

## **APPENDIX FIVE**

### **Spectra of Compounds Relevant to Chapter Three**

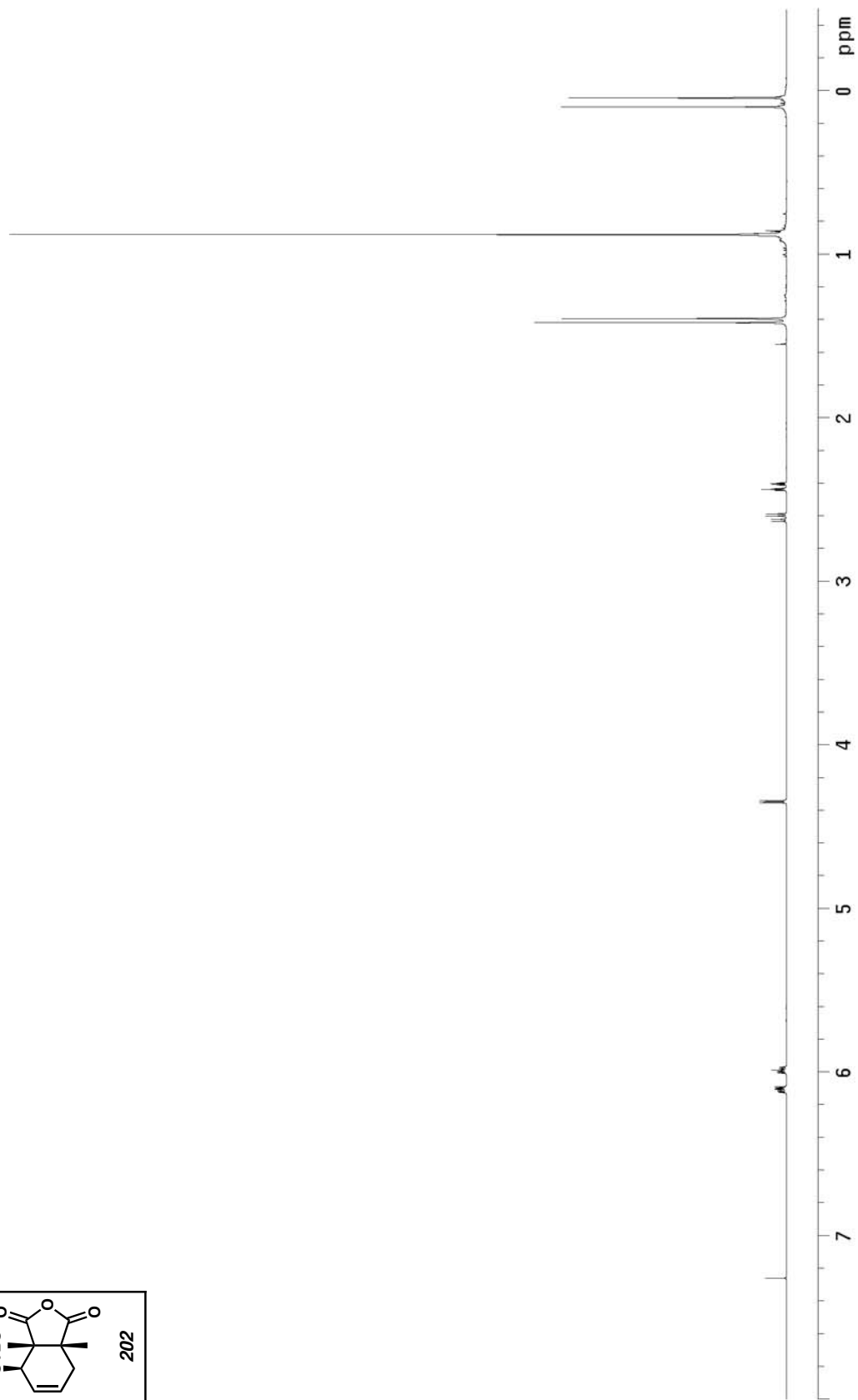
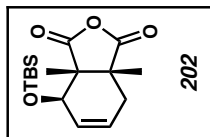


Figure A5.1 <sup>1</sup>H NMR of compound **202** (500 MHz, CDCl<sub>3</sub>)

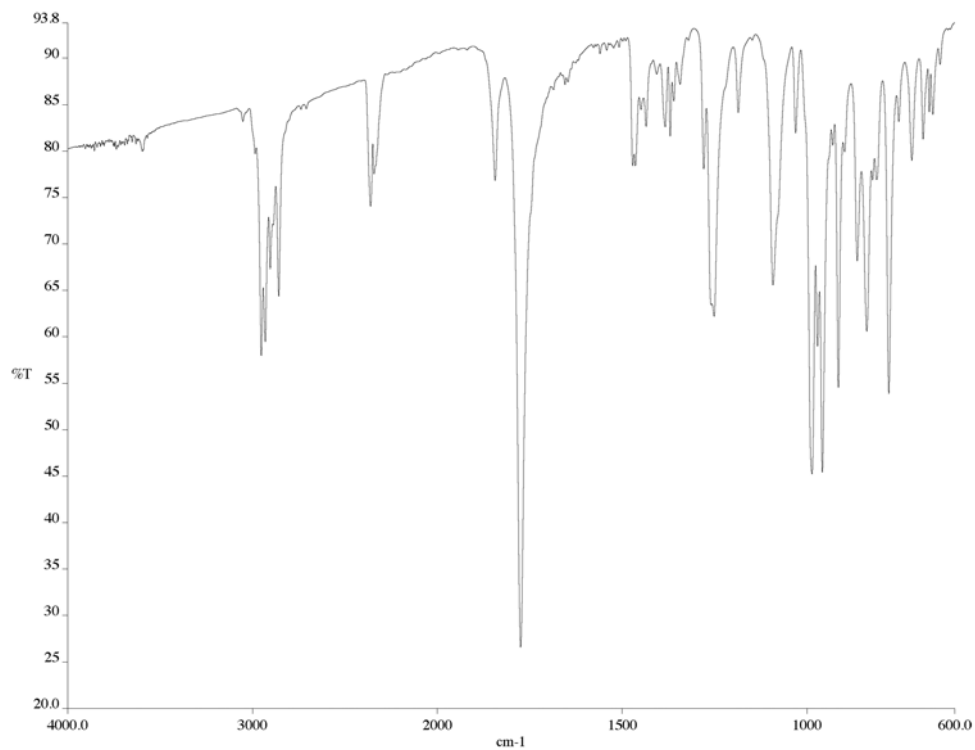


Figure A5.2 IR of compound **202** (NaCl/film)

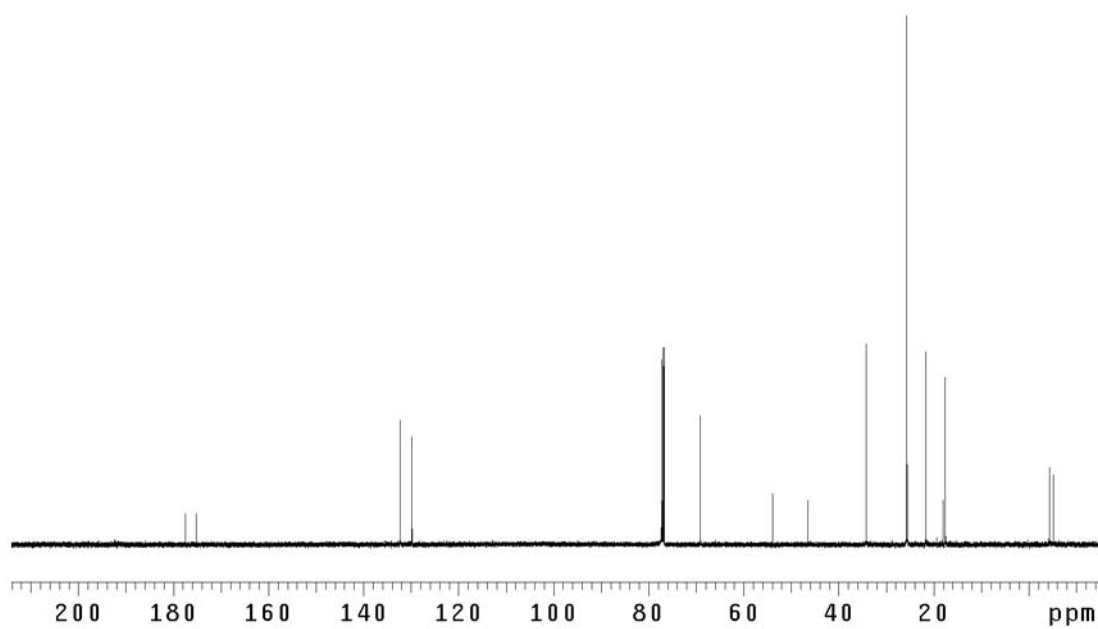


Figure A5.3 <sup>13</sup>C NMR of compound **202** (125 MHz, CDCl<sub>3</sub>)

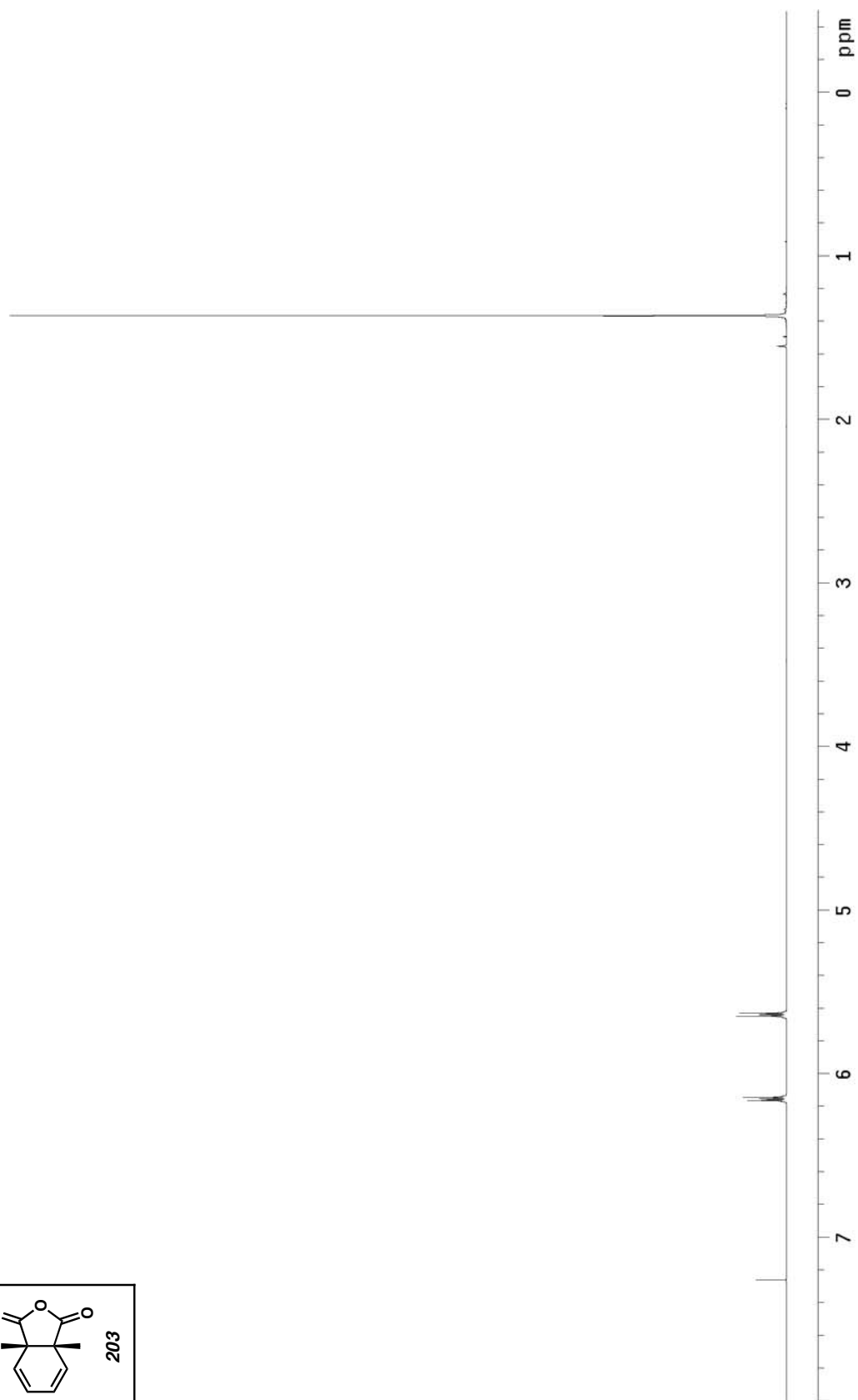
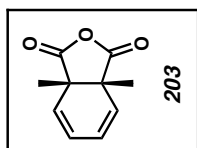
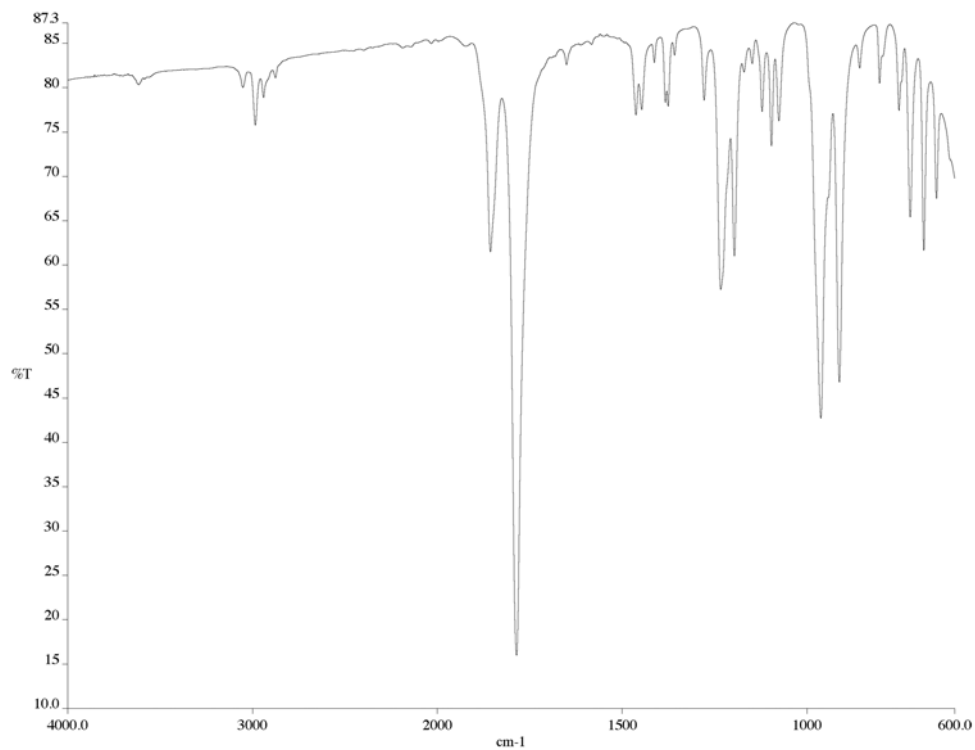
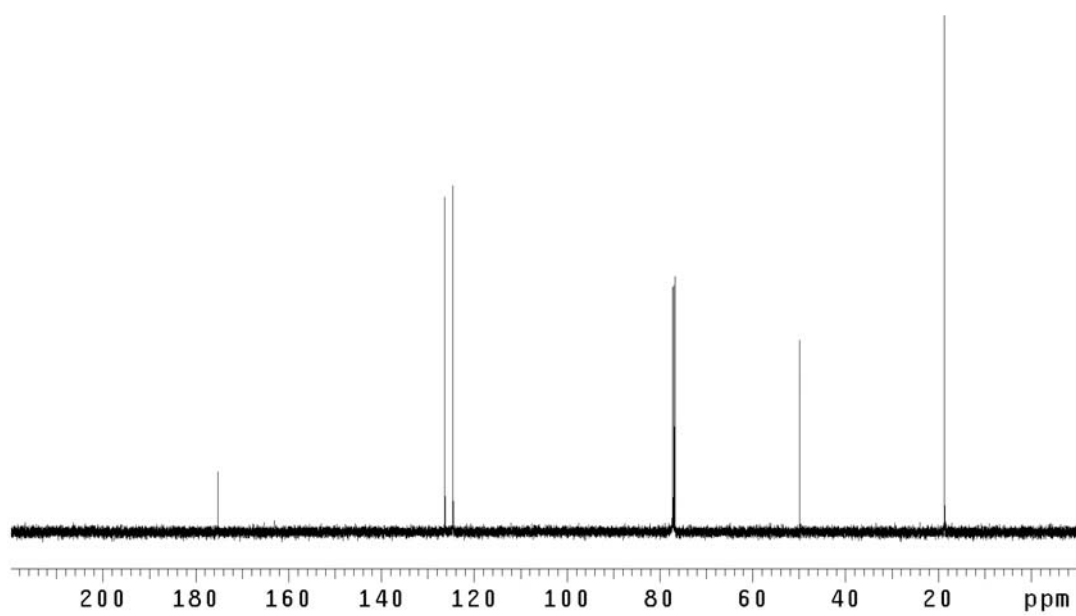


Figure A5.4 <sup>1</sup>H NMR of compound **203** (500 MHz, CDCl<sub>3</sub>)

Figure A5.5 IR of compound **203** (NaCl/film)Figure A5.6 <sup>13</sup>C NMR of compound **203** (125 MHz, CDCl<sub>3</sub>)

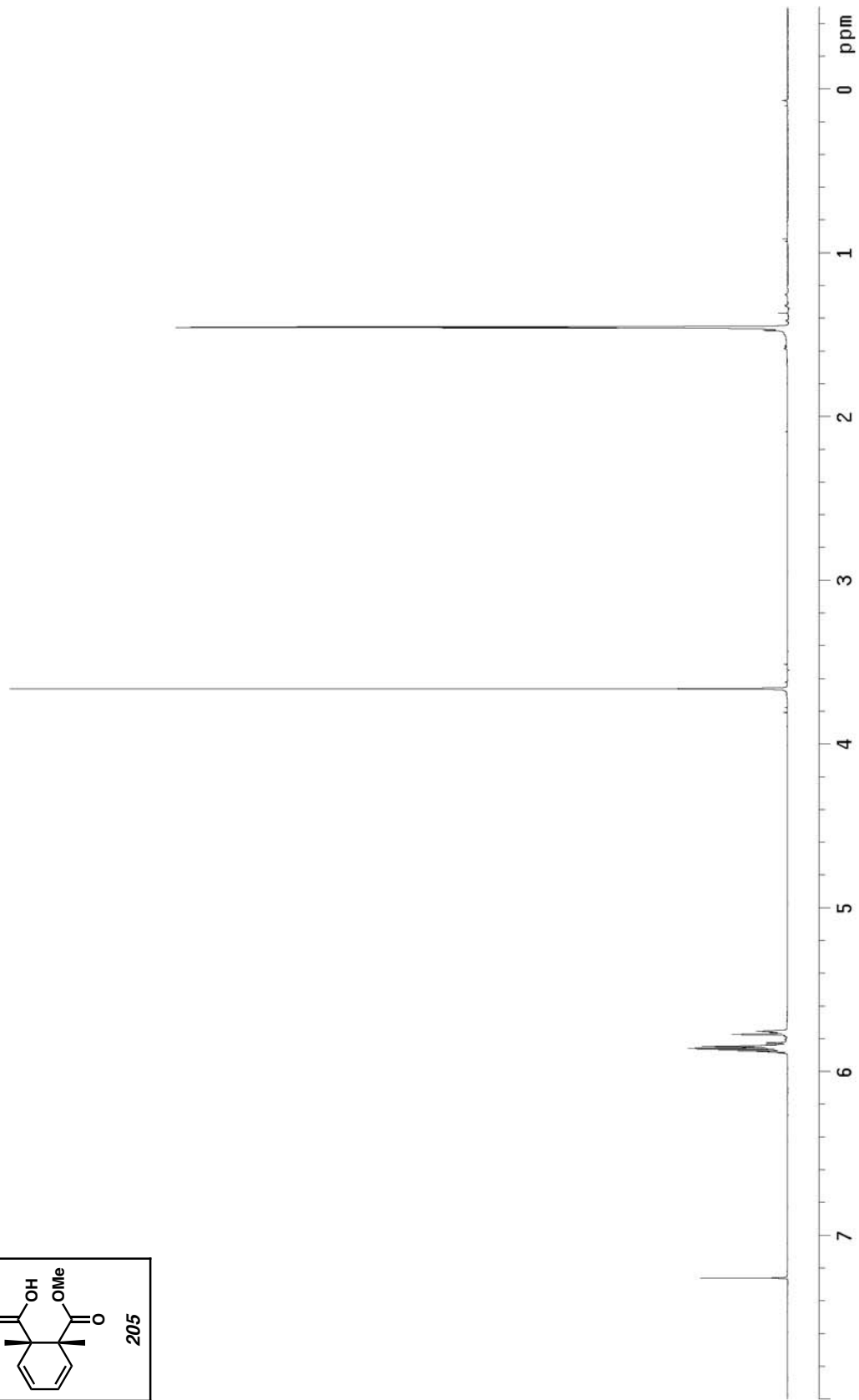
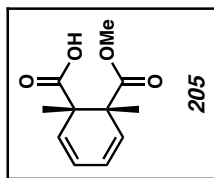
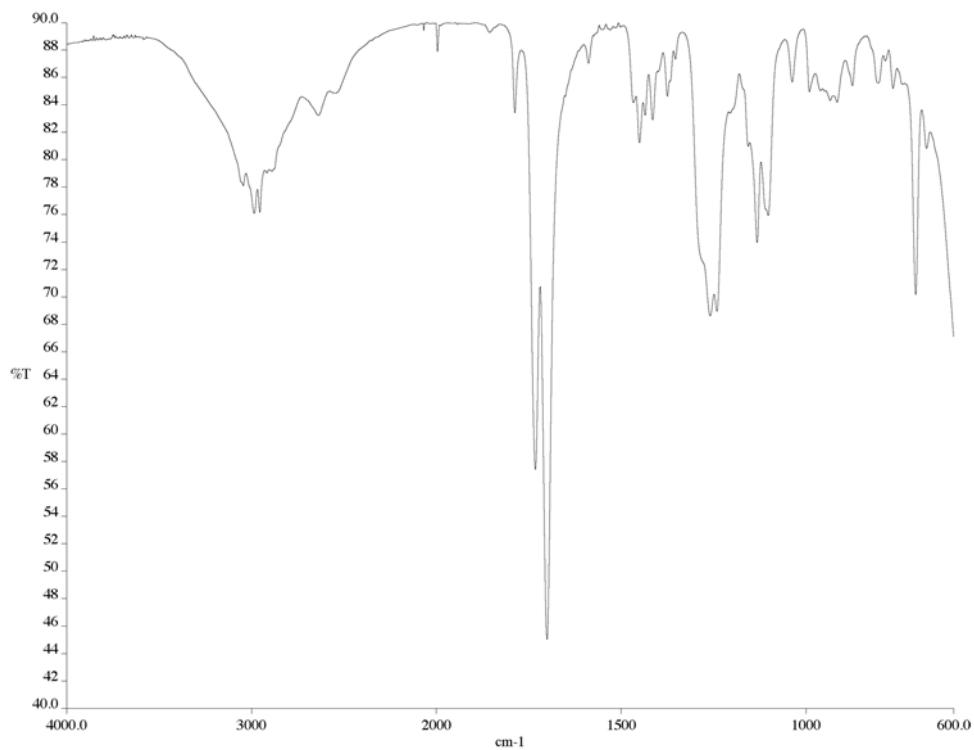
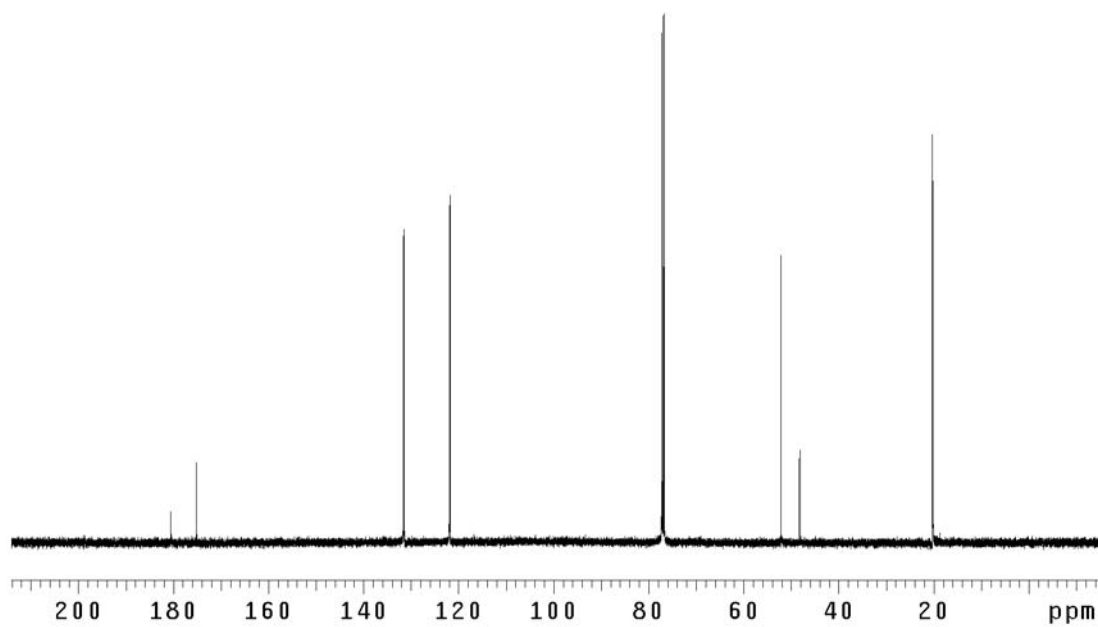


Figure A5.7  $^1\text{H}$  NMR of compound **205** (500 MHz,  $\text{CDCl}_3$ )

Figure A5.8 IR of compound **205** (NaCl/film)Figure A5.9 <sup>13</sup>C NMR of compound **205** (125 MHz, CDCl<sub>3</sub>)

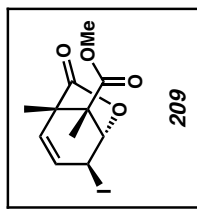
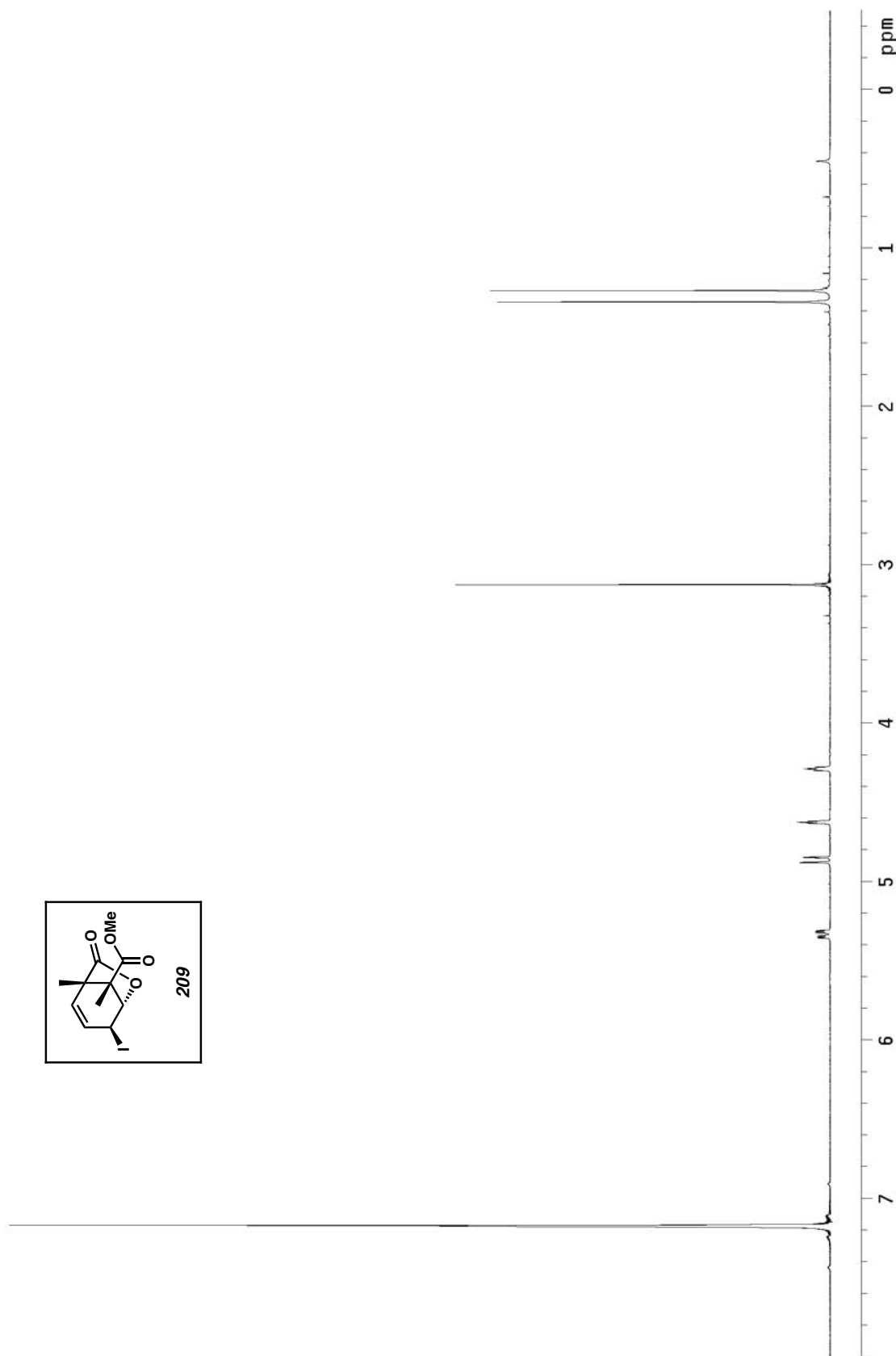


Figure A5.10 <sup>1</sup>H NMR of compound **209** (300 MHz, C<sub>6</sub>D<sub>6</sub>)



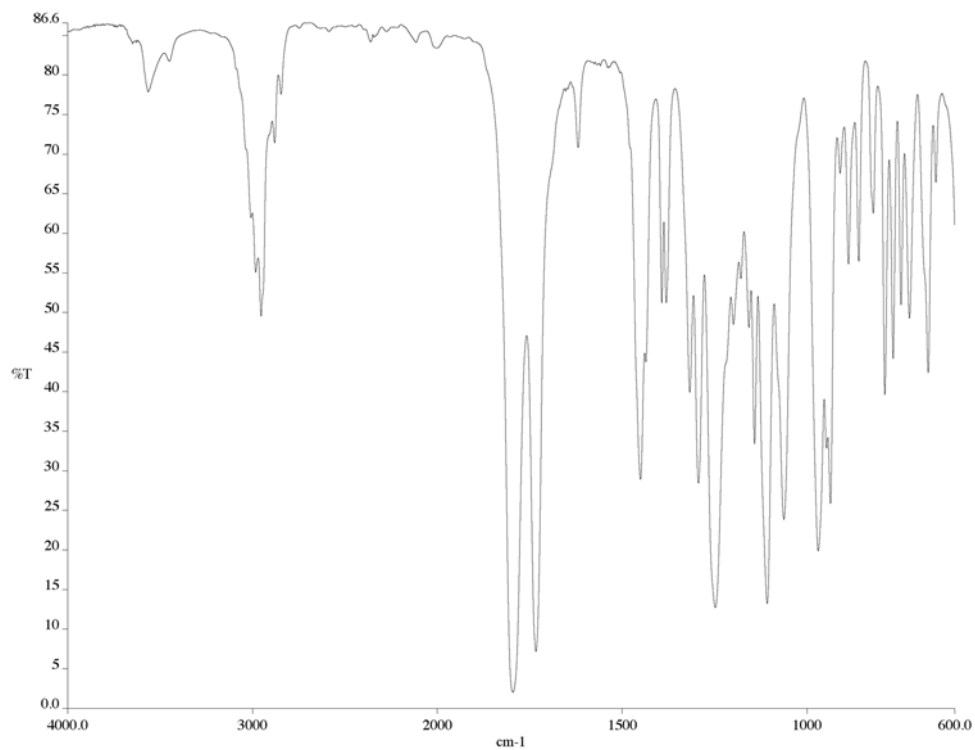


Figure A5.11 IR of compound **209** (NaCl/film)

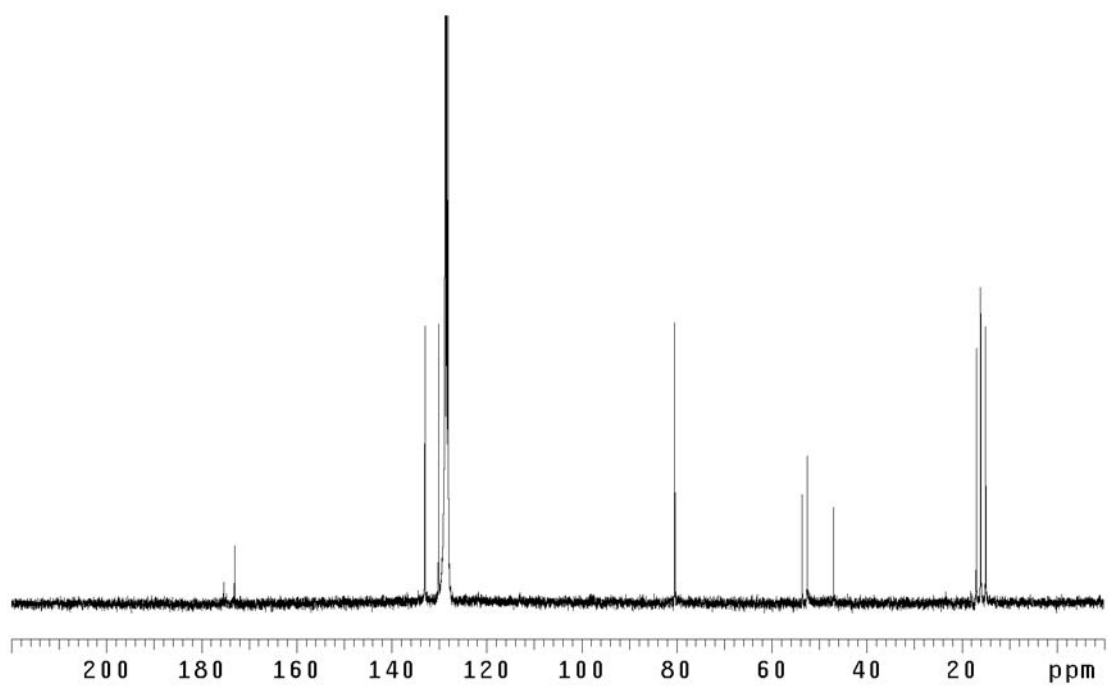
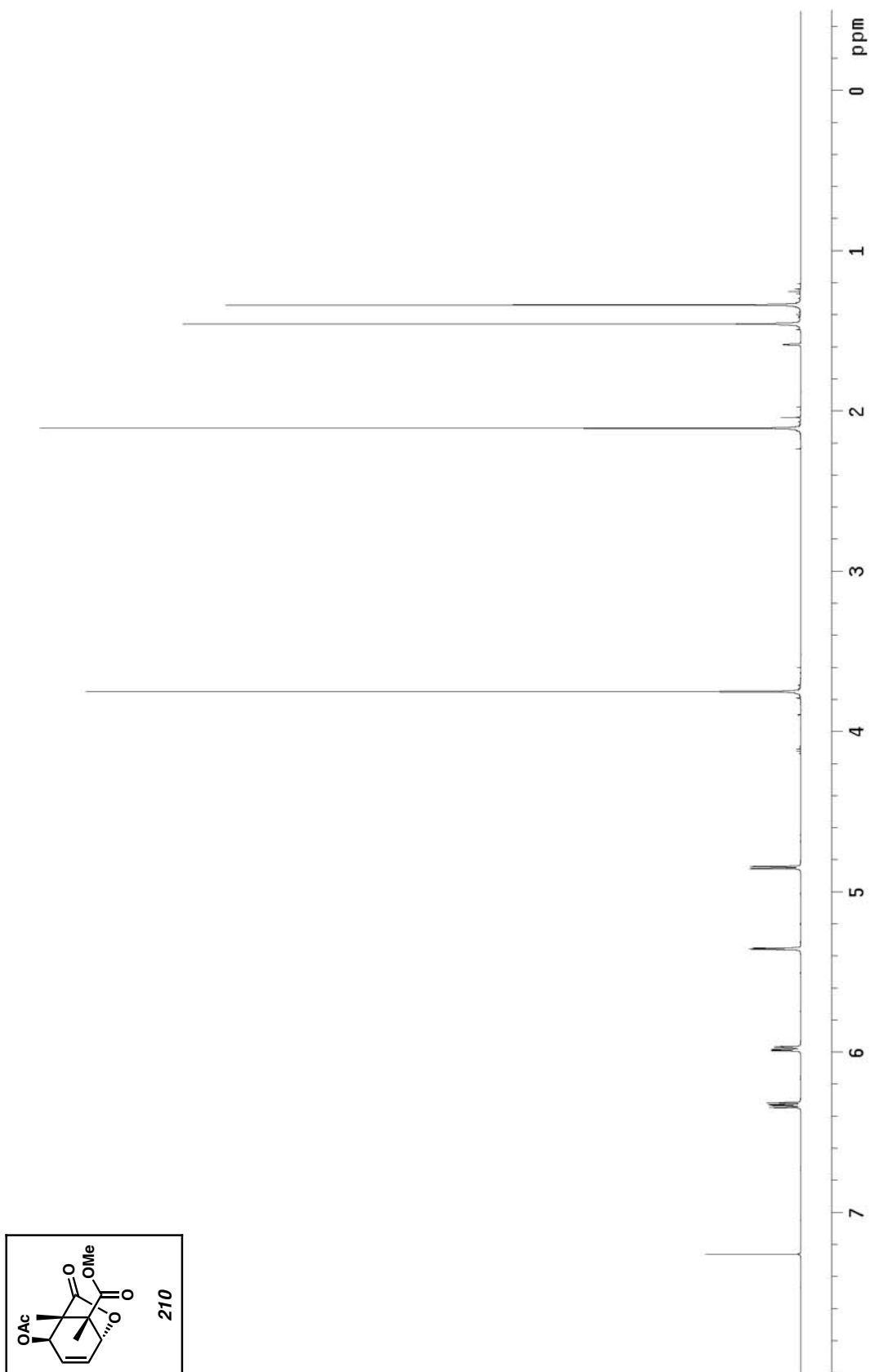


Figure A5.12 <sup>13</sup>C NMR of compound **209** (75 MHz, C<sub>6</sub>D<sub>6</sub>)

Figure A5.13 <sup>1</sup>H NMR of compound **210** (500 MHz, CDCl<sub>3</sub>)

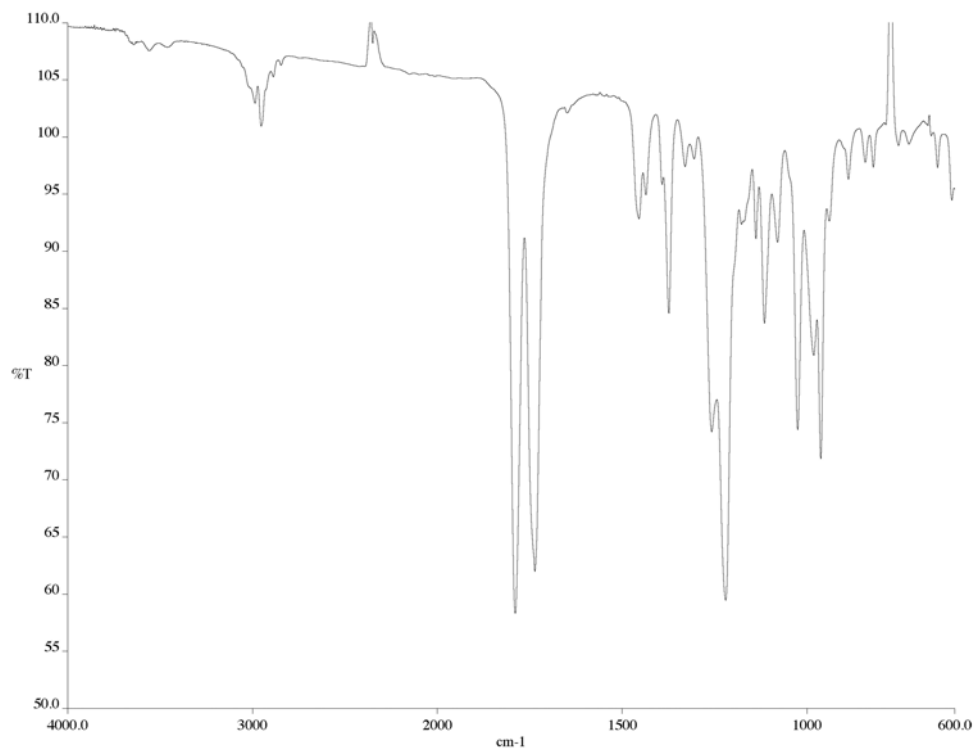


Figure A5.14 IR of compound **210** (NaCl/film)

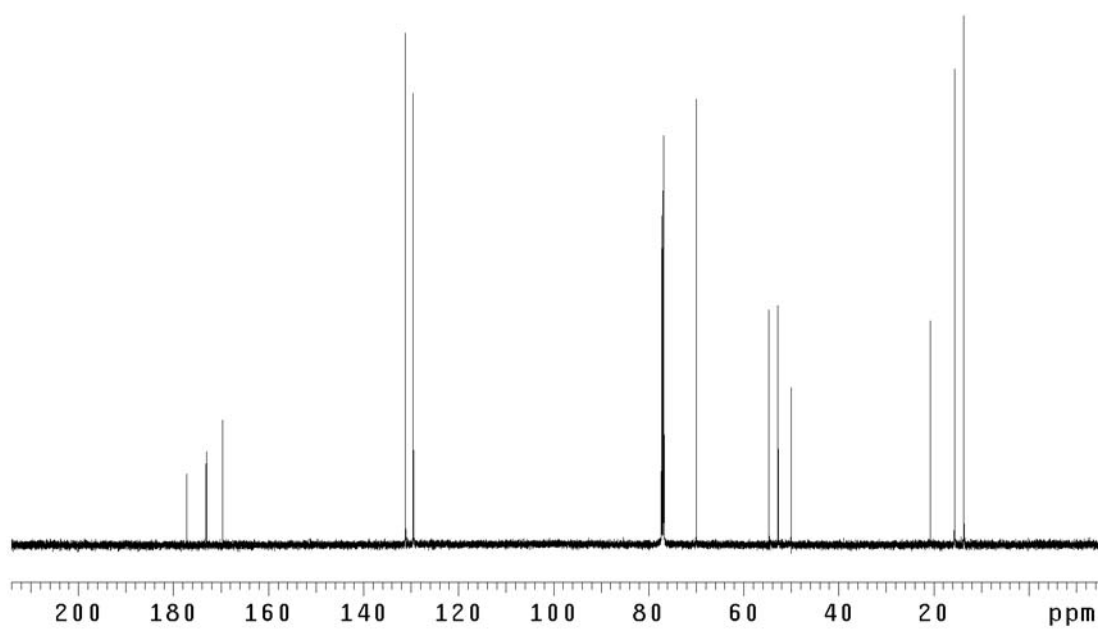
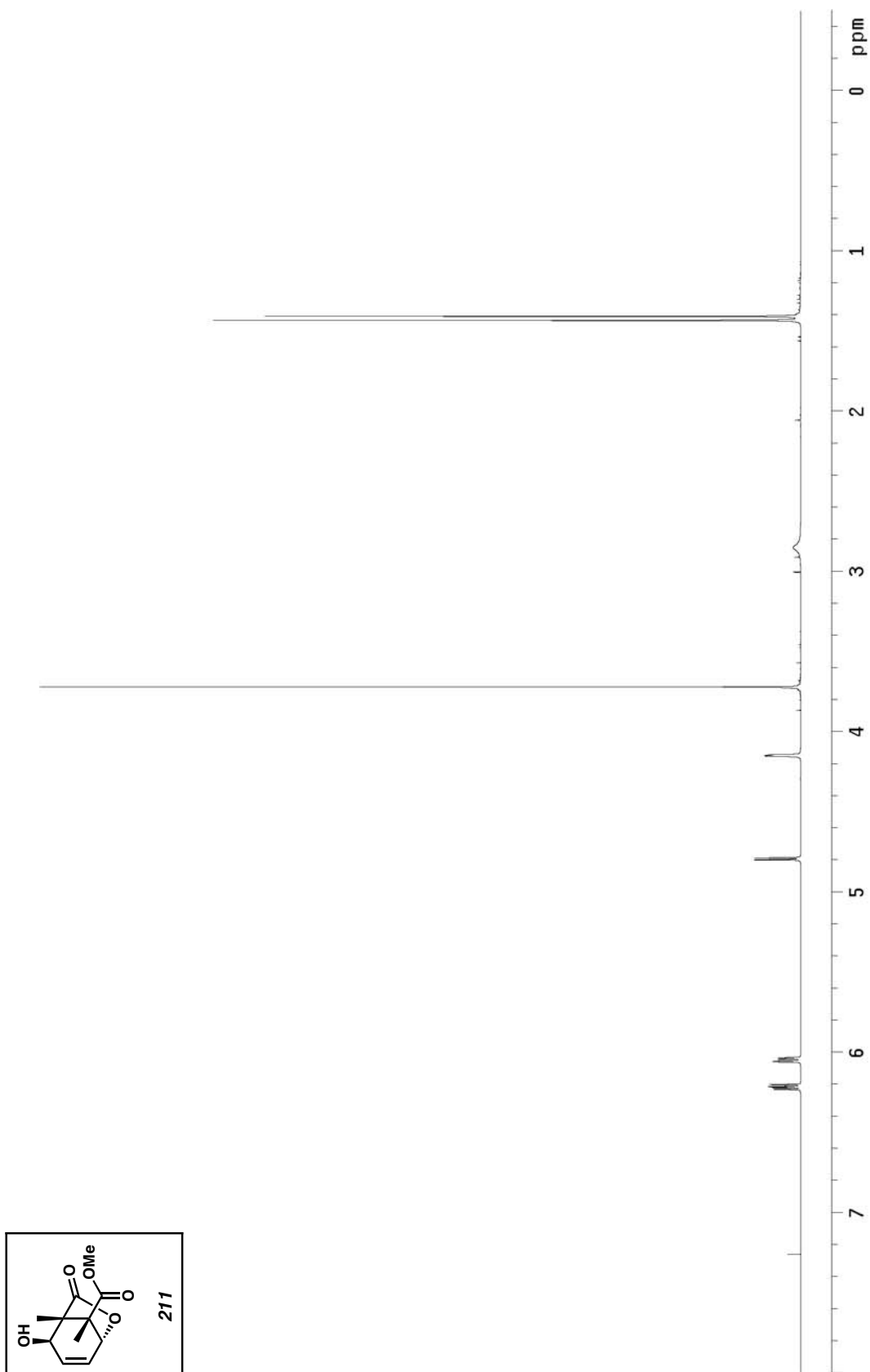


Figure A5.15 <sup>13</sup>C NMR of compound **210** (125 MHz, CDCl<sub>3</sub>)

Figure A5.16  $^1\text{H}$  NMR of compound **211** (500 MHz,  $\text{CDCl}_3$ )

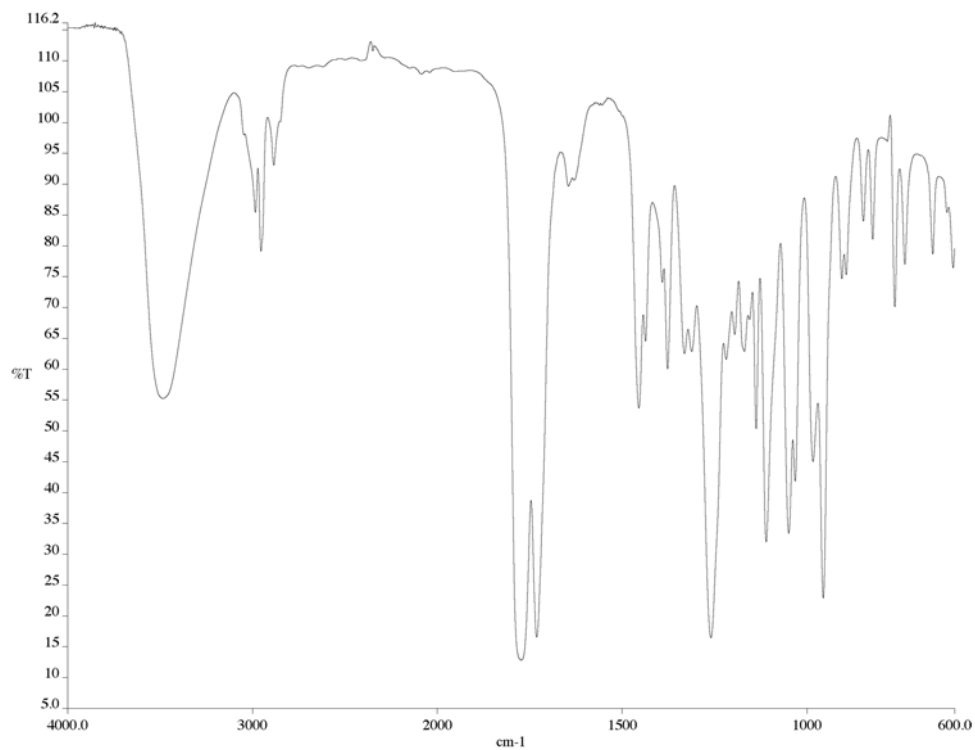


Figure A5.17 IR of compound **211** (NaCl/film)

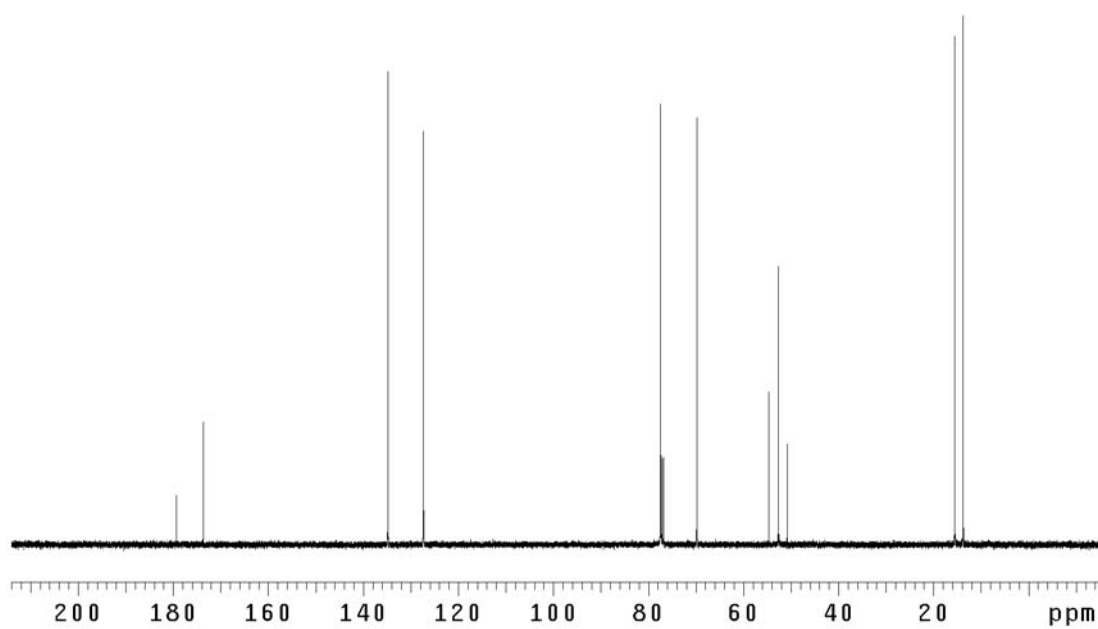


Figure A5.18 <sup>13</sup>C NMR of compound **211** (125 MHz, CDCl<sub>3</sub>)

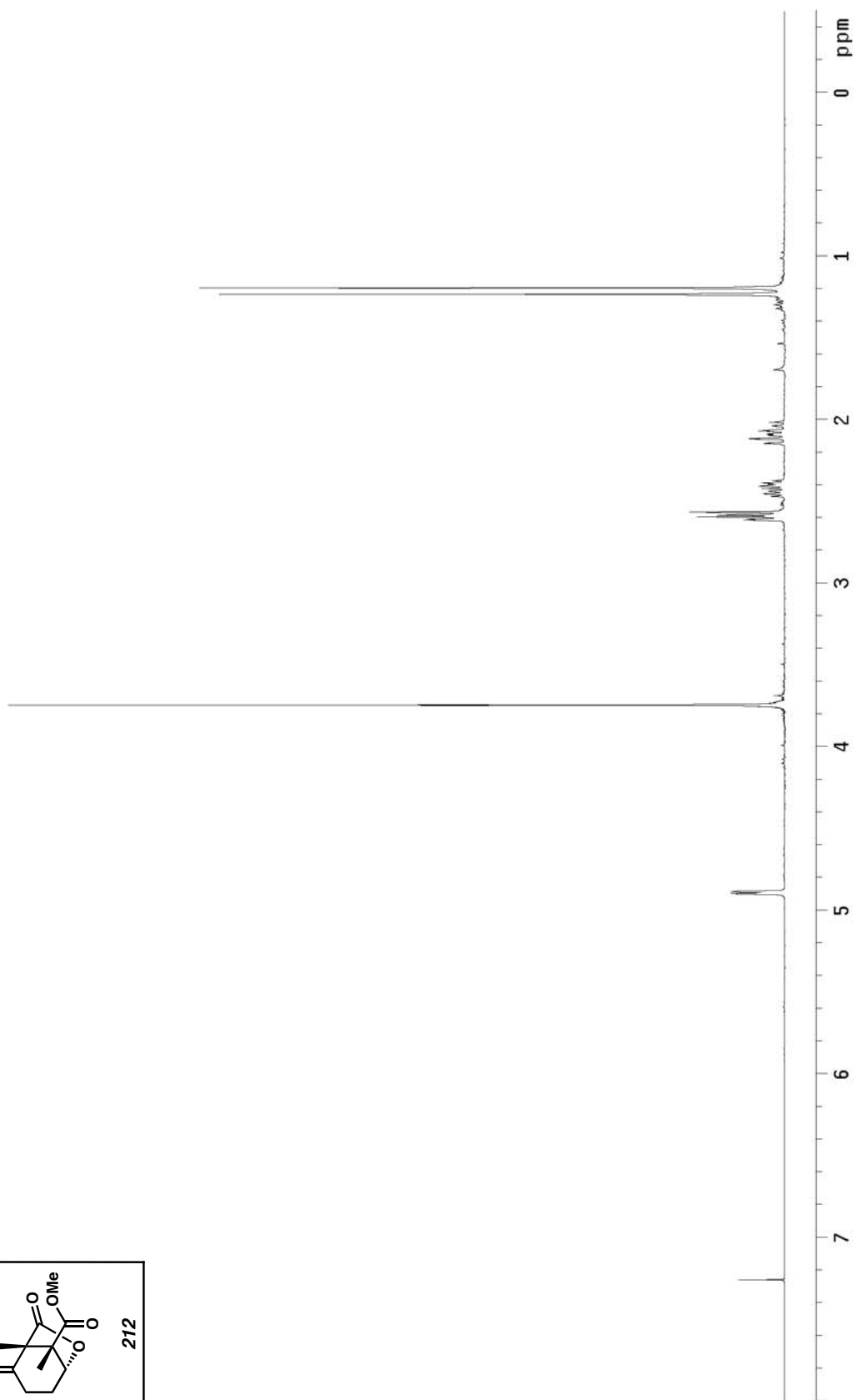
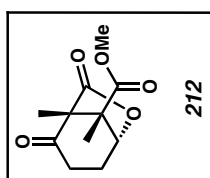
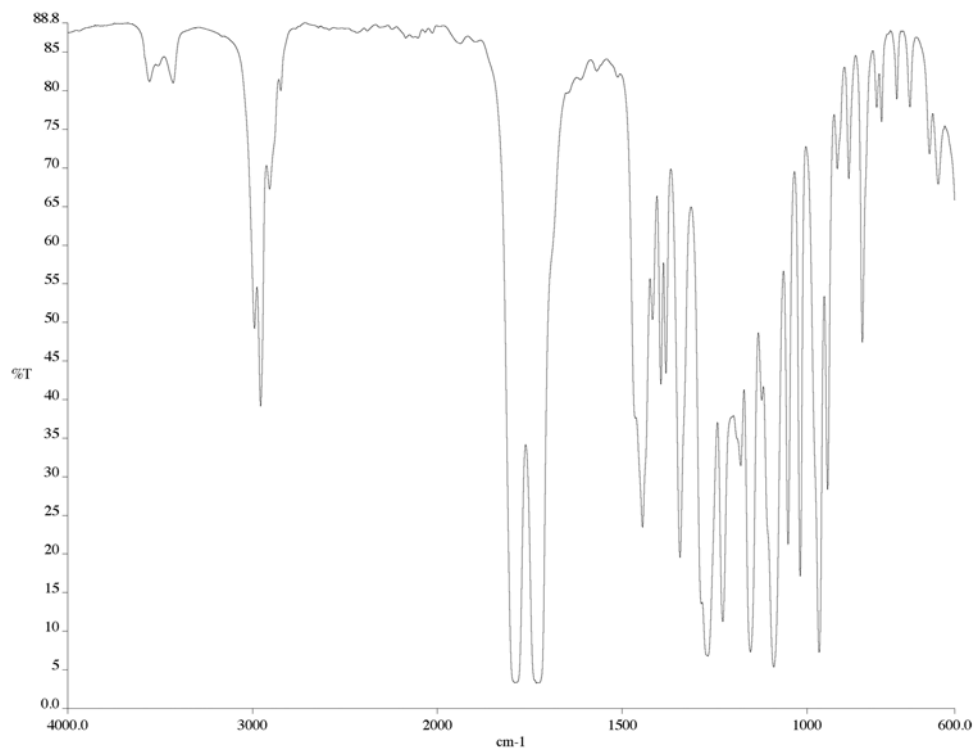
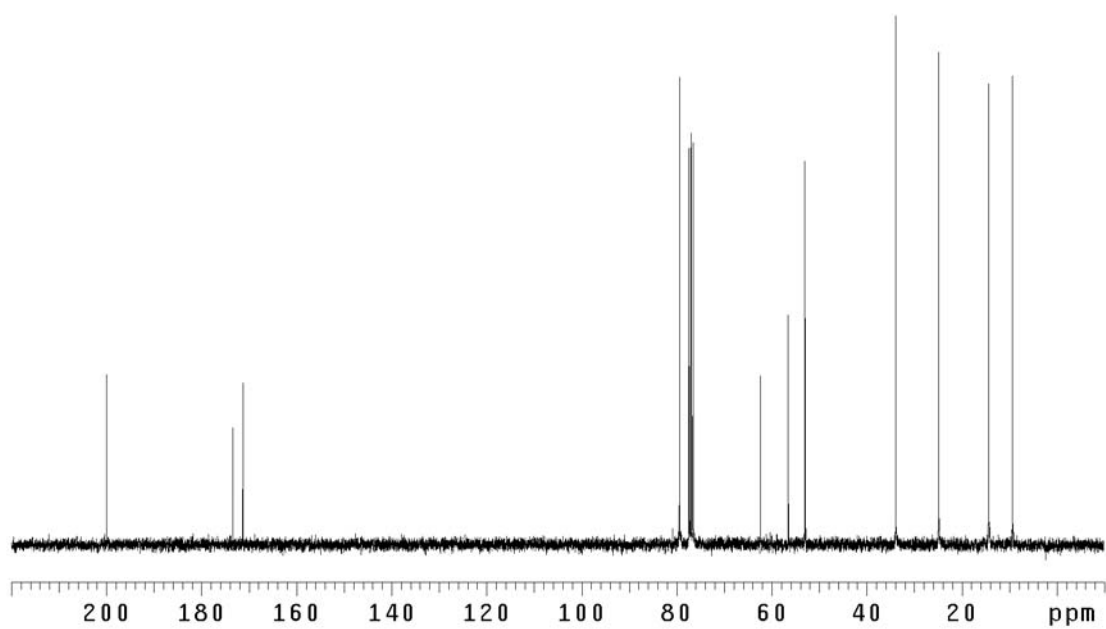
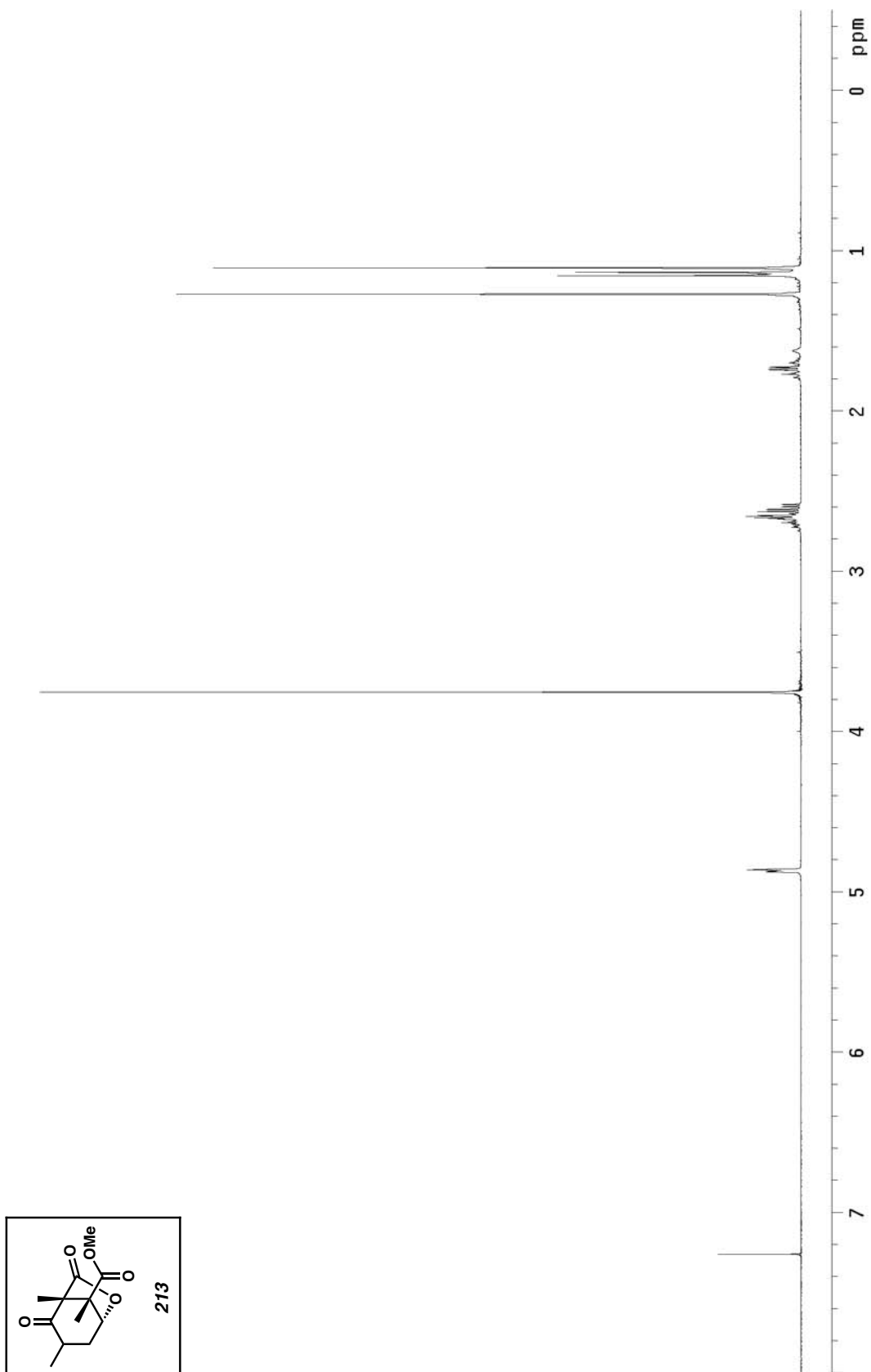
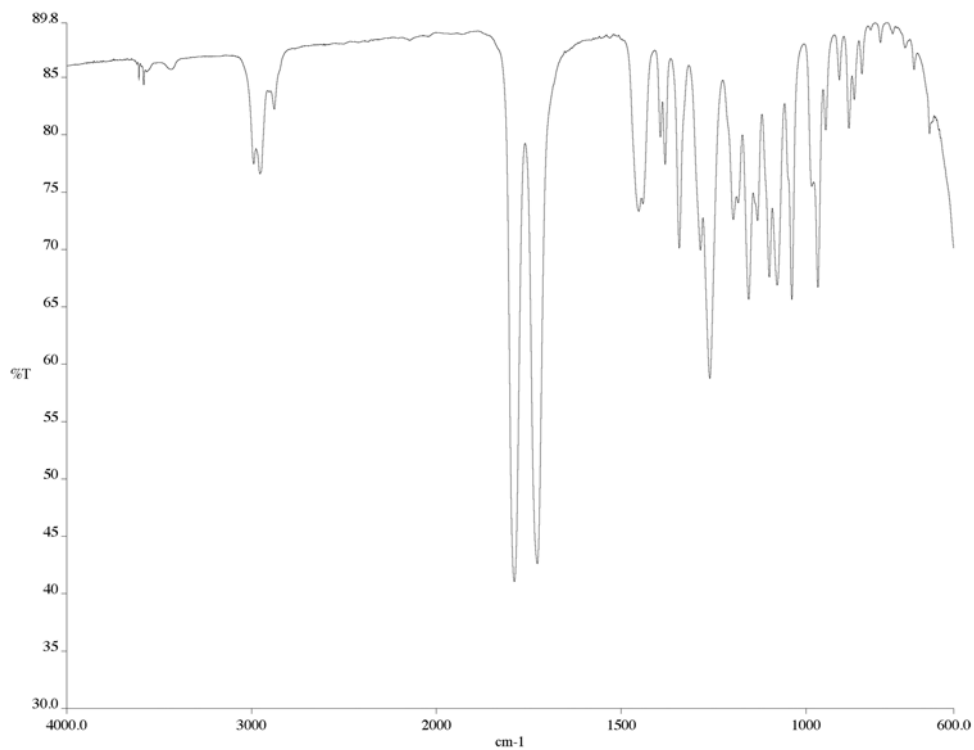
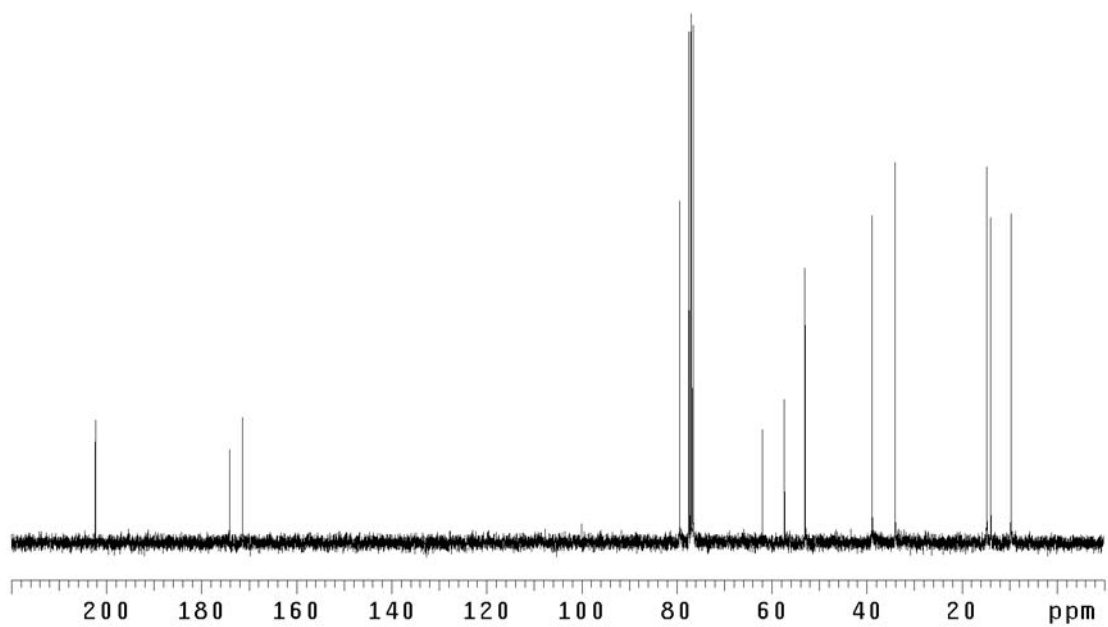


Figure A5.19  $^1\text{H}$  NMR of compound **212** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.20 IR of compound **212** (NaCl/film)Figure A5.21 <sup>13</sup>C NMR of compound **212** (75 MHz, CDCl<sub>3</sub>)

Figure A5.22 <sup>1</sup>H NMR of compound **213** (300 MHz, CDCl<sub>3</sub>)



Figure A5.23 IR of compound **213** (NaCl/film)Figure A5.24 <sup>13</sup>C NMR of compound **213** (75 MHz, CDCl<sub>3</sub>)

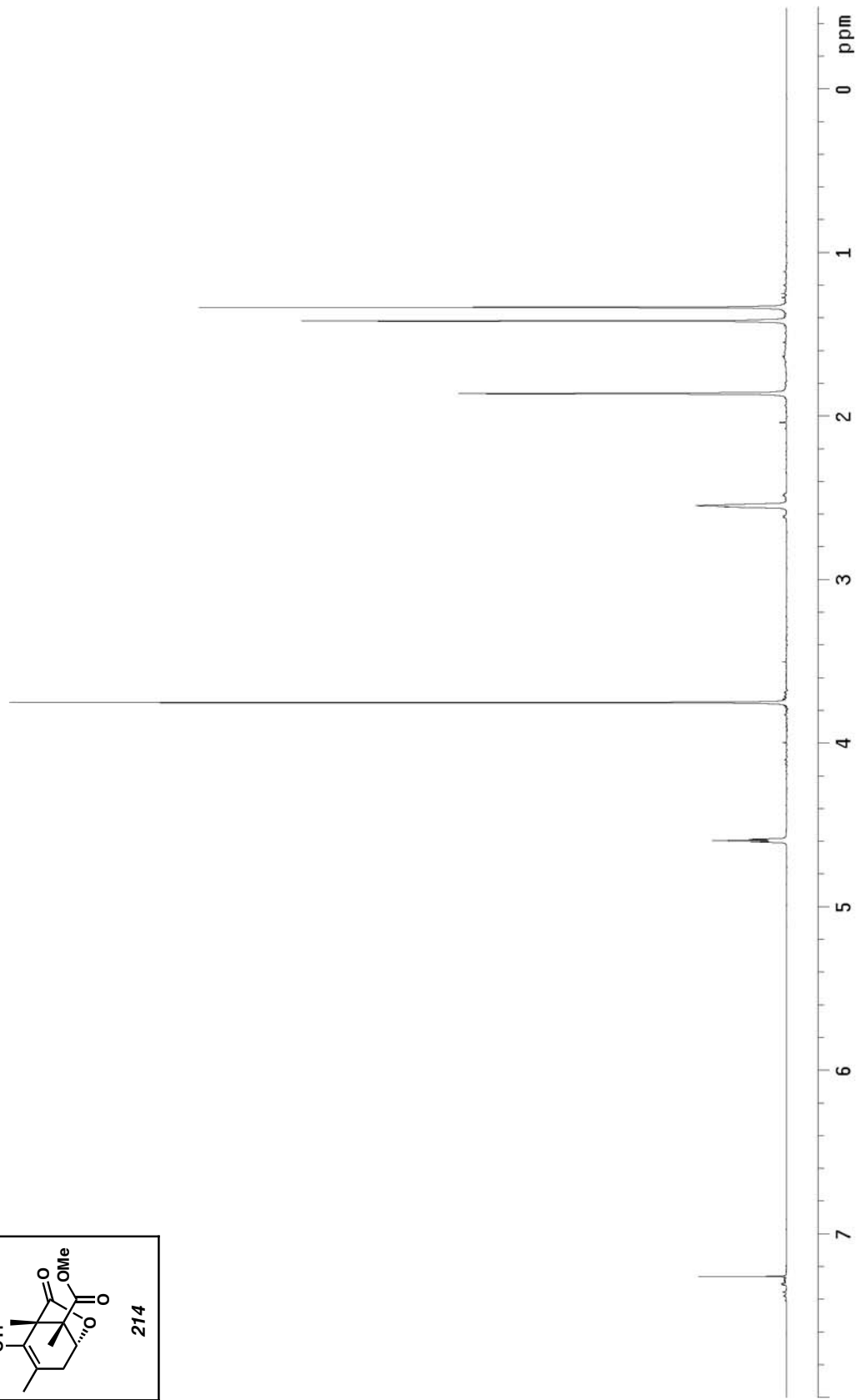
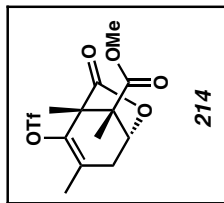
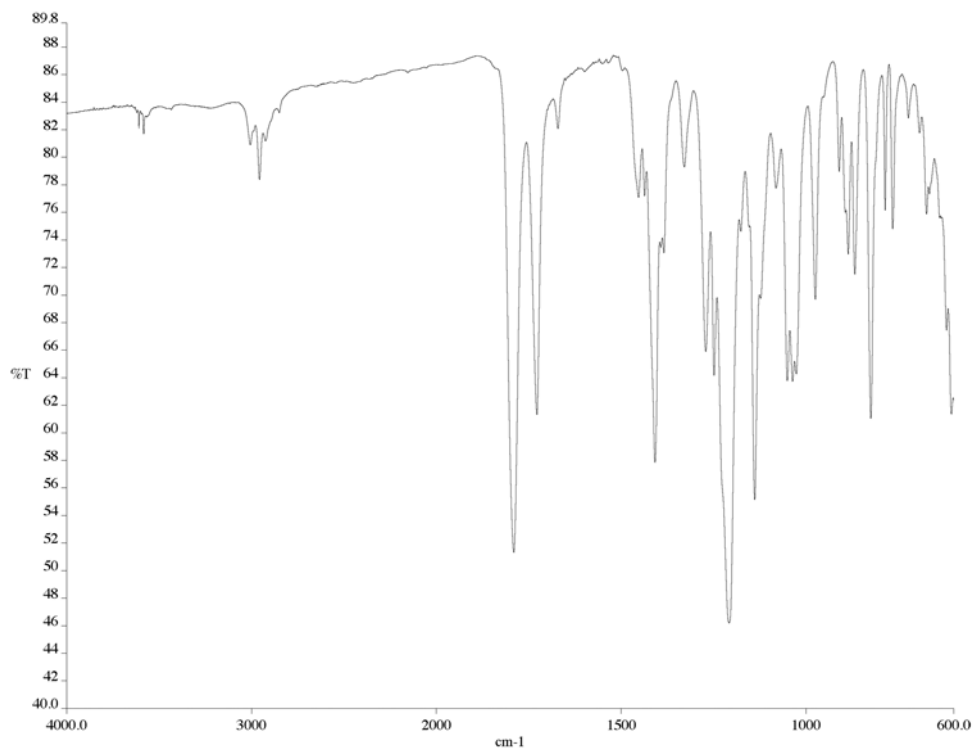
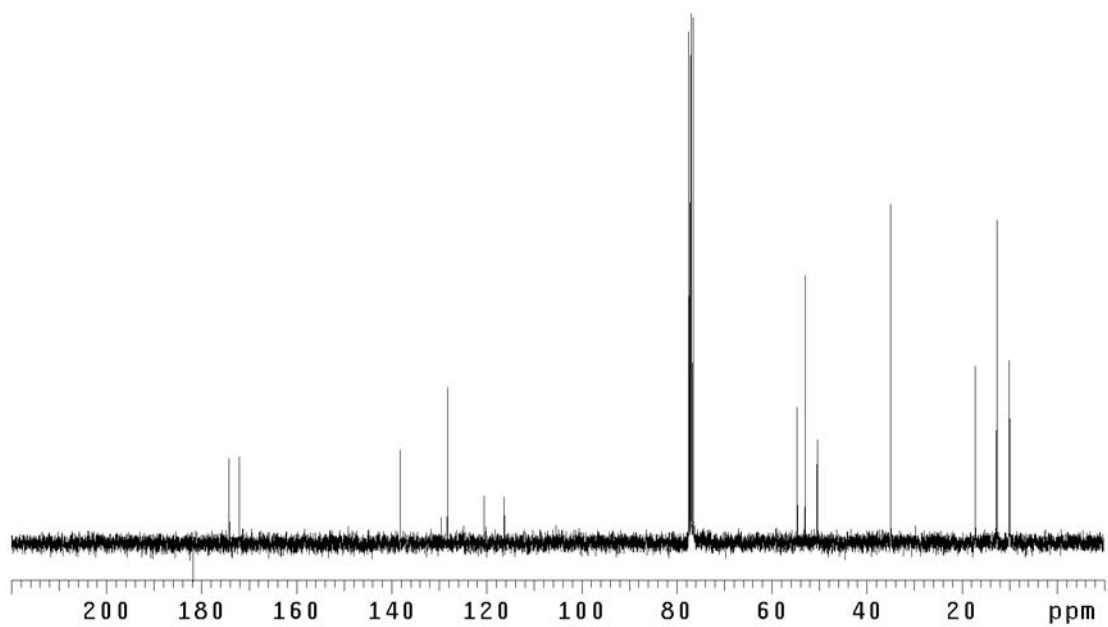
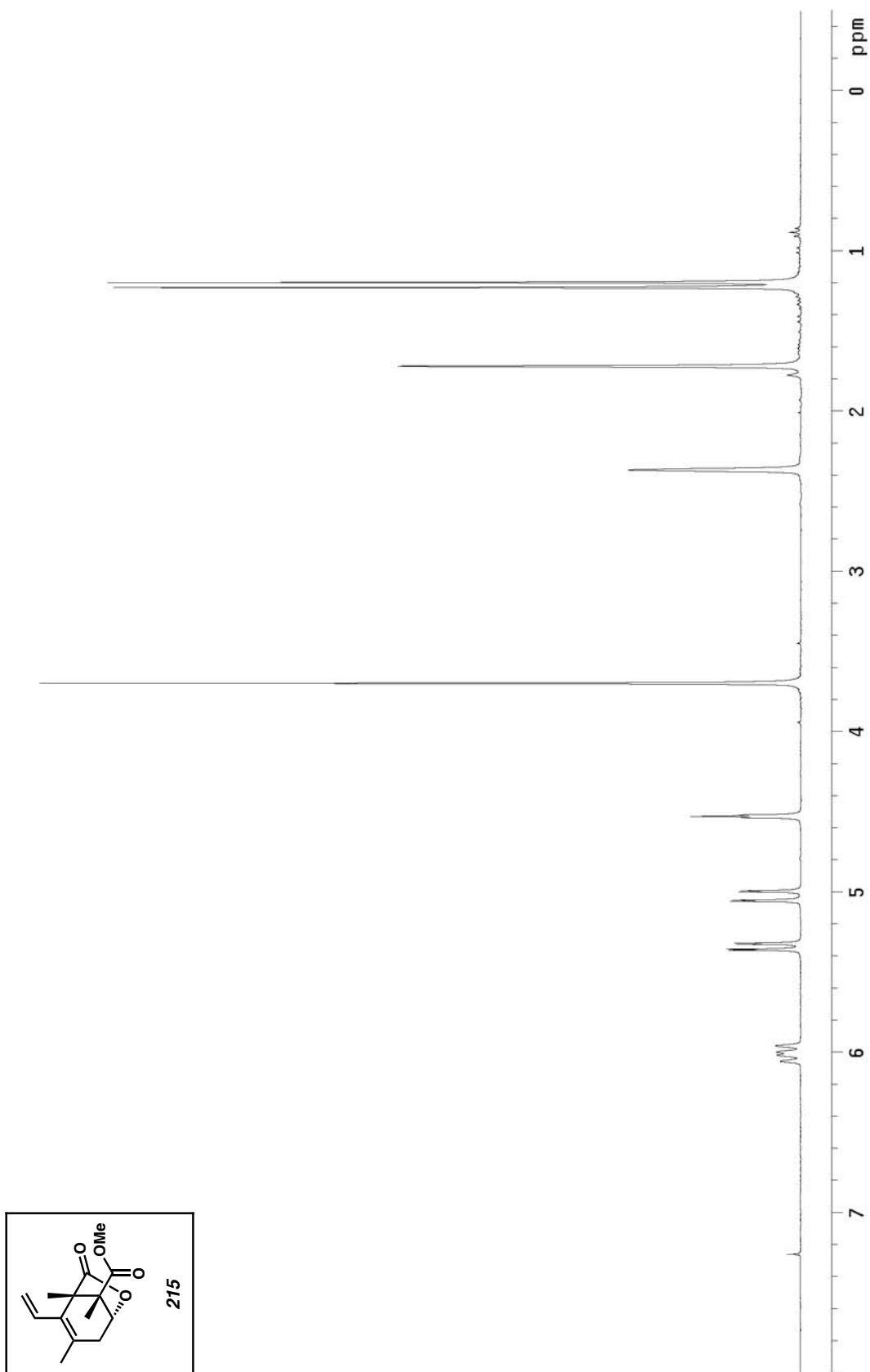
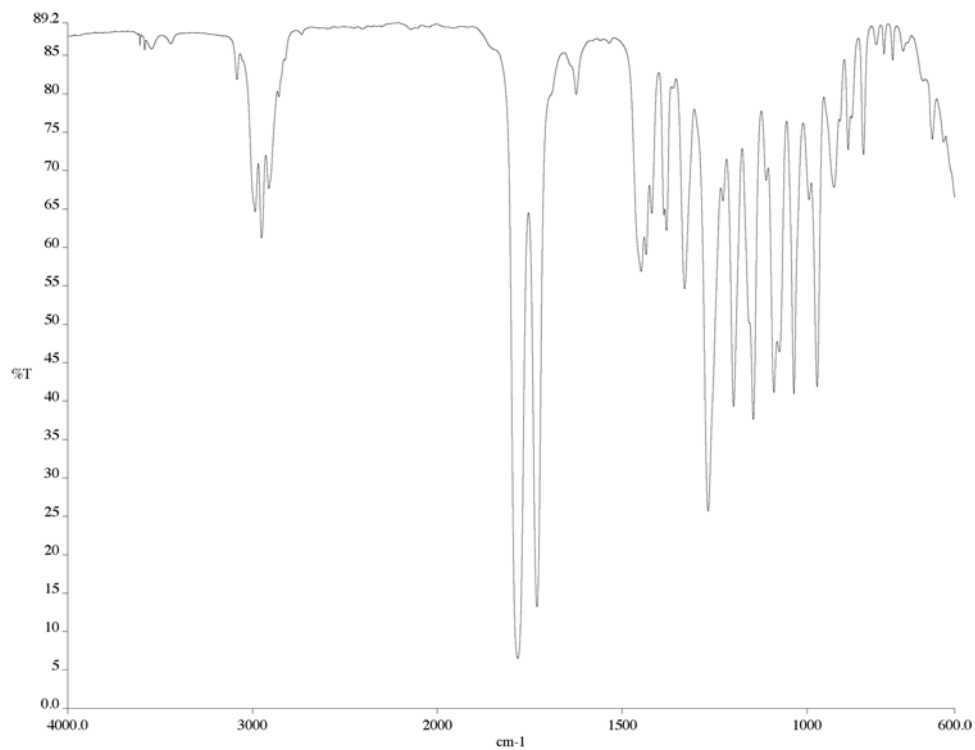
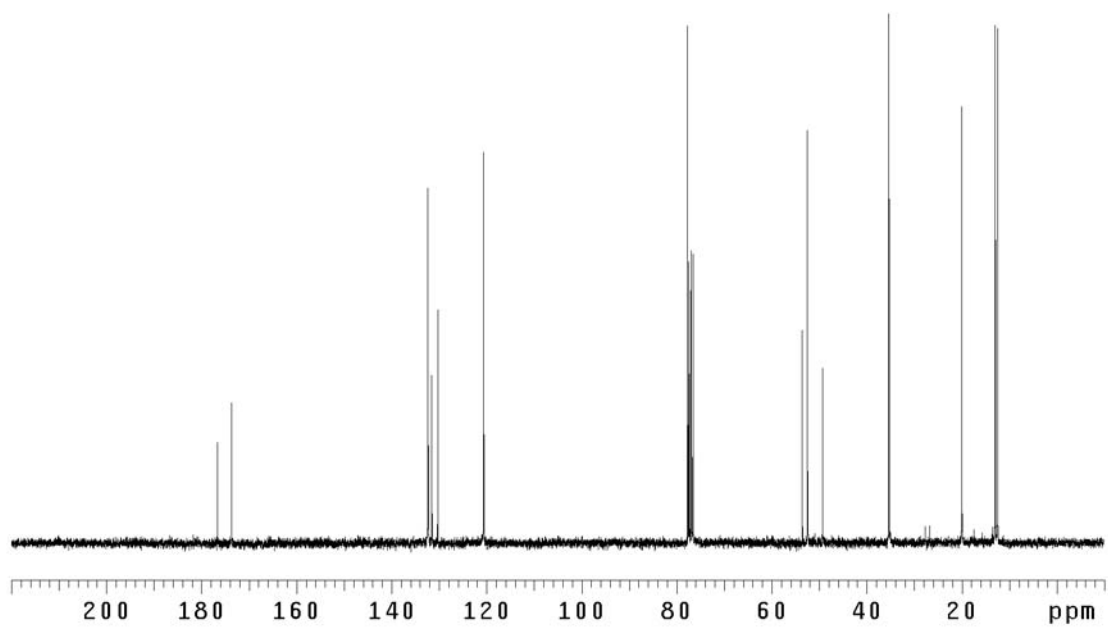


Figure A5.25 <sup>1</sup>H NMR of compound **214** (300 MHz, CDCl<sub>3</sub>)

Figure A5.26 IR of compound **214** (NaCl/film)Figure A5.27 <sup>13</sup>C NMR of compound **214** (75 MHz, CDCl<sub>3</sub>)

Figure A5.28  $^1\text{H}$  NMR of compound **215** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.29 IR of compound **215** (NaCl/film)Figure A5.30 <sup>13</sup>C NMR of compound **215** (75 MHz, CDCl<sub>3</sub>)

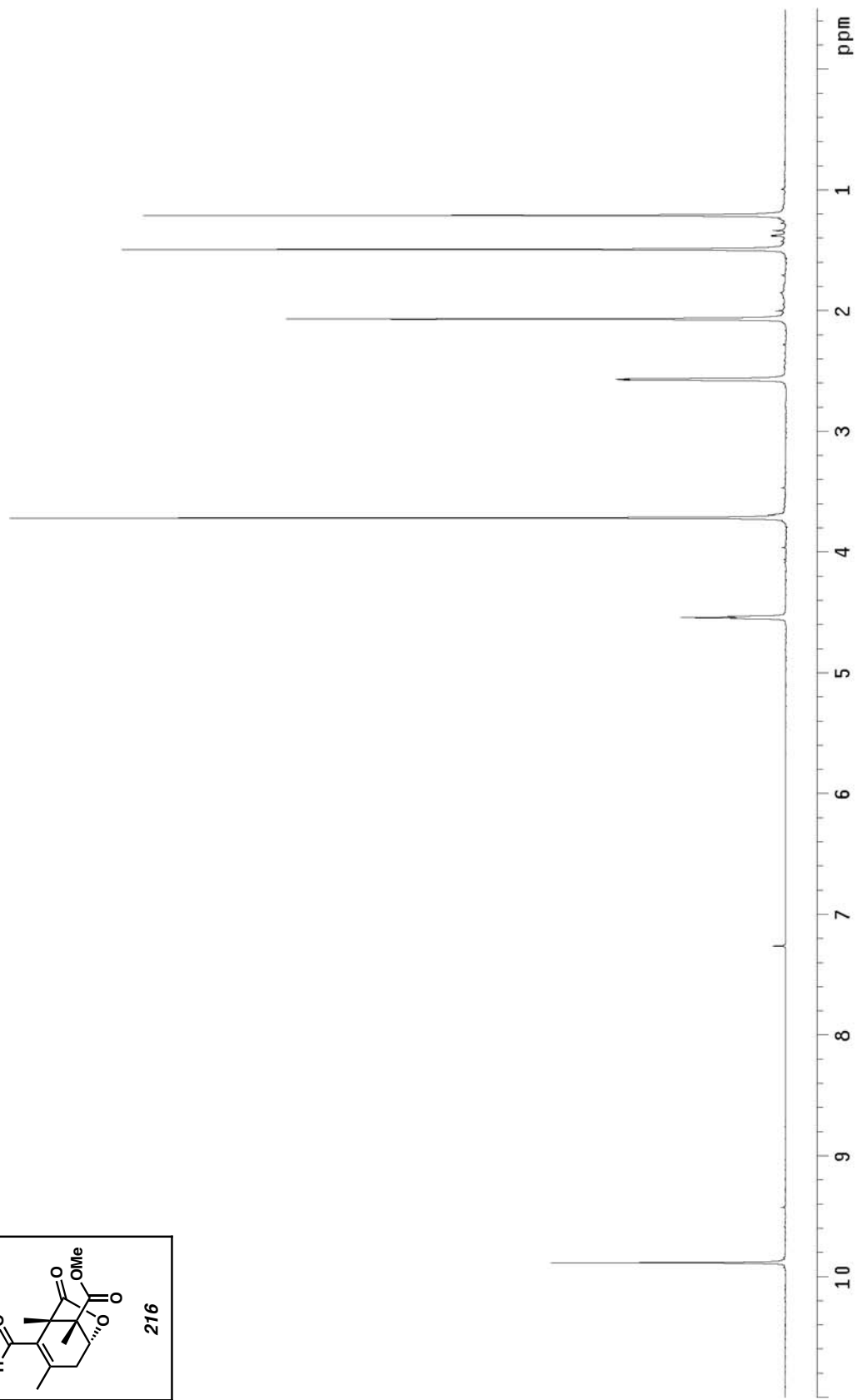
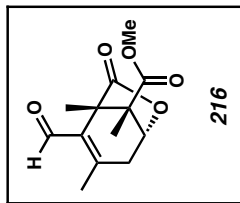
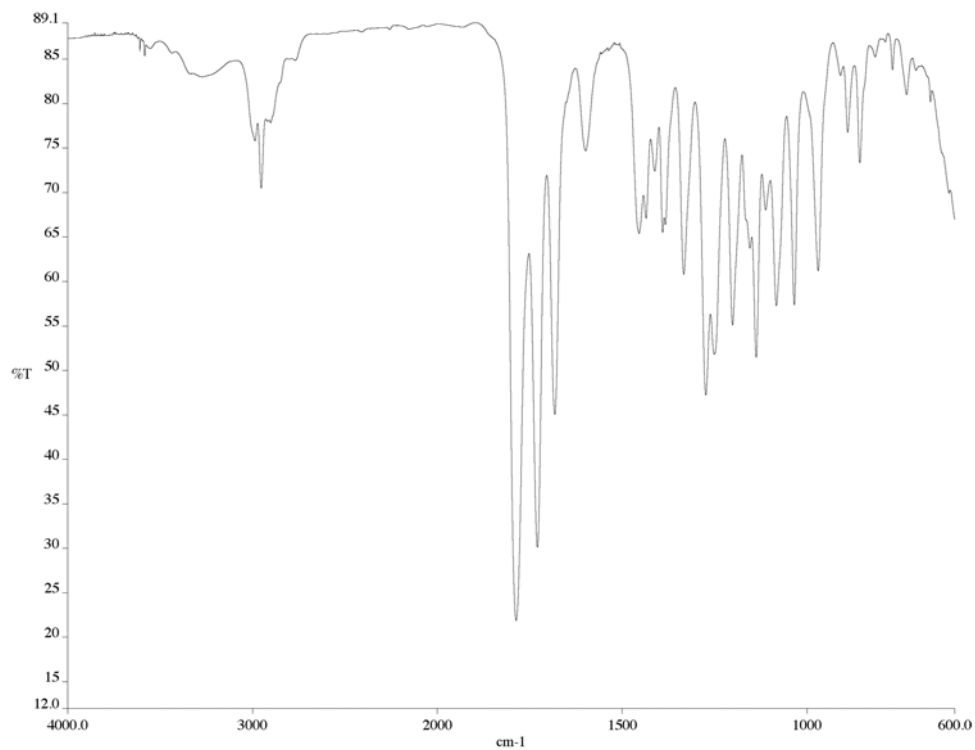
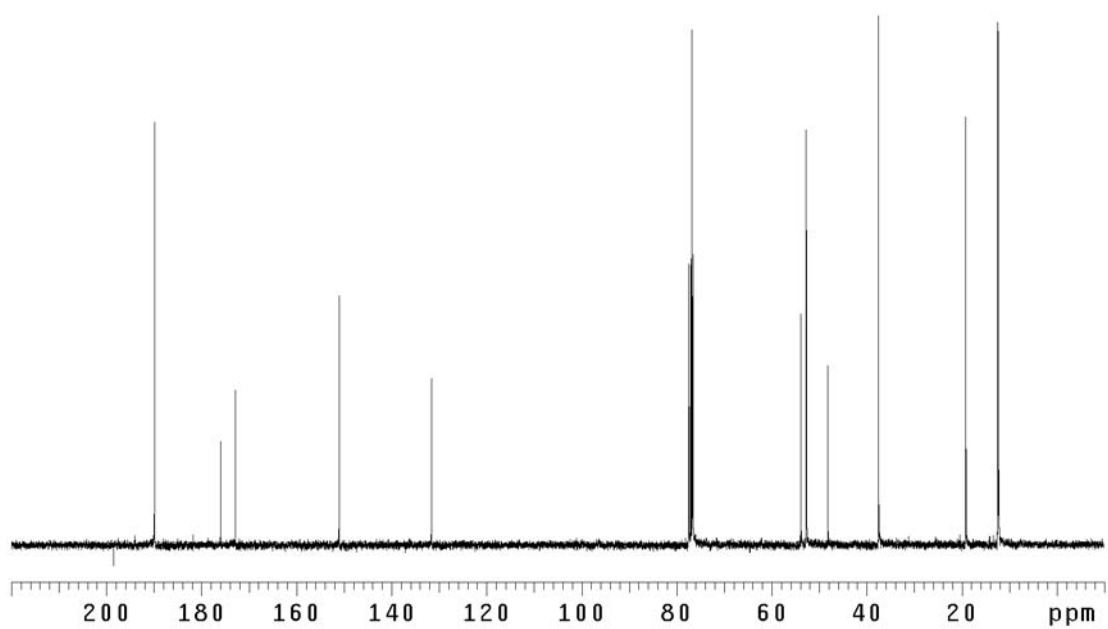
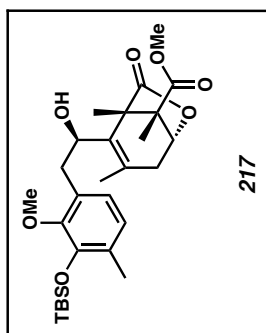
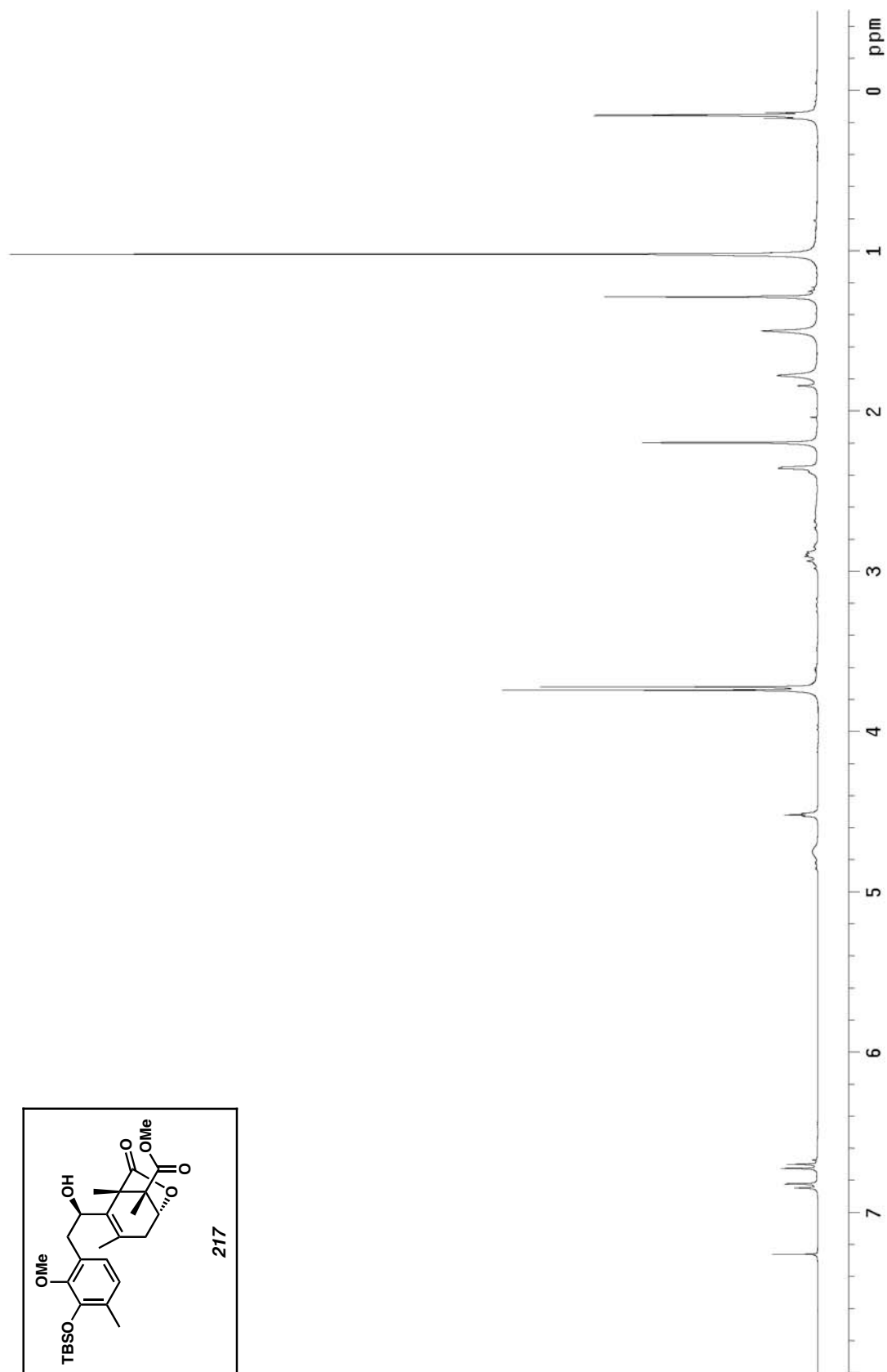
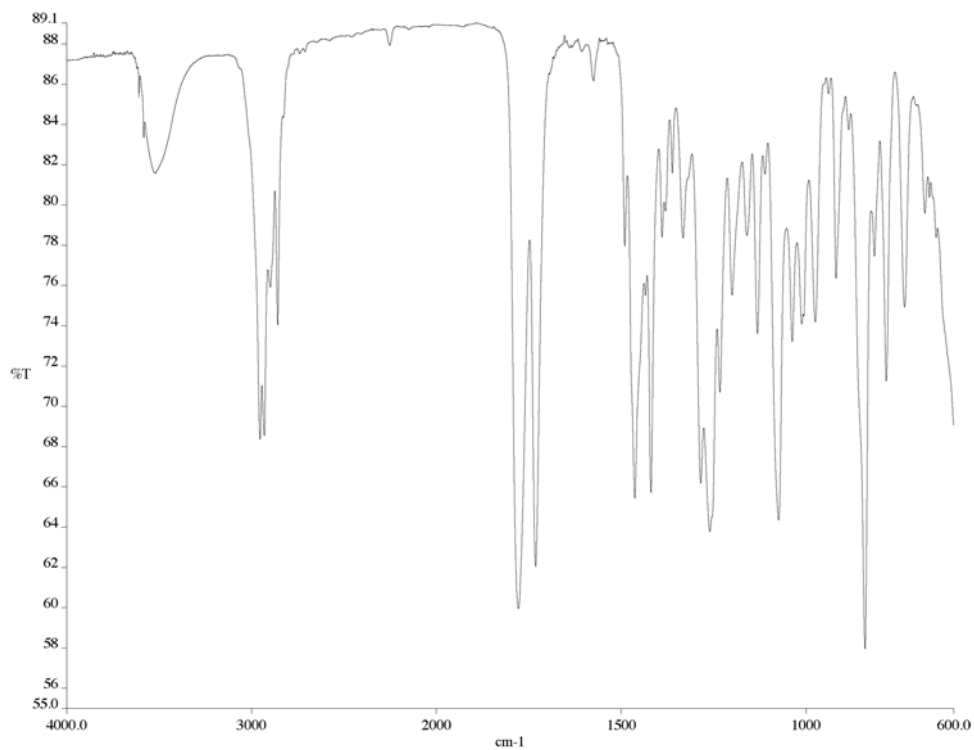
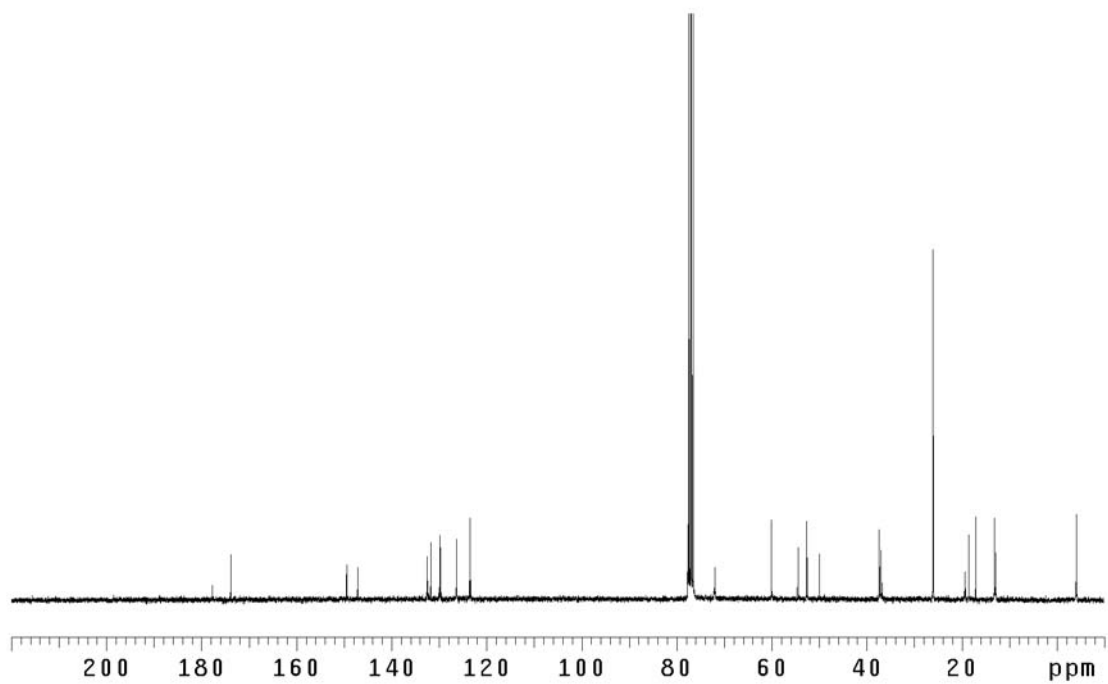


Figure A5.31 <sup>1</sup>H NMR of compound **216** (300 MHz, CDCl<sub>3</sub>)

Figure A5.32 IR of compound **216** (NaCl/film)Figure A5.33 <sup>13</sup>C NMR of compound **216** (75 MHz, CDCl<sub>3</sub>)

Figure A5.34 <sup>1</sup>H NMR of compound **217** (300 MHz, CDCl<sub>3</sub>)



Figure A5.35 IR of compound **217** (NaCl/film)Figure A5.36 <sup>13</sup>C NMR of compound **217** (75 MHz, CDCl<sub>3</sub>)

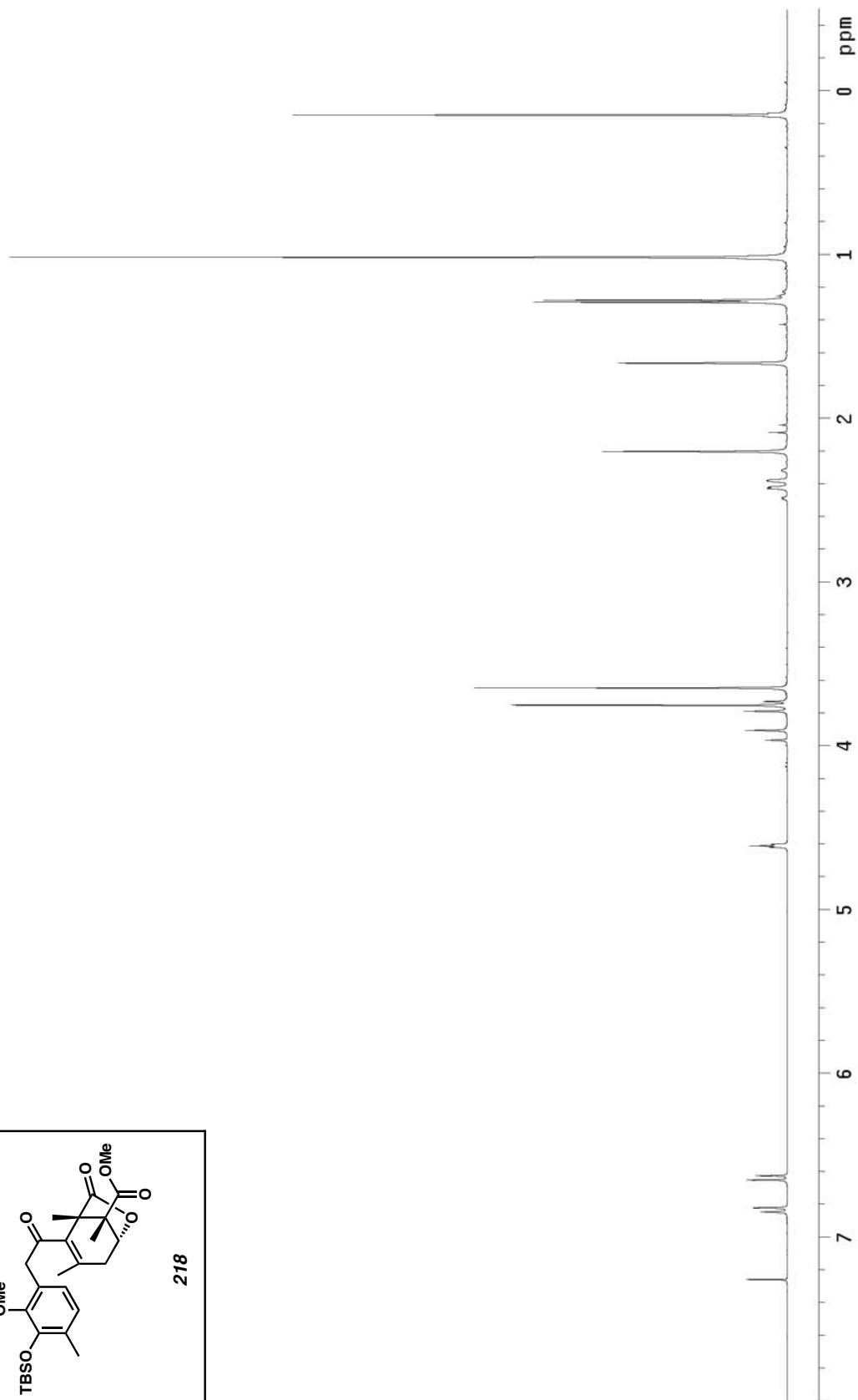
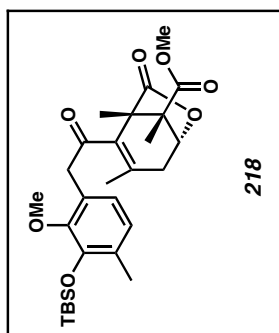
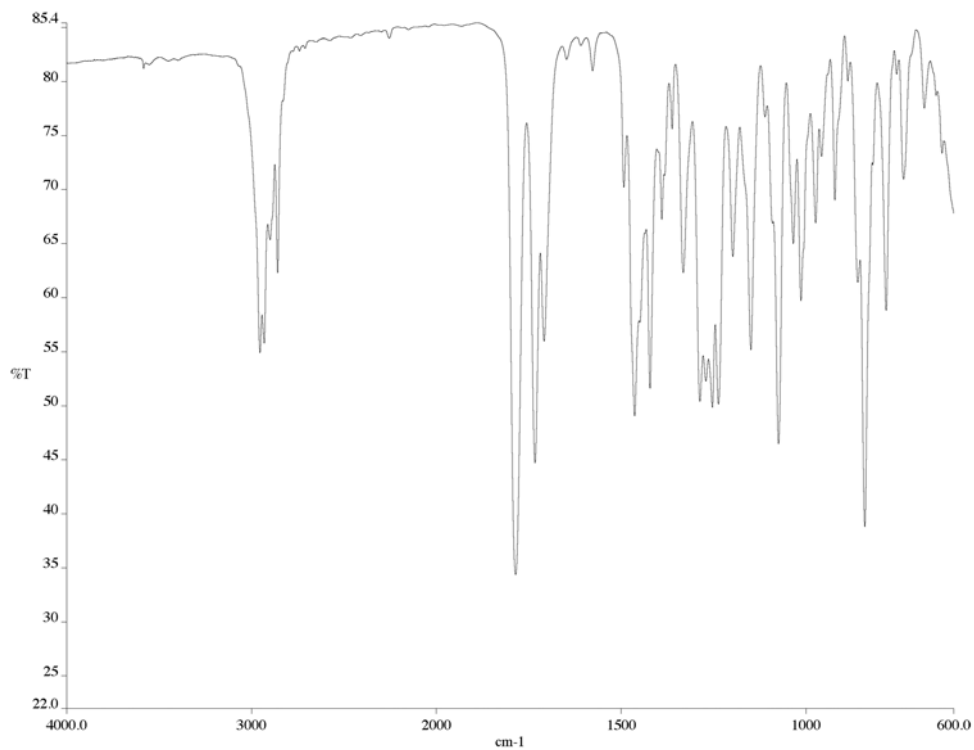
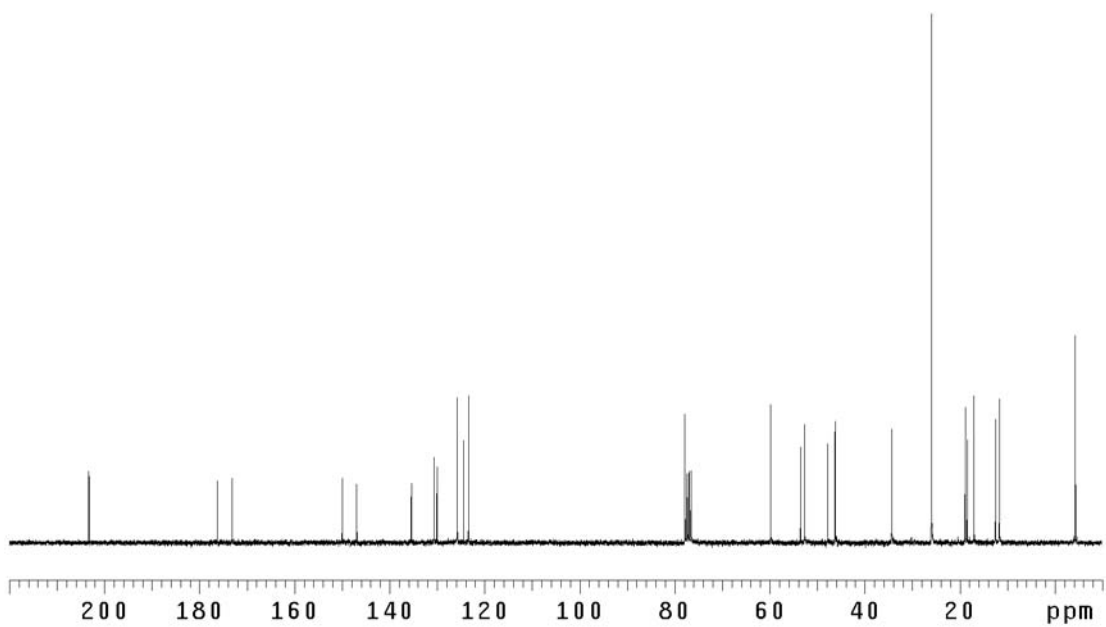
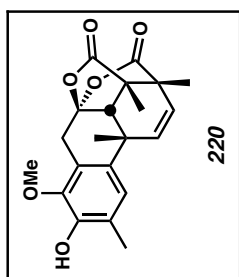


Figure A5.37  $^1\text{H}$  NMR of compound **218** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.38 IR of compound **218** (NaCl/film)Figure A5.39 <sup>13</sup>C NMR of compound **218** (75 MHz, CDCl<sub>3</sub>)



**220**

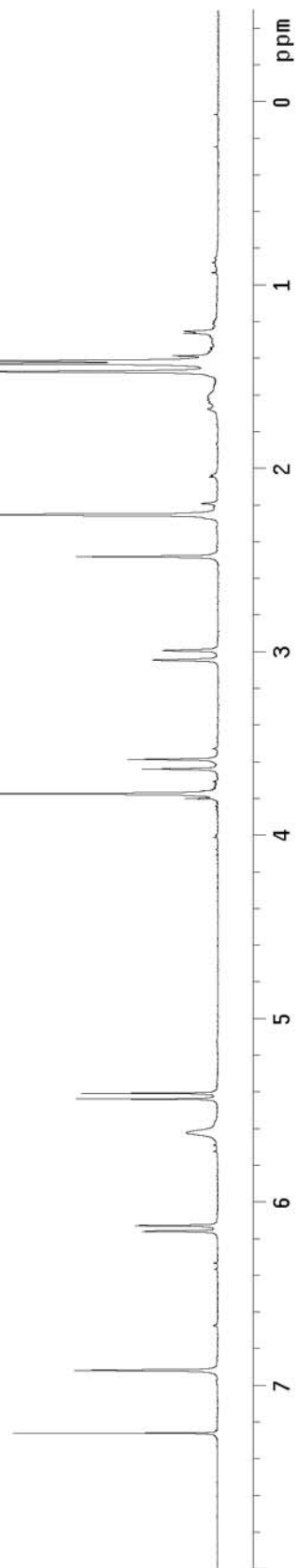
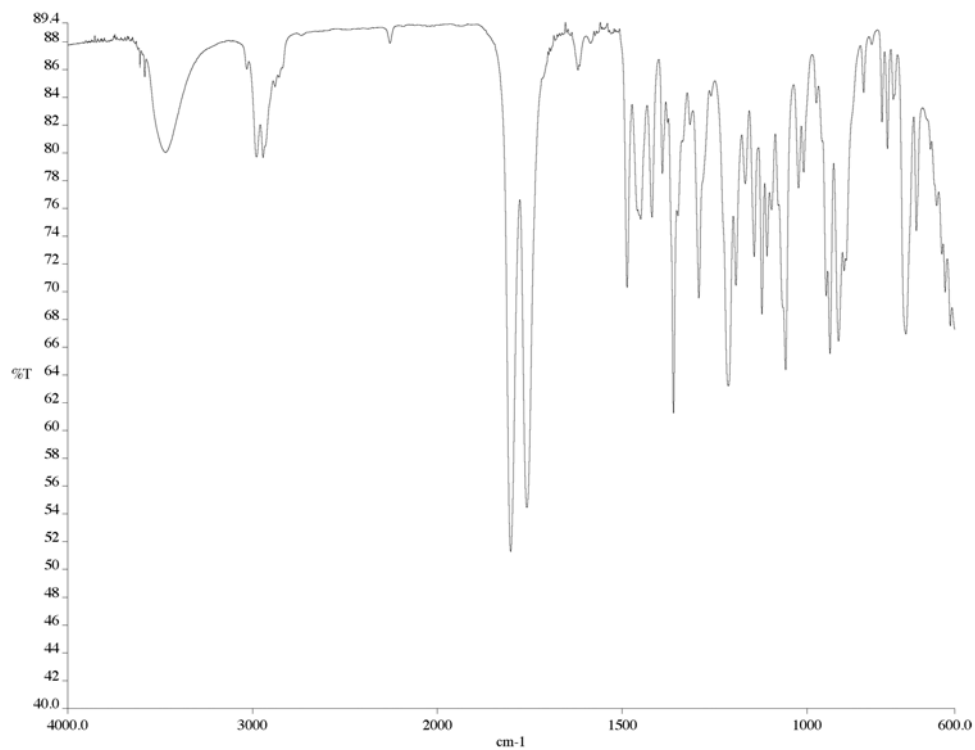
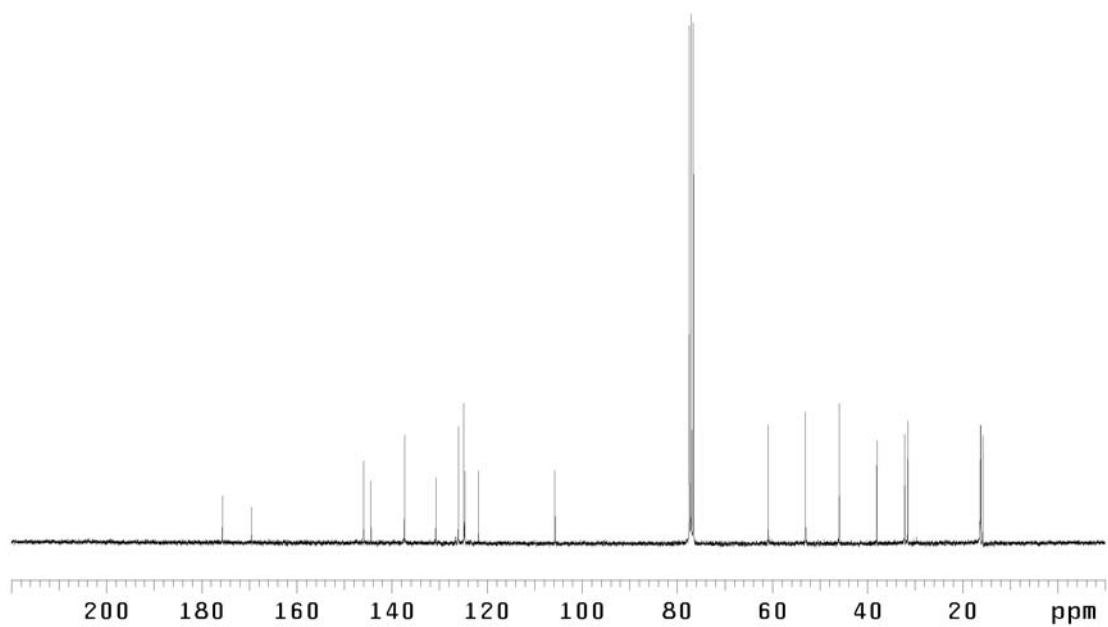


Figure A5.40  $^1\text{H}$  NMR of compound **220** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.41 IR of compound **220** (NaCl/film)Figure A5.42 <sup>13</sup>C NMR of compound **220** (75 MHz, CDCl<sub>3</sub>)

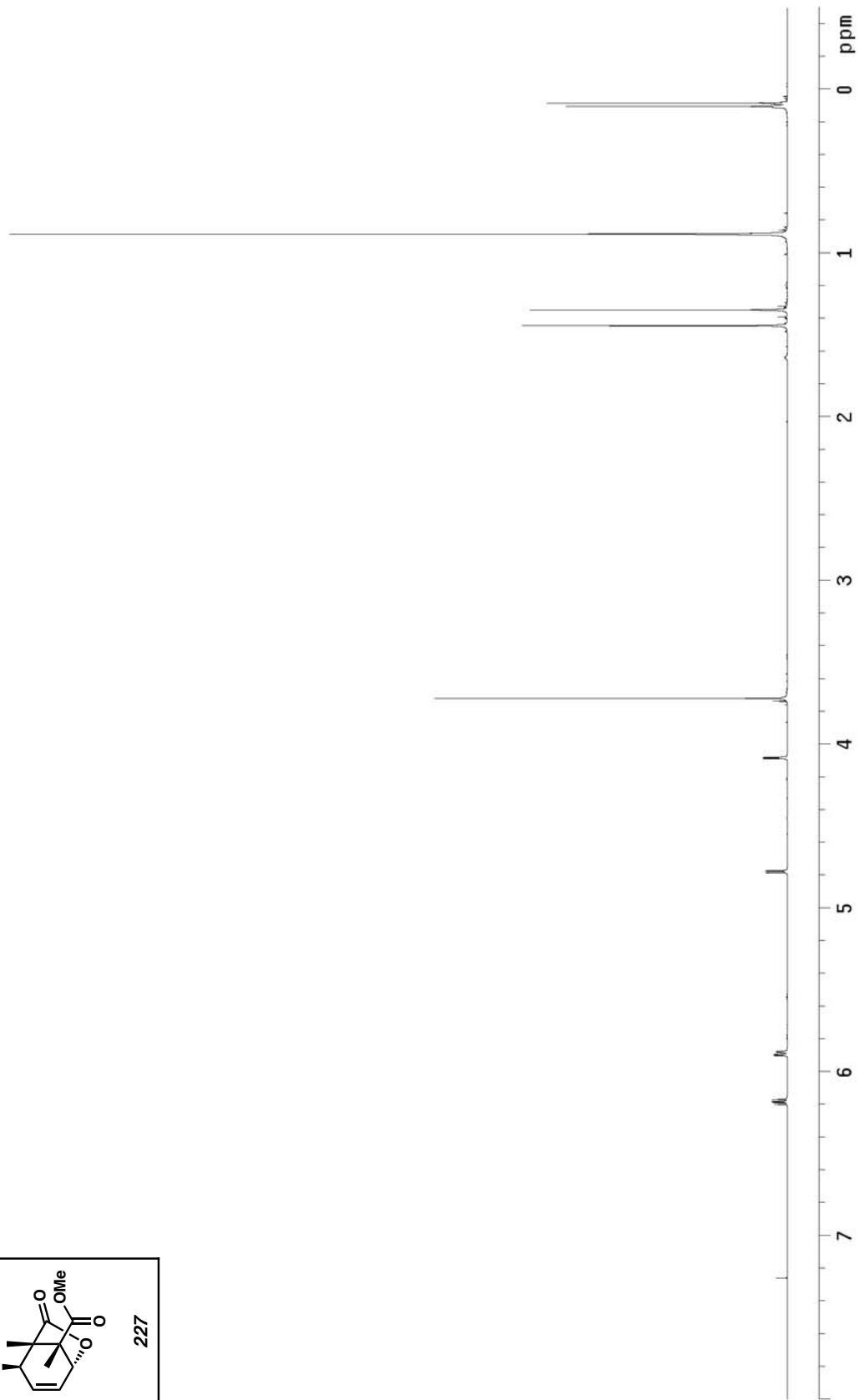
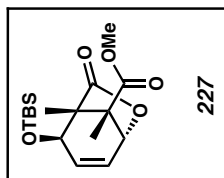
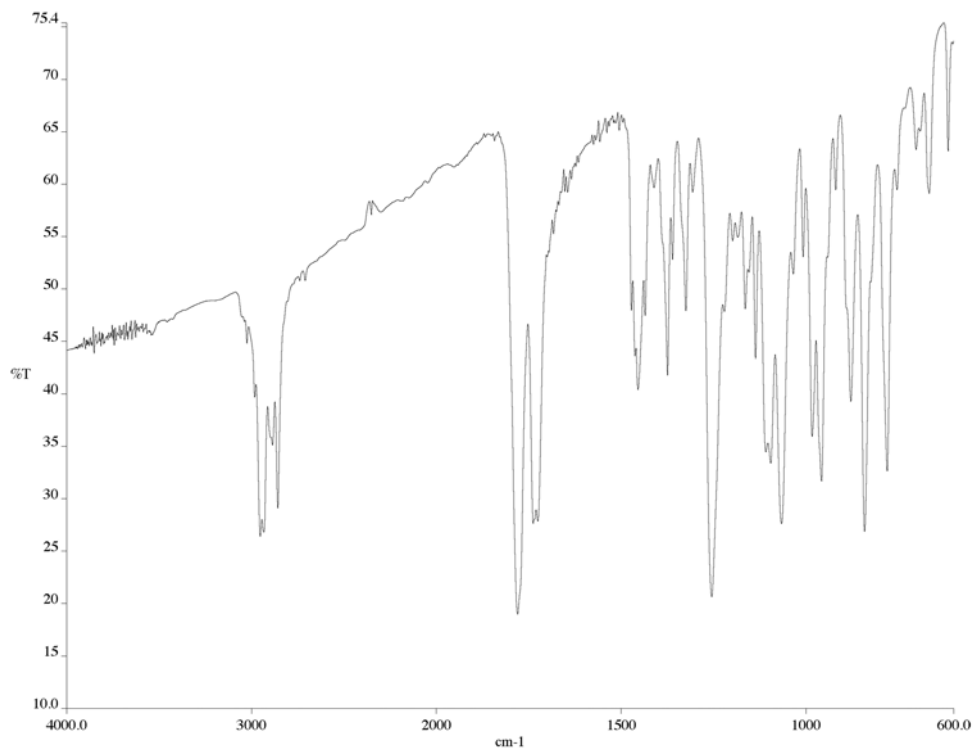
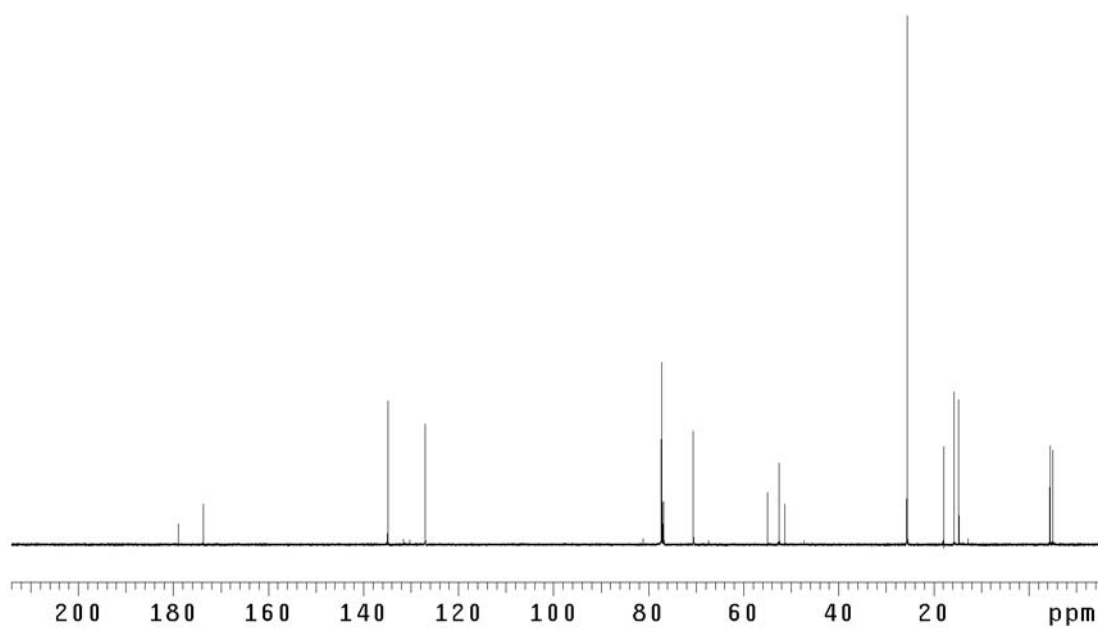


Figure A5.43  $^1\text{H}$  NMR of compound 227 (500 MHz,  $\text{CDCl}_3$ )

Figure A5.44 IR of compound **227** (NaCl/film)Figure A5.45 <sup>13</sup>C NMR of compound **227** (125 MHz, CDCl<sub>3</sub>)

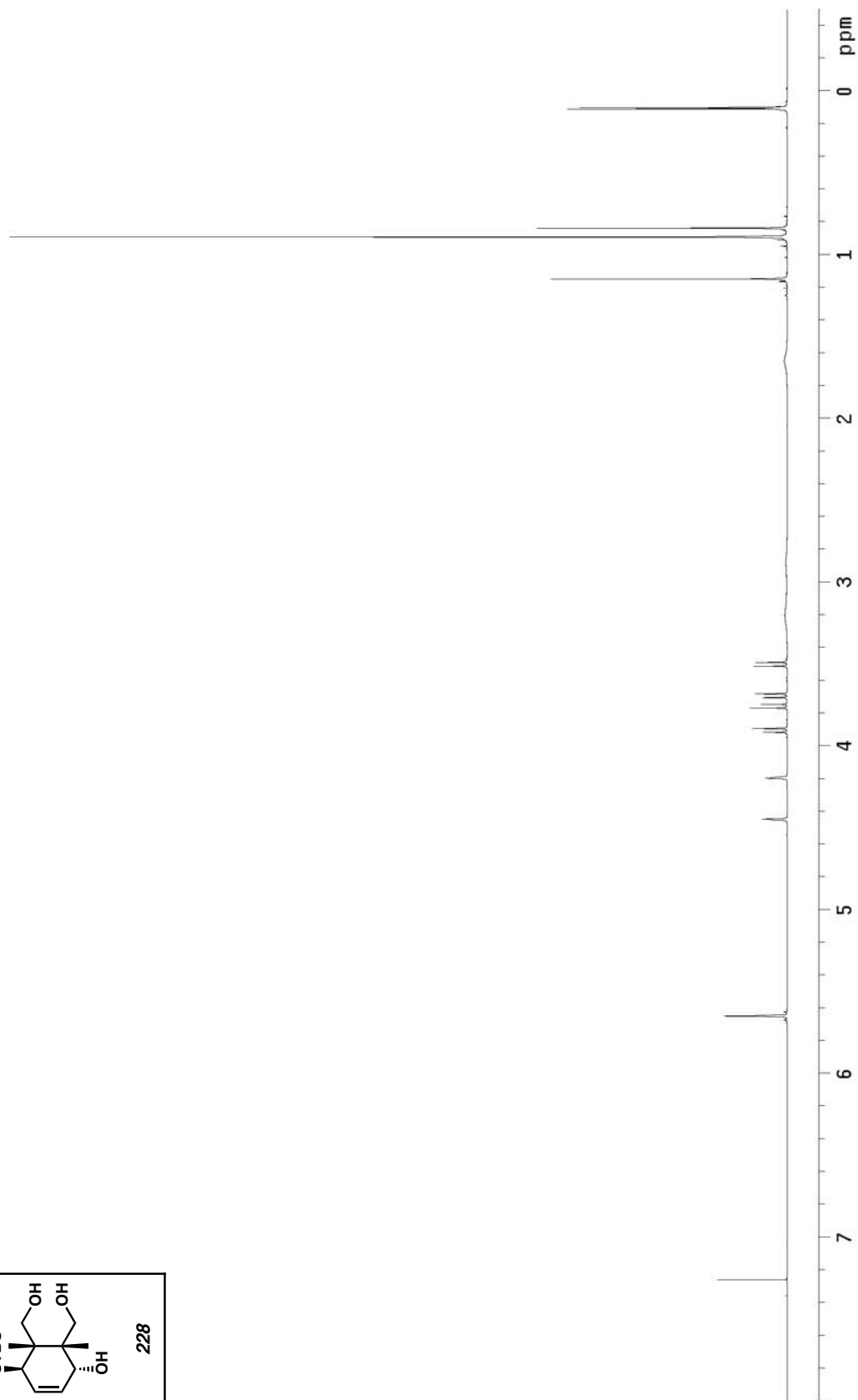
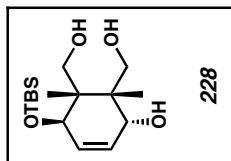
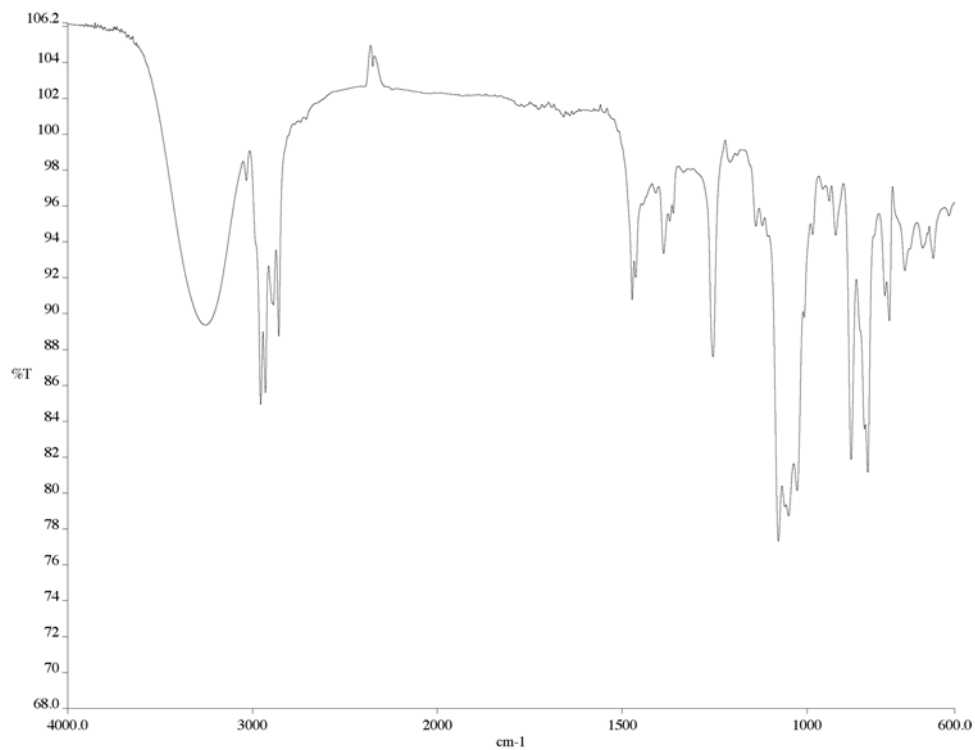
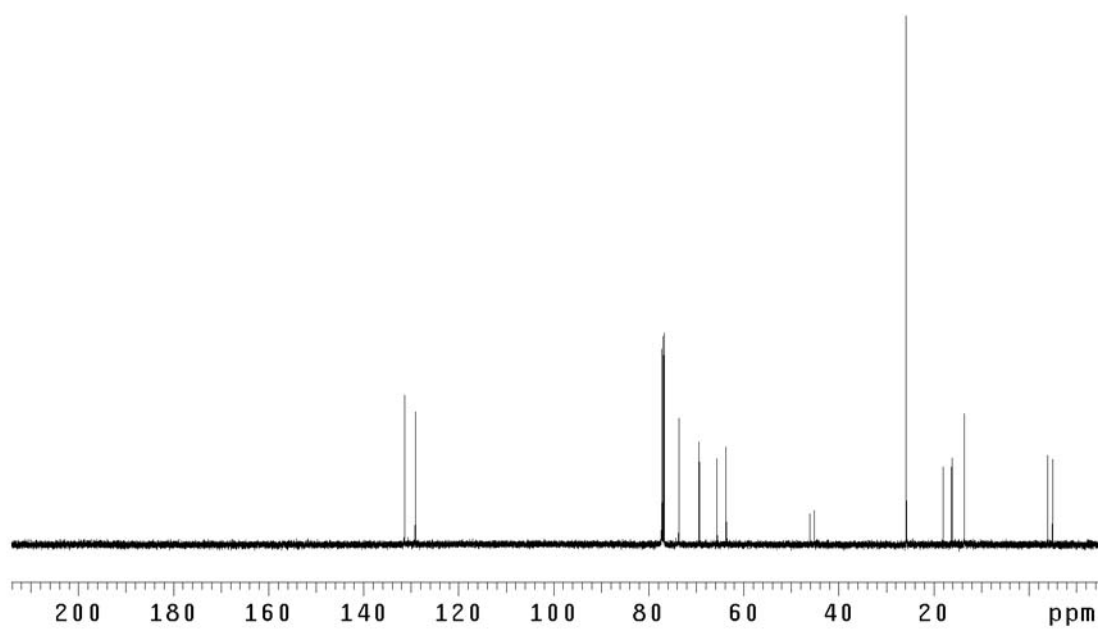


Figure A5.46 <sup>1</sup>H NMR of compound 228 (500 MHz, CDCl<sub>3</sub>)



Figure A5.47 IR of compound **228** (NaCl/film)Figure A5.48 <sup>13</sup>C NMR of compound **228** (125 MHz, CDCl<sub>3</sub>)

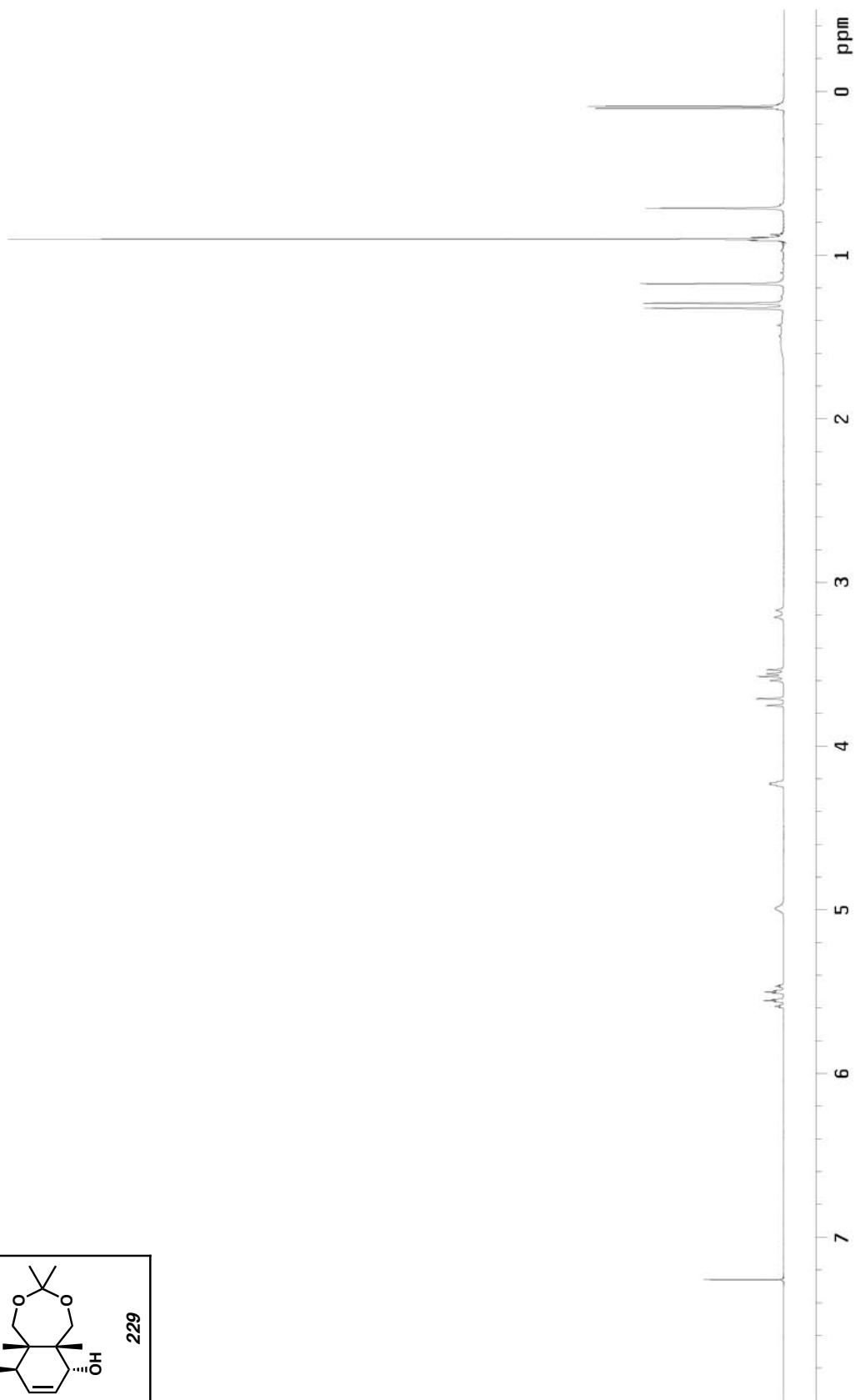
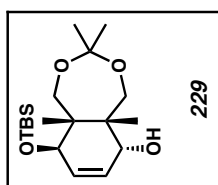
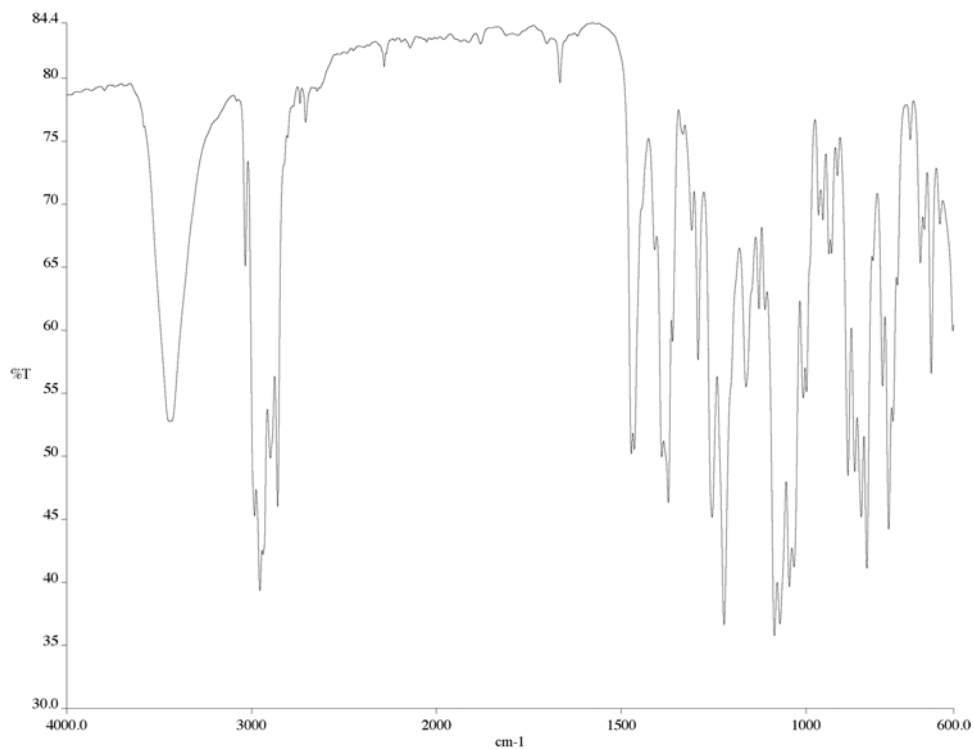
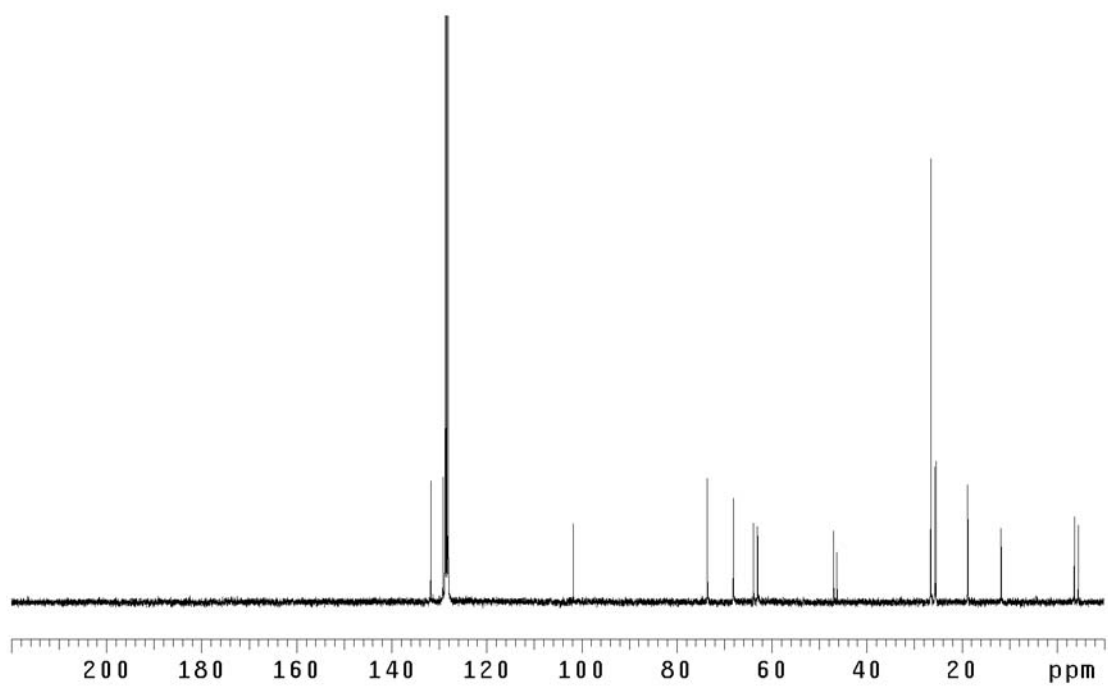


Figure A5.49  $^1\text{H}$  NMR of compound **229** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.50 IR of compound **229** (NaCl/film)Figure A5.51 <sup>13</sup>C NMR of compound **229** (75 MHz, C<sub>6</sub>D<sub>6</sub>)

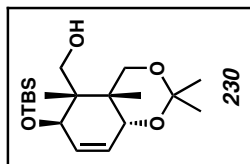
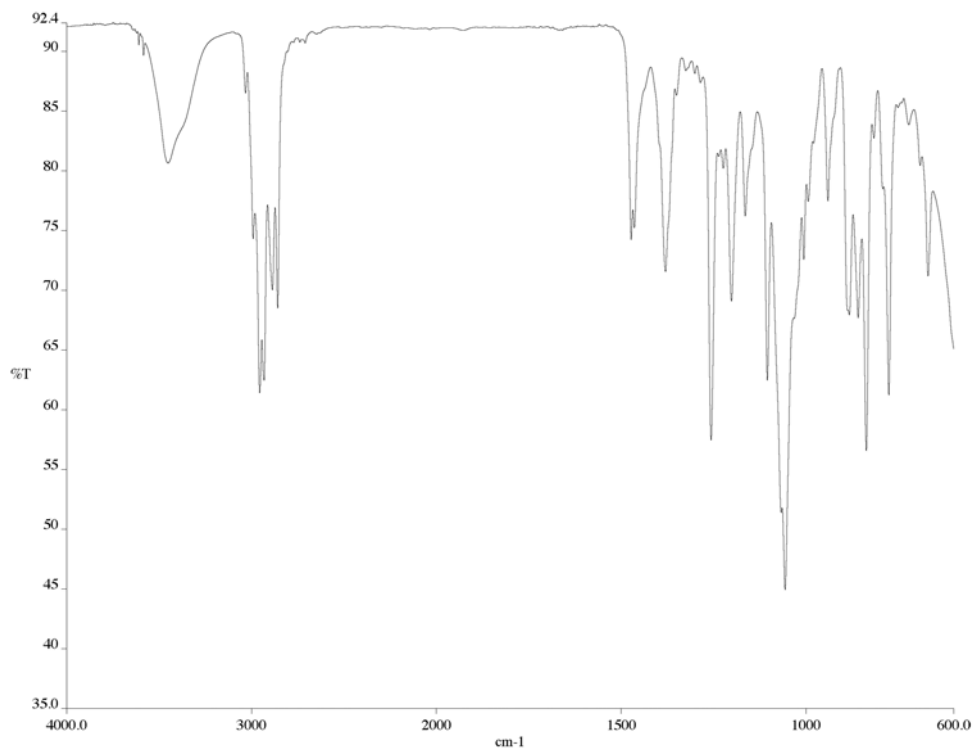
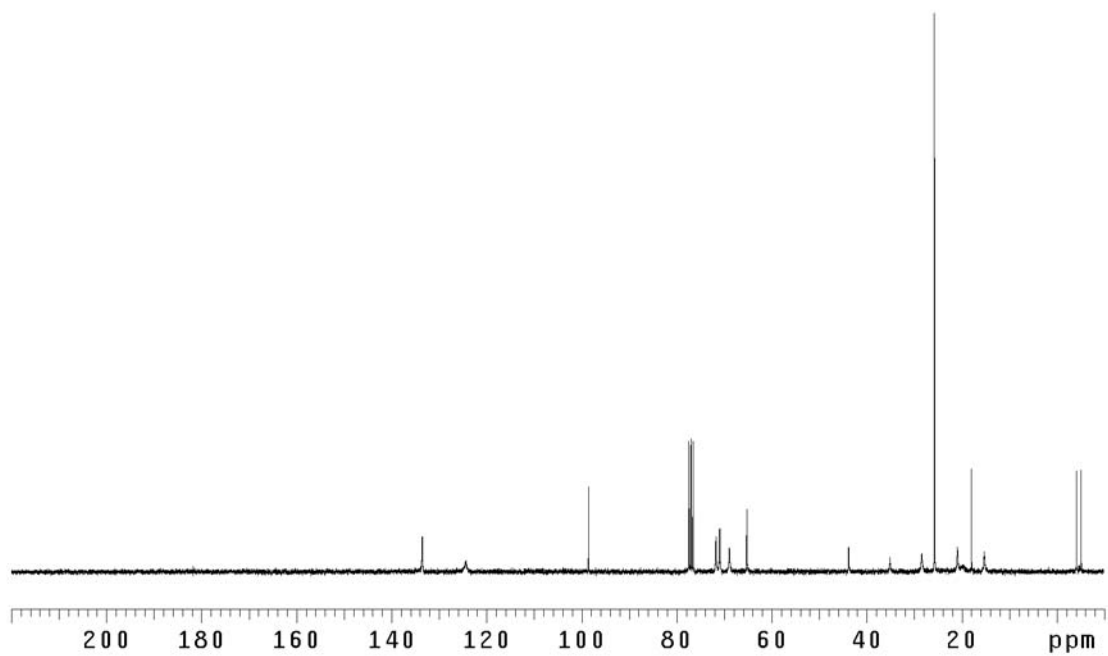


Figure A5.52  $^1\text{H}$  NMR of compound **230** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.53 IR of compound **230** (NaCl/film)Figure A5.54 <sup>13</sup>C NMR of compound **230** (75 MHz, CDCl<sub>3</sub>)

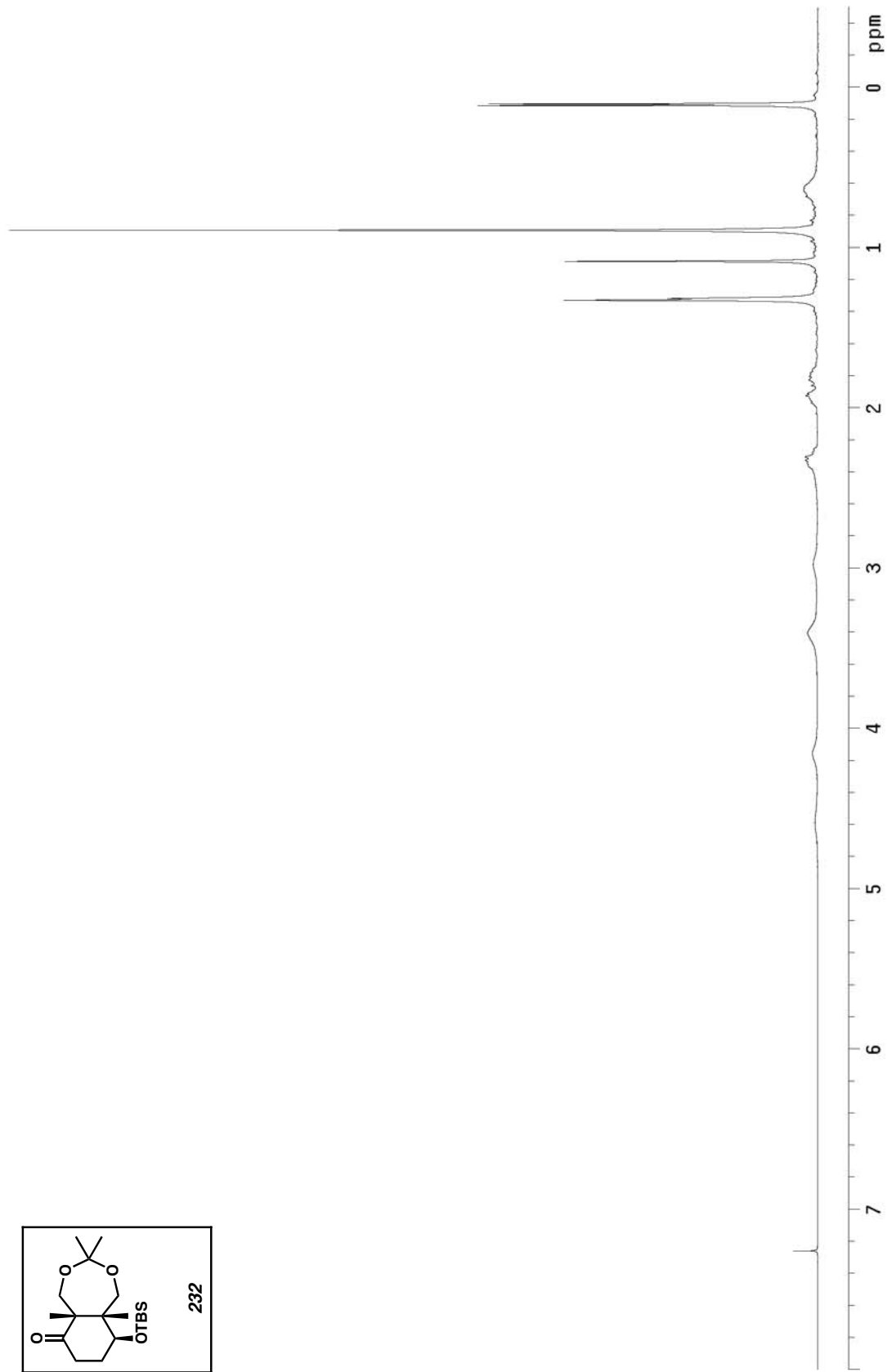
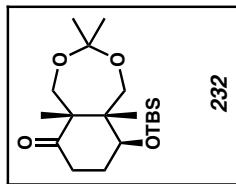
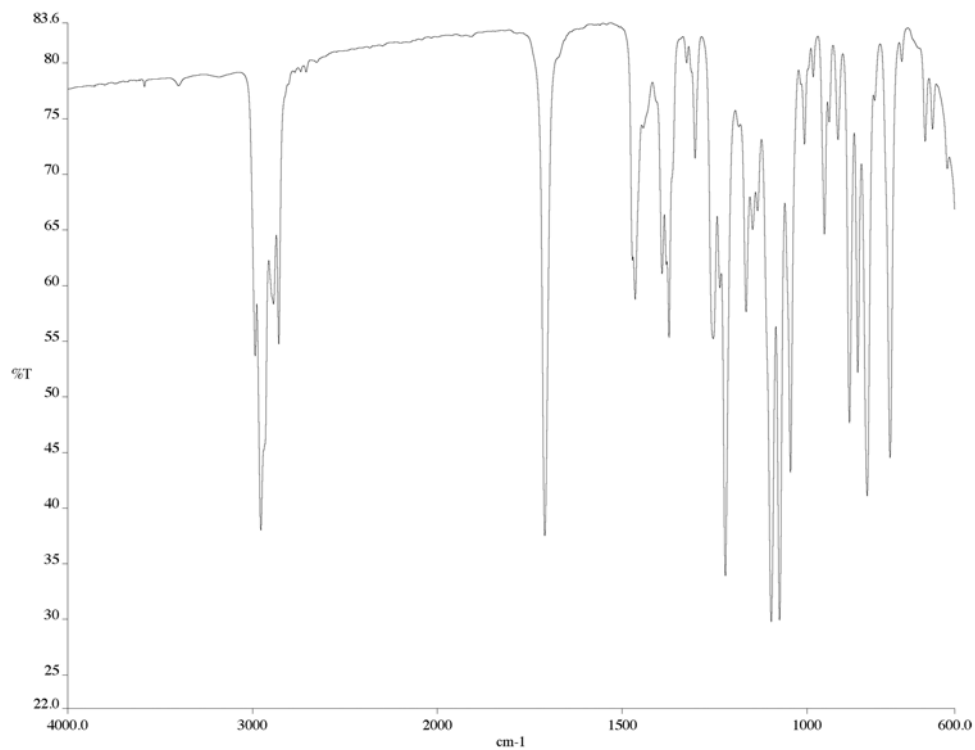
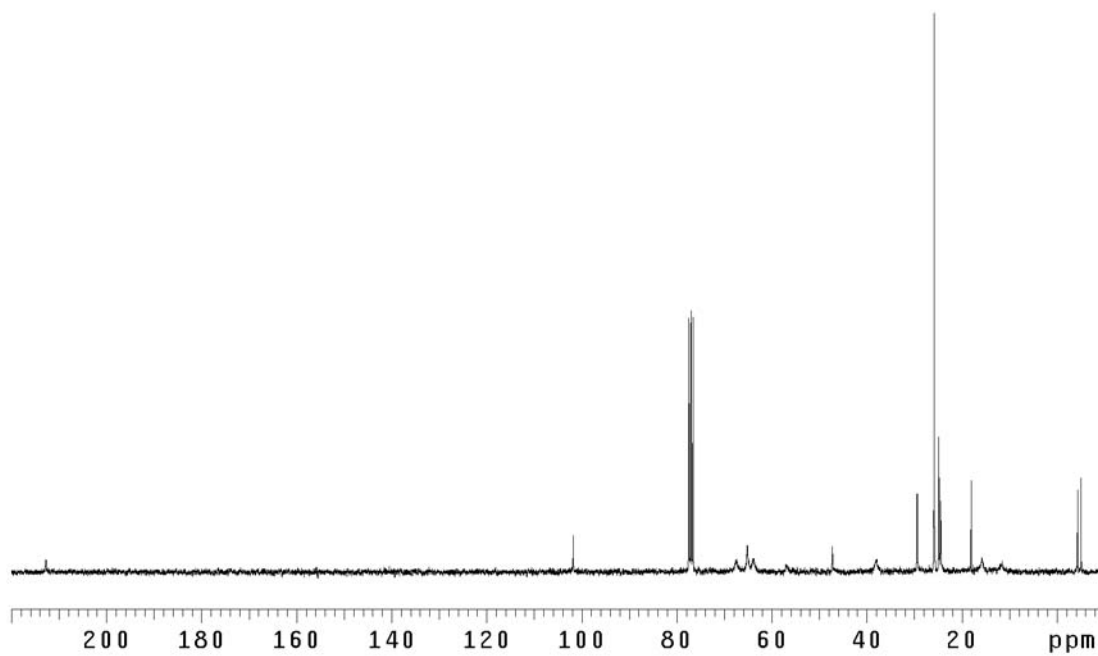


Figure A5.55  $^1\text{H}$  NMR of compound **232** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.56 IR of compound **232** (NaCl/film)Figure A5.57 <sup>13</sup>C NMR of compound **232** (75 MHz, CDCl<sub>3</sub>)

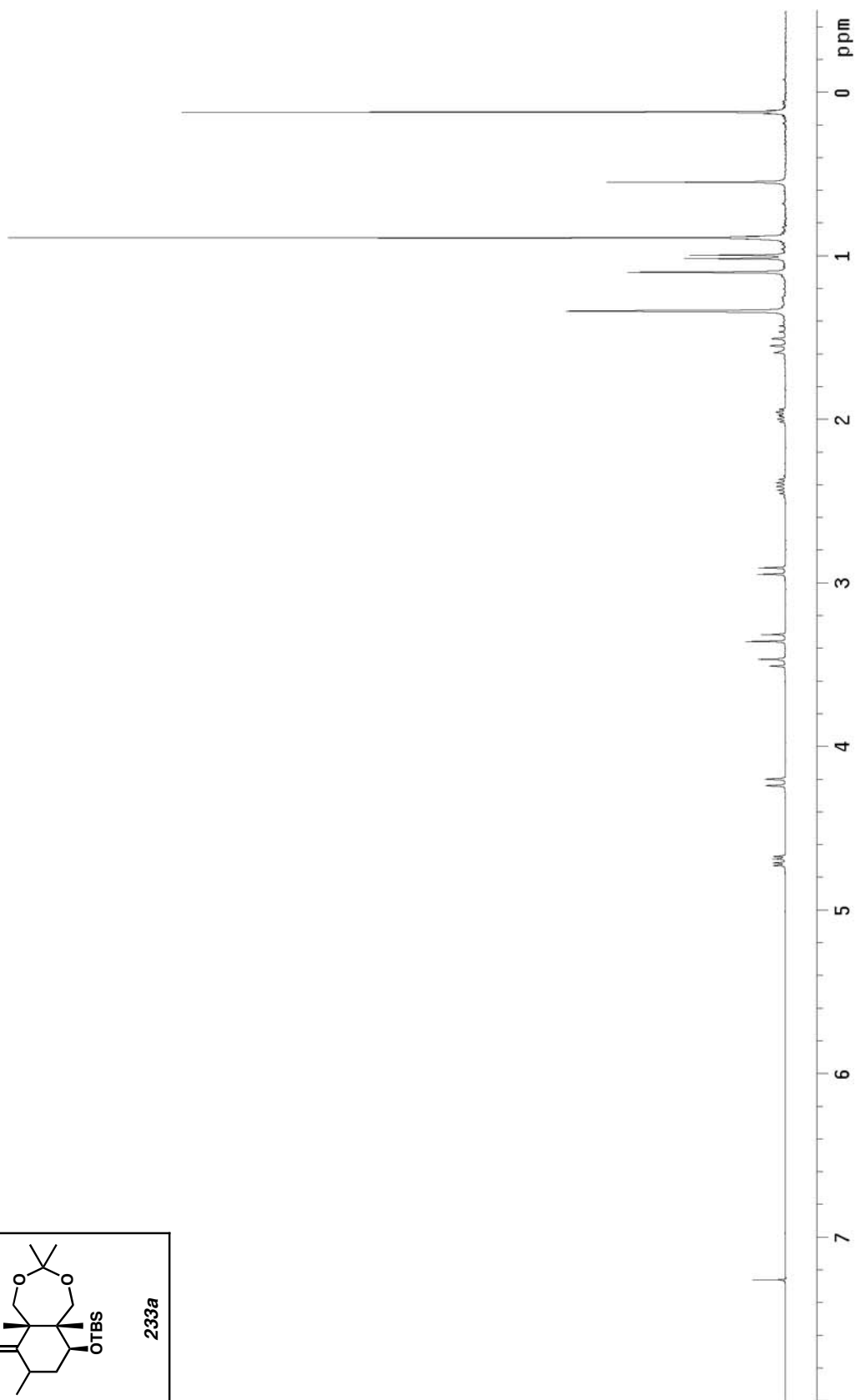
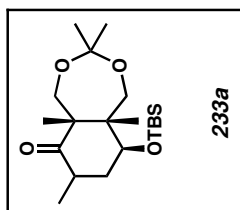
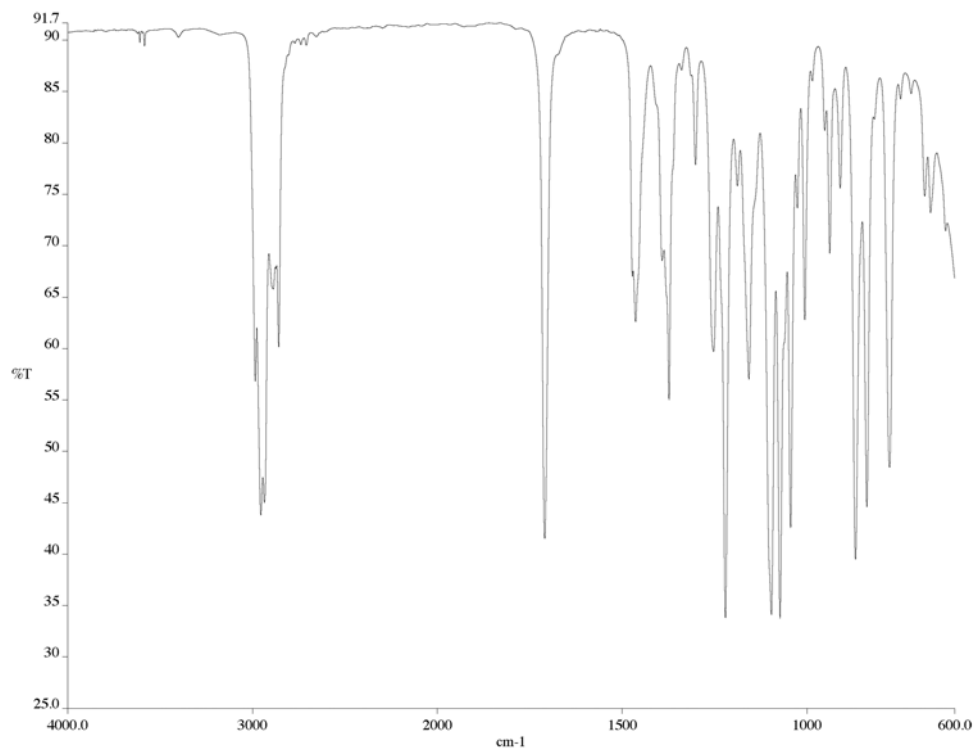
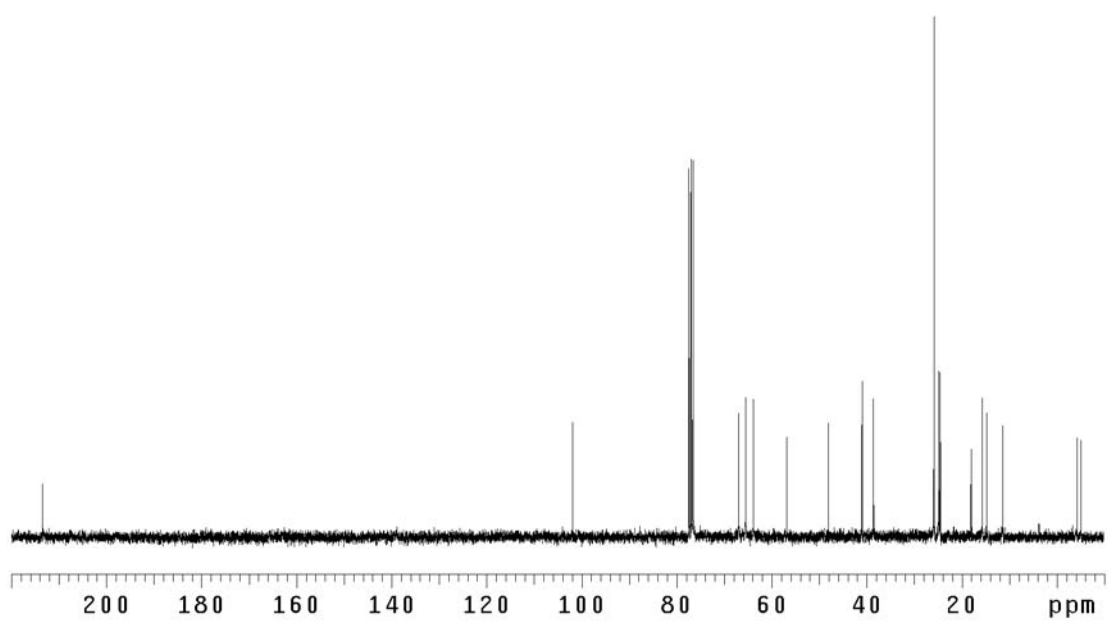


Figure A5.58  $^1\text{H}$  NMR of compound **233a** (300 MHz,  $\text{CDCl}_3$ )



Figure A5.59 IR of compound **233a** (NaCl/film)Figure A5.60 <sup>13</sup>C NMR of compound **233a** (75 MHz, CDCl<sub>3</sub>)

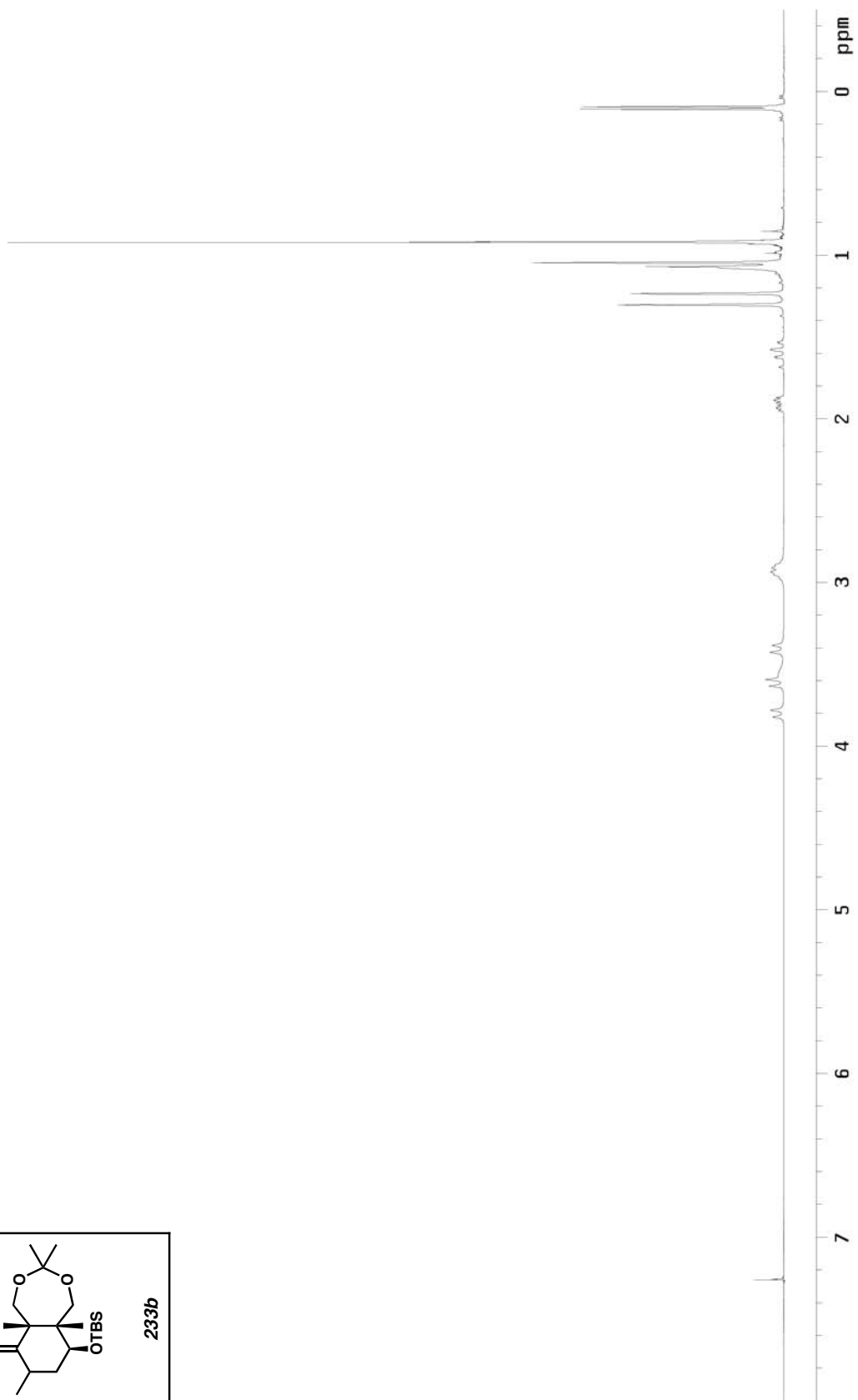
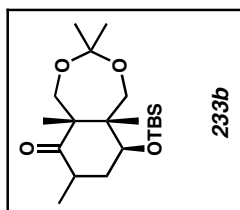


Figure A5.61  $^1\text{H}$  NMR of compound **233b** (300 MHz,  $\text{CDCl}_3$ )

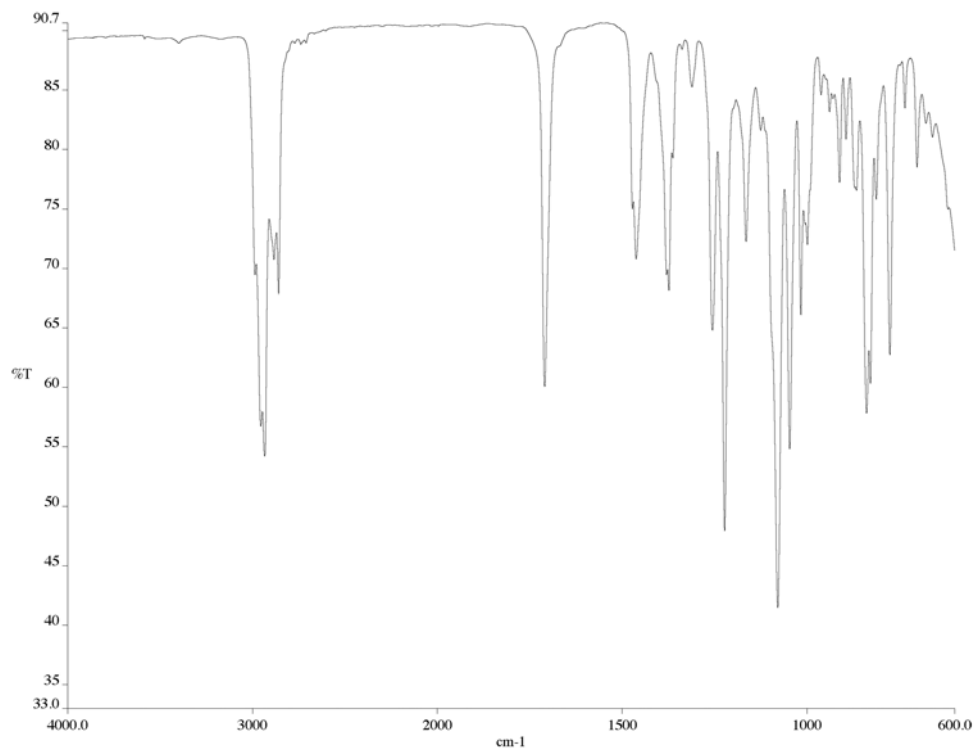


Figure A5.62 IR of compound **233b** (NaCl/film)

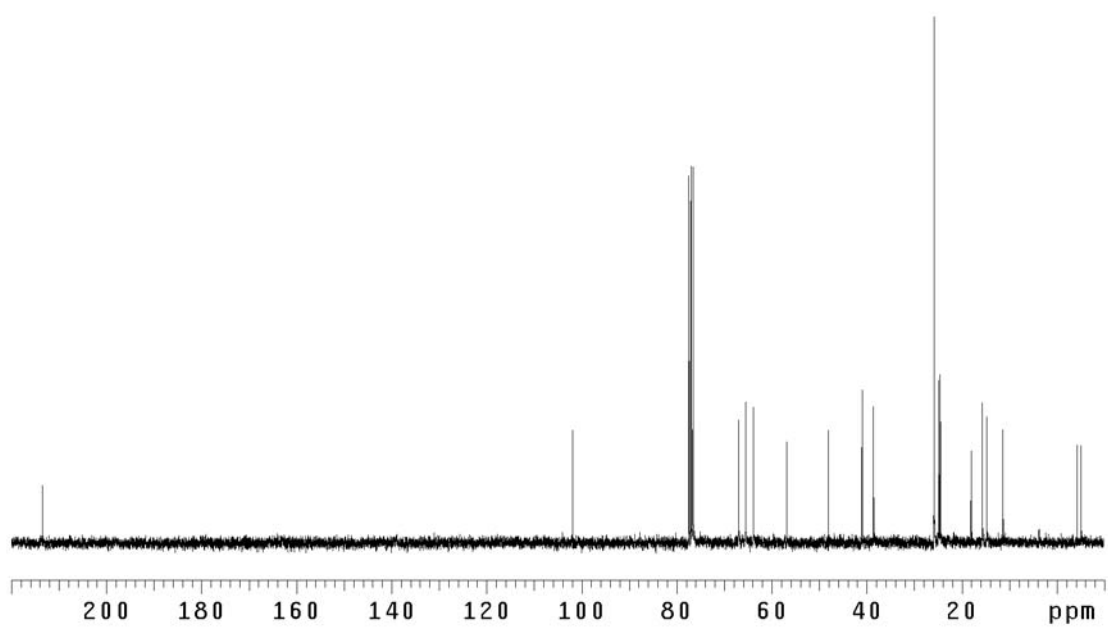


Figure A5.63 <sup>13</sup>C NMR of compound **233b** (75 MHz, CDCl<sub>3</sub>)

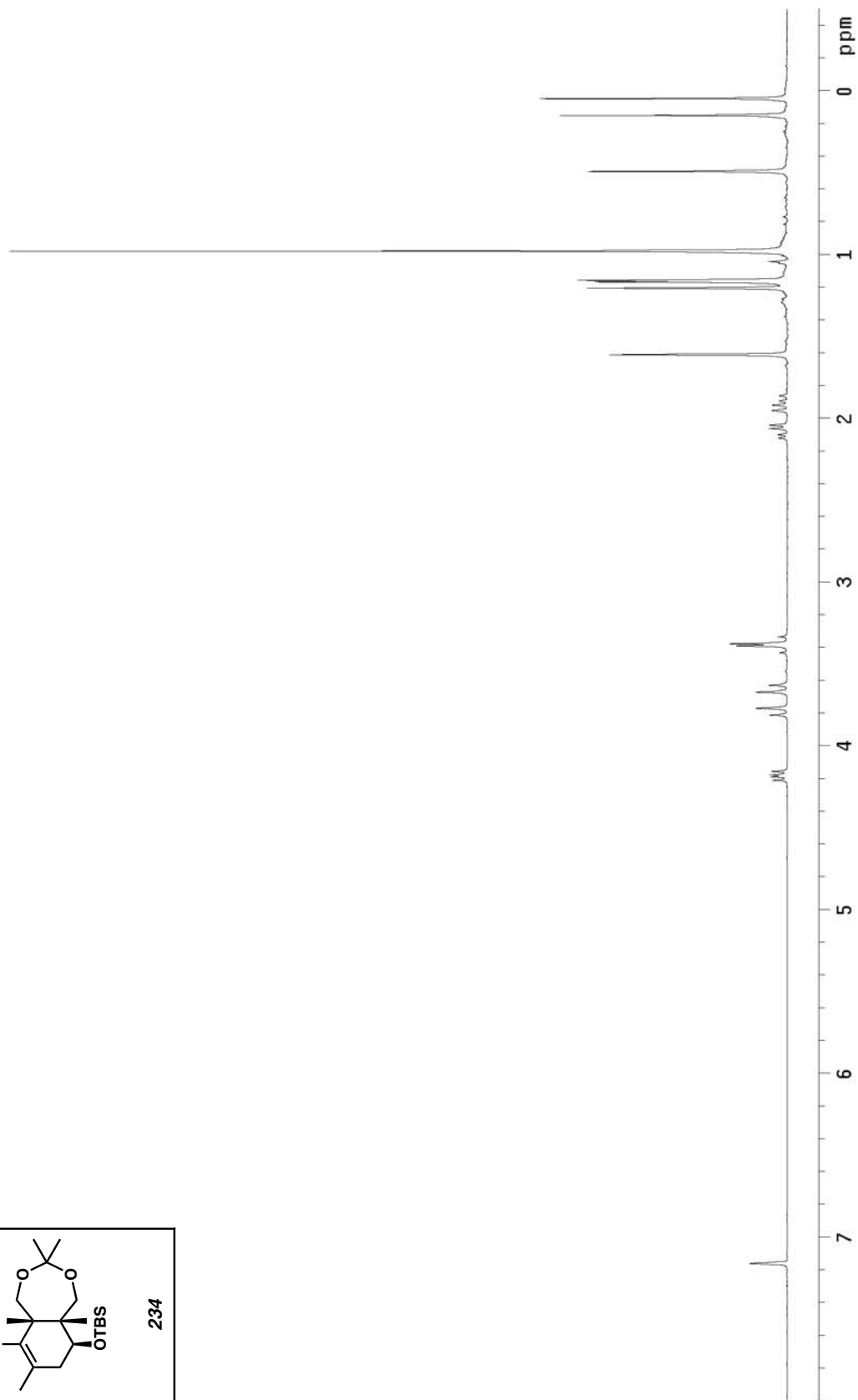
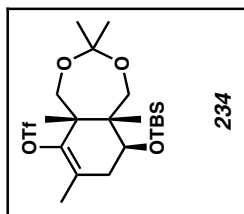
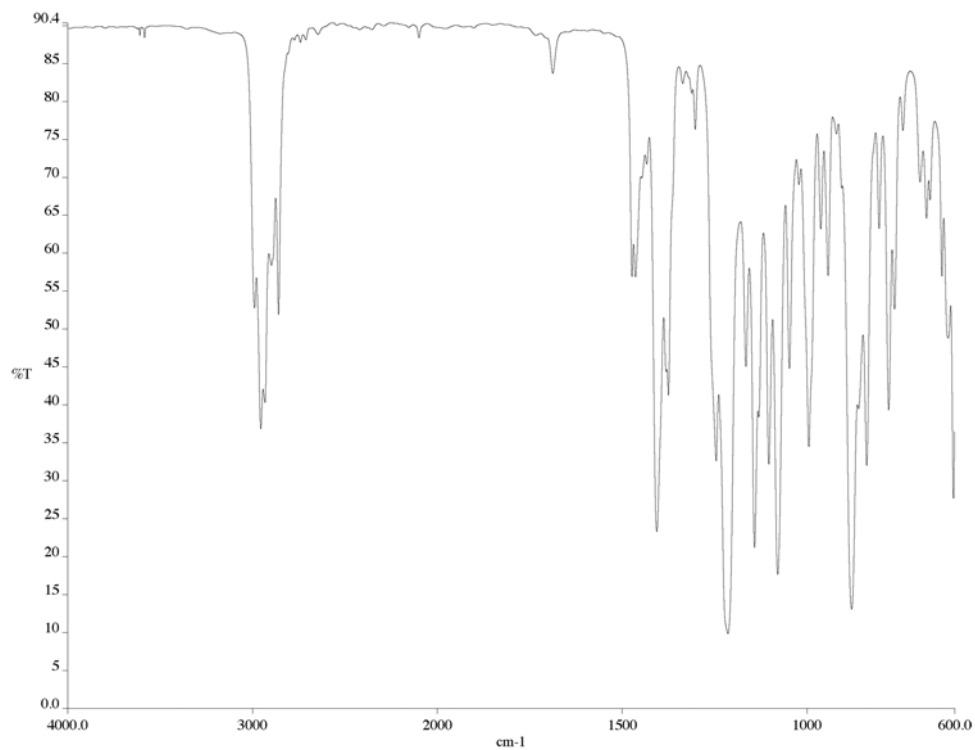
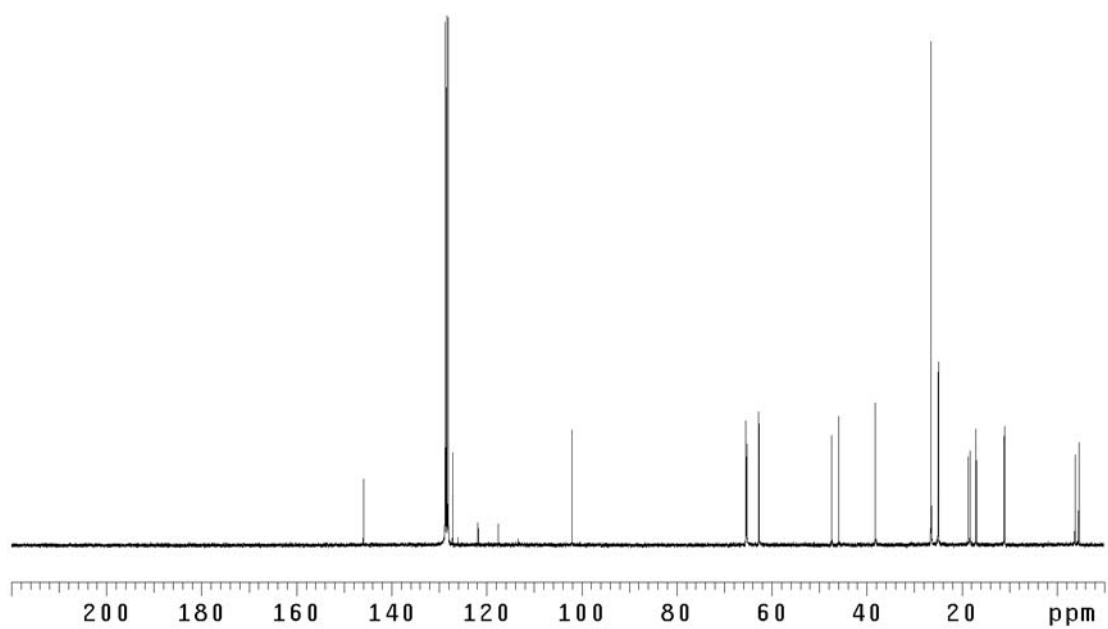


Figure A5.64  $^1\text{H NMR}$  of compound **234** (300 MHz,  $\text{C}_6\text{D}_6$ )

Figure A5.65 IR of compound **234** (NaCl/film)Figure A5.66 <sup>13</sup>C NMR of compound **234** (75 MHz, C<sub>6</sub>D<sub>6</sub>)

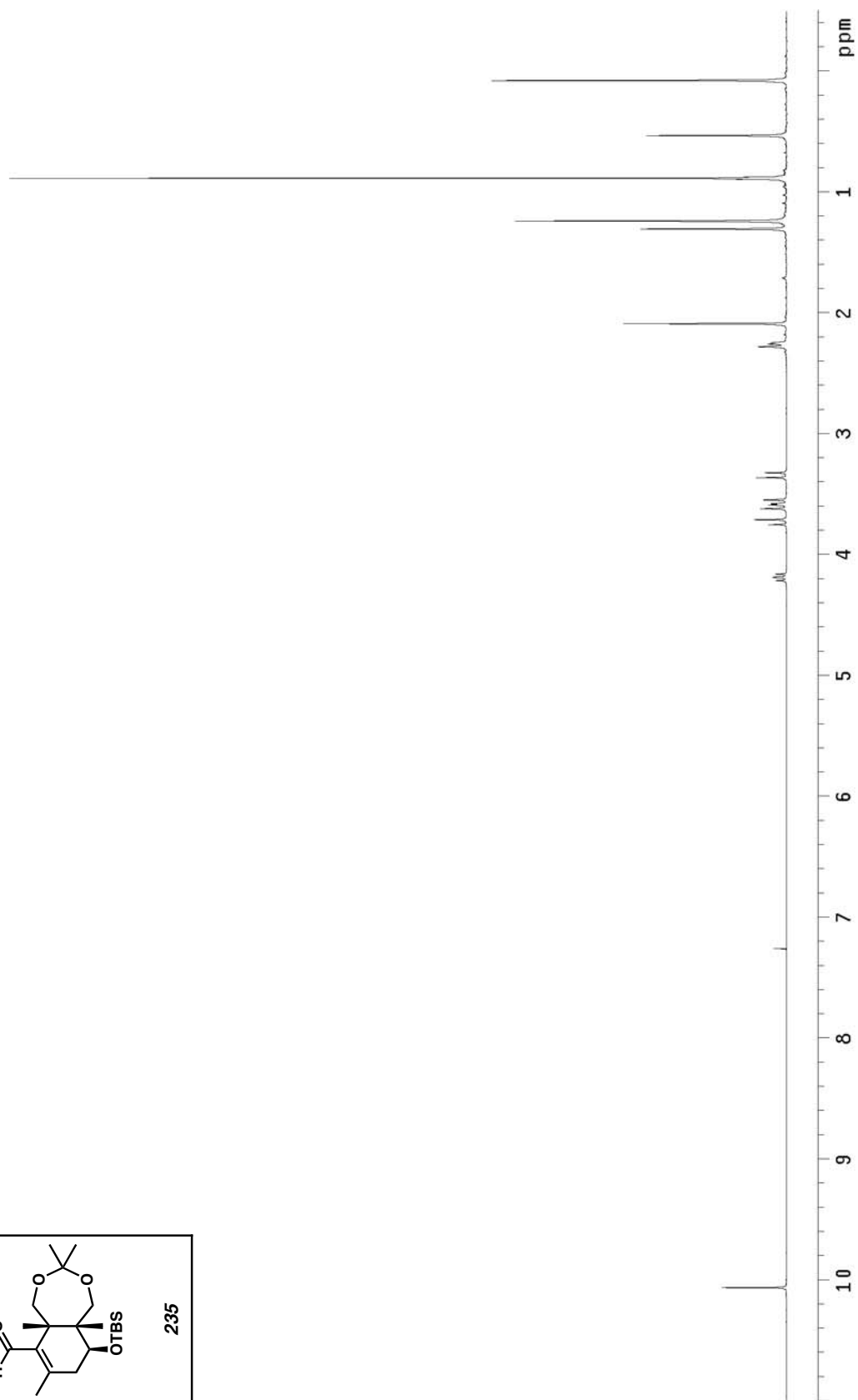
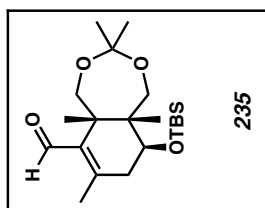
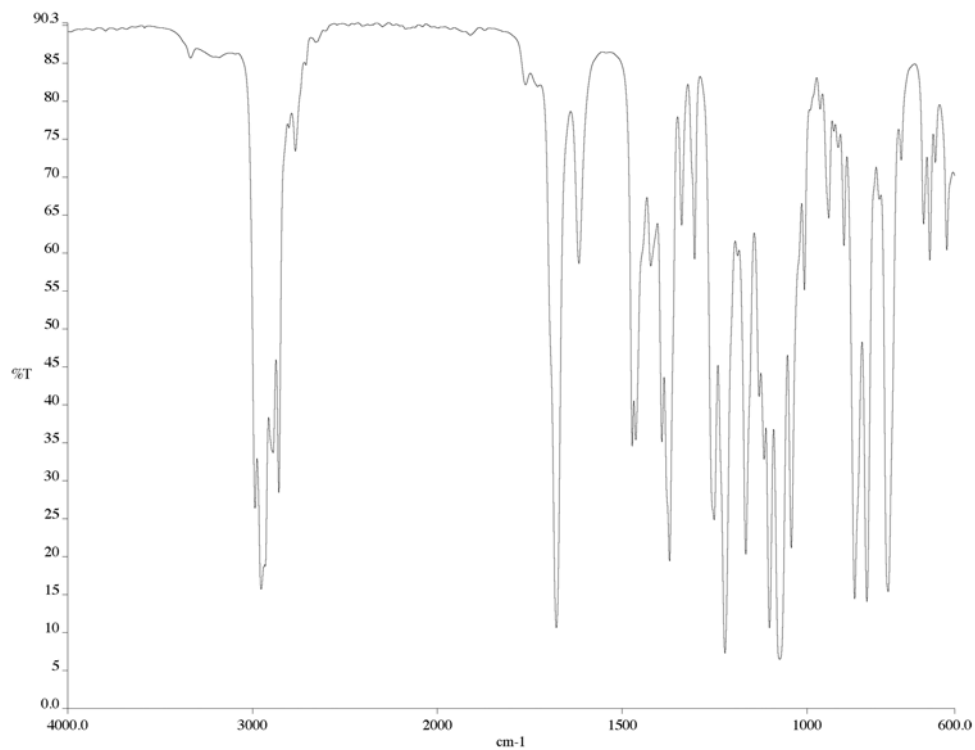
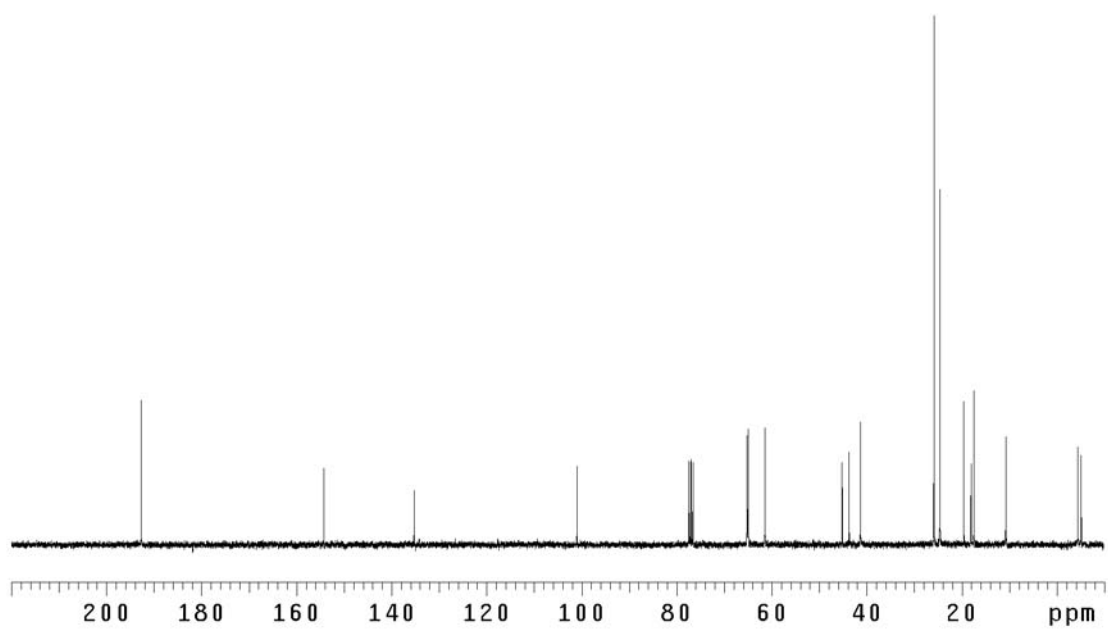


Figure A5.67  $^1\text{H}$  NMR of compound **235** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.68 IR of compound **235** (NaCl/film)Figure A5.69 <sup>13</sup>C NMR of compound **235** (75 MHz, CDCl<sub>3</sub>)

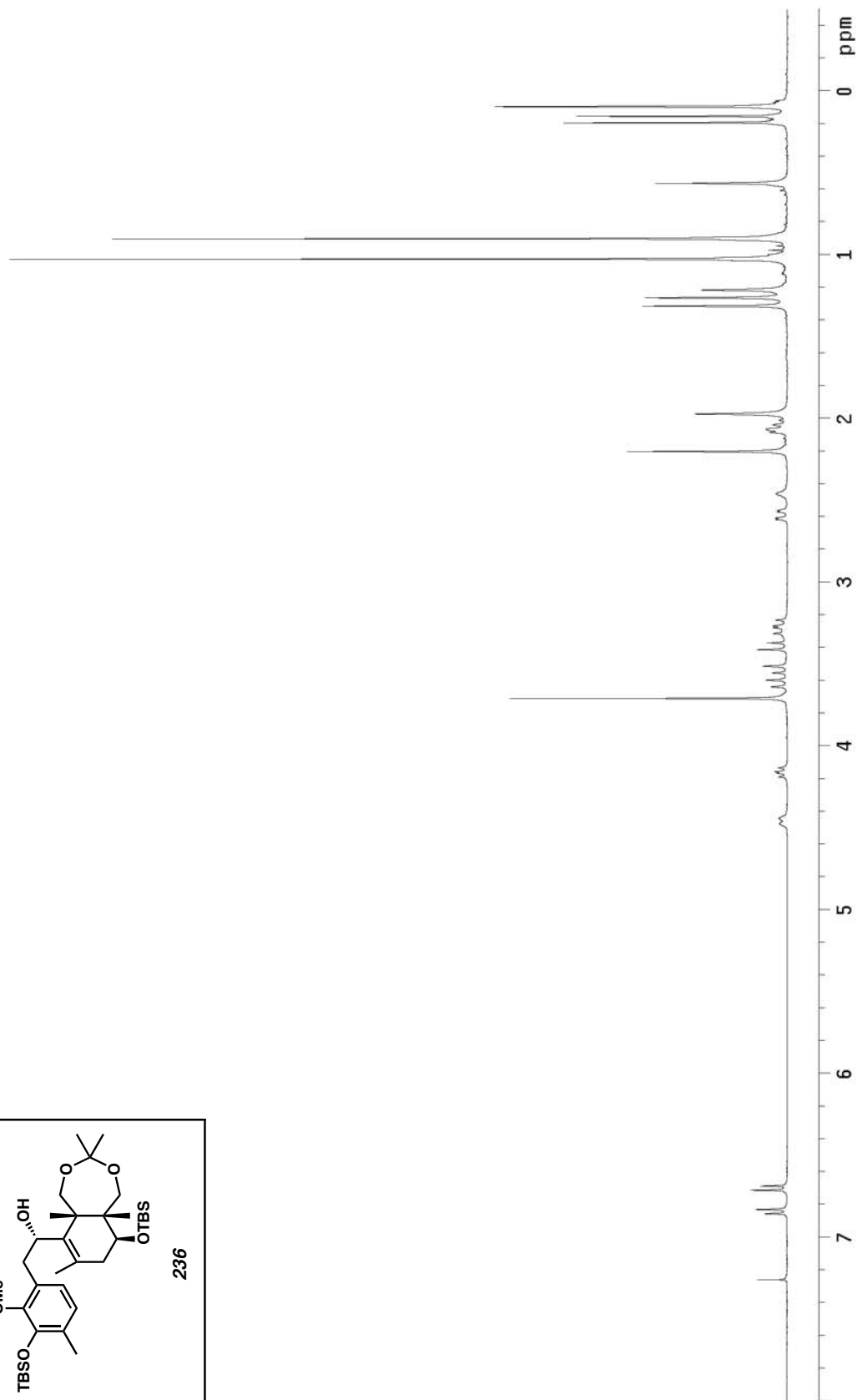
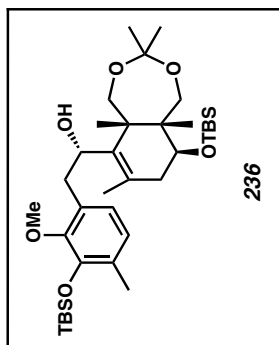
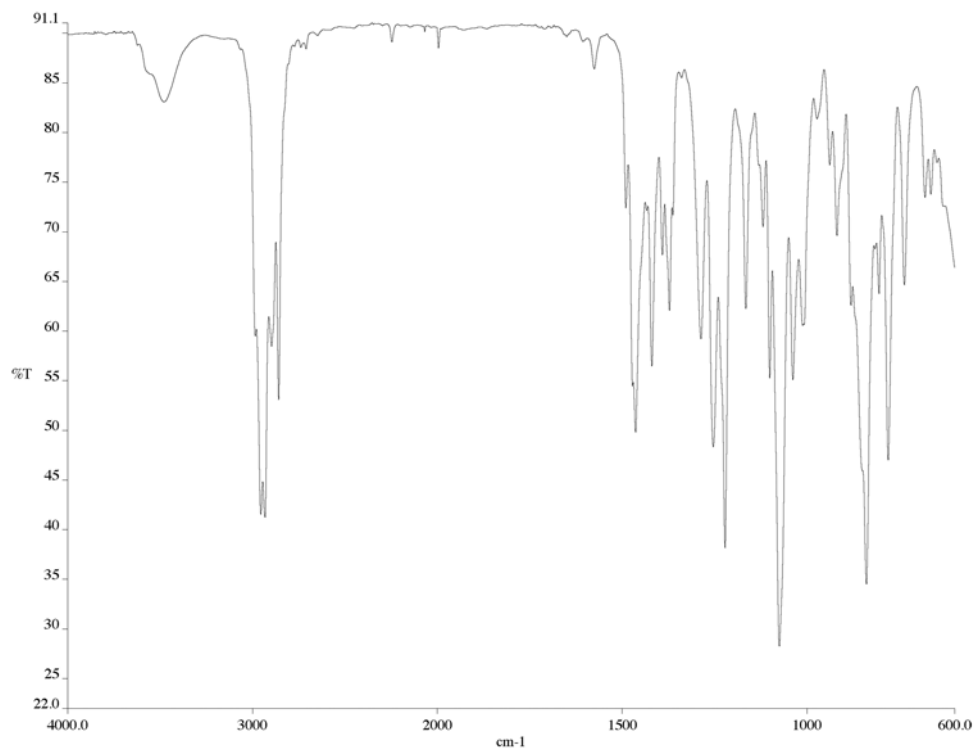
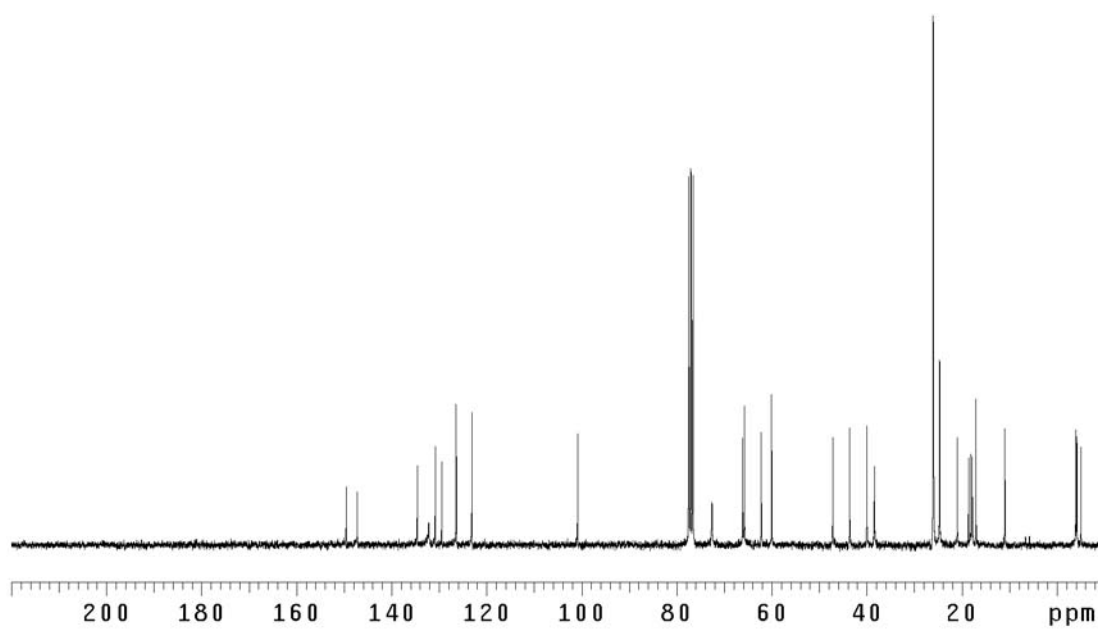


Figure A5.70  $^1\text{H}$  NMR of compound **236** (300 MHz,  $\text{CDCl}_3$ )



Figure A5.71 IR of compound **236** (NaCl/film)Figure A5.72 <sup>13</sup>C NMR of compound **236** (75 MHz, CDCl<sub>3</sub>)

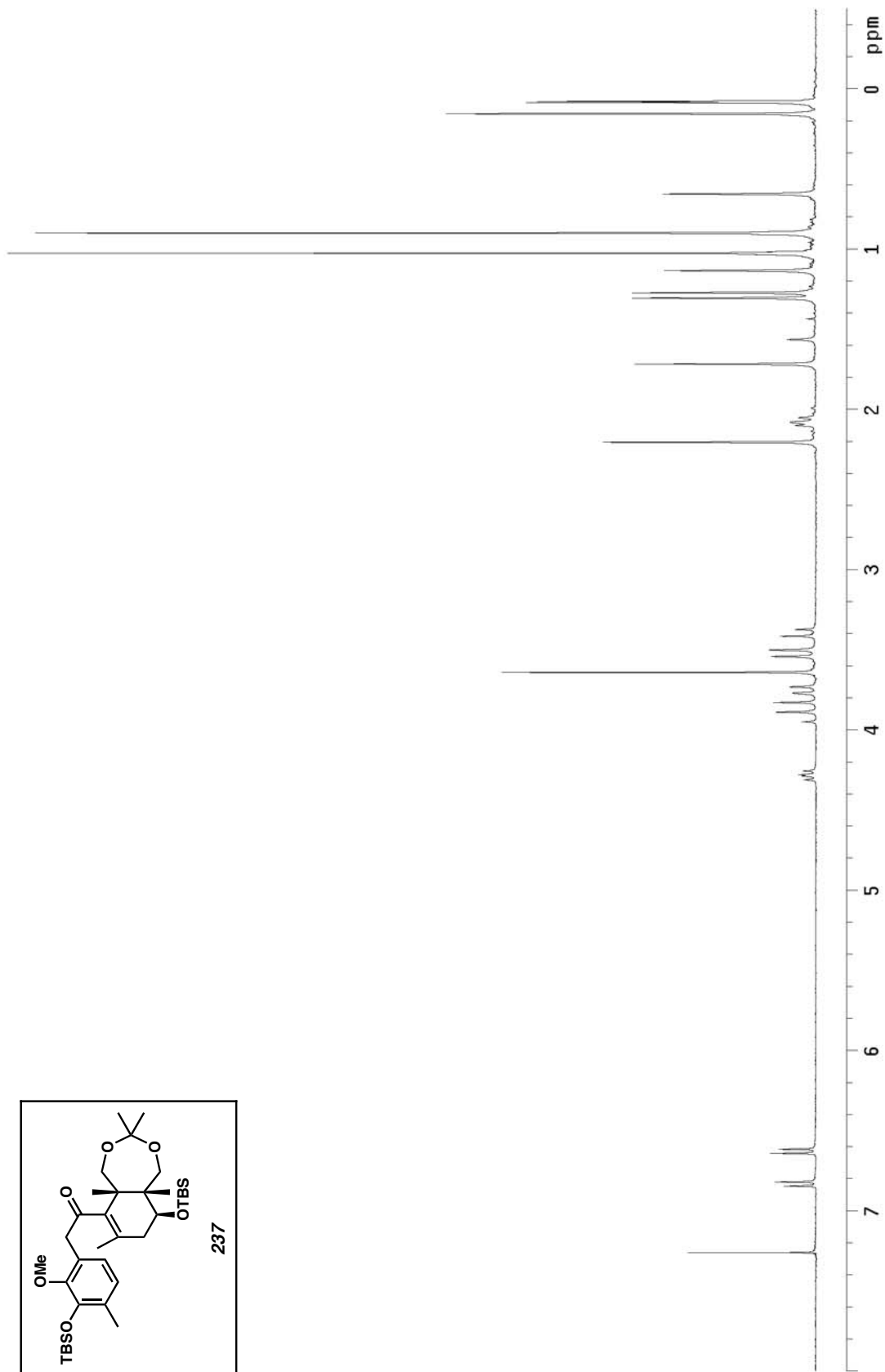
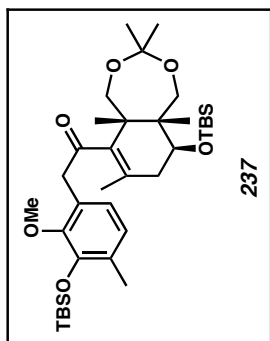
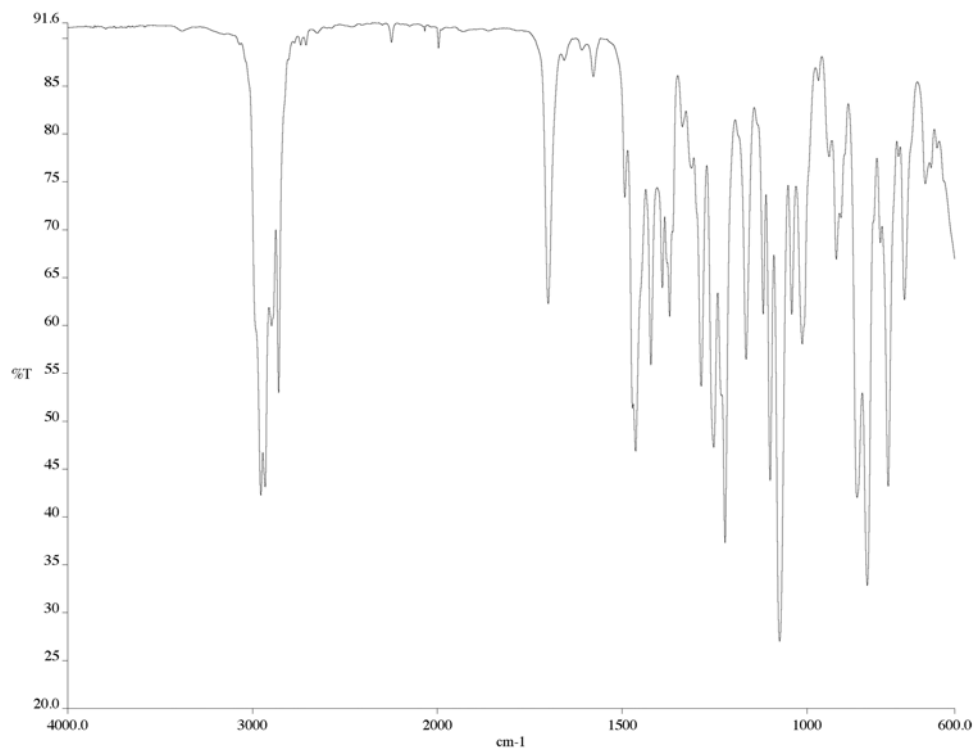
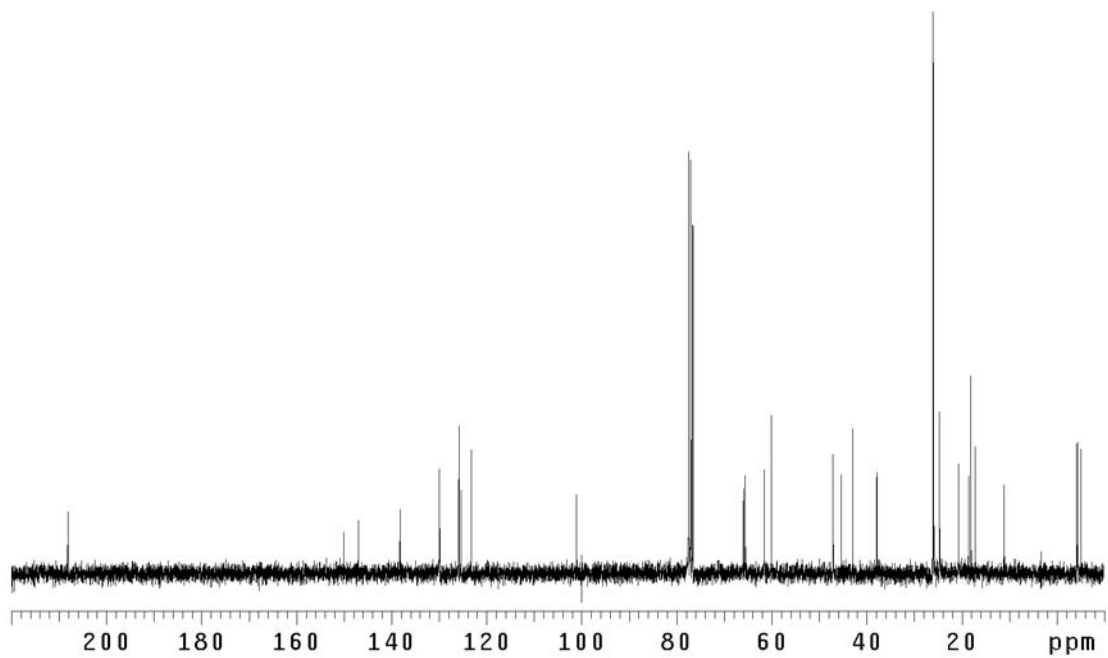


Figure A5.73  $^1\text{H}$  NMR of compound **237** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.74 IR of compound **237** (NaCl/film)Figure A5.75 <sup>13</sup>C NMR of compound **237** (75 MHz, CDCl<sub>3</sub>)

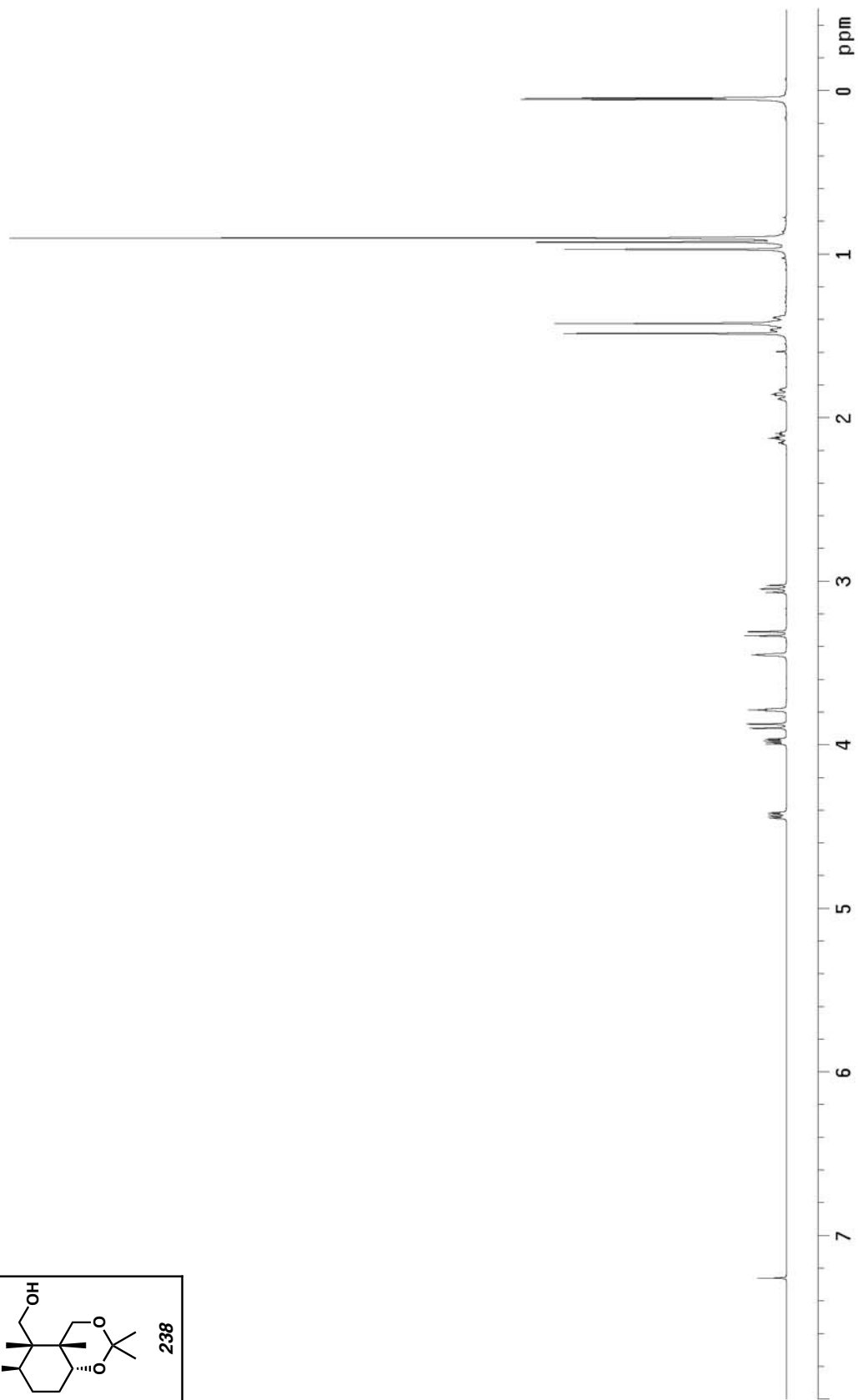
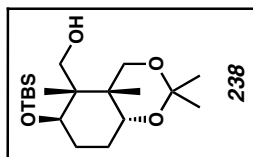
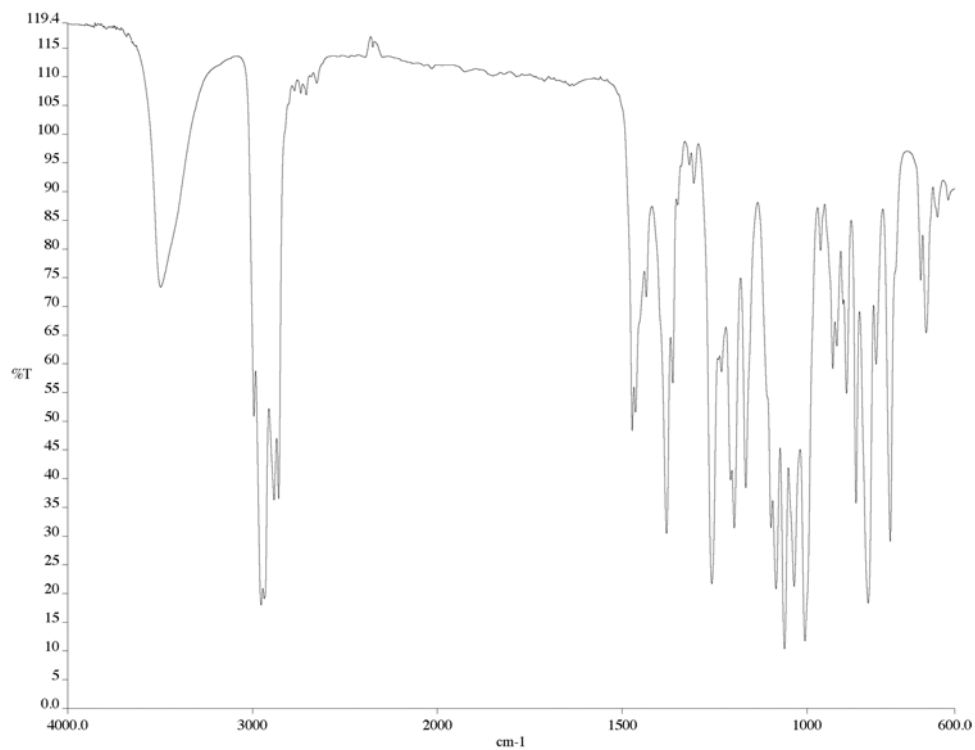
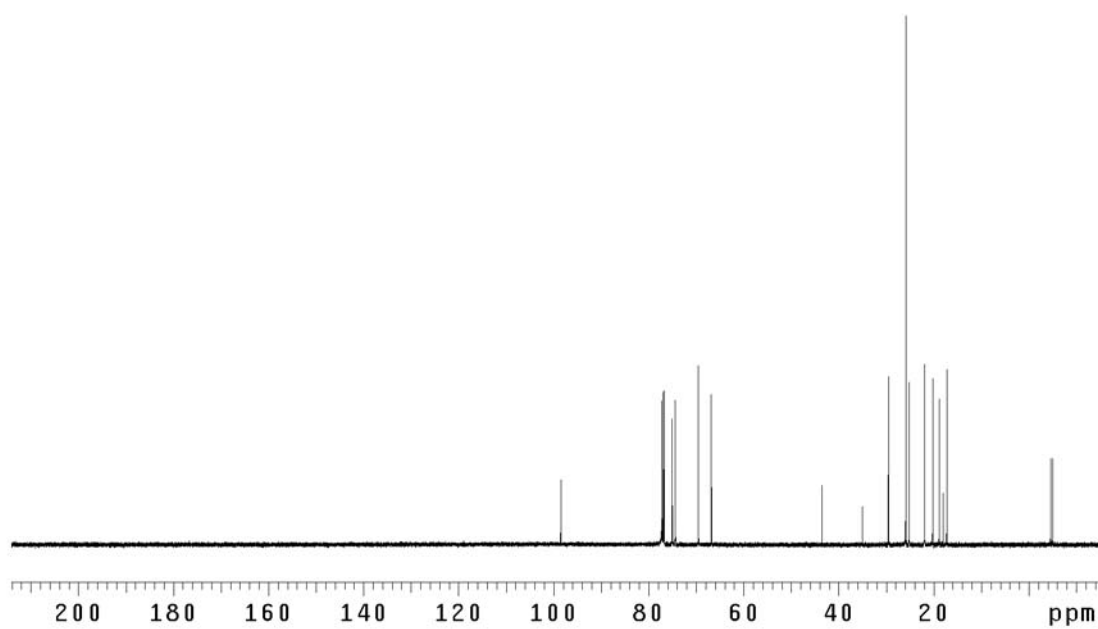


Figure A5.76  $^1\text{H}$  NMR of compound **238** (500 MHz,  $\text{CDCl}_3$ )

Figure A5.77 IR of compound **238** (NaCl/film)Figure A5.78 <sup>13</sup>C NMR of compound **238** (125 MHz, CDCl<sub>3</sub>)

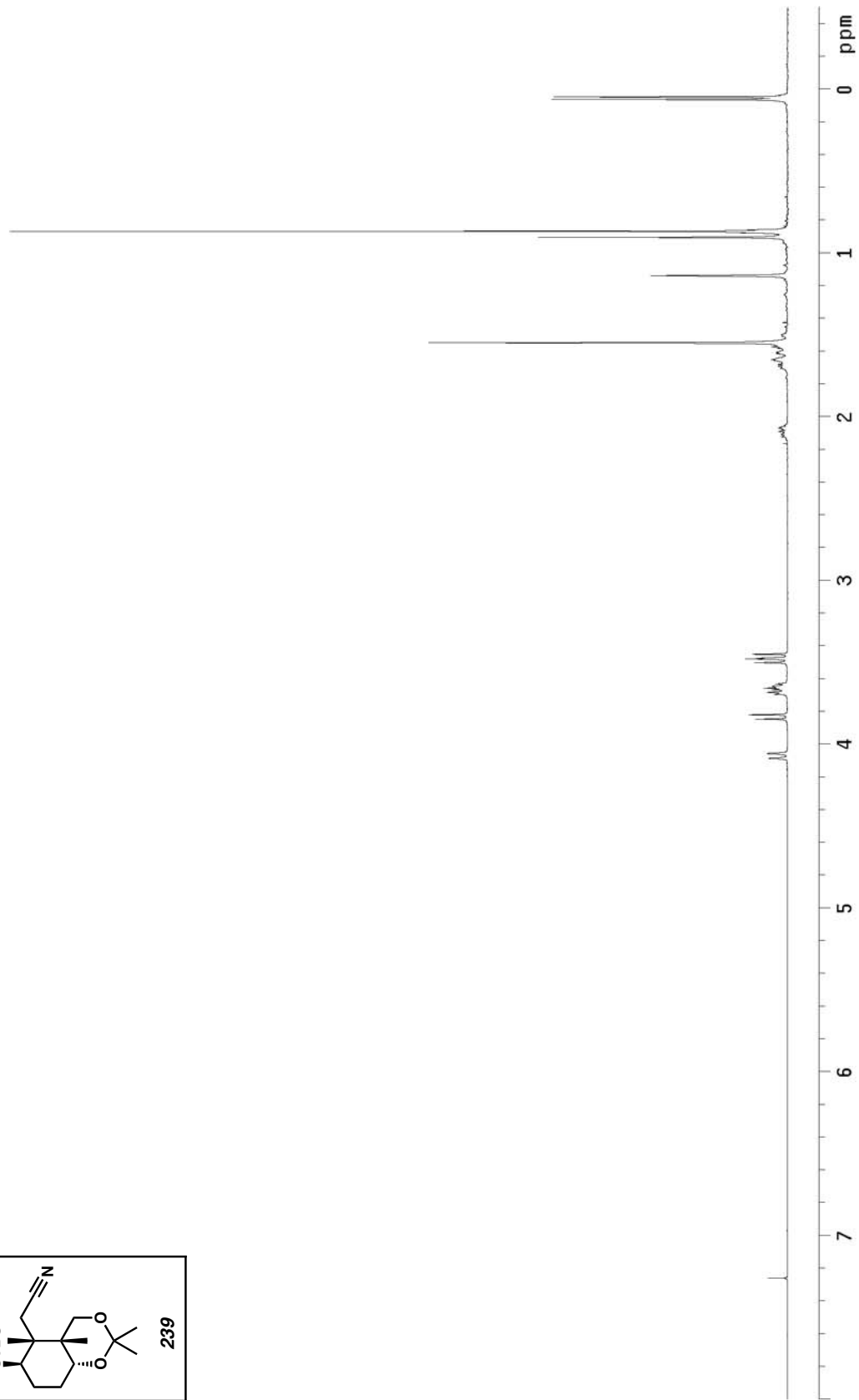
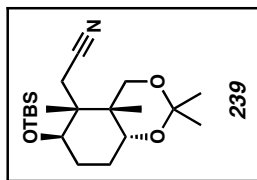
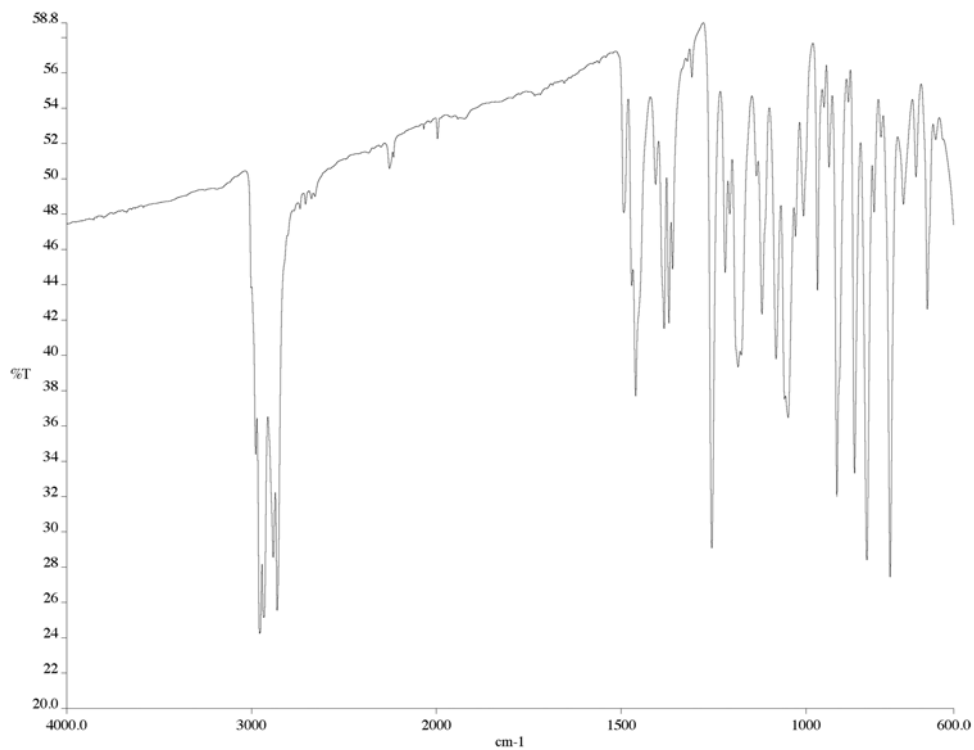
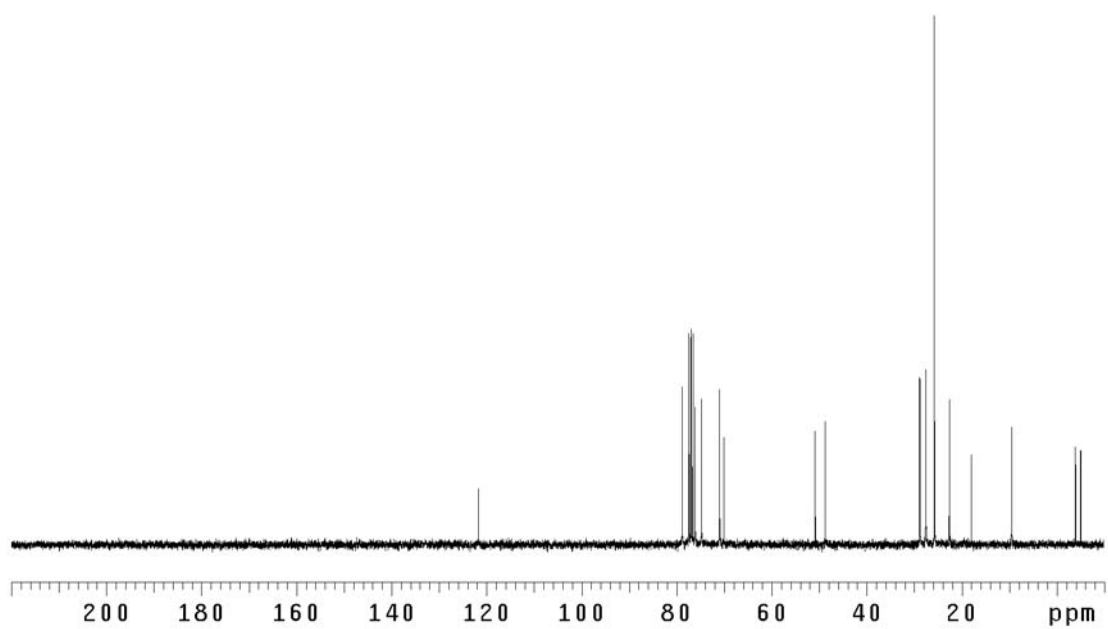


Figure A5.79  $^1\text{H}$  NMR of compound **239** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.80 IR of compound **239** (NaCl/film)Figure A5.81 <sup>13</sup>C NMR of compound **239** (75 MHz, CDCl<sub>3</sub>)

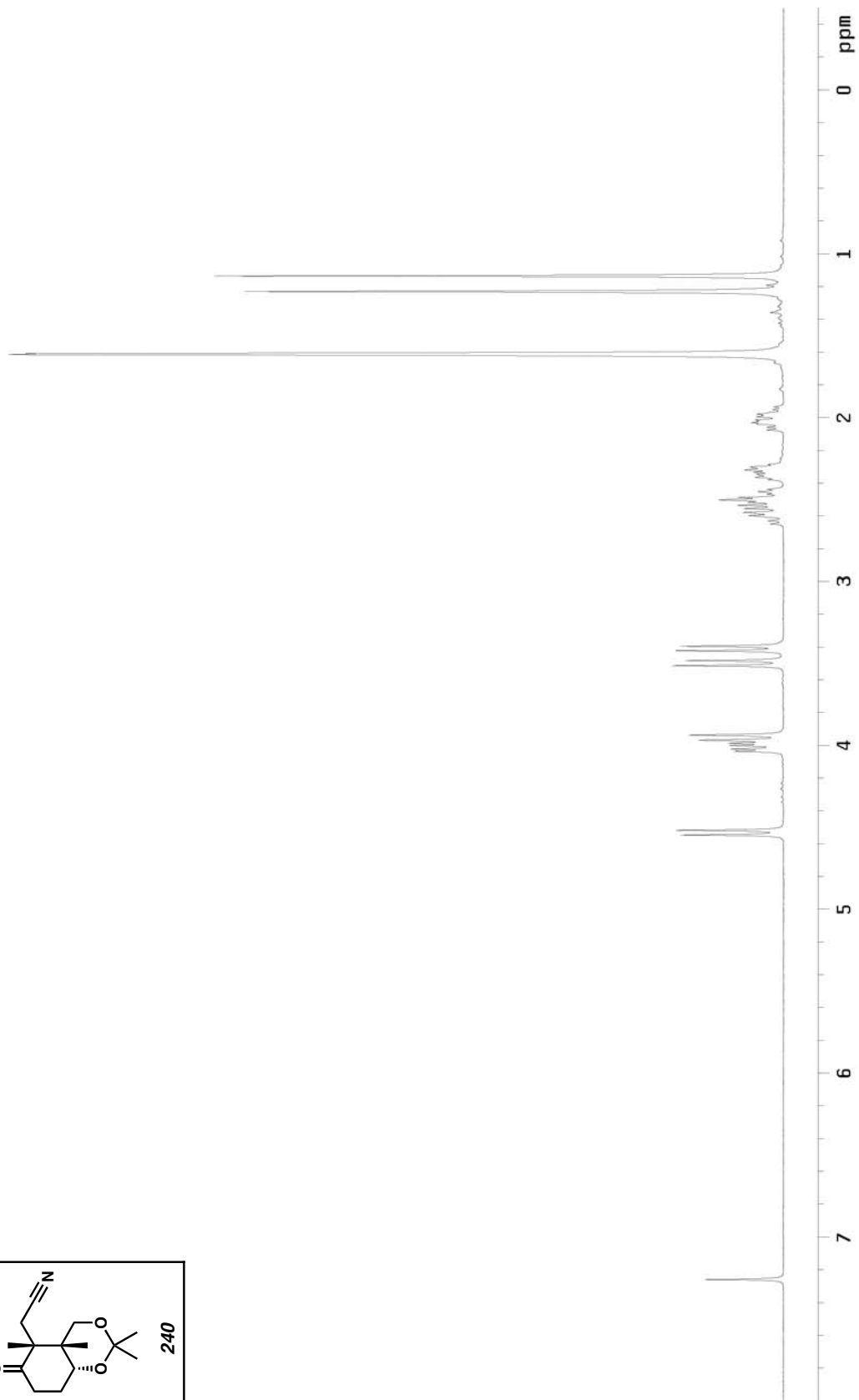
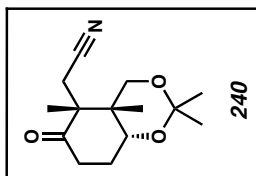
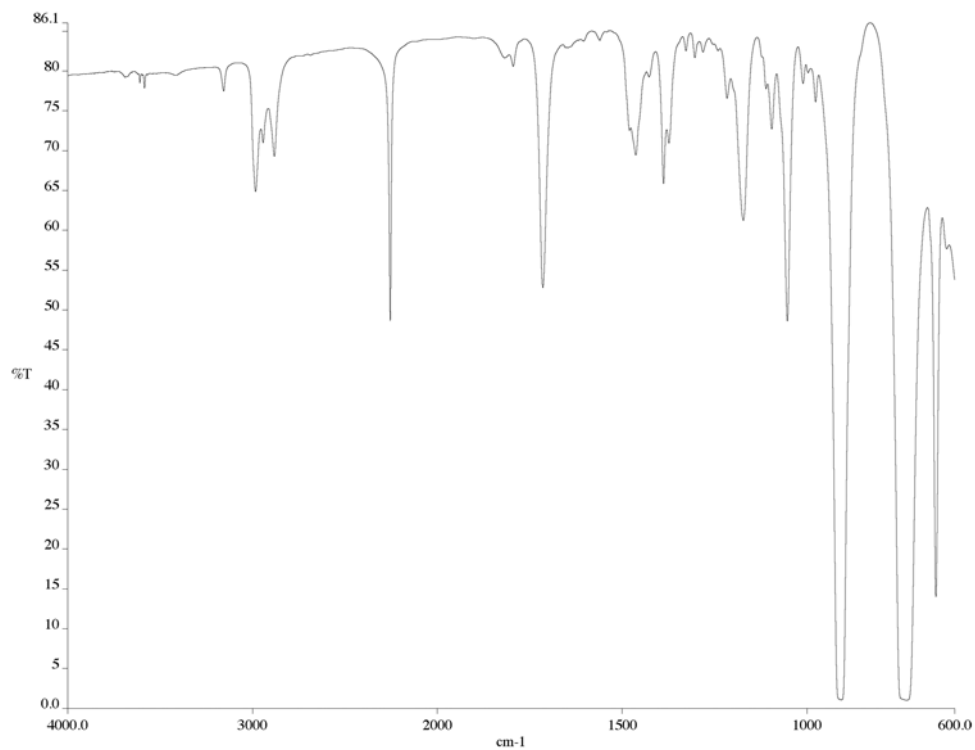
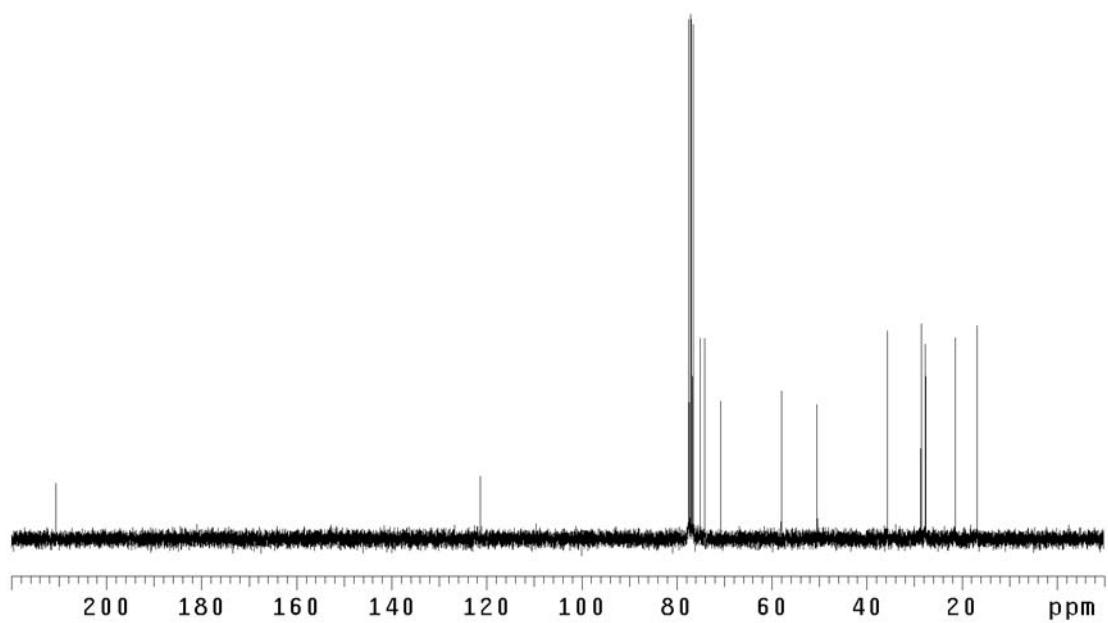


Figure A5.82  $^1\text{H}$  NMR of compound **240** (300 MHz,  $\text{CDCl}_3$ )



Figure A5.83 IR of compound **240** (NaCl/film)Figure A5.84 <sup>13</sup>C NMR of compound **240** (75 MHz, CDCl<sub>3</sub>)

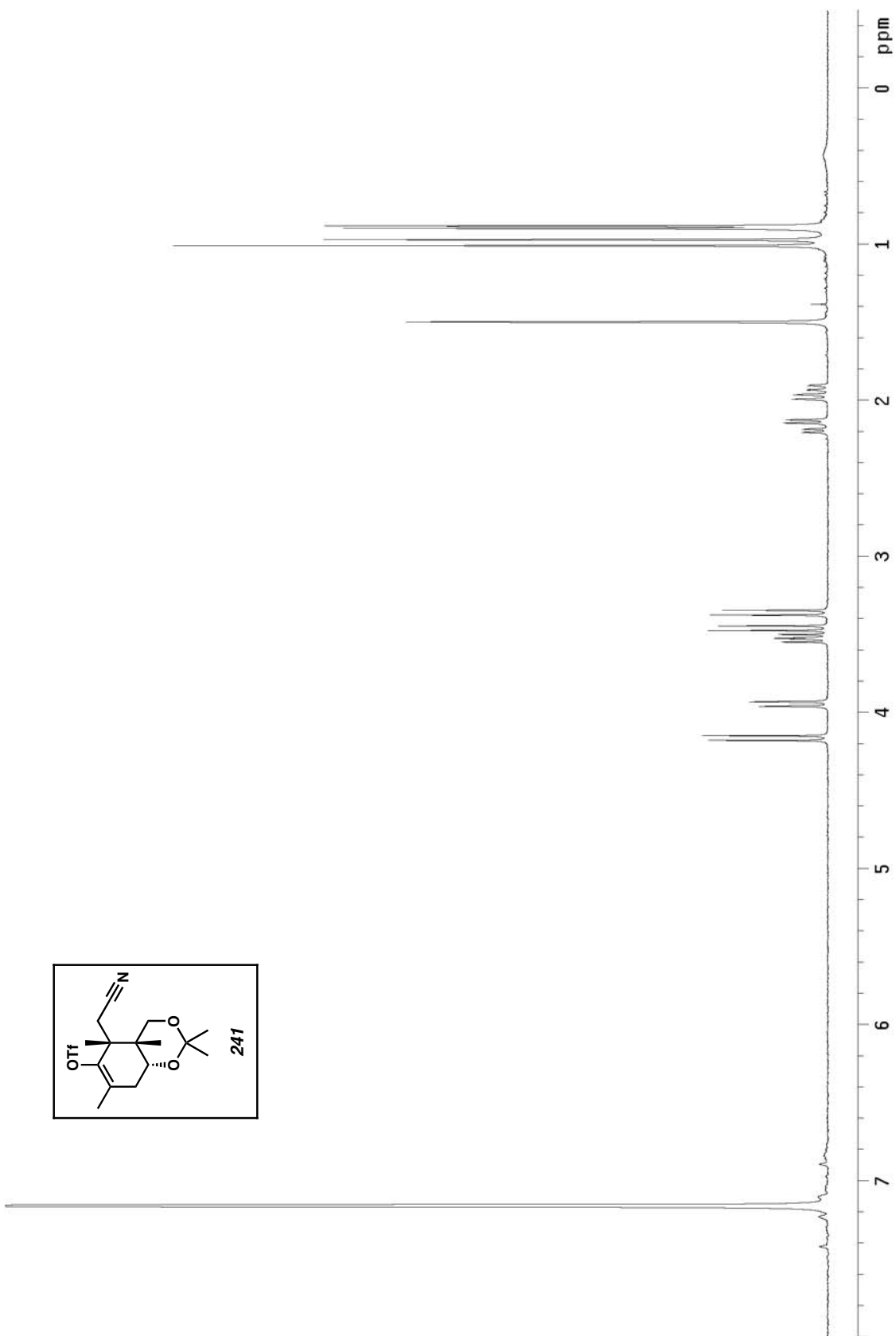


Figure A5.85  $^1\text{H}$  NMR of compound **241** (300 MHz,  $\text{C}_6\text{D}_6$ )

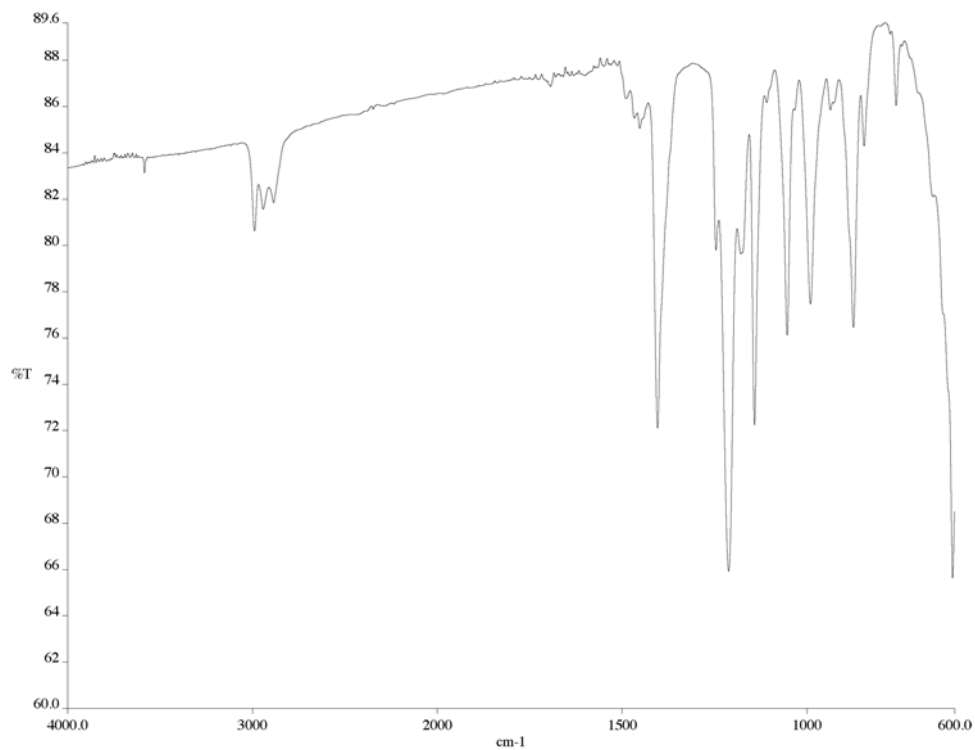


Figure A5.86 IR of compound **241** (NaCl/film)

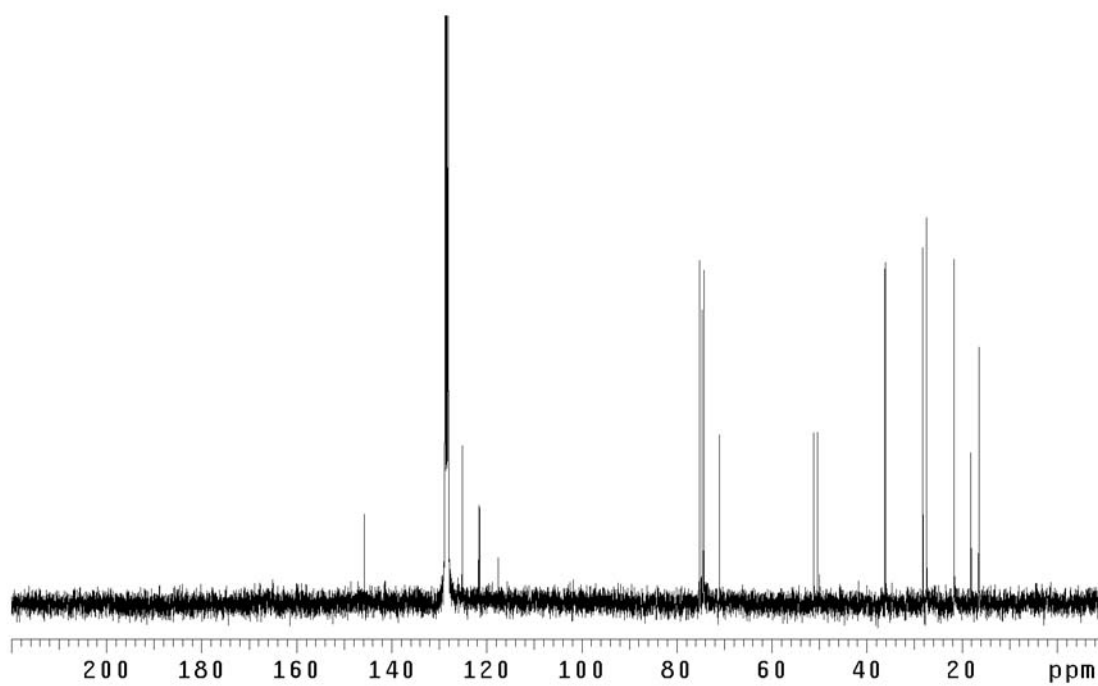


Figure A5.87 <sup>13</sup>C NMR of compound **241** (75 MHz, C<sub>6</sub>D<sub>6</sub>)

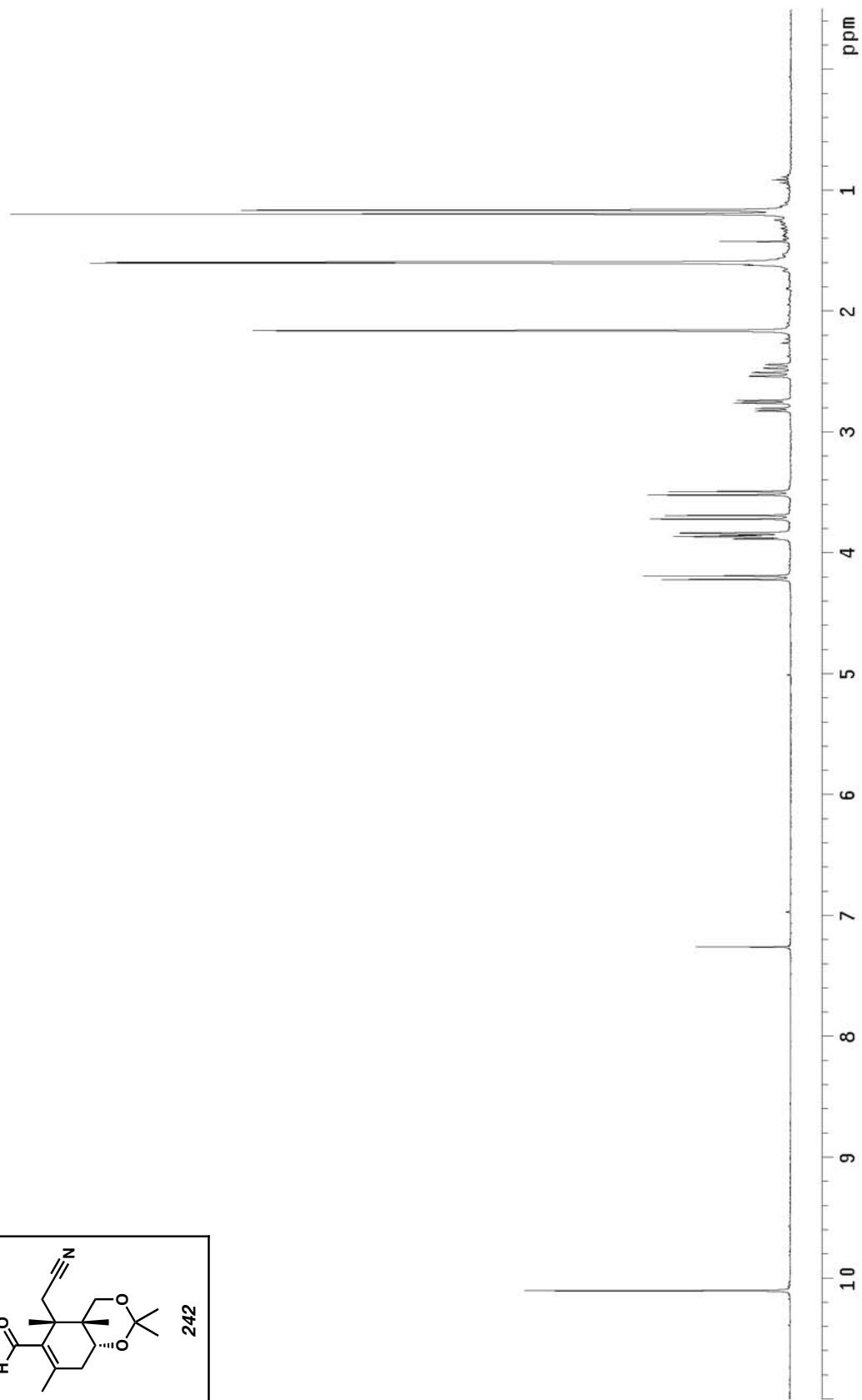
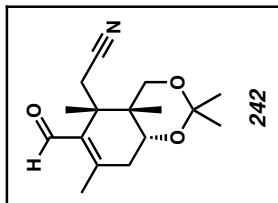
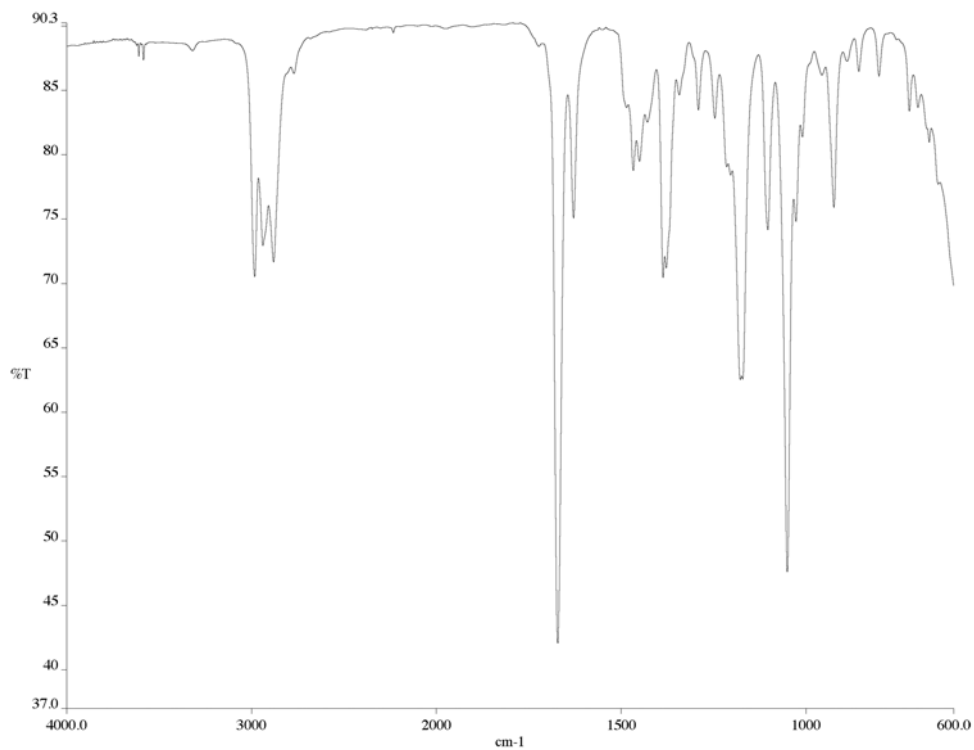
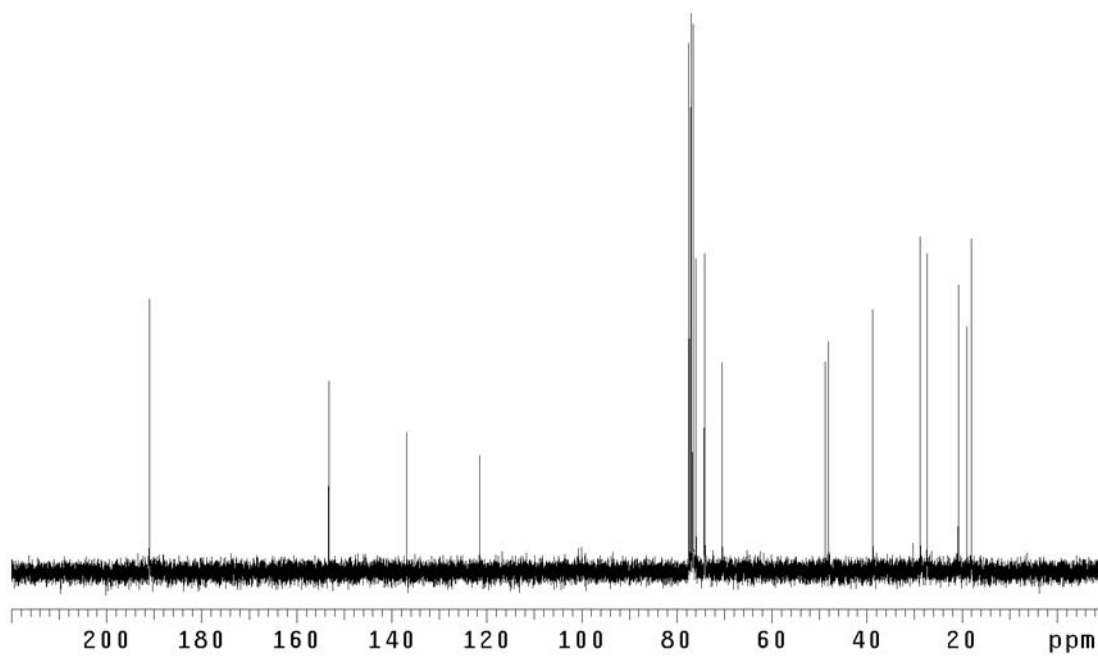


Figure A5.88  $^1\text{H}$  NMR of compound **242** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.89 IR of compound **242** (NaCl/film)Figure A5.90 <sup>13</sup>C NMR of compound **242** (75 MHz, CDCl<sub>3</sub>)

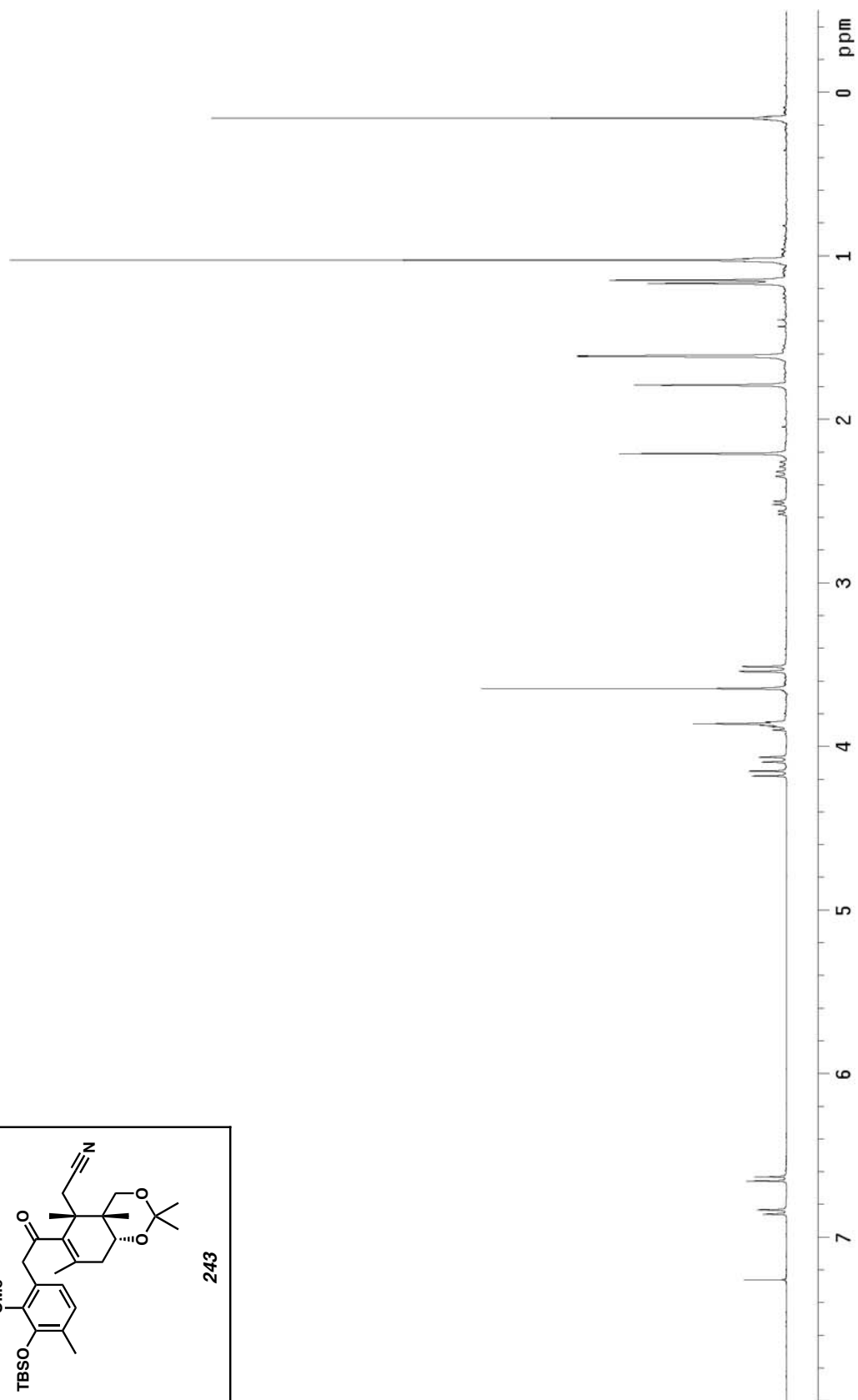
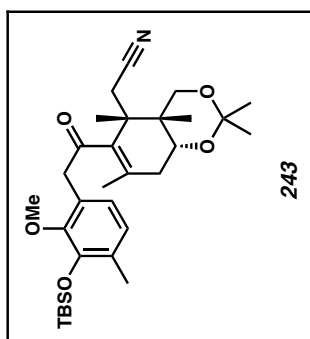
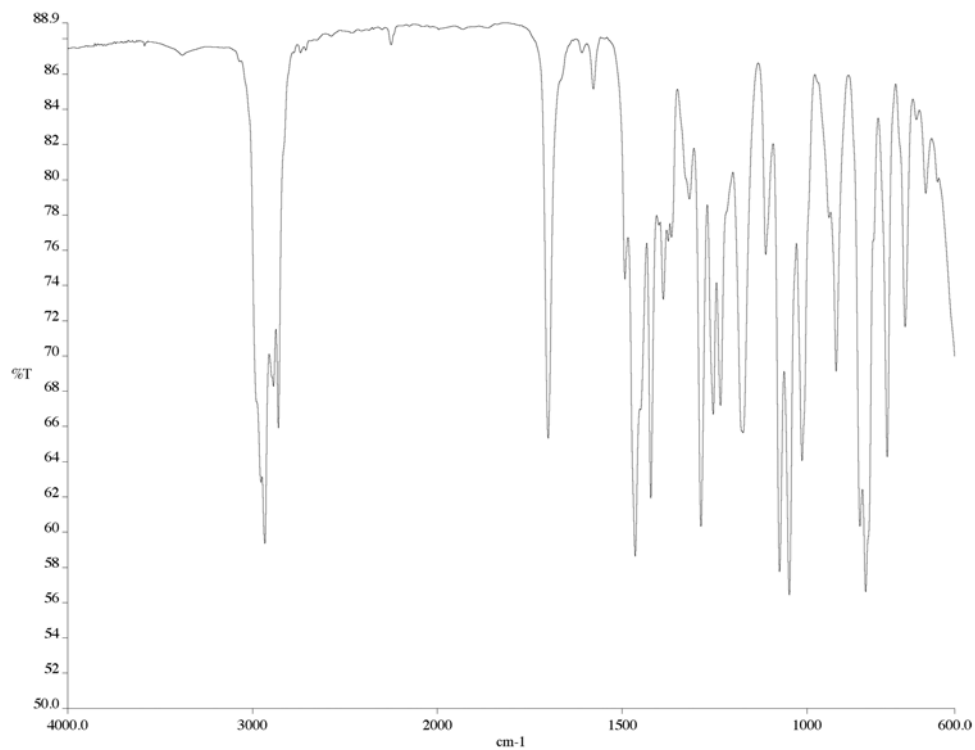
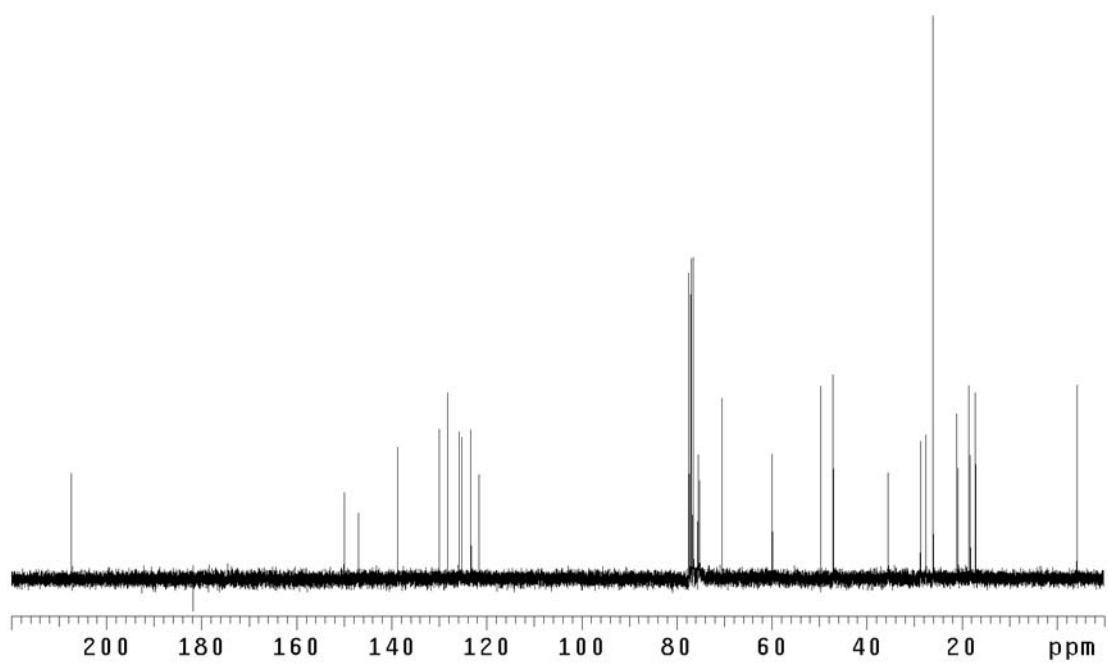


Figure A5.91 <sup>1</sup>H NMR of compound **243** (300 MHz, CDCl<sub>3</sub>)

Figure A5.92 IR of compound **243** (NaCl/film)Figure A5.93 <sup>13</sup>C NMR of compound **243** (75 MHz, CDCl<sub>3</sub>)

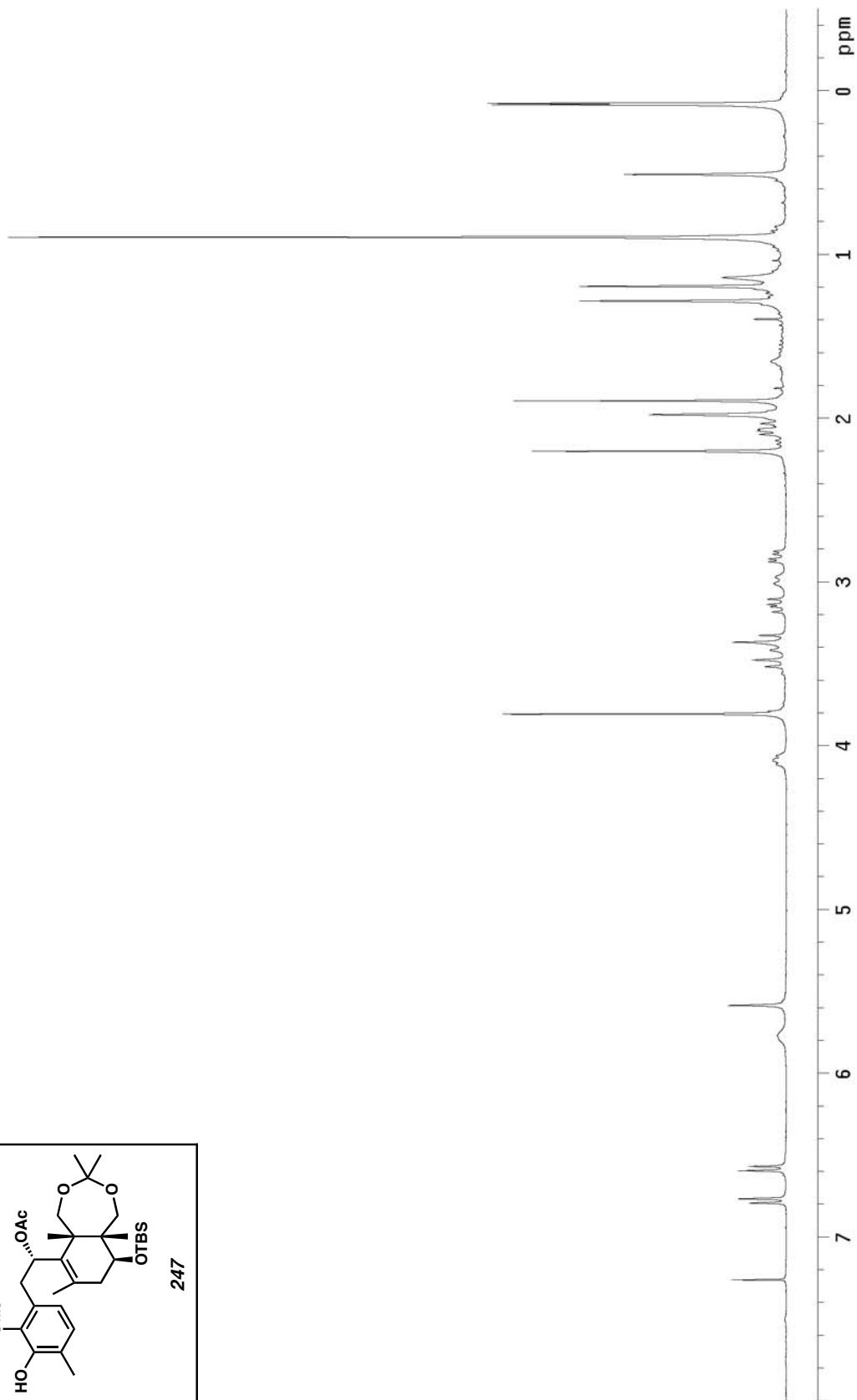
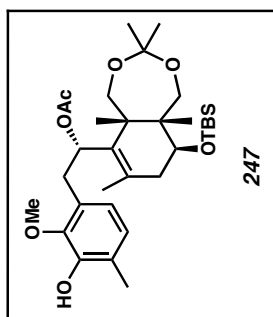
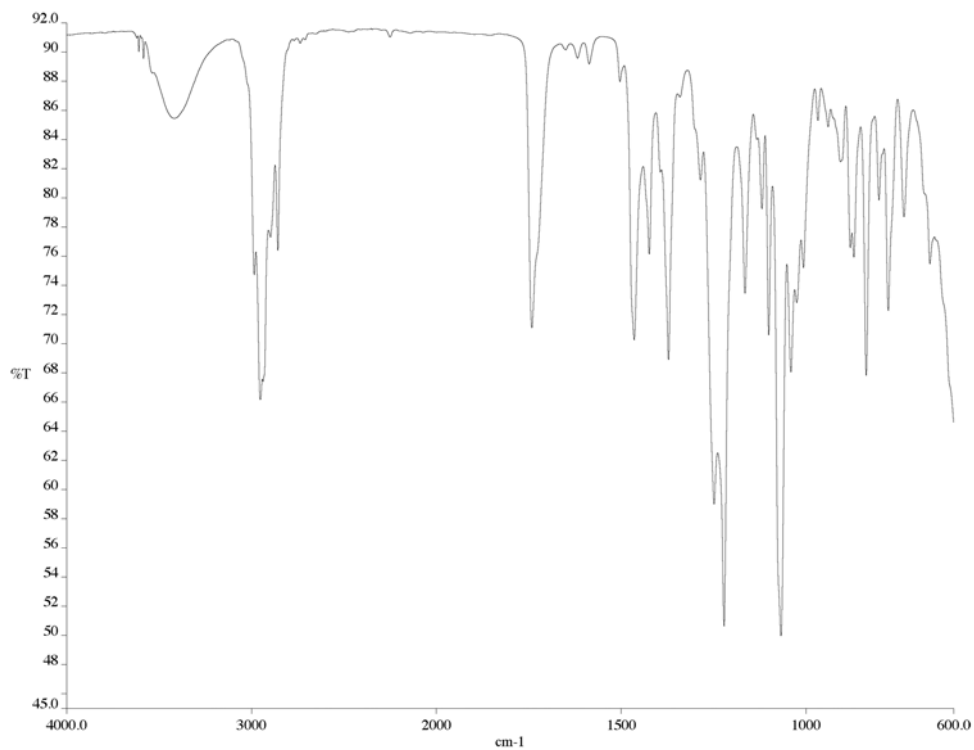
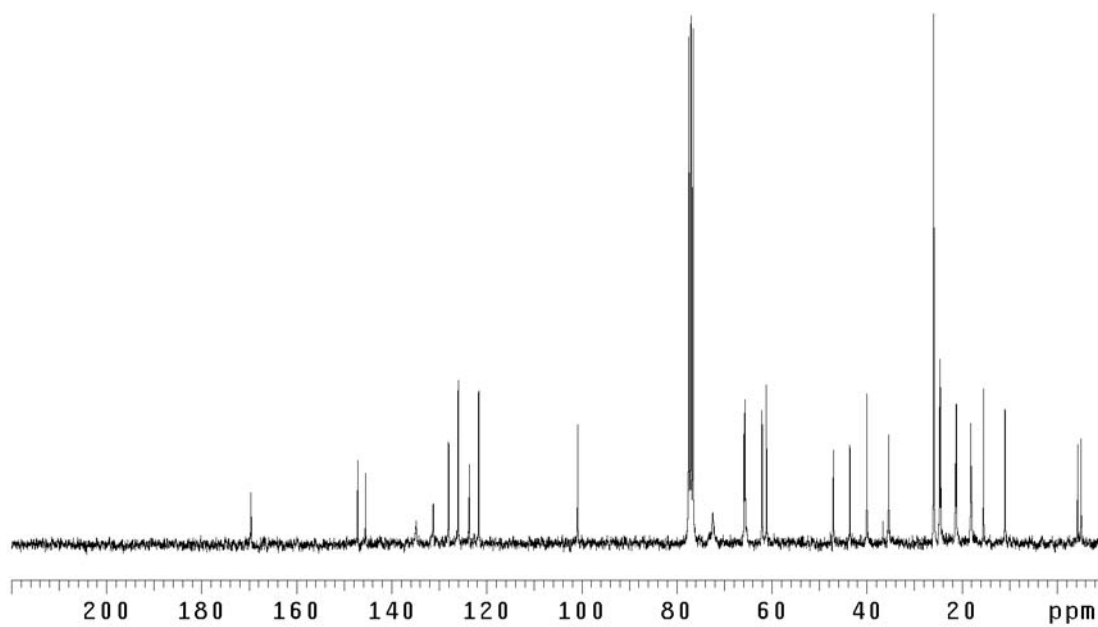


Figure A5.94  $^1\text{H}$  NMR of compound **247** (300 MHz,  $\text{CDCl}_3$ )



Figure A5.95 IR of compound **247** (NaCl/film)Figure A5.96 <sup>13</sup>C NMR of compound **247** (75 MHz, CDCl<sub>3</sub>)

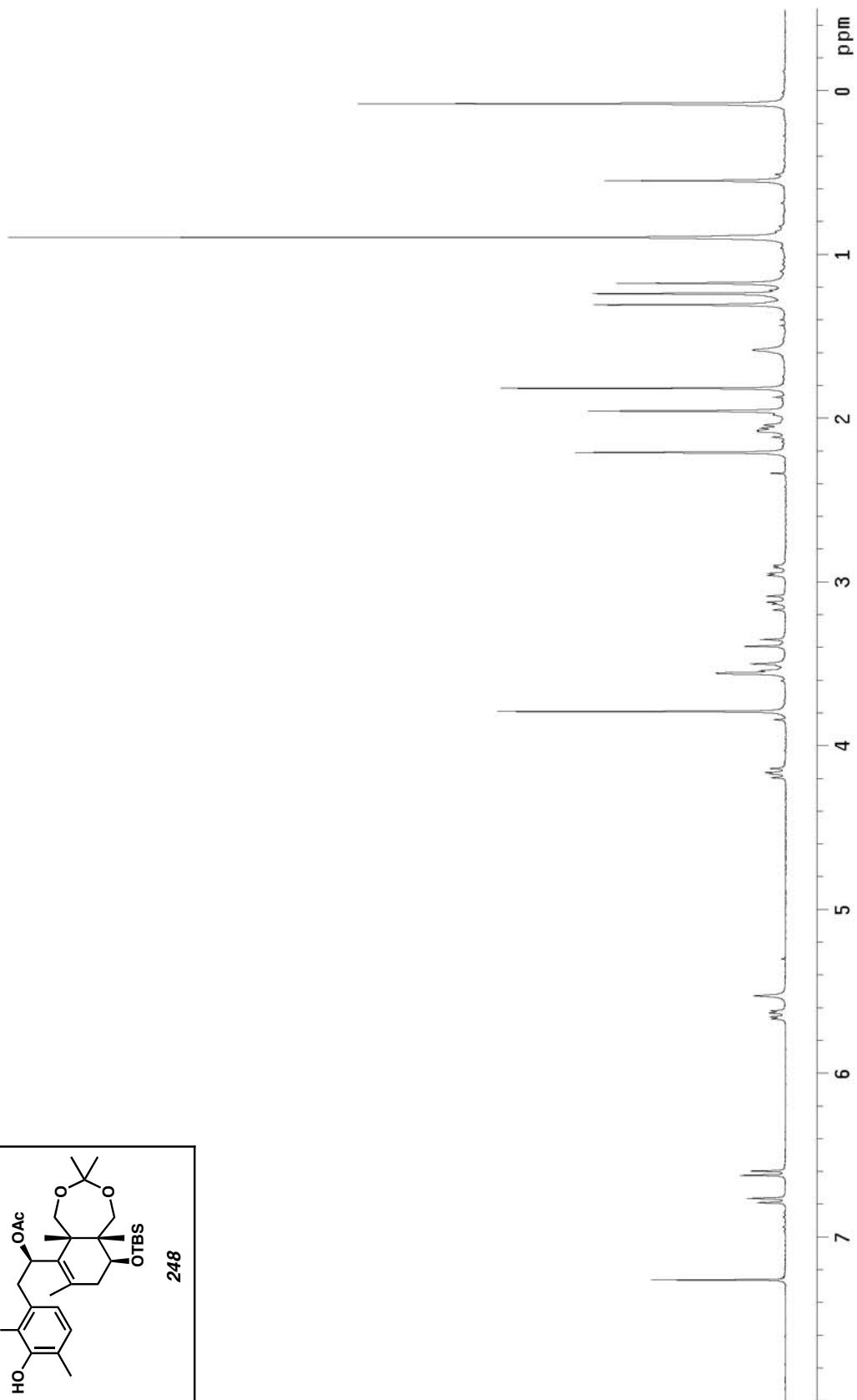
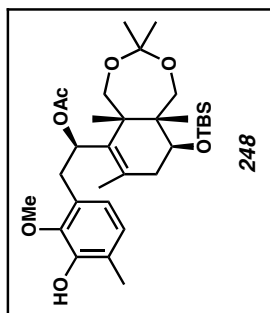
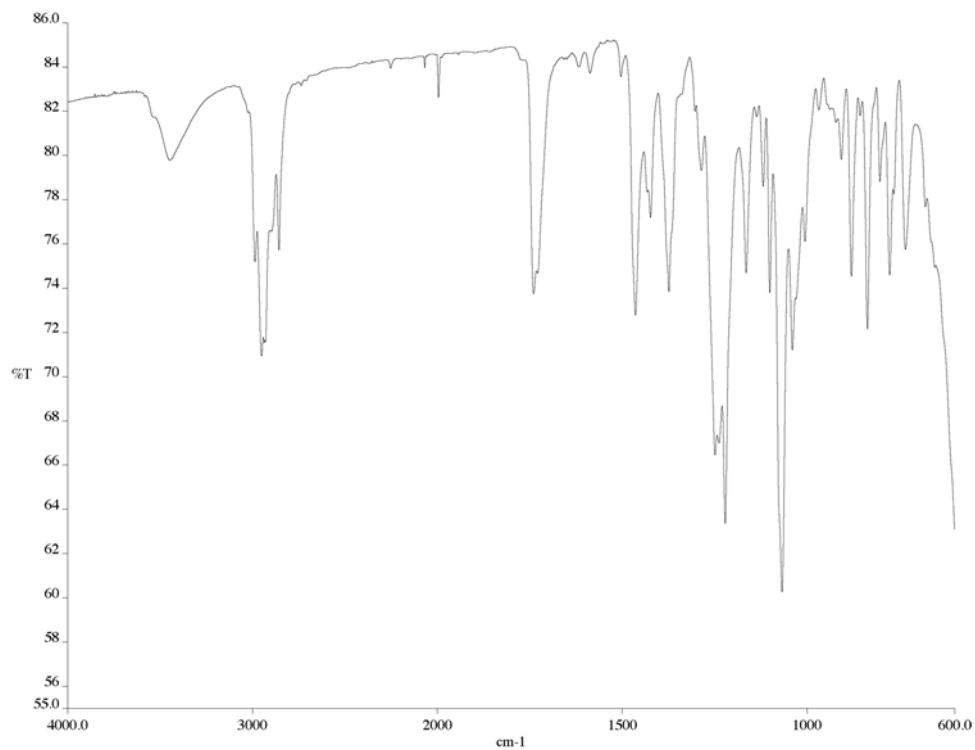
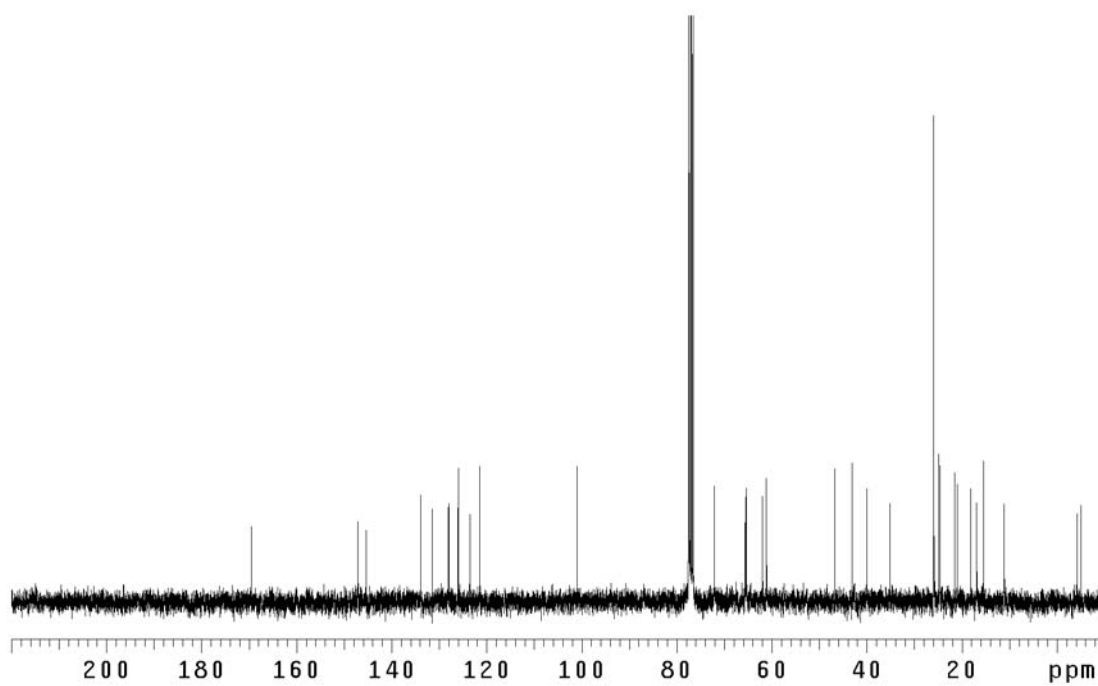


Figure A5.97 <sup>1</sup>H NMR of compound **248** (300 MHz, CDCl<sub>3</sub>)

Figure A5.98 IR of compound **248** (NaCl/film)Figure A5.99 <sup>13</sup>C NMR of compound **248** (75 MHz, CDCl<sub>3</sub>)

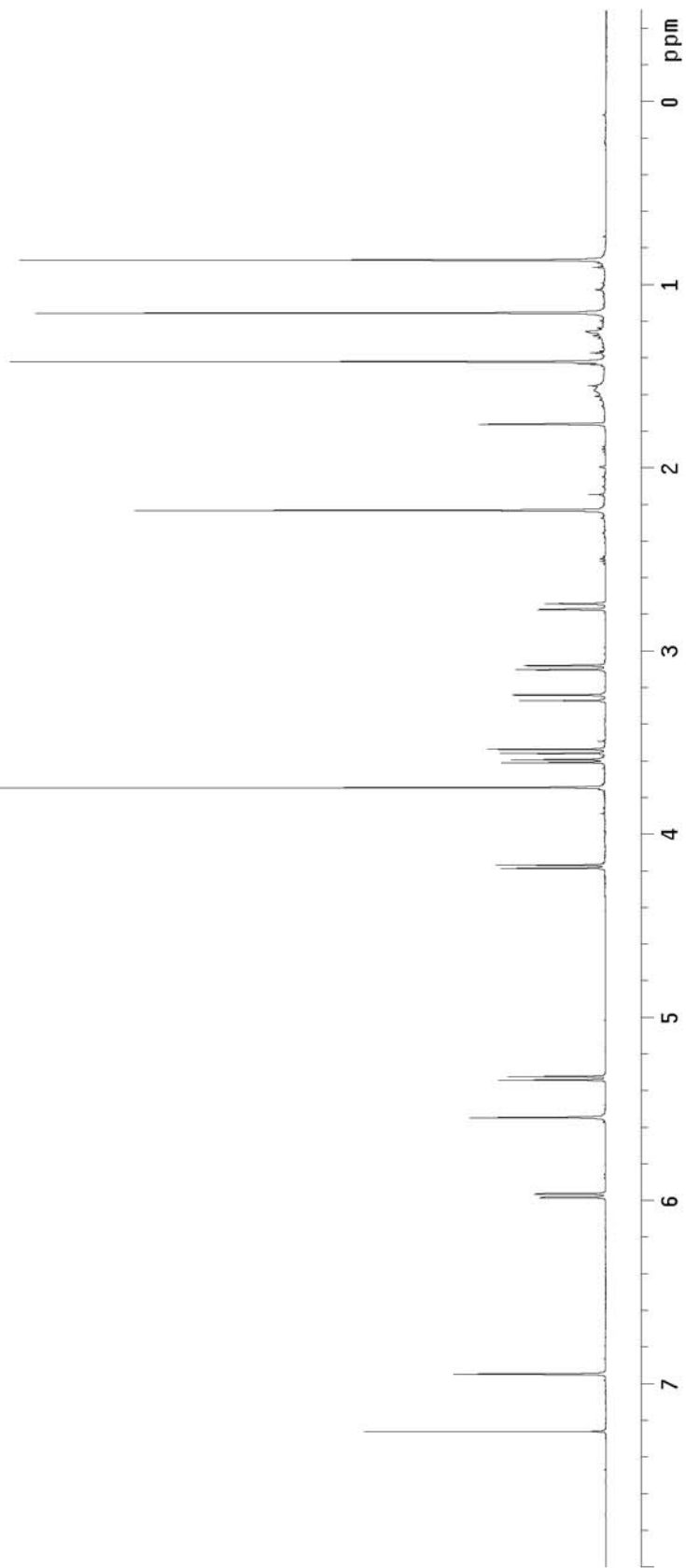
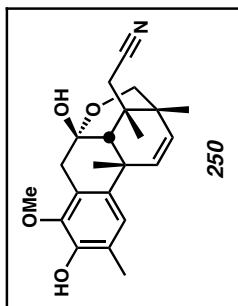
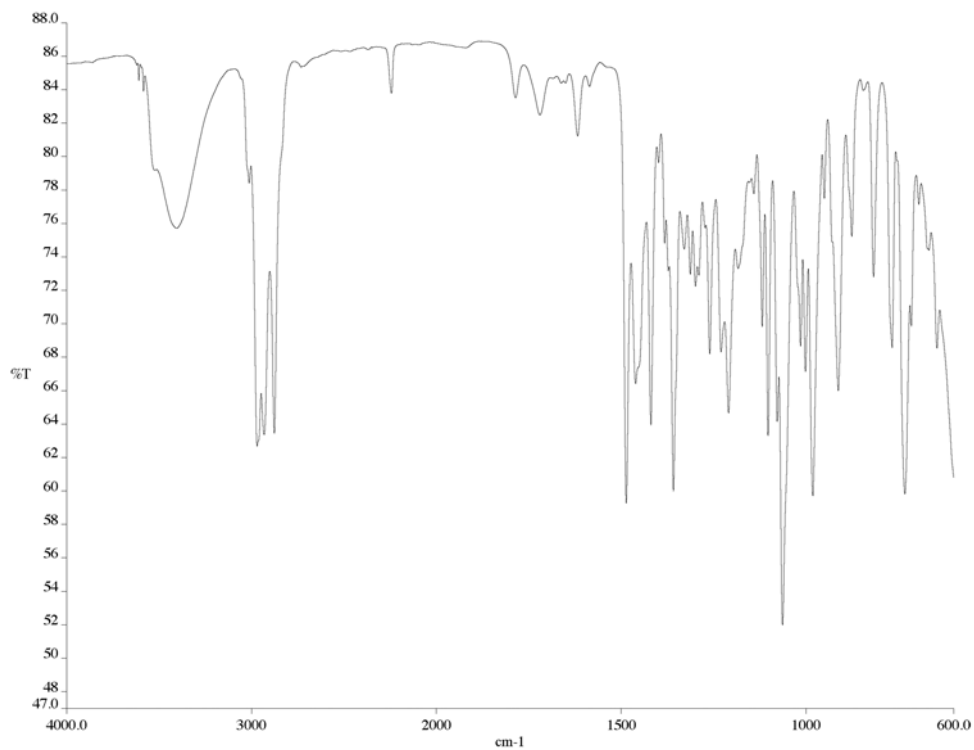
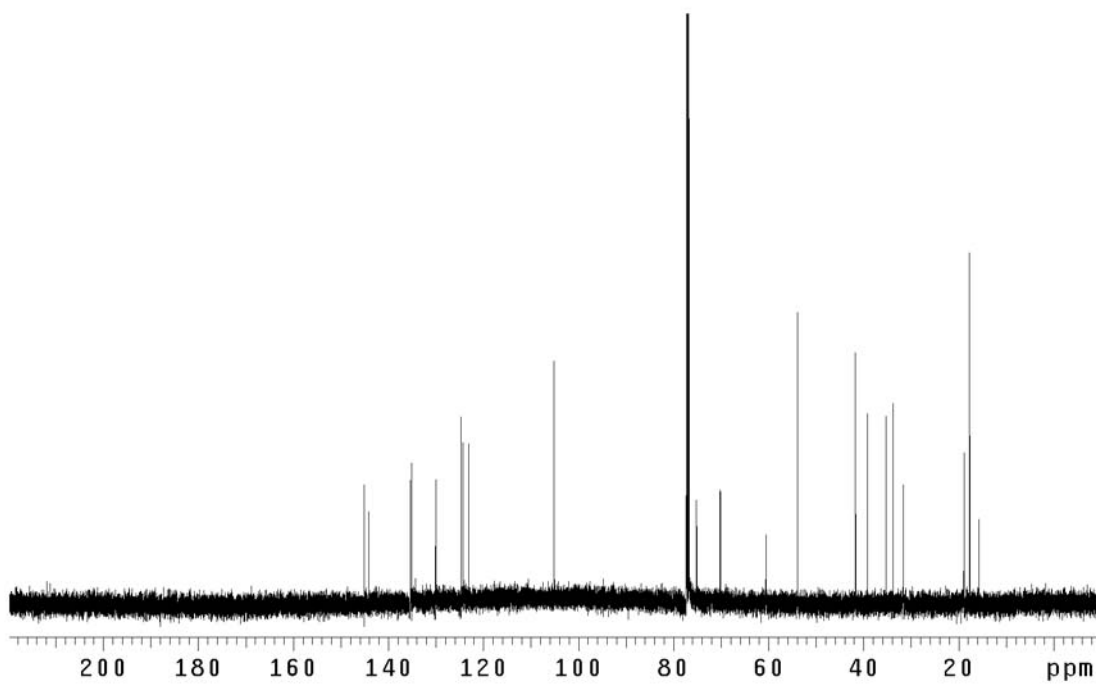


Figure A5.100  $^1\text{H}$  NMR of compound **250** (500 MHz,  $\text{CDCl}_3$ )

Figure A5.101 IR of compound **250** (NaCl/film)Figure A5.102 <sup>13</sup>C NMR of compound **250** (125 MHz, CDCl<sub>3</sub>)

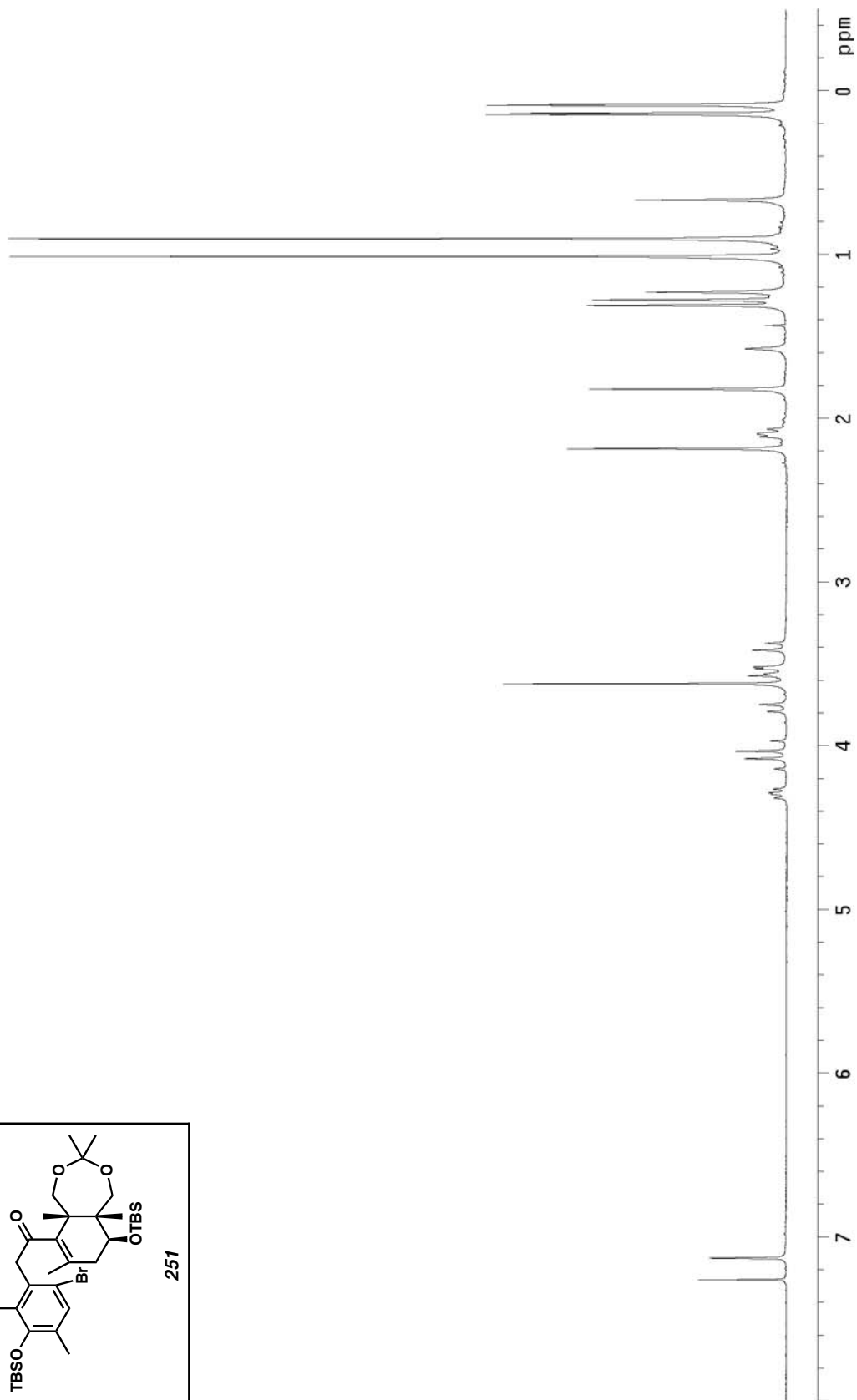
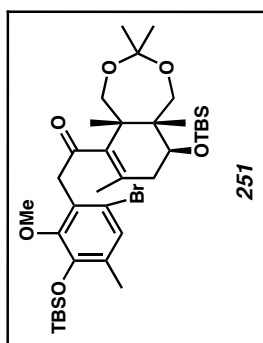


Figure A5.103  $^1\text{H}$  NMR of compound **251** (300 MHz,  $\text{CDCl}_3$ )

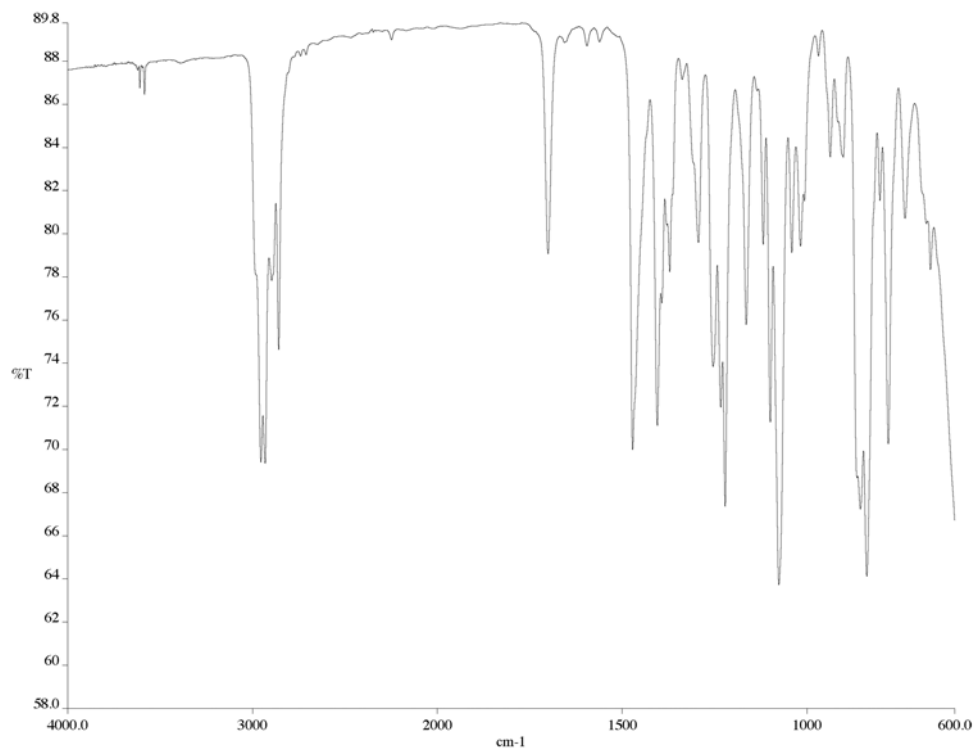


Figure A5.104 IR of compound **251** (NaCl/film)

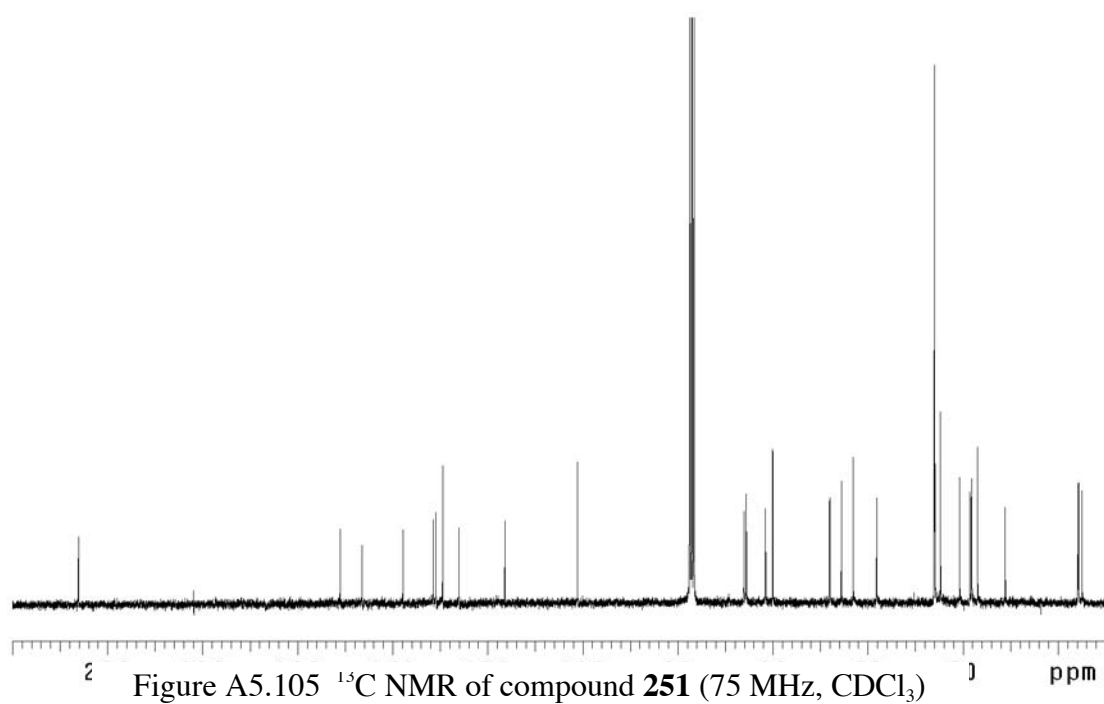


Figure A5.105 <sup>13</sup>C NMR of compound **251** (75 MHz, CDCl<sub>3</sub>)

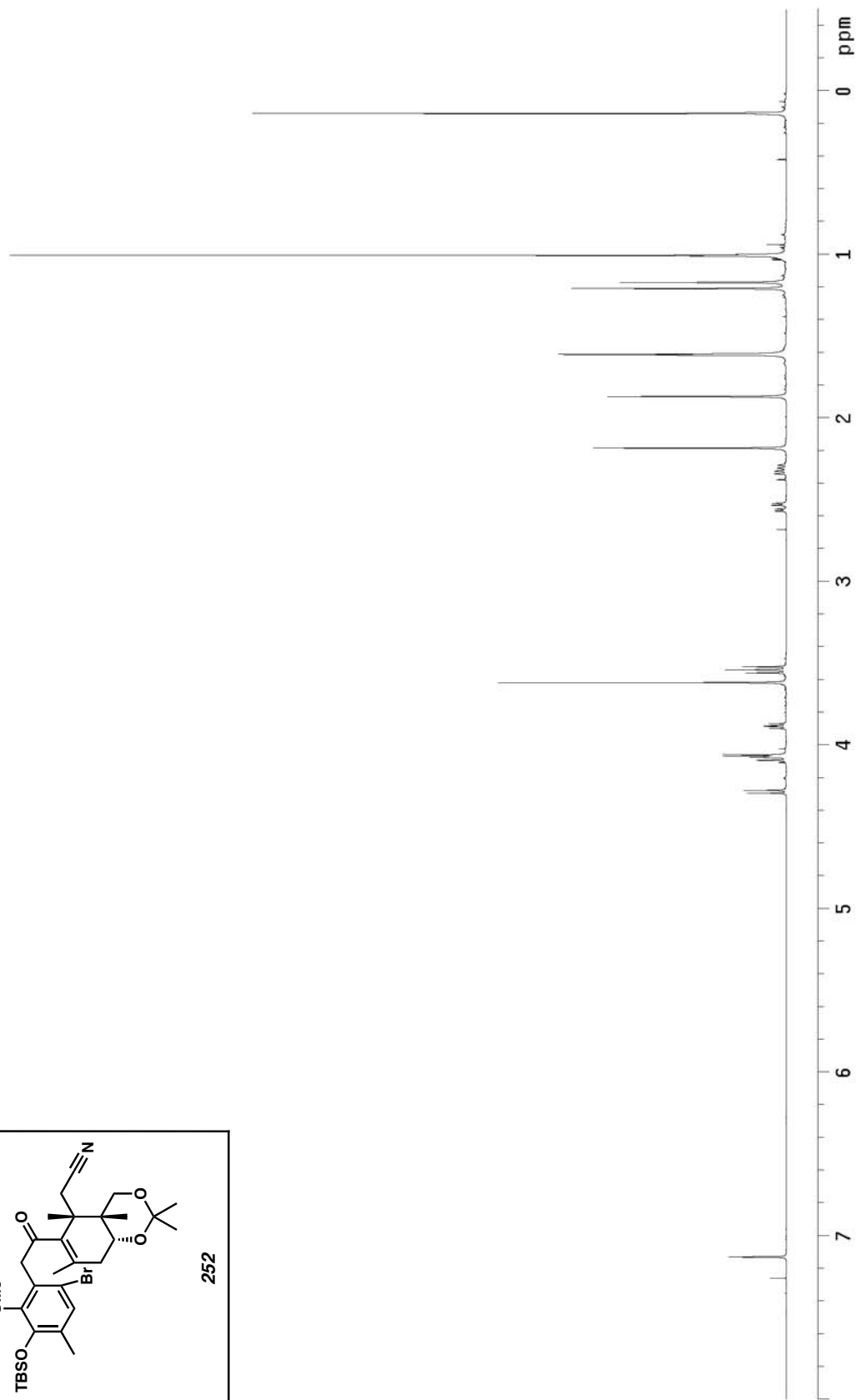
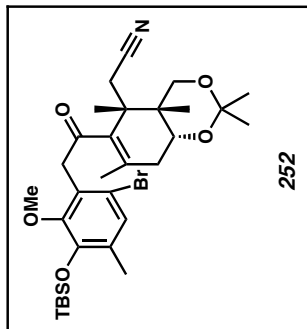
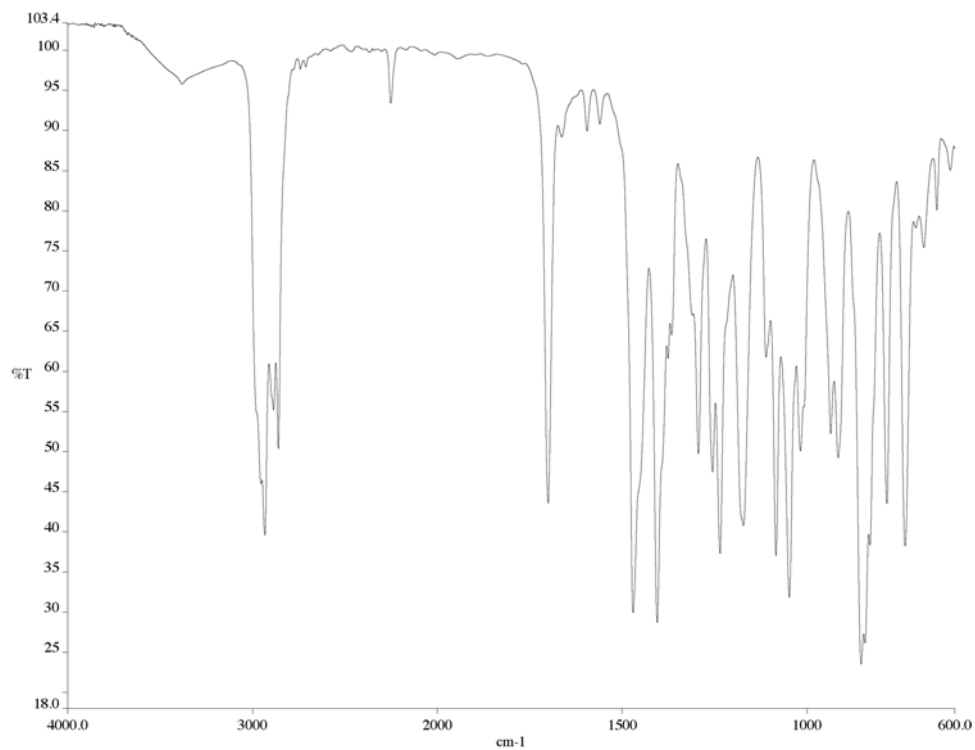
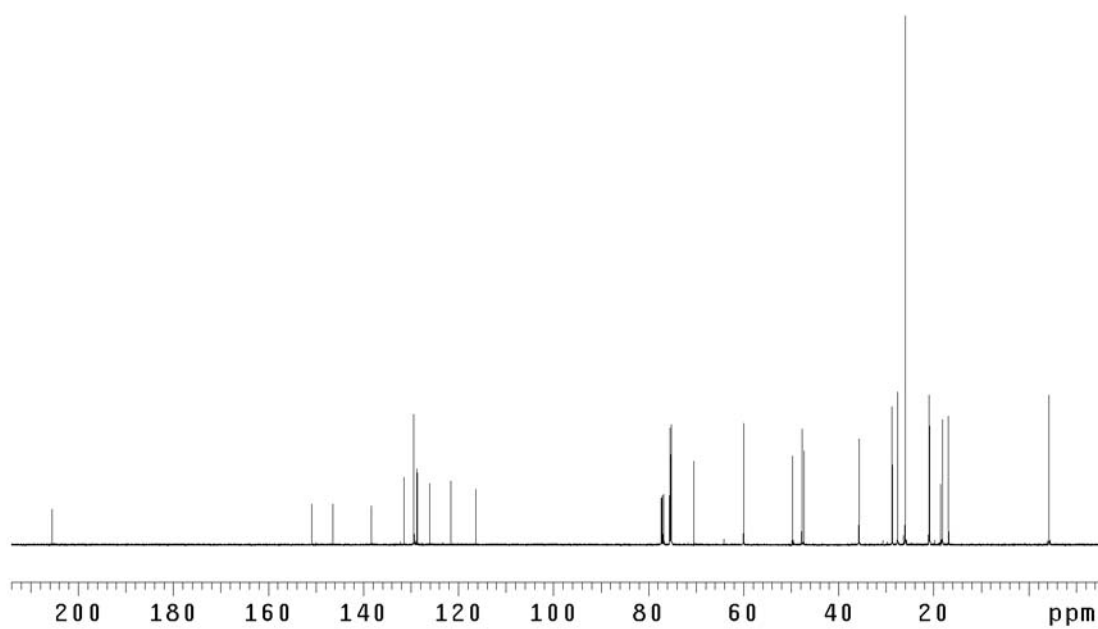


Figure A5.106 <sup>1</sup>H NMR of compound **252** (500 MHz, CDCl<sub>3</sub>)



Figure A5.107 IR of compound **252** (NaCl/film)Figure A5.108  $^{13}\text{C}$  NMR of compound **252** (125 MHz,  $\text{CDCl}_3$ )

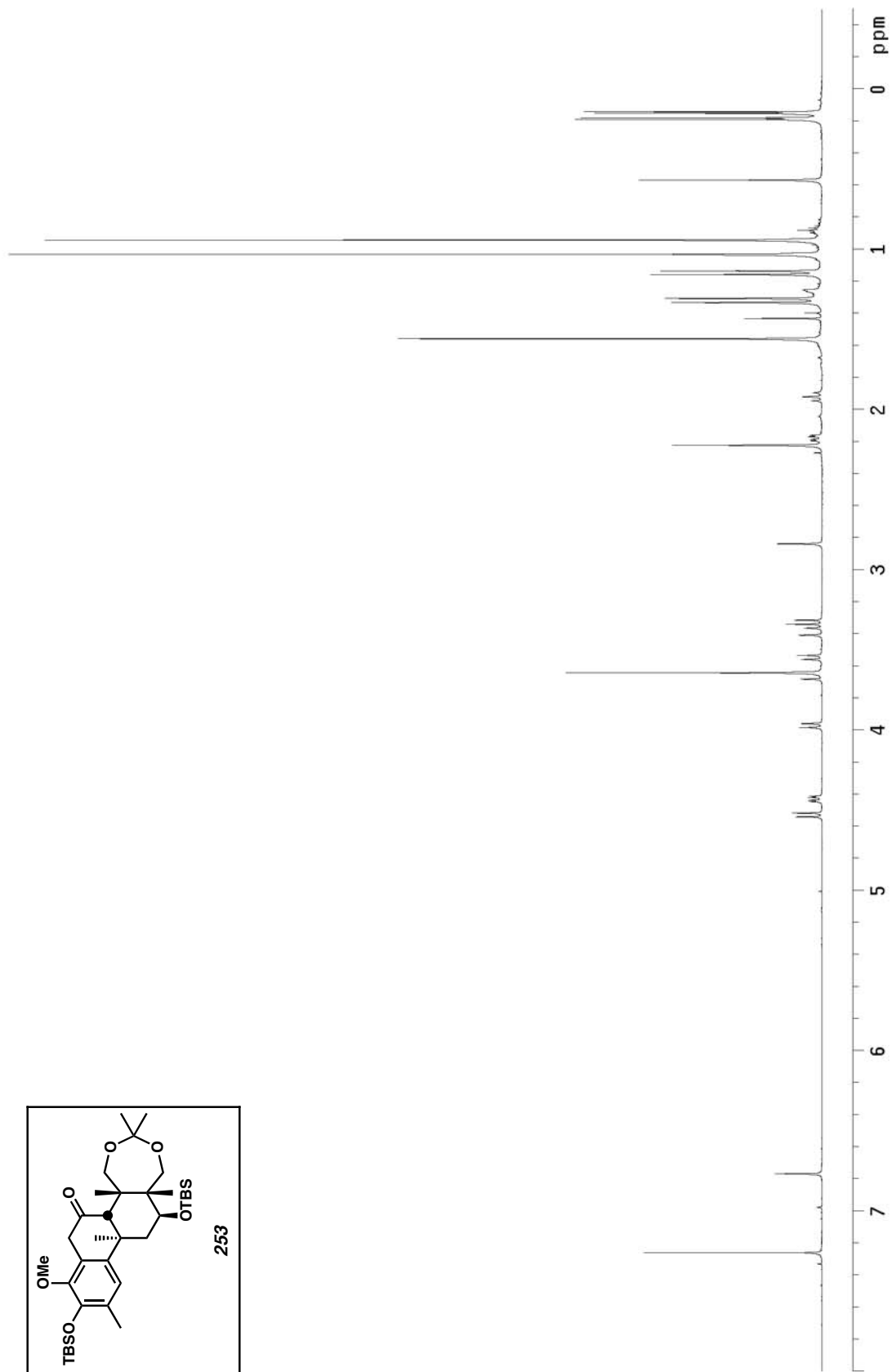
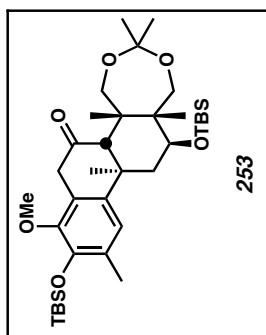
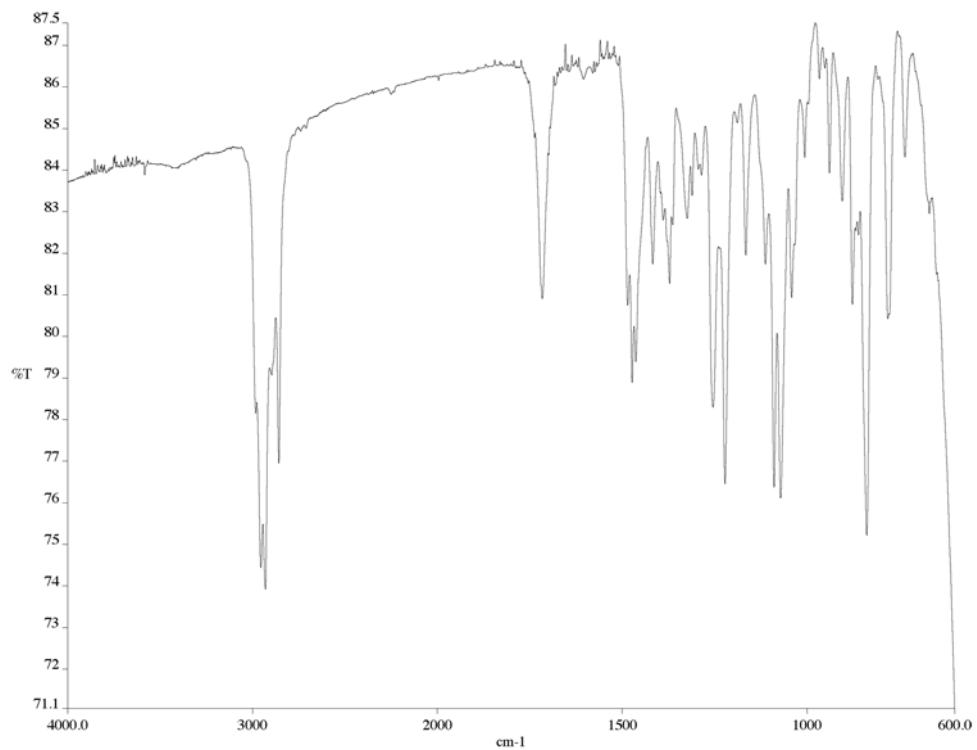
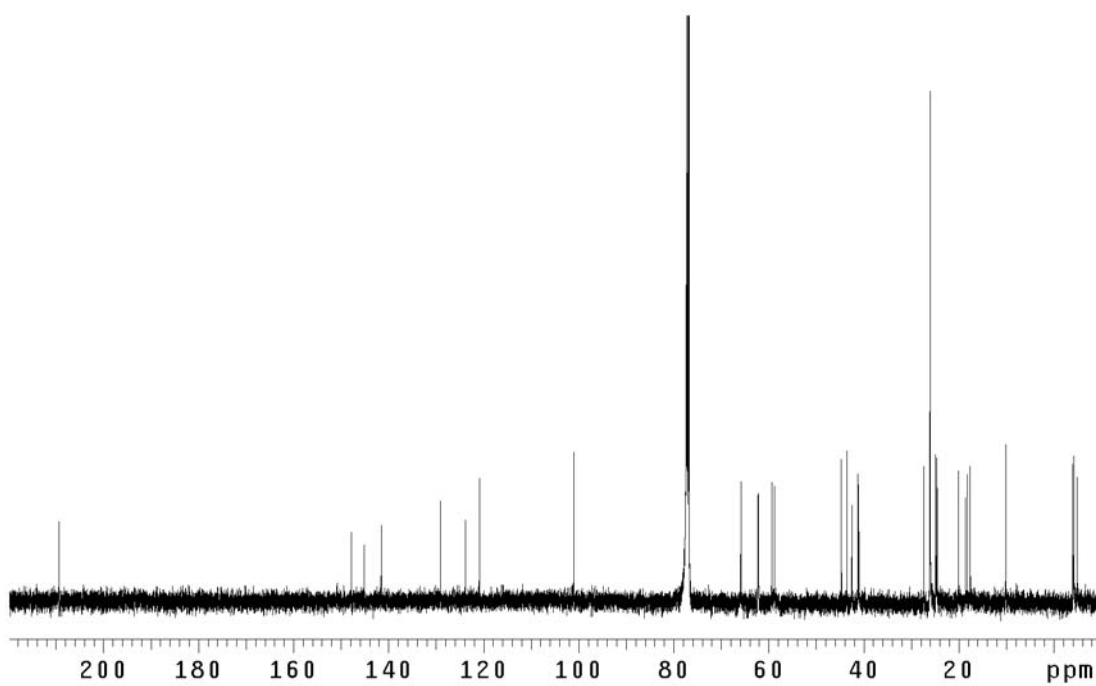


Figure A5.109 <sup>1</sup>H NMR of compound **253** (500 MHz, CDCl<sub>3</sub>)

Figure A5.110 IR of compound **253** (NaCl/film)Figure A5.111  $^{13}\text{C}$  NMR of compound **253** (125 MHz,  $\text{CDCl}_3$ )

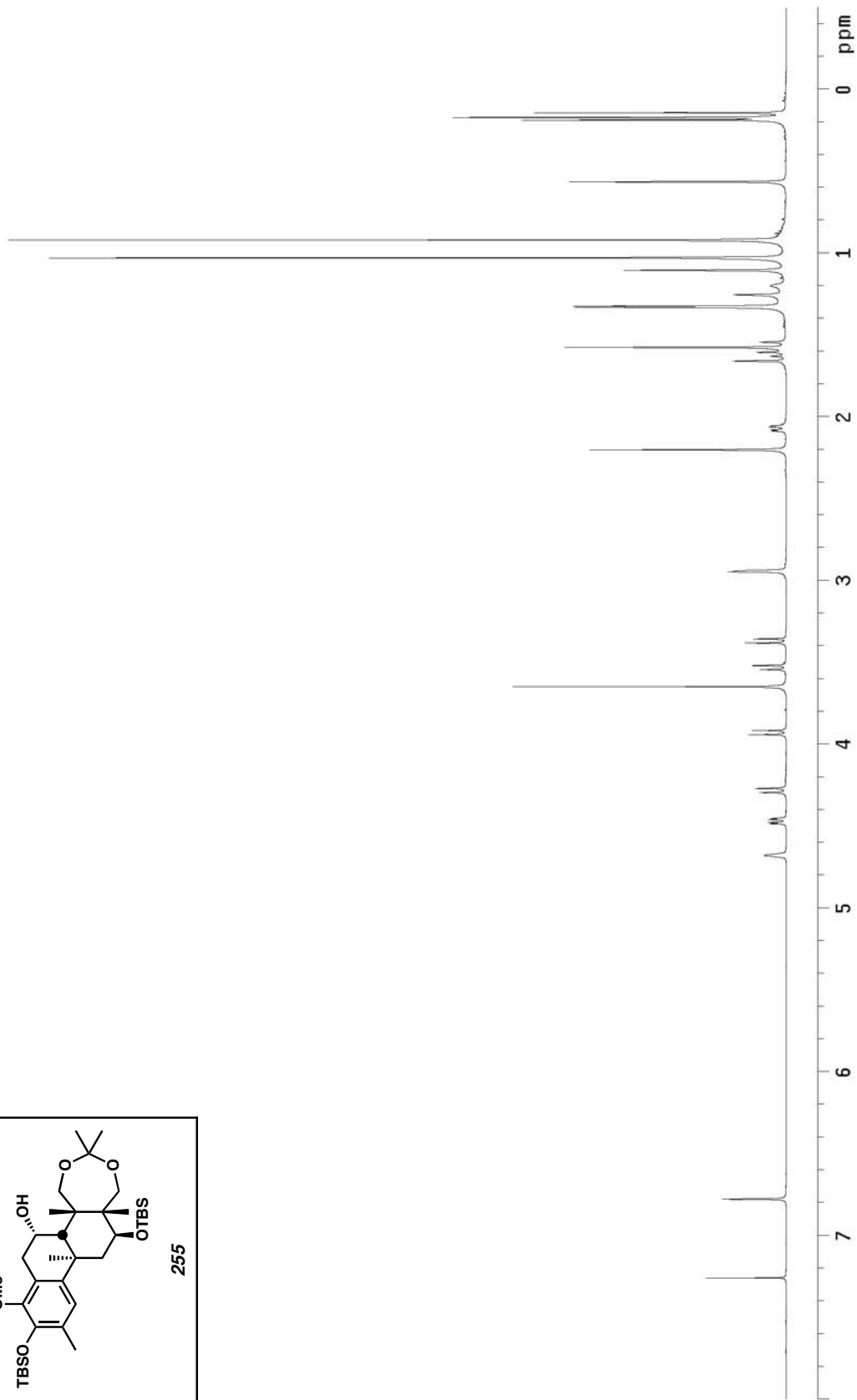
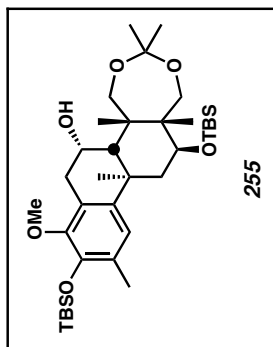
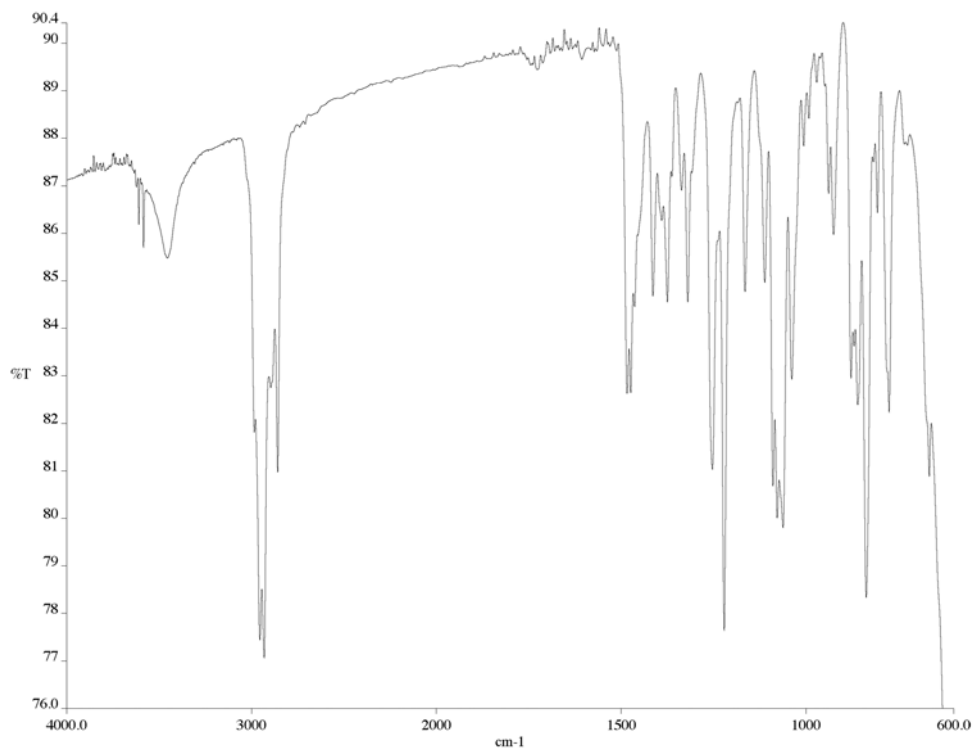
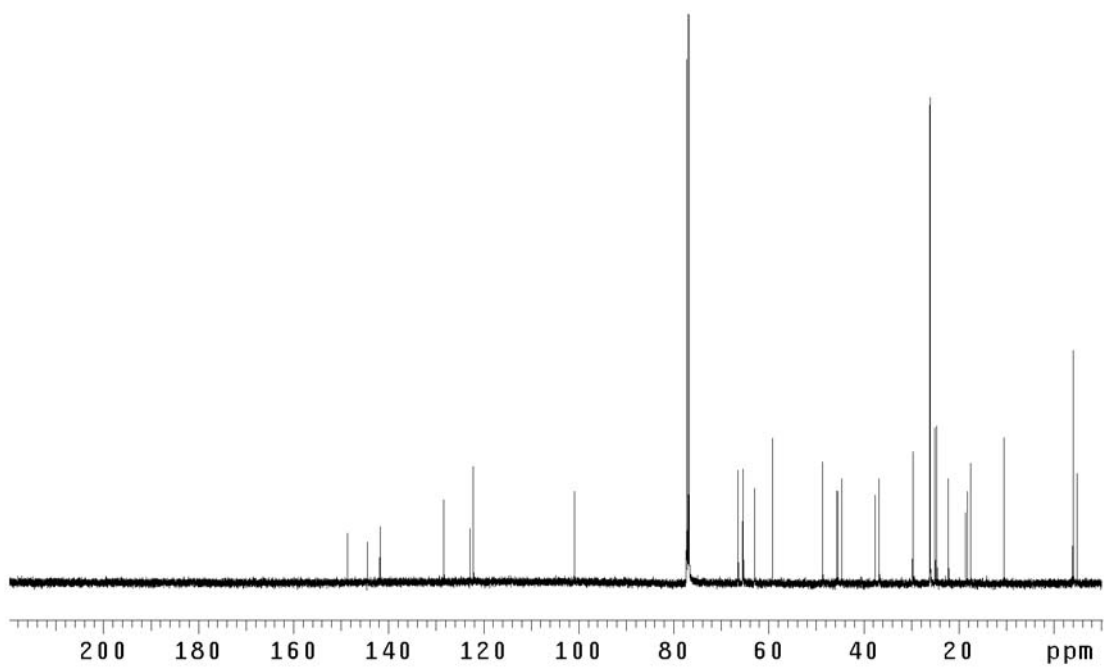


Figure A5.112 <sup>1</sup>H NMR of compound **255** (500 MHz, CDCl<sub>3</sub>)

Figure A5.113 IR of compound **255** (NaCl/film)Figure A5.114  $^{13}\text{C}$  NMR of compound **255** (125 MHz,  $\text{CDCl}_3$ )

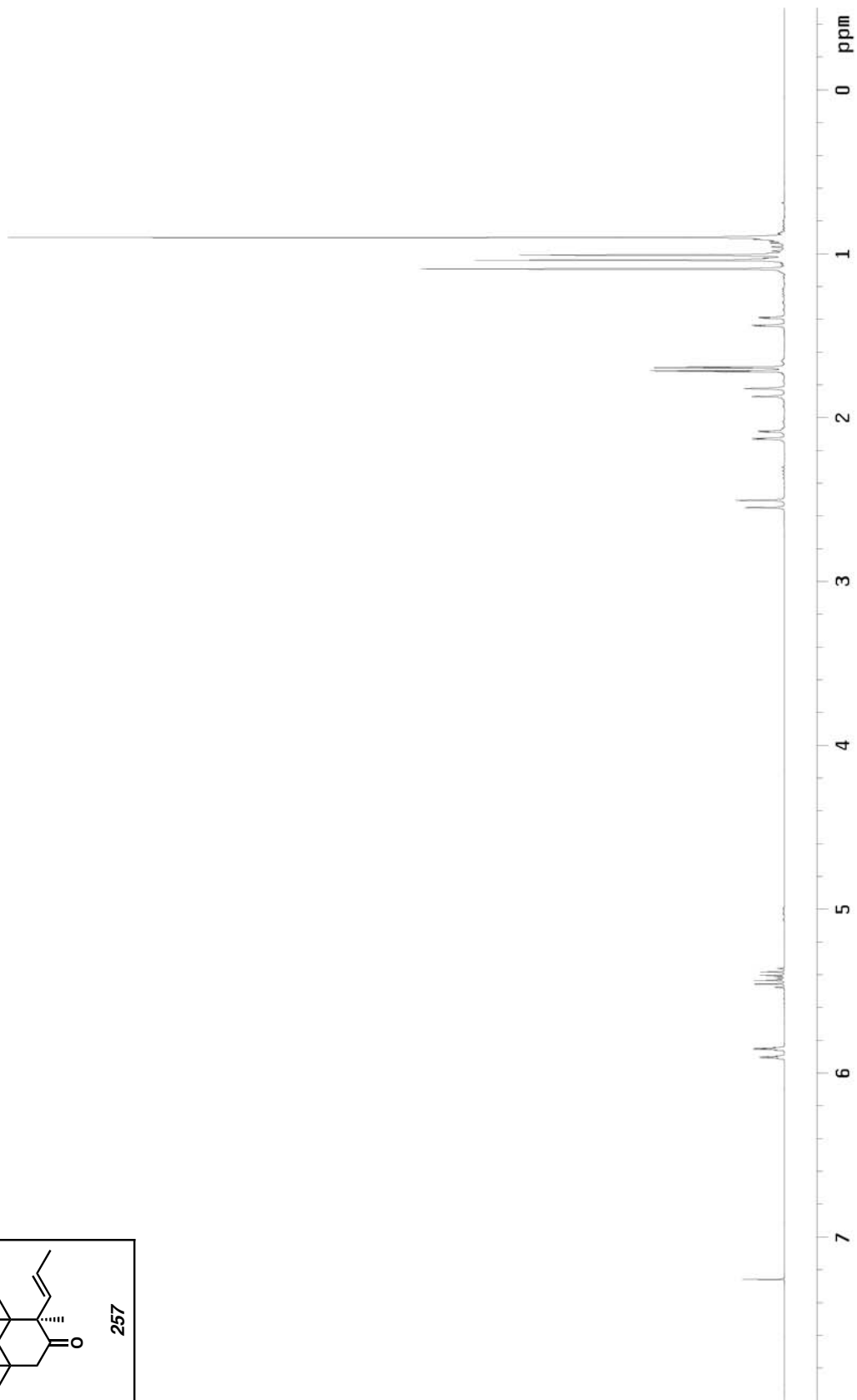
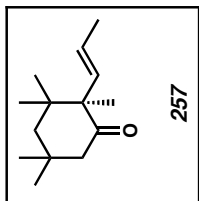
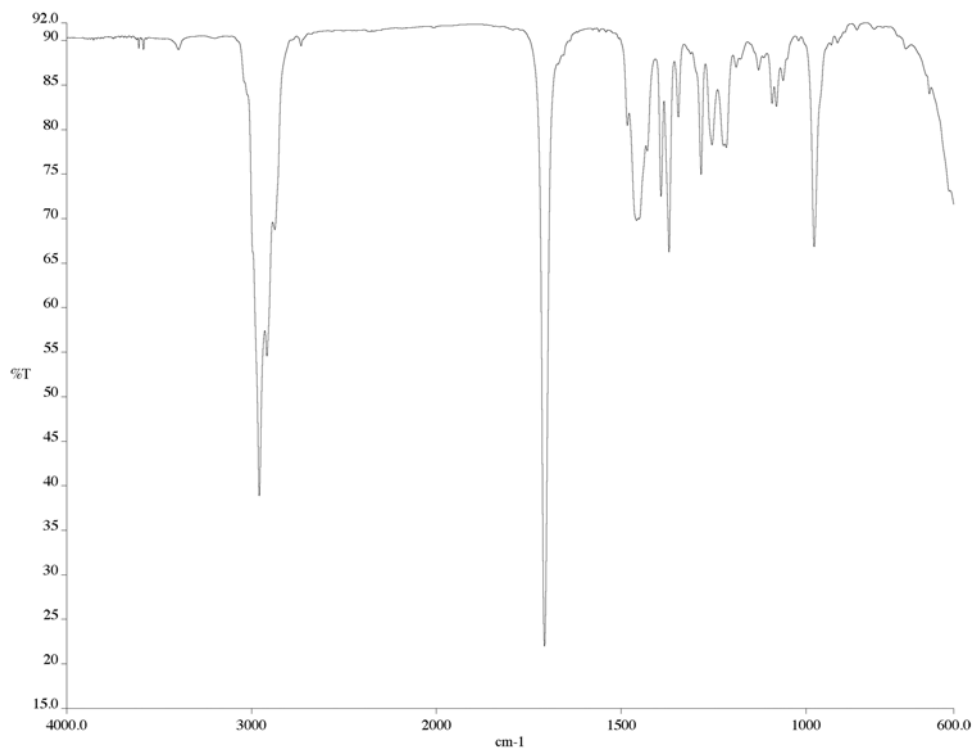
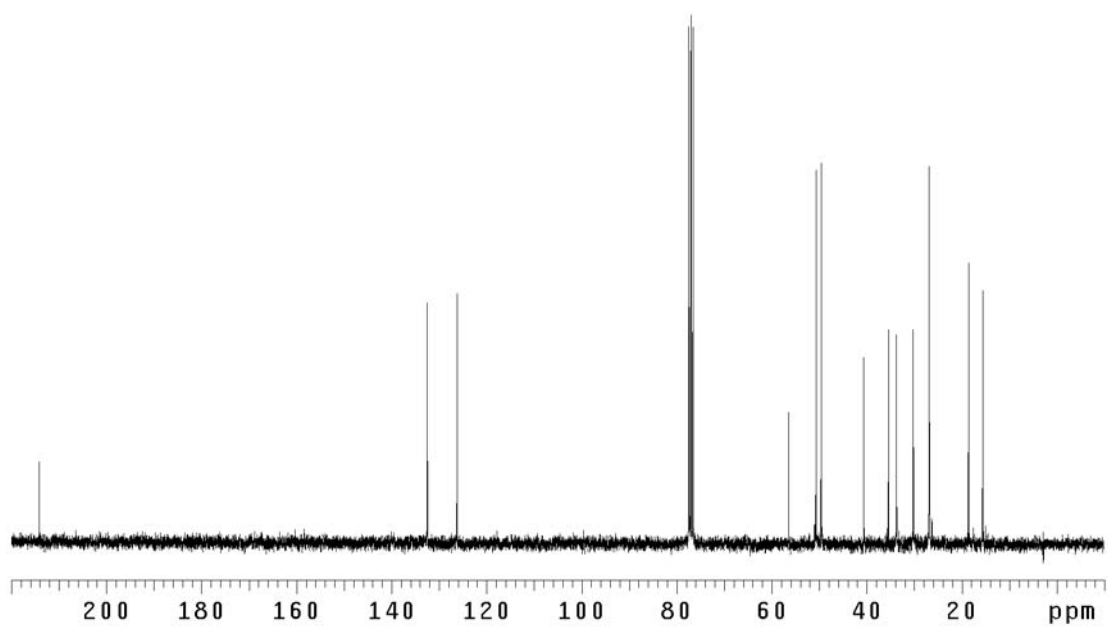


Figure A5.115  $^1\text{H}$  NMR of compound **257** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.116 IR of compound **257** (NaCl/film)Figure A5.117 <sup>13</sup>C NMR of compound **257** (75 MHz, CDCl<sub>3</sub>)

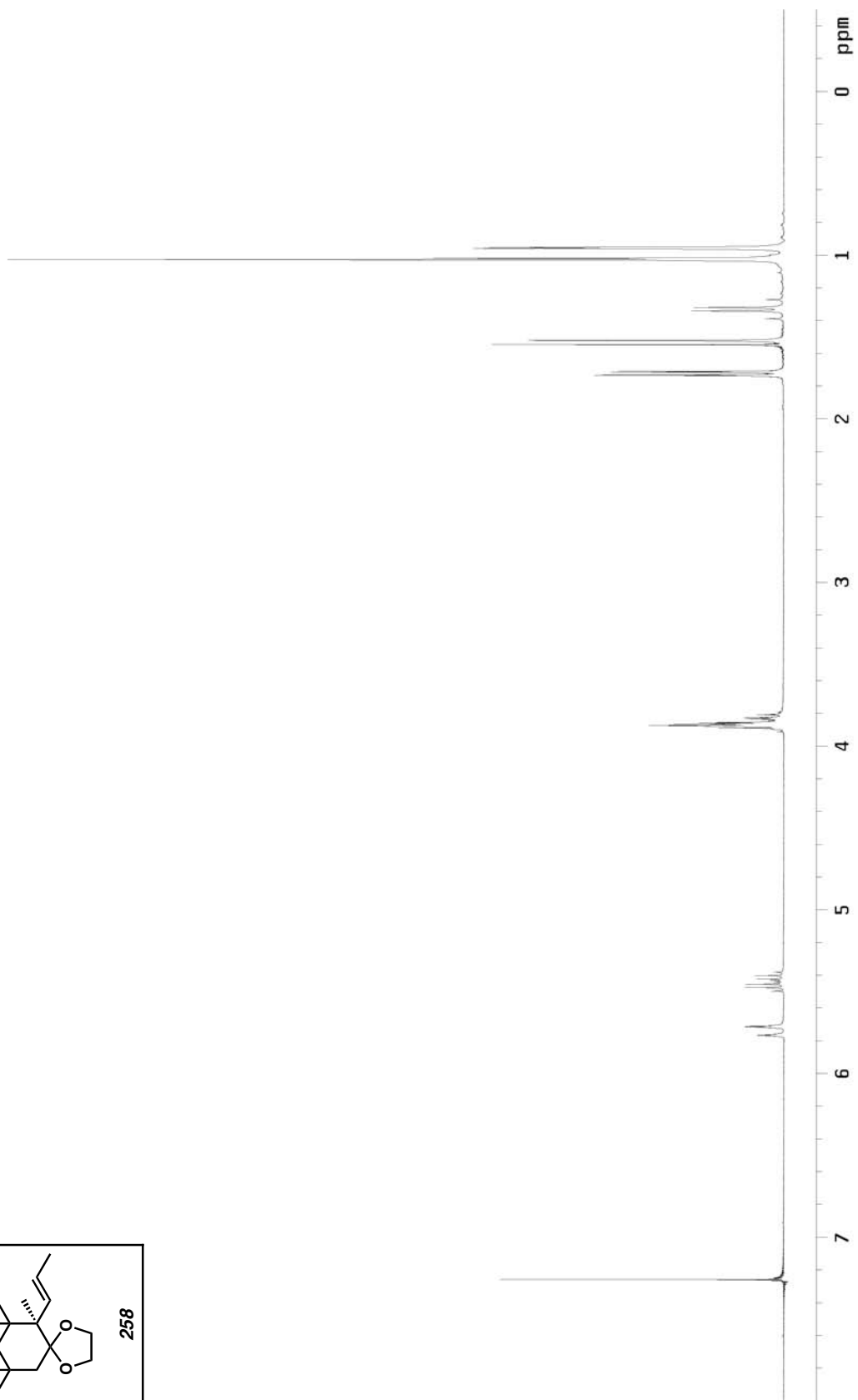
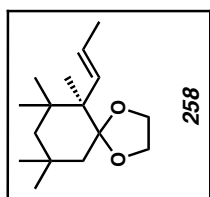
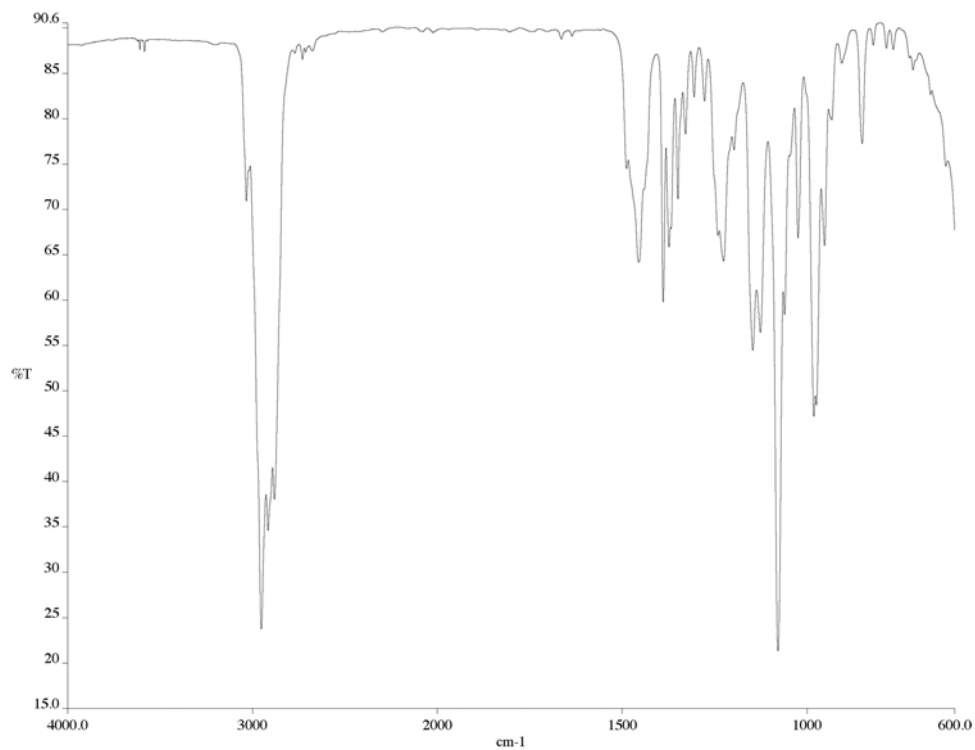
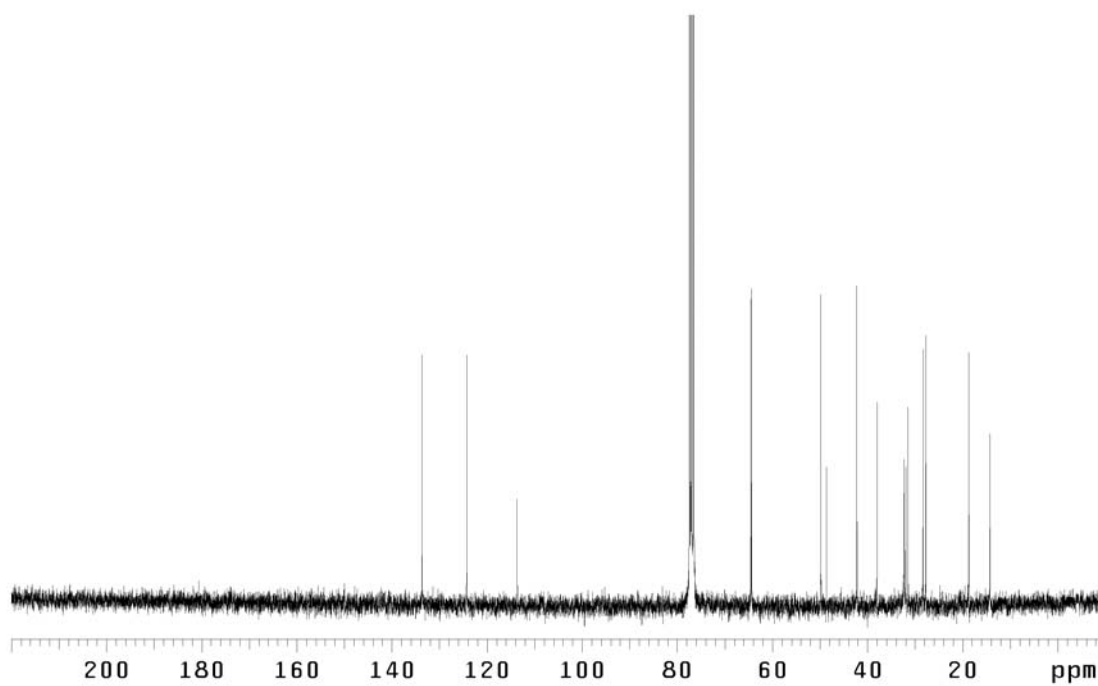


Figure A5.118  $^1\text{H}$  NMR of compound **258** (300 MHz,  $\text{CDCl}_3$ )



Figure A5.119 IR of compound **258** (NaCl/film)Figure A5.120 <sup>13</sup>C NMR of compound **258** (75 MHz, CDCl<sub>3</sub>)

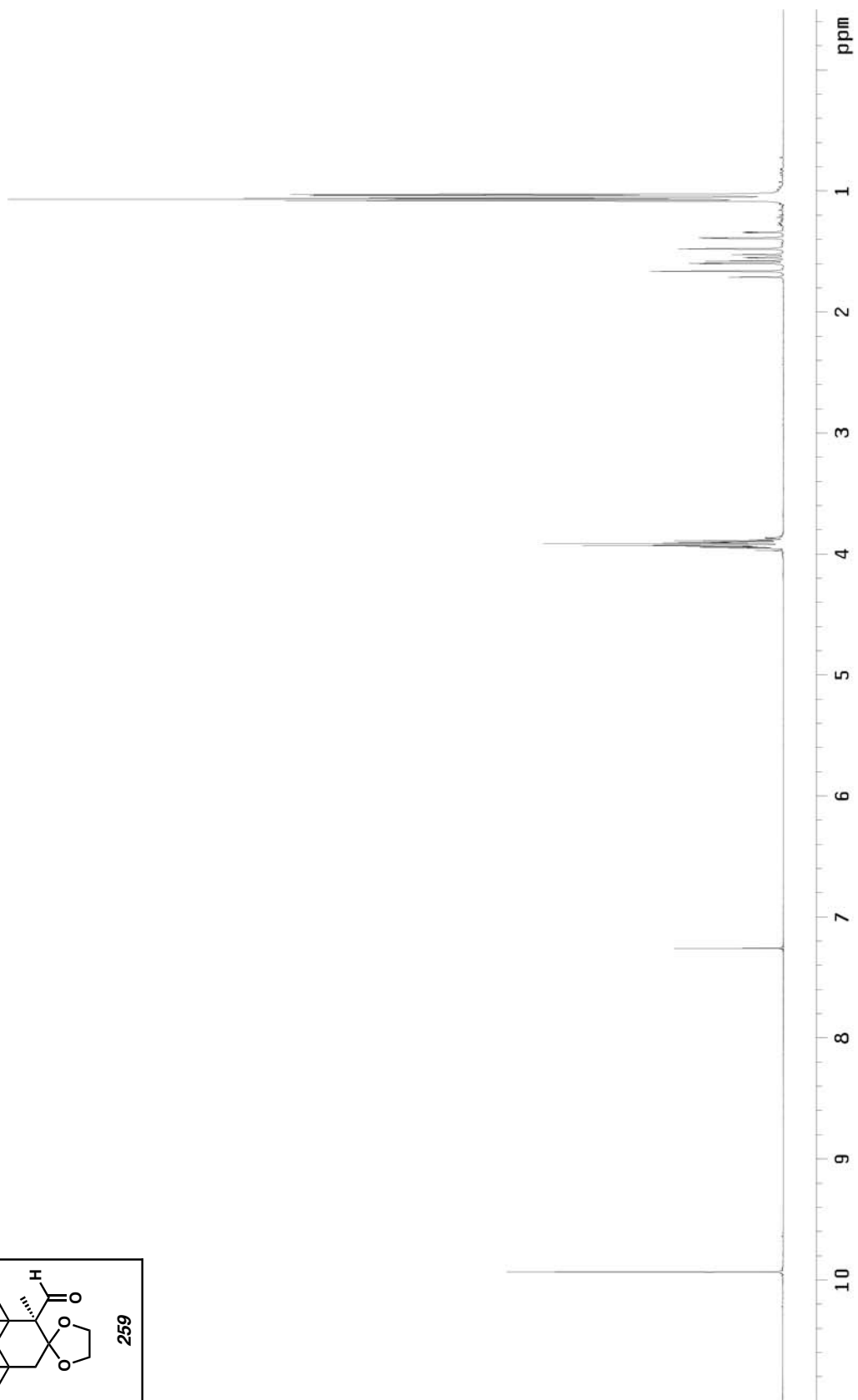
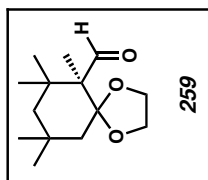


Figure A5.121  $^1\text{H}$  NMR of compound **259** (300 MHz,  $\text{CDCl}_3$ )

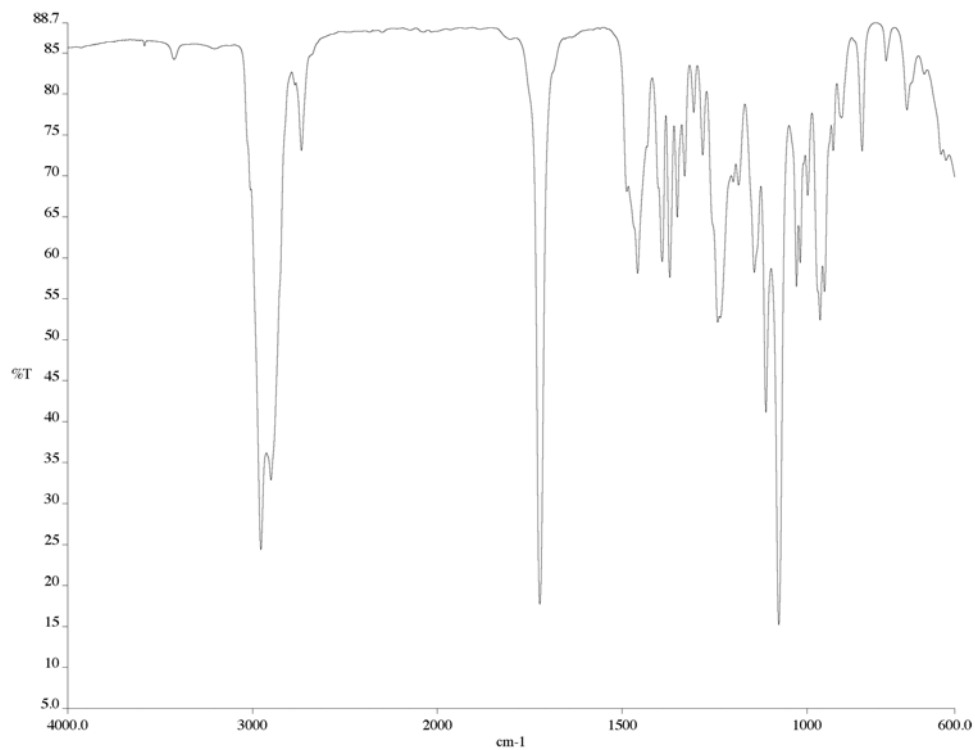


Figure A5.122 IR of compound **259** (NaCl/film)

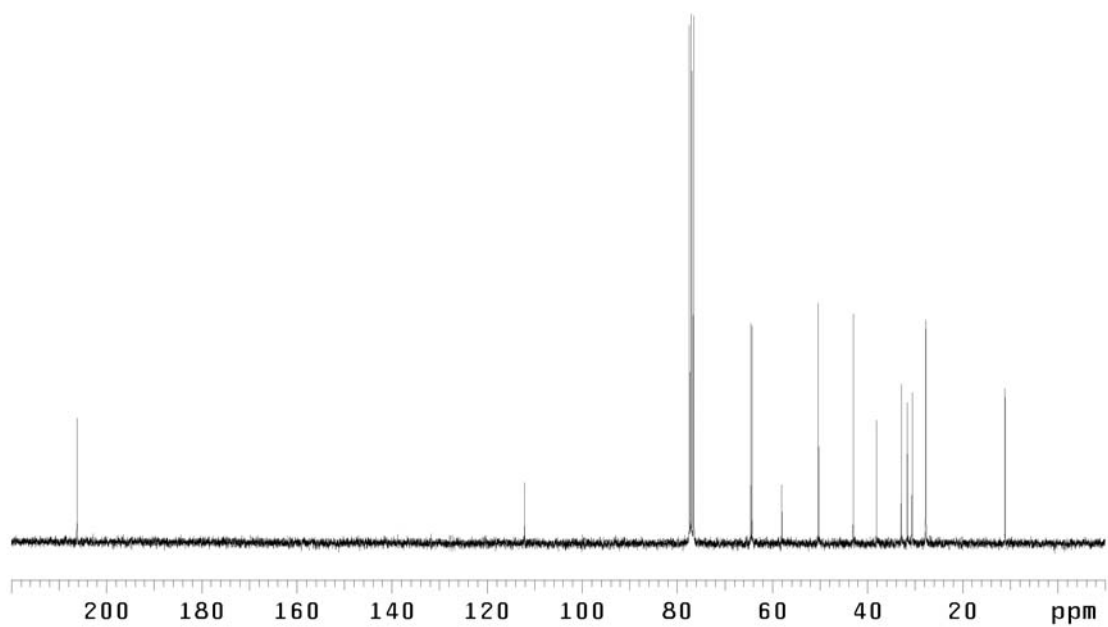


Figure A5.123 <sup>13</sup>C NMR of compound **259** (75 MHz, CDCl<sub>3</sub>)

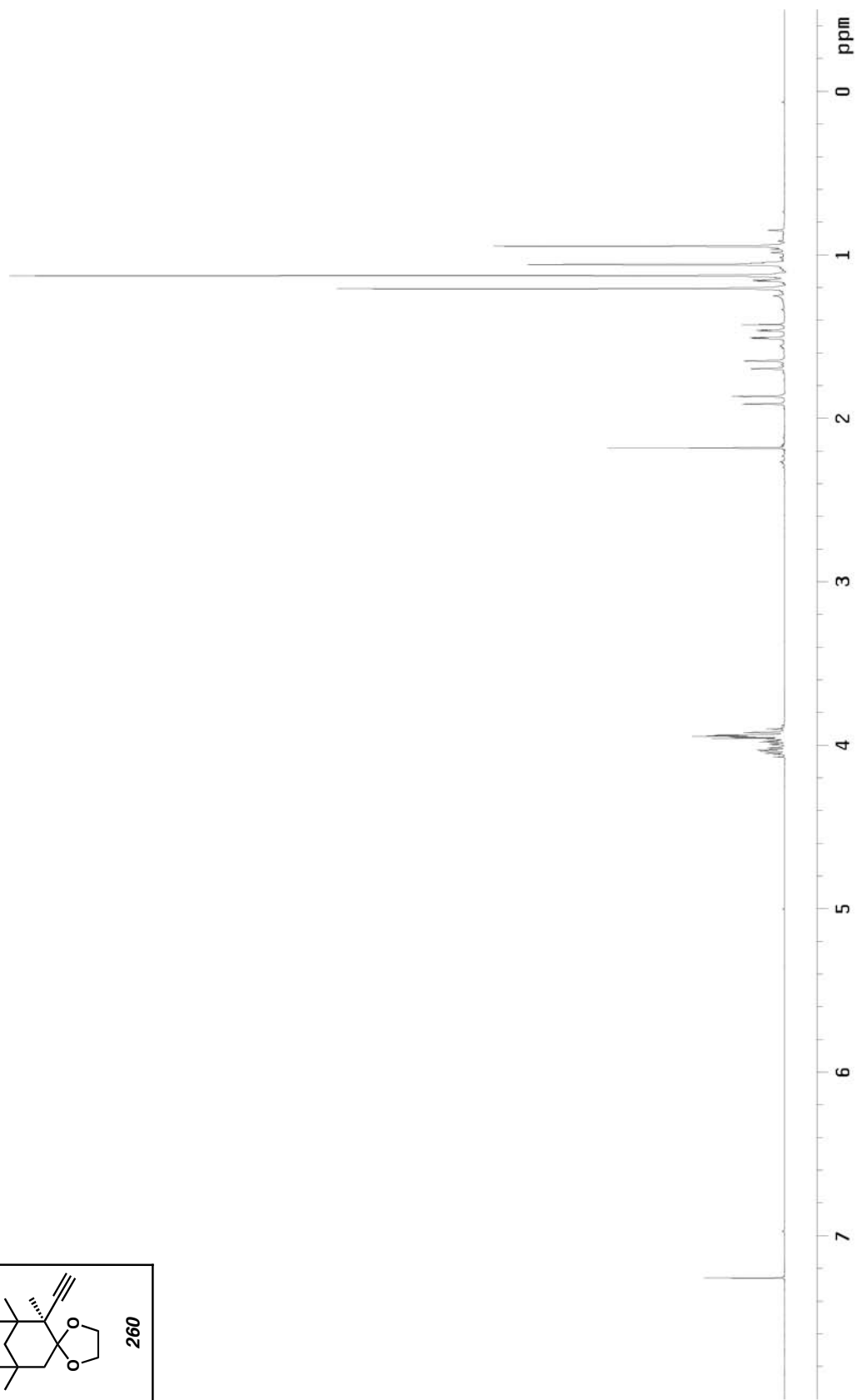
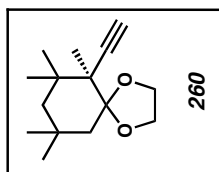
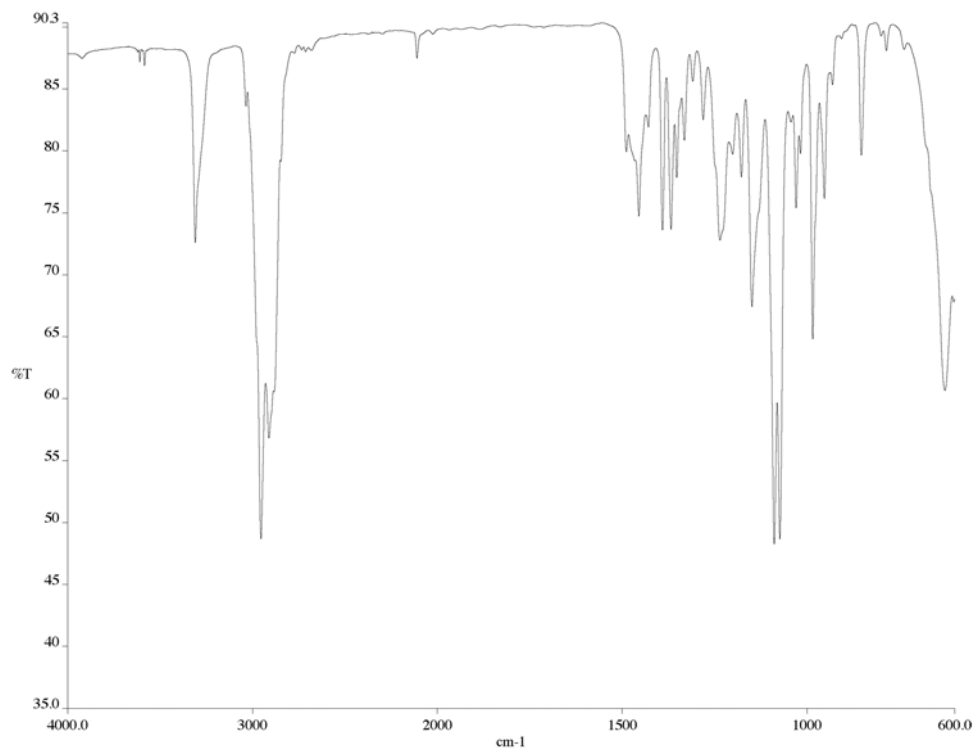
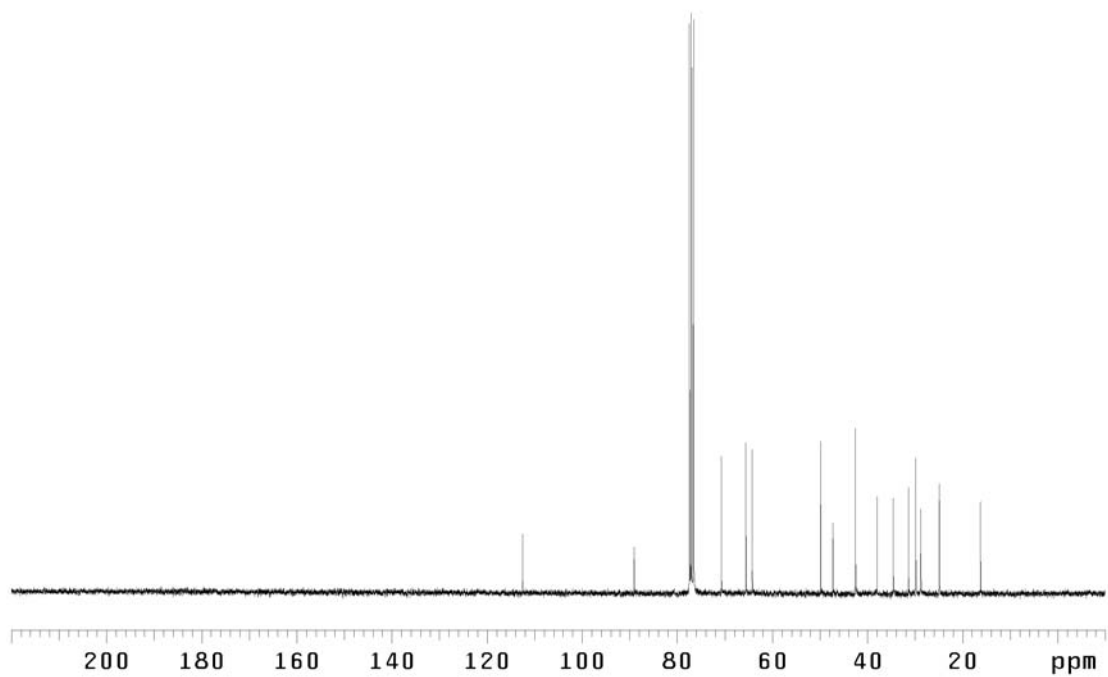


Figure A5.124  $^1\text{H}$  NMR of compound **260** (300 MHz,  $\text{CDCl}_3$ )

Figure A5.125 IR of compound **260** (NaCl/film)Figure A5.126 <sup>13</sup>C NMR of compound **260** (75 MHz, CDCl<sub>3</sub>)

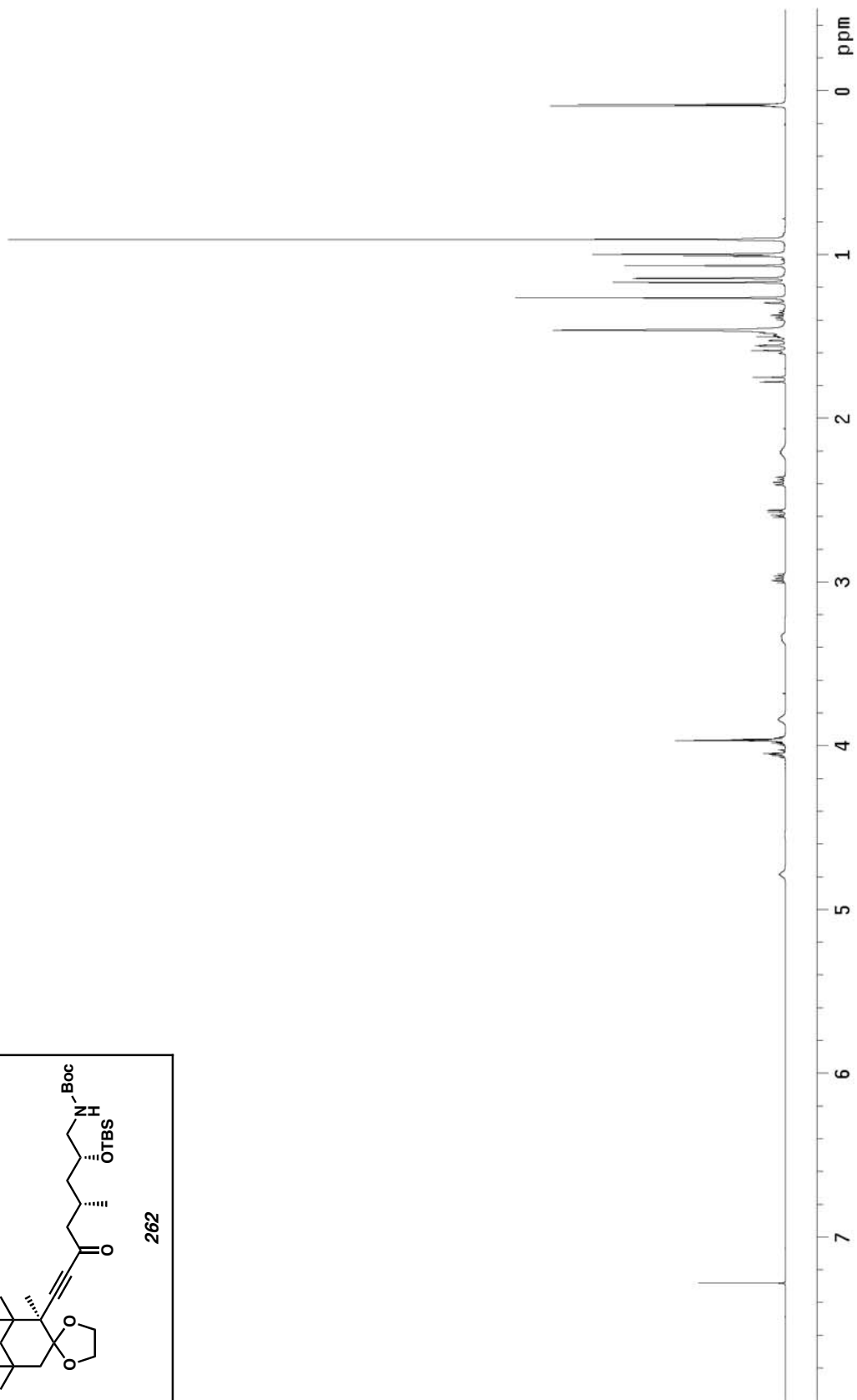
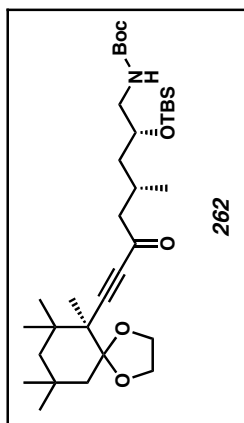
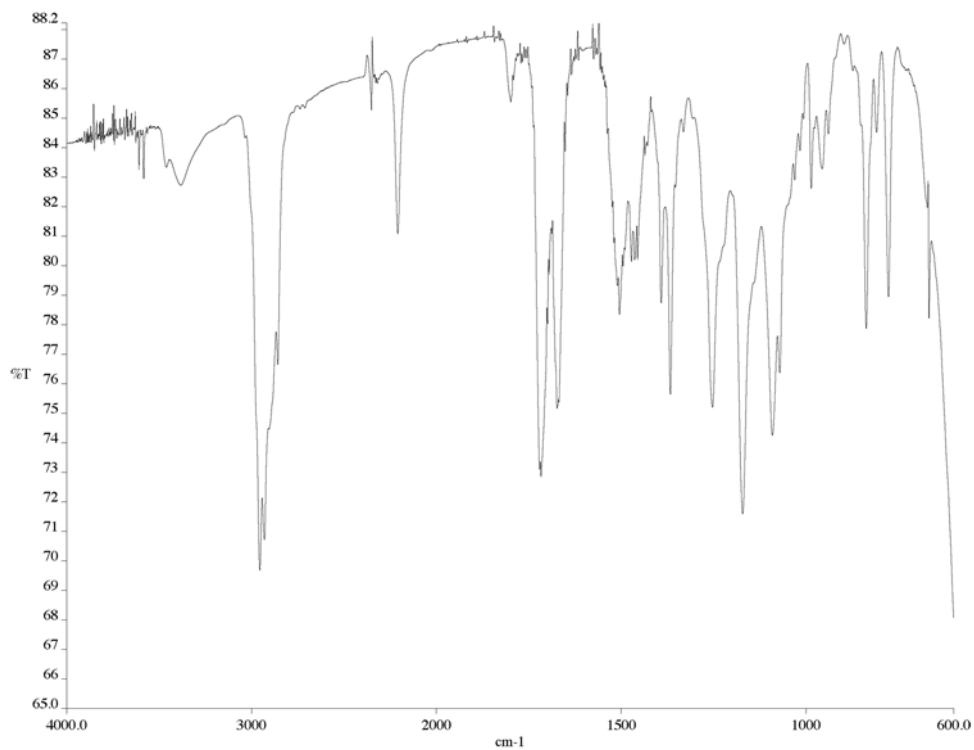
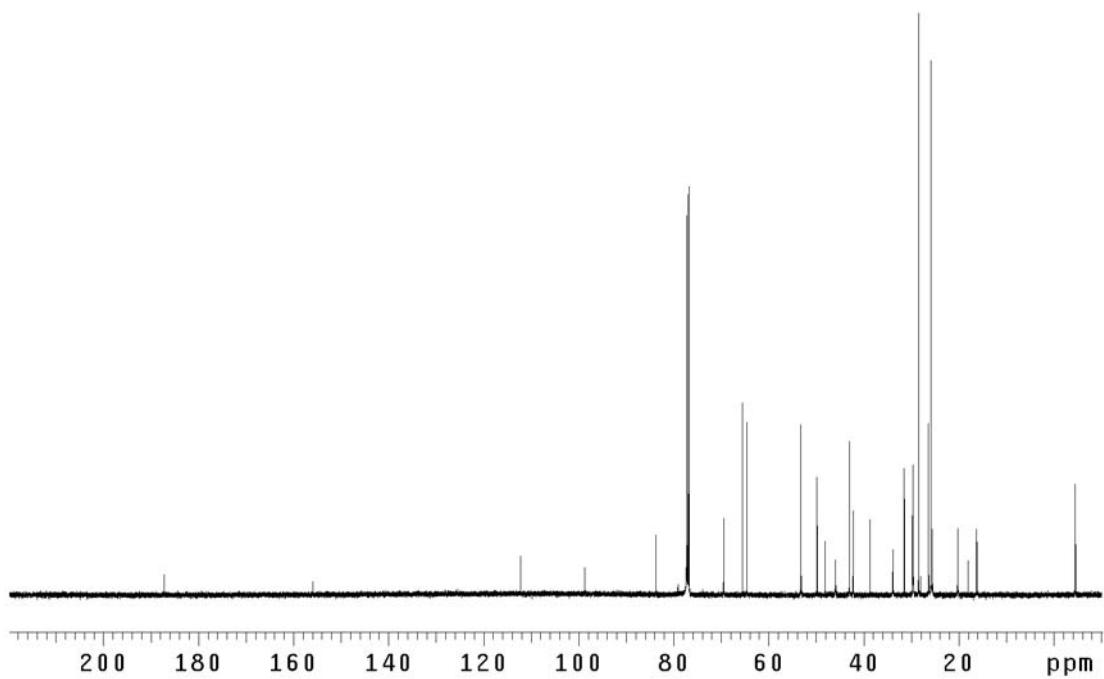


Figure A5.127 <sup>1</sup>H NMR of compound **262** (500 MHz, CDCl<sub>3</sub>)

Figure A5.128 IR of compound **262** (NaCl/film)Figure A5.129 <sup>13</sup>C NMR of compound **262** (125 MHz, CDCl<sub>3</sub>)

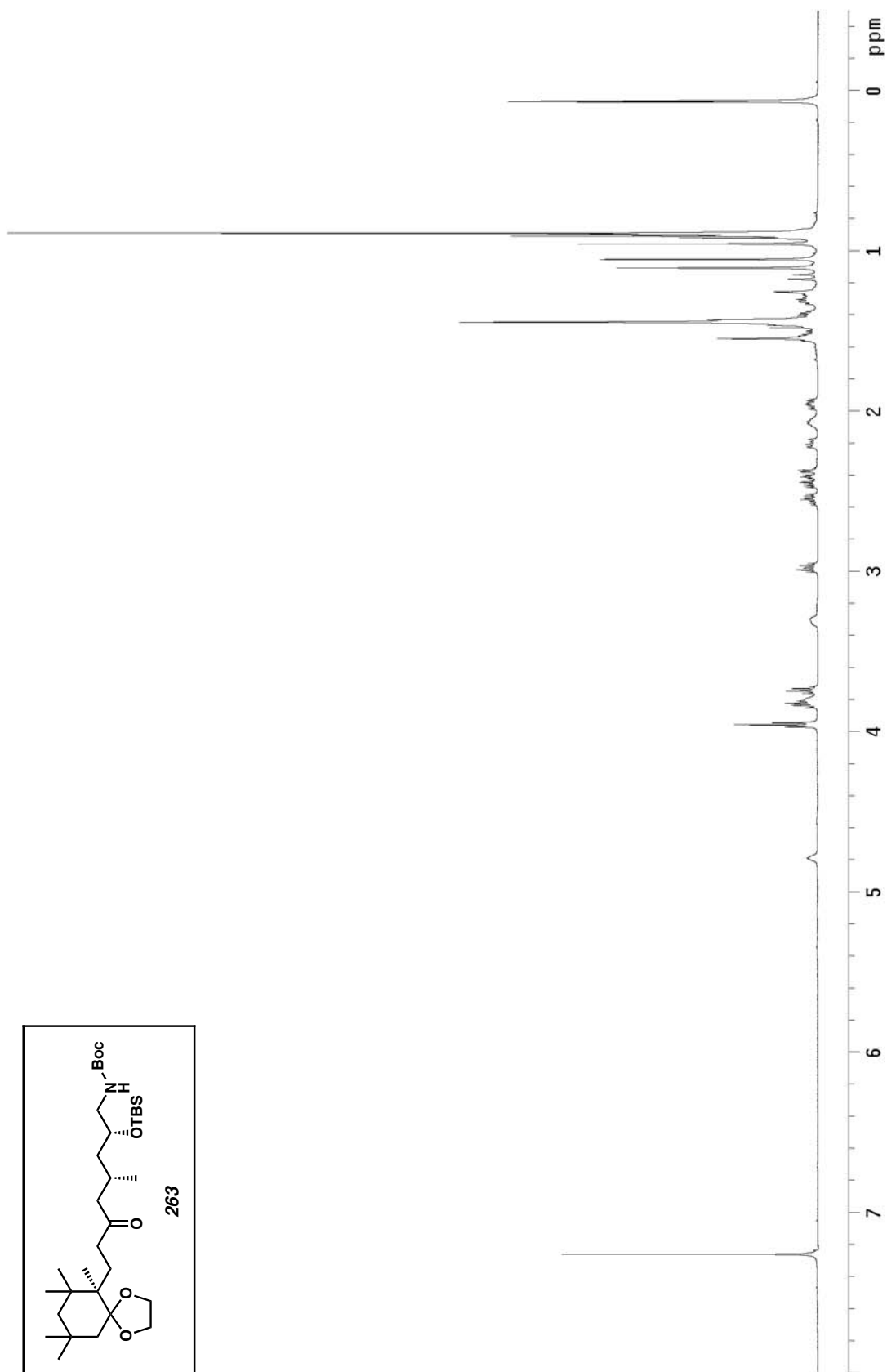
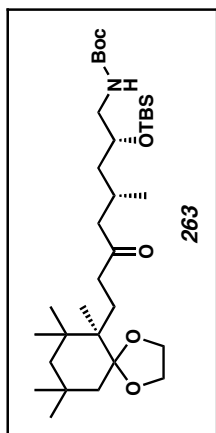
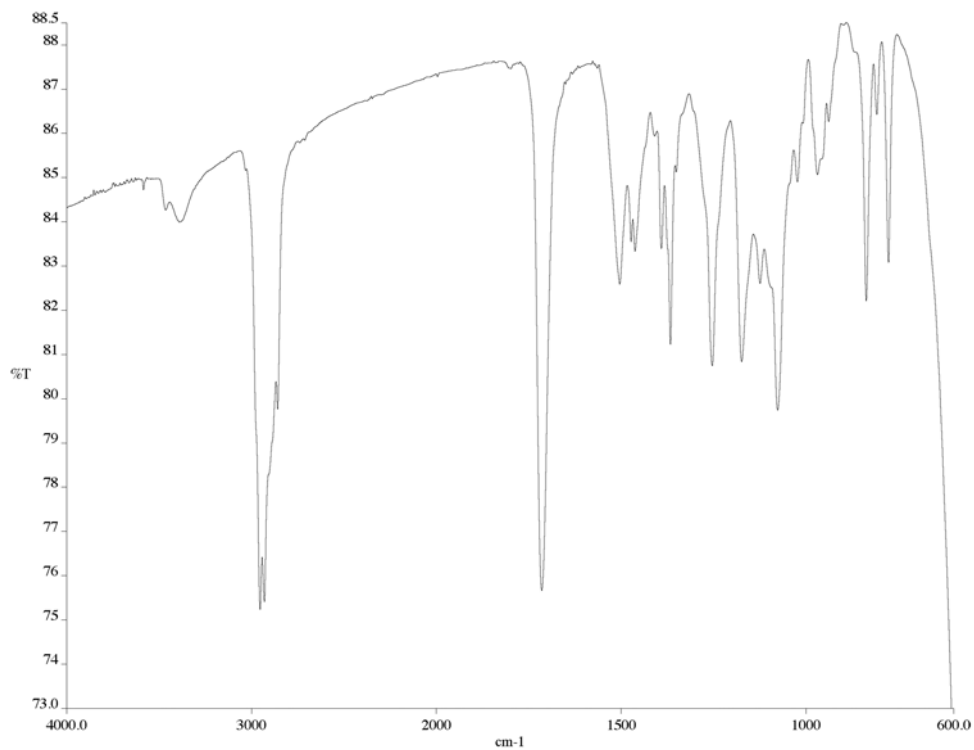
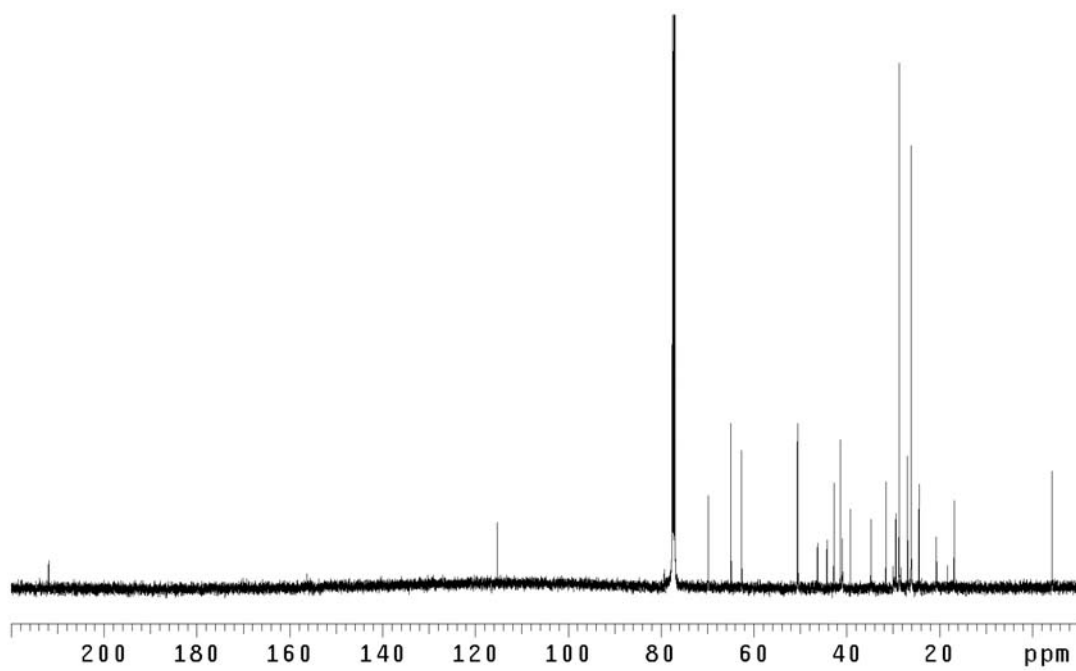


Figure A5.130  $^1\text{H}$  NMR of compound **263** (500 MHz,  $\text{CDCl}_3$ )



Figure A5.131 IR of compound **263** (NaCl/film)Figure A5.132 <sup>13</sup>C NMR of compound **263** (125 MHz, CDCl<sub>3</sub>)