APPENDIX 3

Spectra Relevant to Chapter 3

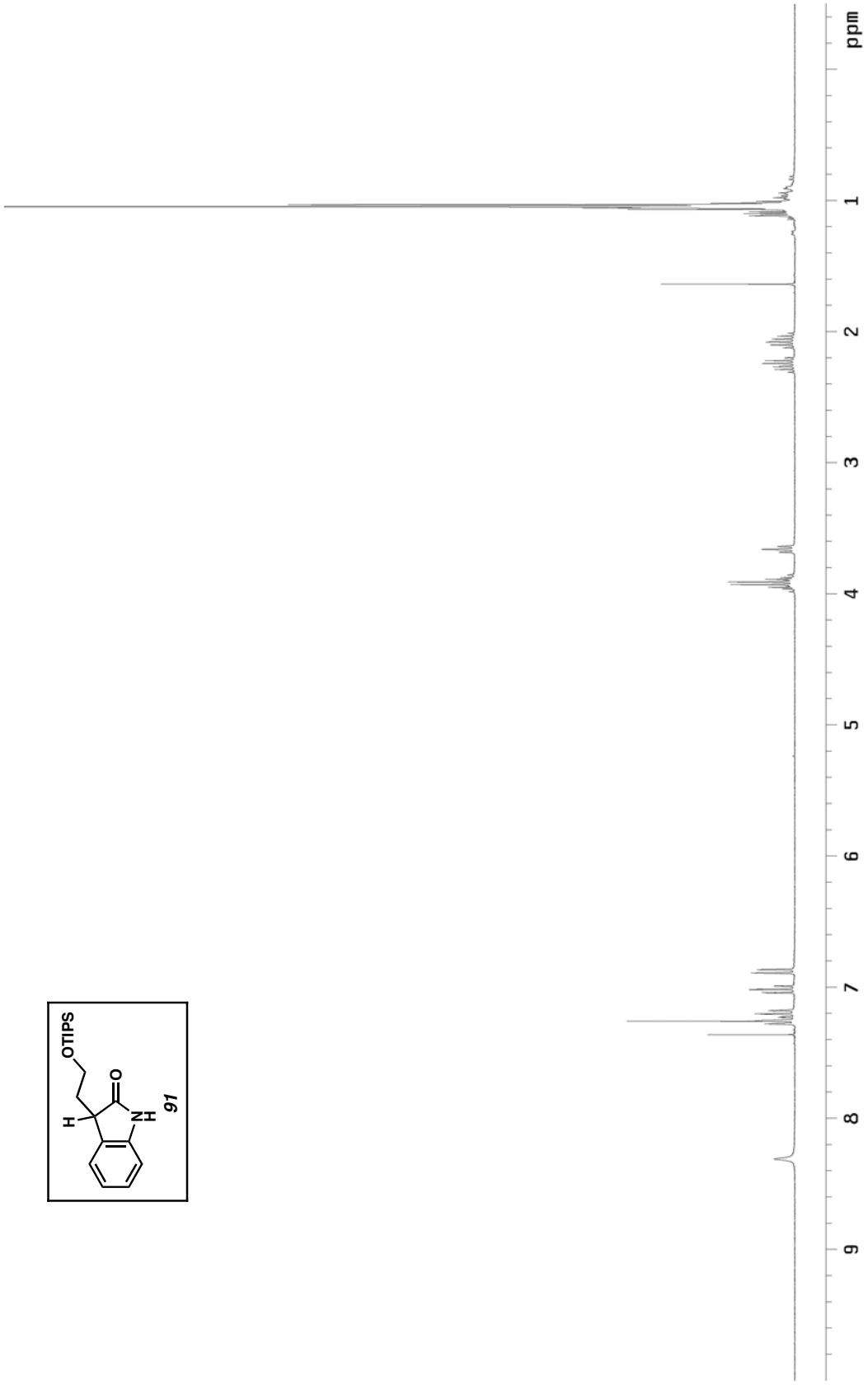


Figure A3.1.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **91**.

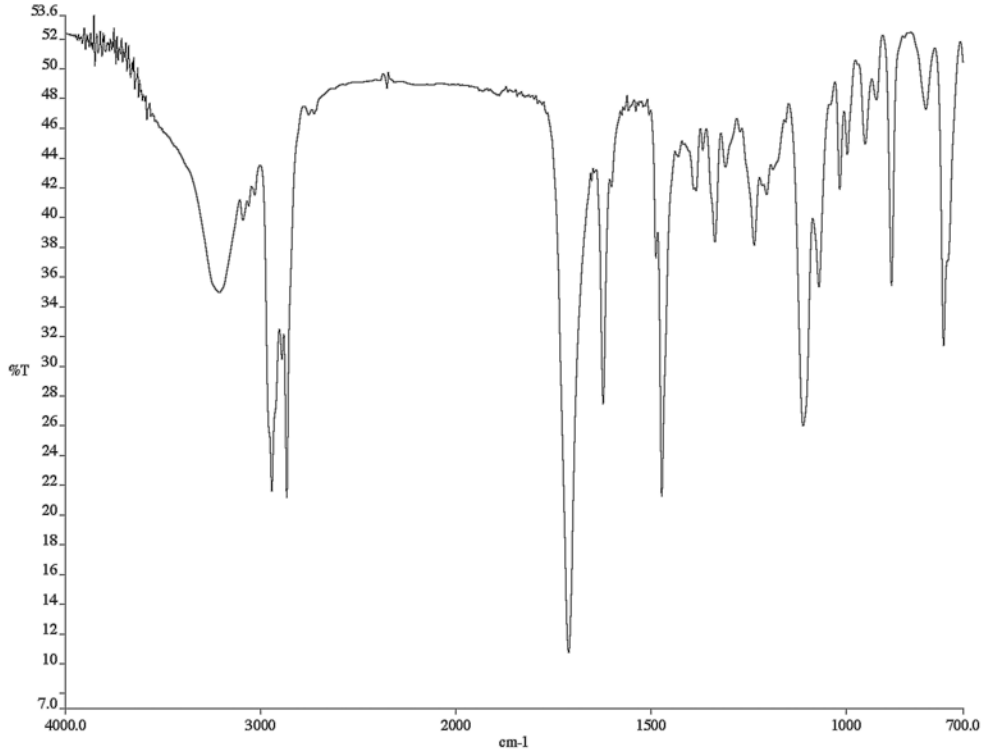


Figure A3.1.2 Infrared spectrum (thin film/NaCl) of compound **91**.

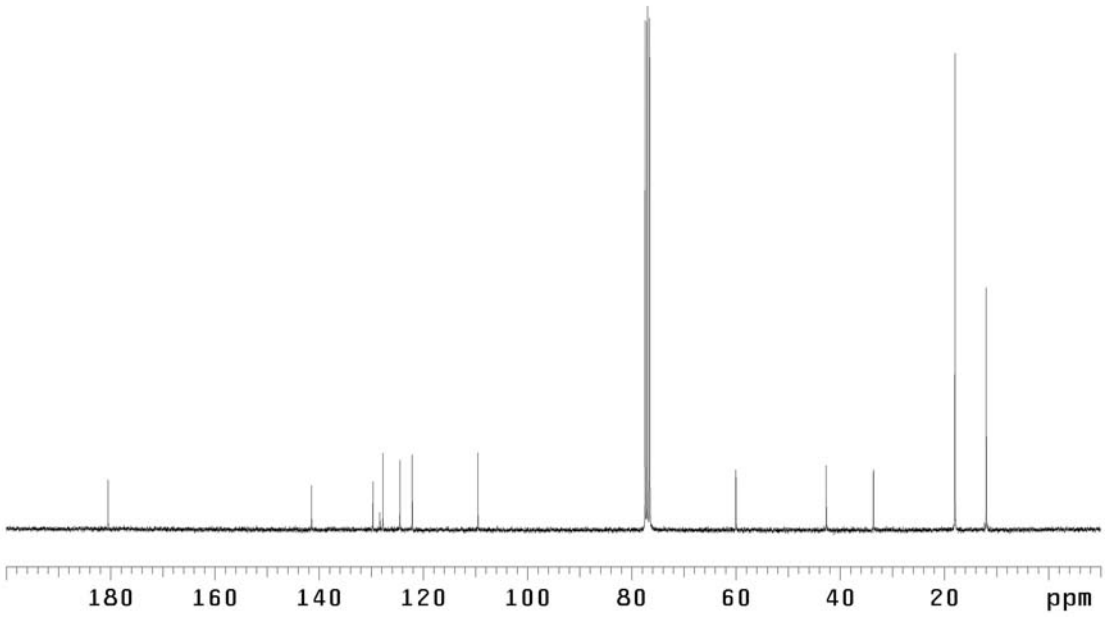


Figure A3.1.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **91**.

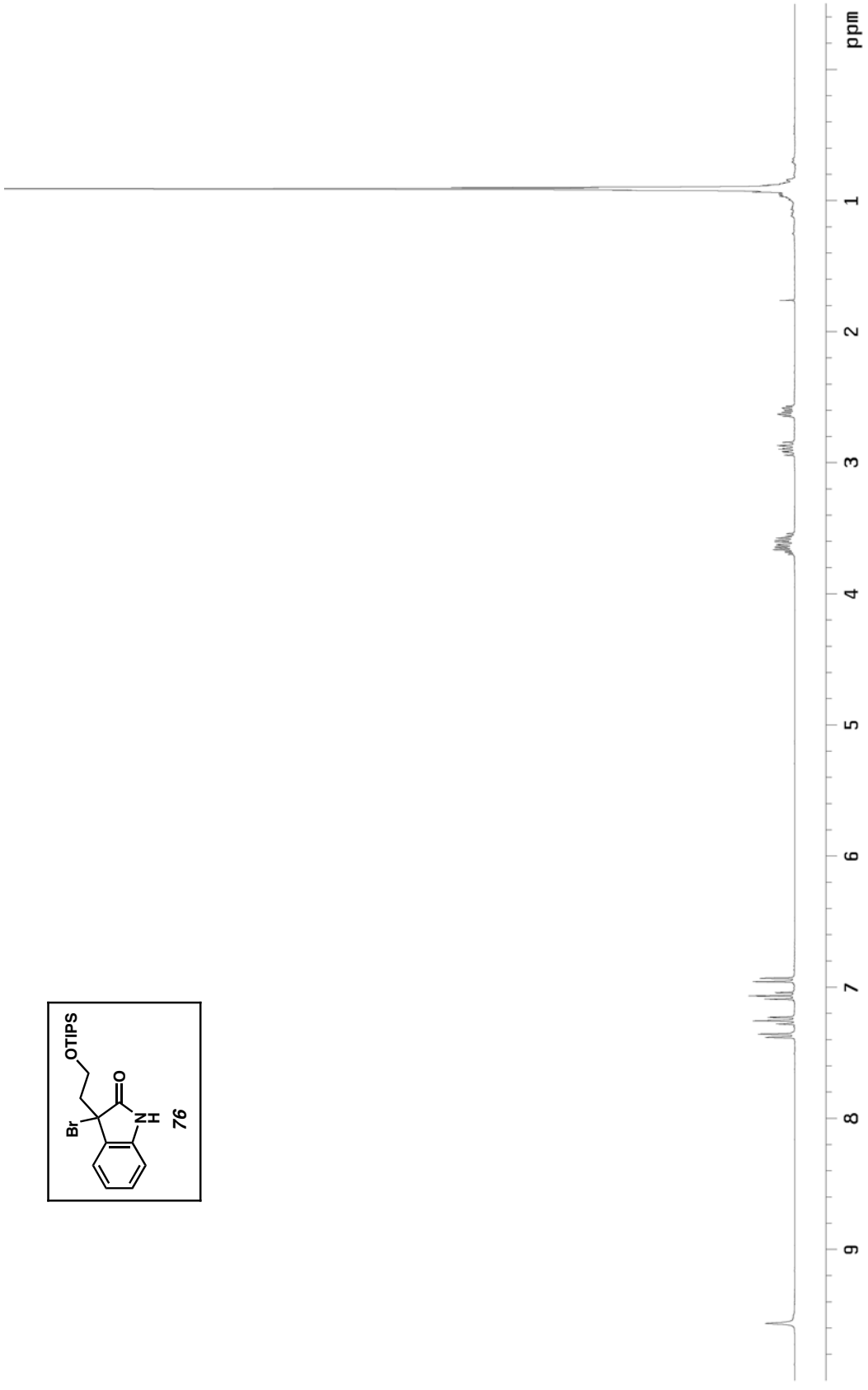


Figure A3.2.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **76**.

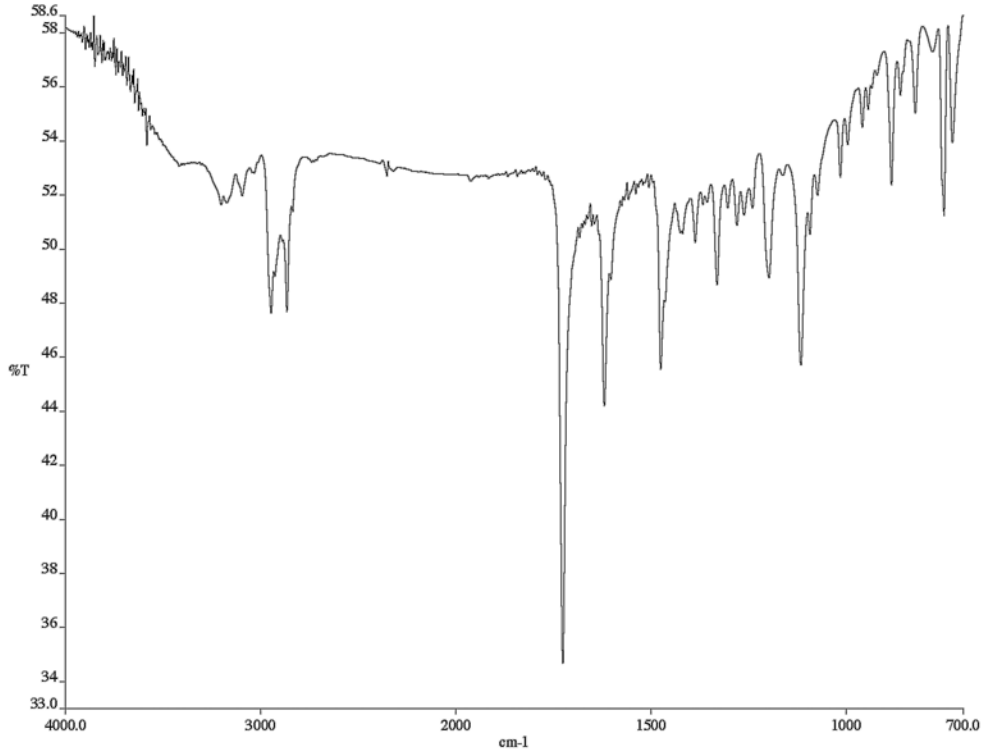


Figure A3.2.2 Infrared spectrum (thin film/NaCl) of compound **76**.

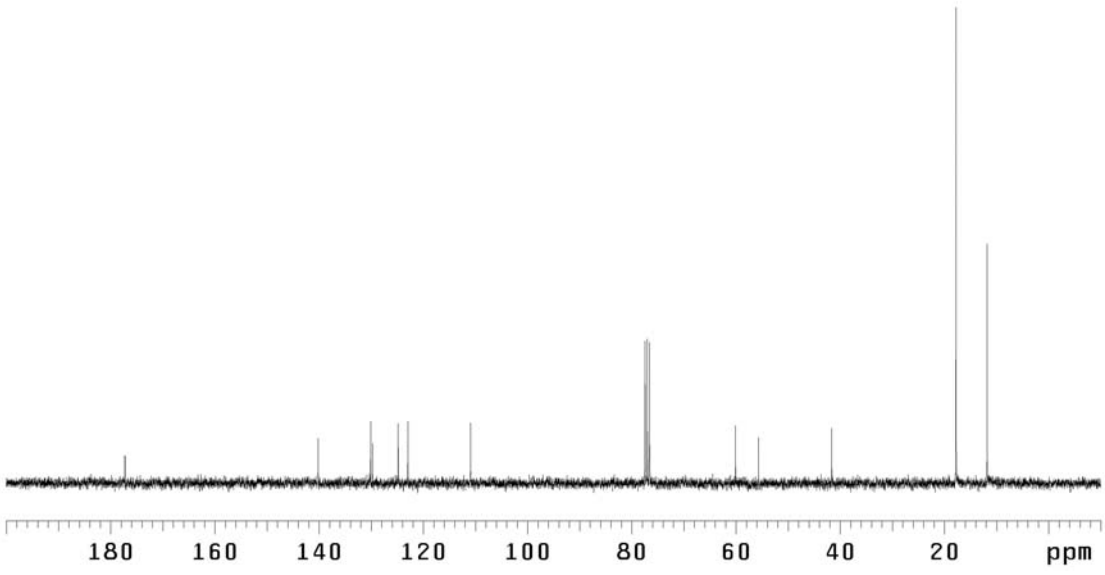


Figure A3.2.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **76**.

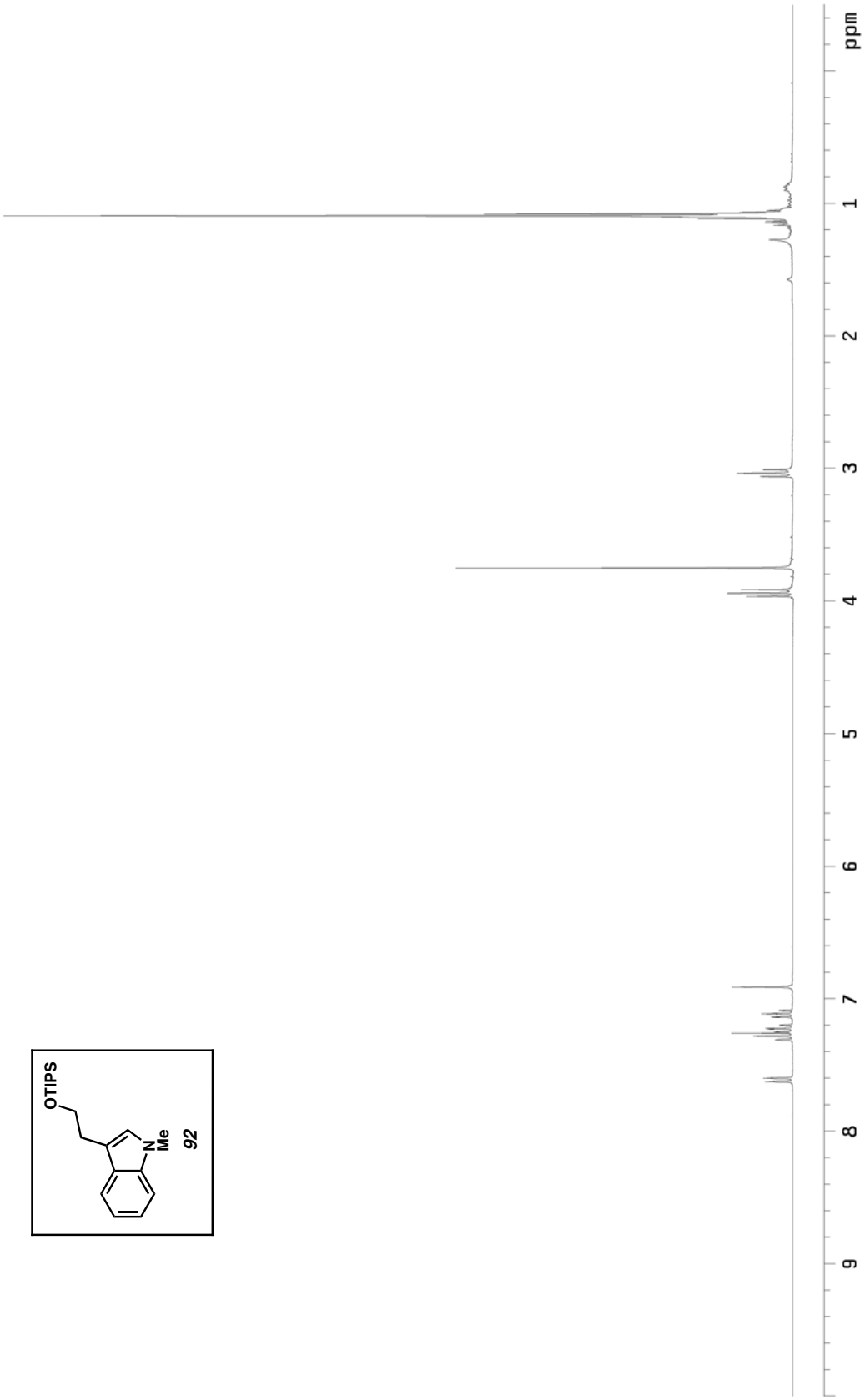


Figure A3.3.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **92**.

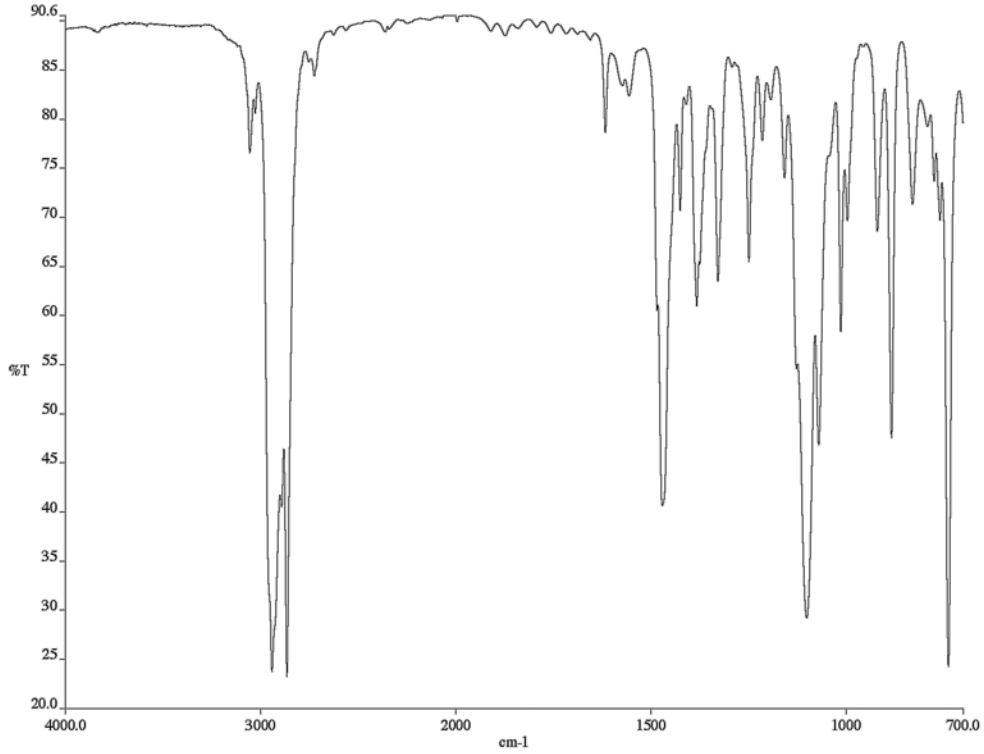


Figure A3.3.2 Infrared spectrum (thin film/NaCl) of compound **92**.

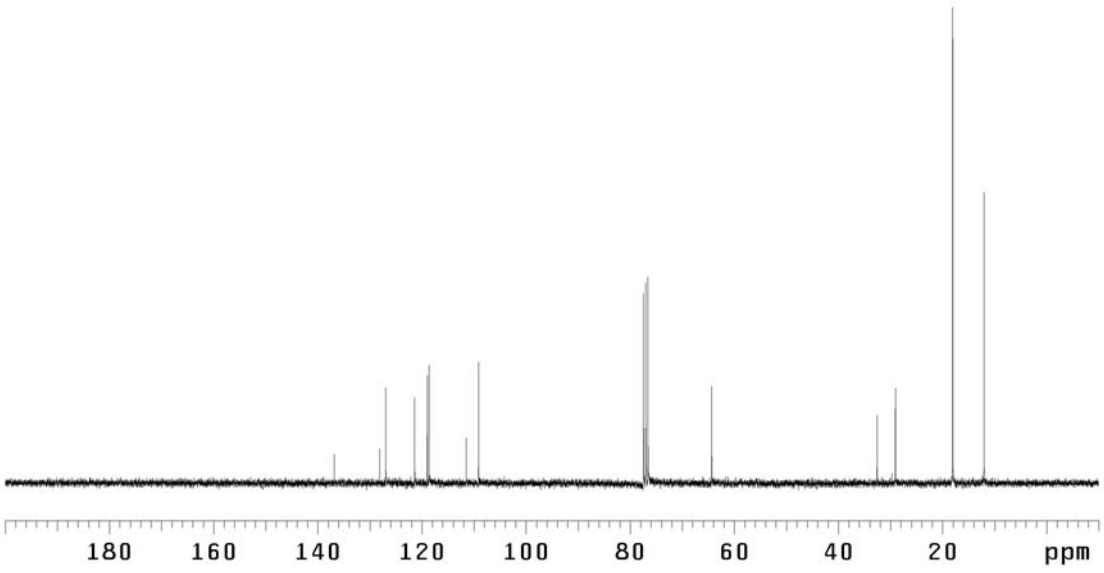


Figure A3.3.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **92**.

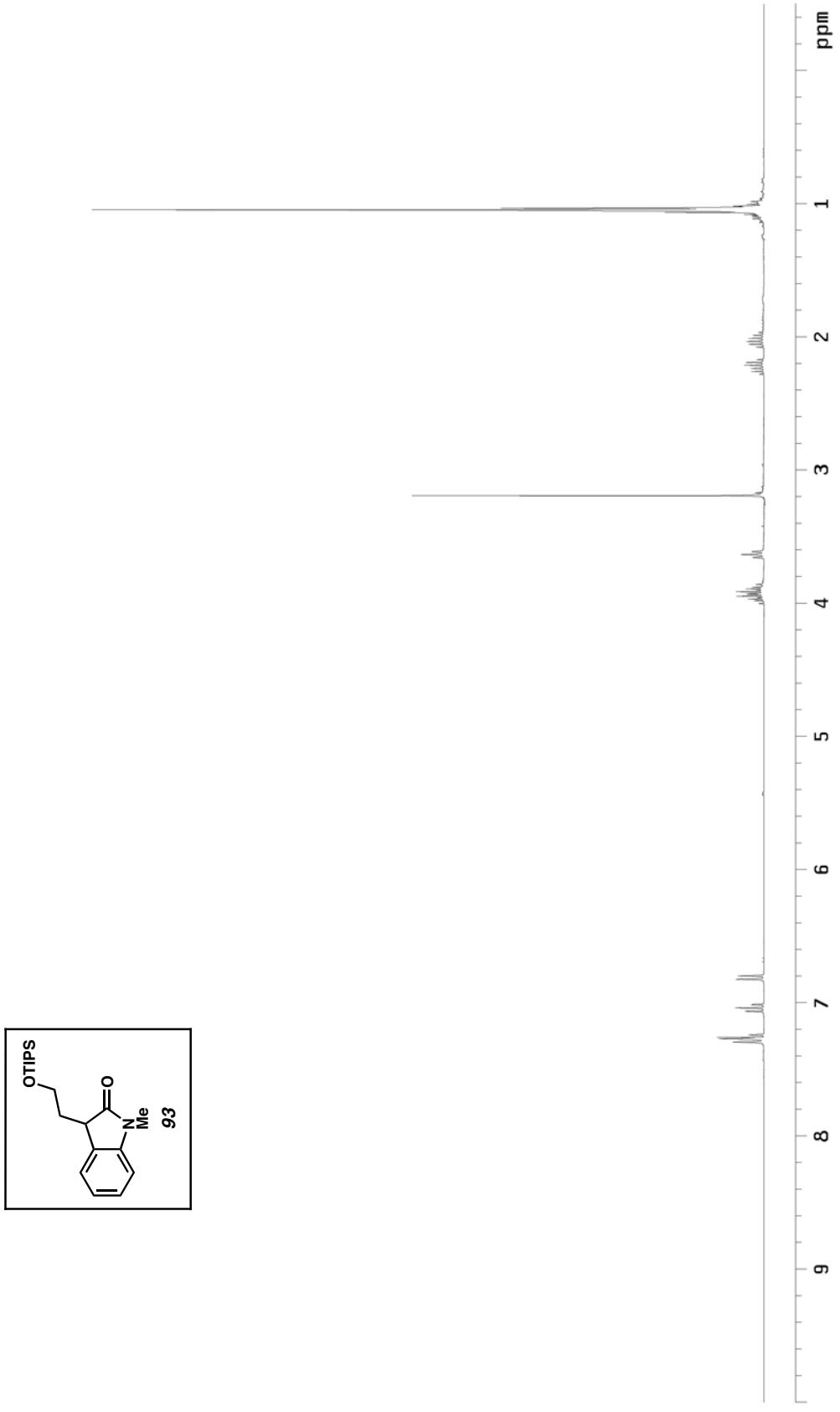


Figure A3.4.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **93**.

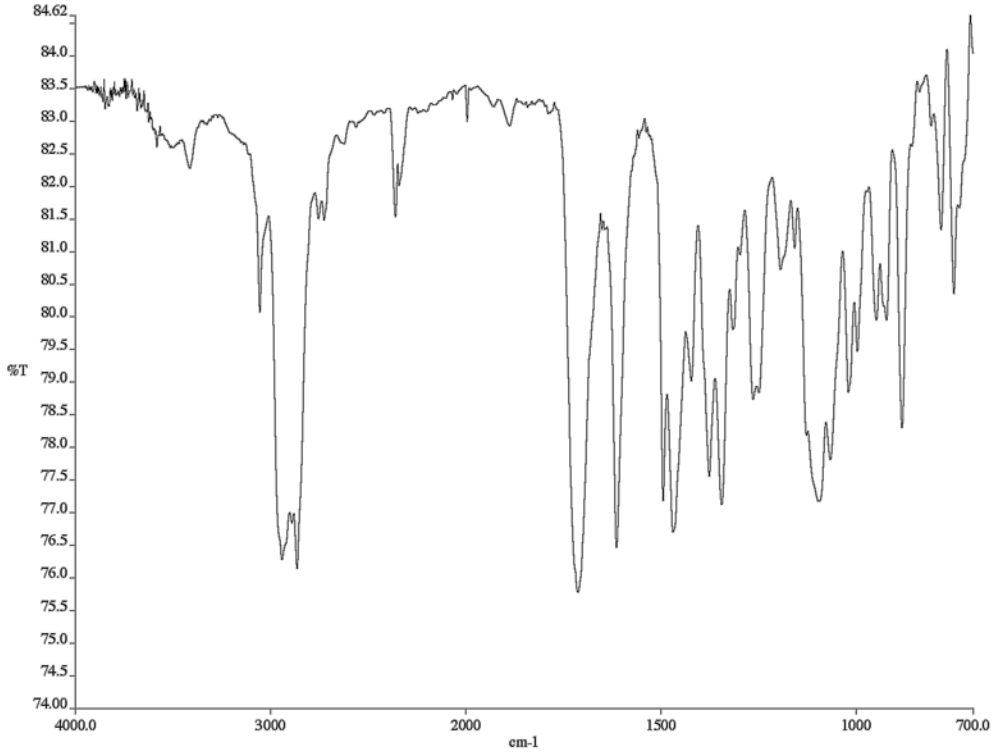


Figure A3.4.2 Infrared spectrum (thin film/NaCl) of compound **93**.

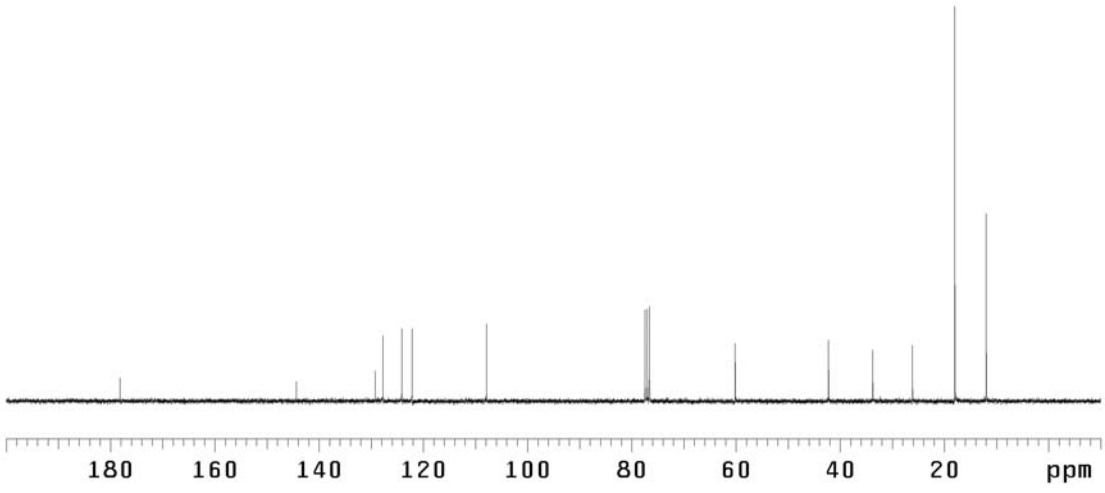


Figure A3.4.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **93**.

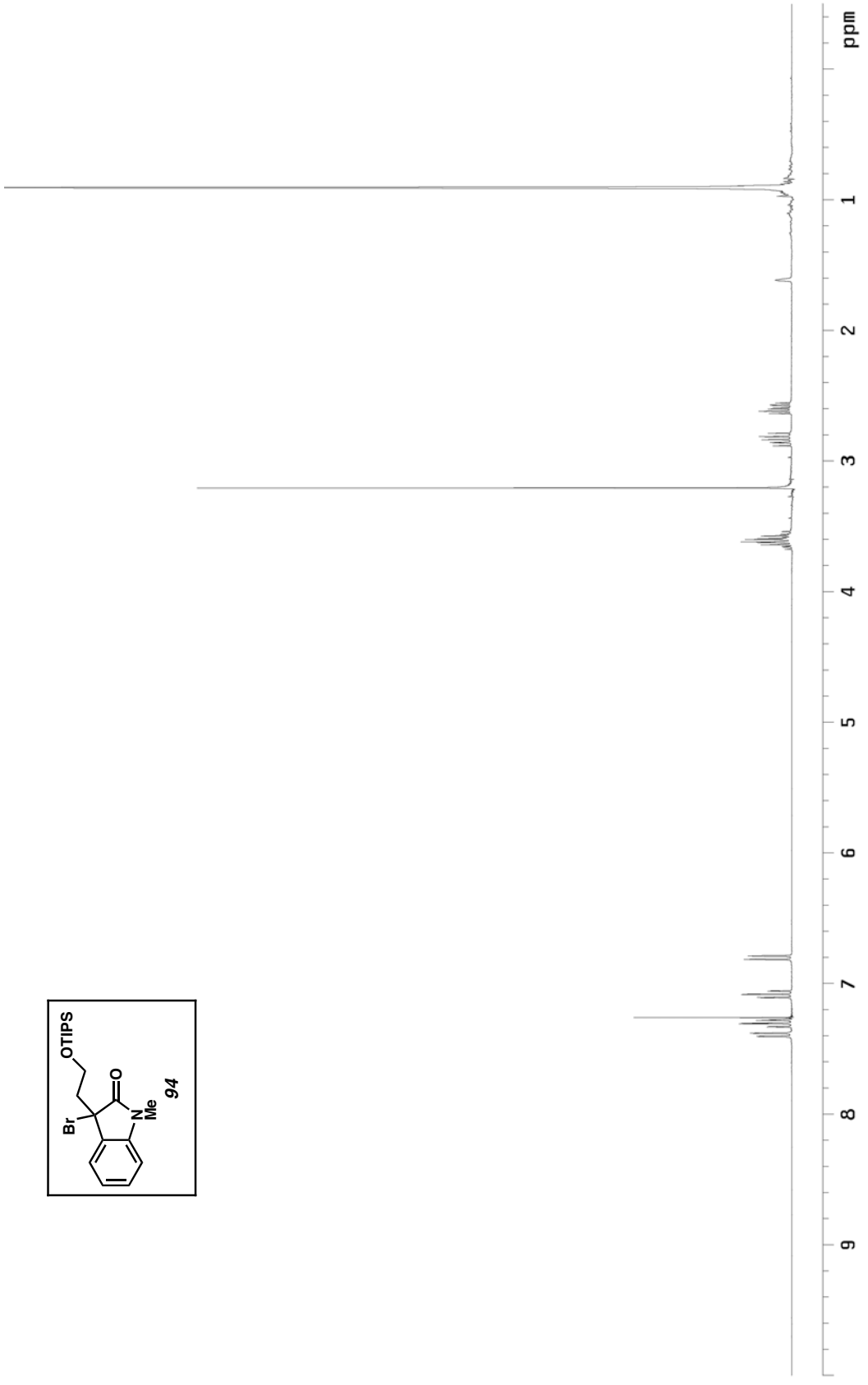


Figure A3.5.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **94**.

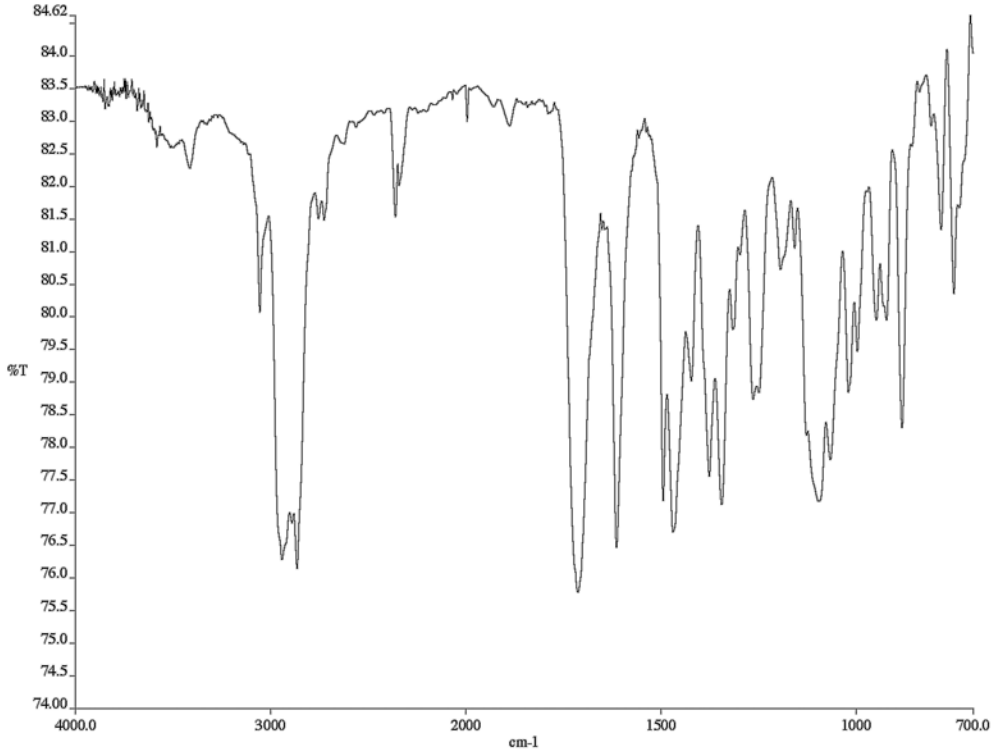


Figure A3.5.2 Infrared spectrum (thin film/NaCl) of compound **94**.

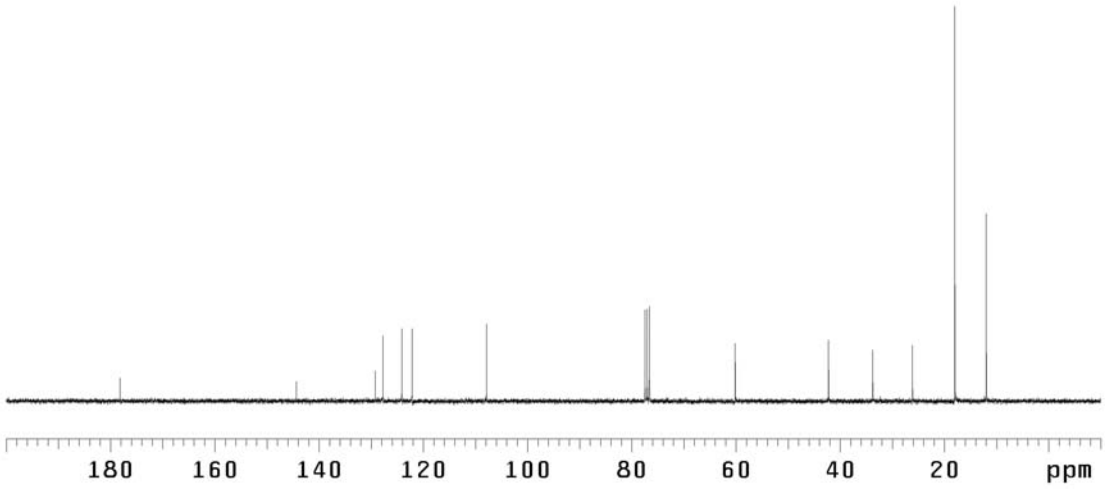


Figure A3.5.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **94**.

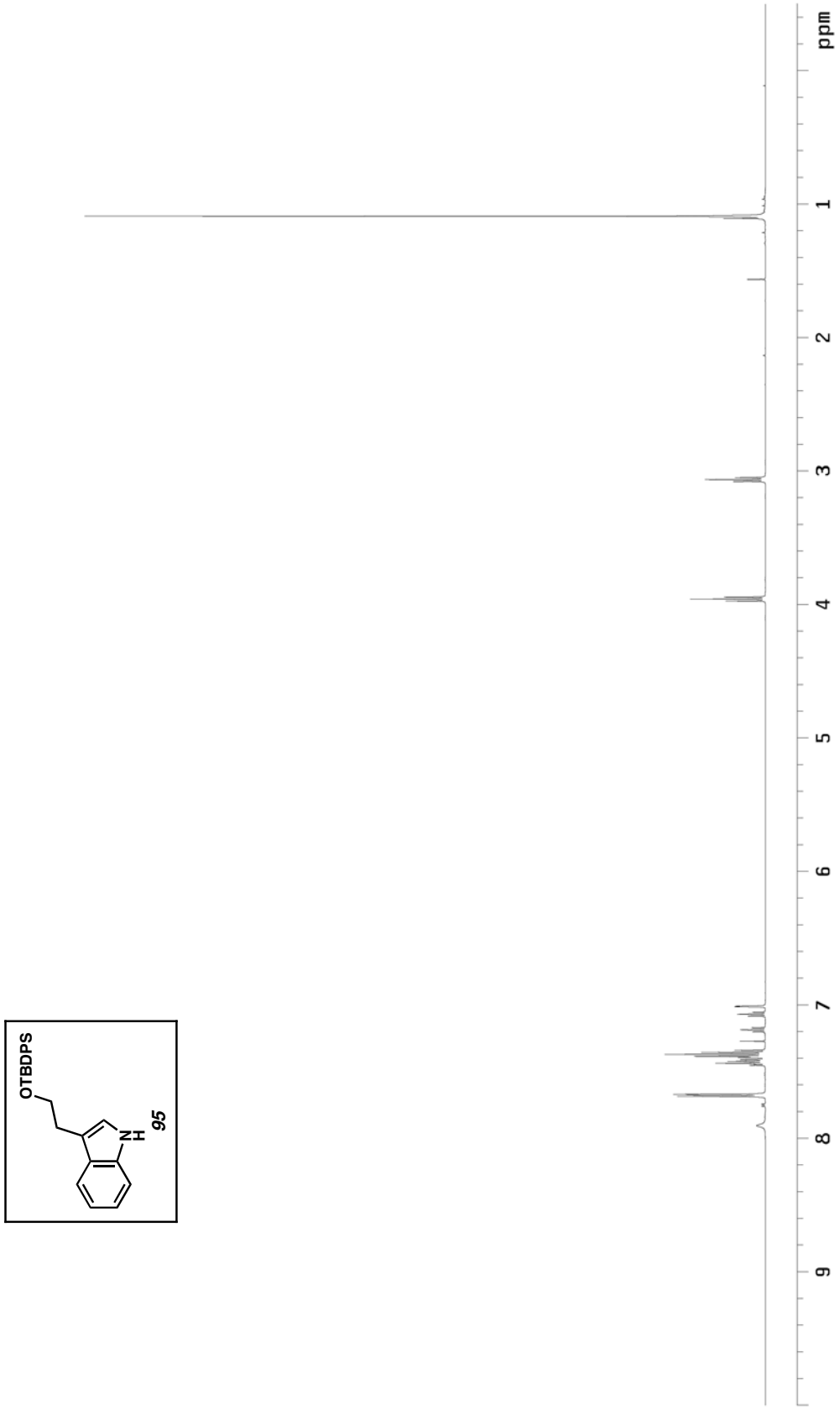


Figure A3.6.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **95**.

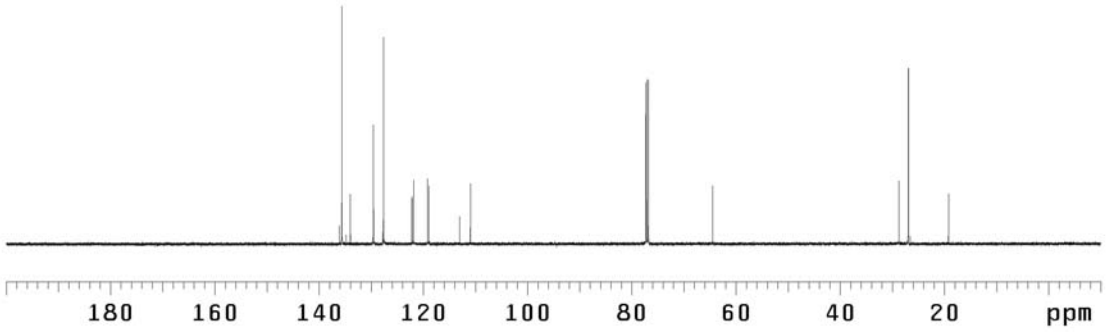


Figure A6.6.2 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **95**.

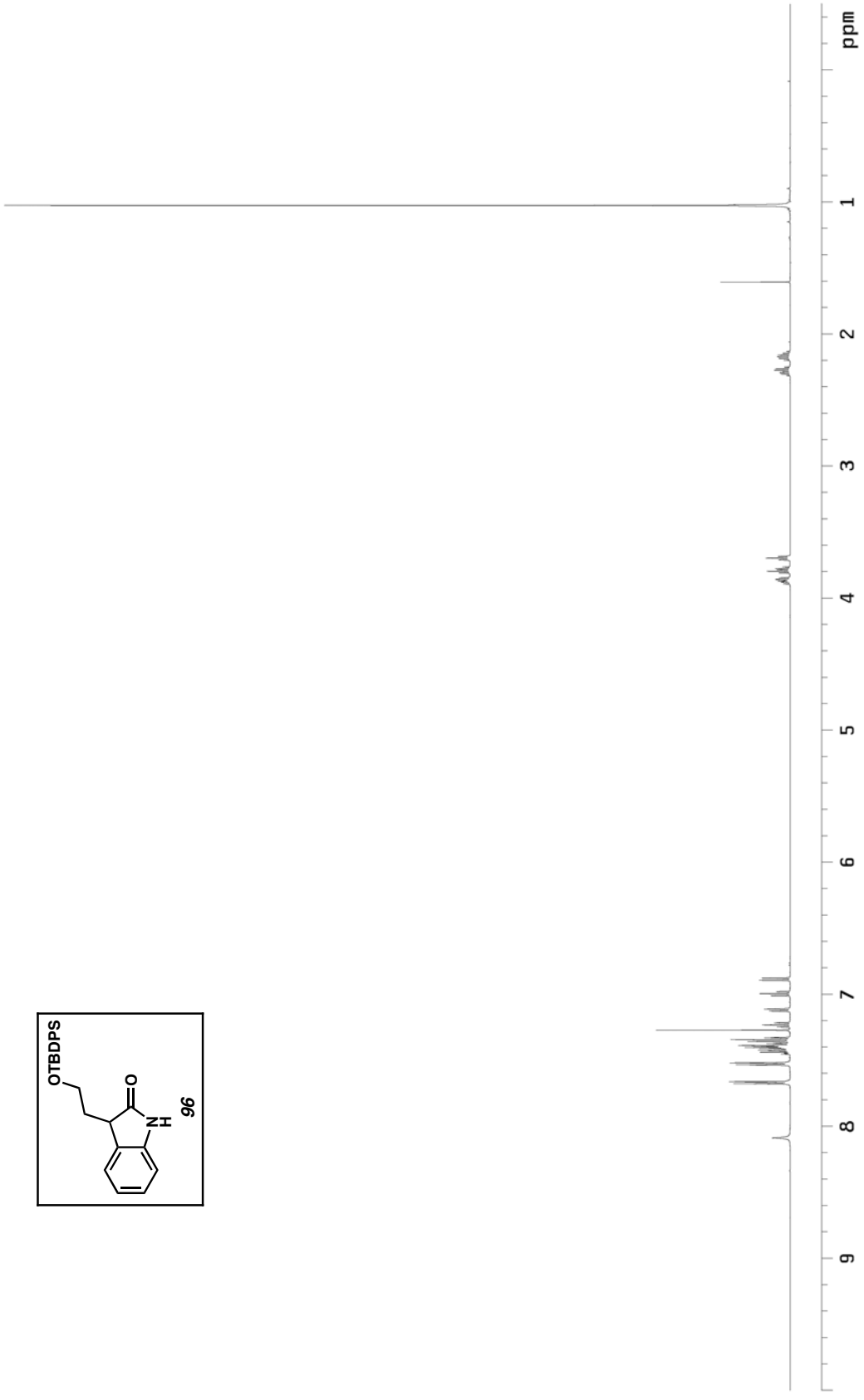


Figure A3.7.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **96**.

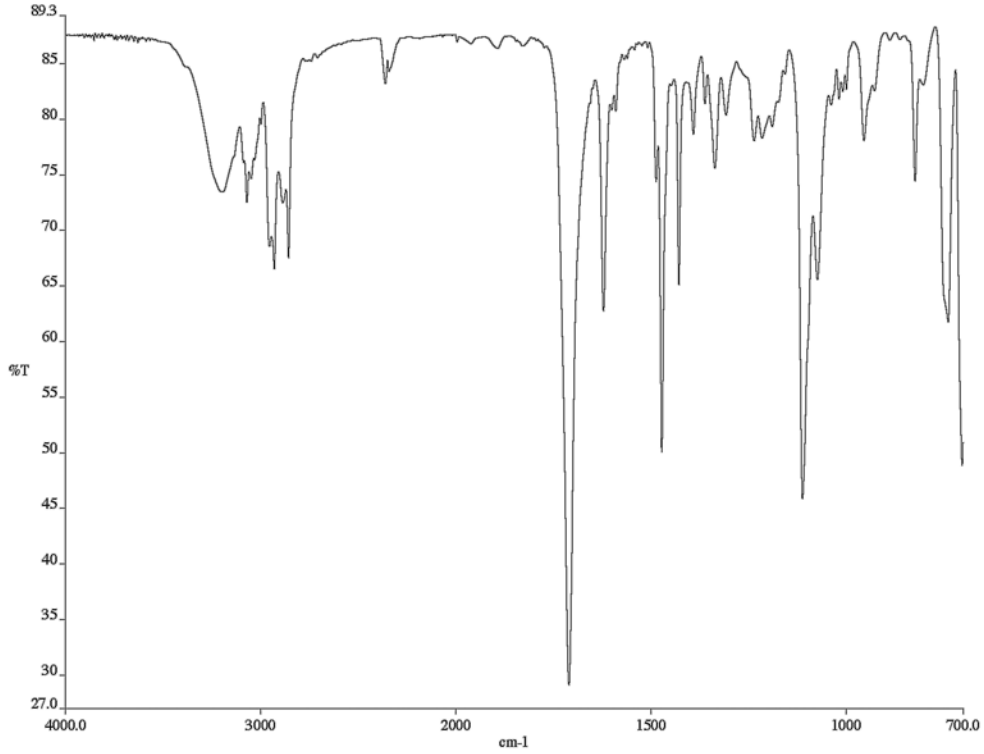


Figure A3.7.2 Infrared spectrum (thin film/NaCl) of compound **96**.

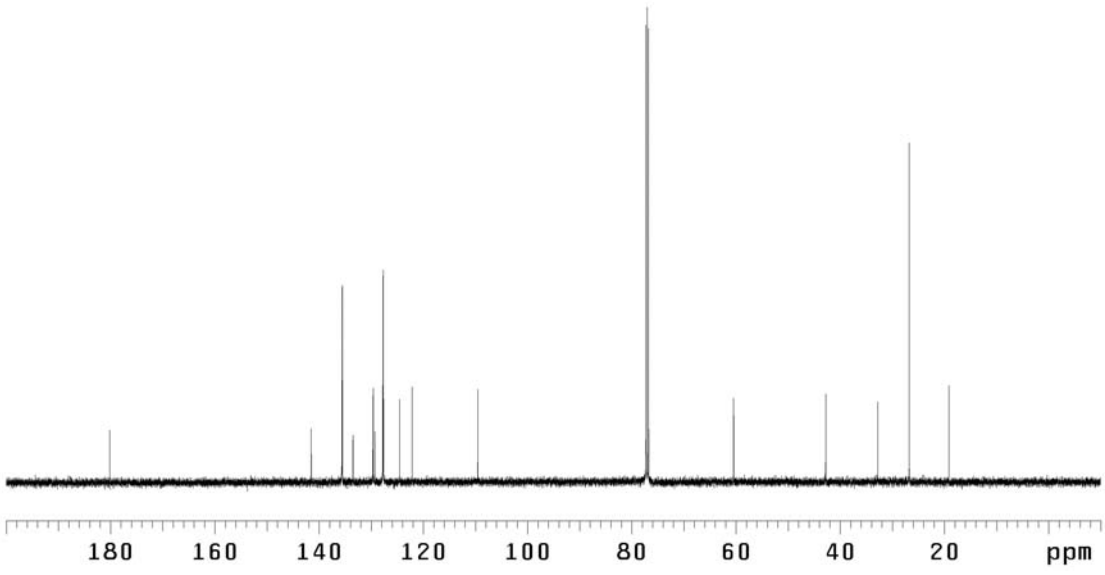


Figure A3.7.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **96**.

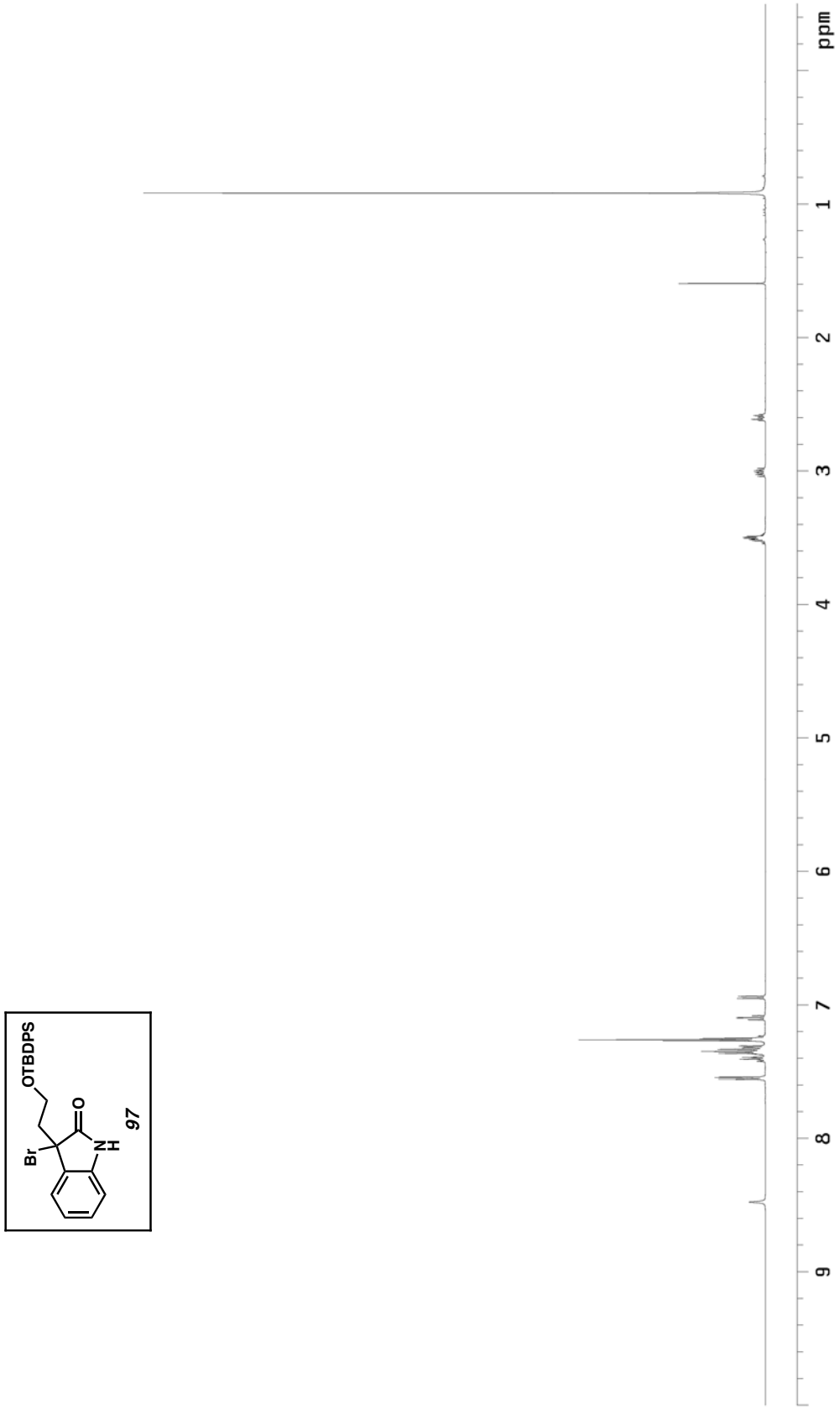


Figure A3.8.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **97**.

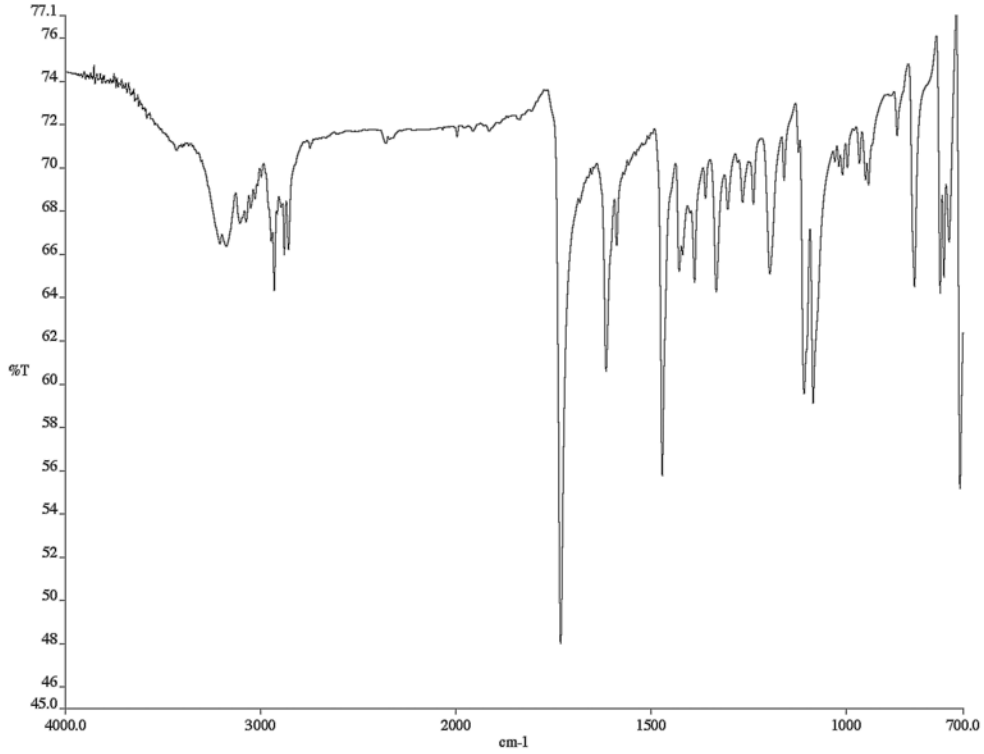


Figure A3.8.2 Infrared spectrum (thin film/NaCl) of compound **97**.

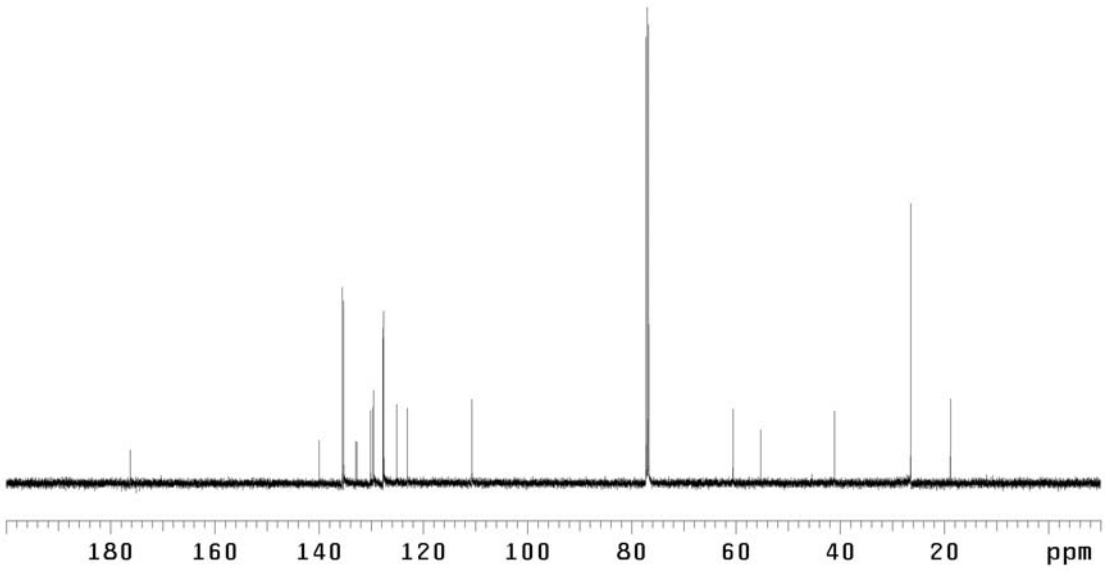


Figure A3.8.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **97**.

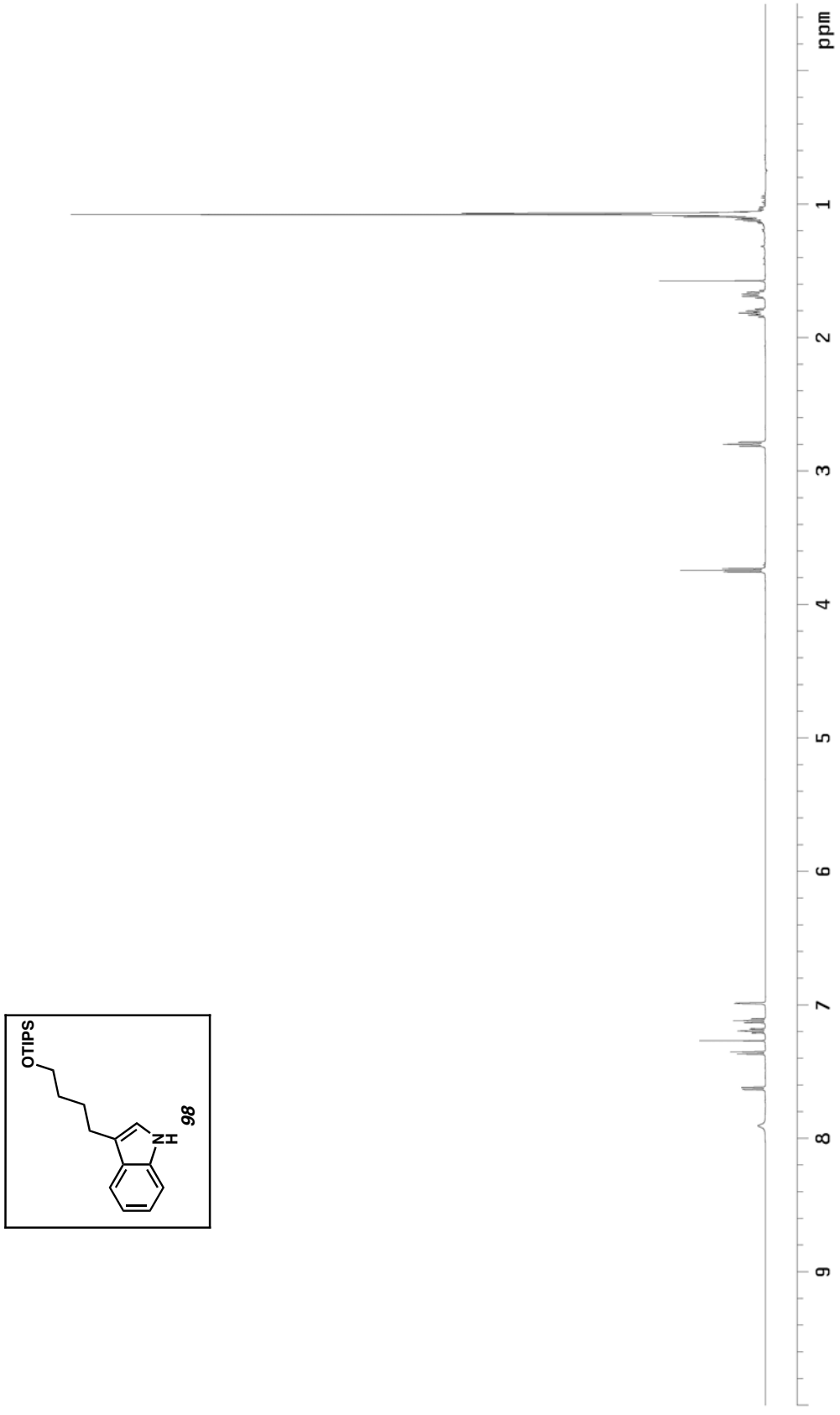


Figure A3.9.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **98**.

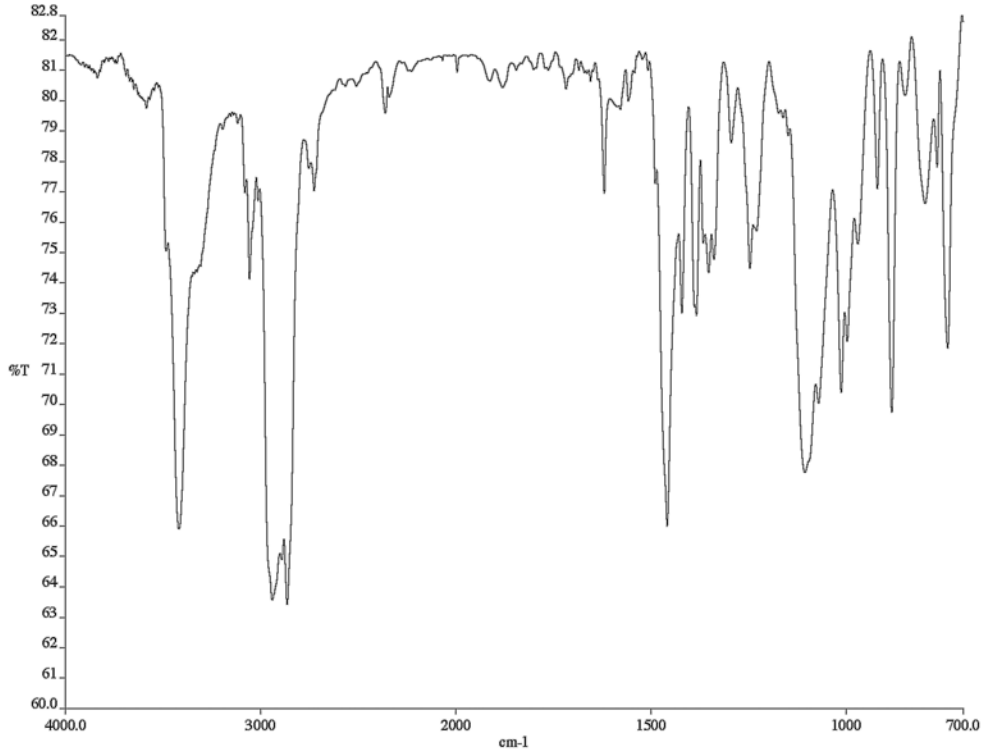


Figure A3.9.2 Infrared spectrum (thin film/NaCl) of compound **98**.

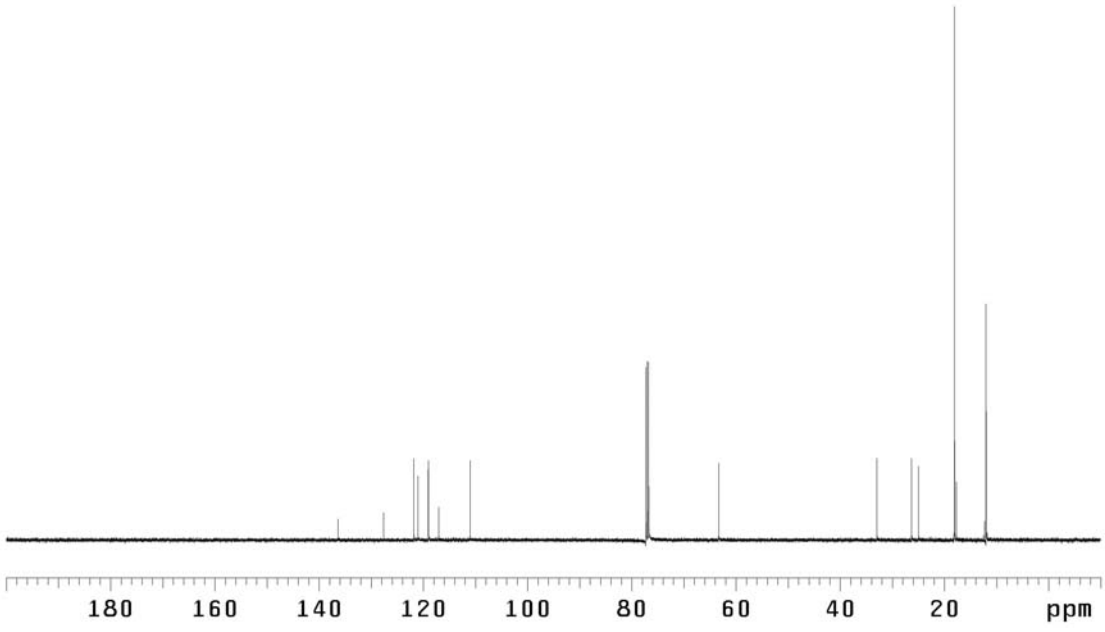


Figure A3.9.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **98**.

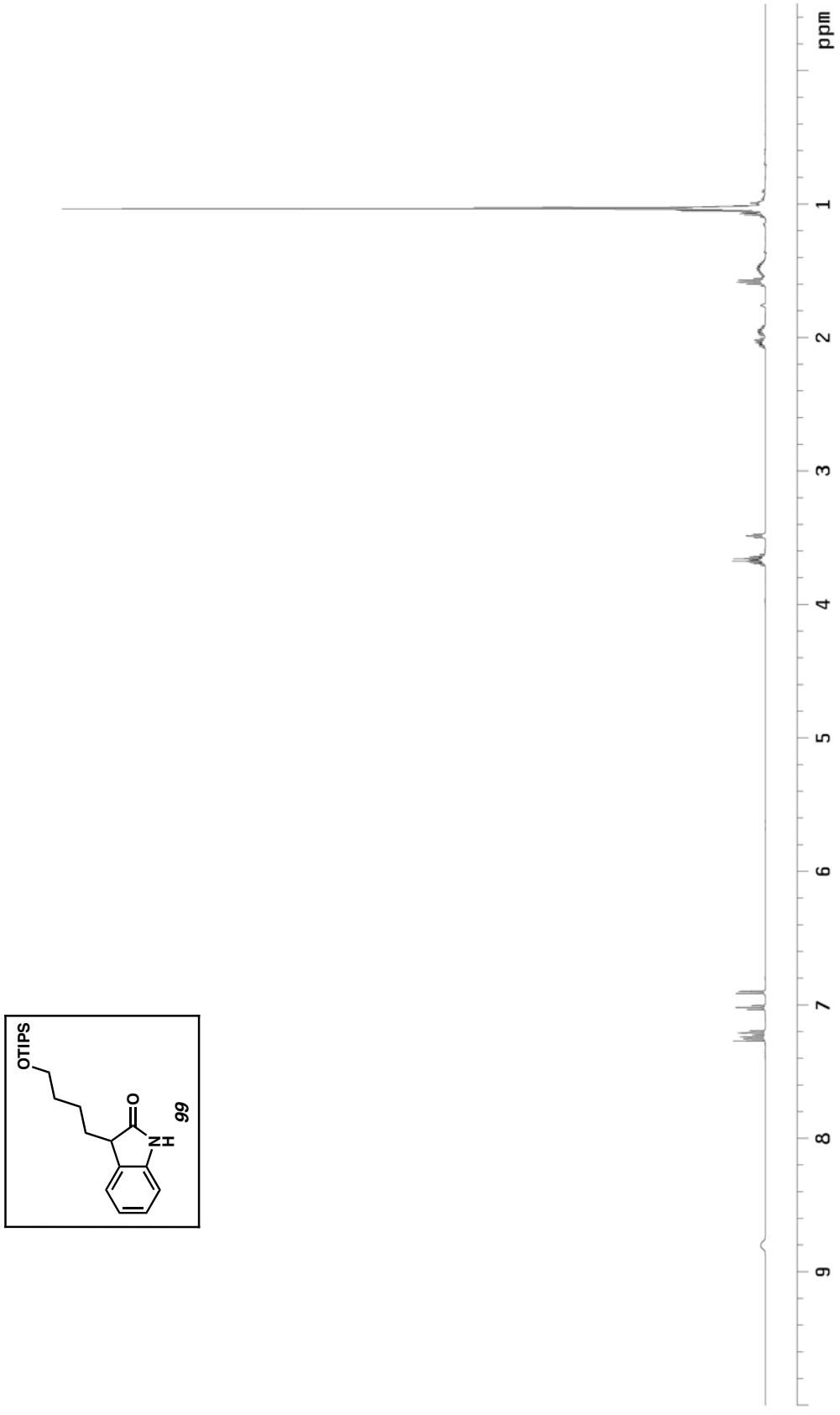


Figure A3.10.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **99**.

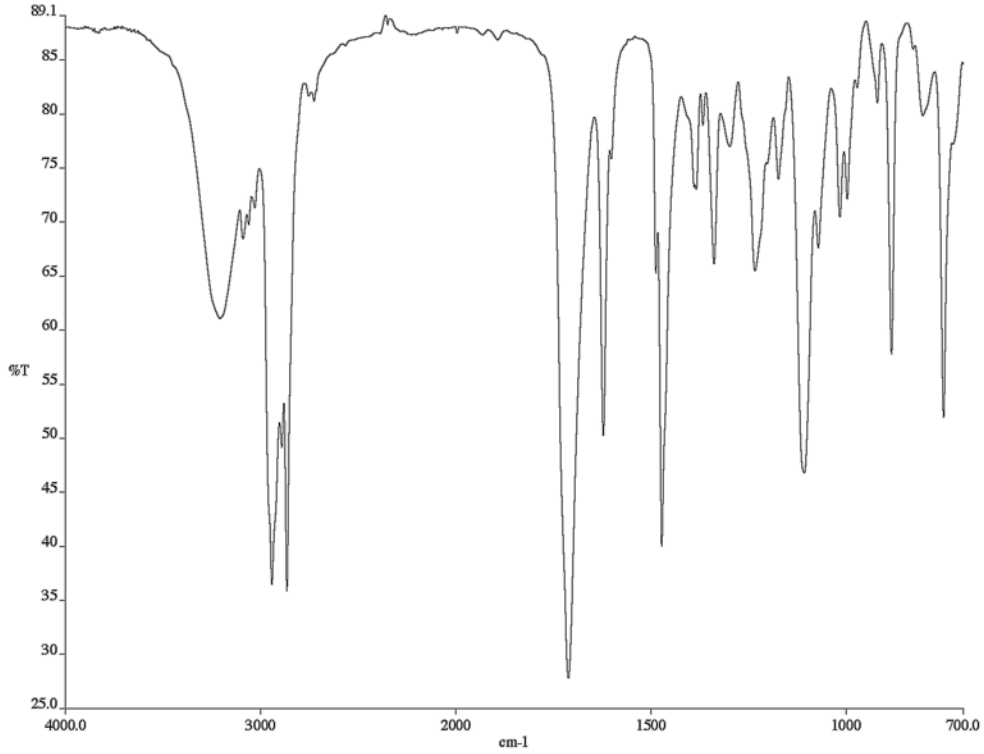


Figure A3.10.2 Infrared spectrum (thin film/NaCl) of compound **99**.

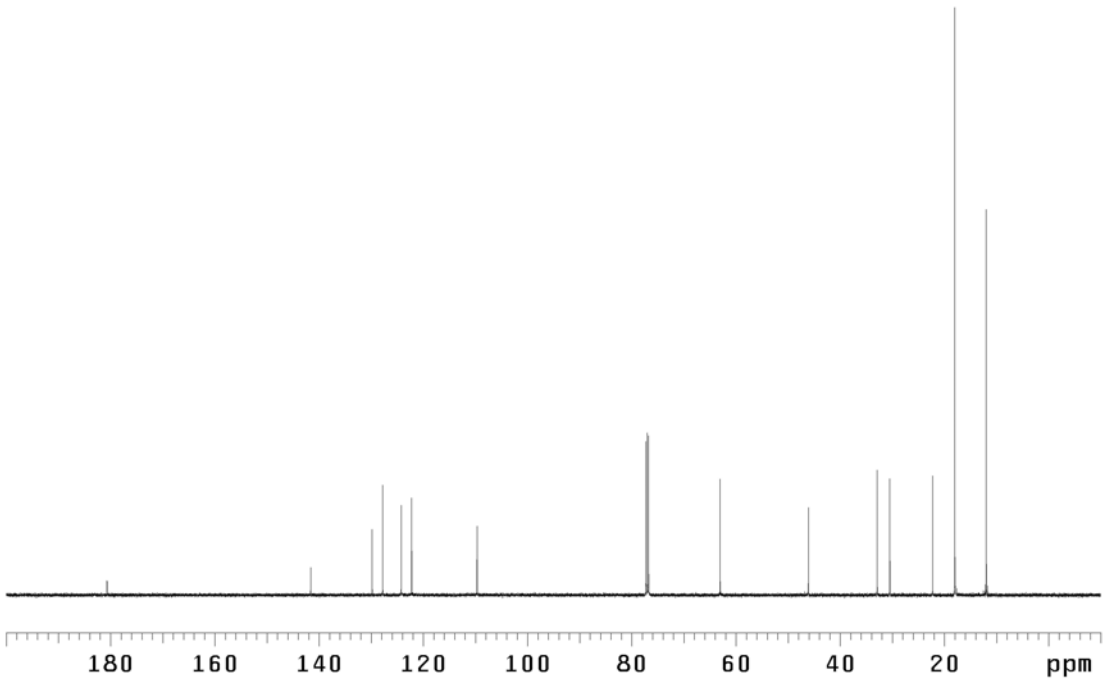


Figure A3.10.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **99**.

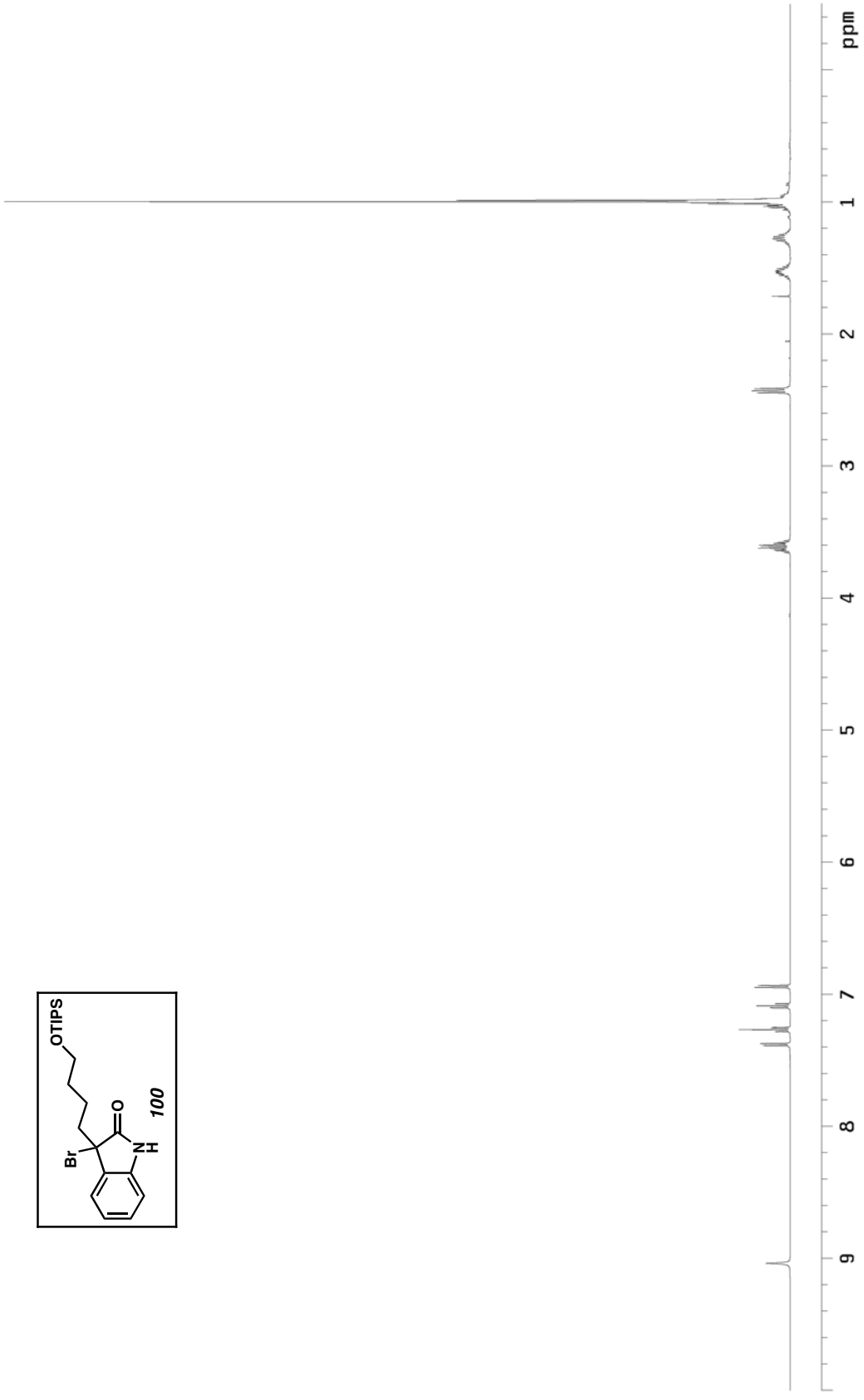


Figure A3.11.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **100**.

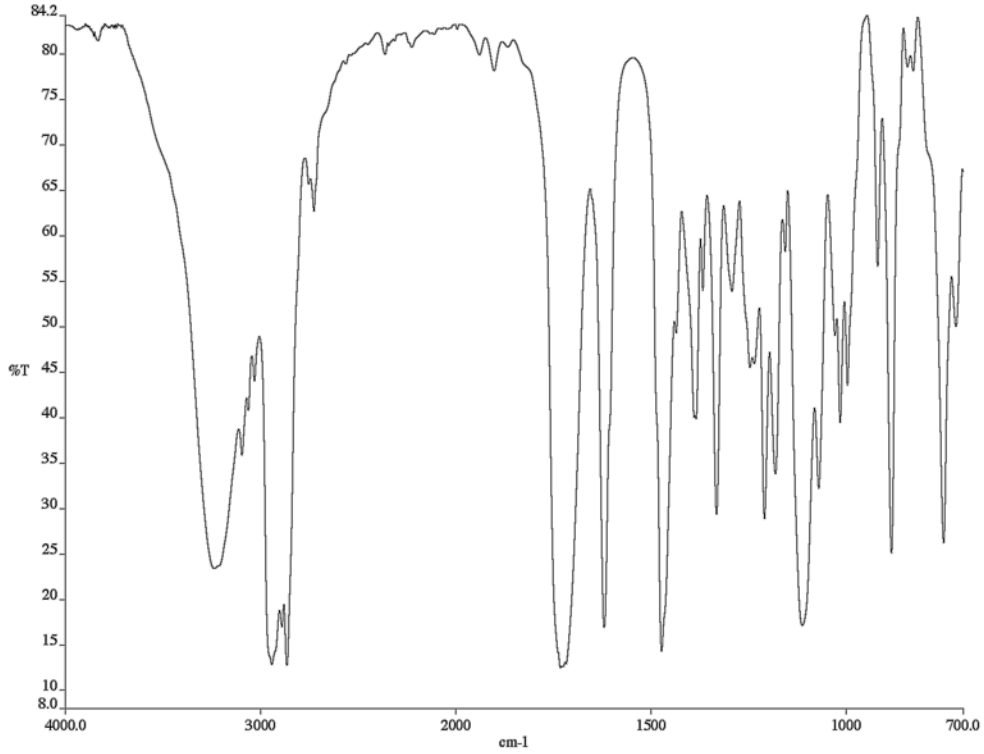


Figure A3.11.2 Infrared spectrum (thin film/NaCl) of compound **100**.

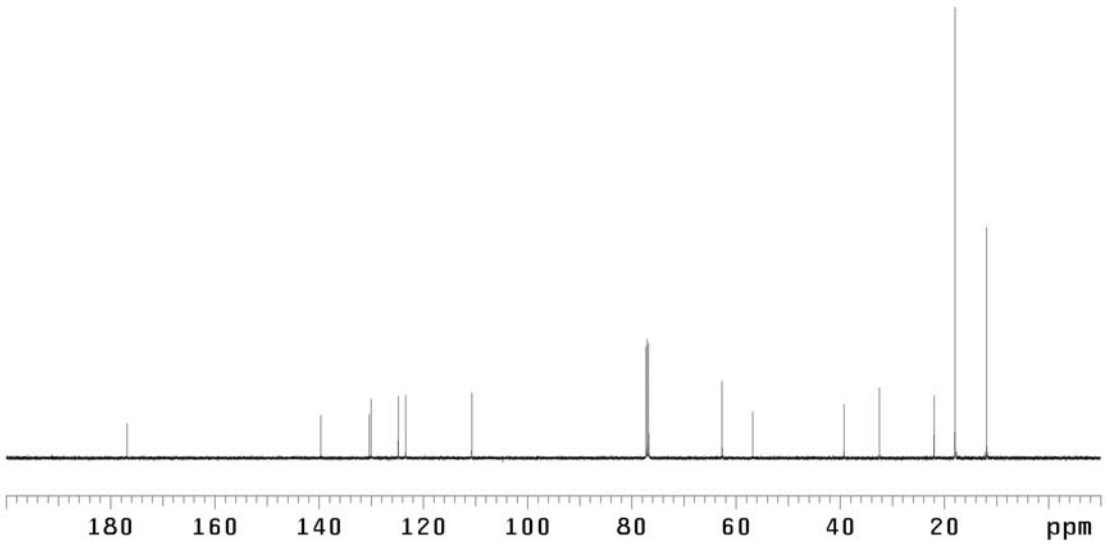
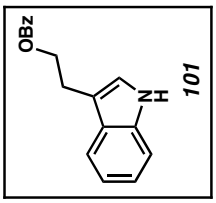


Figure A3.11.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **100**.



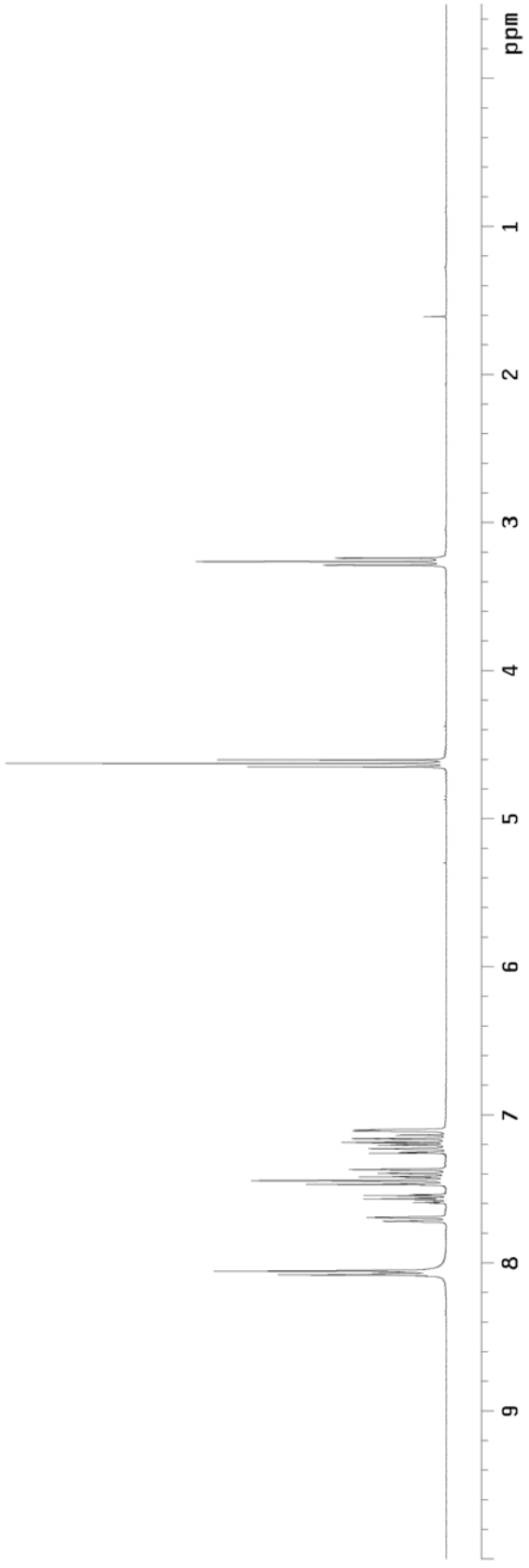


Figure A3.12.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **101**.

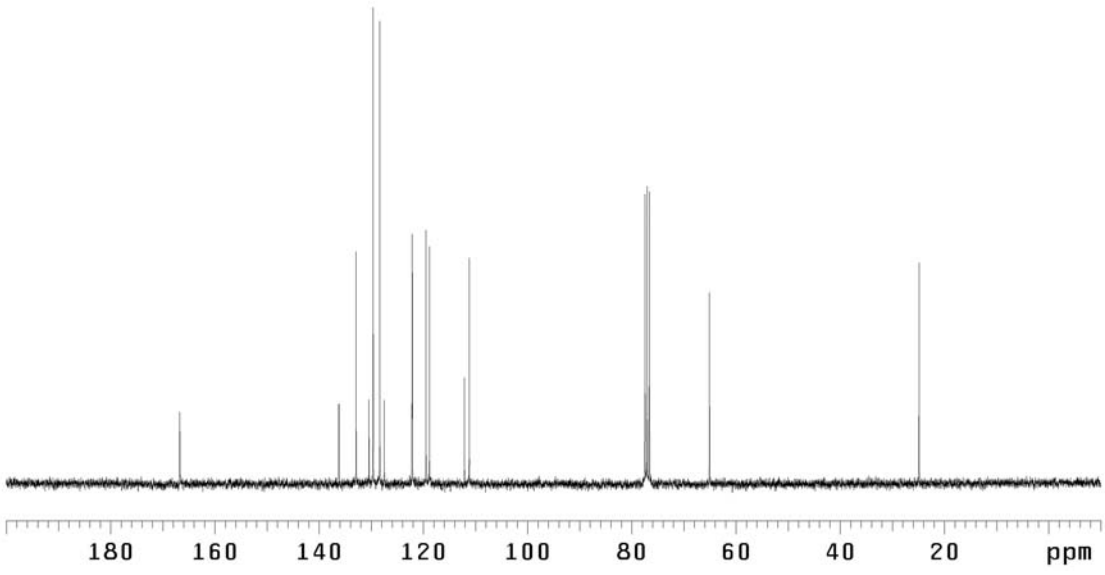


Figure A3.12.2 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **101**.

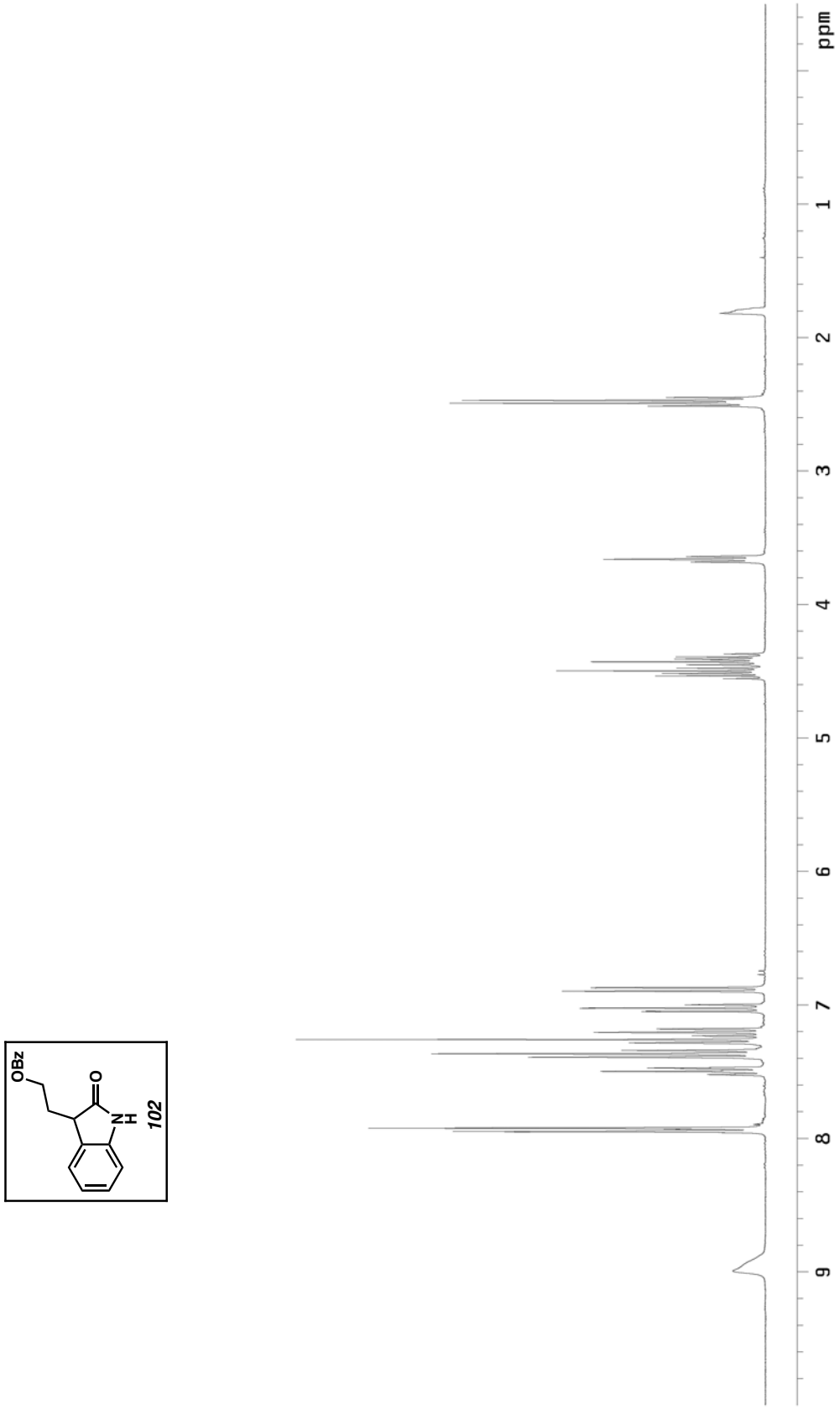


Figure A3.13.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **102**.

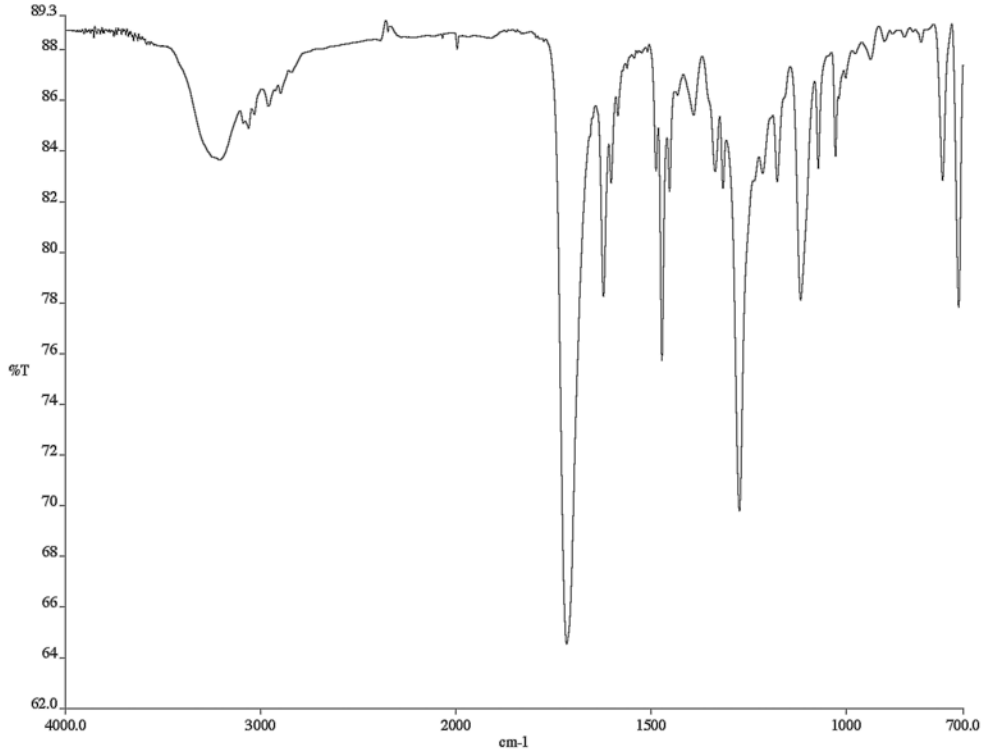


Figure A3.13.2 Infrared spectrum (thin film/NaCl) of compound **102**.

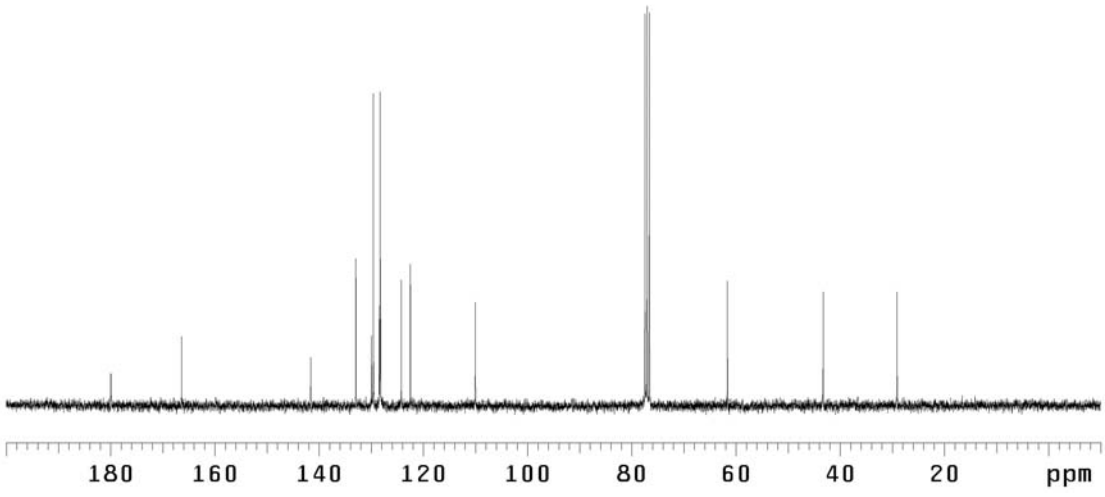


Figure A3.13.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **102**.

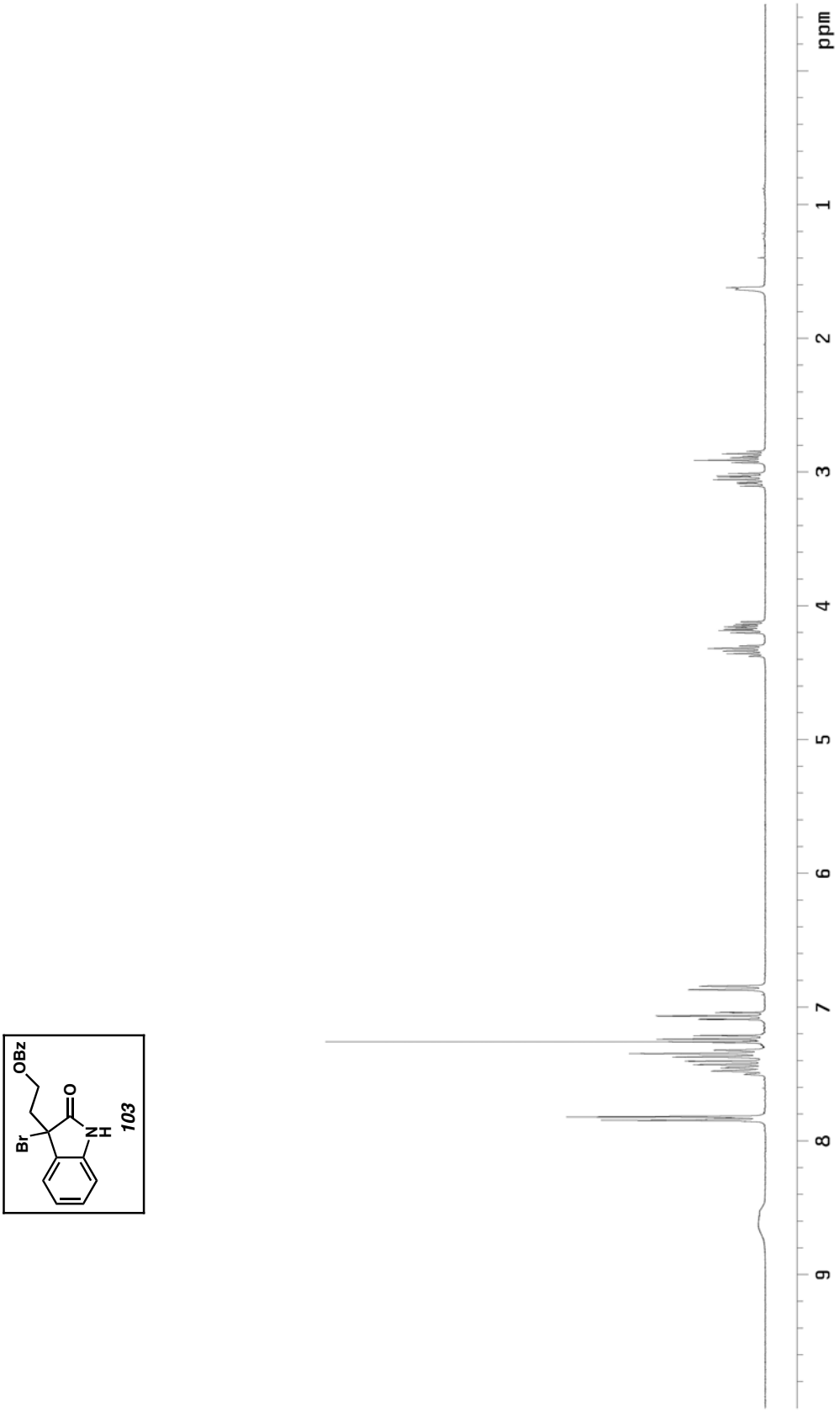


Figure A3.14.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **103**.

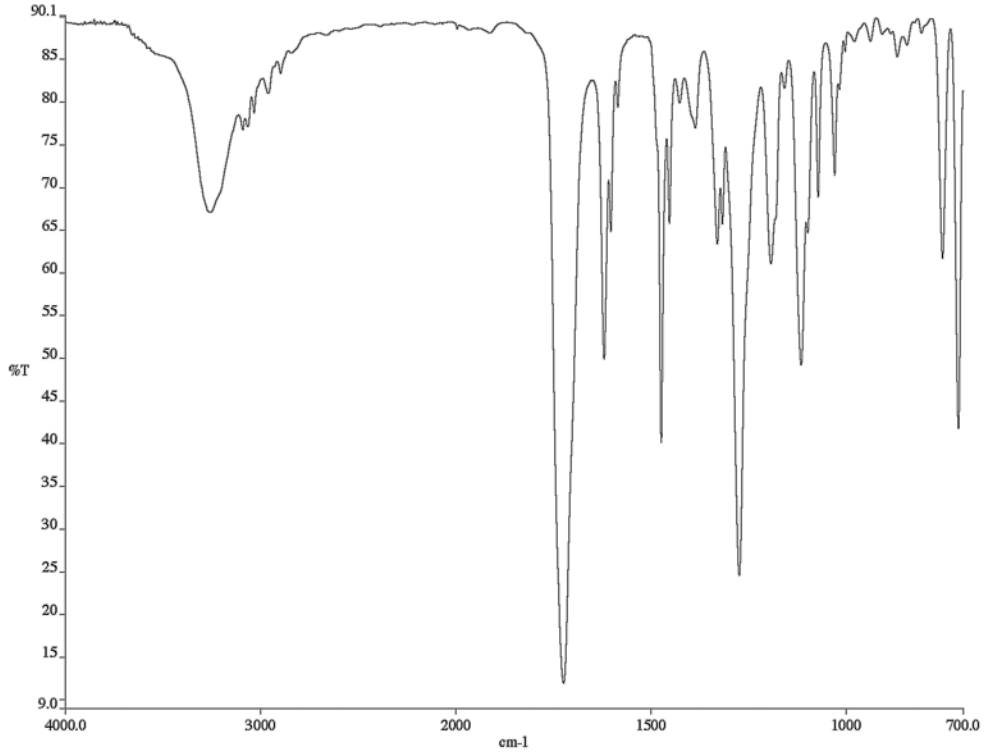


Figure A3.14.2 Infrared spectrum (thin film/NaCl) of compound **103**.

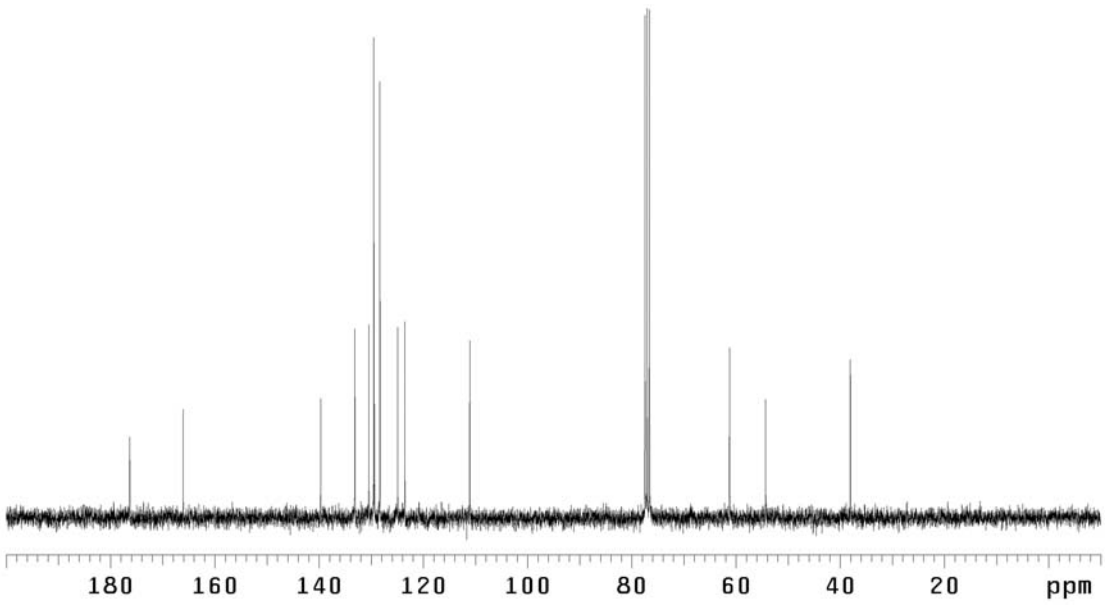


*Figure A3.14.*3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **103**.

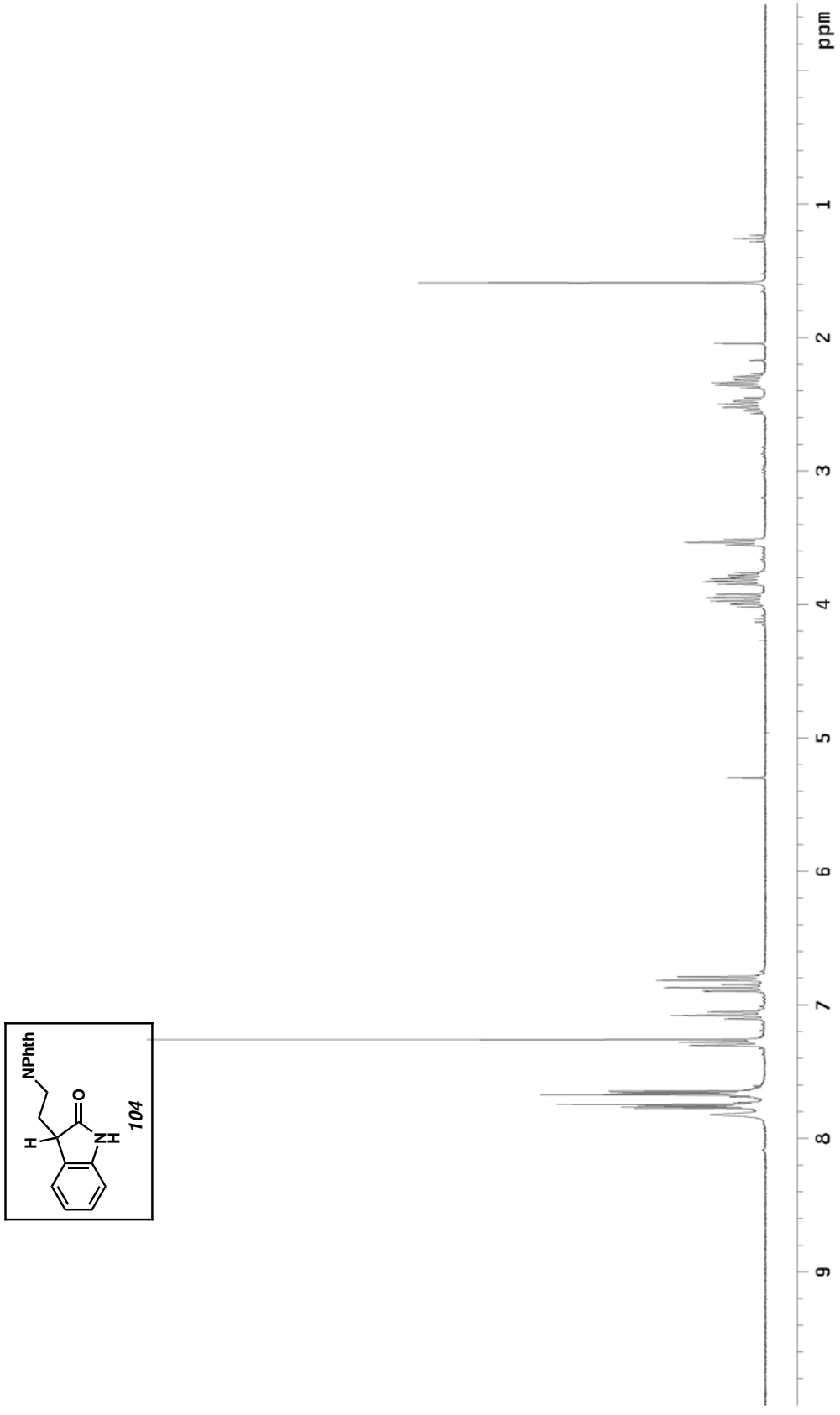


Figure A3.15.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **104**.

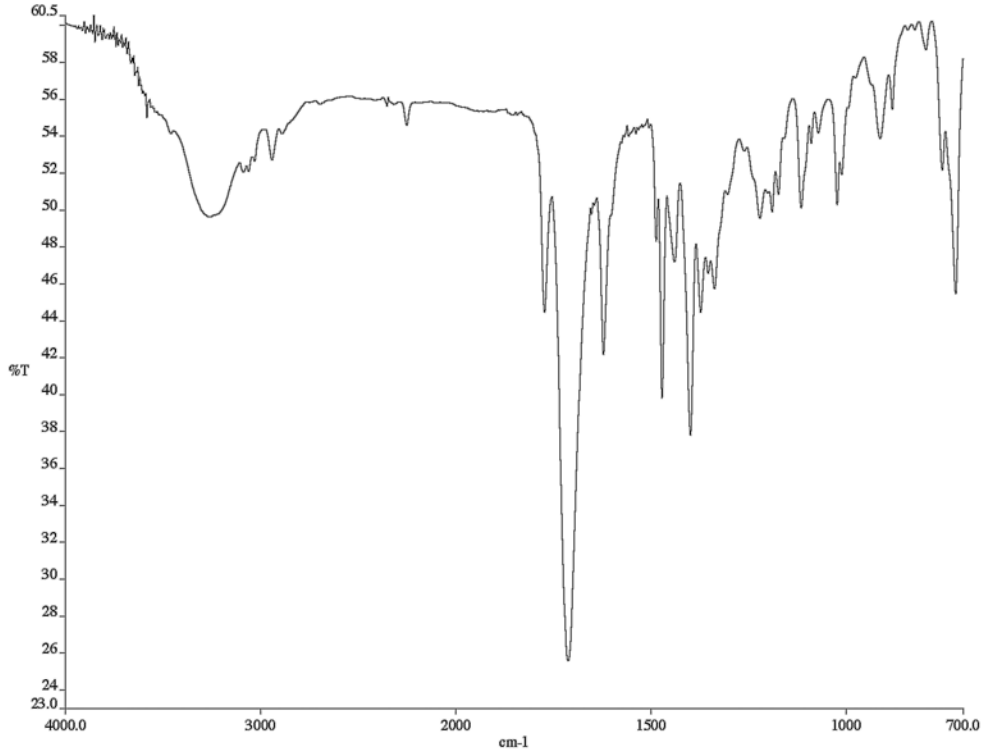


Figure A3.15.2 Infrared spectrum (thin film/NaCl) of compound **104**.

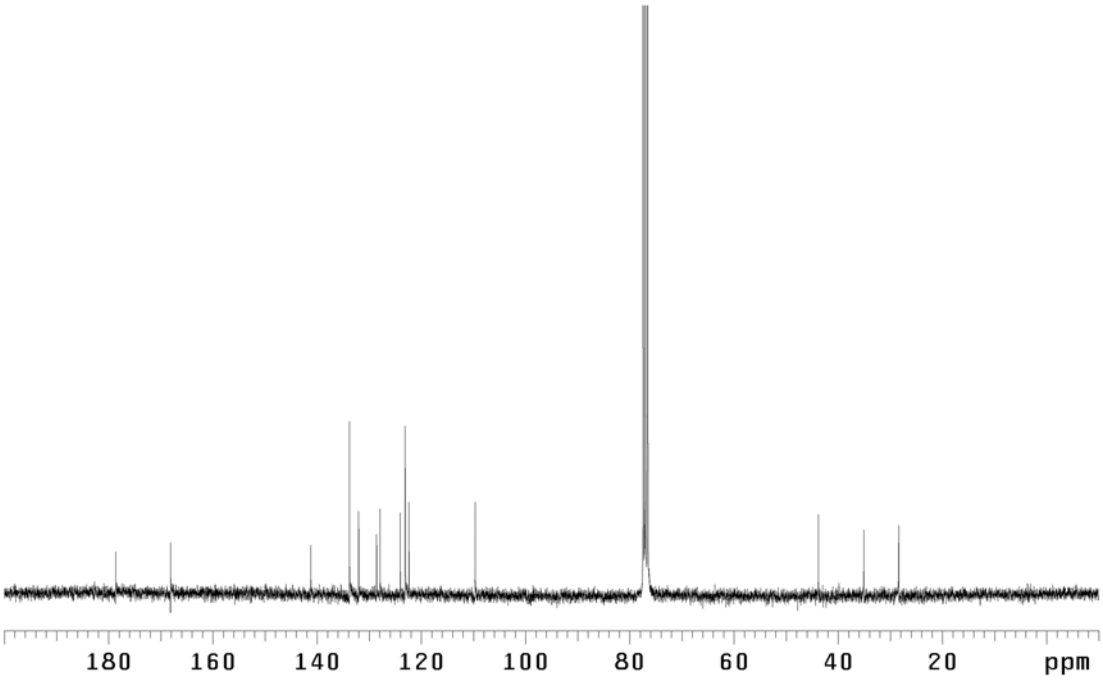
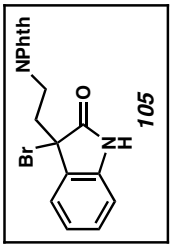


Figure A3.15.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **104**.



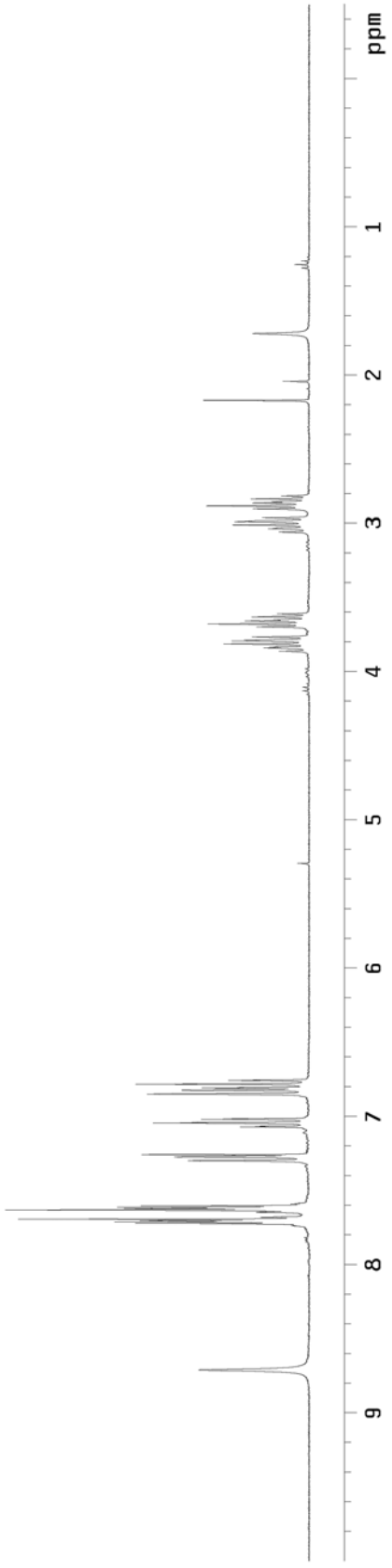


Figure A3.16.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **105**.

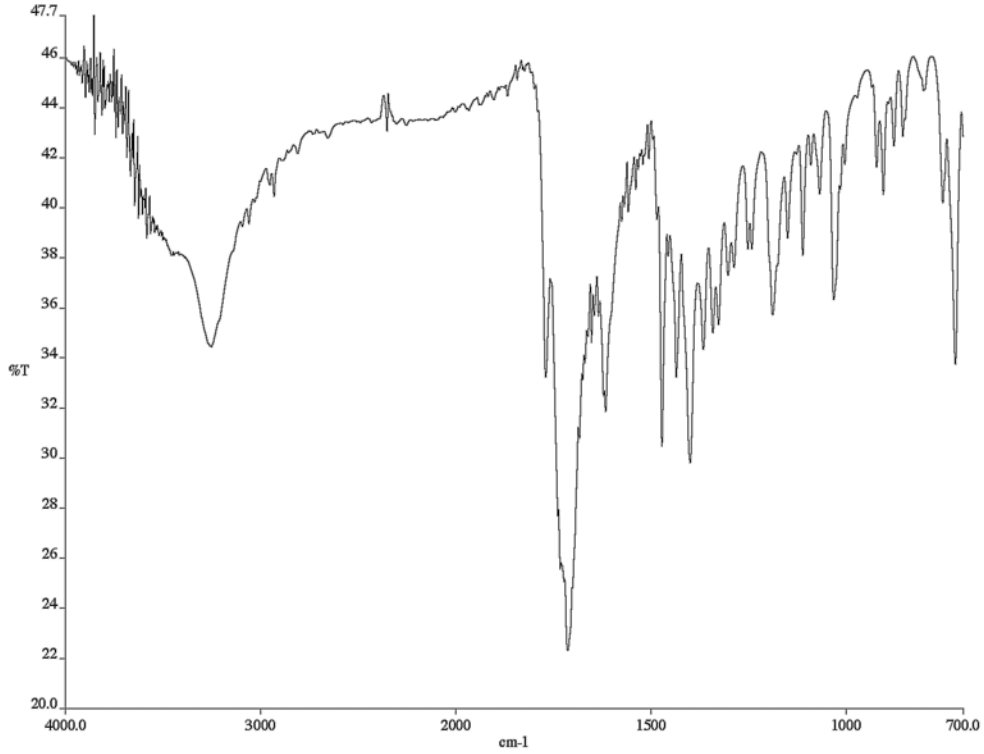


Figure A3.16.2 Infrared spectrum (thin film/NaCl) of compound **105**.

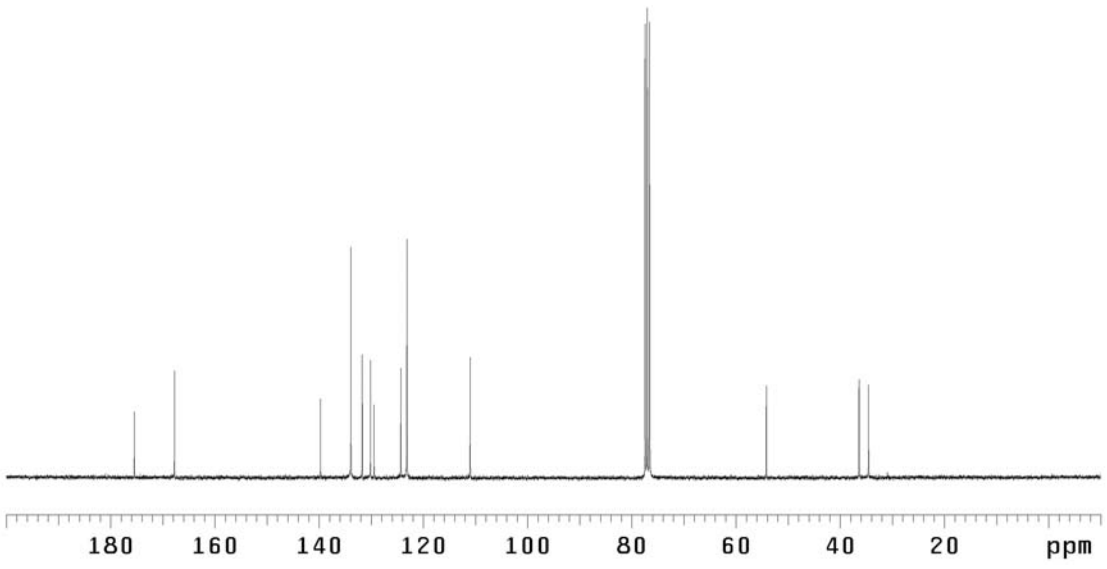


Figure A3.16.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **105**.

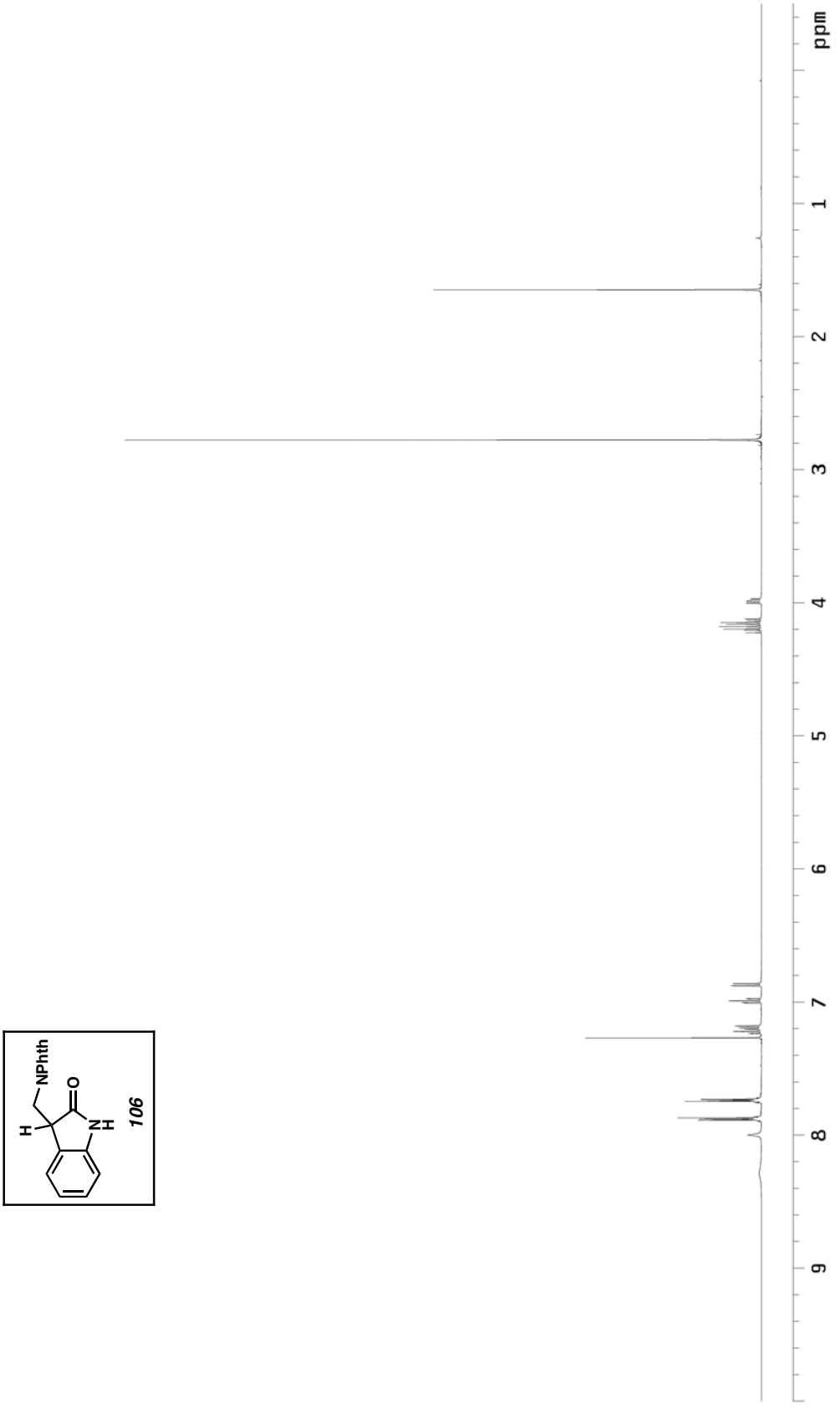


Figure A3.17.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **106** with succinimide impurity.

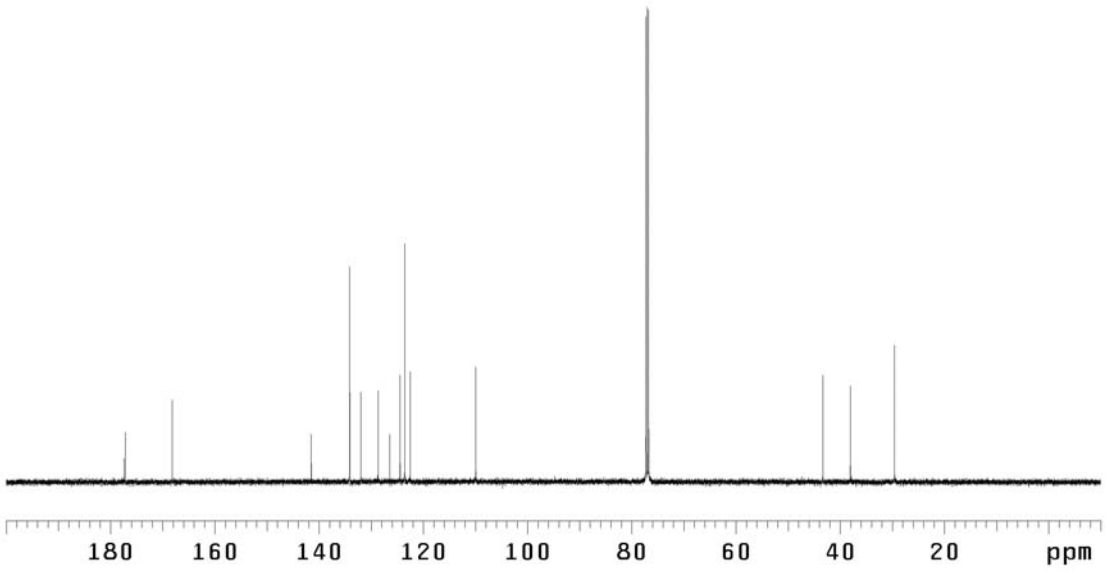
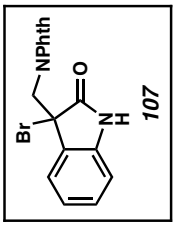


Figure A3.17.2 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **106** with succinimide impurity.



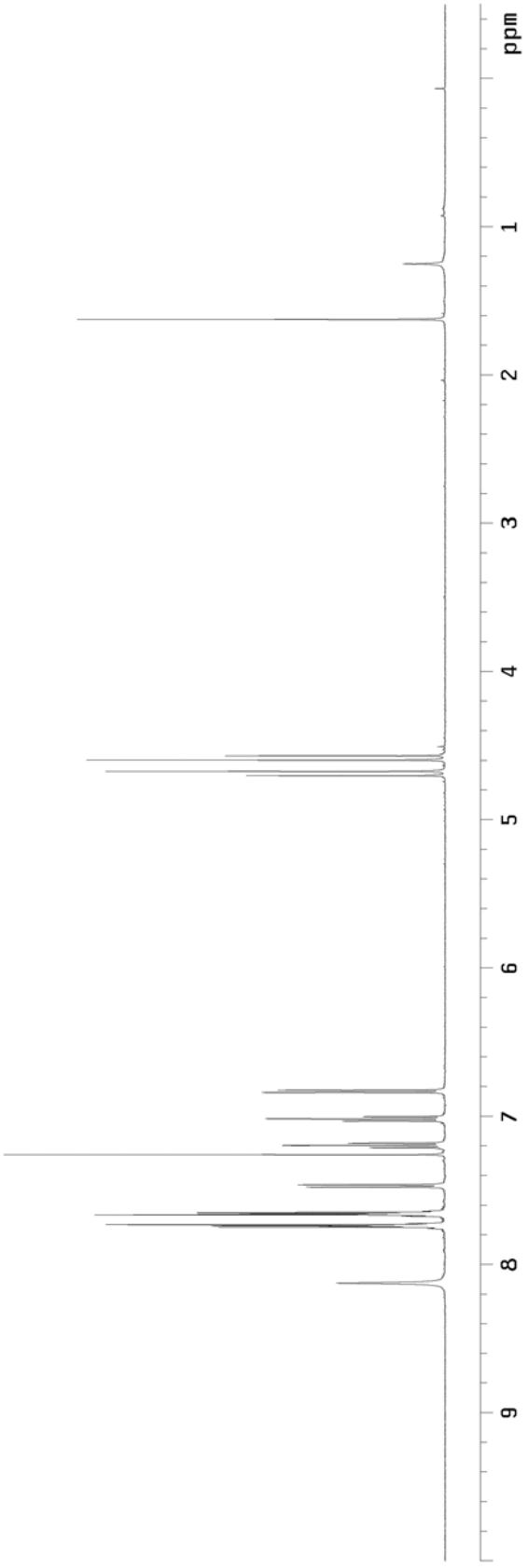


Figure A3.18.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **107**.

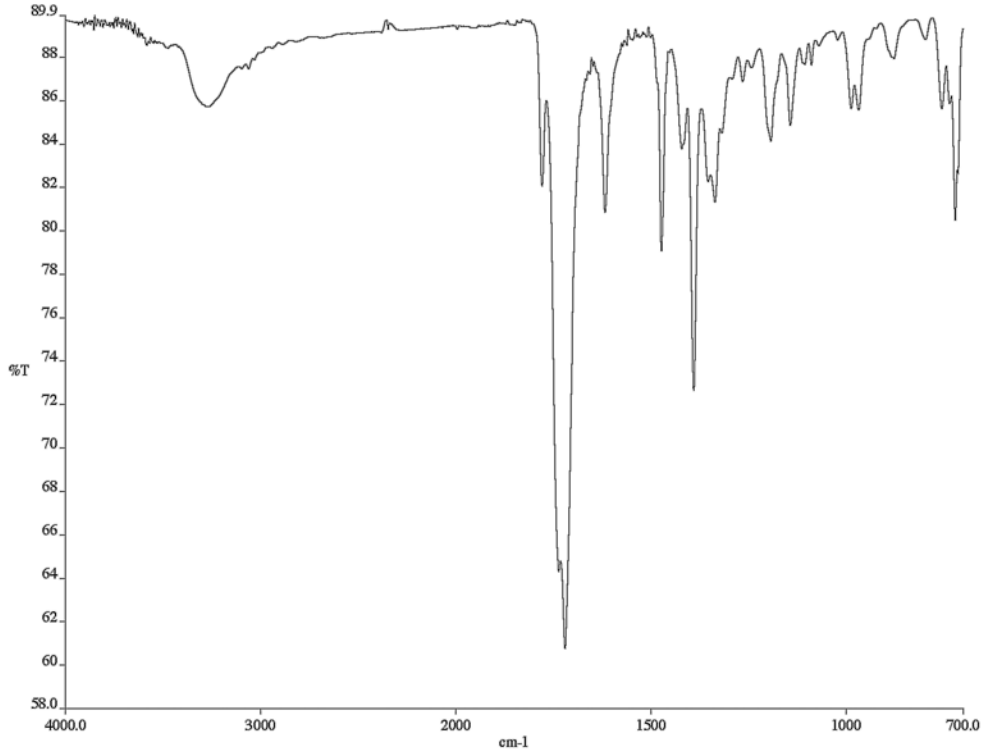


Figure A3.18.2 Infrared spectrum (thin film/NaCl) of compound **107**.

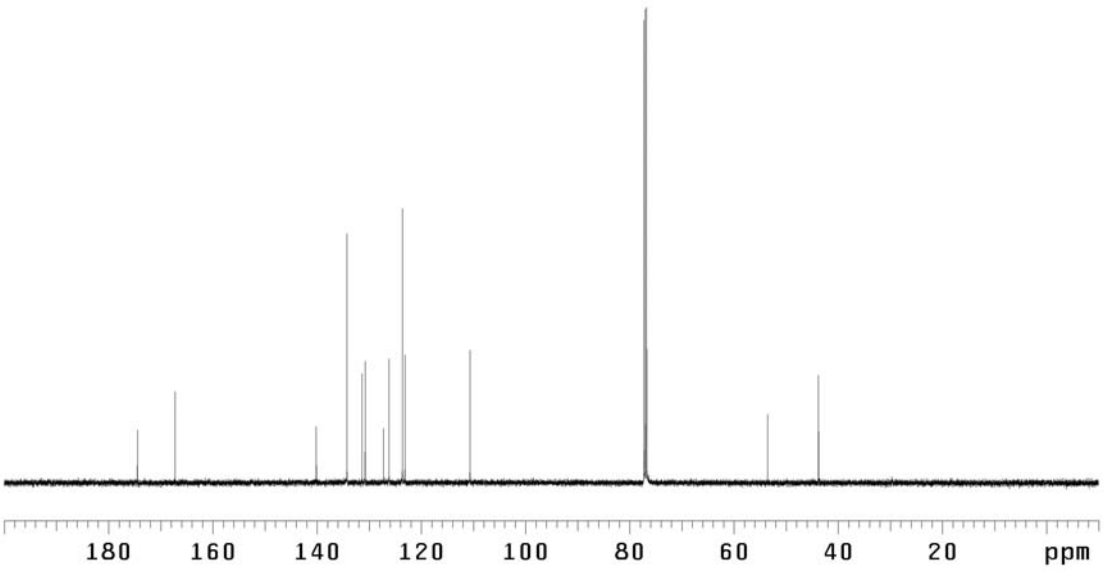


Figure A3.18.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **107**.

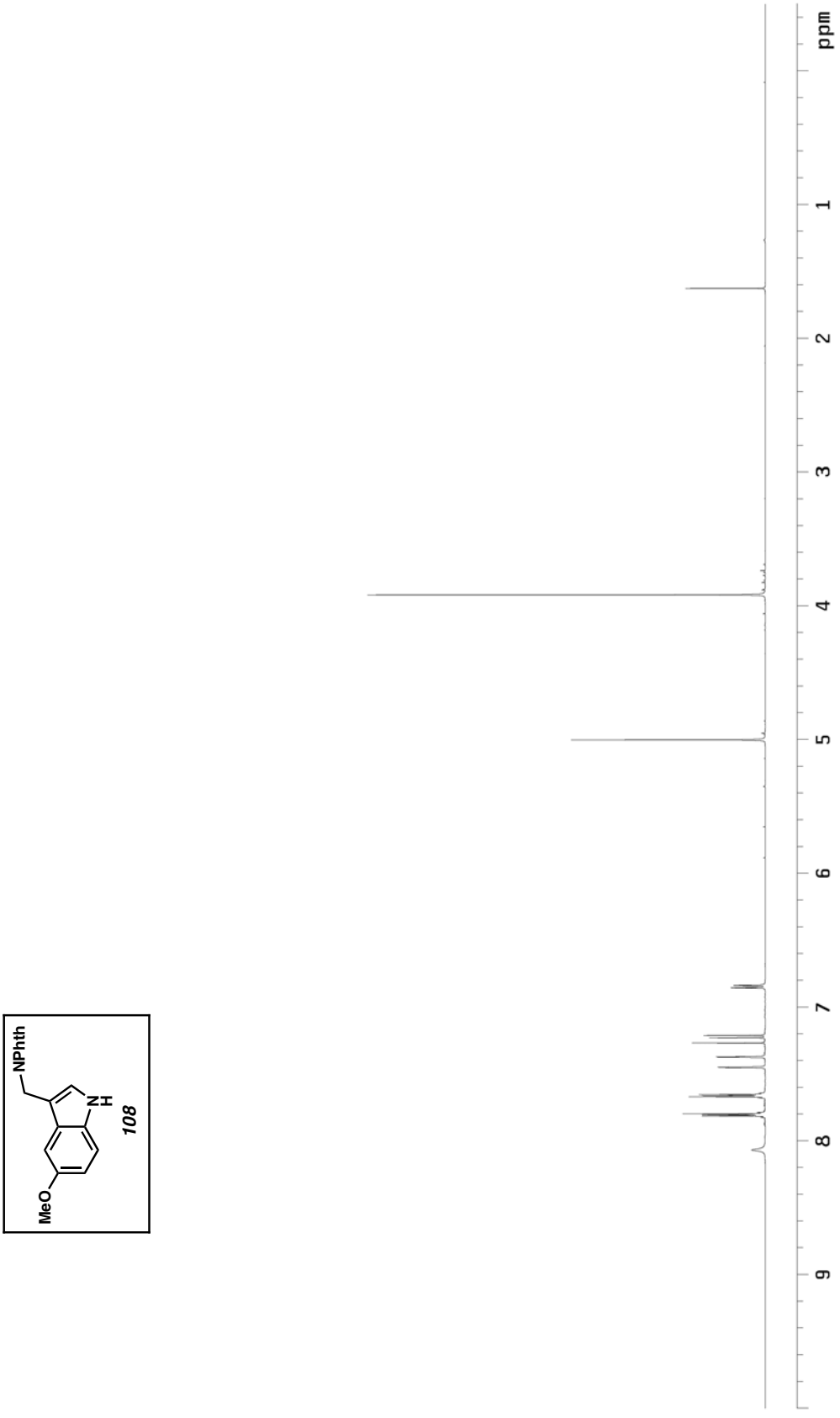


Figure A3.19.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **108**.

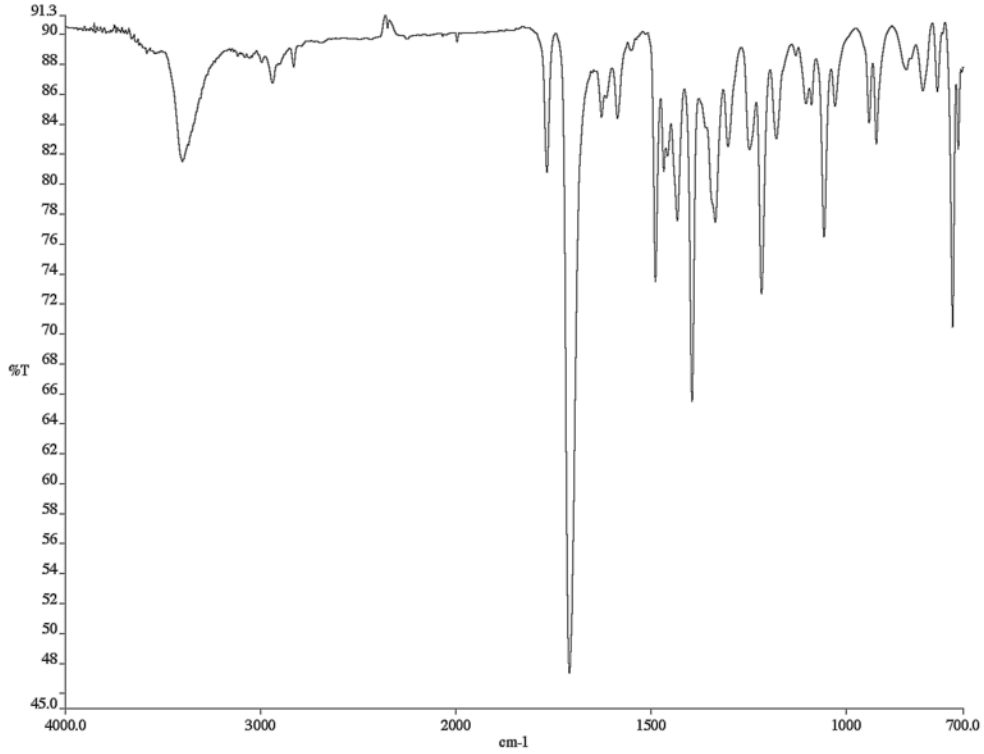


Figure A3.19.2 Infrared spectrum (thin film/NaCl) of compound **108**.

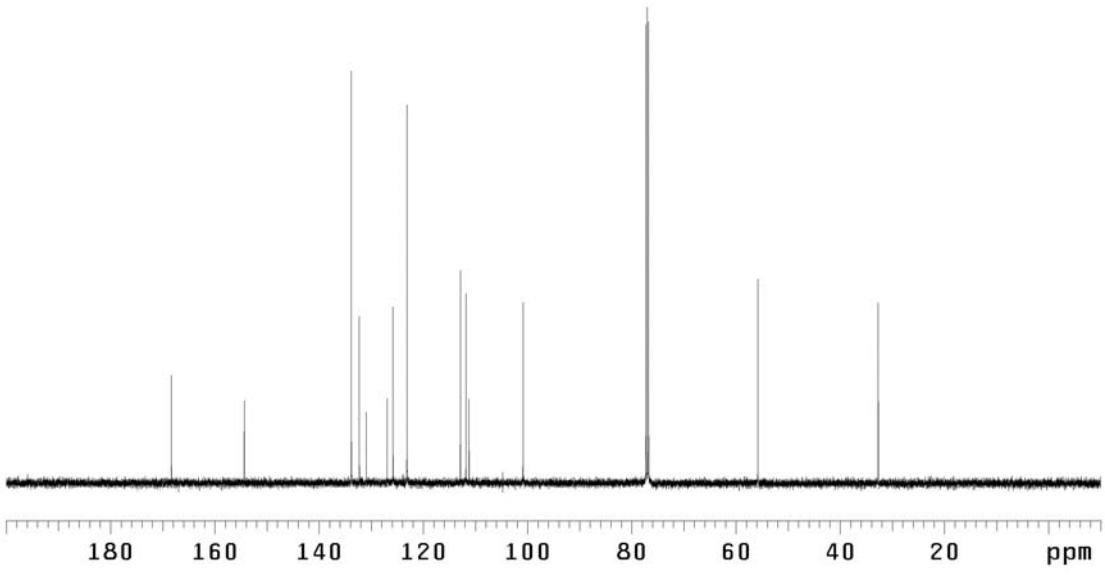


Figure A3.19.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **108**.

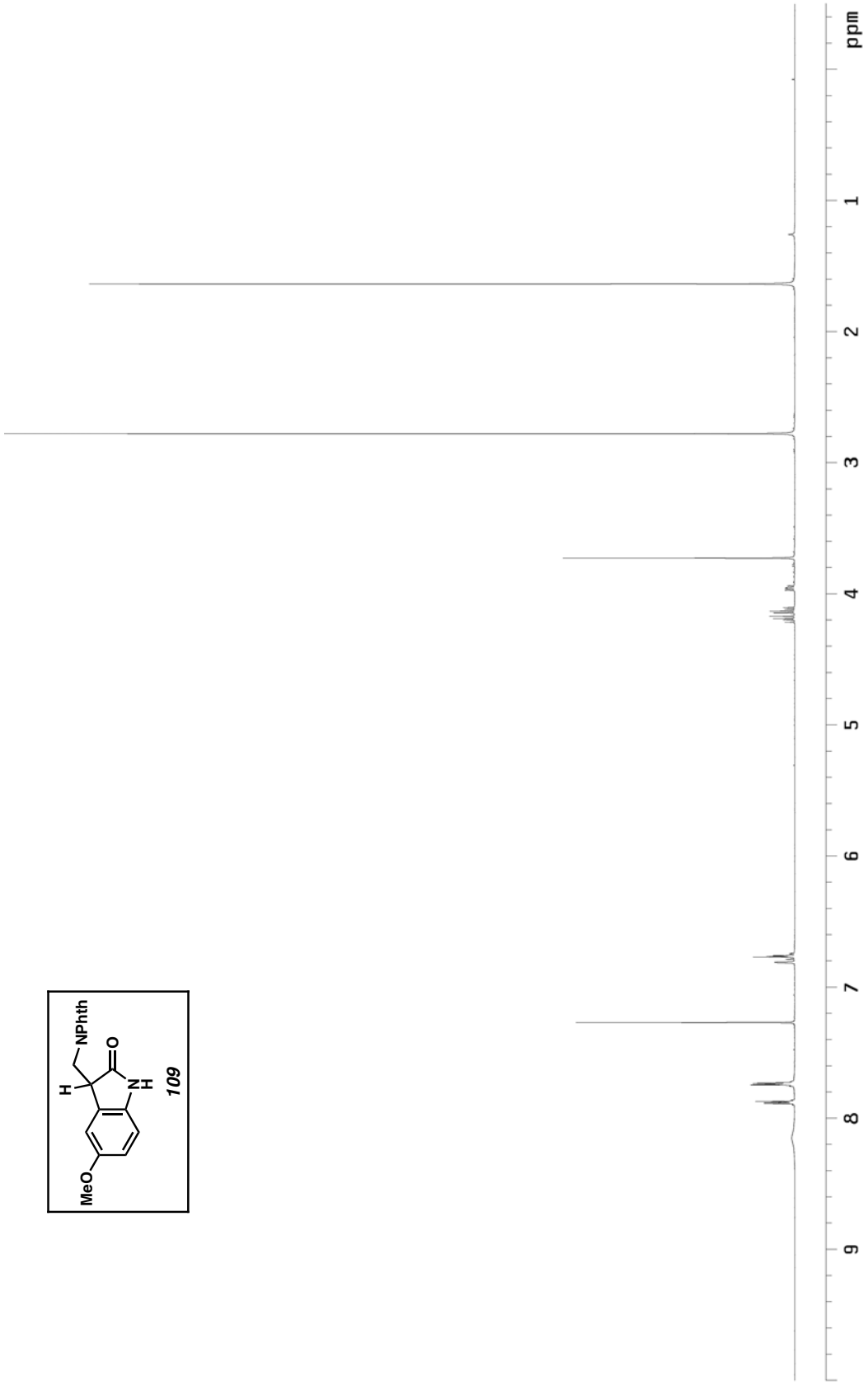


Figure A3.20.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **109** with succinimide impurity.

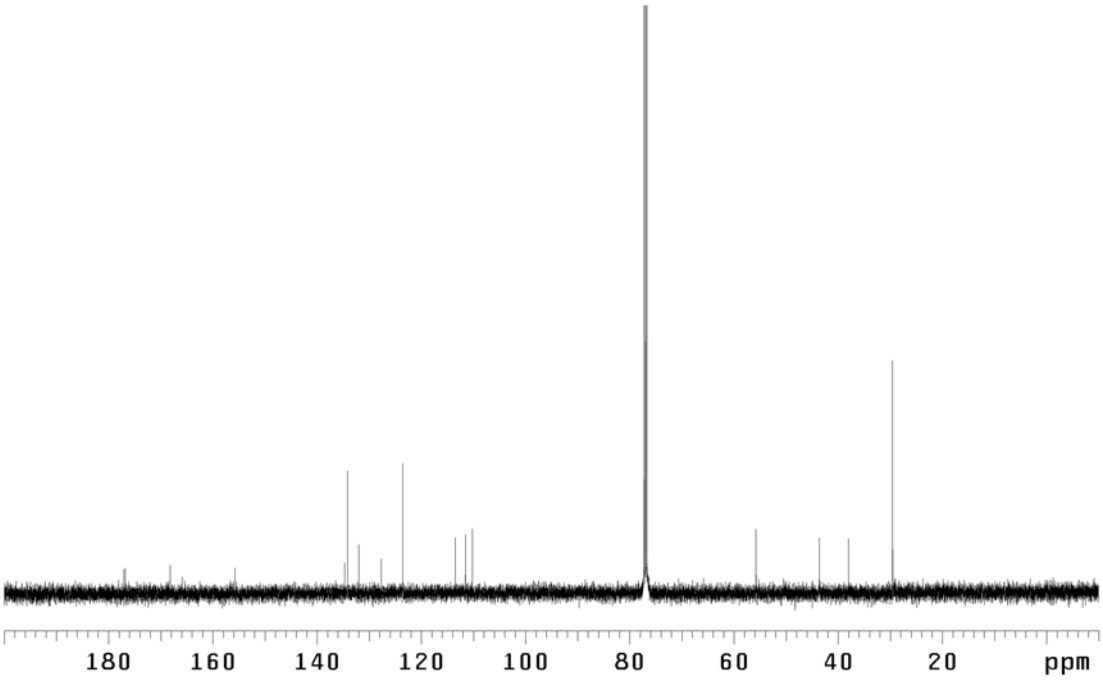


Figure A3.20.2 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **109** with succinimide impurity.

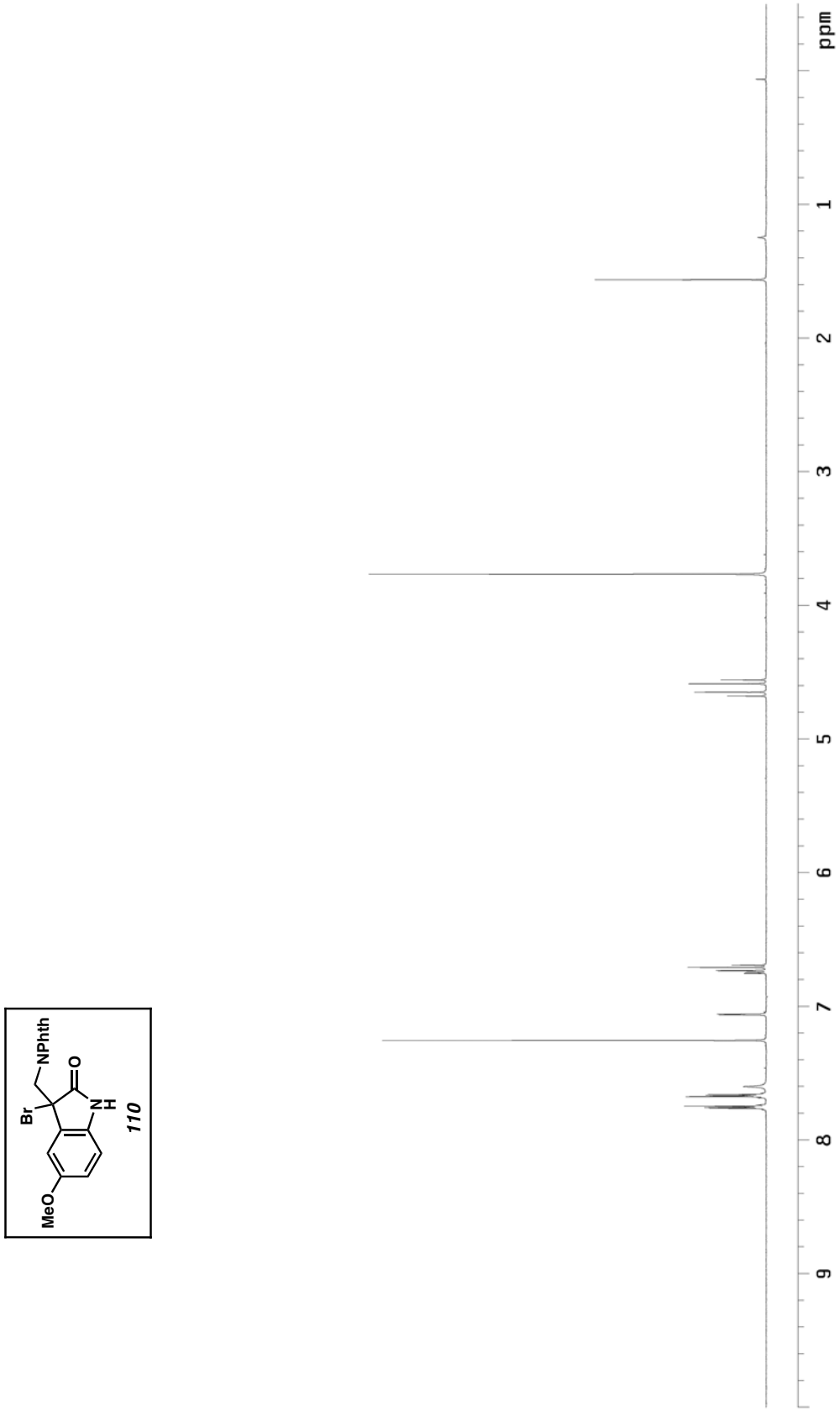


Figure A3.21.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **110**.

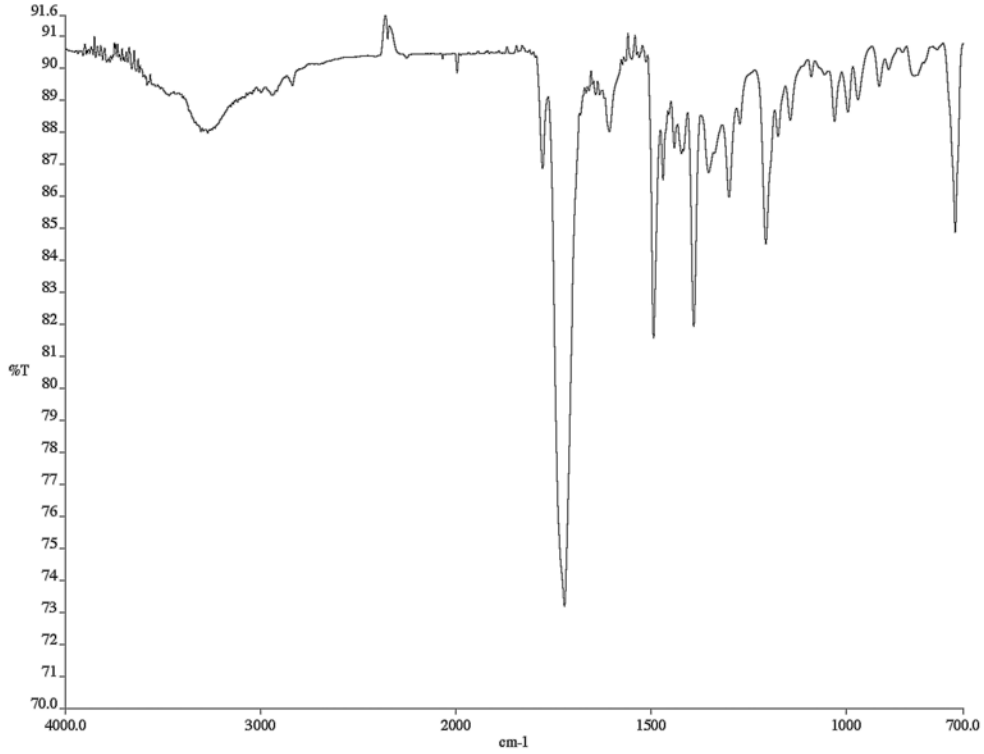


Figure A3.21.2 Infrared spectrum (thin film/NaCl) of compound **110**.

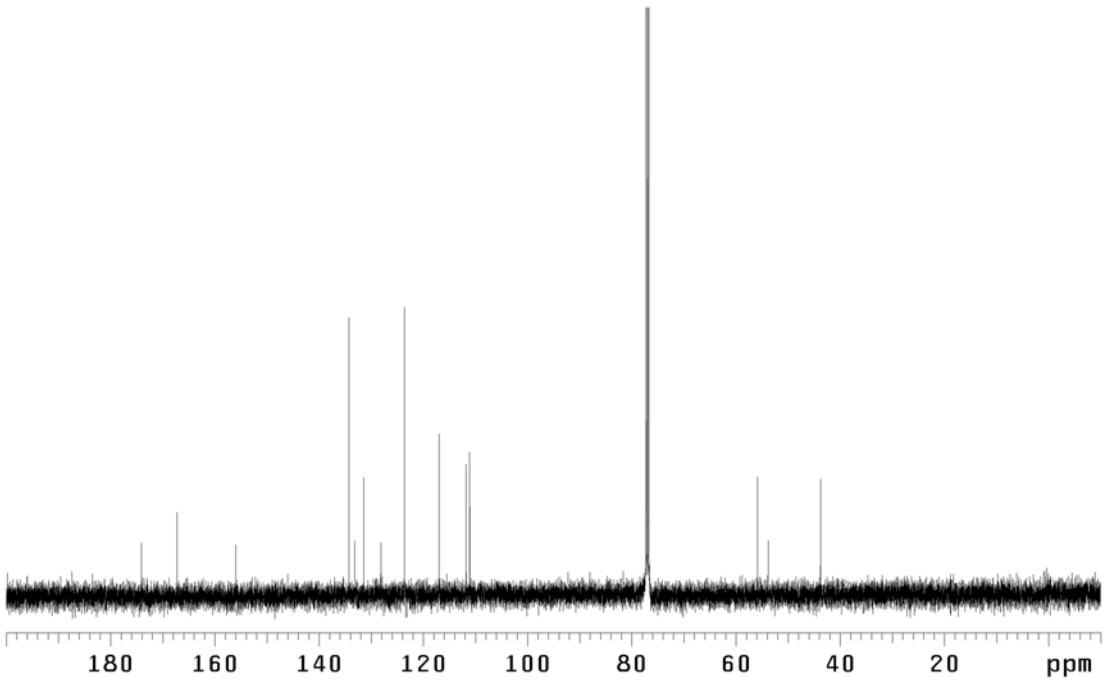
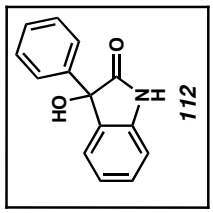


Figure A3.21.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **110**.



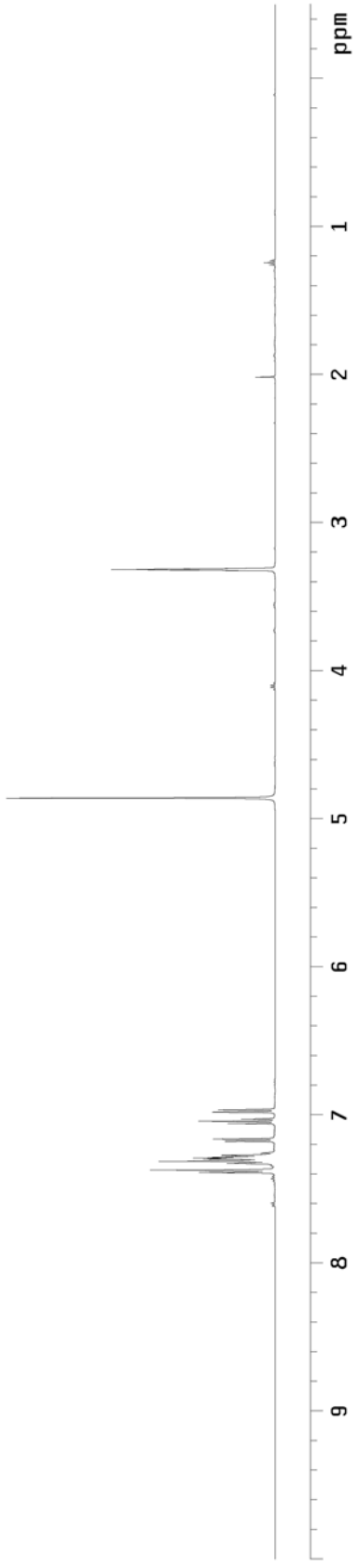


Figure A3.22.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **112**.

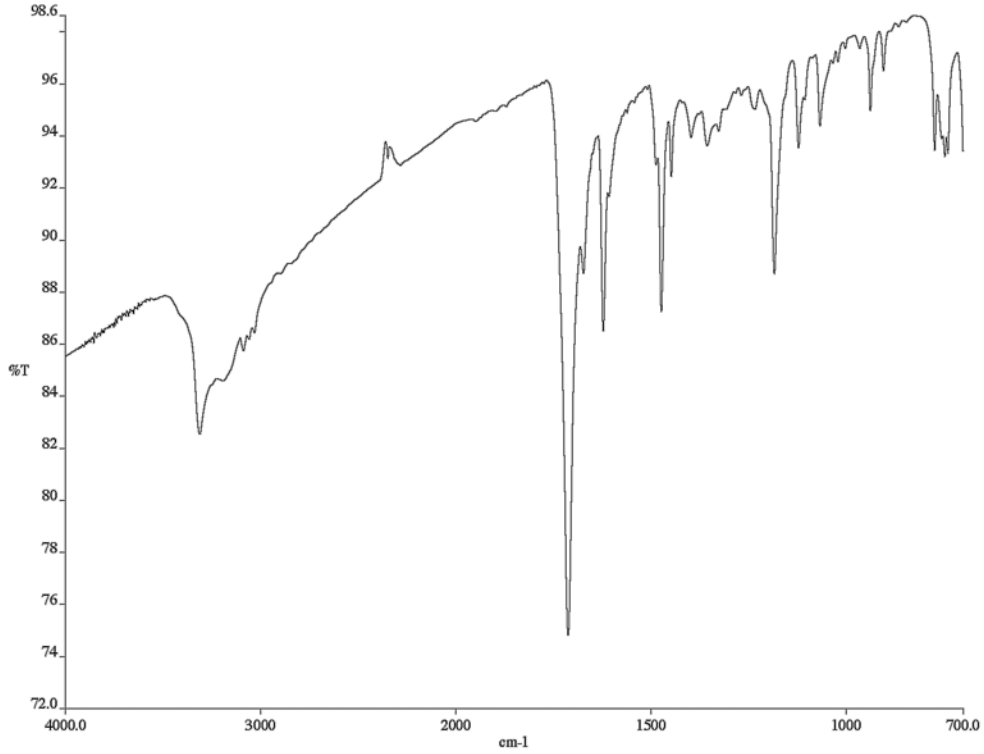


Figure A3.22.2 Infrared spectrum (thin film/NaCl) of compound **112**.

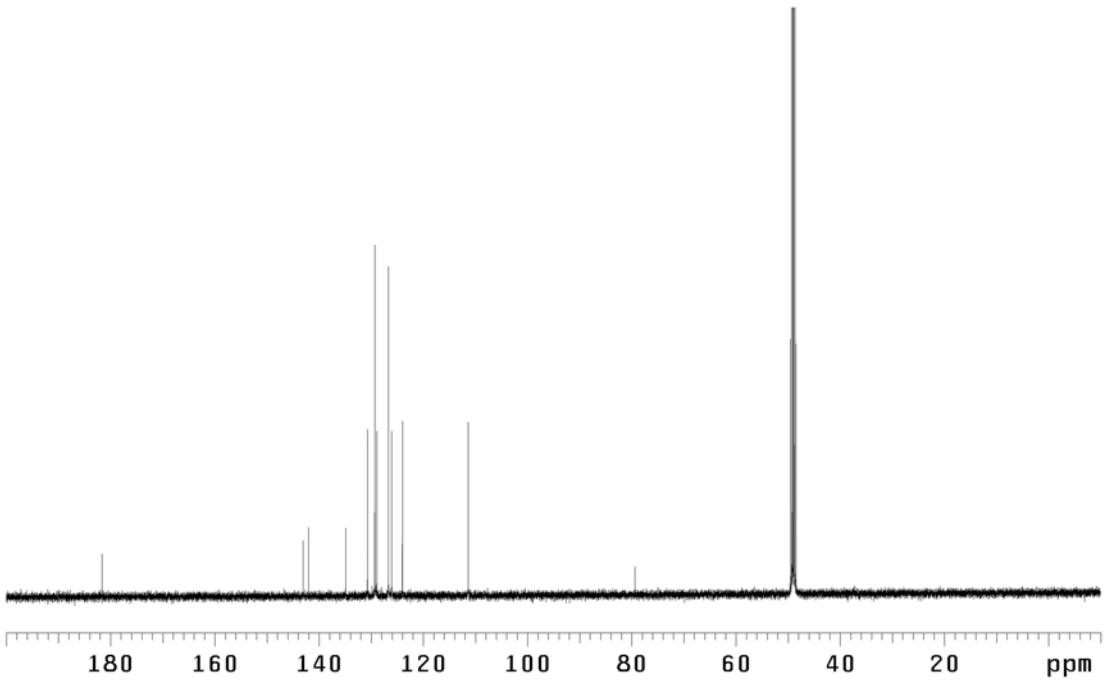
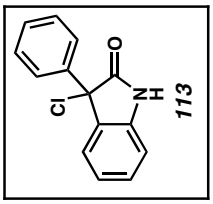


Figure A3.22.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **112**.



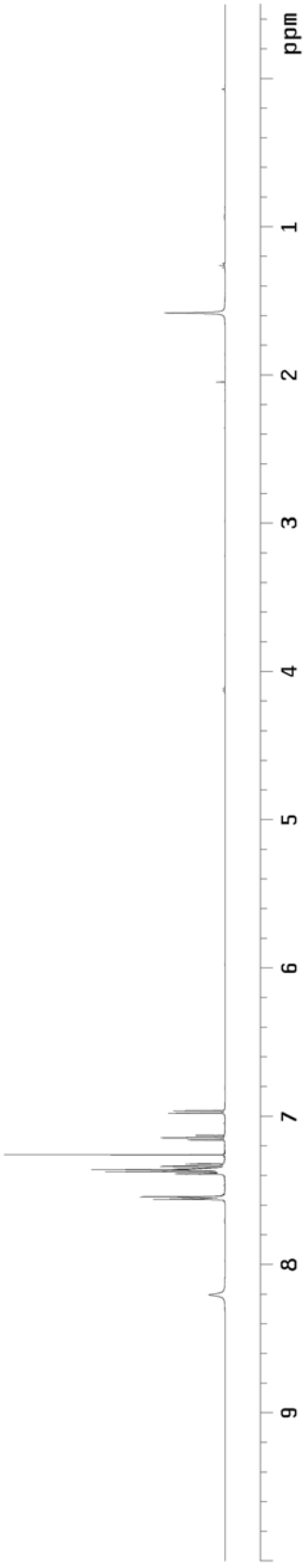


Figure A3.23.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **113**.

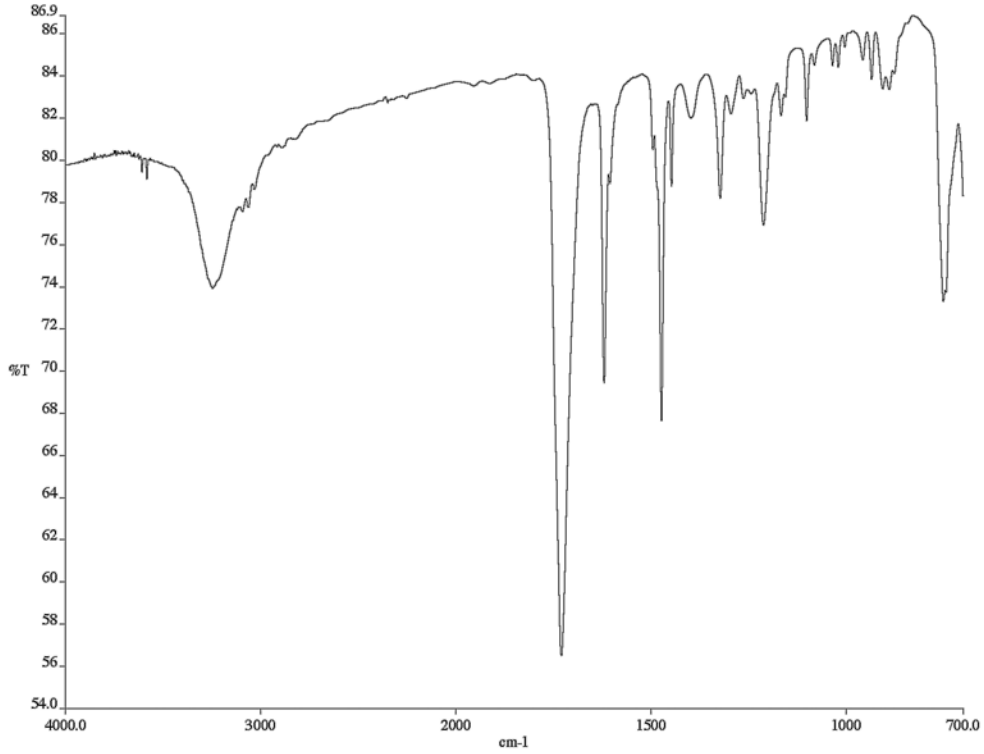


Figure A3.23.2 Infrared spectrum (thin film/NaCl) of compound **113**.

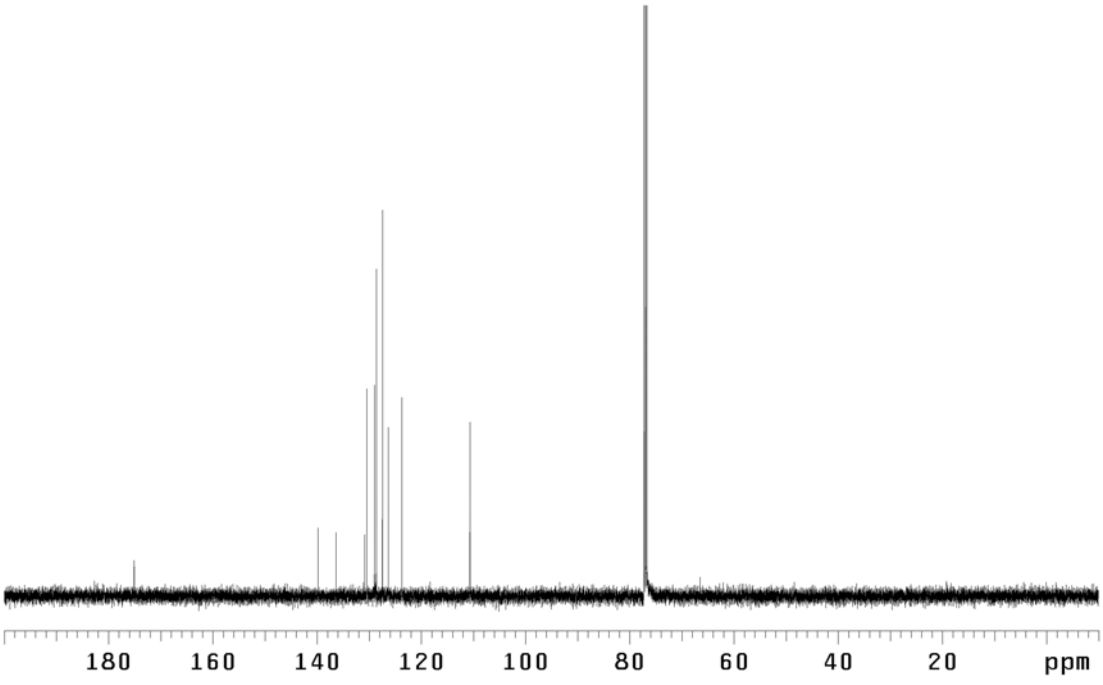
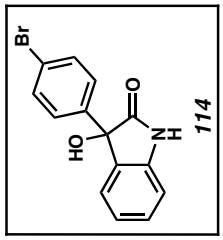


Figure A3.23.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **113**.



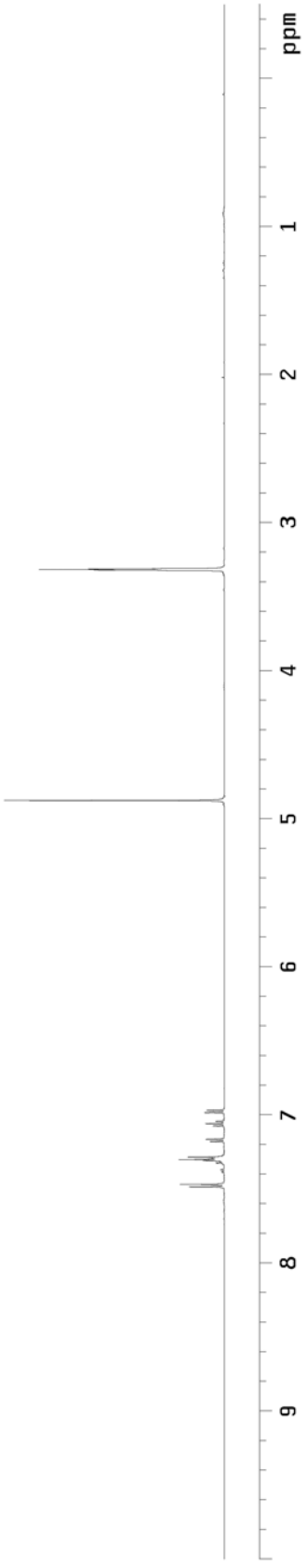


Figure A3.24.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **114**.

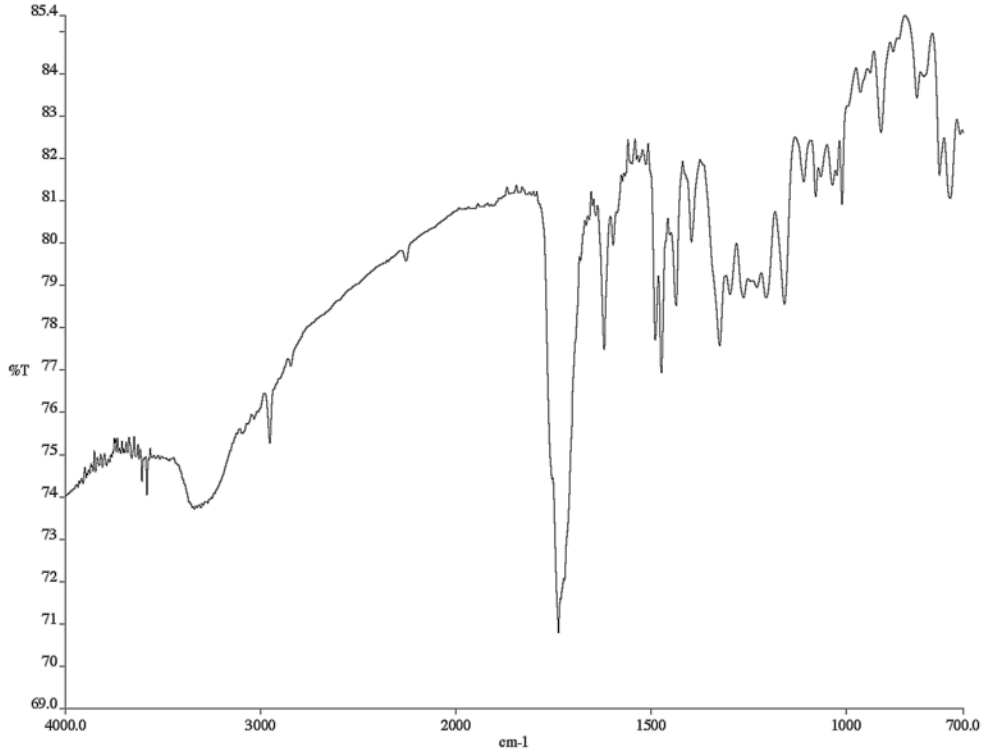


Figure A3.24.2 Infrared spectrum (thin film/NaCl) of compound **114**.

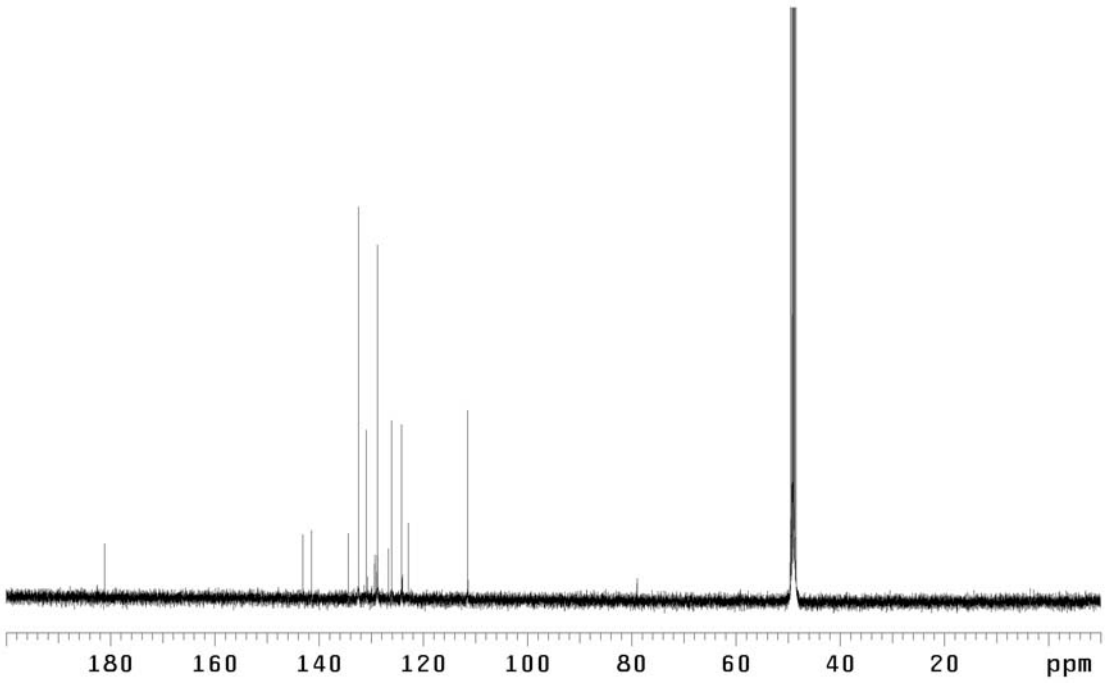
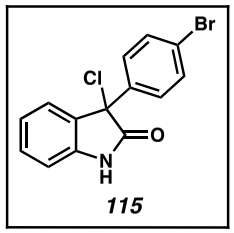


Figure A3.24.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **114**.



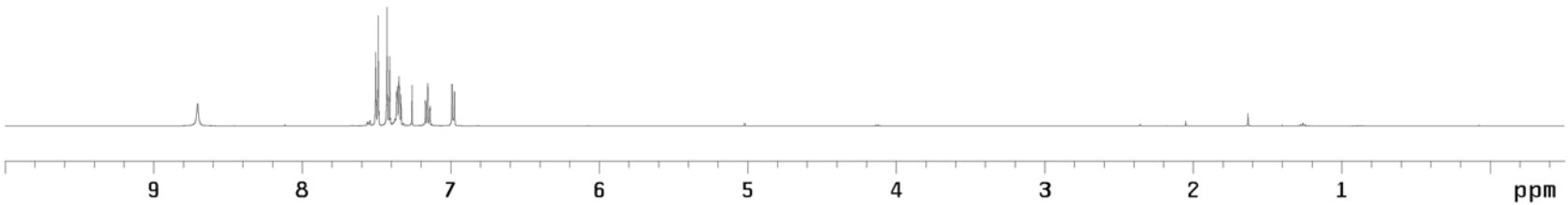


Figure A3.25.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **115**.

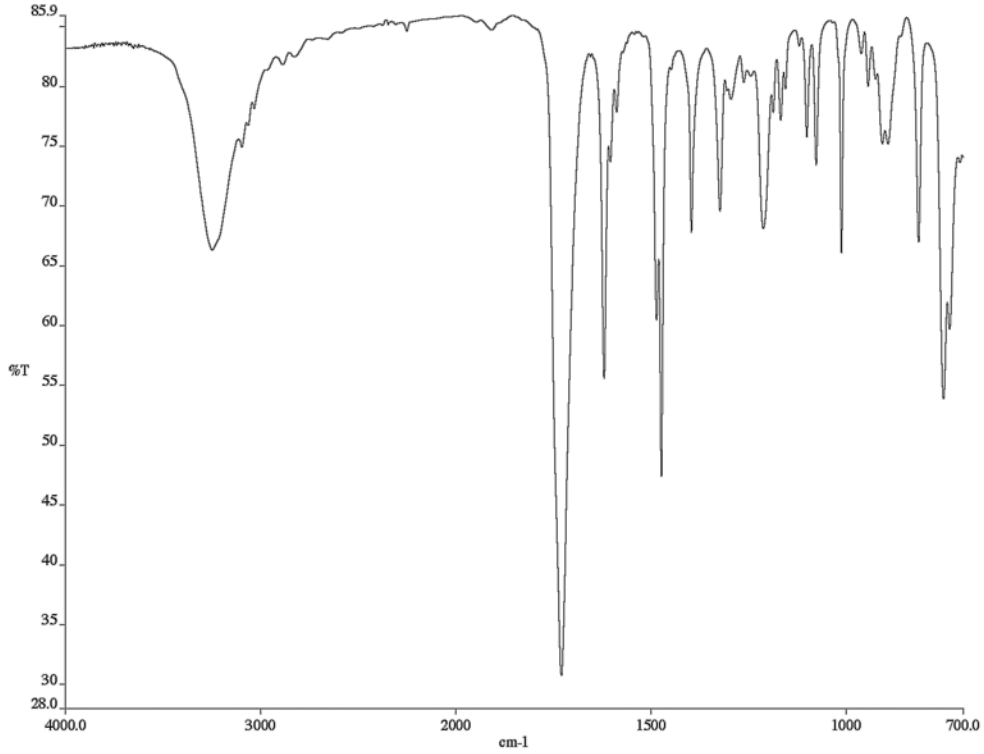


Figure A3.25.2 Infrared spectrum (thin film/NaCl) of compound **115**.

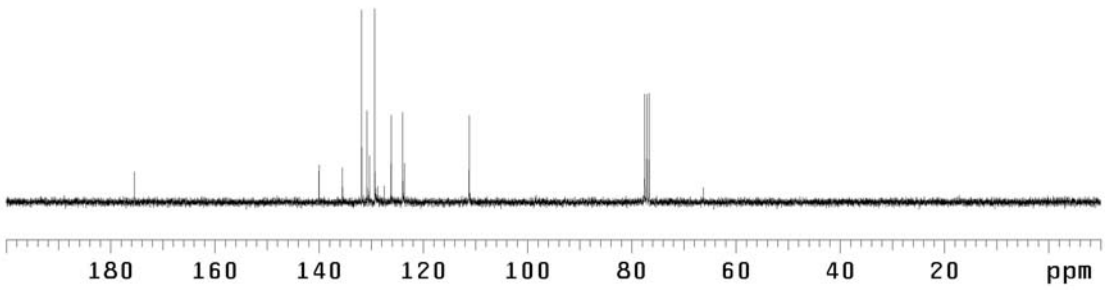
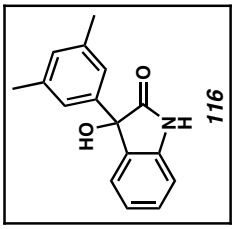


Figure A3.25.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **115**.



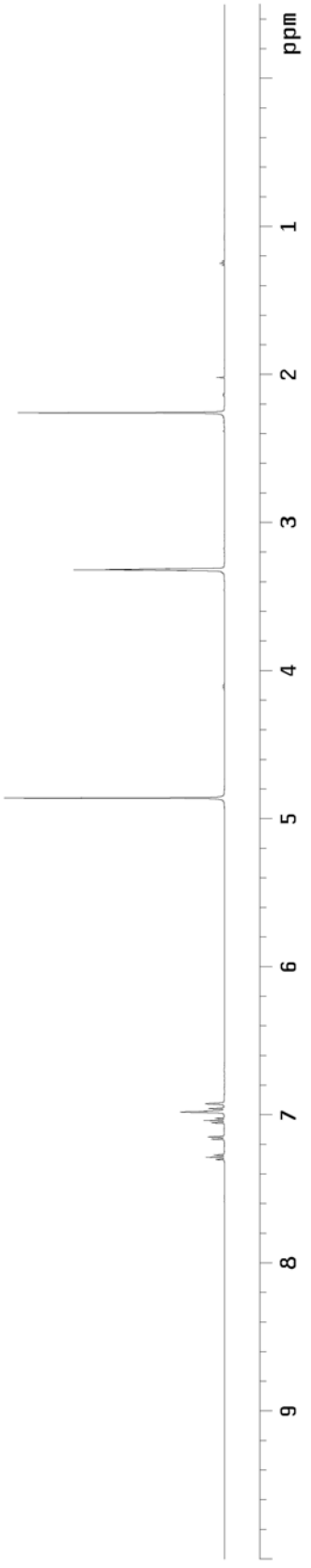


Figure A3.26.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **116**.

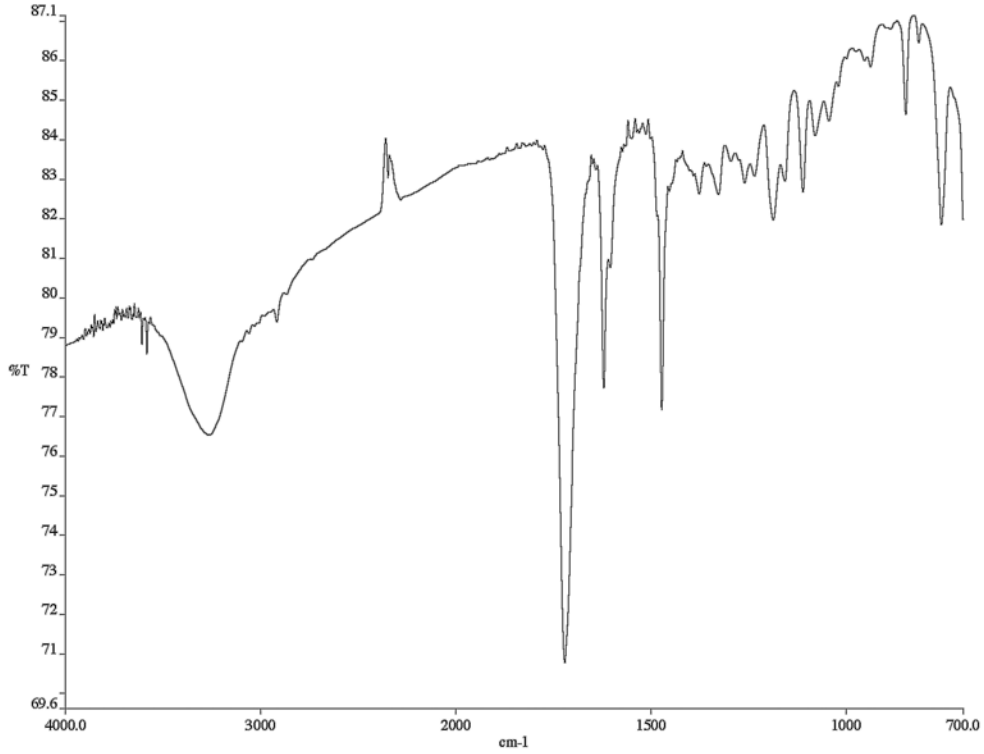


Figure A3.26.2 Infrared spectrum (thin film/NaCl) of compound **116**.

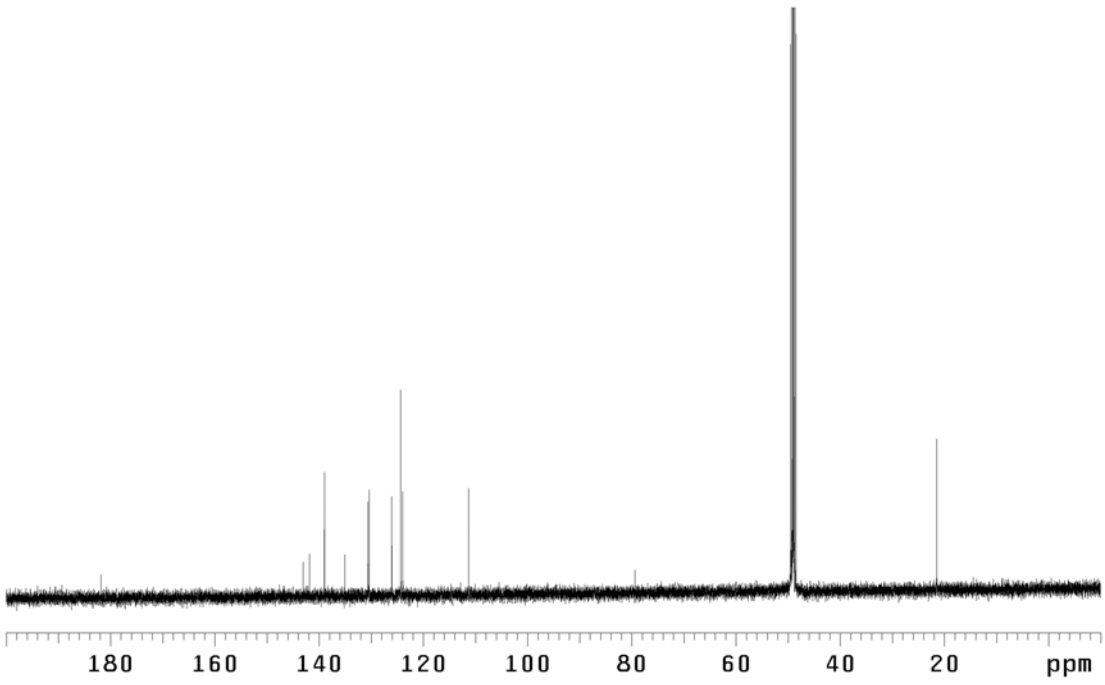
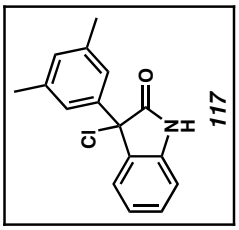


Figure A3.26.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **116**.



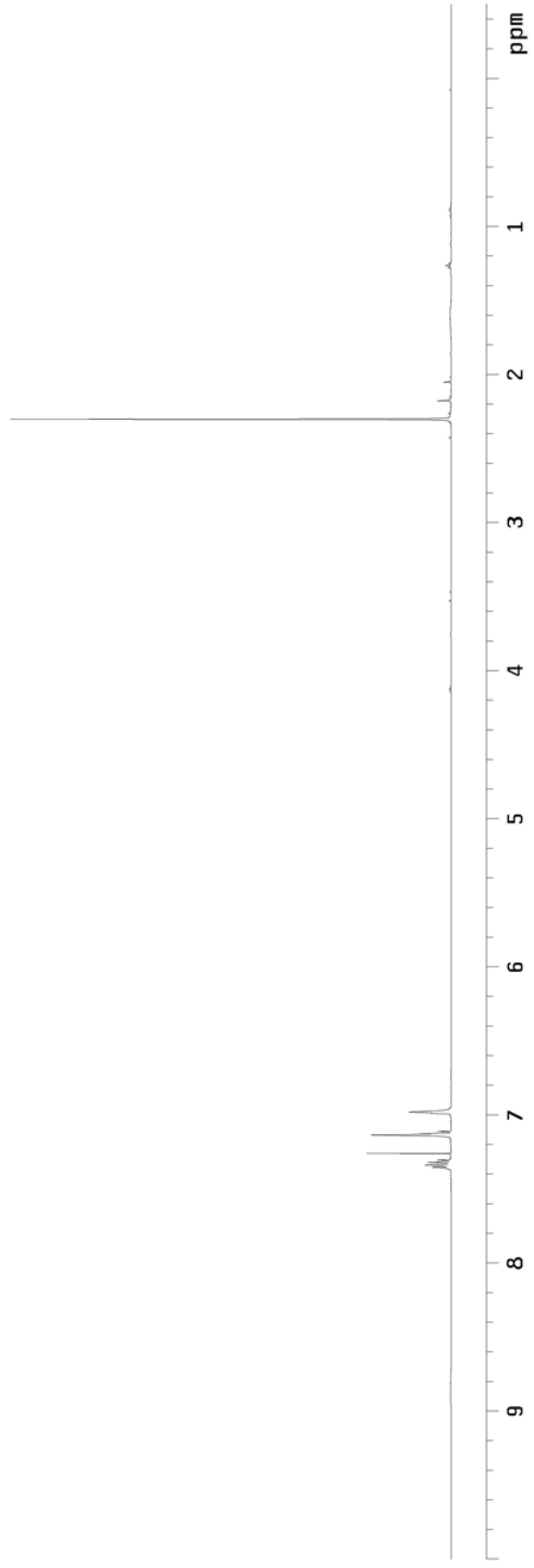


Figure A3.27.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **117**.

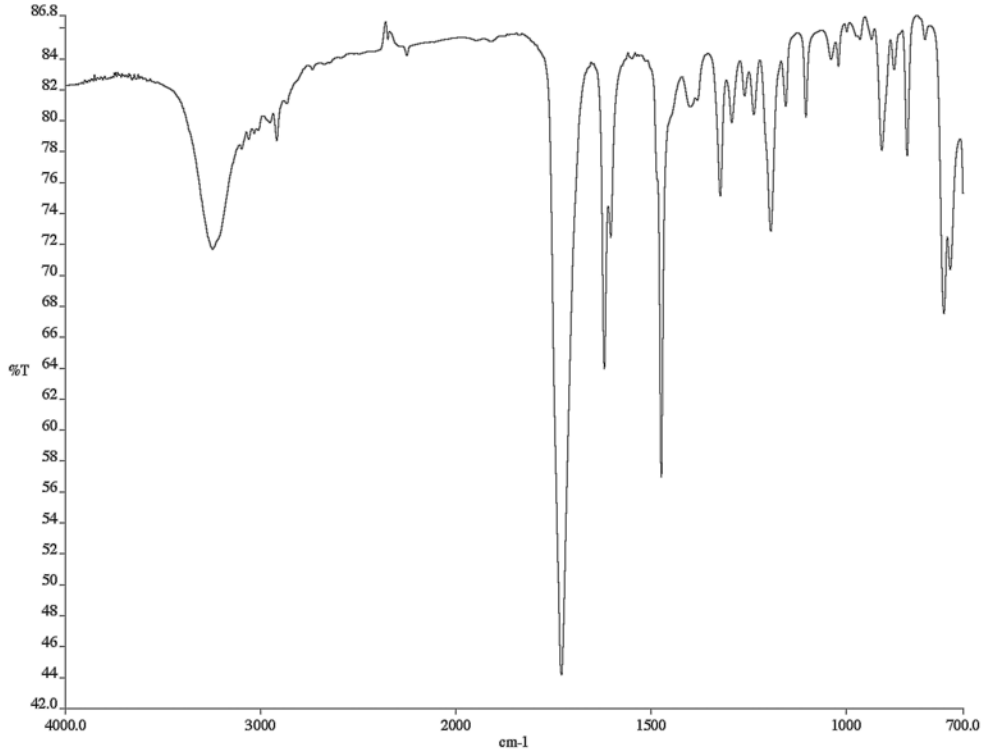


Figure A3.27.2 Infrared spectrum (thin film/NaCl) of compound **117**.

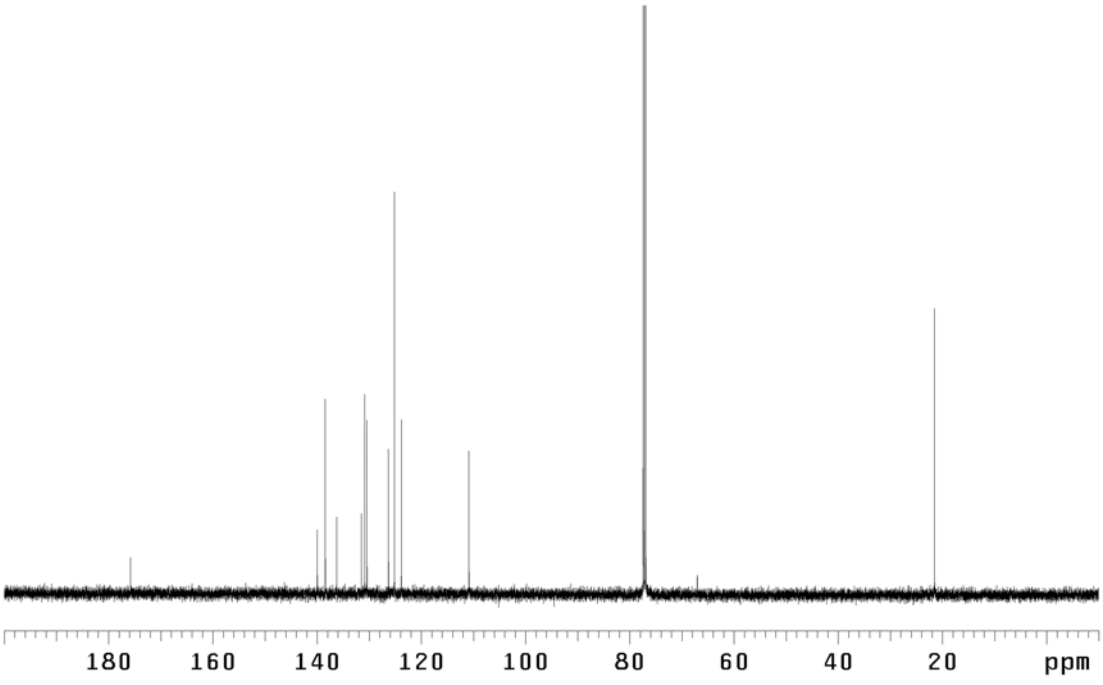


Figure A3.27.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **117**.

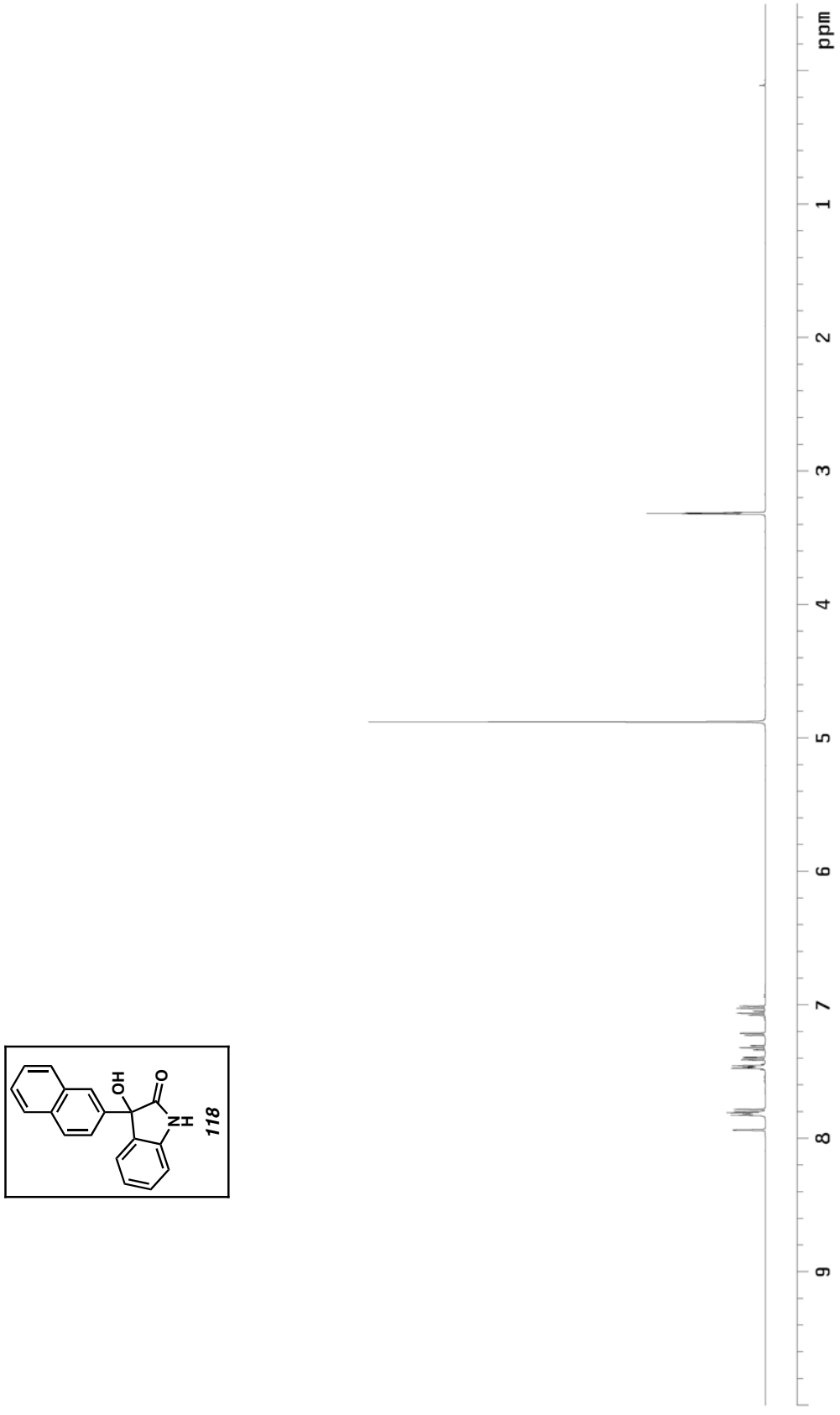


Figure A3.28.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **118**.

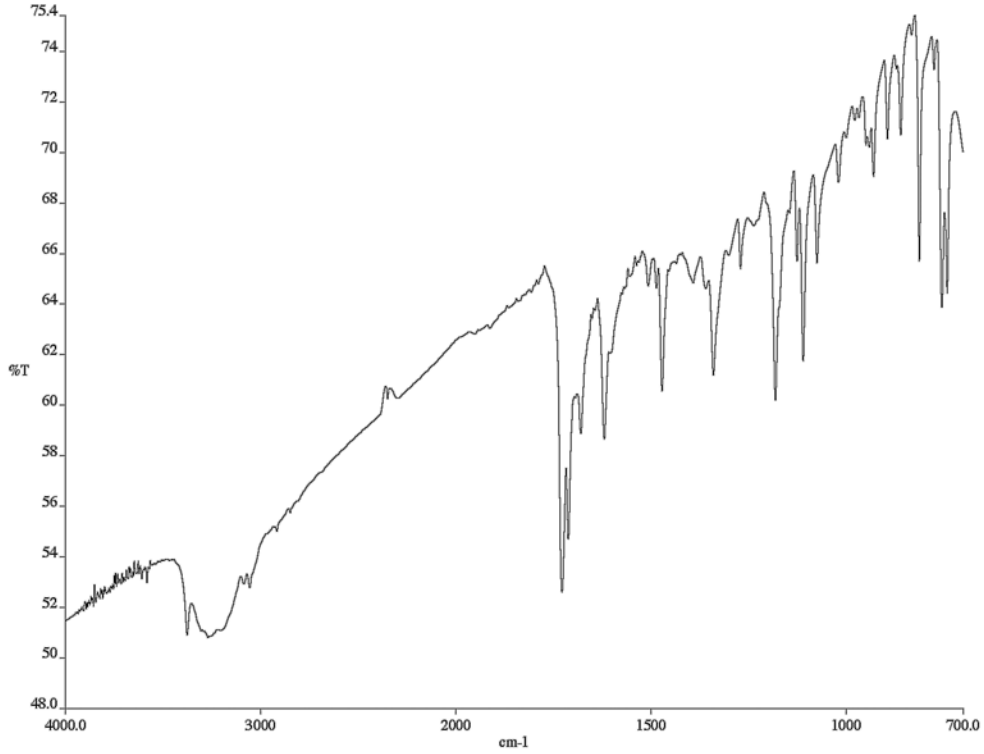


Figure A3.28.2 Infrared spectrum (thin film/NaCl) of compound **118**.

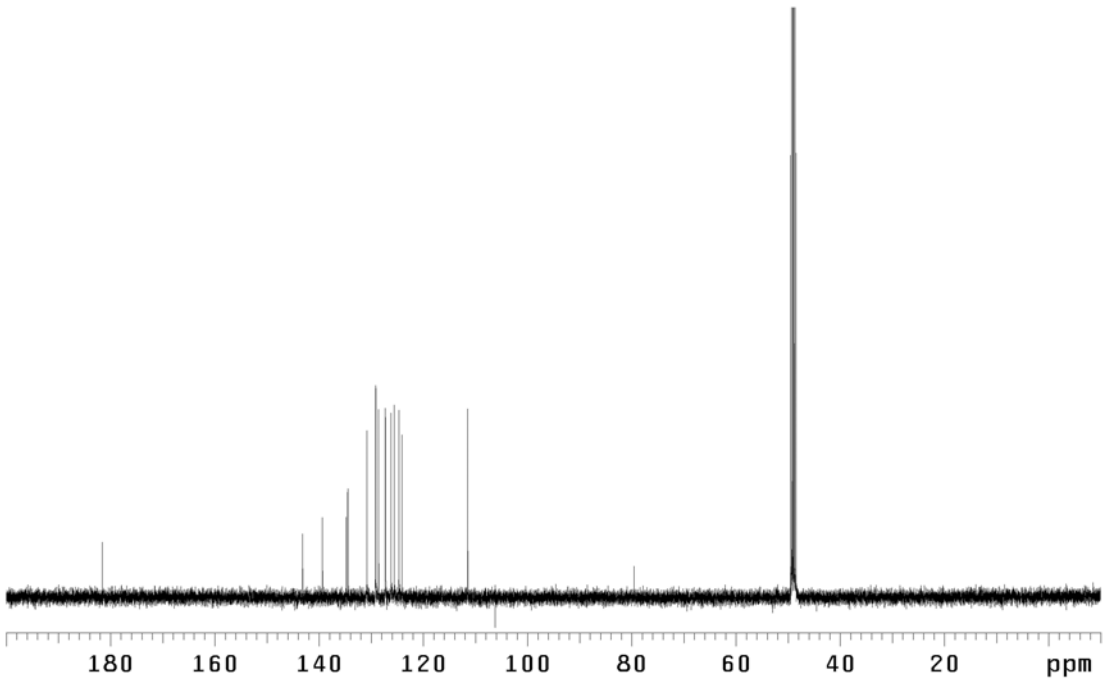
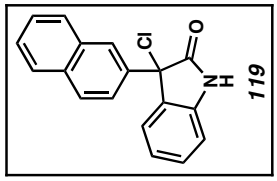


Figure A3.28.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **118**.



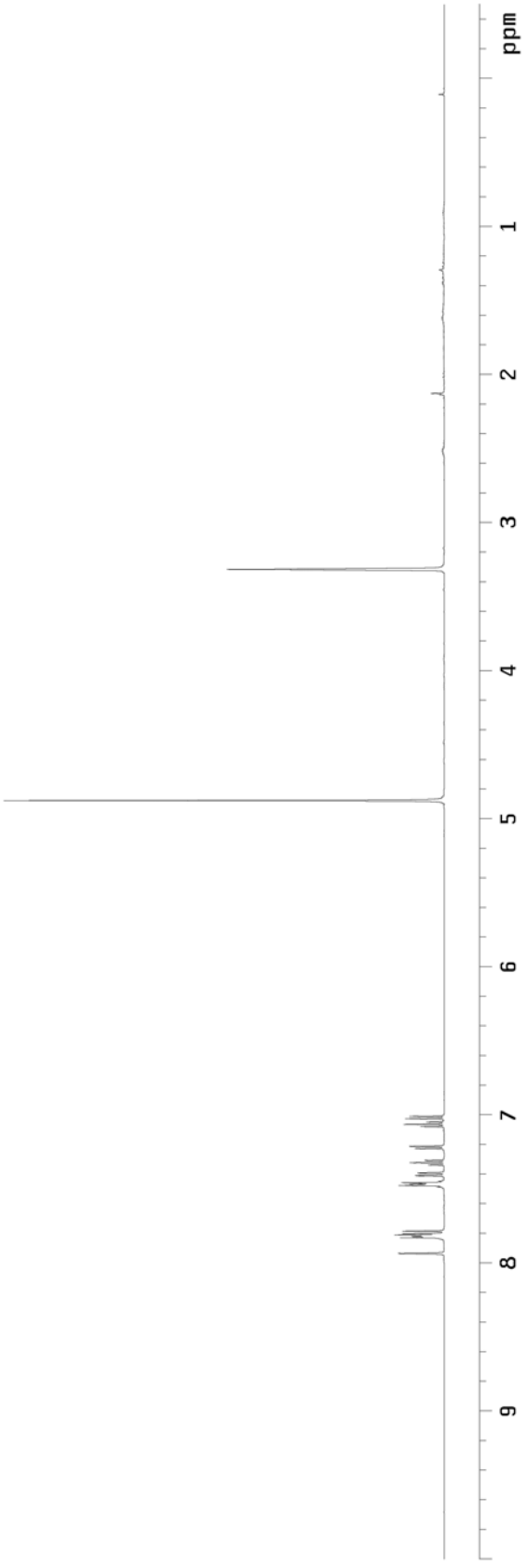


Figure A3.29.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **119**.

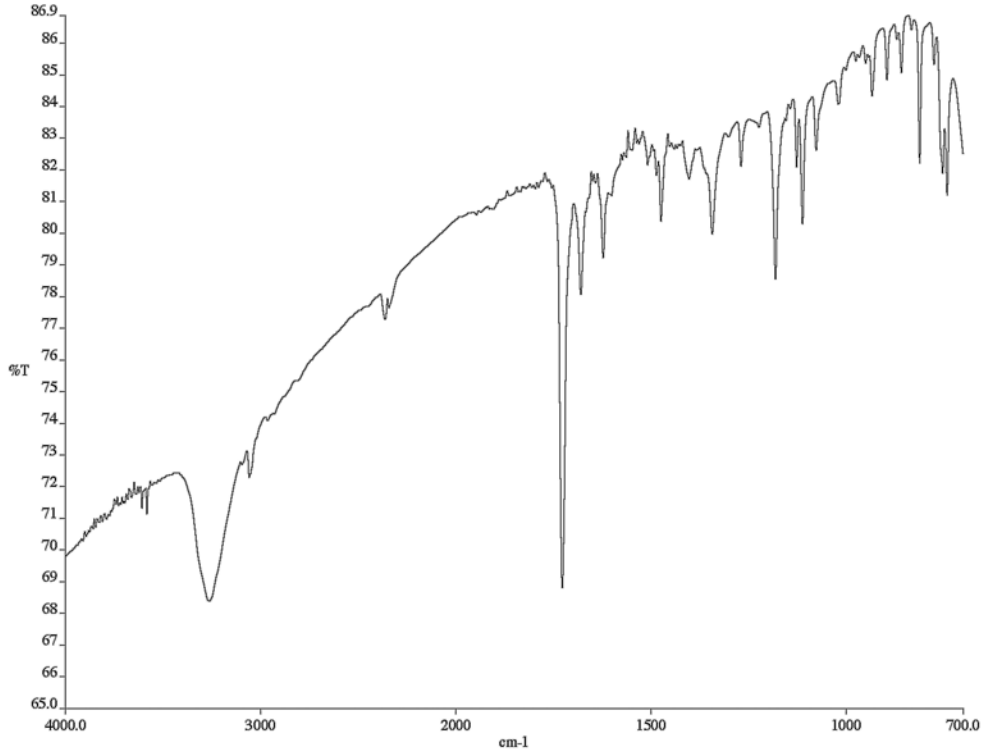


Figure A3.29.2 Infrared spectrum (thin film/NaCl) of compound **119**.

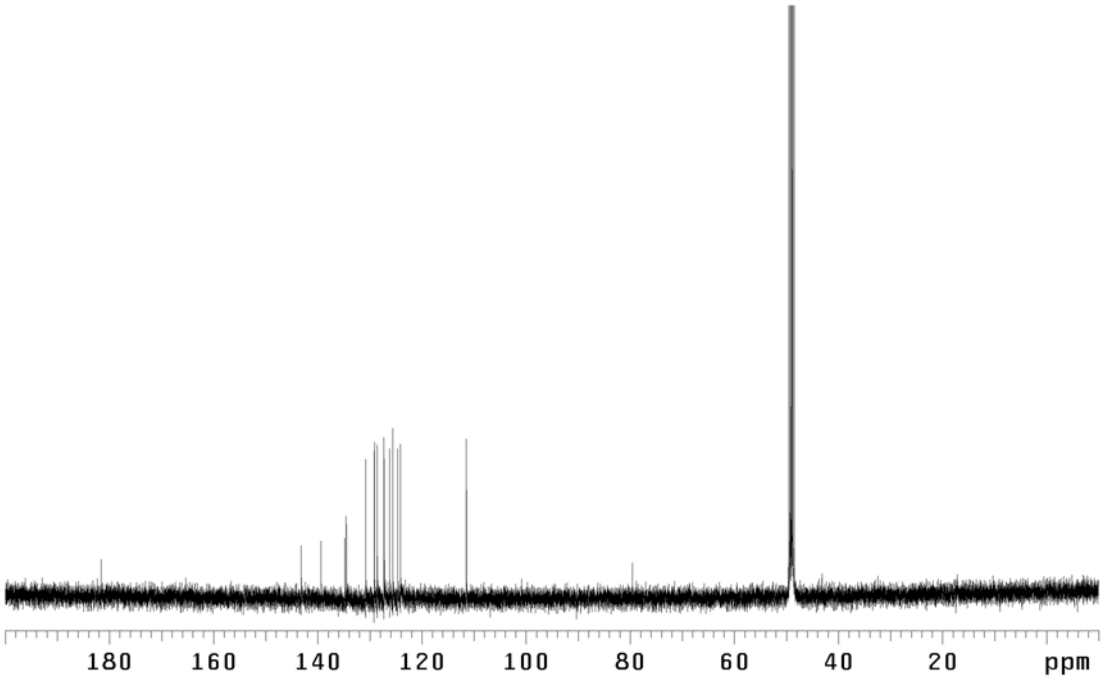
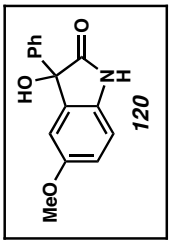


Figure A3.29.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **119**.



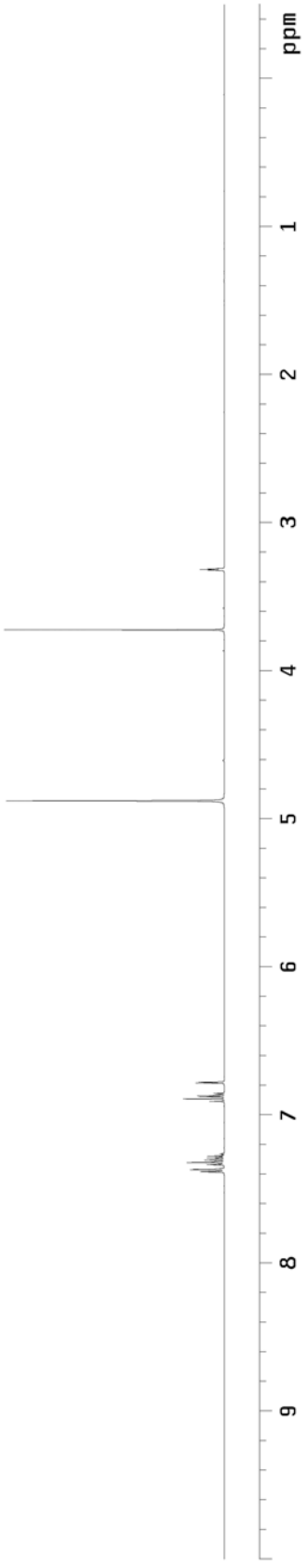


Figure A3.30.1 ^{1}H NMR (500 MHz, CD_3OD) of compound **120**.

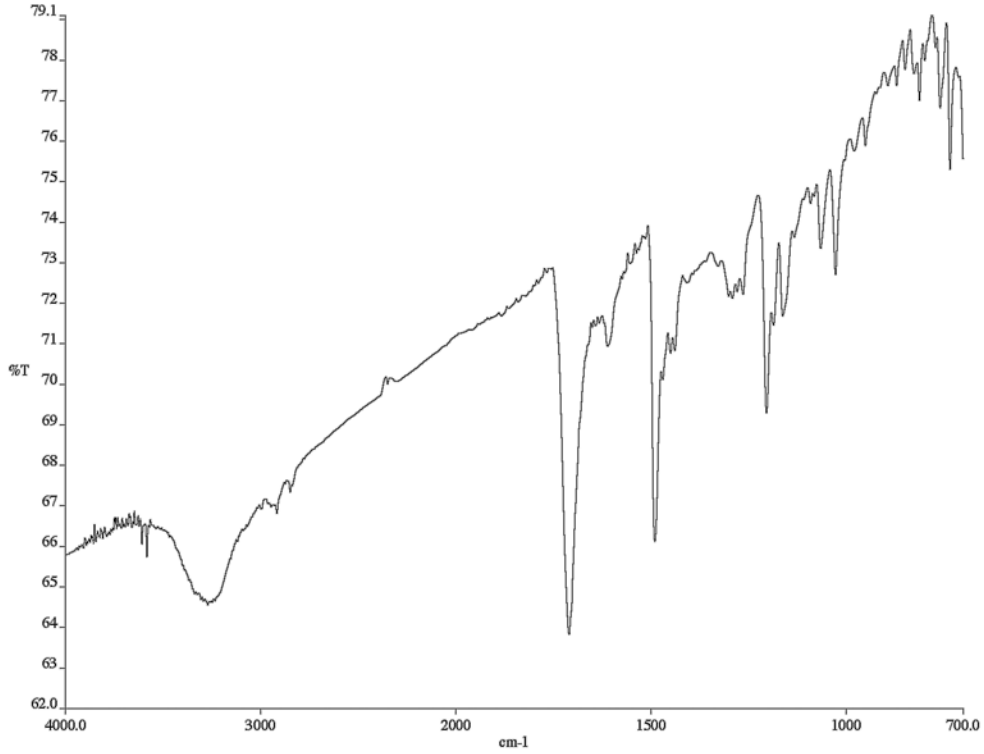


Figure A3.30.2 Infrared spectrum (thin film/NaCl) of compound **120**.

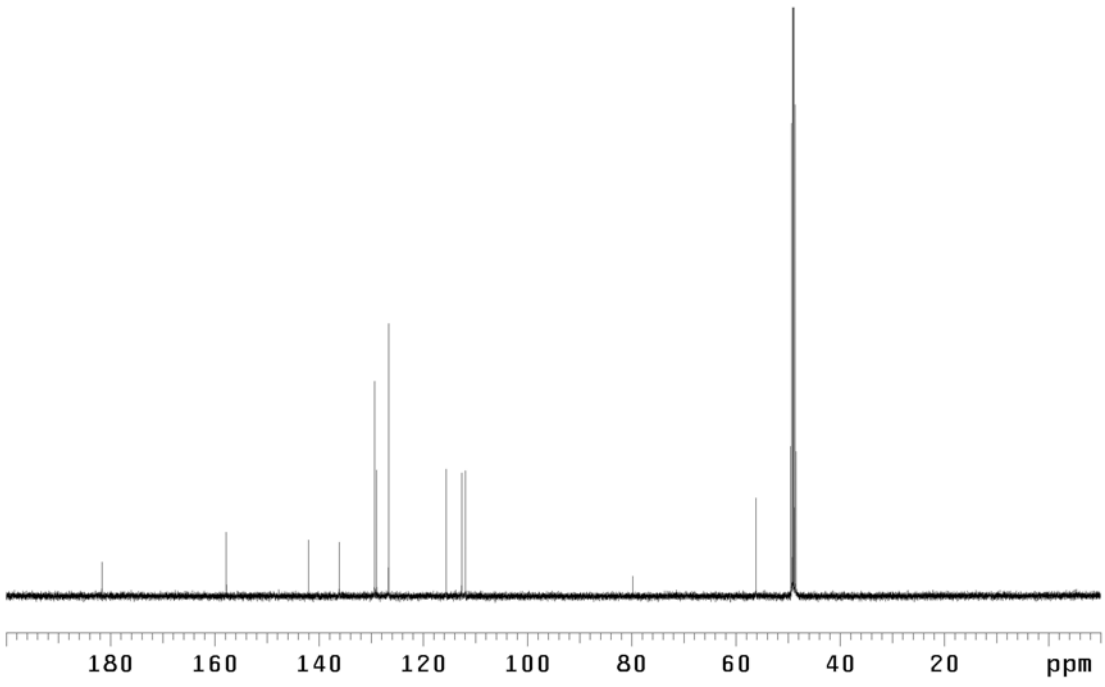


Figure A3.30.3 ^{13}C NMR (125 MHz, CD_3OD) of compound **120**.

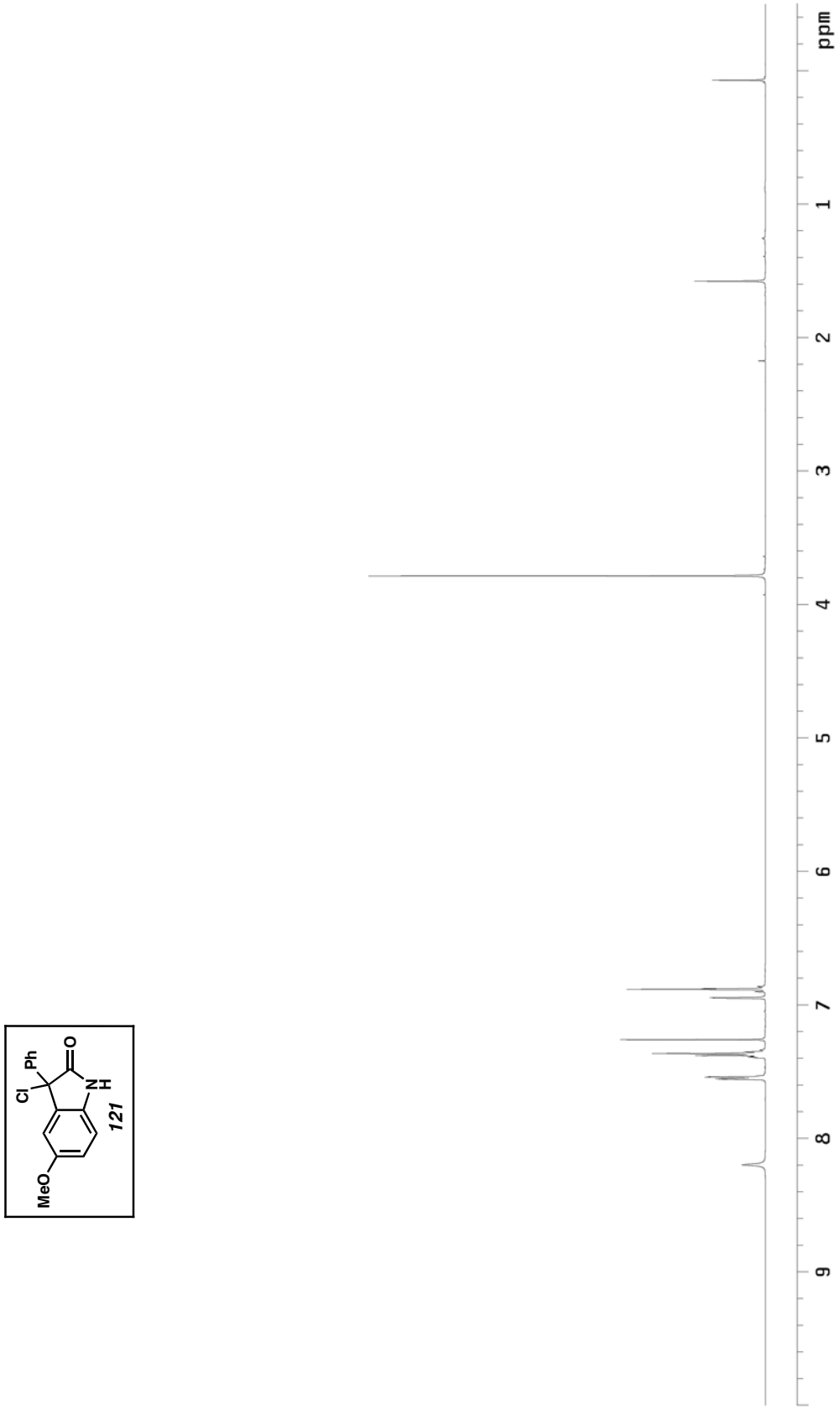


Figure A3.31.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **121**.

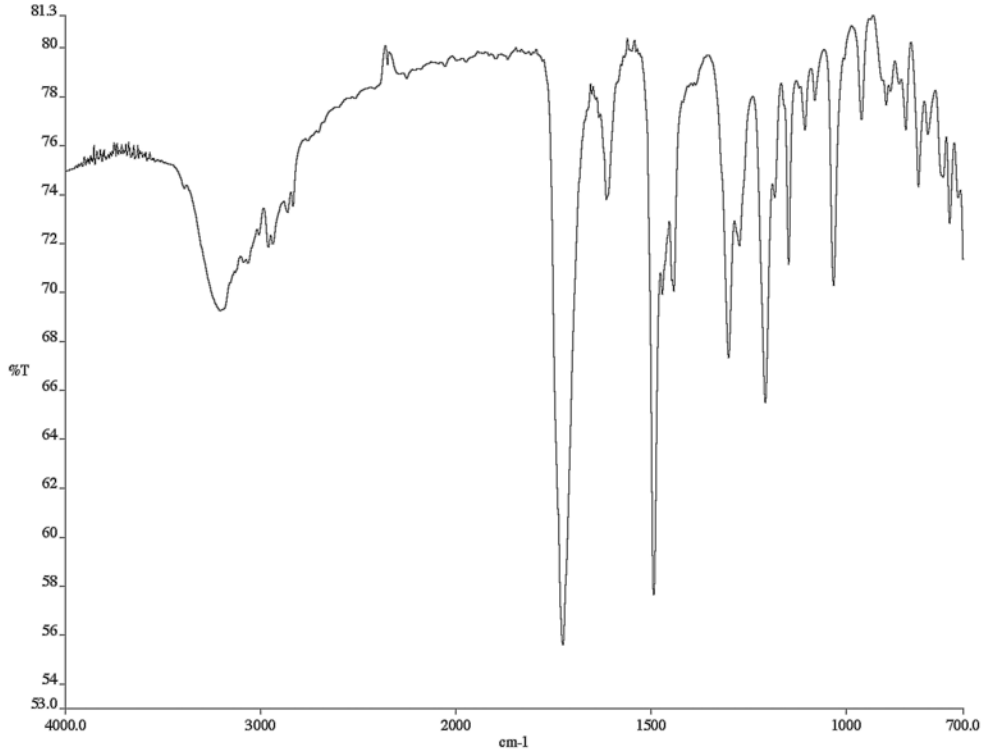


Figure A3.31.2 Infrared spectrum (thin film/NaCl) of compound **121**.

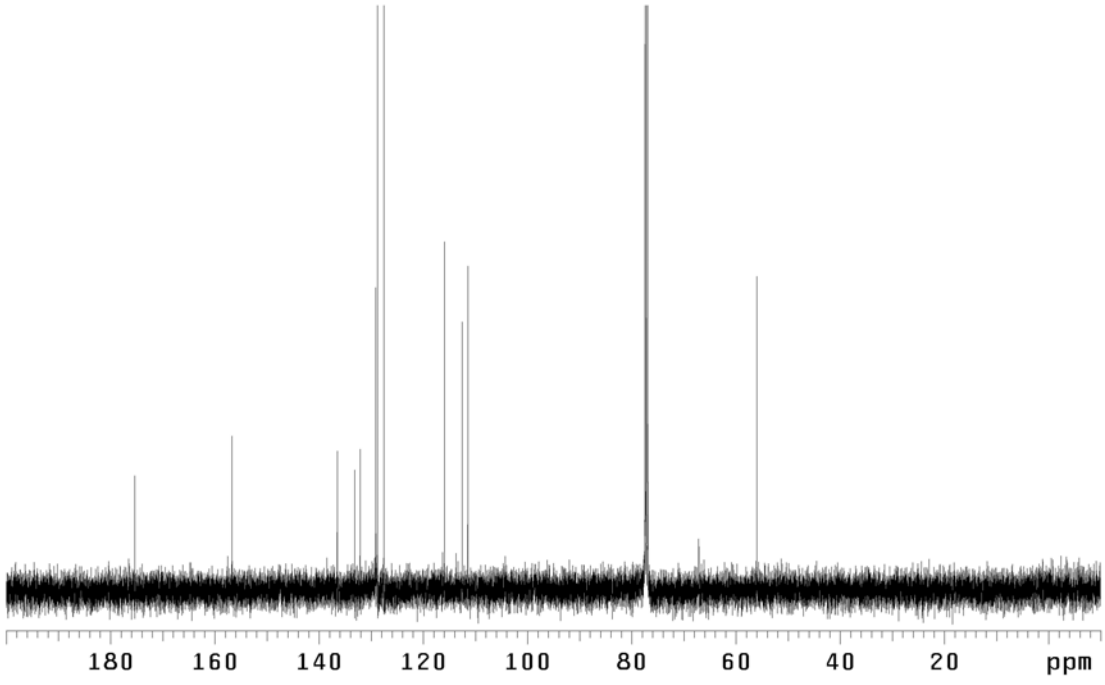


Figure A3.31.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **121**.

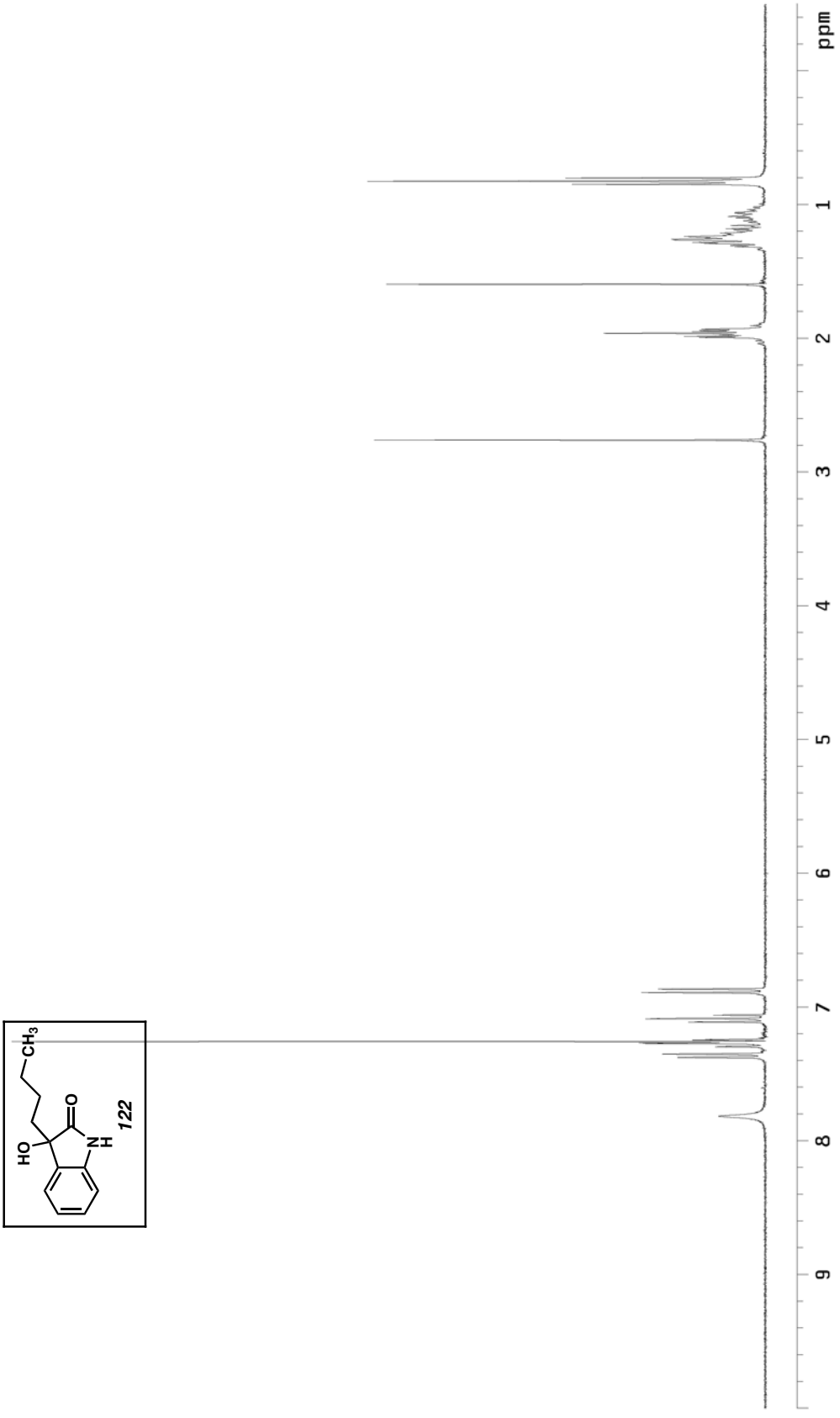


Figure A3.32.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **122**.

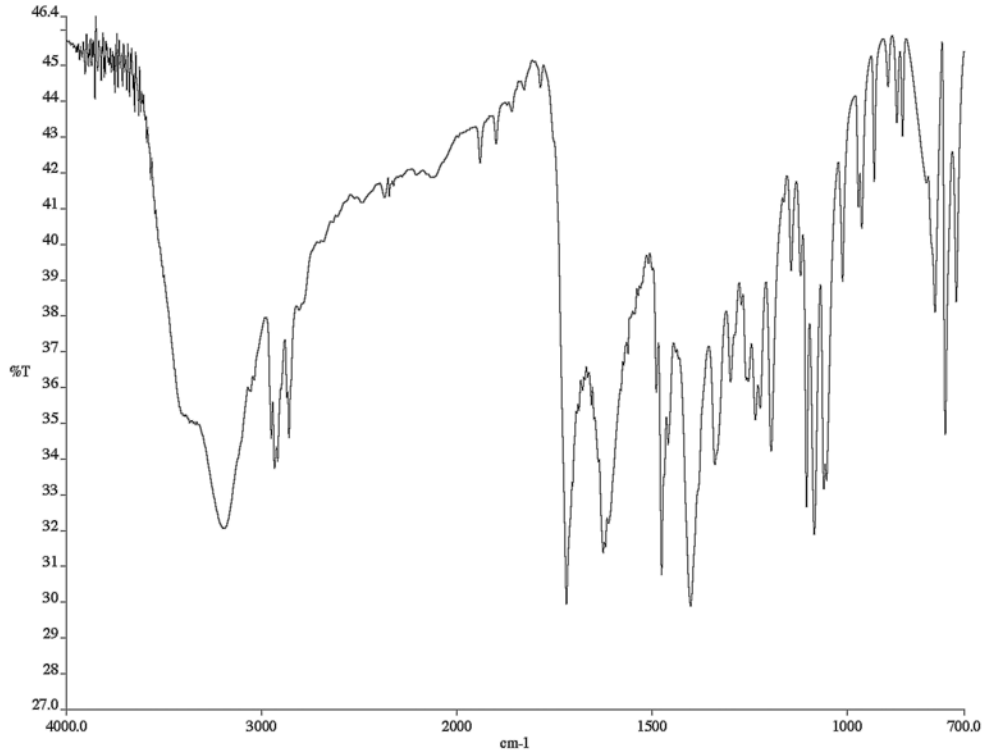


Figure A3.32.2 Infrared spectrum (thin film/NaCl) of compound **122**.

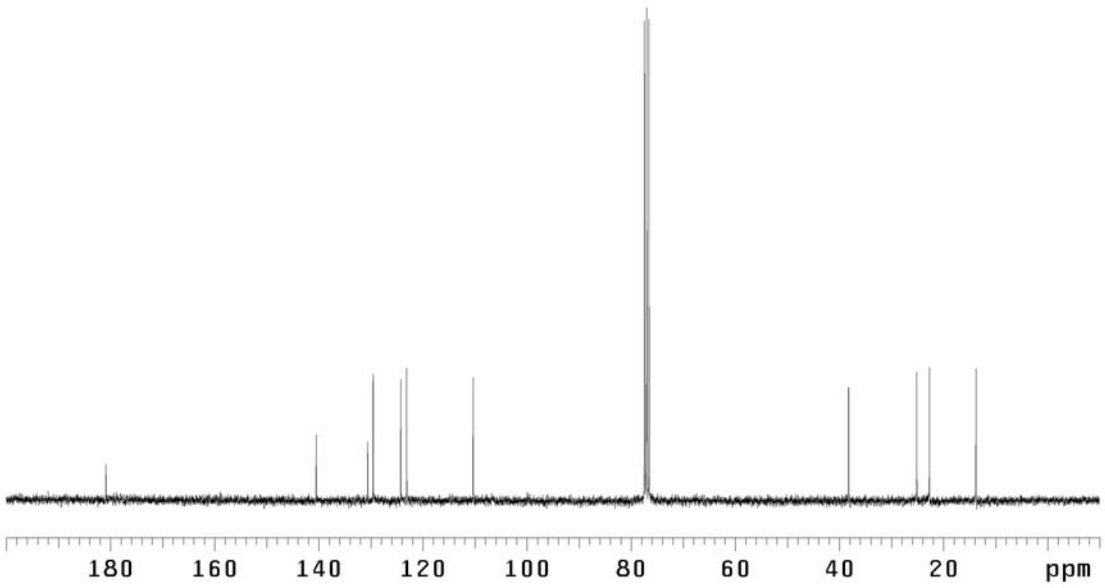


Figure A3.32.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **122**.

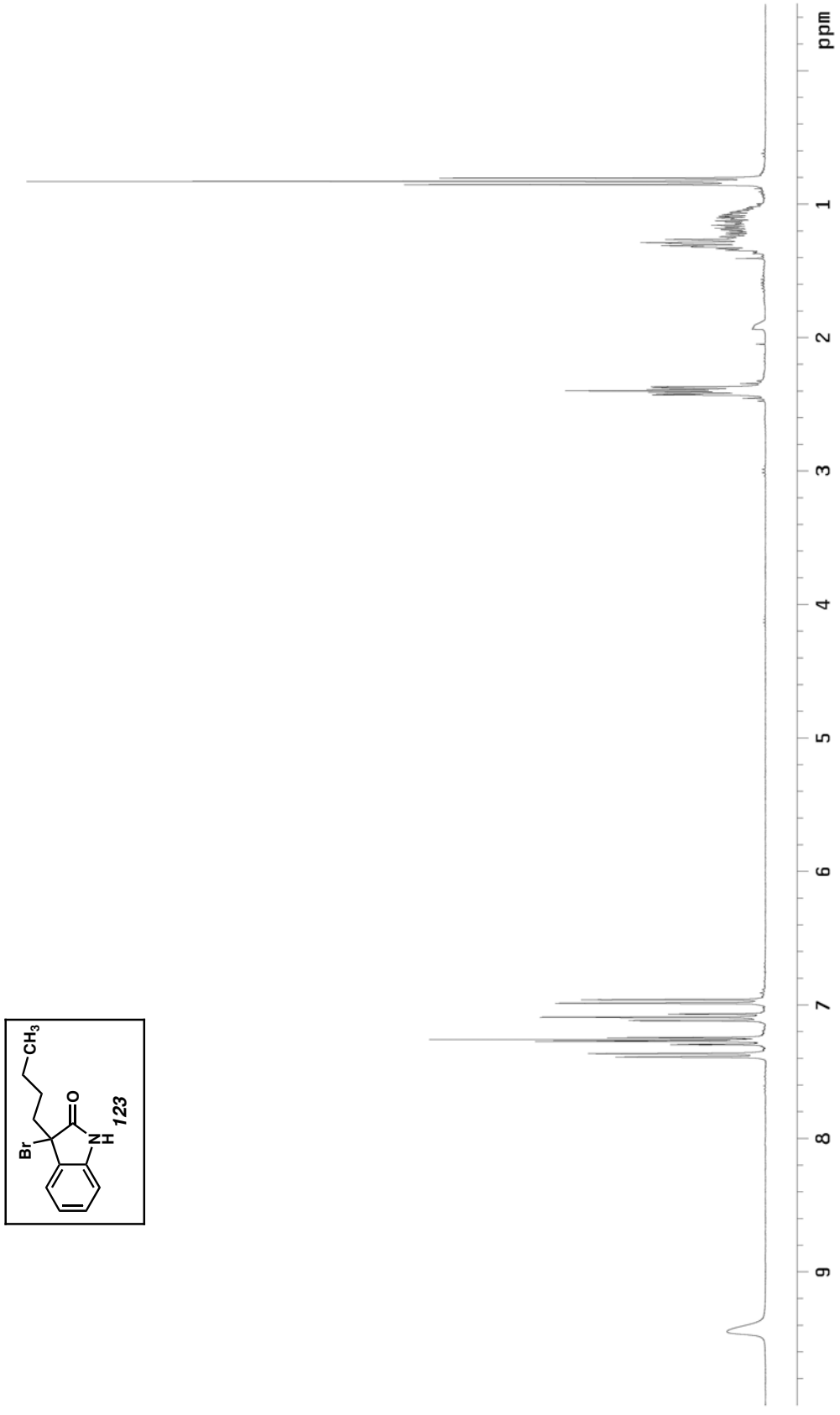


Figure A3.33.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **123**.

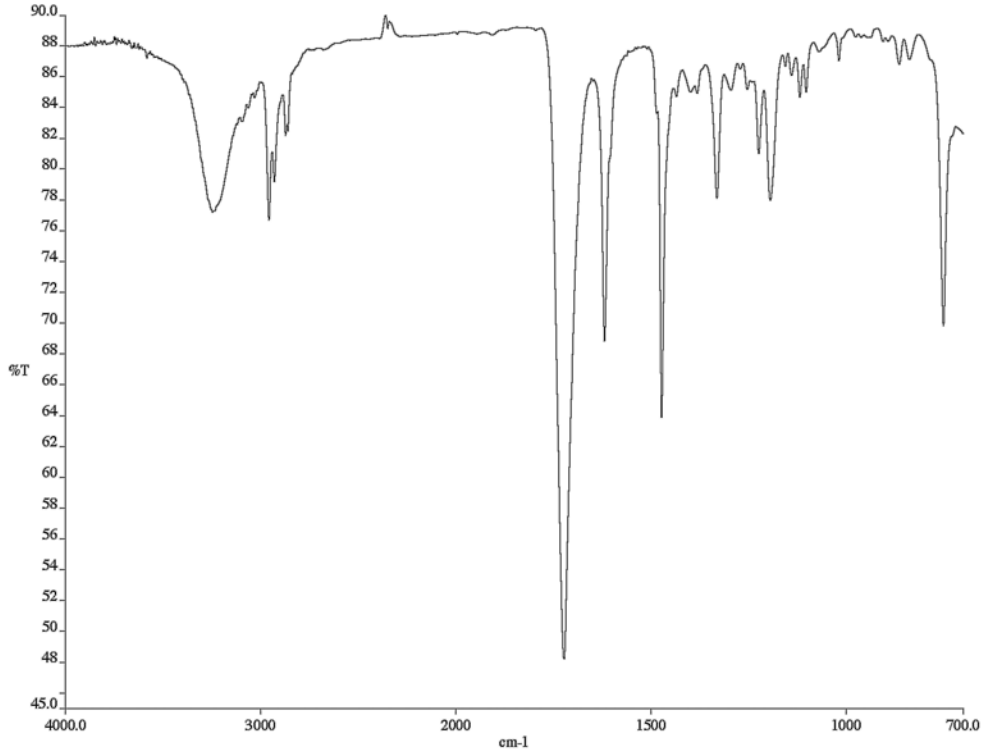


Figure A3.33.2 Infrared spectrum (thin film/NaCl) of compound **123**.

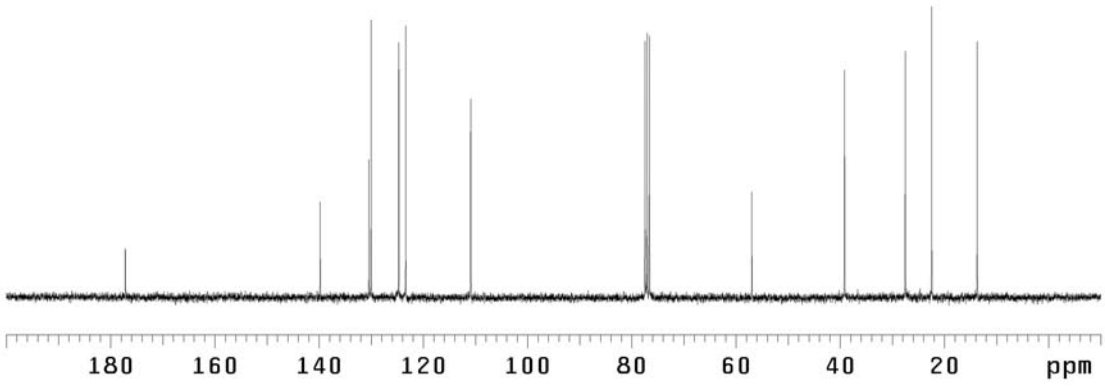


Figure A3.33.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **123**.

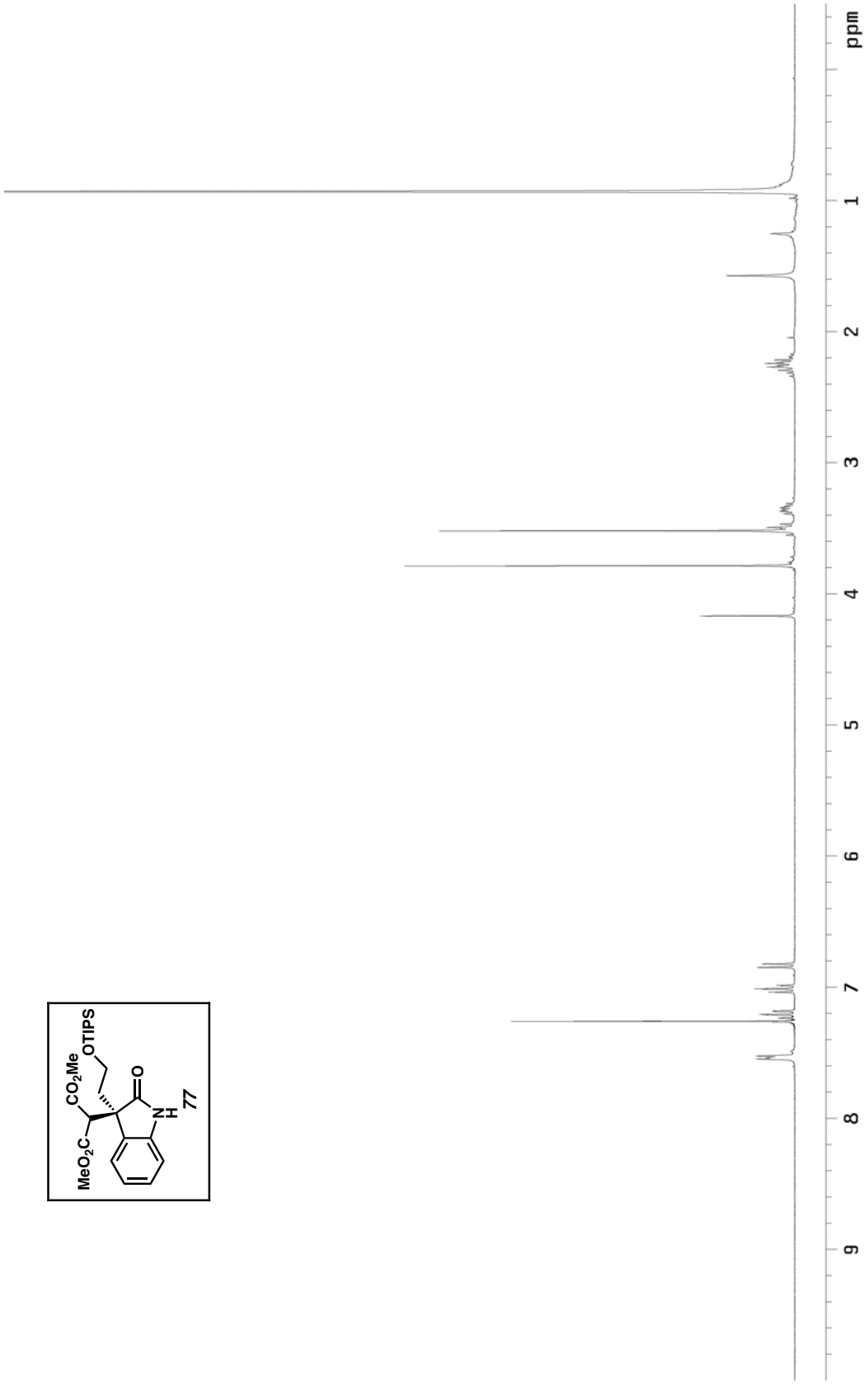


Figure A3.34.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **77** (Table 3.4, Entry 1).

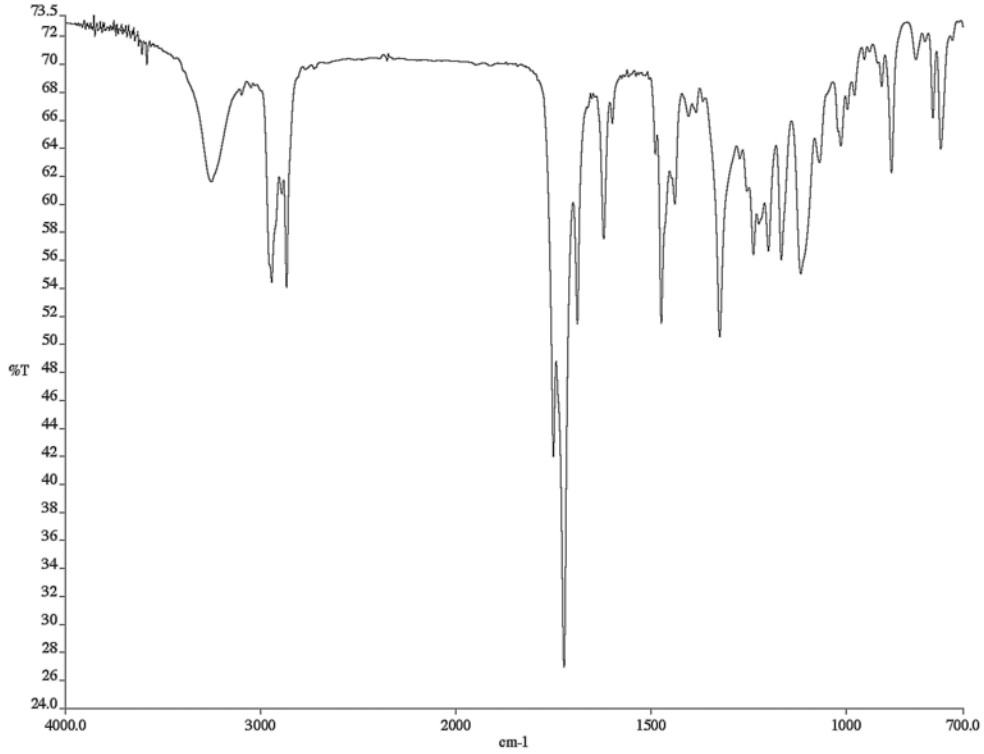


Figure A3.34.2 Infrared spectrum (thin film/NaCl) of compound **77** (Table 3.4, Entry 1).

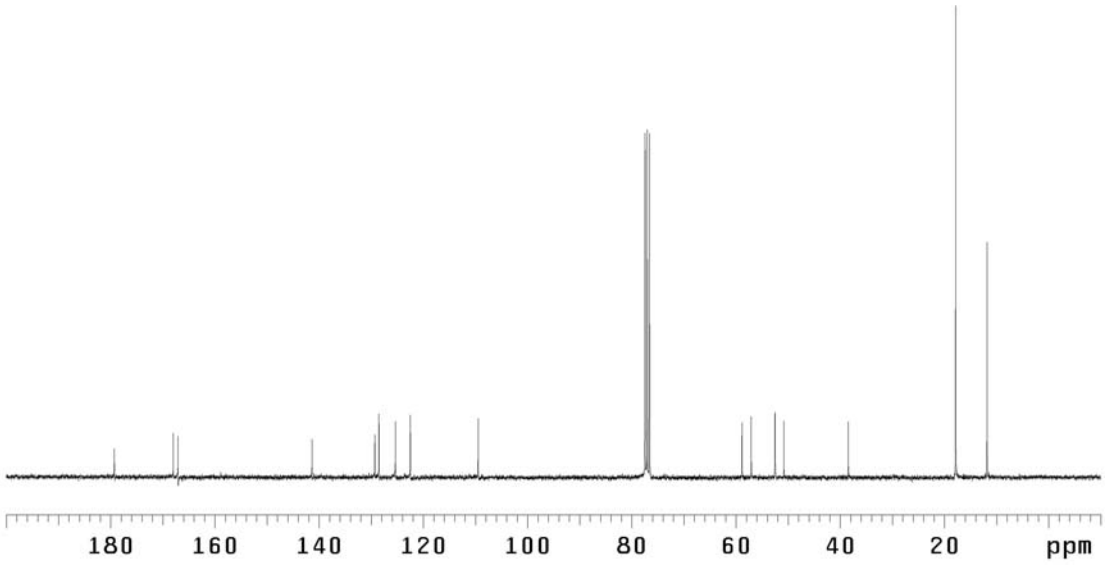


Figure A3.34.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **77** (Table 3.4, Entry 1).

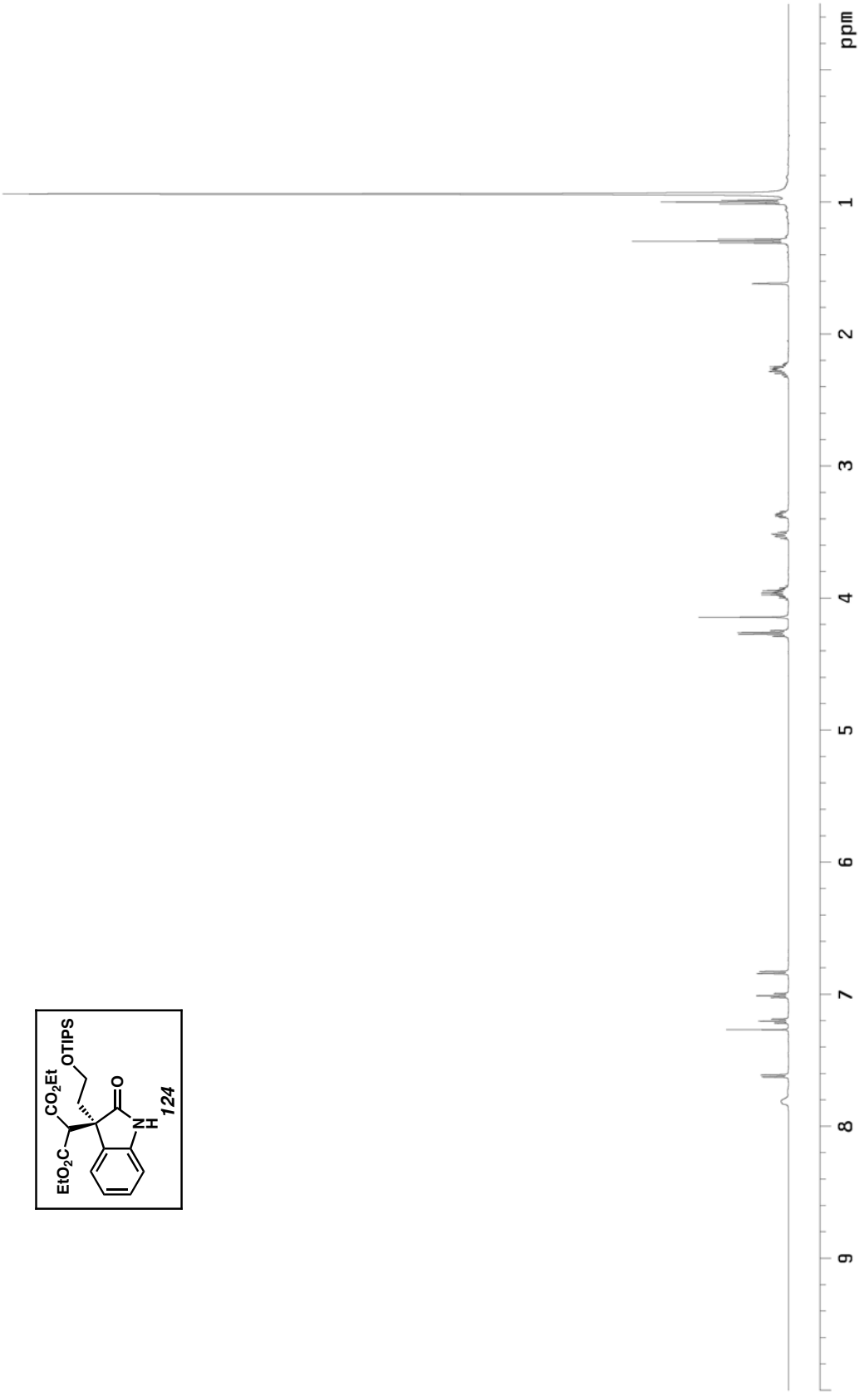


Figure A3.35.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **124** (Table 3.4, Entry 2).

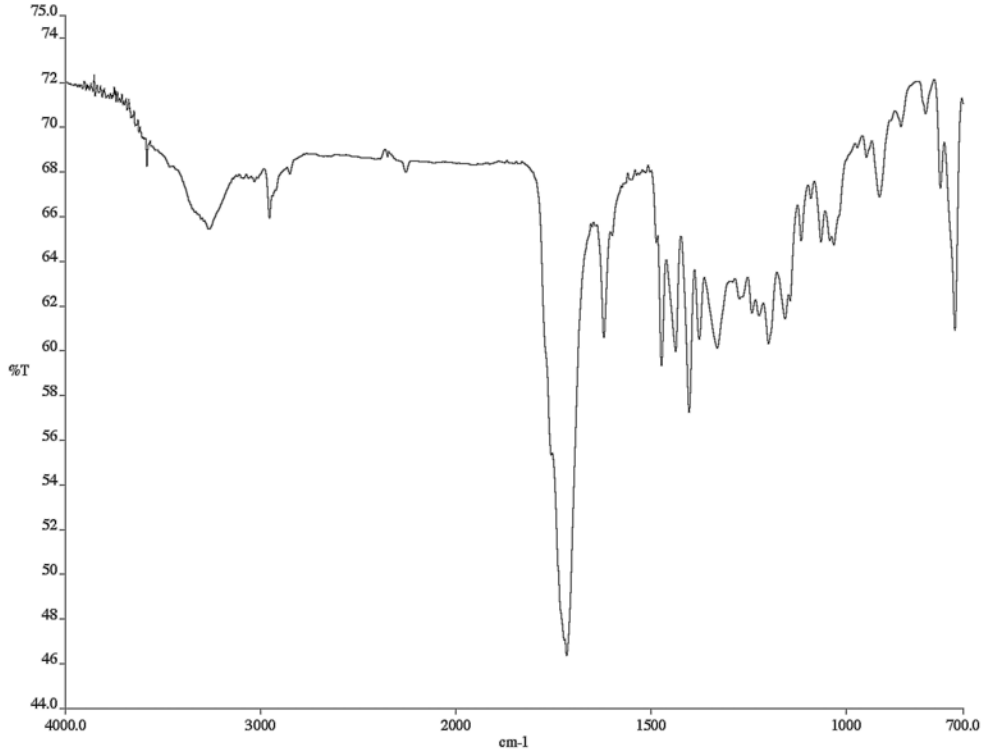


Figure A3.35.2 Infrared spectrum (thin film/NaCl) of compound **124** (Table 3.4, Entry 2).

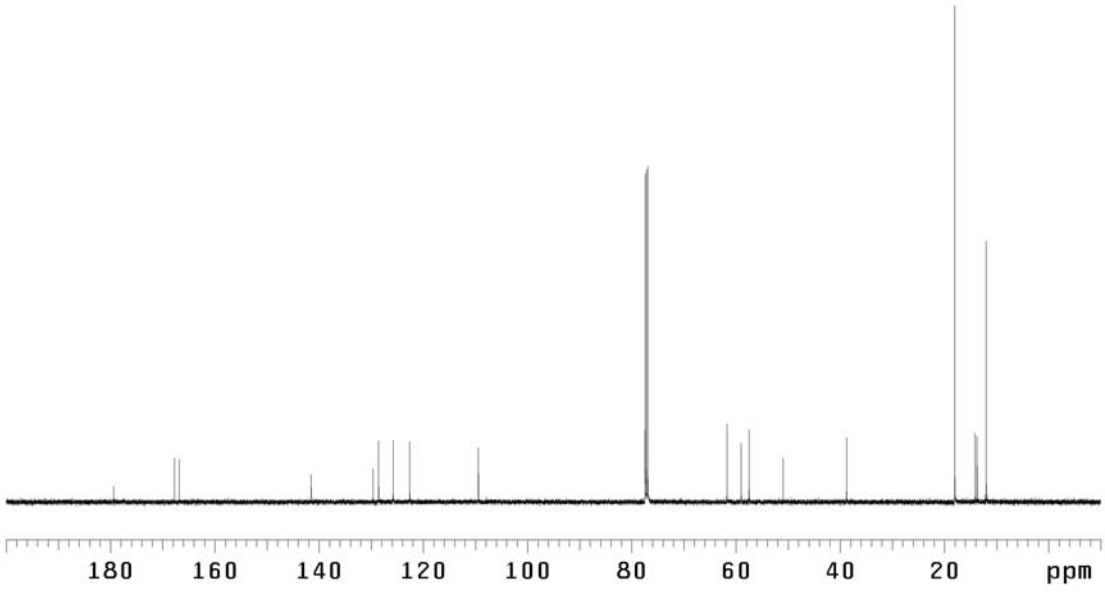
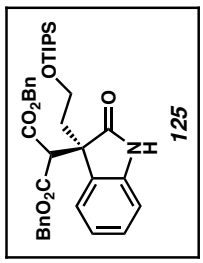


Figure A3.35.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **124** (Table 3.4, Entry 2).



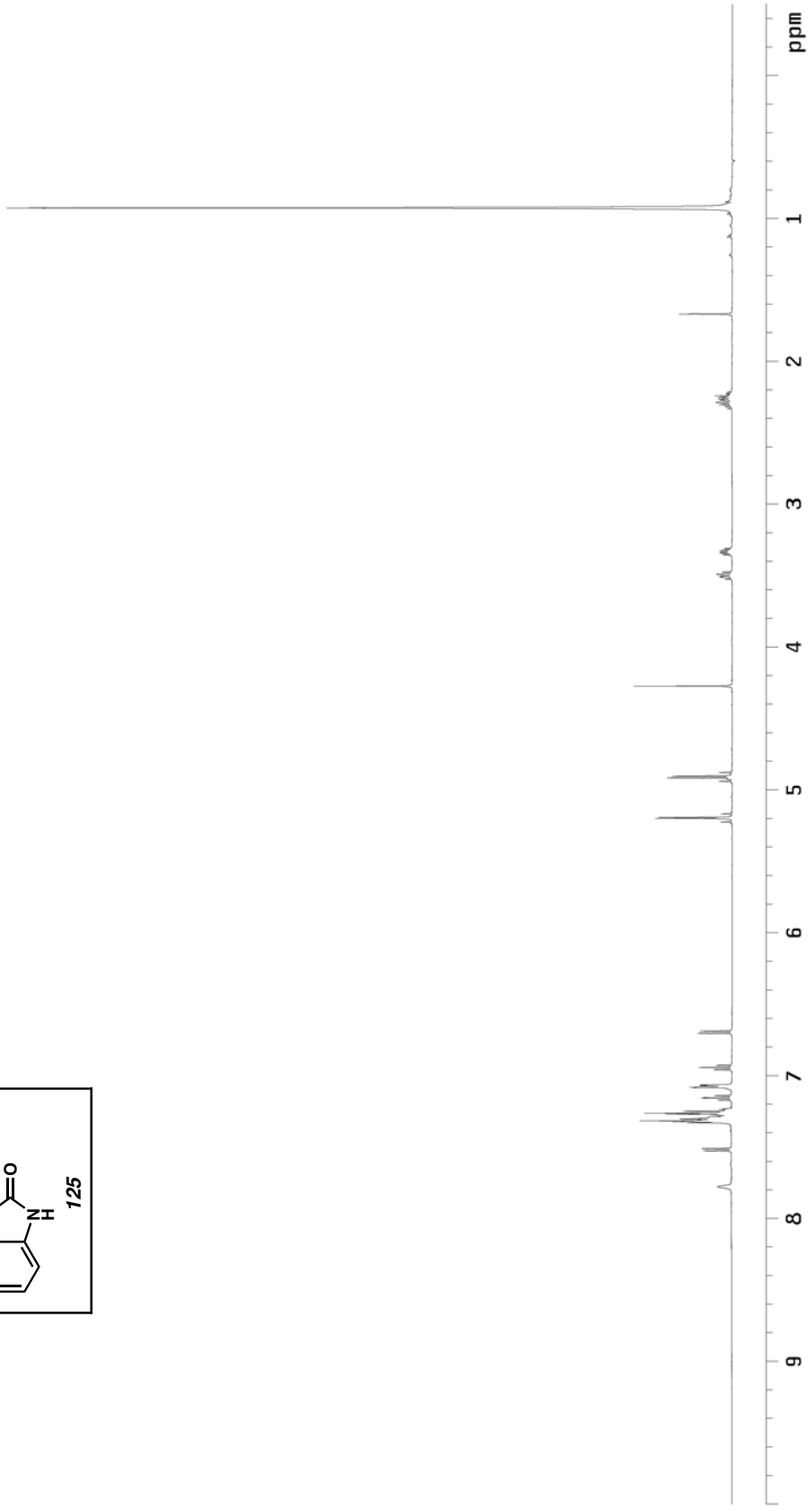


Figure A3.36.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **125** (Table 3.4, Entry 3).

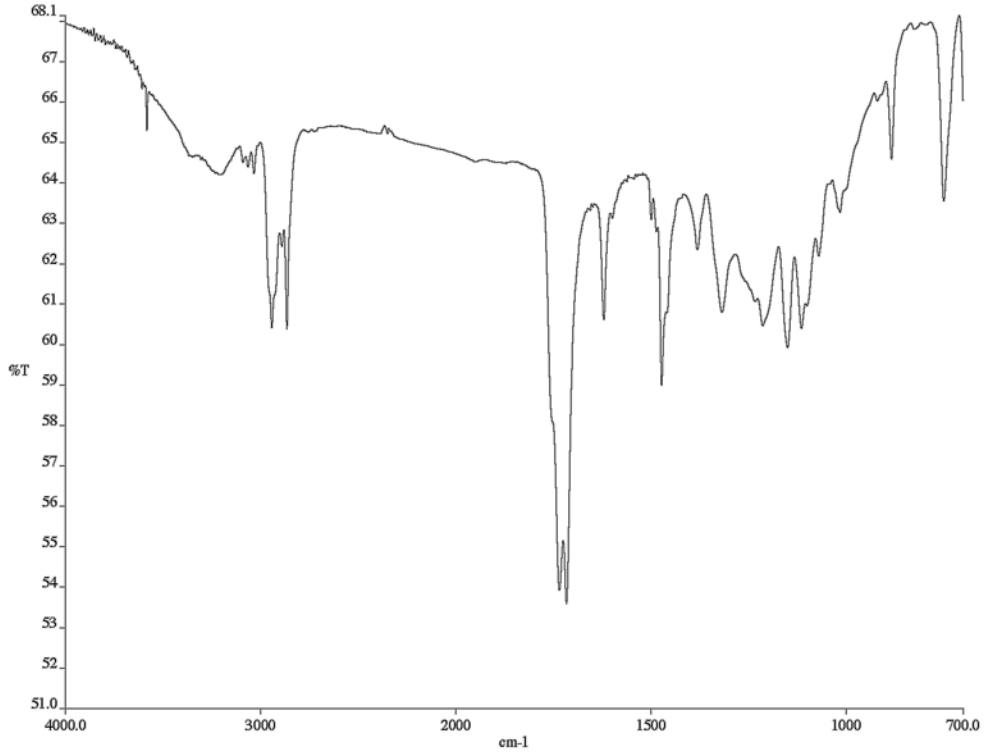


Figure A3.36.2 Infrared spectrum (thin film/NaCl) of compound **125** (Table 3.4, Entry 3).

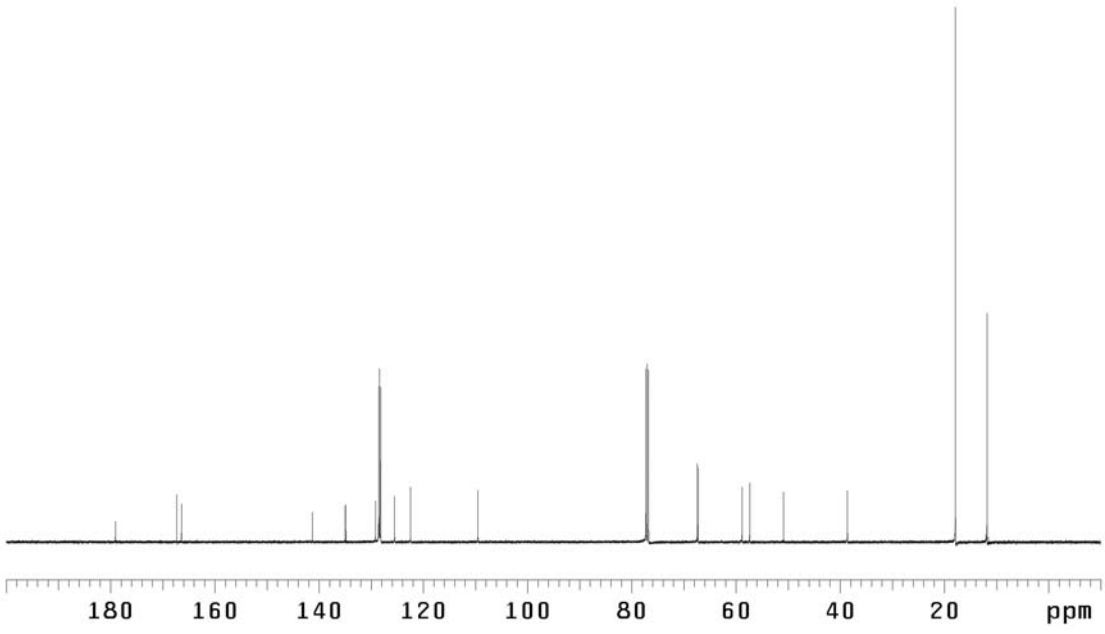
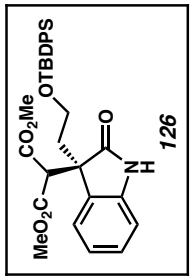


Figure A3.36.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **125** (Table 3.4, Entry 3).



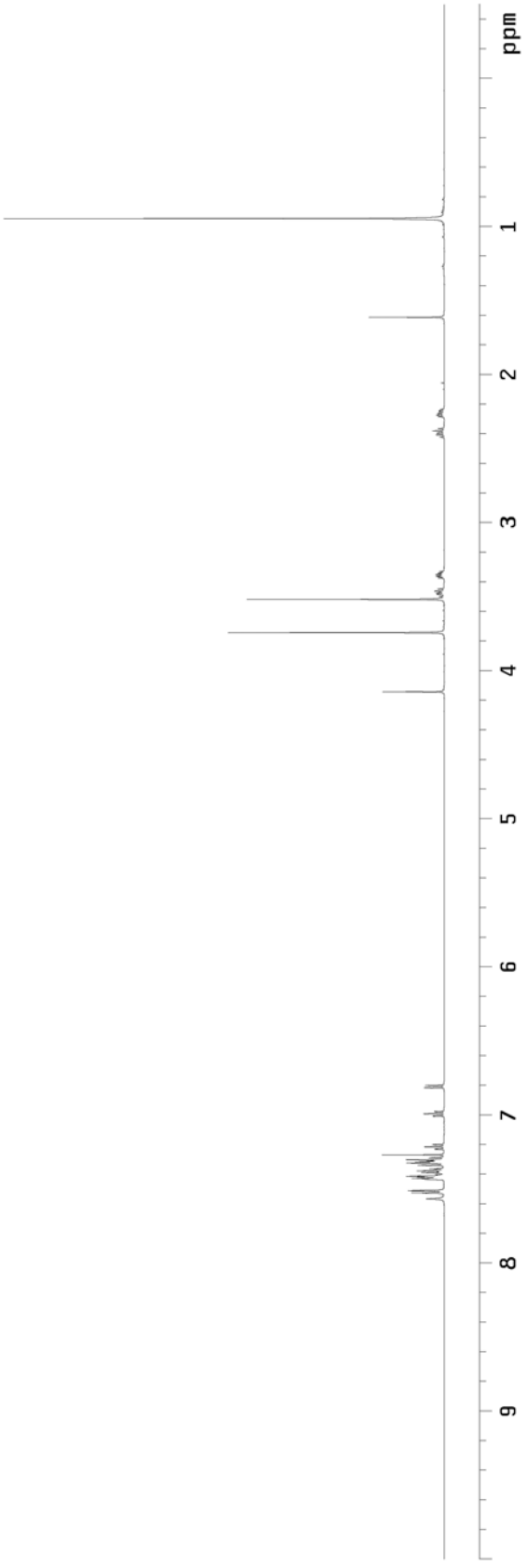


Figure A3.37.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **126** (Table 3.4, Entry 4).

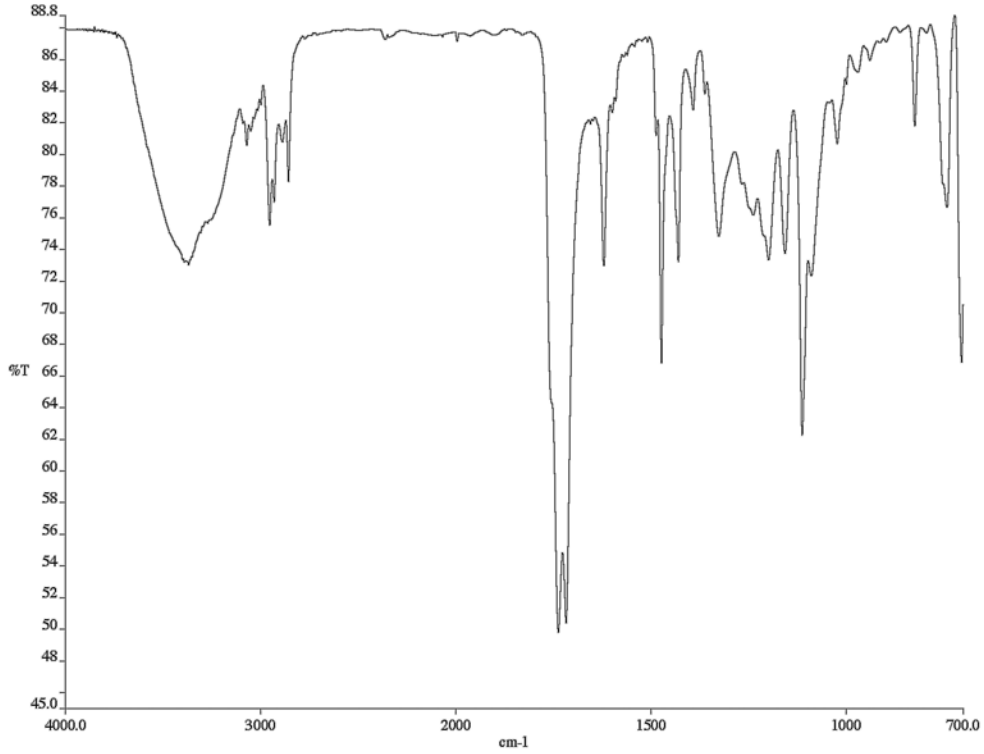


Figure A3.37.2 Infrared spectrum (thin film/NaCl) of compound **126** (Table 3.4, Entry 4).

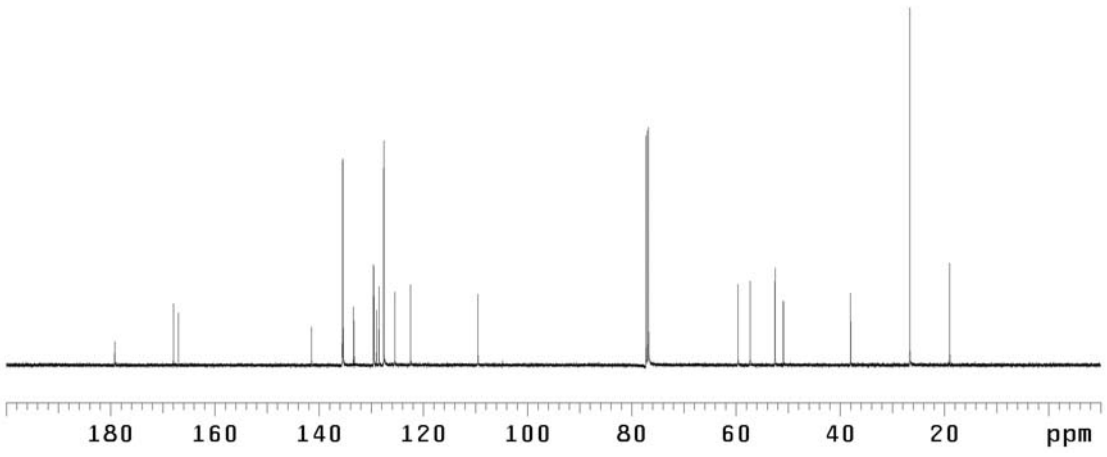


Figure A3.37.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **126** (Table 3.4, Entry 4)

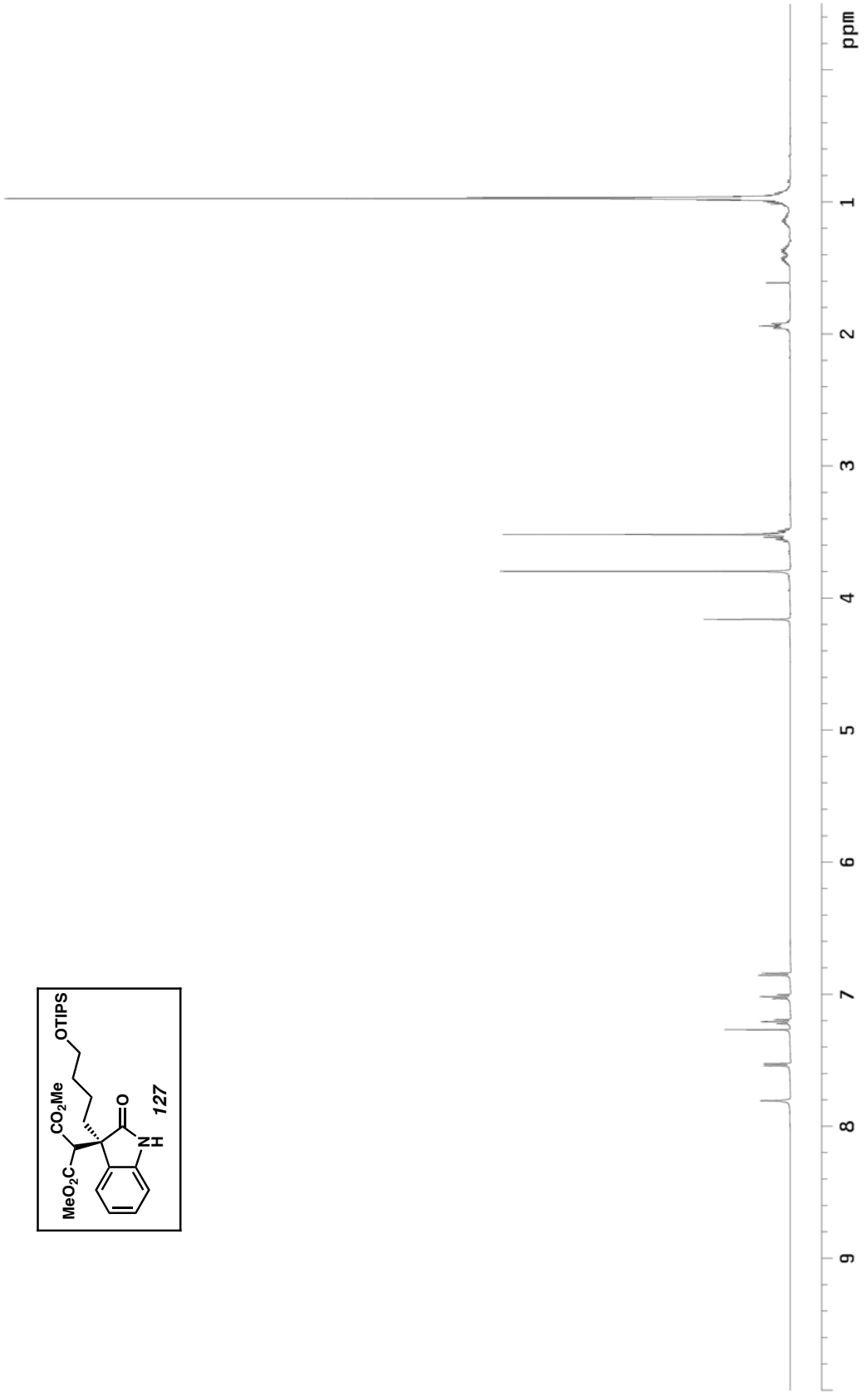


Figure A3.38.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **127** (Table 3.4, Entry 6).

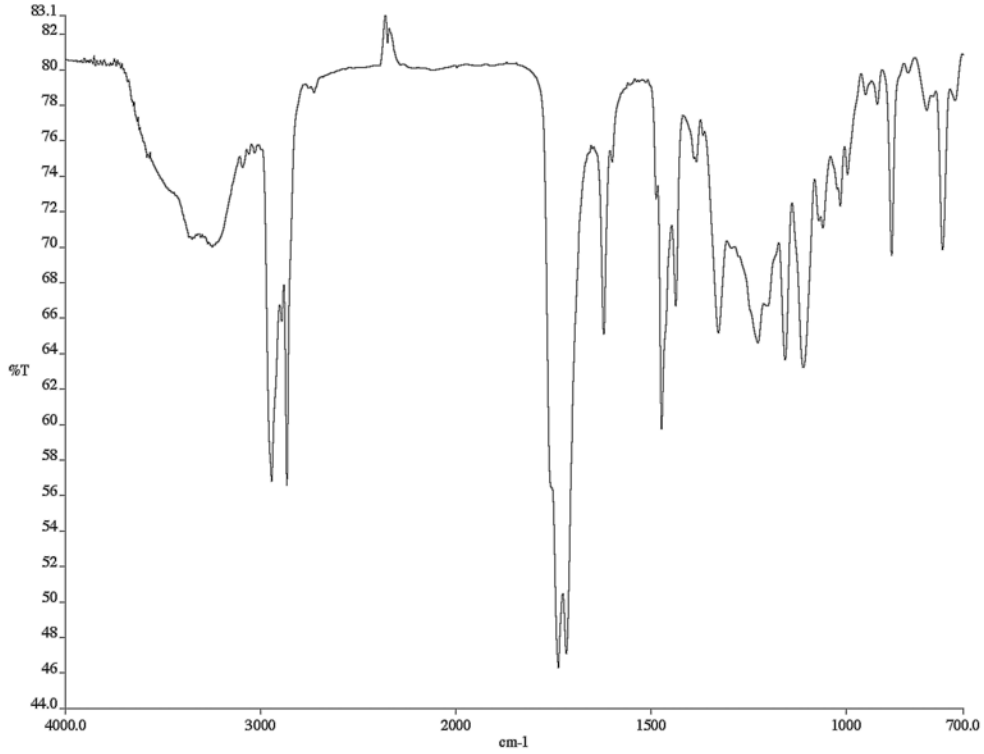


Figure A3.38.2 Infrared spectrum (thin film/NaCl) of compound **127** (Table 3.4, Entry 6)

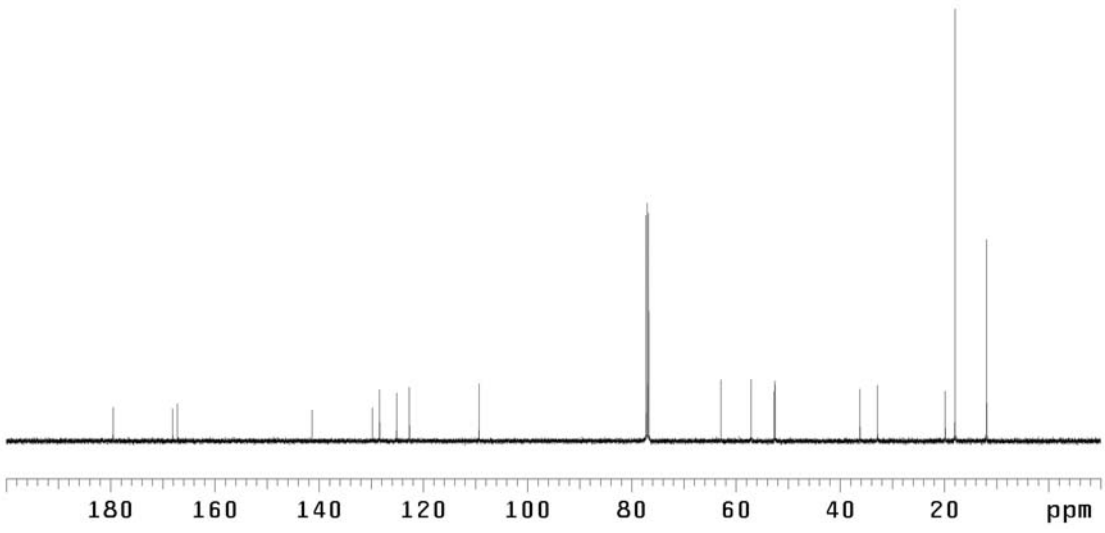
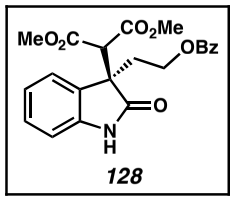


Figure A3.38.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **127** (Table 3.4, Entry 6).



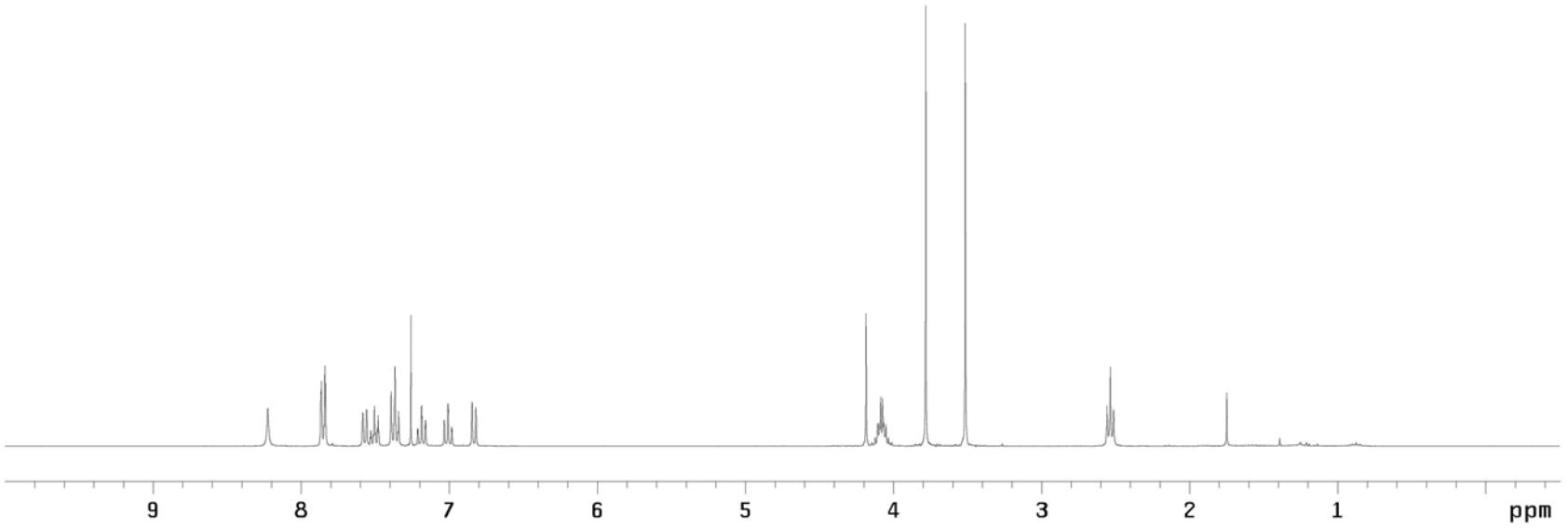


Figure A3.39.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **128** (Table 3.4, Entry5).

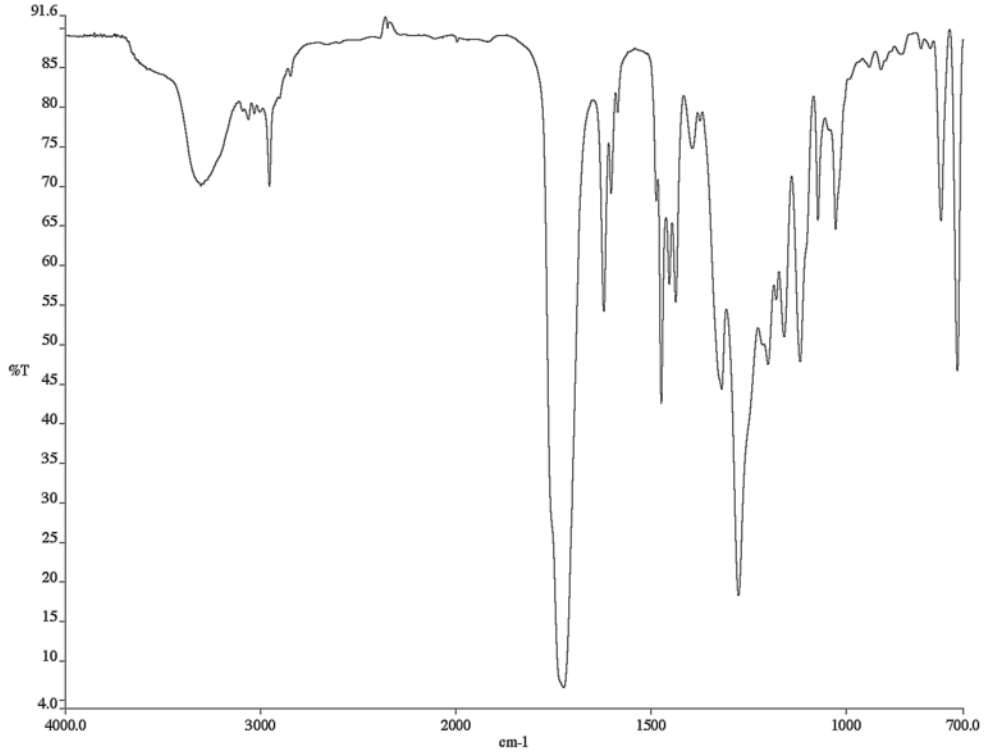


Figure A3.39.2 Infrared spectrum (thin film/NaCl) of compound **128** (Table 3.4, Entry 5).

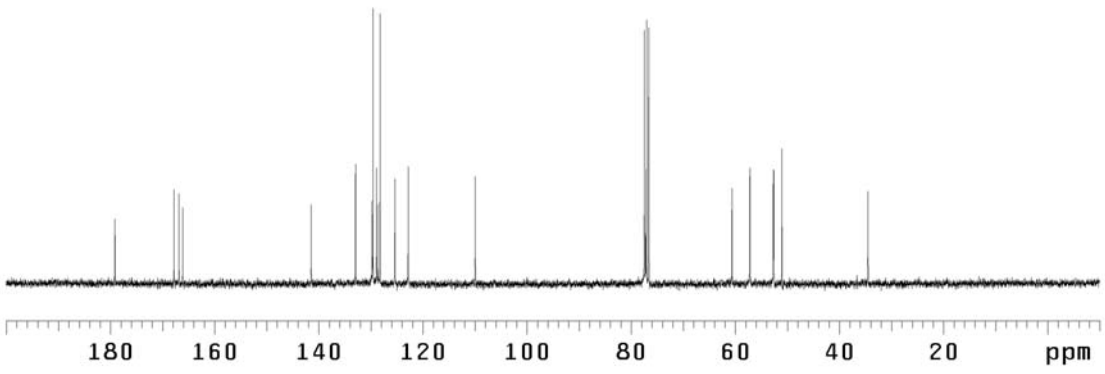


Figure A3.39.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **128** (Table 3.4, Entry 5).

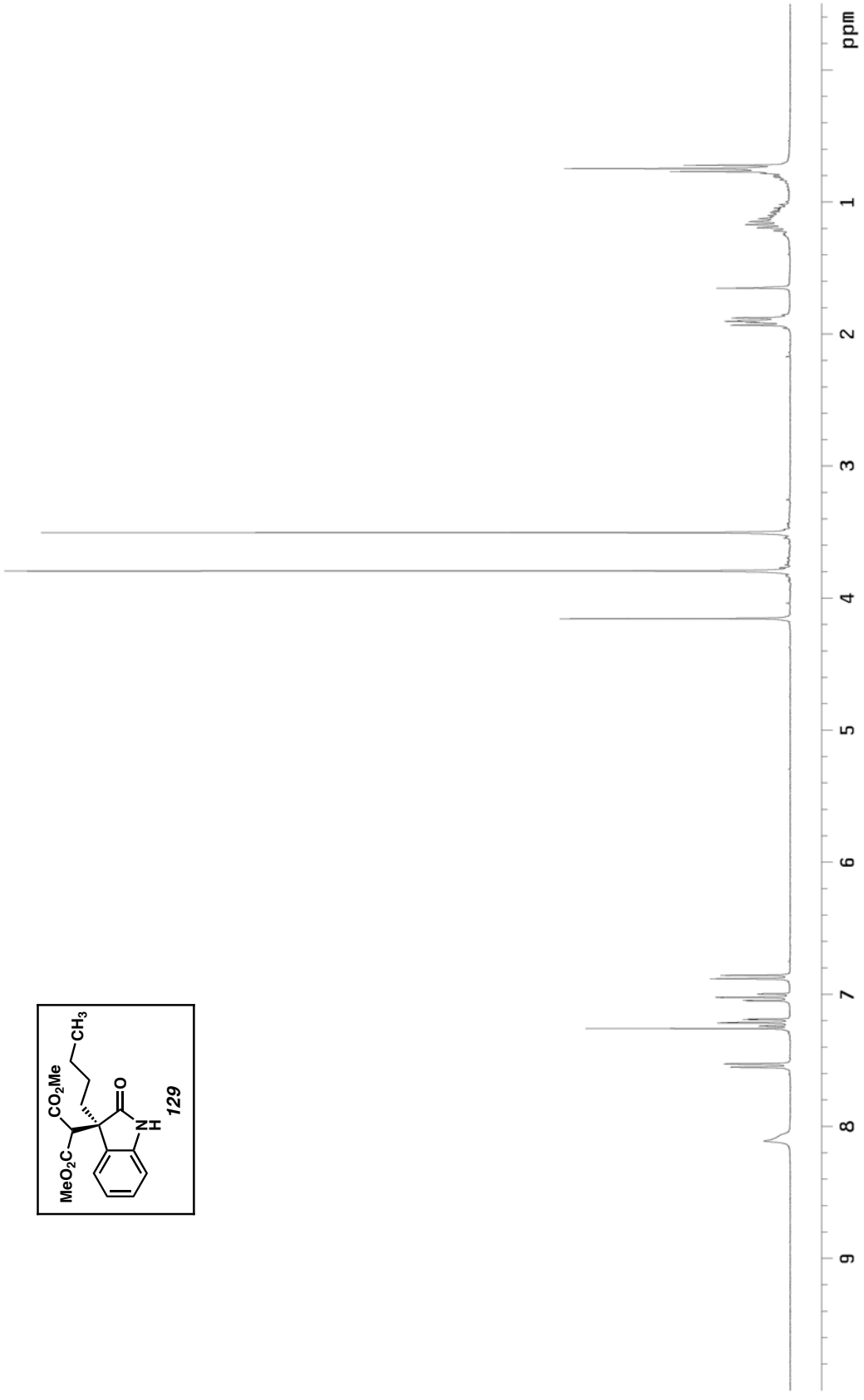


Figure A3.40.1 ^{1}H NMR (300 MHz, $CDCl_3$) of compound **129** (Table 3.4, Entry 7).

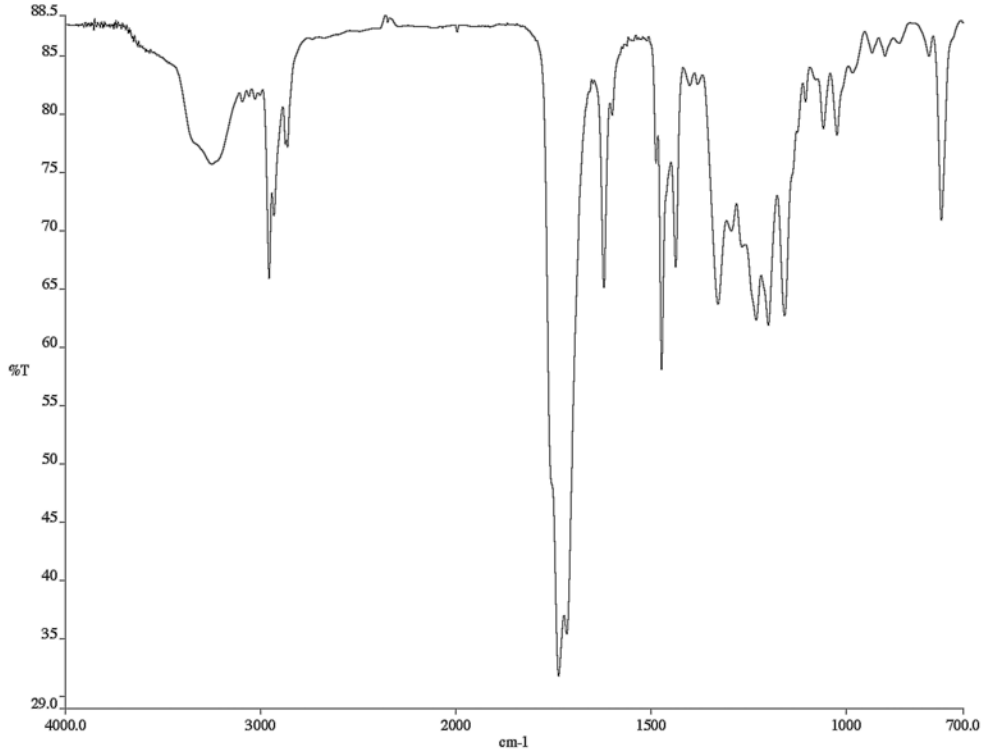


Figure A3.40.2 Infrared spectrum (thin film/NaCl) of compound **129** (Table 3.4, Entry 7).

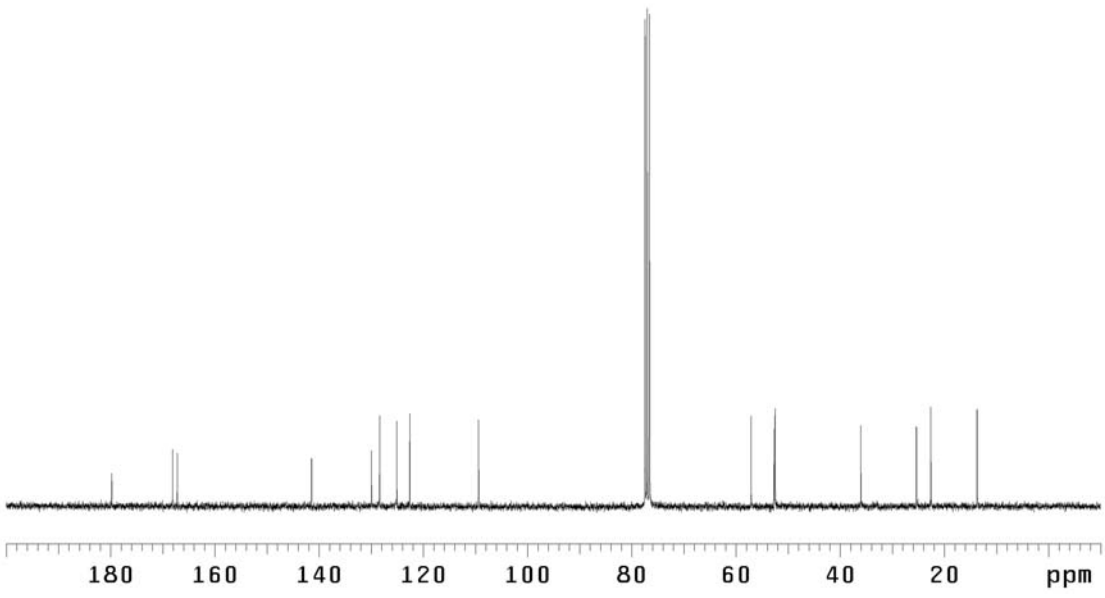


Figure A3.40.3 ^{13}C NMR (75 MHz, $CDCl_3$) of compound **129** (Table 3.4, Entry 7).

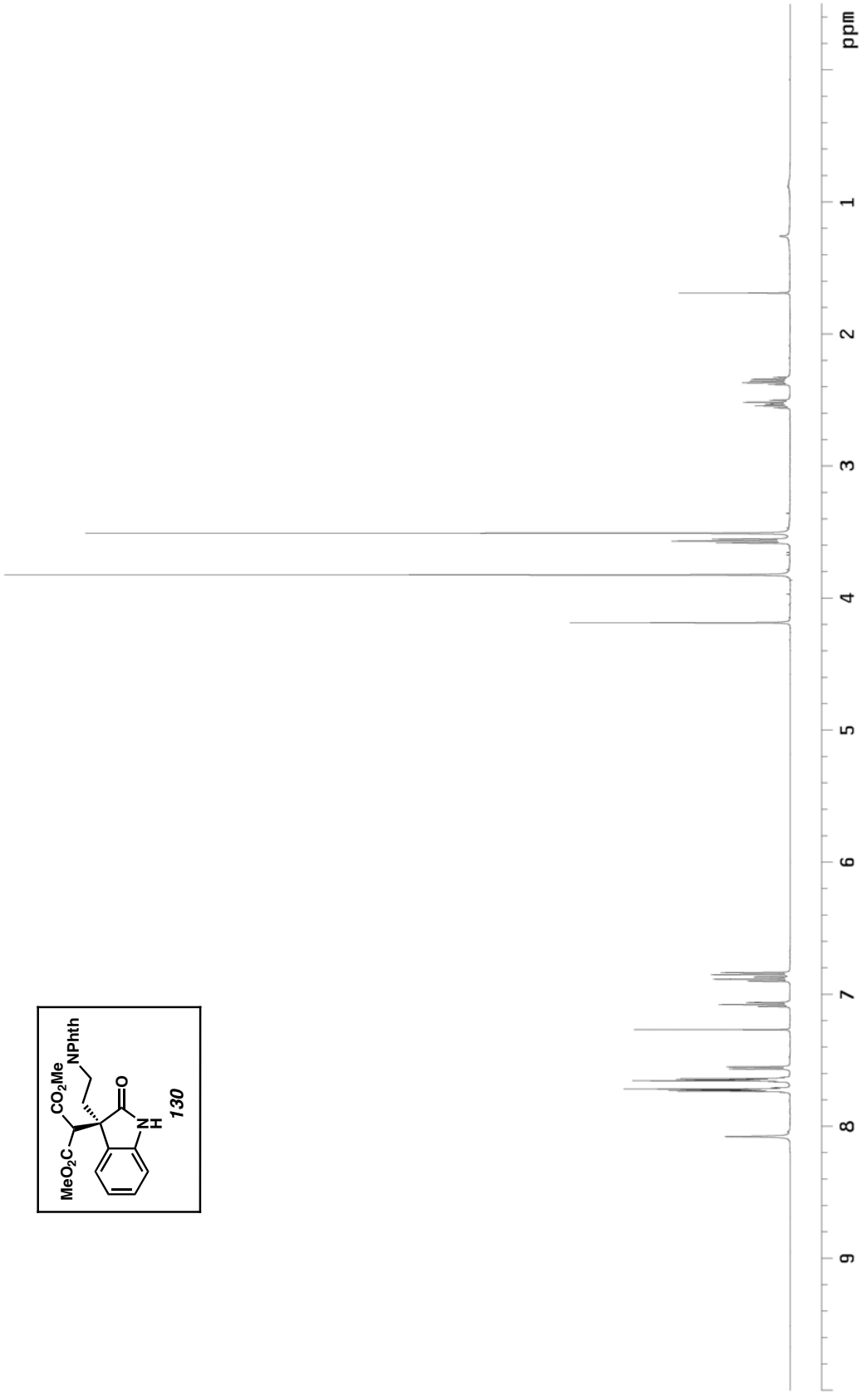


Figure A3.41.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **130** (Table 3.4, Entry 10).

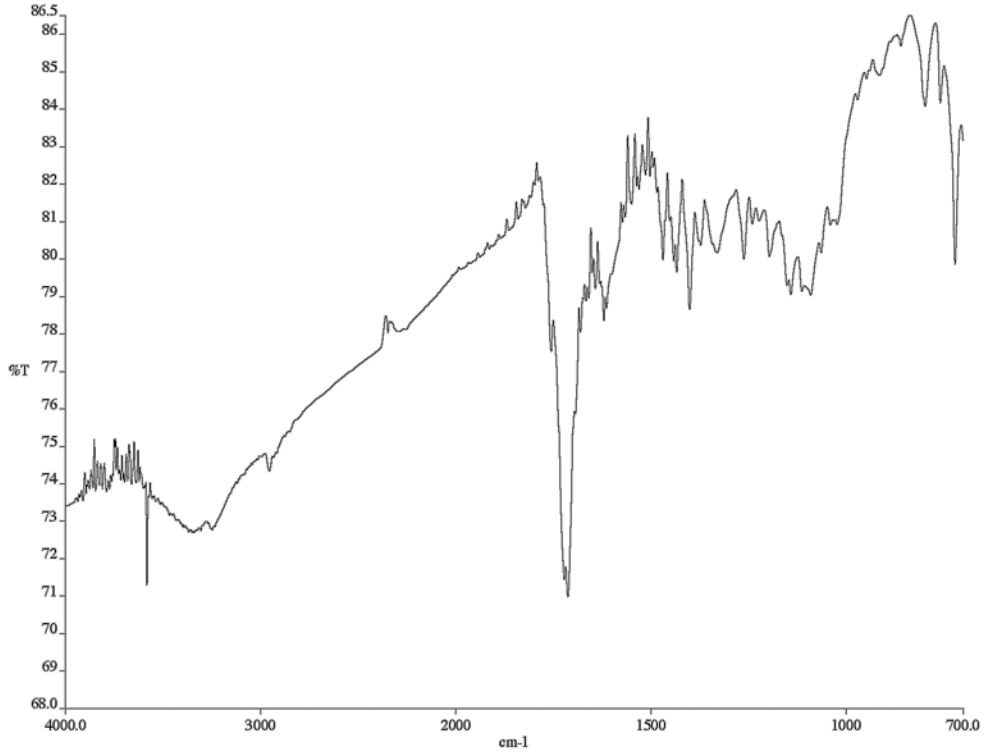


Figure A3.41.2 Infrared spectrum (thin film/NaCl) of compound **130** (Table 3.4, Entry 10).

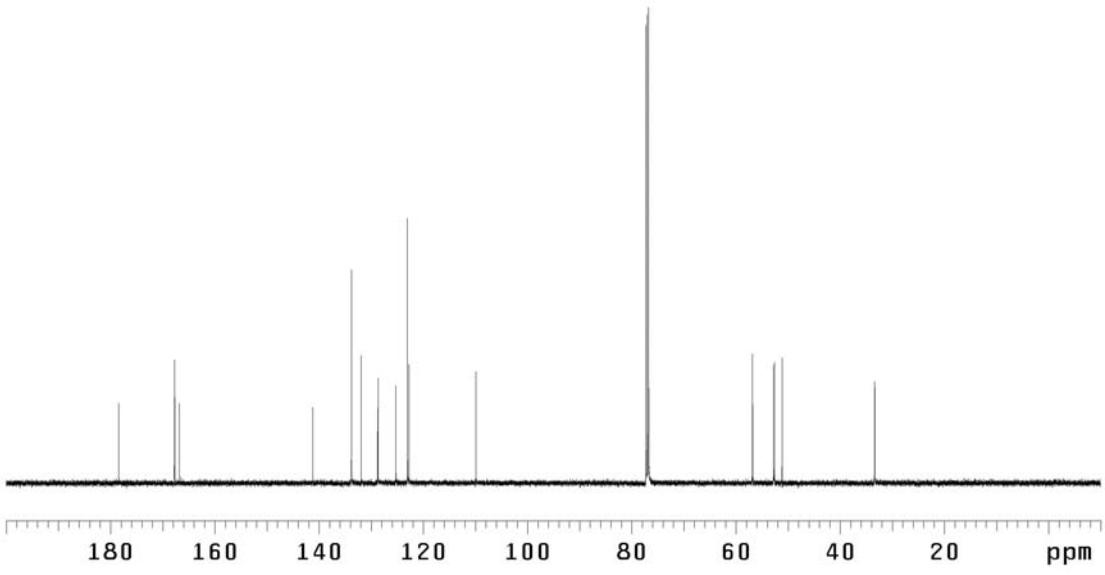


Figure A3.41.3 ^{13}C NMR (500 MHz, $CDCl_3$) of compound **130** (Table 3.4, Entry 10).

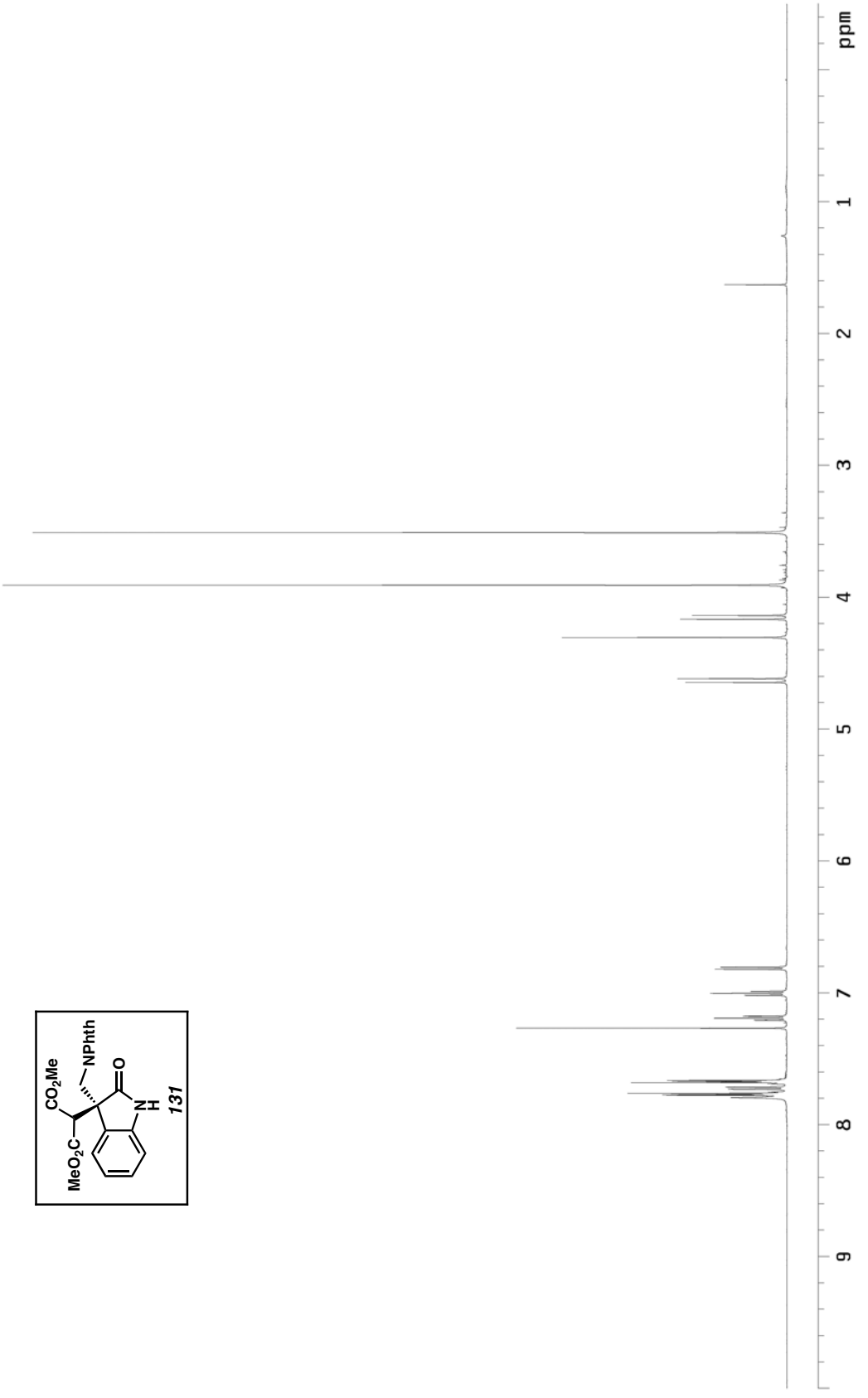


Figure A3.42.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **131** (Table 3.4, Entry 8).

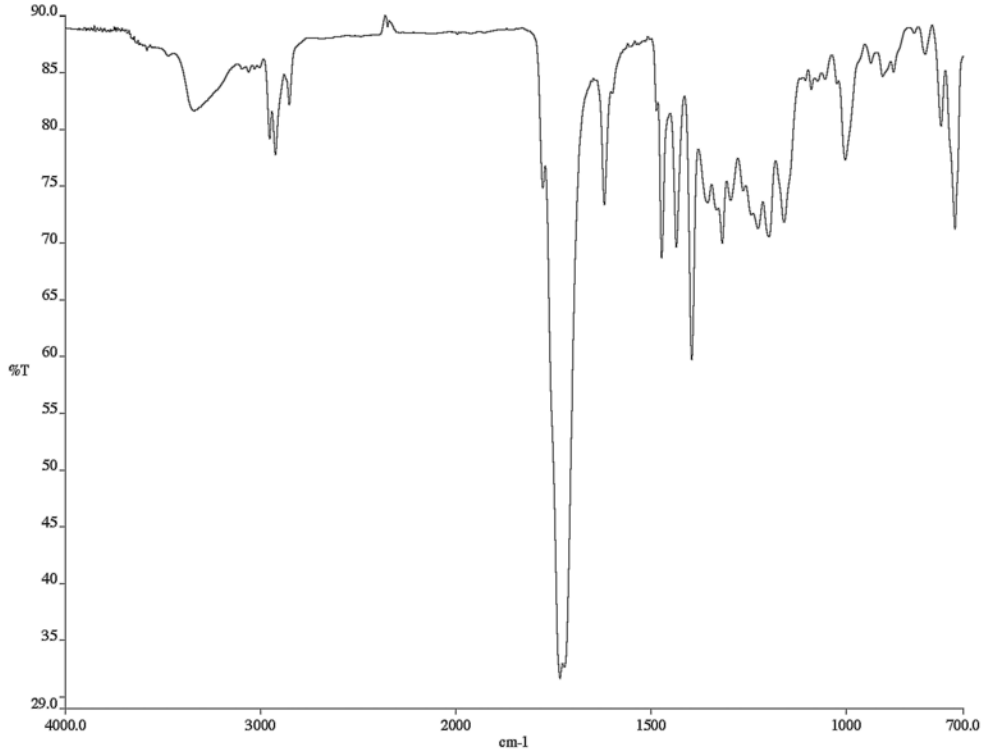


Figure A3.42.2 Infrared spectrum (thin film/NaCl) of compound **131** (Table 3.4, Entry 8).

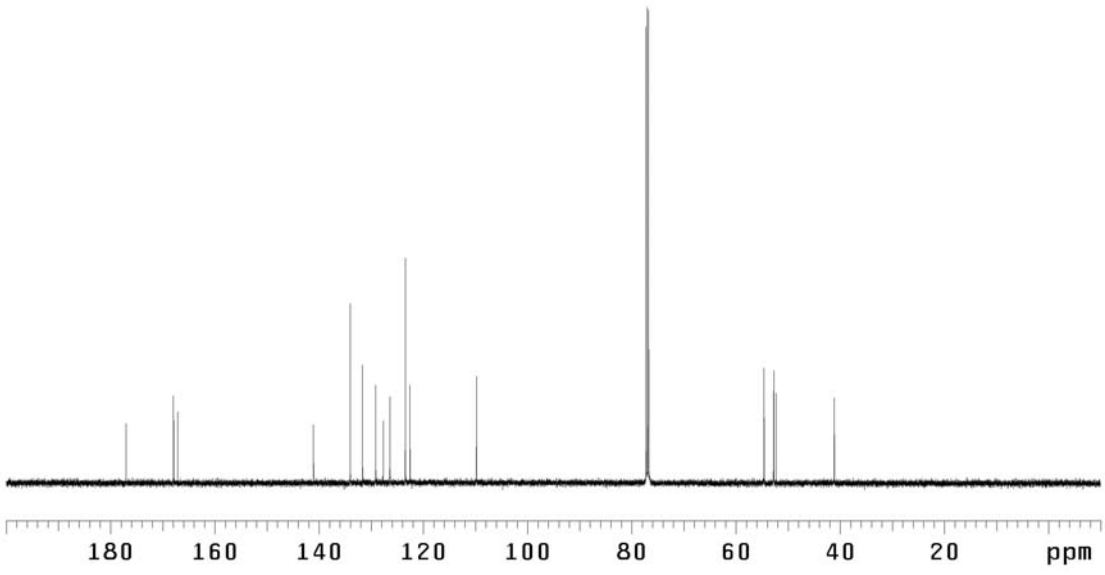
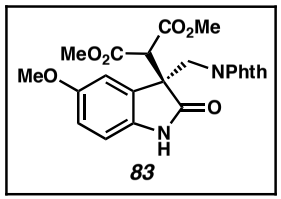


Figure A3.42.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **131** (Table 3.4, Entry 8).



83

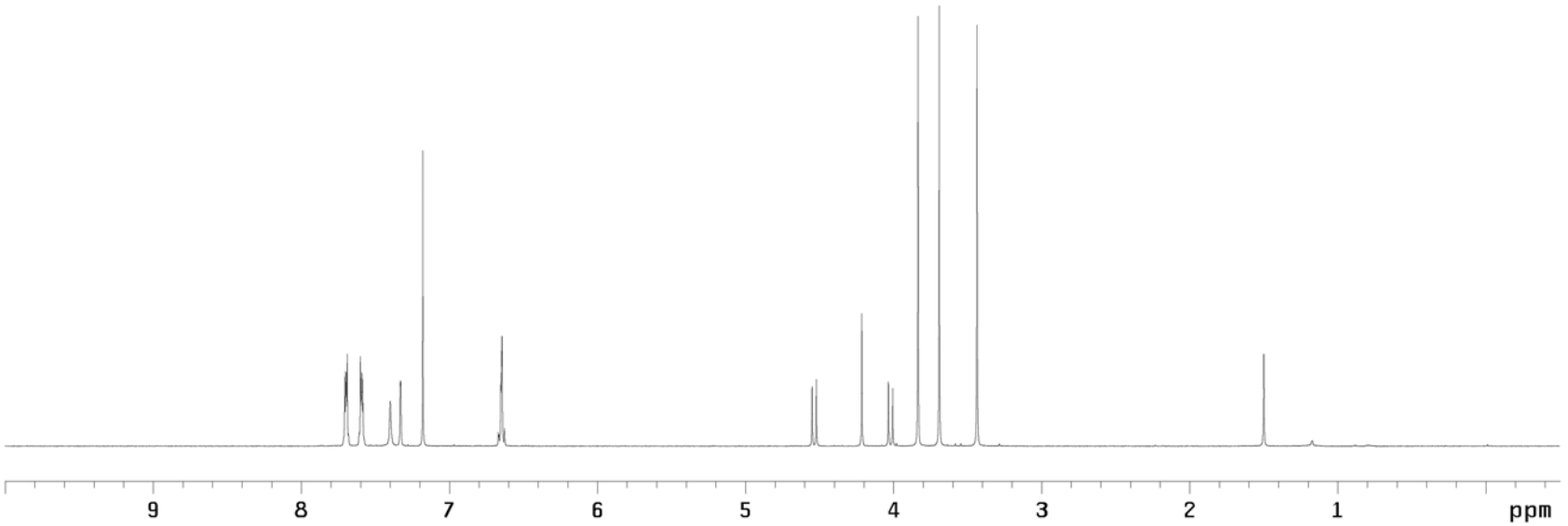


Figure A3.43.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **83** (Table 3.4, Entry 9).

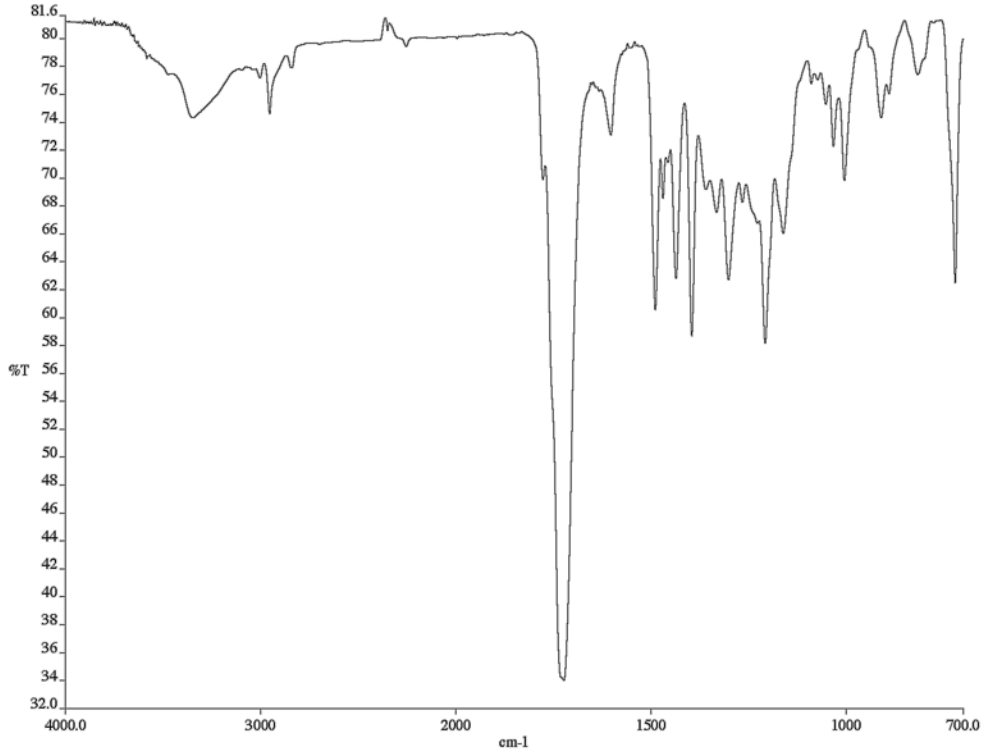


Figure A3.43.2 Infrared spectrum (thin film/NaCl) of compound **83** (Table 3.4, Entry 9).

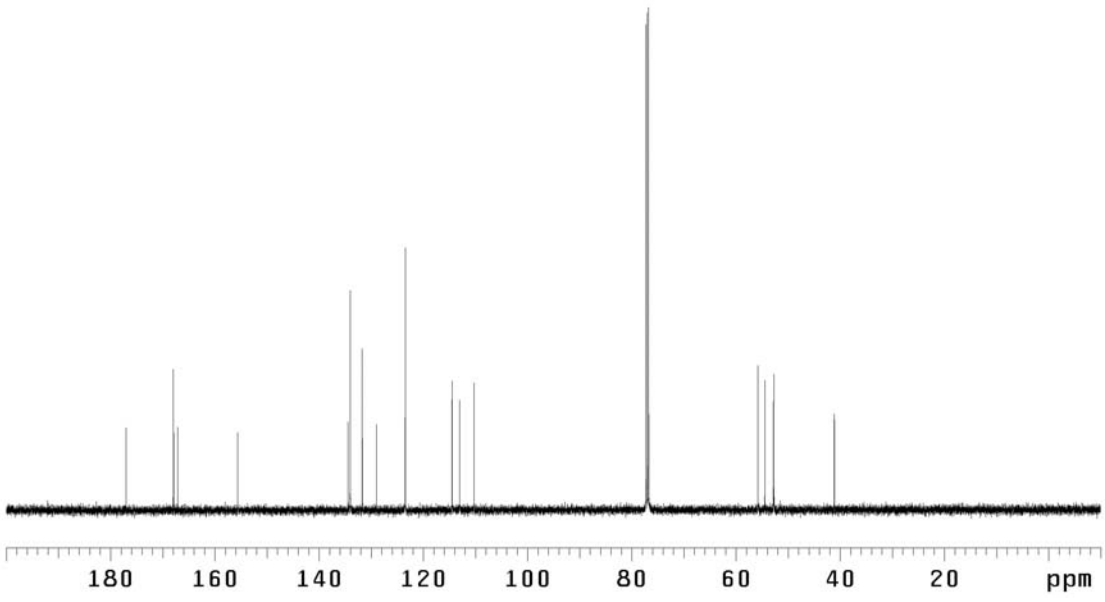


Figure A3.43.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **83** (Table 3.4, Entry 9).

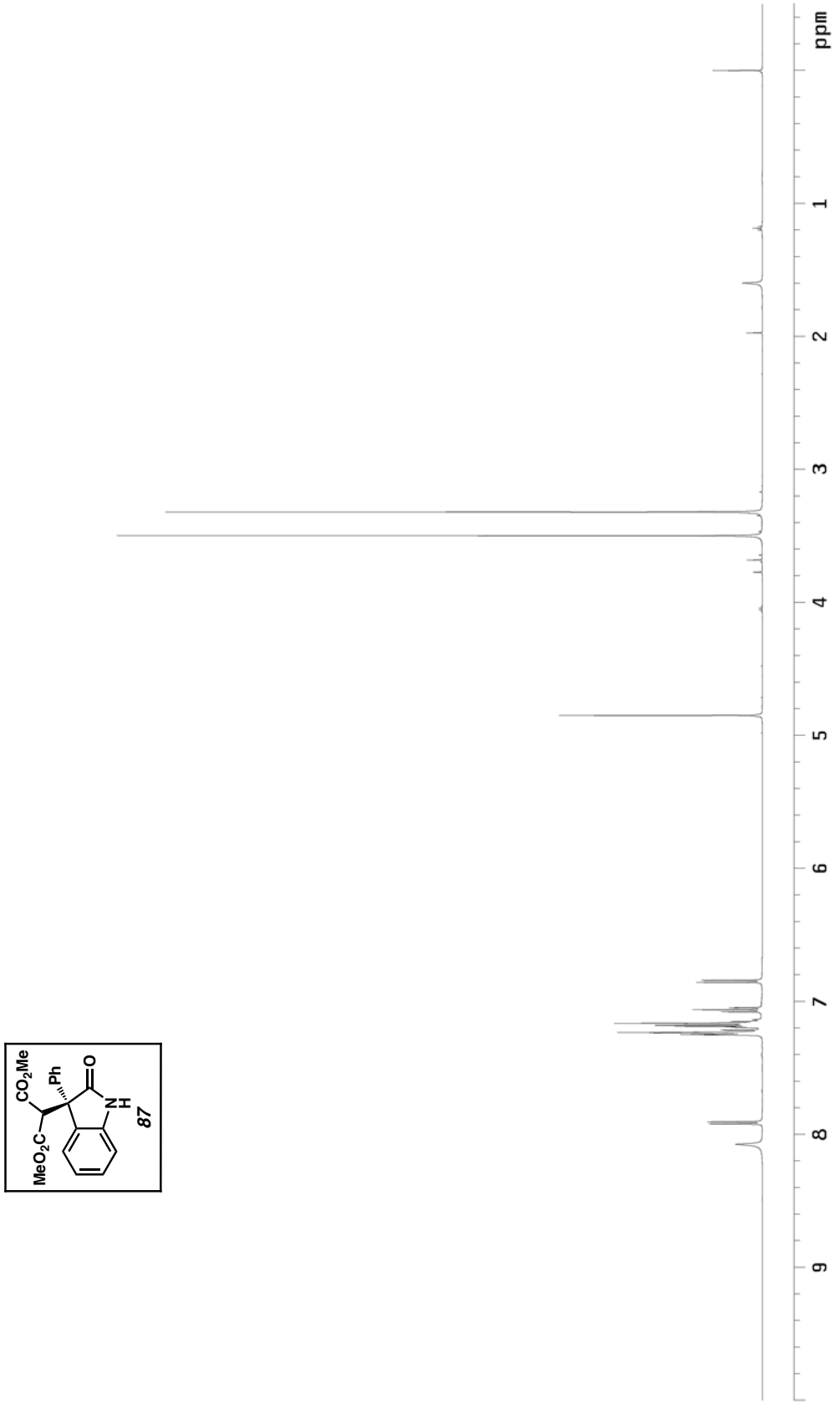


Figure A3.44.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **87** (Table 3.5, Entry 1).

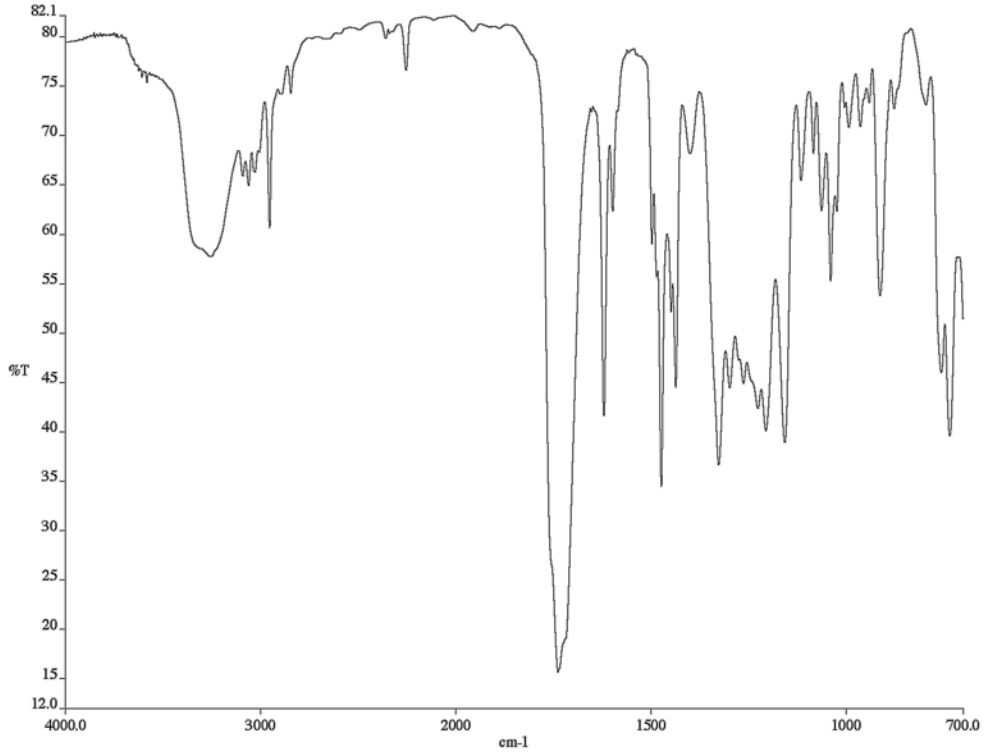


Figure A3.44.2 Infrared spectrum (thin film/NaCl) of compound **87** (Table 3.5, Entry 1).

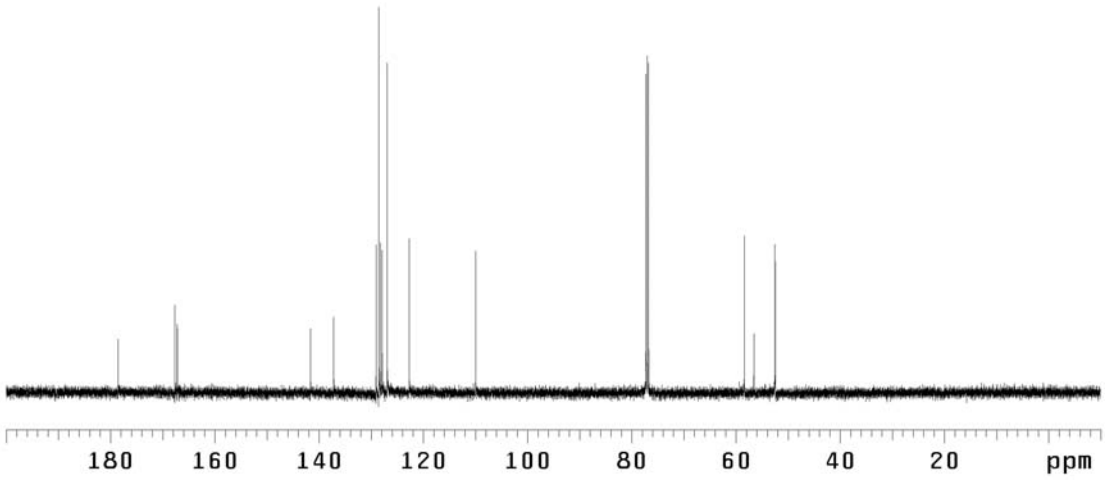
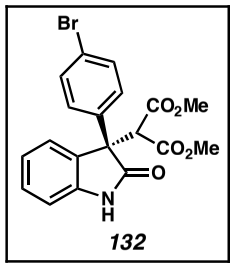


Figure A3.44.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **87** (Table 3.5, Entry 1).



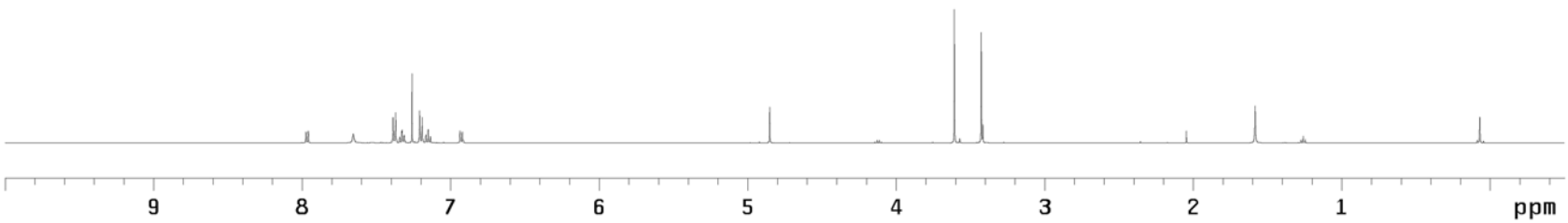


Figure A3.45.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **132** (Table 3.5, Entry 3).

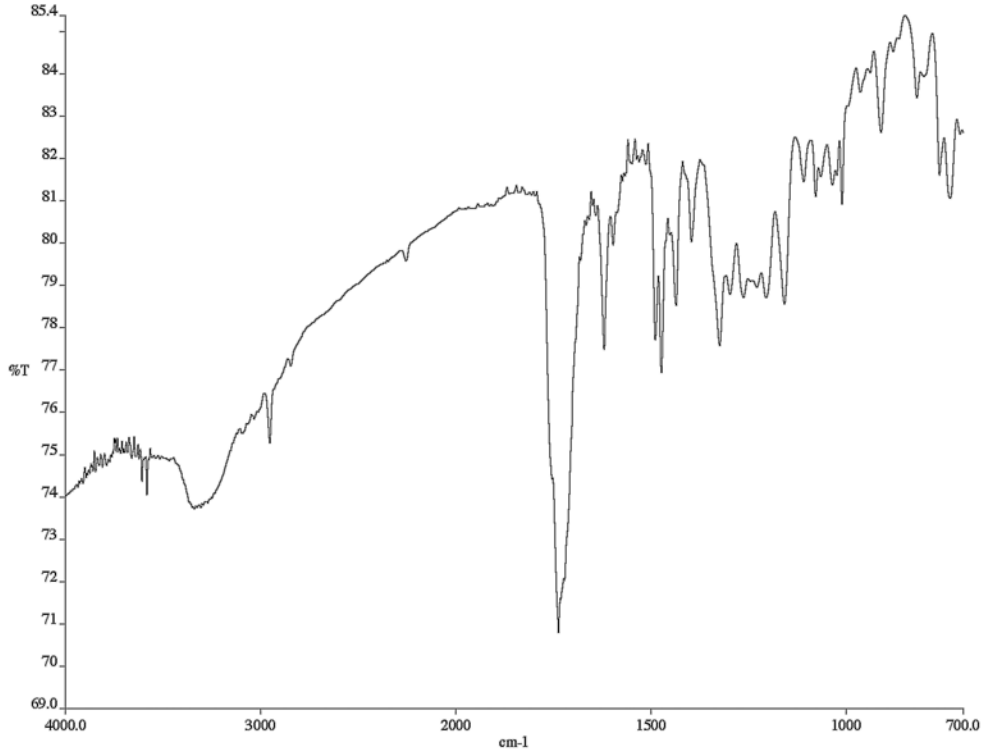


Figure A3.45.2 Infrared spectrum (thin film/NaCl) of compound **132** (Table 3.5, Entry 3).

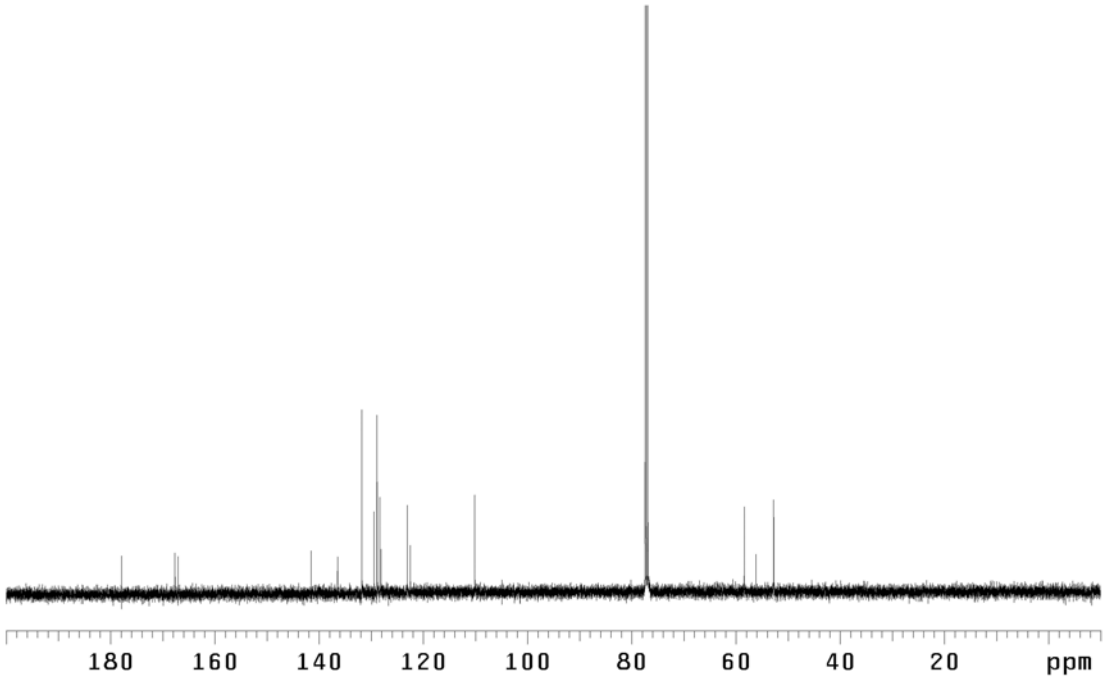
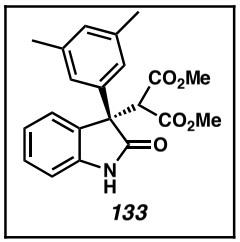


Figure A3.45.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **132** (Table 3.5, Entry 3).



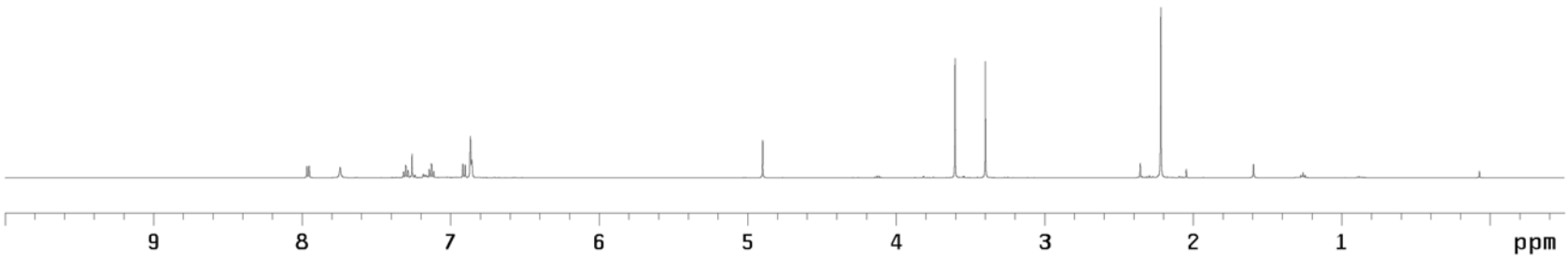


Figure A3.46.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **133** (Table 3.5, Entry 4).

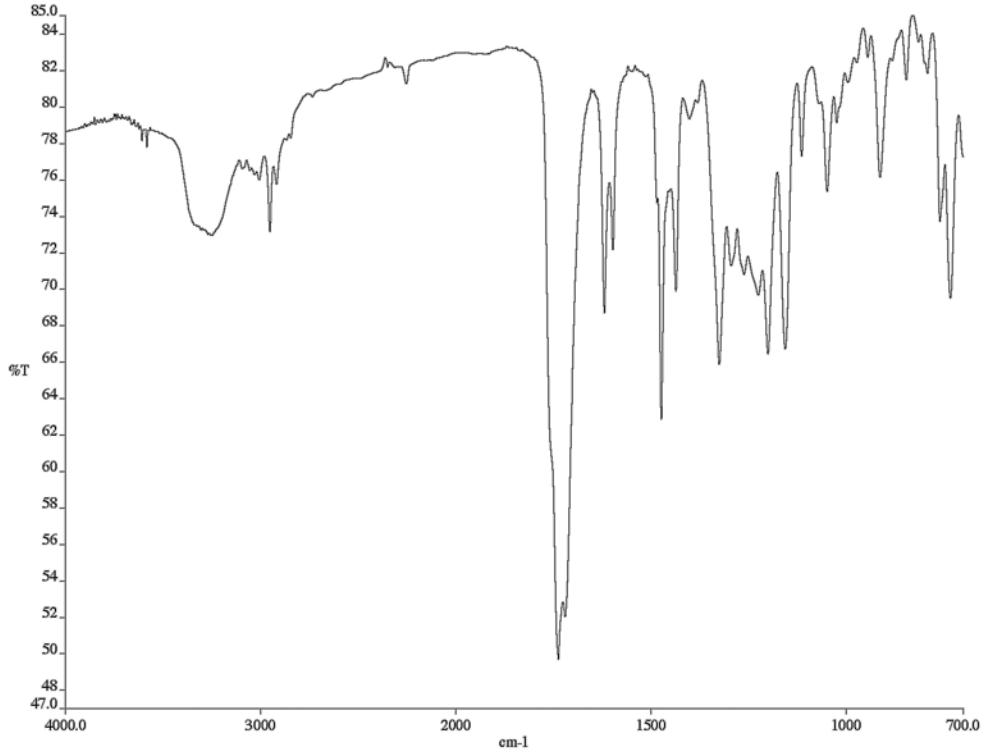


Figure A3.46.2 Infrared spectrum (thin film/NaCl) of compound **133** (Table 3.5, Entry 4).

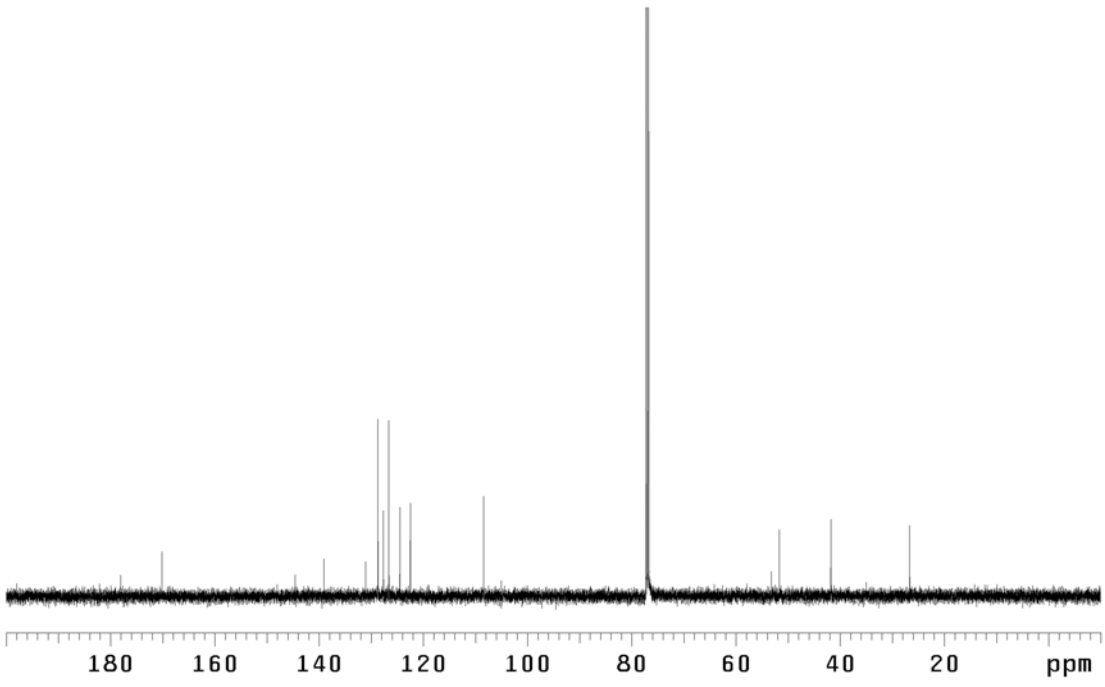
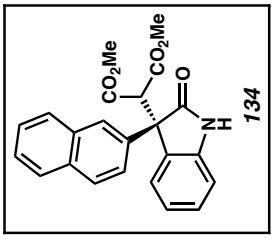


Figure A3.46.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **133** (Entry 3.5, Entry 4).



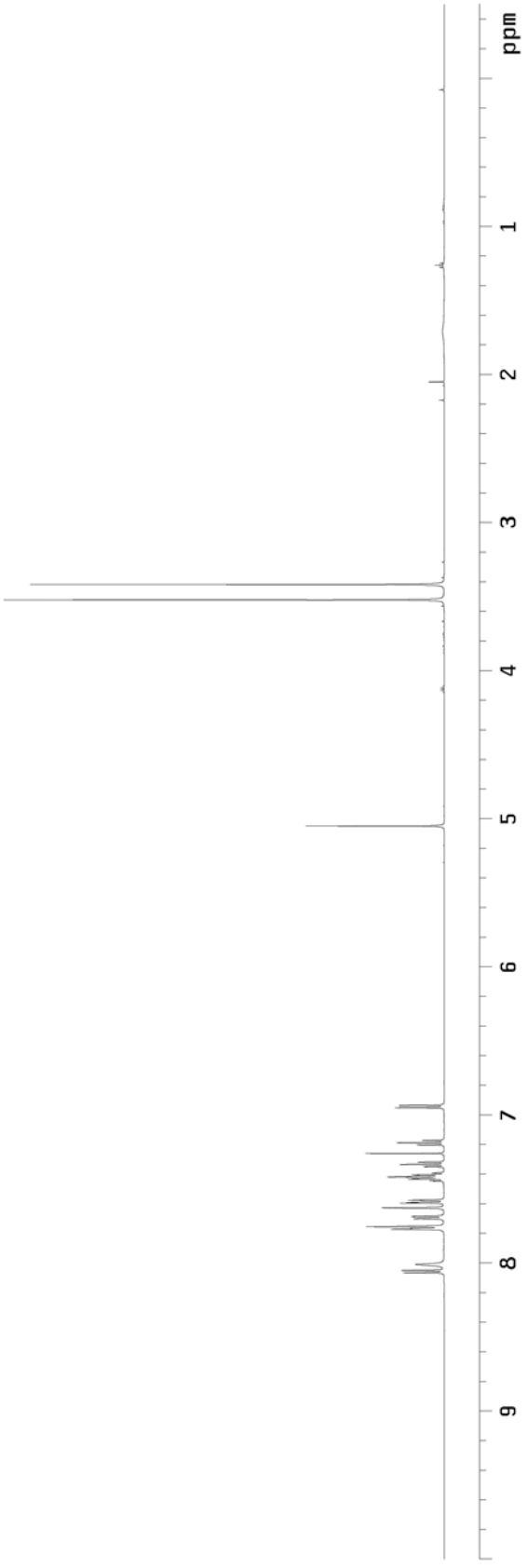


Figure A3.47.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **134** (Table 3.5, Entry 5).

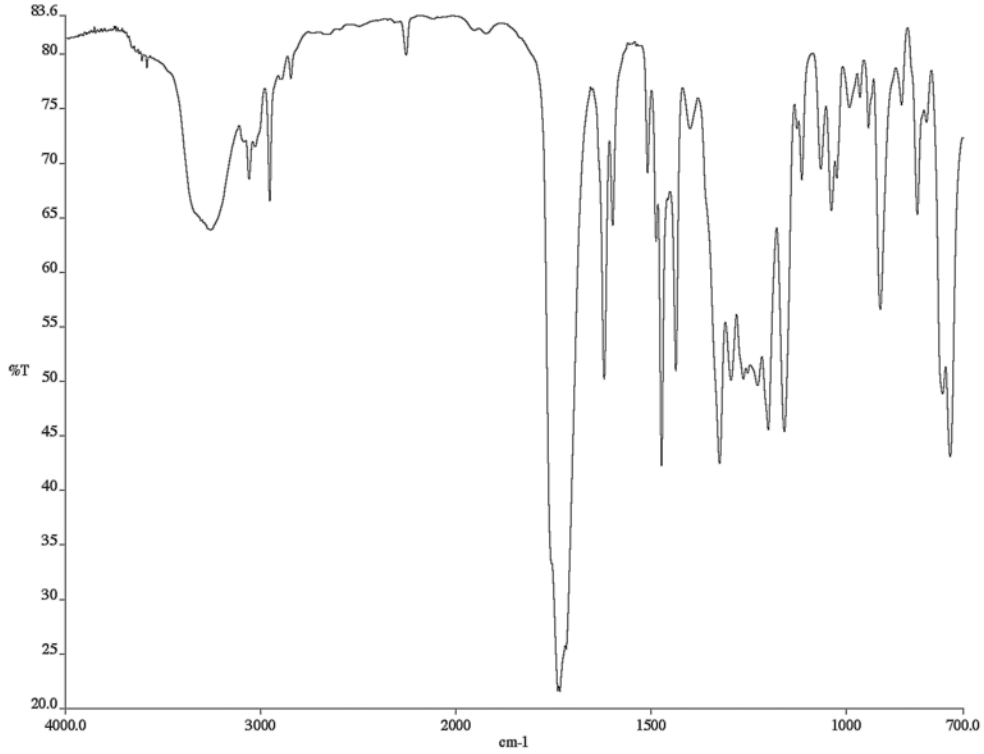


Figure A3.47.2 Infrared spectrum (thin film/NaCl) of compound **134** (Table 3.5, Entry 5).

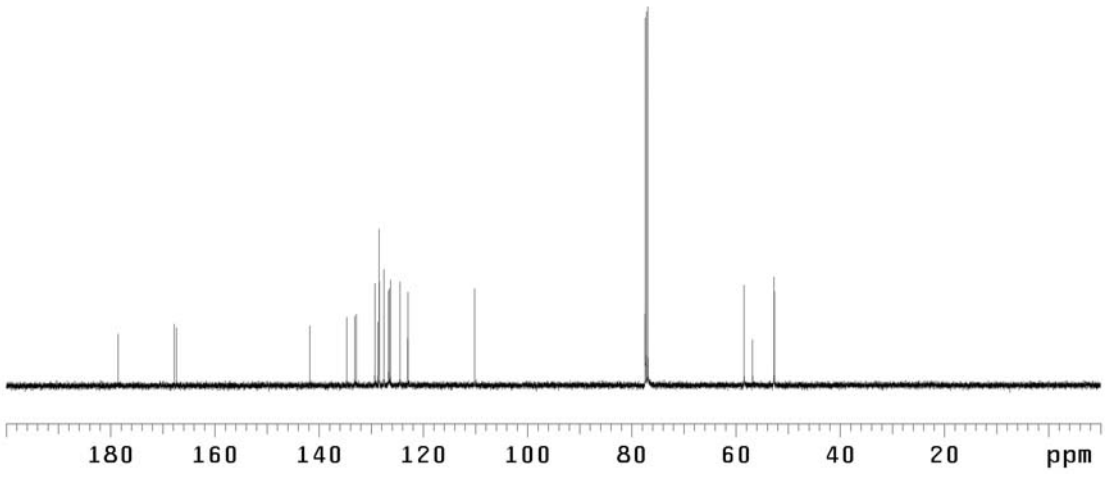
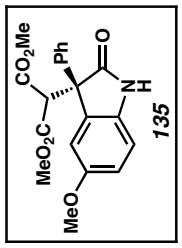


Figure A3.47.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **134** (Table, 3.5, Entry 5).



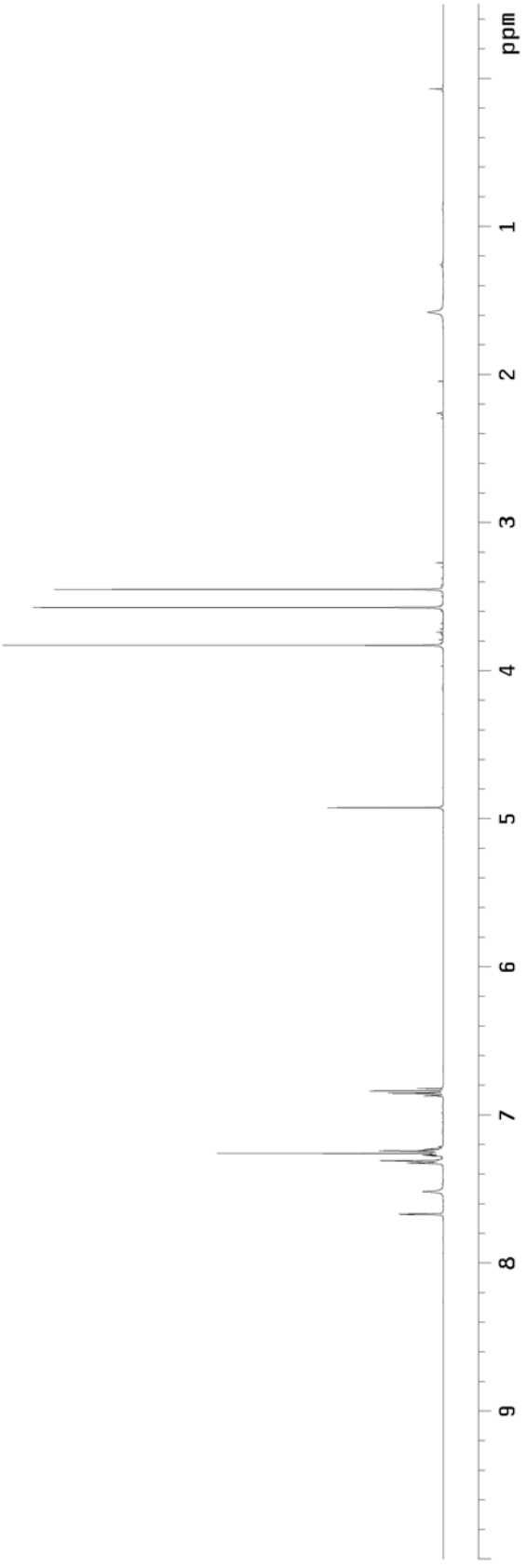


Figure A3.48.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **135** (Table 3.5, Entry 2).

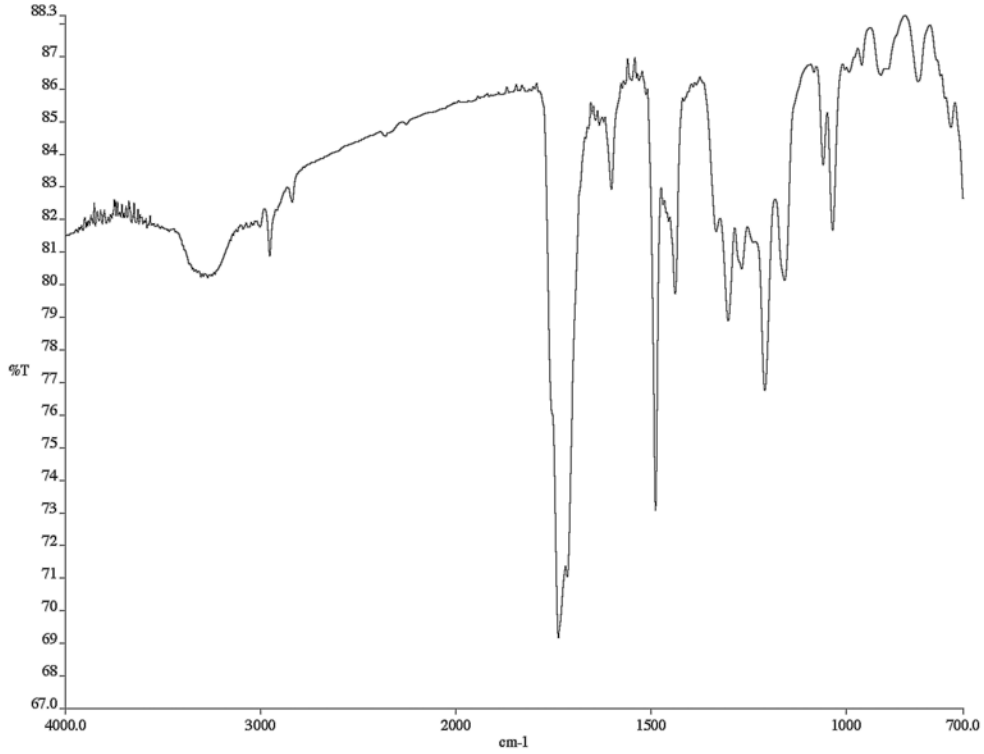


Figure A3.48.2 Infrared spectrum (thin film/NaCl) of compound **135** (Table 3.5, Entry 2).

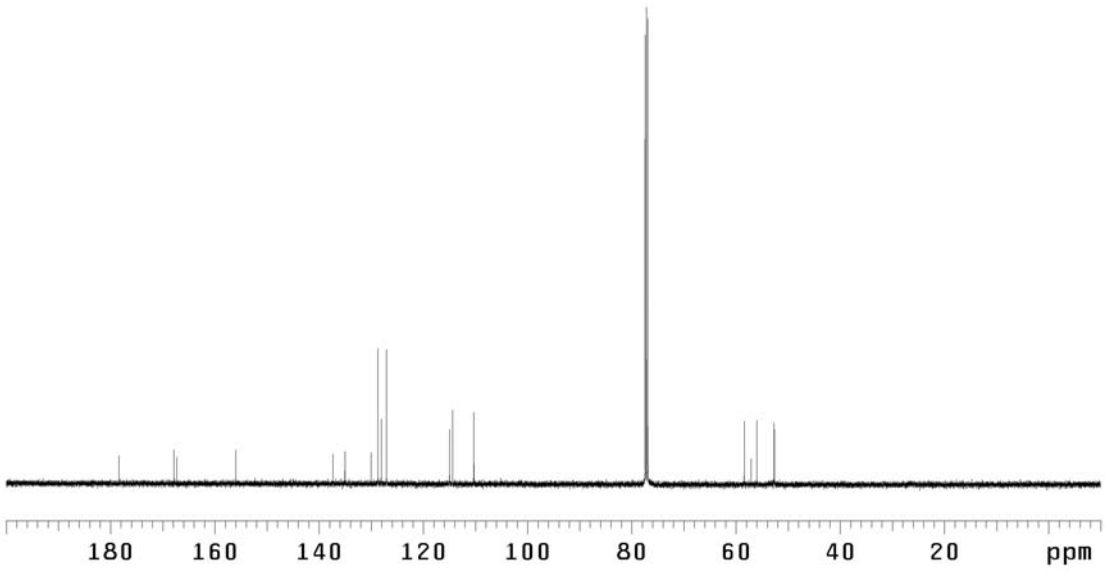
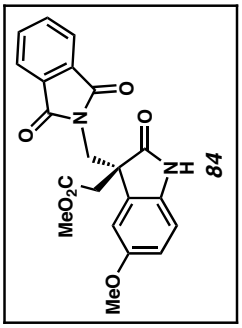


Figure A3.48.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **135** (Table 3.5, Entry 2).



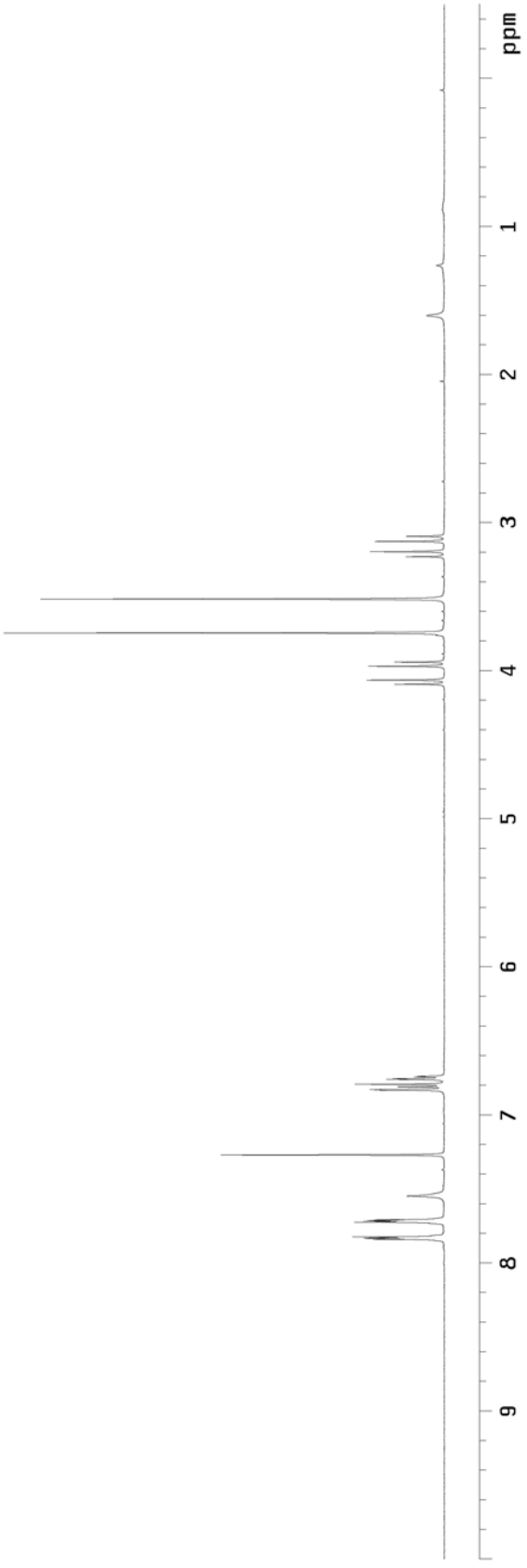


Figure A3.49.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **84**.

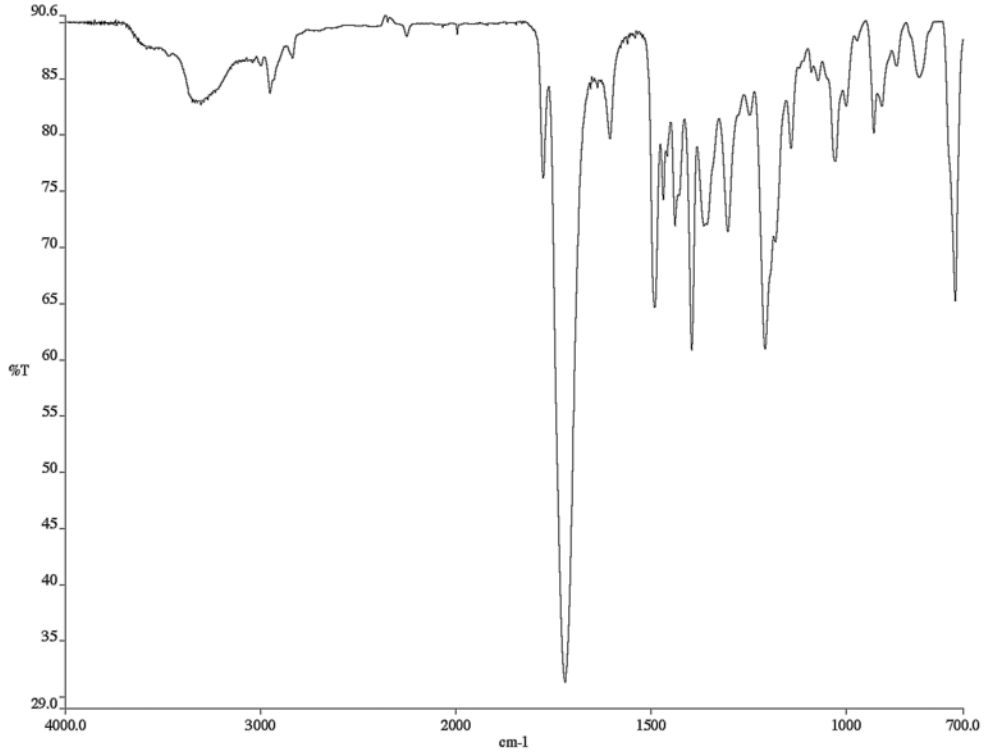


Figure A3.49.2 Infrared spectrum (thin film/NaCl) of compound **84**.

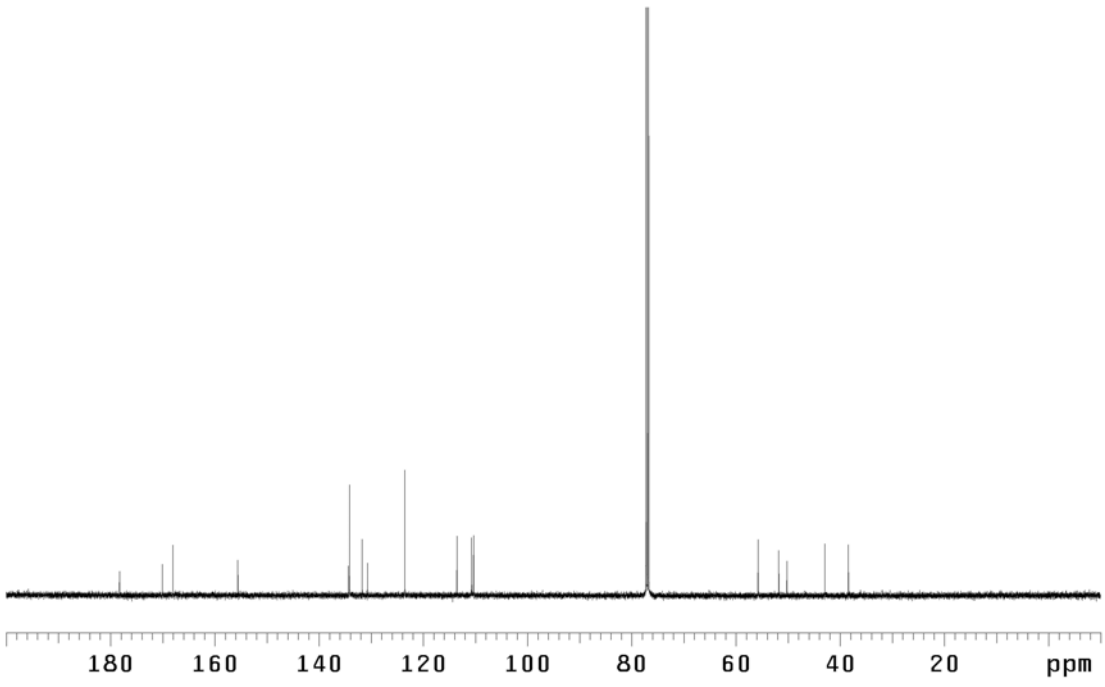


Figure A3.49.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **84**.

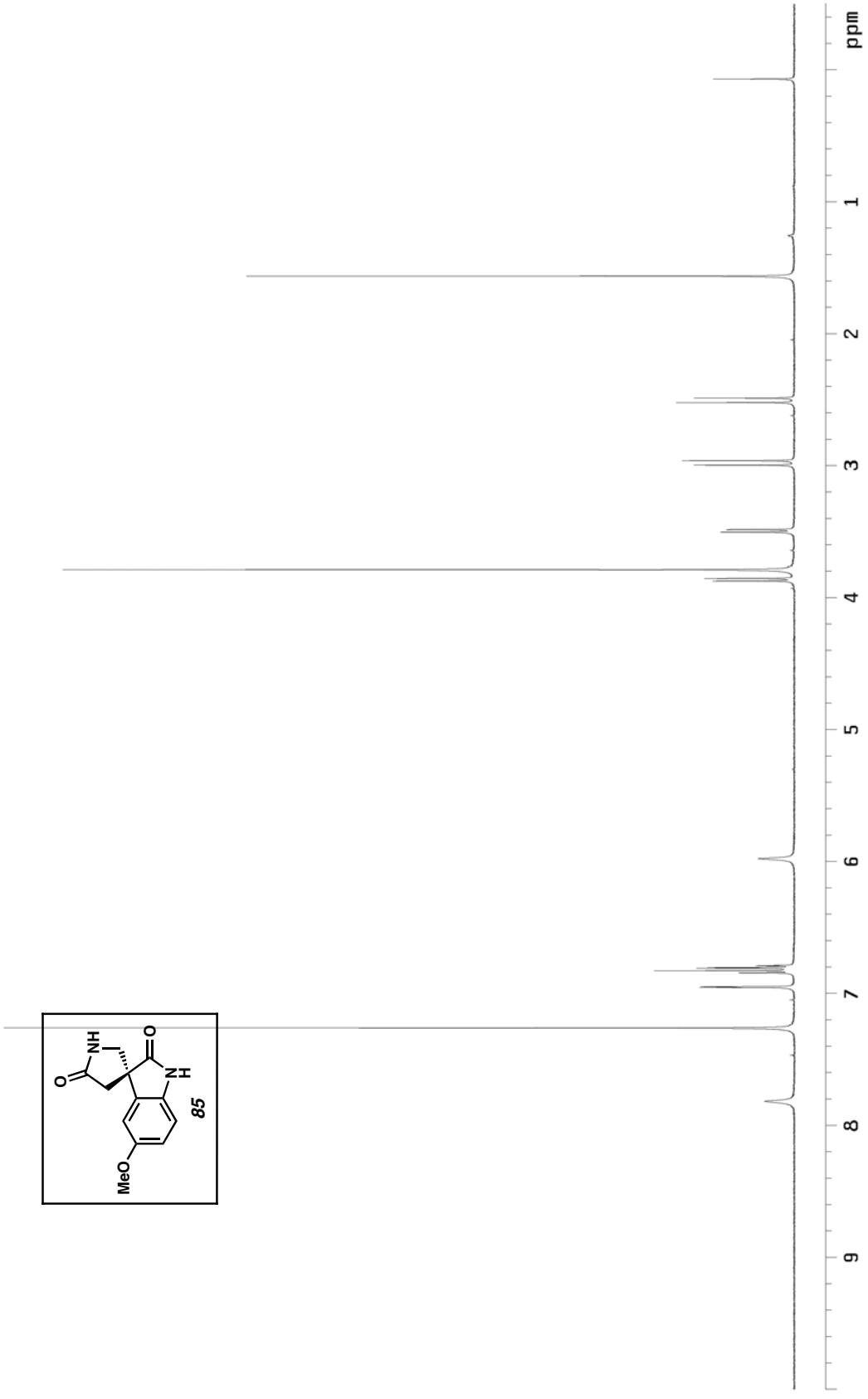


Figure A3.50.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **85**.

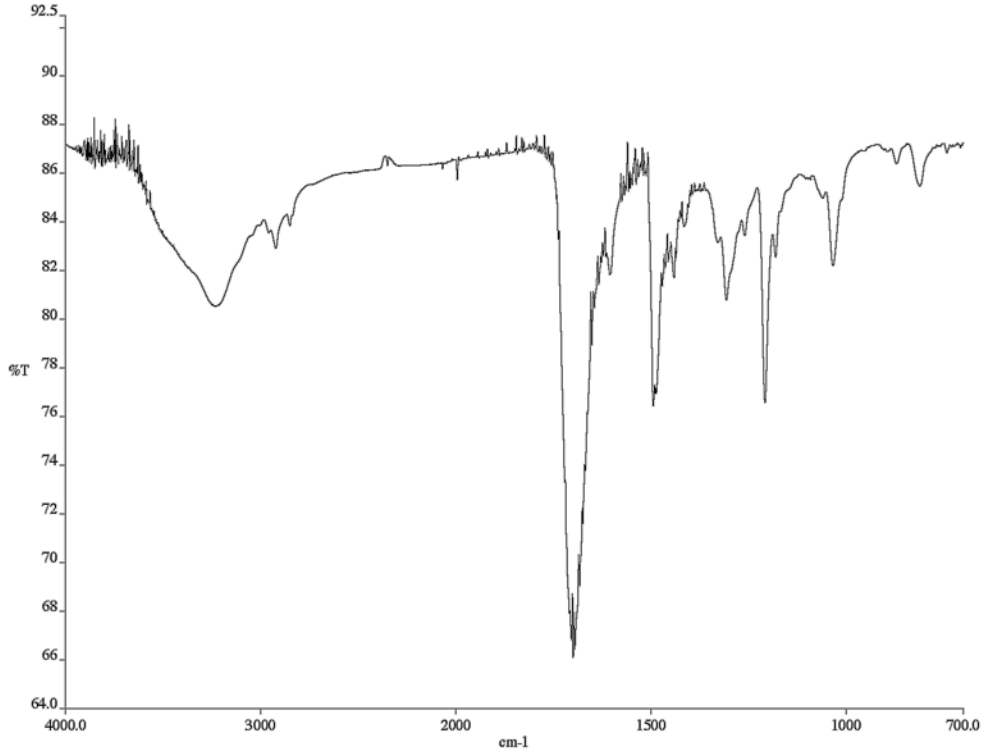


Figure A3.50.2 Infrared spectrum (thin film/NaCl) of compound **85**.

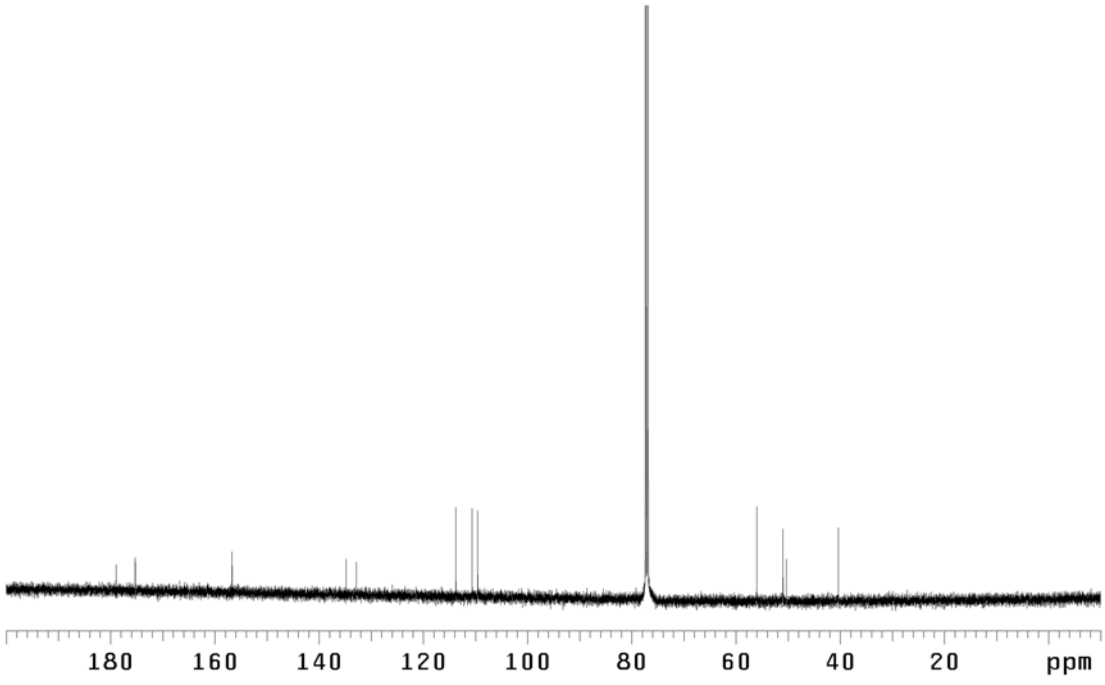
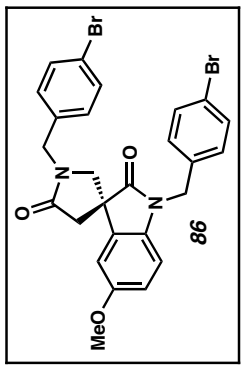


Figure A3.50.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **85**.



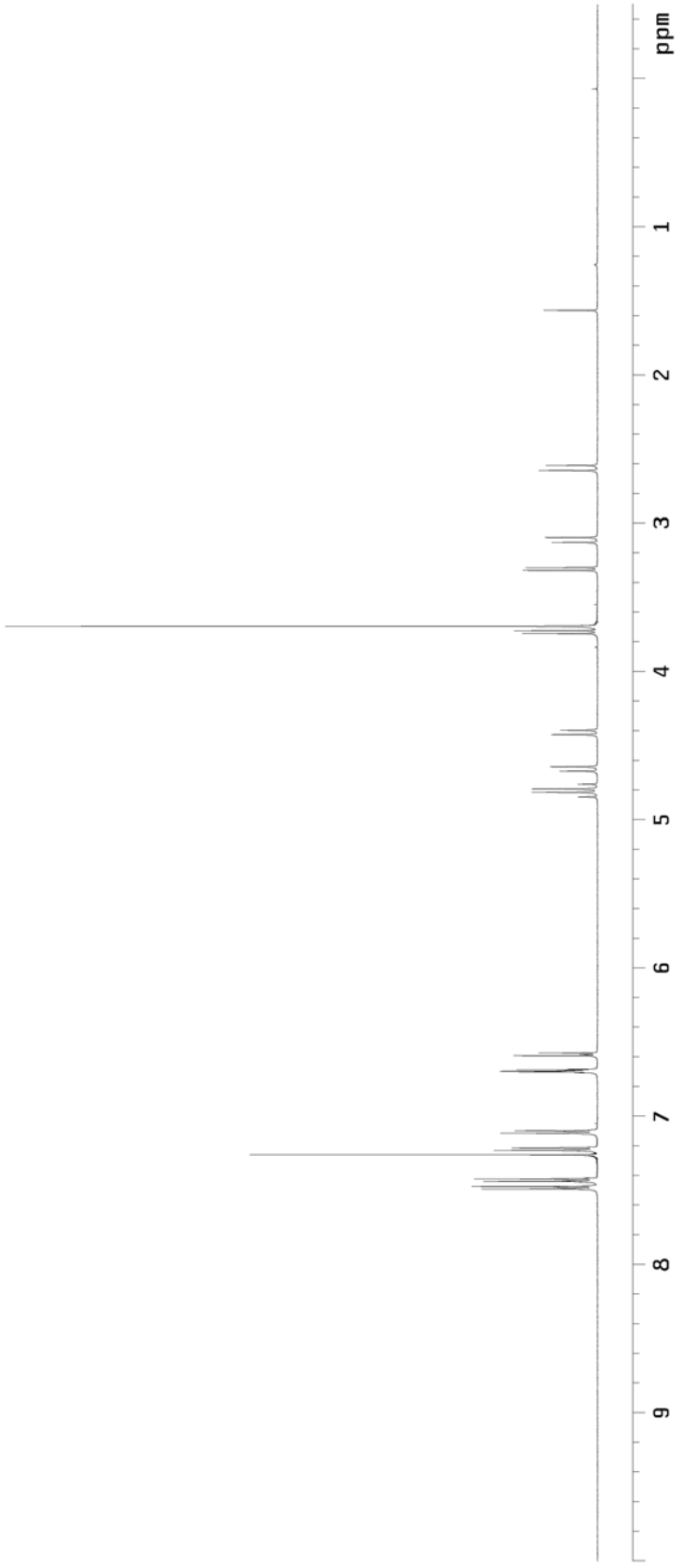


Figure A3.51.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **86**.

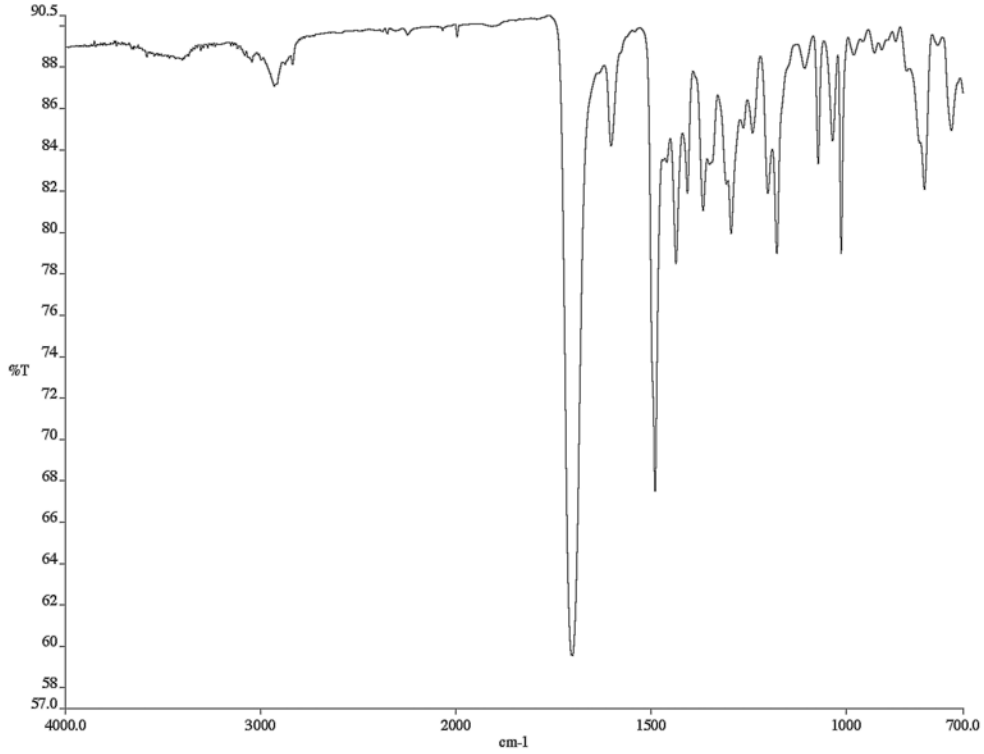


Figure A3.51.2 Infrared spectrum (thin film/NaCl) of compound **86**.

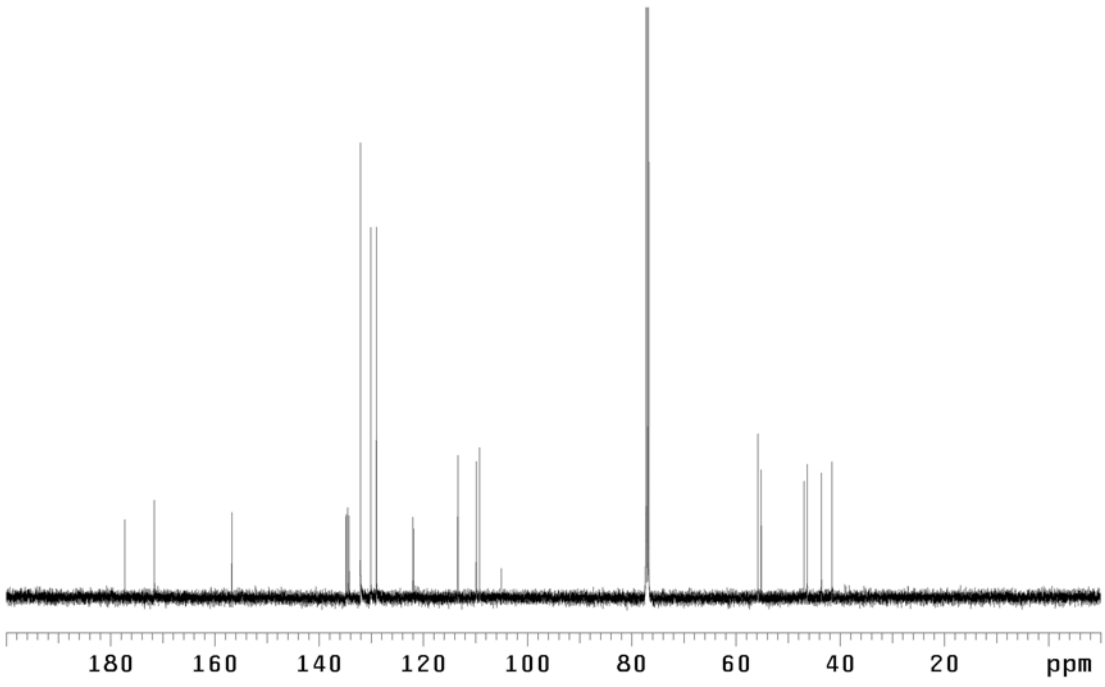


Figure A3.51.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **86**.

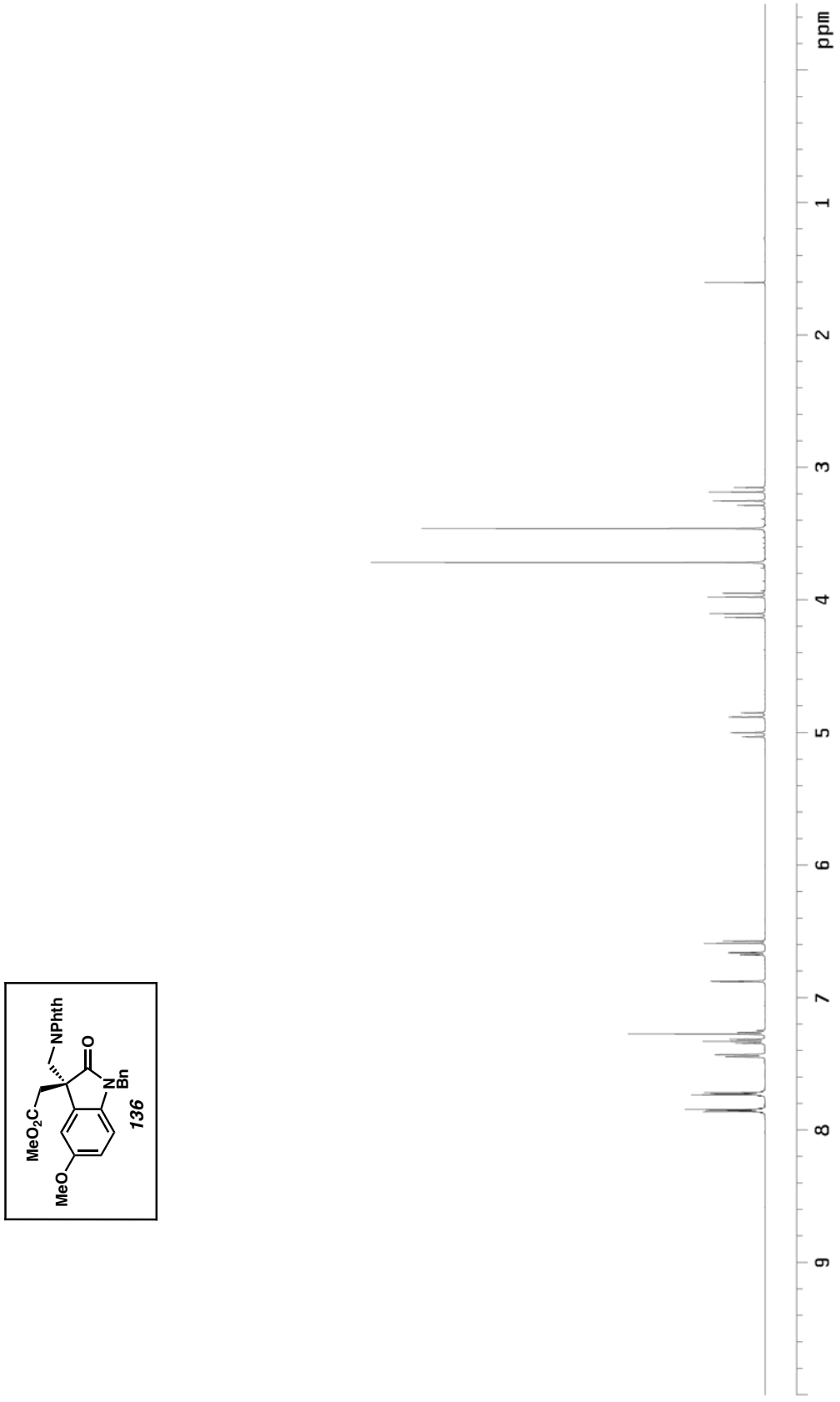


Figure A3.52.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **136**.

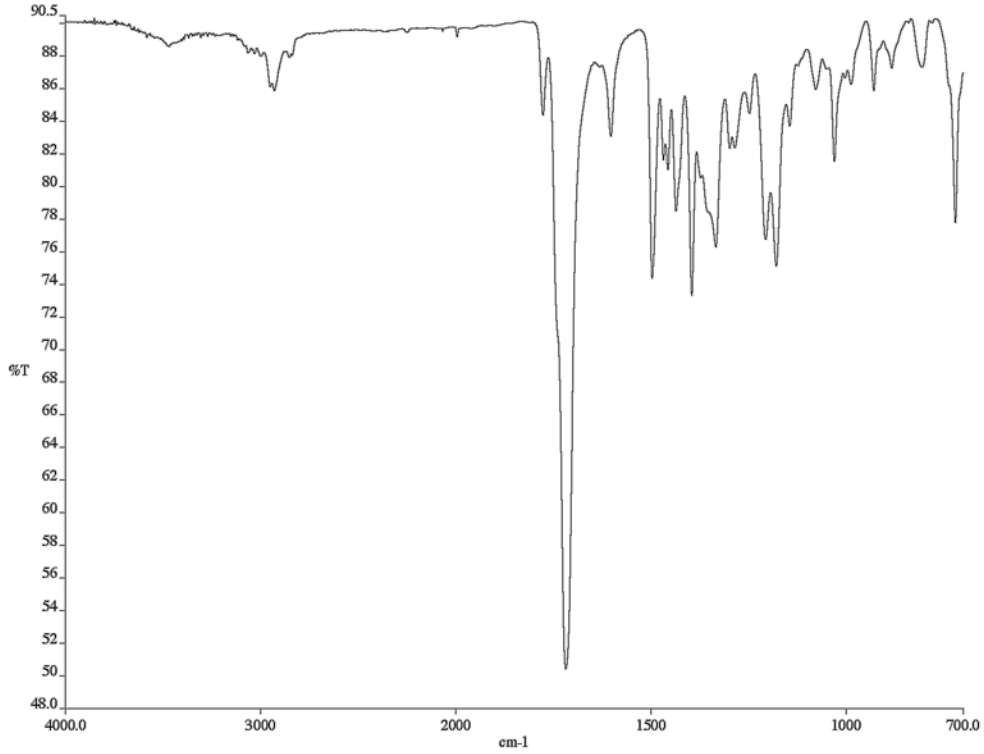


Figure A3.52.2 Infrared spectrum (thin film/NaCl) of compound **136**.

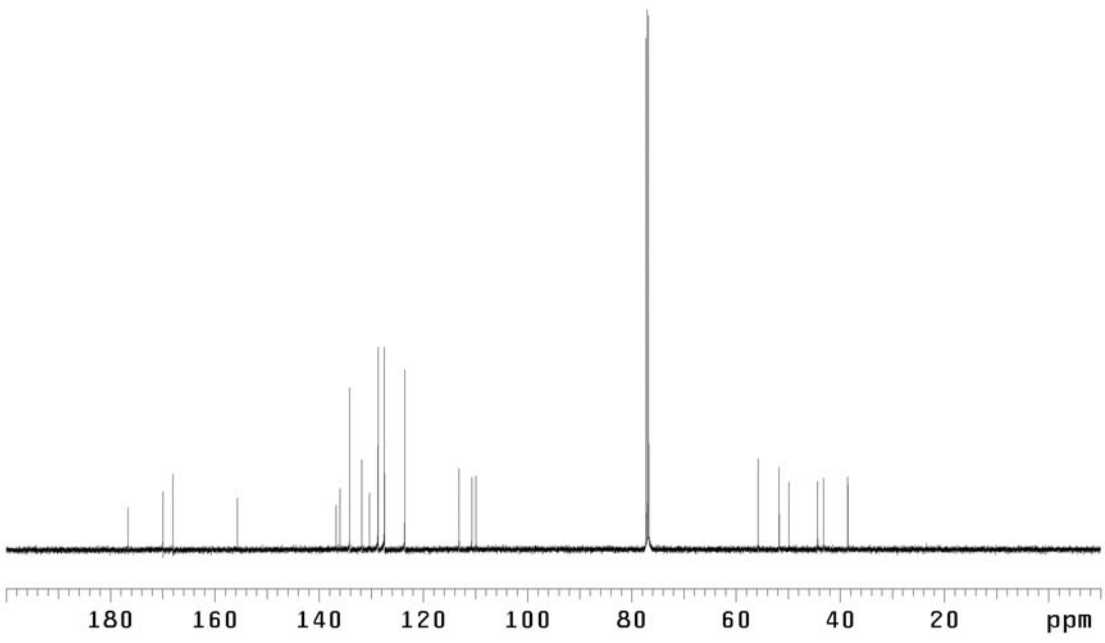


Figure A3.52.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **136**.

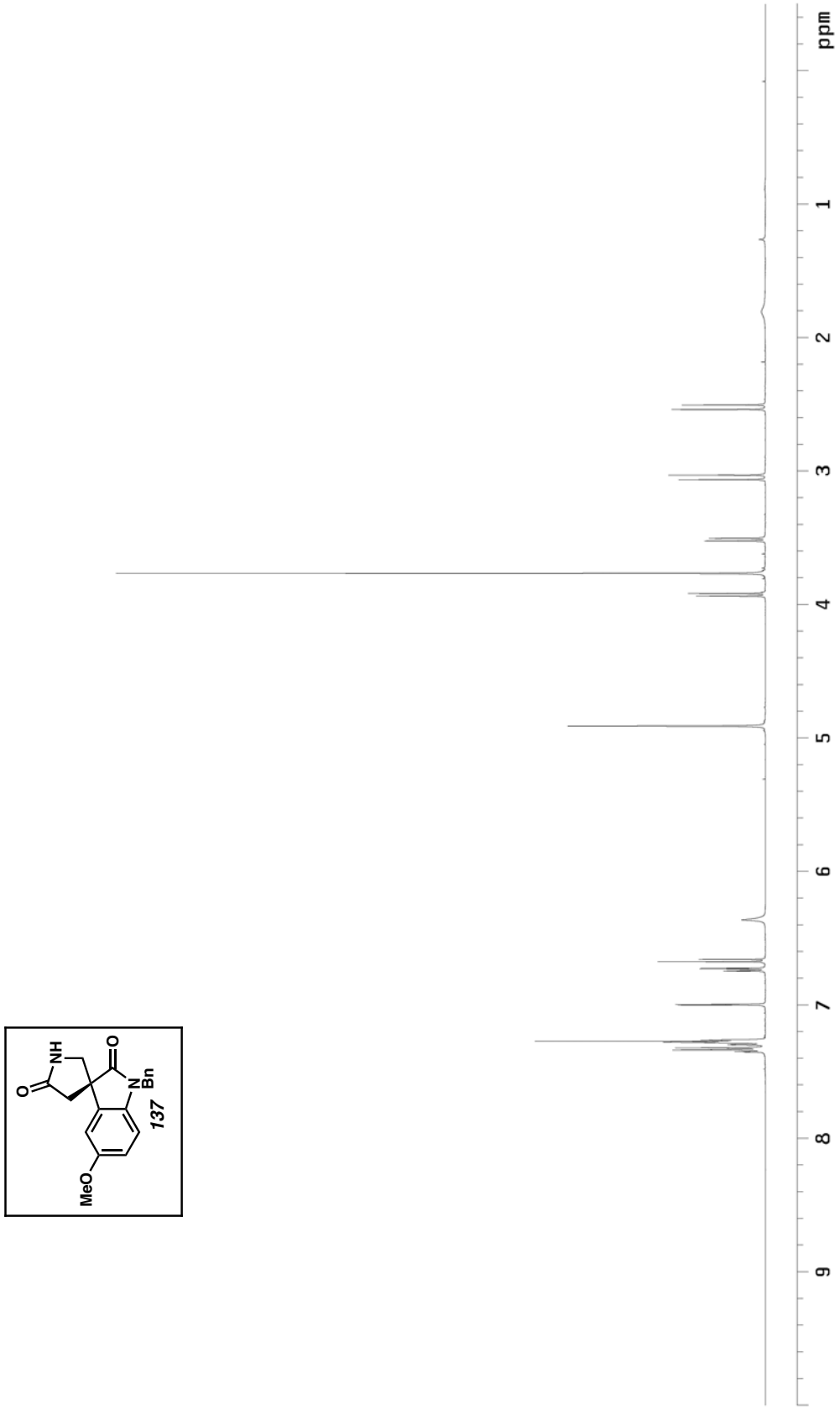


Figure A3.53.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **137**.

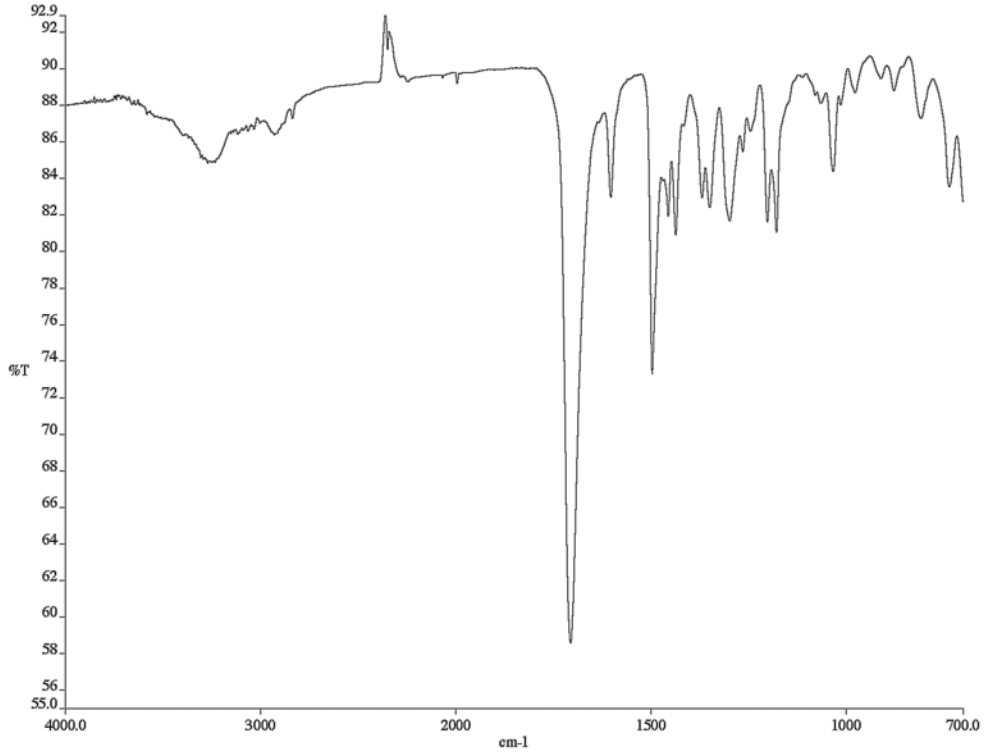


Figure A3.53.2 Infrared spectrum (thin film/NaCl) of compound **137**.

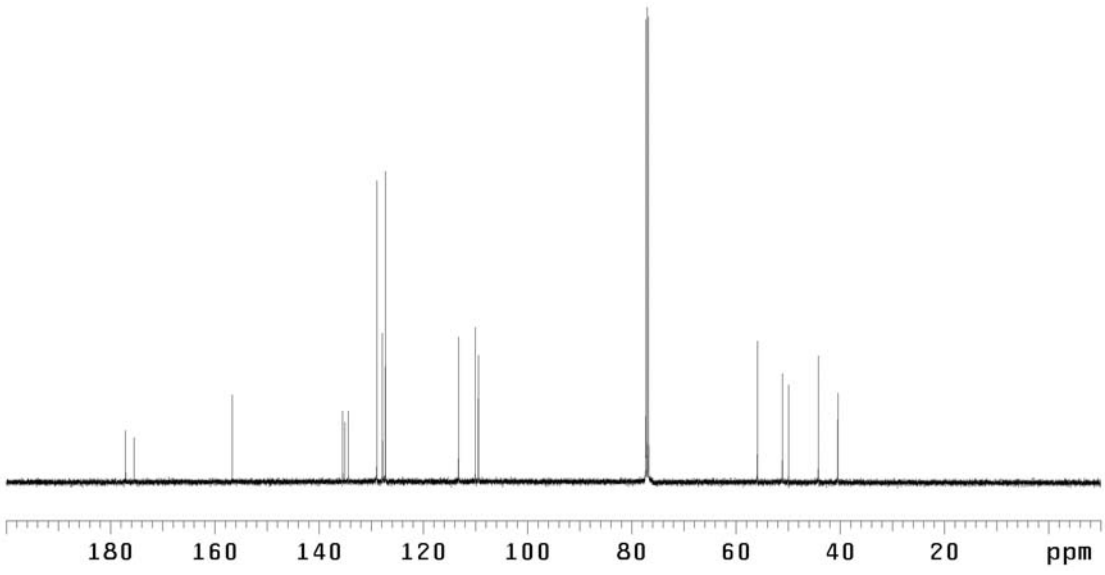


Figure A3.53.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **137**.

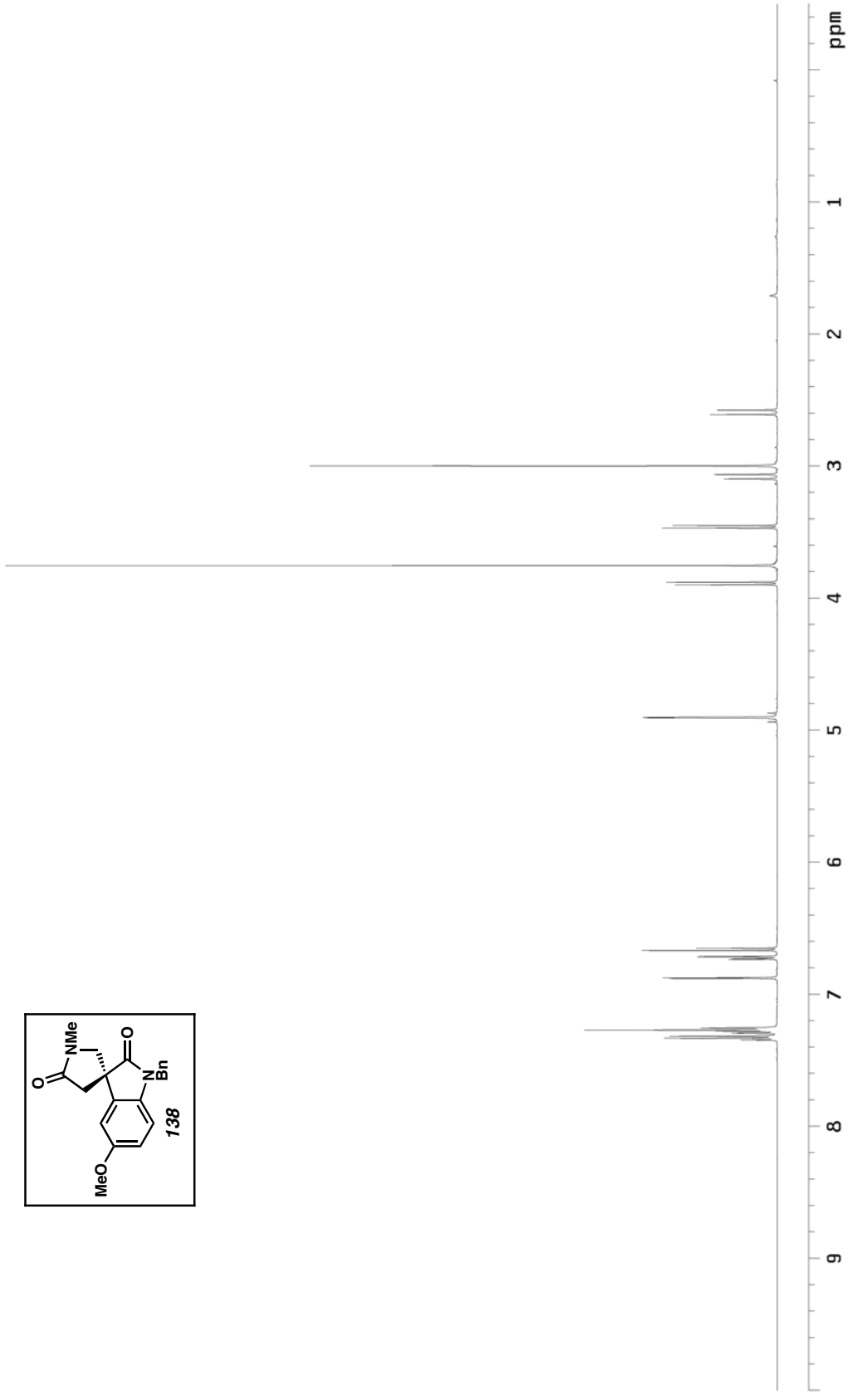


Figure A3.54.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **138**.

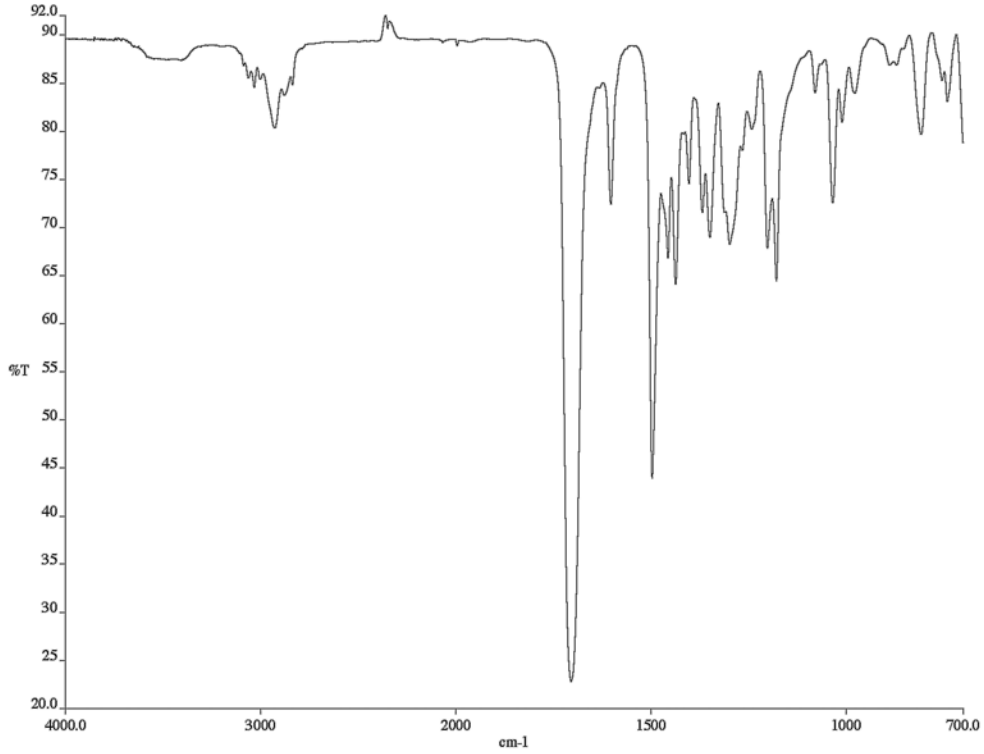


Figure A3.54.2 Infrared spectrum (thin film/NaCl) of compound **138**.

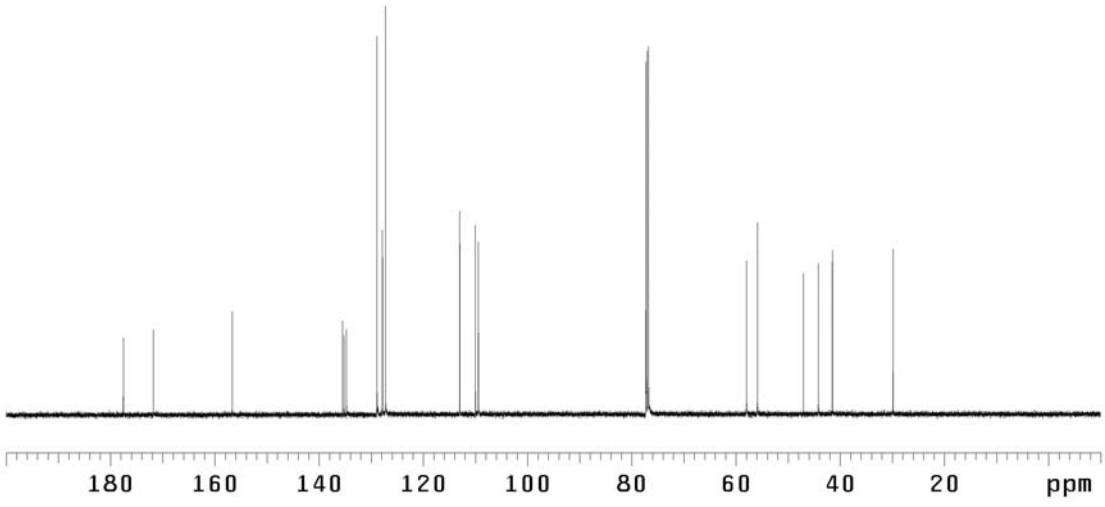
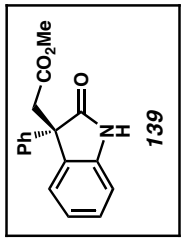


Figure A3.54.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **138**.



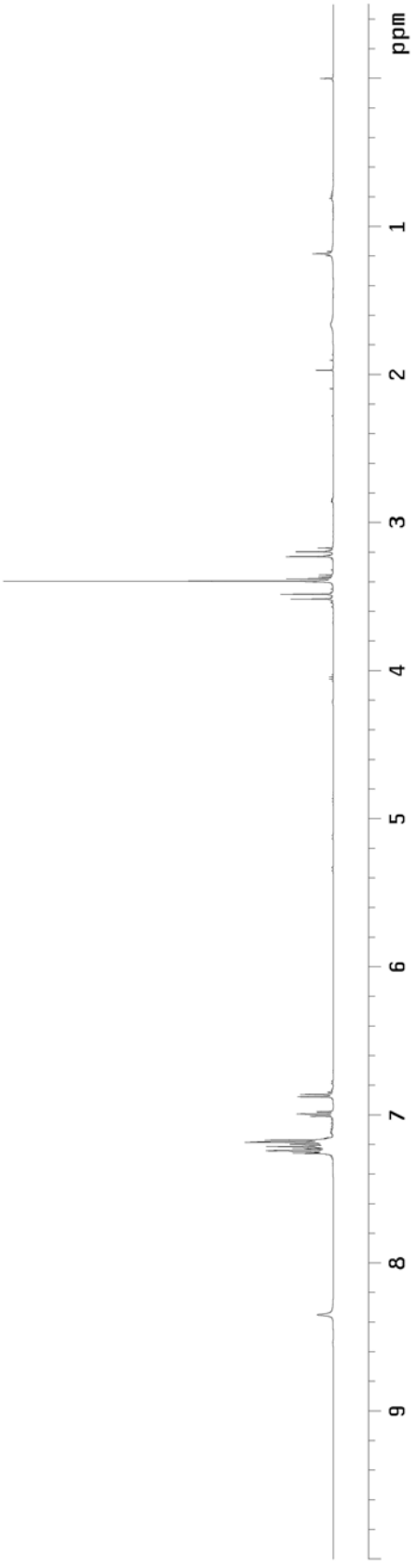


Figure A3.55.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **139**.

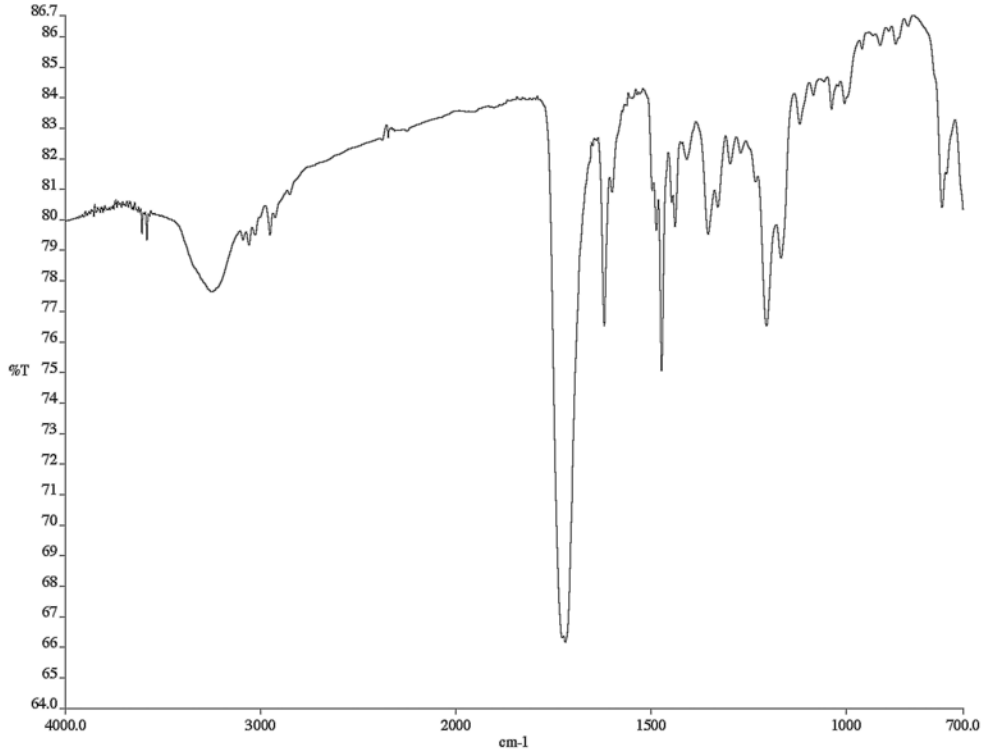


Figure A3.55.2 Infrared spectrum (thin film/NaCl) of compound **139**.

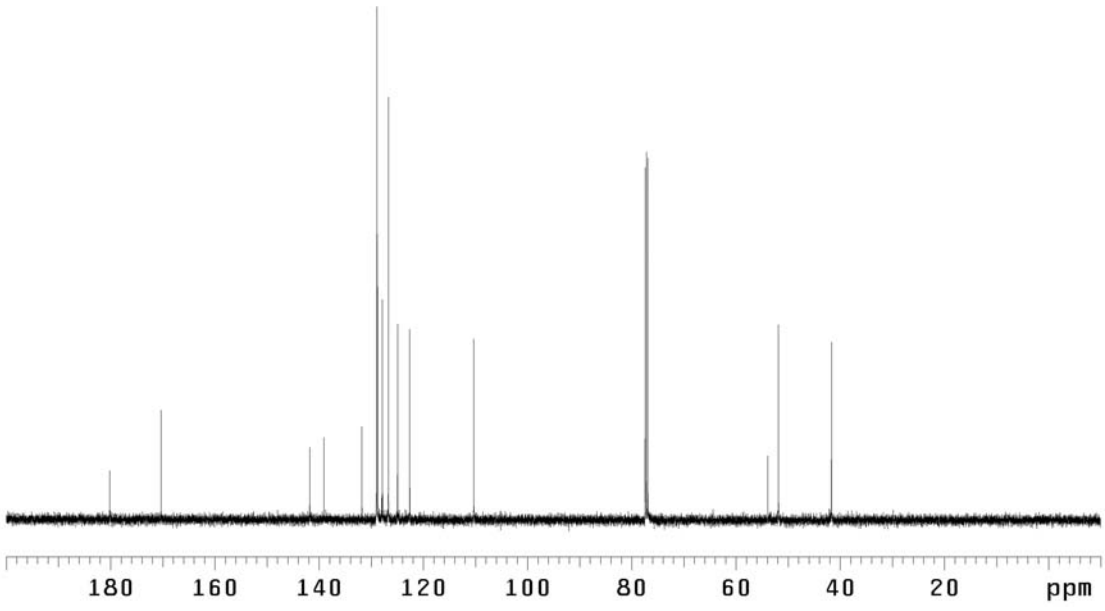
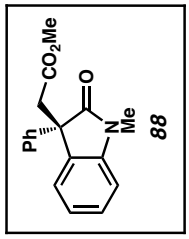


Figure A3.55.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **139**.



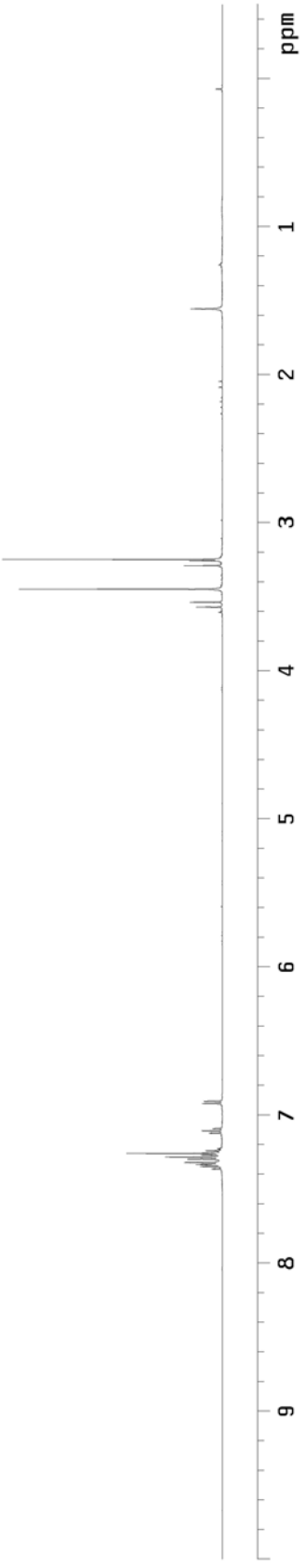


Figure A3.56.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **88**.

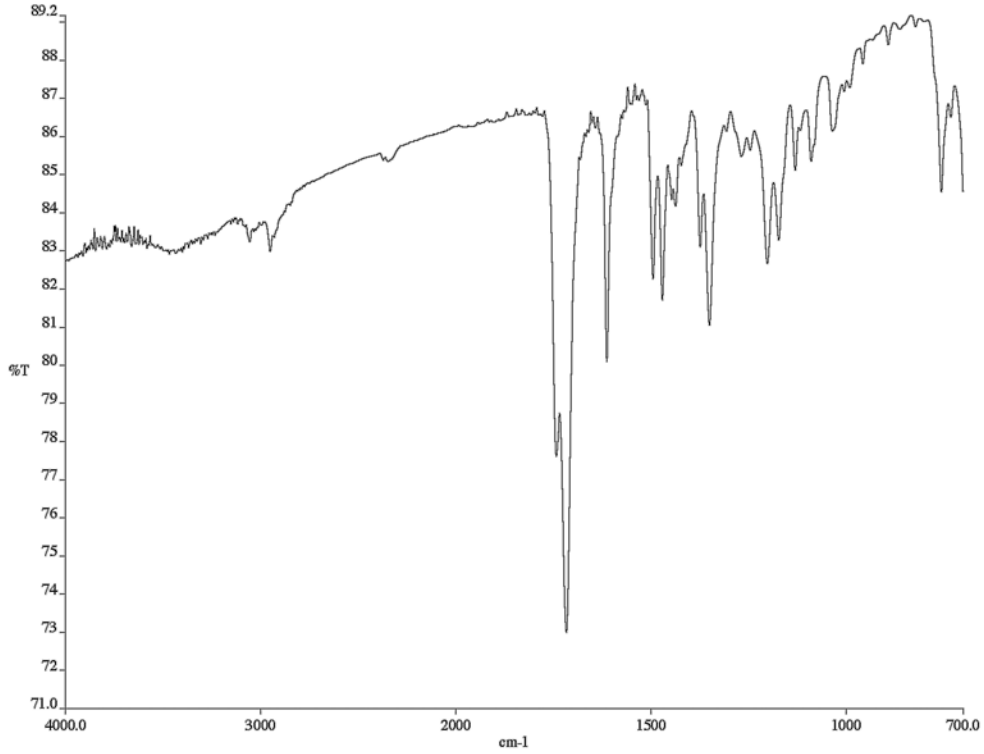


Figure A3.56.2 Infrared spectrum (thin film/NaCl) of compound **88**.

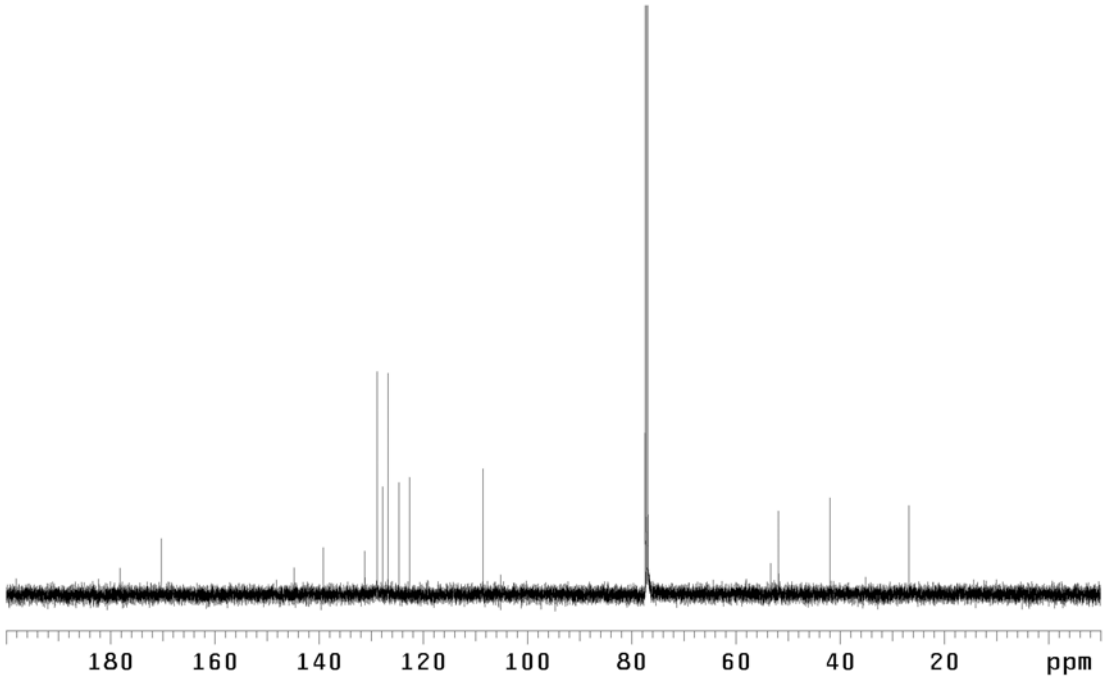


Figure A3.56.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **88**.

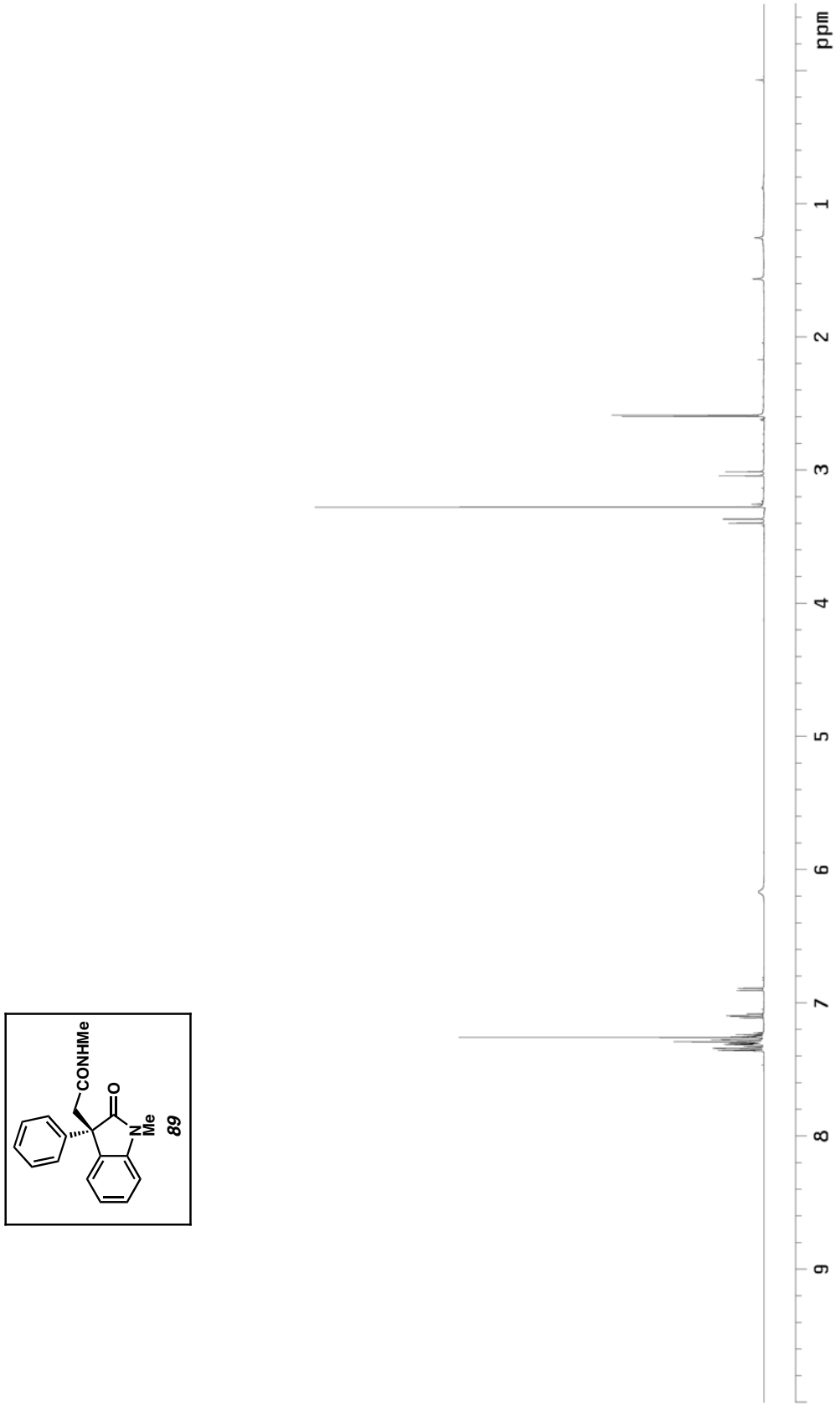


Figure A3.57.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **89**.

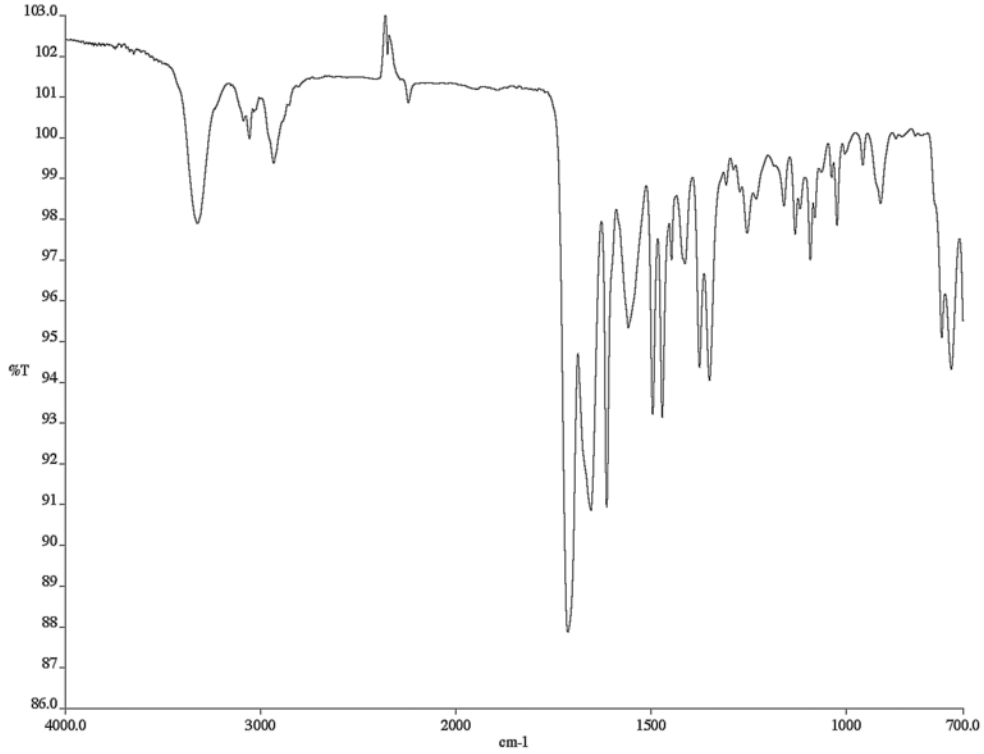


Figure A3.57.2 Infrared spectrum (thin film/NaCl) of compound **89**.

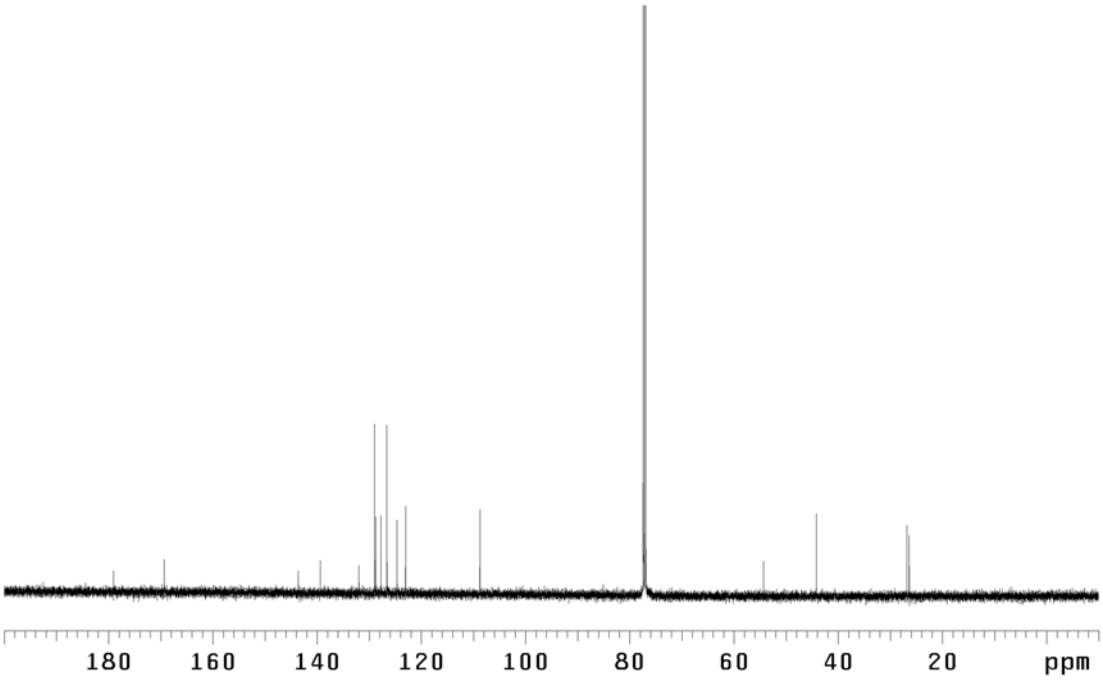
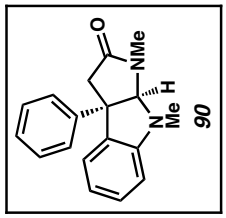


Figure A3.57.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **89**.



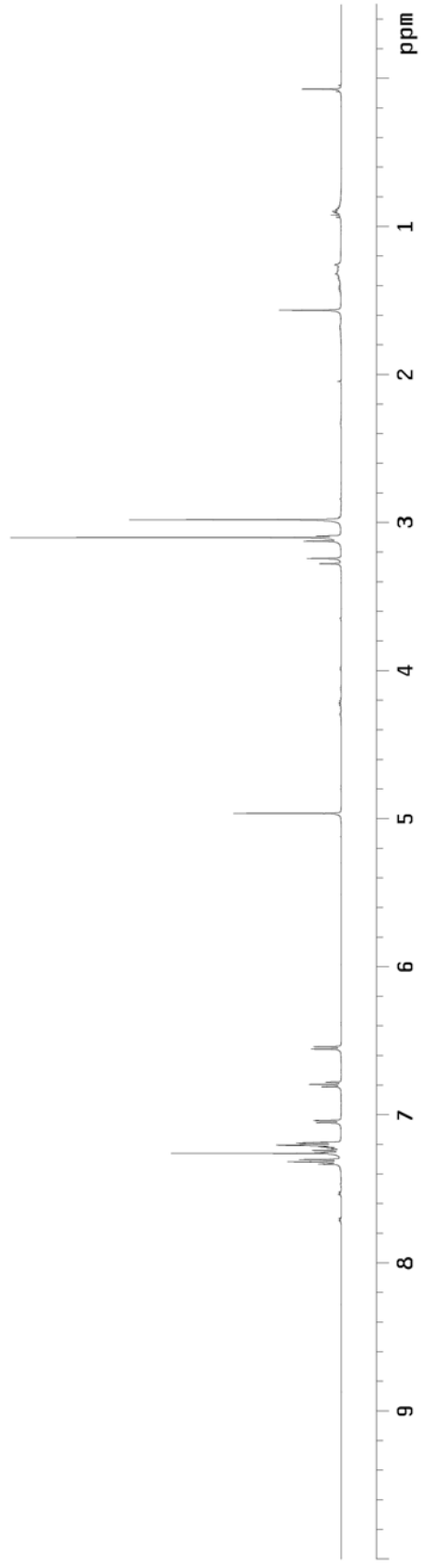


Figure A3.58.1 ^{1}H NMR (500 MHz, $CDCl_3$) of compound **90**.

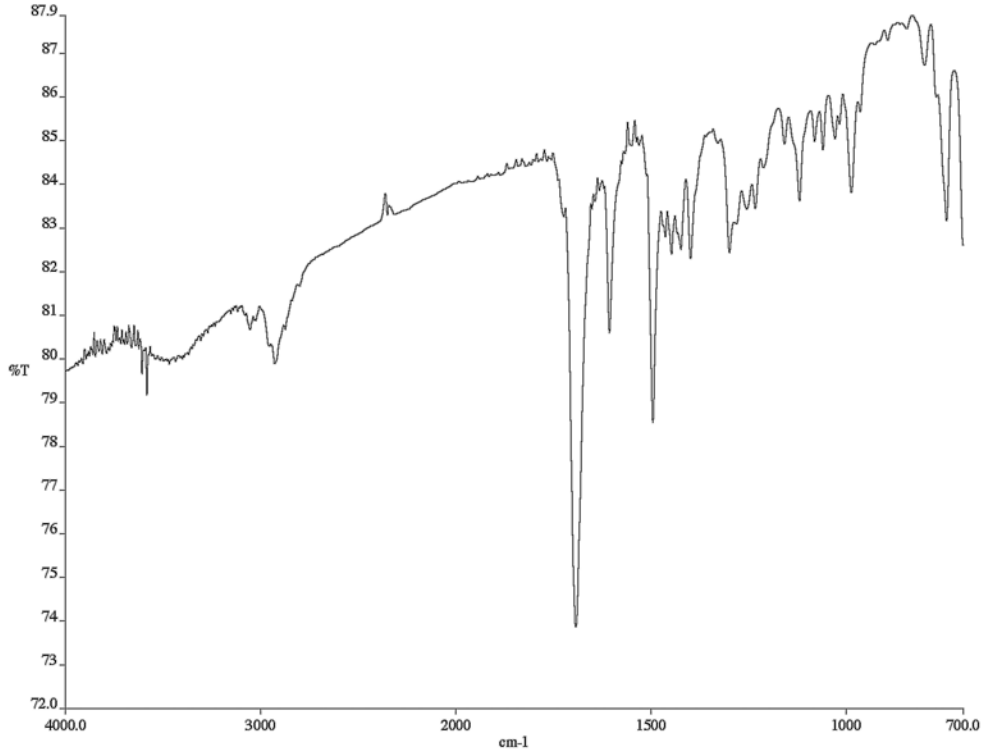


Figure A3.58.2 Infrared spectrum (thin film/NaCl) of compound **90**.

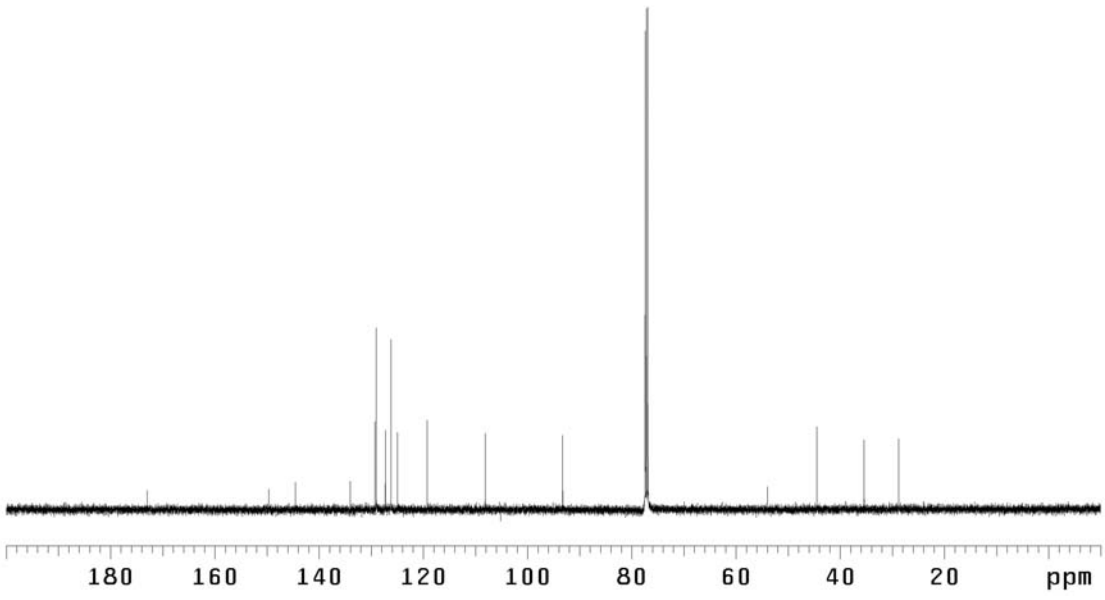


Figure A3.58.3 ^{13}C NMR (125 MHz, $CDCl_3$) of compound **90**.