

APPENDIX 2

Spectra Relevant to Chapter 3:

Progress toward the Asymmetric

Total Synthesis of Variocolin

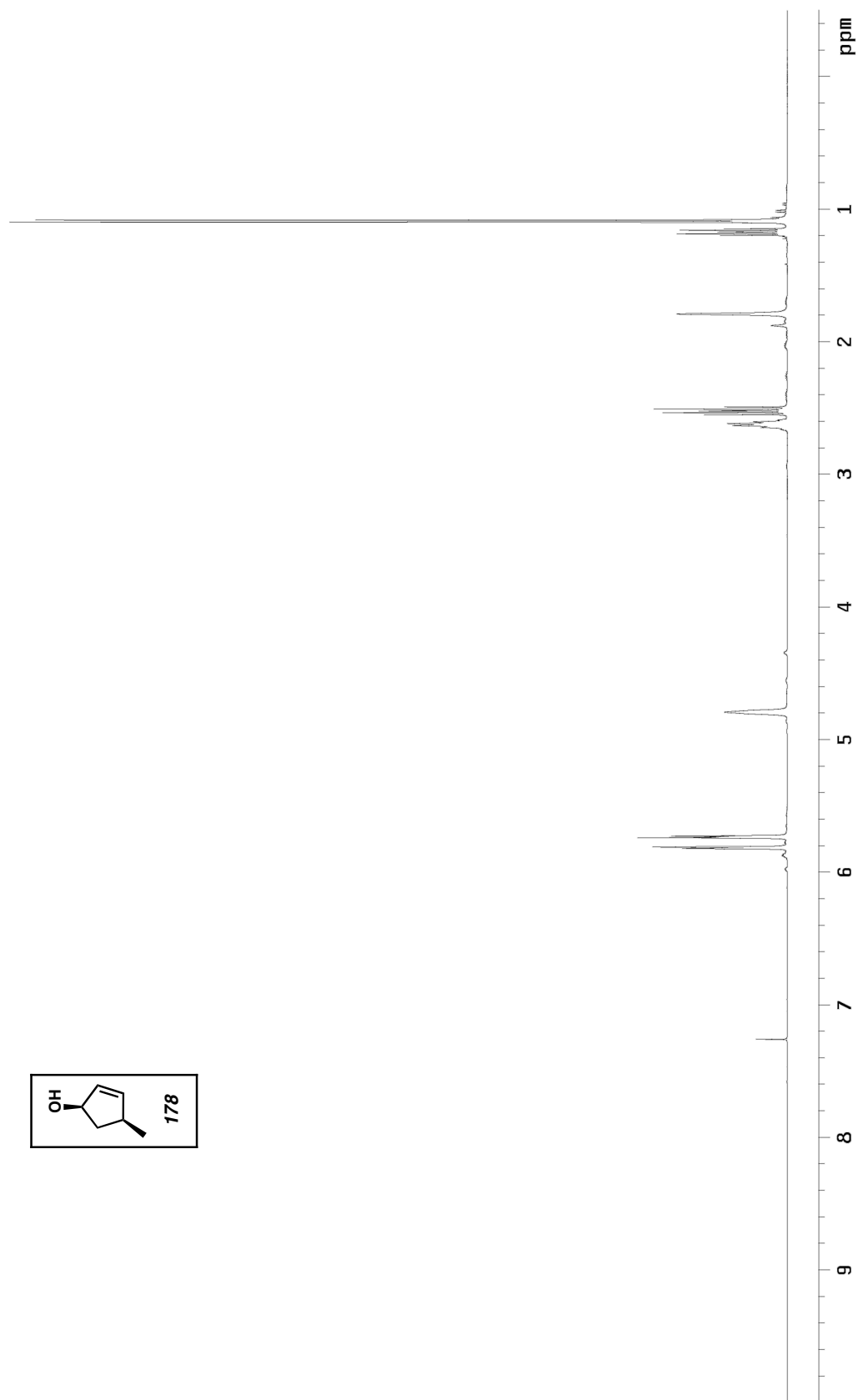


Figure A2.1. ^1H NMR spectrum (500 MHz, CDCl_3) of **178**.

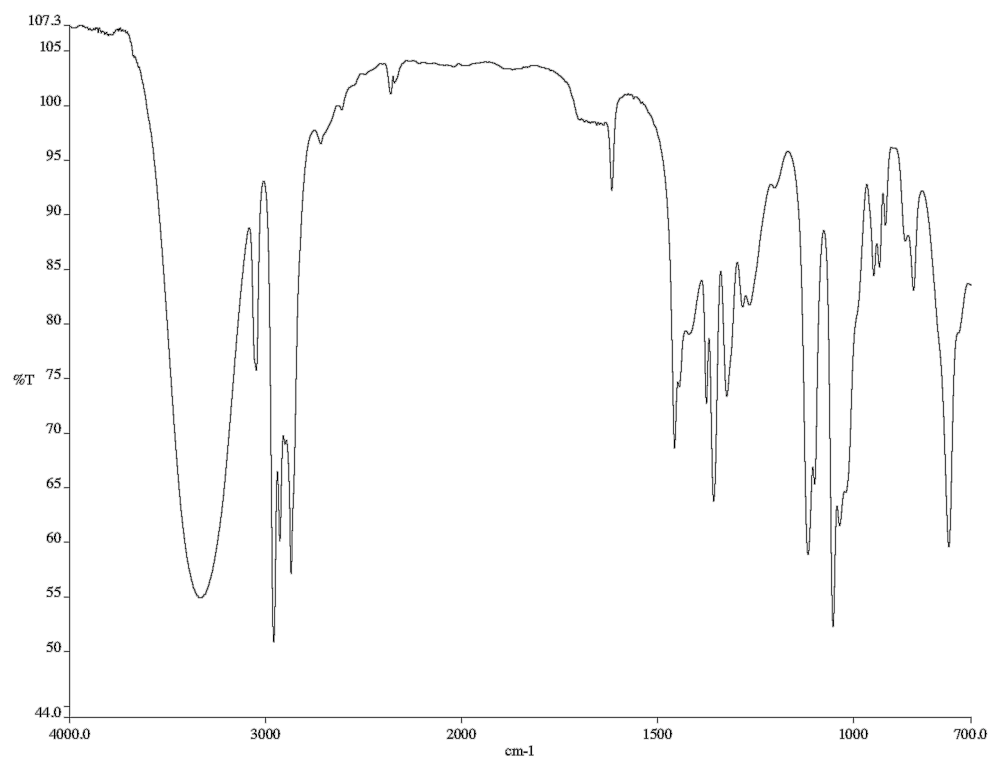


Figure A2.2. Infrared spectrum (neat film/NaCl) of **178**.

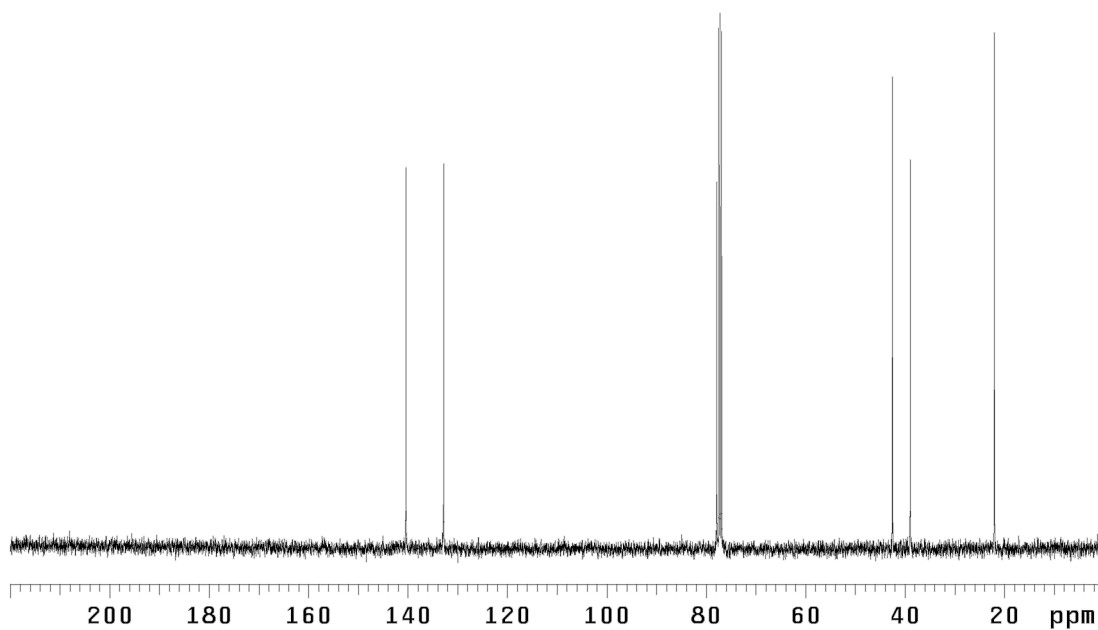
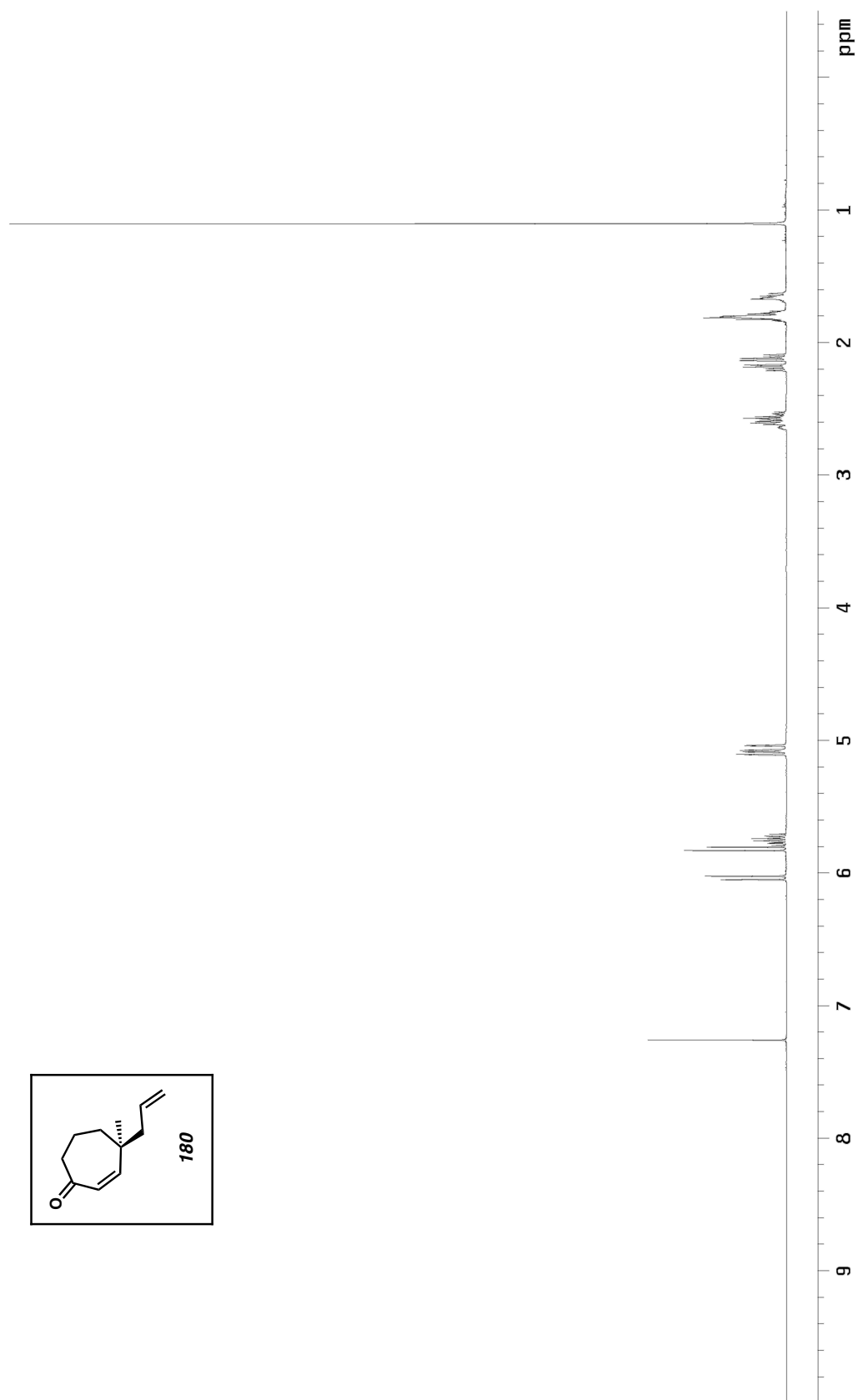


Figure A2.3. ¹³C NMR spectrum (126 MHz, CDCl₃) of **178**.

Figure A2.4. ^1H NMR spectrum (500 MHz, CDCl_3) of **180**.

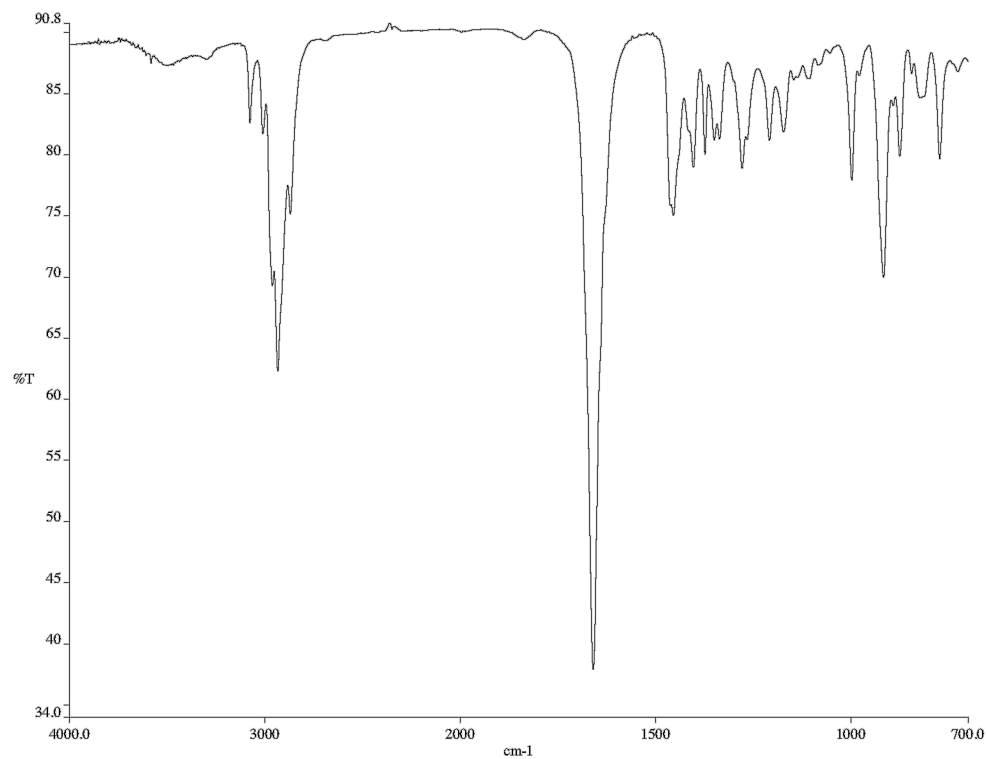


Figure A2.5. Infrared spectrum (neat film/NaCl) of **180**.

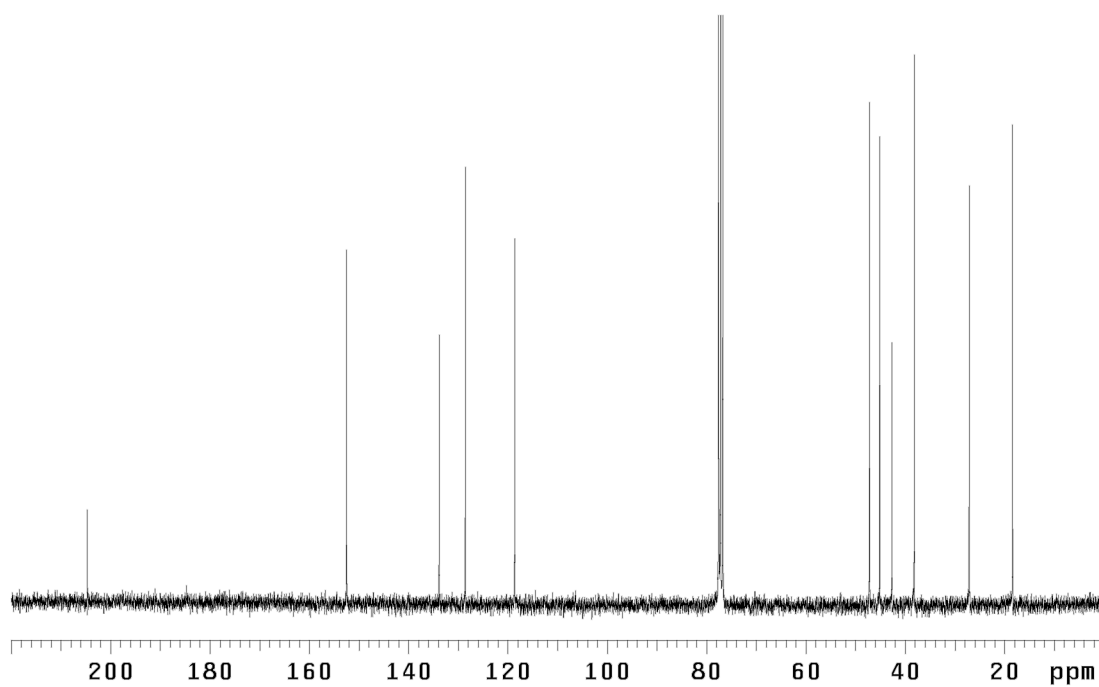
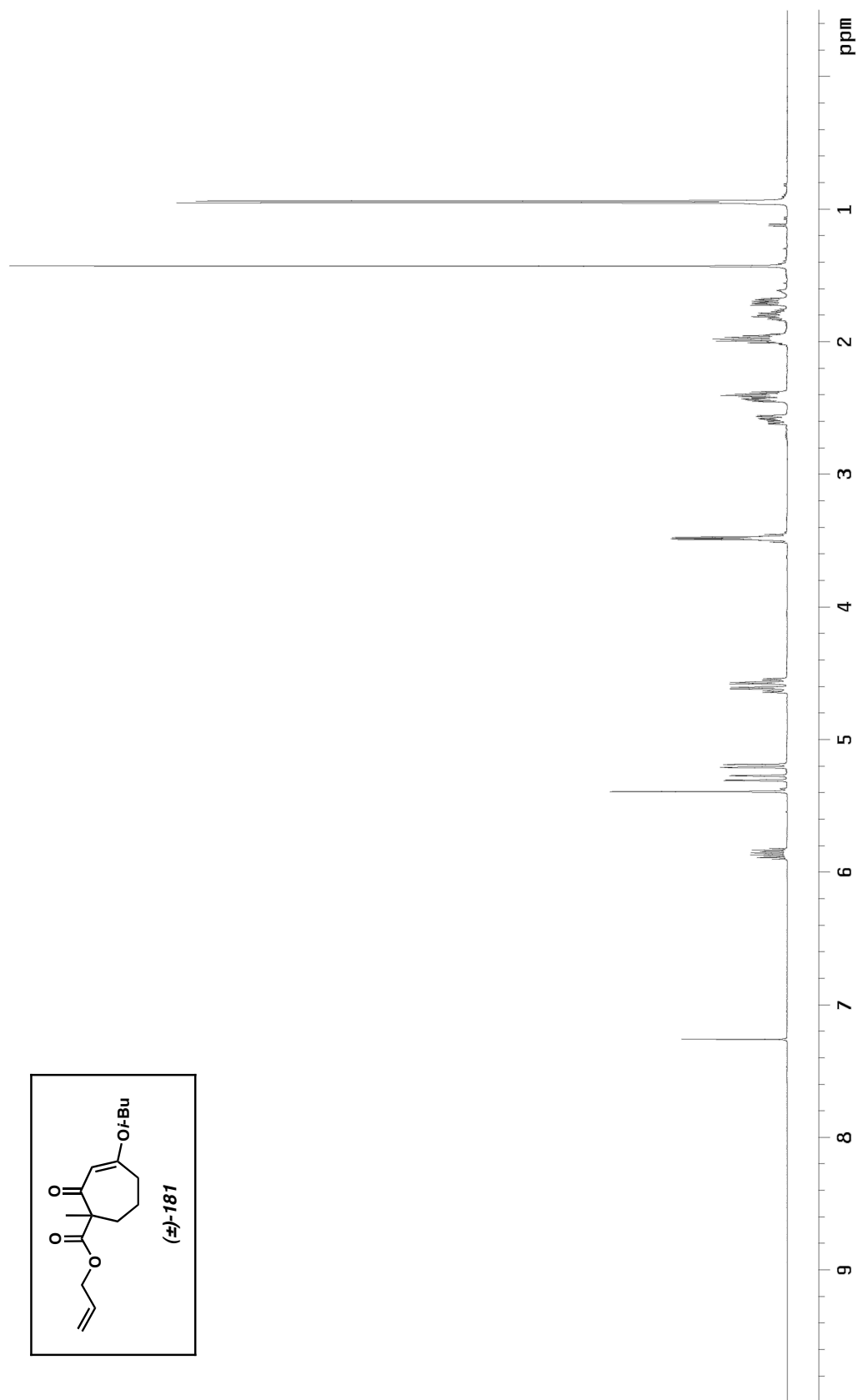


Figure A2.6. ¹³C NMR spectrum (75 MHz, CDCl₃) of **180**.

Figure A2.7. ^1H NMR spectrum (500 MHz, CDCl_3) of **181**.

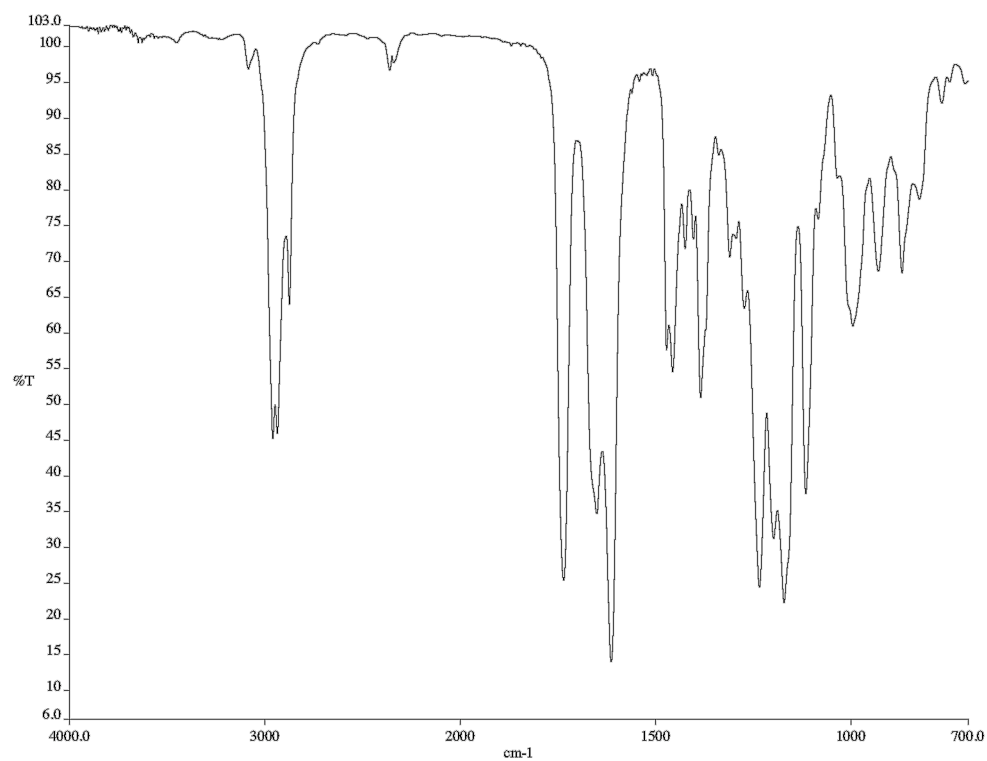


Figure A2.8. Infrared spectrum (neat film/NaCl) of **181**.

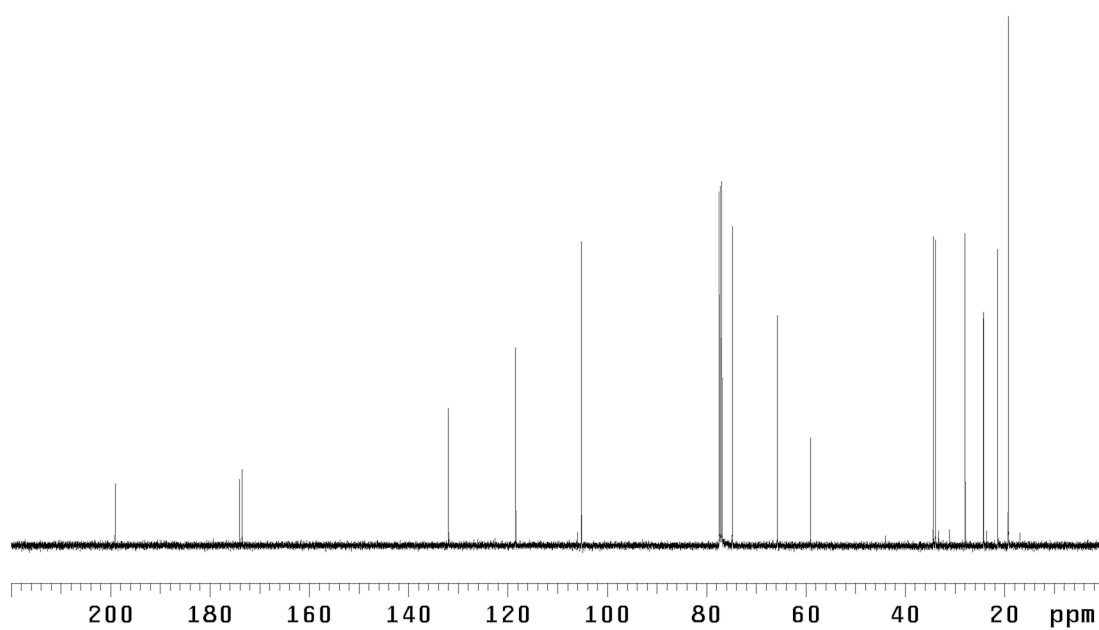
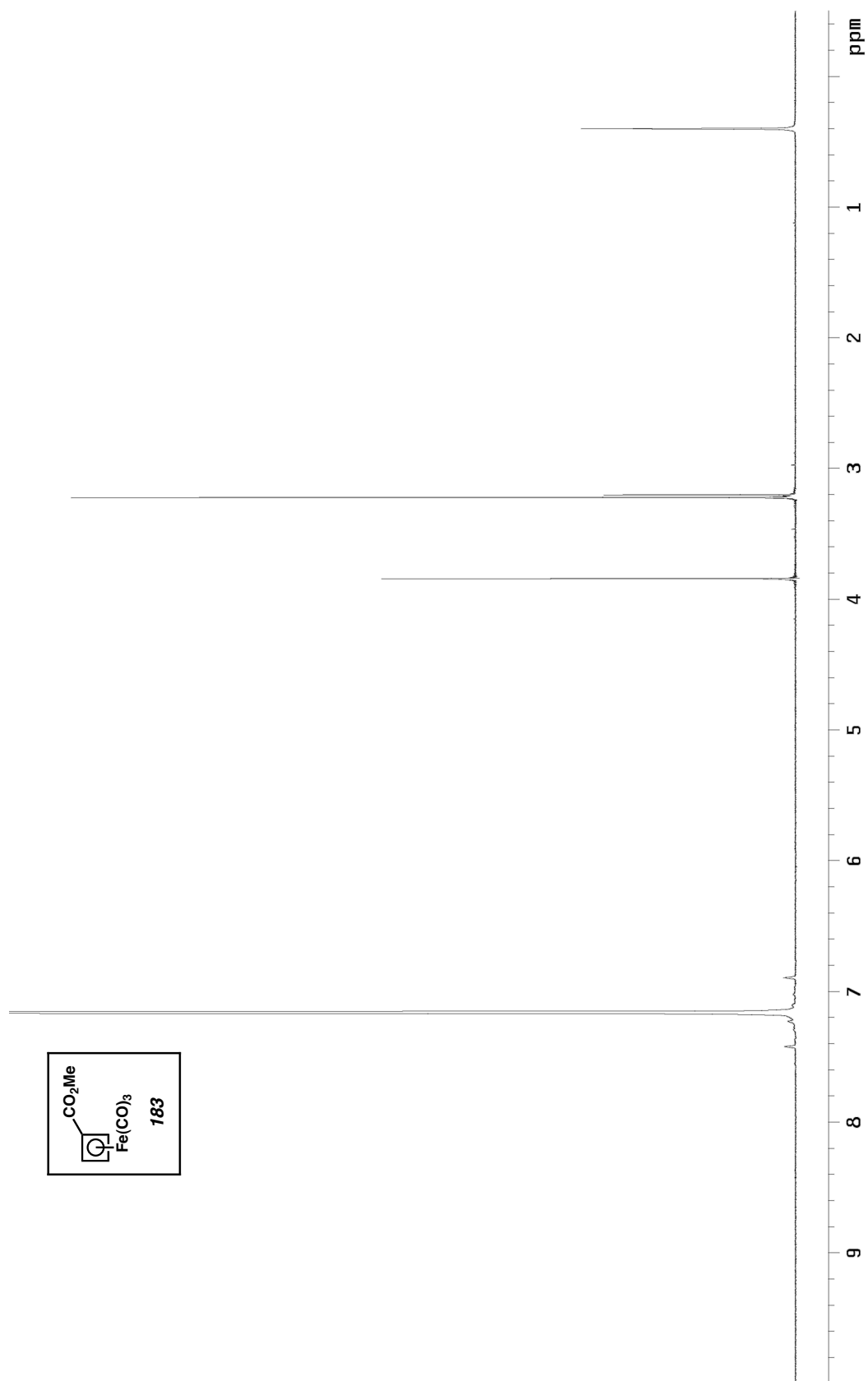
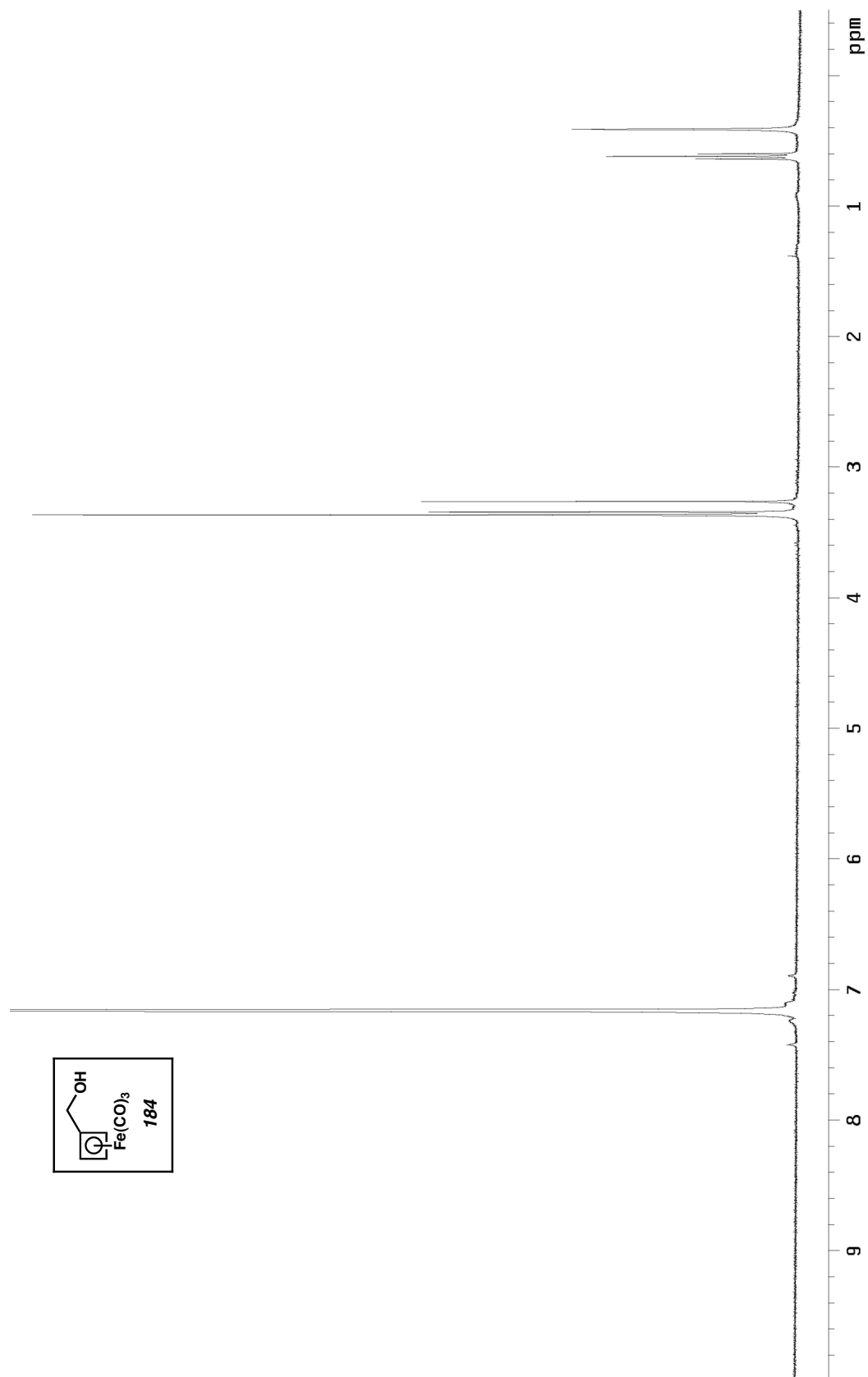


Figure A2.9. ¹³C NMR spectrum (126 MHz, CDCl₃) of **181**.

Figure A2.10. ^1H NMR spectrum (300 MHz, C_6D_6) of **183**.

Figure A2.11. ^1H NMR spectrum (300 MHz, C_6D_6) of **184**.

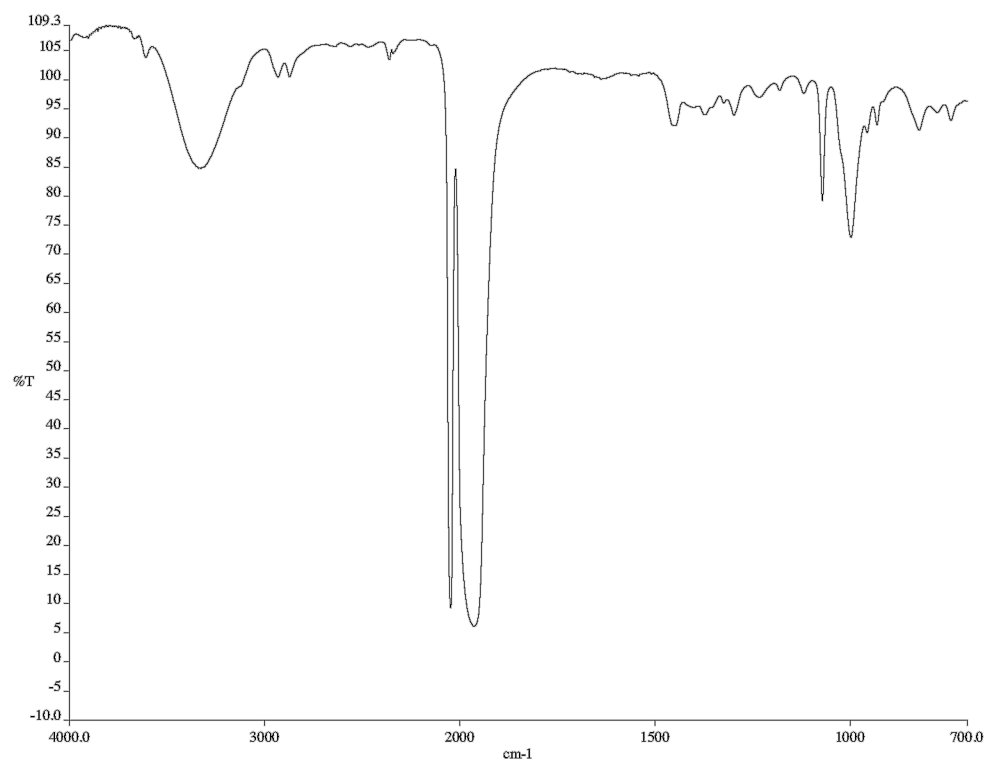


Figure A2.12. Infrared spectrum (neat film/NaCl) of **184**.

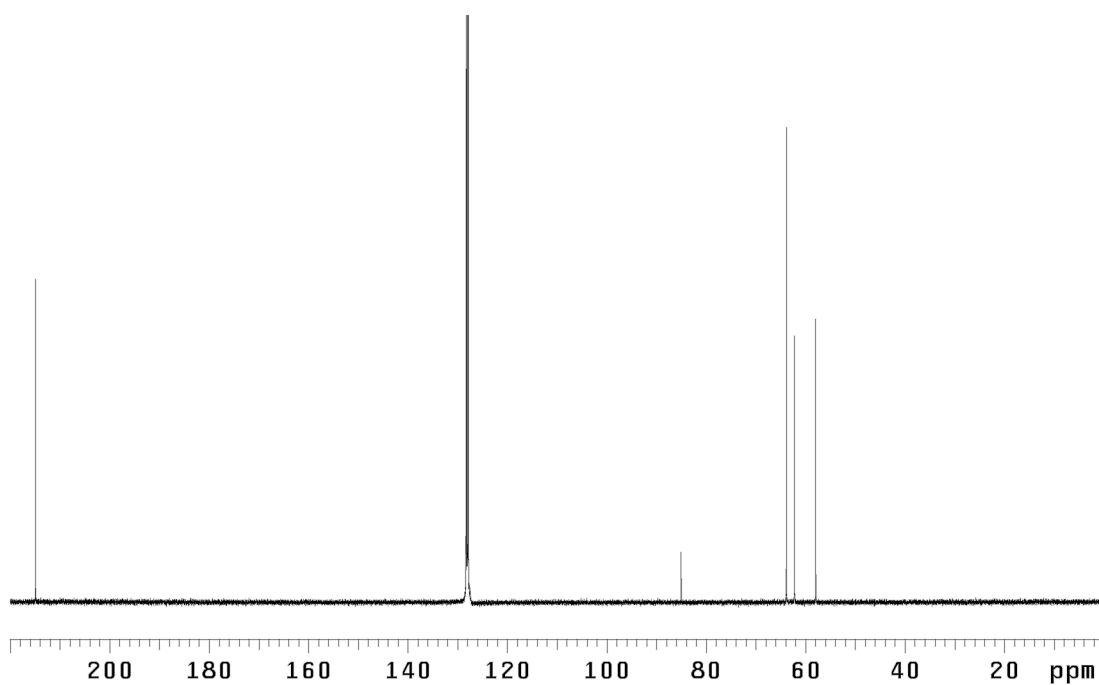
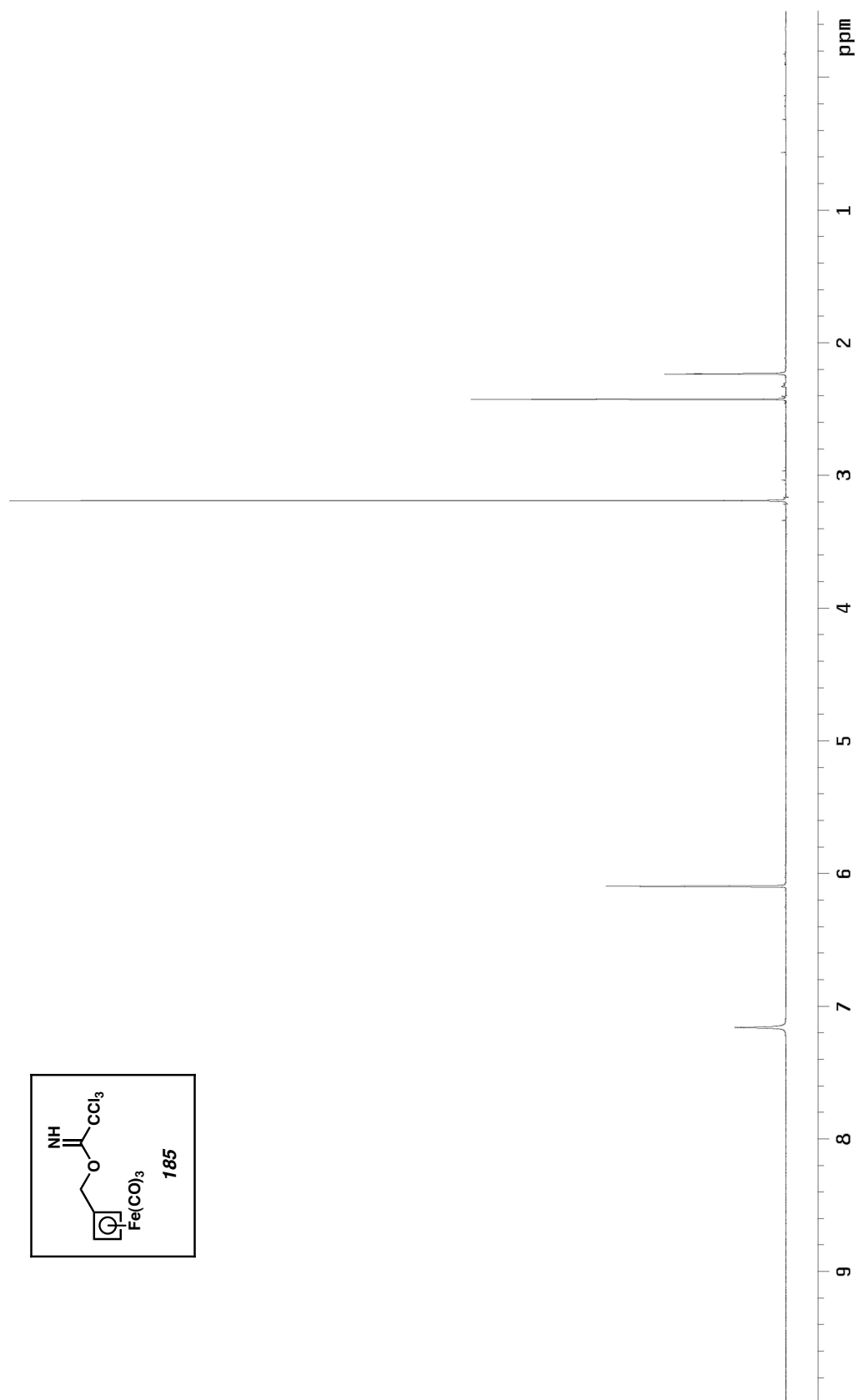


Figure A2.13. ¹³C NMR spectrum (126 MHz, C₆D₆) of **184**.

Figure A2.14. ^1H NMR spectrum (500 MHz, C_6D_6) of **185**.

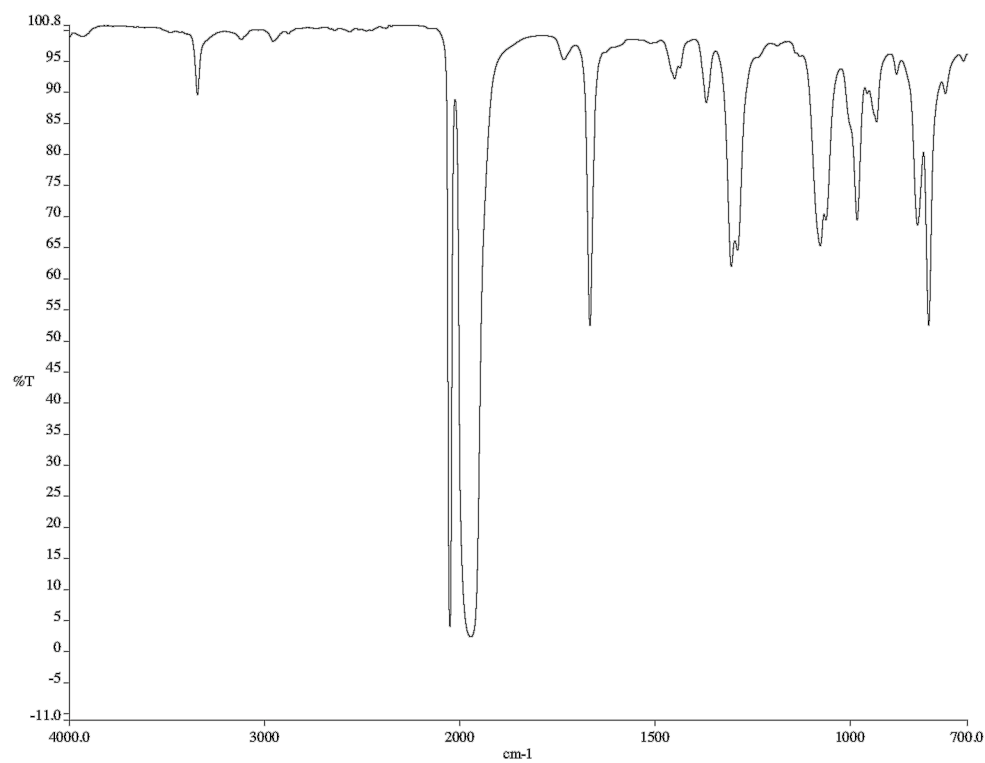


Figure A2.15. Infrared spectrum (neat film/NaCl) of **185**.

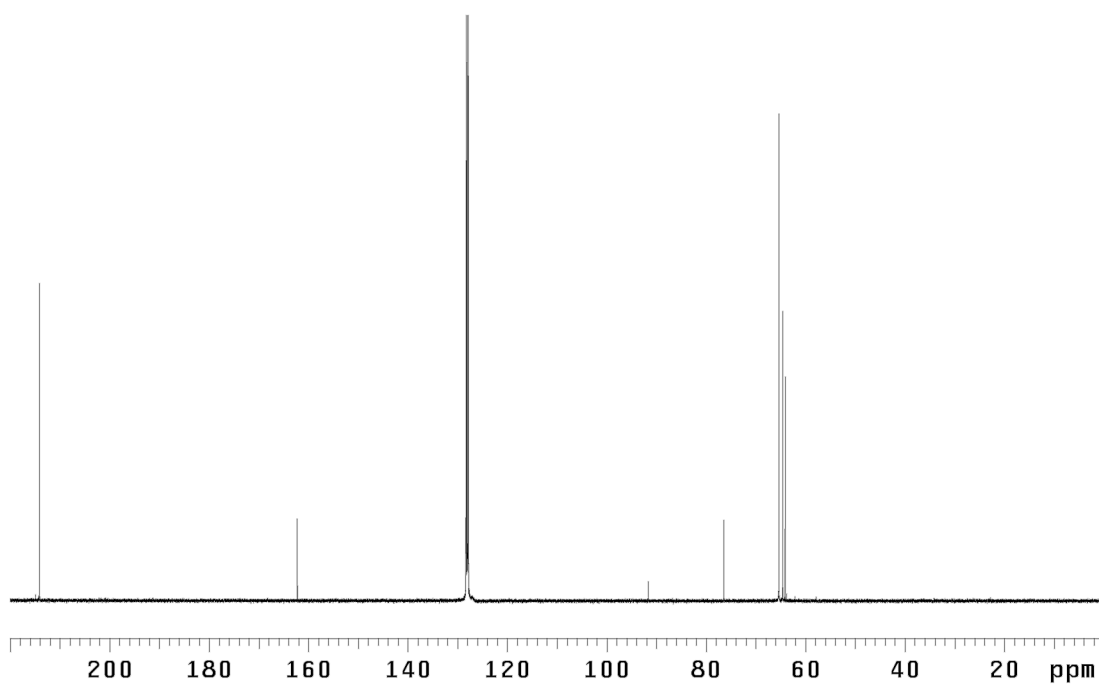


Figure A2.16. ¹³C NMR spectrum (126 MHz, C₆D₆) of **185**.

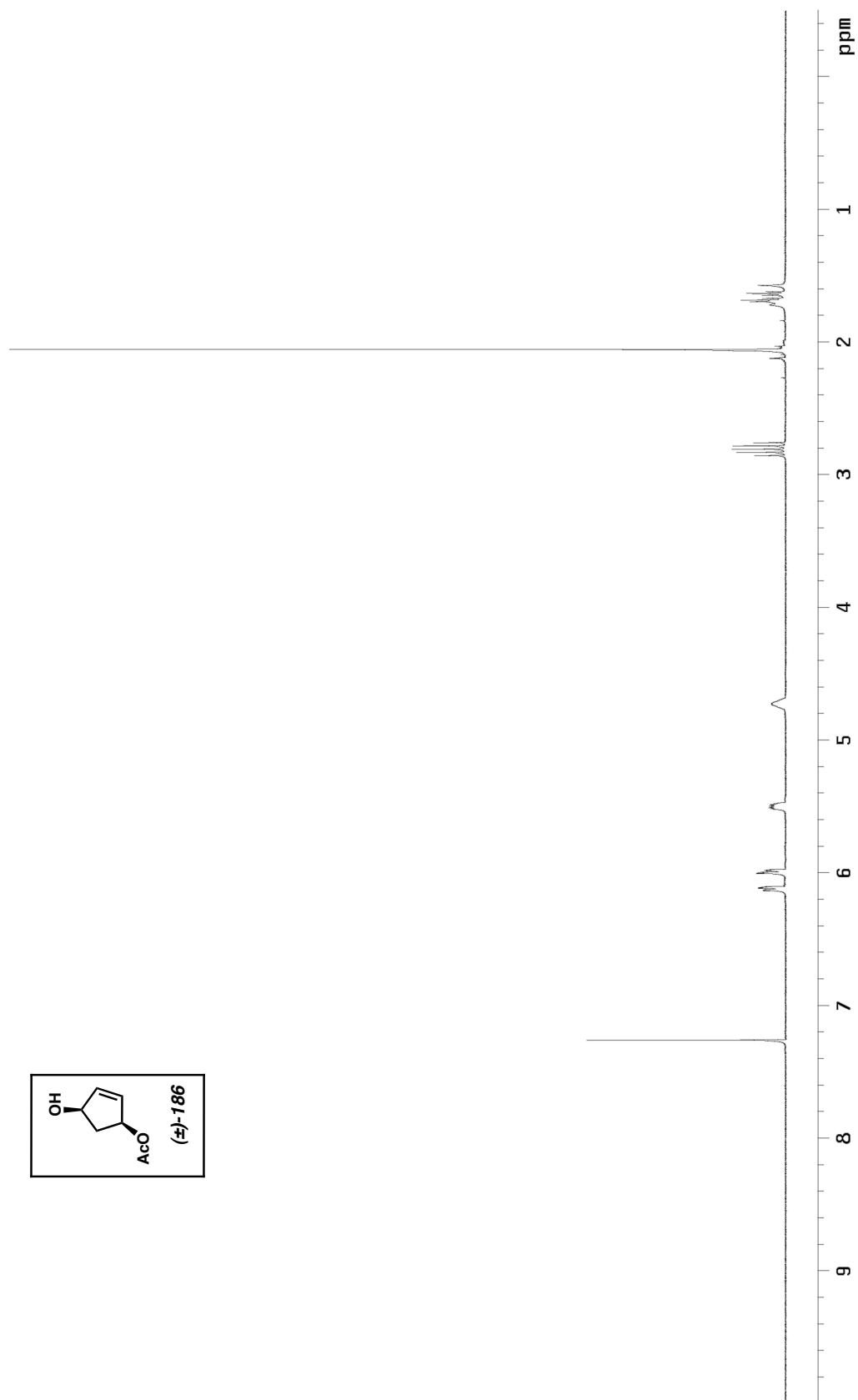
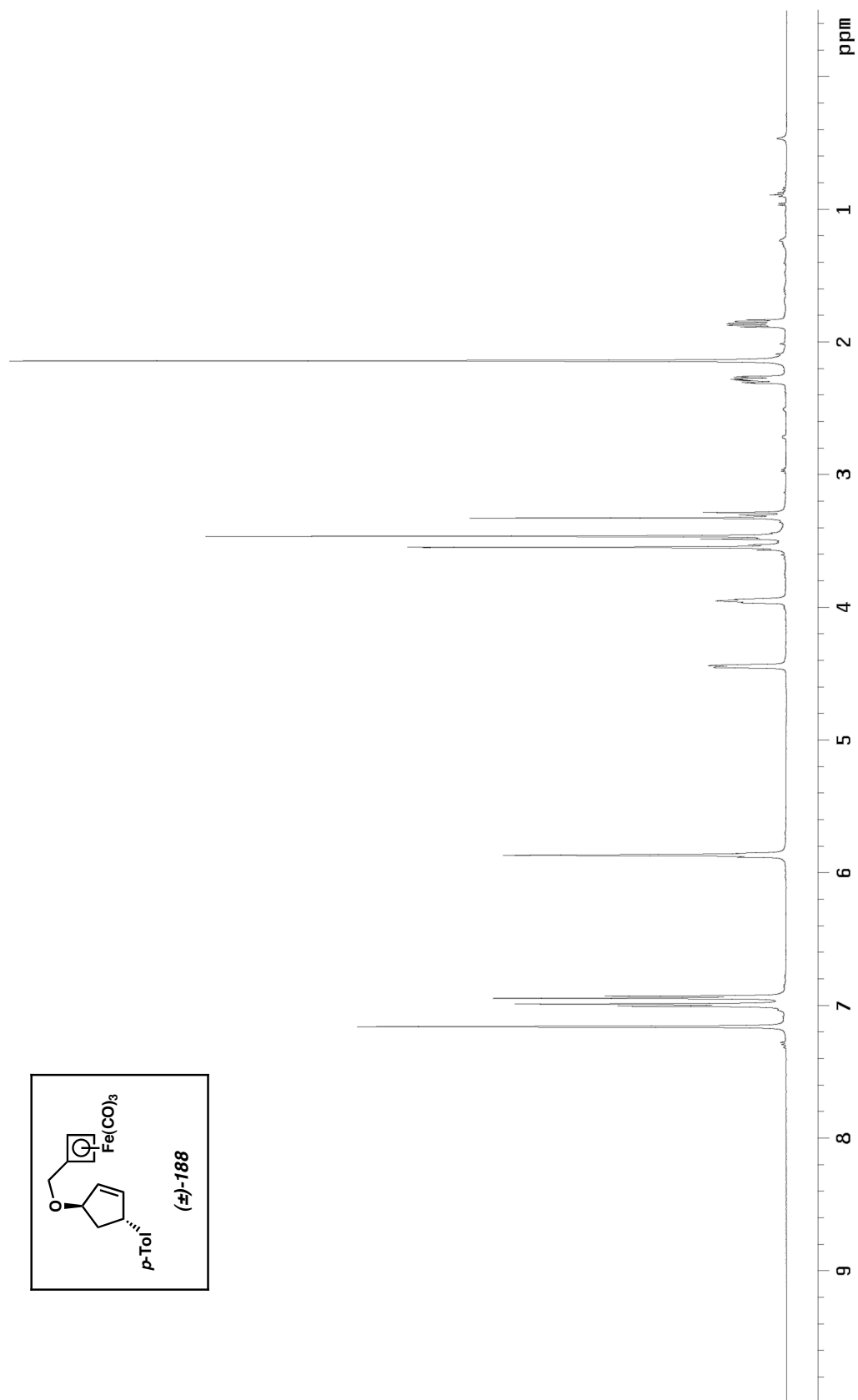
Figure A2.17. ^1H NMR spectrum (300 MHz, CDCl_3) of **186**.



Figure A2.18. ^1H NMR spectrum (500 MHz, CDCl_3) of **187**.

Figure A2.19. ^1H NMR spectrum (300 MHz, C_6D_6) of **188**.

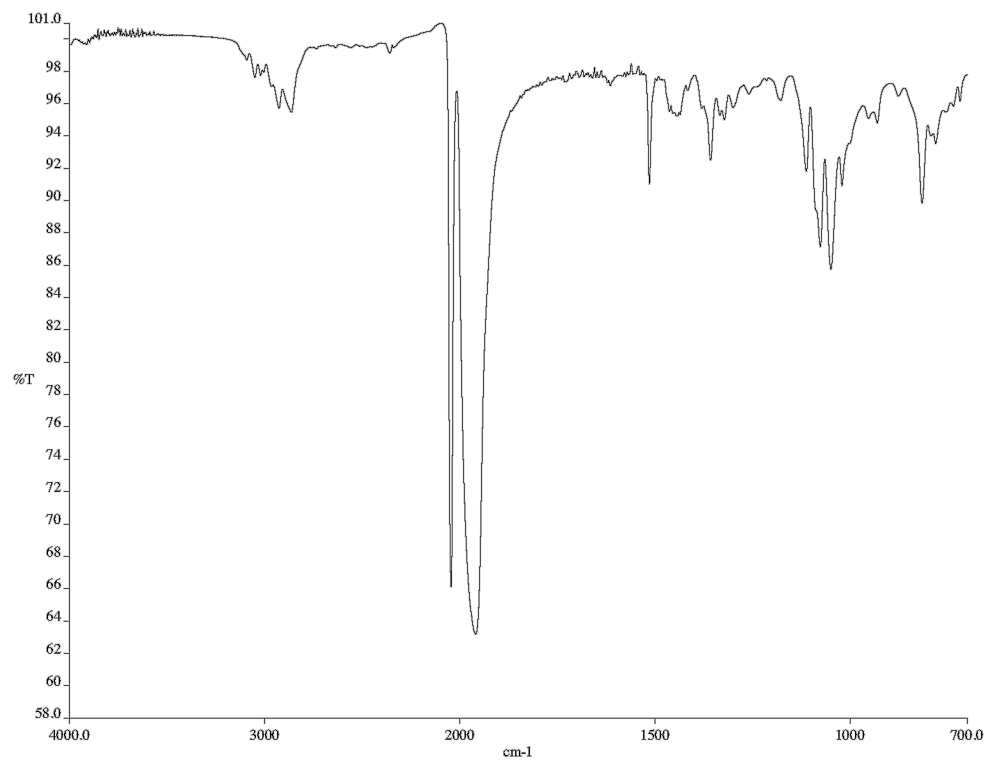


Figure A2.20. Infrared spectrum (neat film/NaCl) of **188**.

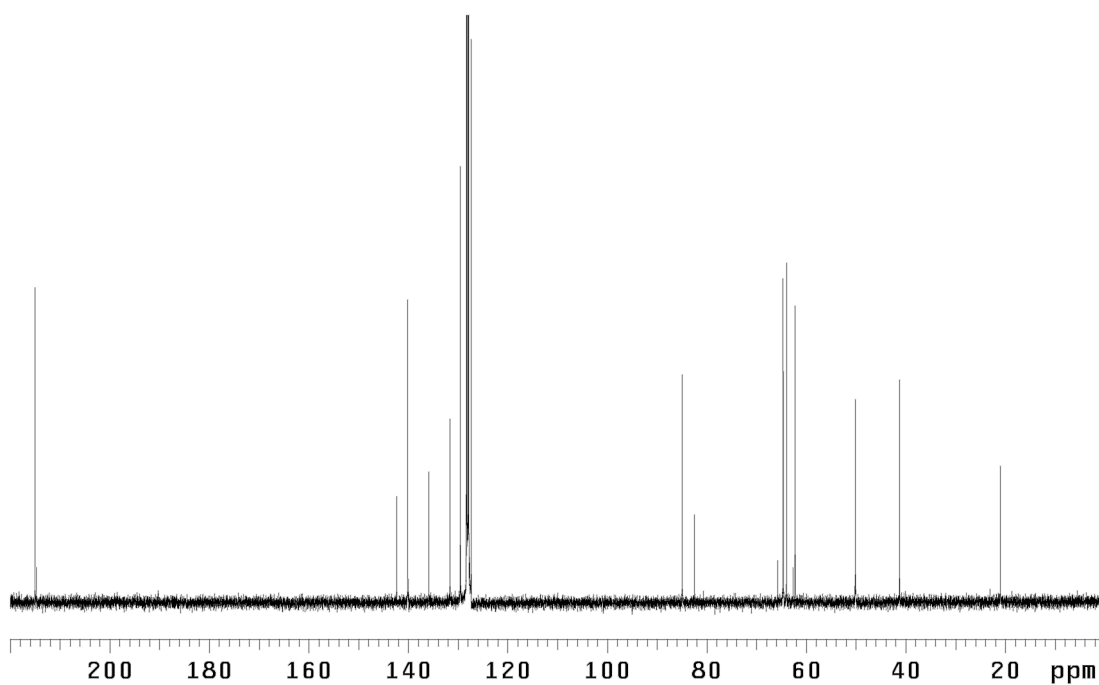
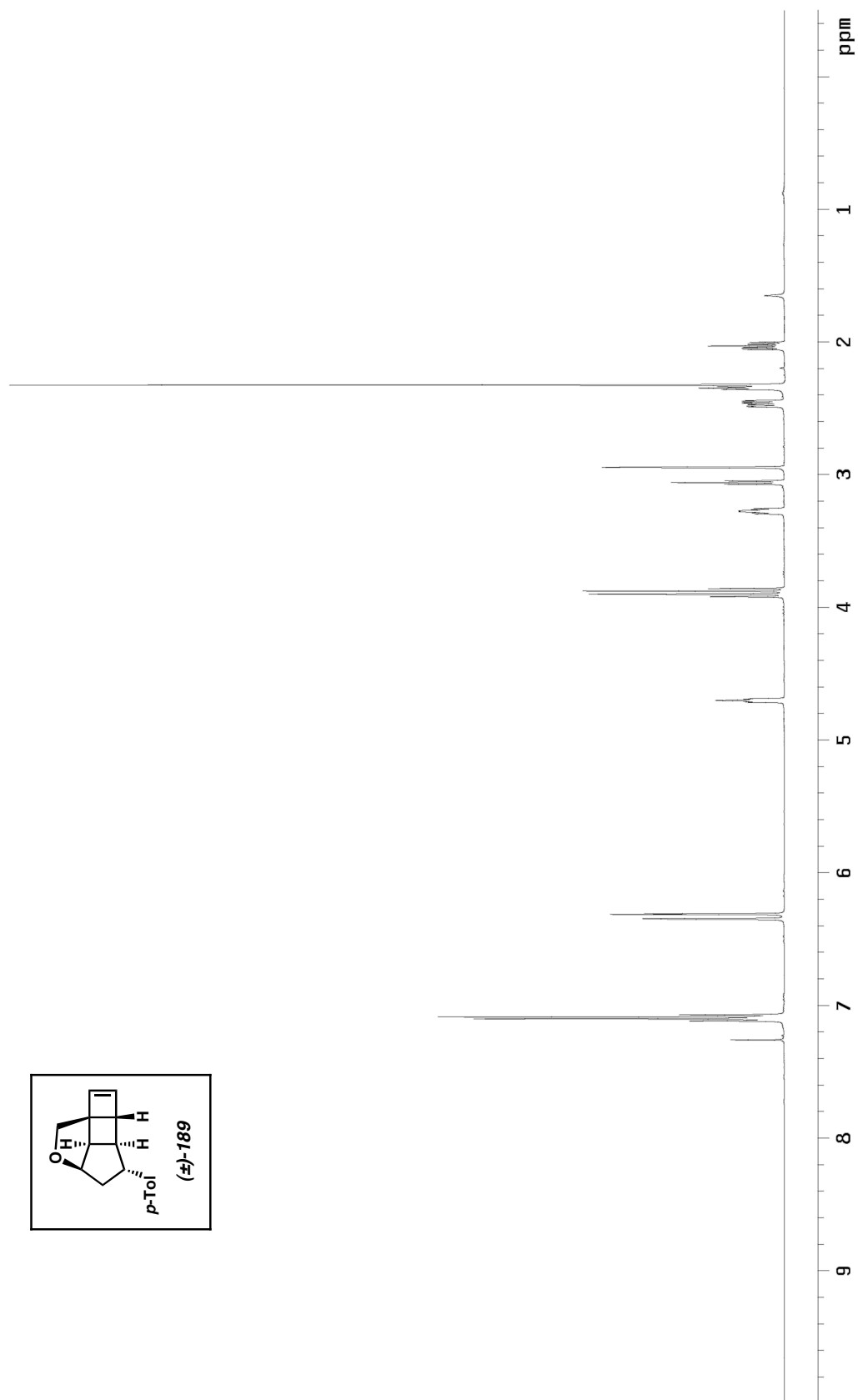


Figure A2.21. ¹³C NMR spectrum (126 MHz, C₆D₆) of **188**.

Figure A2.22. ^1H NMR spectrum (500 MHz, CDCl_3) of **189**.

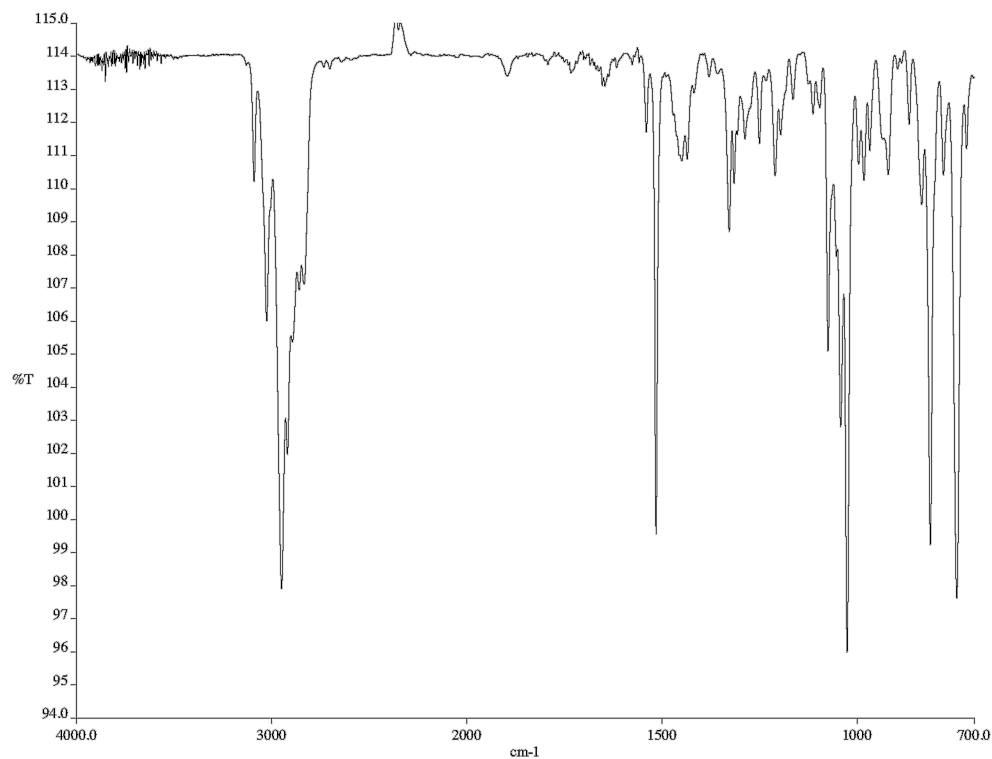


Figure A2.23. Infrared spectrum (neat film/NaCl) of **189**.

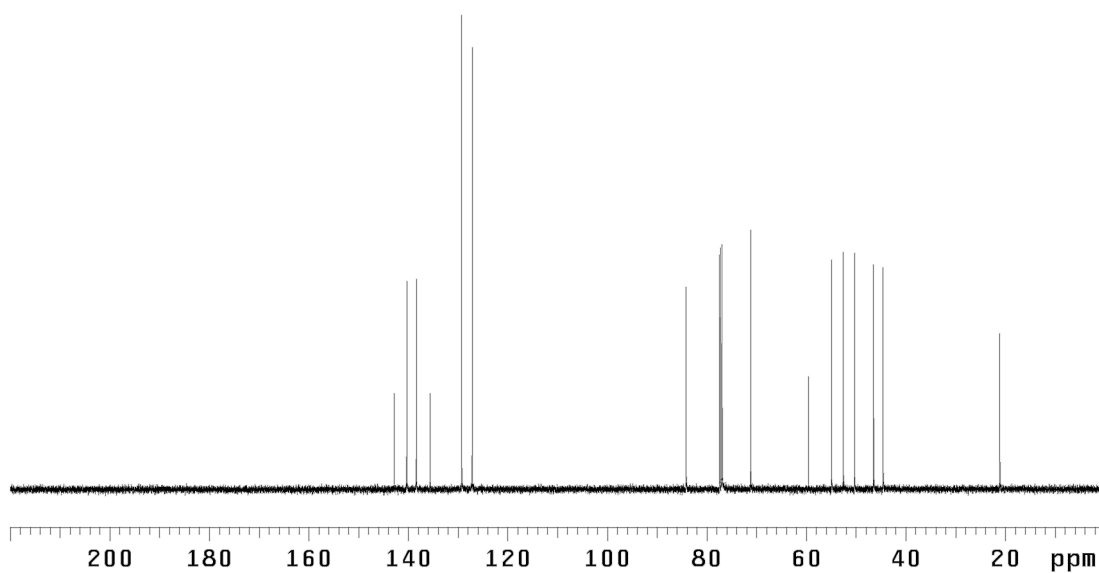


Figure A2.24. ¹³C NMR spectrum (126 MHz, CDCl₃) of **189**.

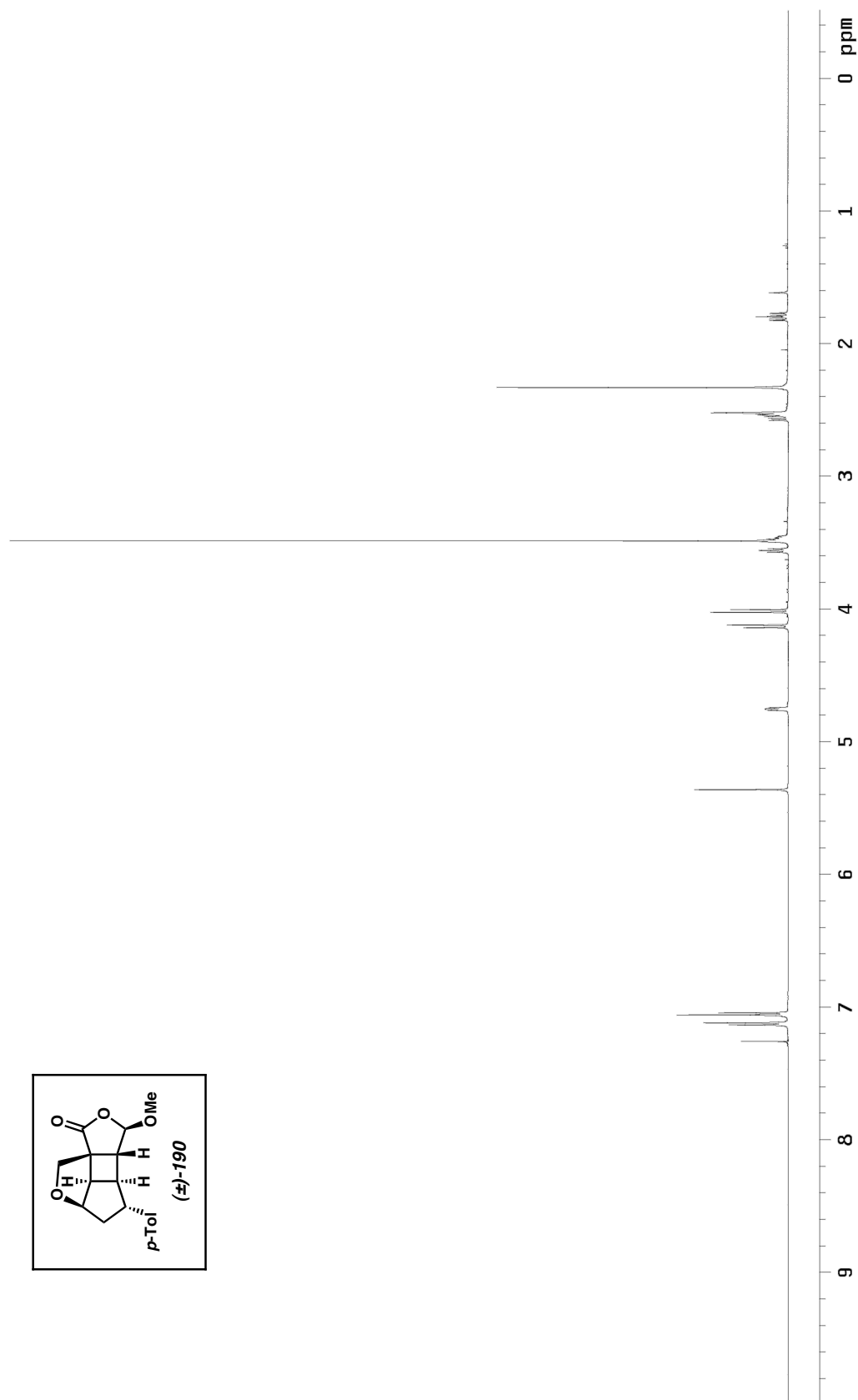


Figure A2.25. ^1H NMR spectrum (500 MHz, CDCl_3) of **190**.

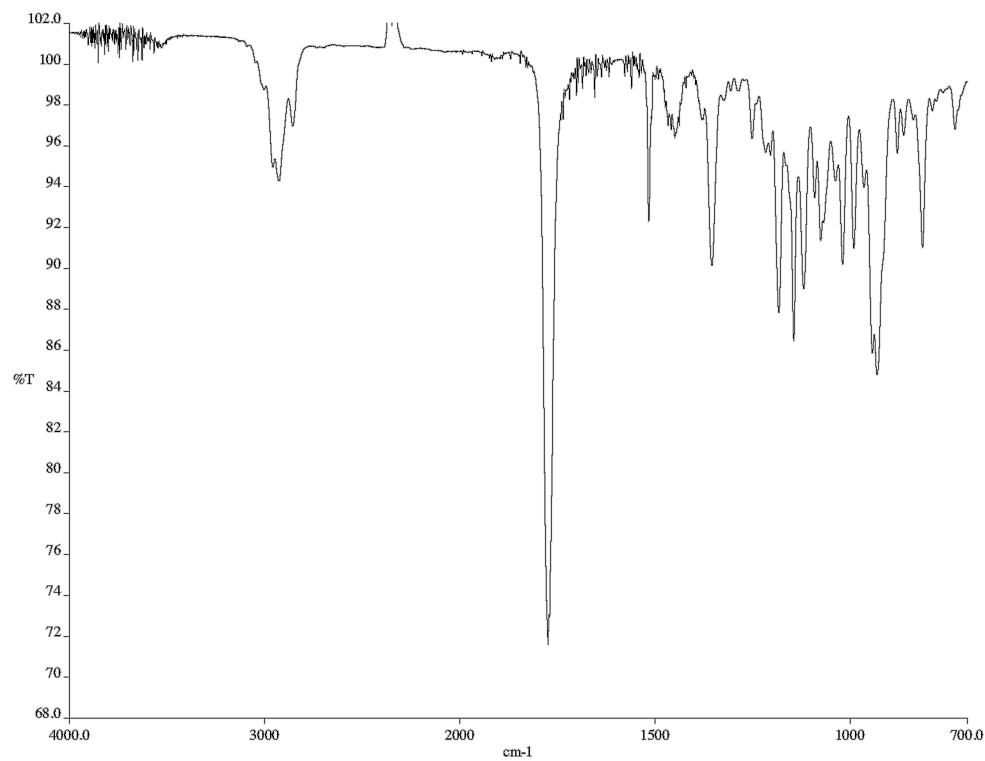


Figure A2.26. Infrared spectrum (neat film/NaCl) of **190**.

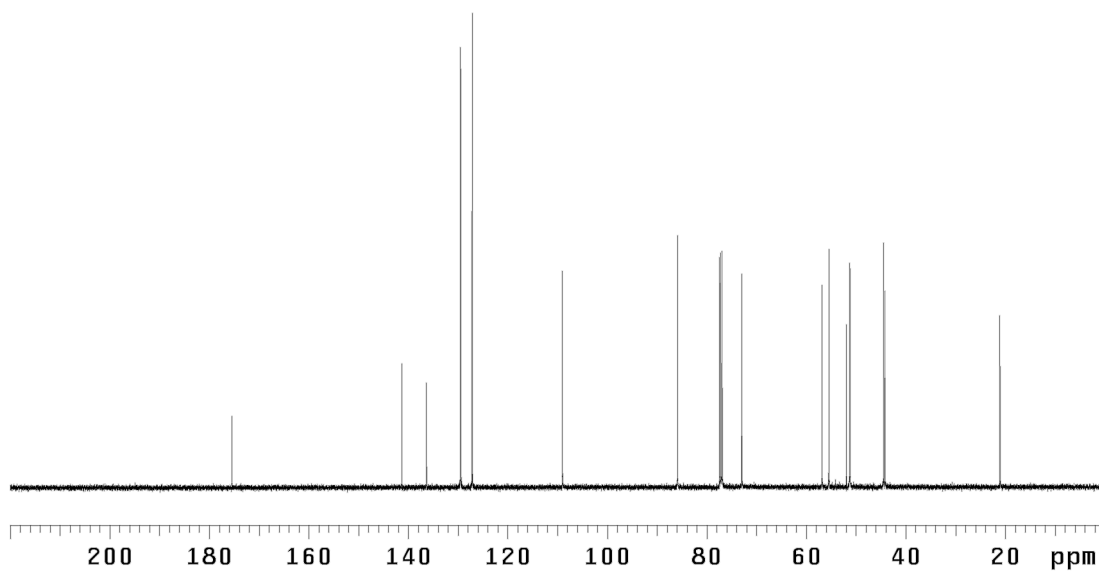
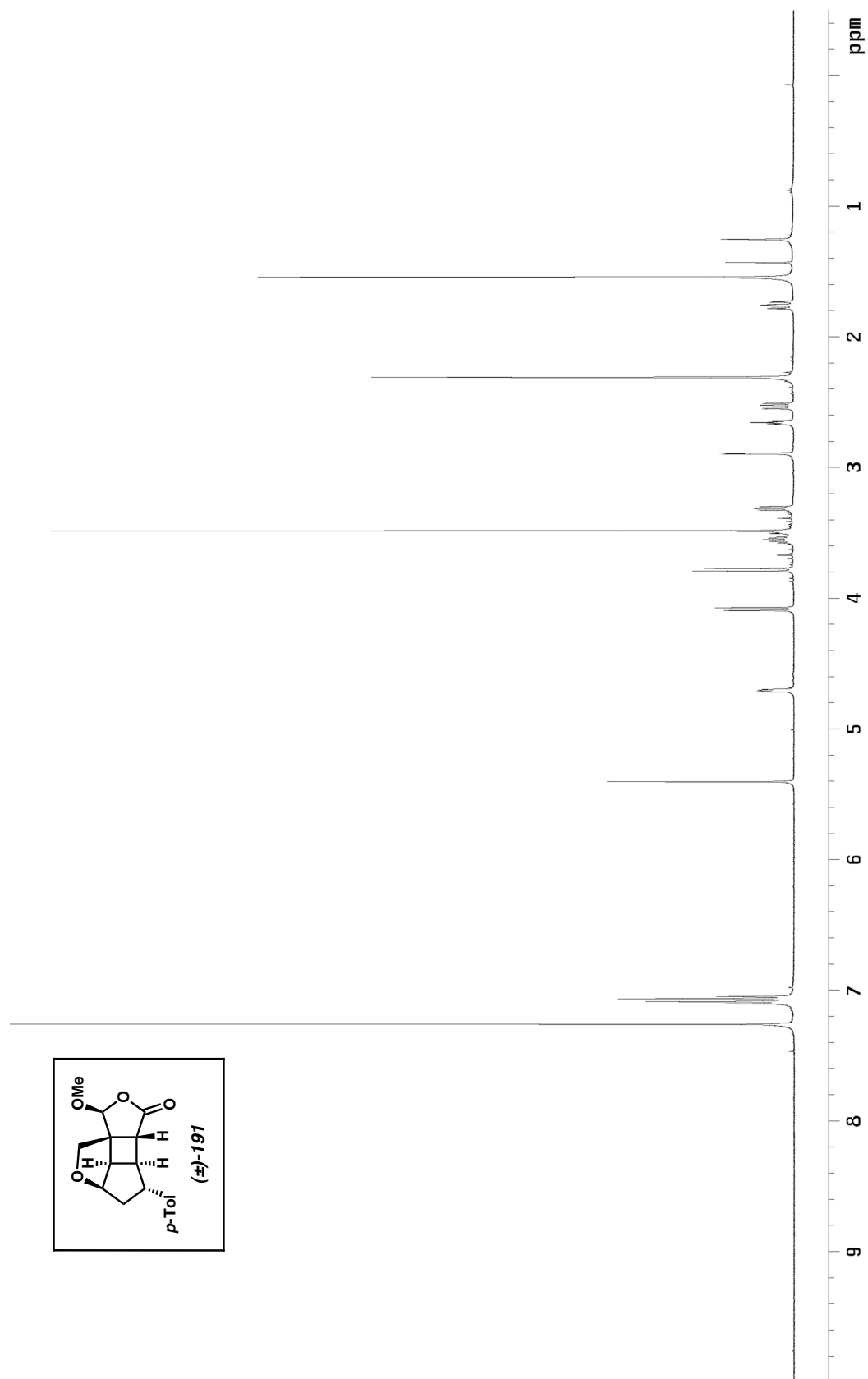


Figure A2.27. ¹³C NMR spectrum (126 MHz, CDCl₃) of **190**.

Figure A2.28. ^1H NMR spectrum (500 MHz, CDCl_3) of **191**.

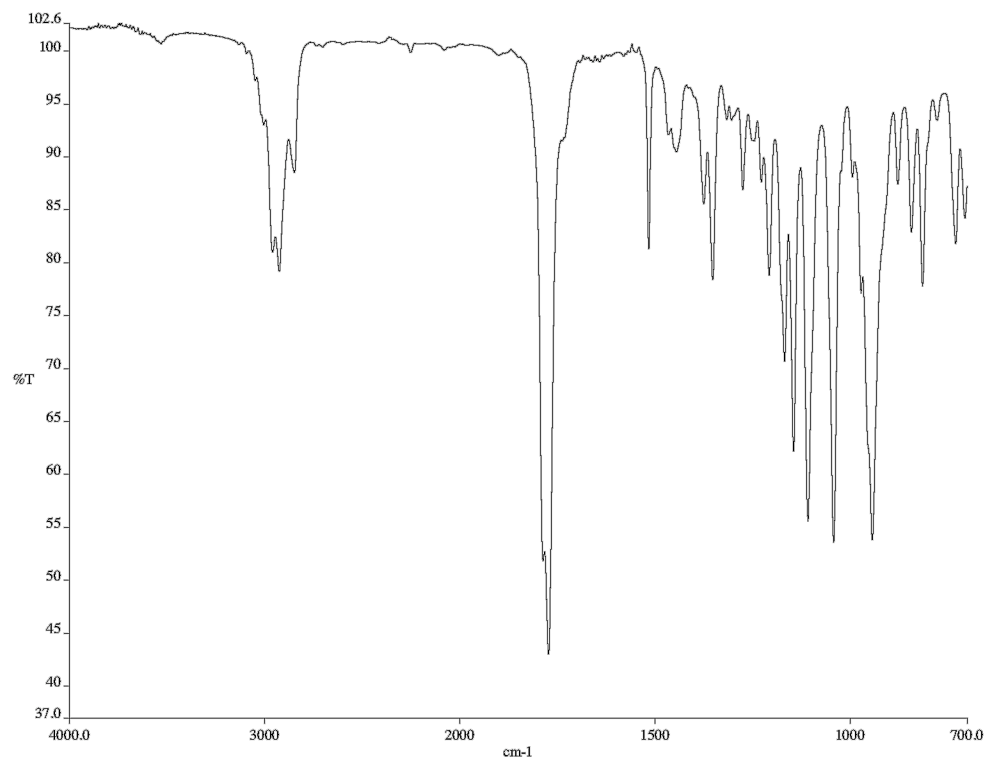


Figure A2.29. Infrared spectrum (neat film/NaCl) of **191**.

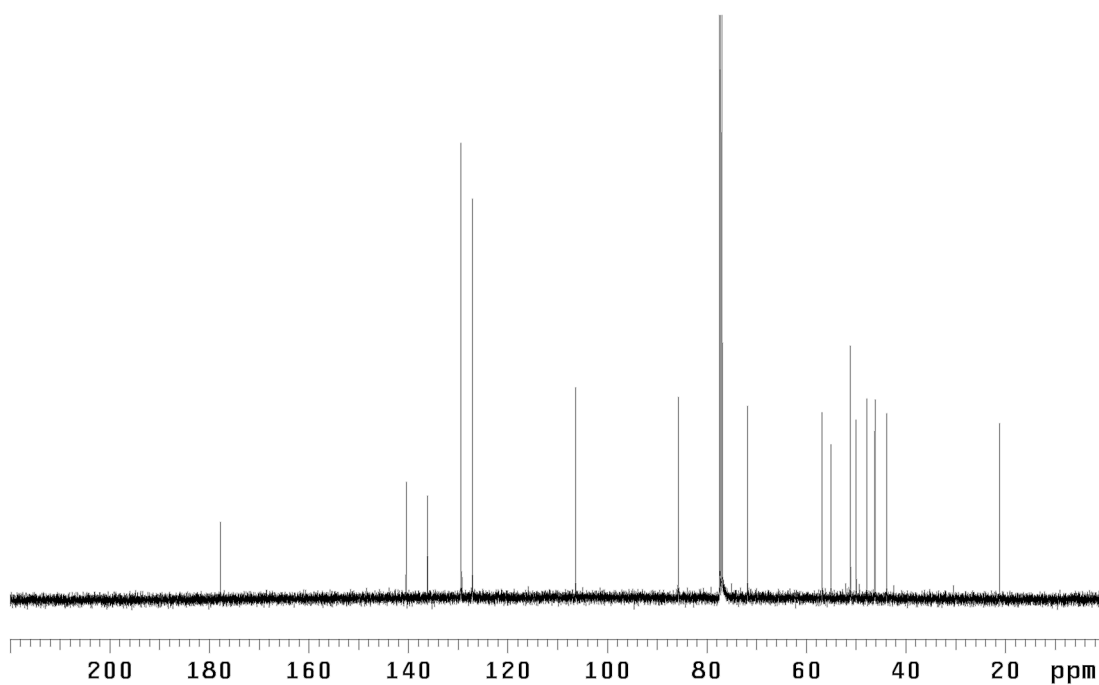
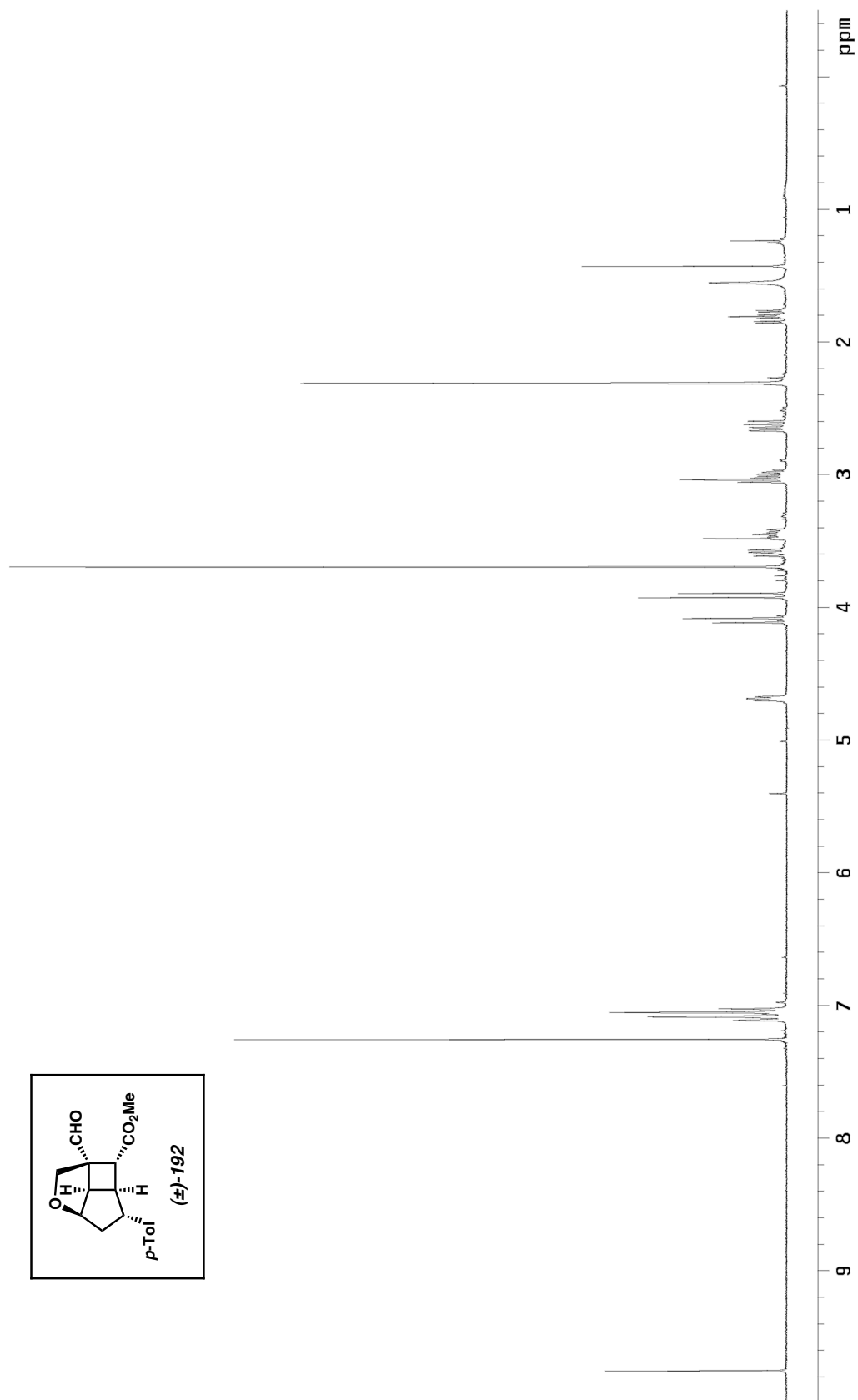
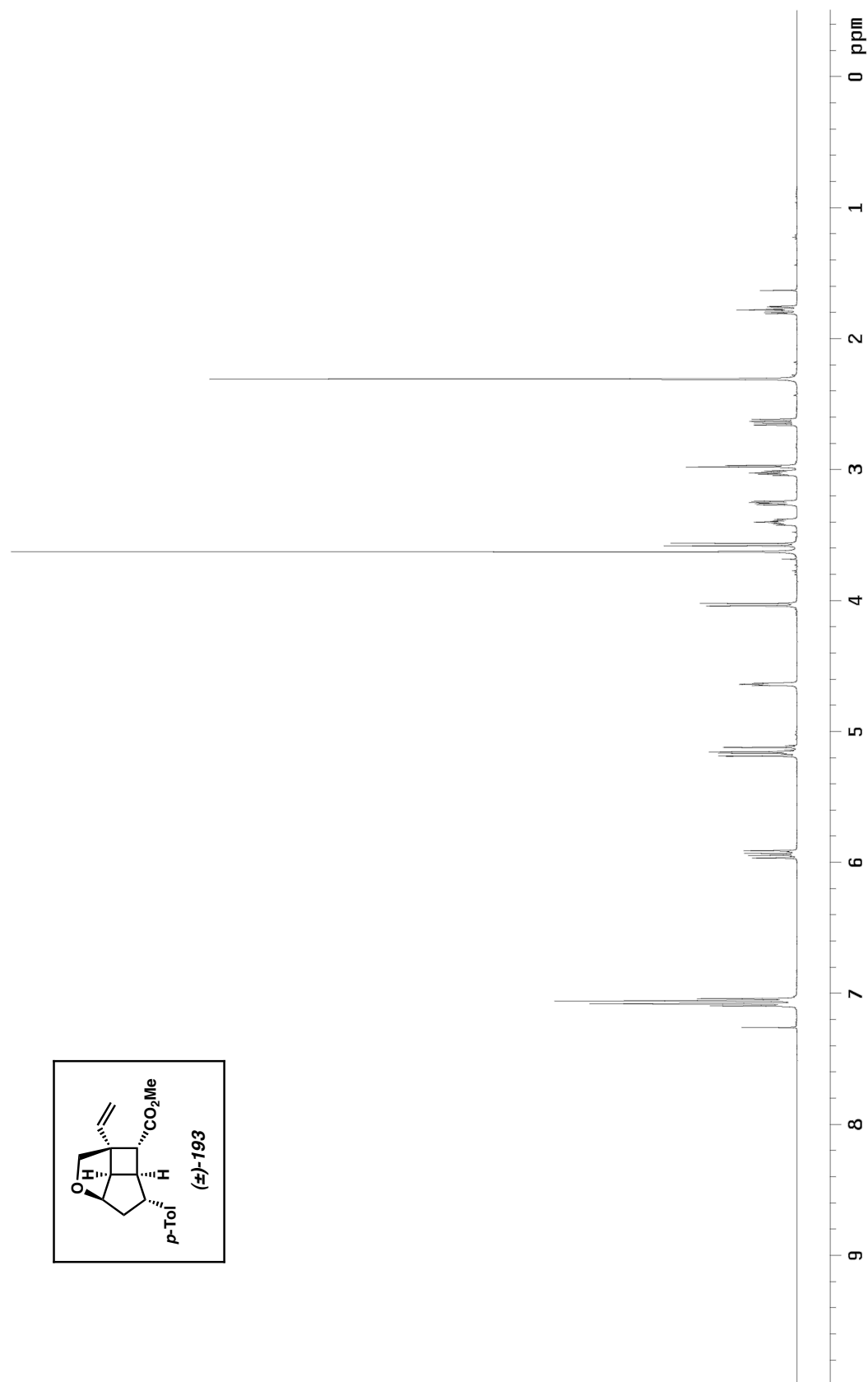


Figure A2.30. ¹³C NMR spectrum (126 MHz, CDCl₃) of **191**.

Figure A2.31. ^1H NMR spectrum (300 MHz, CDCl_3) of **192**.

Figure A2.32. ^1H NMR spectrum (500 MHz, CDCl_3) of **193**.

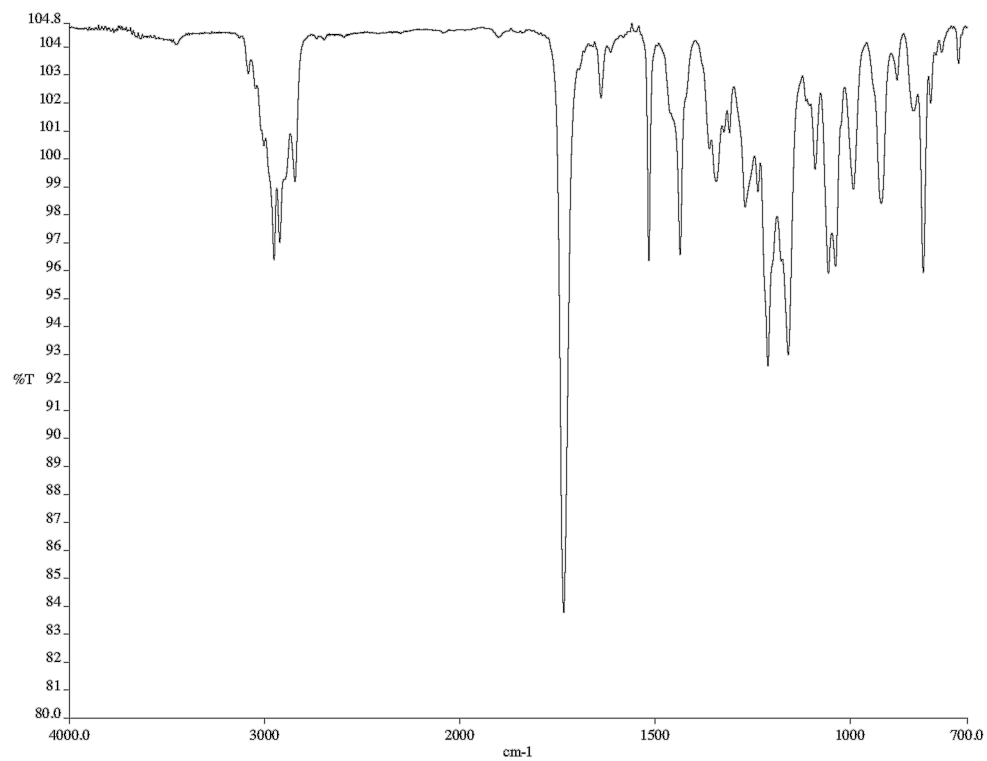


Figure A2.33. Infrared spectrum (neat film/NaCl) of **193**.

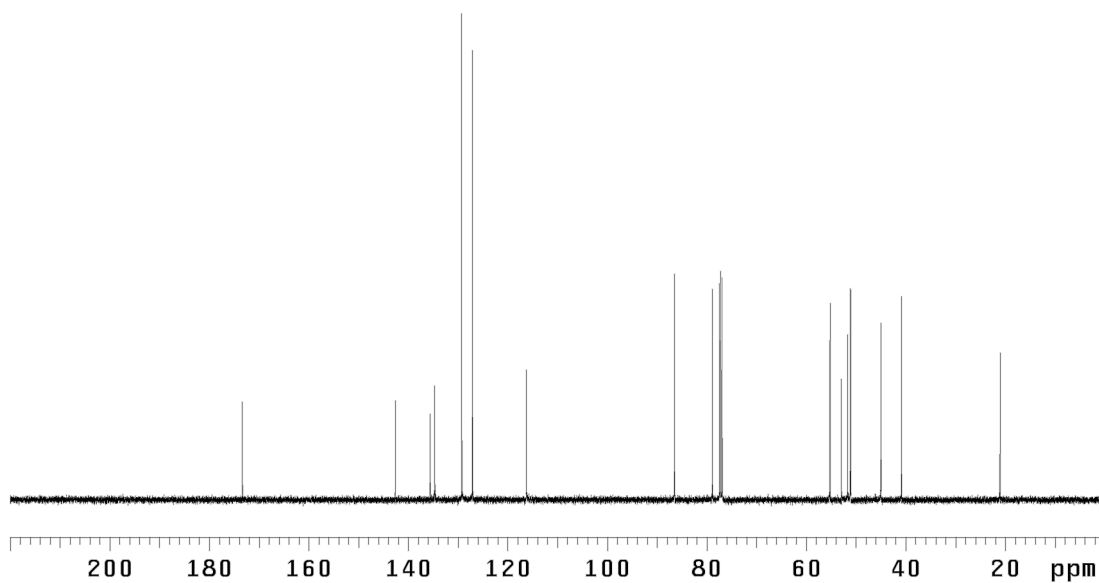


Figure A2.34. ¹³C NMR spectrum (126 MHz, CDCl₃) of **193**.

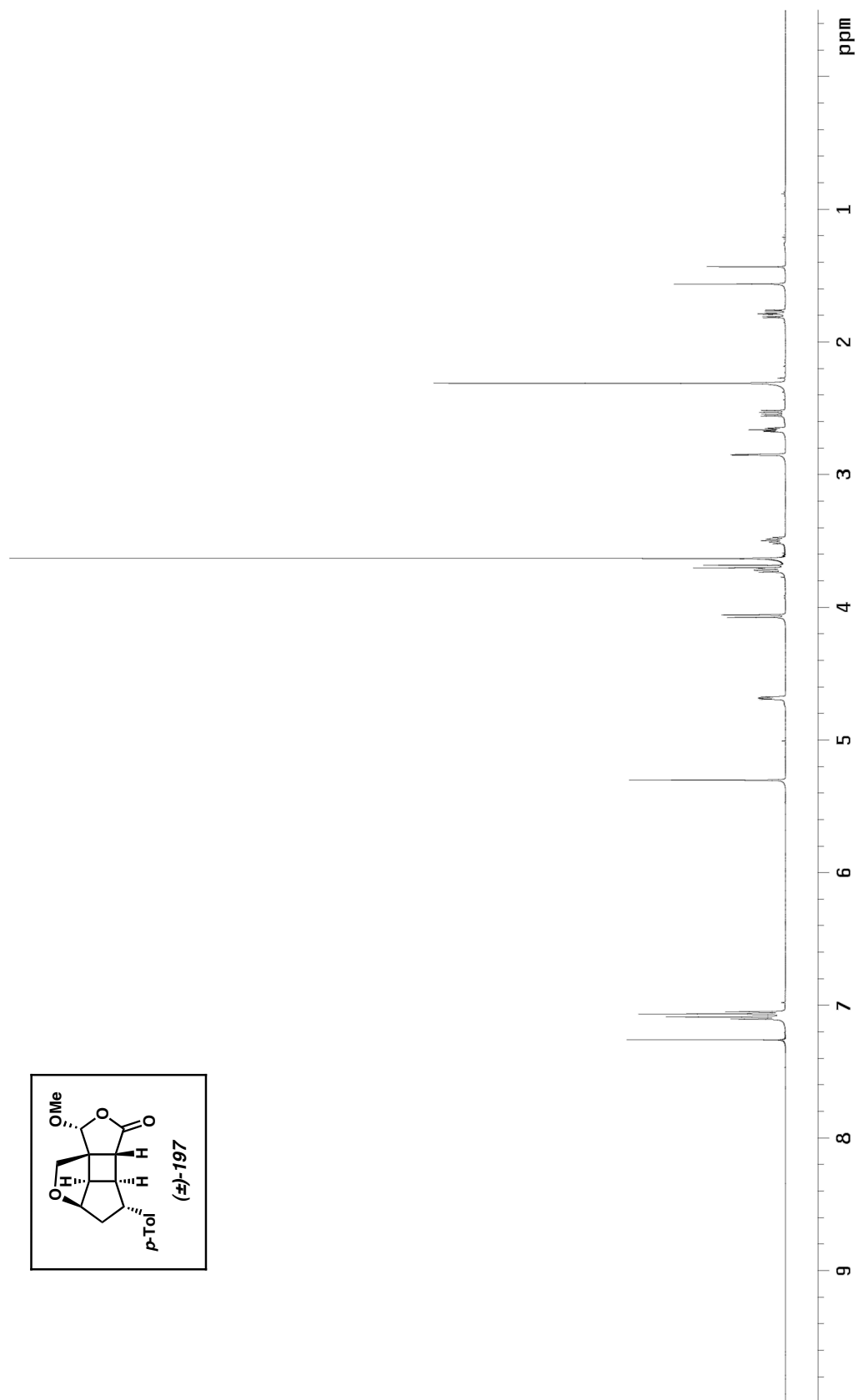


Figure A2.35. ^1H NMR spectrum (500 MHz, CDCl_3) of **197**.

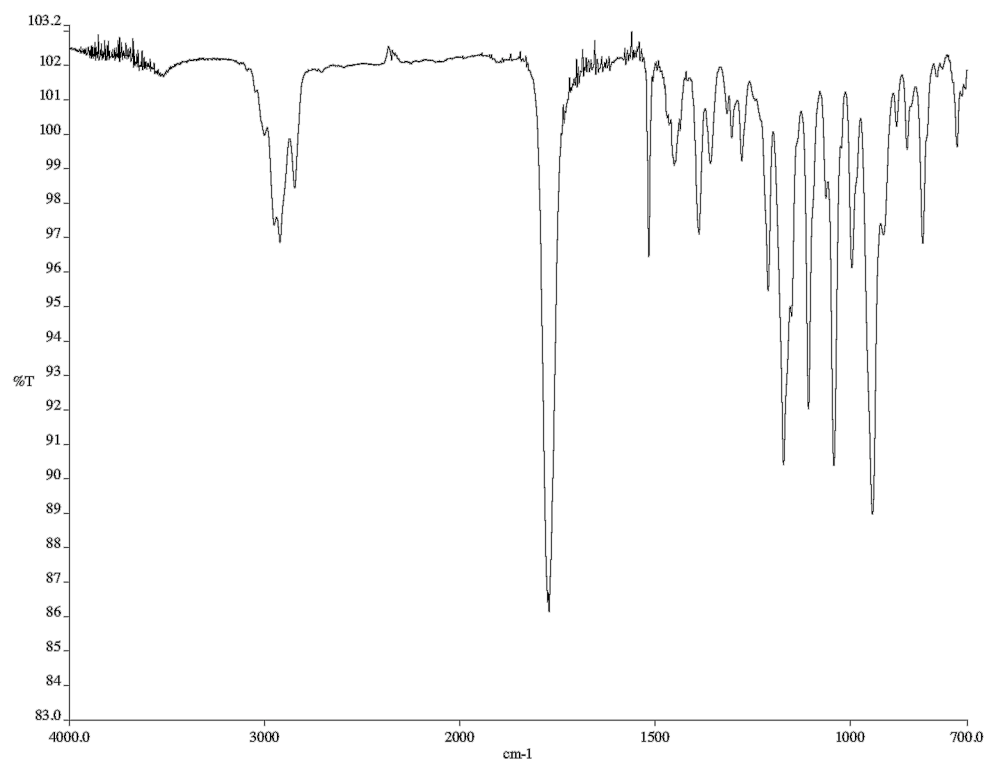


Figure A2.36. Infrared spectrum (neat film/NaCl) of **197**.

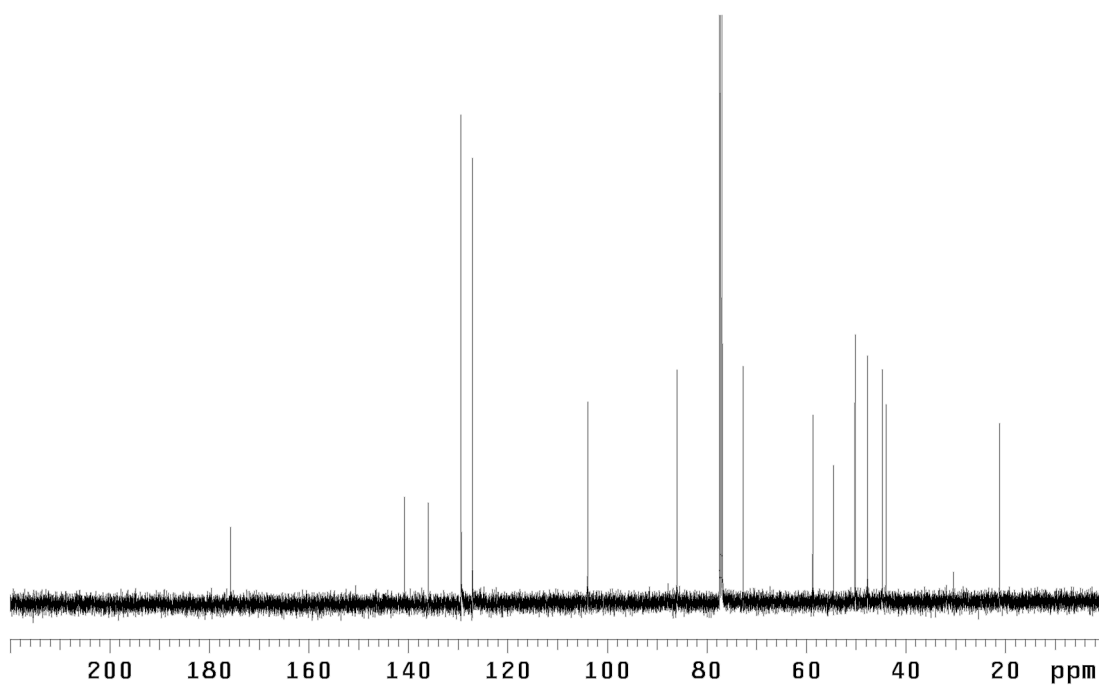
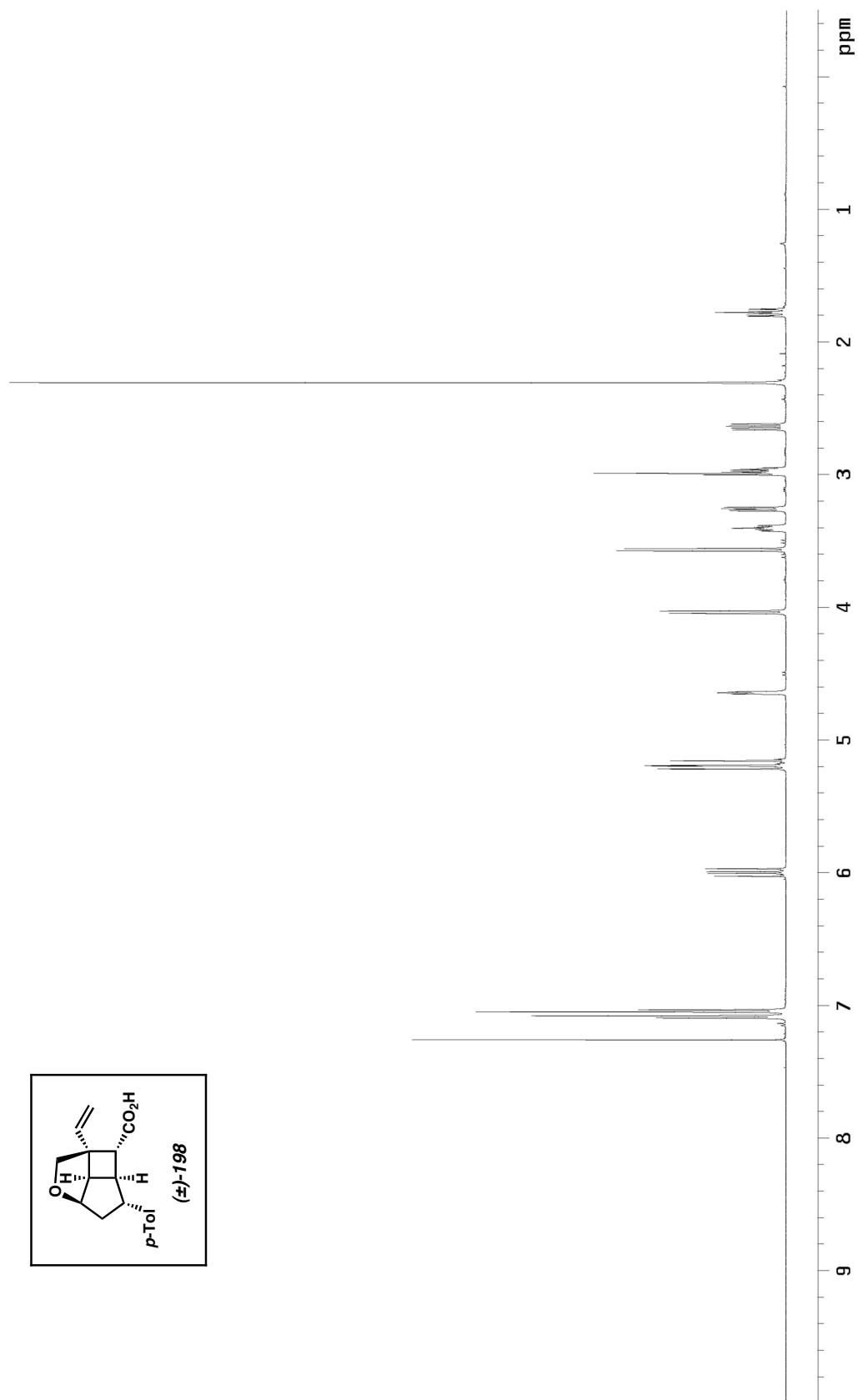


Figure A2.37. ¹³C NMR spectrum (126 MHz, CDCl₃) of **197**.

Figure A2.38. ^1H NMR spectrum (500 MHz, CDCl_3) of **198**.

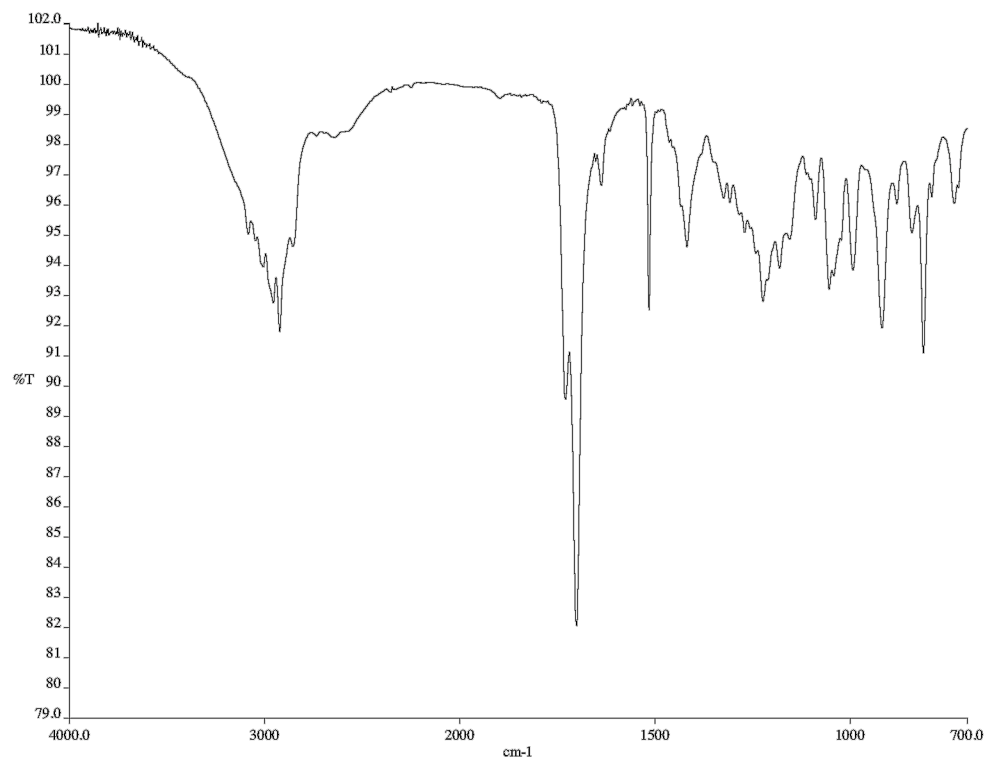


Figure A2.39. Infrared spectrum (neat film/NaCl) of **198**.

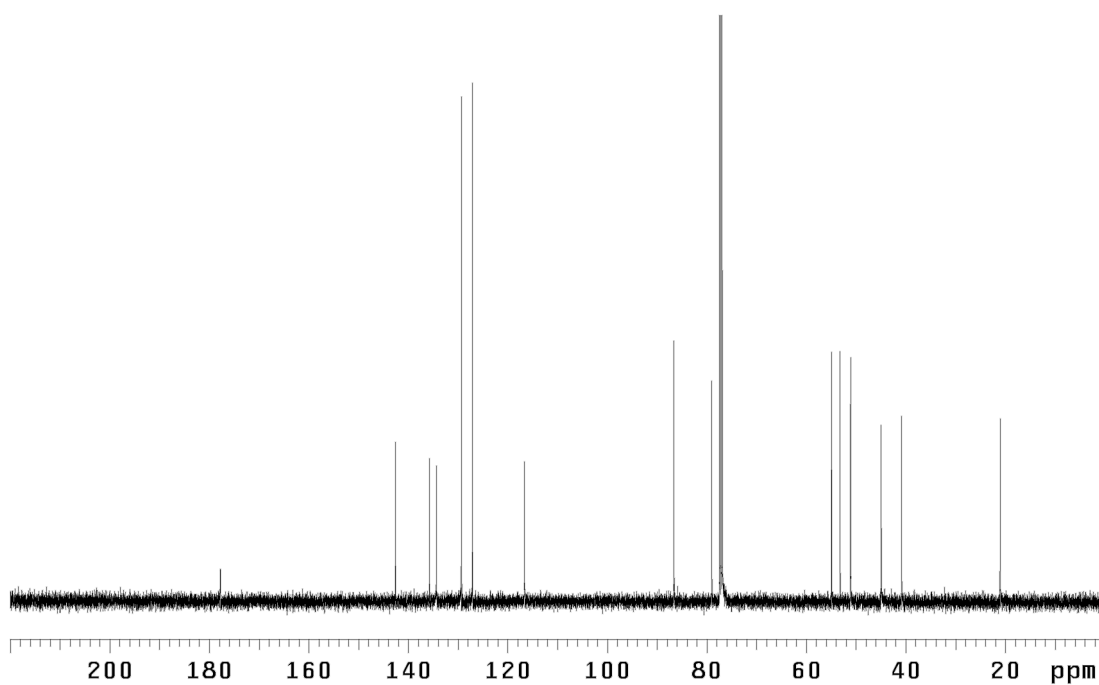


Figure A2.40. ¹³C NMR spectrum (126 MHz, CDCl₃) of **198**.

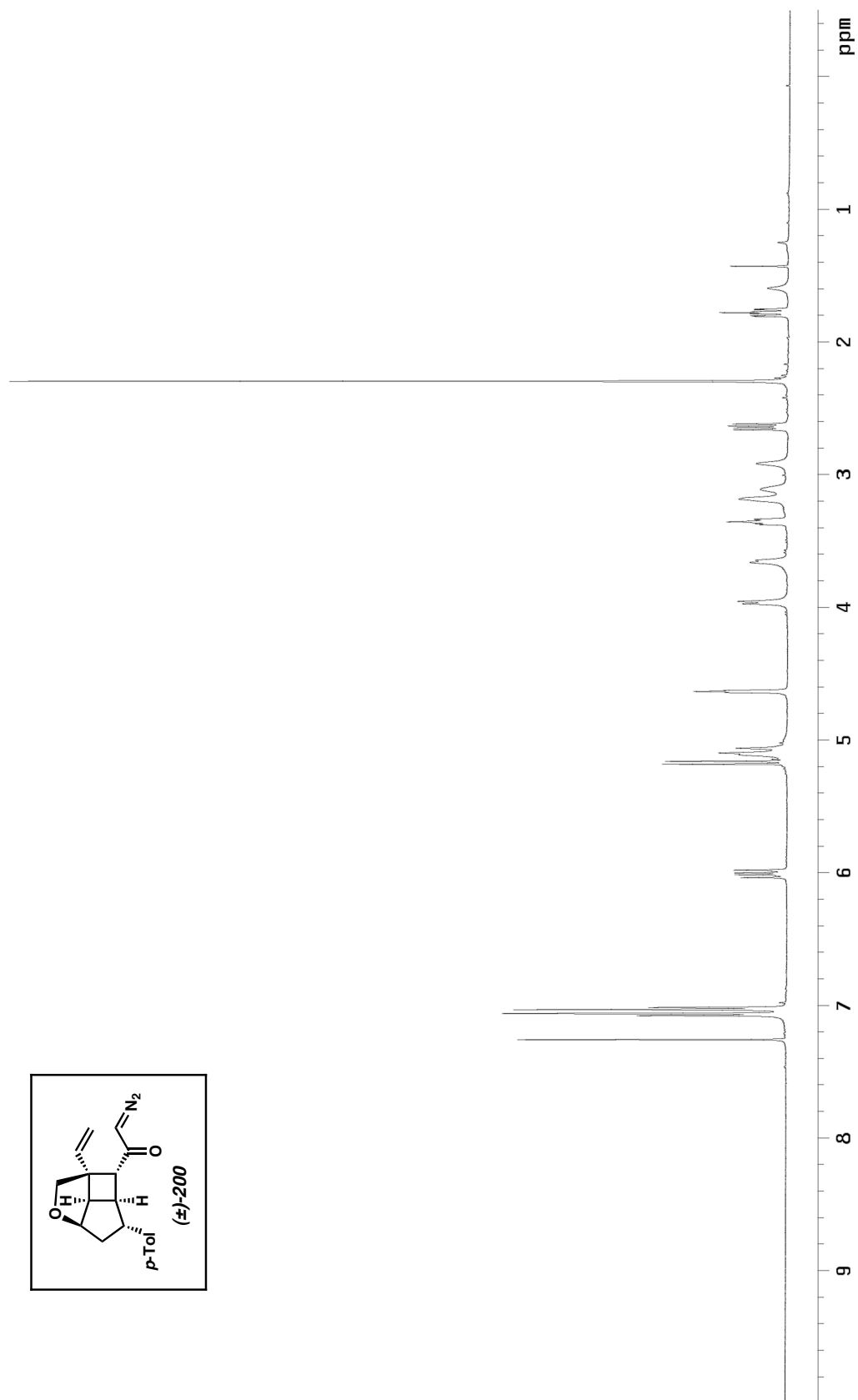


Figure A2.41. ^1H NMR spectrum (500 MHz, CDCl_3) of **200**.

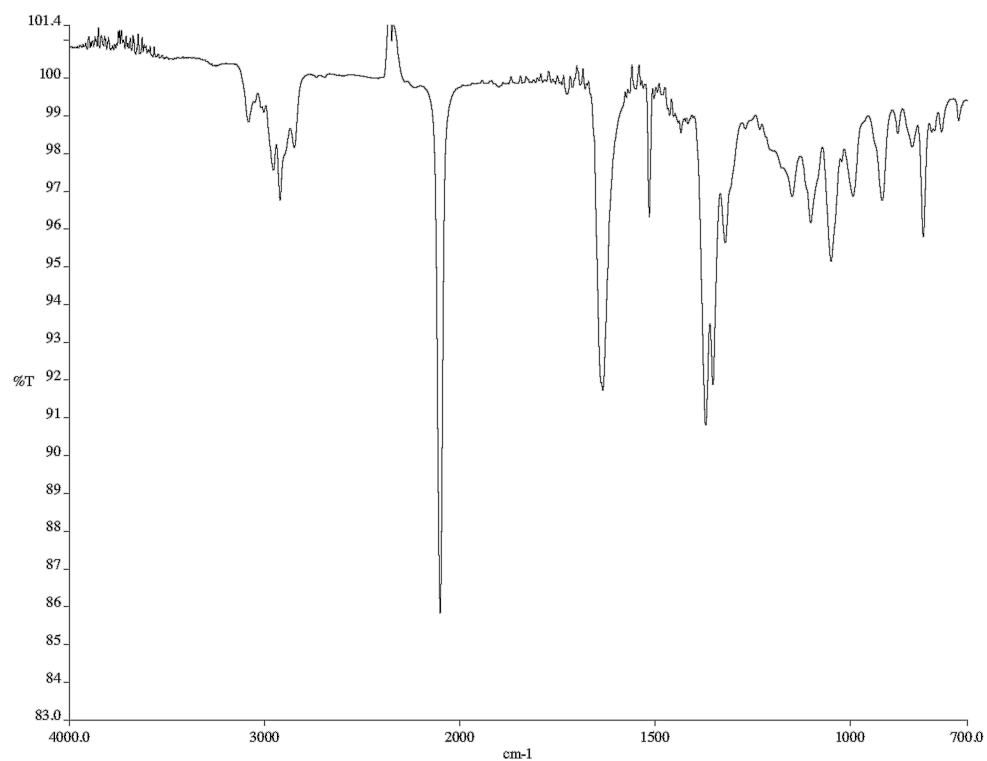


Figure A2.42. Infrared spectrum (neat film/NaCl) of **200**.

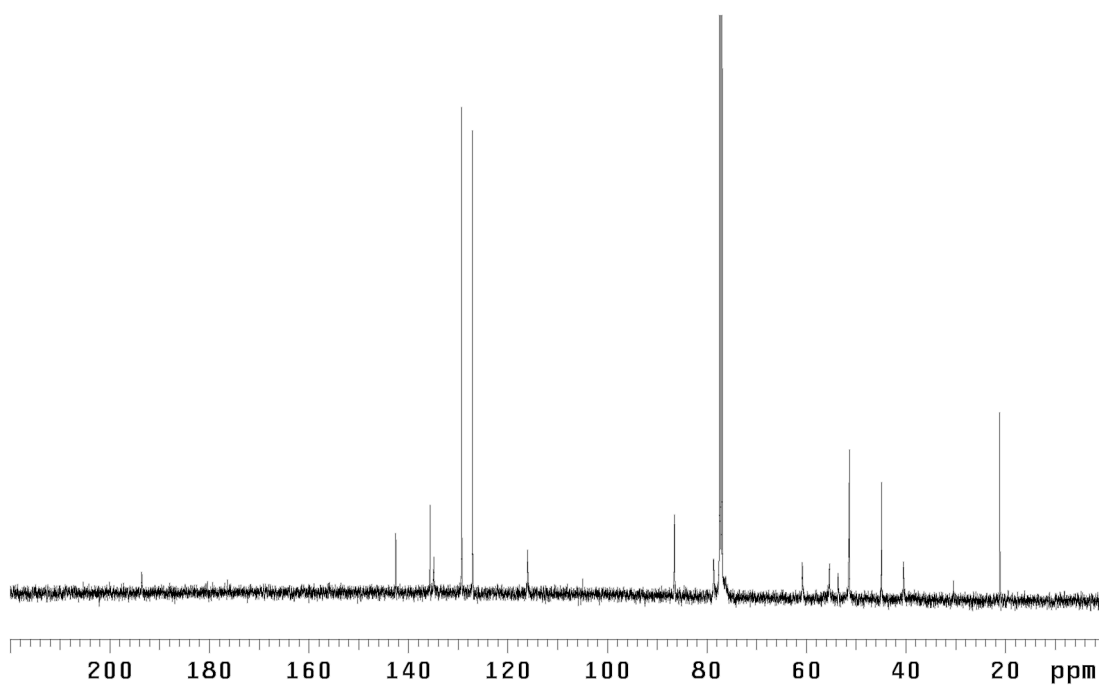


Figure A2.43. ¹³C NMR spectrum (126 MHz, CDCl₃) of **200**.

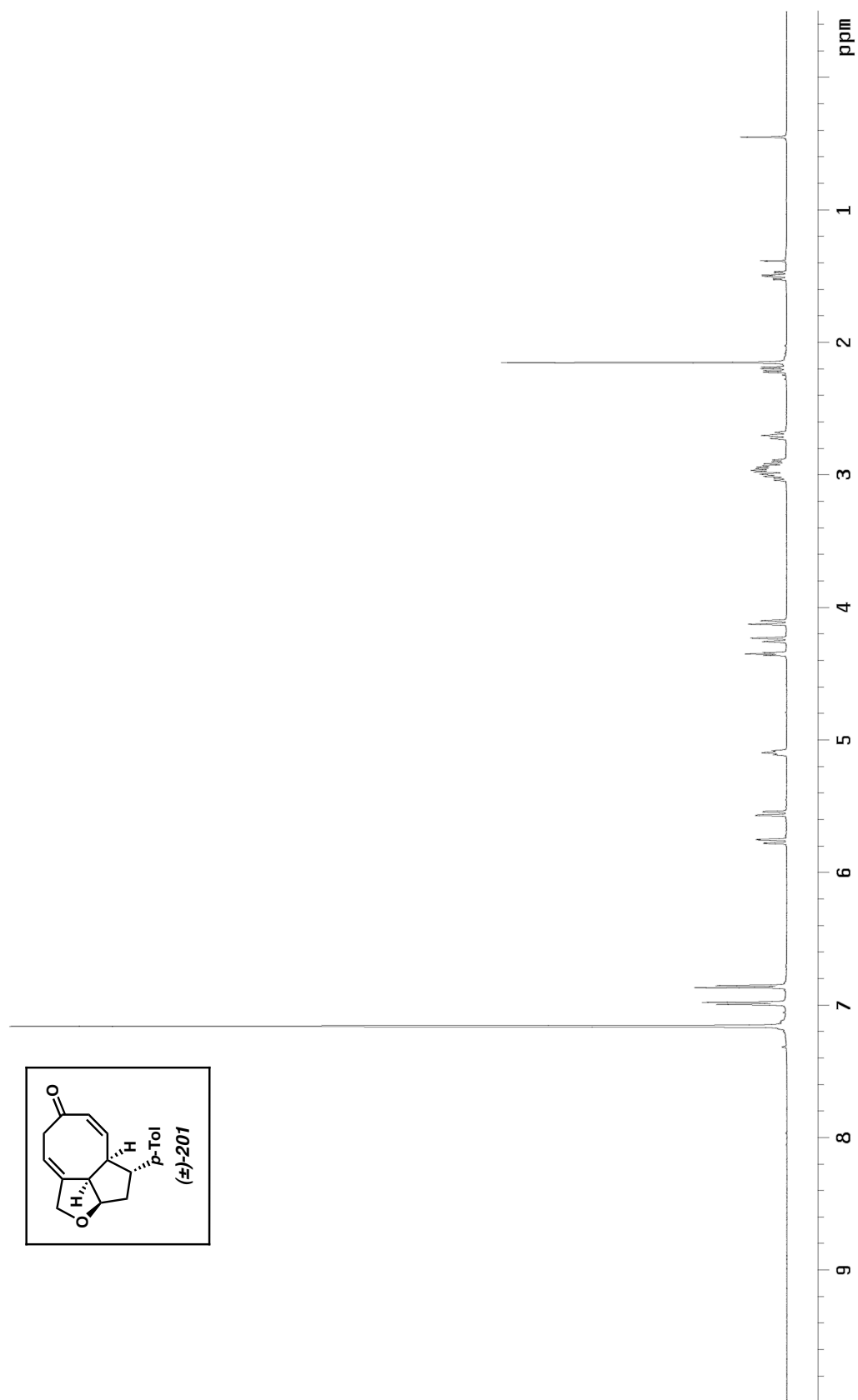
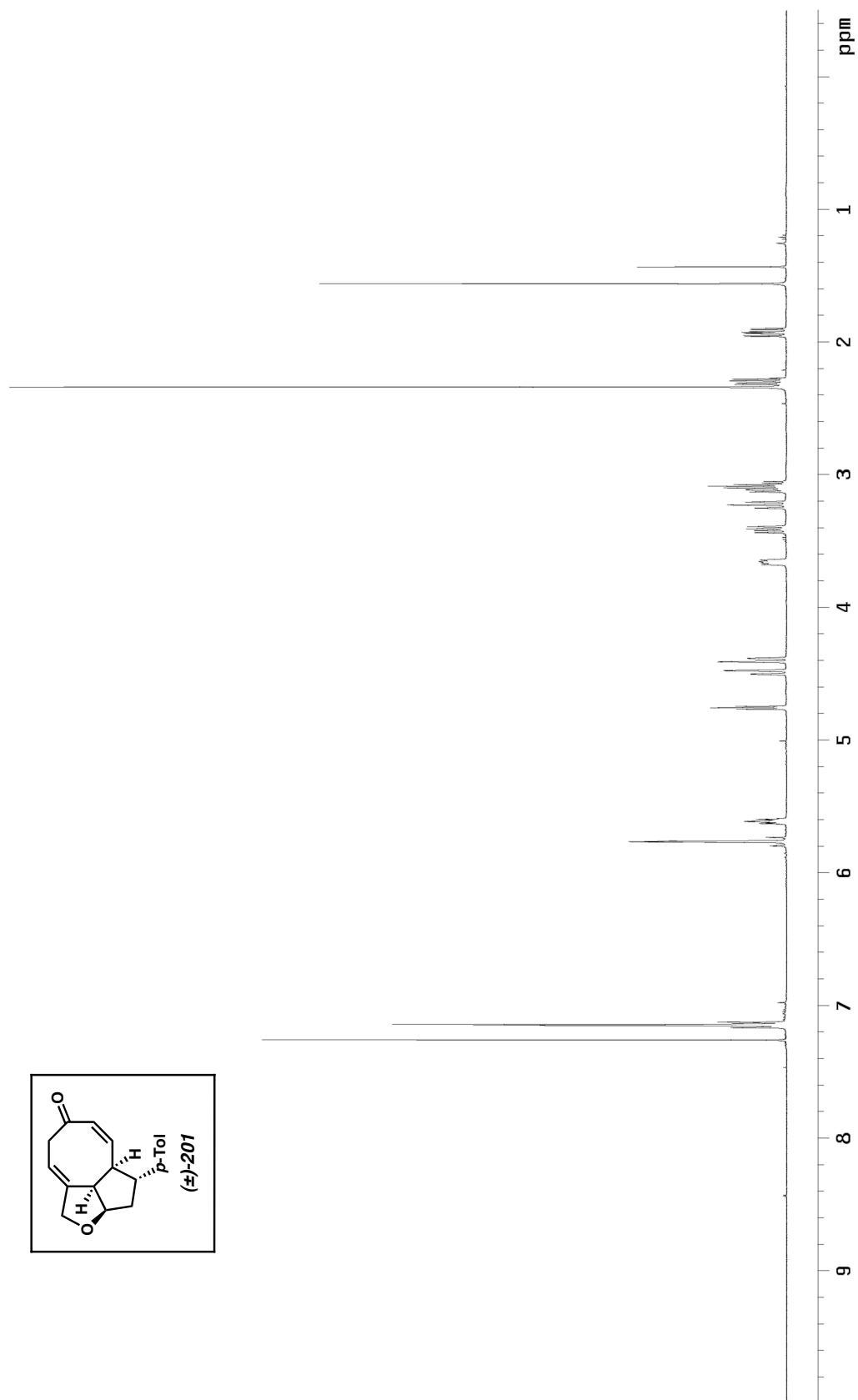


Figure A2.44. ^1H NMR spectrum (500 MHz, C_6D_6) of **201**.

Figure A2.45. ^1H NMR spectrum (500 MHz, CDCl_3) of **201**.

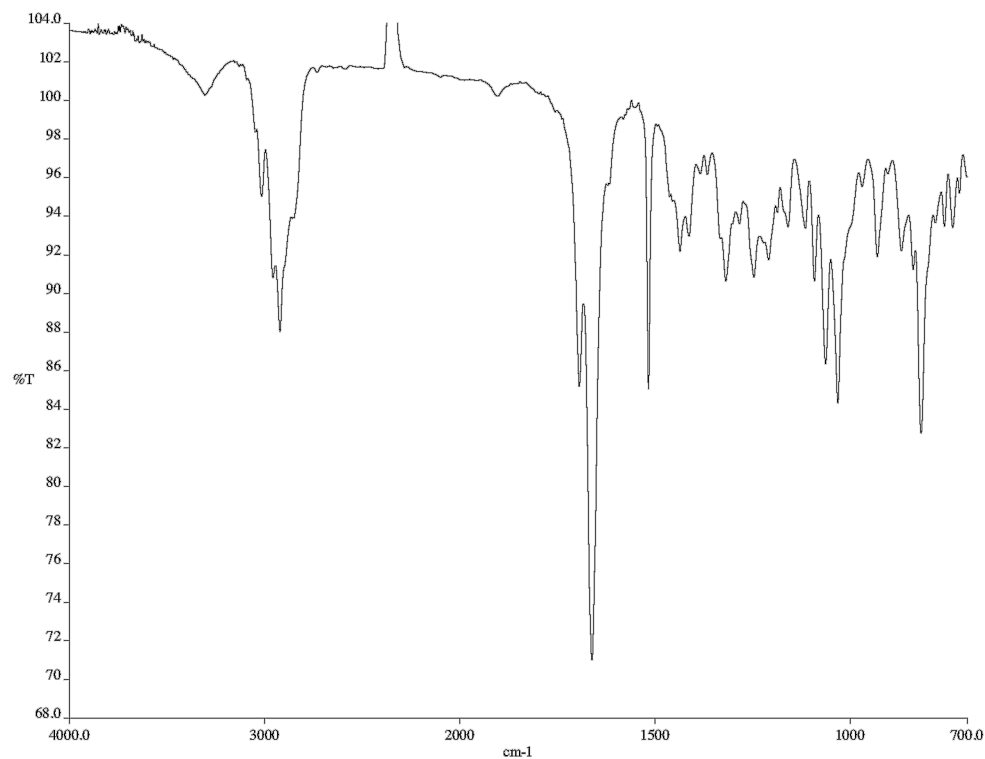


Figure A2.46. Infrared spectrum (neat film/NaCl) of **201**.

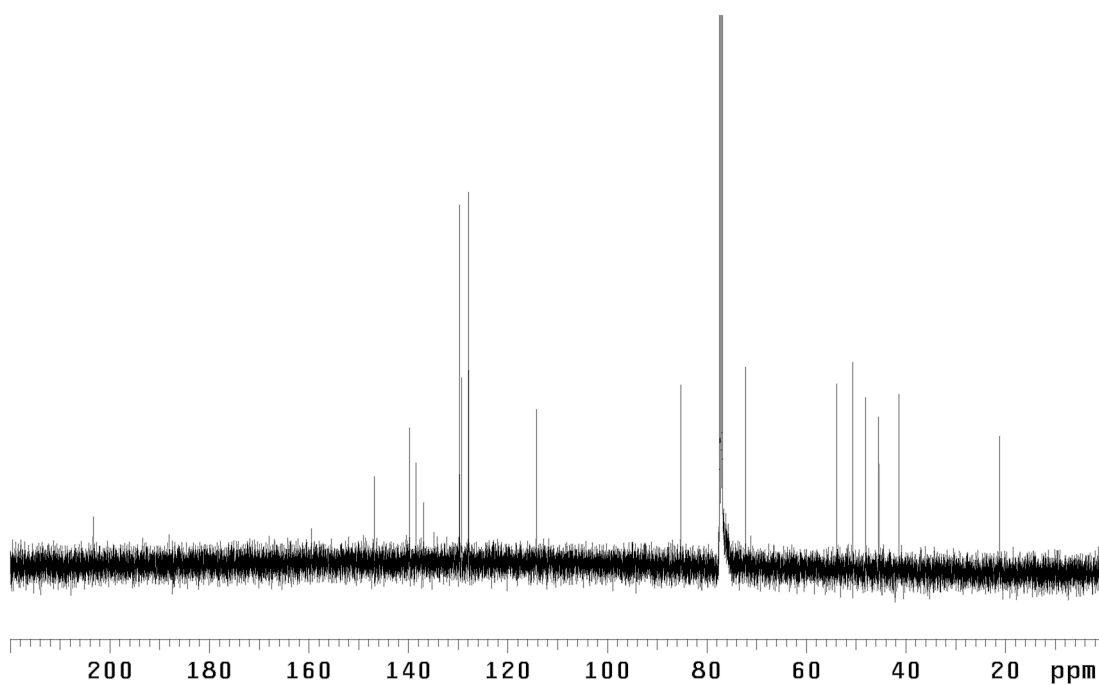
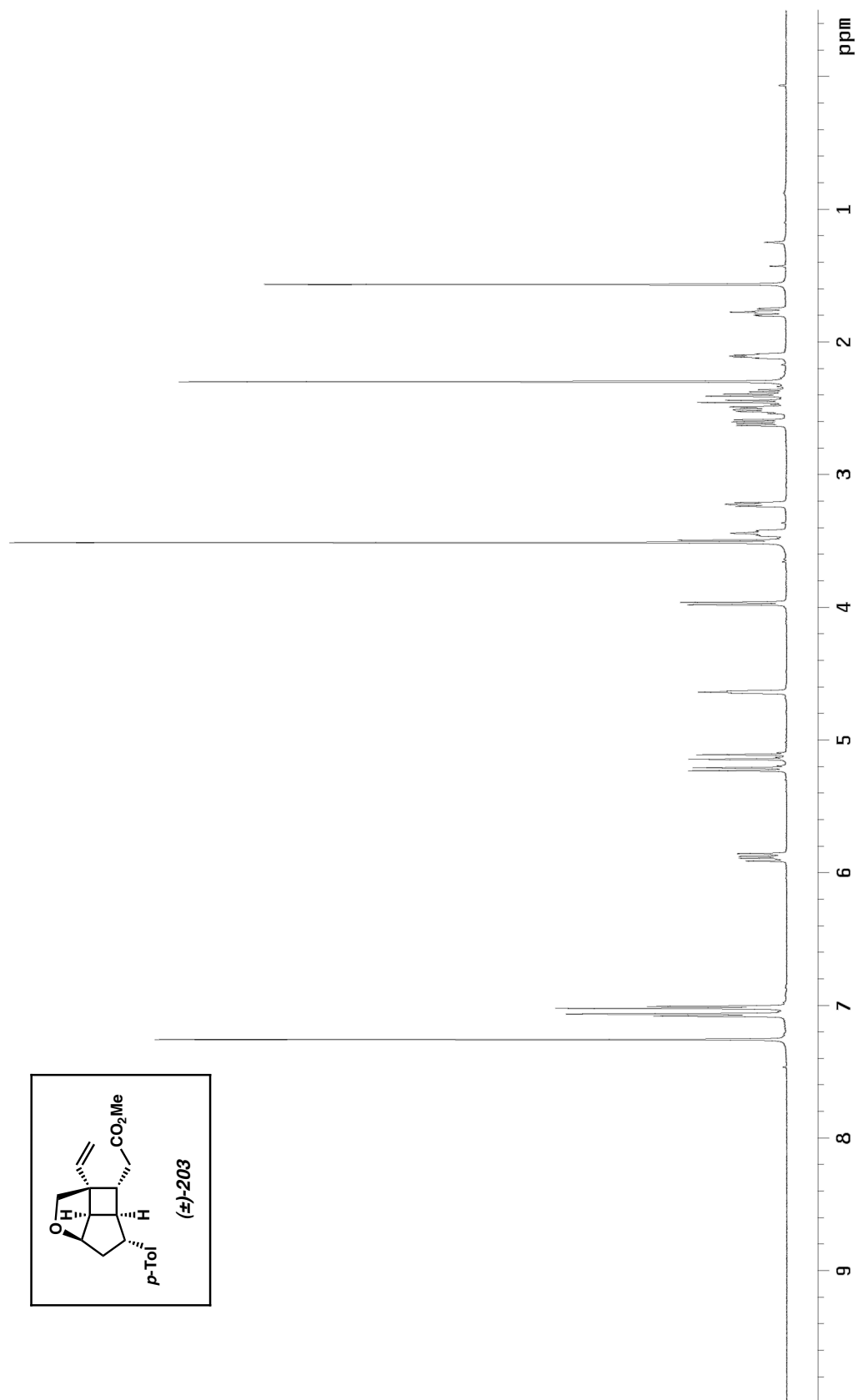


Figure A2.47. ¹³C NMR spectrum (126 MHz, CDCl₃) of **201**.

Figure A2.48. ^1H NMR spectrum (500 MHz, CDCl_3) of **203**.

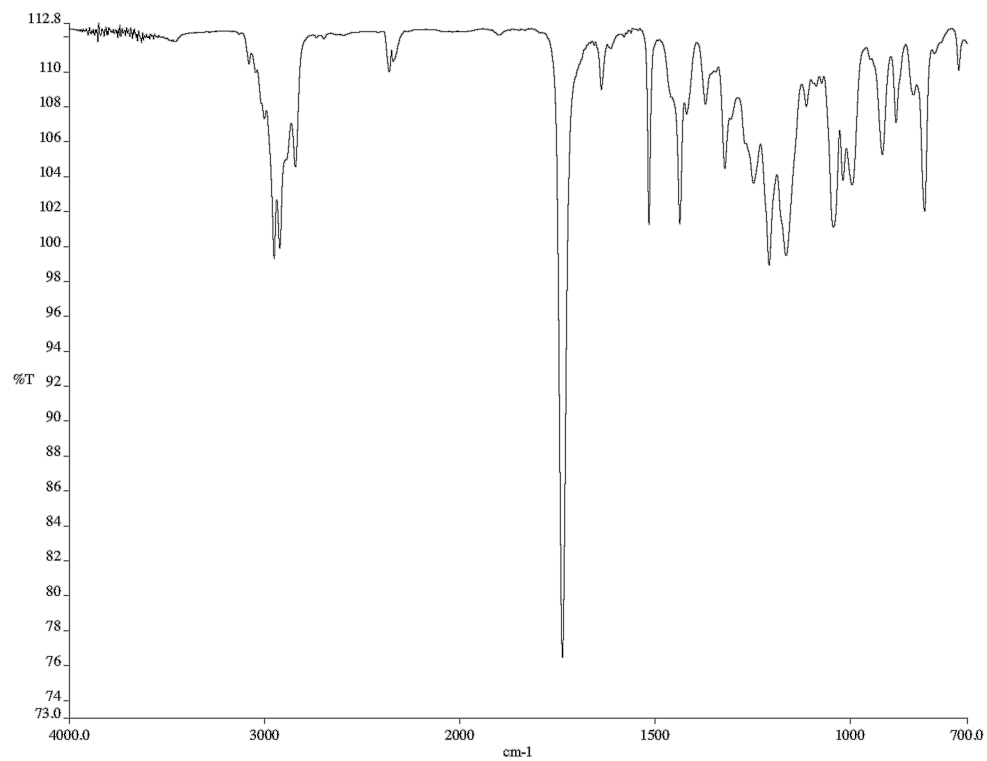


Figure A2.49. Infrared spectrum (neat film/NaCl) of **203**.

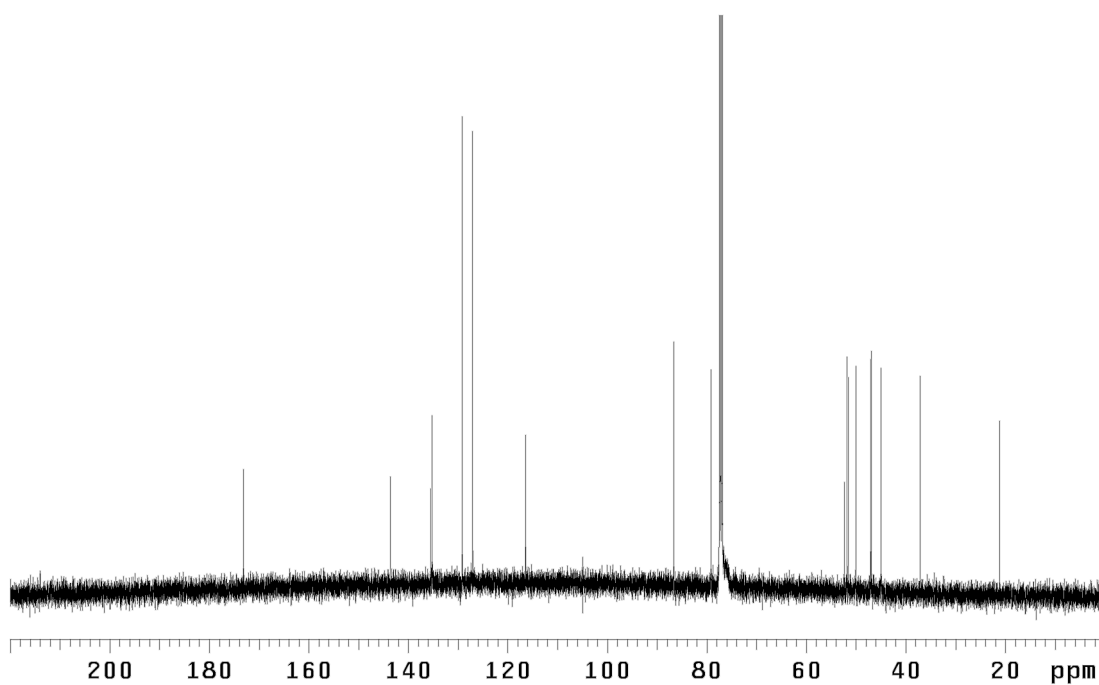


Figure A2.50. ¹³C NMR spectrum (126 MHz, CDCl₃) of **203**.

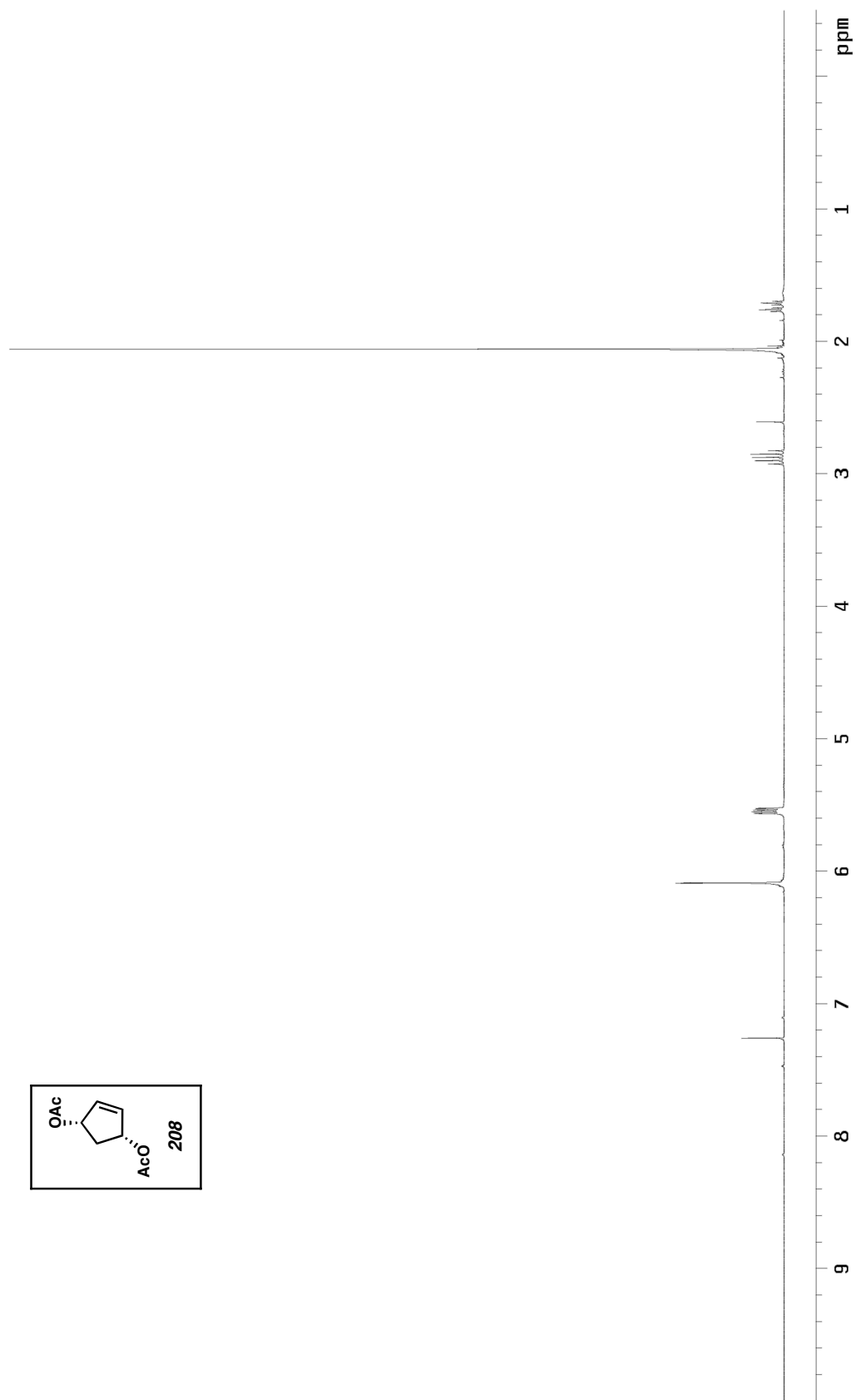


Figure A2.51. ^1H NMR spectrum (300 MHz, CDCl_3) of **208**.

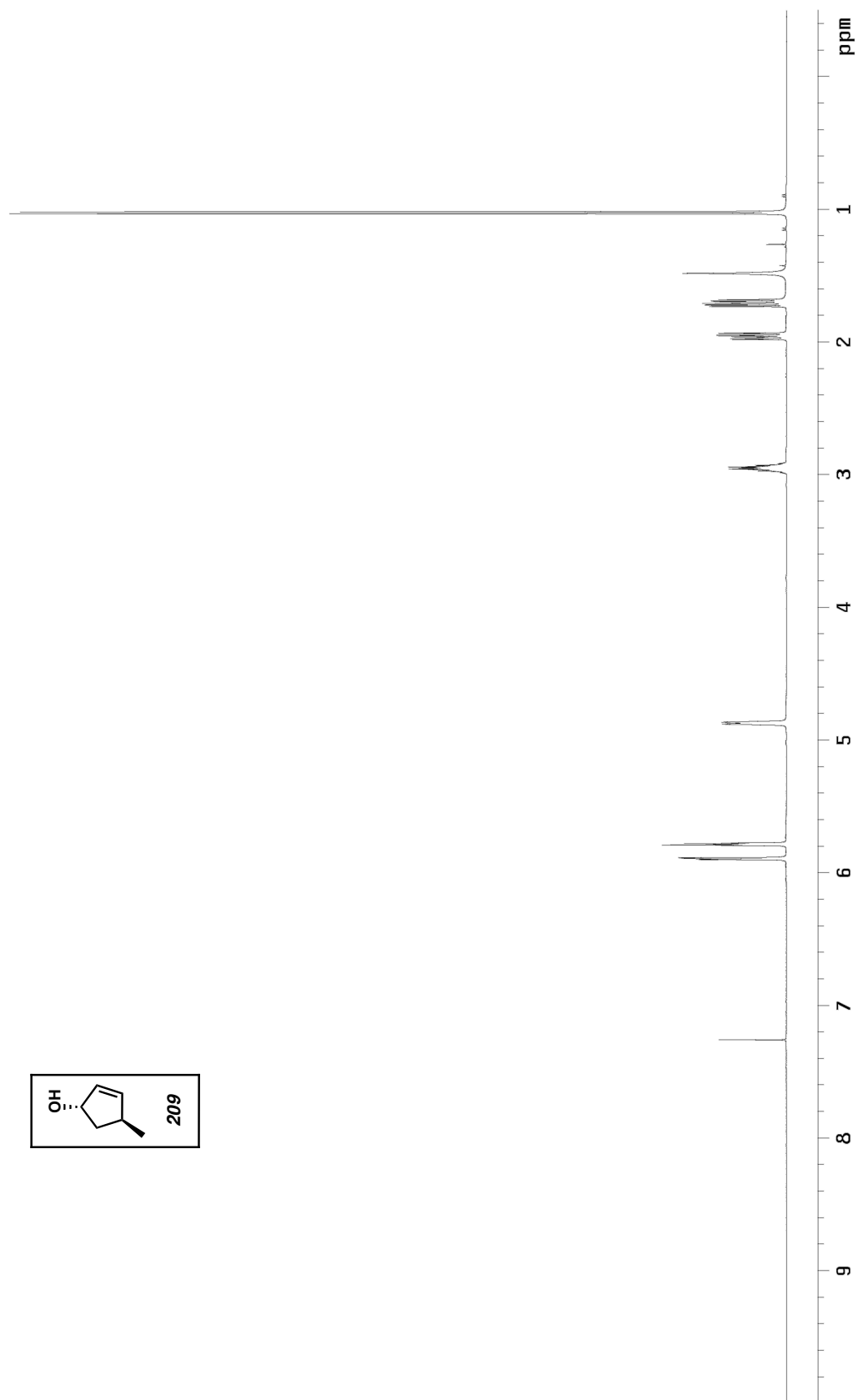


Figure A2.52. ^1H NMR spectrum (500 MHz, CDCl_3) of **209**.

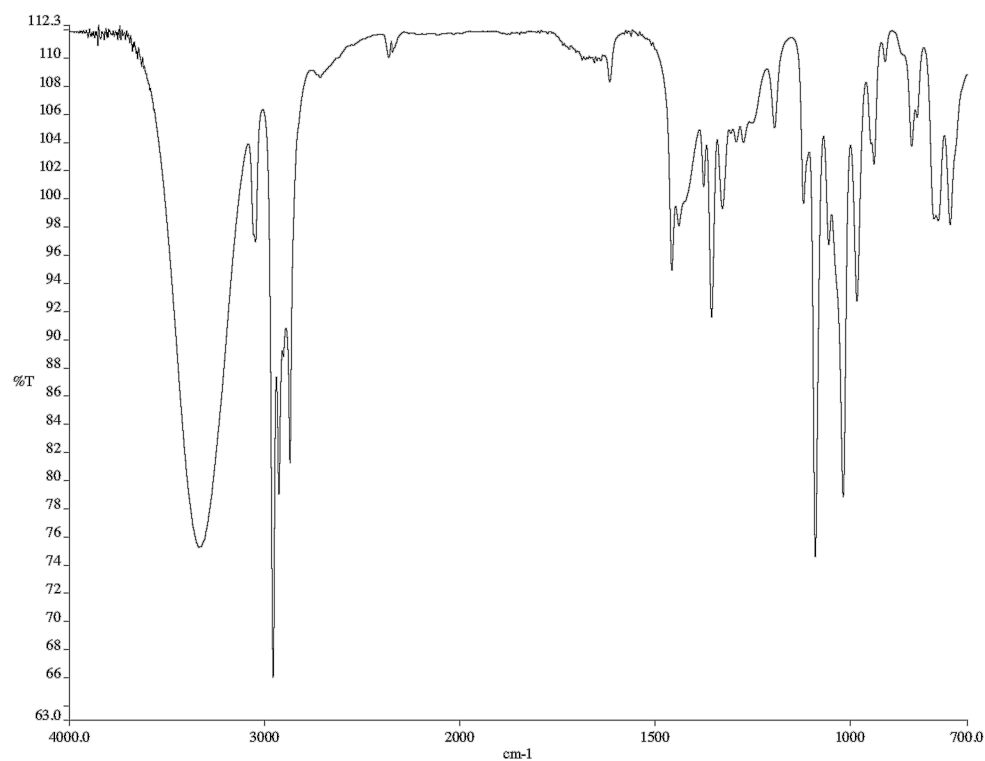


Figure A2.53. Infrared spectrum (neat film/NaCl) of **209**.

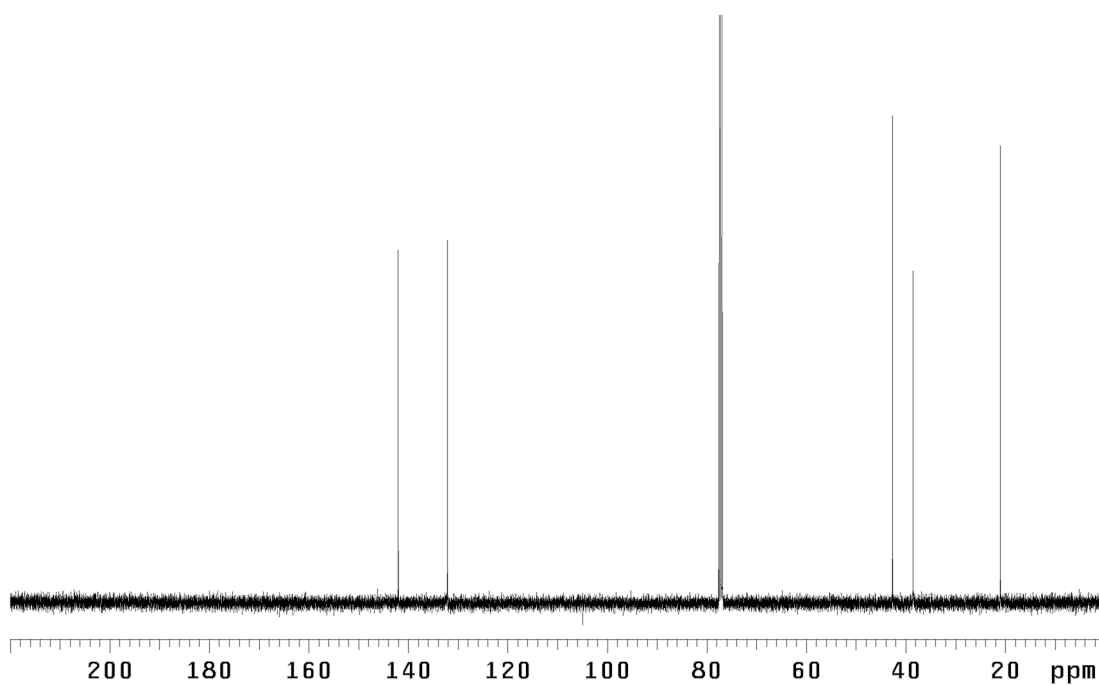


Figure A2.54. ¹³C NMR spectrum (126 MHz, CDCl₃) of **209**.

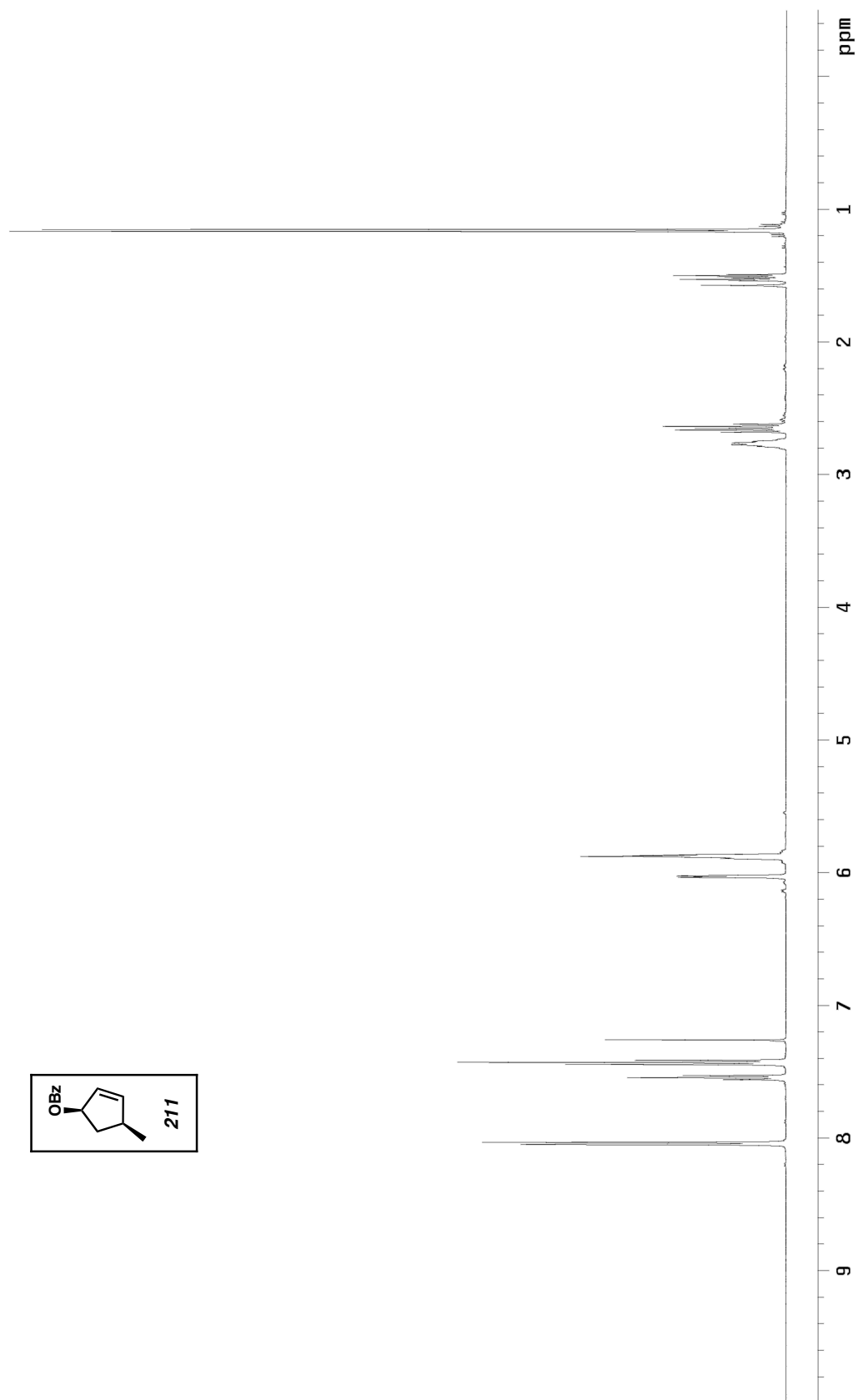


Figure A2.55. ^1H NMR spectrum (500 MHz, CDCl_3) of **211**.

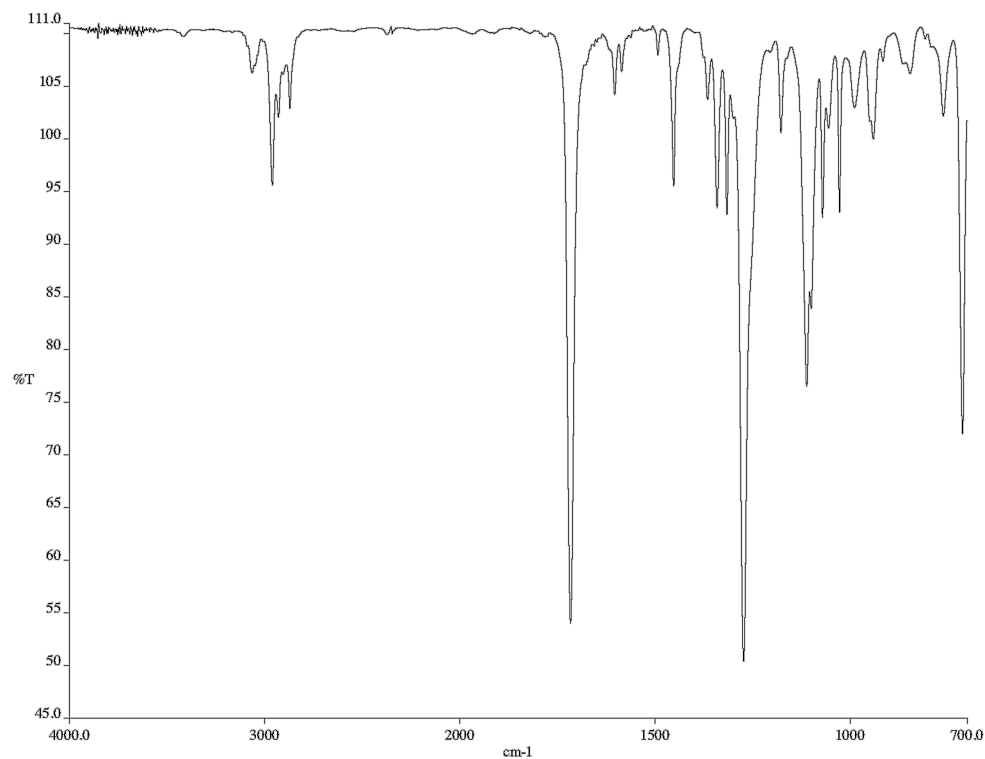


Figure A2.56. Infrared spectrum (neat film/NaCl) of **211**.

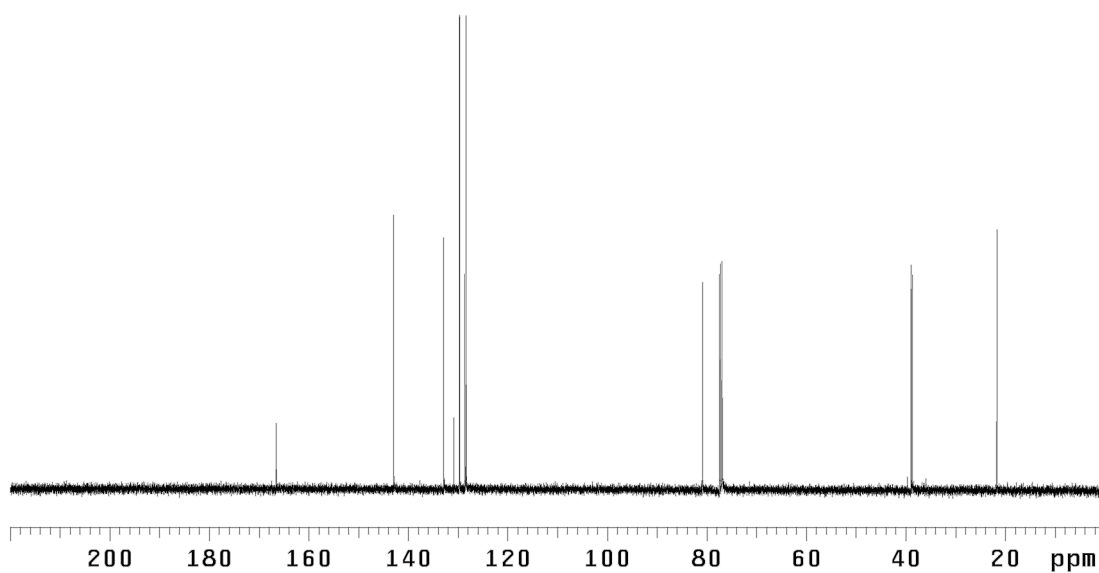
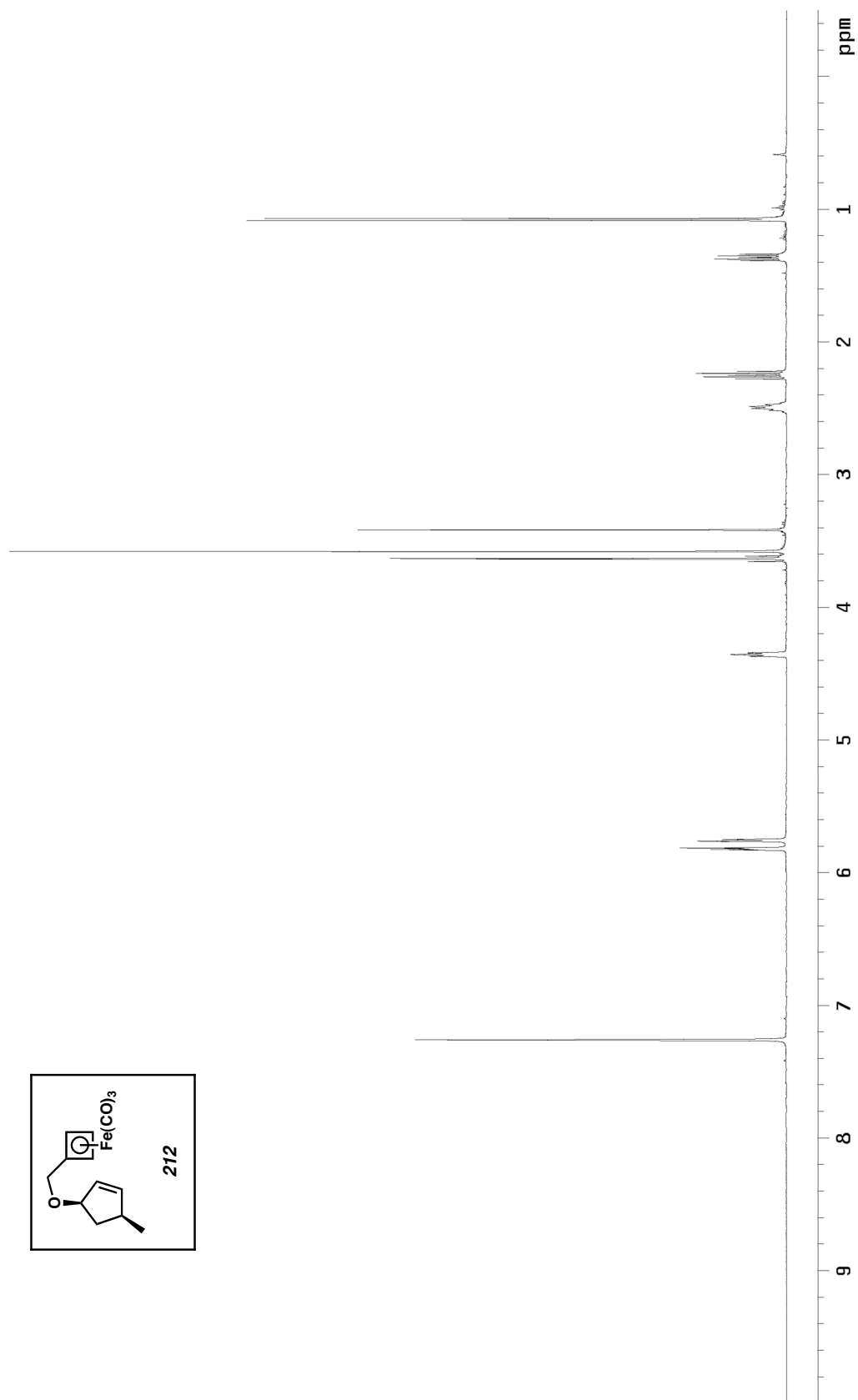


Figure A2.57. ¹³C NMR spectrum (126 MHz, CDCl₃) of **211**.

Figure A2.58. ^1H NMR spectrum (500 MHz, $\text{C}_6\text{D}_6\text{O}$) of **212**.

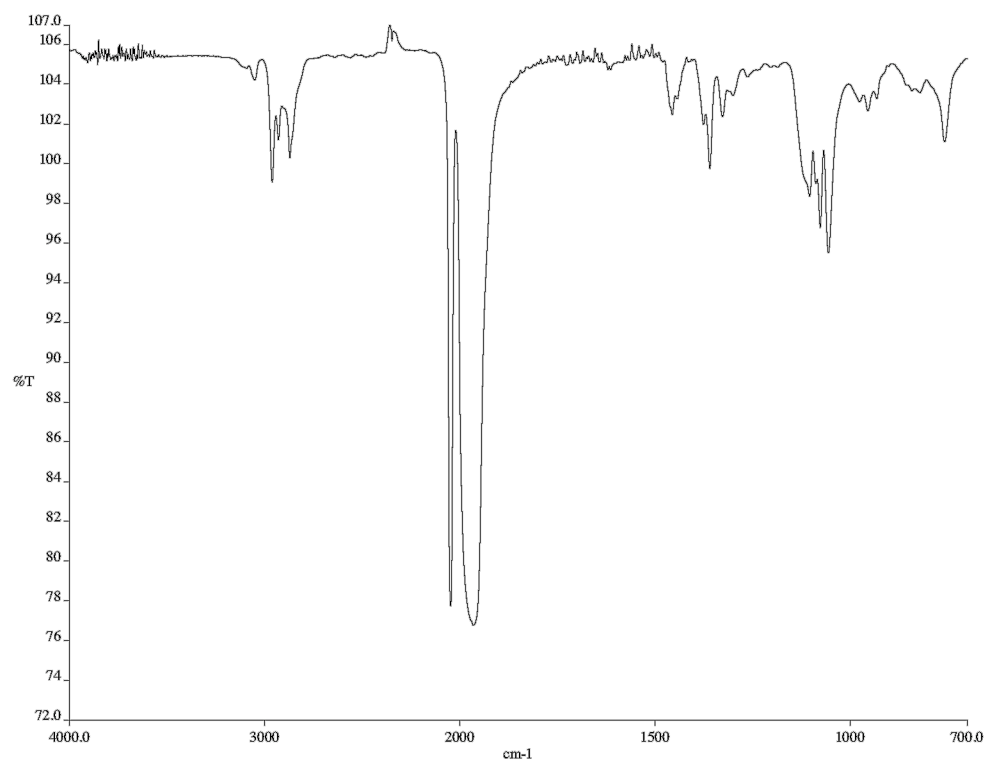


Figure A2.59. Infrared spectrum (neat film/NaCl) of **212**.

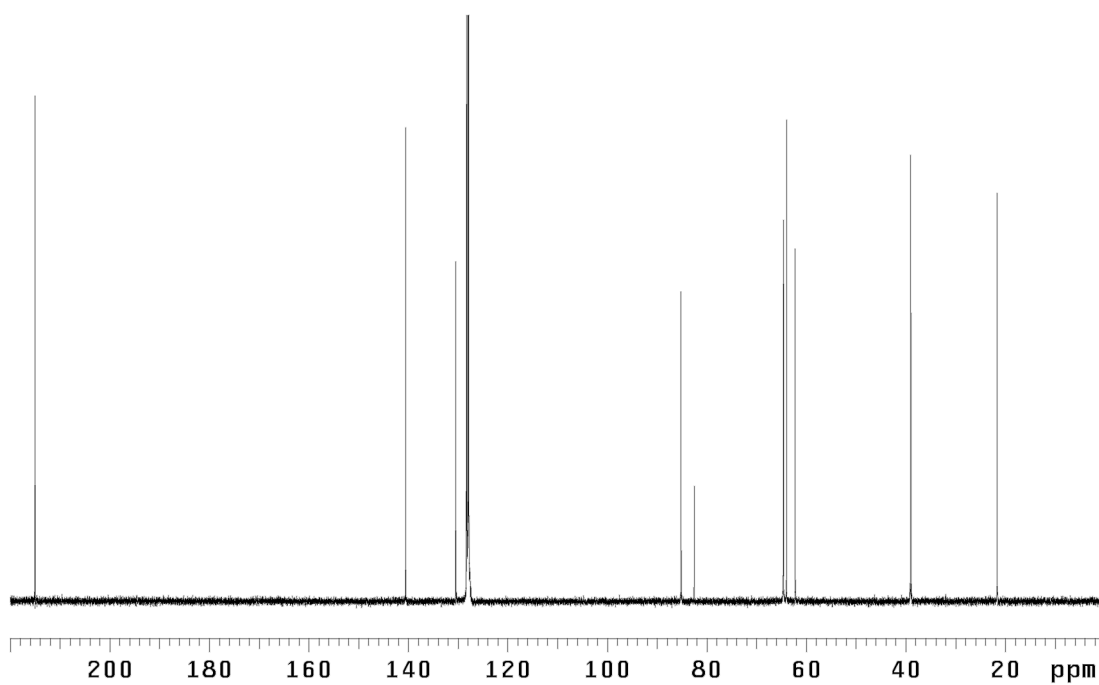


Figure A2.60. ¹³C NMR spectrum (126 MHz, CDCl₃) of **212**.

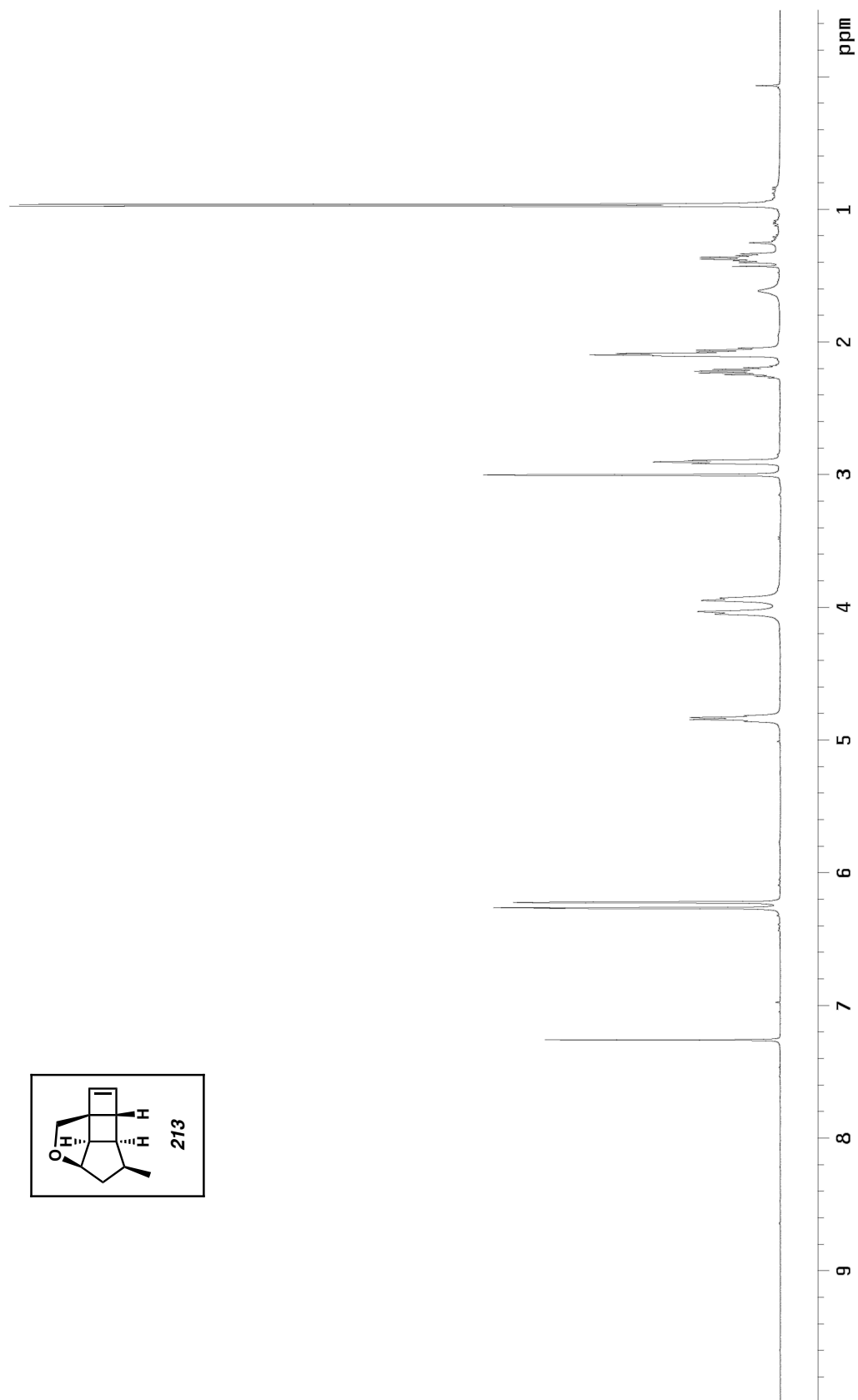


Figure A2.61. ^1H NMR spectrum (500 MHz, CDCl_3) of **213**.

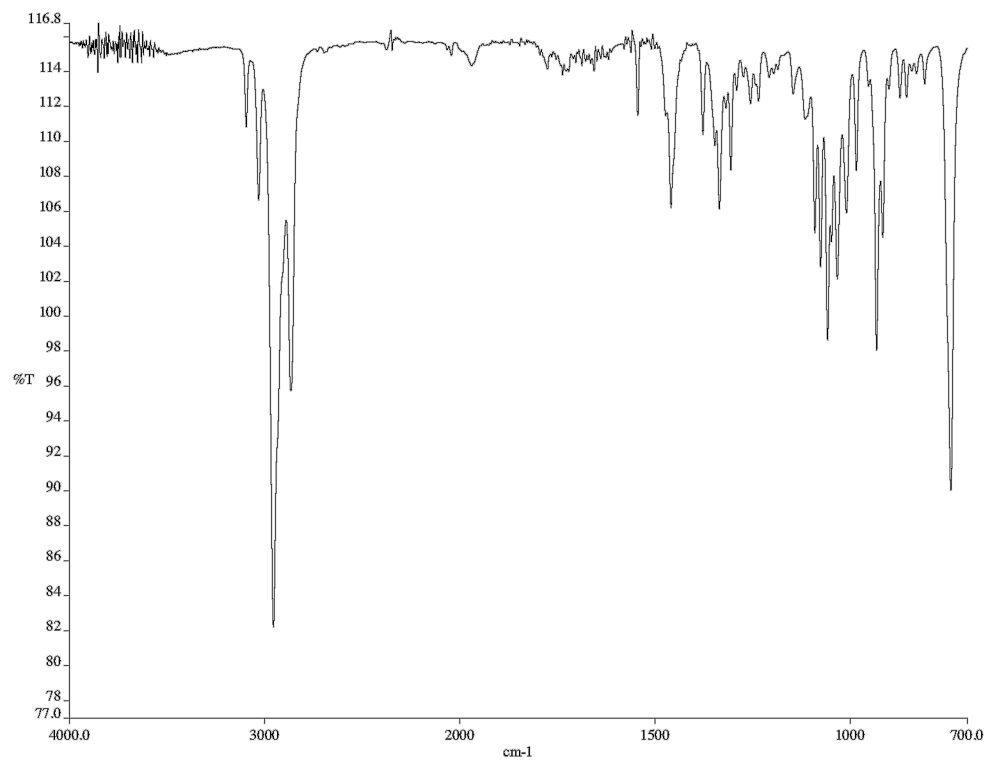


Figure A2.62. Infrared spectrum (neat film/NaCl) of **213**.

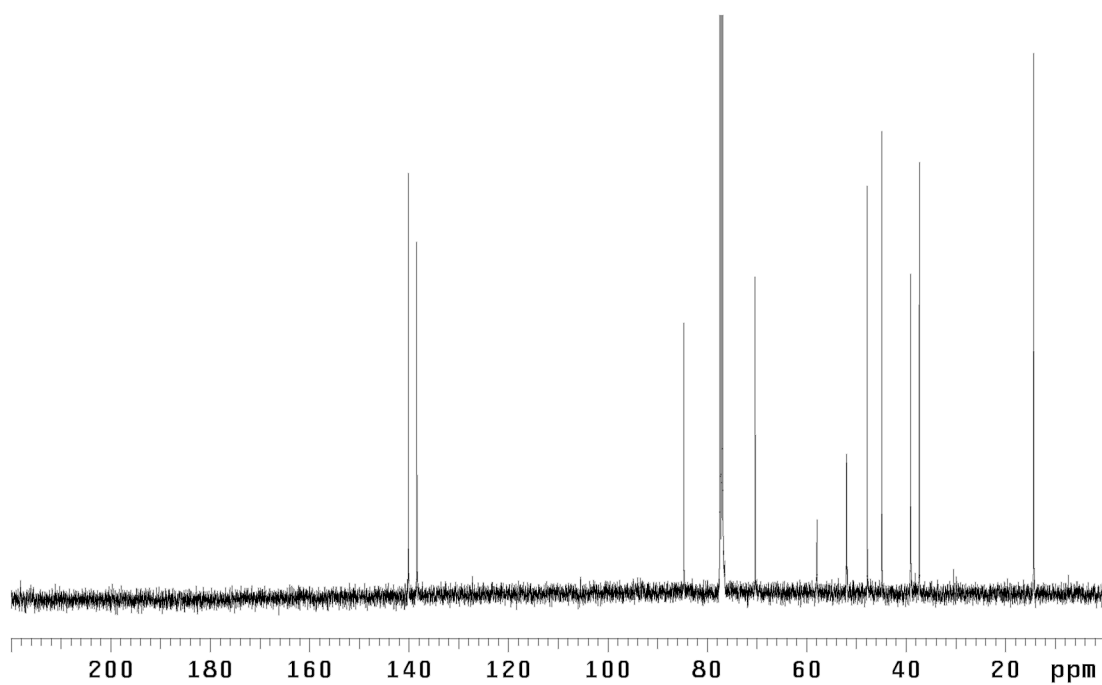


Figure A2.63. ¹³C NMR spectrum (126 MHz, CDCl₃) of **213**.

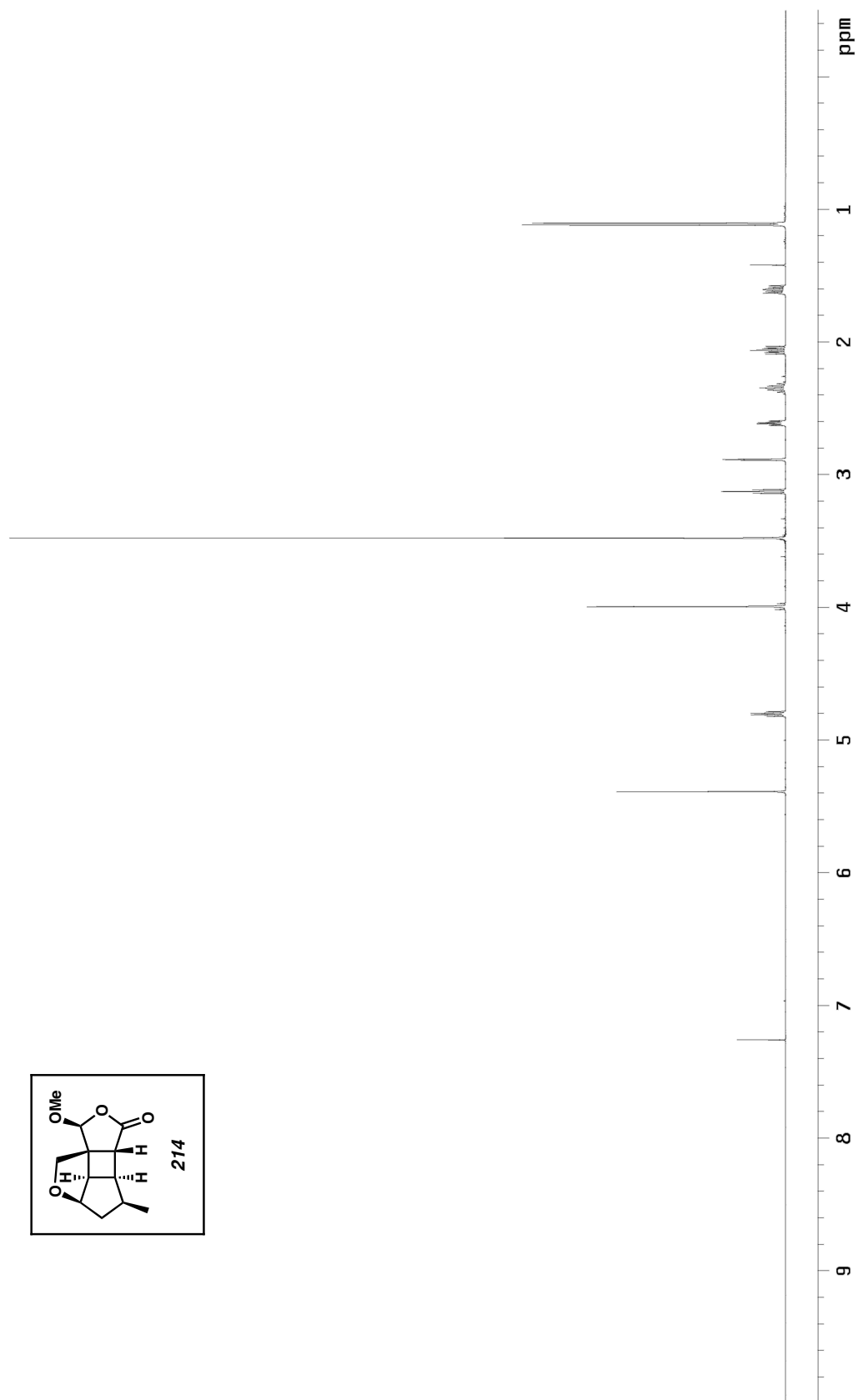


Figure A2.64. ^1H NMR spectrum (500 MHz, CDCl_3) of **214**.

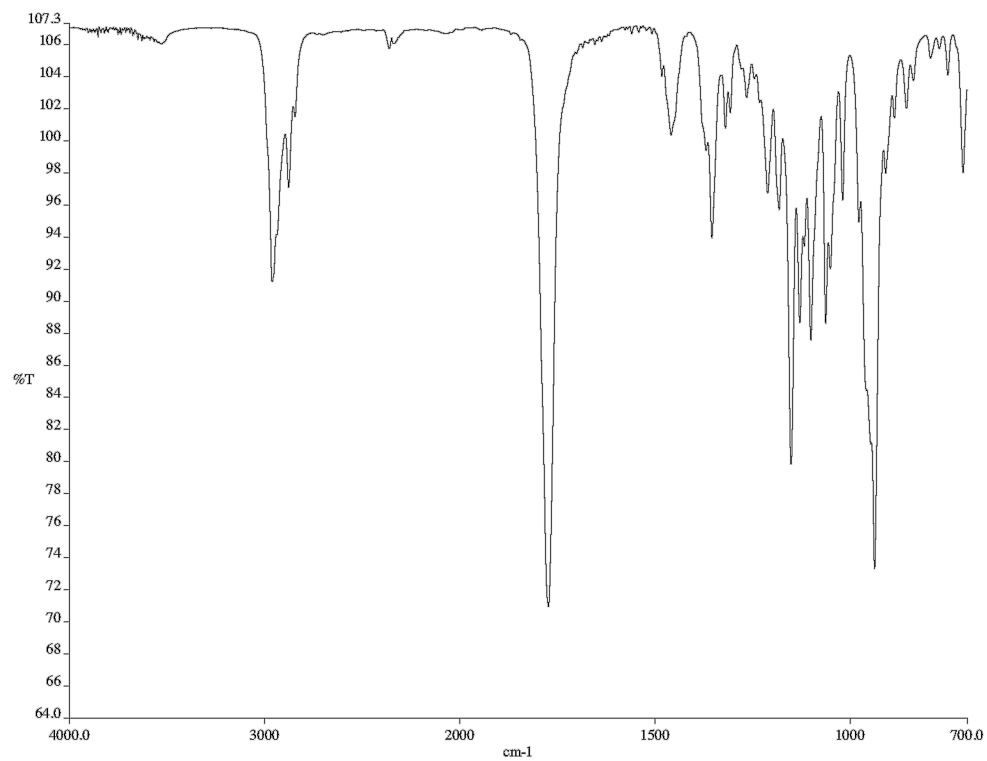


Figure A2.65. Infrared spectrum (neat film/NaCl) of **214**.

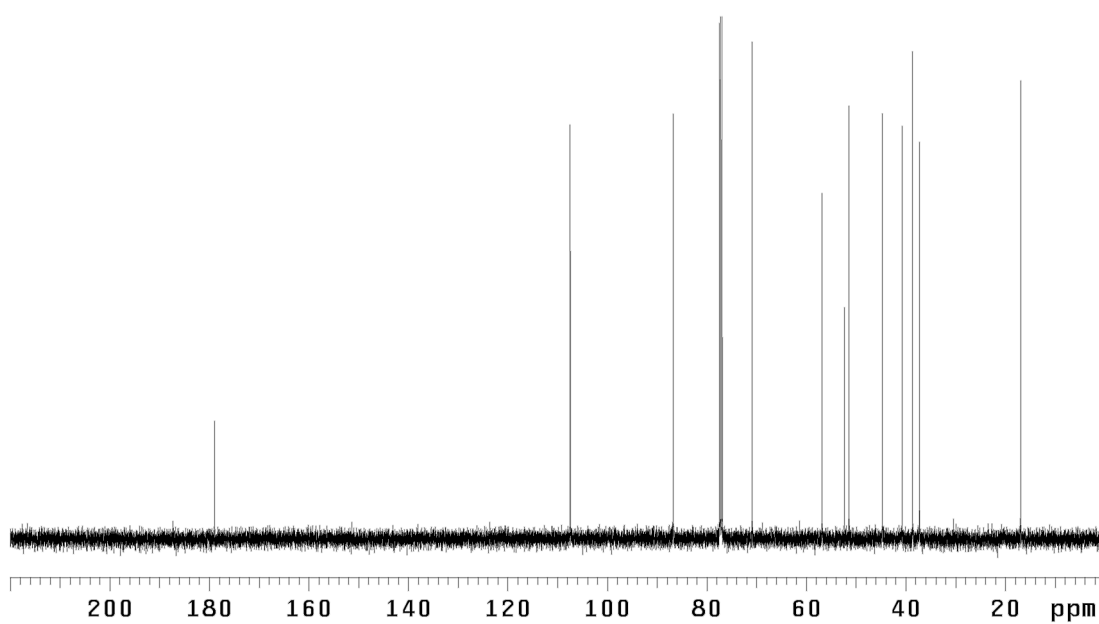


Figure A2.66. ¹³C NMR spectrum (126 MHz, CDCl₃) of **214**.

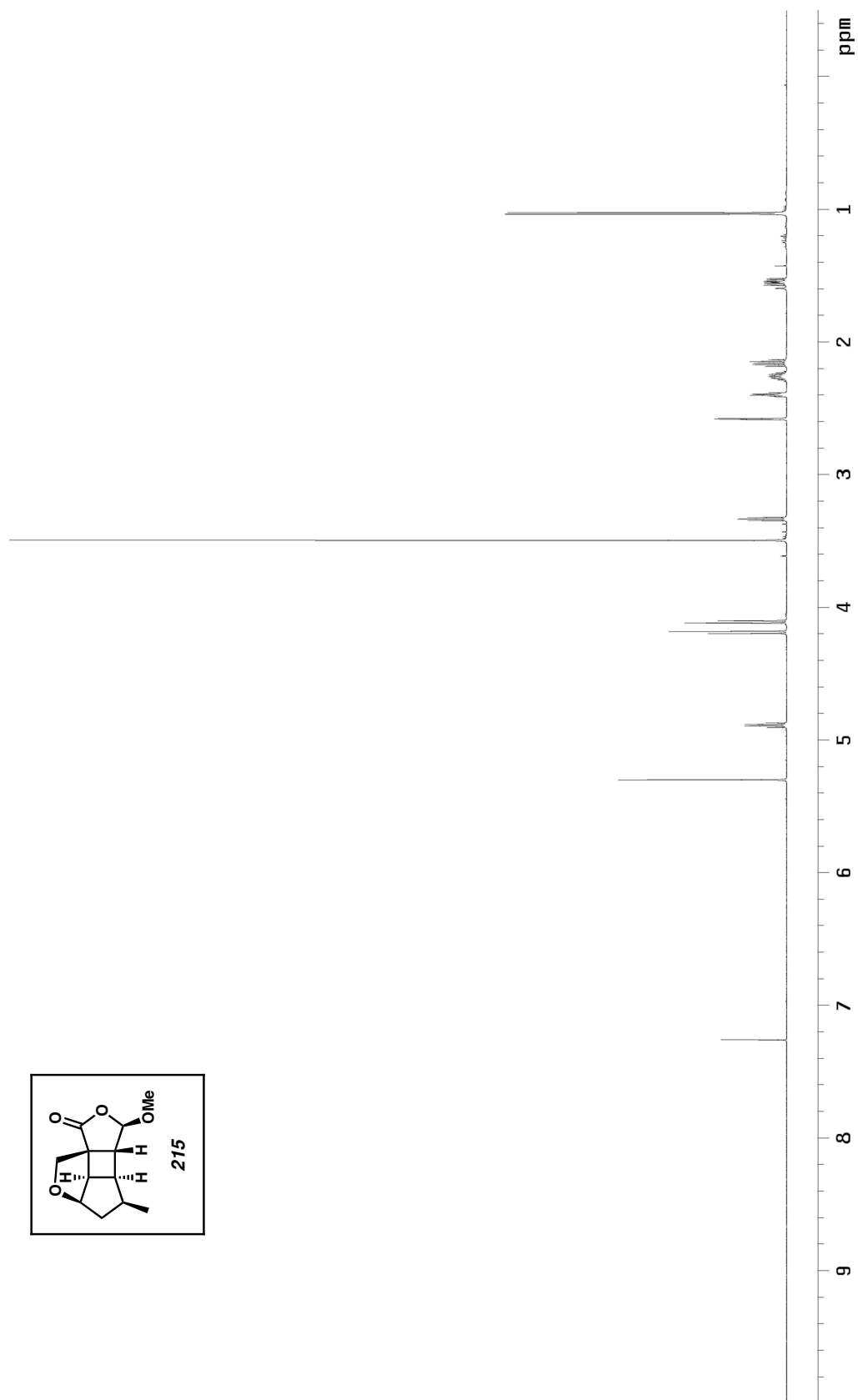


Figure A2.67. ^1H NMR spectrum (600 MHz, CDCl_3) of **215**.

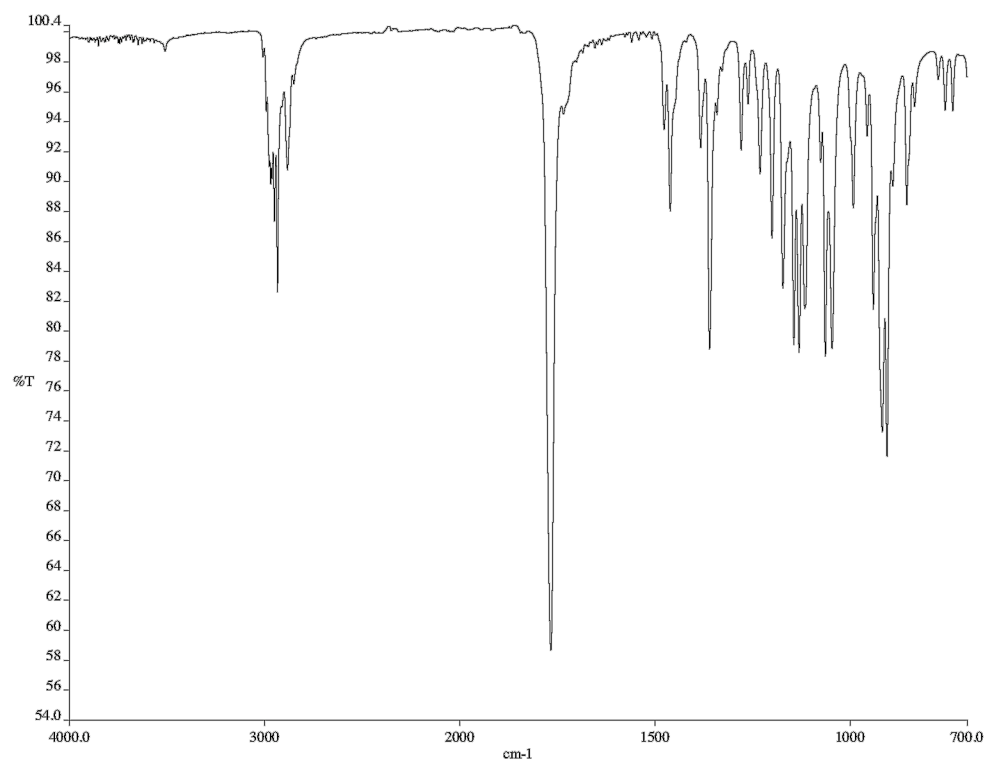


Figure A2.68. Infrared spectrum (neat film/NaCl) of **215**.

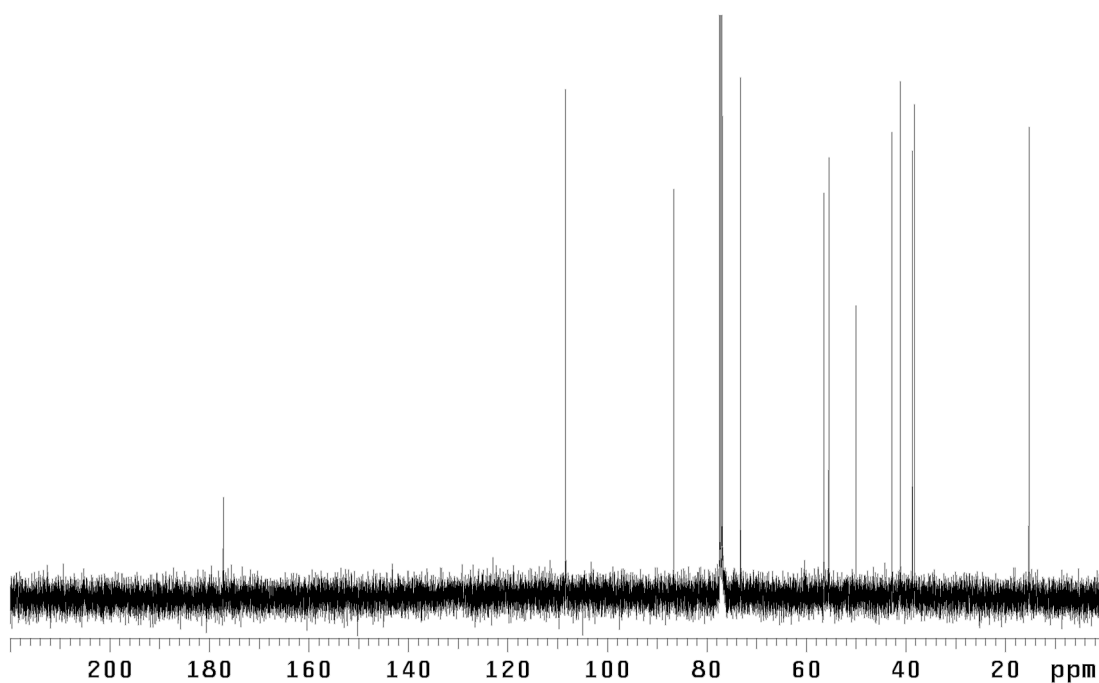


Figure A2.69. ¹³C NMR spectrum (126 MHz, CDCl₃) of **215**.

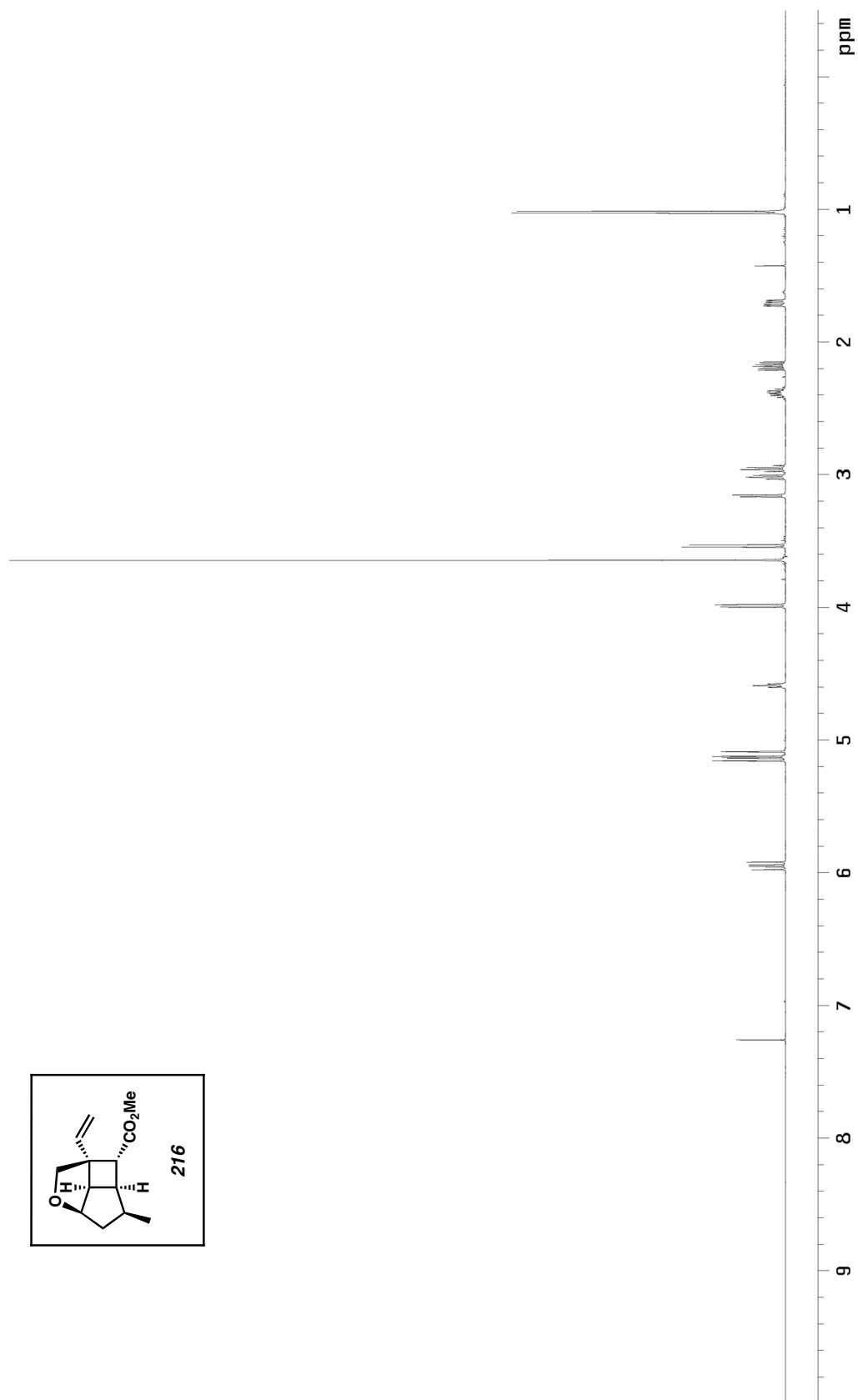


Figure A2.70. ¹H NMR spectrum (500 MHz, CDCl₃) of **216**.

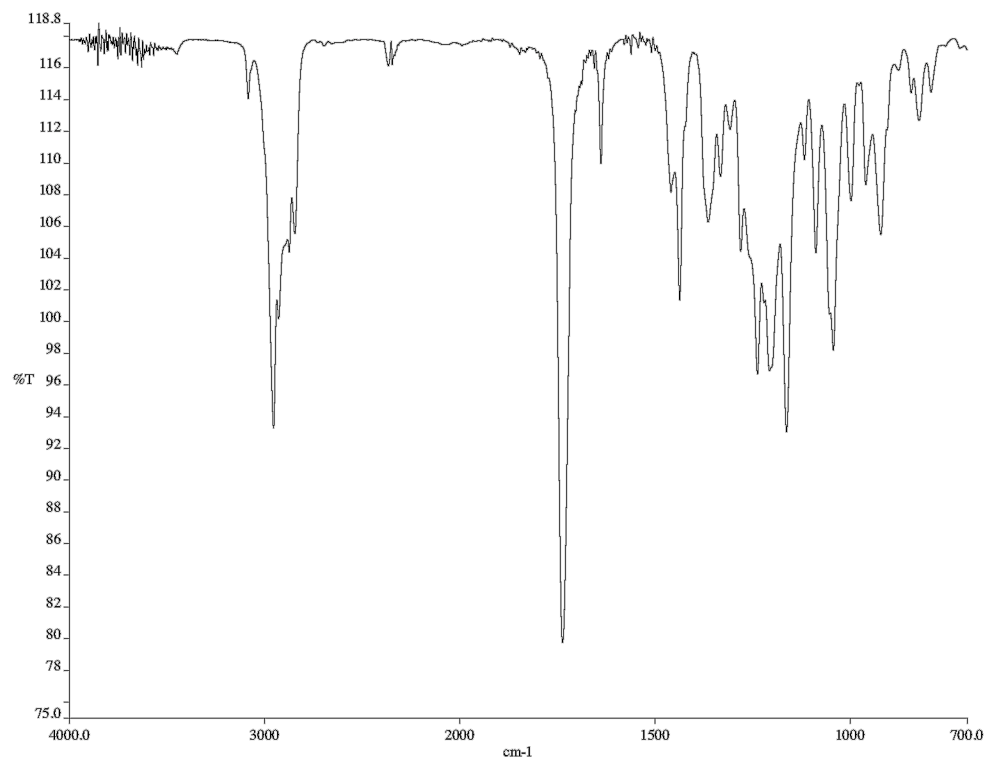


Figure A2.71. Infrared spectrum (neat film/NaCl) of **216**.

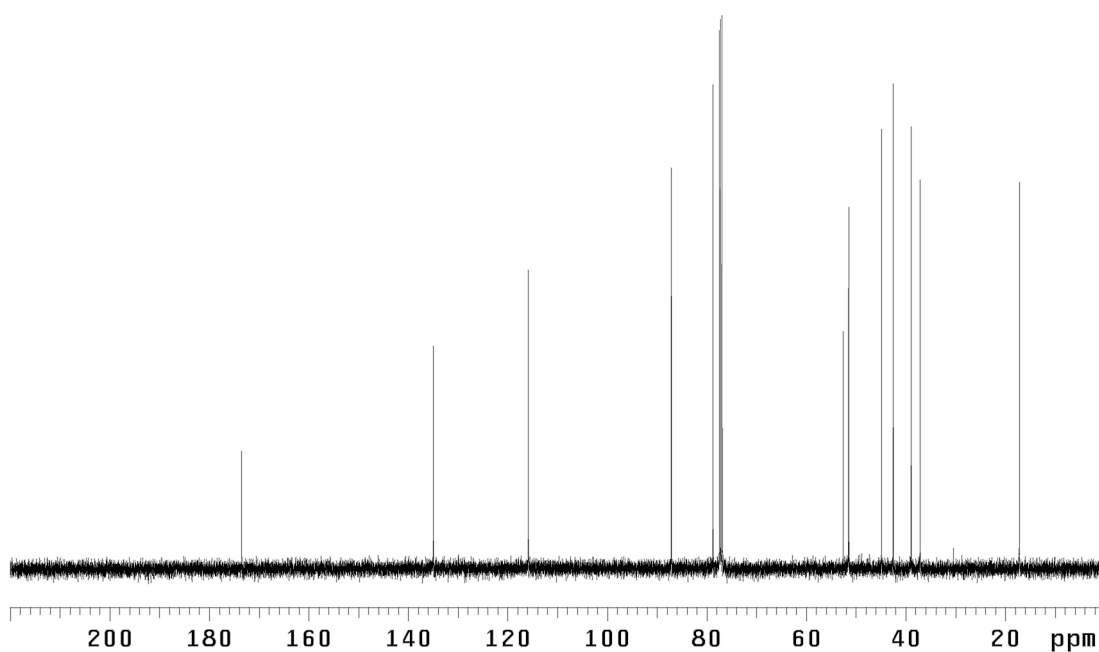


Figure A2.72. ¹³C NMR spectrum (126 MHz, CDCl₃) of **216**.

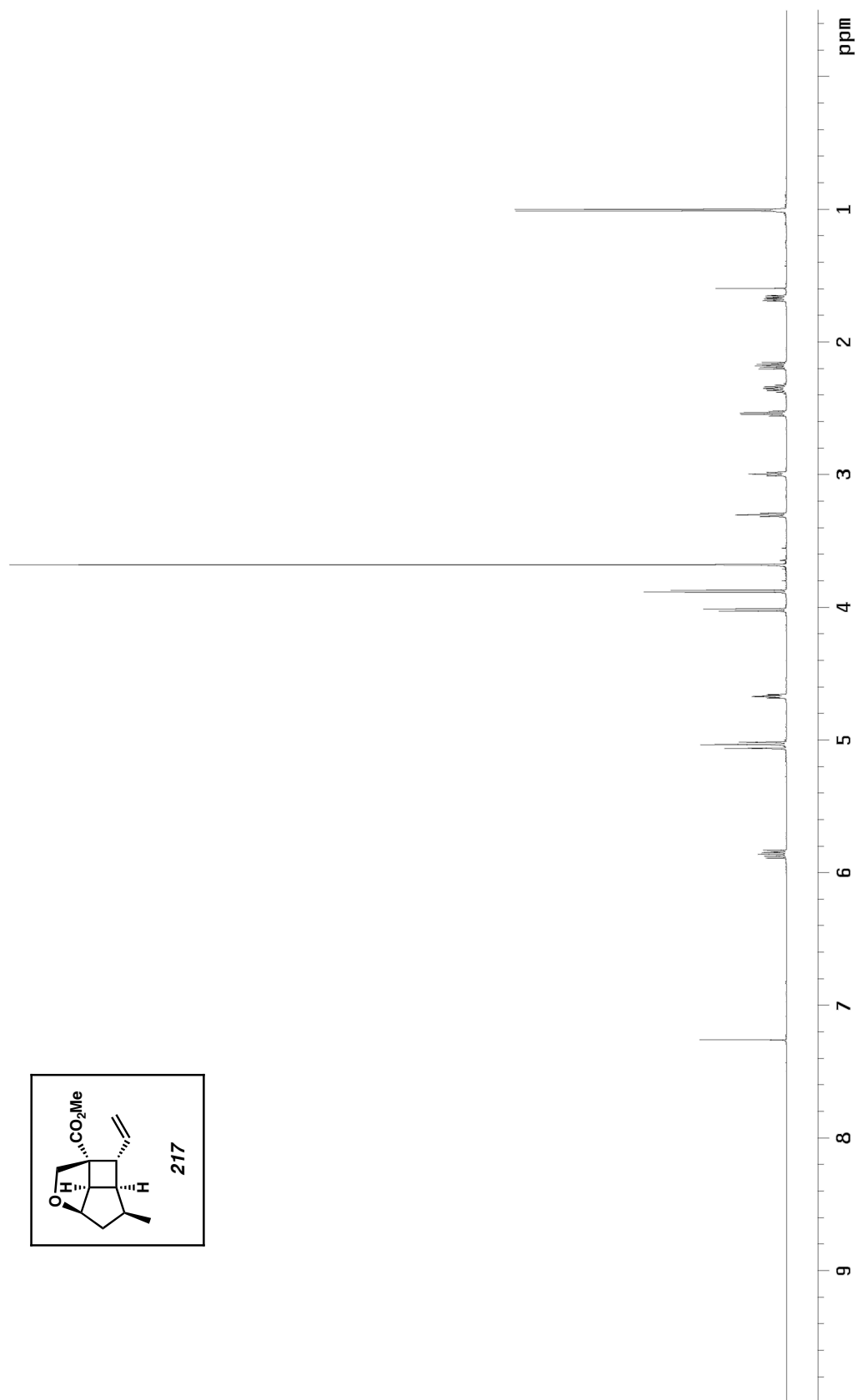


Figure A2.73. ¹H NMR spectrum (500 MHz, CDCl₃) of **217**.

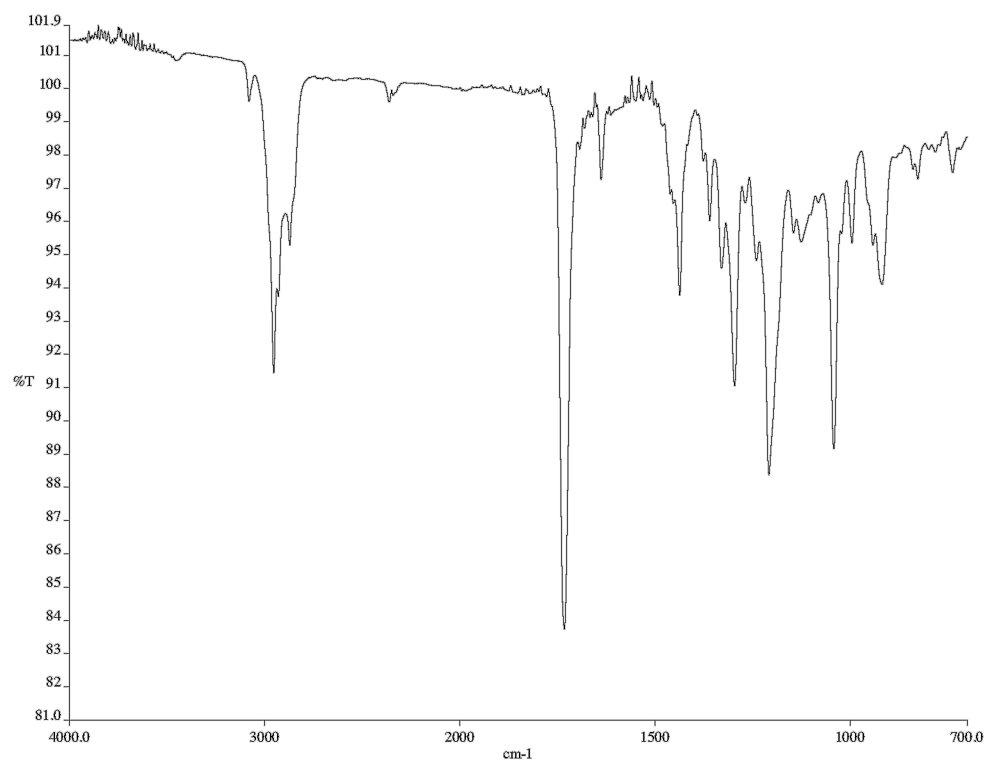


Figure A2.74. Infrared spectrum (neat film/NaCl) of **217**.

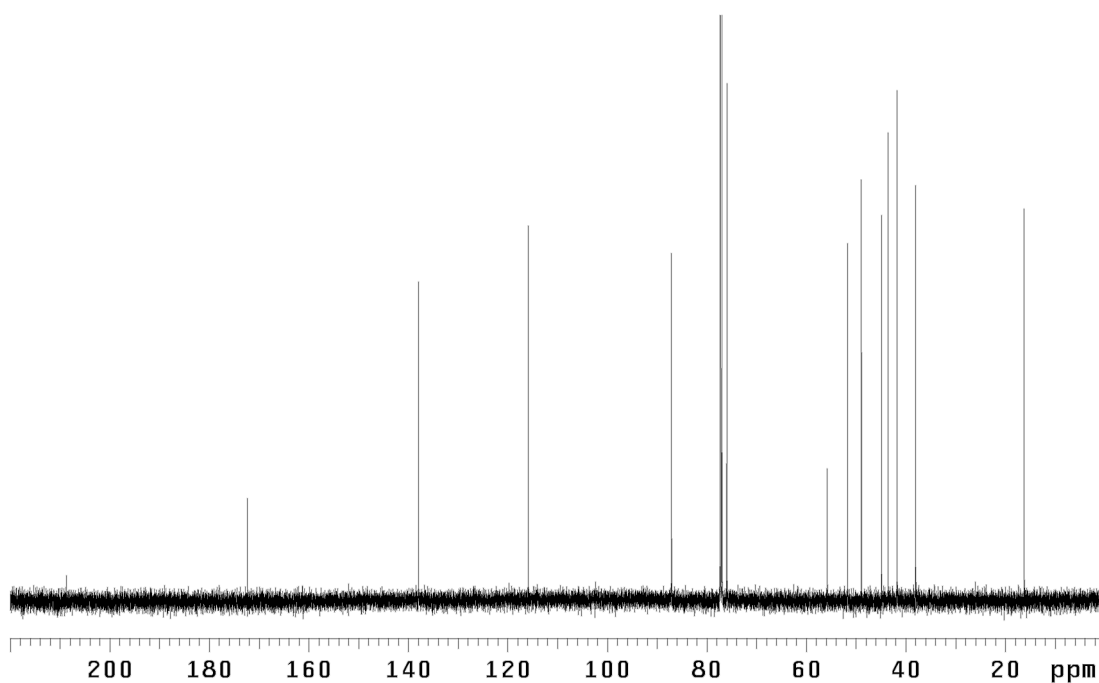


Figure A2.75. ¹³C NMR spectrum (126 MHz, CDCl₃) of **217**.

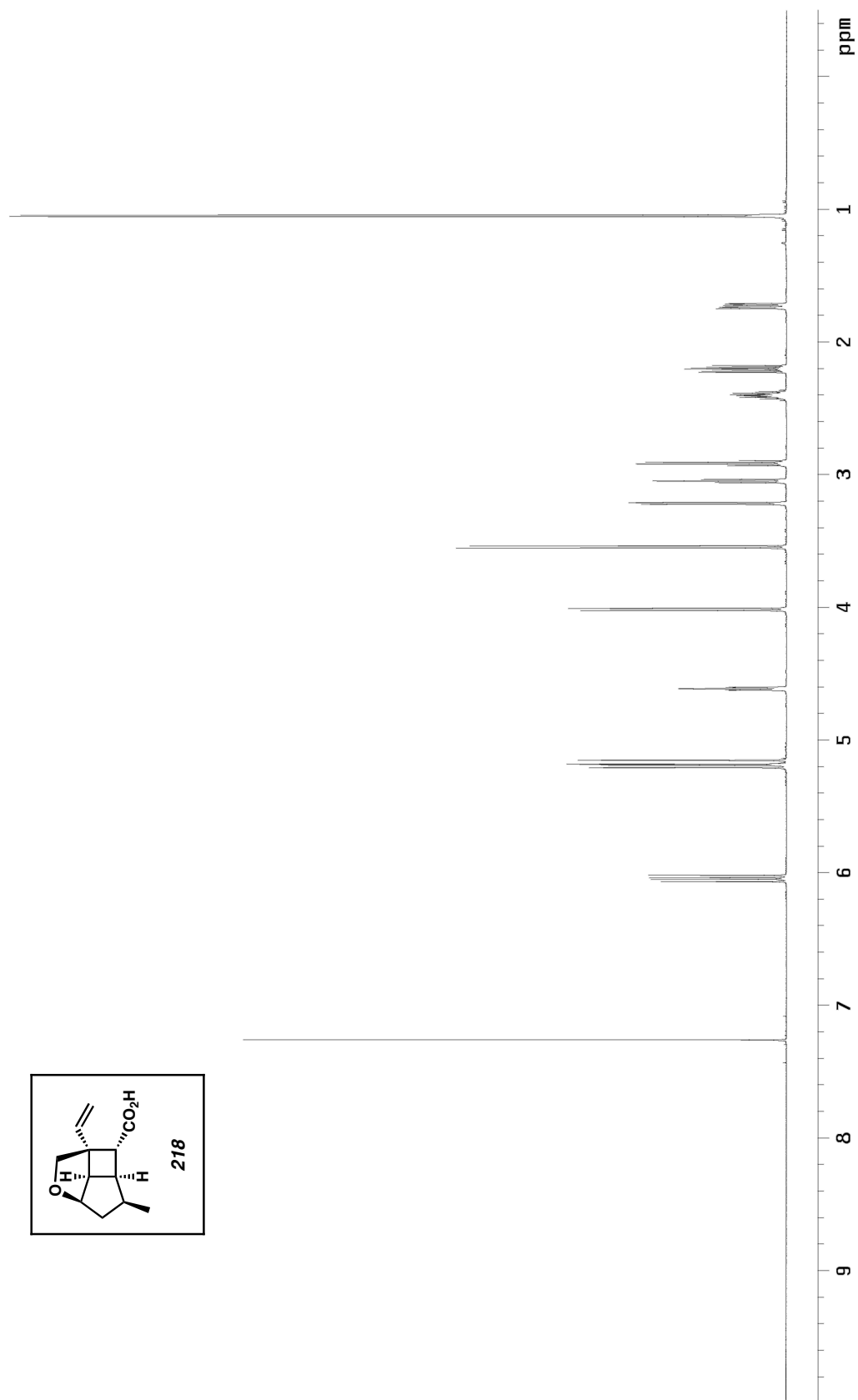


Figure A2.76. ^1H NMR spectrum (600 MHz, CDCl_3) of **218**.

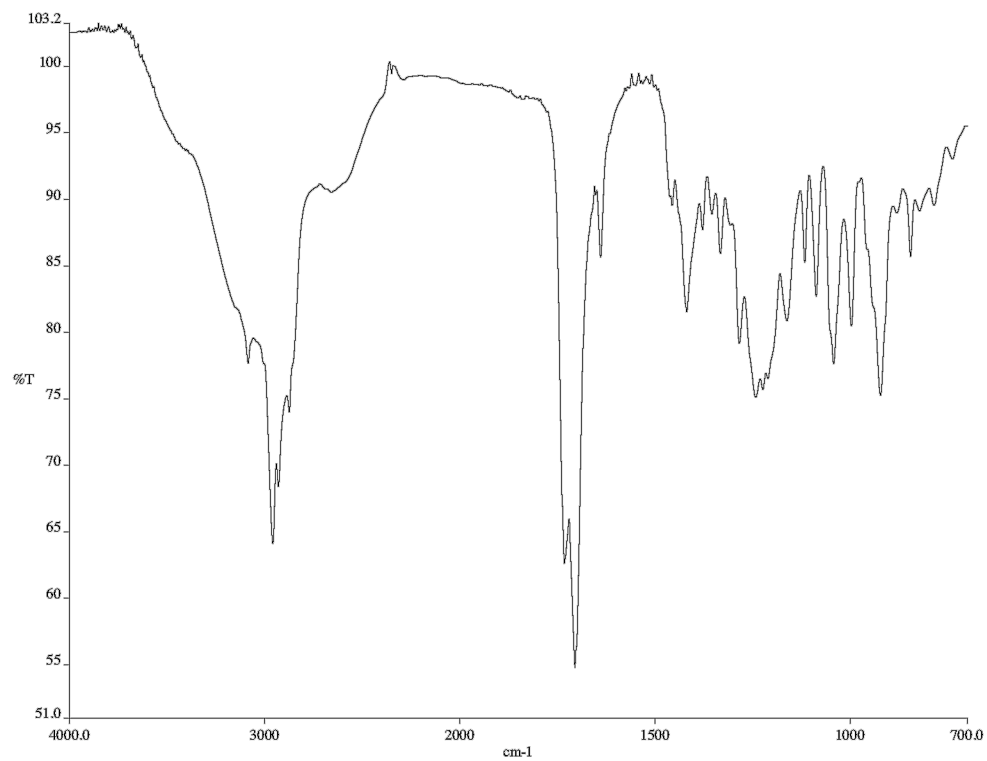


Figure A2.77. Infrared spectrum (neat film/NaCl) of **218**.

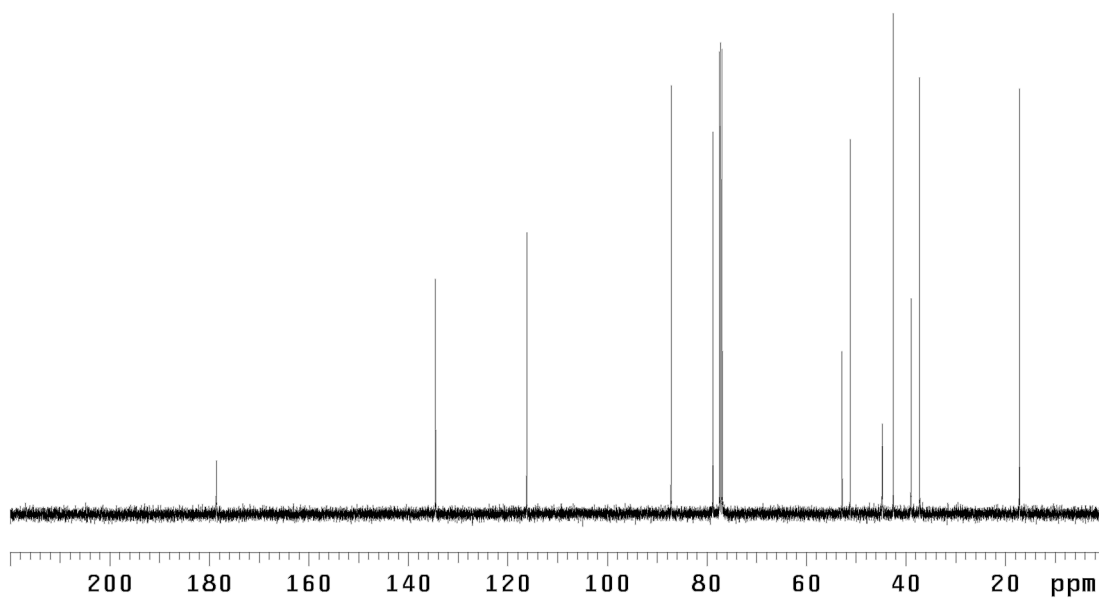


Figure A2.78. ¹³C NMR spectrum (126 MHz, CDCl₃) of **218**.

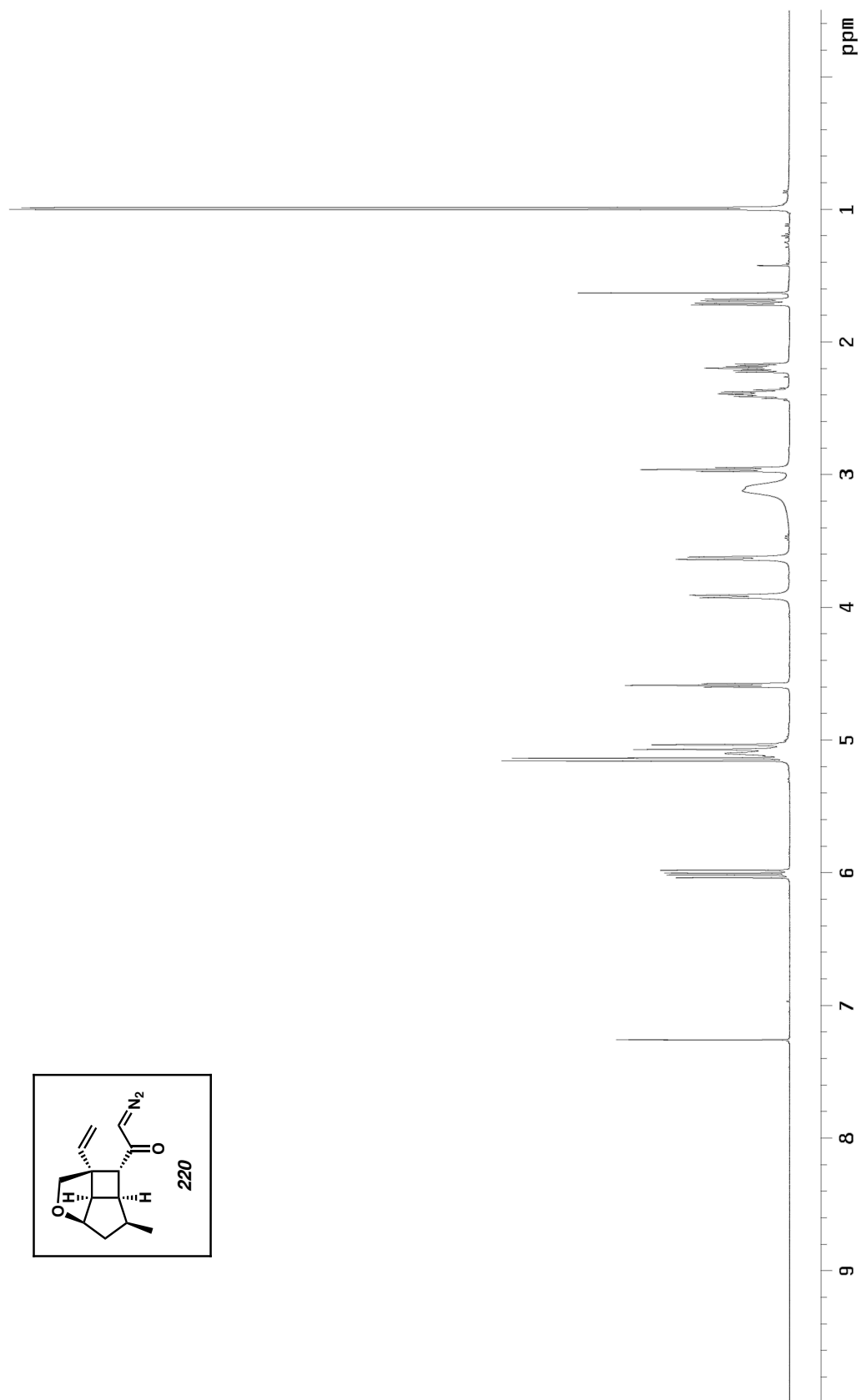


Figure A2.79. ^1H NMR spectrum (500 MHz, CDCl_3) of **220**.

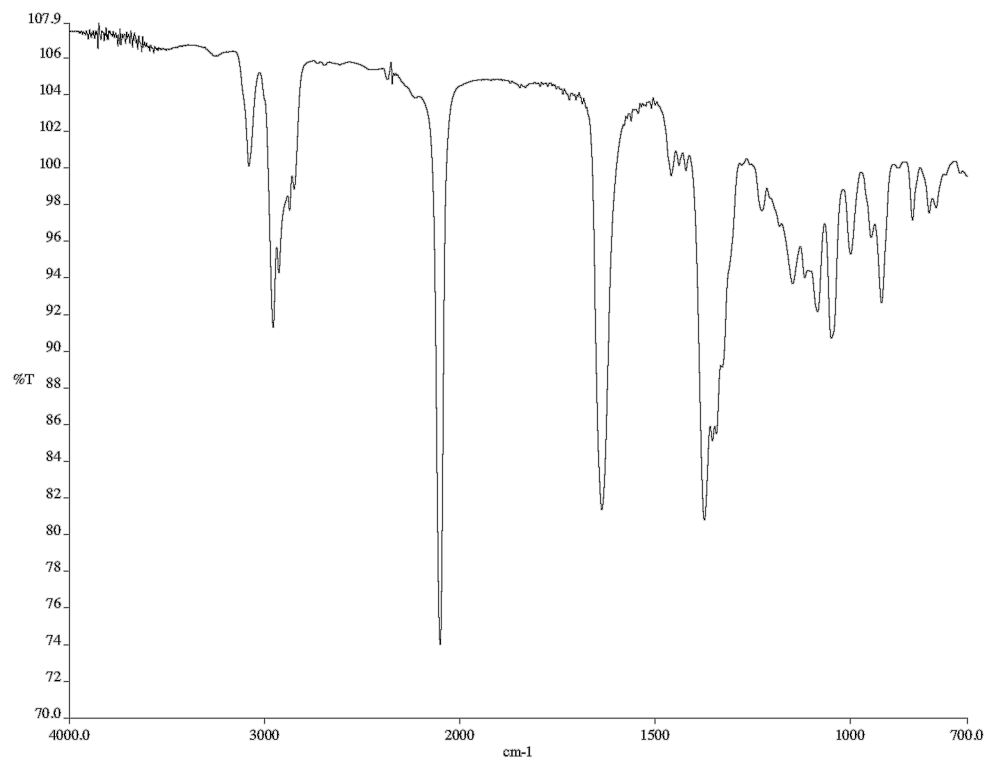


Figure A2.80. Infrared spectrum (neat film/NaCl) of **220**.

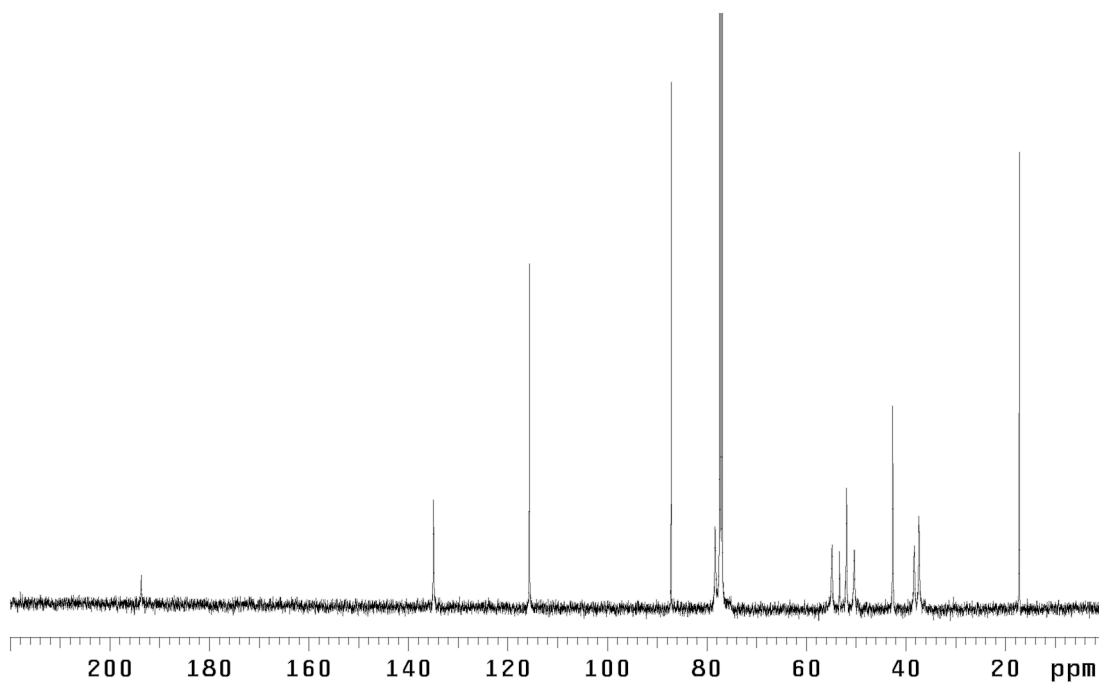


Figure A2.81. ¹³C NMR spectrum (126 MHz, CDCl₃) of **220**.

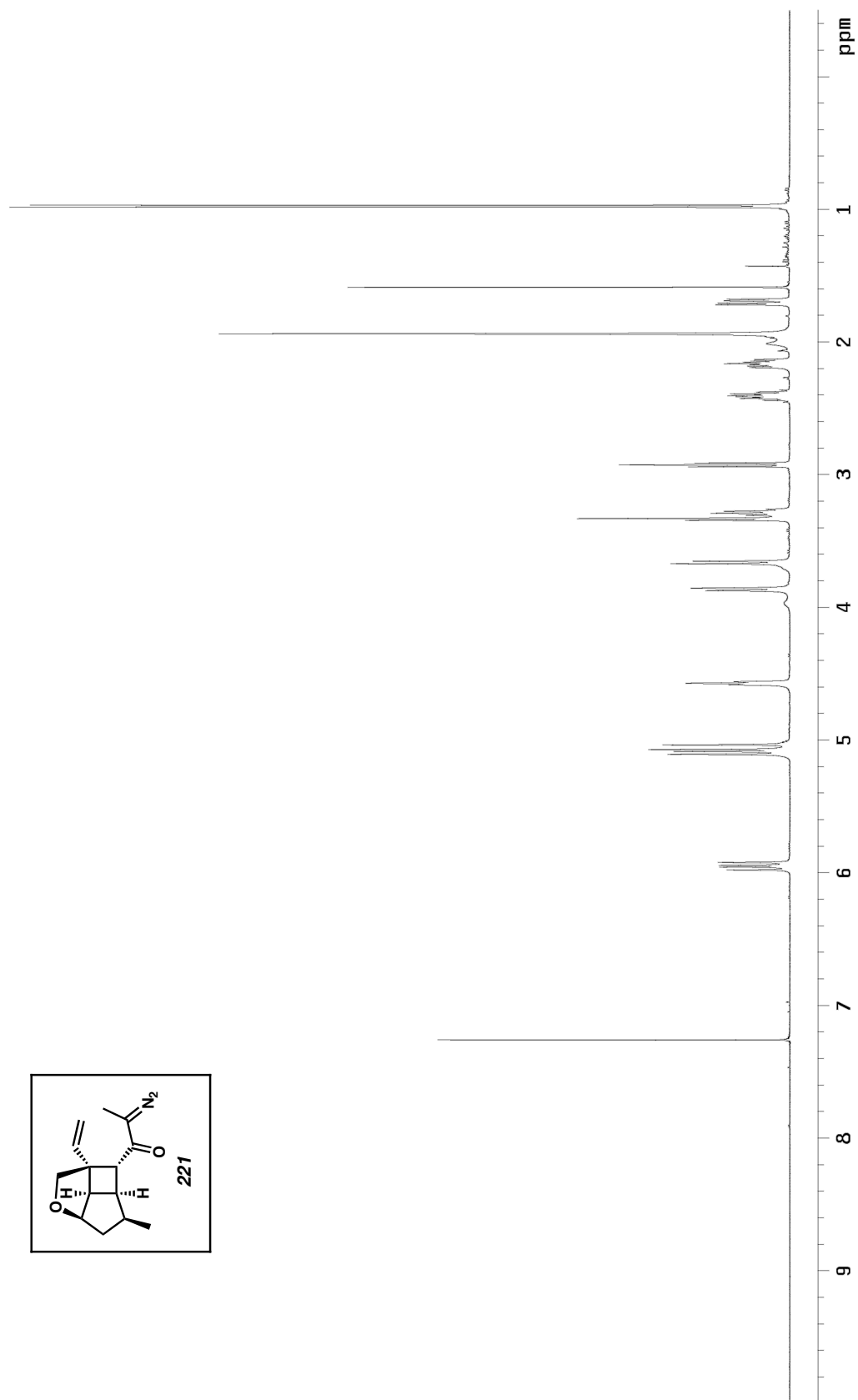


Figure A2.82. ^1H NMR spectrum (500 MHz, CDCl_3) of **221**.

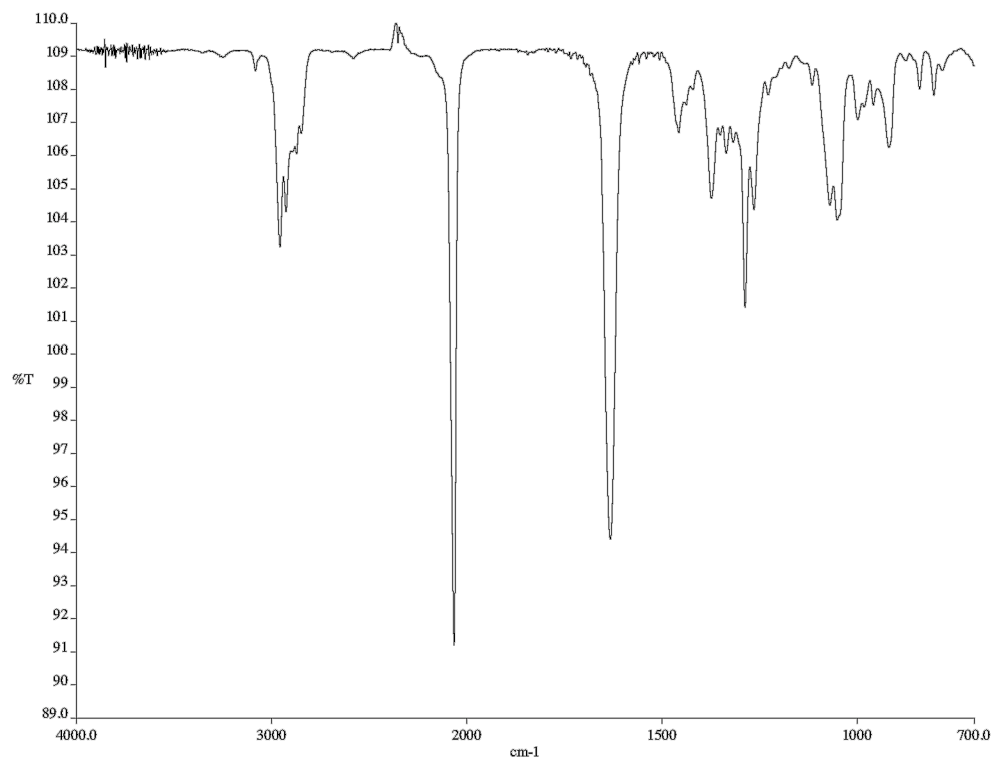


Figure A2.83. Infrared spectrum (neat film/NaCl) of **221**.

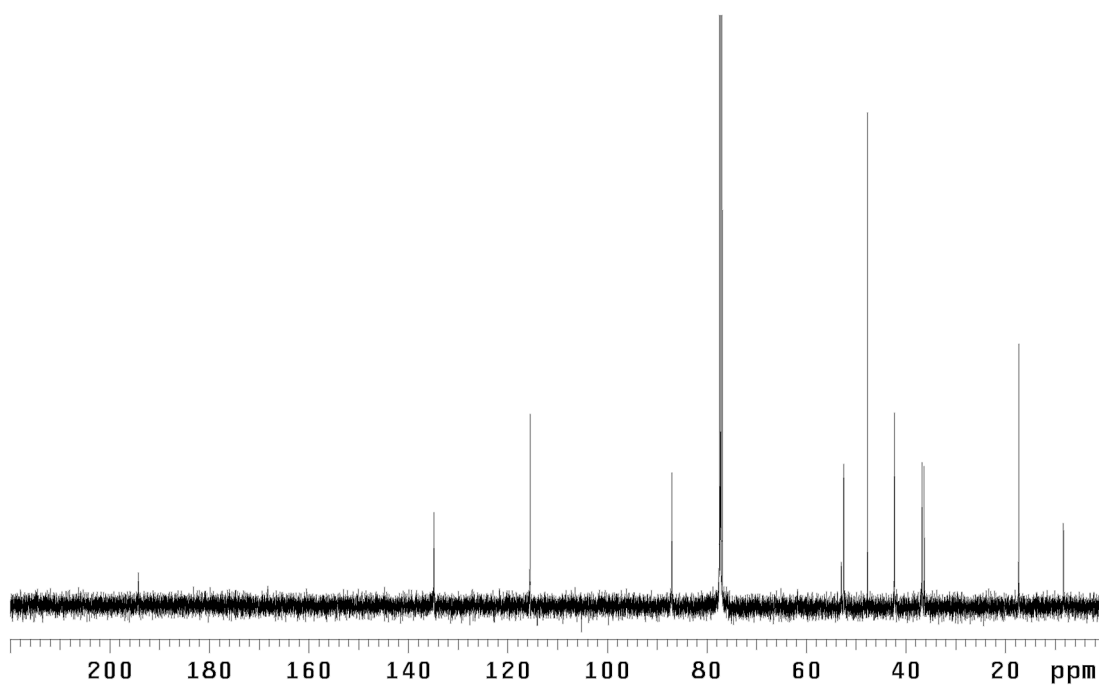


Figure A2.84. ¹³C NMR spectrum (126 MHz, CDCl₃) of **221**.

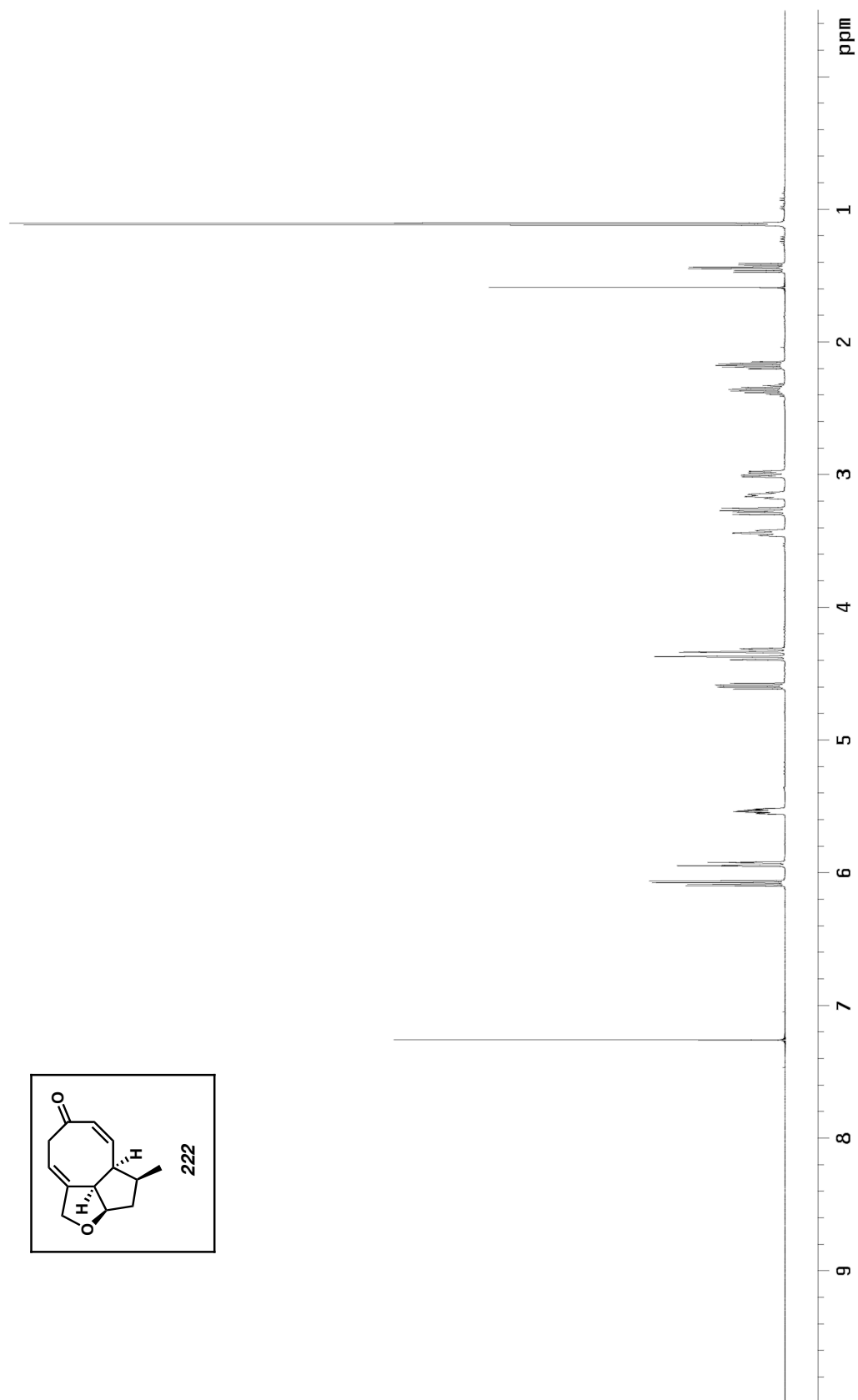


Figure A2.85. ^1H NMR spectrum (500 MHz, CDCl_3) of **222**.

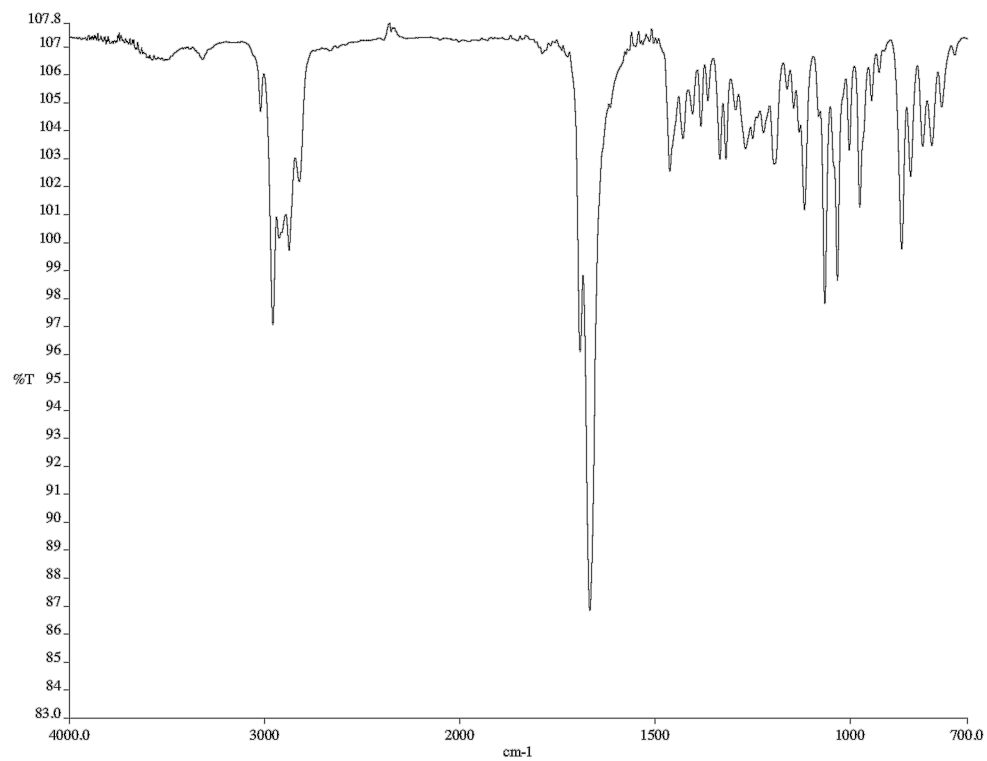


Figure A2.86. Infrared spectrum (neat film/NaCl) of **222**.

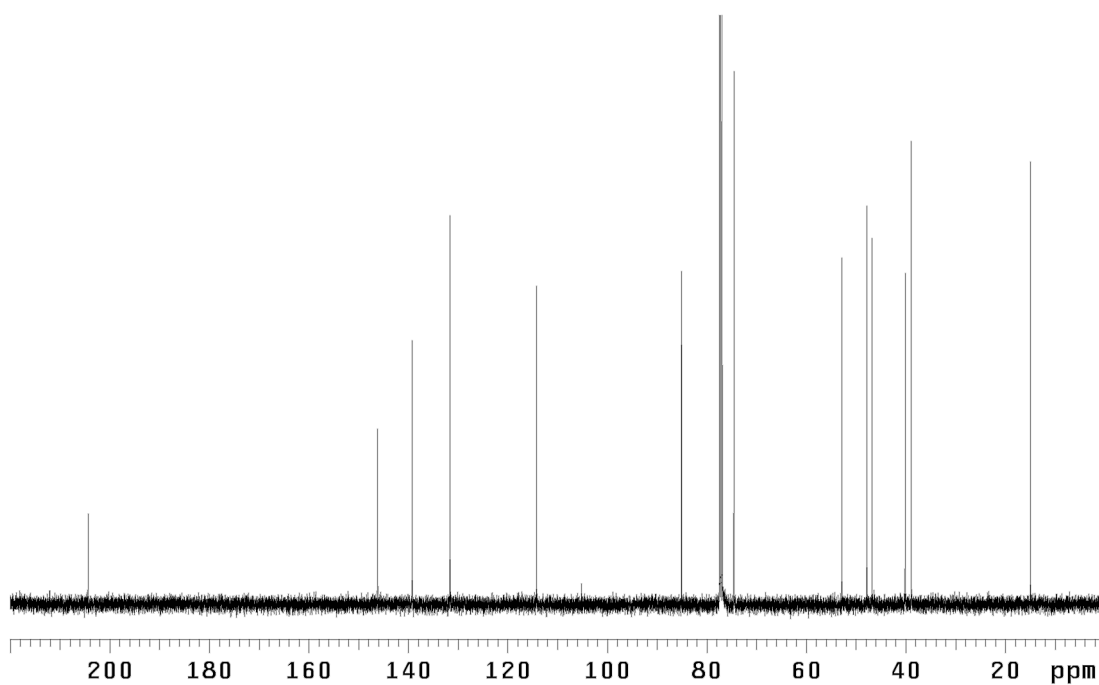


Figure A2.87. ¹³C NMR spectrum (126 MHz, CDCl₃) of **222**.

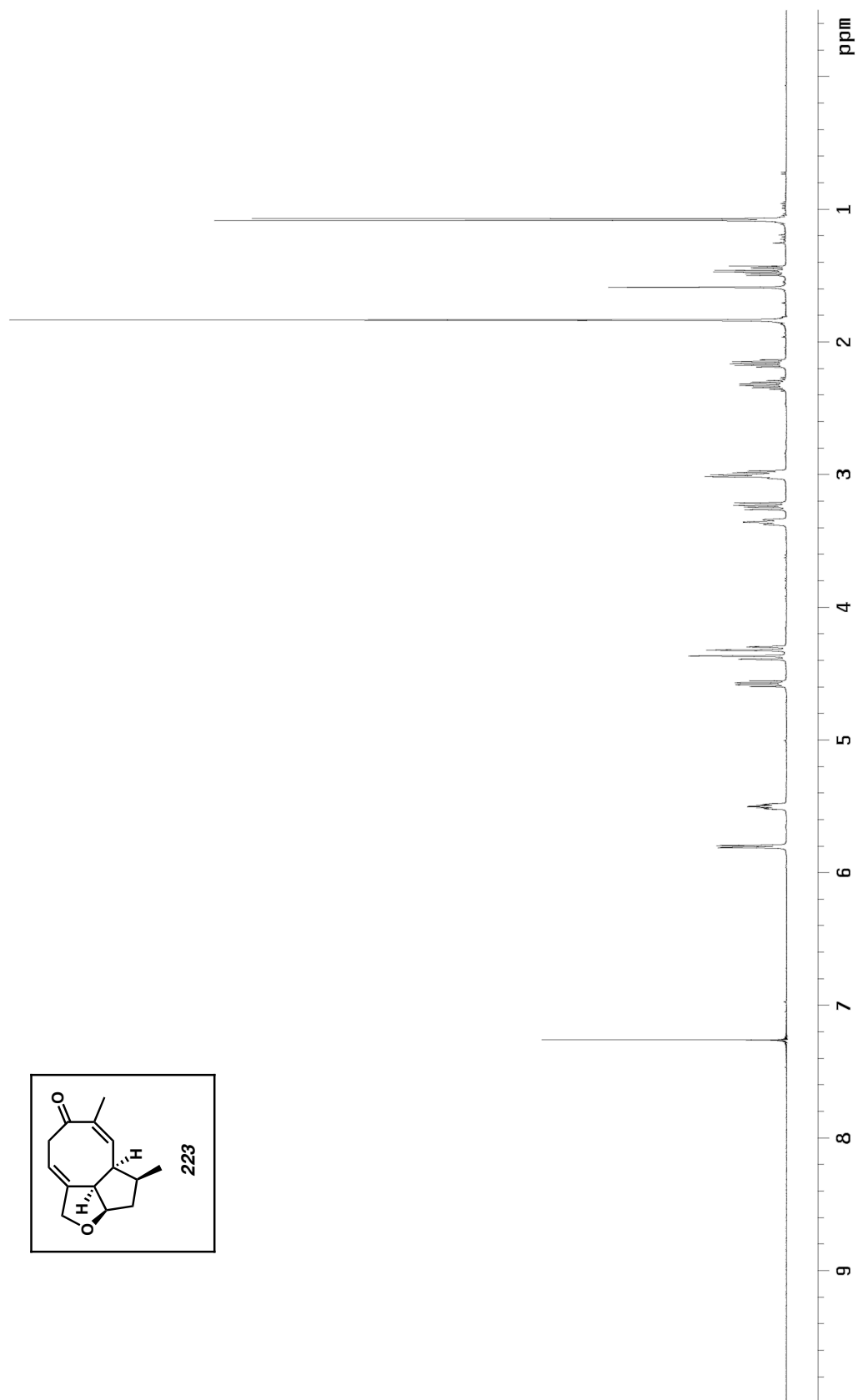


Figure A2.88. ^1H NMR spectrum (600 MHz, CDCl_3) of **223**.

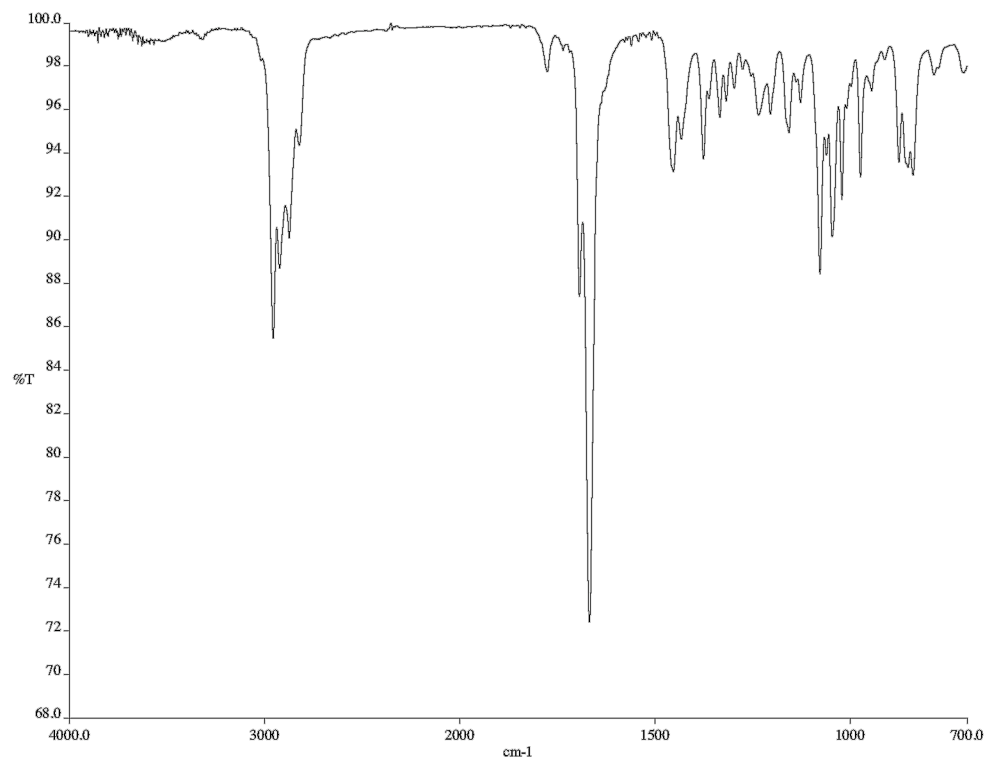


Figure A2.89. Infrared spectrum (neat film/NaCl) of **223**.

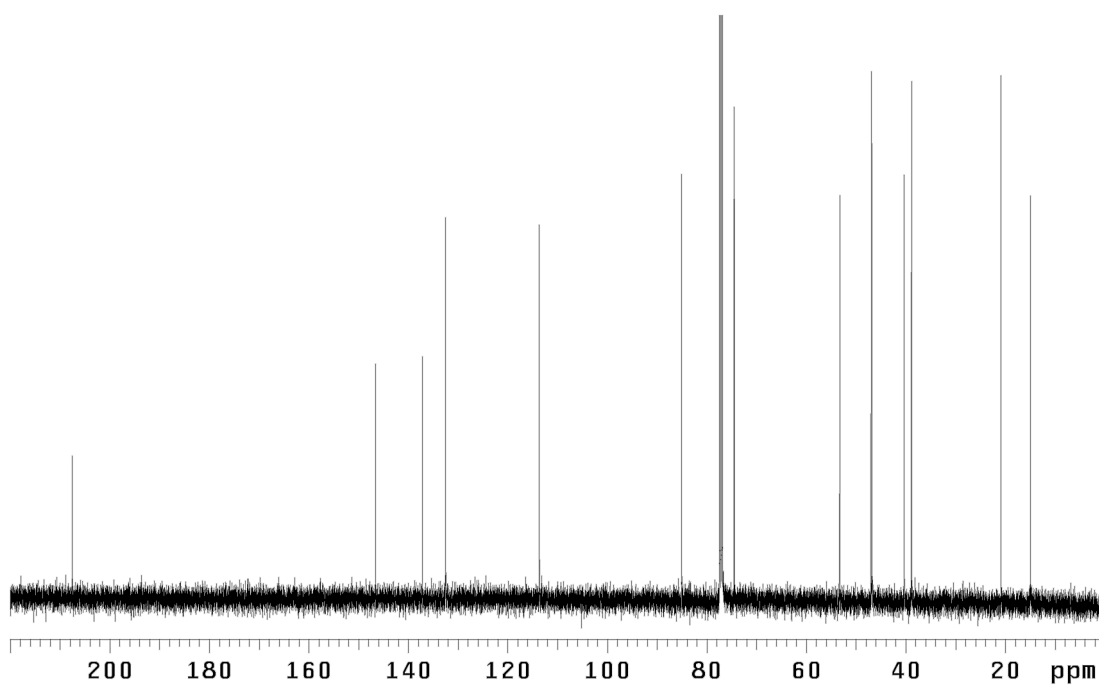


Figure A2.90. ¹³C NMR spectrum (126 MHz, CDCl₃) of **223**.

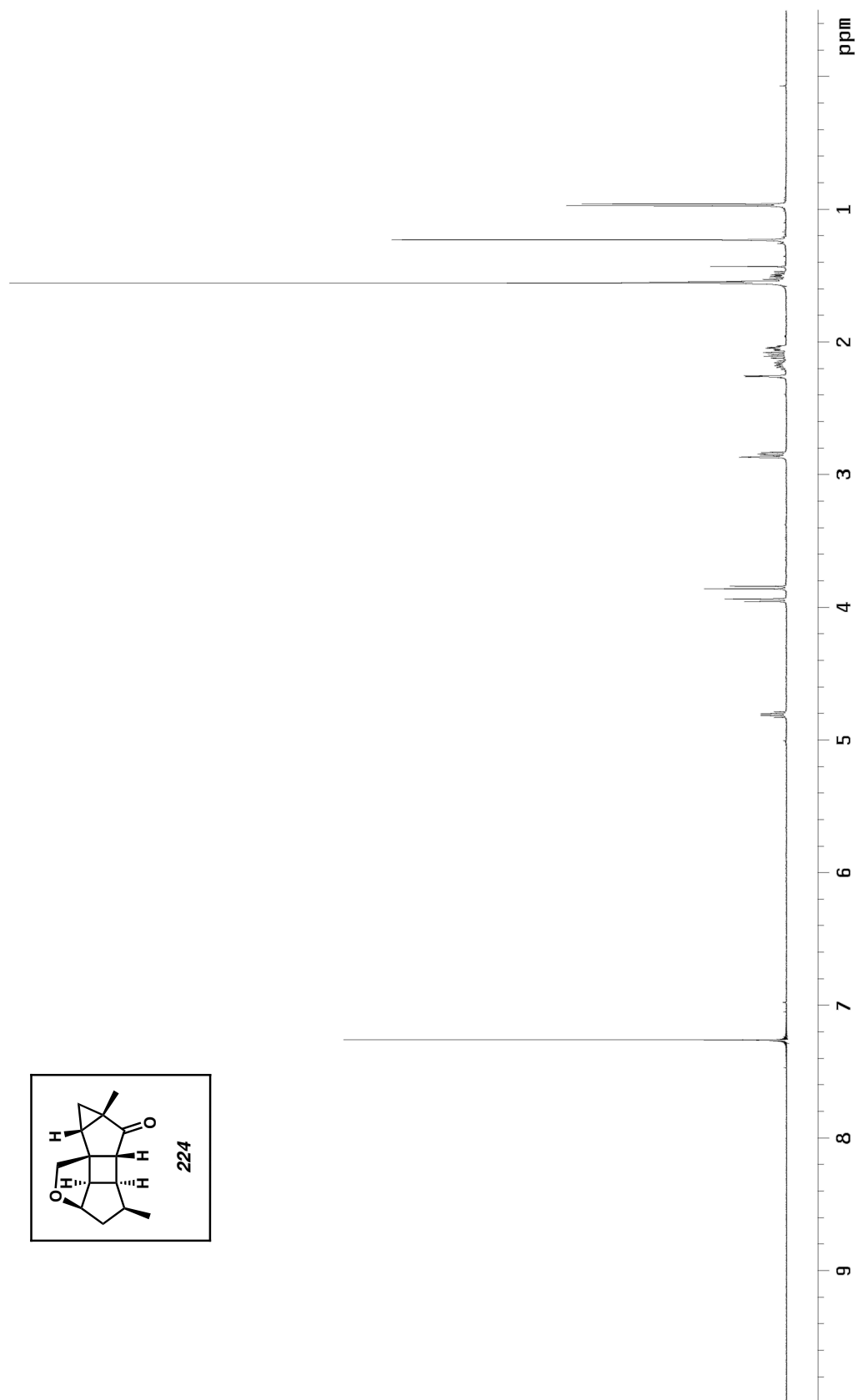


Figure A2.91. ^1H NMR spectrum (500 MHz, CDCl_3) of **224**.

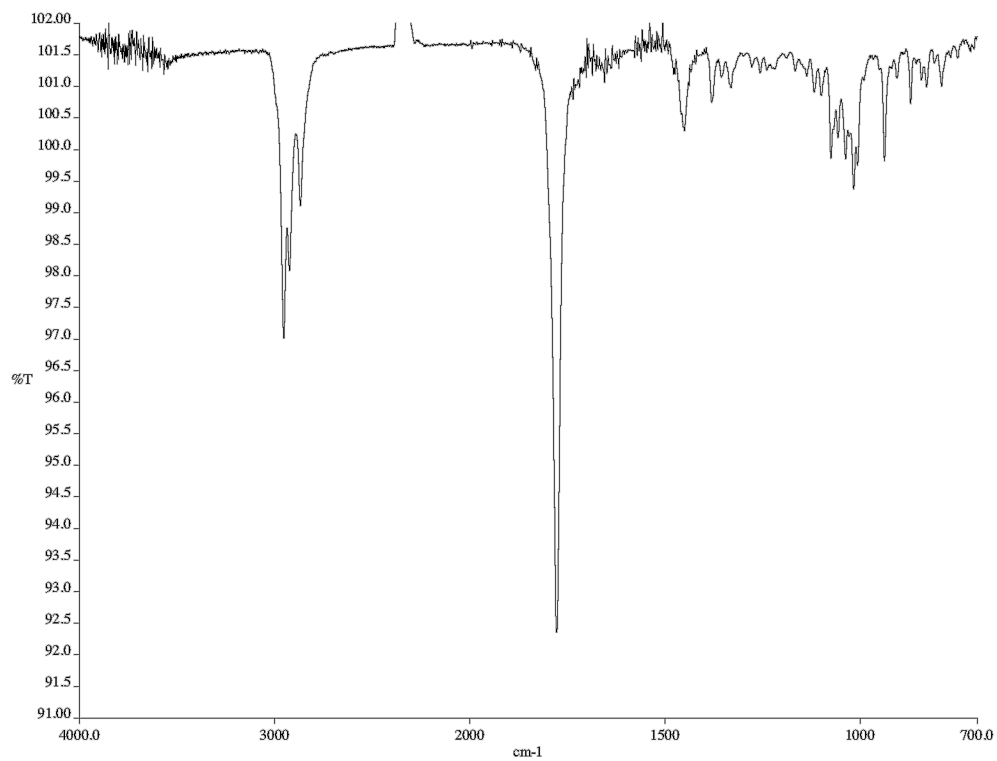


Figure A2.92. Infrared spectrum (neat film/NaCl) of **224**.

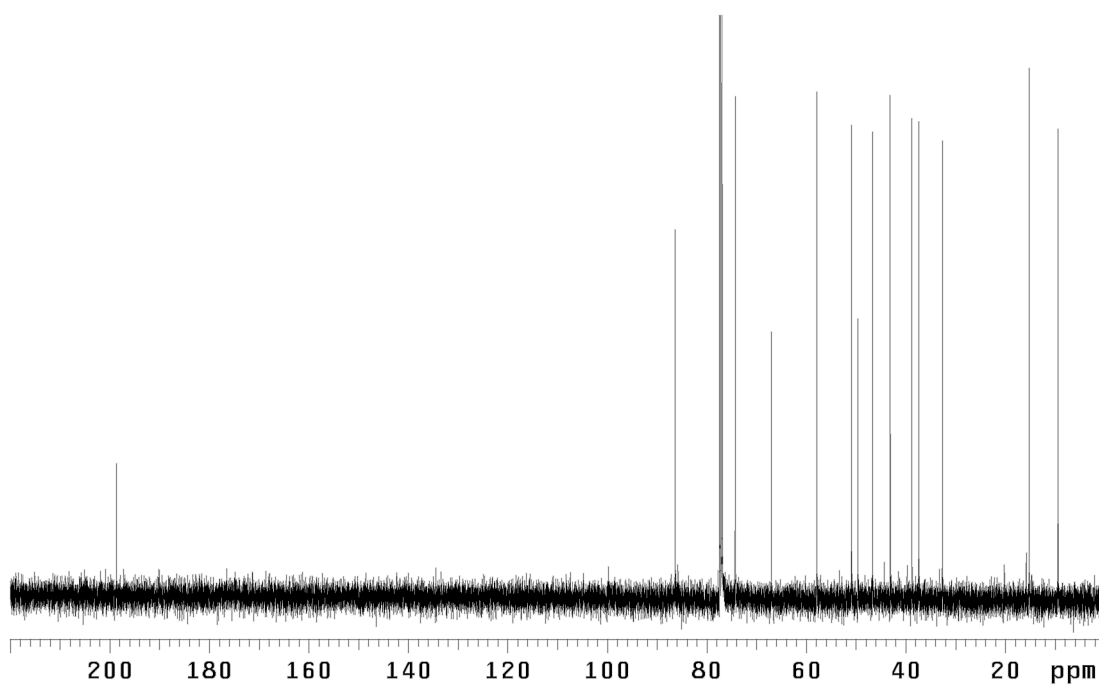
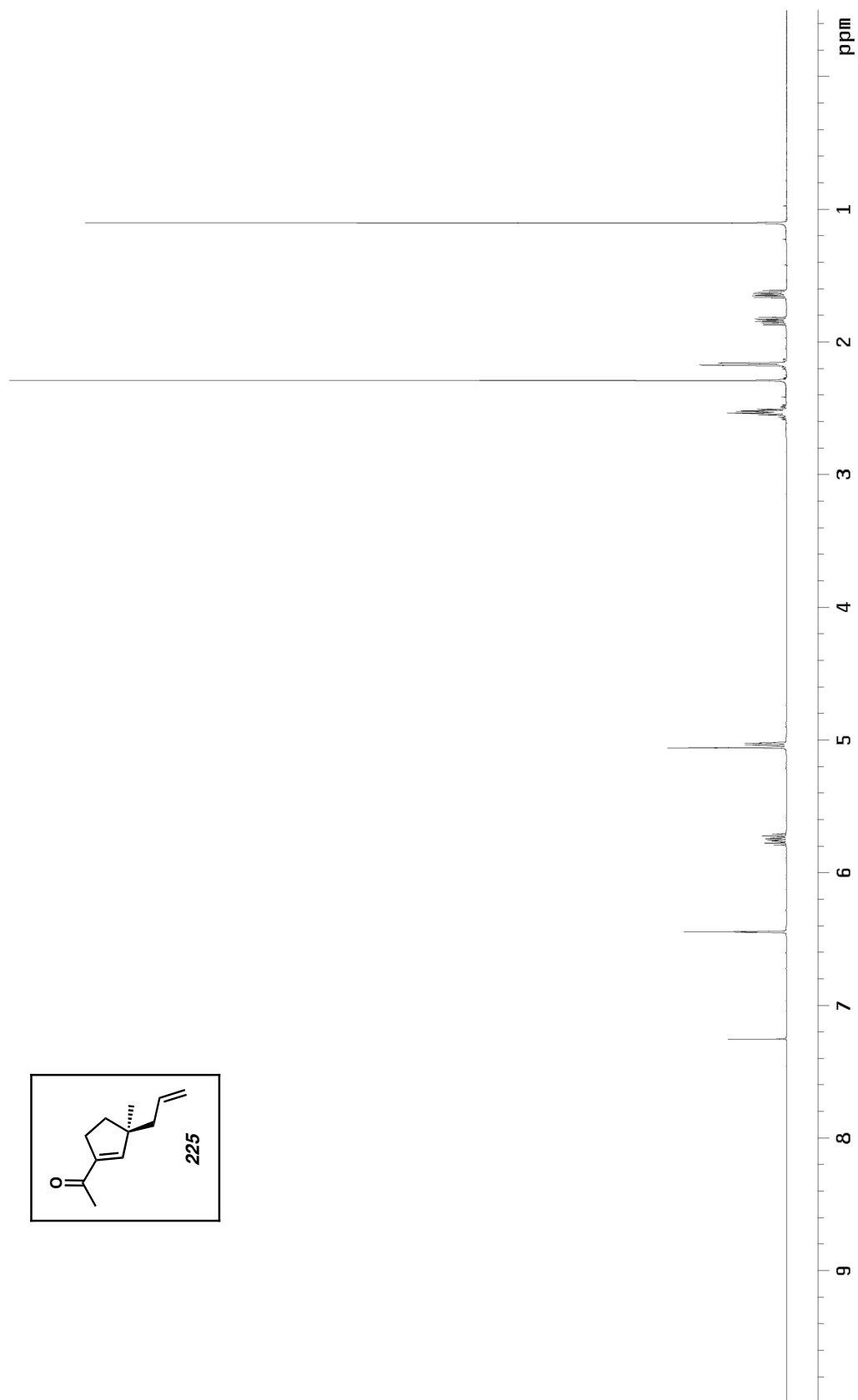


Figure A2.93. ¹³C NMR spectrum (126 MHz, CDCl₃) of **224**.

Figure A2.94. ^1H NMR spectrum (500 MHz, CDCl_3) of **225**.

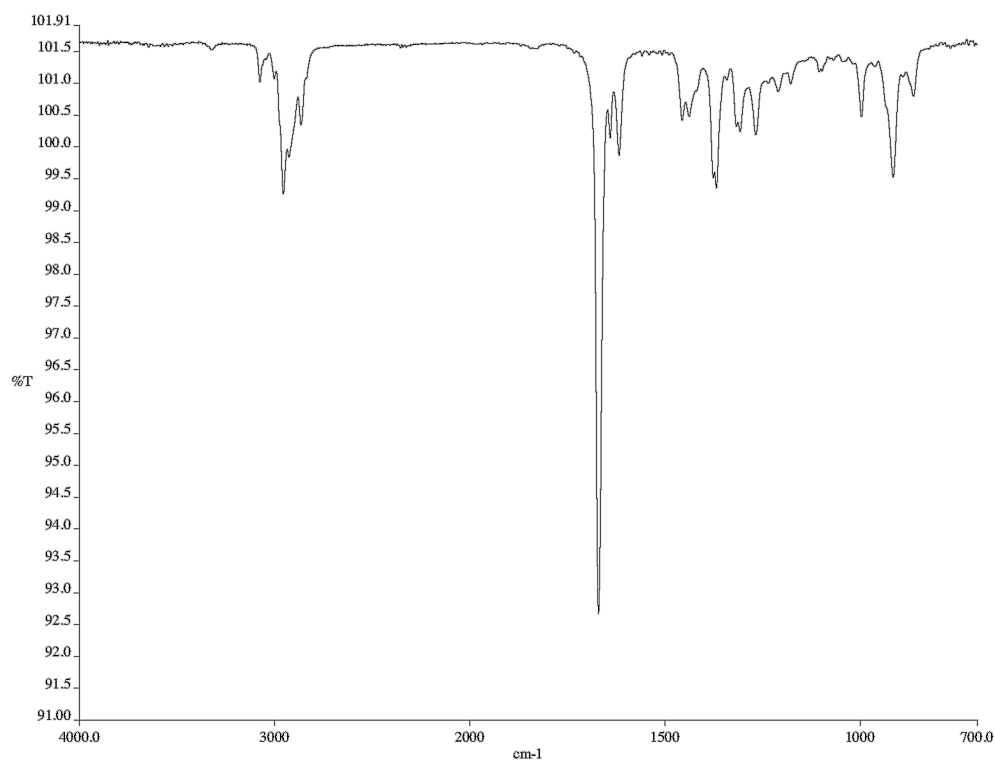


Figure A2.95. Infrared spectrum (neat film/NaCl) of **225**.

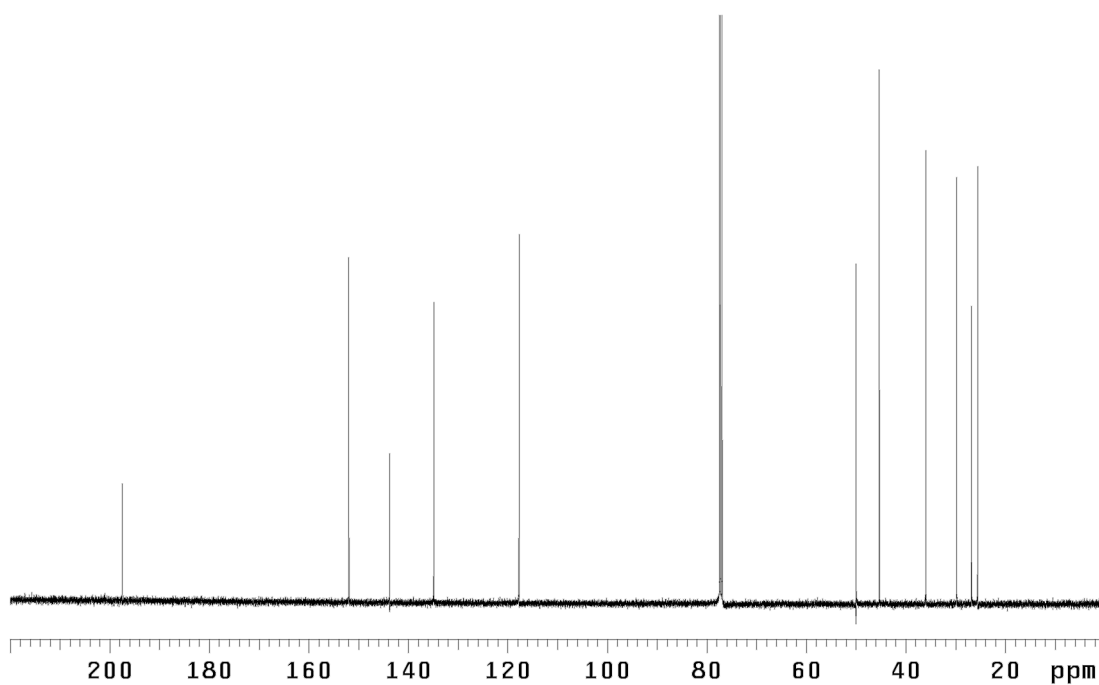


Figure A2.96. ¹³C NMR spectrum (126 MHz, CDCl₃) of **225**.

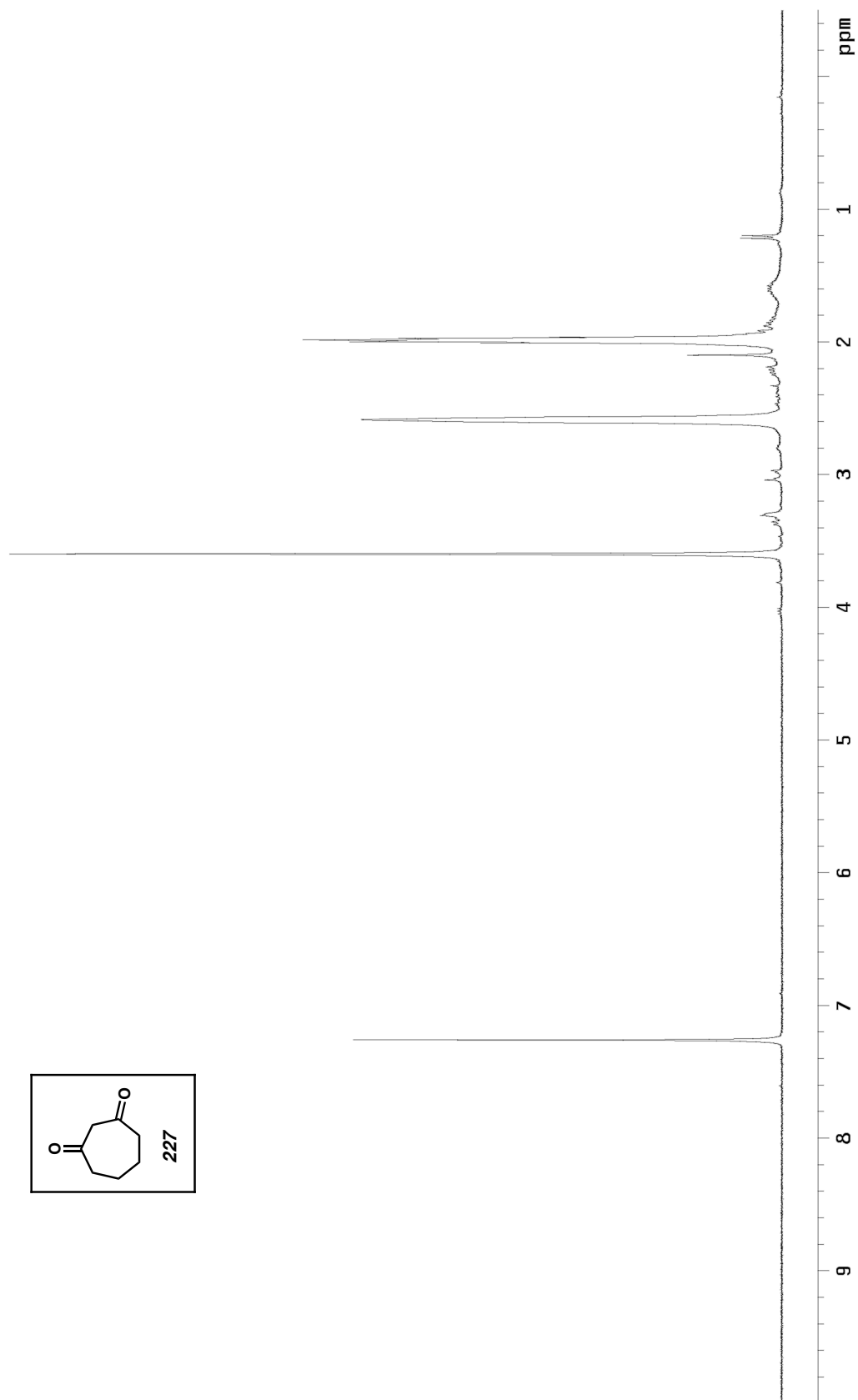
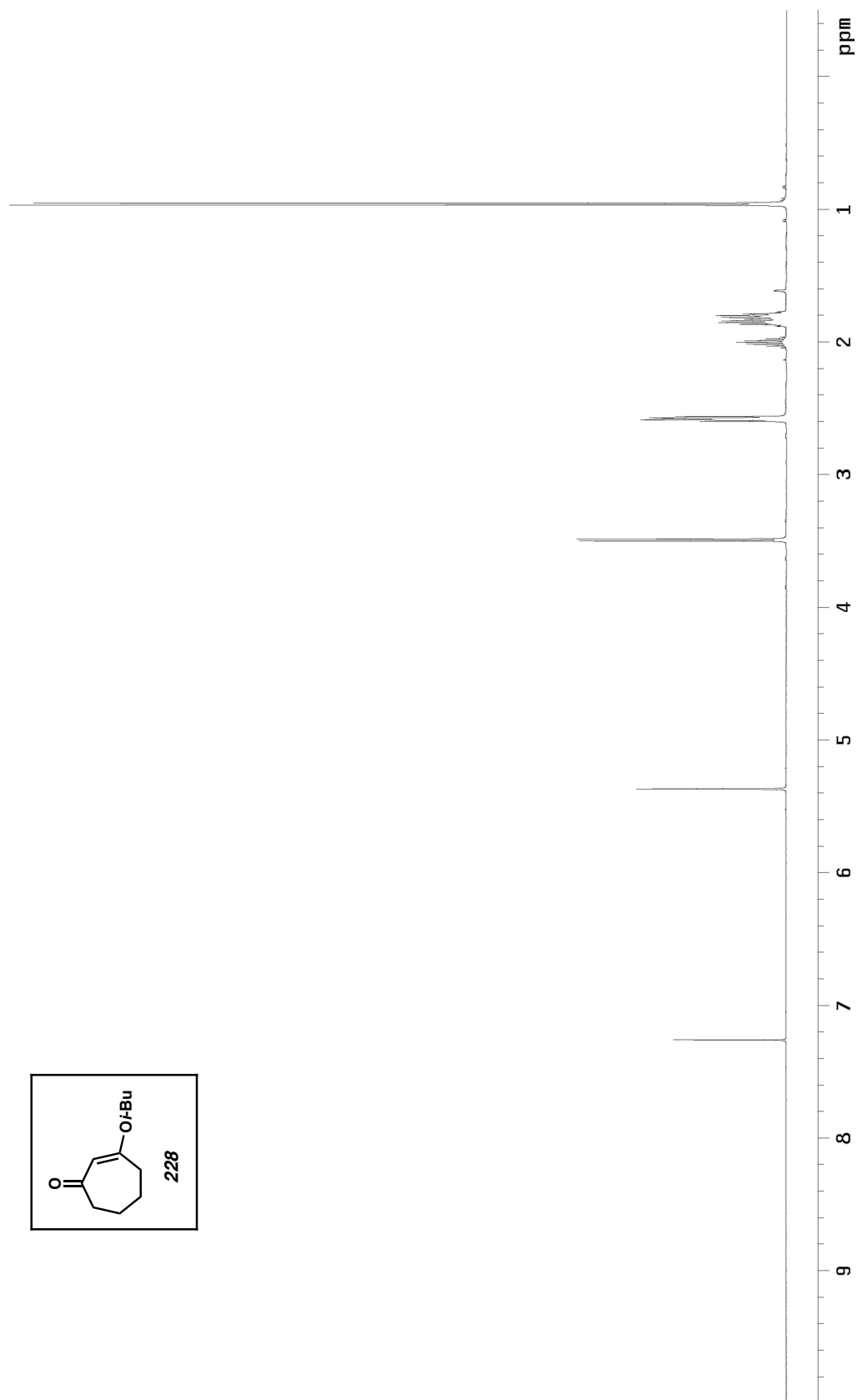


Figure A2.97. ^1H NMR spectrum (300 MHz, CDCl_3) of **227**.

Figure A2.98. ^1H NMR spectrum (500 MHz, CDCl_3) of **228**.

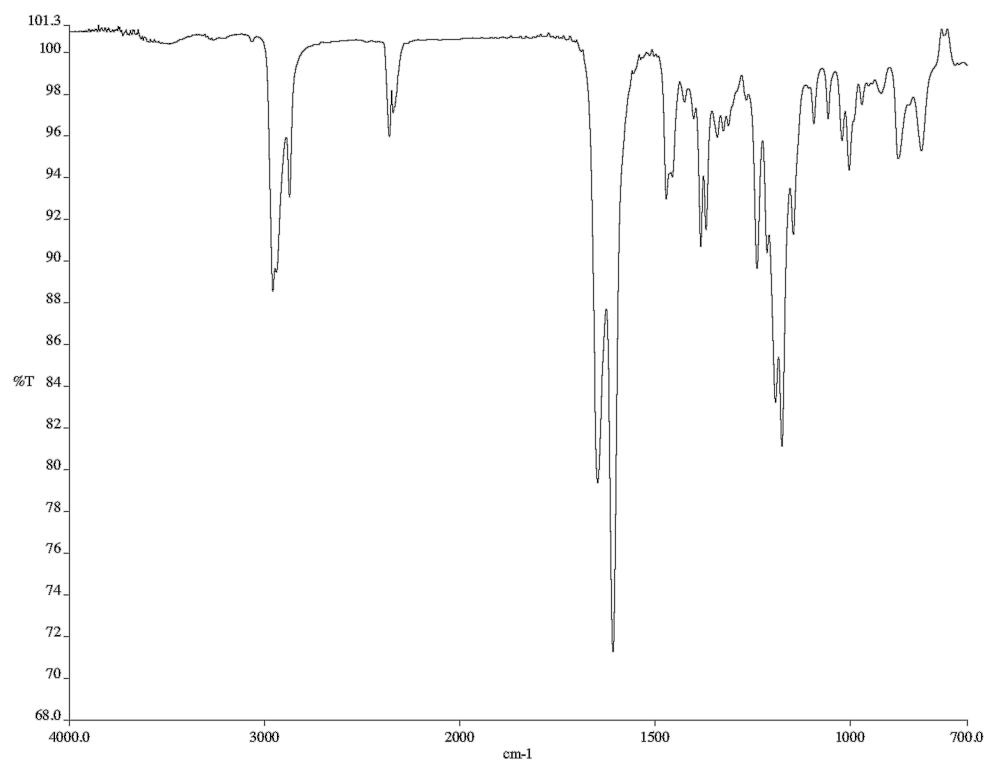


Figure A2.99. Infrared spectrum (neat film/NaCl) of **228**.

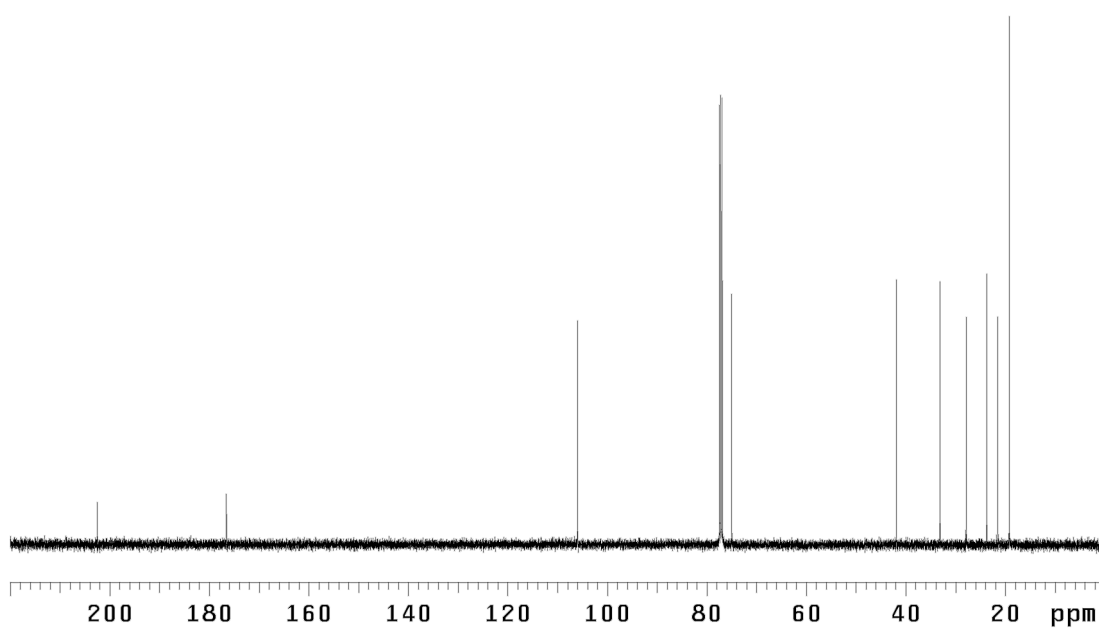
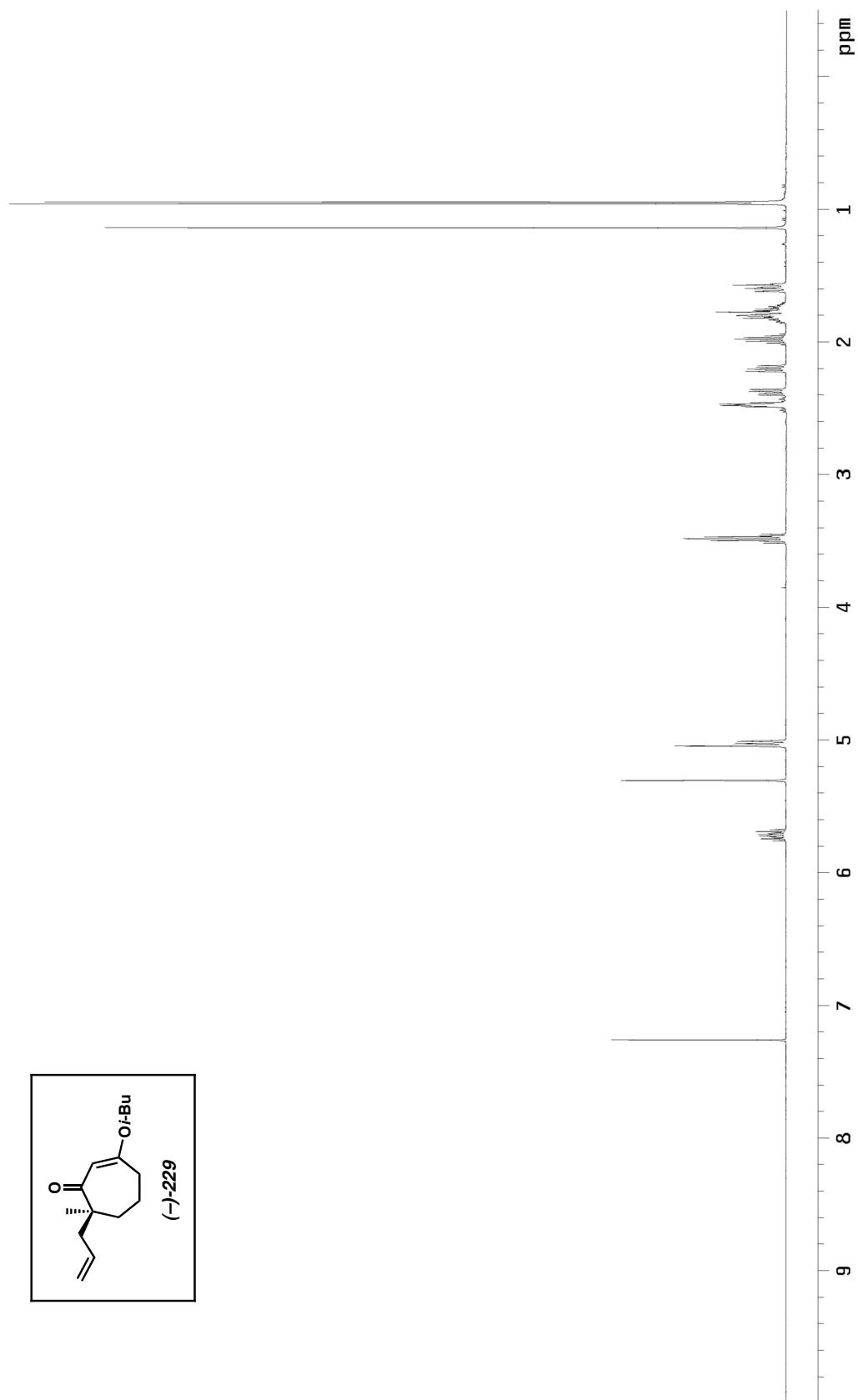


Figure A2.100. ¹³C NMR spectrum (126 MHz, CDCl₃) of **228**.

Figure A2.101. ^1H NMR spectrum (500 MHz, CDCl_3) of **229**.

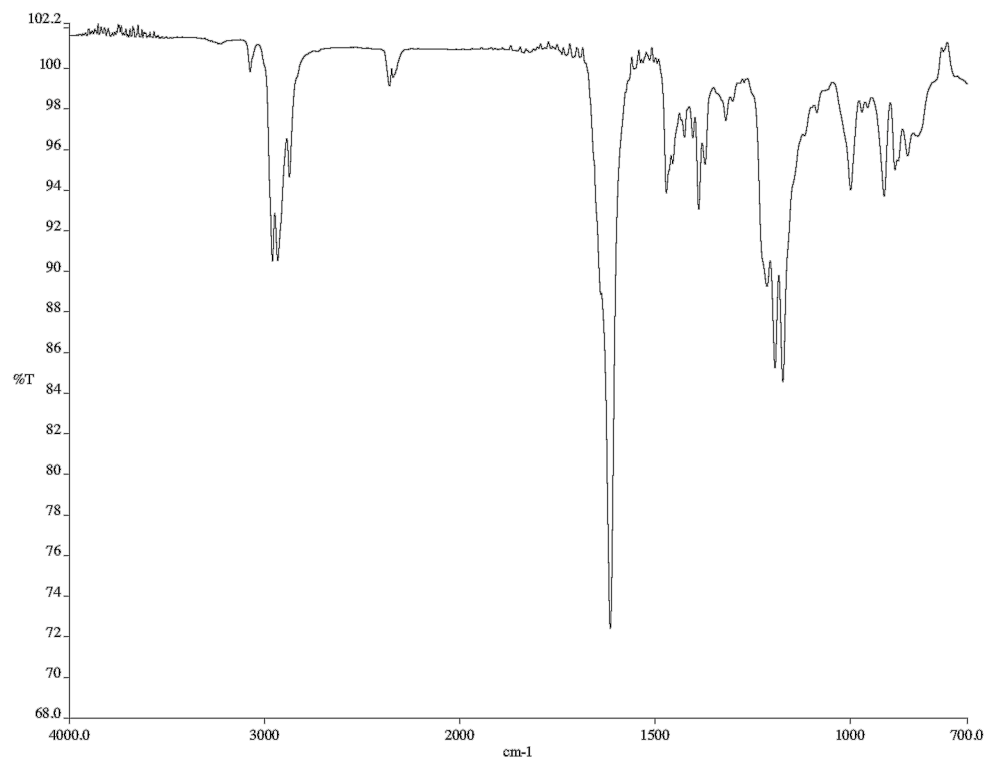


Figure A2.102. Infrared spectrum (neat film/NaCl) of **229**.

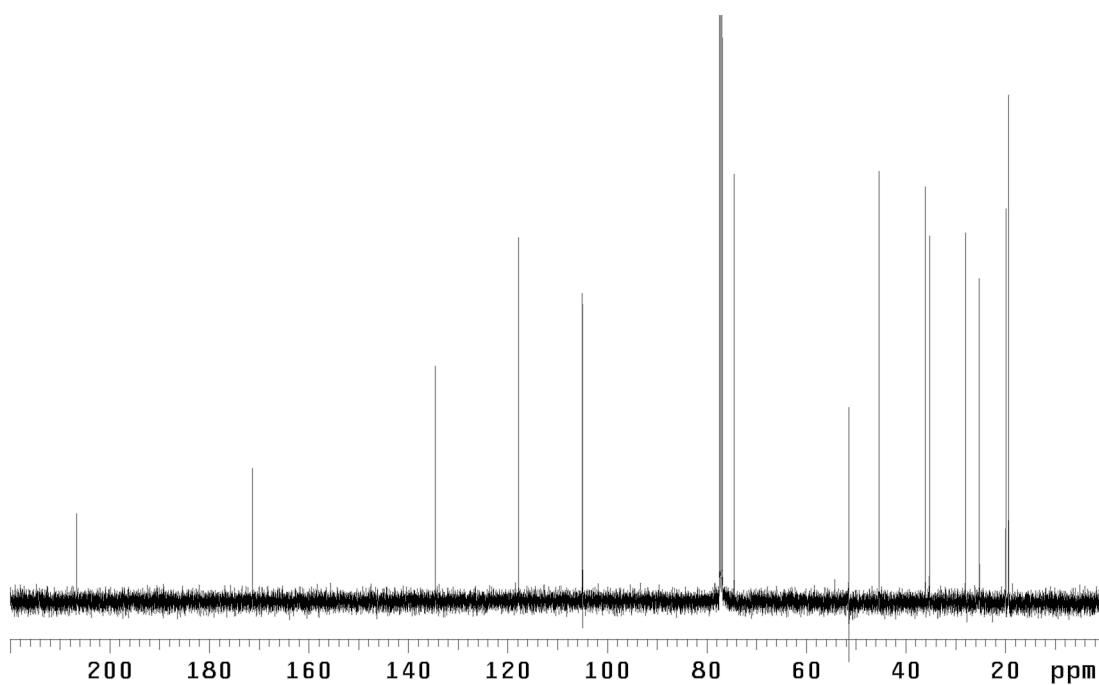
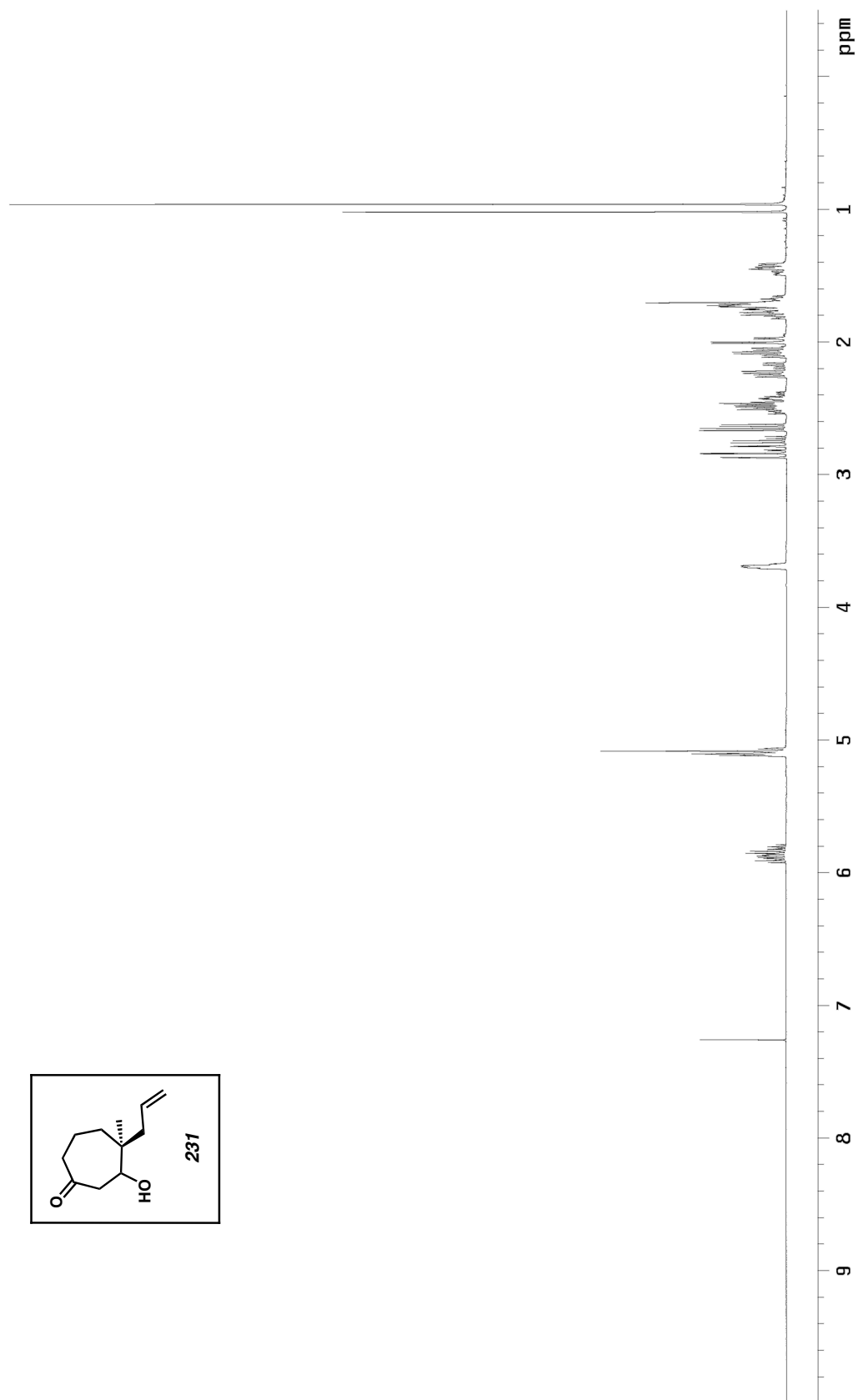


Figure A2.103. ¹³C NMR spectrum (126 MHz, CDCl₃) of **229**.

Figure A2.104. ¹H NMR spectrum (500 MHz, CDCl₃) of **231**.

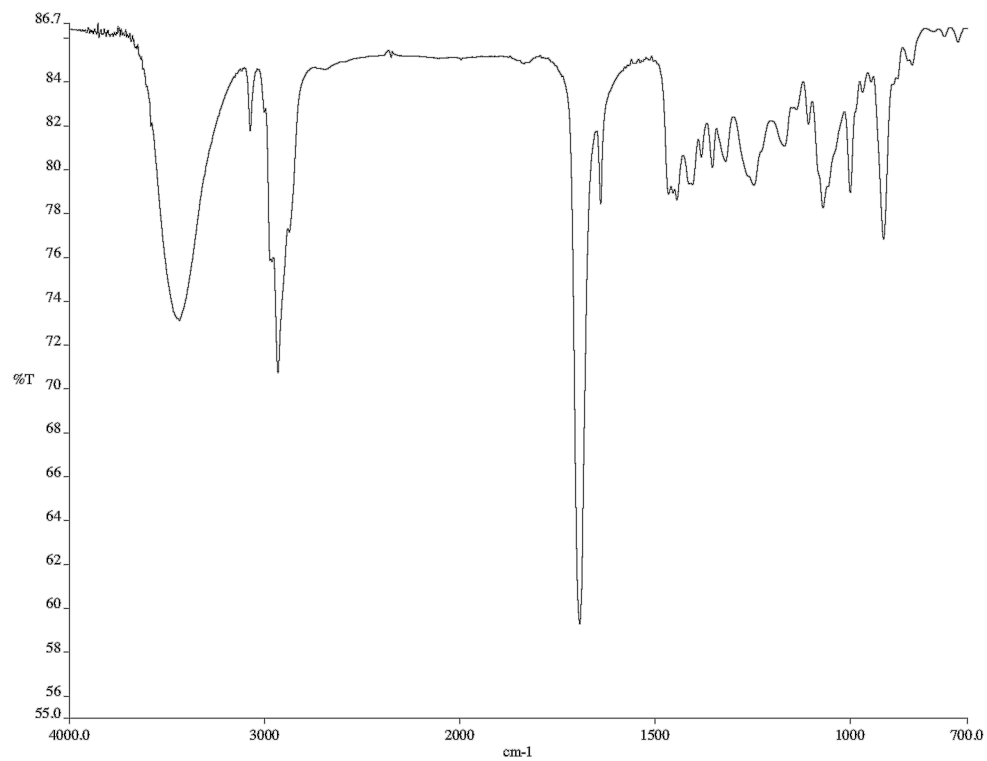


Figure A2.105. Infrared spectrum (neat film/NaCl) of **231**.

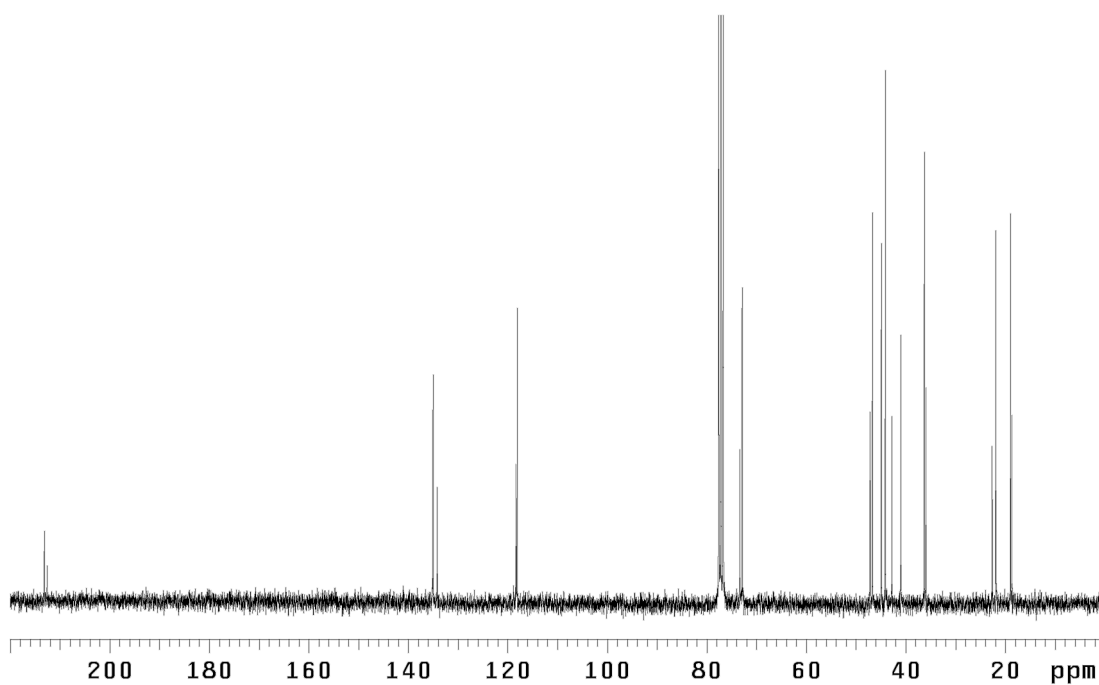
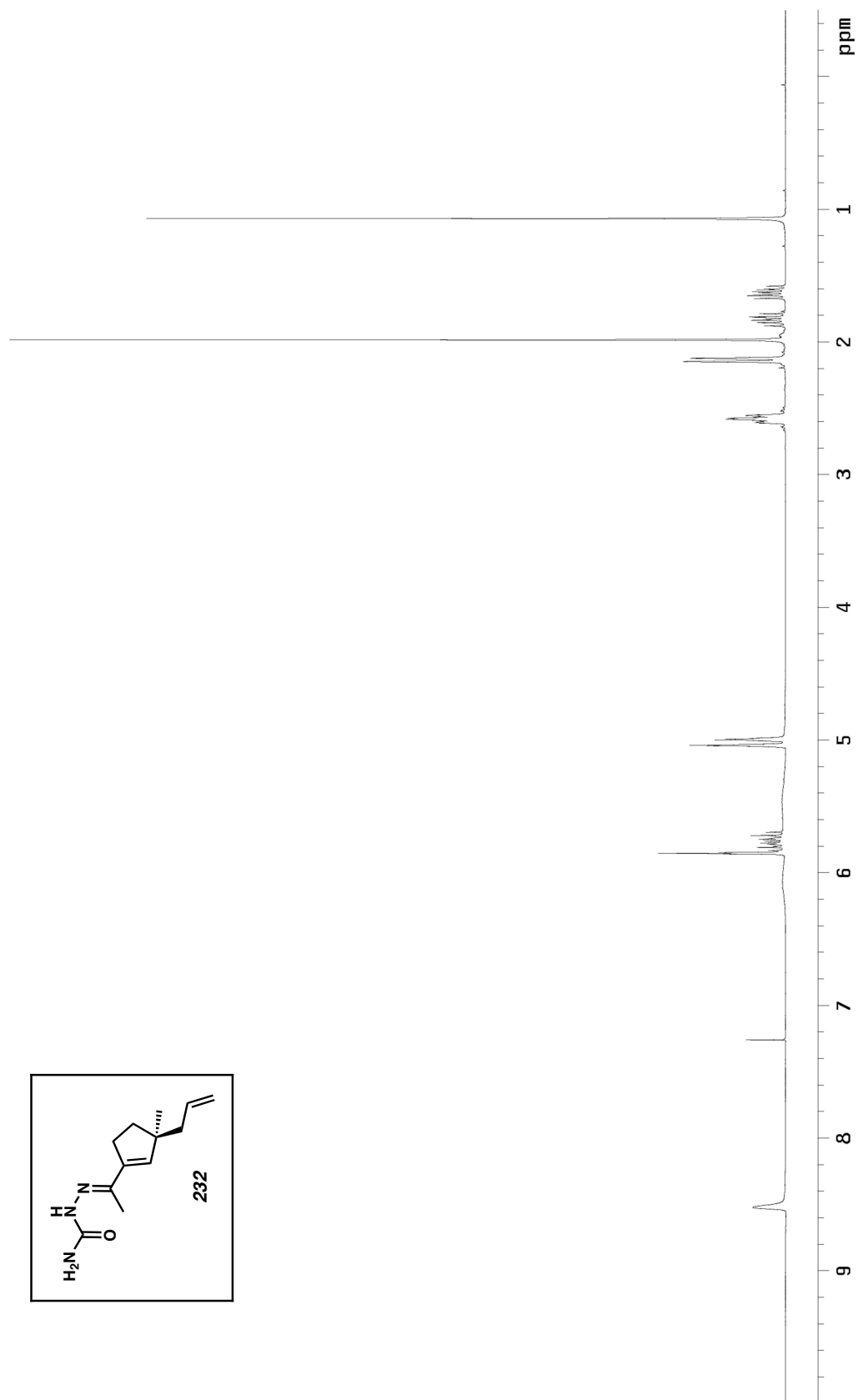


Figure A2.106. ¹³C NMR spectrum (75 MHz, CDCl₃) of **231**.

Figure A2.107. ^1H NMR spectrum (300 MHz, CDCl_3) of **232**.

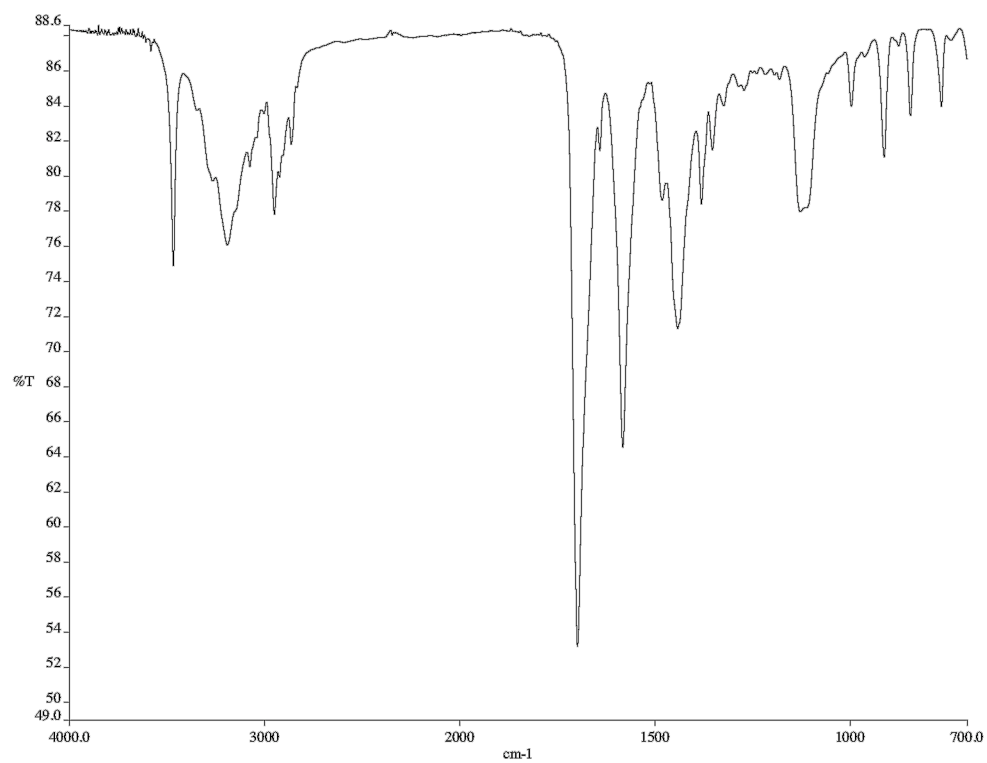


Figure A2.108. Infrared spectrum (neat film/NaCl) of **232**.

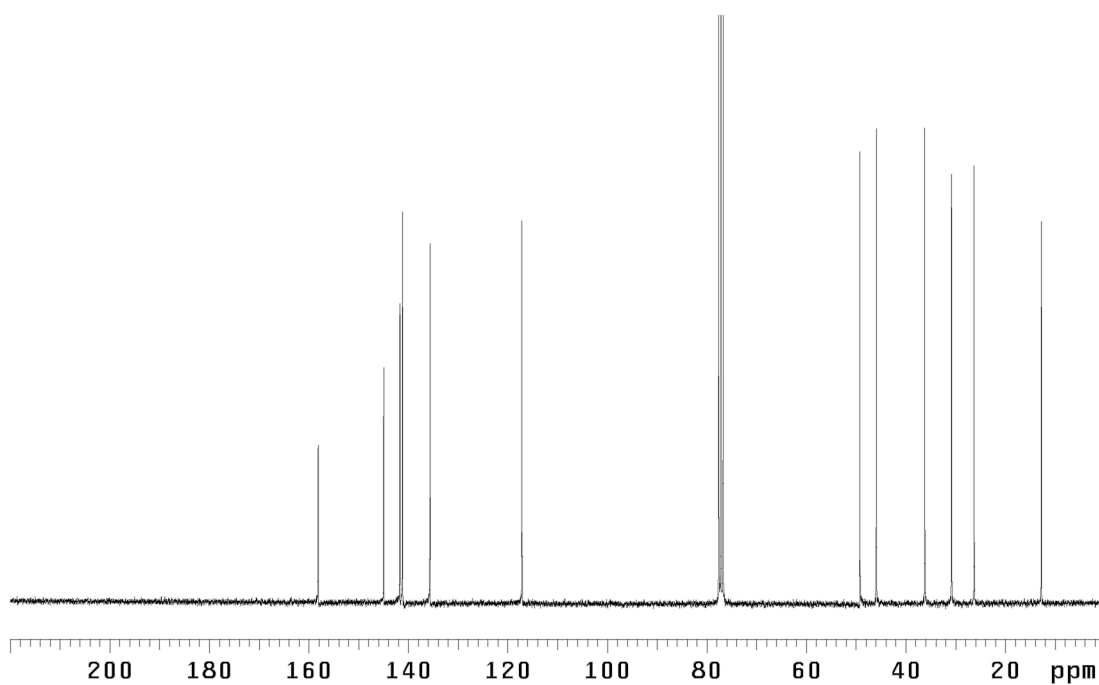
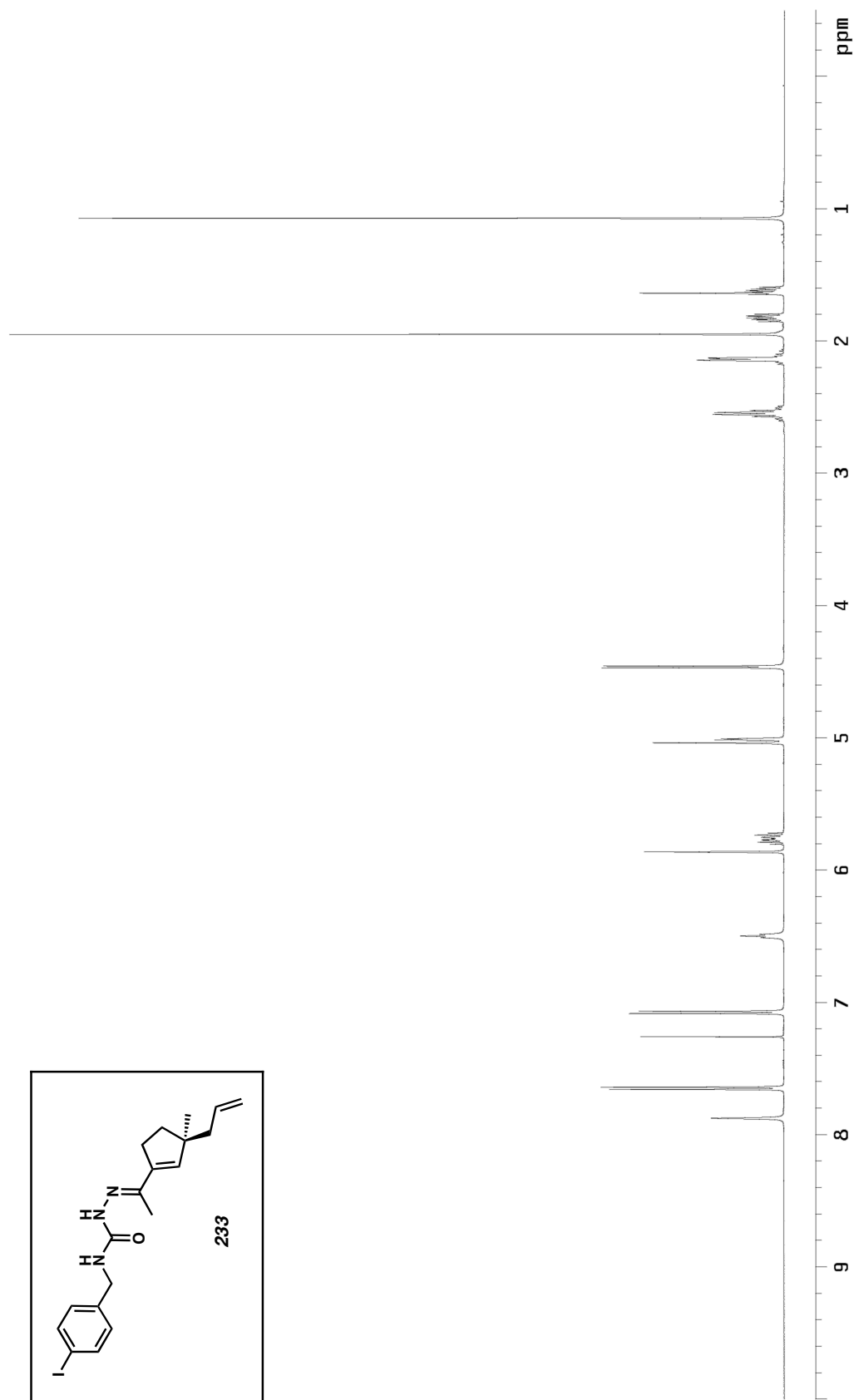


Figure A2.109. ¹³C NMR spectrum (75 MHz, CDCl₃) of **232**.

Figure A2.110. ^1H NMR spectrum (500 MHz, CDCl_3) of **233**.

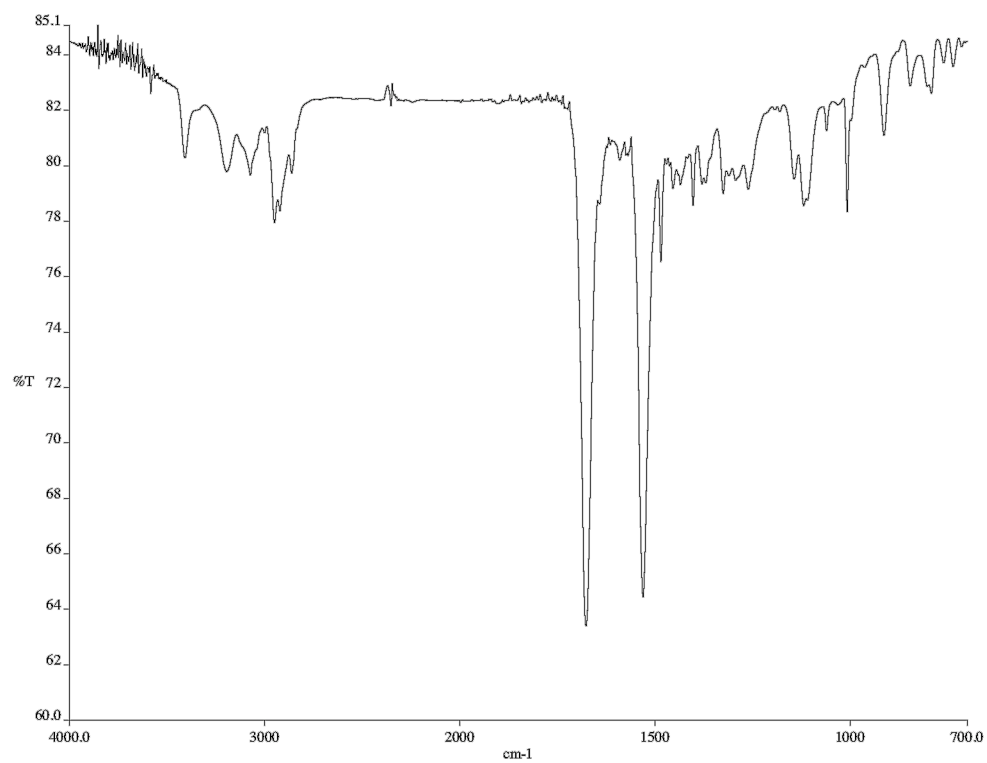


Figure A2.111. Infrared spectrum (neat film/NaCl) of **233**.

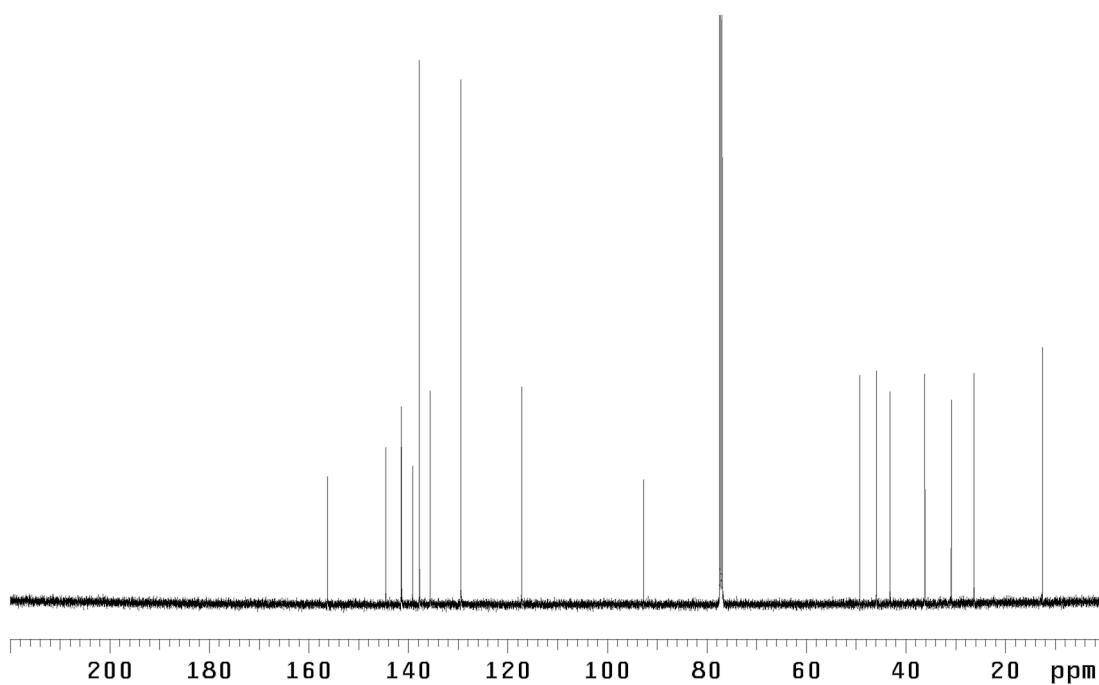
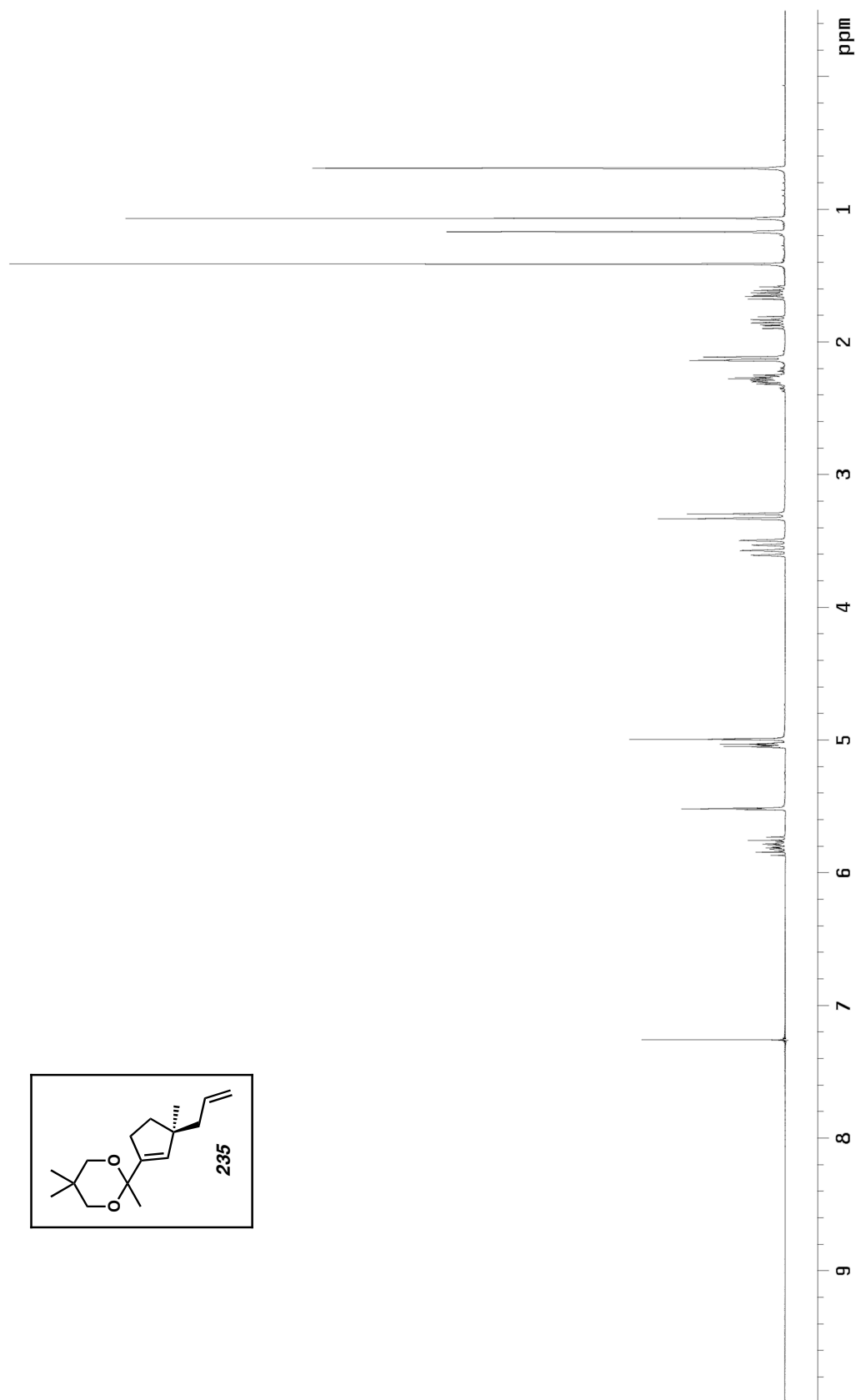


Figure A2.112. ¹³C NMR spectrum (126 MHz, CDCl₃) of **233**.

Figure A2.113. ^1H NMR spectrum (300 MHz, CDCl_3) of **235**.

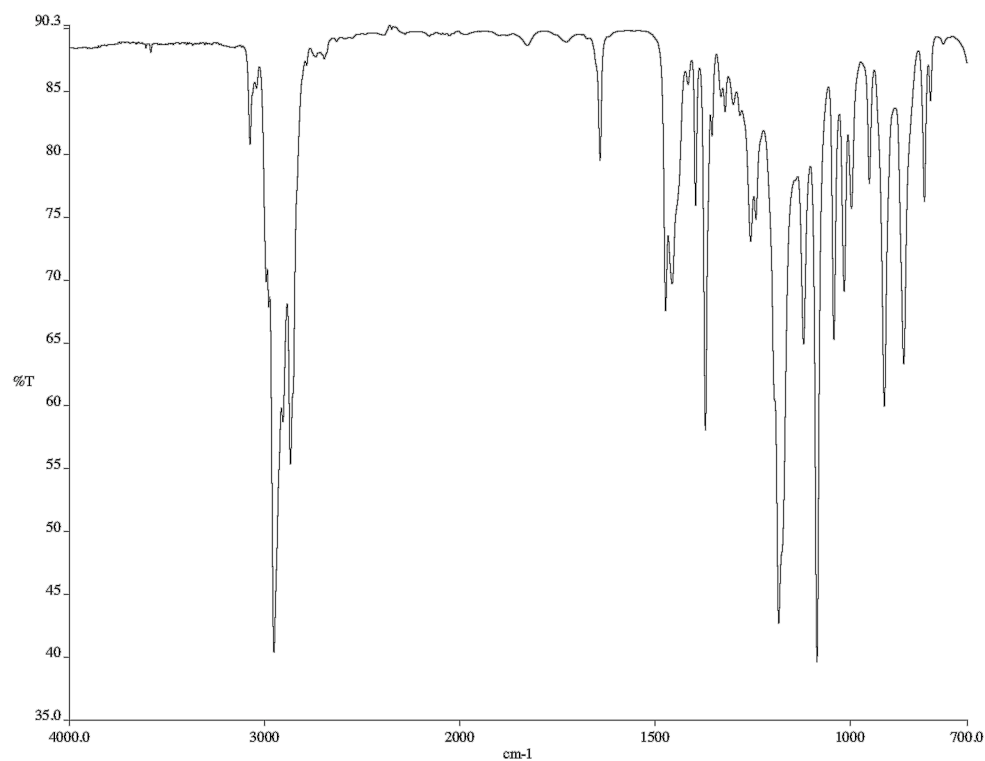


Figure A2.114. Infrared spectrum (neat film/NaCl) of **235**.

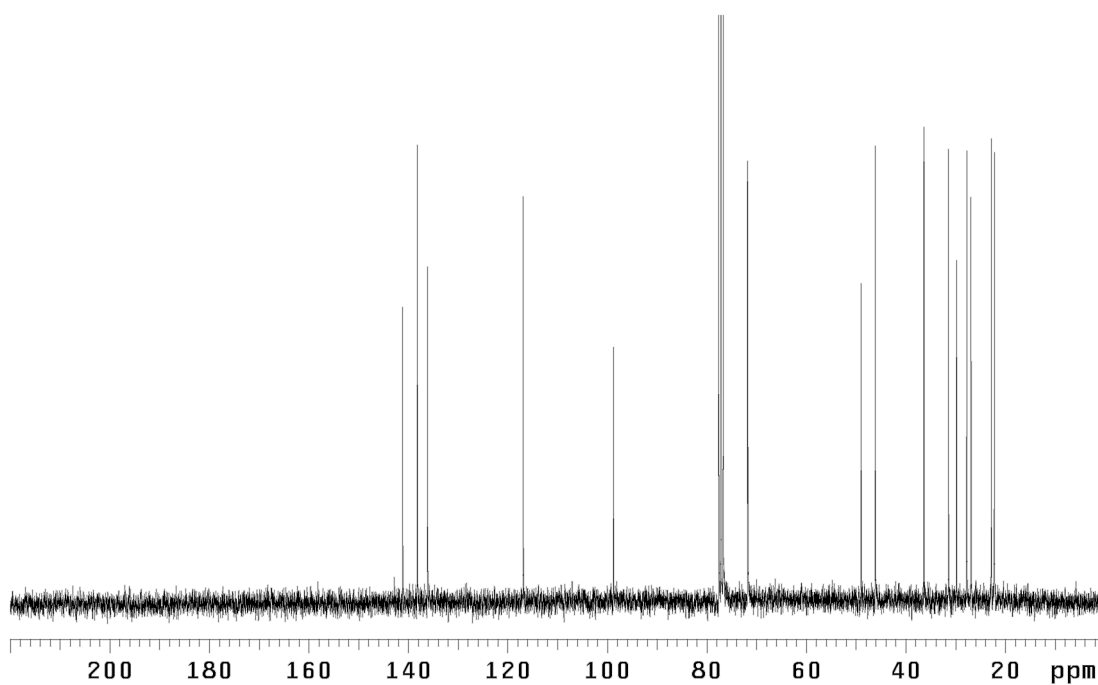
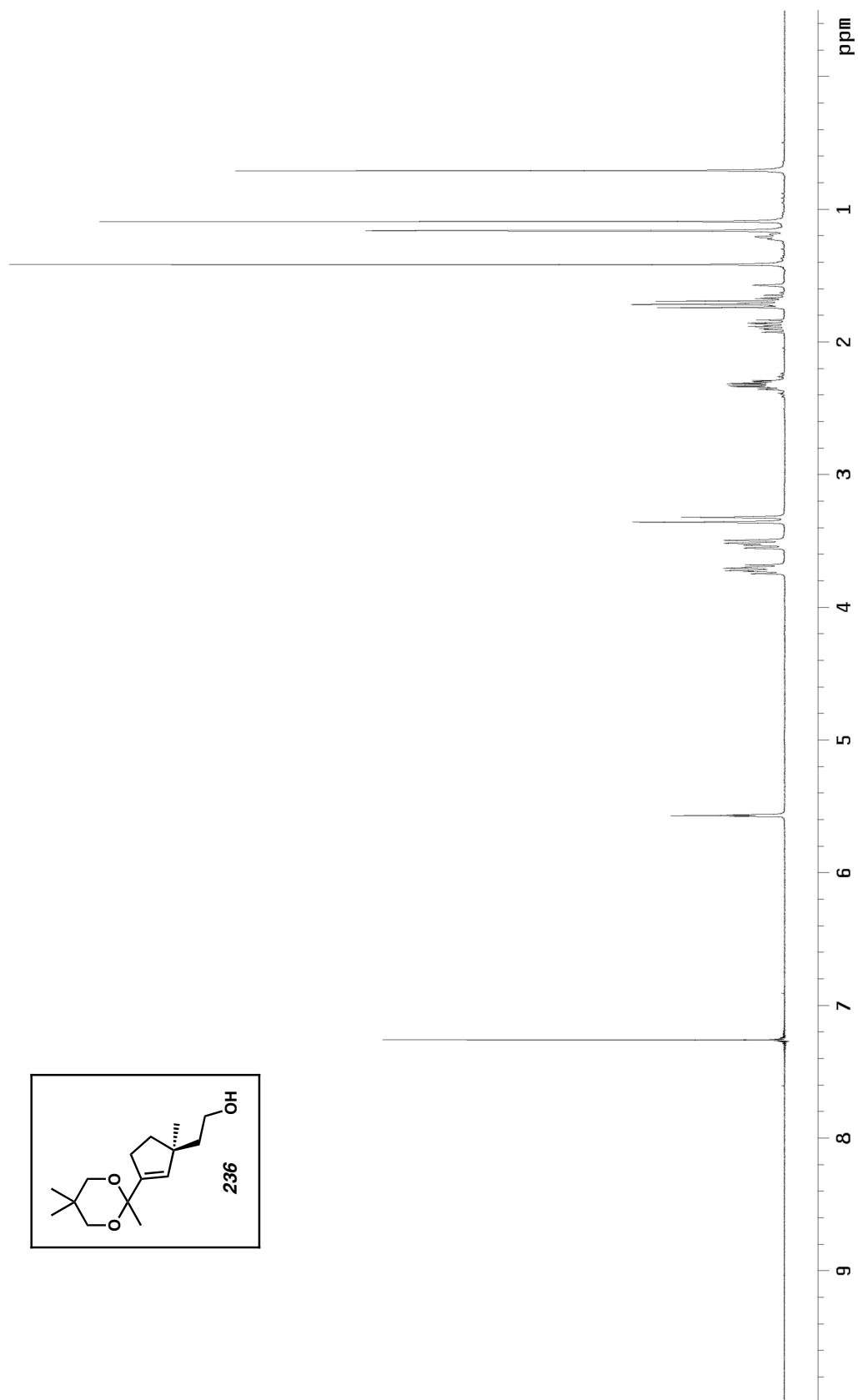


Figure A2.115. ¹³C NMR spectrum (75 MHz, CDCl₃) of **235**.

Figure A2.116. ^1H NMR spectrum (500 MHz, CDCl_3) of **236**.

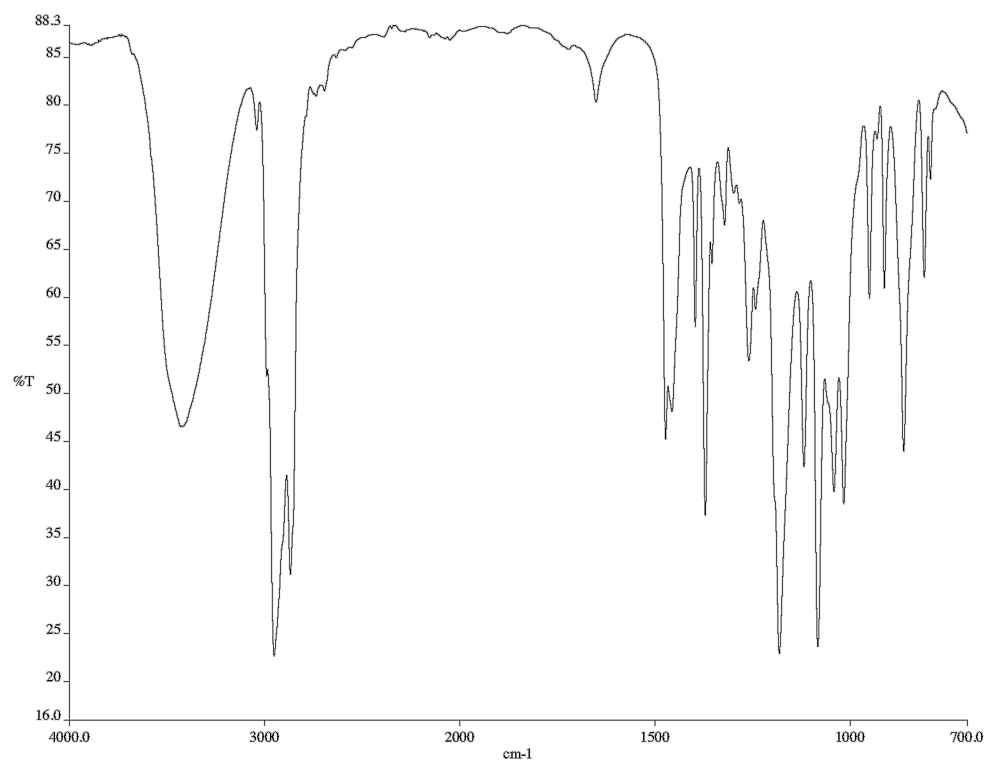


Figure A2.117. Infrared spectrum (neat film/NaCl) of **236**.

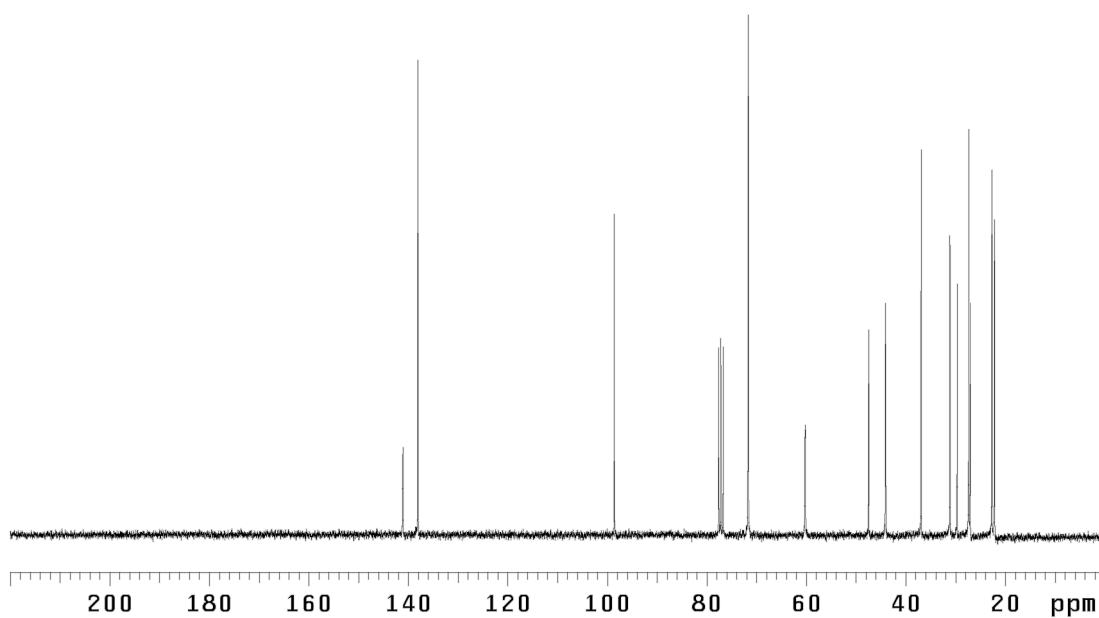
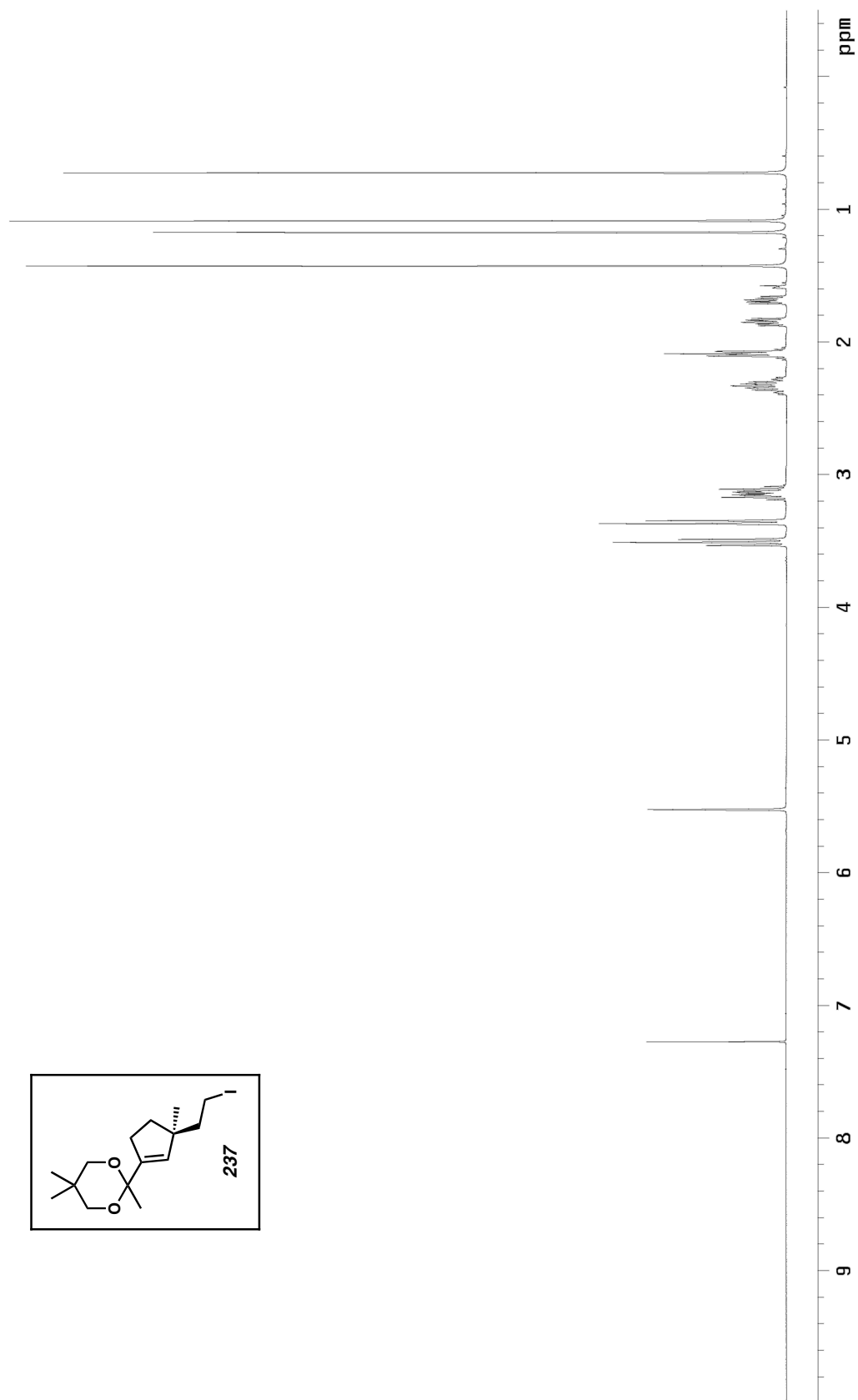


Figure A2.118. ¹³C NMR spectrum (75 MHz, CDCl₃) of **236**.

Figure A2.119. ^1H NMR spectrum (500 MHz, CDCl_3) of **237**.

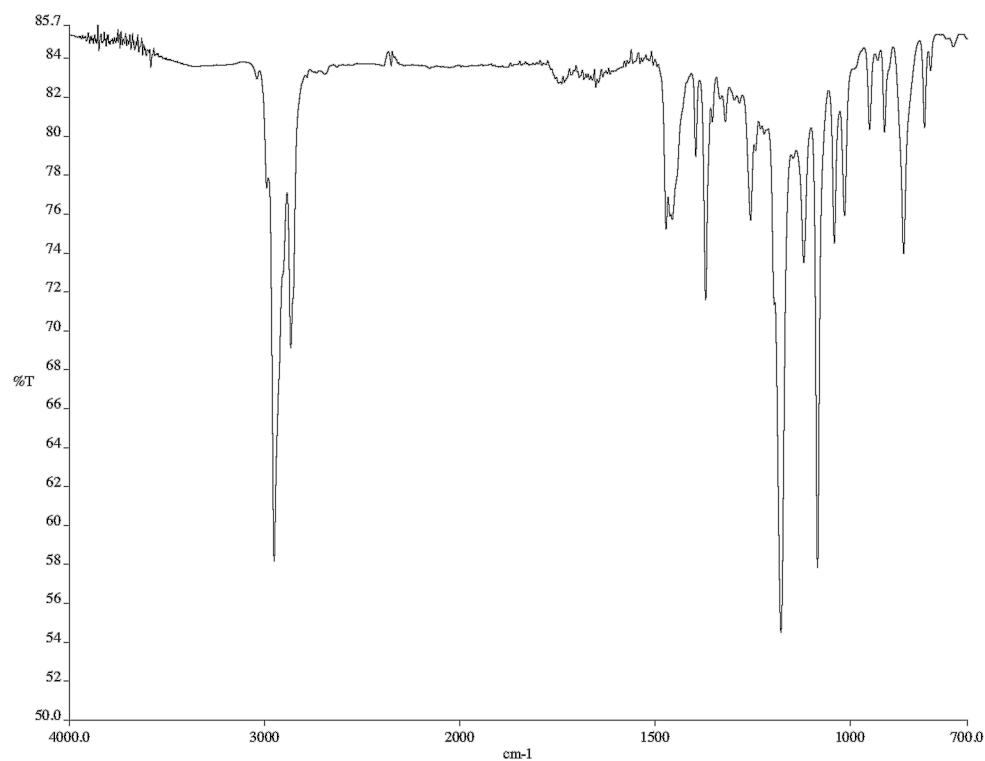


Figure A2.120. Infrared spectrum (neat film/NaCl) of **237**.

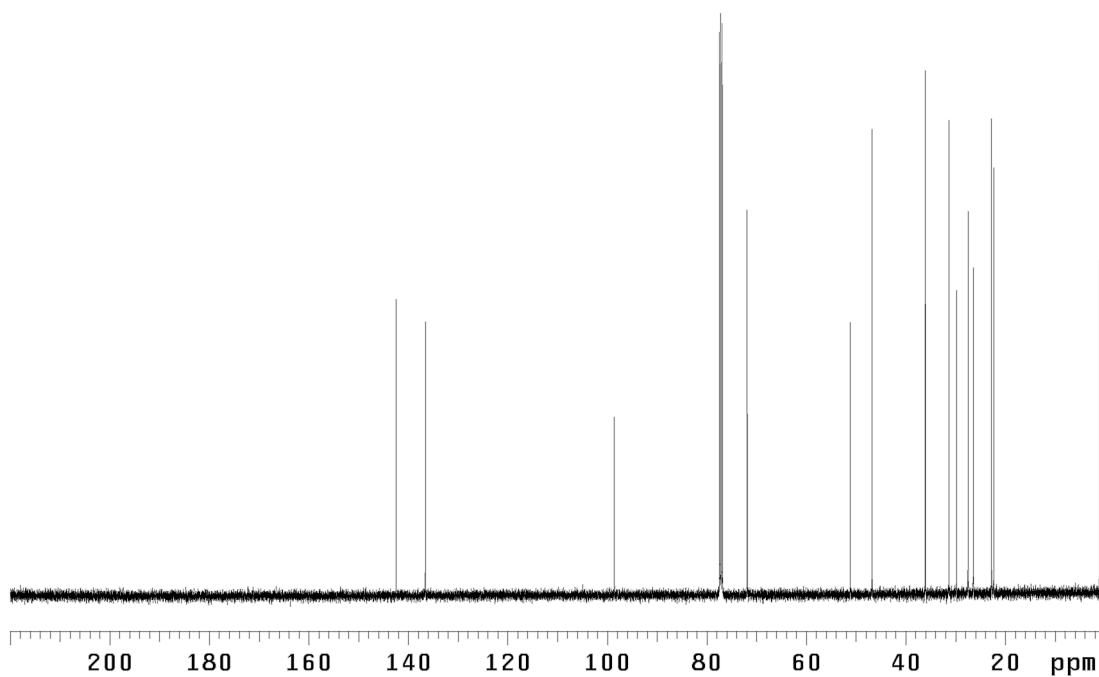
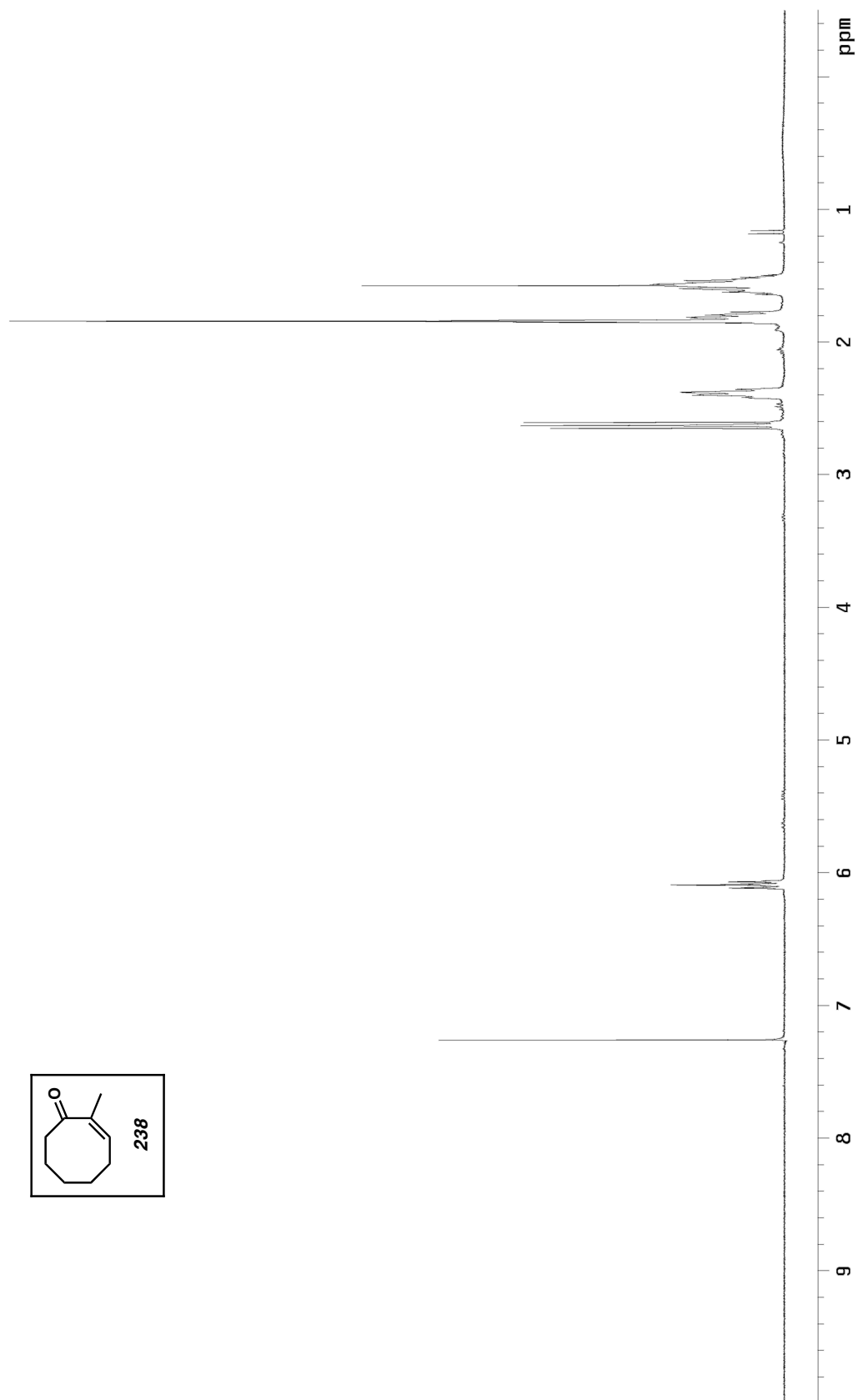


Figure A2.121. ¹³C NMR spectrum (126 MHz, CDCl₃) of **237**.

Figure A2.122. ^1H NMR spectrum (300 MHz, CDCl_3) of **238**.

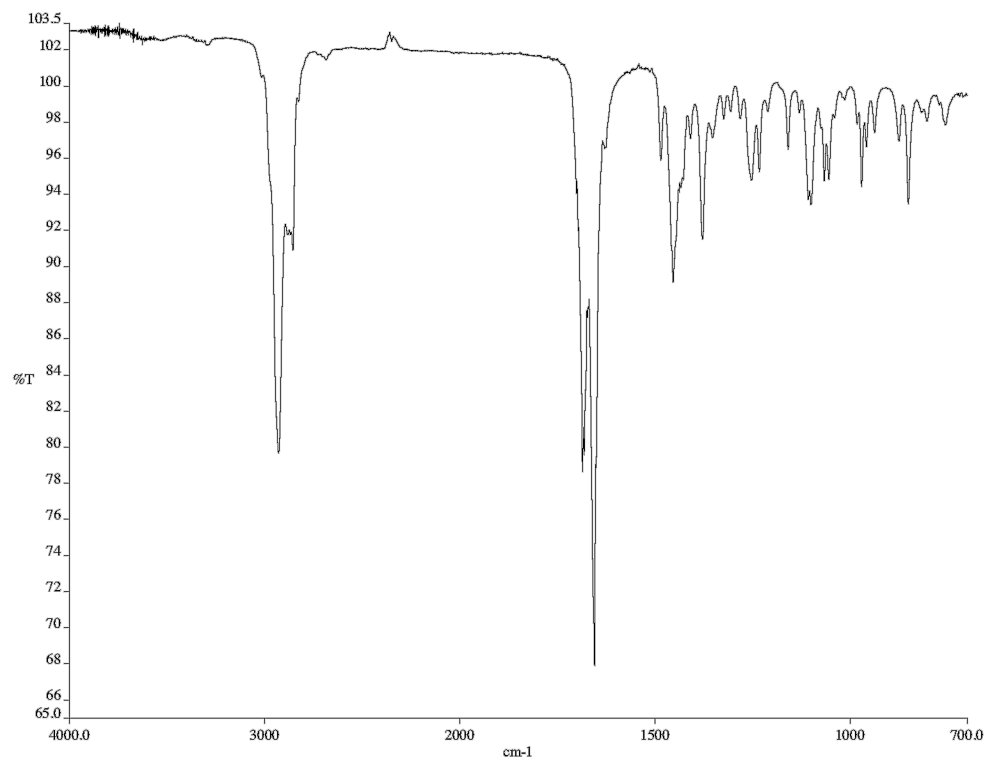


Figure A2.123. Infrared spectrum (neat film/NaCl) of **238**.

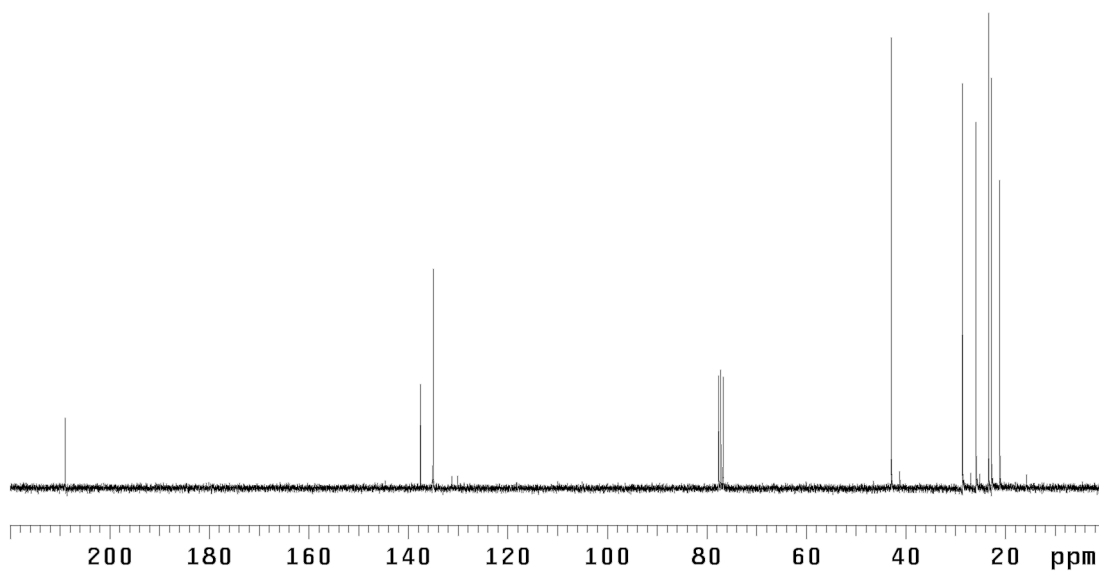


Figure A2.124. ¹³C NMR spectrum (75 MHz, CDCl₃) of **238**.

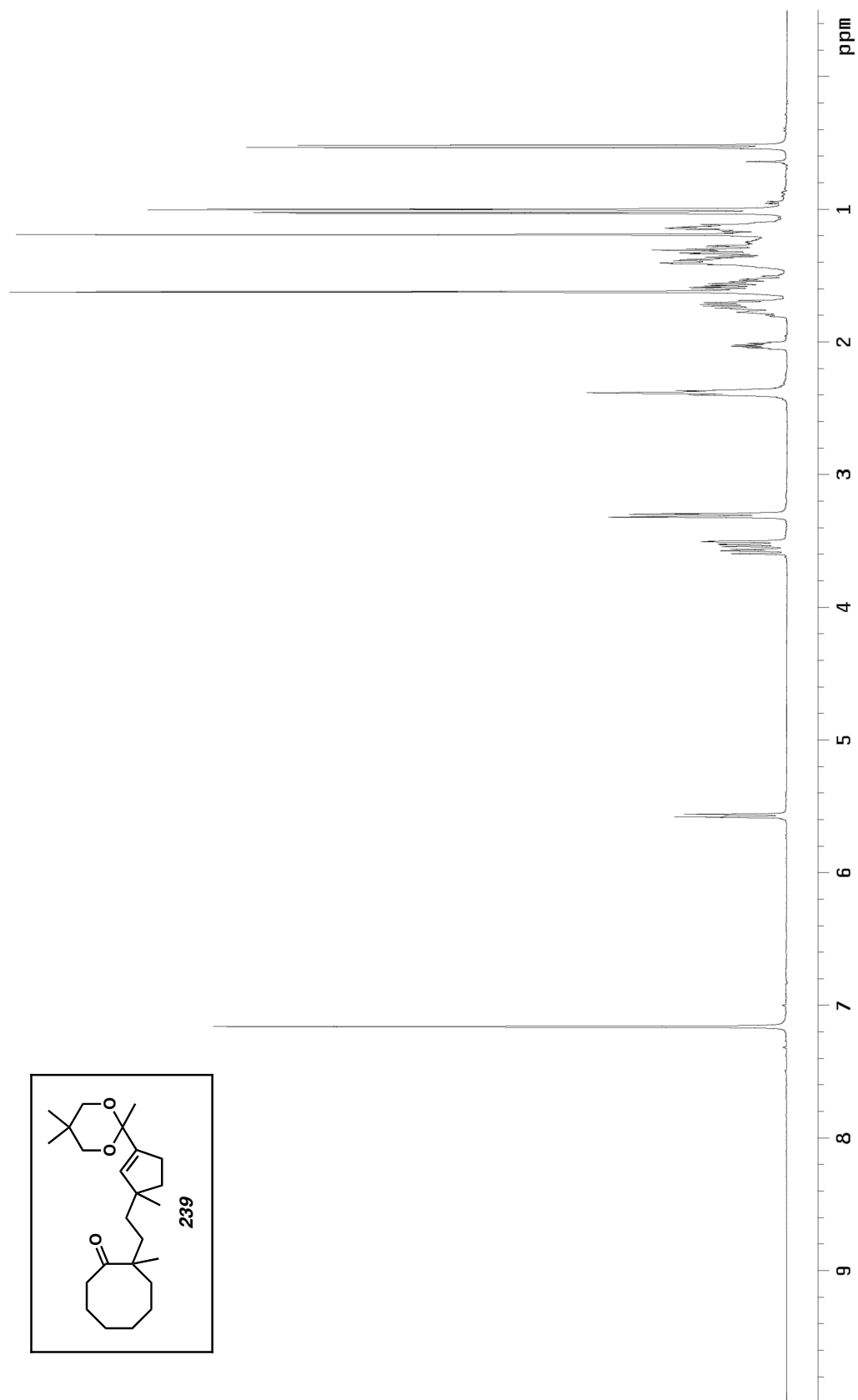


Figure A2.125. ^1H NMR spectrum (500 MHz, CDCl_3) of **239**.

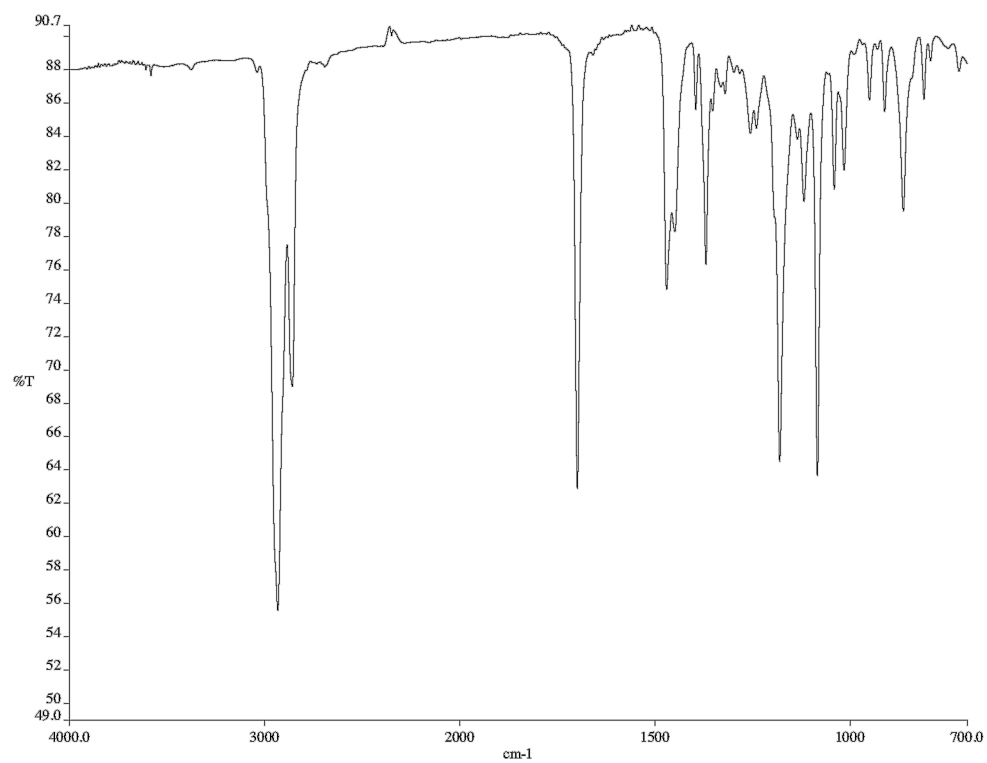


Figure A2.126. Infrared spectrum (neat film/NaCl) of **239**.

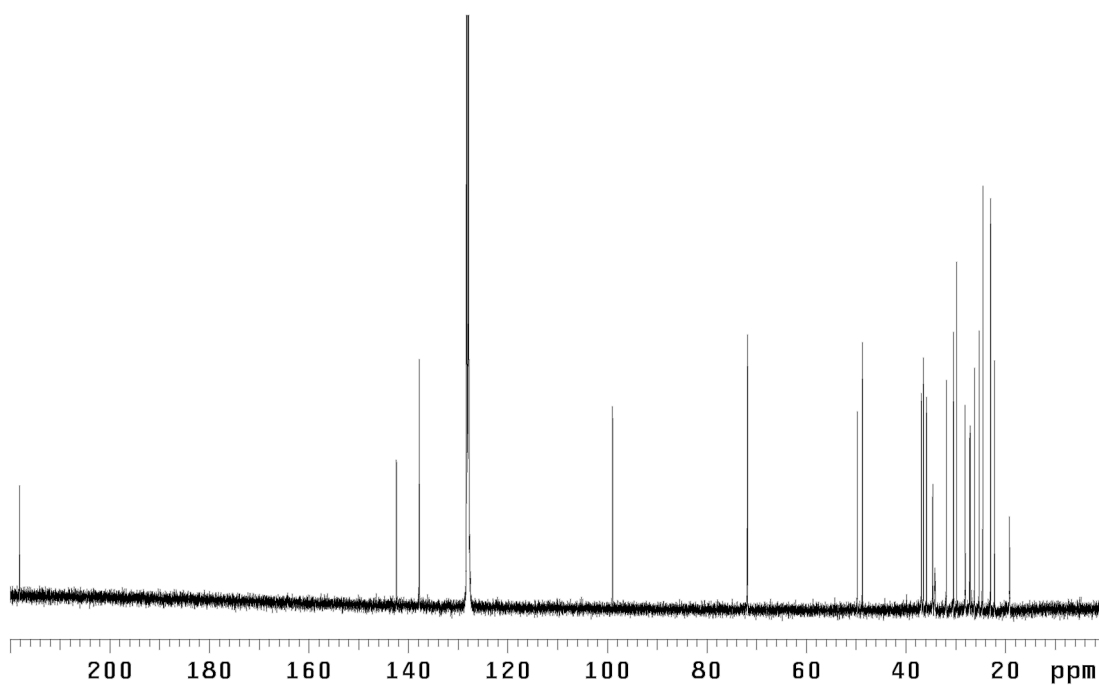
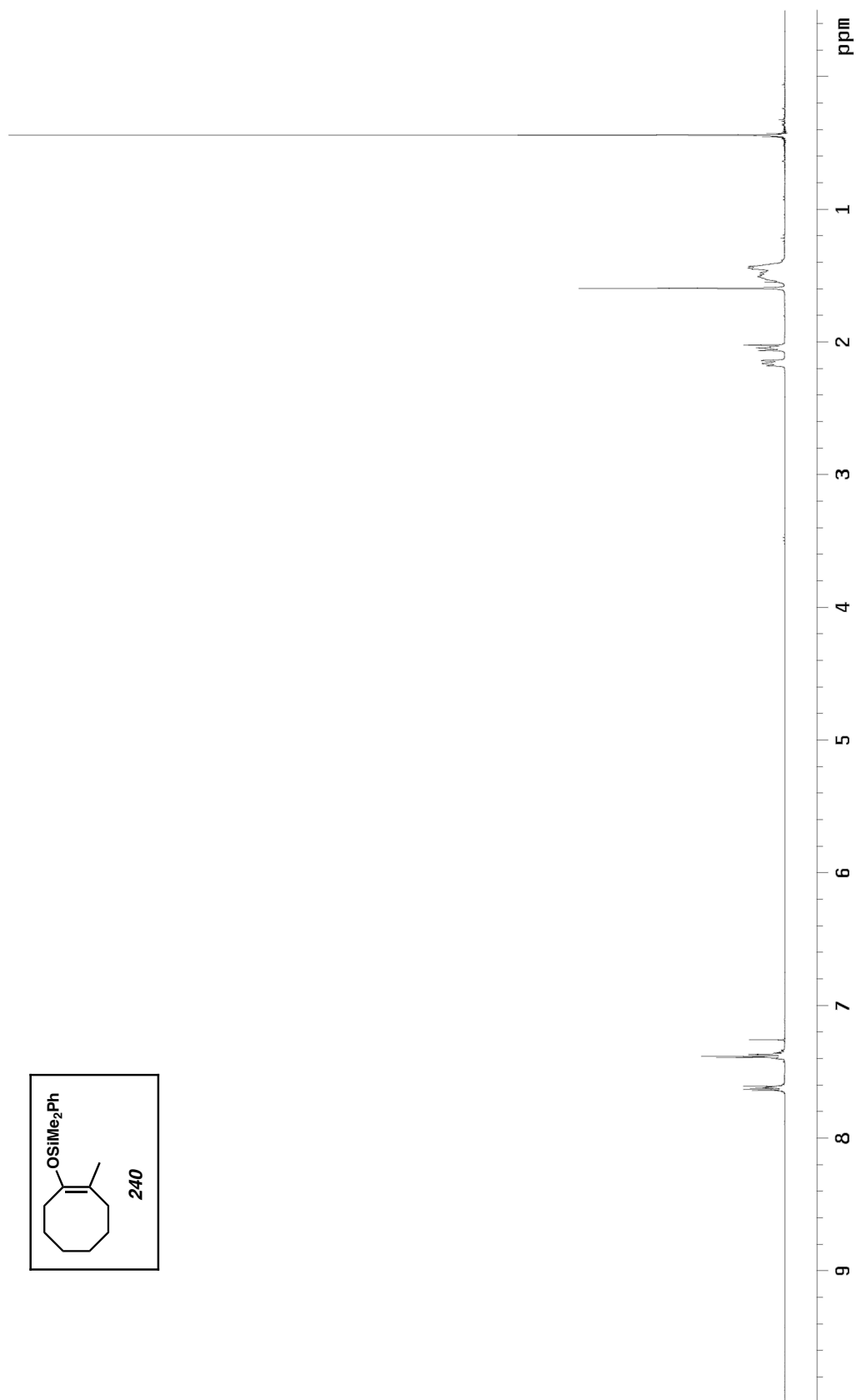


Figure A2.127. ¹³C NMR spectrum (126 MHz, C₆D₆) of **239**.

Figure A2.128. ^1H NMR spectrum (300 MHz, CDCl_3) of **240**.

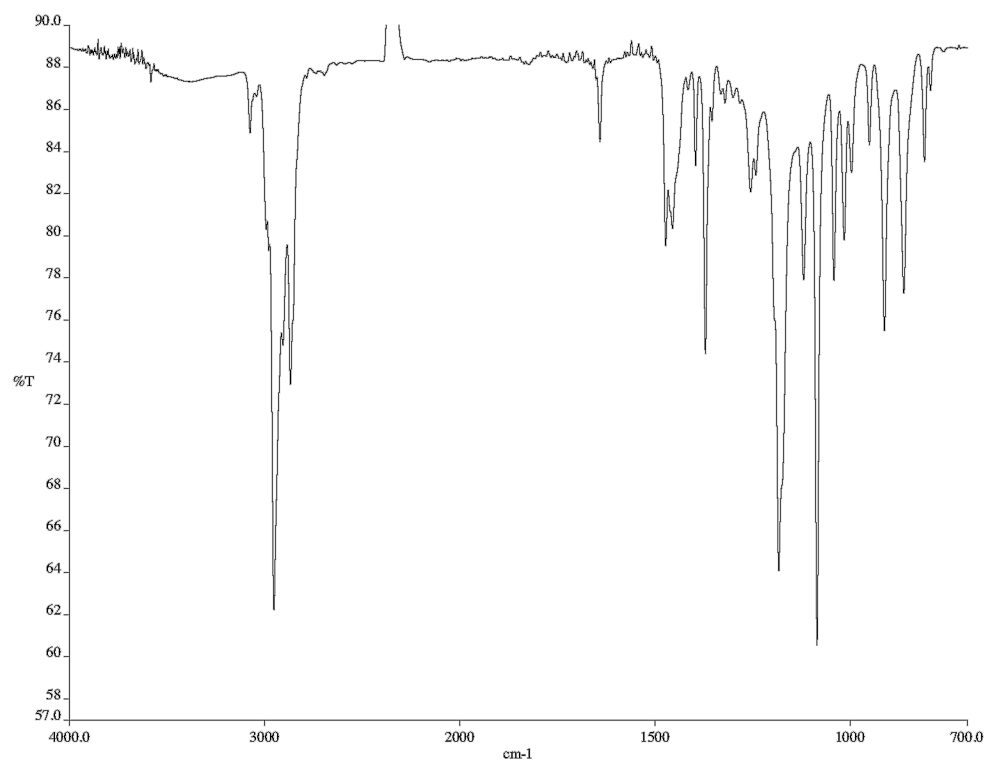


Figure A2.129. Infrared spectrum (neat film/NaCl) of **240**.

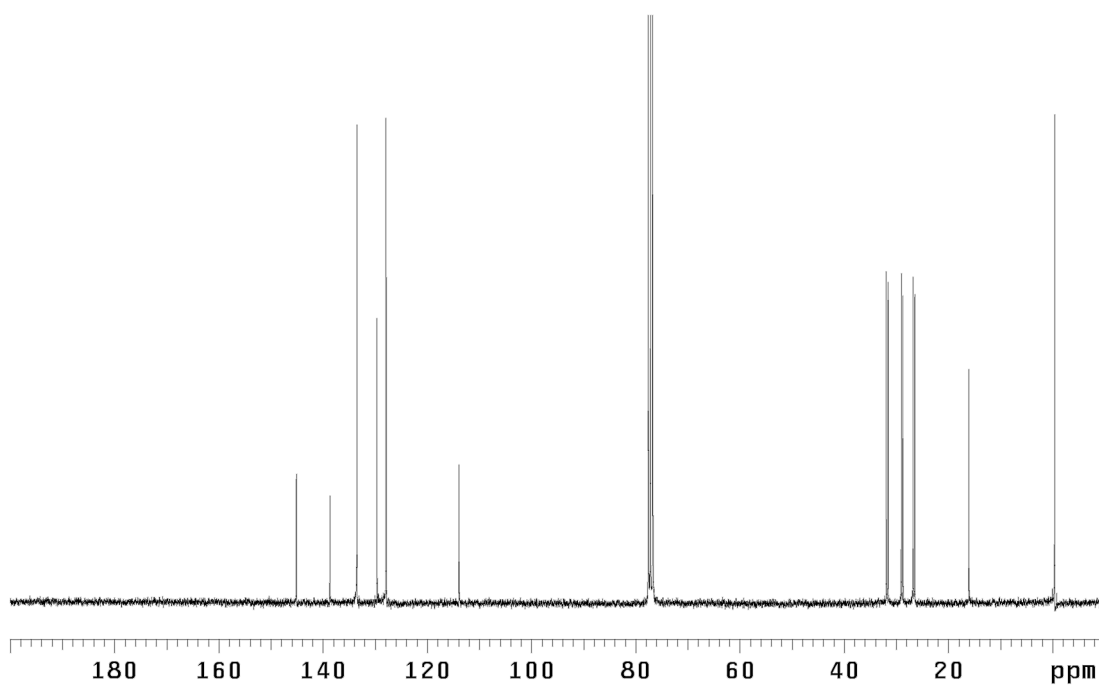
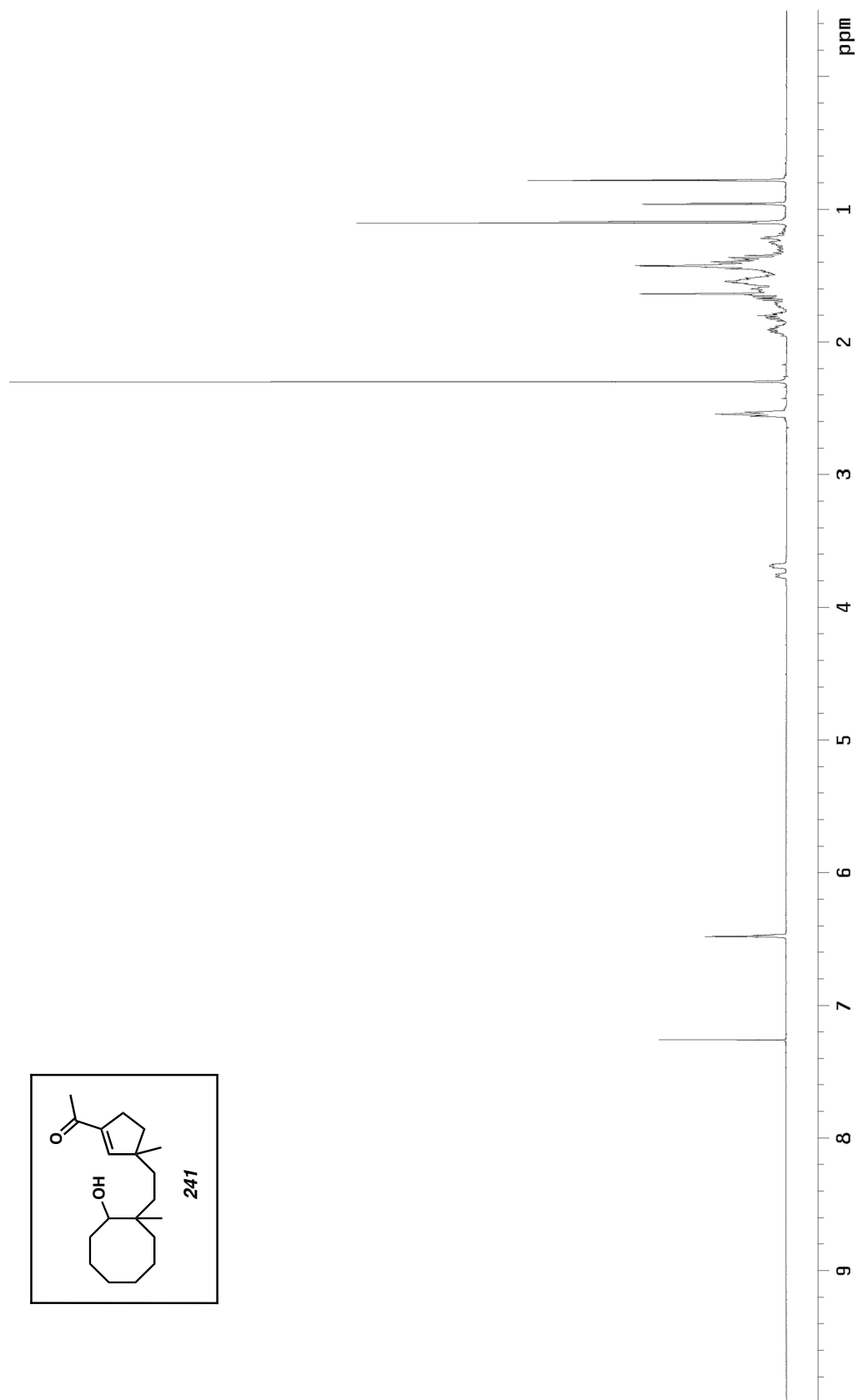


Figure A2.130. ¹³C NMR spectrum (75 MHz, CDCl₃) of **240**.

Figure A2.131. ^1H NMR spectrum (500 MHz, CDCl_3) of **241**.

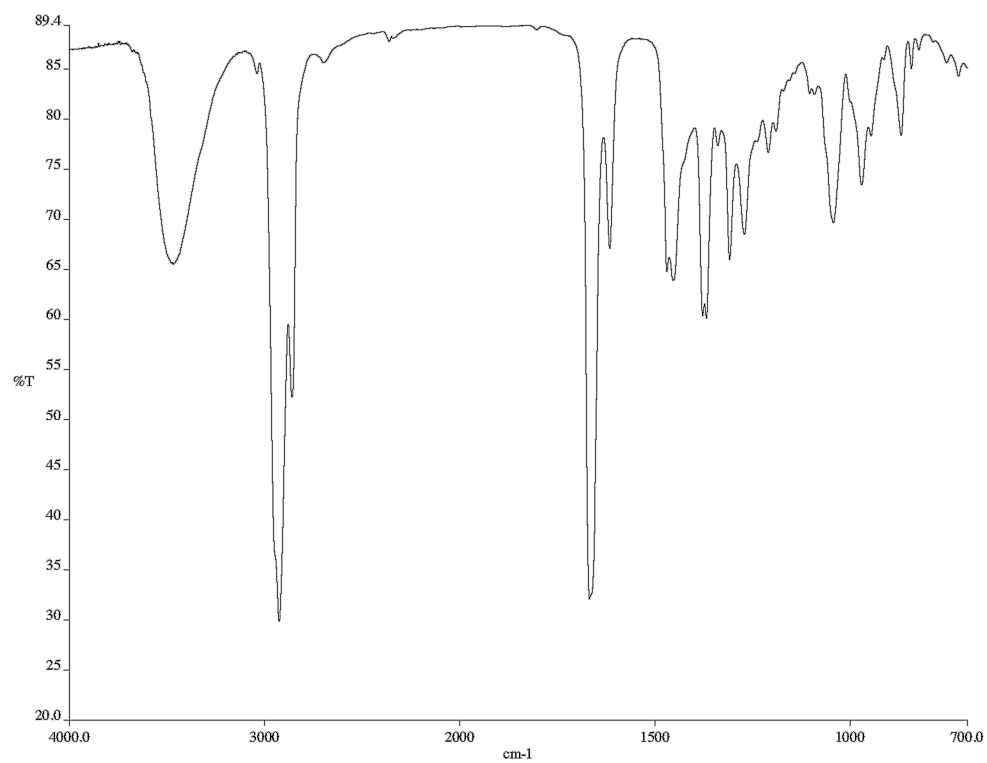


Figure A2.132. Infrared spectrum (neat film/NaCl) of **241**.

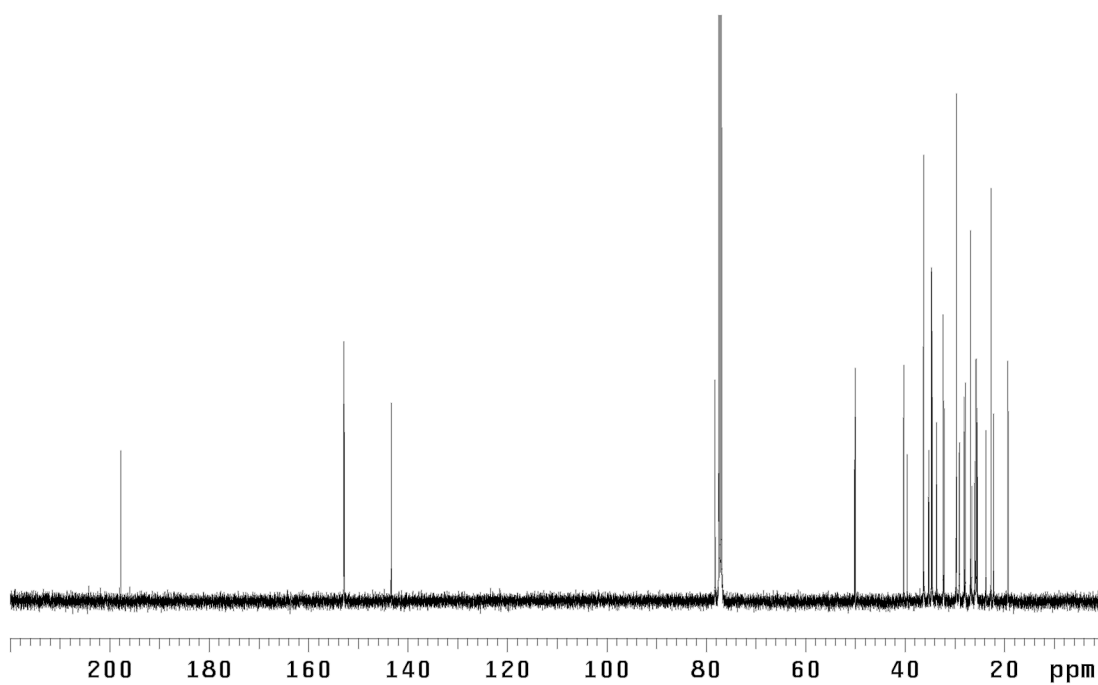
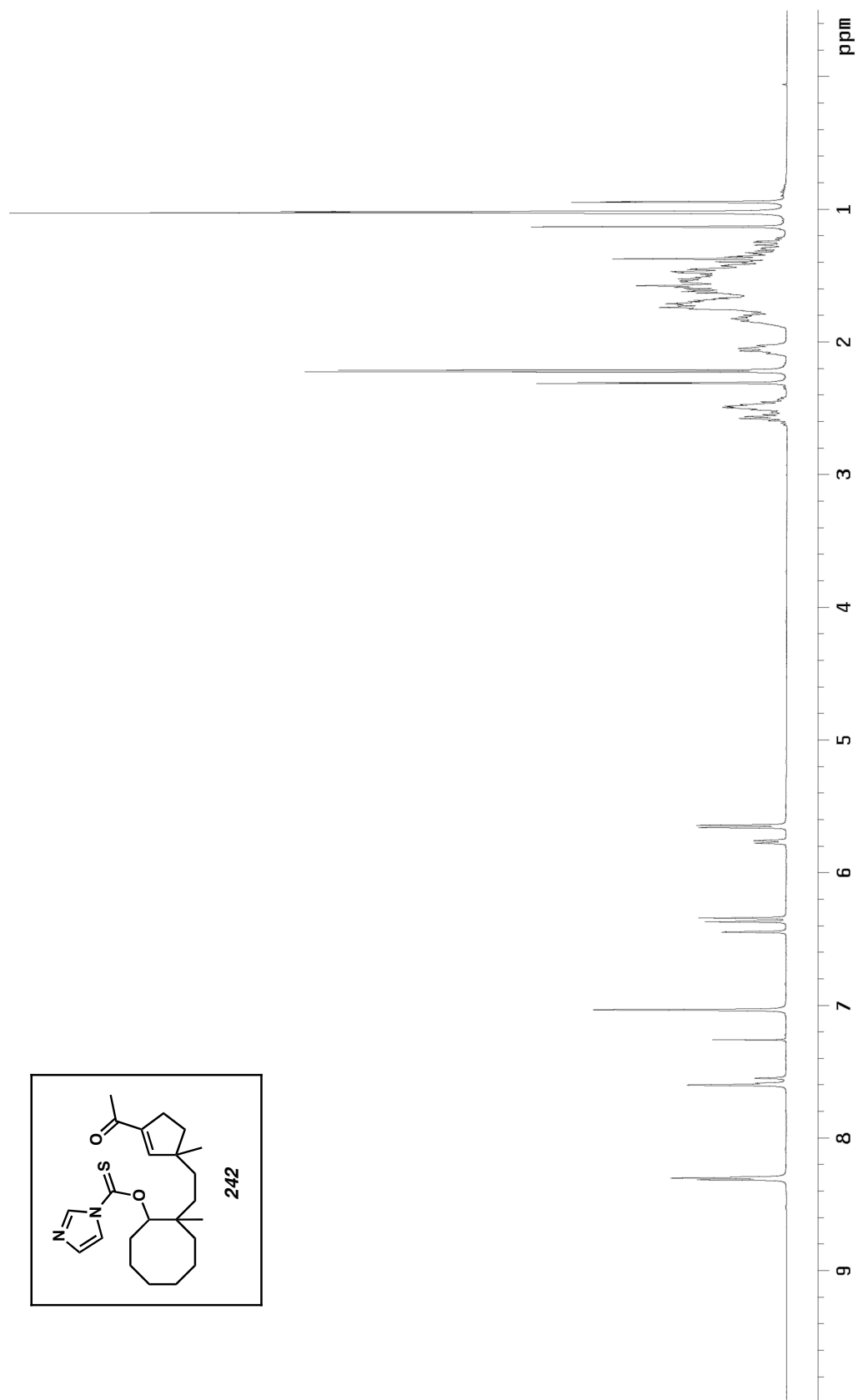


Figure A2.133. ¹³C NMR spectrum (126 MHz, CDCl₃) of **241**.

Figure A2.134. ^1H NMR spectrum (500 MHz, CDCl_3) of **242**.

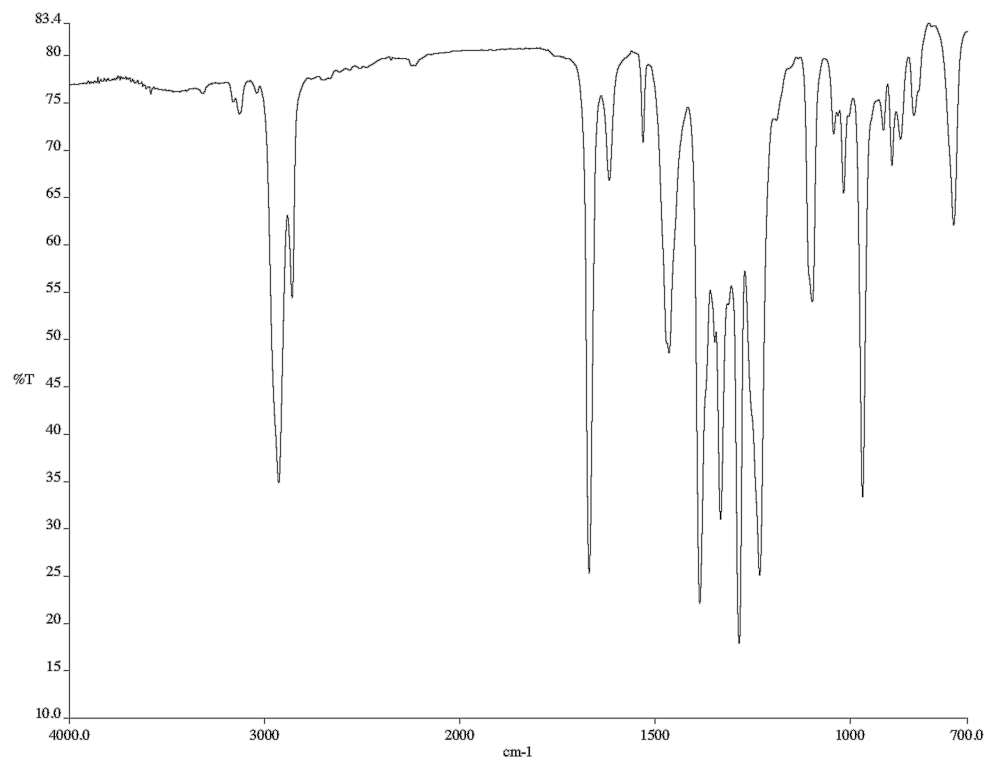


Figure A2.135. Infrared spectrum (neat film/NaCl) of **242**.

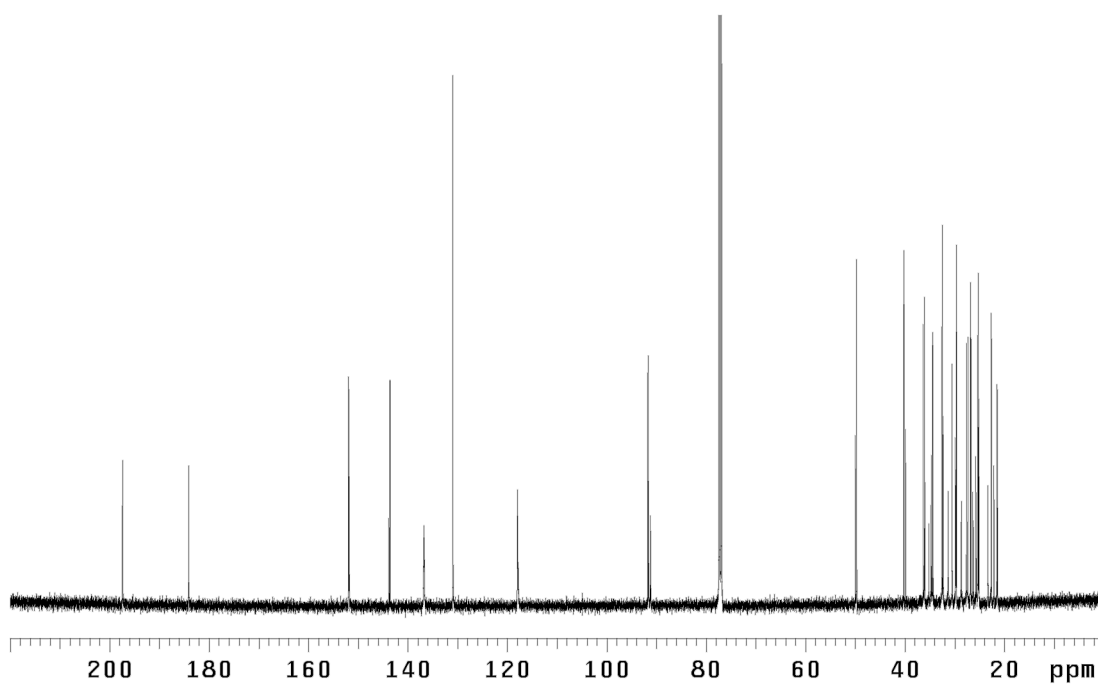


Figure A2.136. ¹³C NMR spectrum (126 MHz, CDCl₃) of **242**.

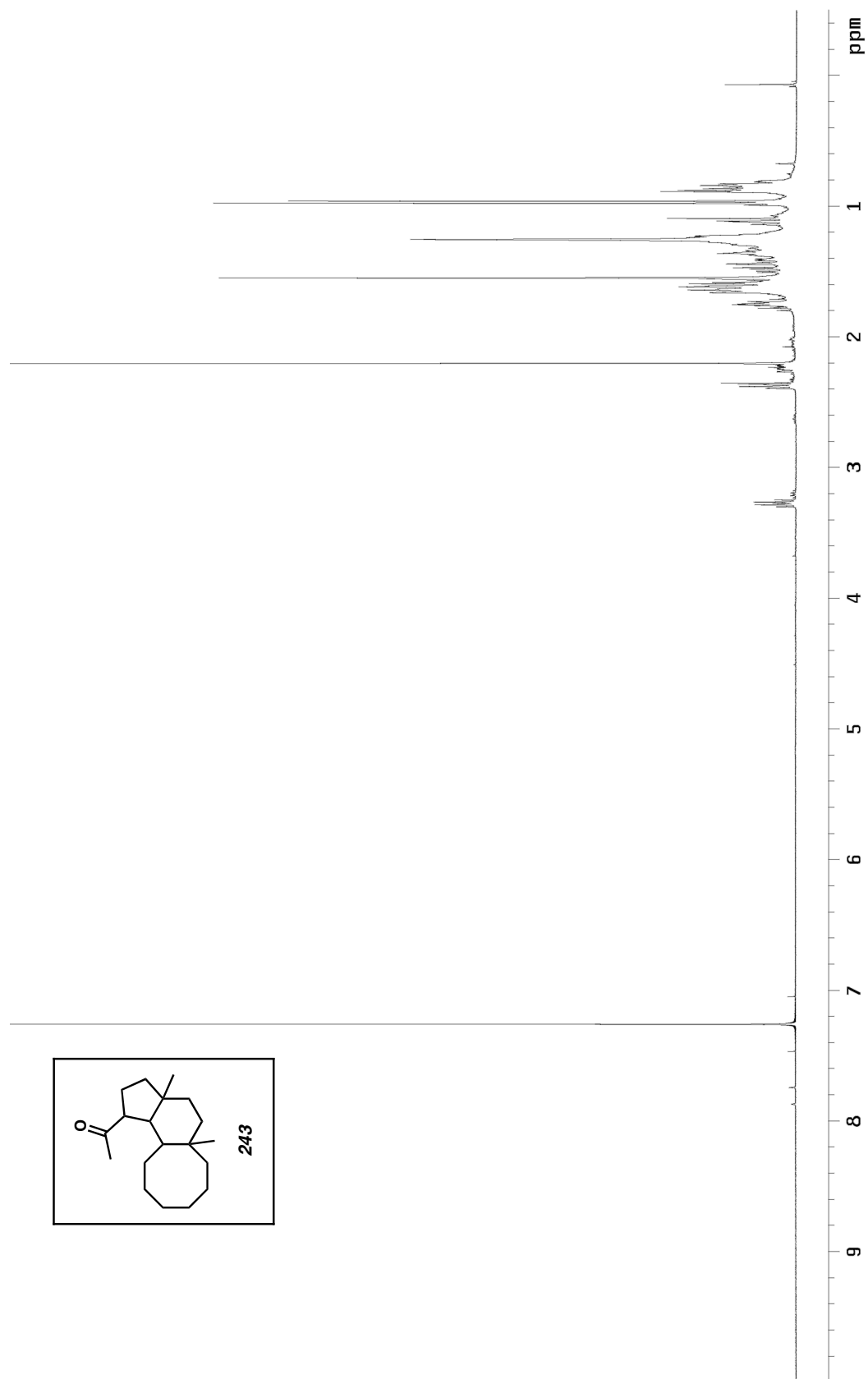


Figure A2.137. ^1H NMR spectrum (500 MHz, CDCl_3) of the major diastereomer of **243**.

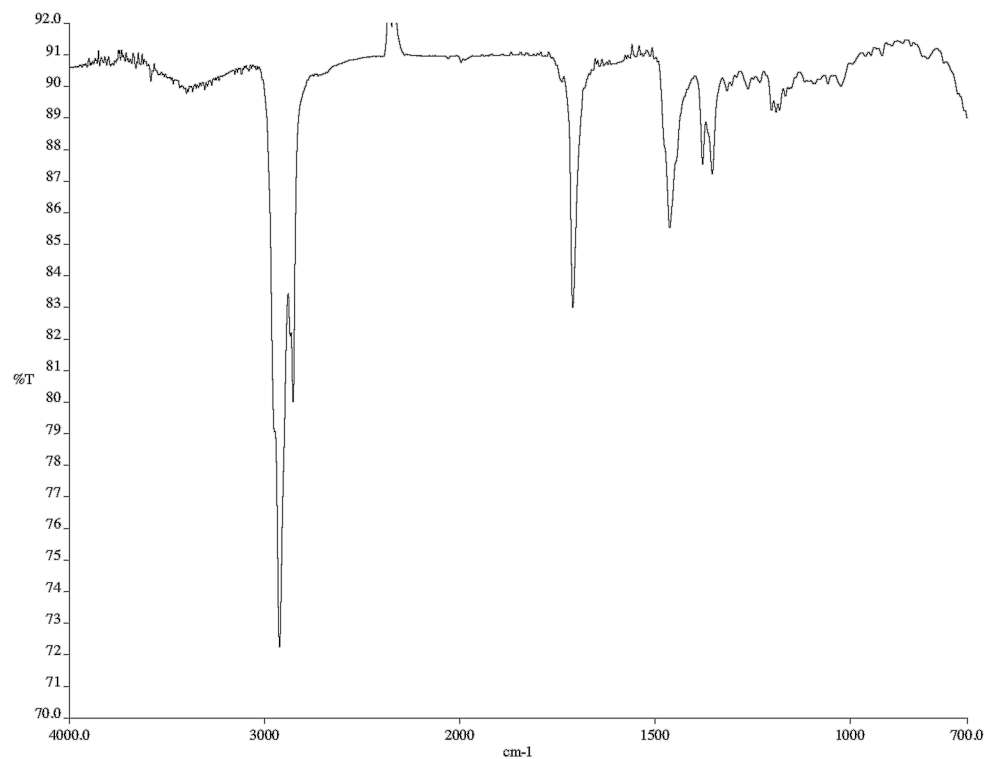


Figure A2.138. Infrared spectrum (neat film/NaCl) of the major diastereomer of **243**.

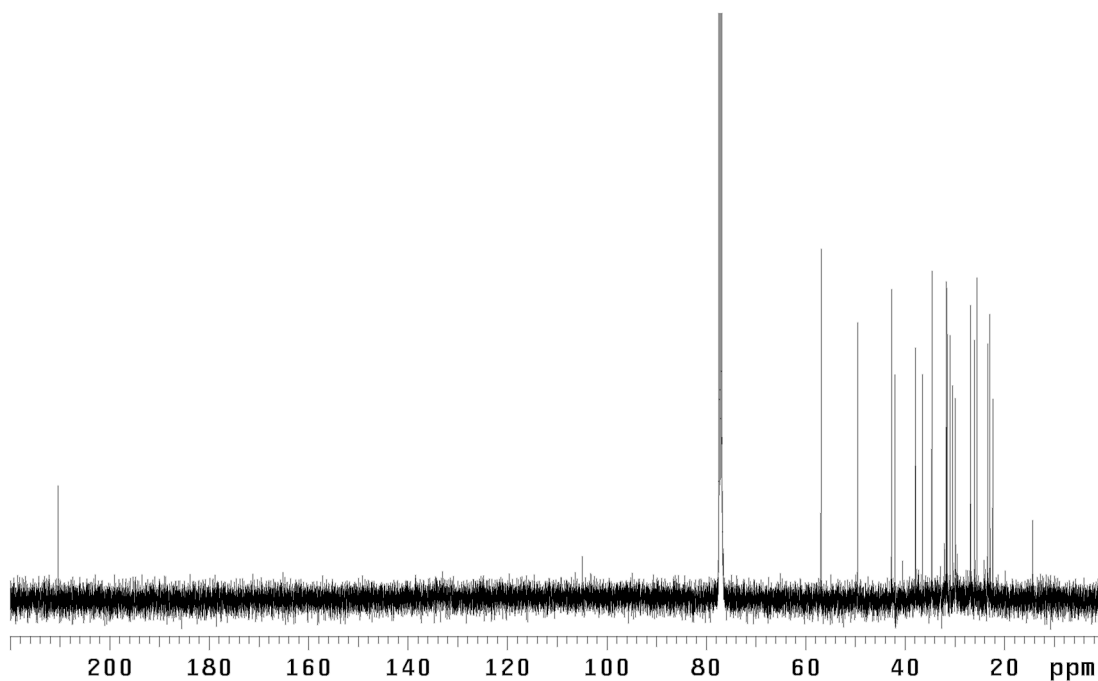


Figure A2.139. ¹³C NMR spectrum (126 MHz, CDCl₃) of the major diastereomer of **243**.

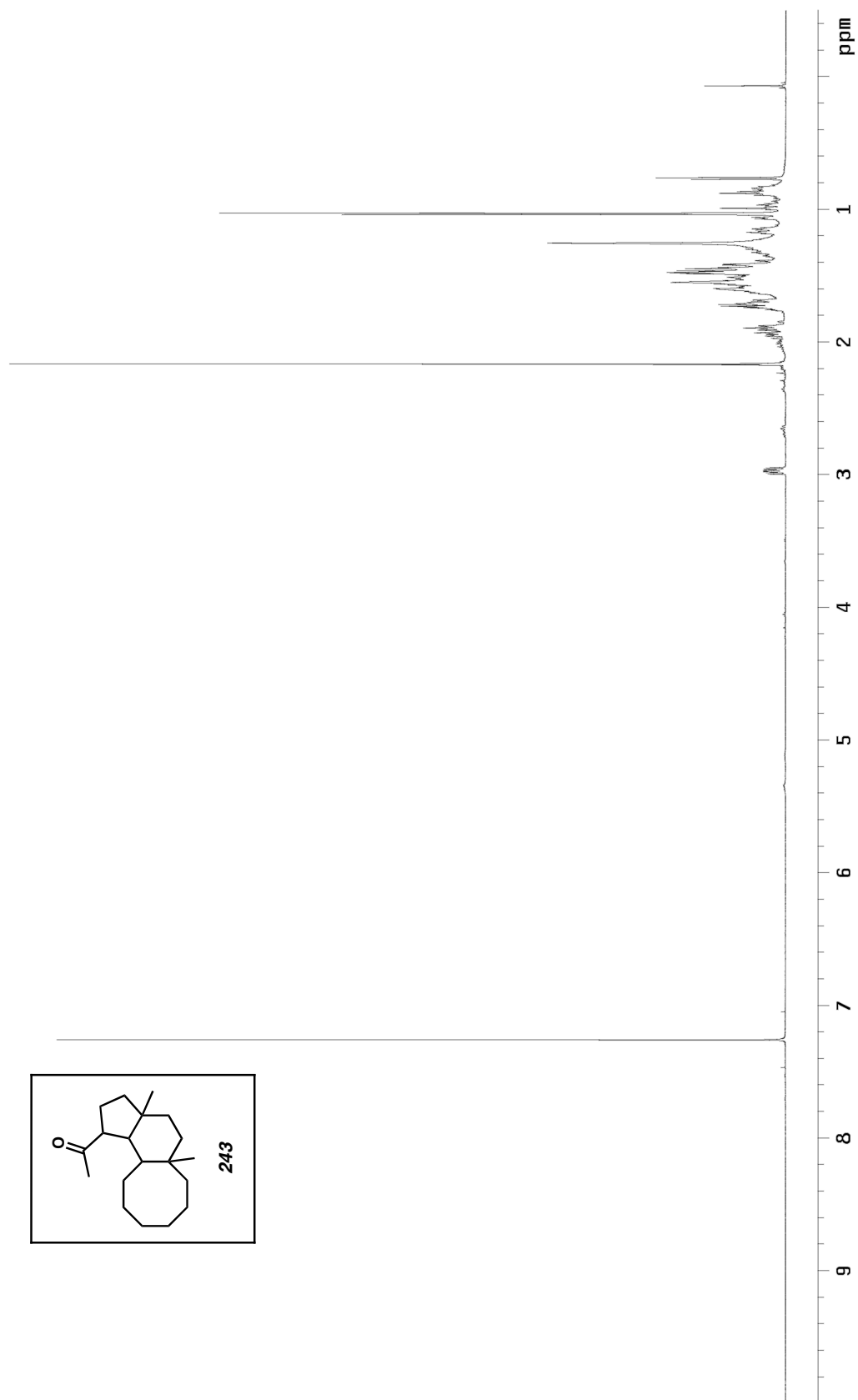


Figure A2.140. ^1H NMR spectrum (500 MHz, CDCl_3) of the minor diastereomer of **243**.

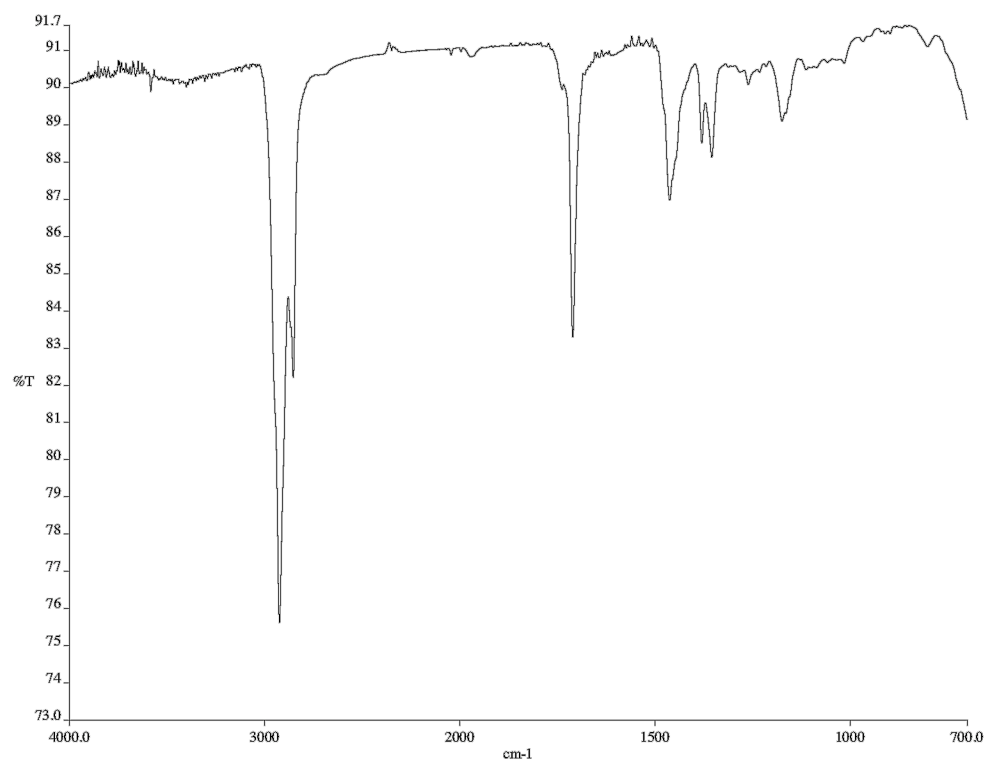


Figure A2.141. Infrared spectrum (neat film/NaCl) of the minor diastereomer of **243**.

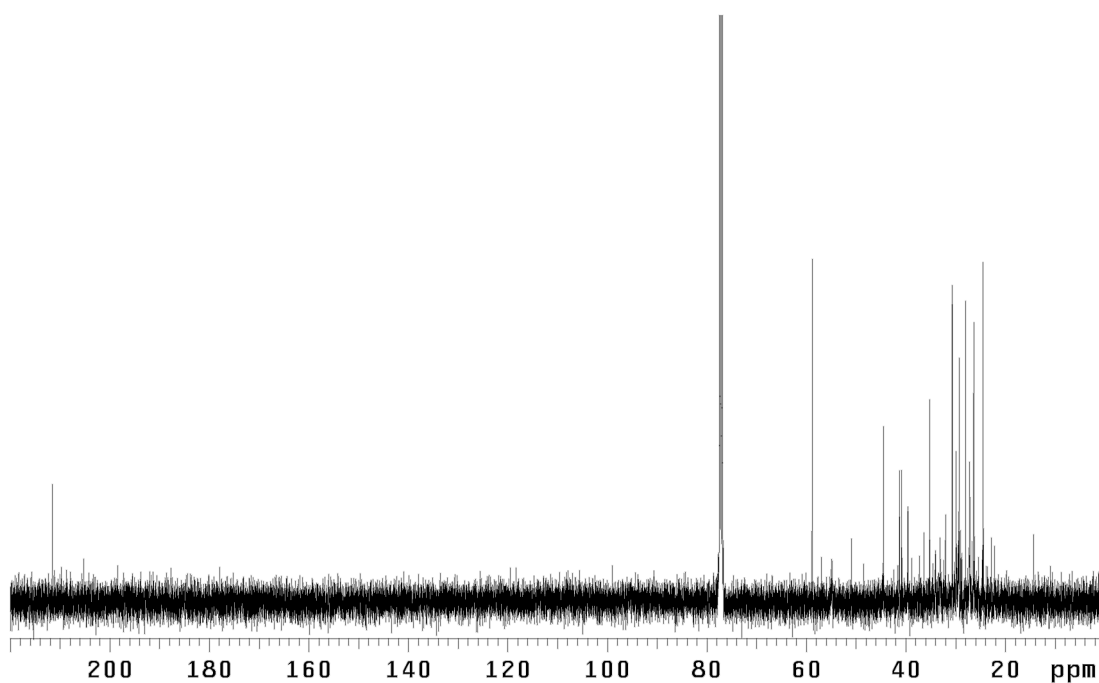
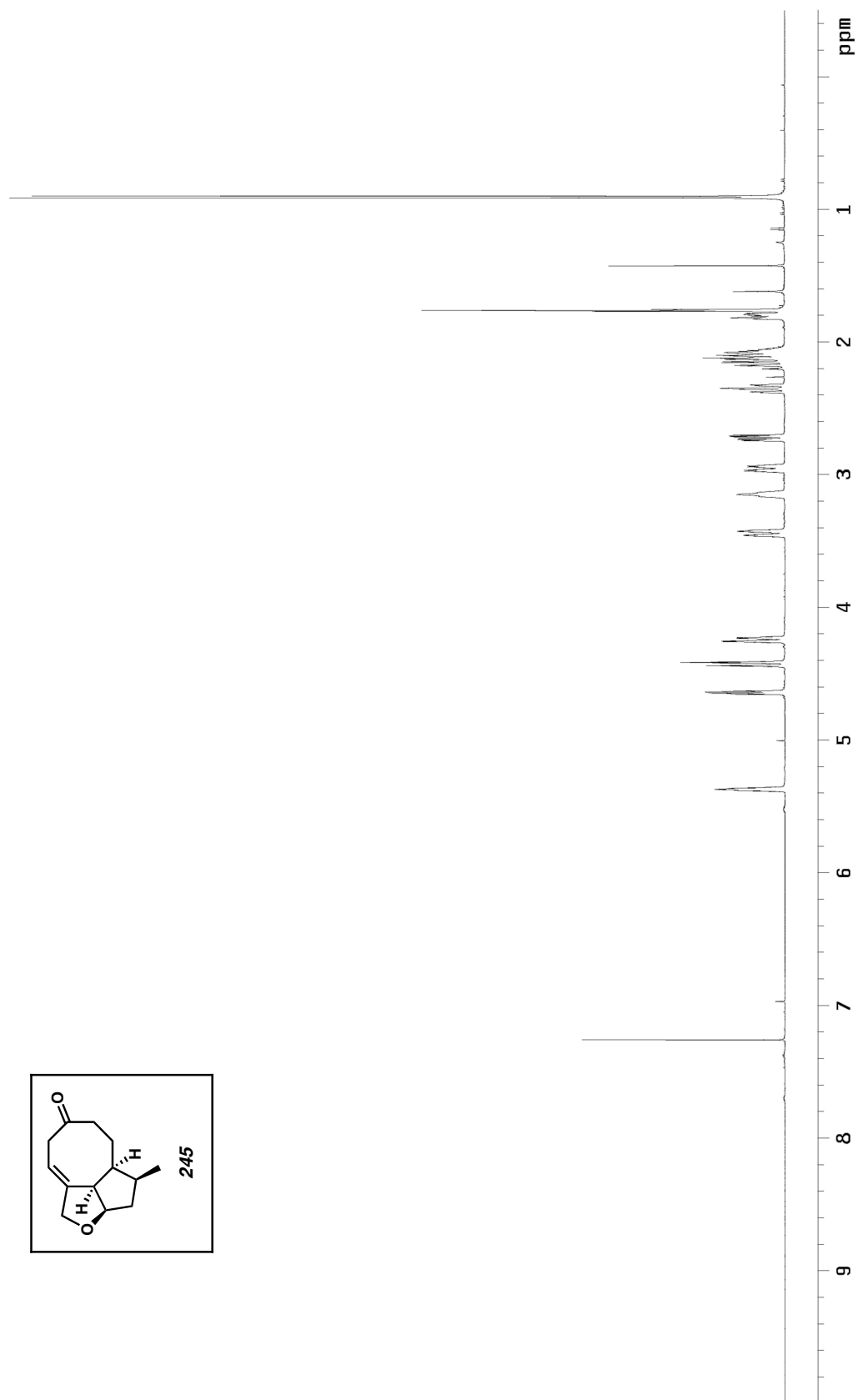


Figure A2.142. ¹³C NMR spectrum (neat film/NaCl) of the minor diastereomer of **243**.

Figure A2.143. ^1H NMR spectrum (500 MHz, CDCl_3) of **245**.

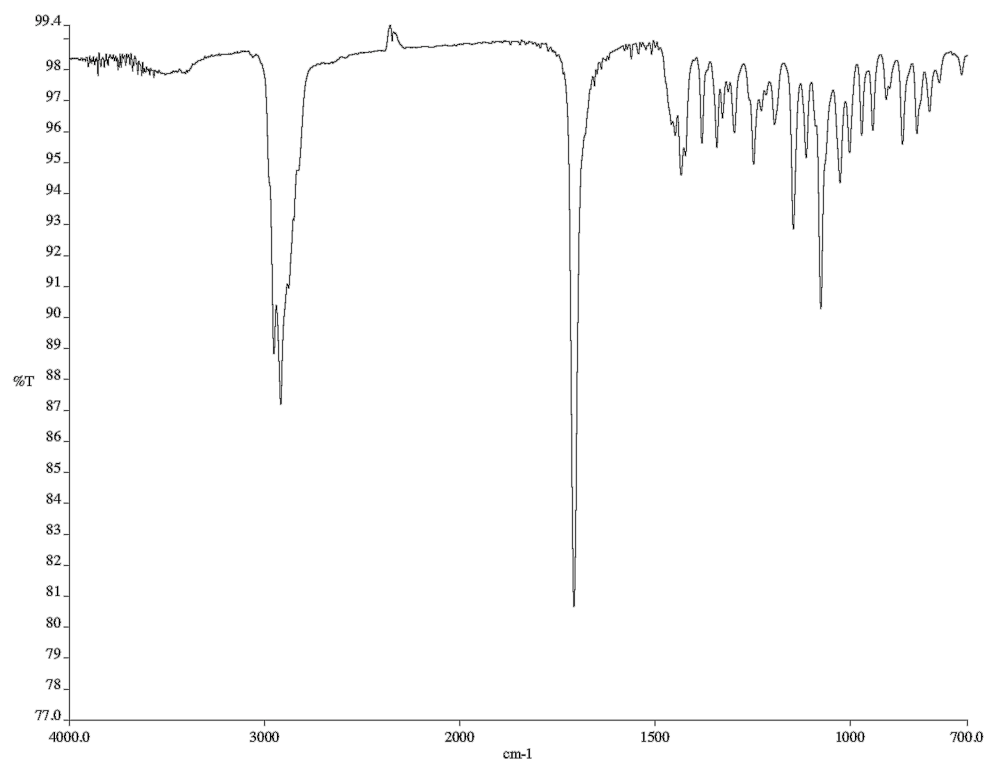


Figure A2.144. Infrared spectrum (neat film/NaCl) of **245**.

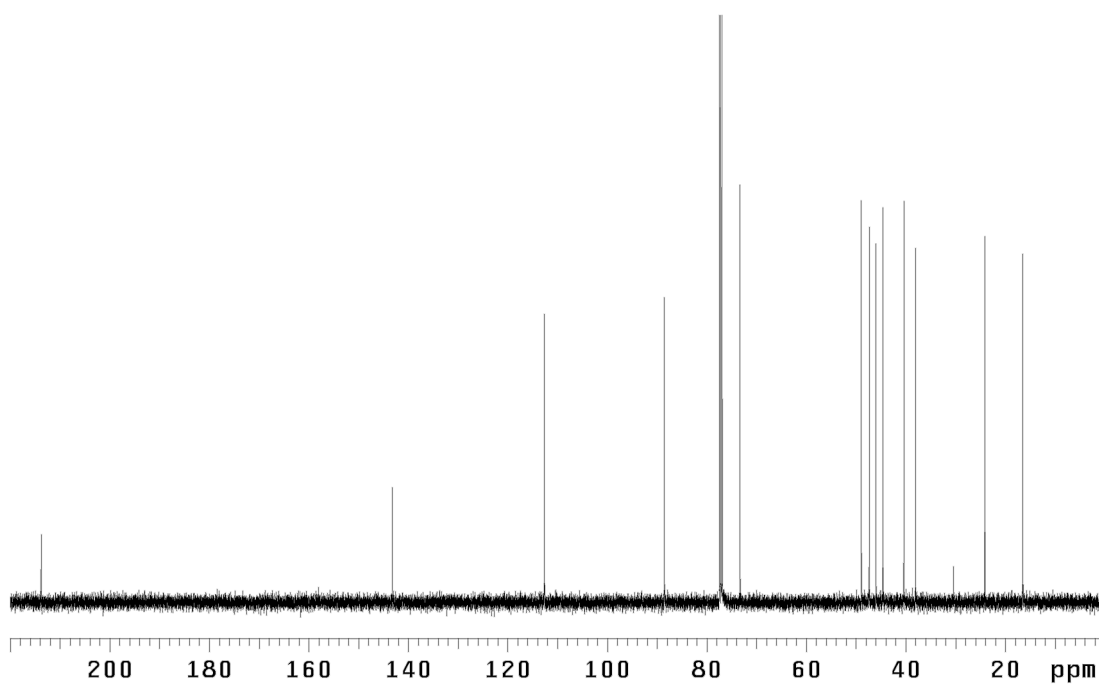
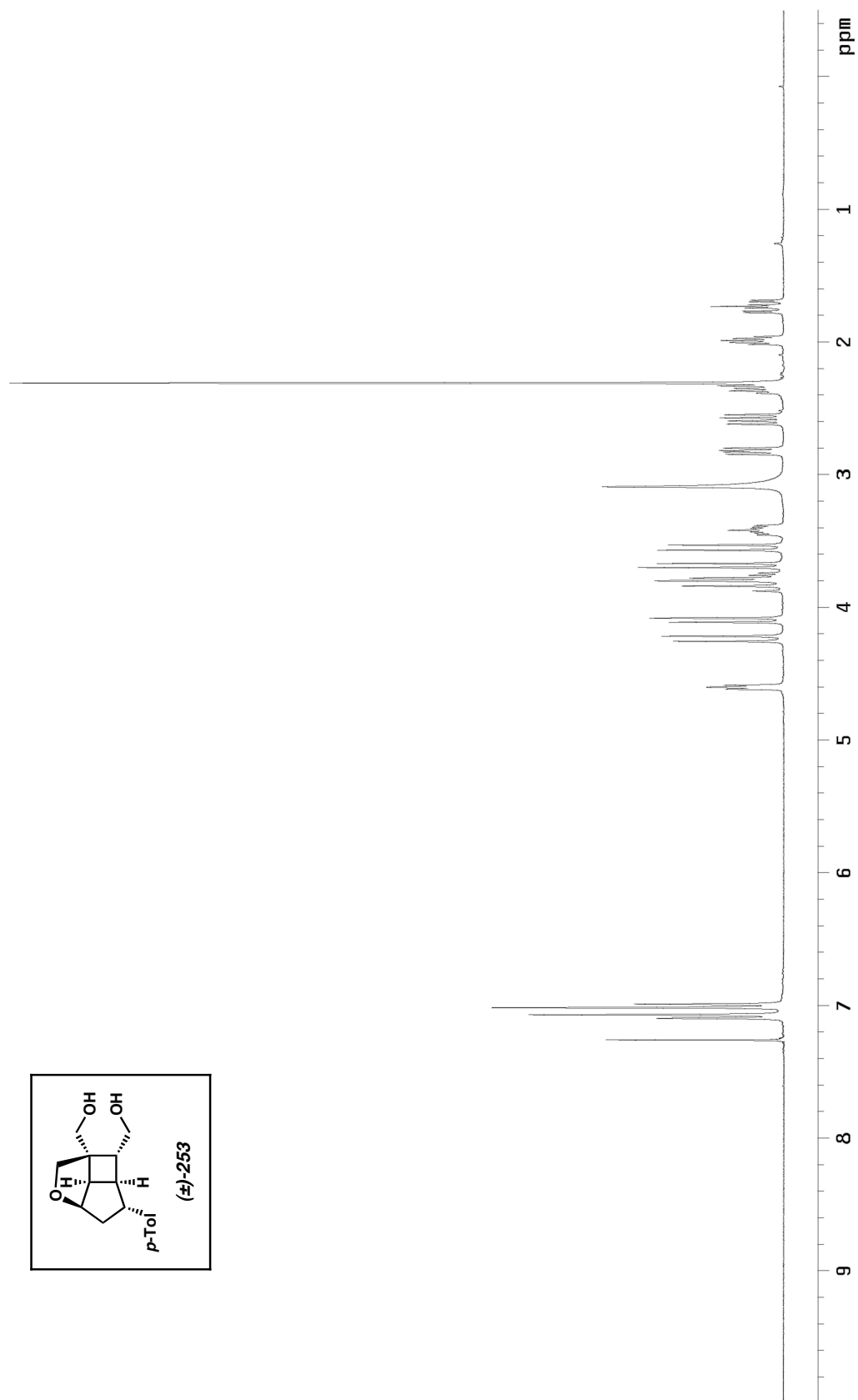


Figure A2.145. ¹³C NMR spectrum (126 MHz, CDCl₃) of **245**.

Figure A2.146. ^1H NMR spectrum (300 MHz, CDCl_3) of **253**.

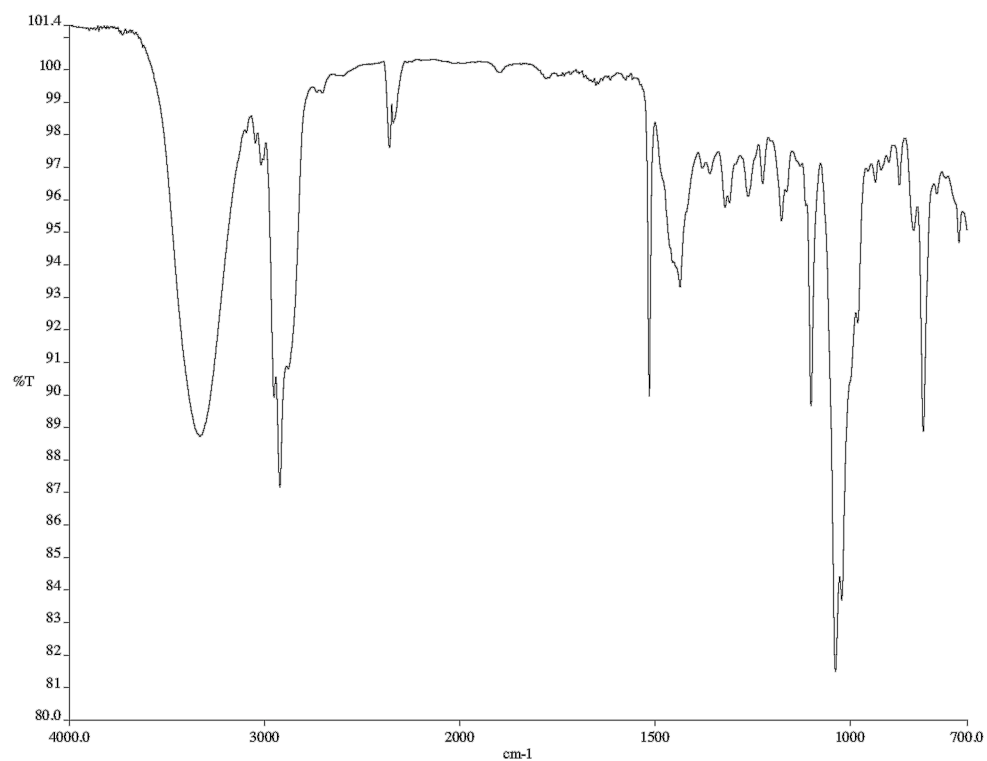


Figure A2.147. Infrared spectrum (neat film/NaCl) of **253**.

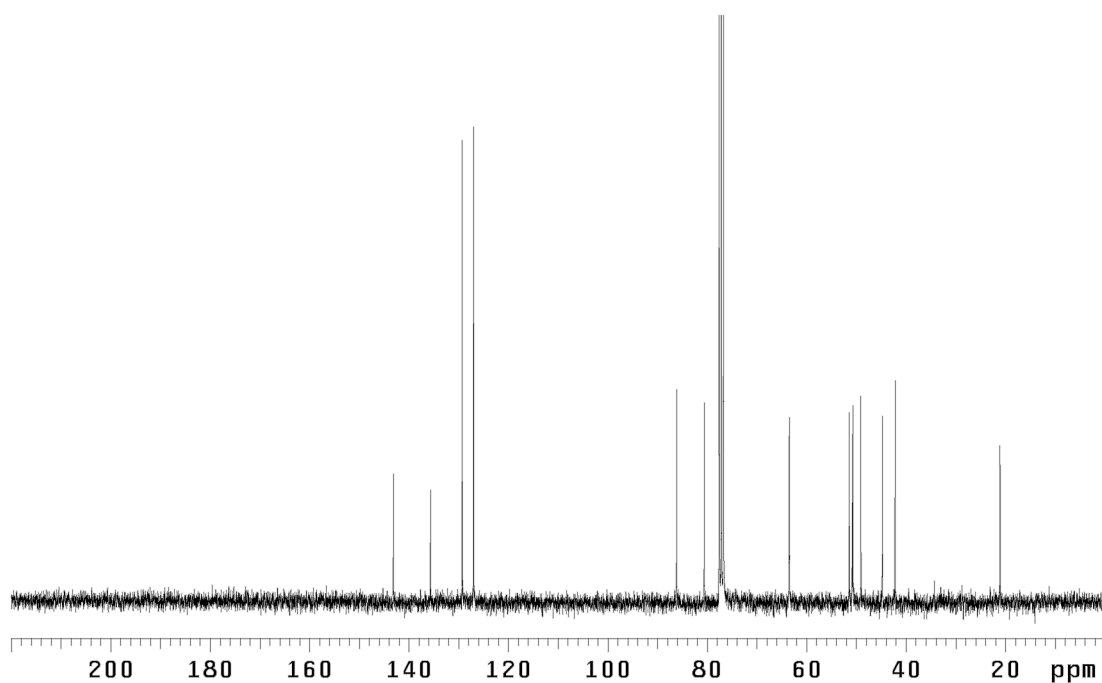
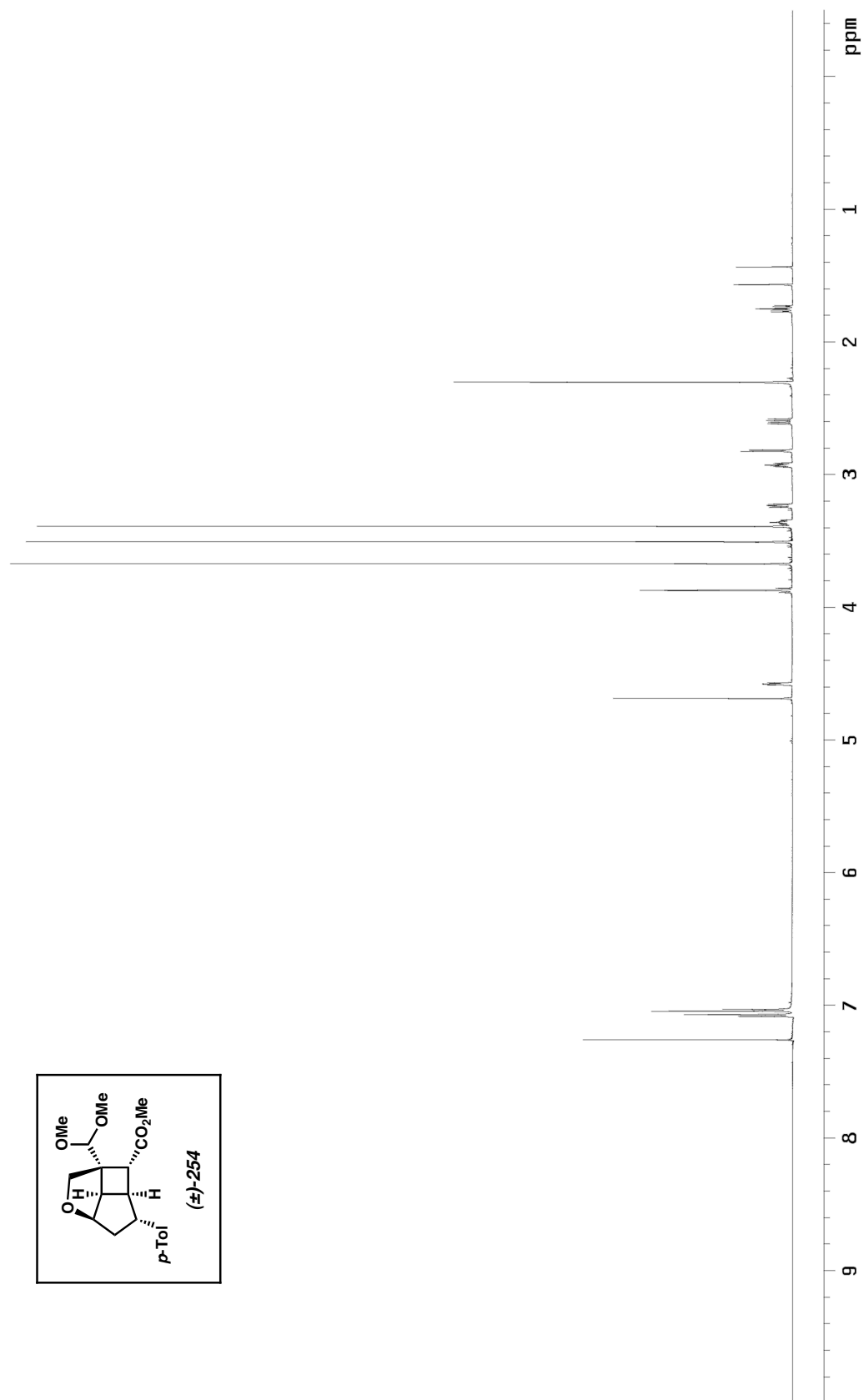


Figure A2.148. ¹³C NMR spectrum (75 MHz, CDCl₃) of **253**.

Figure A2.149. ^1H NMR spectrum (600 MHz, CDCl_3) of **254**.

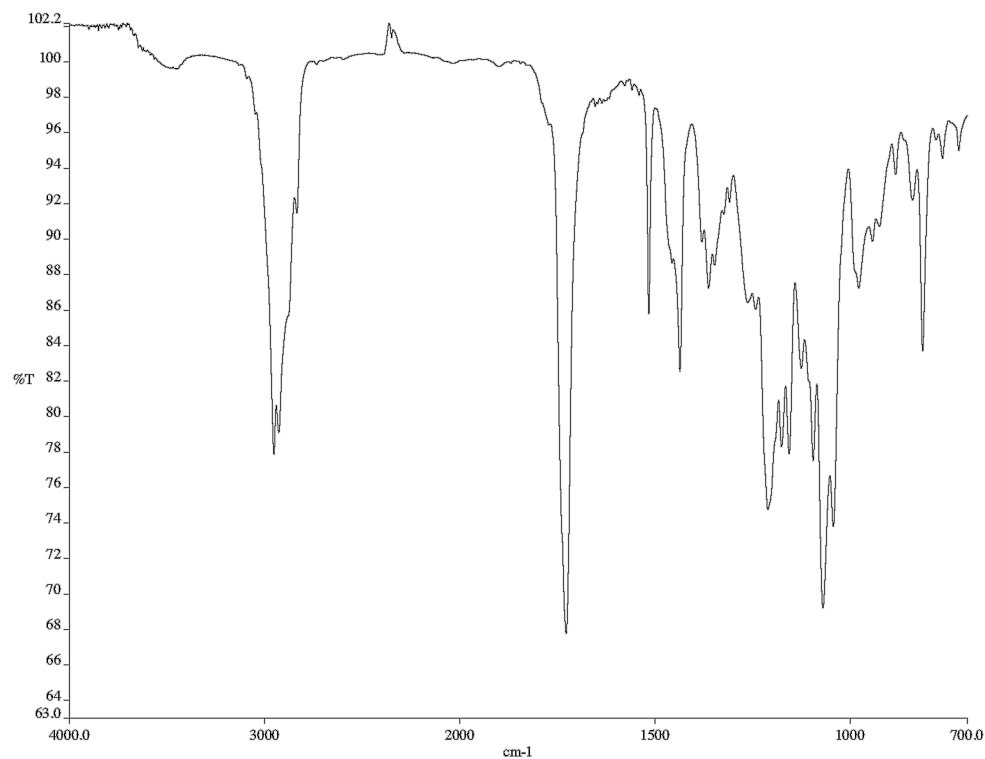


Figure A2.150. Infrared spectrum (neat film/NaCl) of **254**.

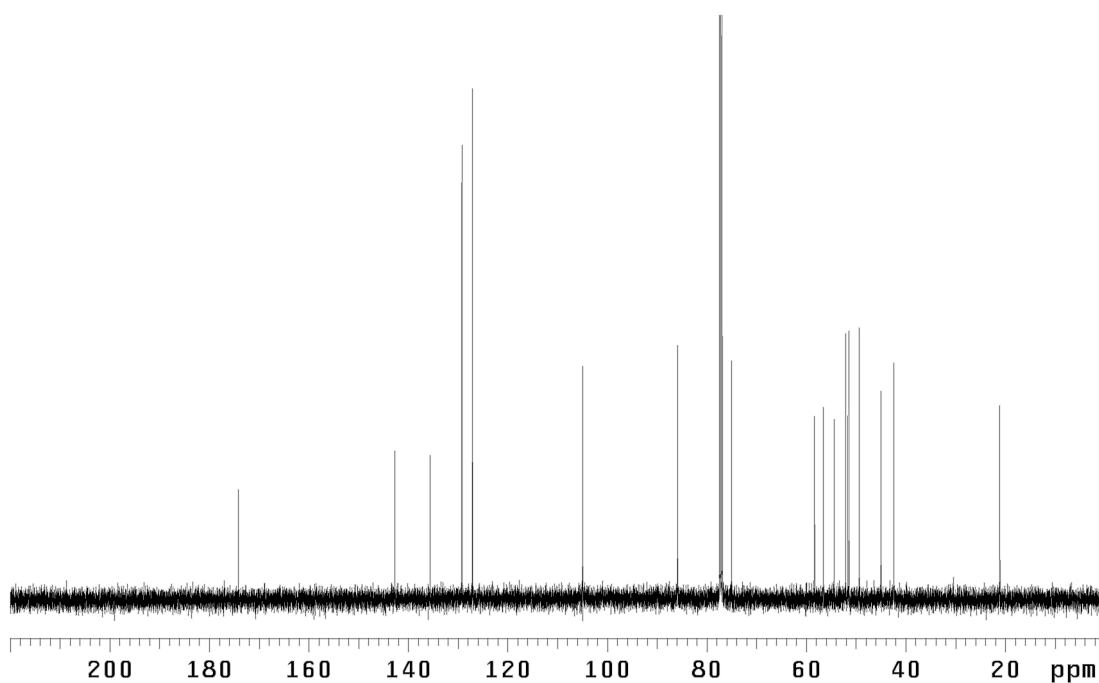
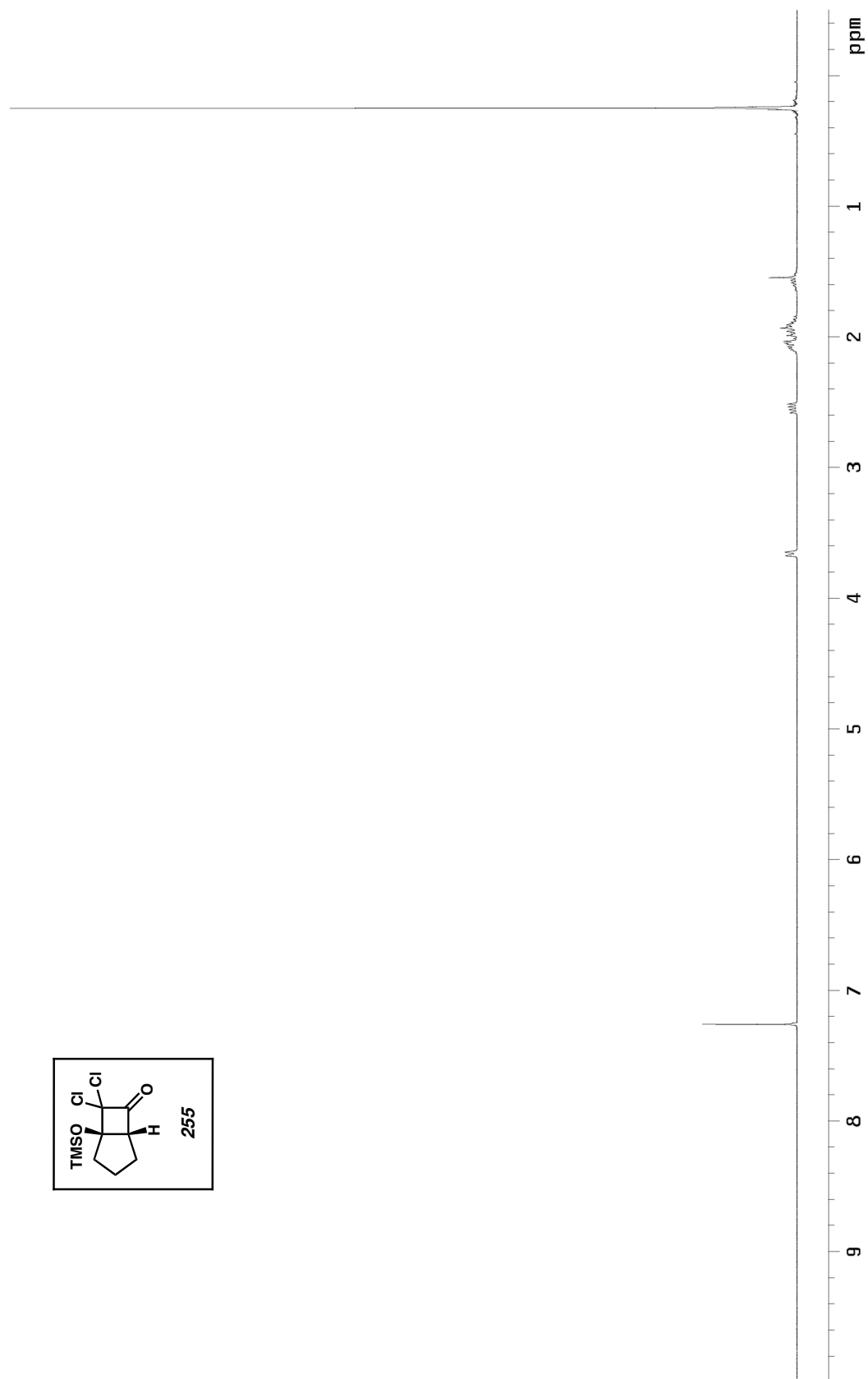
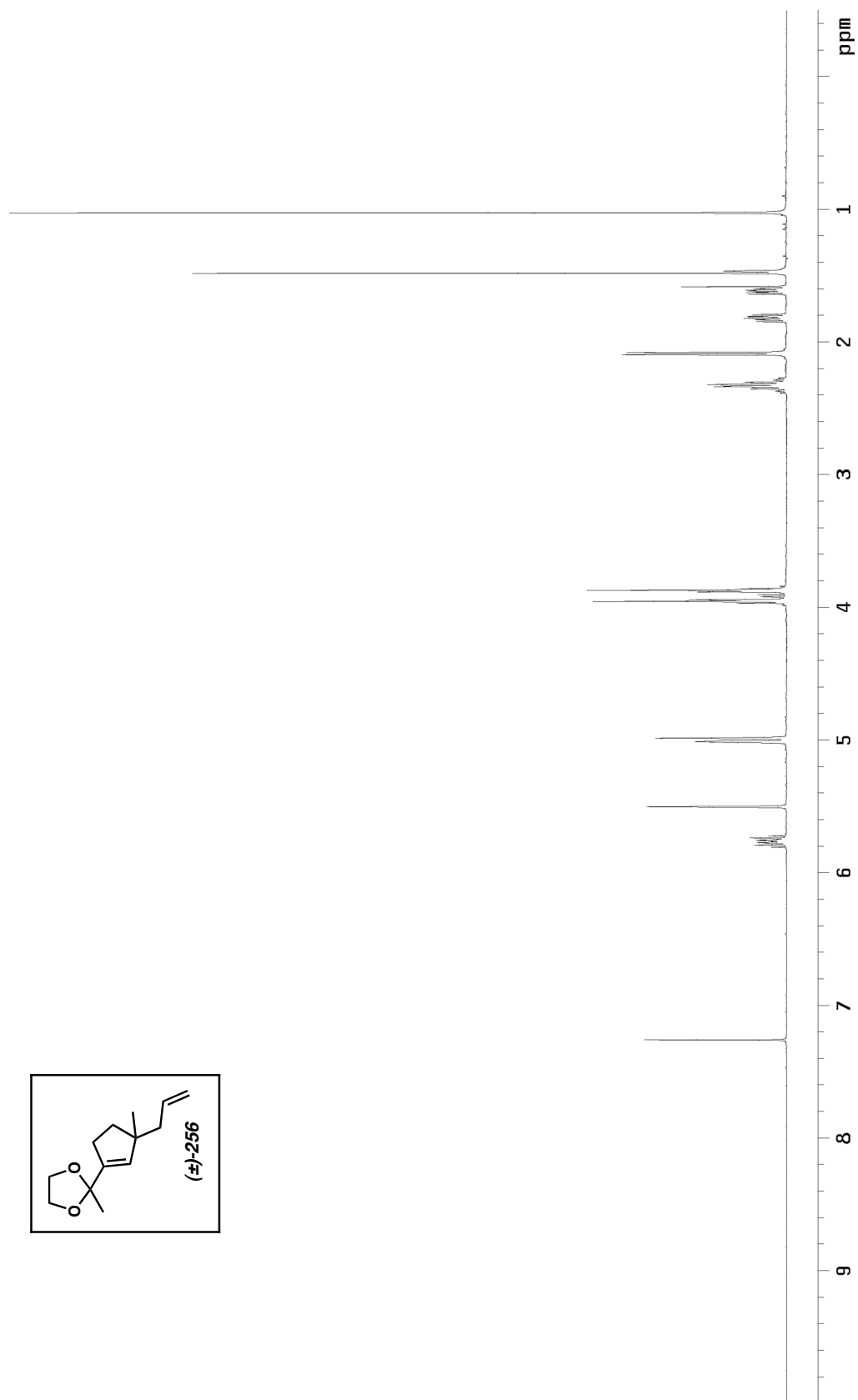


Figure A2.151. ¹³C NMR spectrum (126 MHz, CDCl₃) of **254**.

Figure A2.152. ^1H NMR spectrum (300 MHz, CDCl_3) of **255**.

Figure A2.153. ¹H NMR spectrum (300 MHz, CDCl₃) of **256**.

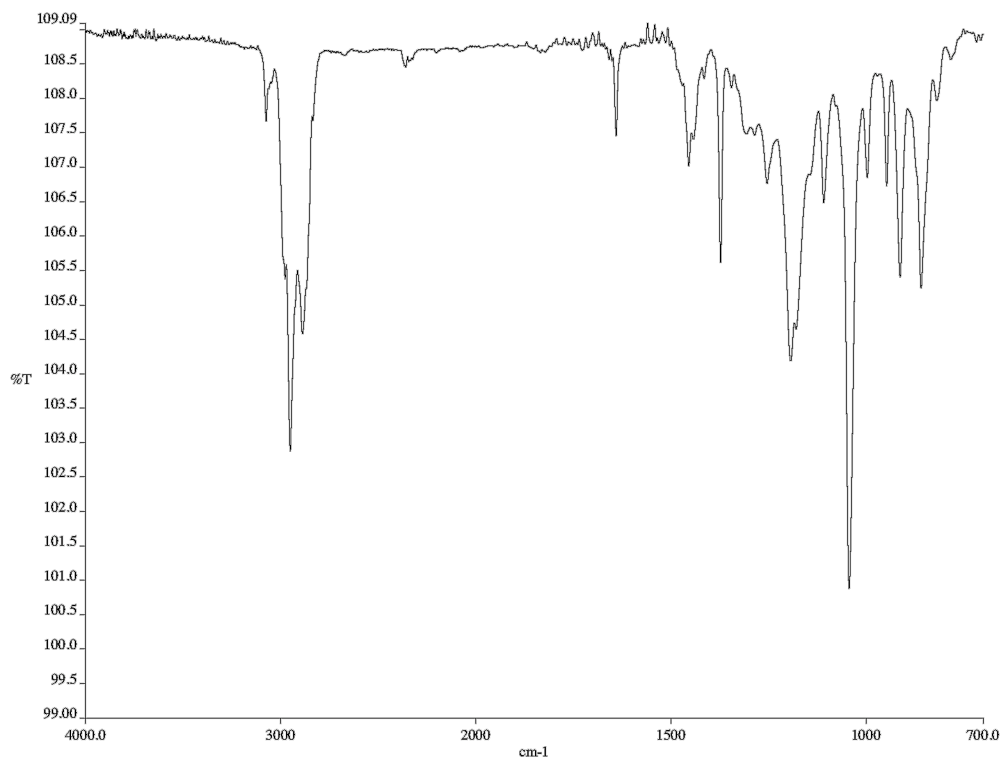


Figure A2.154. Infrared spectrum (neat film/NaCl) of **256**.

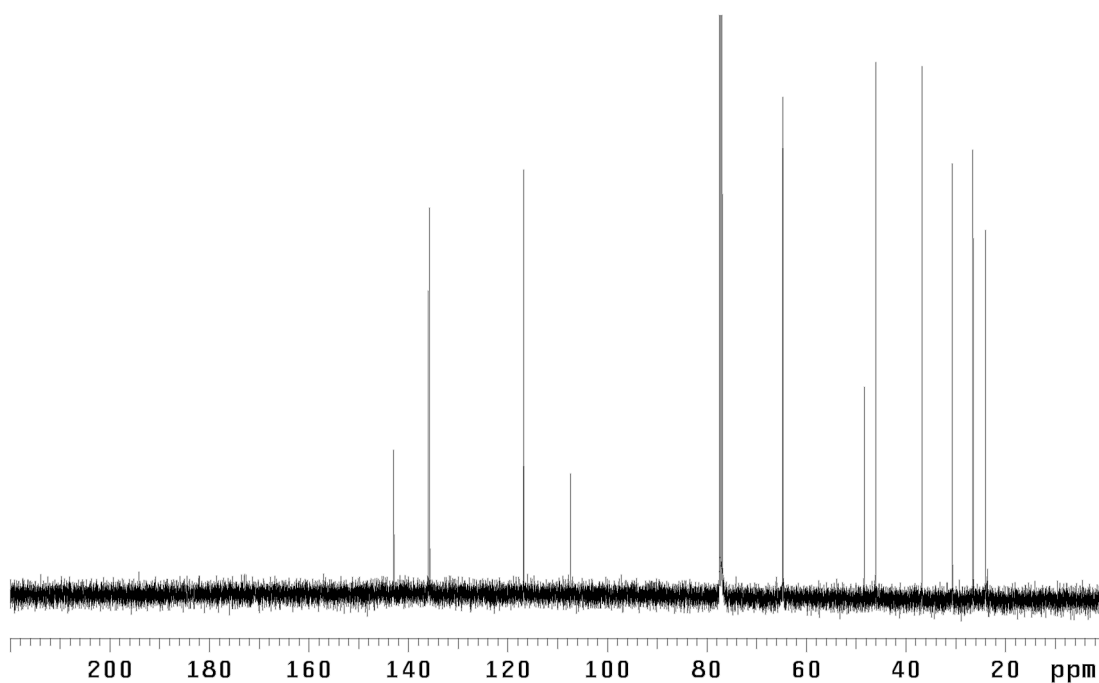


Figure A2.155. ¹³C NMR spectrum (126 MHz, CDCl₃) of **256**.