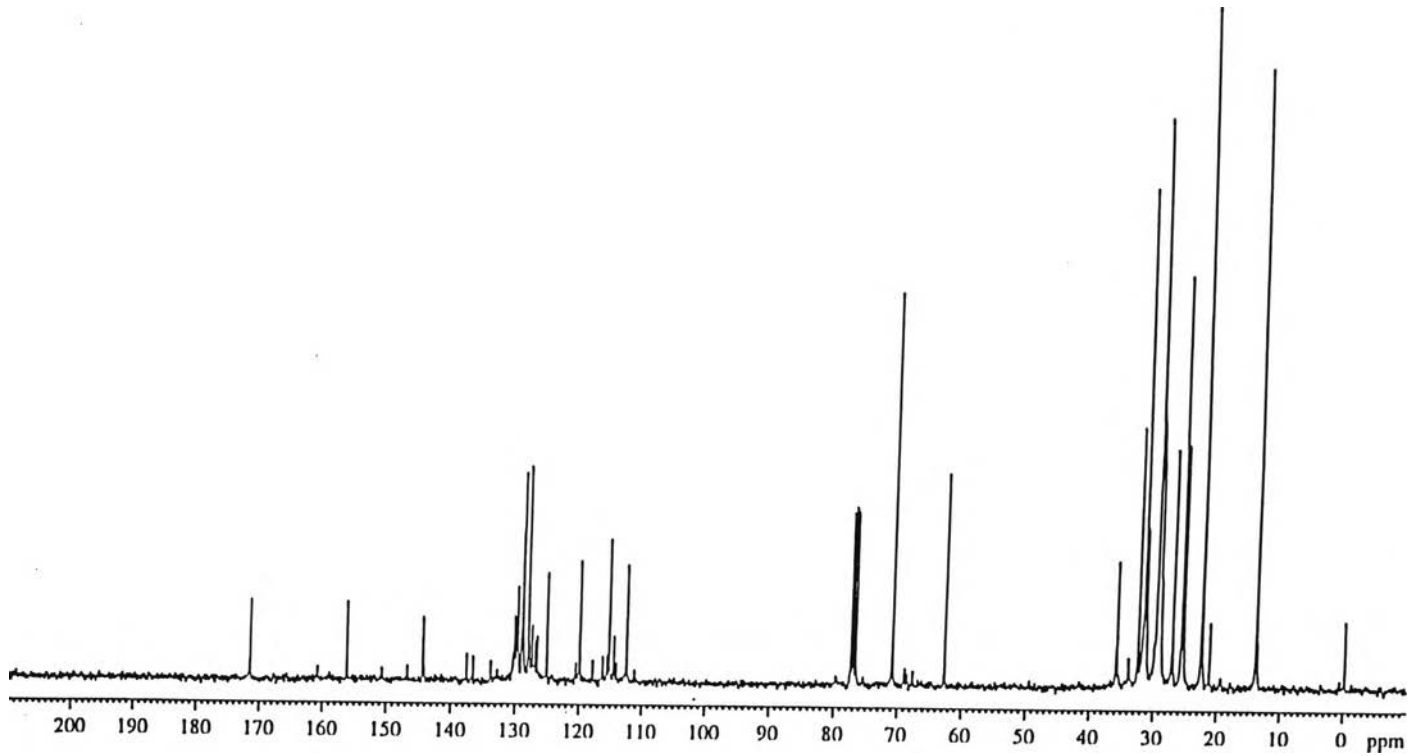

Figure 27 : ^{13}C-NMR spectrum of Compound 10

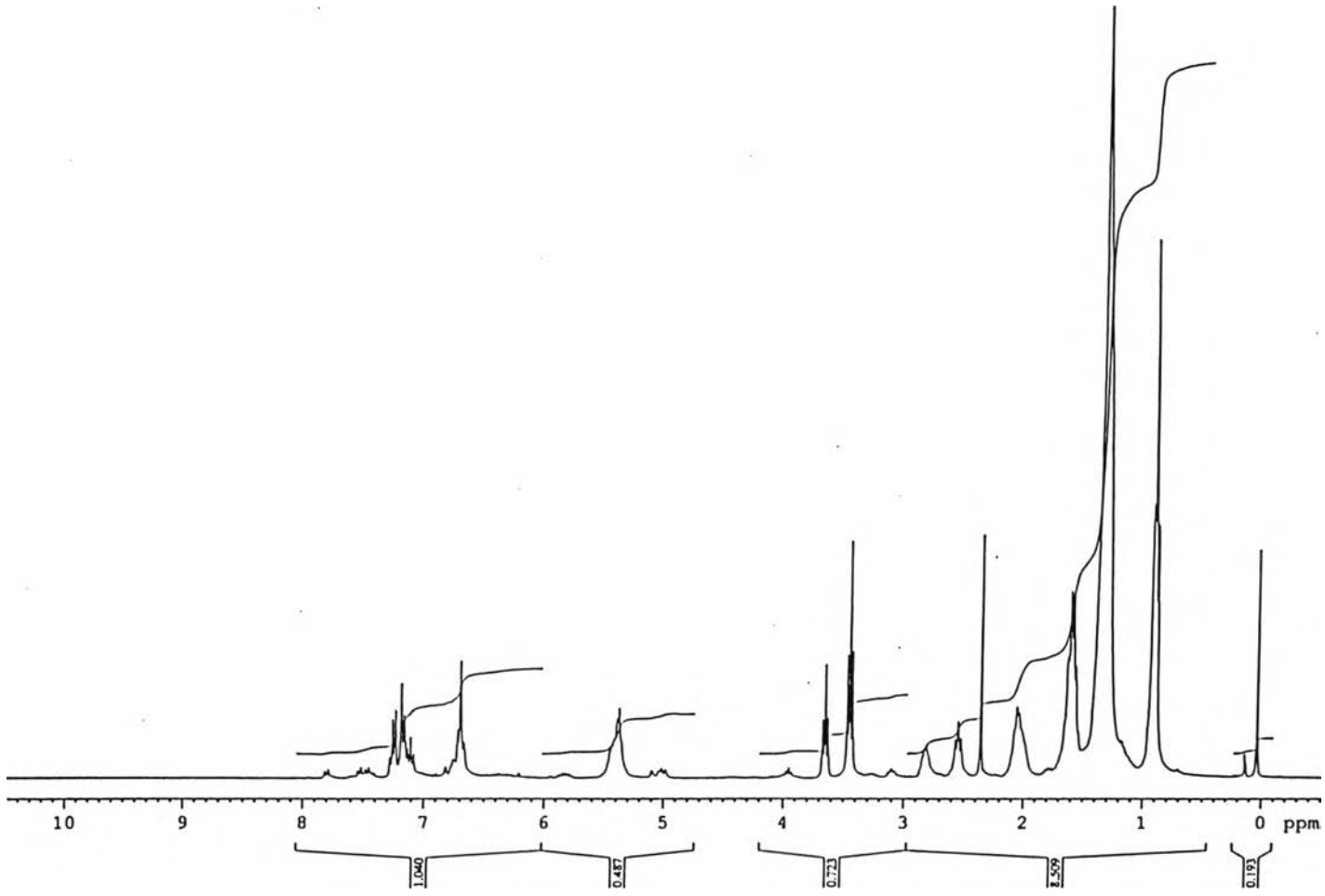

Figure 28 : ^{1}H-NMR spectrum of Compound 10

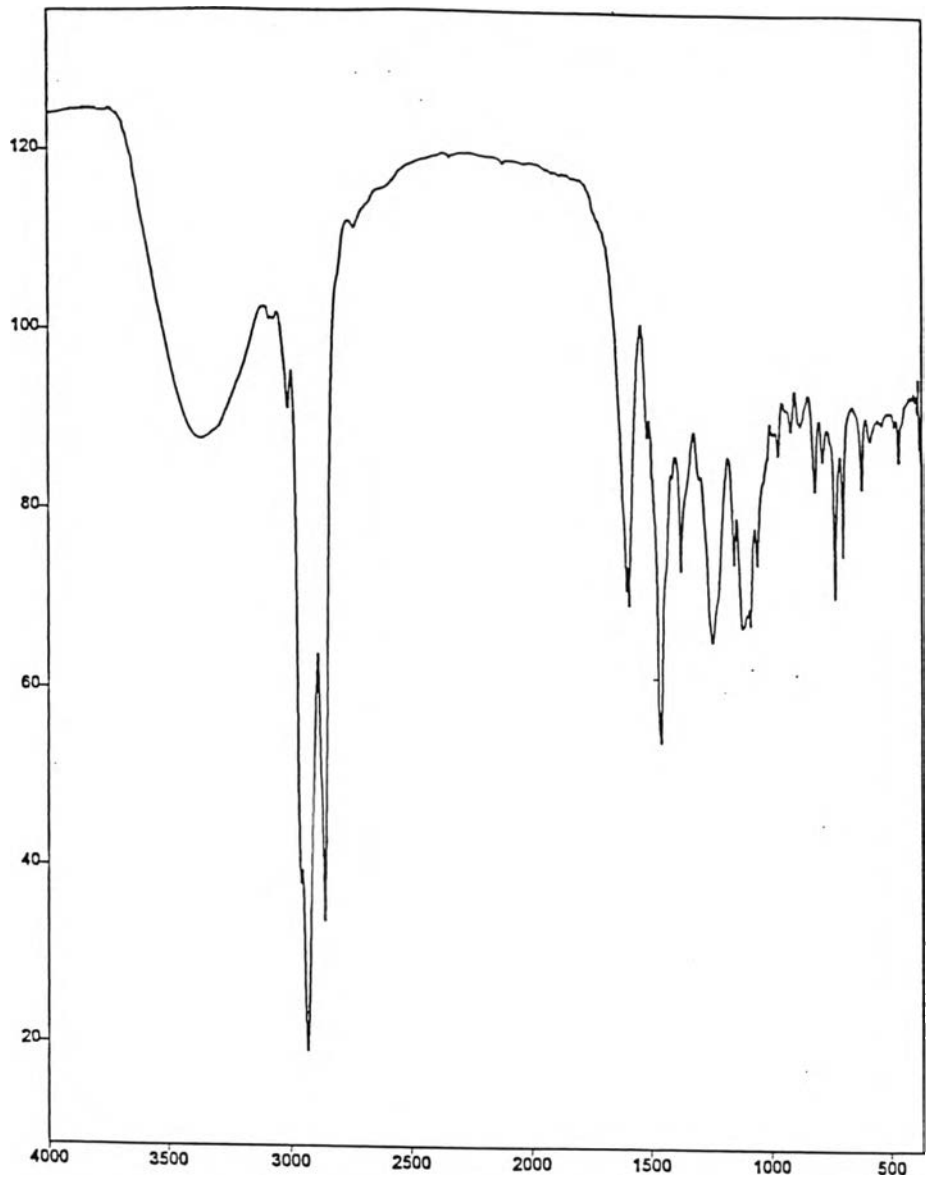

Figure 29 : FT-IR spectrum of Compound 11

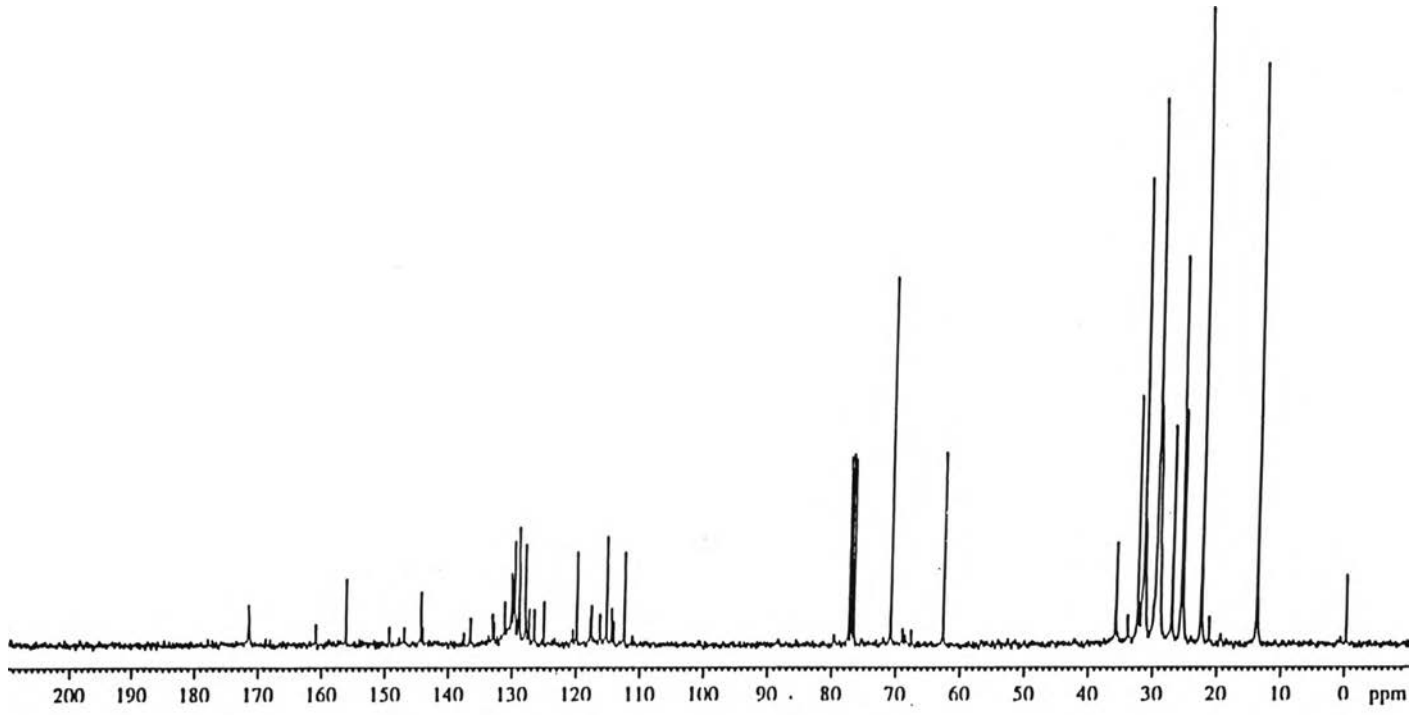

Figure 30 : ^{13}C-NMR spectrum of Compound 11

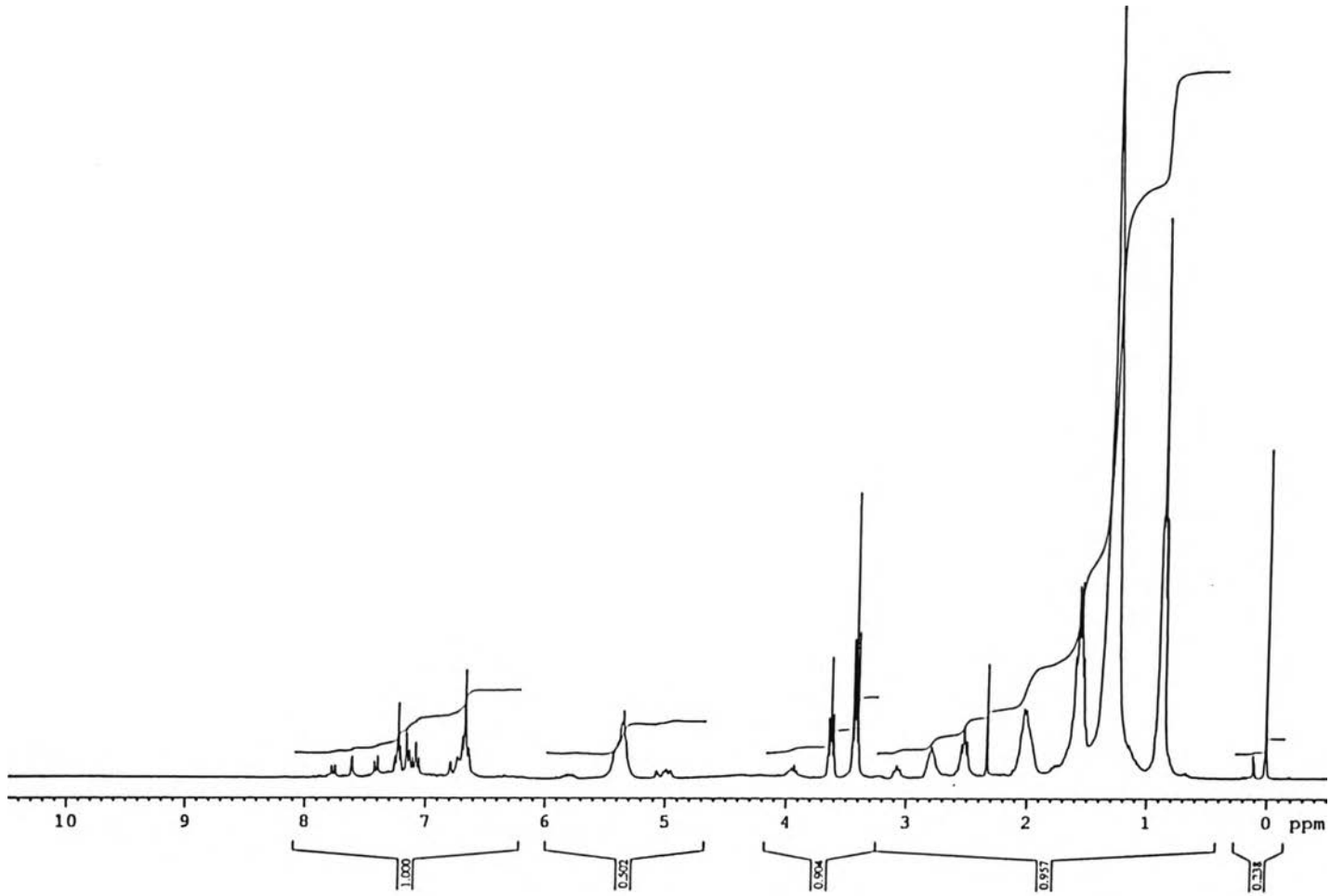

Figure 31 : ^{1}H-NMR spectrum of Compound 11

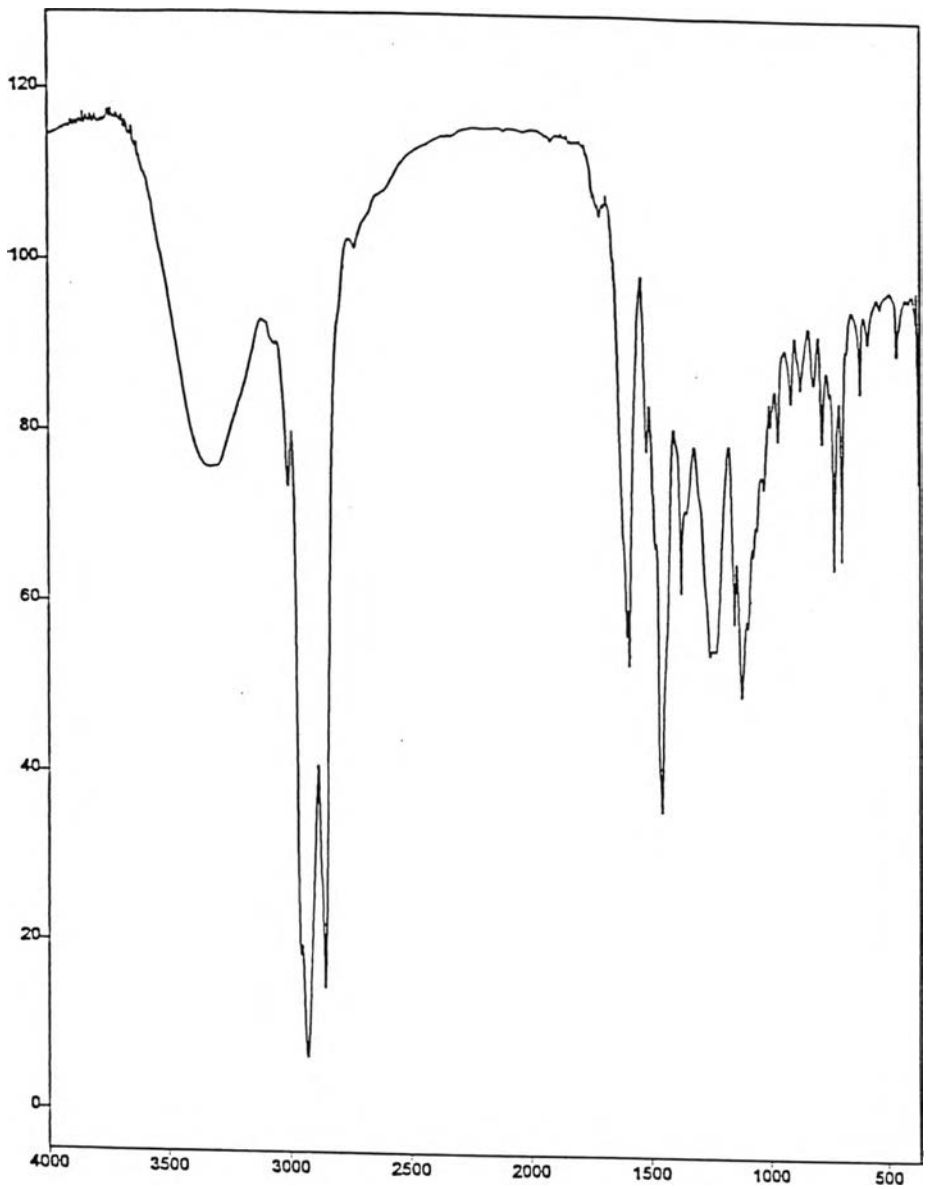

Figure 32 : FT-IR spectrum of Compound 12

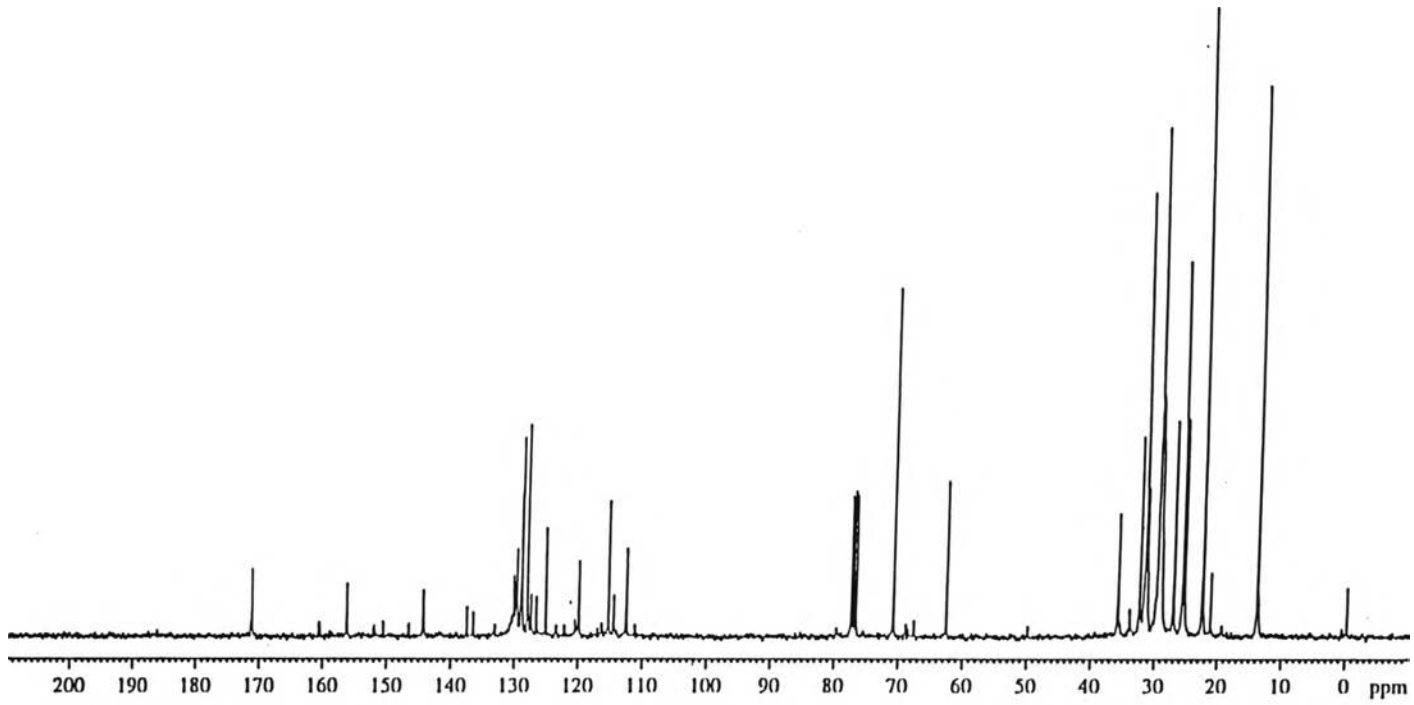

Figure 33 : ^{13}C-NMR spectrum of Compound 12

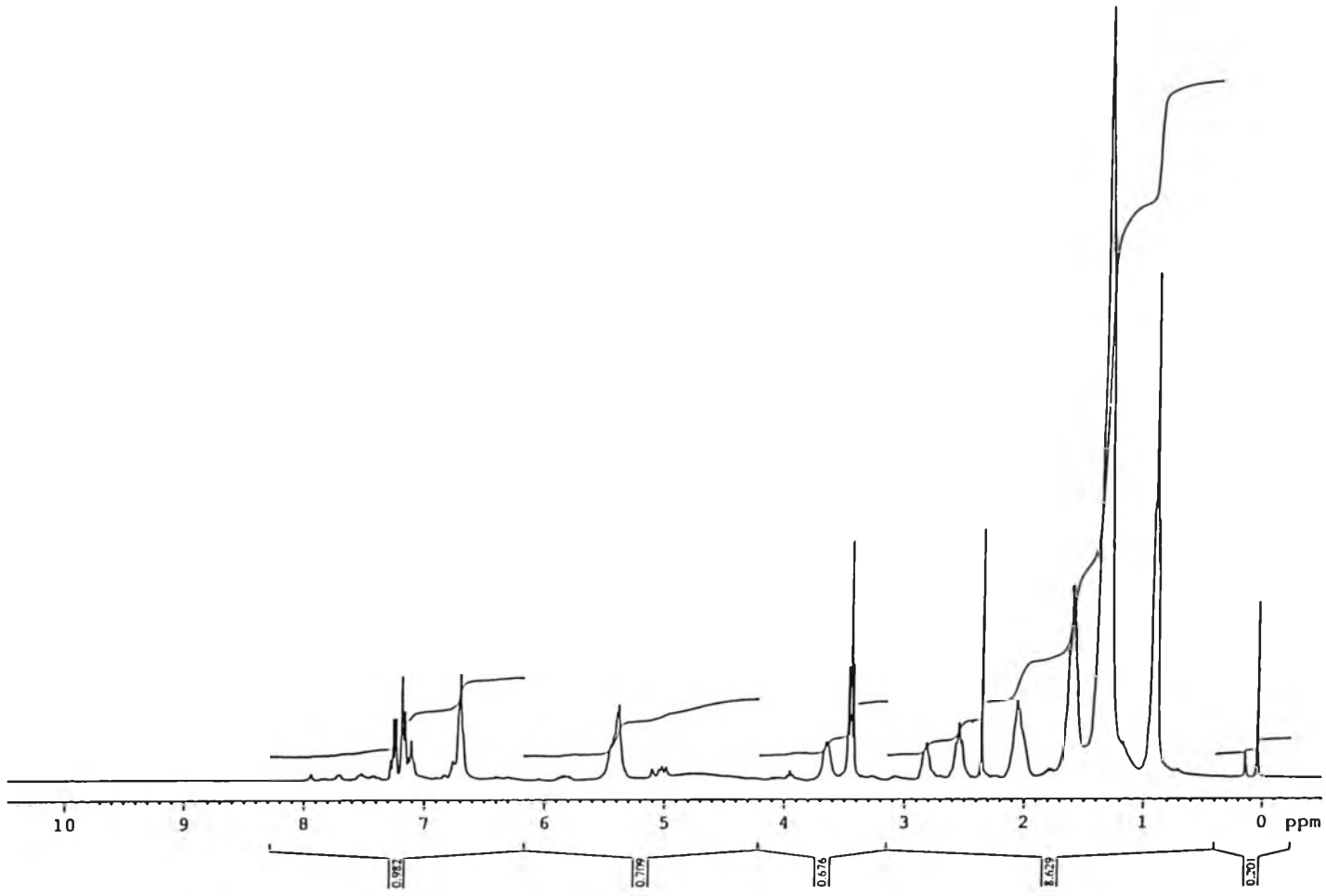

Figure 34 : ^{1}H-NMR spectrum of Compound 12

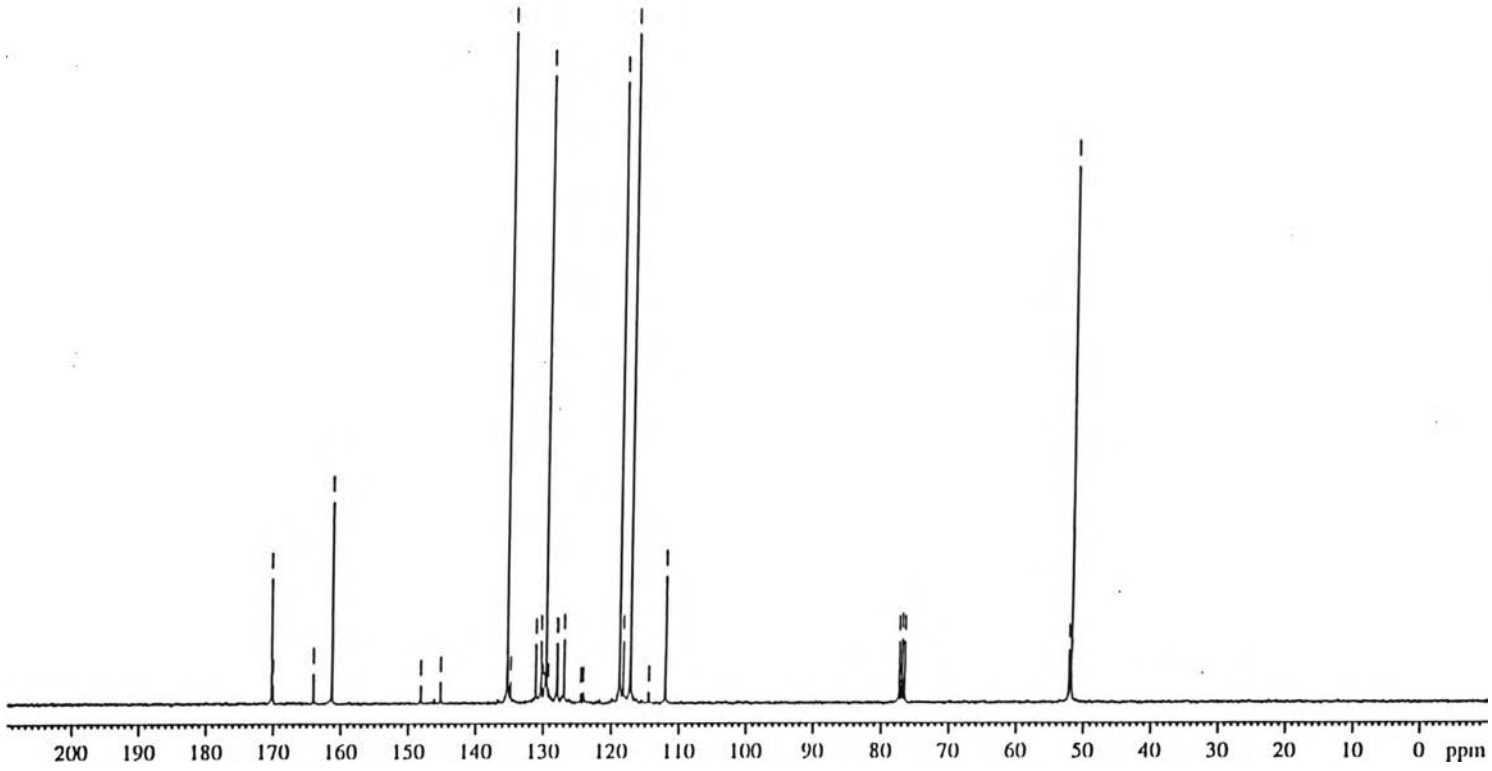

Figure 35 : ^{13}C-NMR spectrum of Compound 13

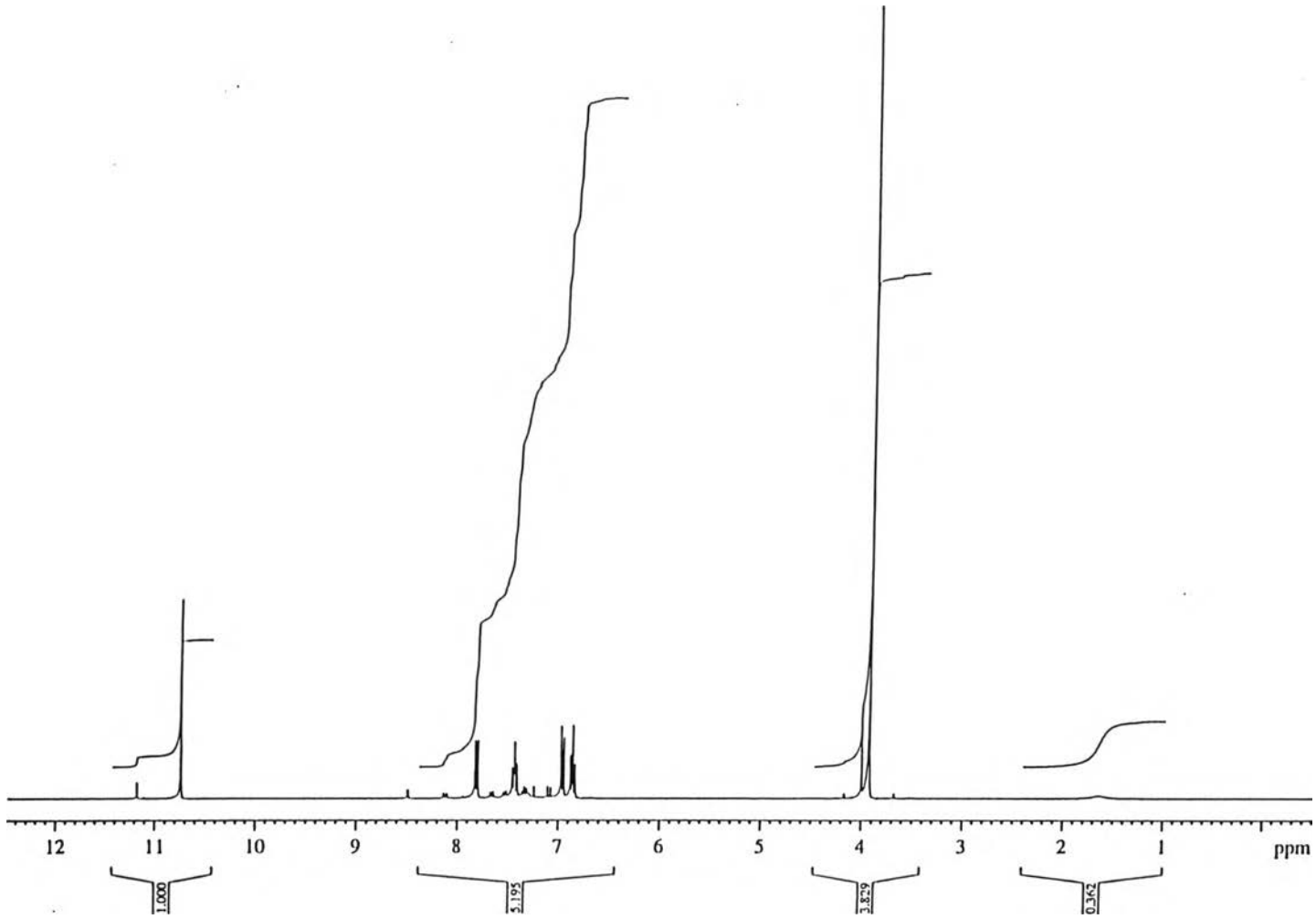

Figure 36 : ^{1}H-NMR spectrum of Compound 13

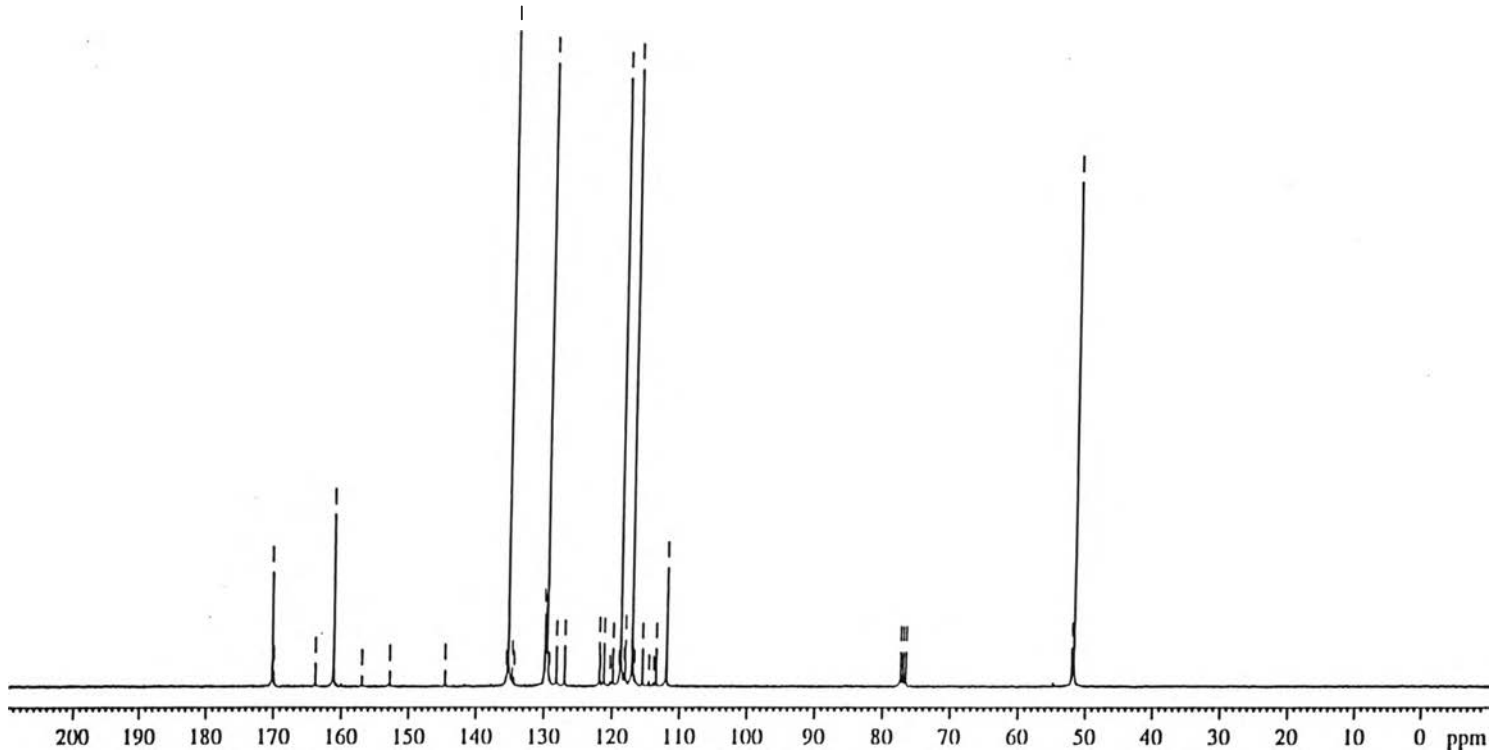

Figure 37 : ^{13}C-NMR spectrum of Compound 14

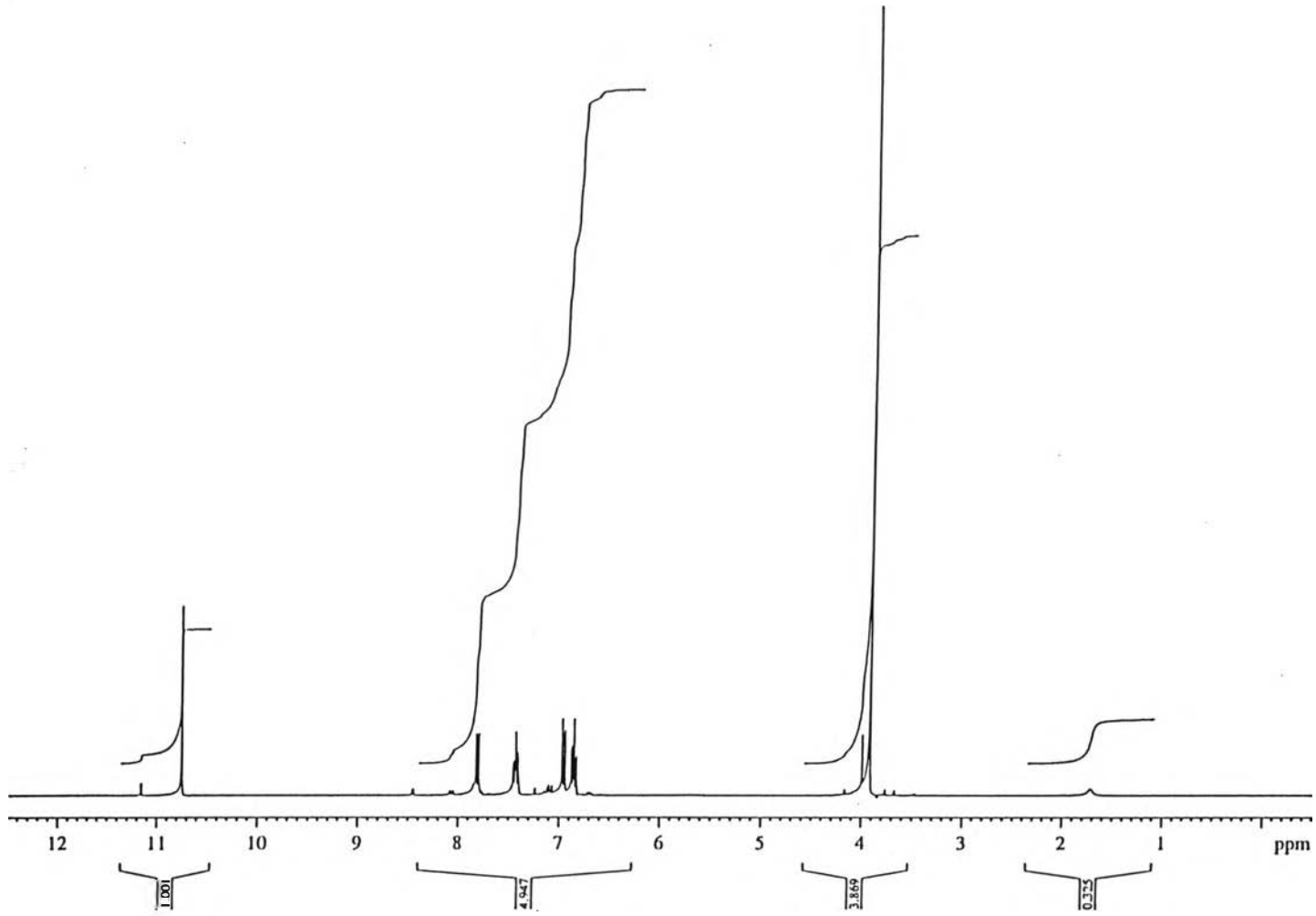

Figure 38 : ^{1}H-NMR spectrum of Compound 14

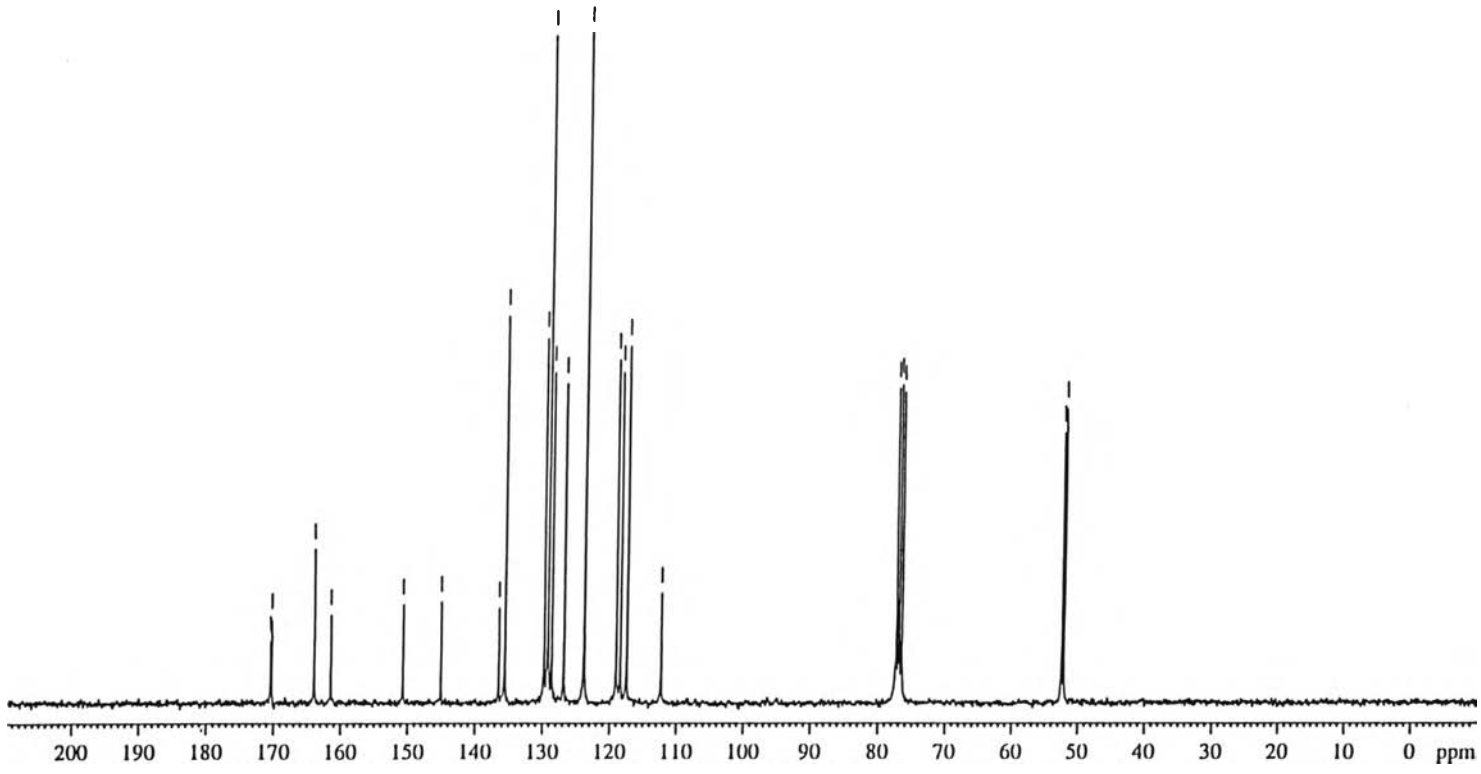

Figure 39 : ^{13}C-NMR spectrum of Compound 15

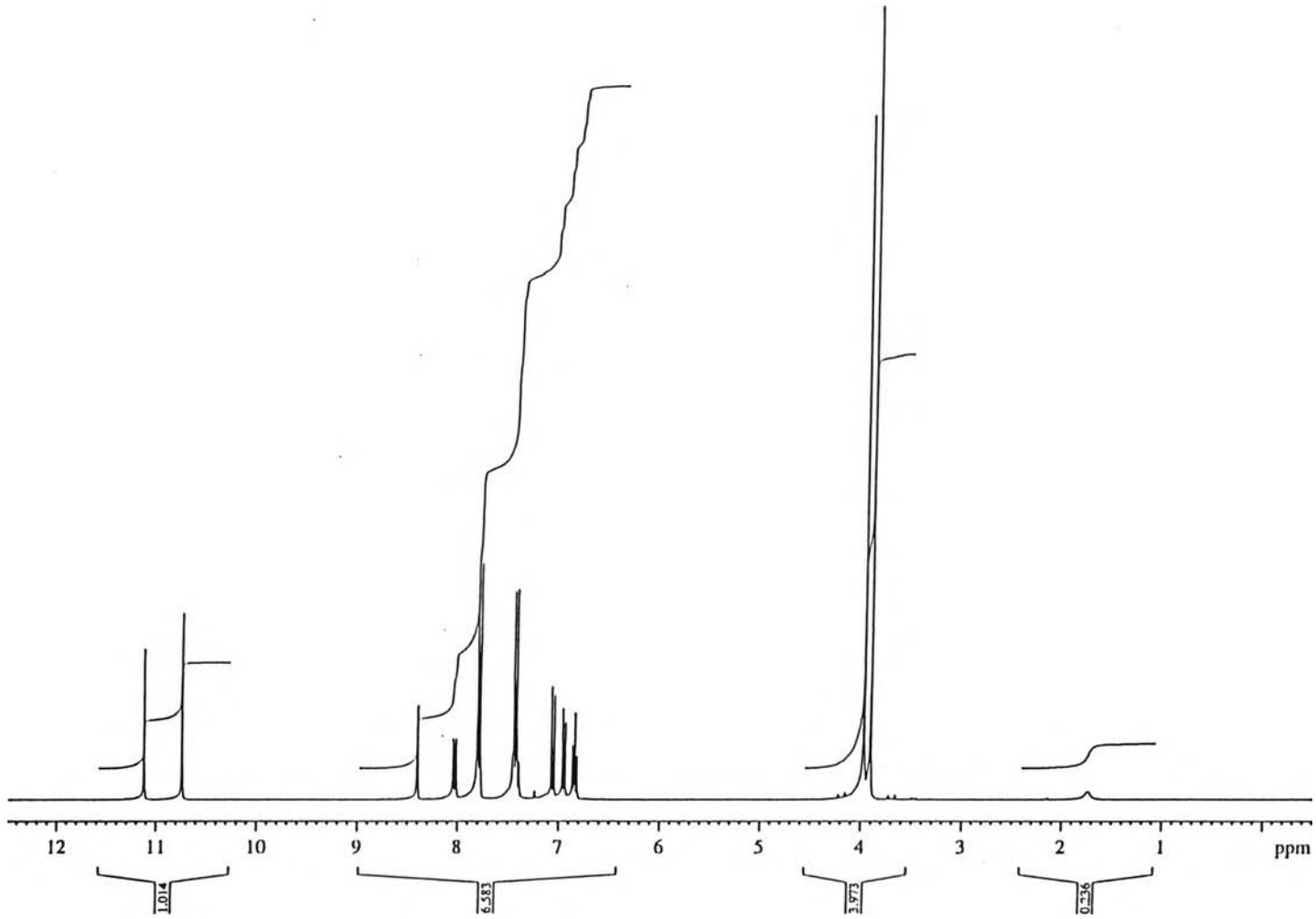

Figure 40 : ^{1}H-NMR spectrum of Compound 15

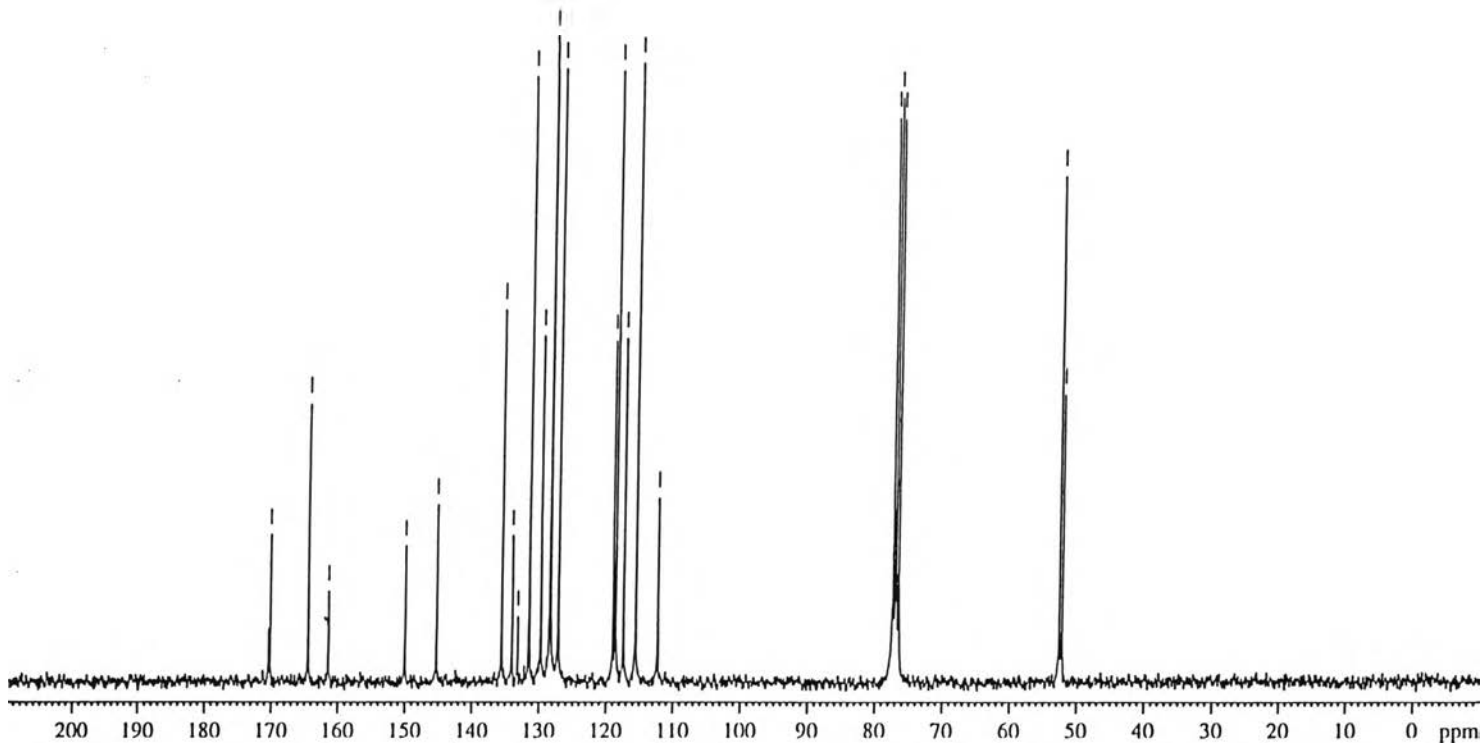

Figure 41 : ^{13}C-NMR spectrum of Compound 16

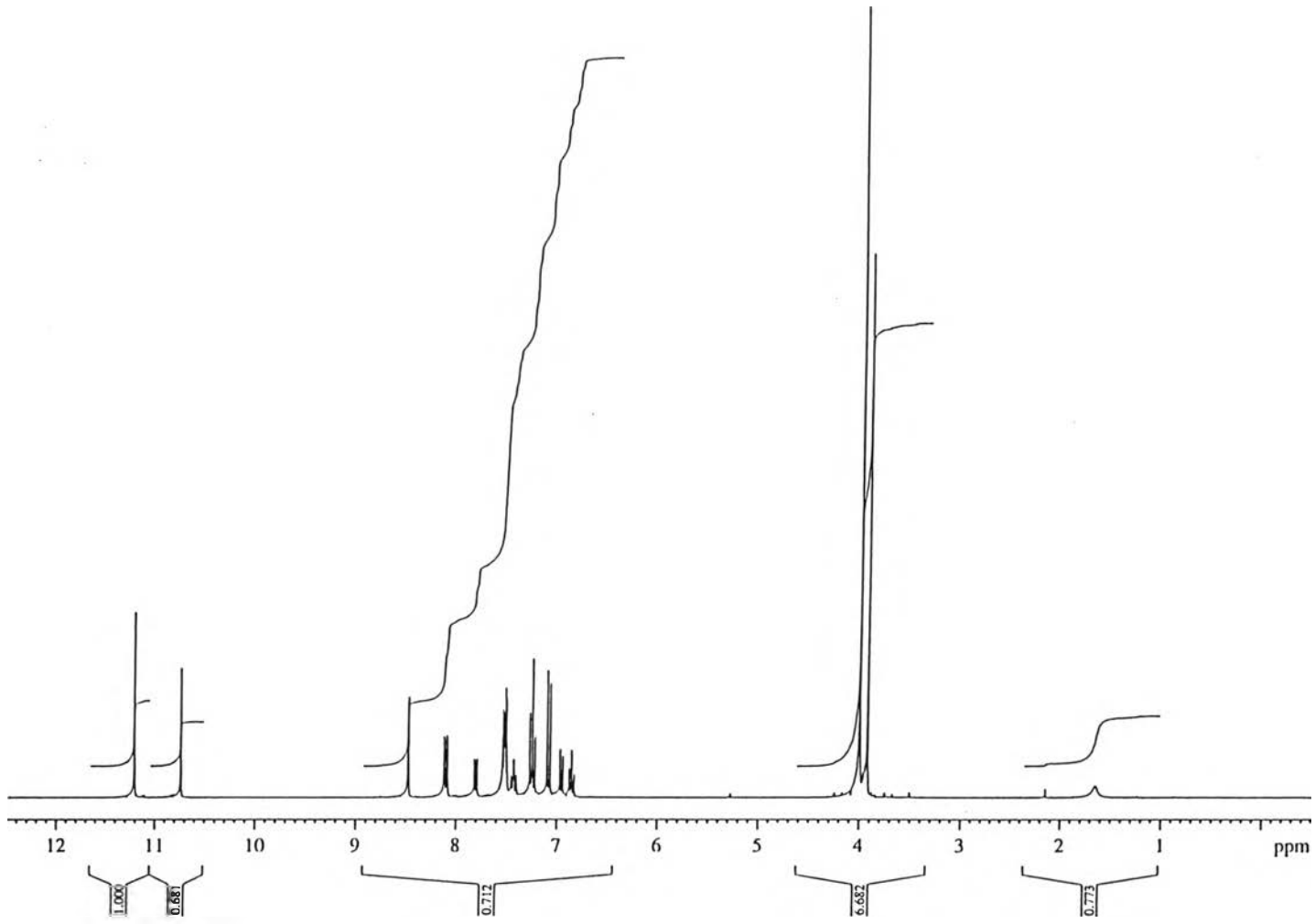

Figure 42 : ^{1}H-NMR spectrum of Compound 16

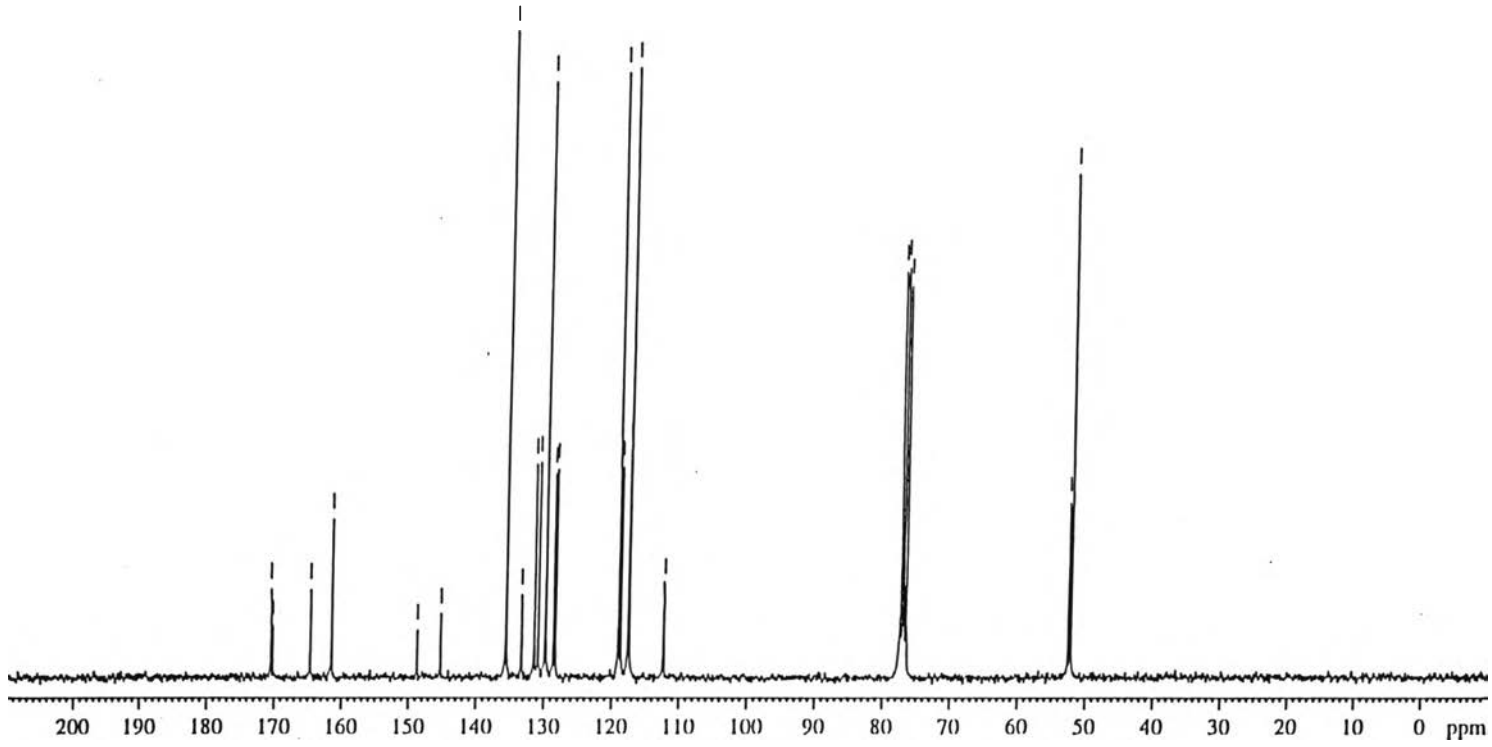

Figure 43 : ^{13}C-NMR spectrum of Compound 17

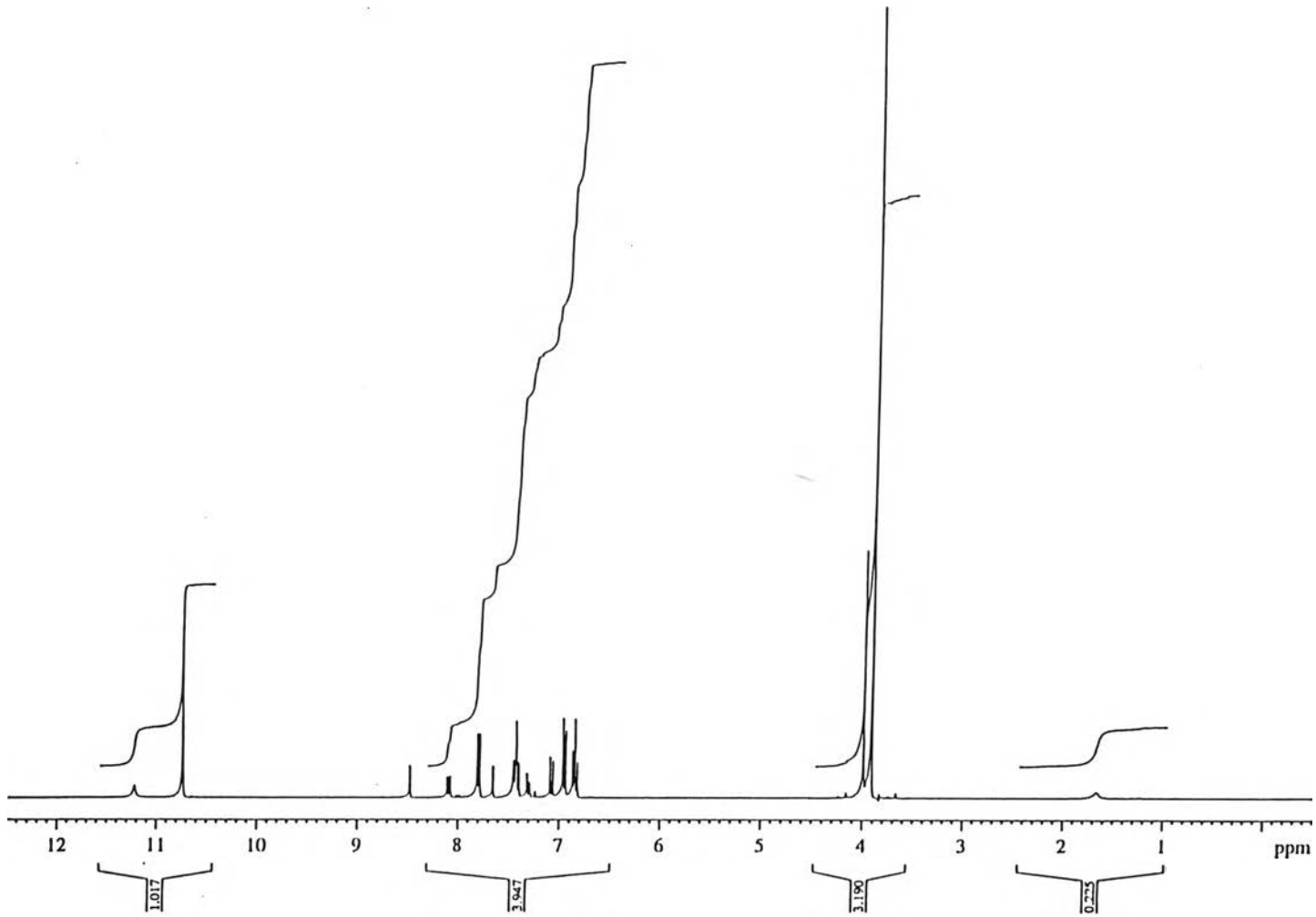

Figure 44 : ^{1}H-NMR spectrum of Compound 17

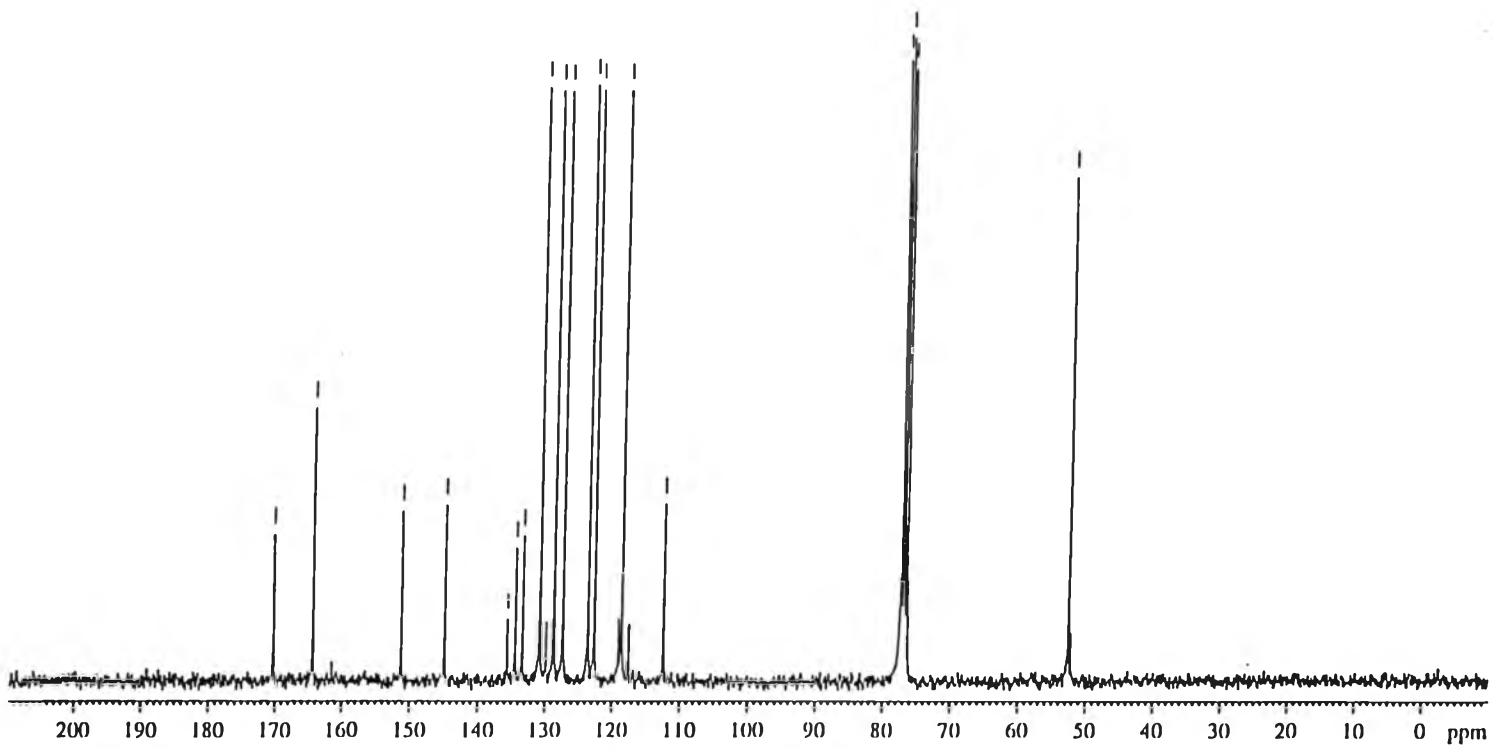

Figure 45 : ^{13}C-NMR spectrum of Compound 18

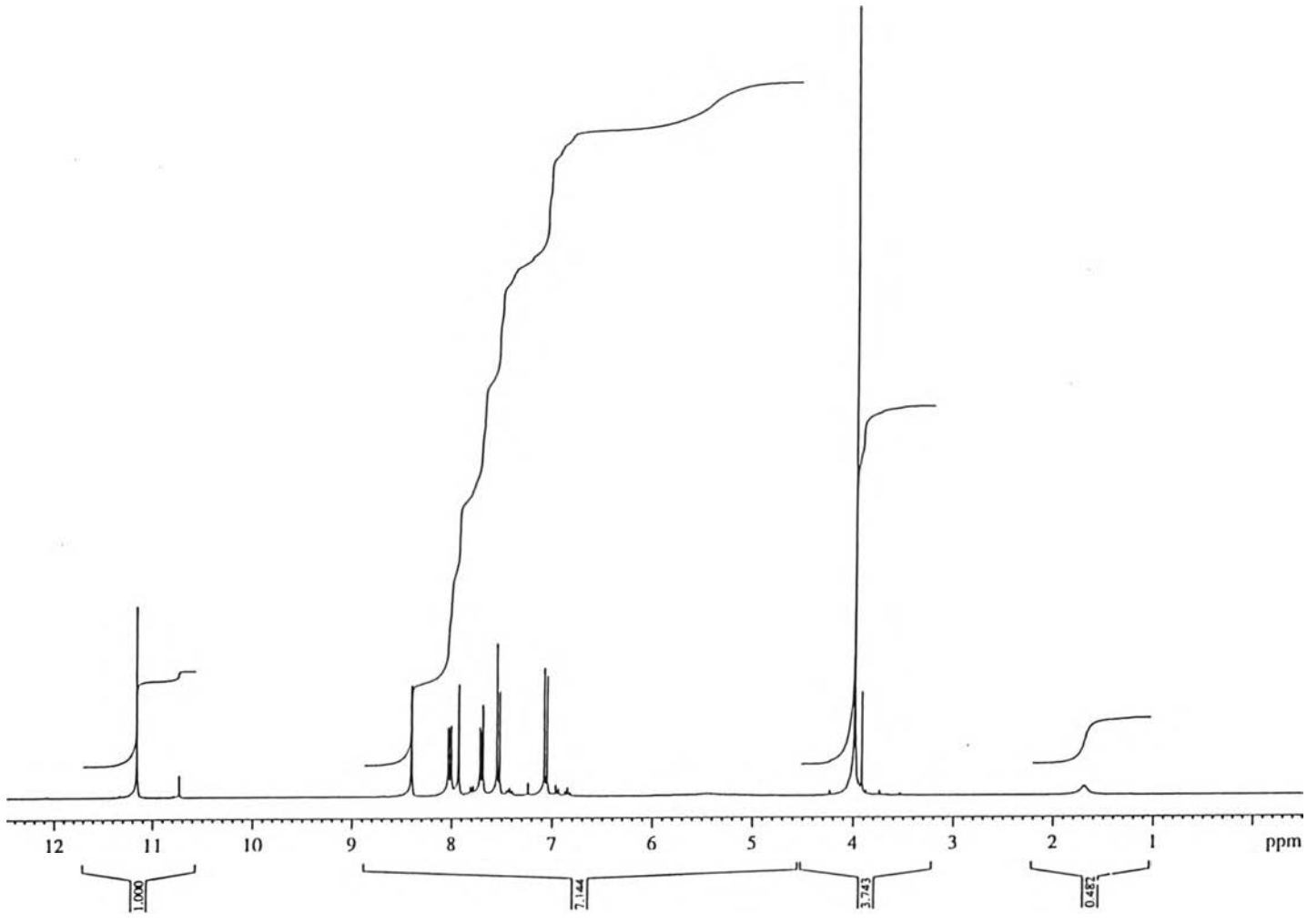

Figure 46 : ^{1}H-NMR spectrum of Compound 18

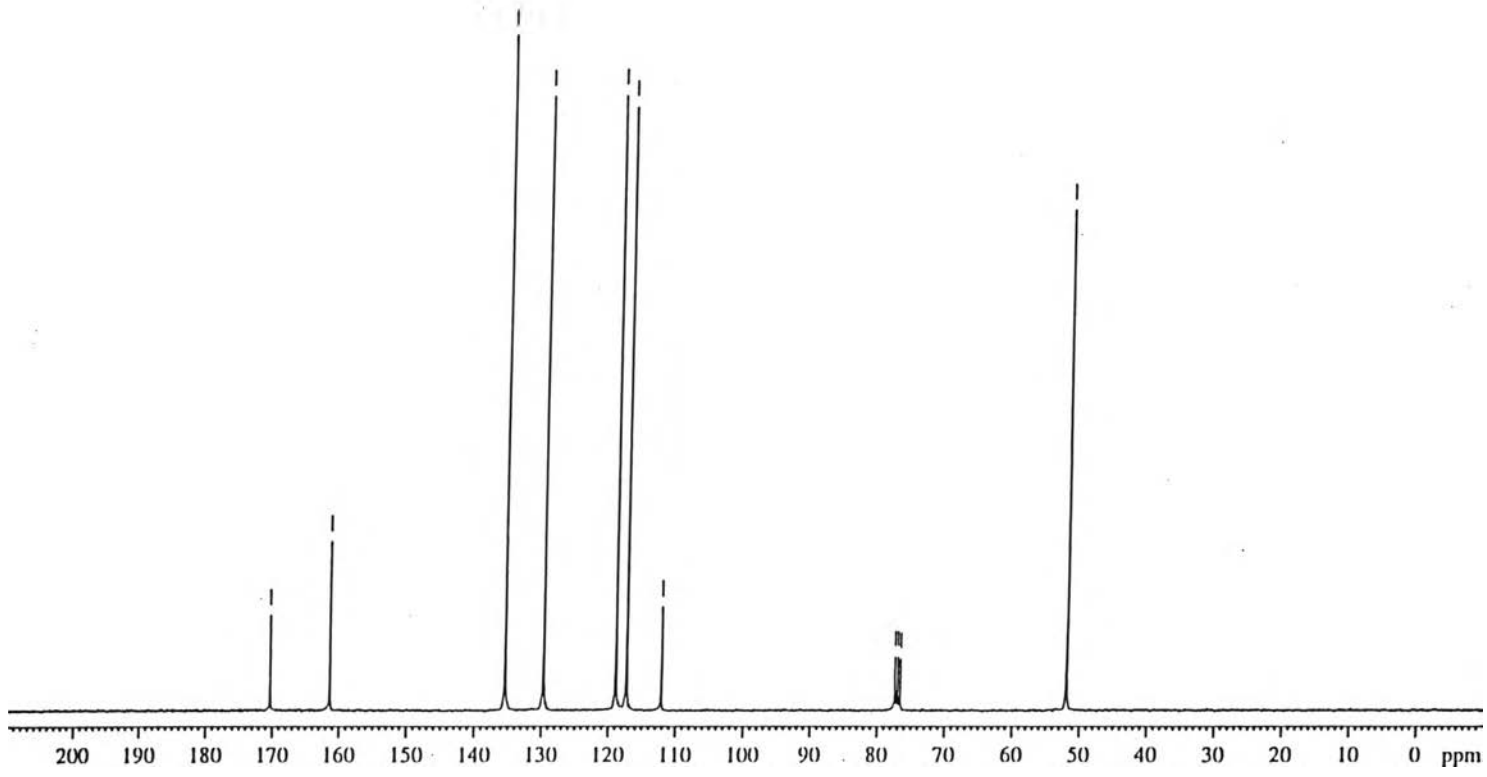

Figure 47 : ^{13}C-NMR spectrum of Compound 19

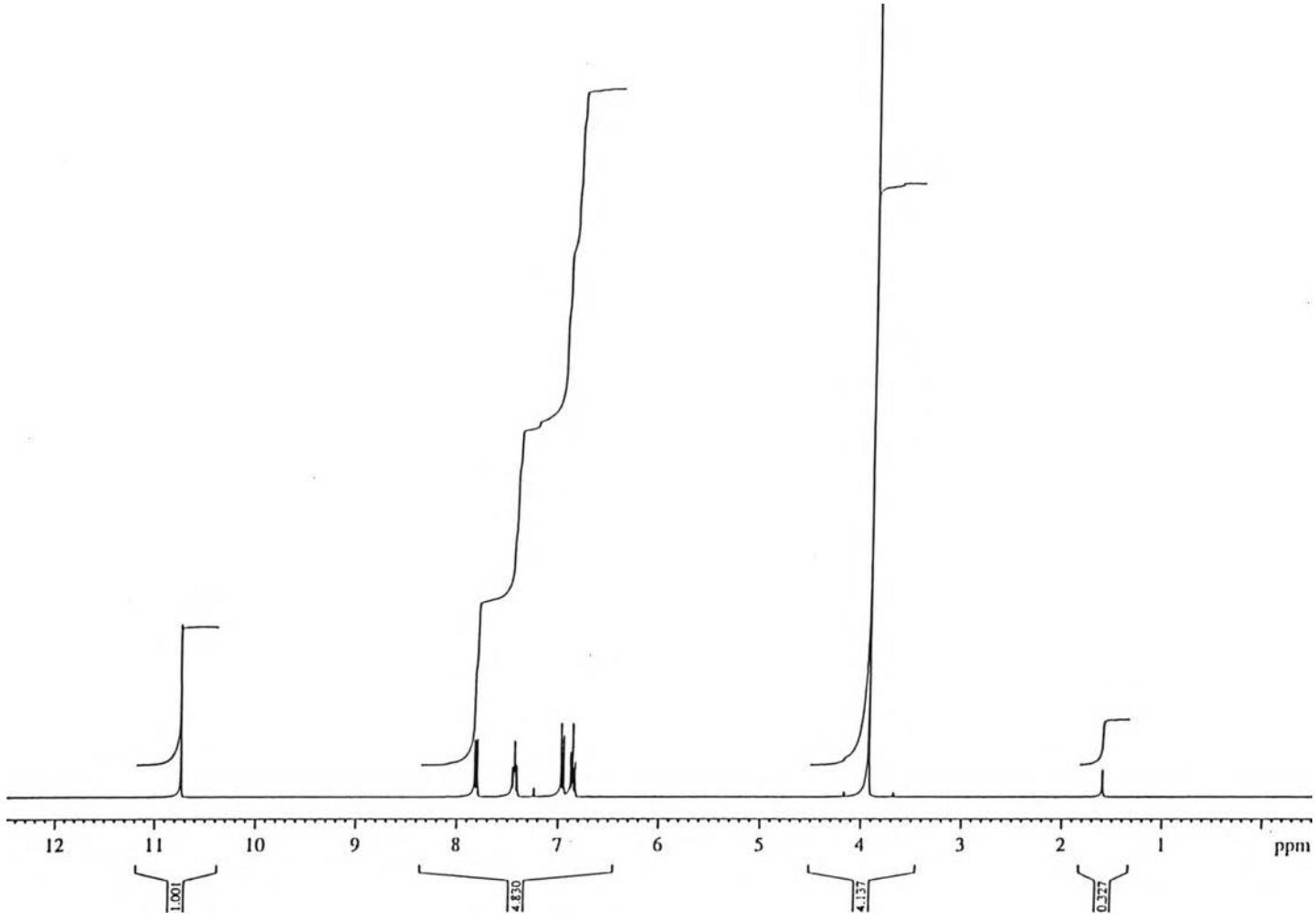

Figure 48 : ^{1}H-NMR spectrum of Compound 19

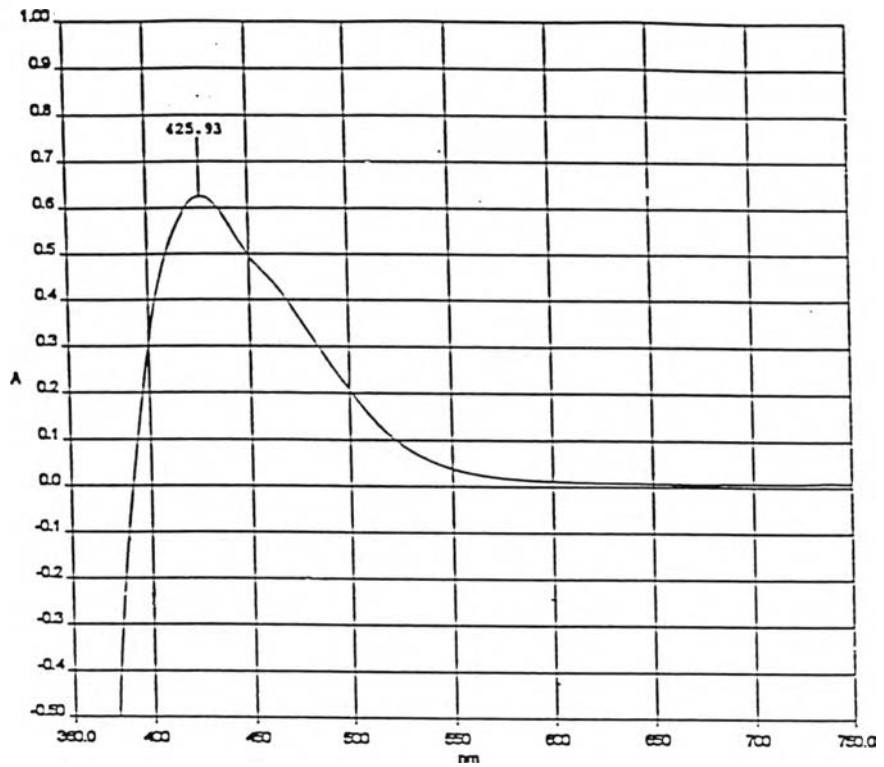

Figure 49 : Maximum wavelength of Compound 7

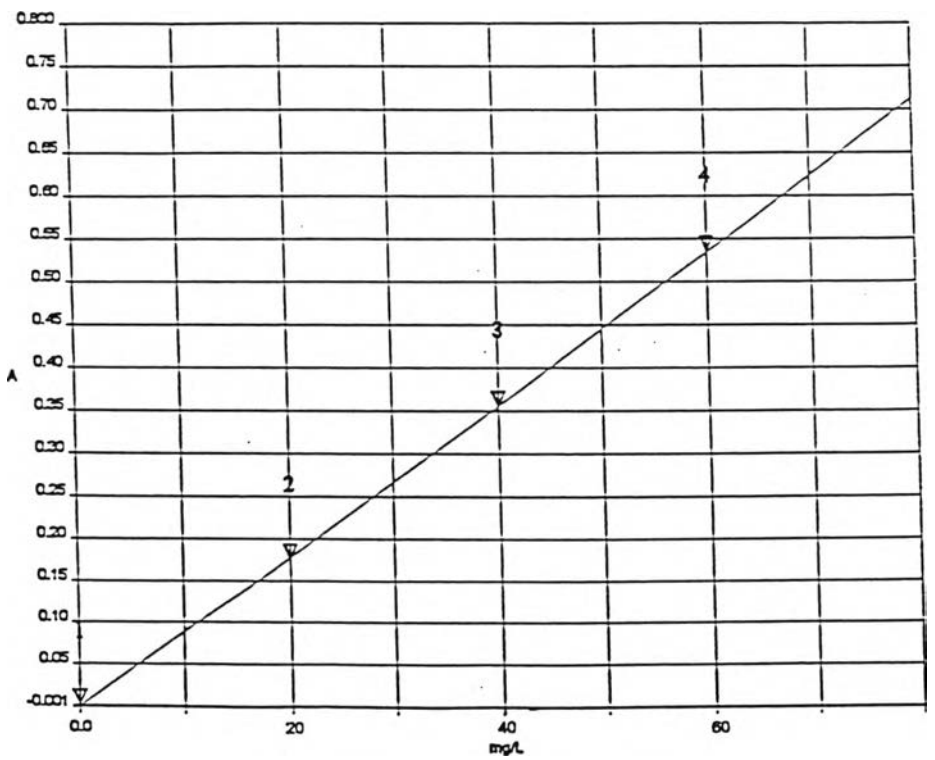

Figure 50 : Standard calibration of Compound 7

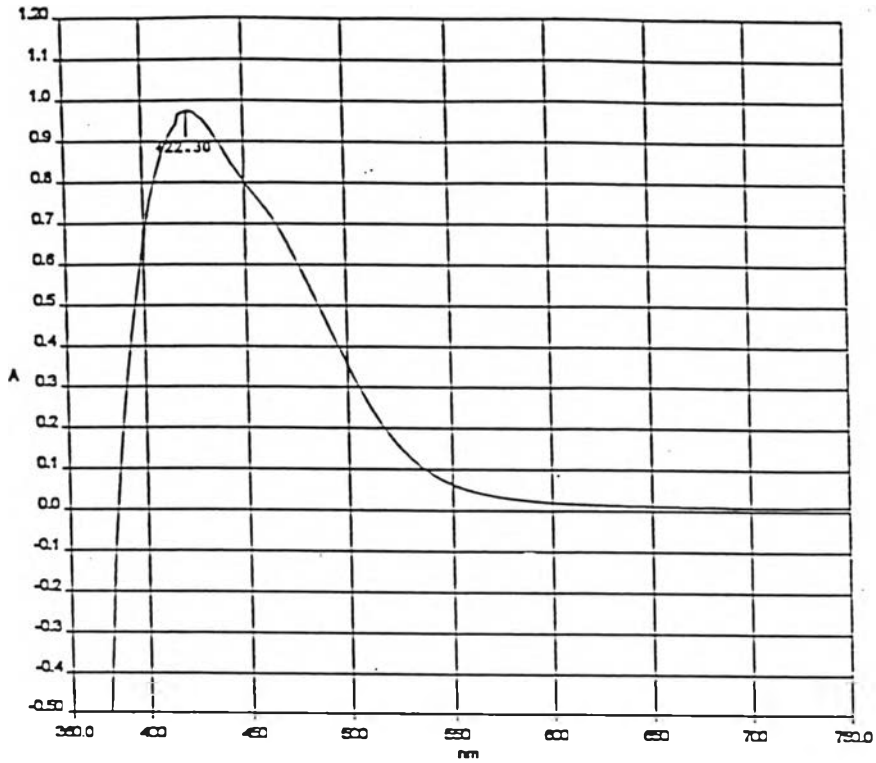

Figure 51 : Maximum wavelength of Compound 8

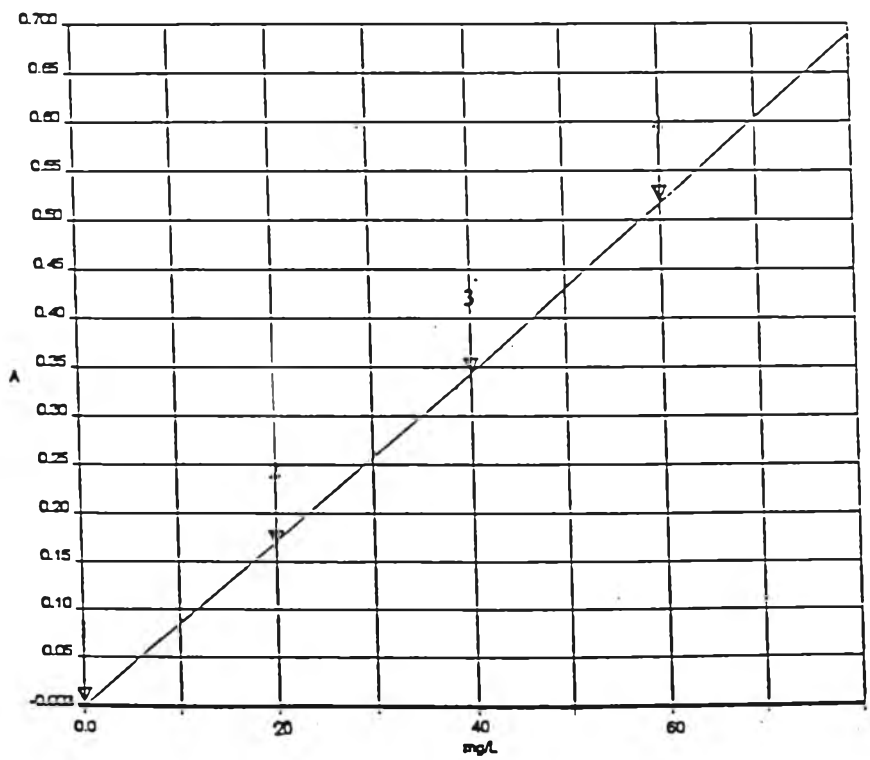

Figure 52 : Standard calibration of Compound 8

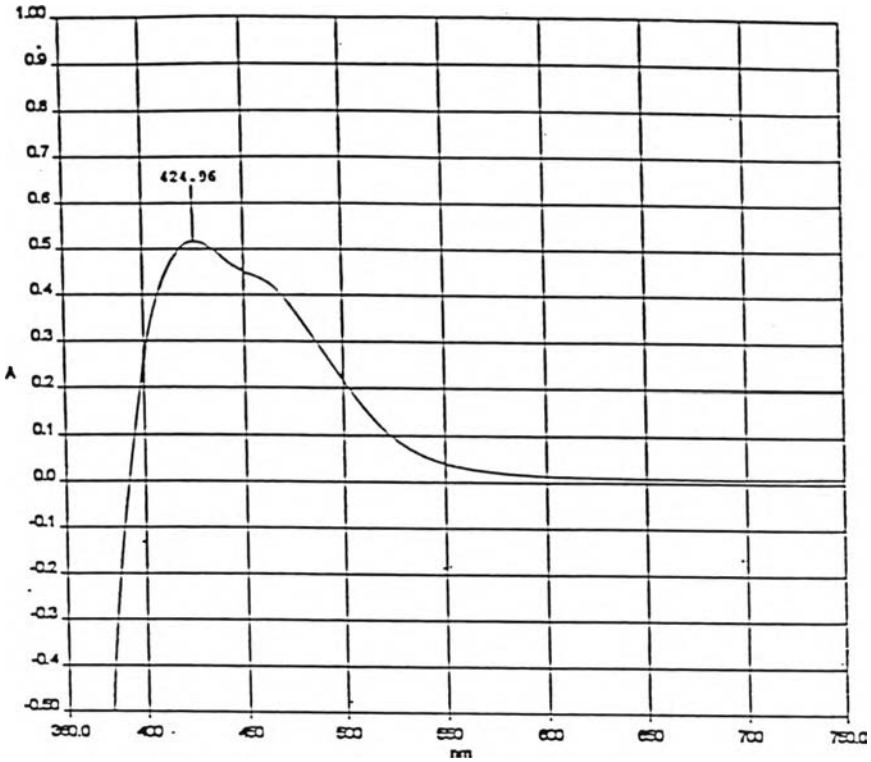

Figure 53 : Maximum wavelength of Compound 9

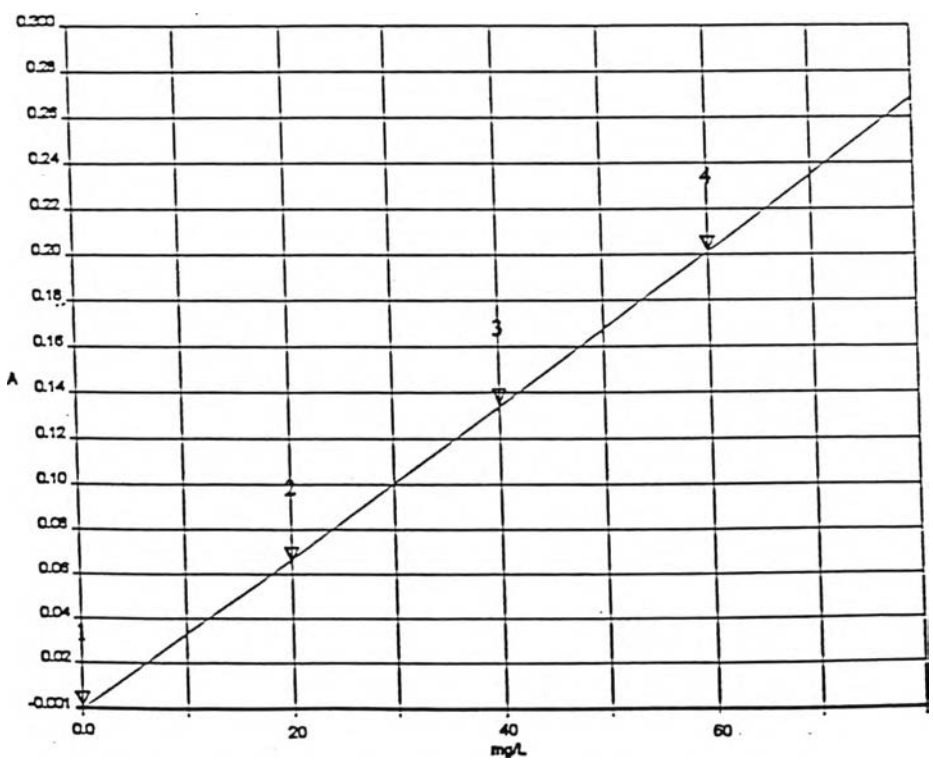

Figure 54 : Standard calibration of Compound 9

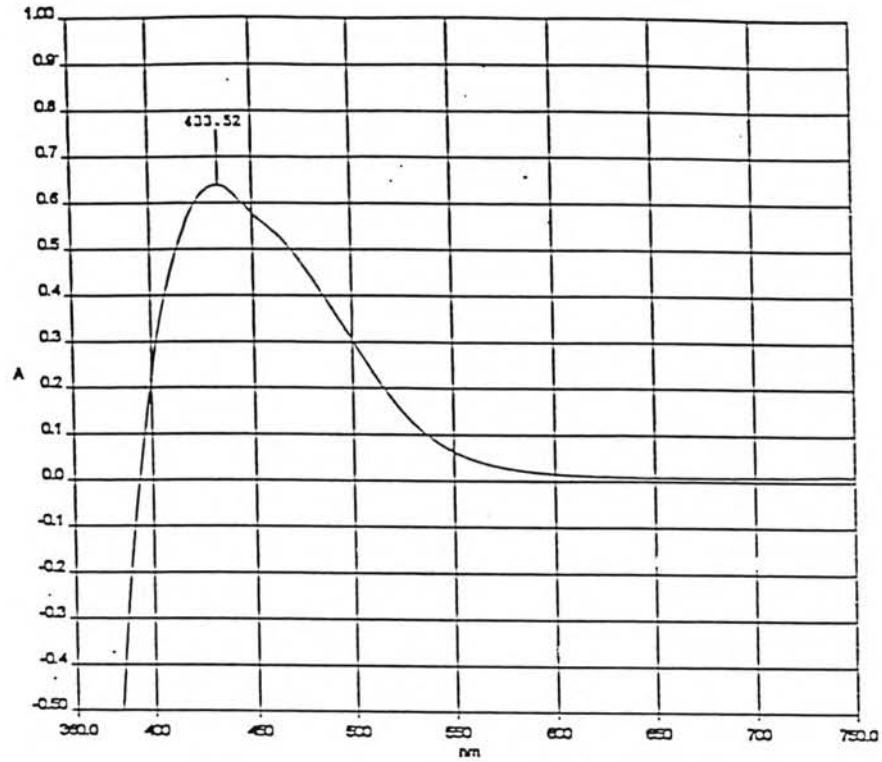

Figure 55 : Maximum wavelength of Compound 10

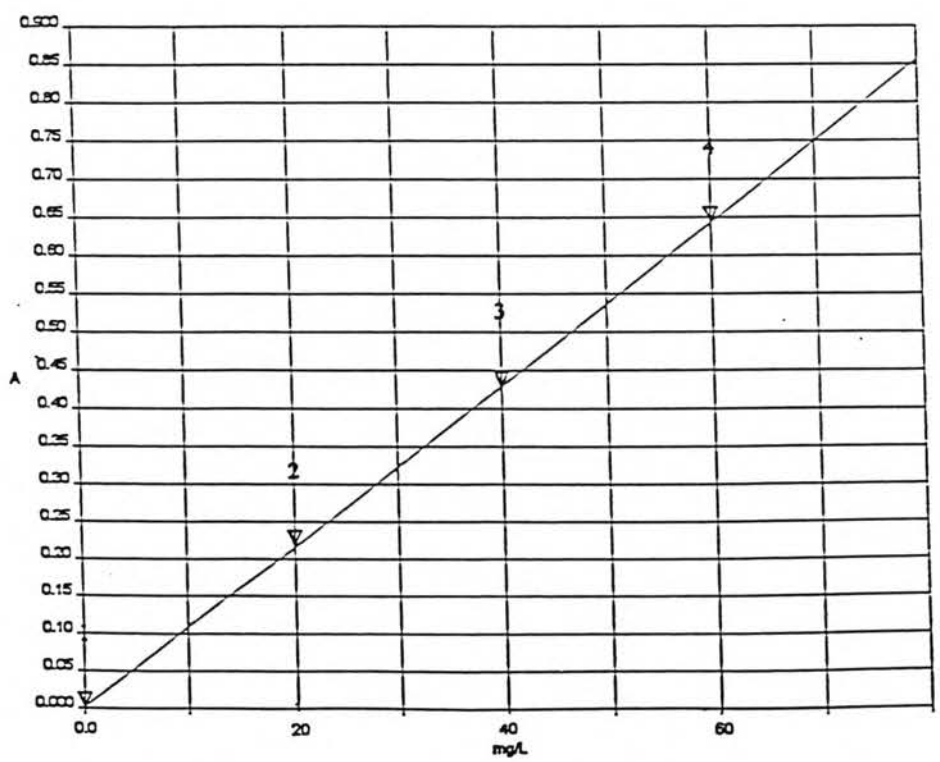

Figure 56 : Standard calibration of Compound 10

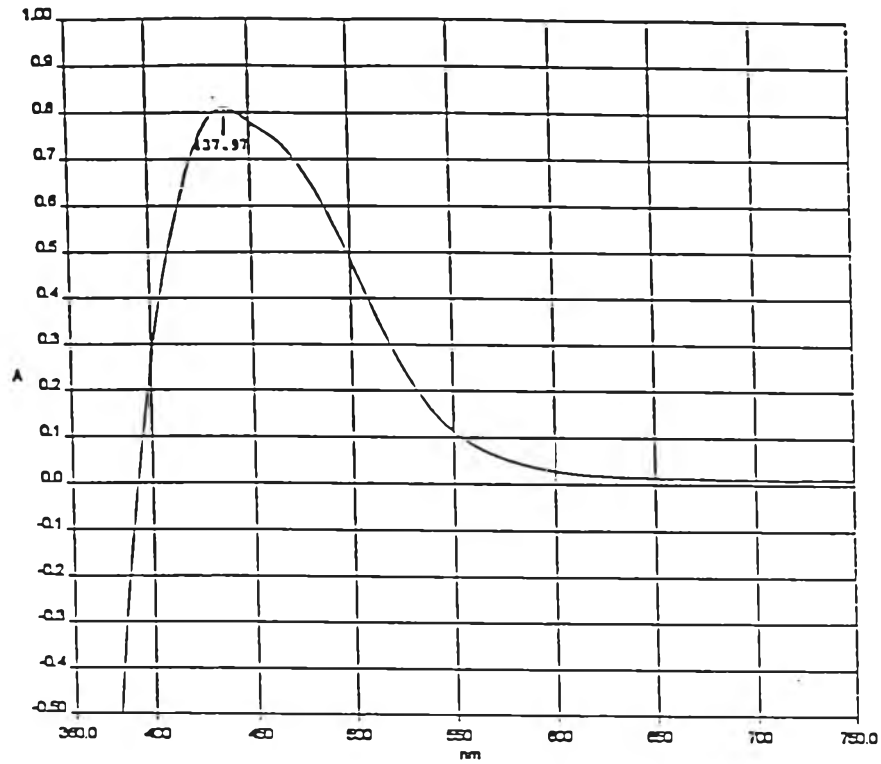

Figure 57 : Maximum wavelength of Compound 11

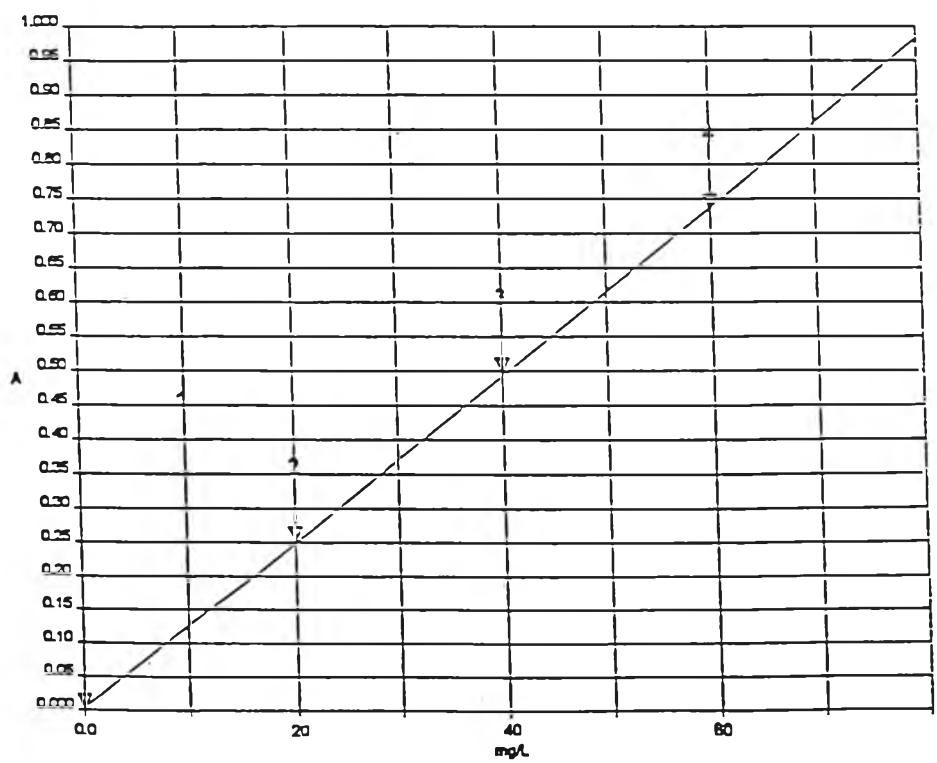

Figure 58 : Standard calibration of Compound 11

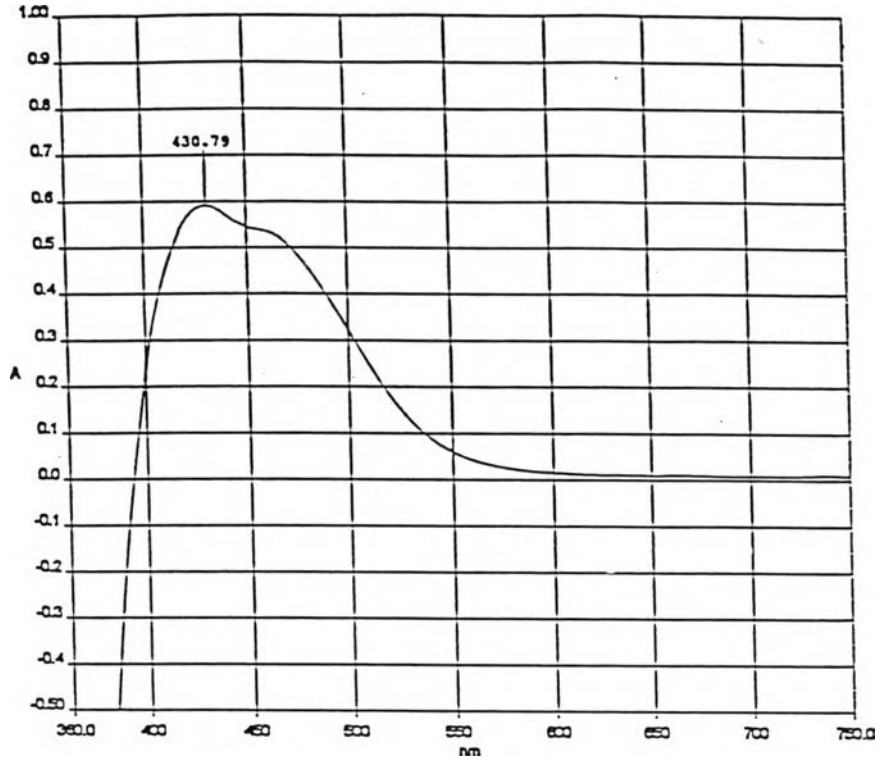

Figure 59 : Maximum wavelength of Compound 12

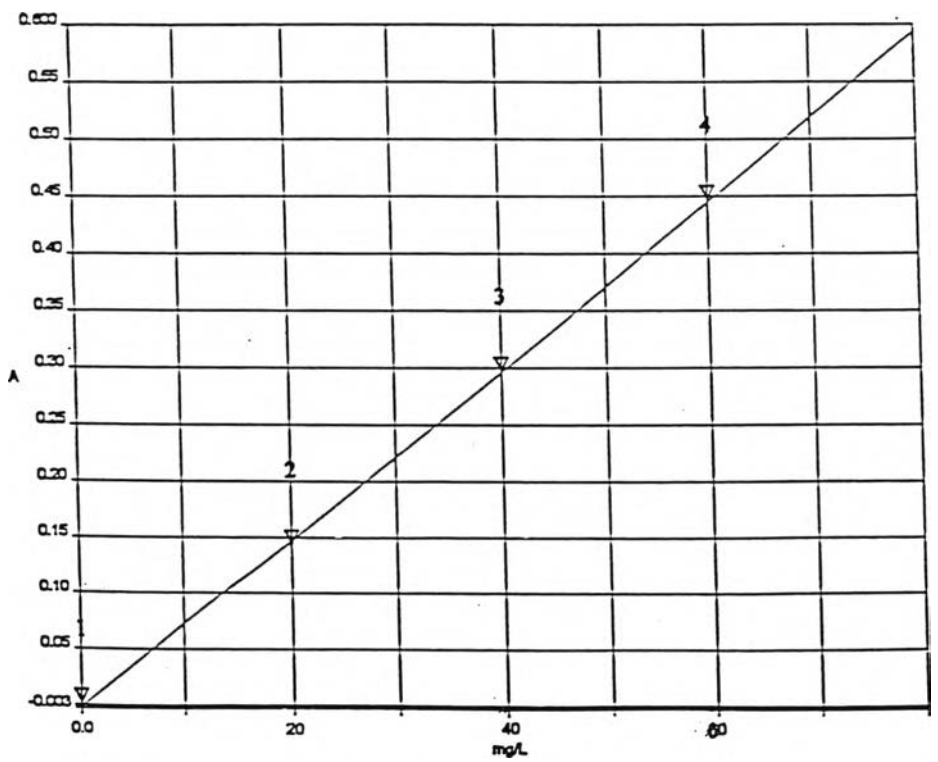

Figure 60 : Standard calibration of Compound 12

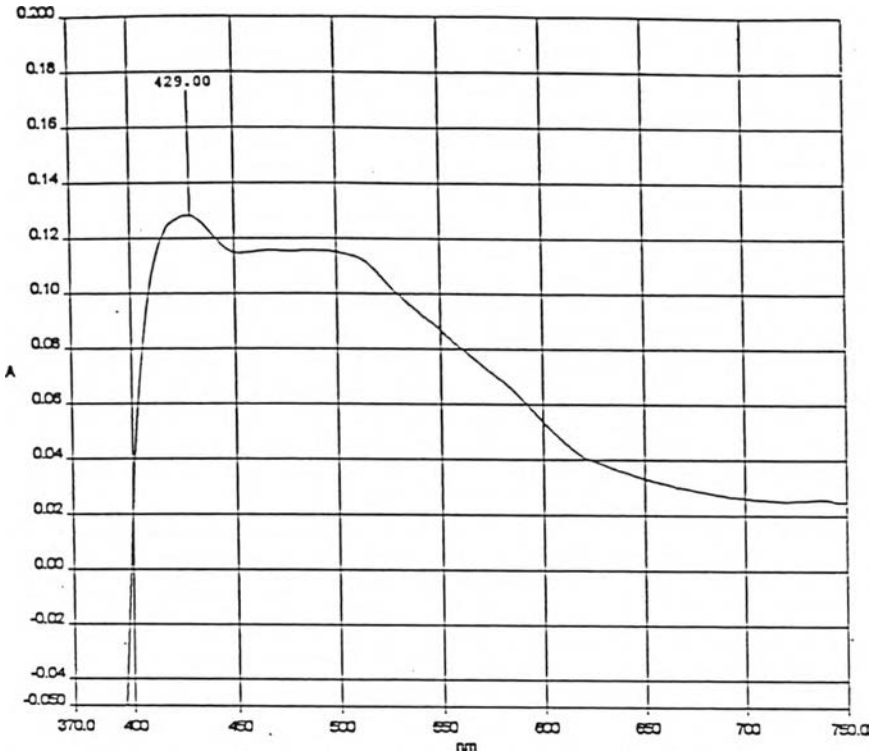

Figure 61 : Absorbance of CNSL

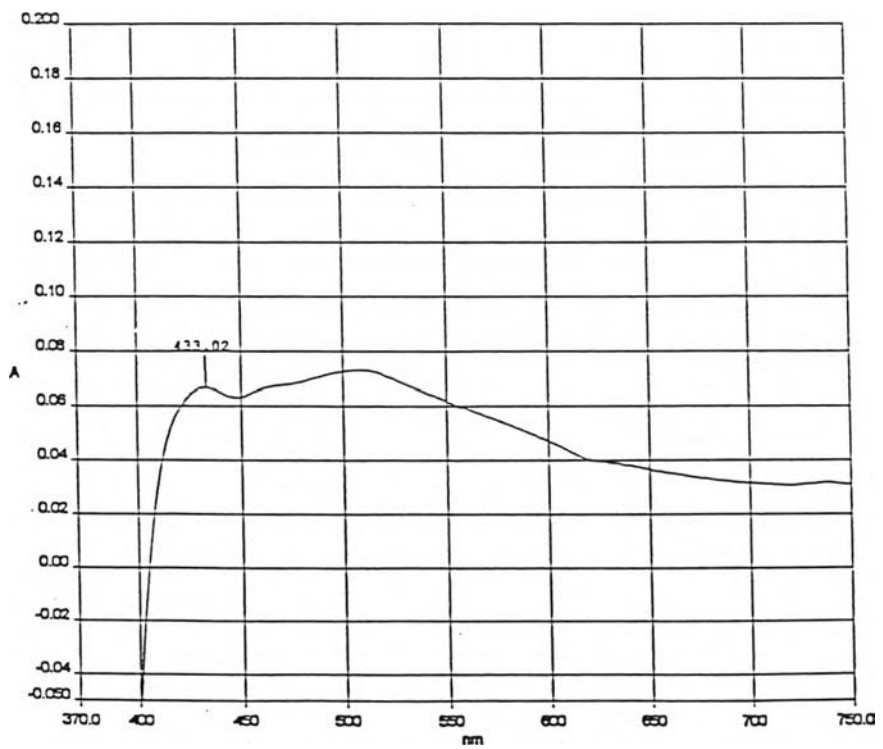

Figure 62 : Absorbance of esterified_CNSL

VITA

Mr. Kitipol Thowongs was born on July 10, 1968 in Petchaburi province, Thailand. He received the Bachelor of Science Degree in Chemistry at Srinakharinwiroj University in 1990. Since 1997 he has been a graduate student studying Petrochemistry at Chulalongkorn University and completed his M.Sc. degree in 1999.