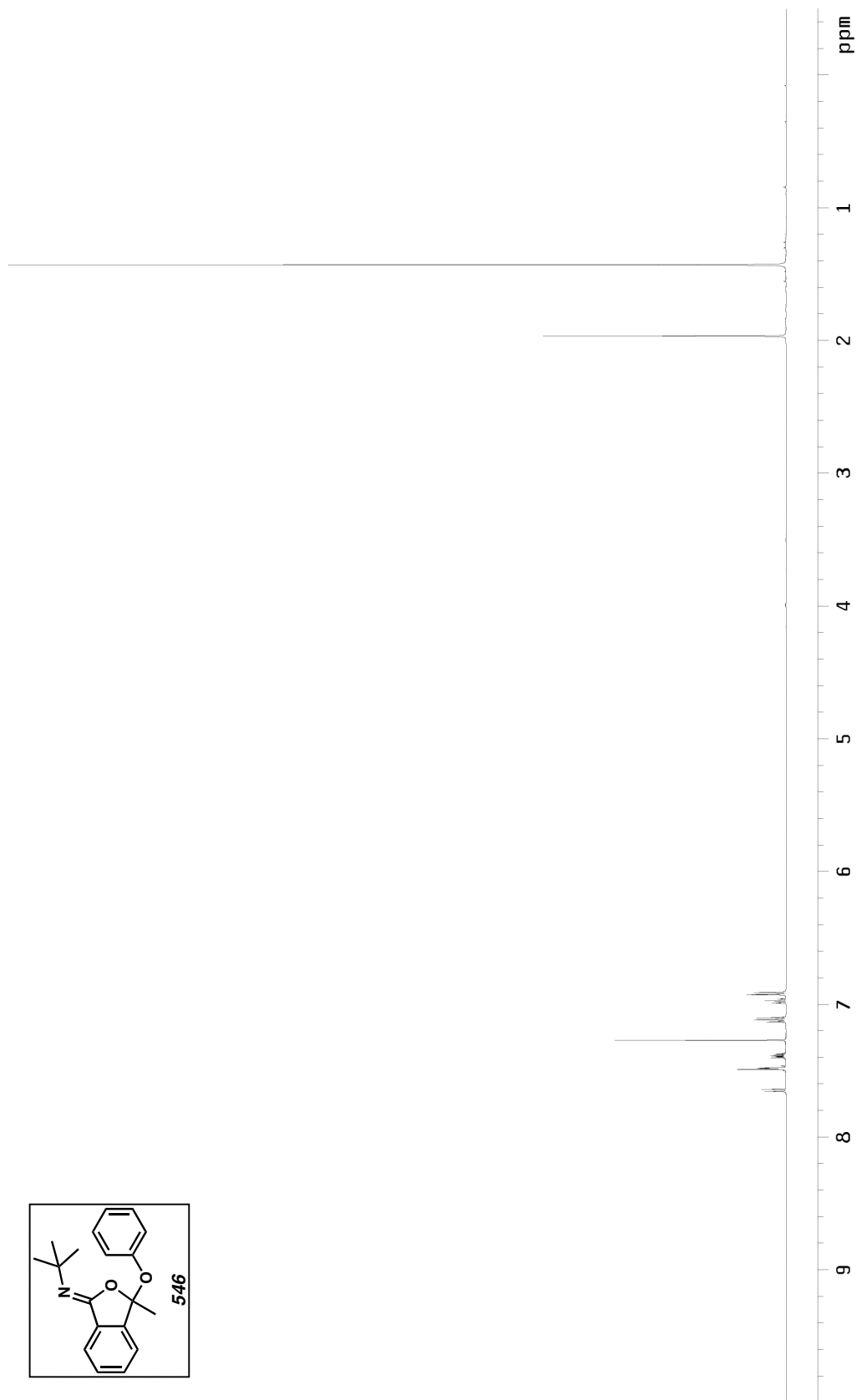
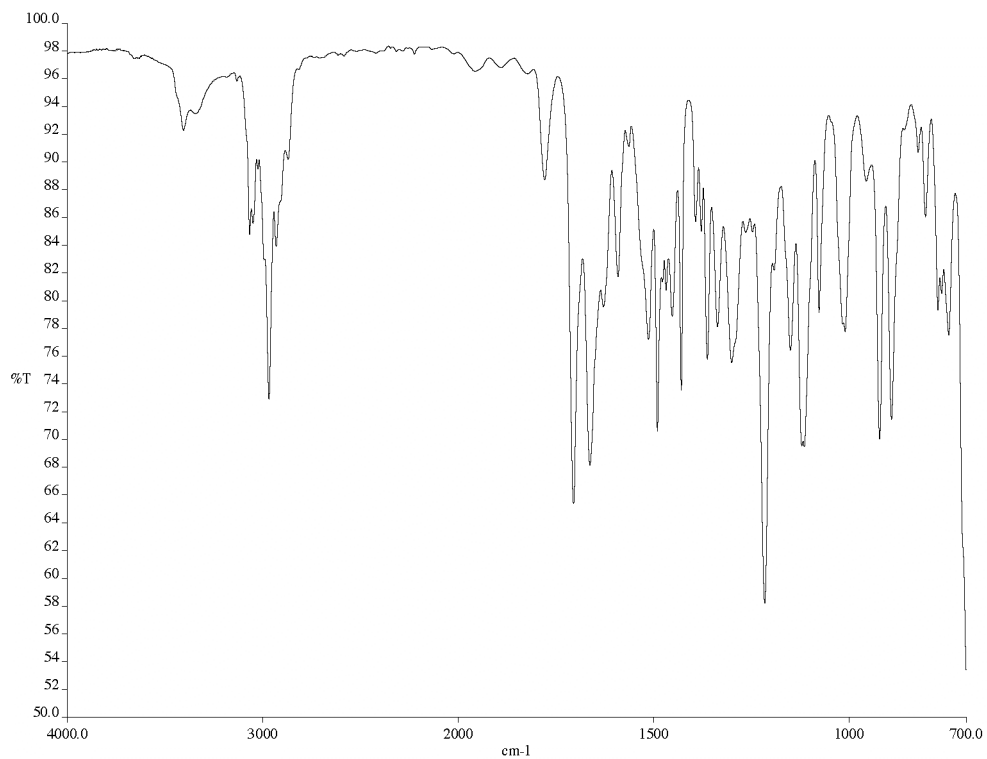
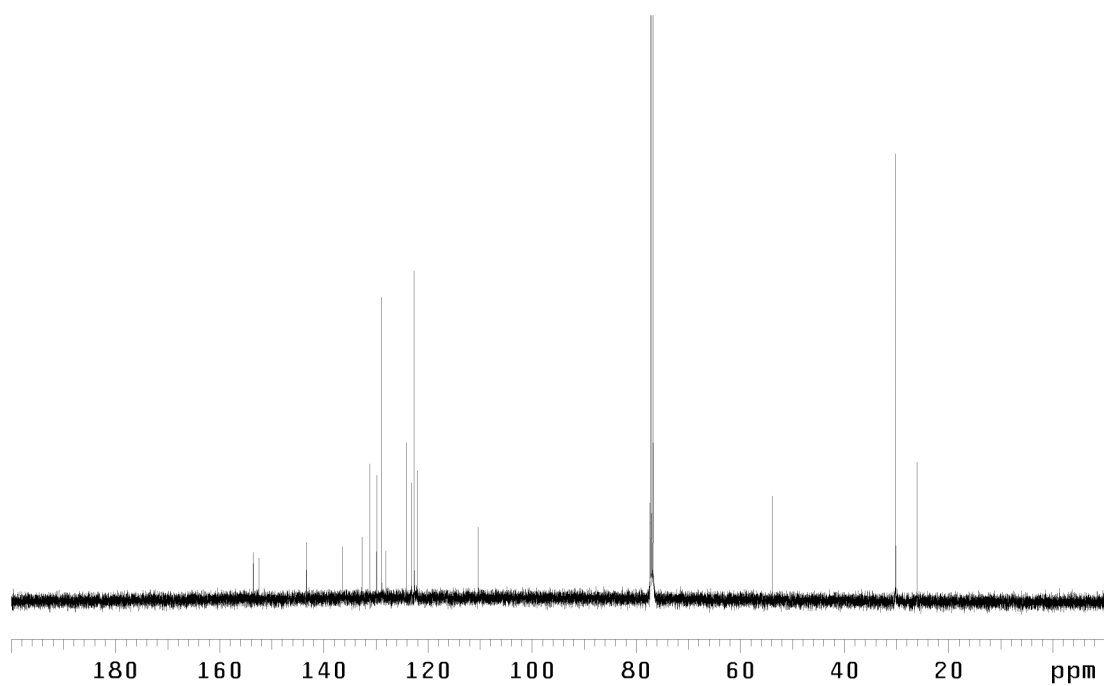


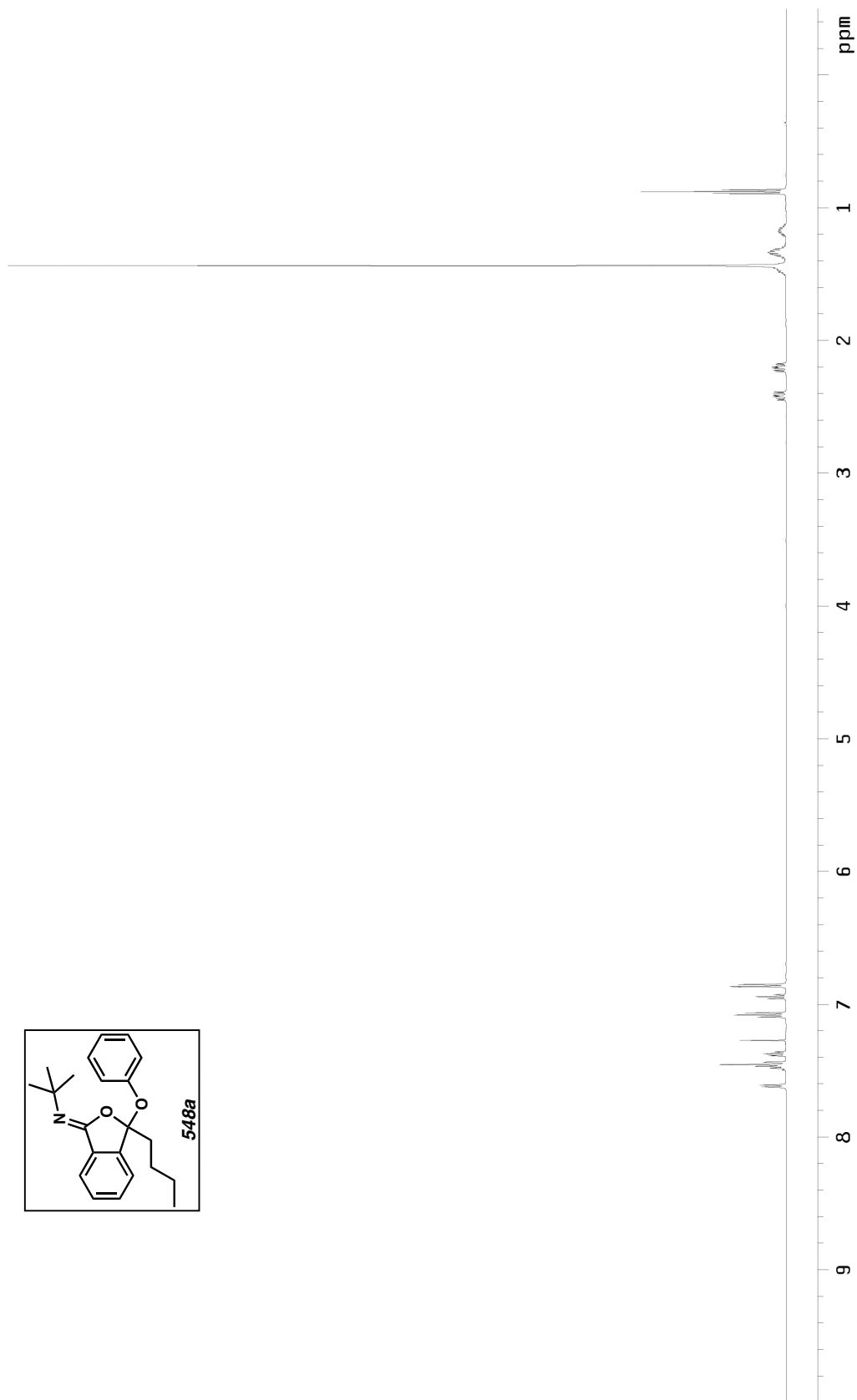
APPENDIX 3

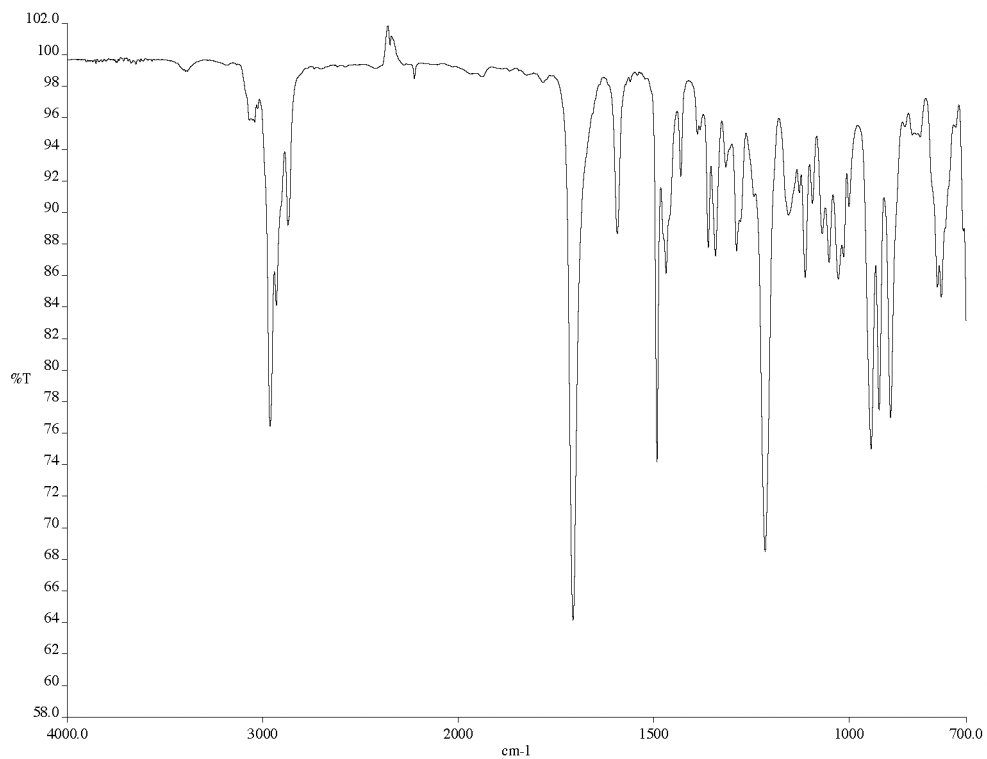
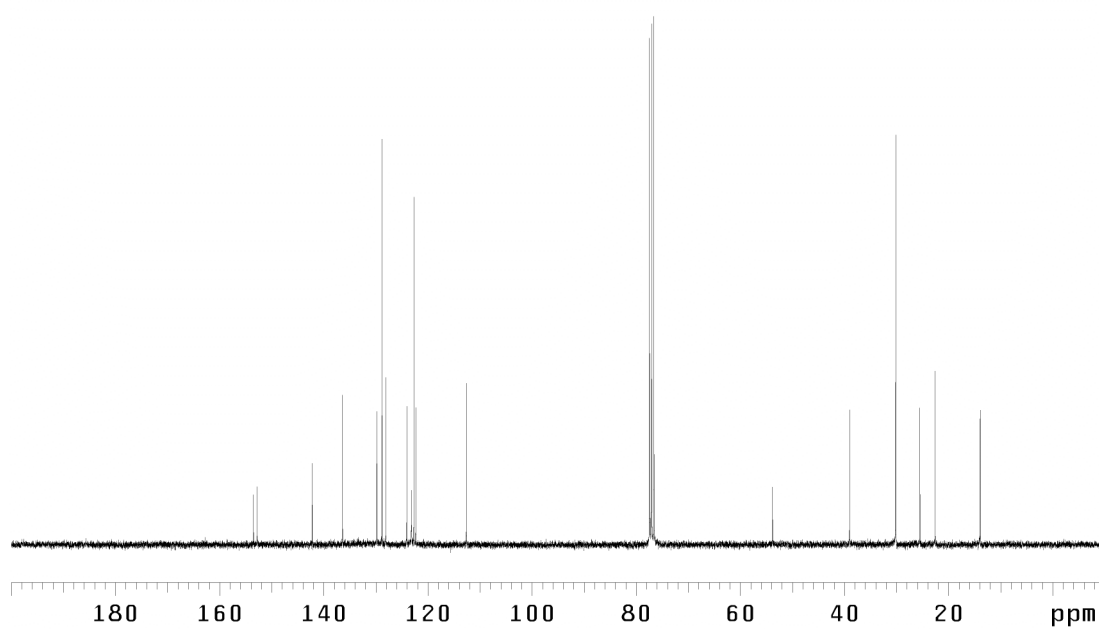
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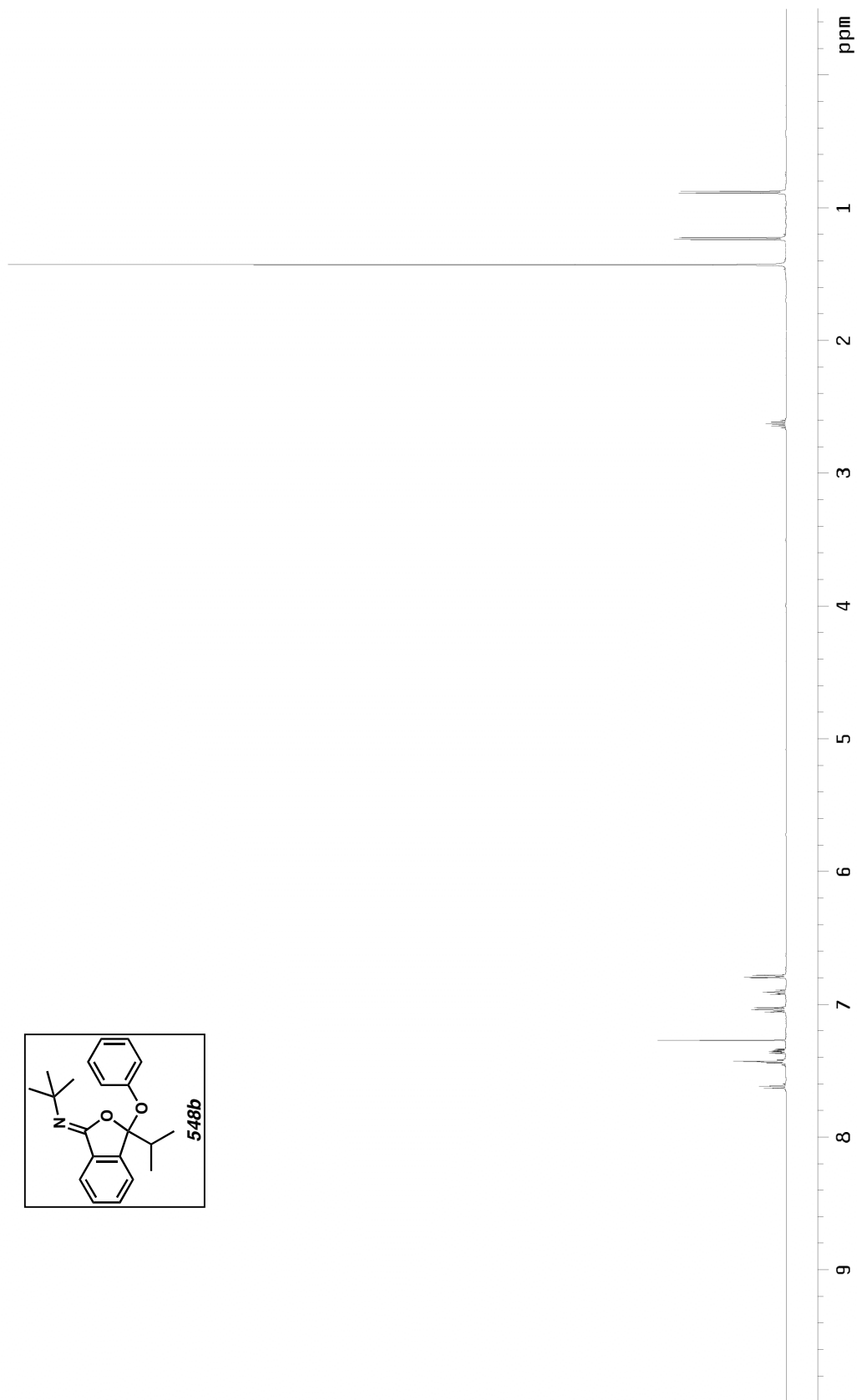
Benzannulated Bicycles by Three-Component Aryne Reactions

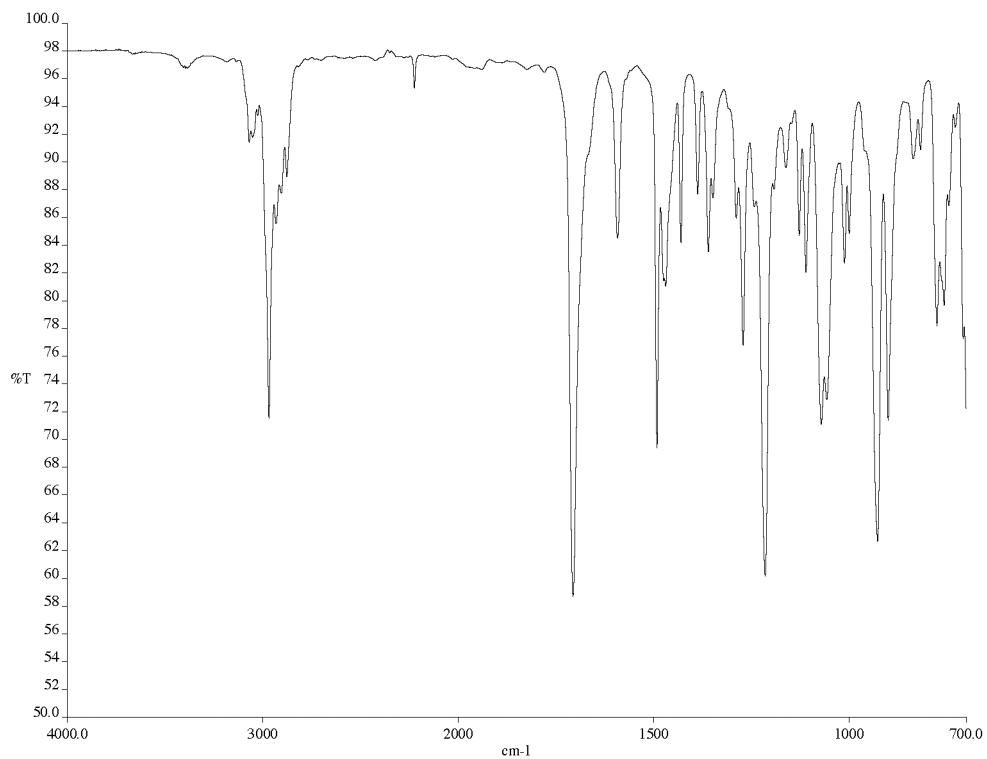
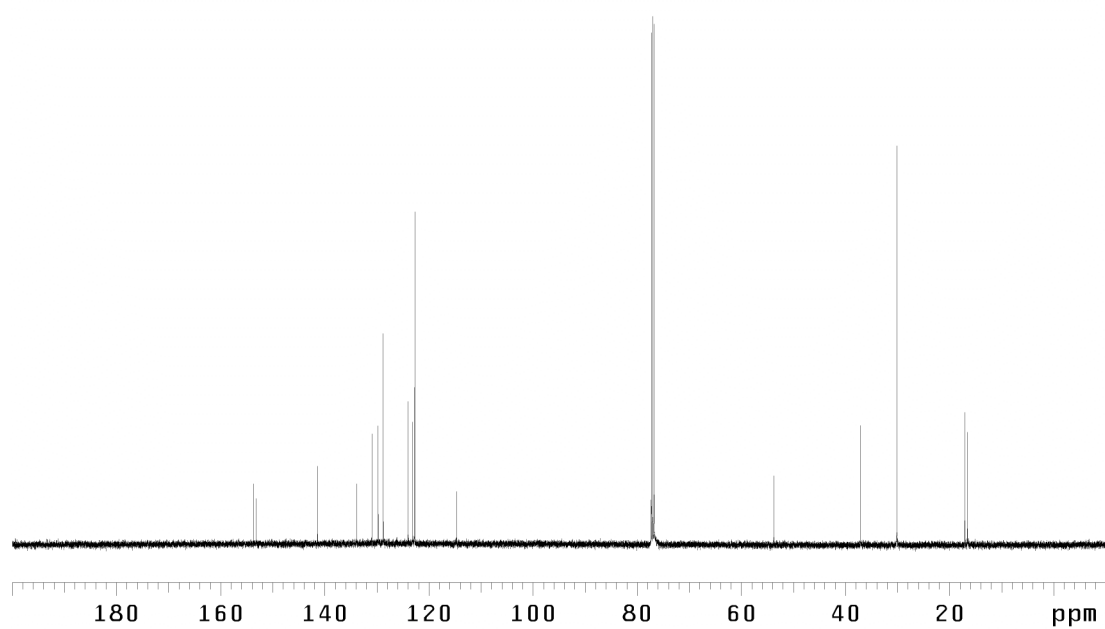
Figure A3.1.1 ^1H NMR (500 MHz, CDCl_3) of compound 546

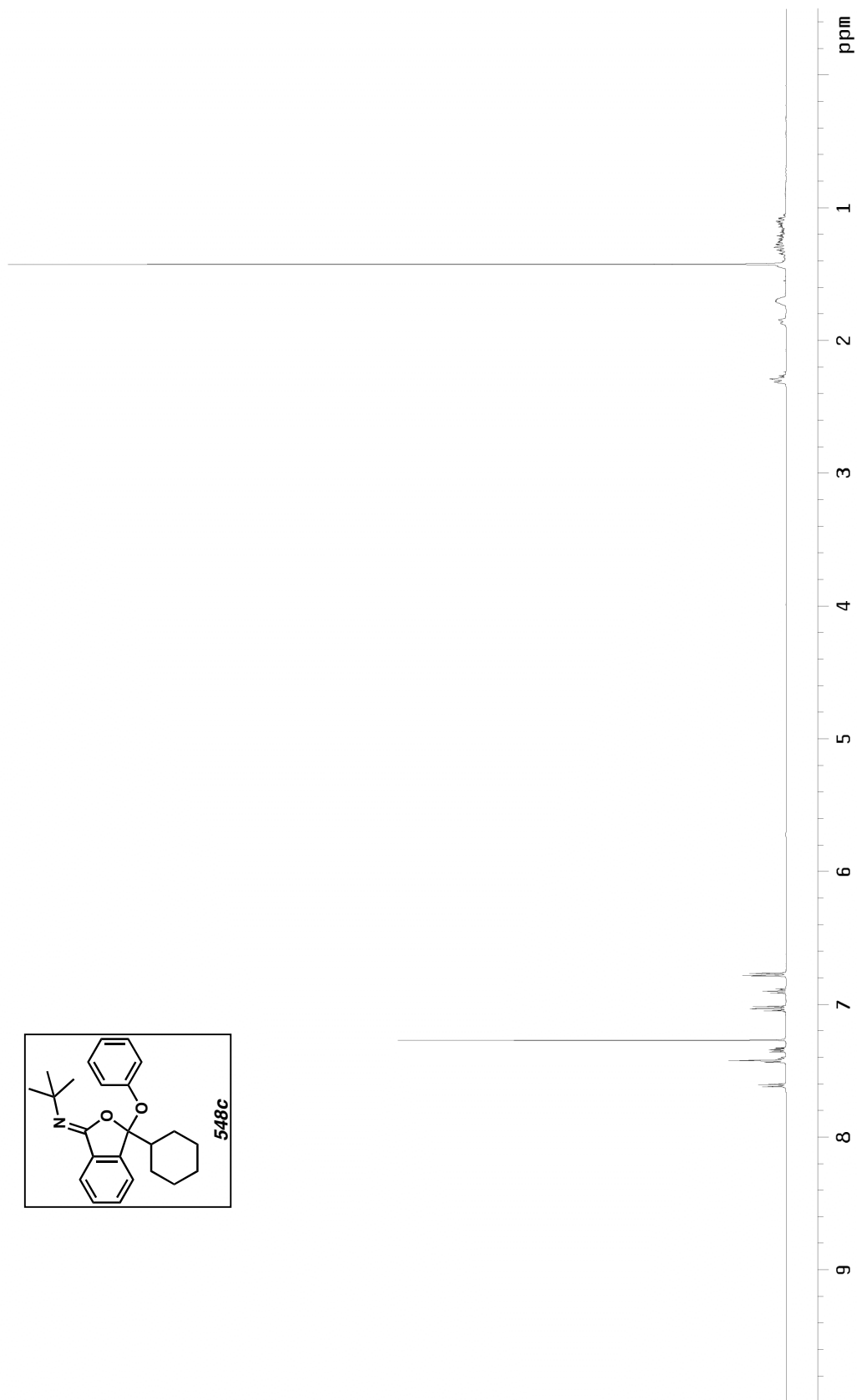
Figure A3.1.2 Infrared spectrum (thin film/NaCl) of compound **546**Figure A3.1.3 ^{13}C NMR (125 MHz, CDCl_3) of compound **546**

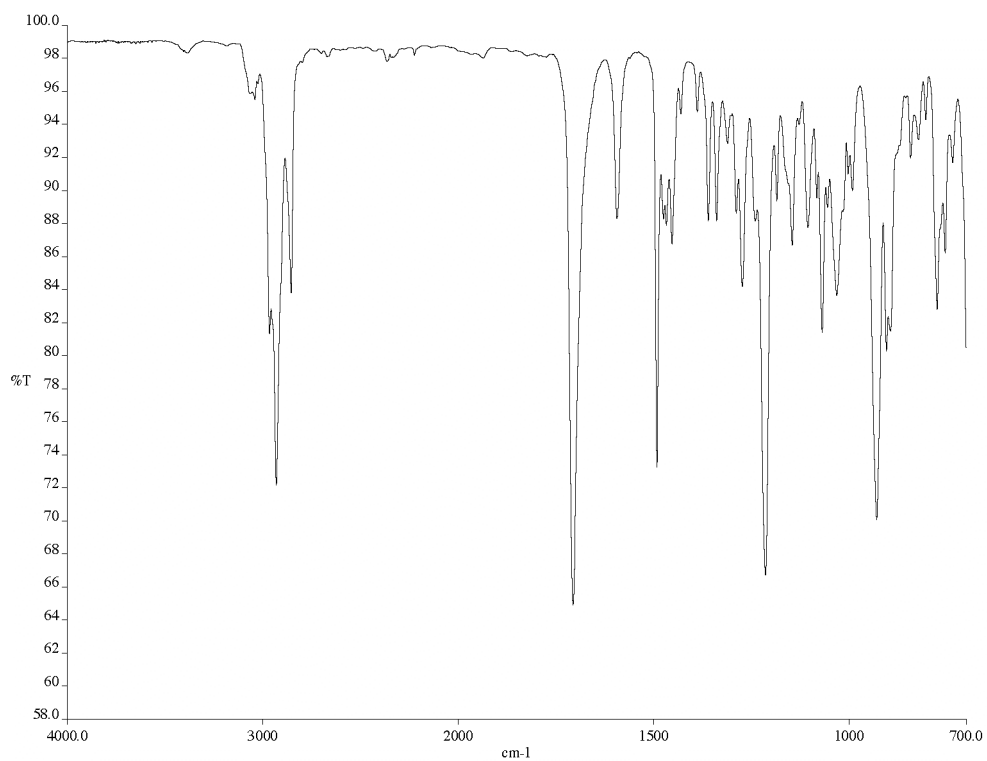
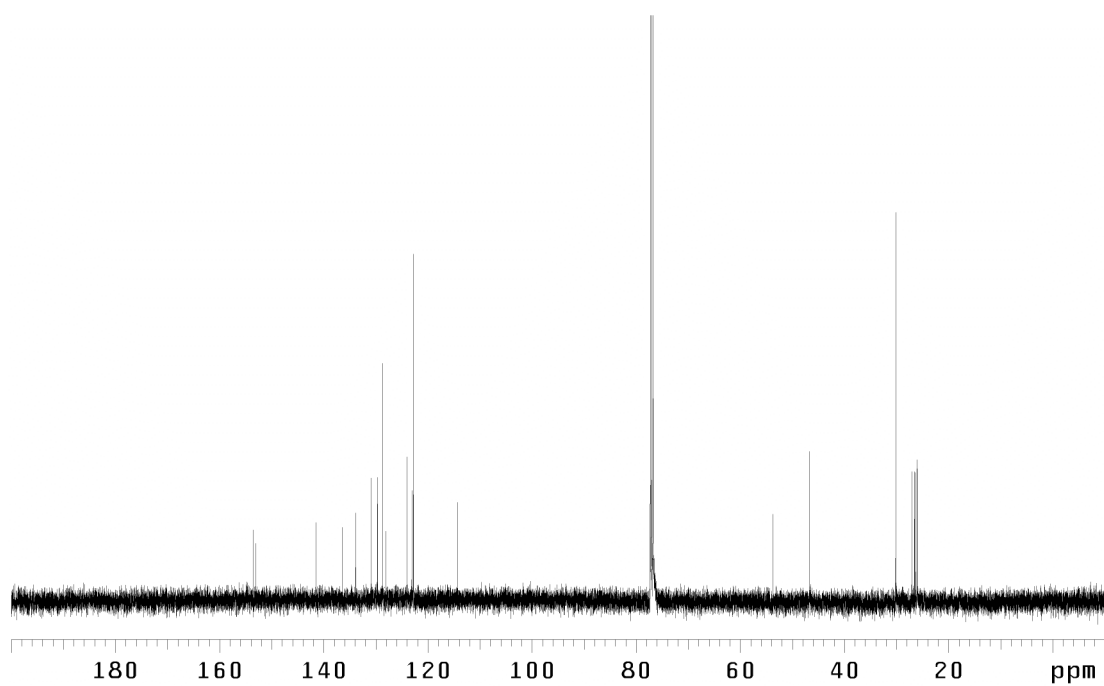
Figure A3.2.1 ^1H NMR (500 MHz, CDCl_3) of compound 548a

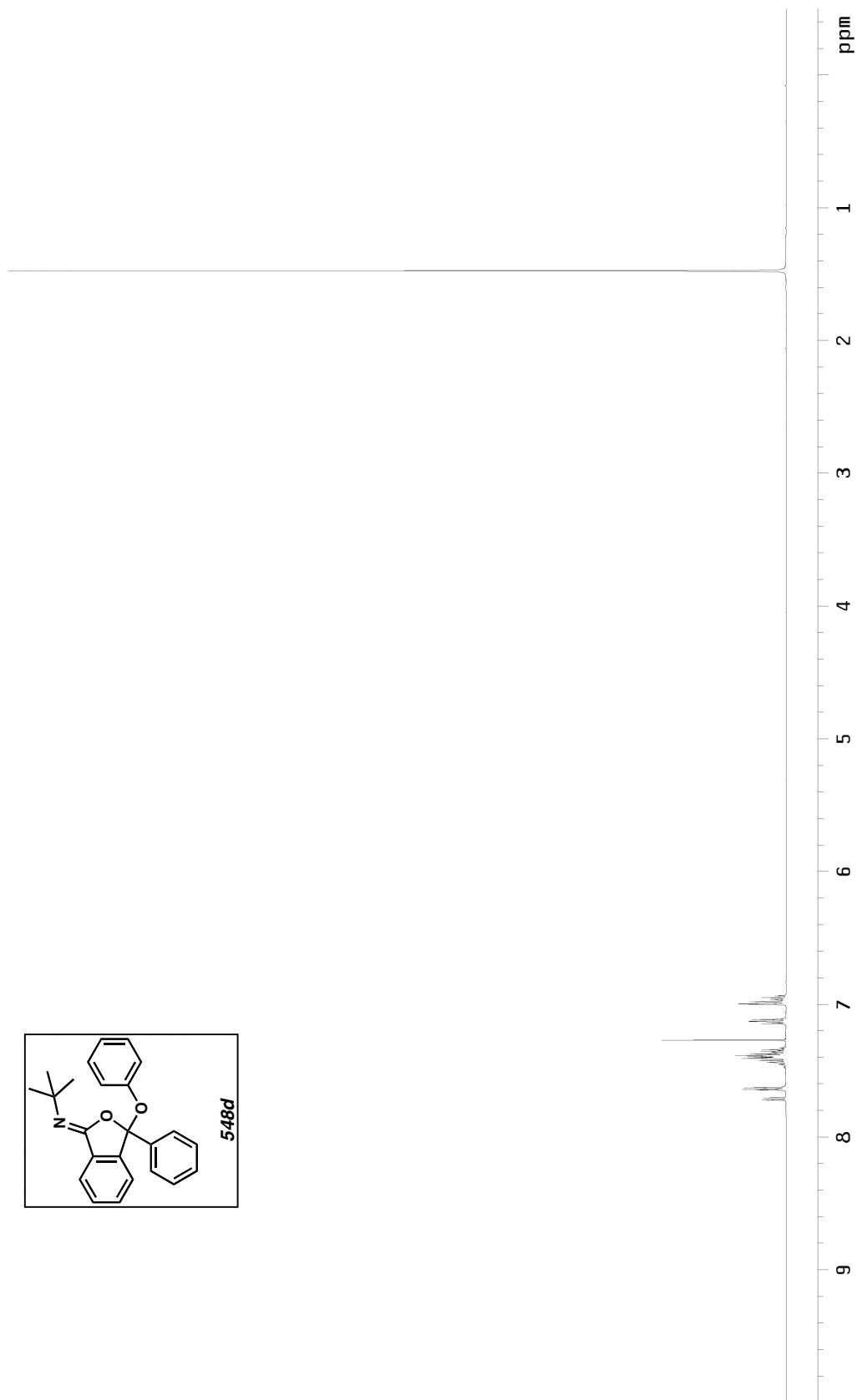
Figure A3.2.2 Infrared spectrum (thin film/NaCl) of compound **548a**Figure A3.2.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548a**

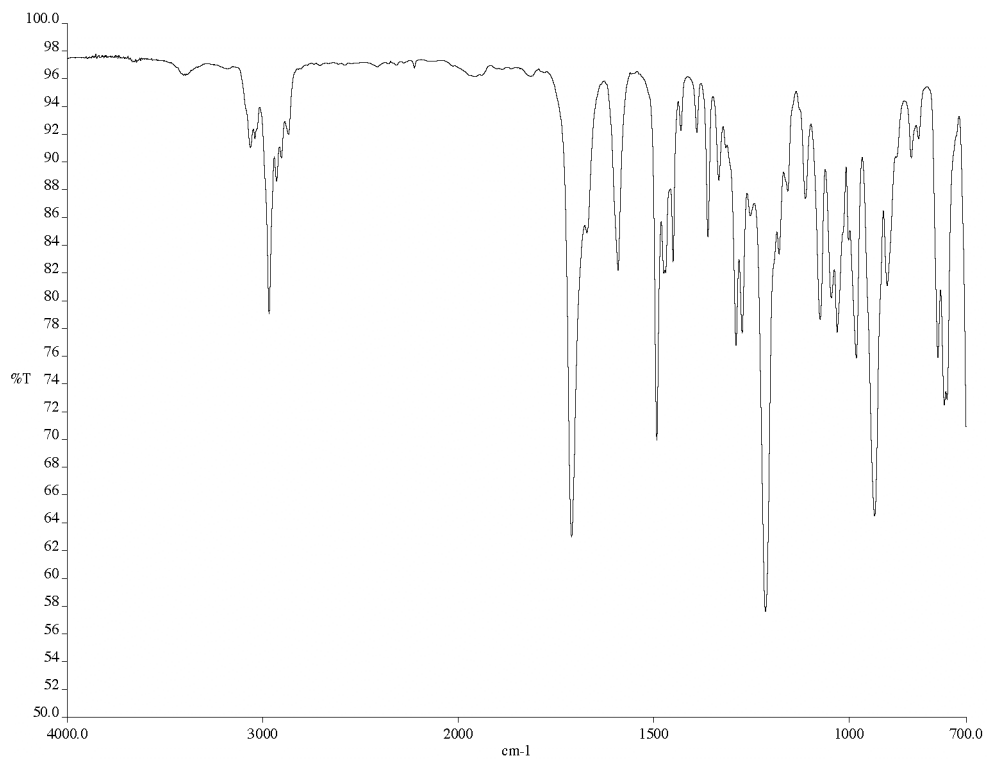
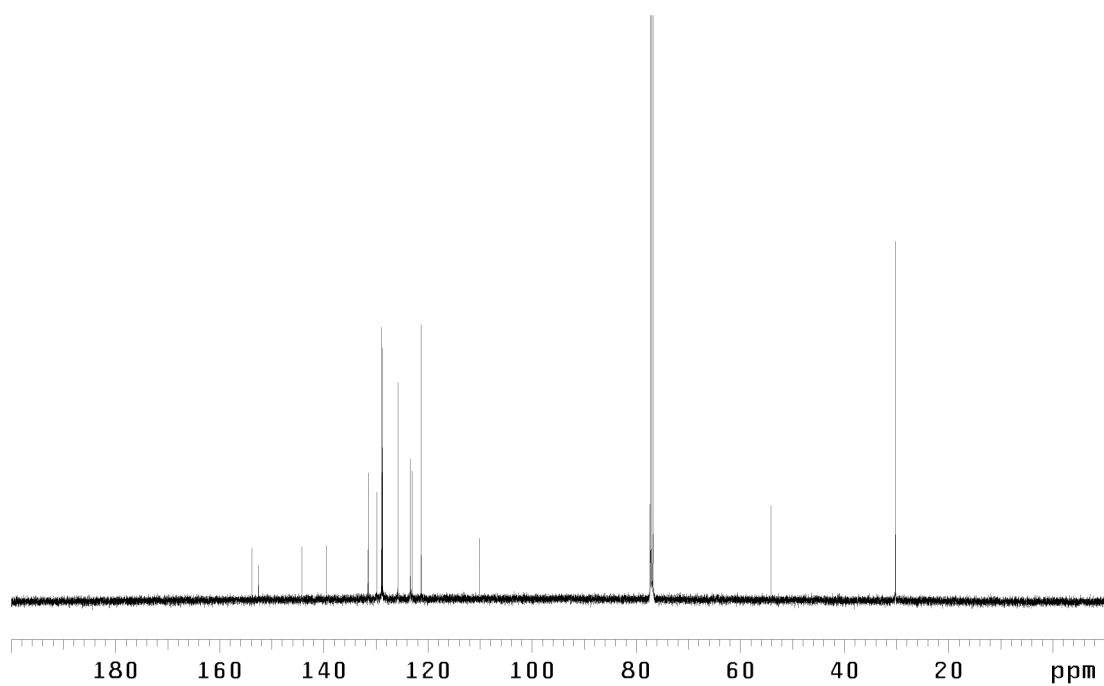
Figure A3.3.1 ¹H NMR (500 MHz, CDCl₃) of compound 548b

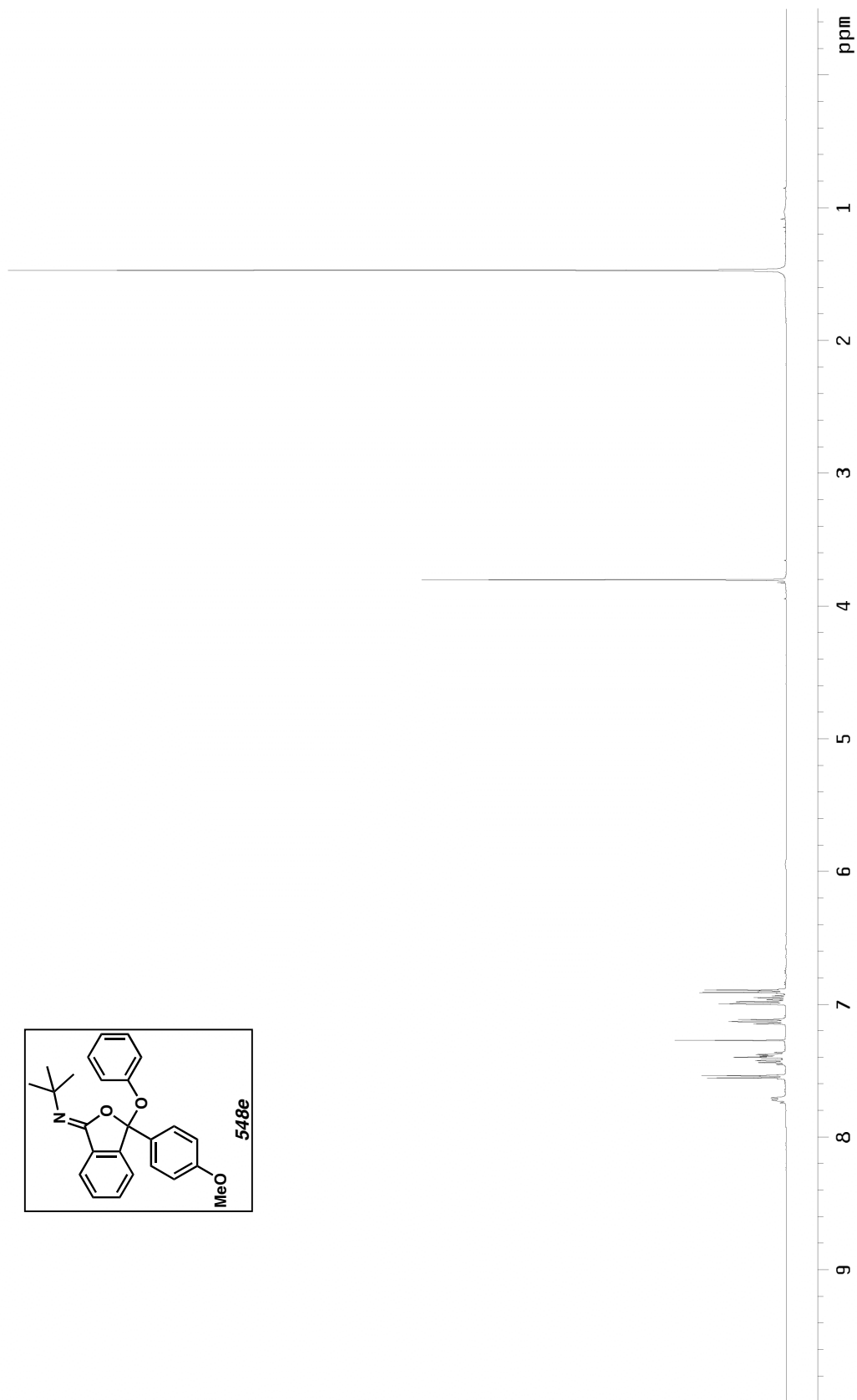
Figure A3.3.2 Infrared spectrum (thin film/NaCl) of compound **548b**Figure A3.3.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548b**

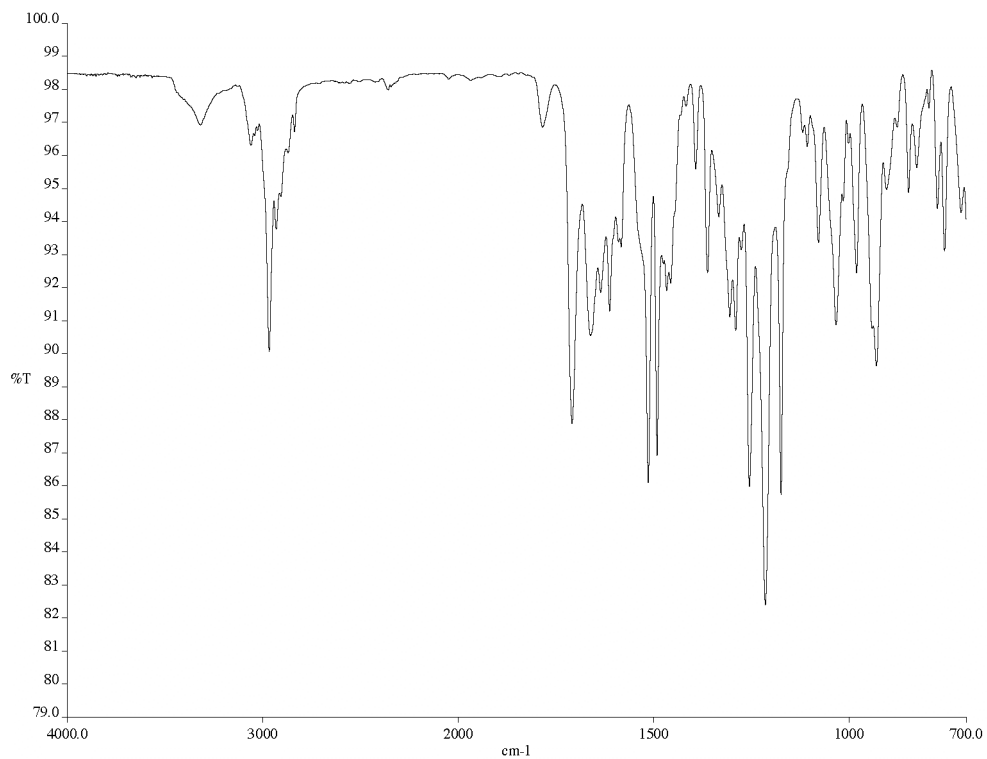
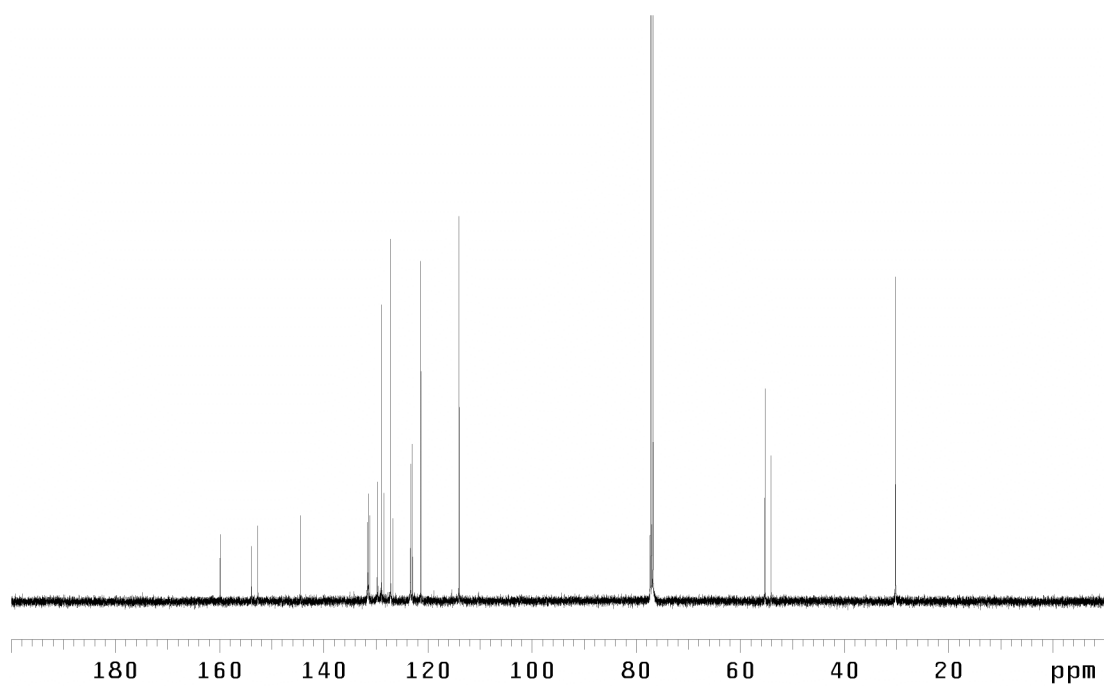
Figure A3.4.1 ¹H NMR (500 MHz, CDCl₃) of compound 548c

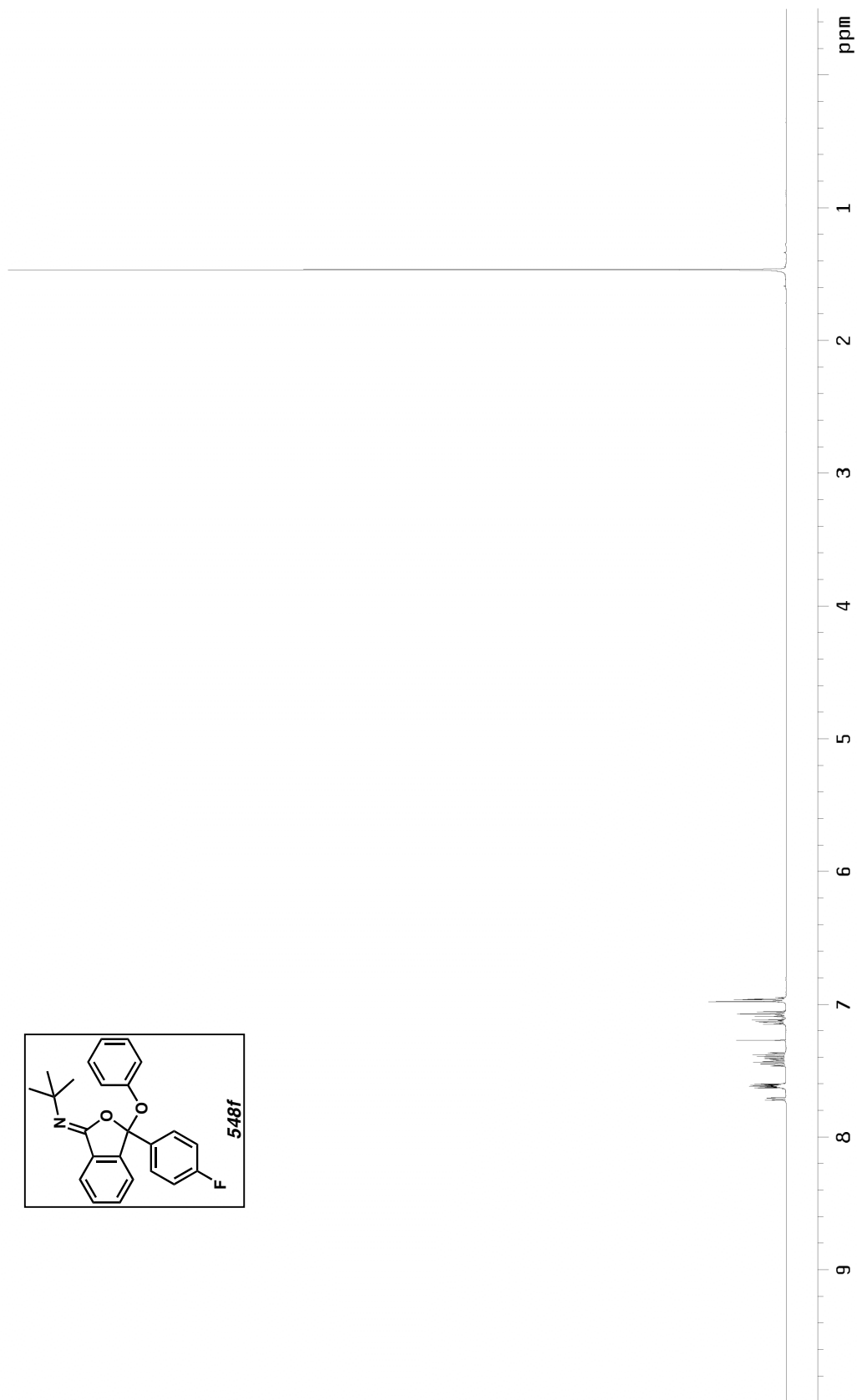
Figure A3.4.2 Infrared spectrum (thin film/NaCl) of compound **548c**Figure A3.4.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548c**

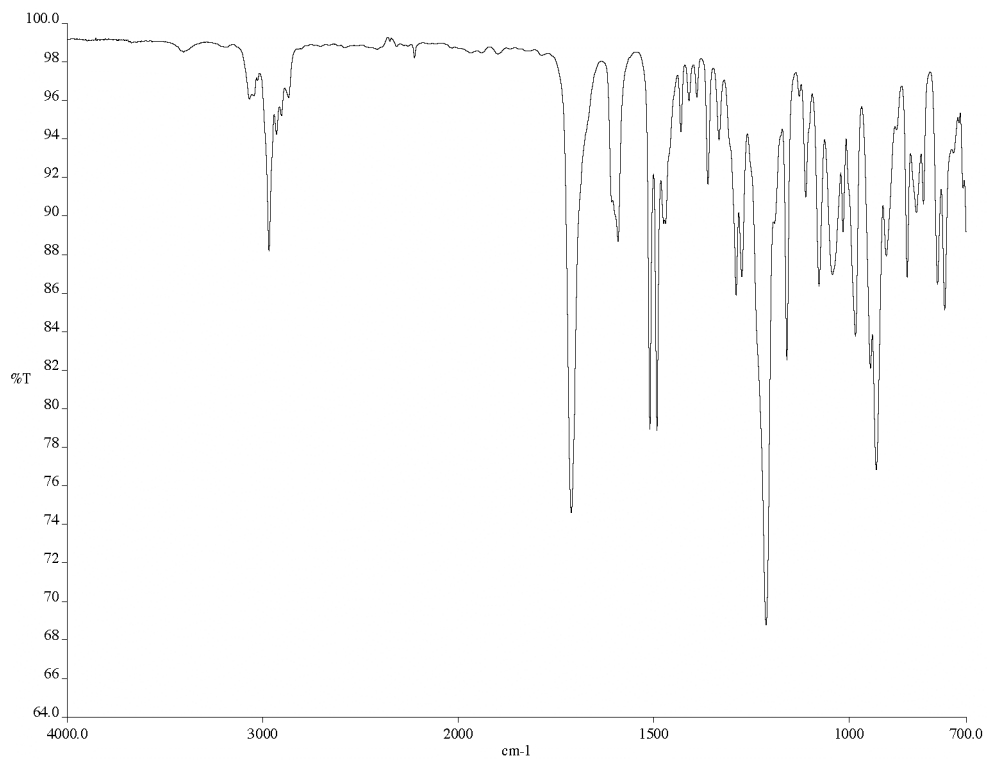
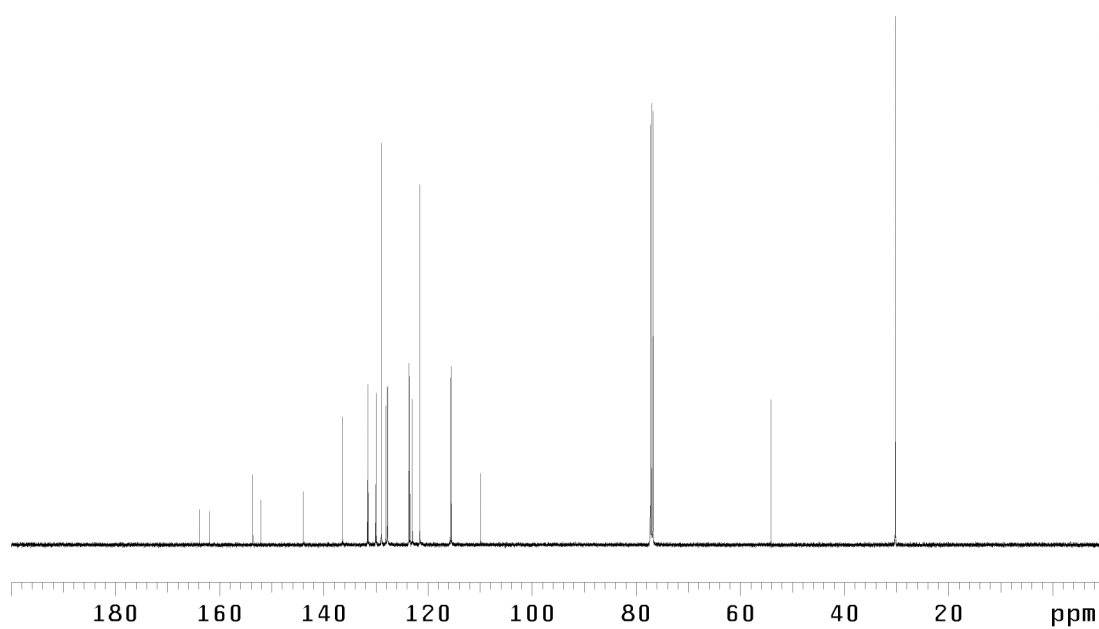
Figure A3.5.1 ¹H NMR (500 MHz, CDCl₃) of compound **548d**

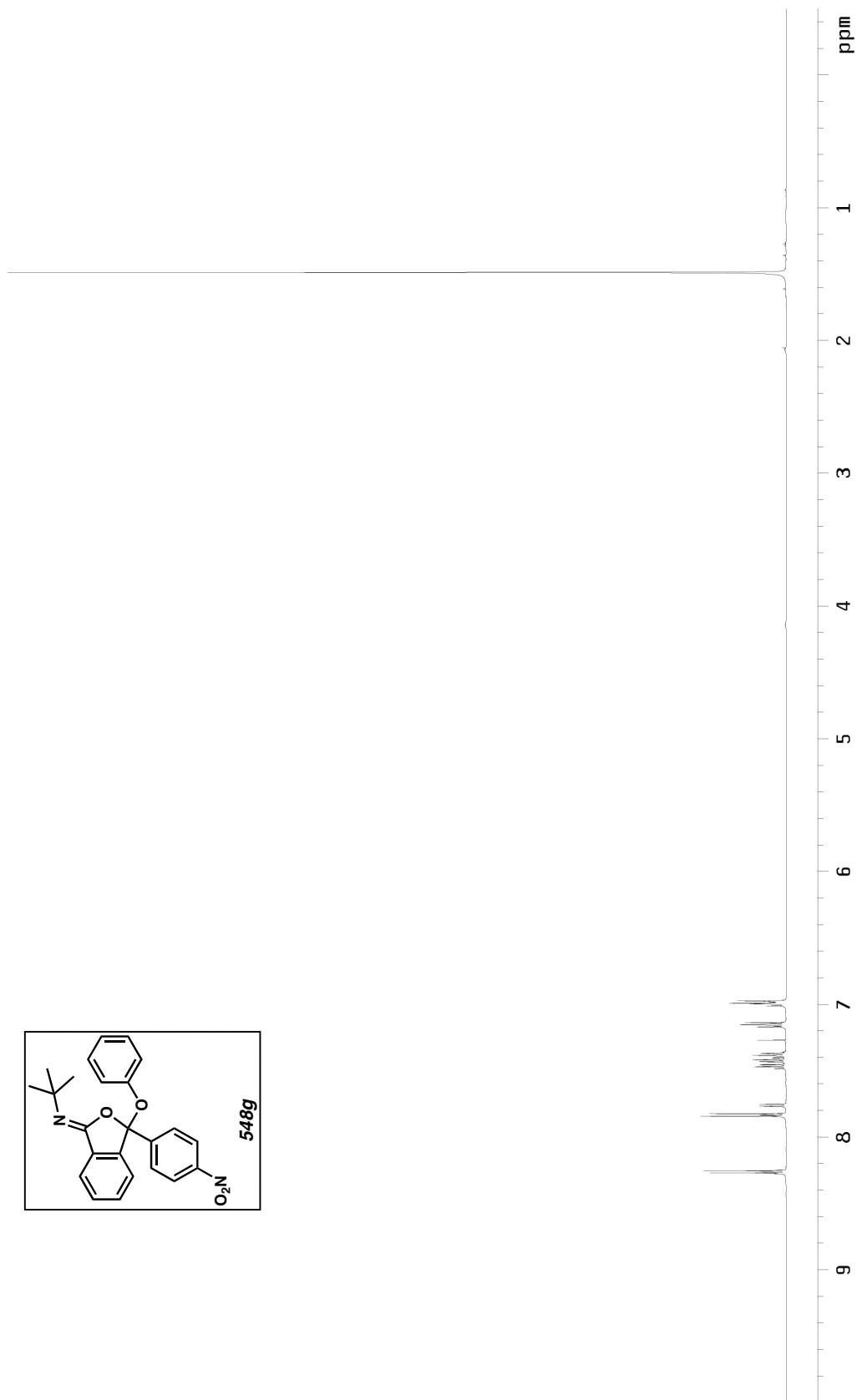
Figure A3.5.2 Infrared spectrum (thin film/NaCl) of compound **548d**Figure A3.5.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548d**

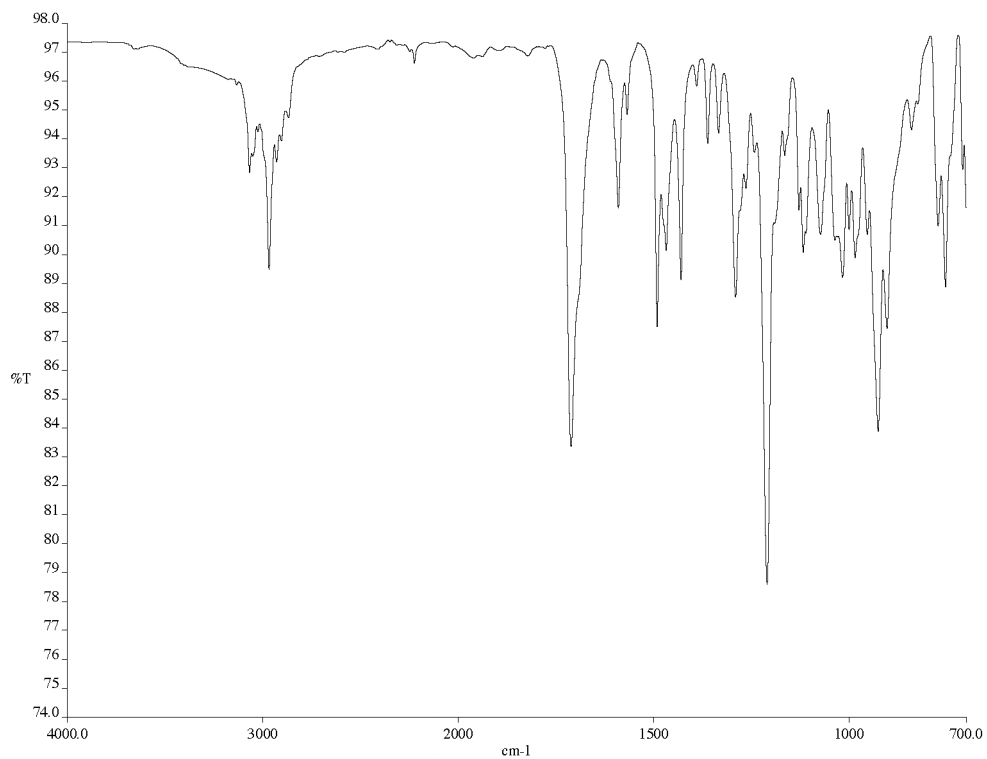
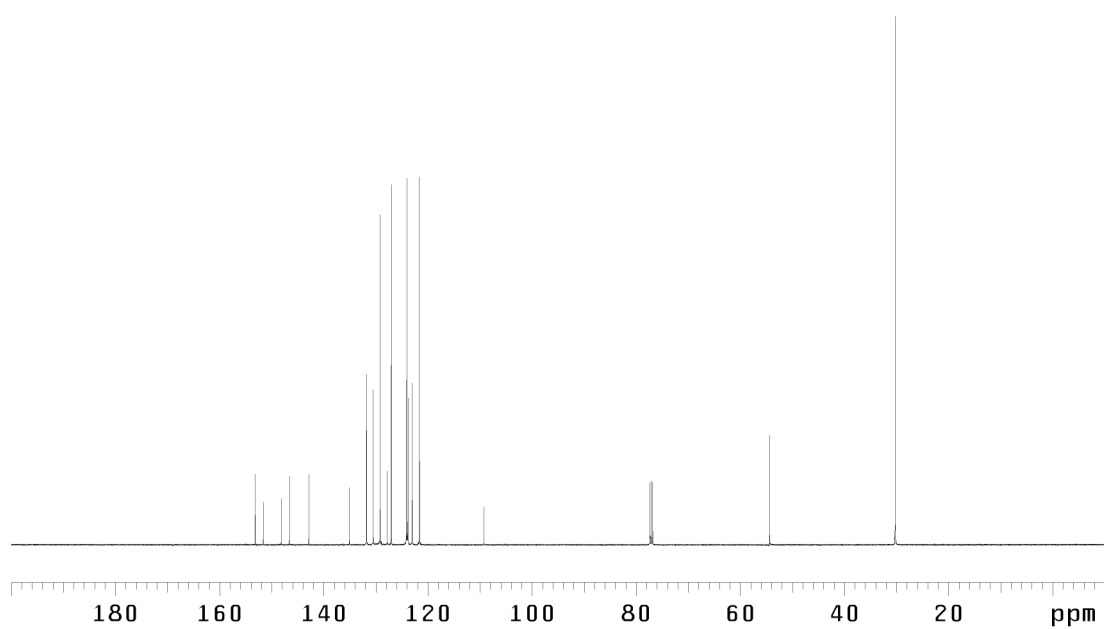
Figure A3.6.1 ^1H NMR (500 MHz, CDCl_3) of compound **548e**

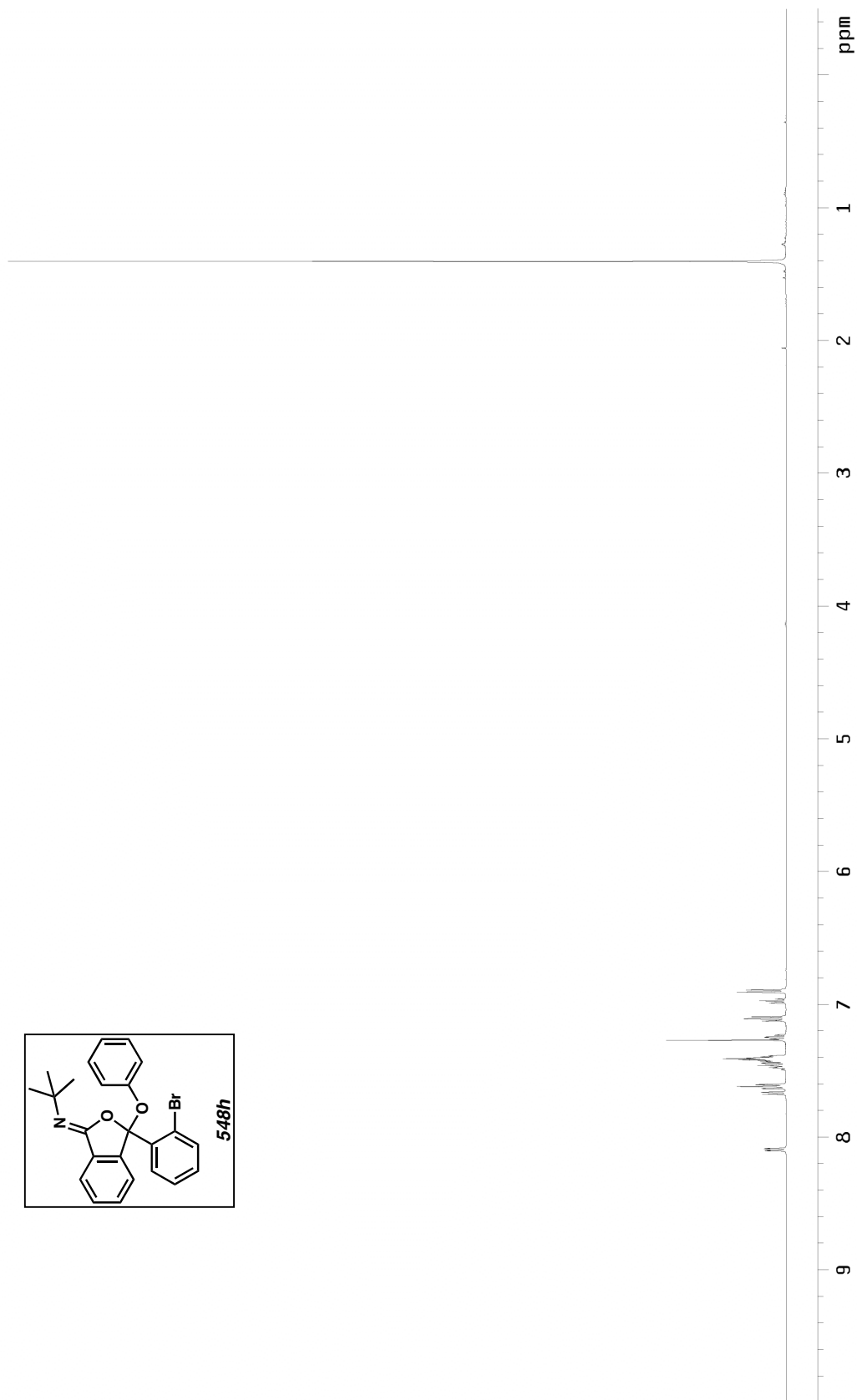
Figure A3.6.2 Infrared spectrum (thin film/NaCl) of compound **548e**Figure A3.6.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548e**

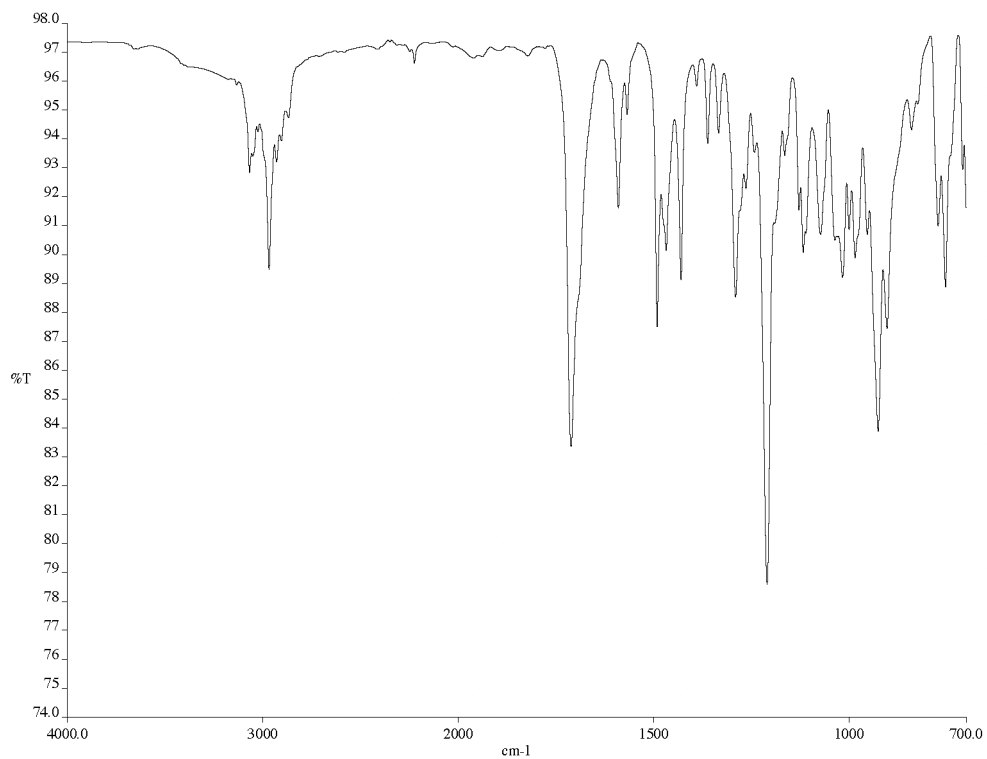
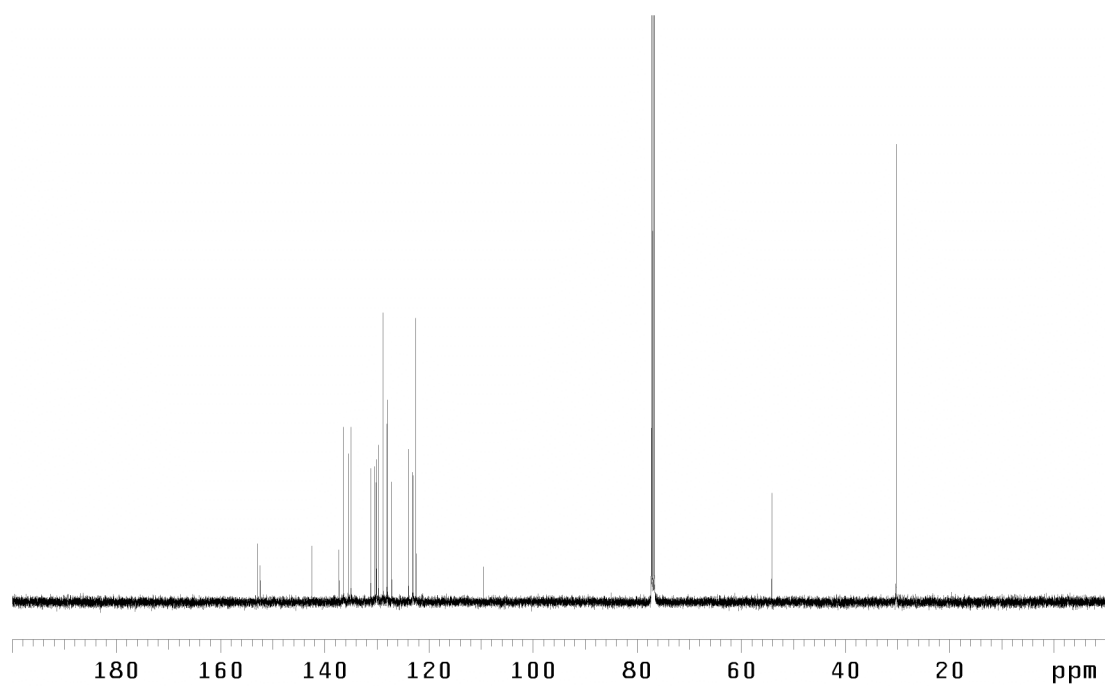
Figure A3.7.1 ¹H NMR (500 MHz, CDCl₃) of compound 548f

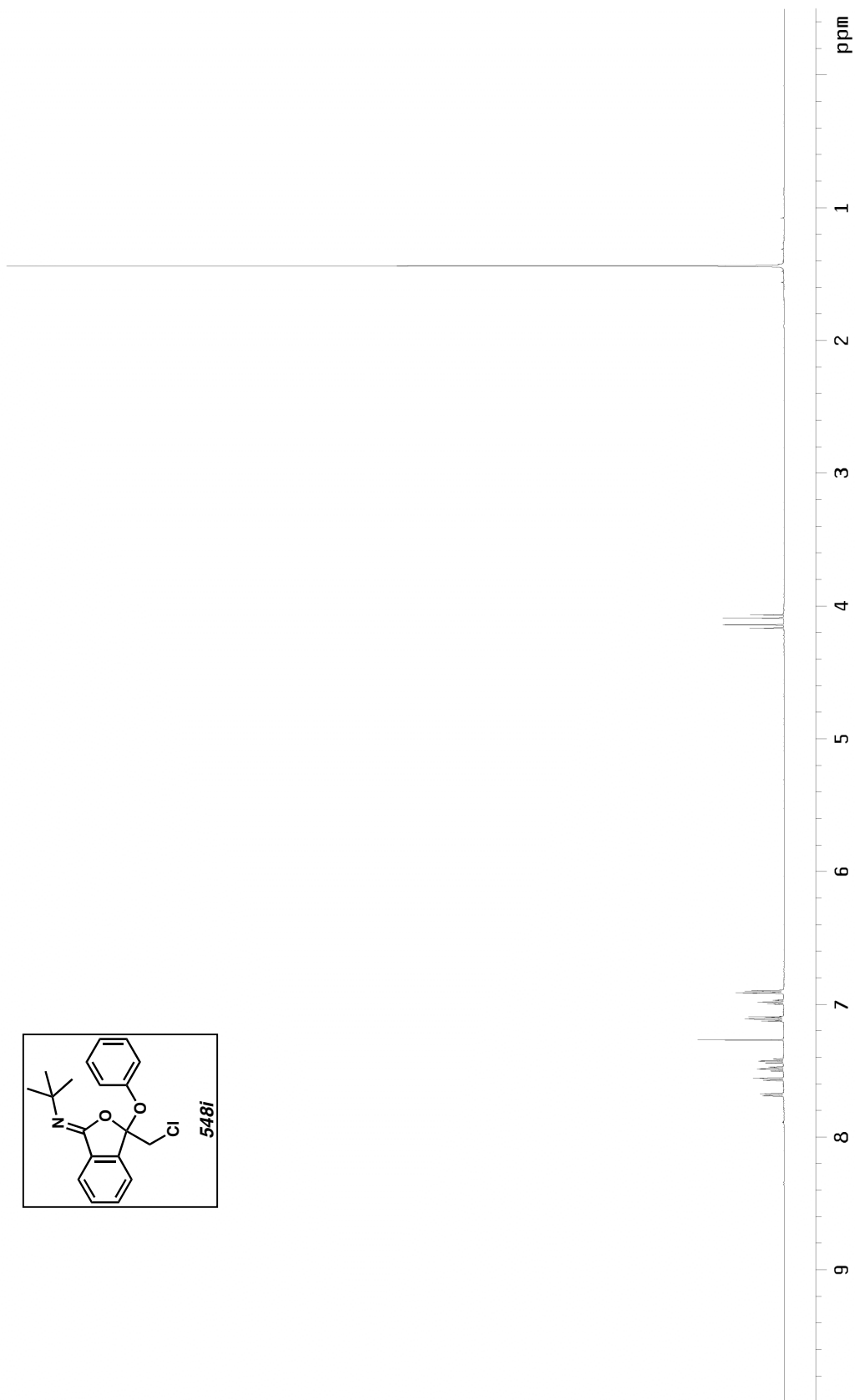
Figure A3.7.2 Infrared spectrum (thin film/NaCl) of compound **548f**Figure A3.7.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548f**

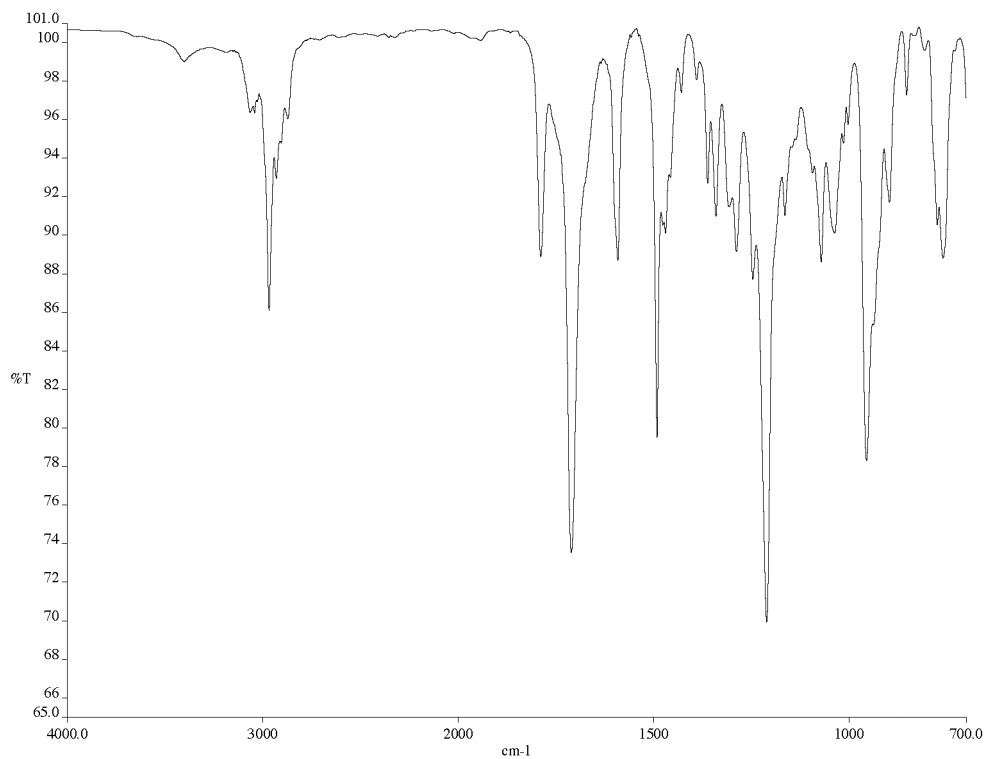
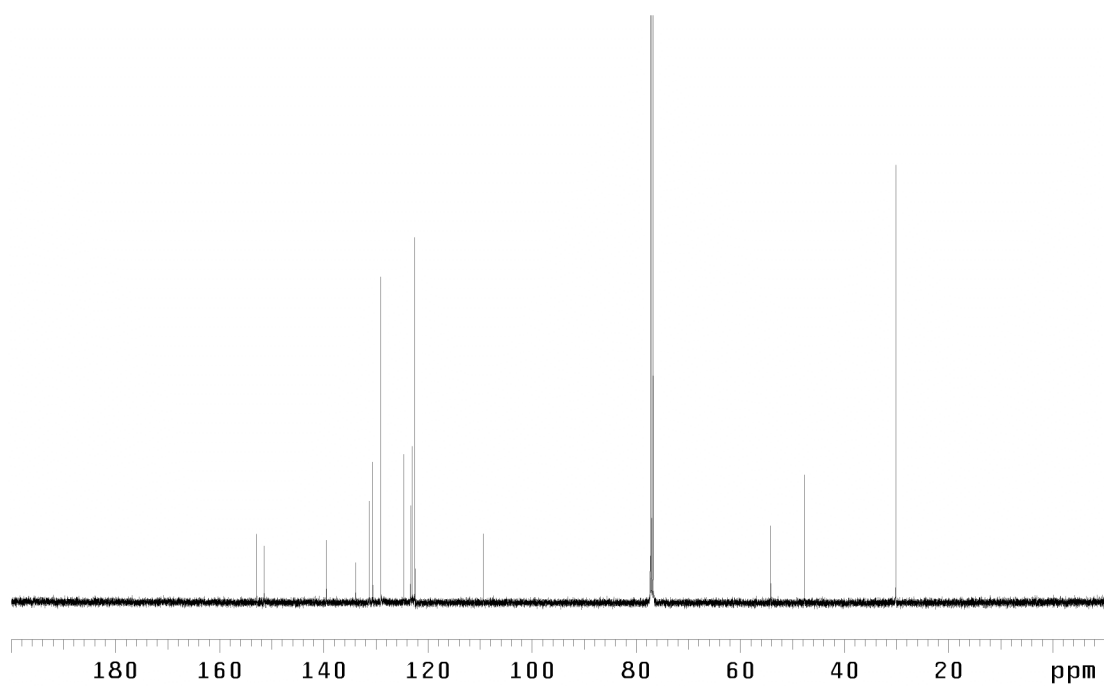
Figure A3.8.1 ¹H NMR (500 MHz, CDCl₃) of compound 548g

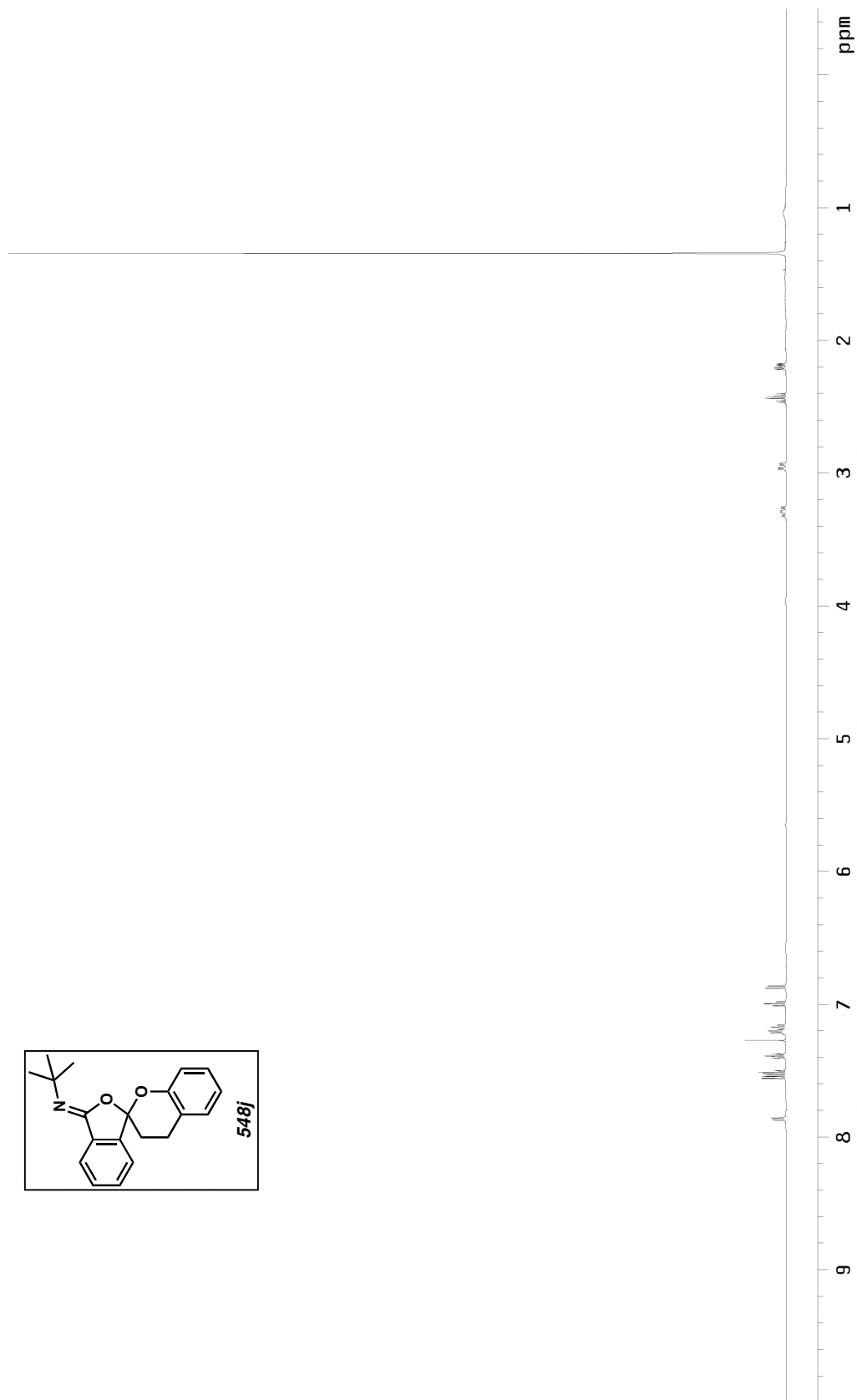
Figure A3.8.2 Infrared spectrum (thin film/NaCl) of compound **548g**Figure A3.8.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548g**

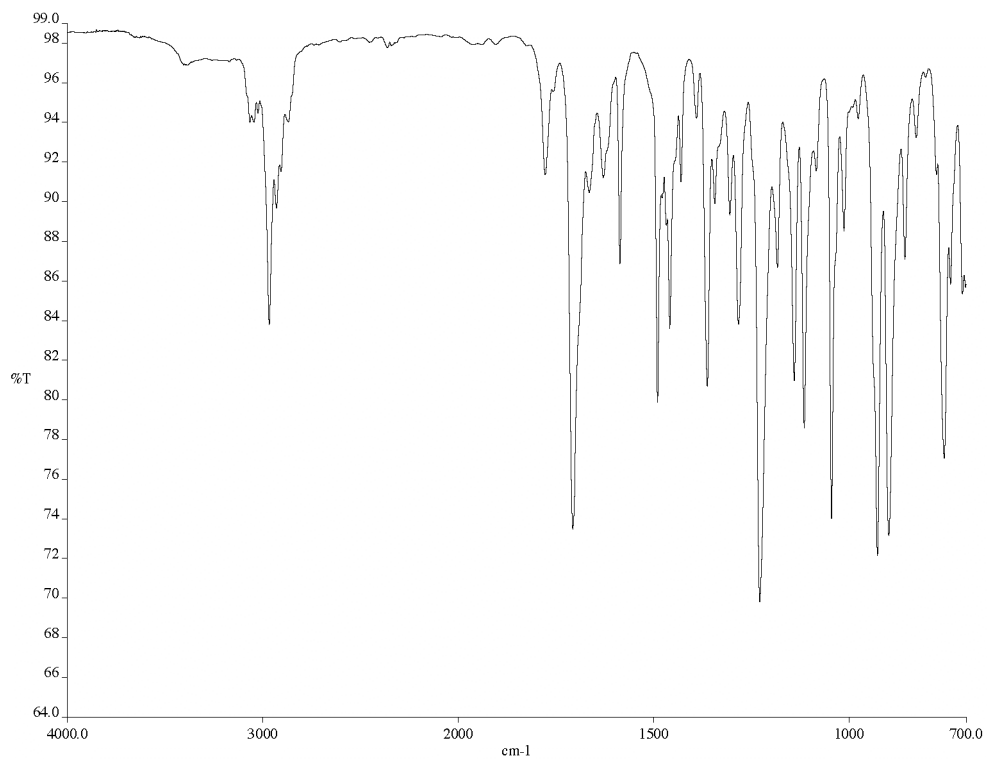
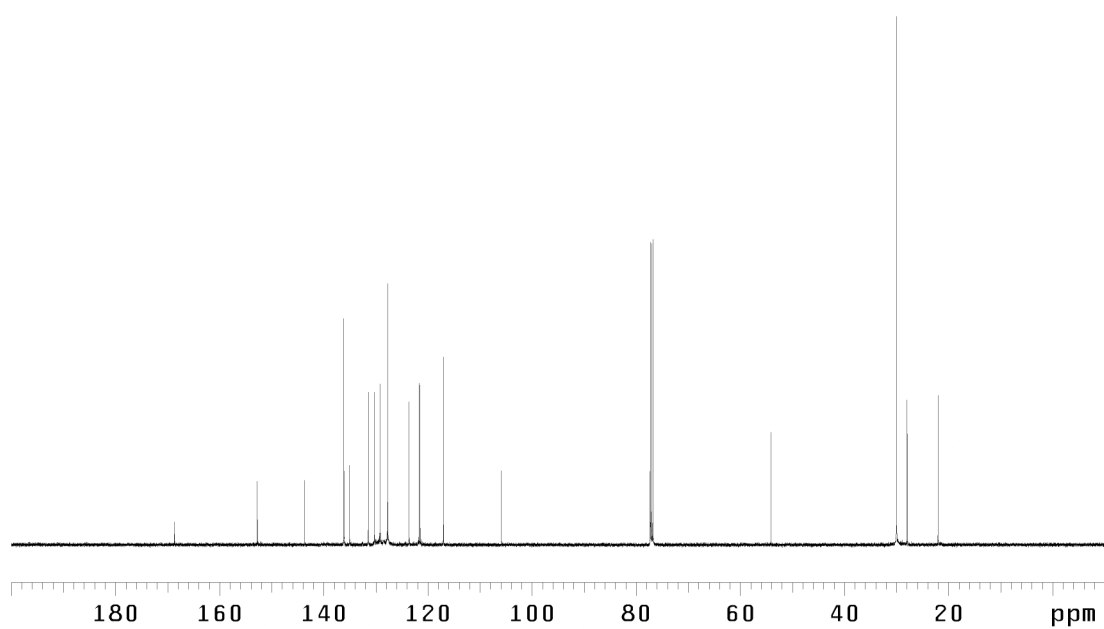
Figure A3.9.1 ¹H NMR (500 MHz, CDCl₃) of compound 548h

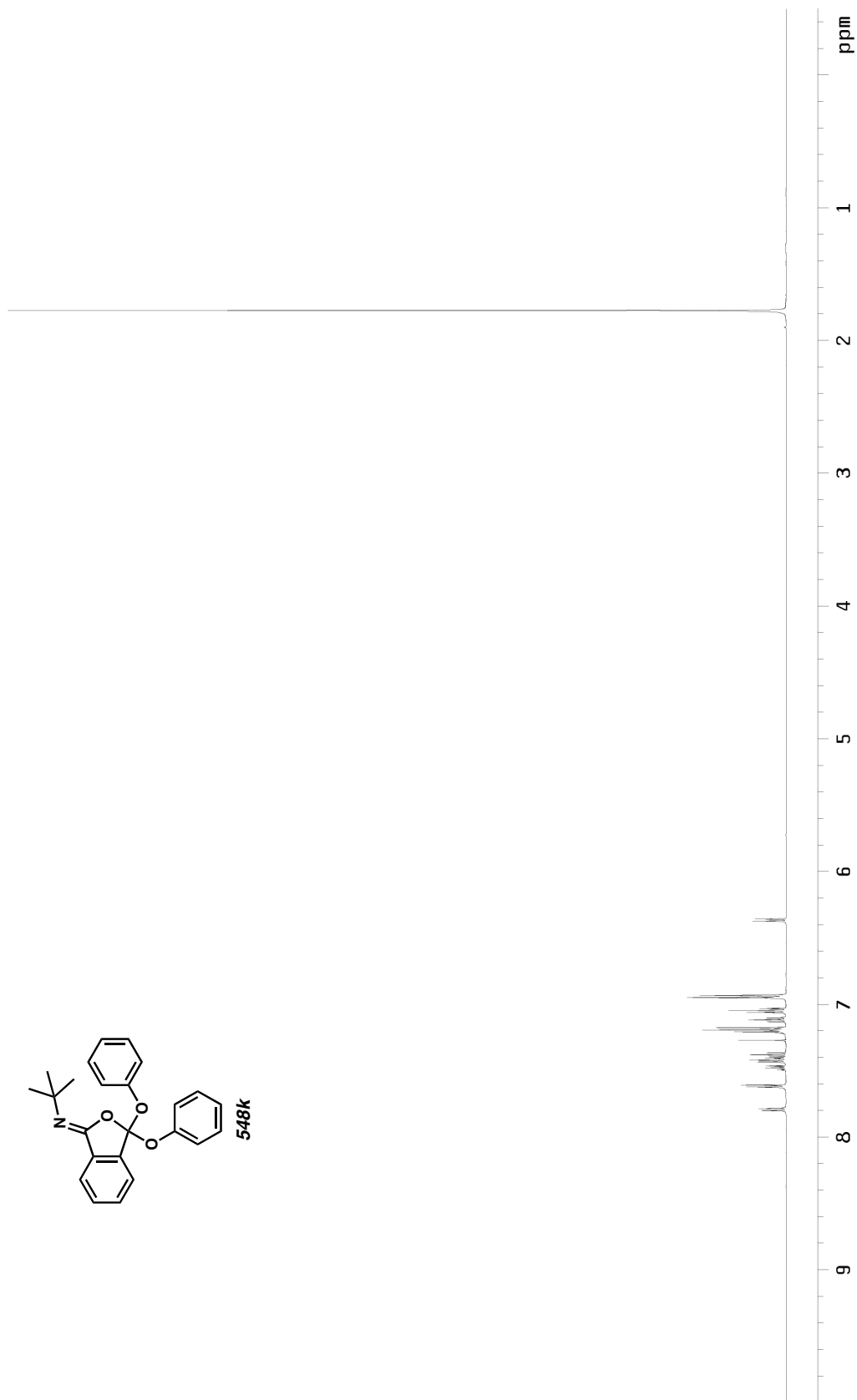
Figure A3.9.2 Infrared spectrum (thin film/NaCl) of compound **548h**Figure A3.9.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548h**

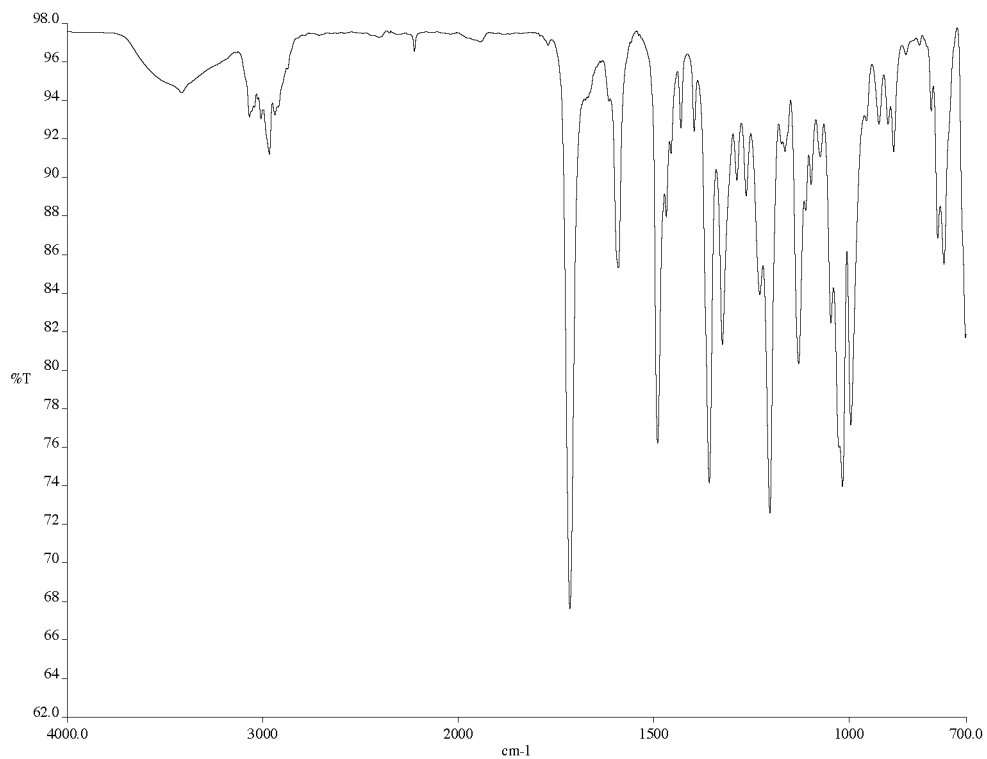
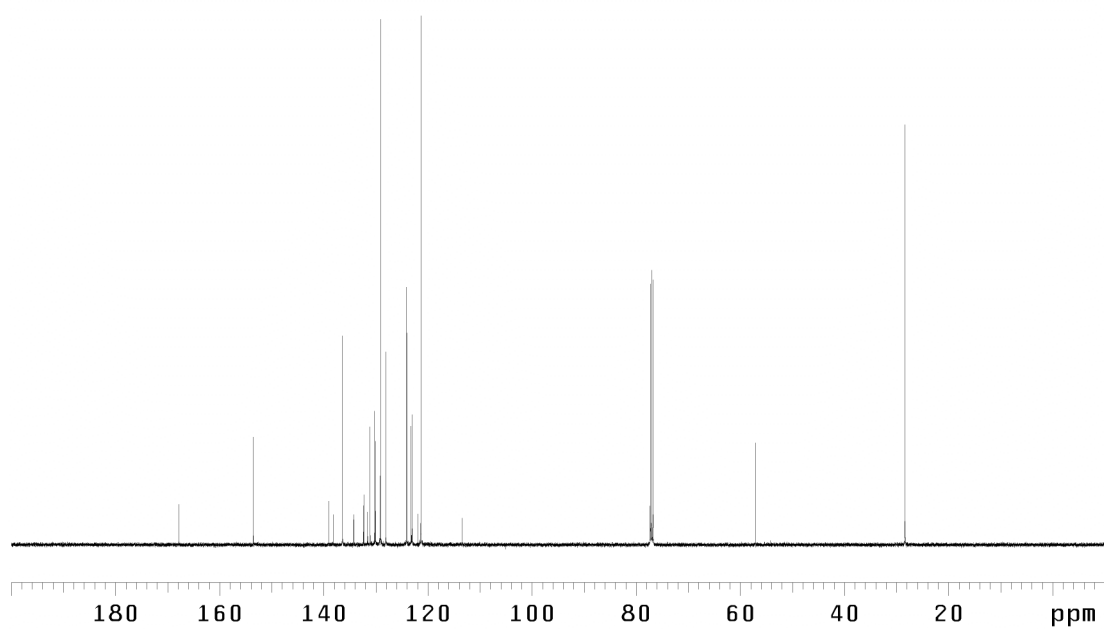
Figure A3.10.1 ^1H NMR (500 MHz, CDCl_3) of compound **548i**

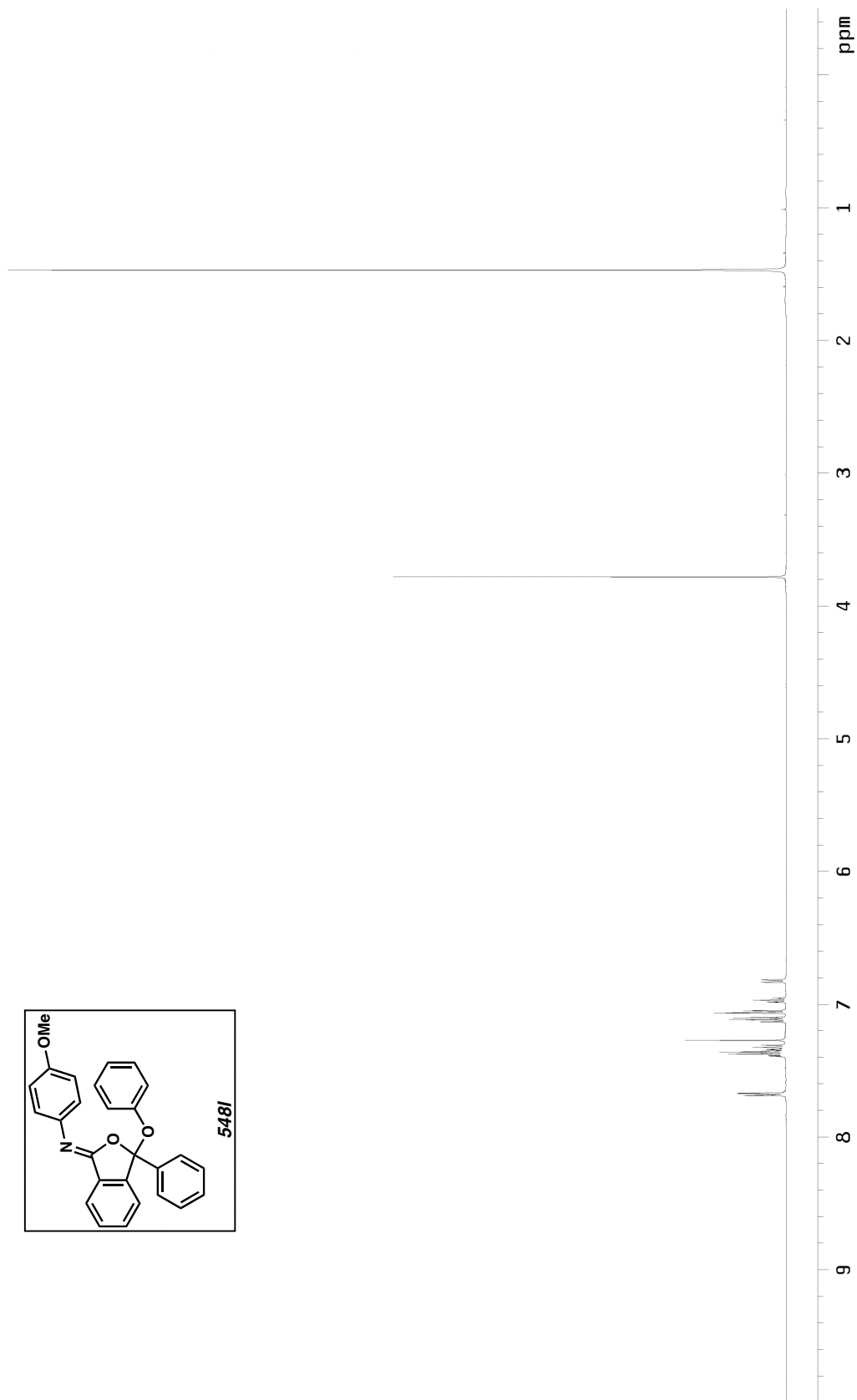
Figure A3.10.2 Infrared spectrum (thin film/NaCl) of compound **548i**Figure A3.10.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548i**

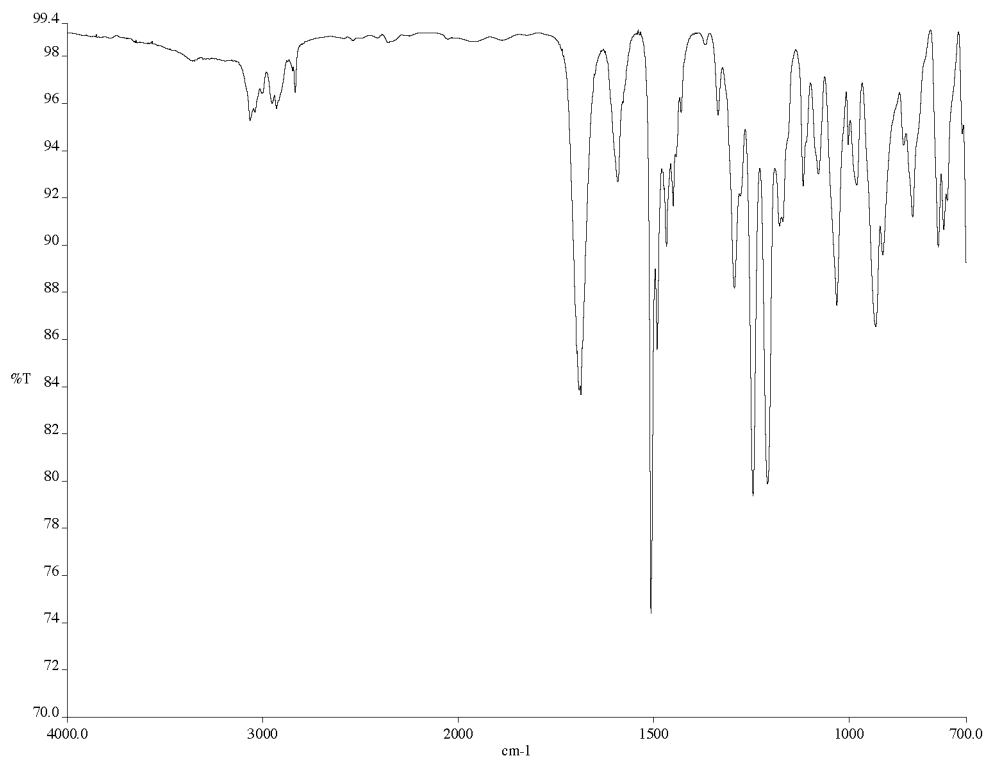
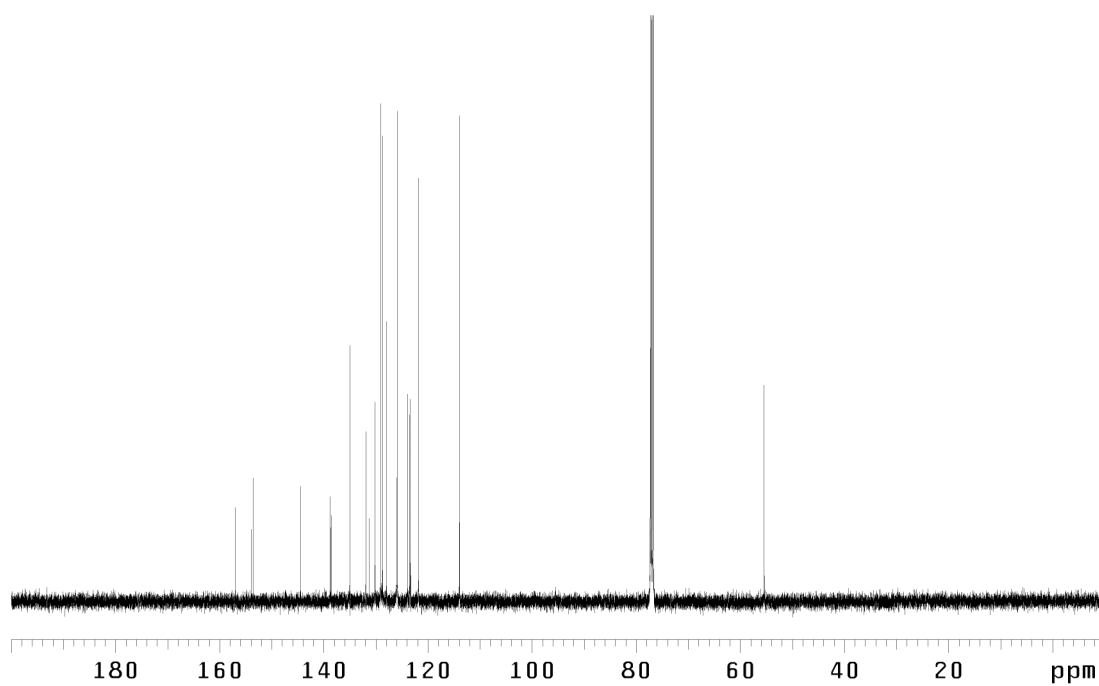
Figure A3.11.1 ¹H NMR (500 MHz, CDCl₃) of compound 548j

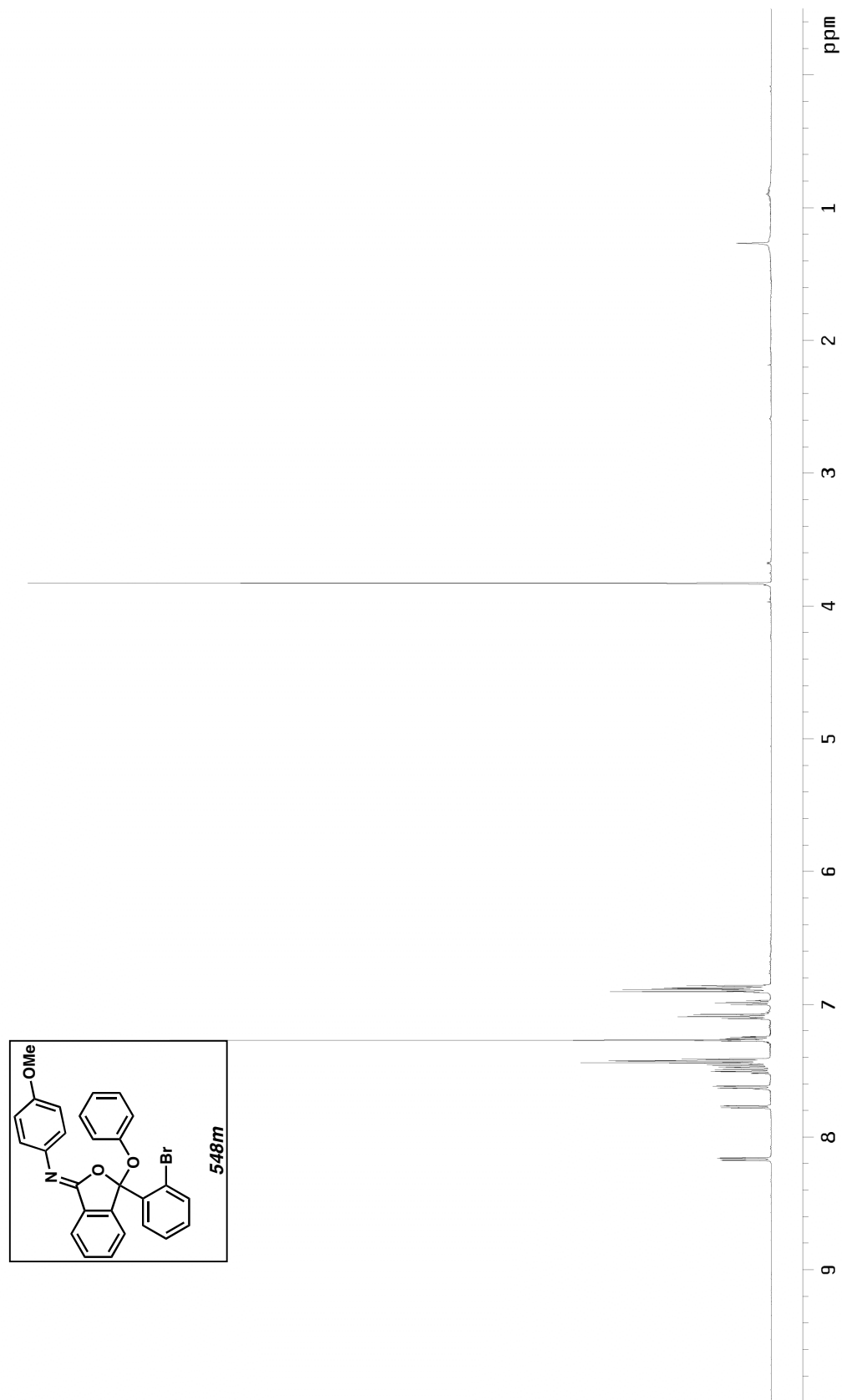
Figure A3.11.2 Infrared spectrum (thin film/NaCl) of compound **548j**Figure A3.11.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548j**

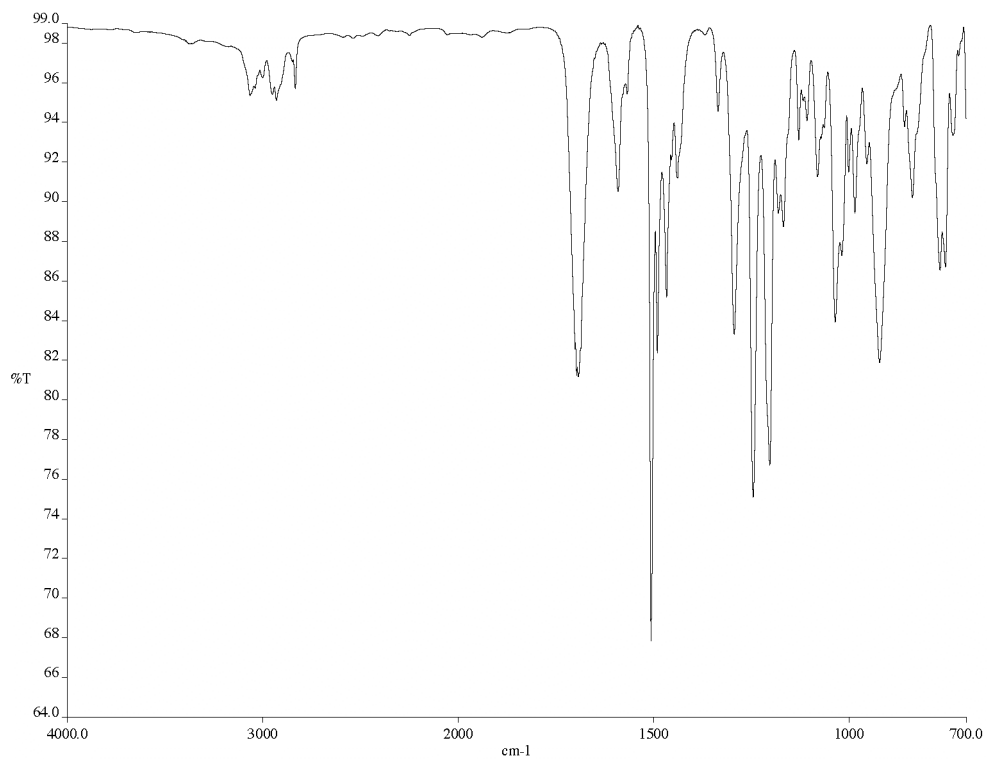
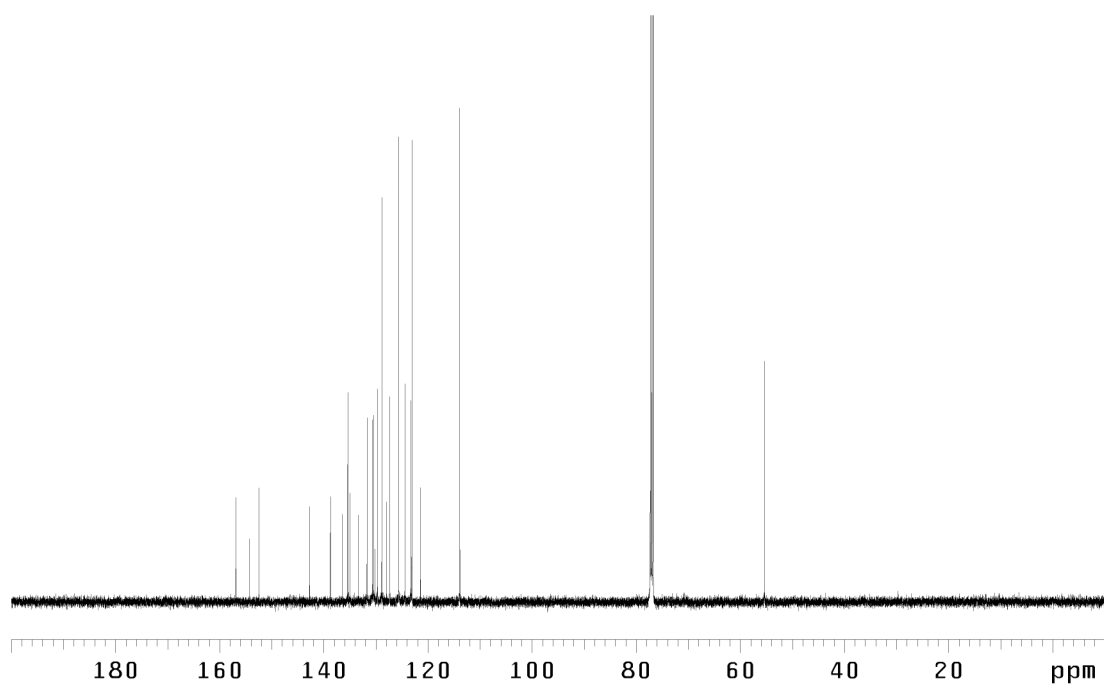


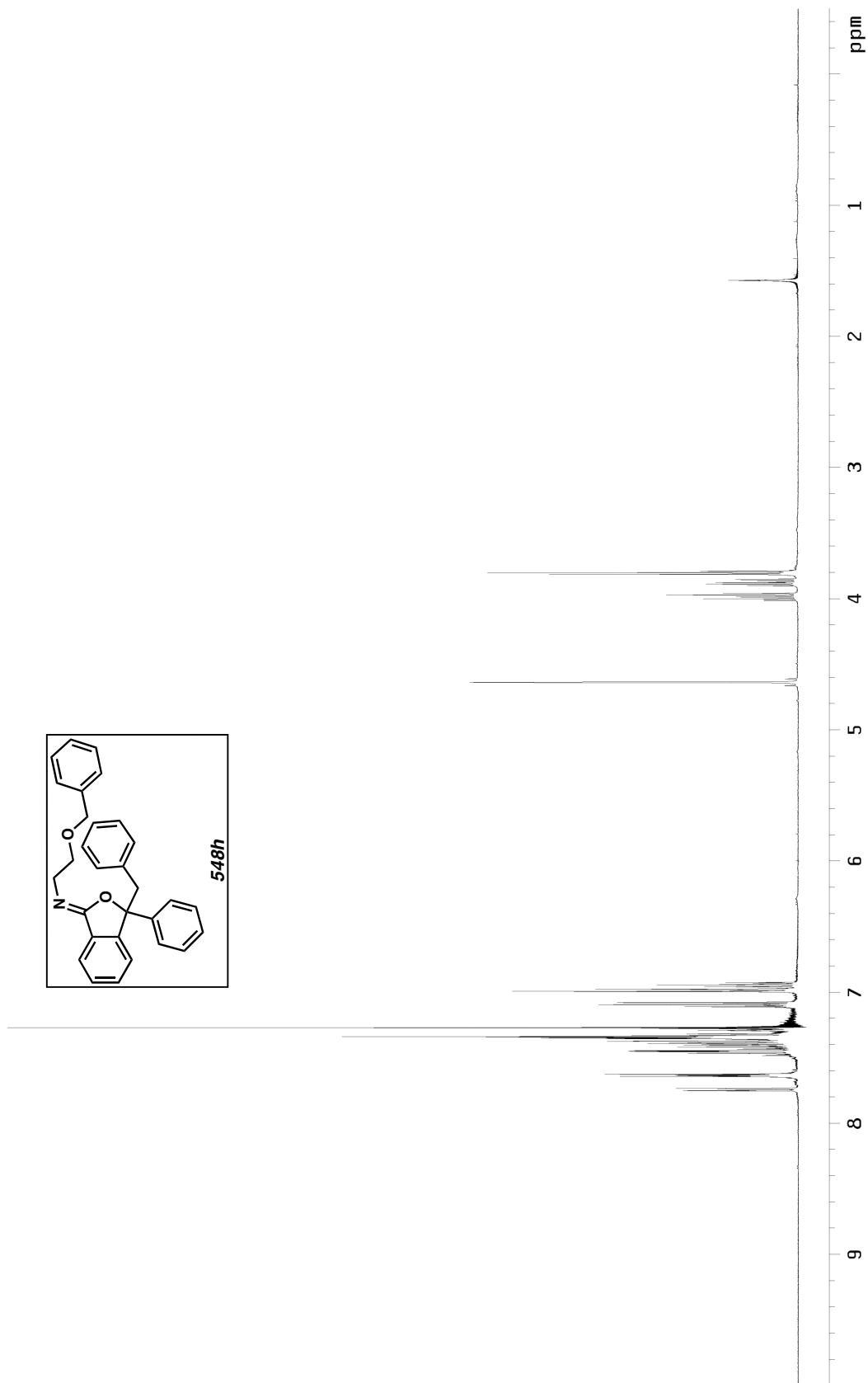
Figure A3.12.2 Infrared spectrum (thin film/NaCl) of compound **548k**Figure A3.12.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548k**

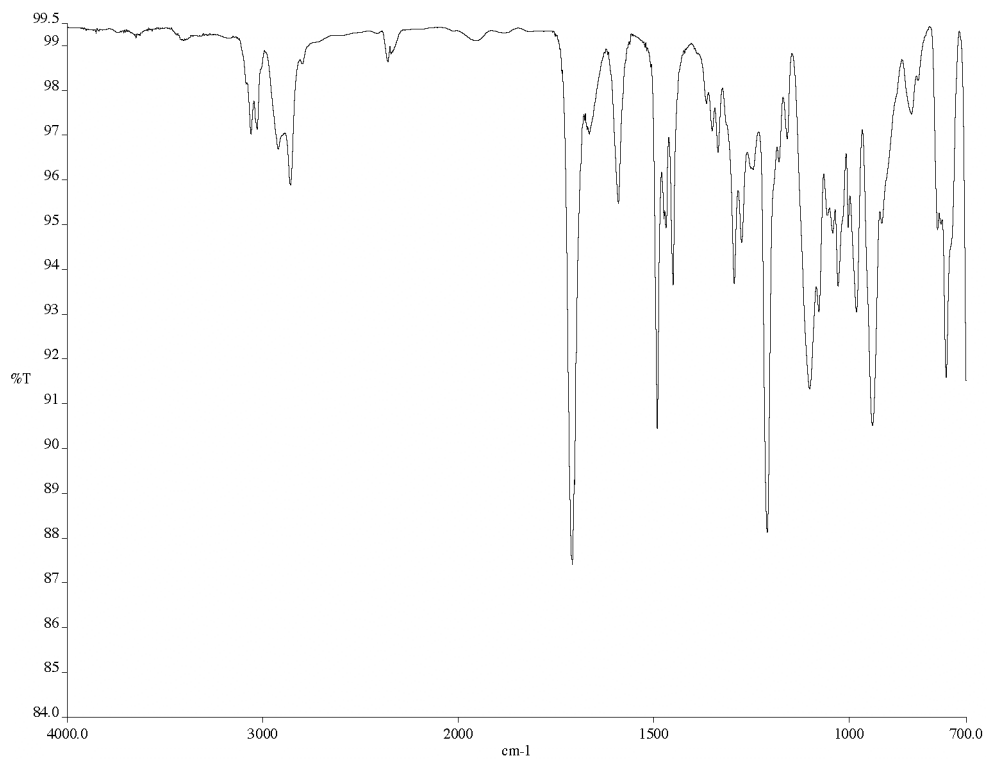
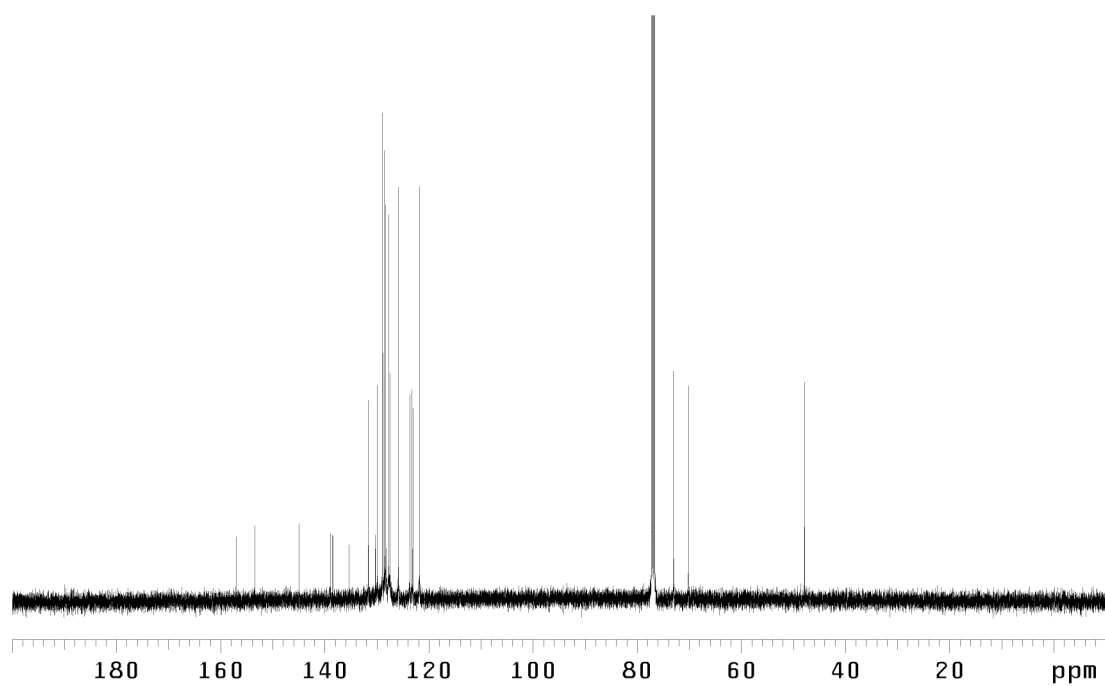
Figure A3.13.1 ¹H NMR (500 MHz, CDCl₃) of compound 548I

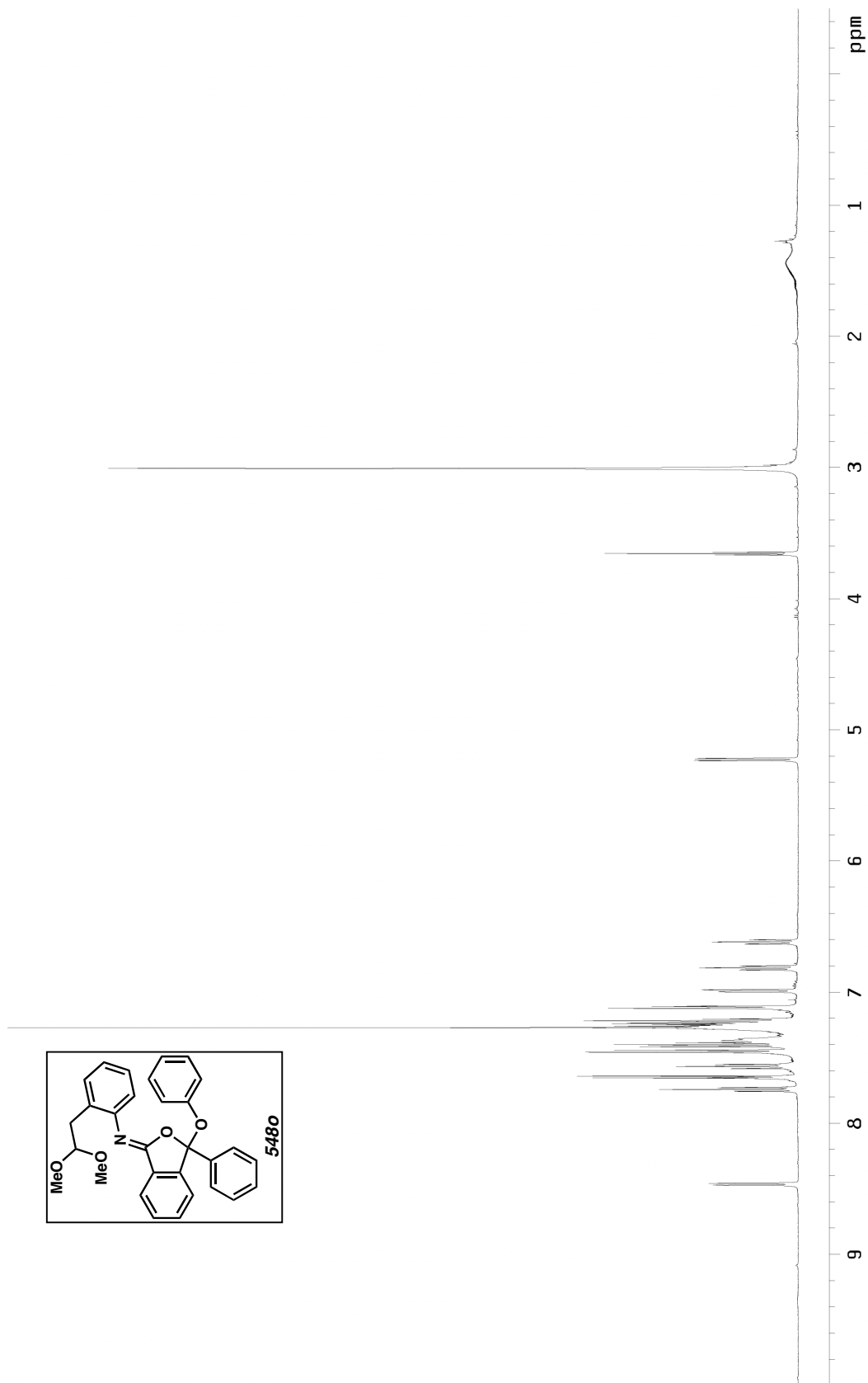
Figure A3.13.2 Infrared spectrum (thin film/NaCl) of compound **548I**Figure A3.13.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548I**

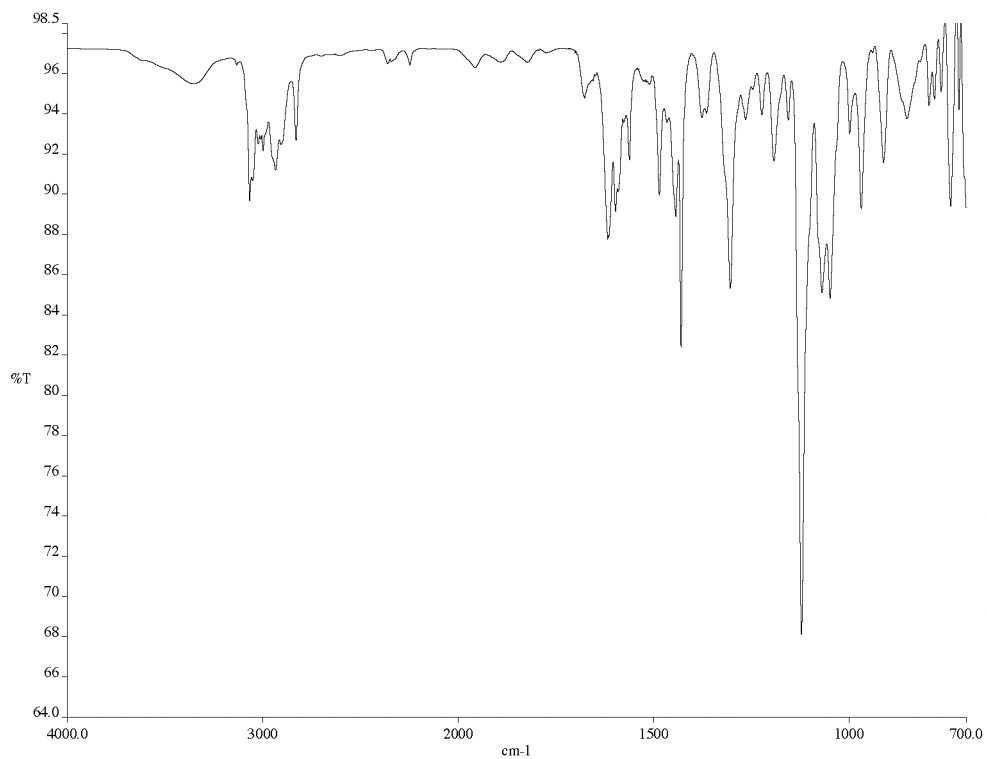
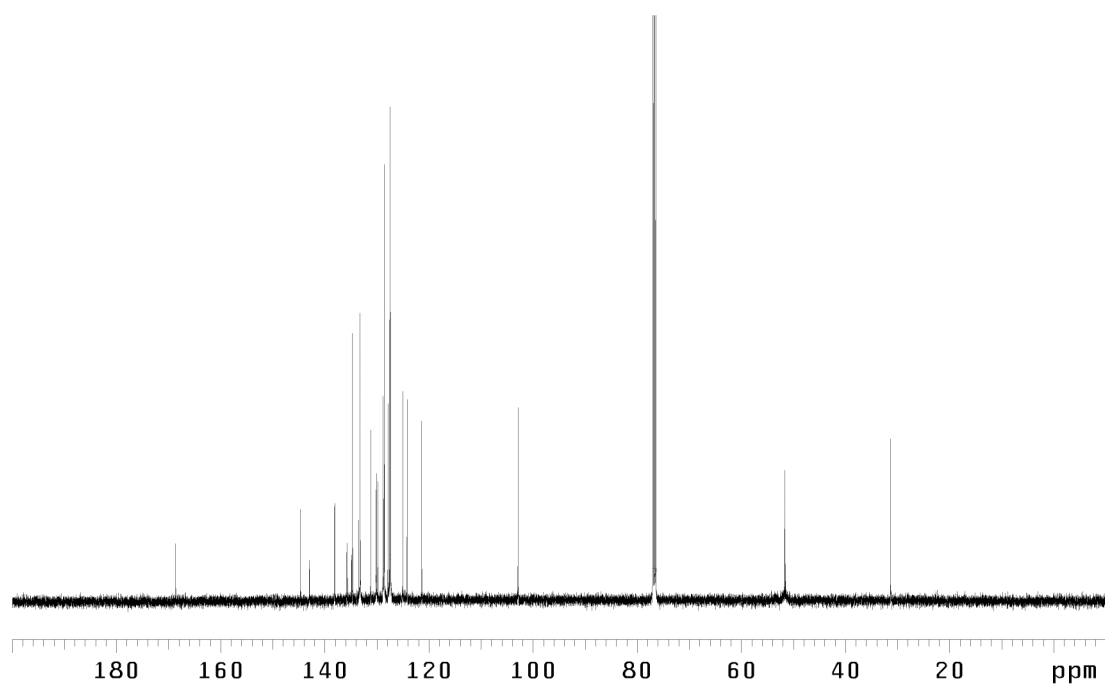
Figure A3.14.1 ^1H NMR (500 MHz, CDCl_3) of compound **548m**

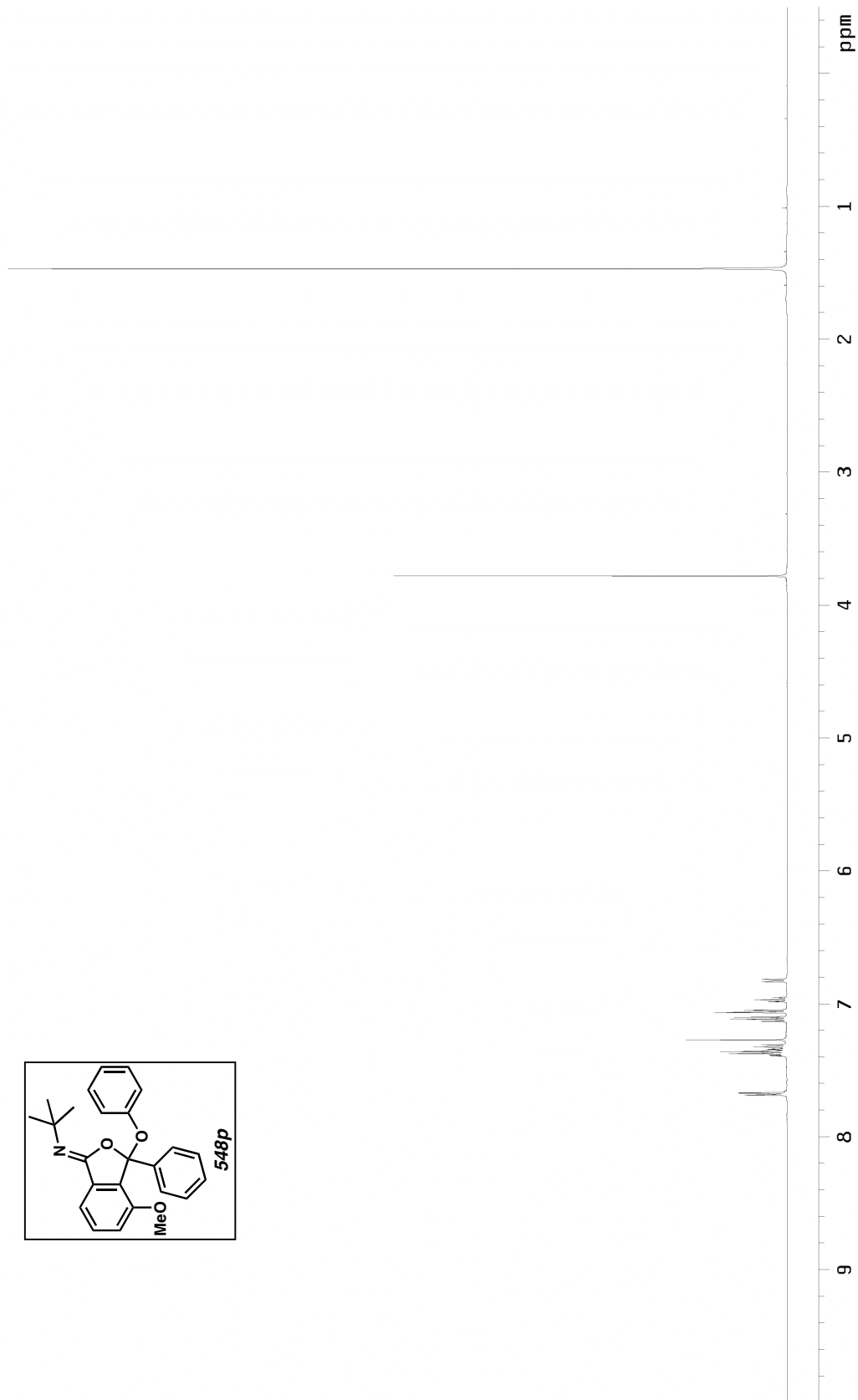
Figure A3.14.2 Infrared spectrum (thin film/NaCl) of compound **548m**Figure A3.14.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548m**

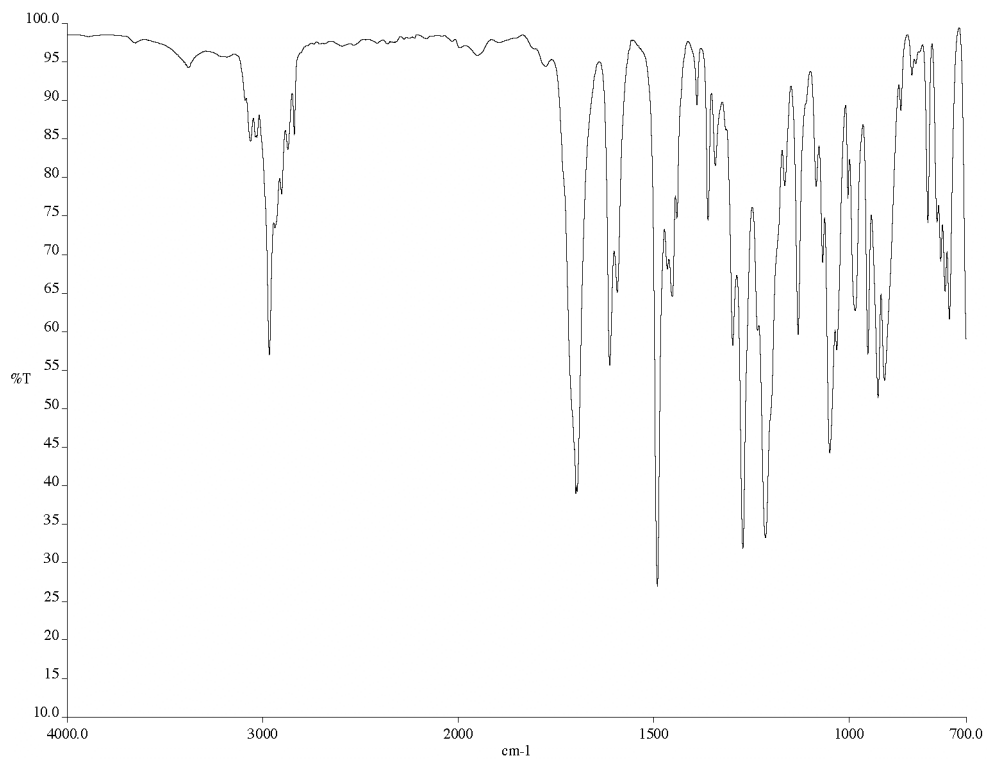
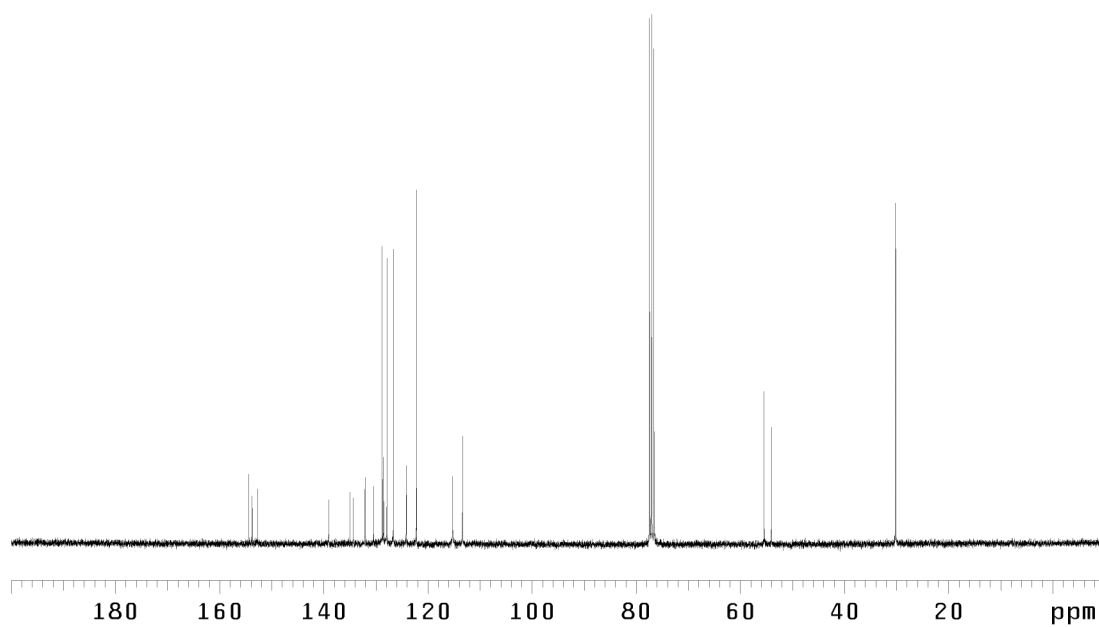
Figure A3.15.1 ¹H NMR (500 MHz, CDCl₃) of compound 548n

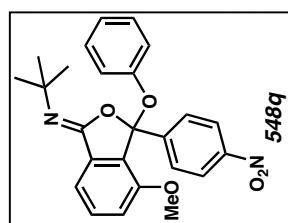
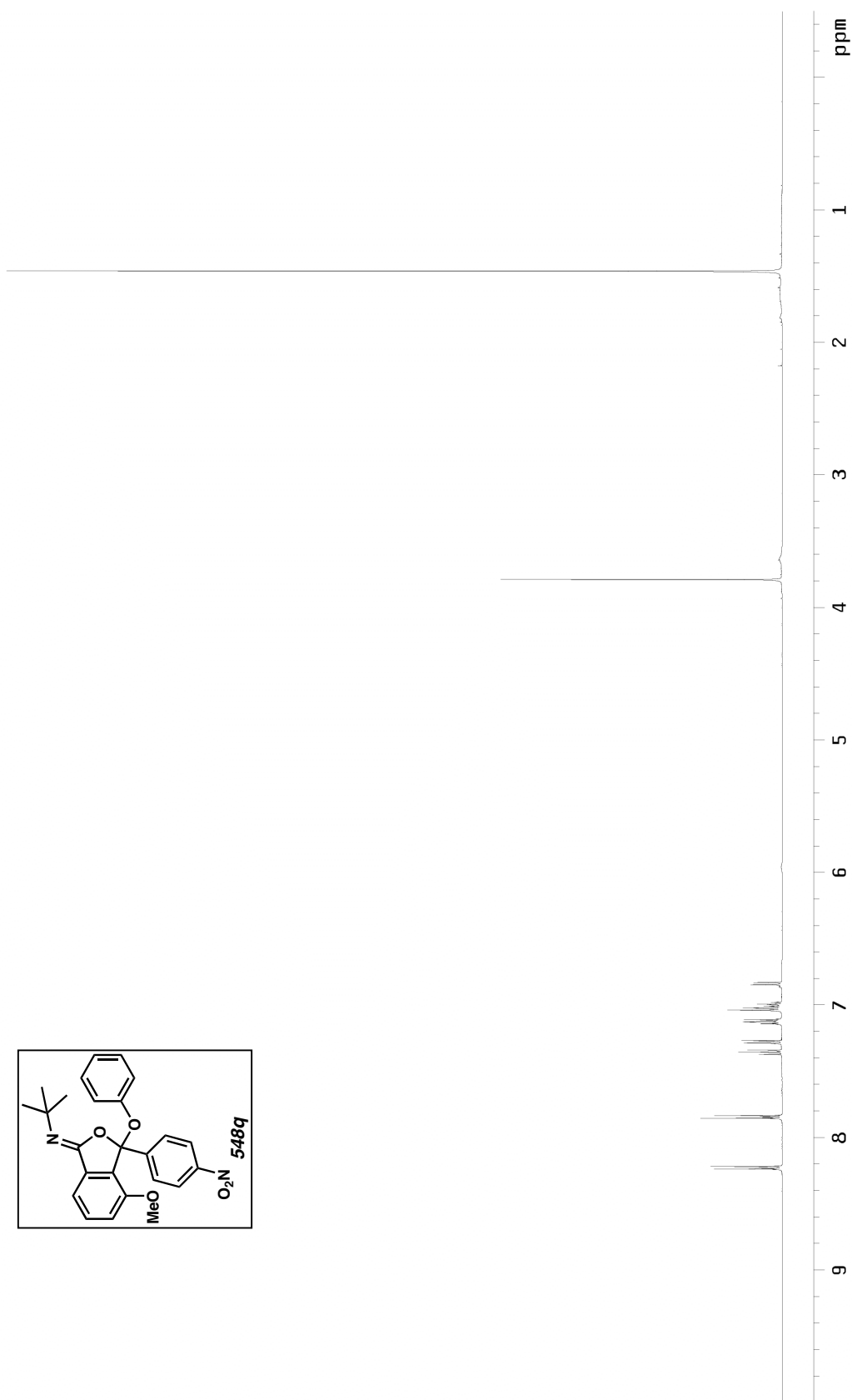
Figure A3.15.2 Infrared spectrum (thin film/NaCl) of compound **548n**Figure A3.15.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548n**

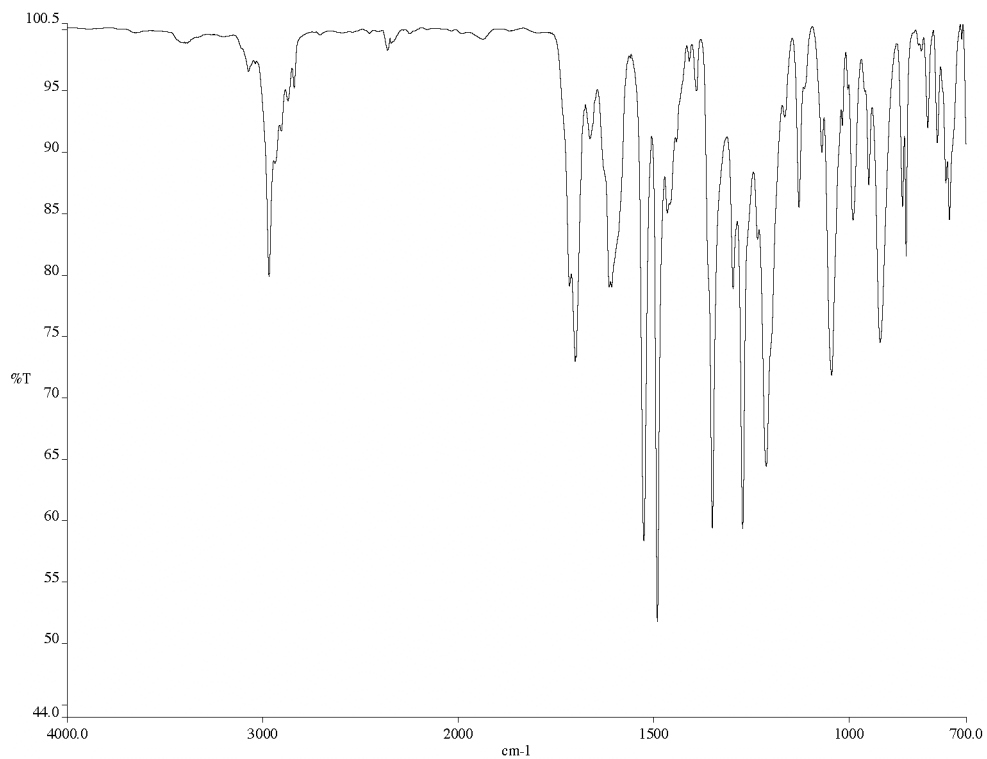
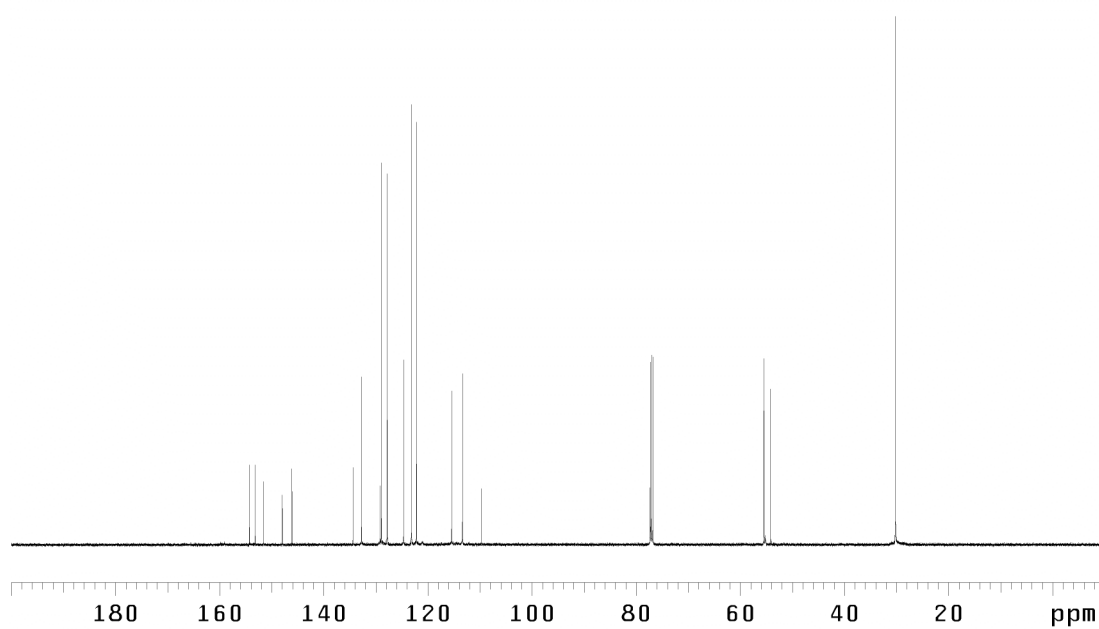
Figure A3.16.1 ^1H NMR (500 MHz, CDCl_3) of compound **548o**

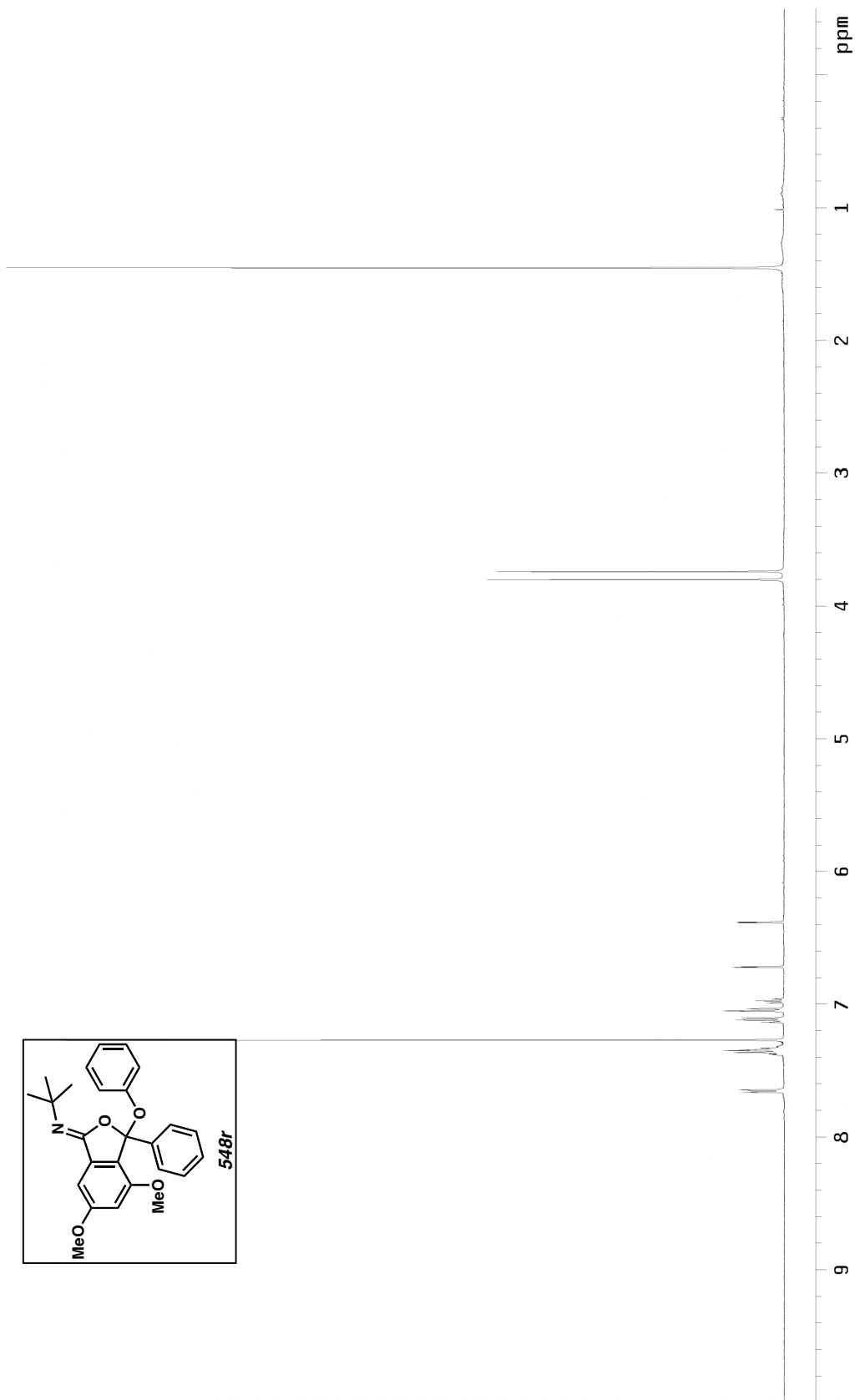
Figure A3.16.2 Infrared spectrum (thin film/NaCl) of compound **548o**Figure A3.16.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548o**

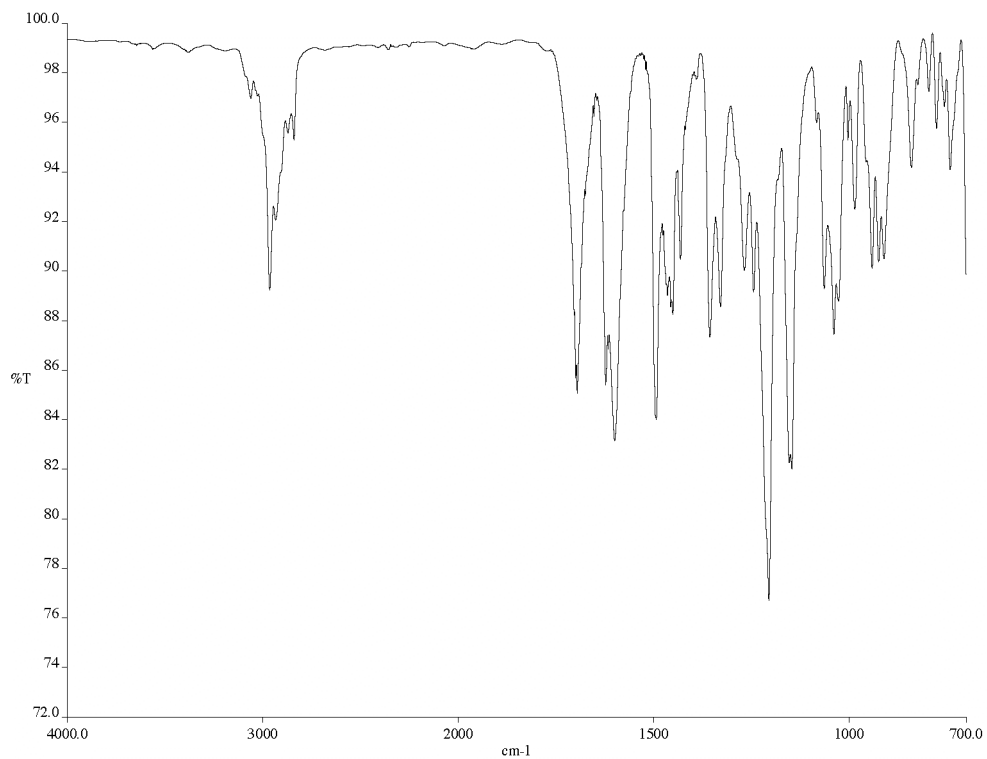
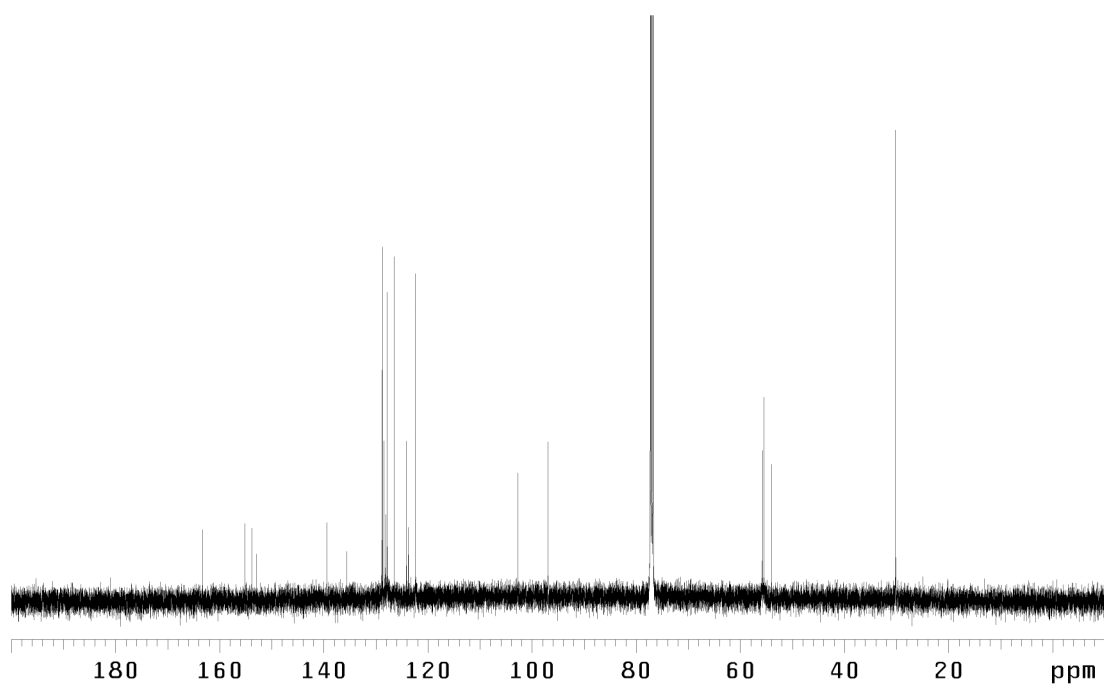
Figure A3.17.1 ^1H NMR (500 MHz, CDCl_3) of compound 548p

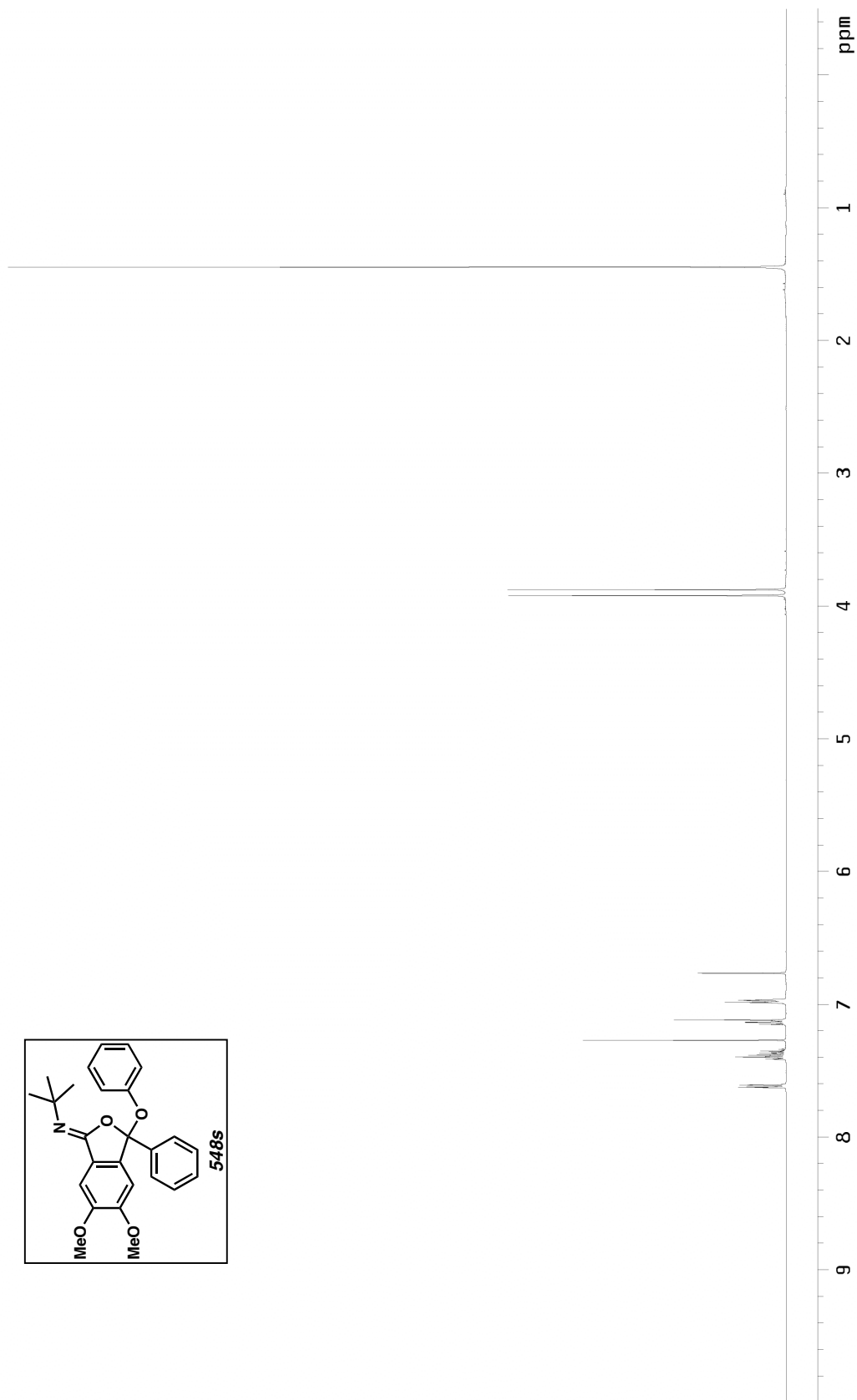
Figure A3.17.2 Infrared spectrum (thin film/NaCl) of compound **548p**Figure A3.17.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548p**

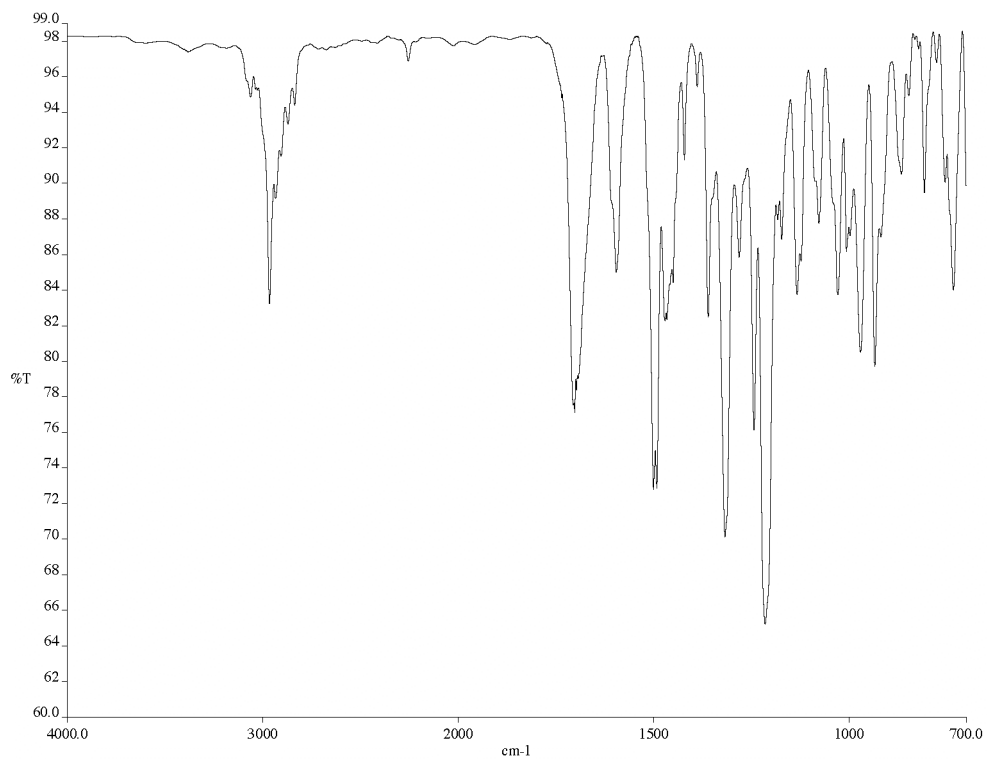
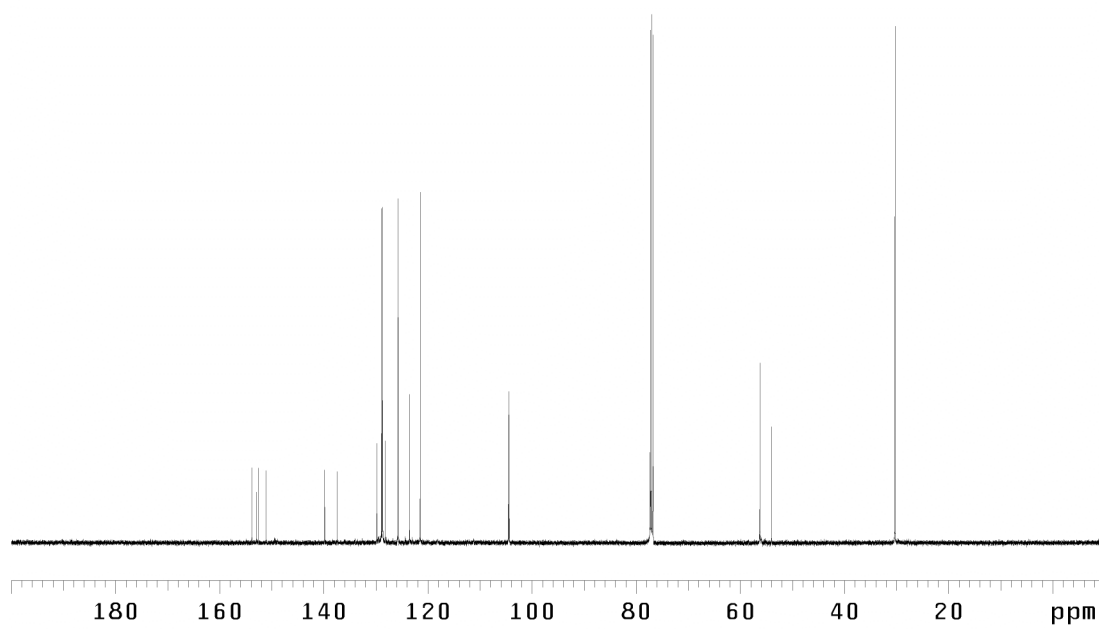
Figure A3.18.1 ^1H NMR (500 MHz, CDCl_3) of compound 548q

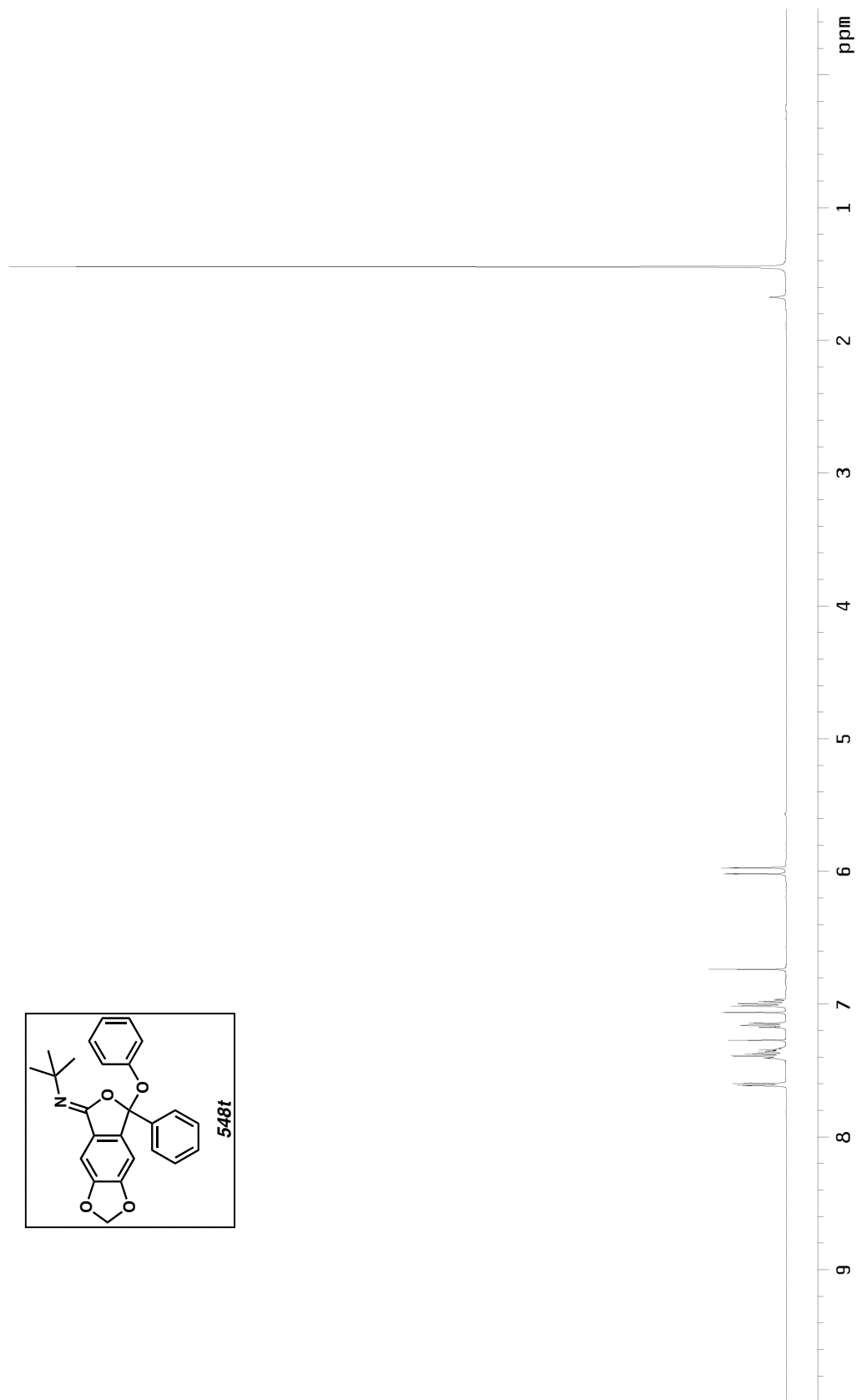
Figure A3.18.2 Infrared spectrum (thin film/NaCl) of compound **548q**Figure A3.18.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548q**

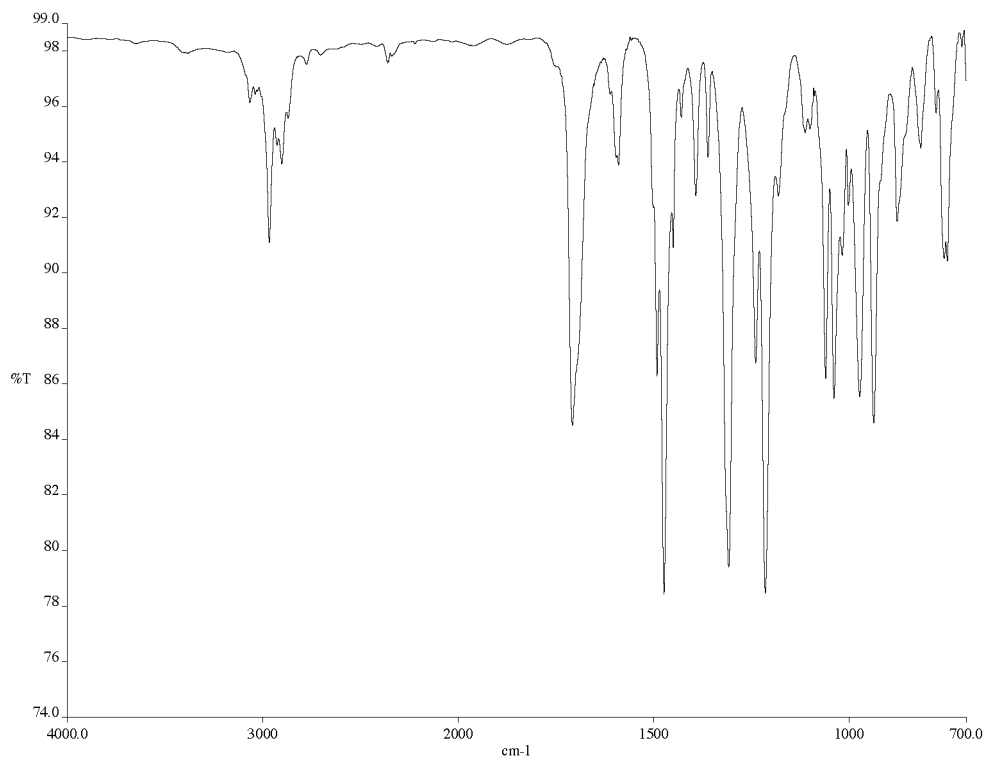
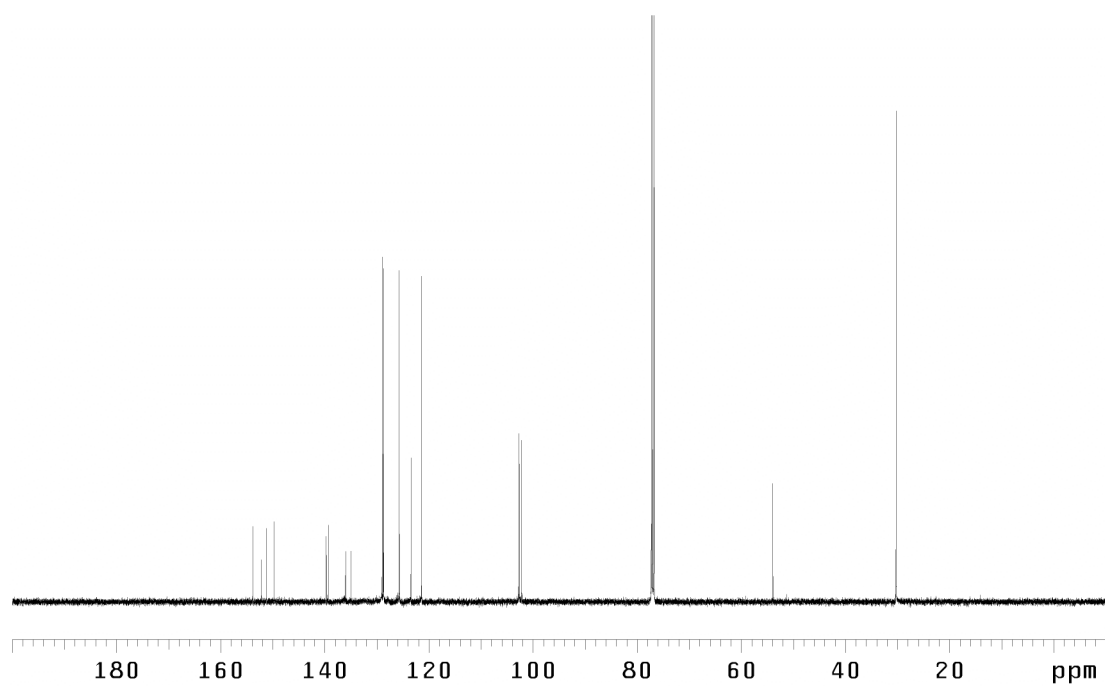
Figure A3.19.1 ¹H NMR (500 MHz, CDCl₃) of compound 548r

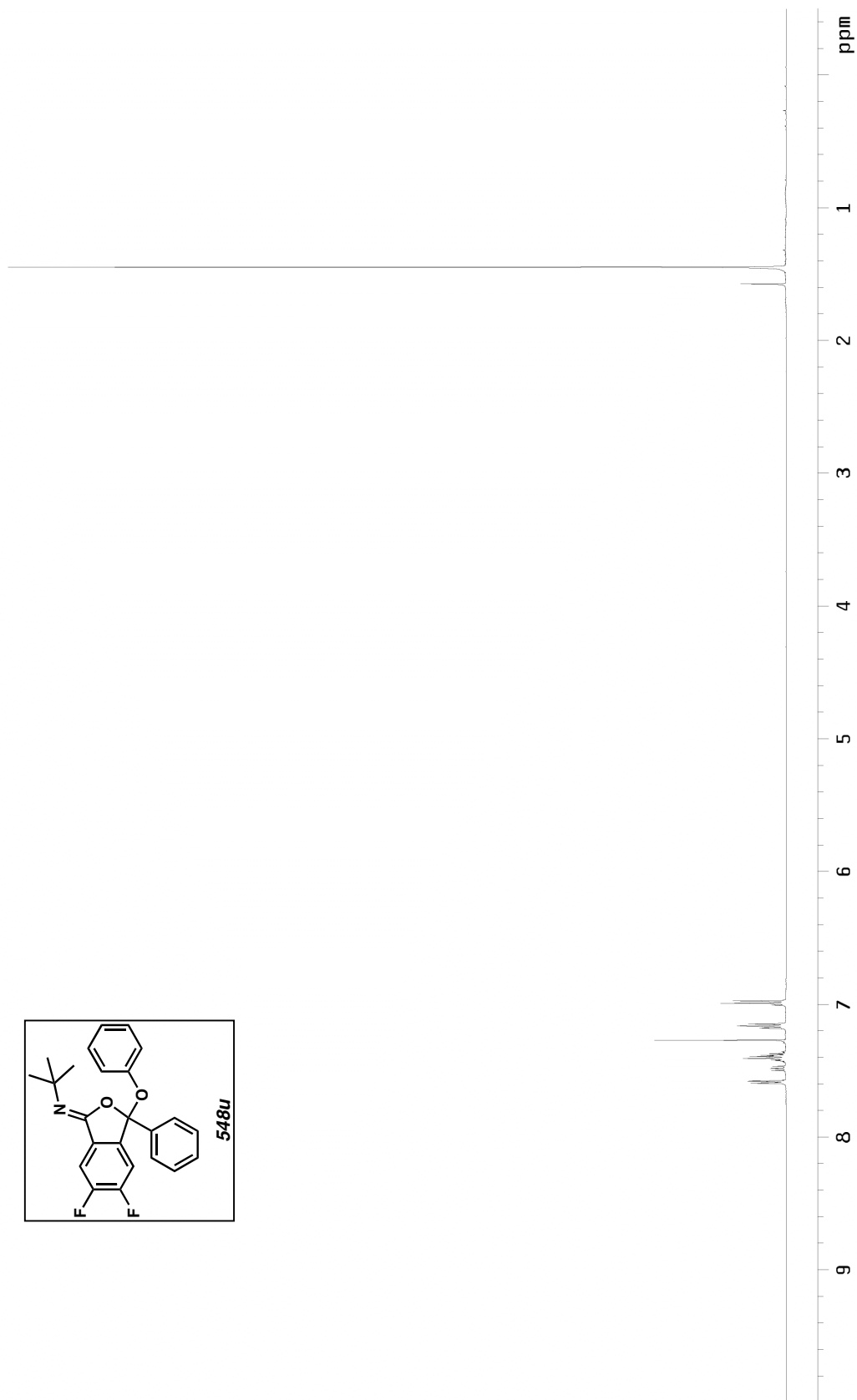
Figure A3.19.2 Infrared spectrum (thin film/NaCl) of compound **548r**Figure A3.19.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548r**

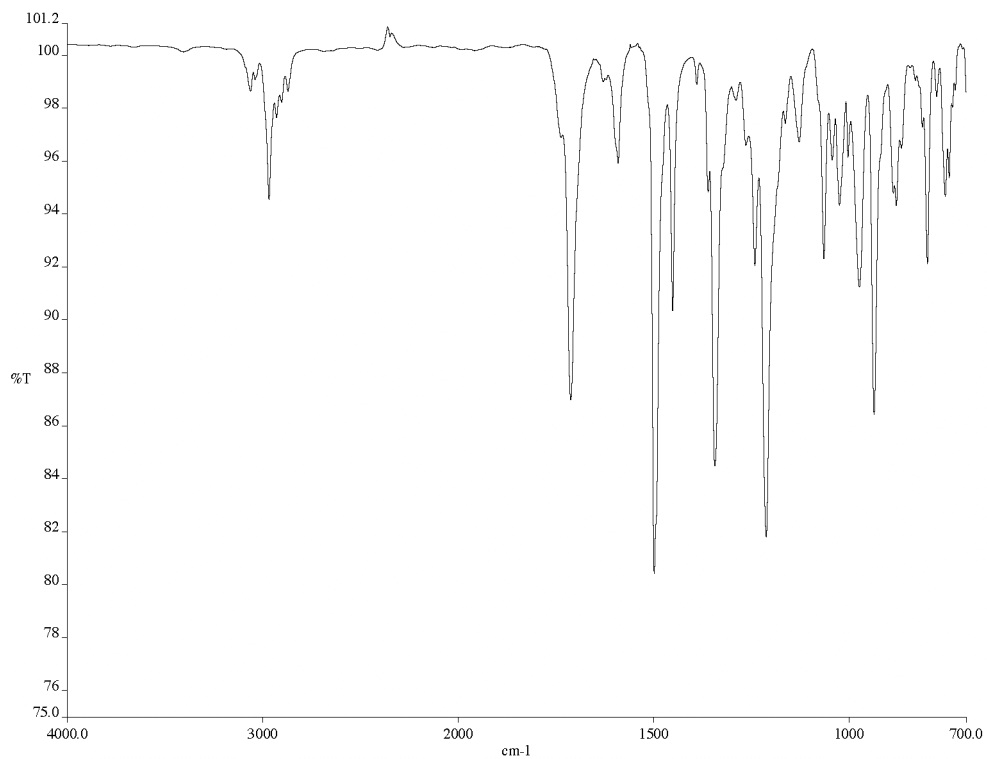
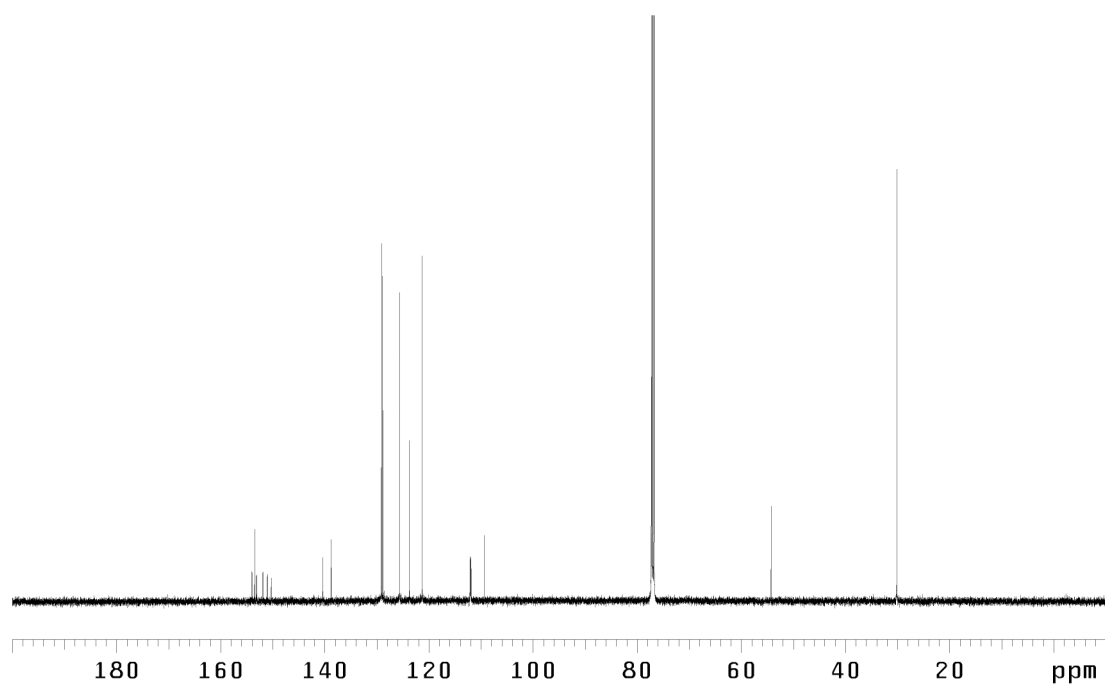
Figure A3.20.1 ^1H NMR (500 MHz, CDCl_3) of compound 548s

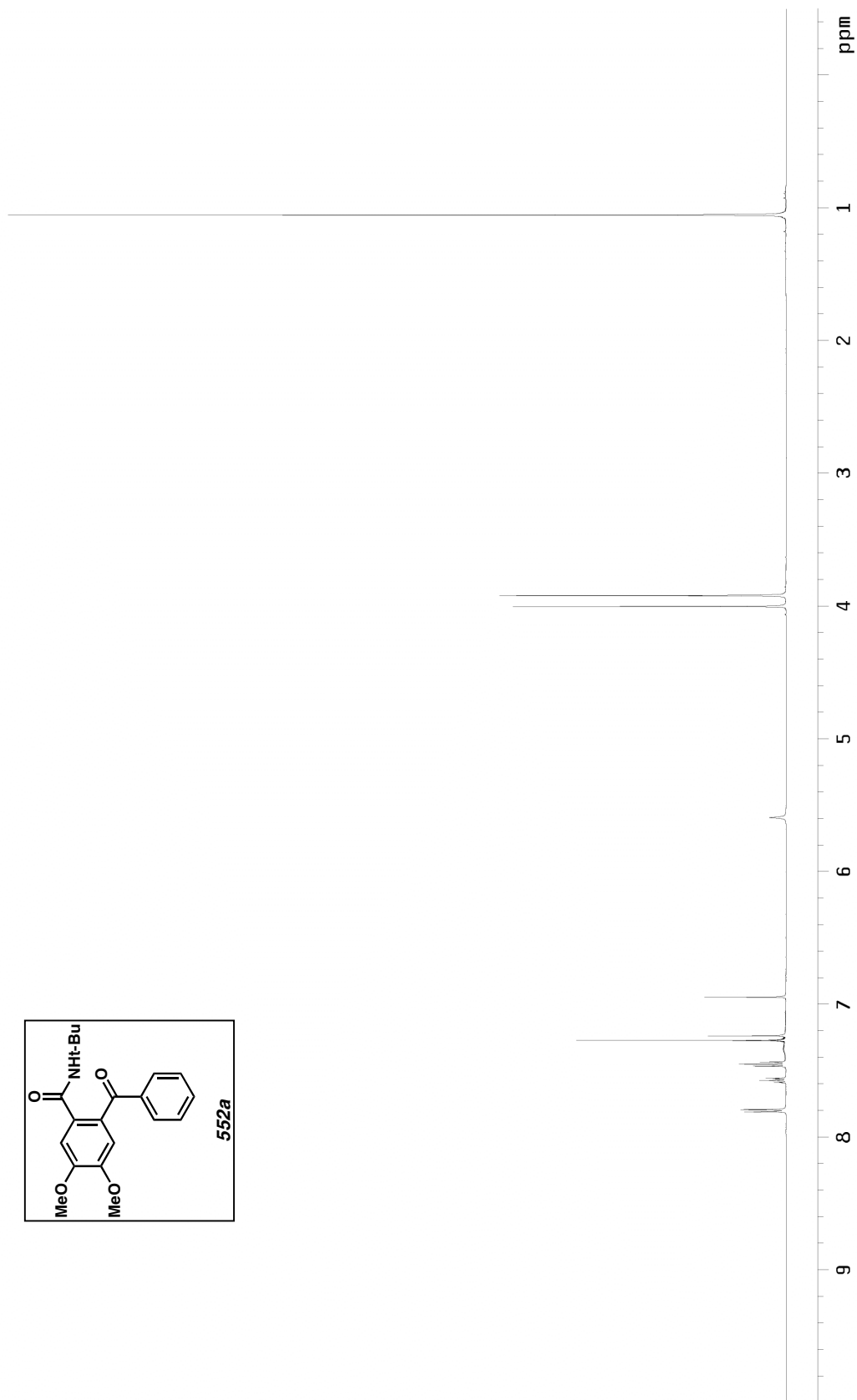
Figure A3.20.2 Infrared spectrum (thin film/NaCl) of compound **548s**Figure A3.20.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548s**

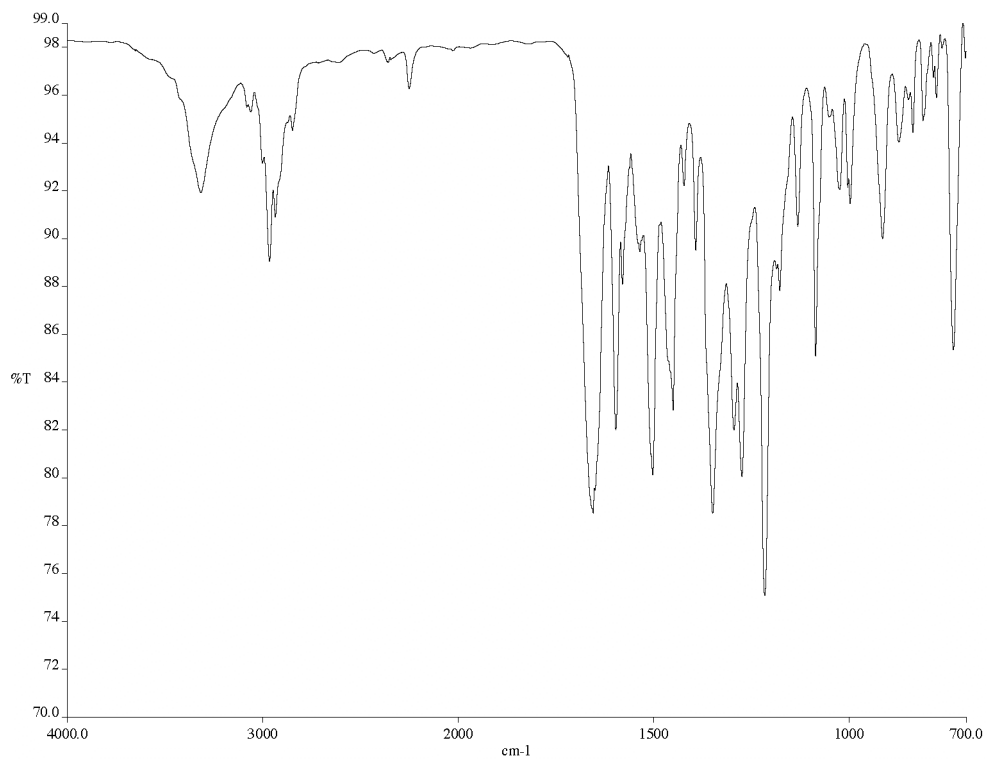
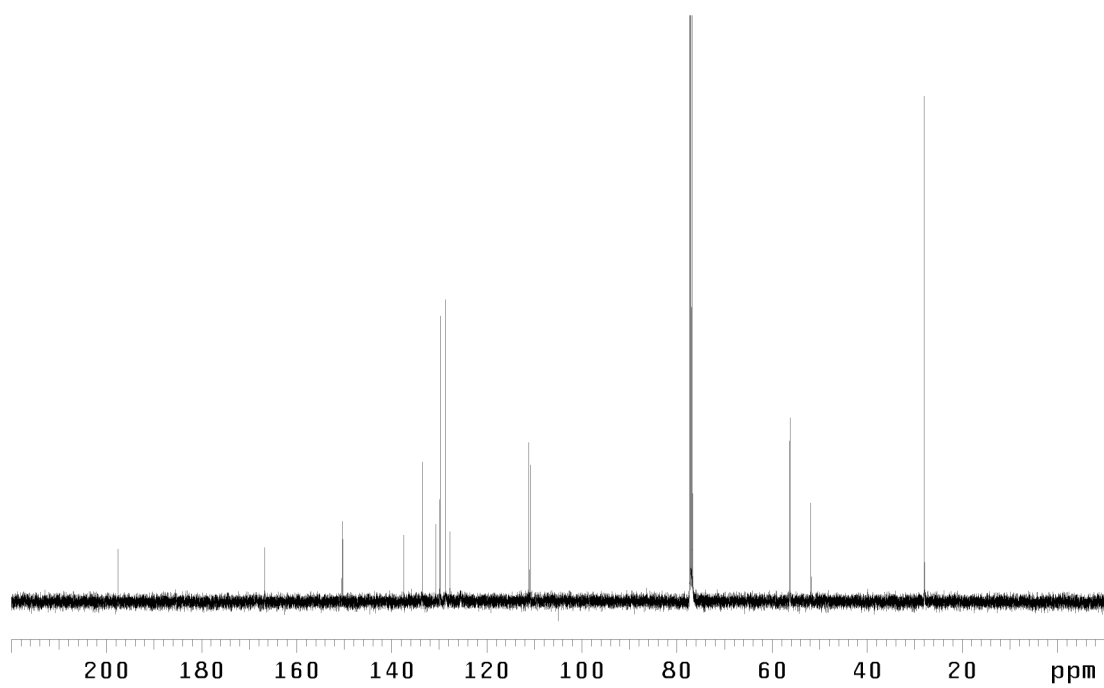
Figure A3.21.1 ¹H NMR (500 MHz, CDCl₃) of compound 548t

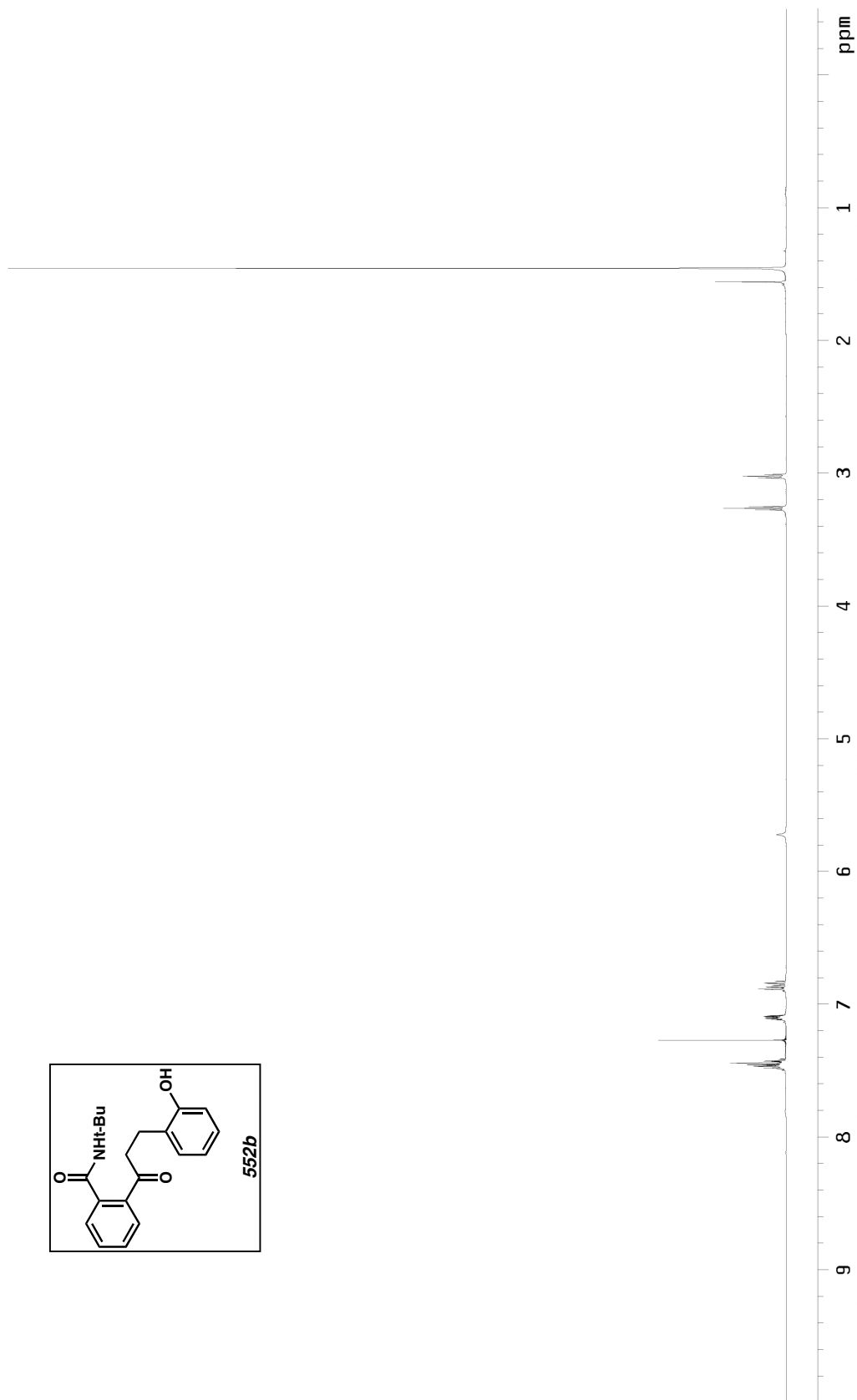
Figure A3.21.2 Infrared spectrum (thin film/NaCl) of compound **548t**Figure A3.21.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548t**

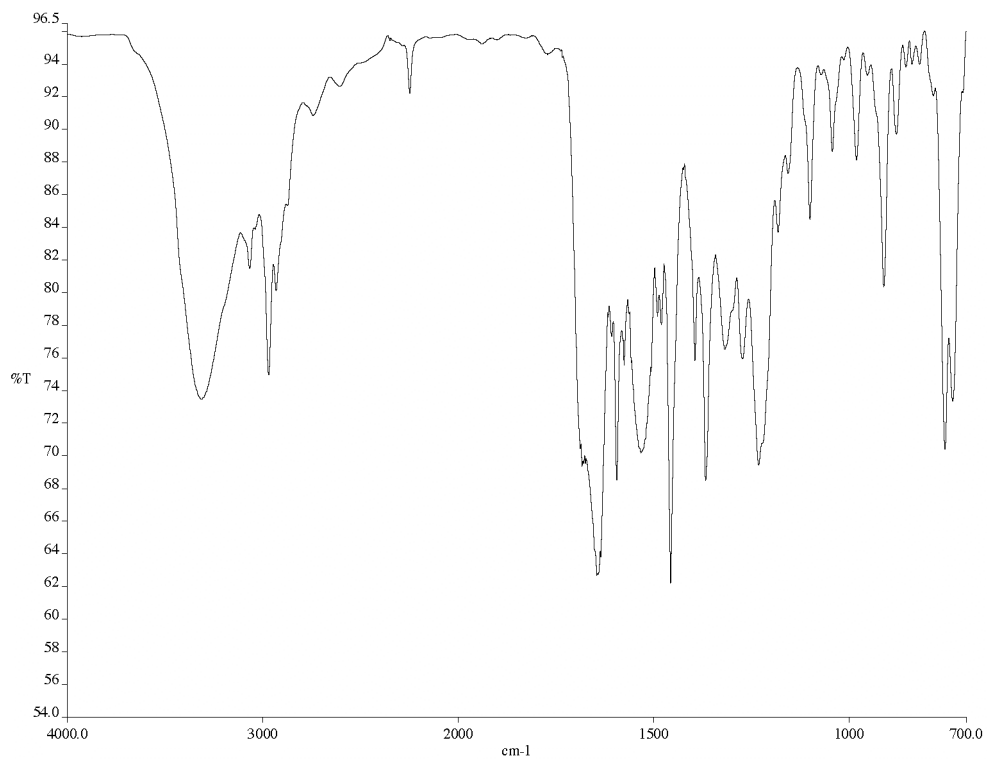
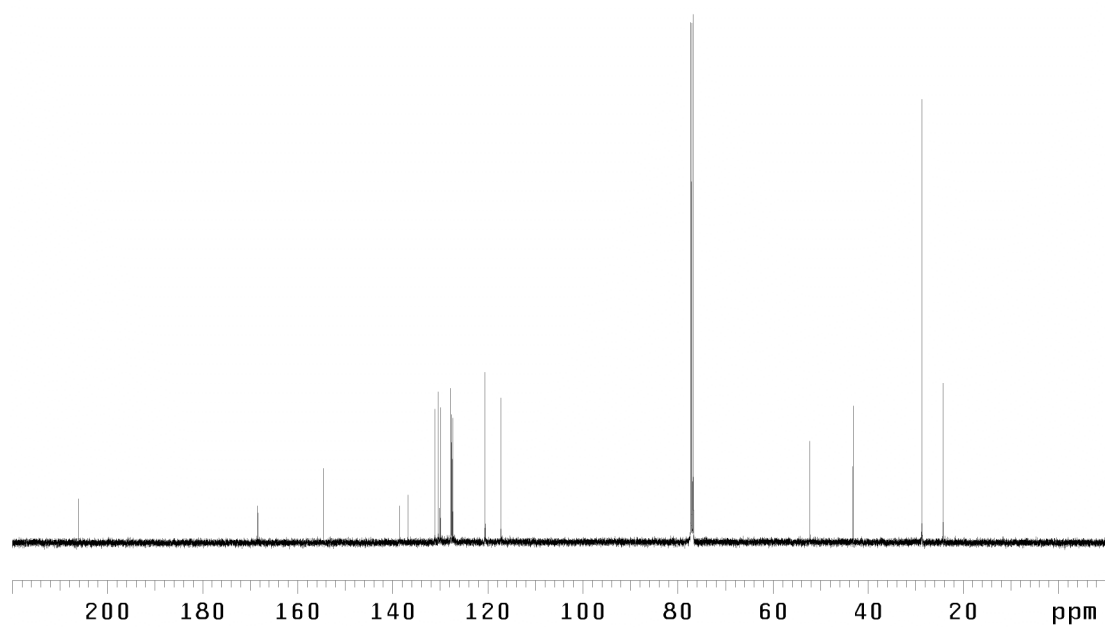
Figure A3.22.1 ^1H NMR (500 MHz, CDCl_3) of compound 548u

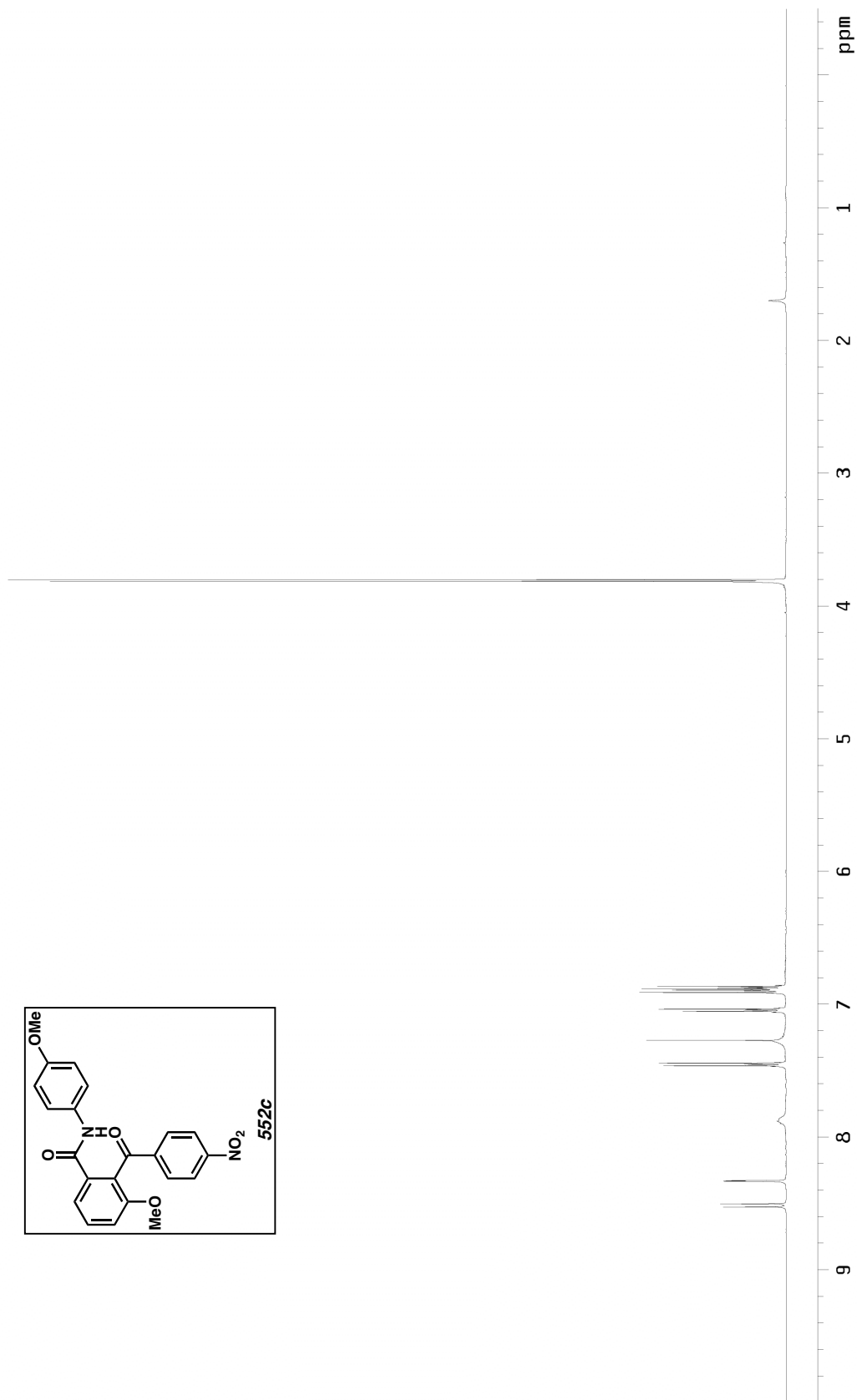
Figure A3.22.2 Infrared spectrum (thin film/NaCl) of compound **548u**Figure A3.22.3 ¹³C NMR (125 MHz, CDCl₃) of compound **548u**

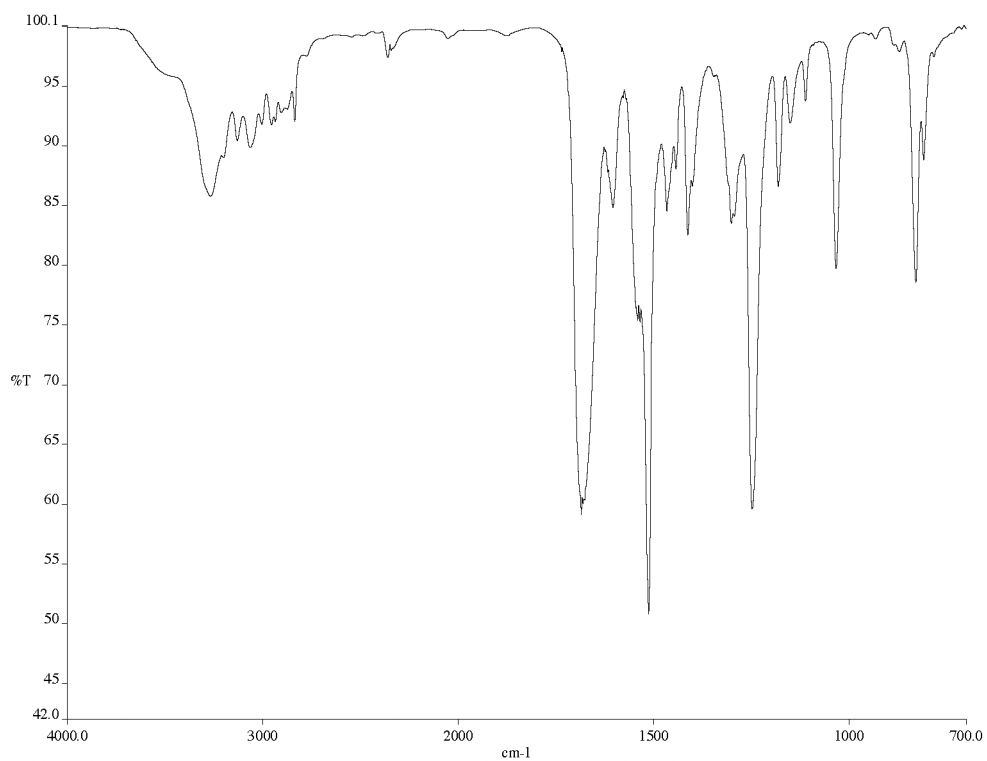
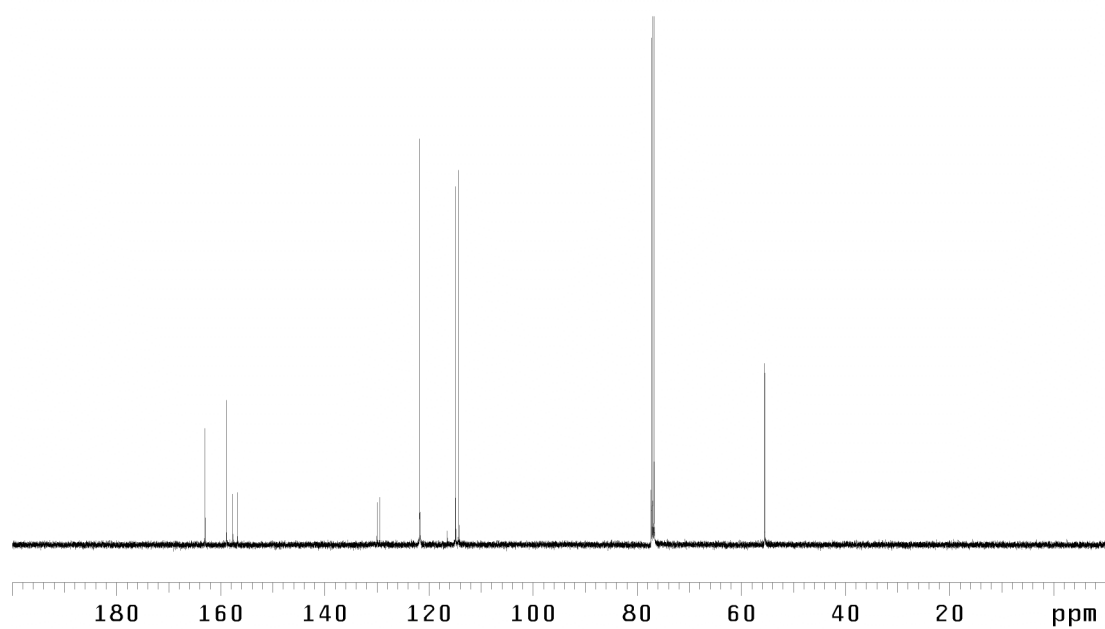
Figure A3.23.1 ¹H NMR (500 MHz, CDCl₃) of compound 552a

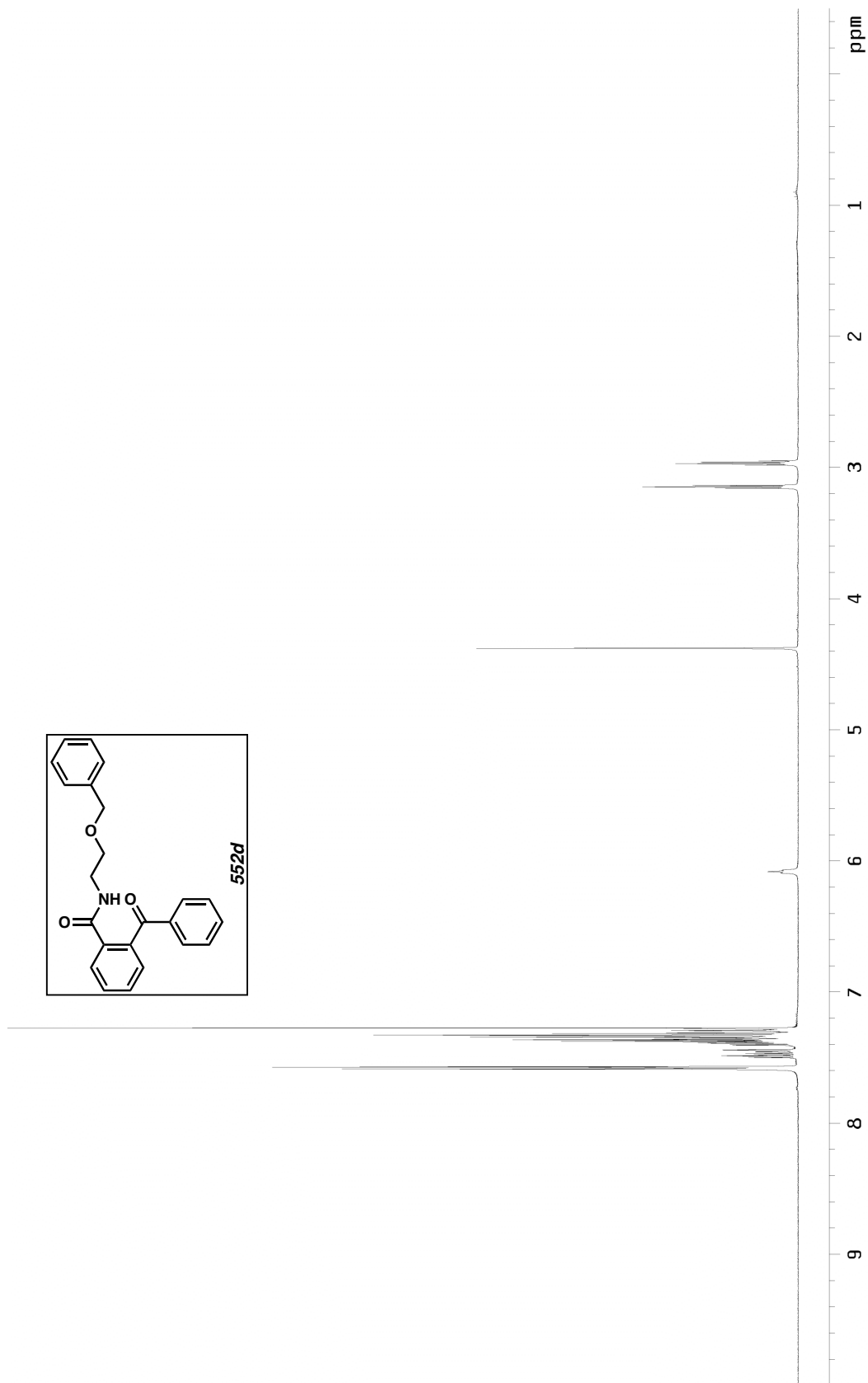
Figure A3.23.2 Infrared spectrum (thin film/NaCl) of compound **552a**Figure A3.23.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552a**

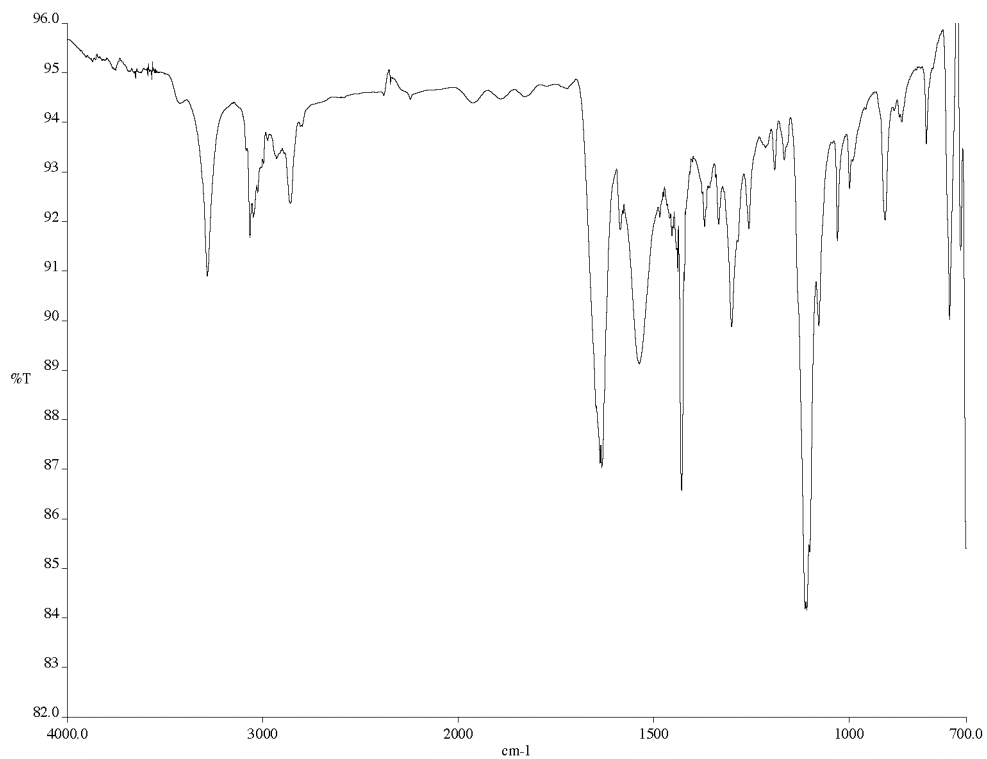
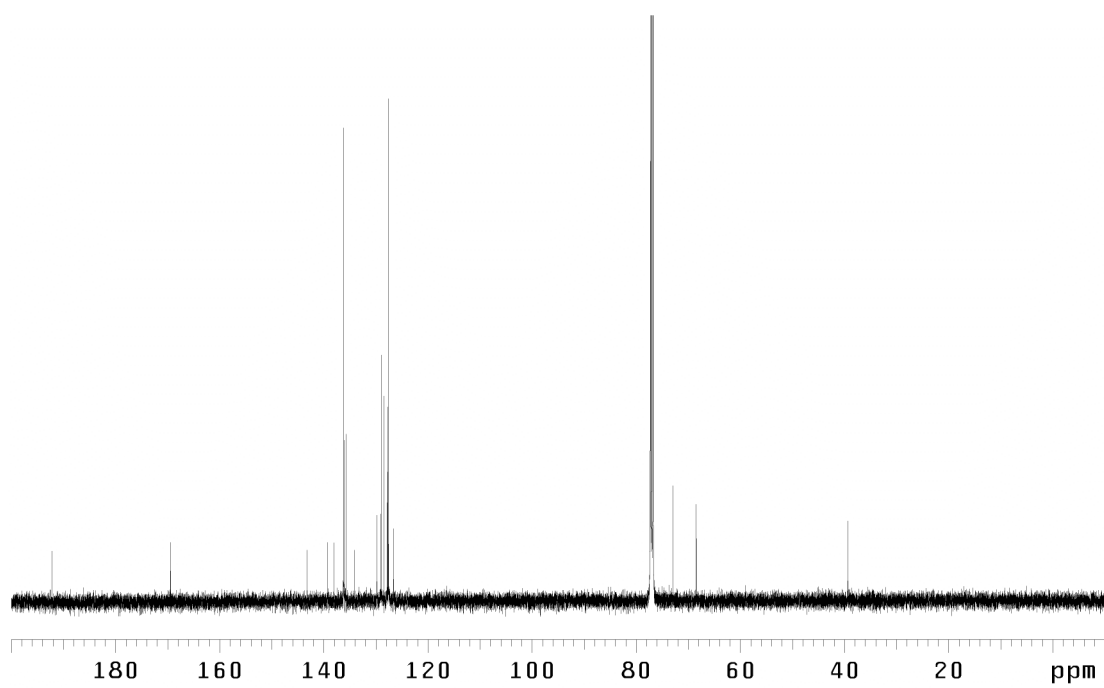
Figure A3.2.4.1 ¹H NMR (500 MHz, CDCl₃) of compound 552b

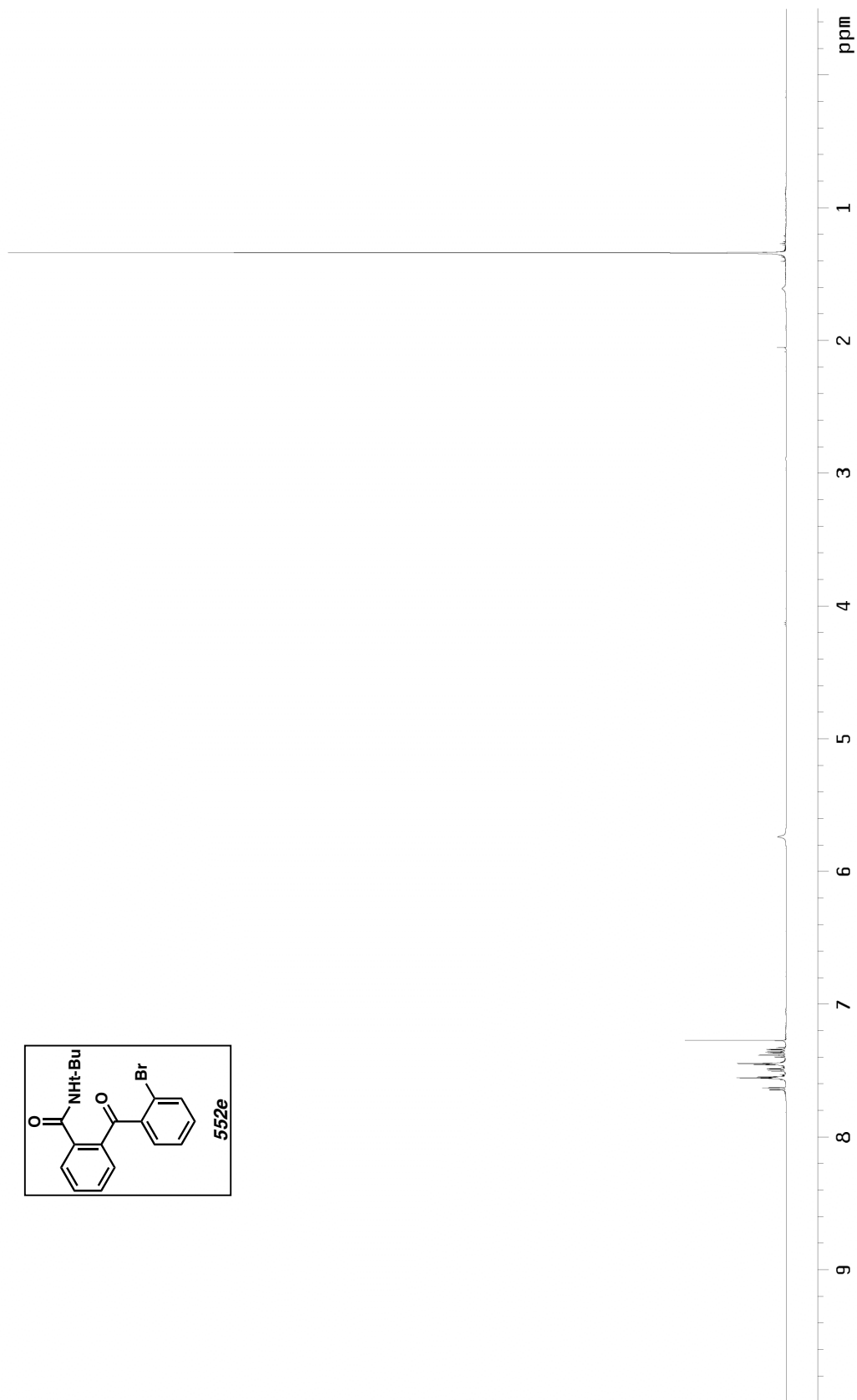
Figure A3.24.2 Infrared spectrum (thin film/NaCl) of compound **552b**Figure A3.24.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552b**

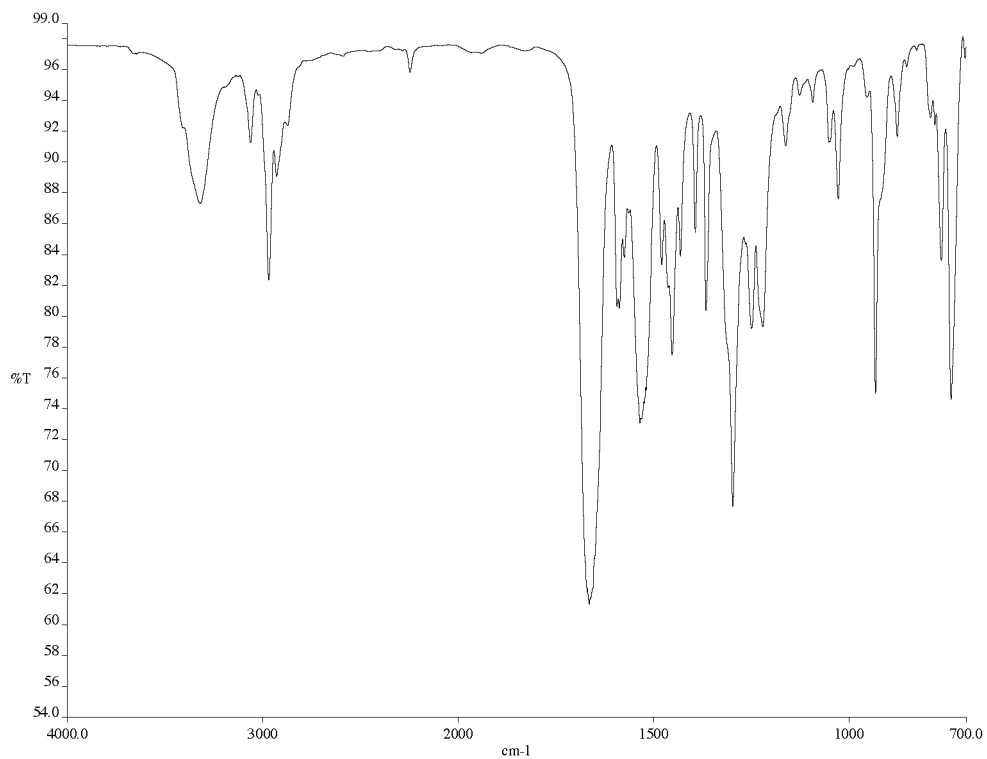
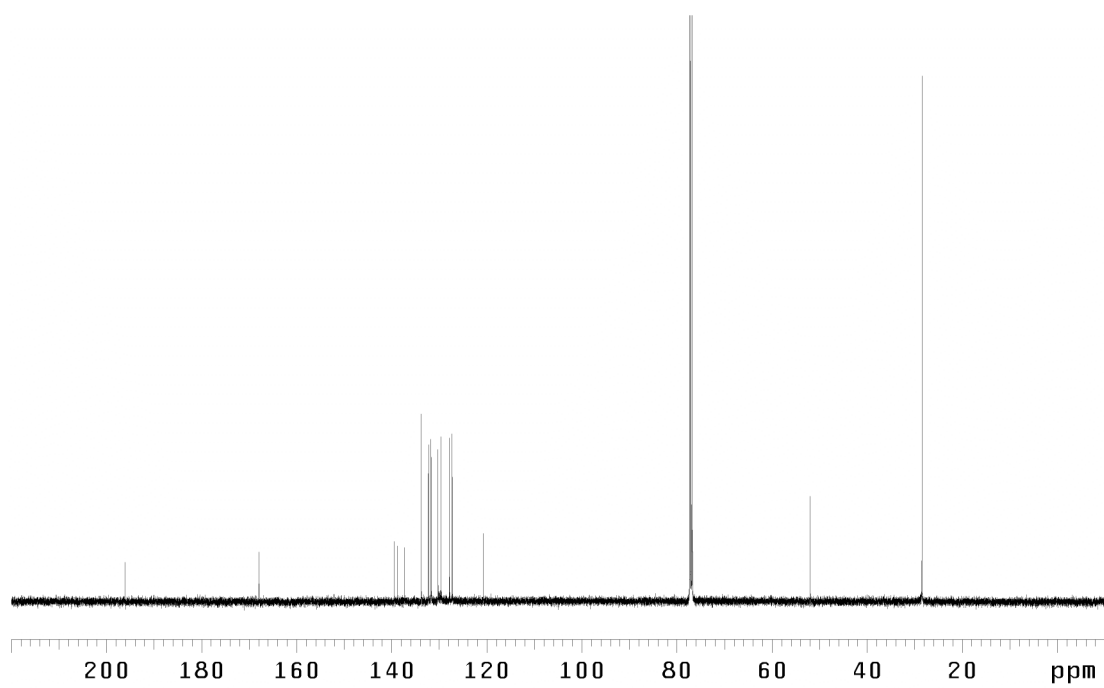
Figure A3.25.1 ¹H NMR (500 MHz, CDCl₃) of compound 552c

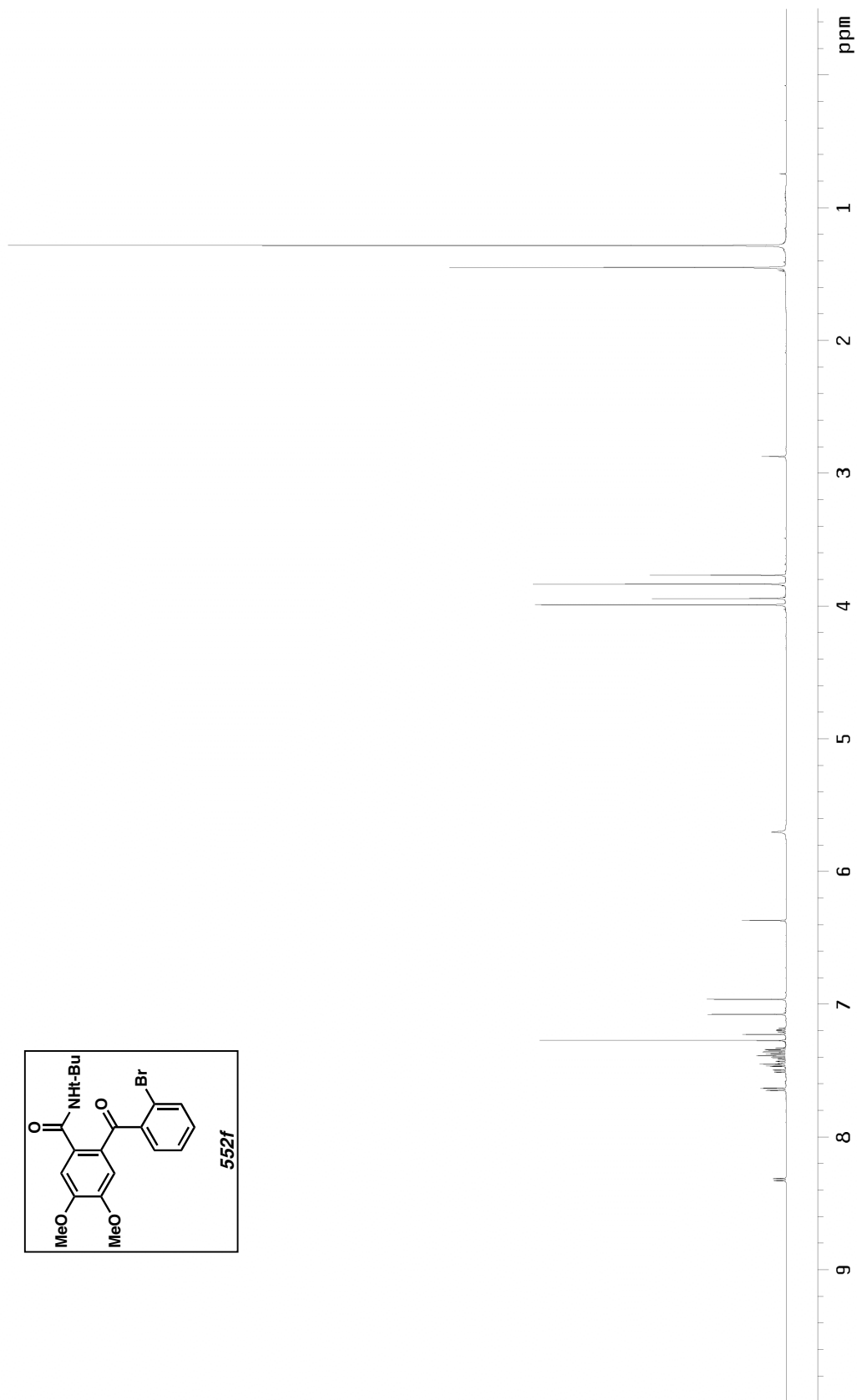
Figure A3.25.2 Infrared spectrum (thin film/NaCl) of compound **552c**Figure A3.25.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552c**

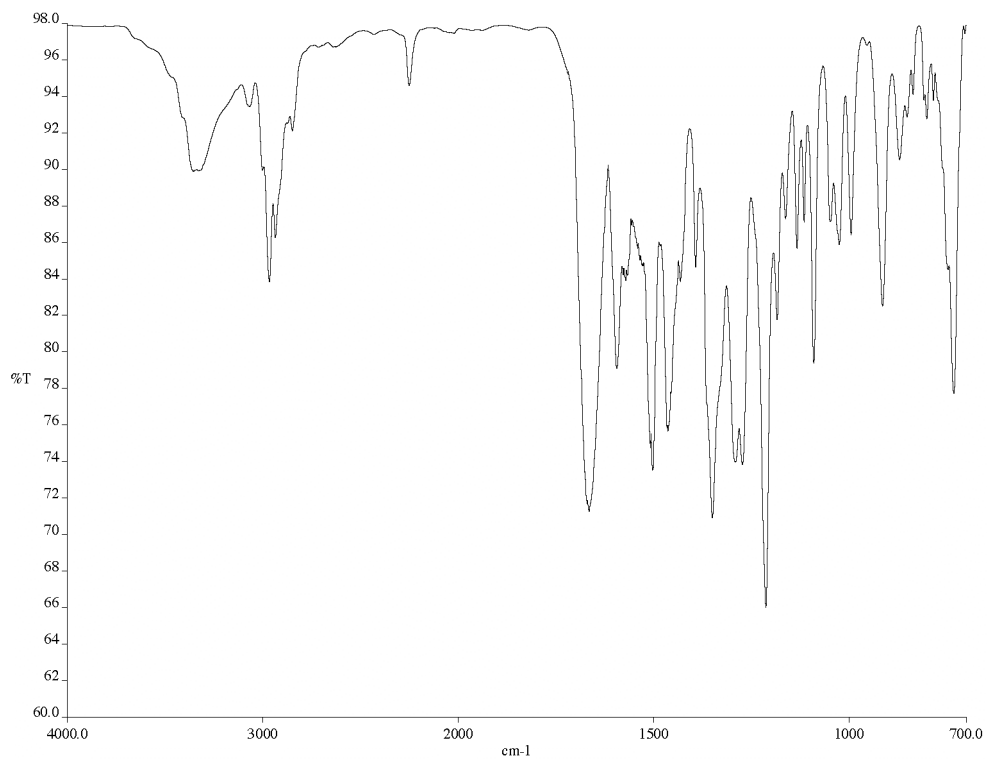
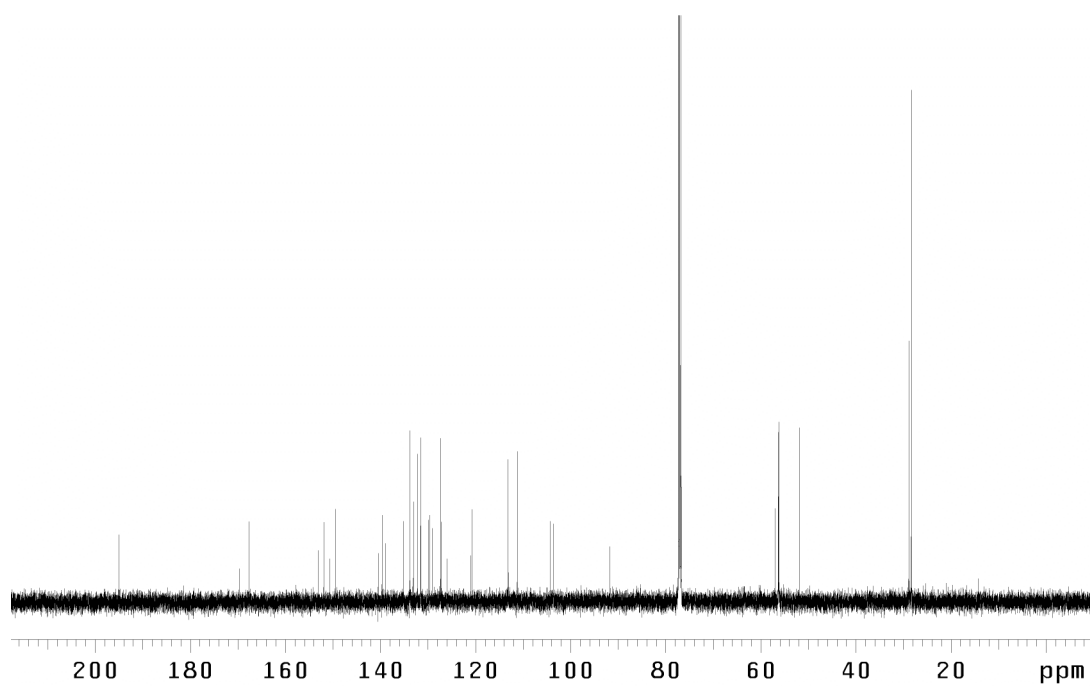
Figure A3.26.1 ¹H NMR (500 MHz, CDCl₃) of compound 552d

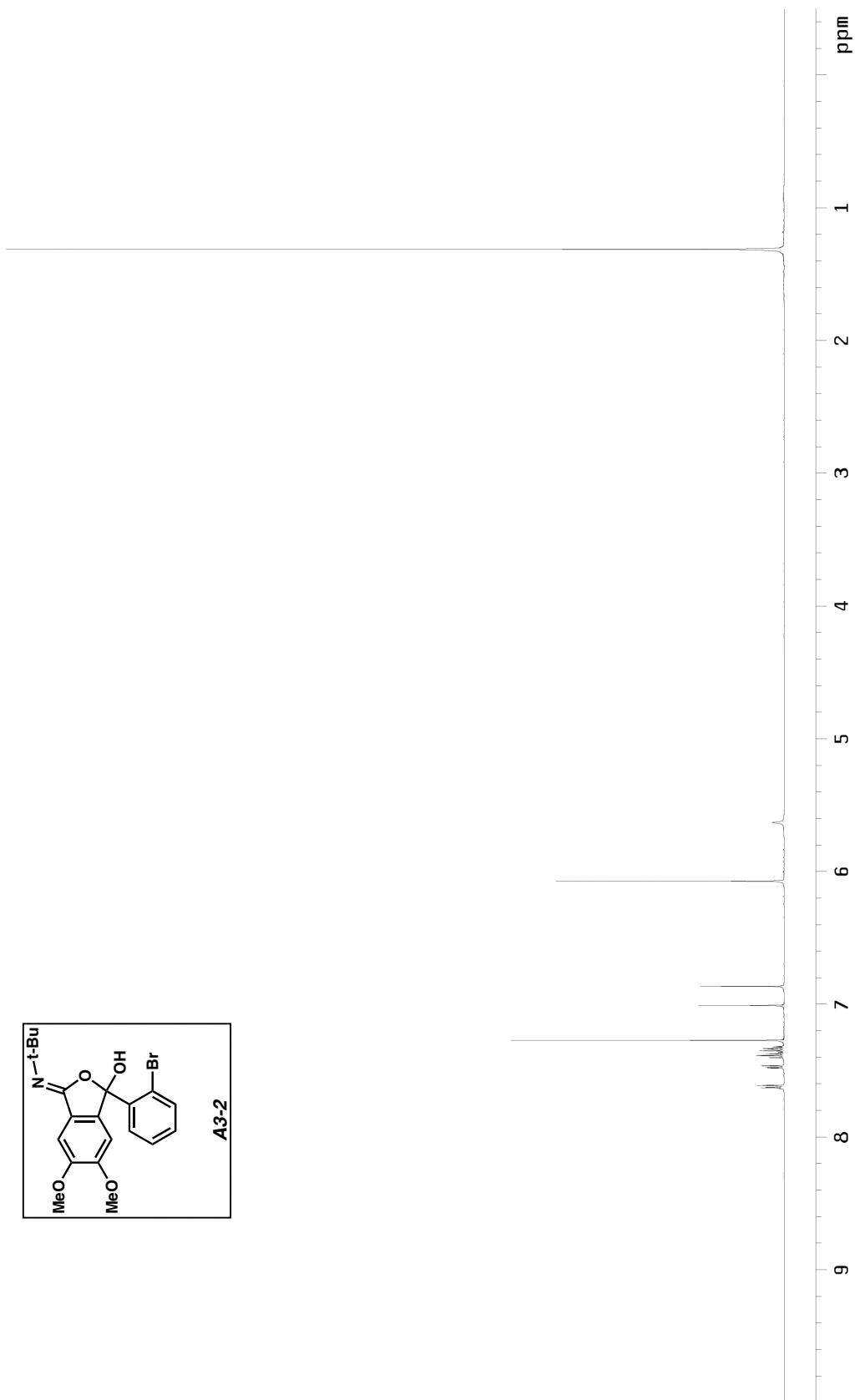
Figure A3.26.2 Infrared spectrum (thin film/NaCl) of compound **552d**Figure A3.26.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552d**

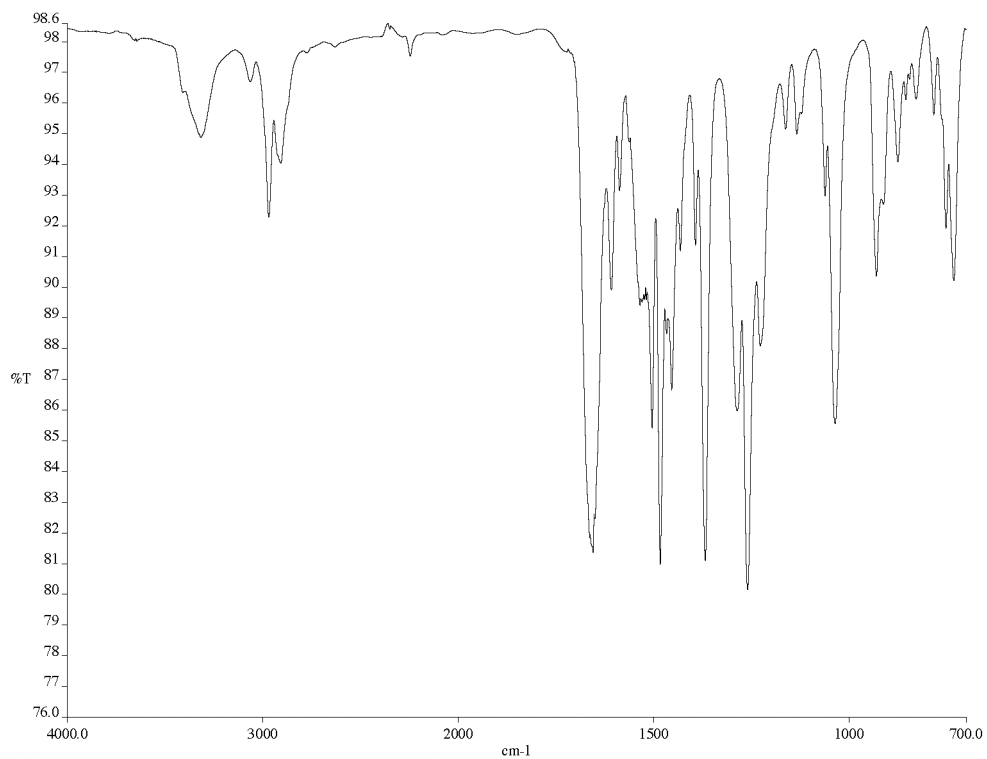
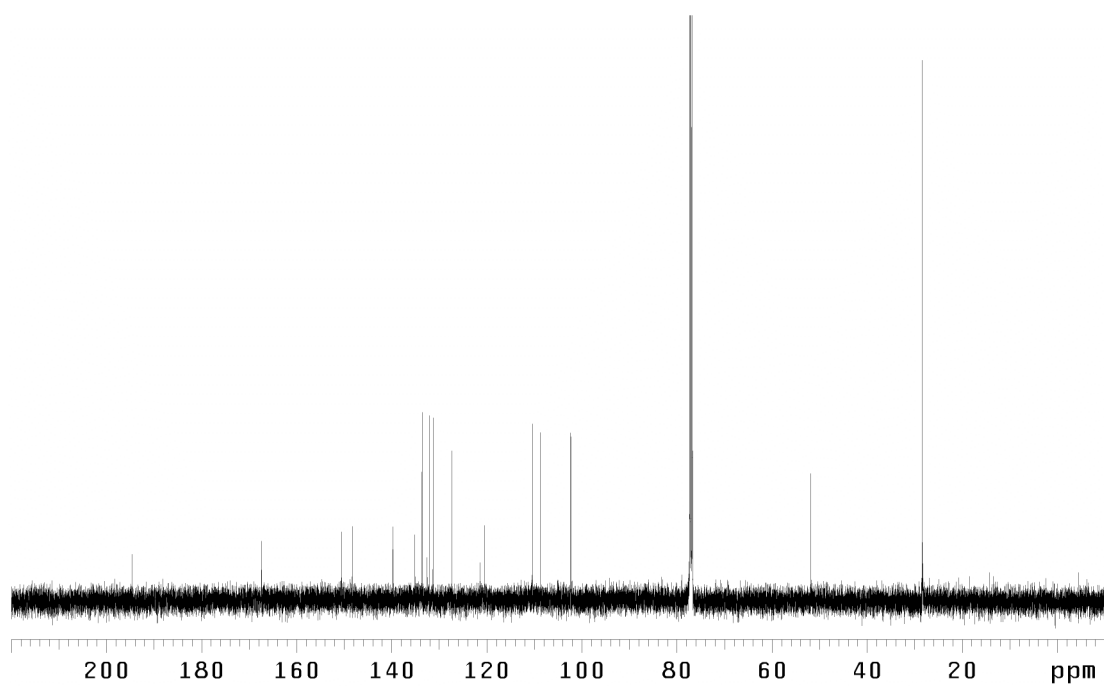
Figure A3.27.1 ¹H NMR (500 MHz, CDCl₃) of compound 552e

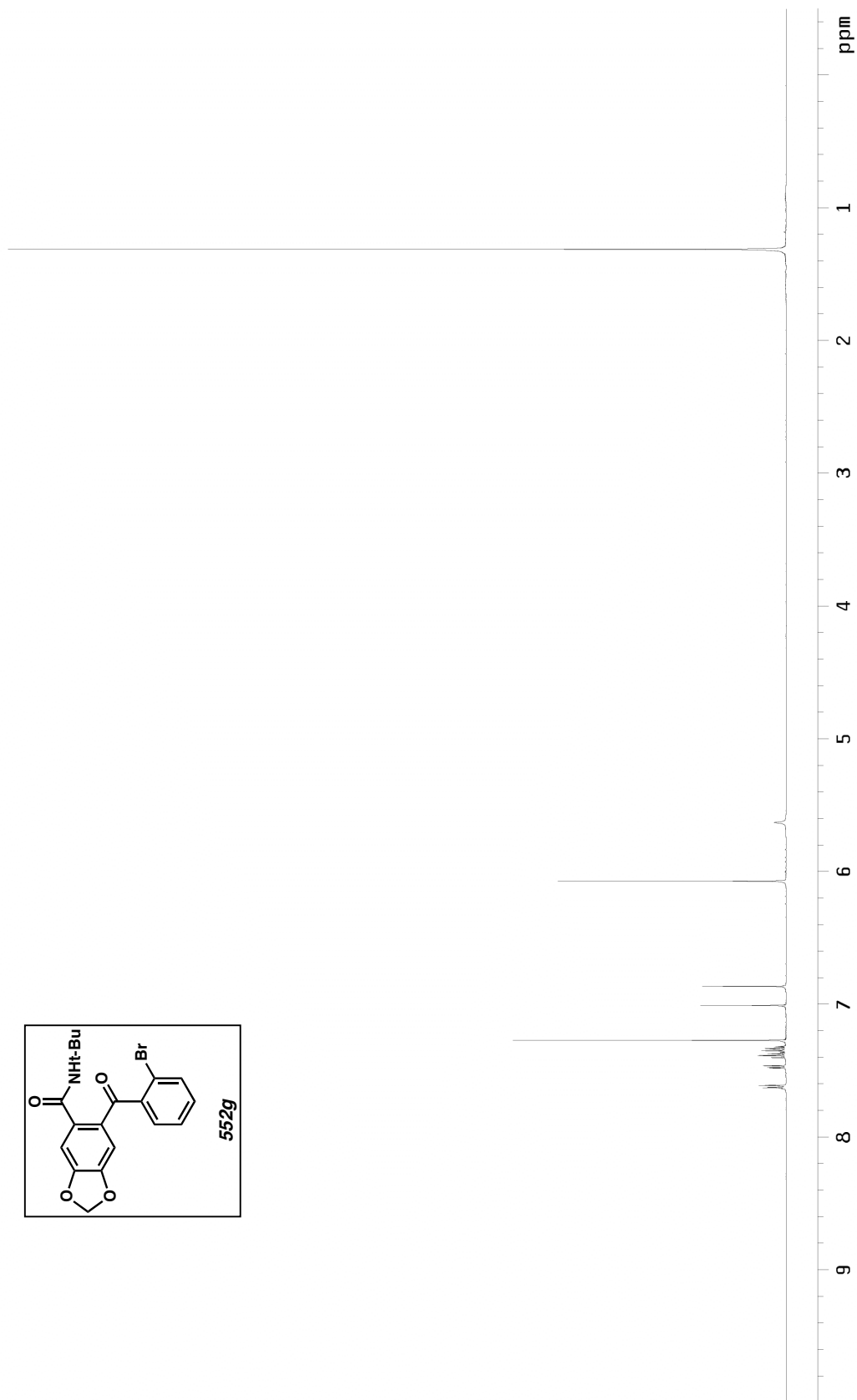
Figure A3.27.2 Infrared spectrum (thin film/NaCl) of compound **552e**Figure A3.27.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552e**

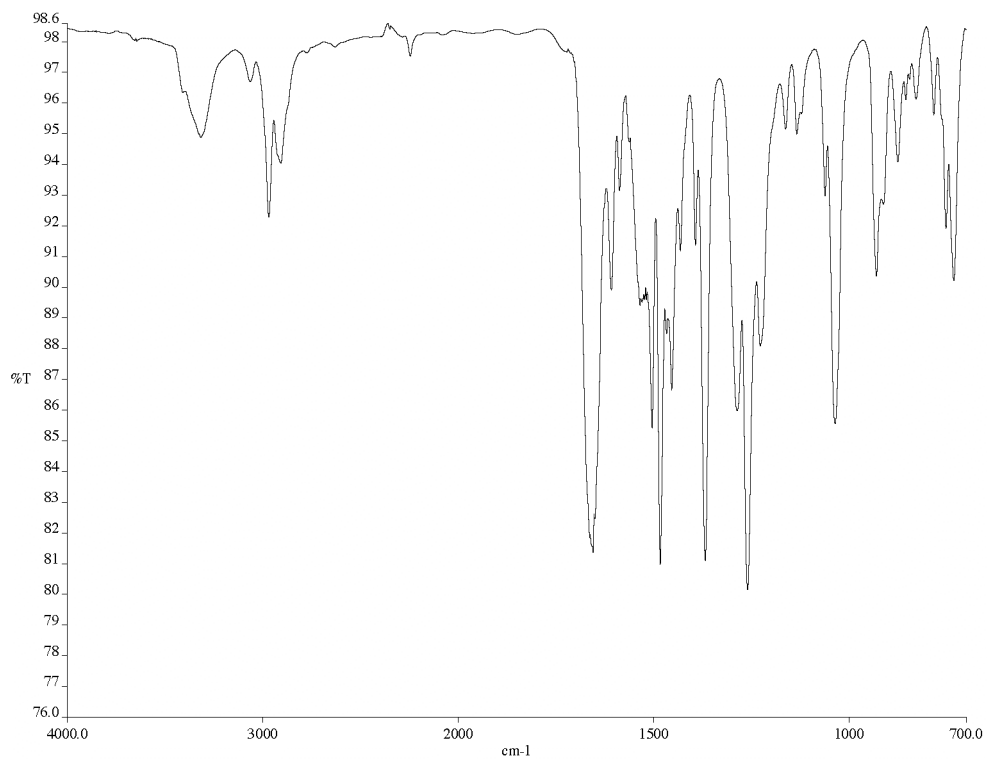
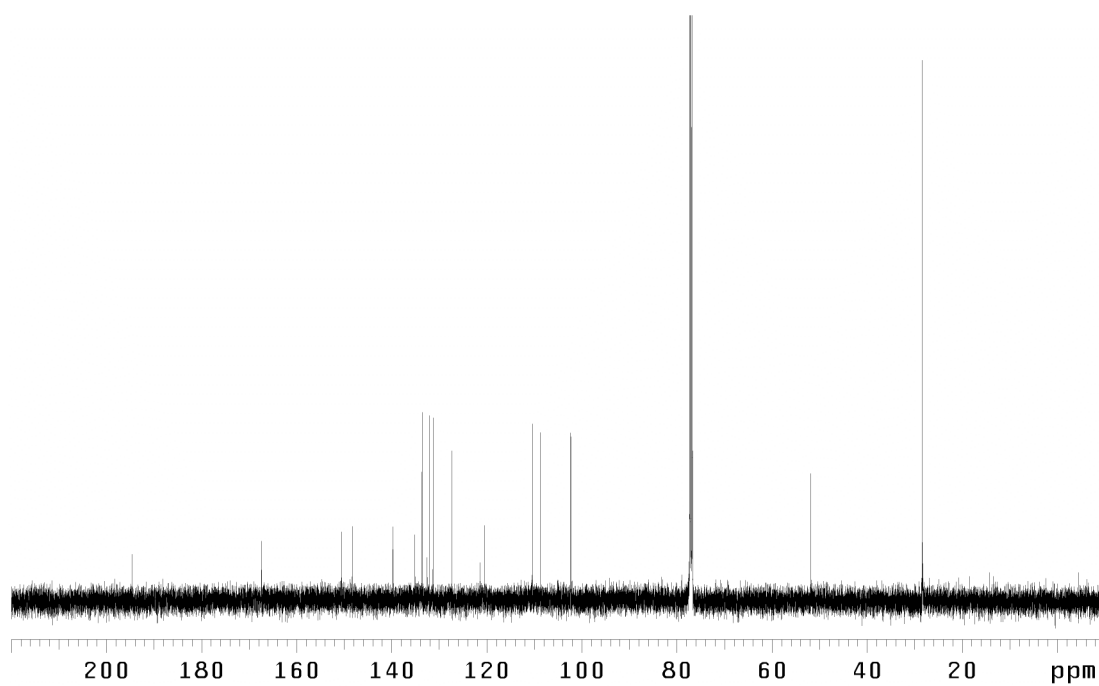
Figure A3.28.1 ¹H NMR (500 MHz, CDCl₃) of compound 552f

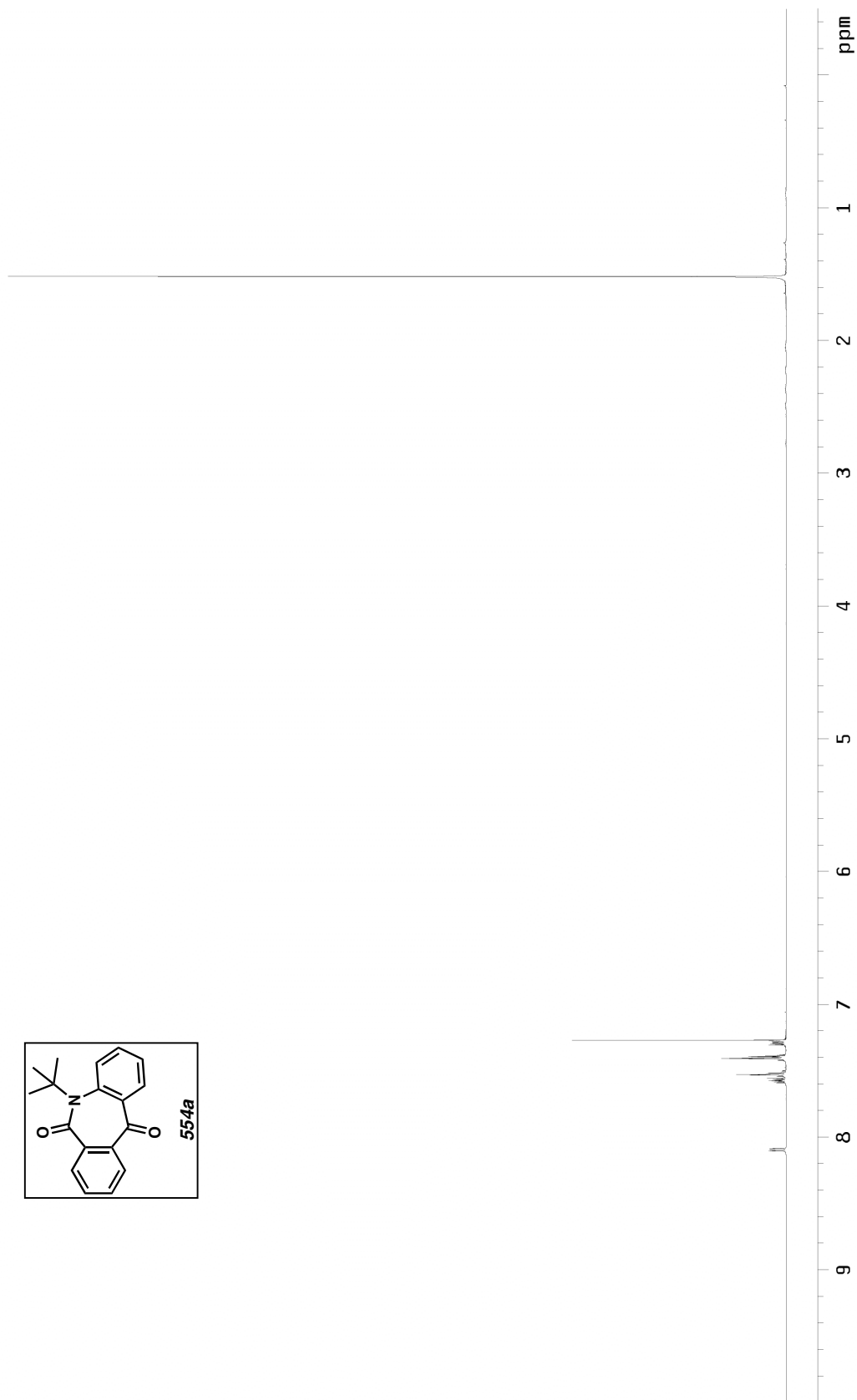
Figure A3.28.2 Infrared spectrum (thin film/NaCl) of compound **552f**Figure A3.28.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552f**

Figure A3.29.1 ^1H NMR (500 MHz, CDCl_3) of compound A3-2

Figure A3.29.2 Infrared spectrum (thin film/NaCl) of compound **A3-2**Figure A3.29.2 Infrared spectrum (thin film/NaCl) of compound **A3-2**

Figure A3.30.1 ¹H NMR (500 MHz, CDCl₃) of compound 552g

Figure A3.30.2 Infrared spectrum (thin film/NaCl) of compound **552g**Figure A3.30.3 ¹³C NMR (125 MHz, CDCl₃) of compound **552g**

Figure A3.31.1 ¹H NMR (500 MHz, CDCl₃) of compound 554a

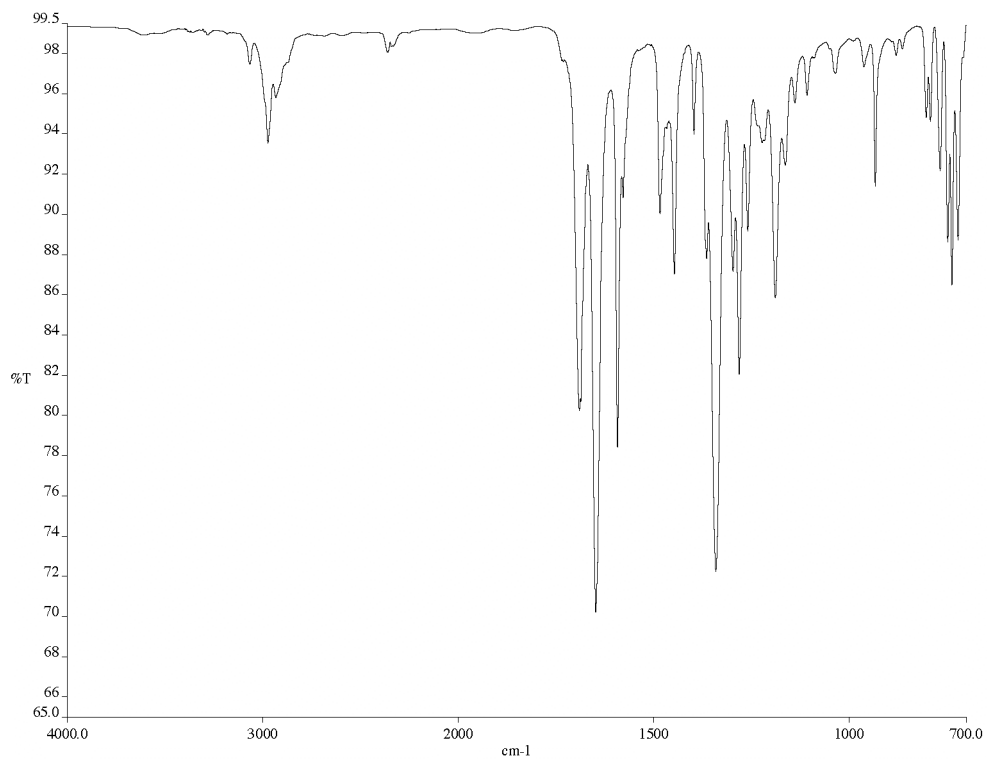
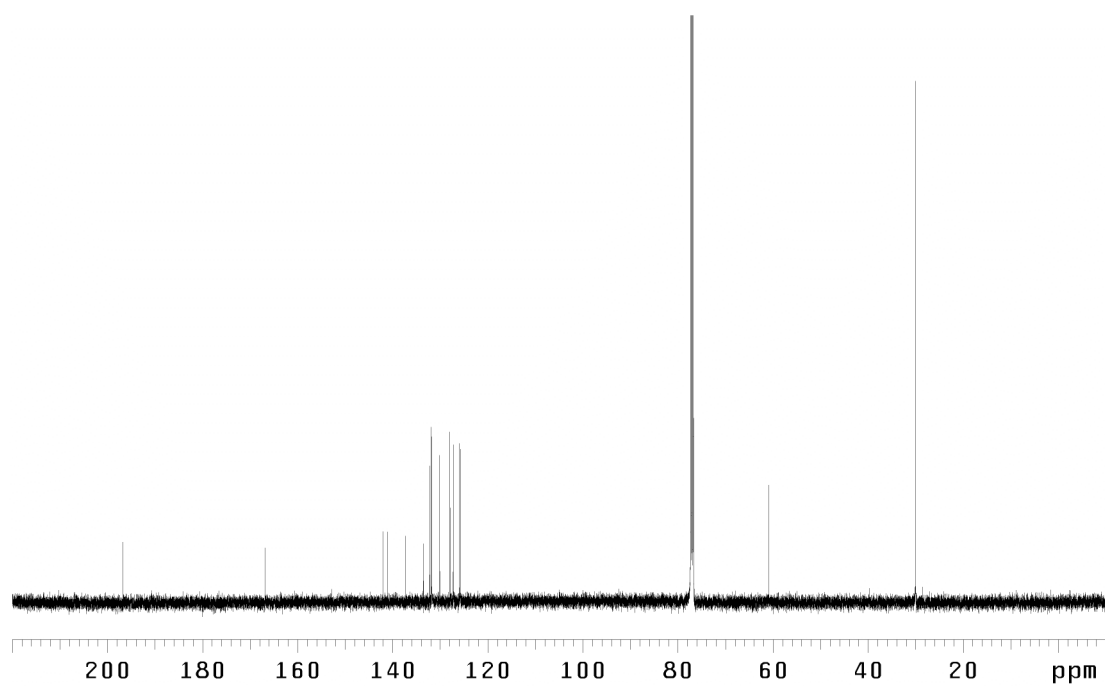
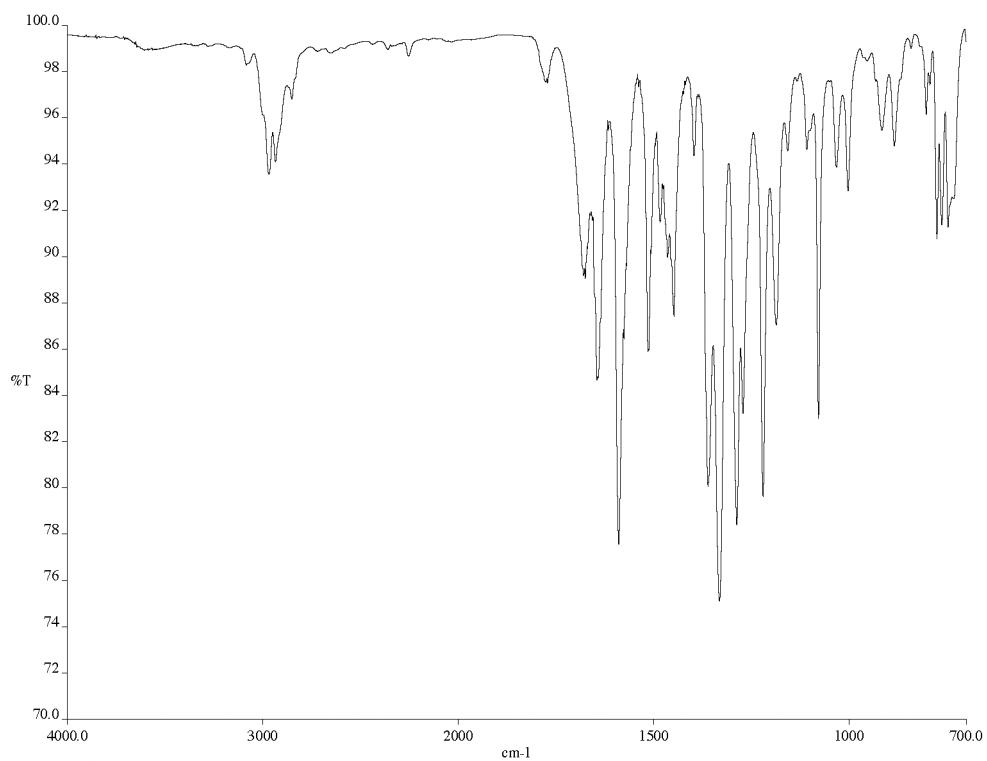
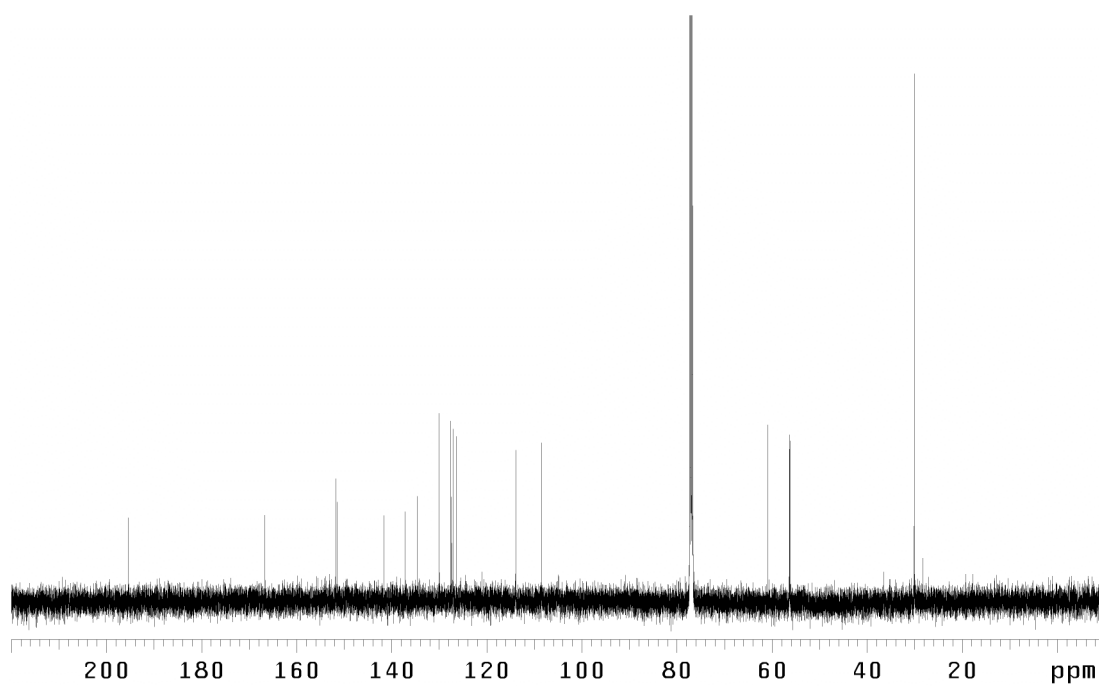
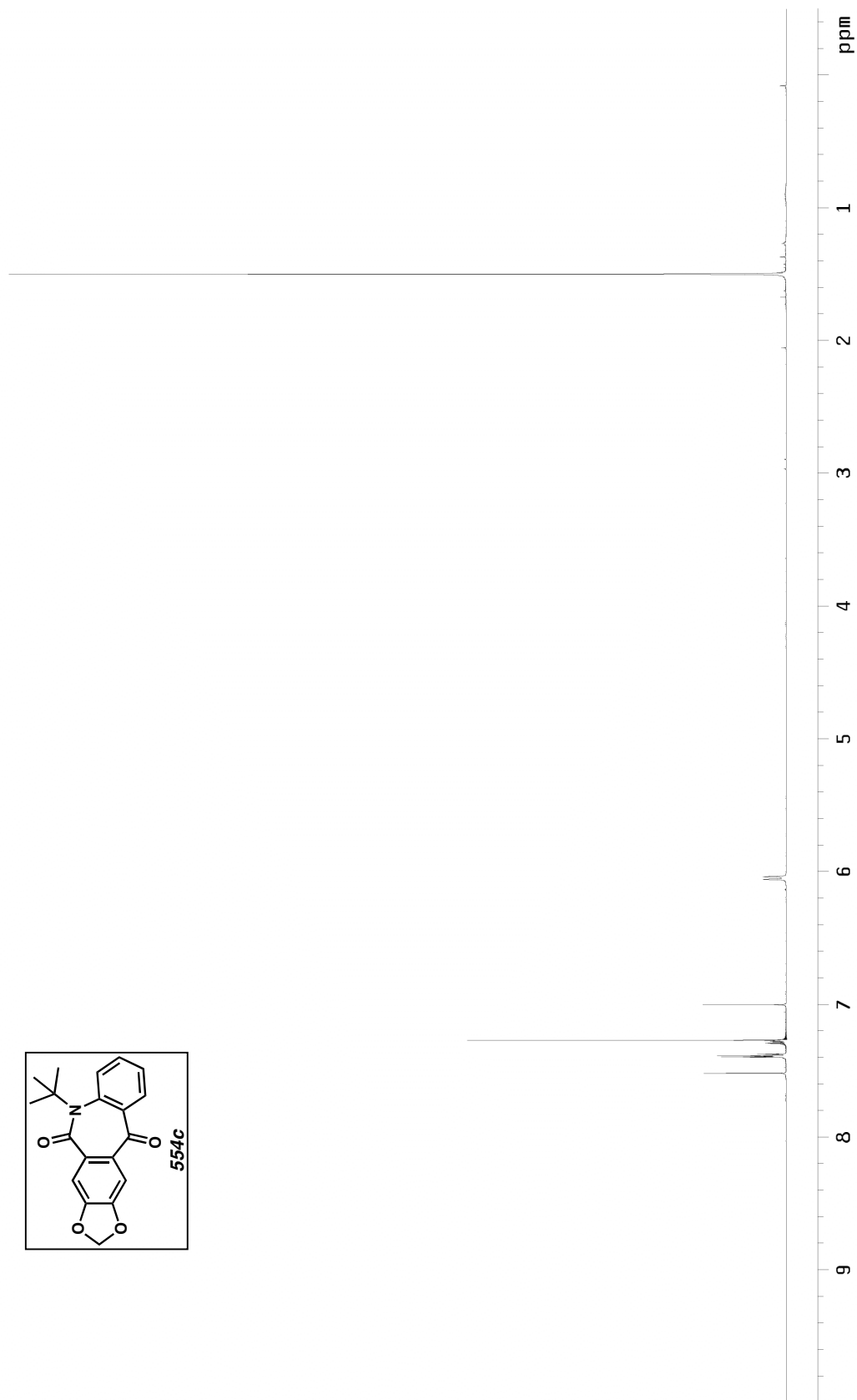
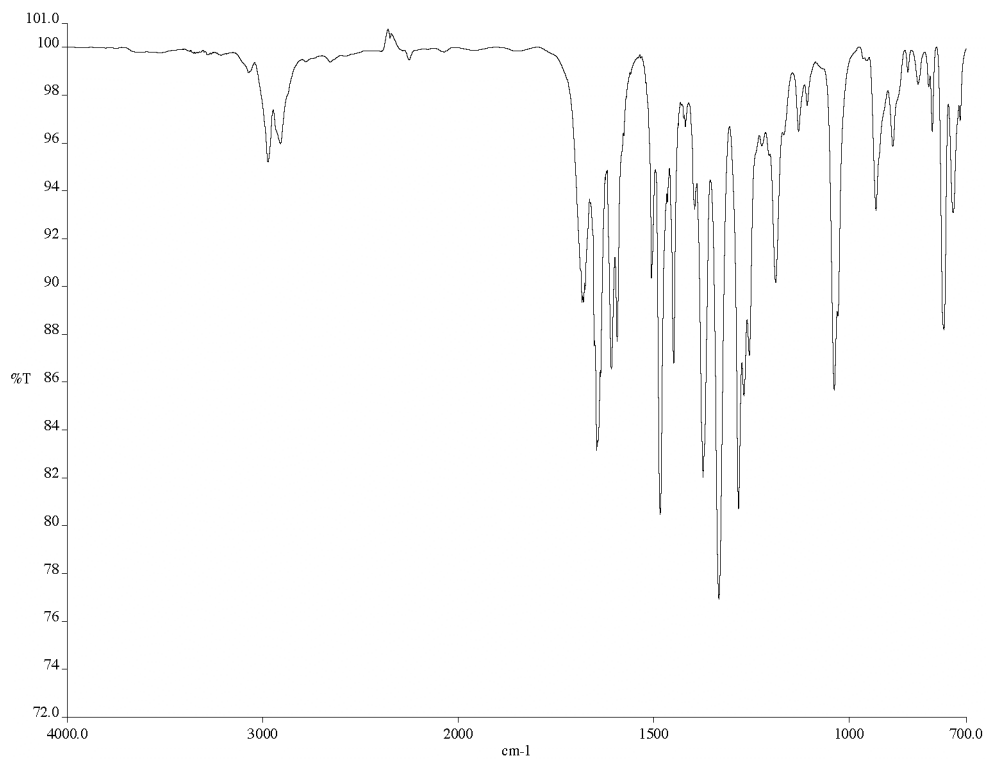
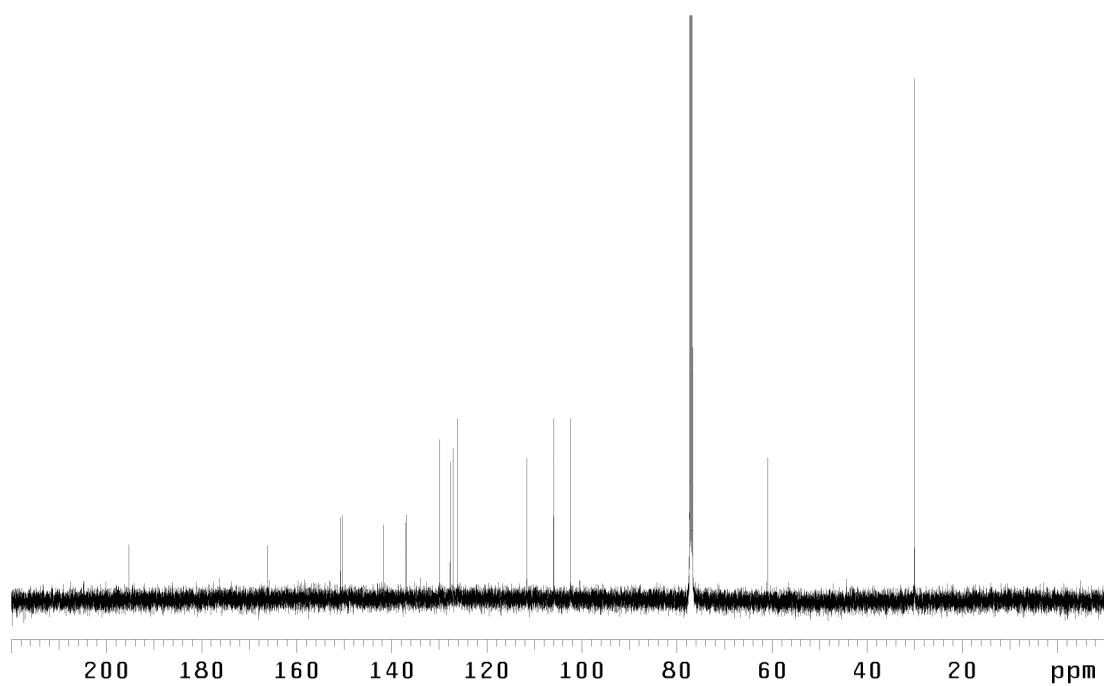
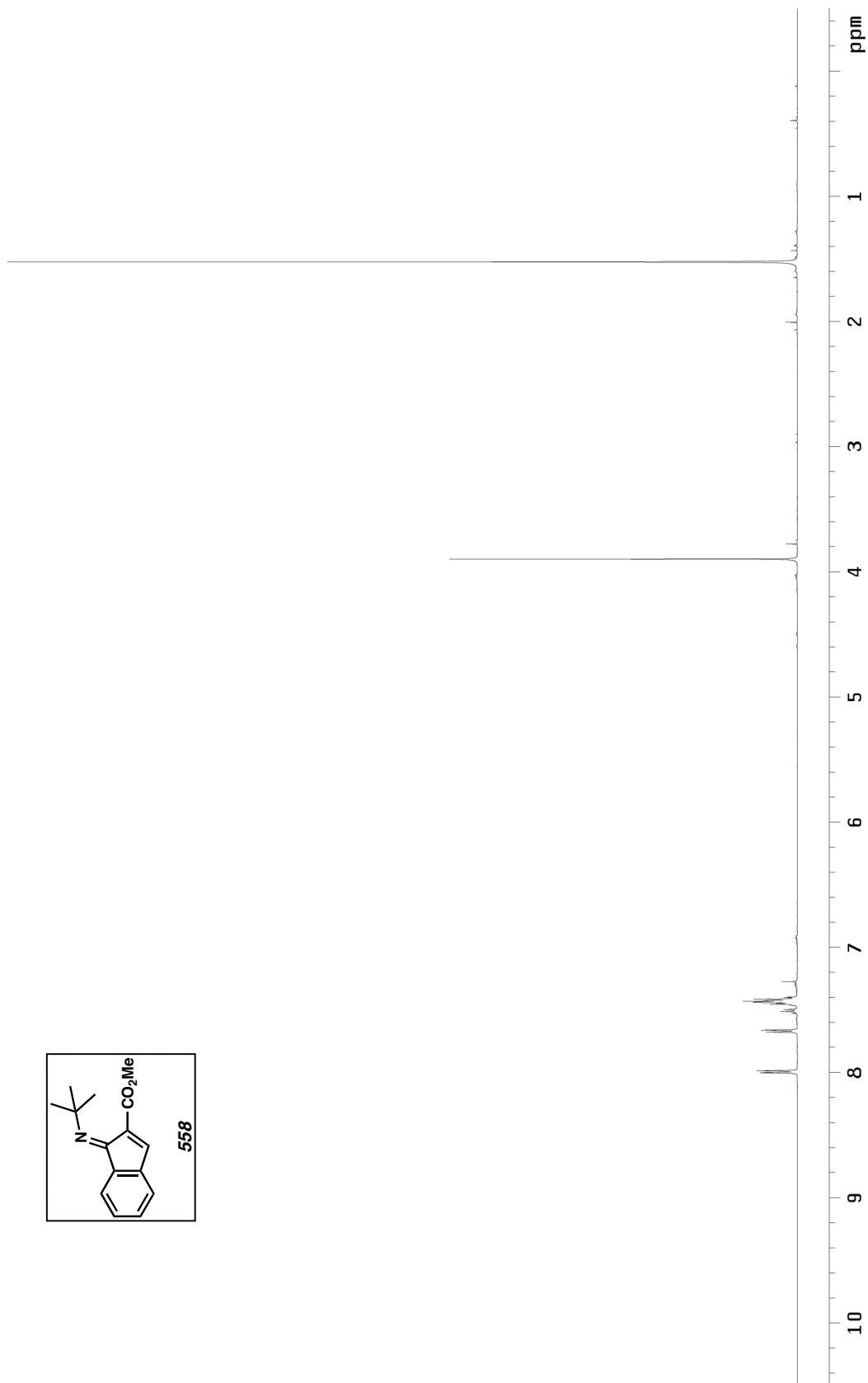
Figure A3.31.2 Infrared spectrum (thin film/NaCl) of compound **554a**Figure A3.31.3 ¹³C NMR (125 MHz, CDCl₃) of compound **554a**

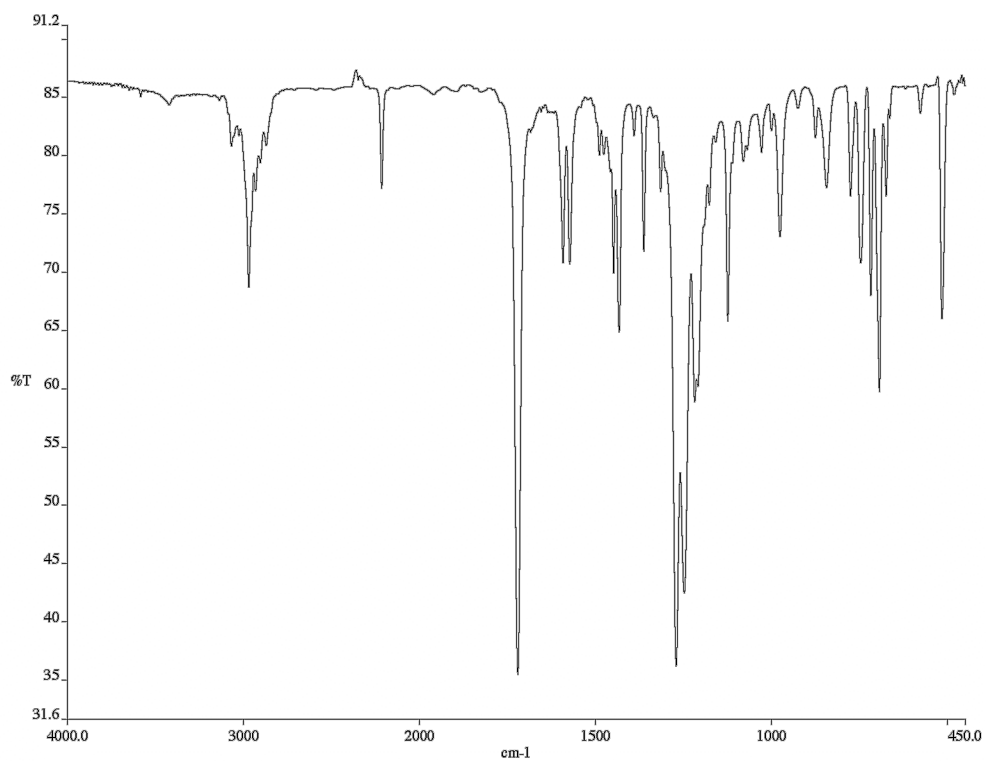
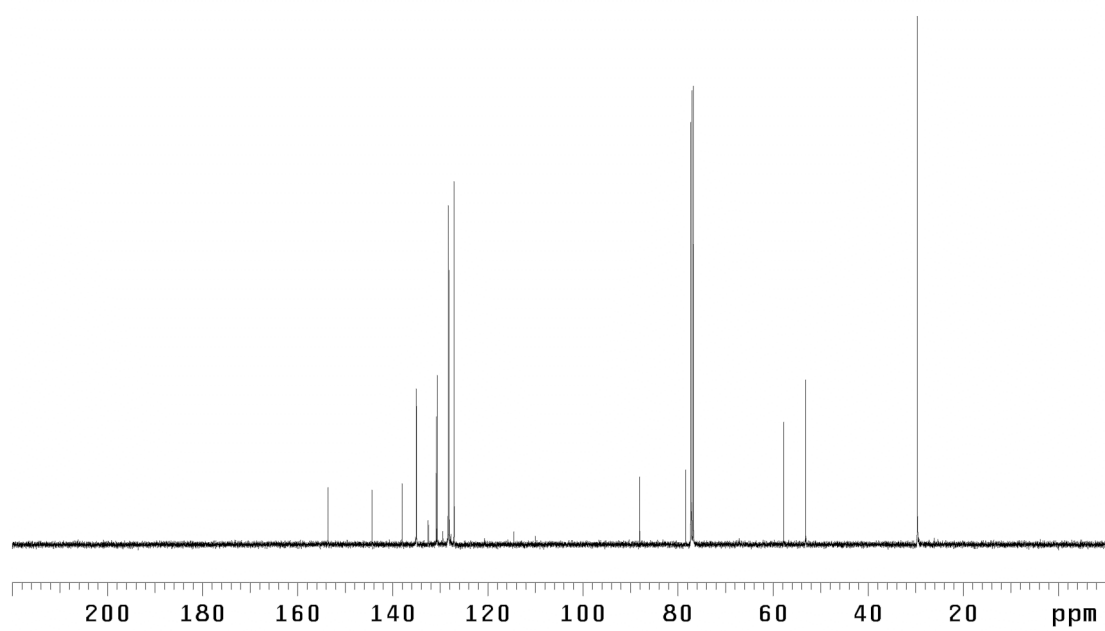
Figure A3.31.1 ^1H NMR (500 MHz, CDCl_3) of compound 554a

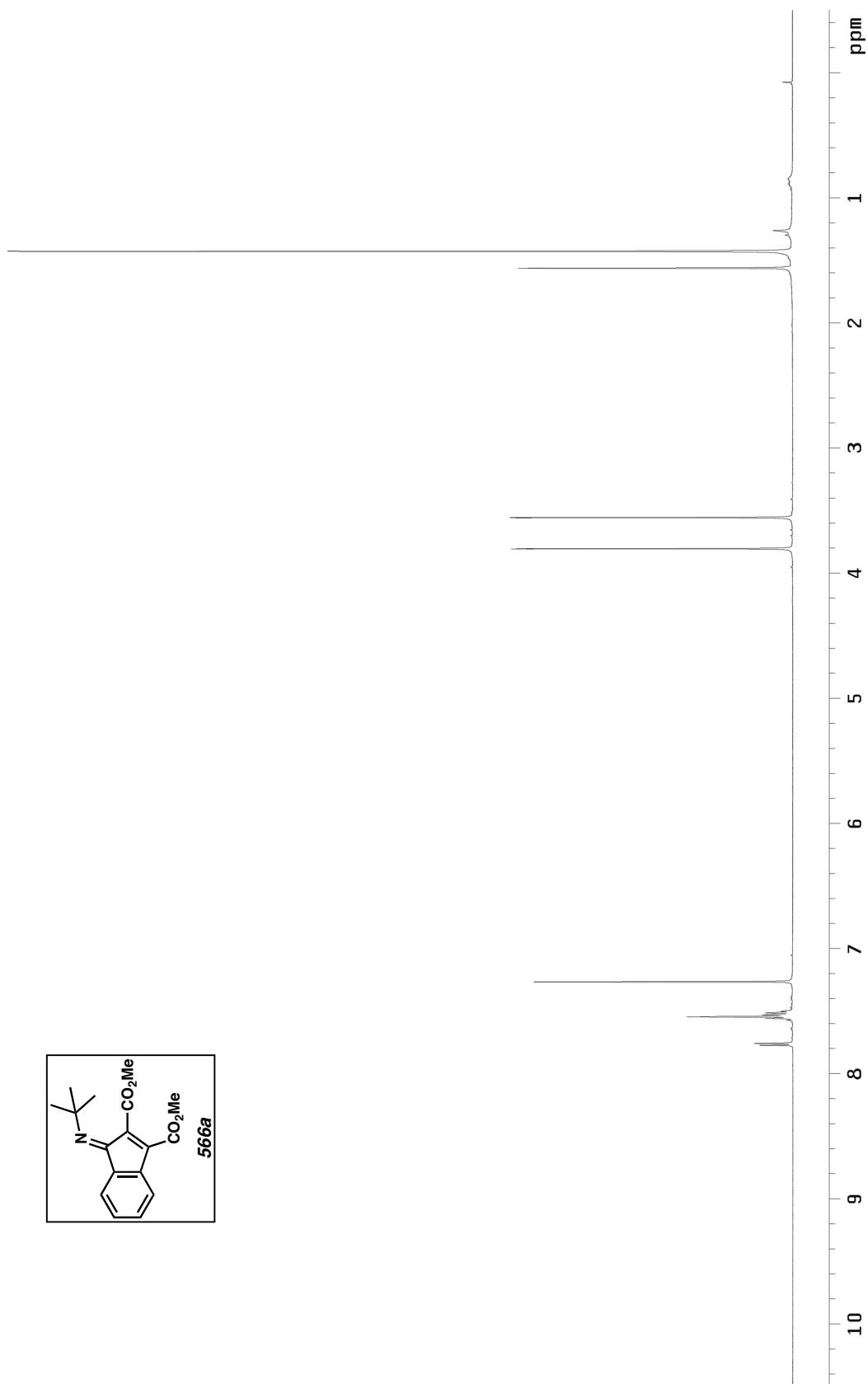
Figure A3.32.2 Infrared spectrum (thin film/NaCl) of compound **554b**Figure A3.32.3 ¹³C NMR (125 MHz, CDCl₃) of compound **554b**

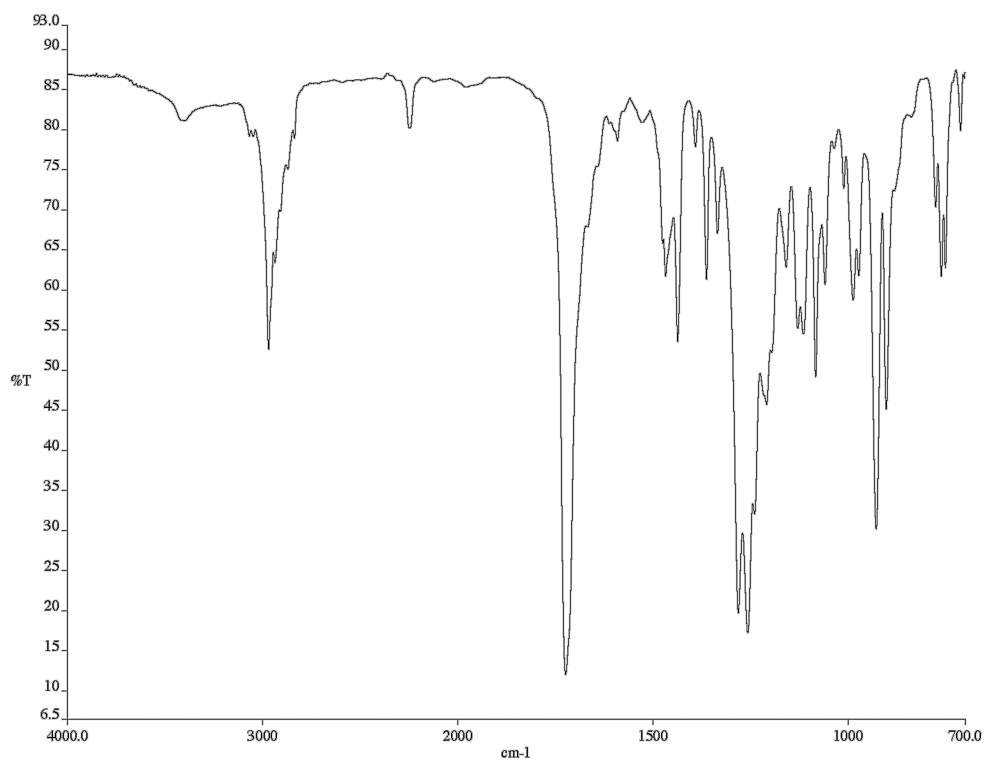
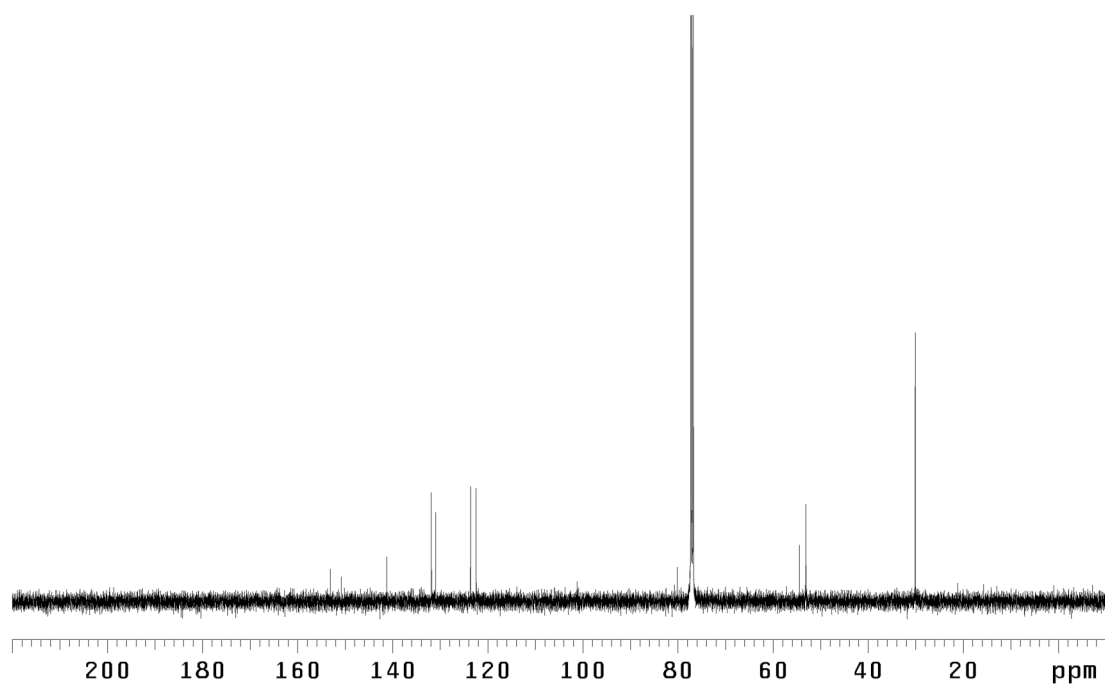
Figure A3.33.1 ^1H NMR (500 MHz, CDCl_3) of compound 554c

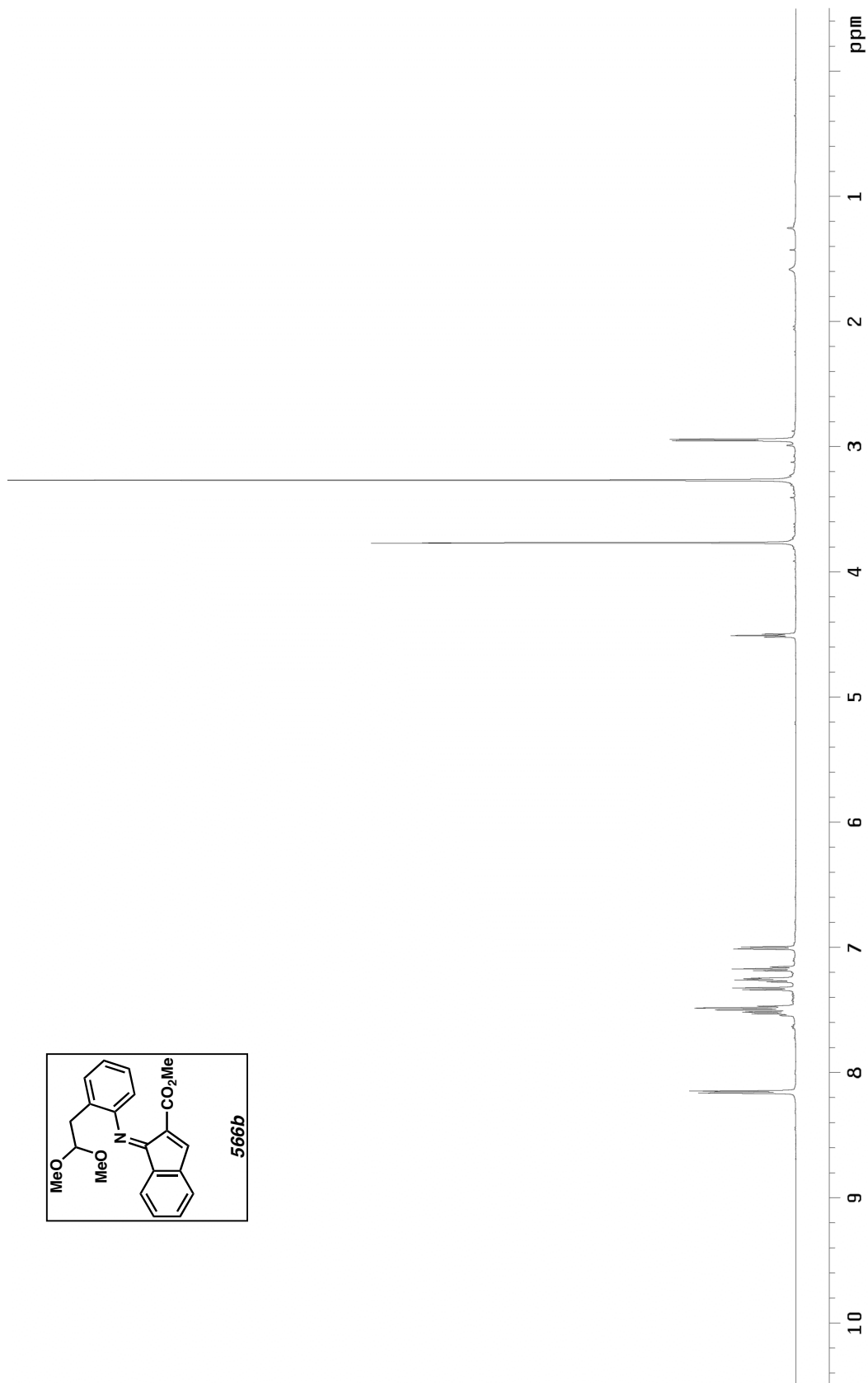
Figure A3.33.2 Infrared spectrum (thin film/NaCl) of compound **554c**Figure A3.33.2 Infrared spectrum (thin film/NaCl) of compound **554c**

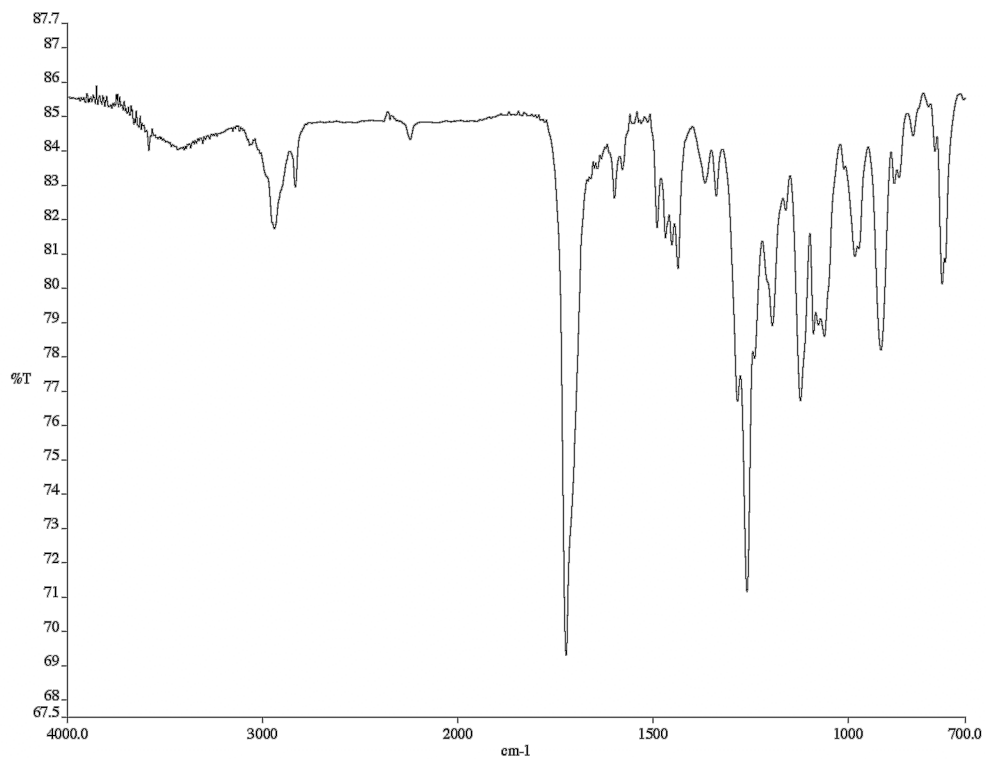
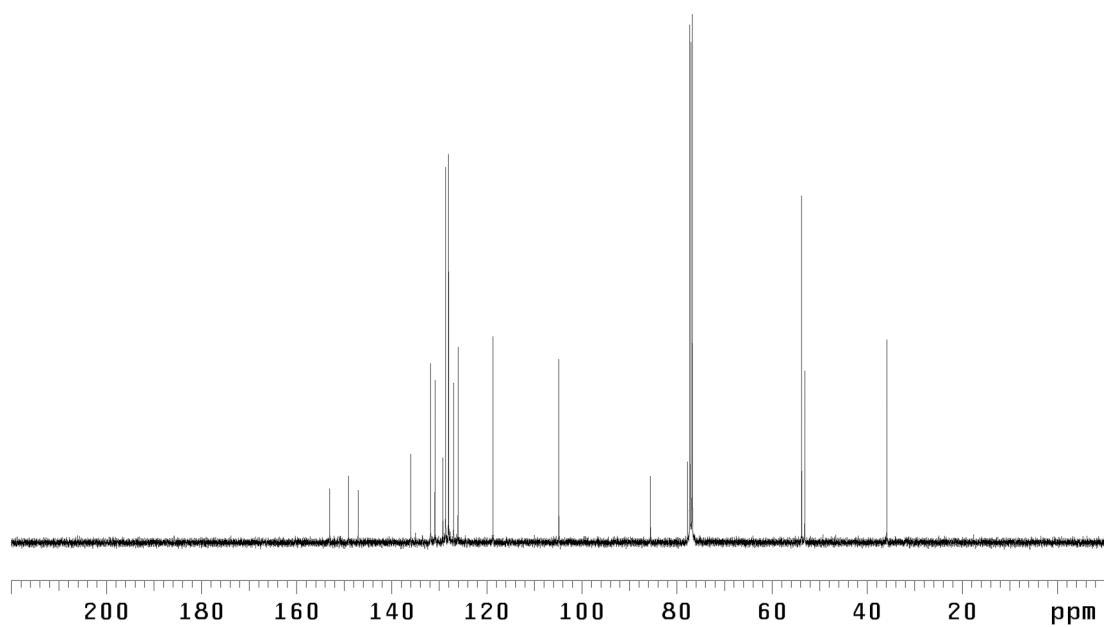
Figure A3.34.1 ¹H NMR (500 MHz, CDCl₃) of compound 558

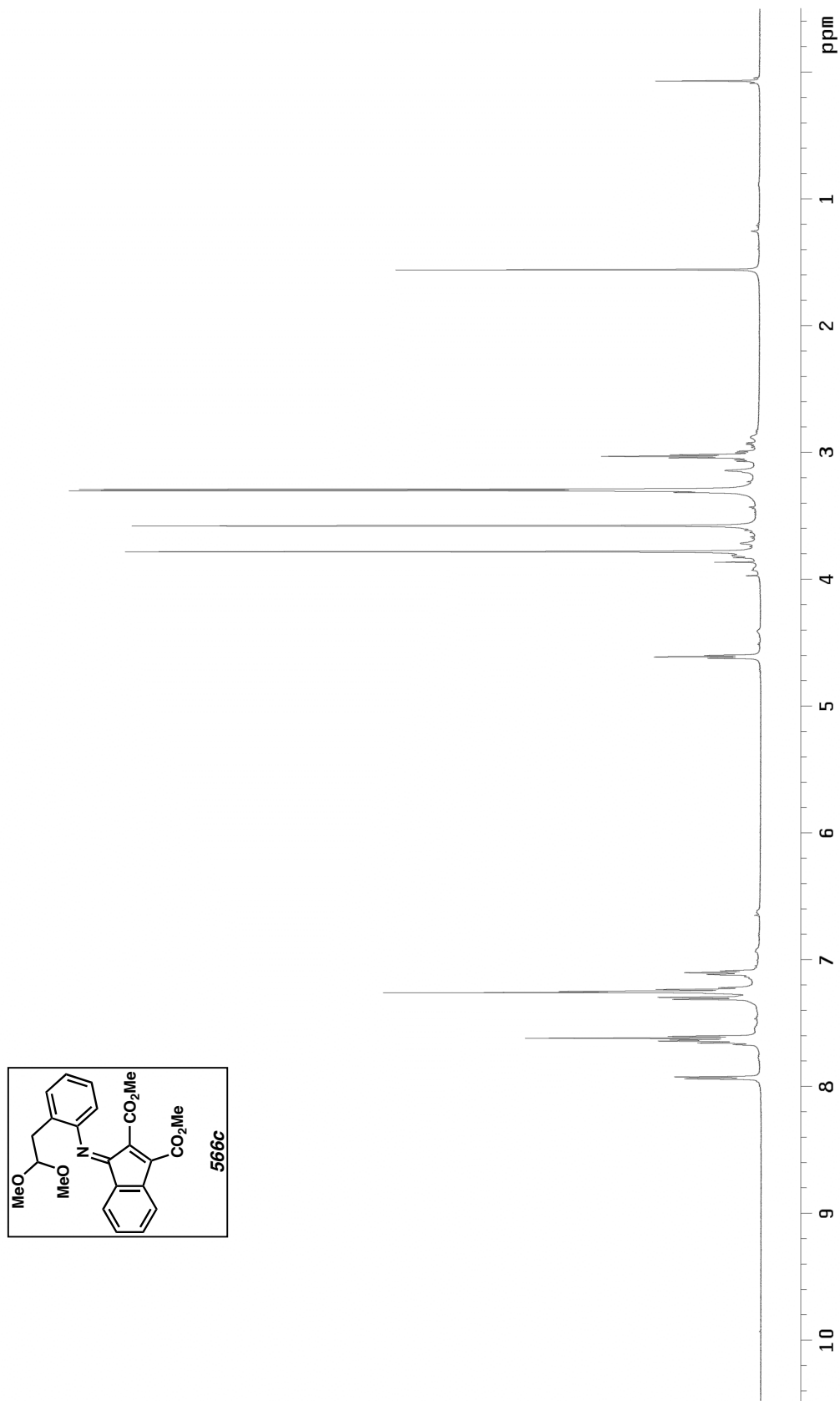
Figure A3.34.2 Infrared spectrum (thin film/NaCl) of compound **558**Figure A3.34.3 ^{13}C NMR (125 MHz, CDCl_3) of compound **558**

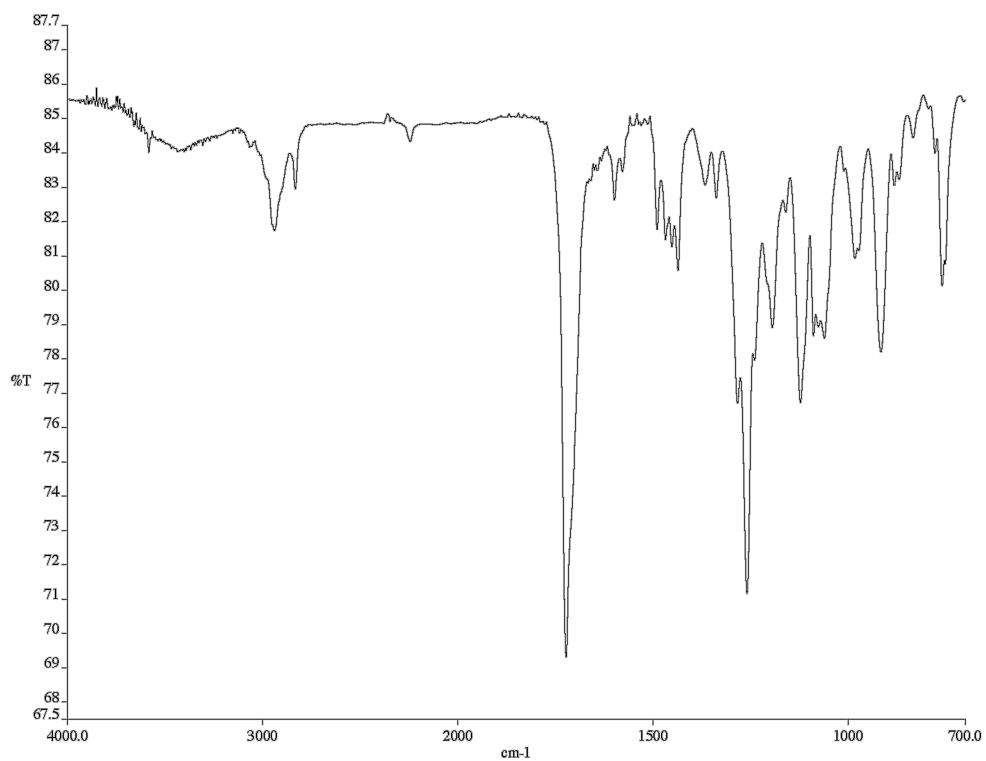
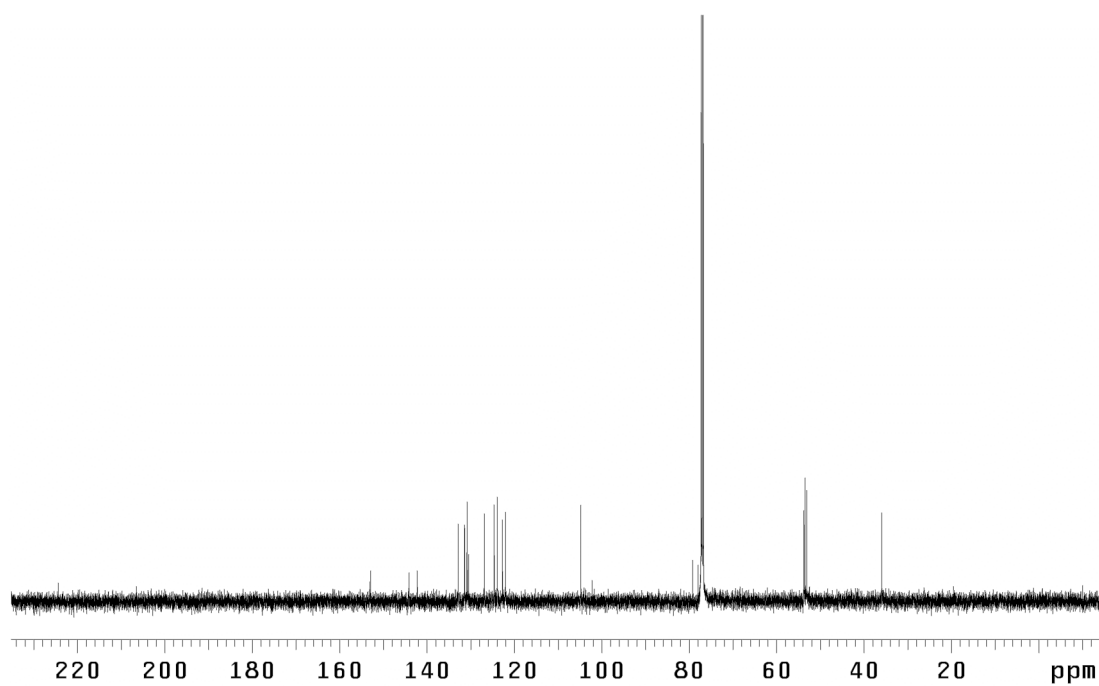
Figure A3.35.1 ^1H NMR (500 MHz, CDCl_3) of compound **566a**

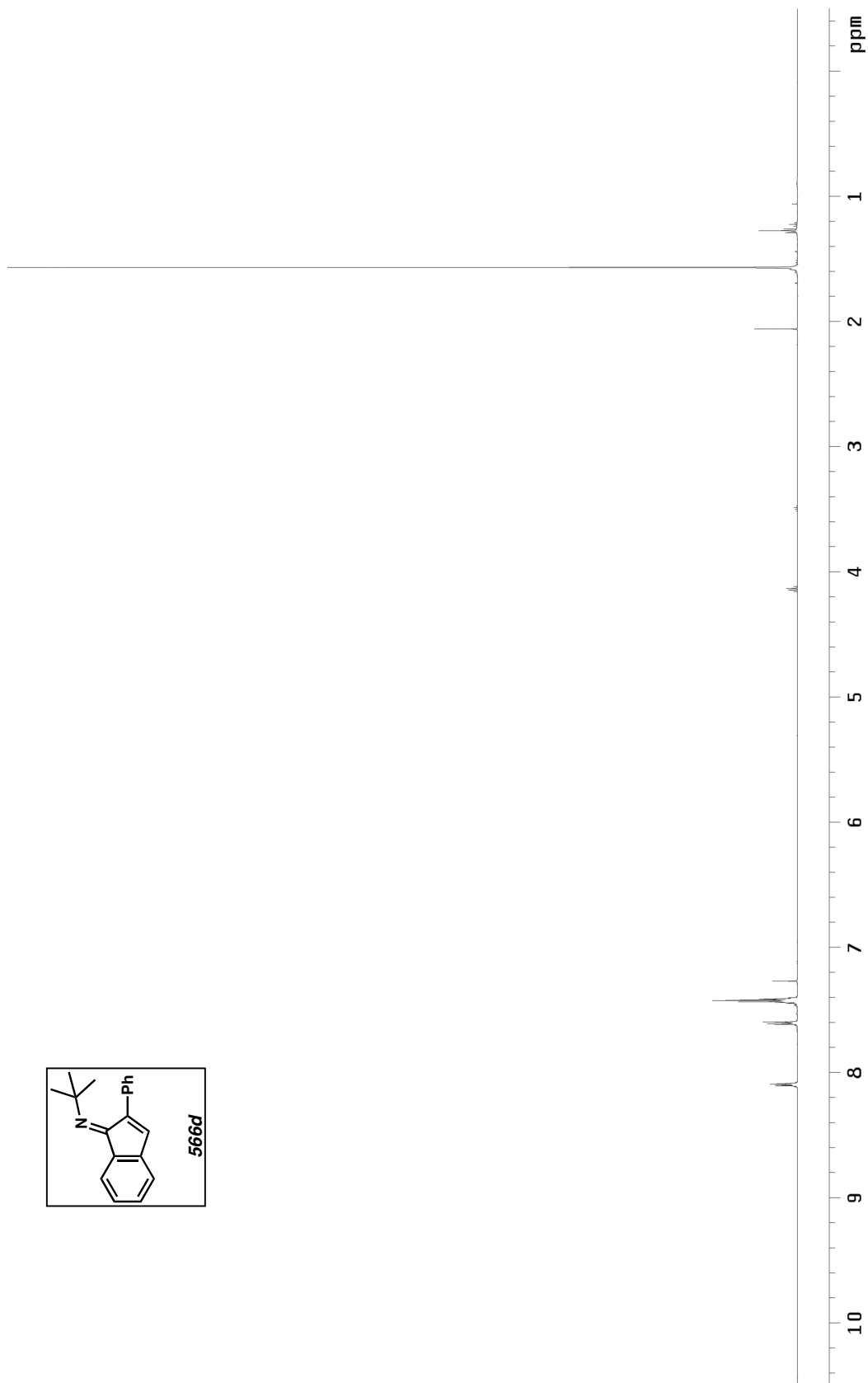
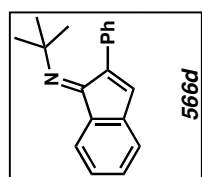
Figure A3.35.2 Infrared spectrum (thin film/NaCl) of compound **566a**Figure A3.35.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566a**

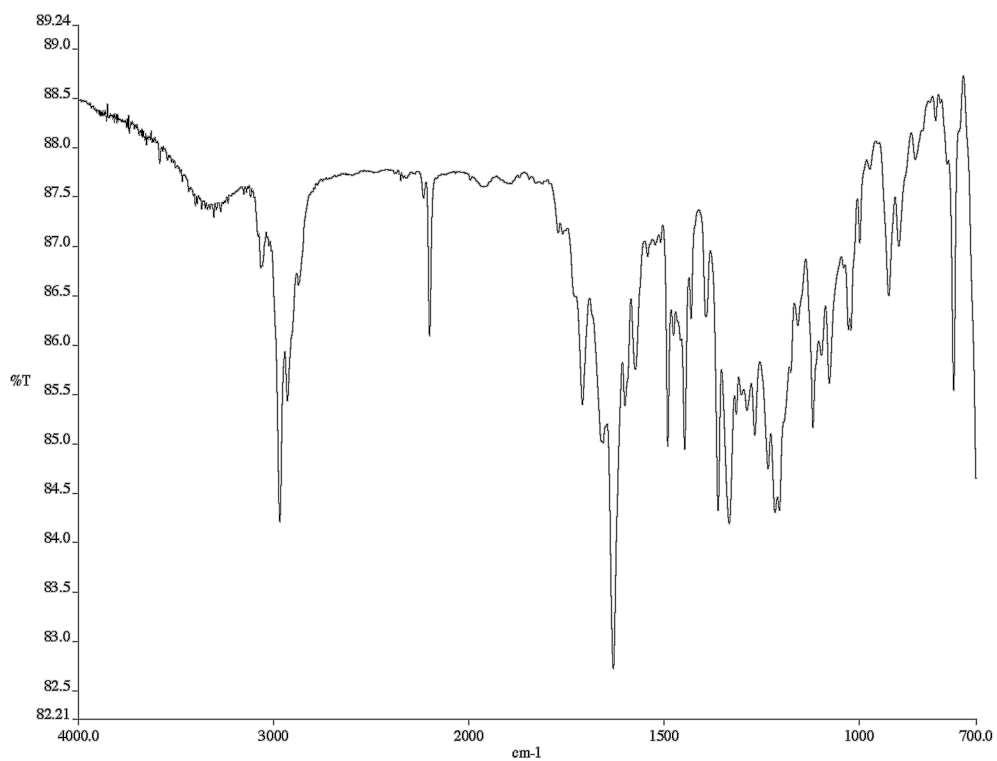
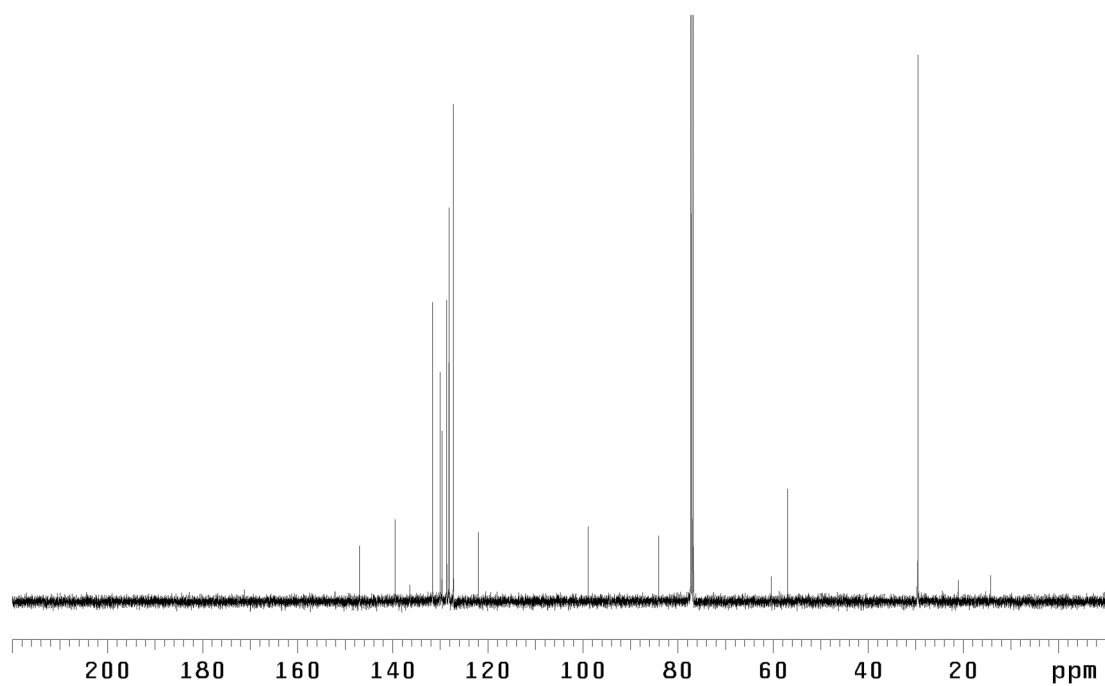
Figure A3.3.6.1 ¹H NMR (500 MHz, CDCl₃) of compound **566b**

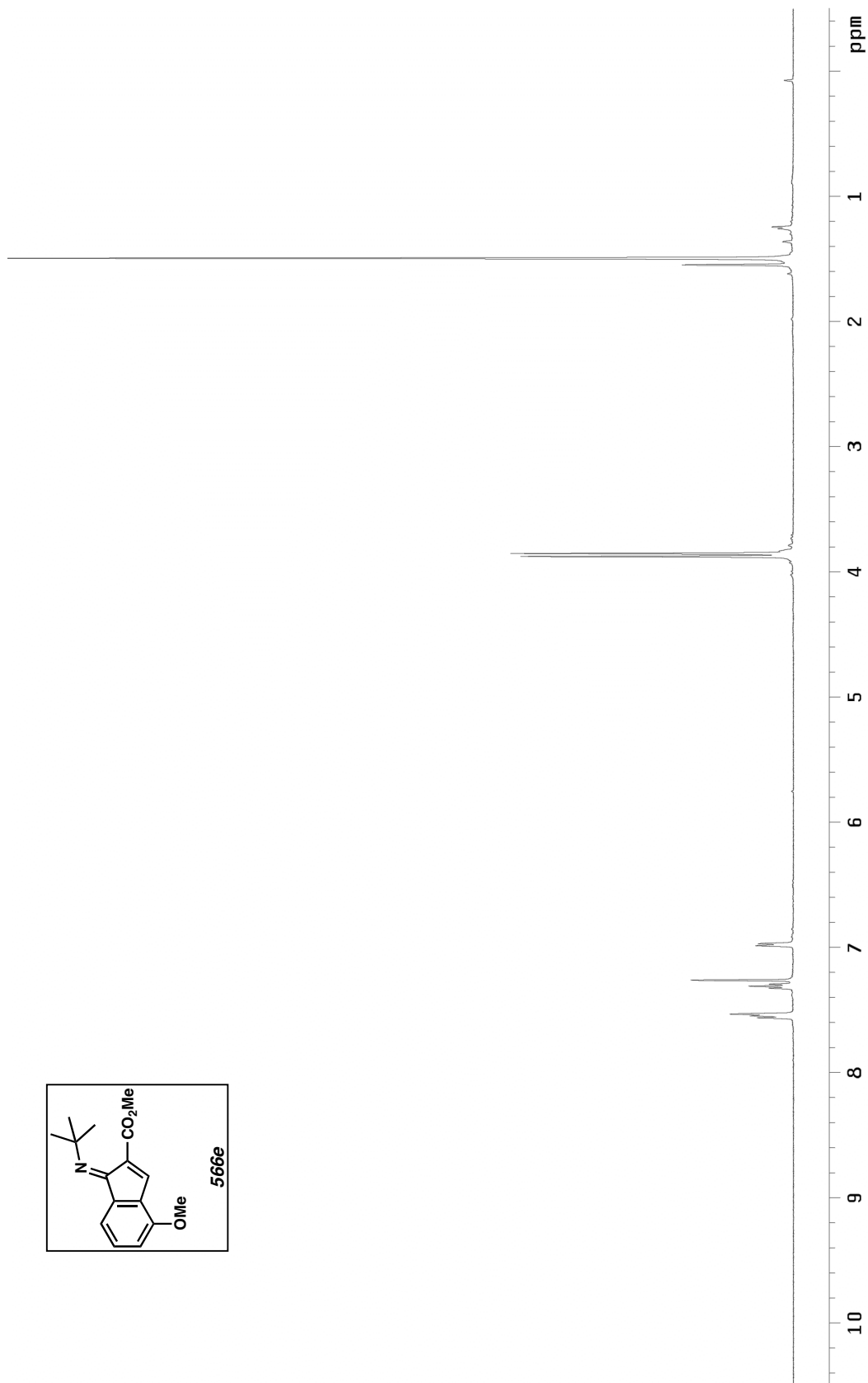
Figure A3.36.2 Infrared spectrum (thin film/NaCl) of compound **566b**Figure A3.36.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566b**

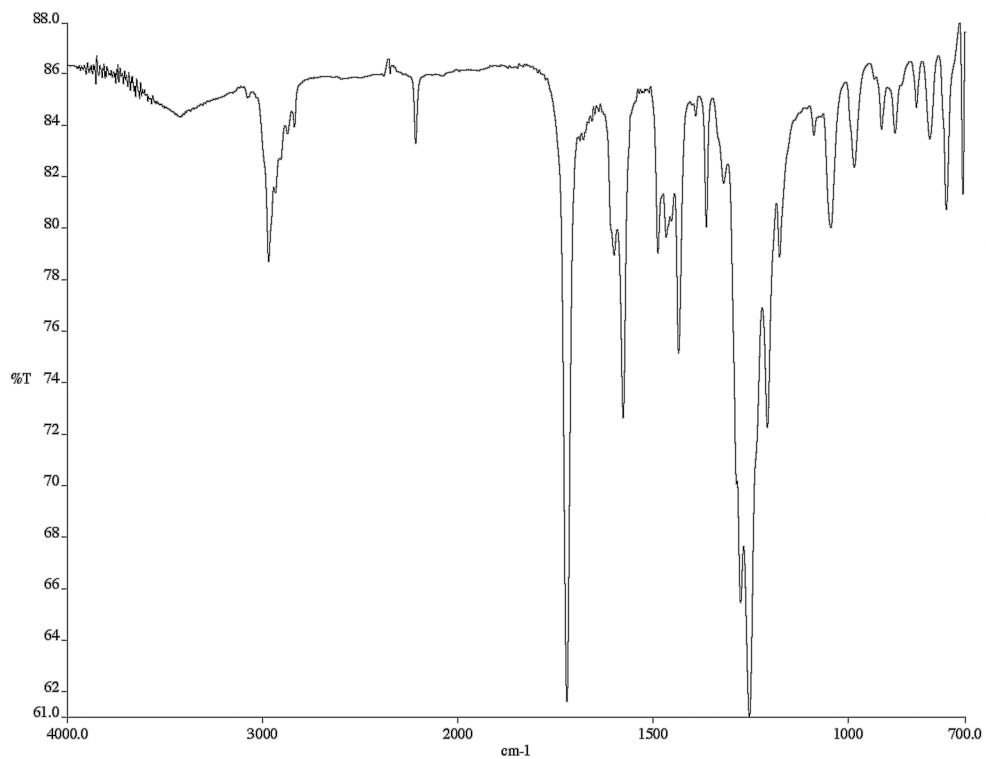
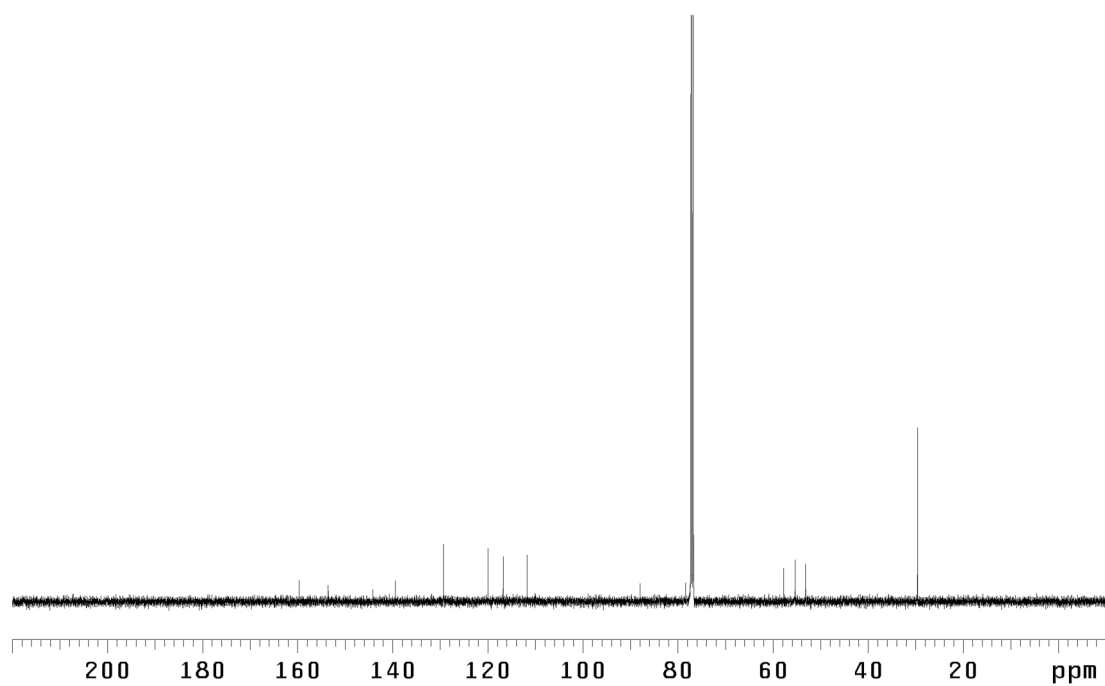
Figure A3.37.1 ¹H NMR (500 MHz, CDCl₃) of compound 566c

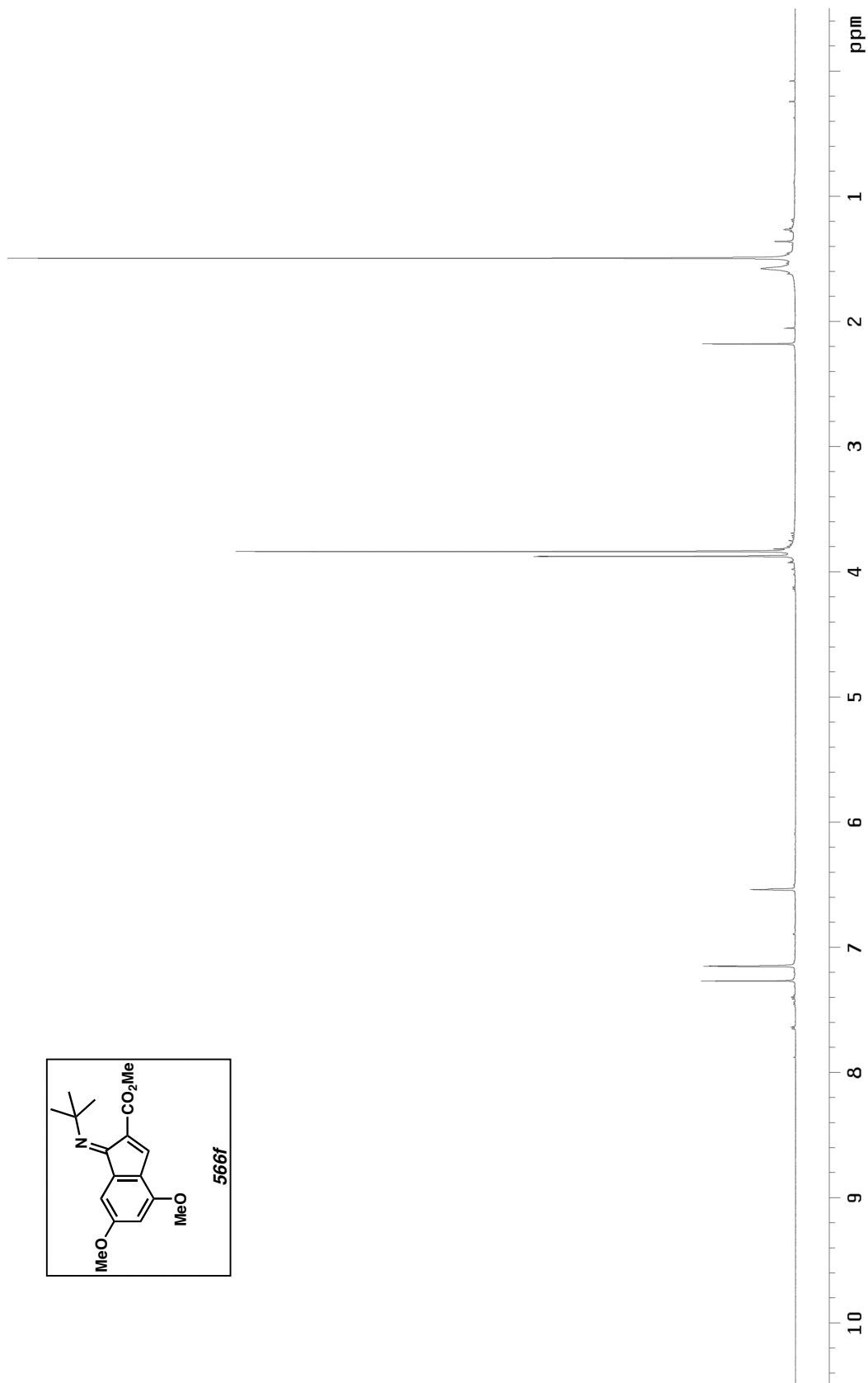
Figure A3.37.2 Infrared spectrum (thin film/NaCl) of compound **566c**Figure A3.37.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566c**

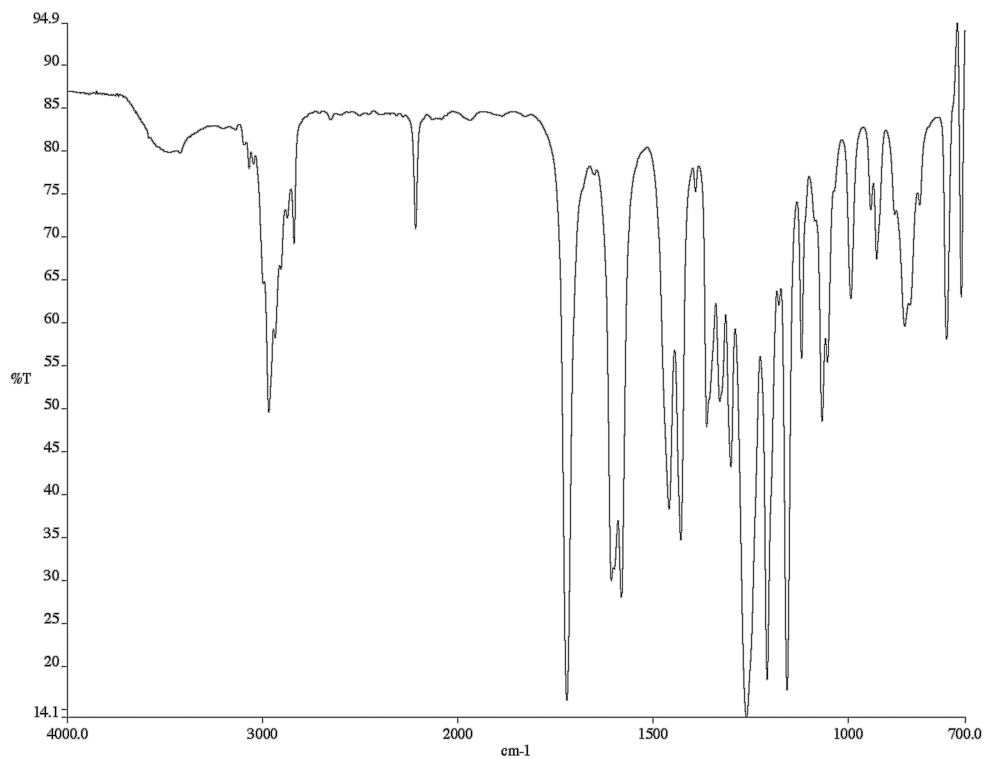
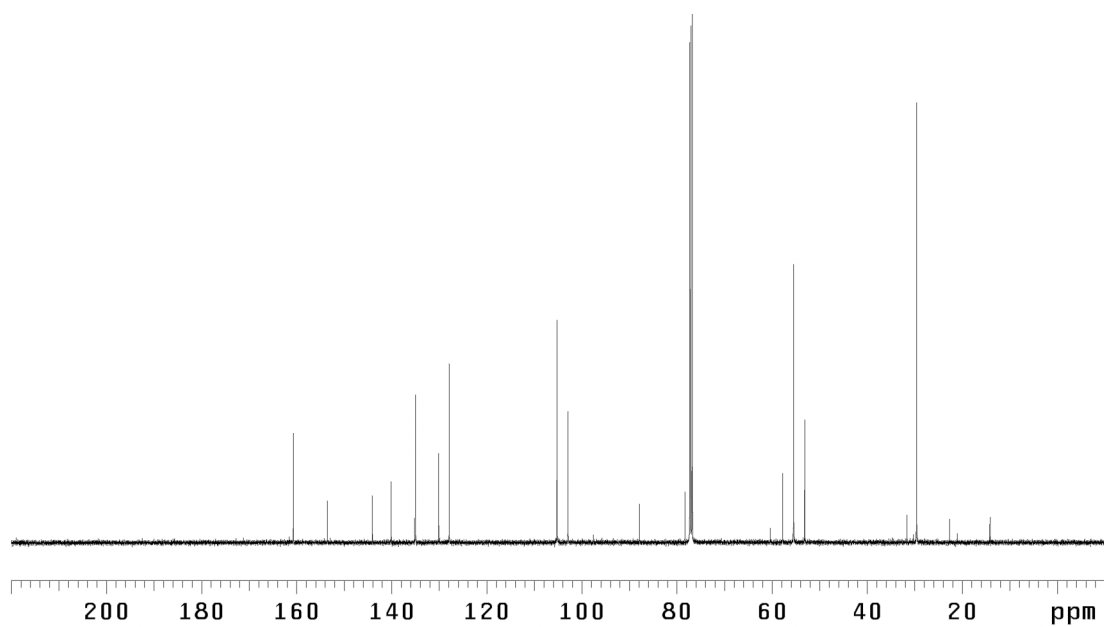
Figure A3.38.1 ¹H NMR (500 MHz, CDCl₃) of compound **566d**

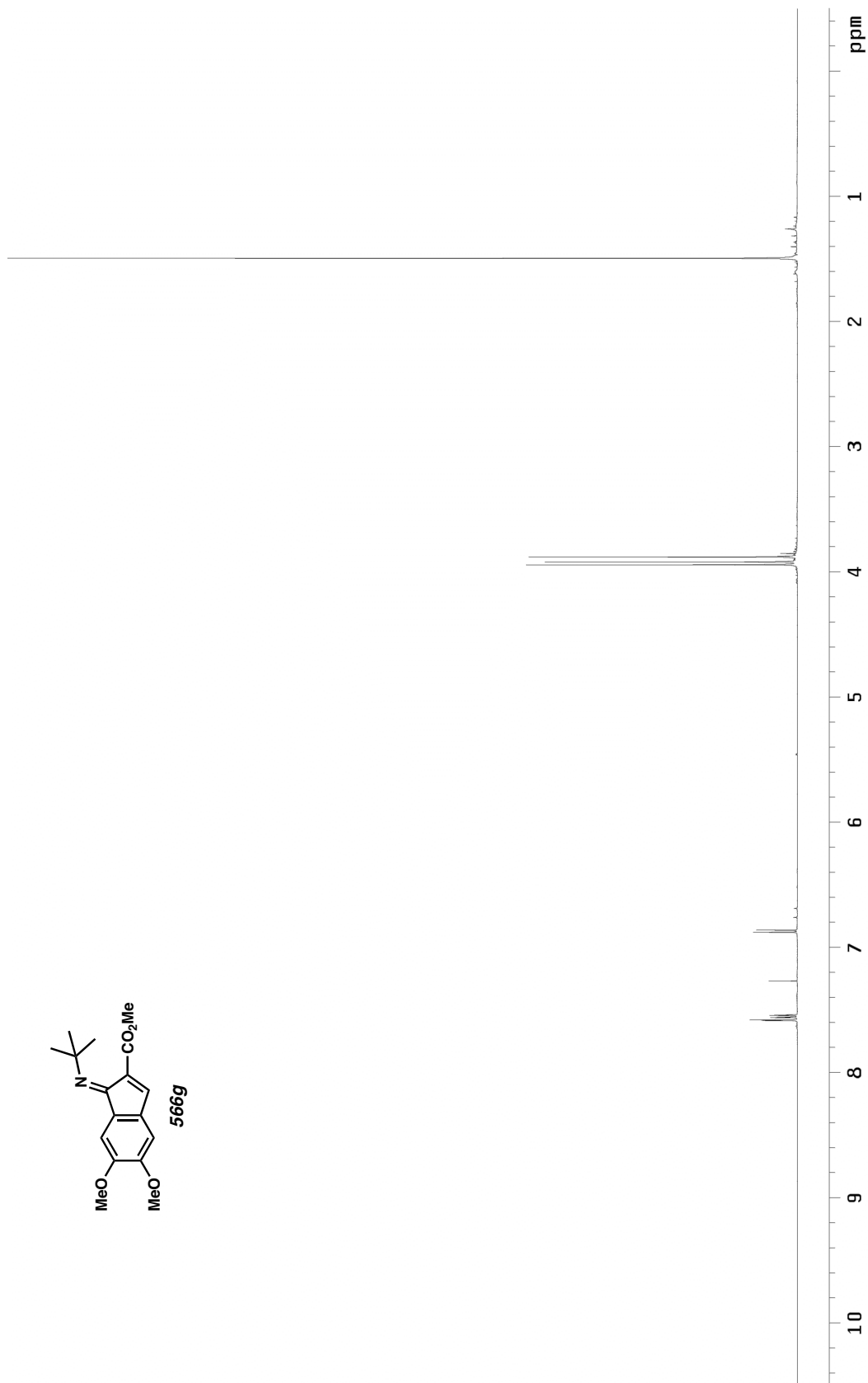
Figure A3.38.2 Infrared spectrum (thin film/NaCl) of compound **566d**Figure A3.38.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566d**

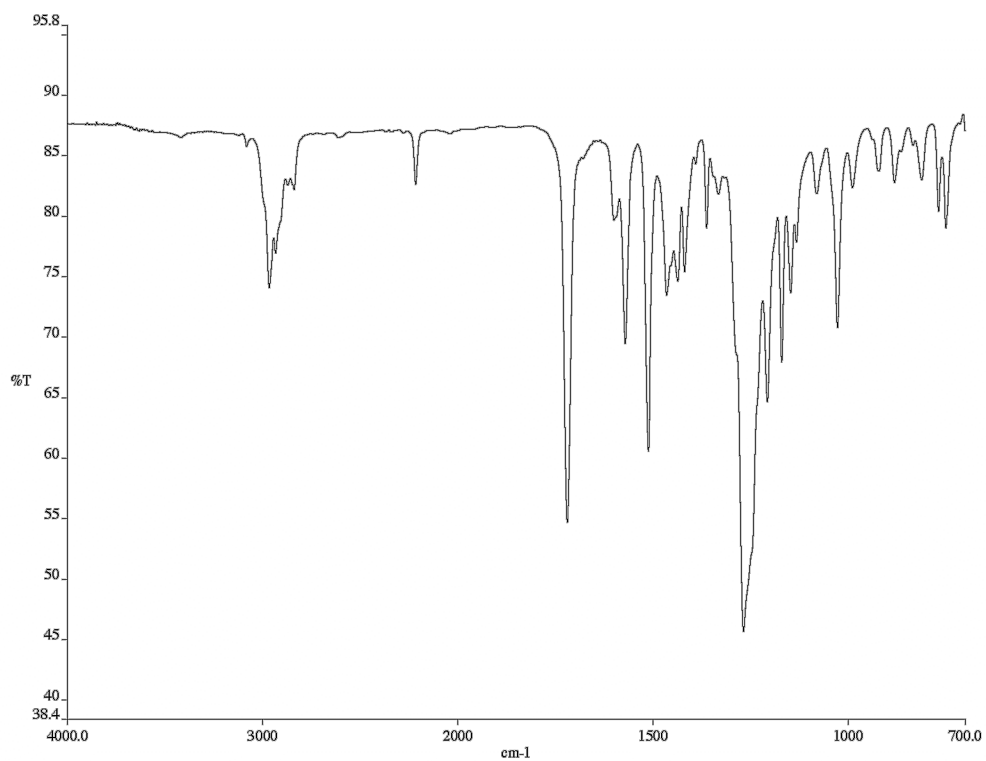
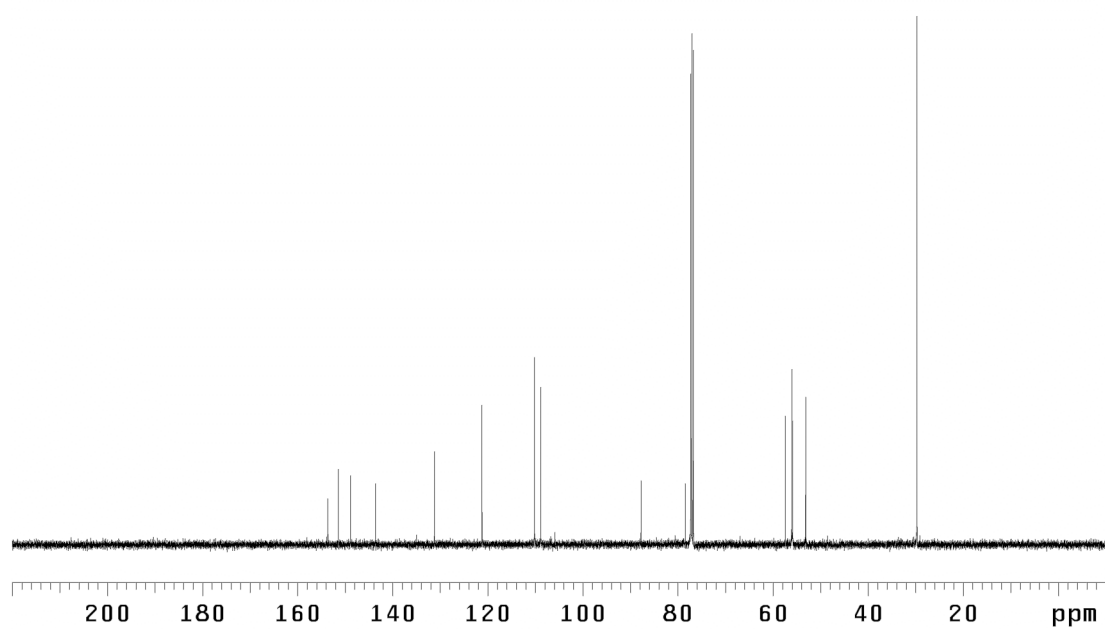
Figure A3.39.1 ^1H NMR (500 MHz, CDCl_3) of compound **566e**

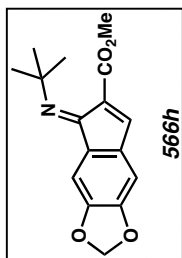
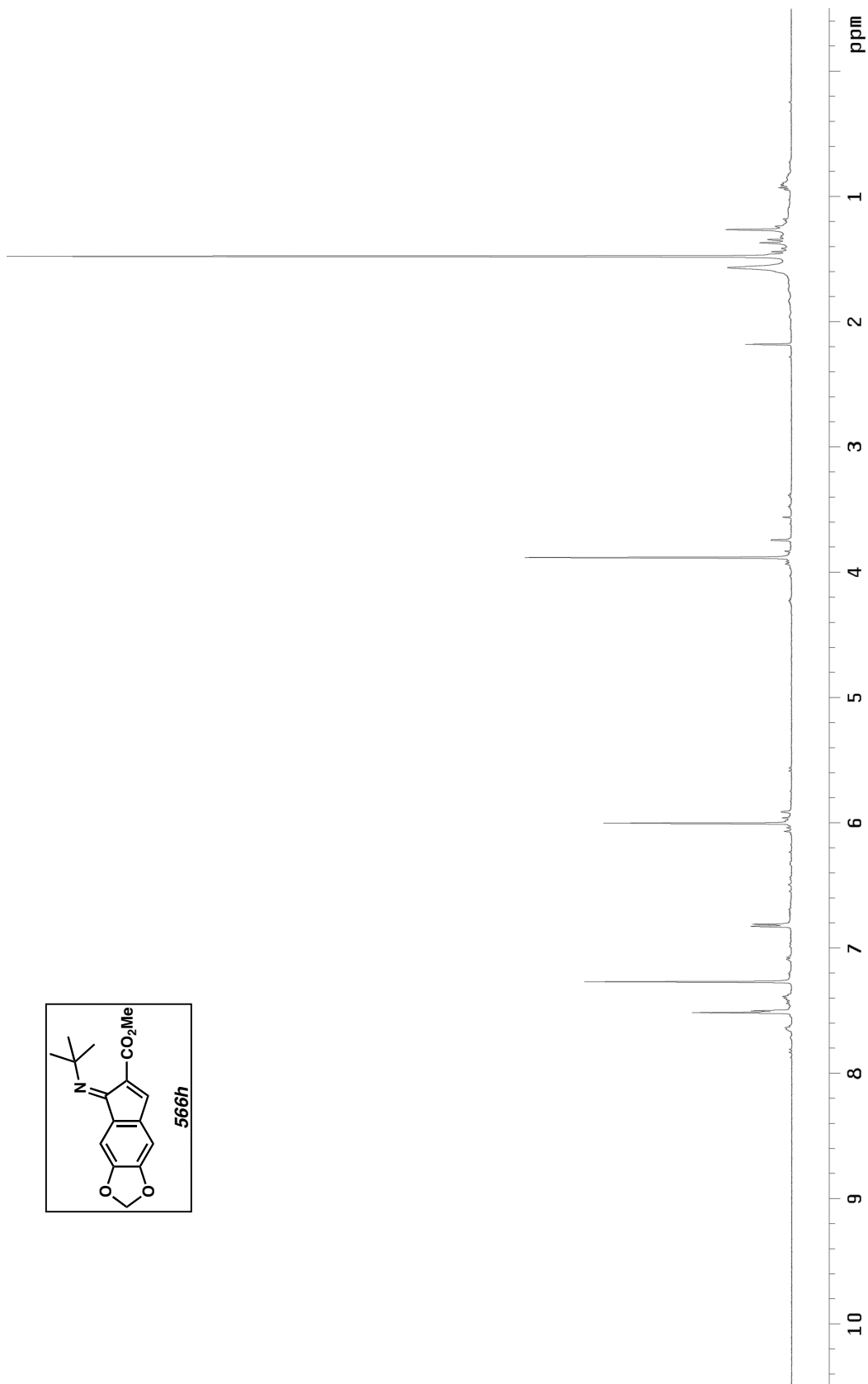
Figure A3.39.2 Infrared spectrum (thin film/NaCl) of compound **566e**Figure A3.39.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566e**

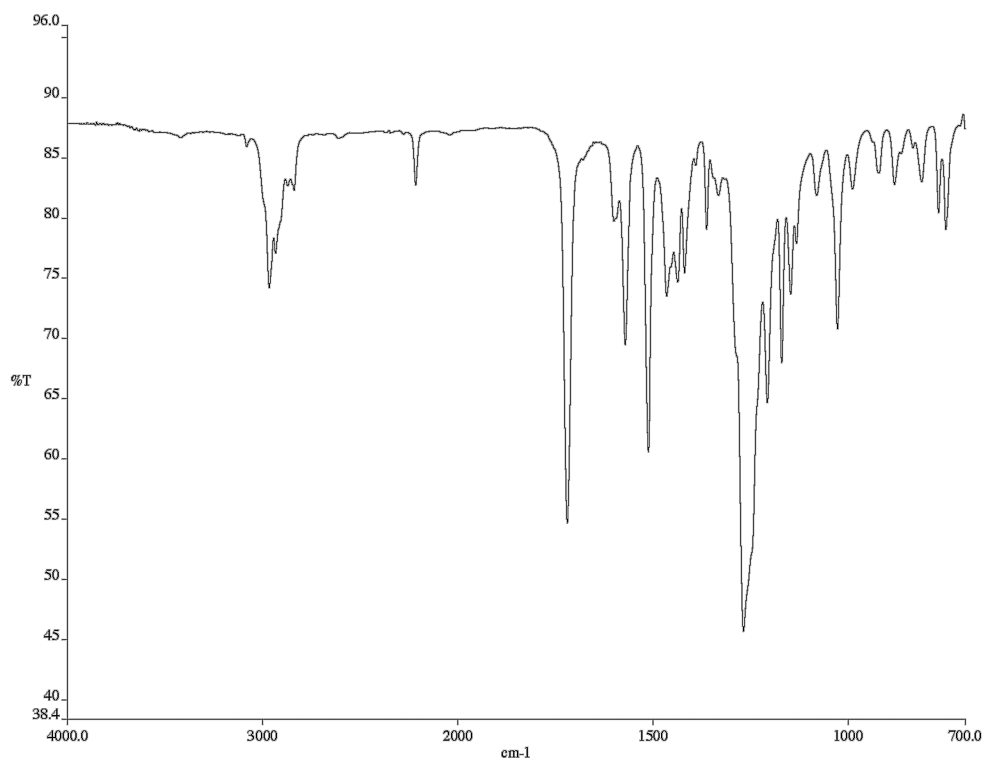
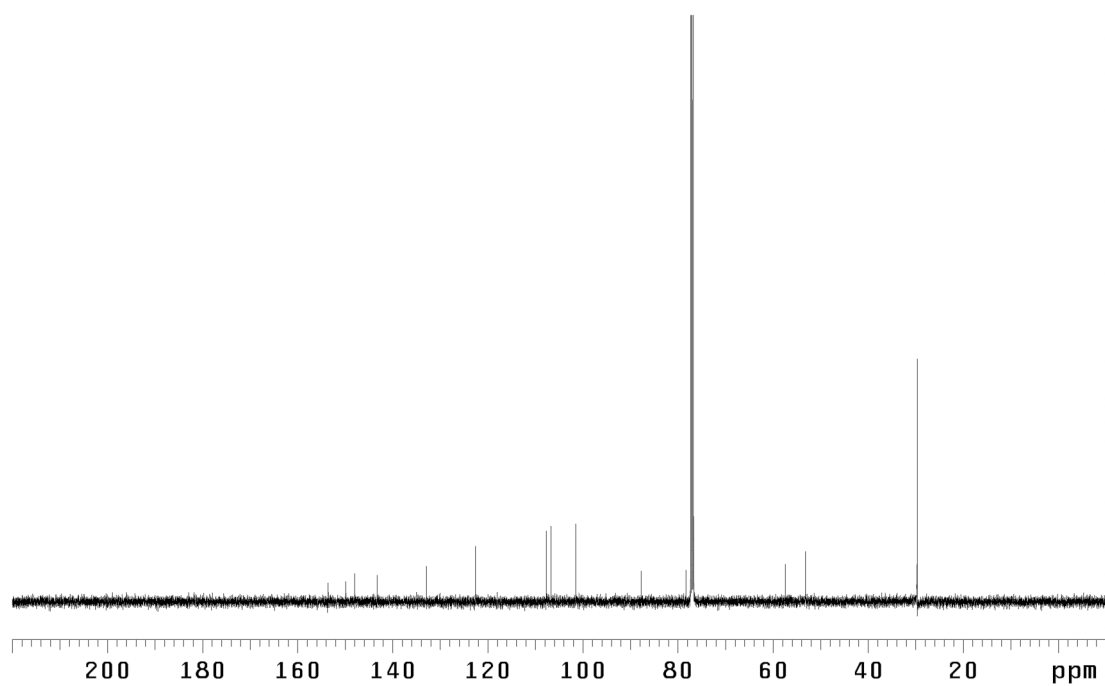
Figure A3.40.1 ^1H NMR (500 MHz, CDCl_3) of compound **566f**

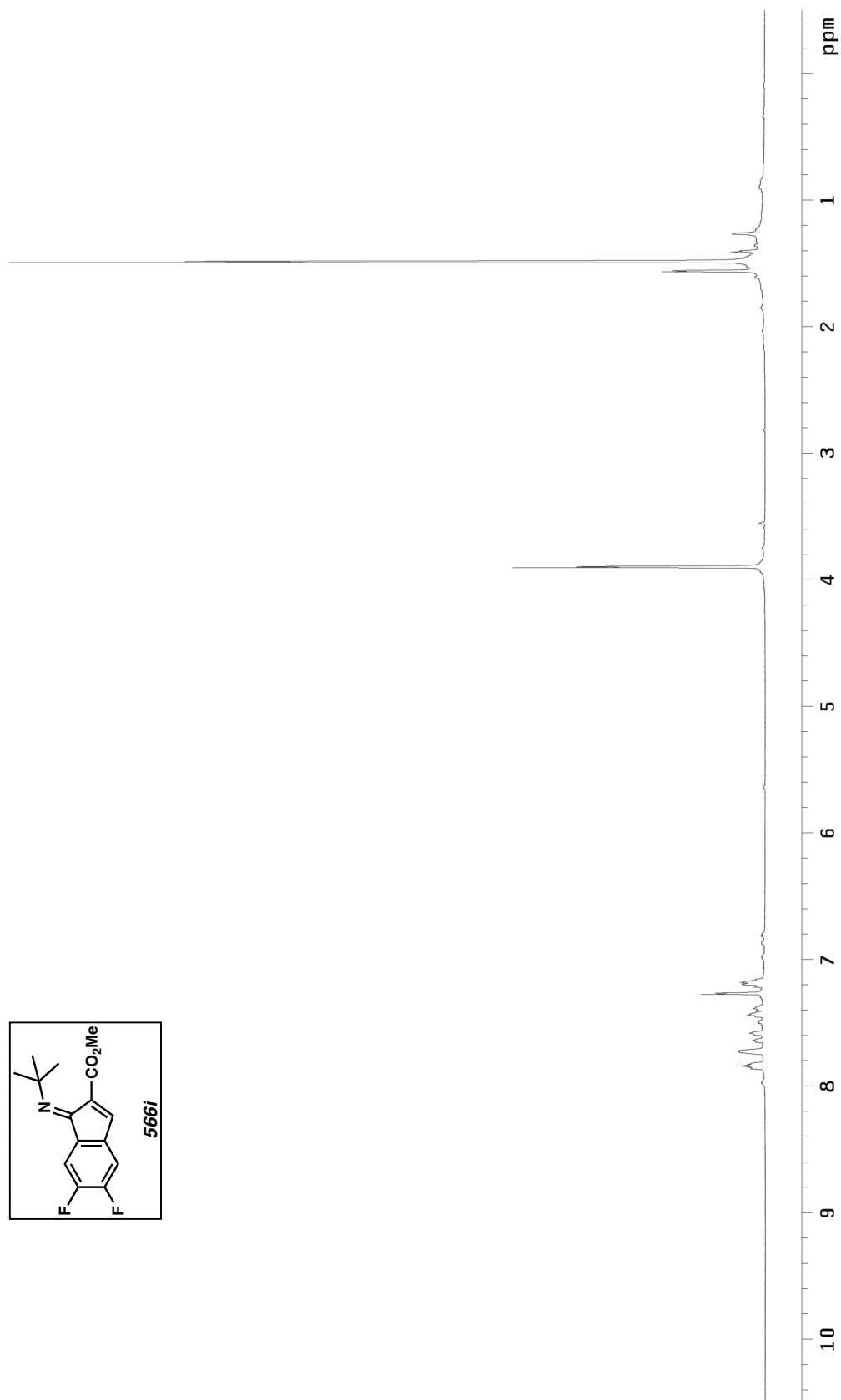
Figure A3.40.2 Infrared spectrum (thin film/NaCl) of compound **566f**Figure A3.40.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566f**

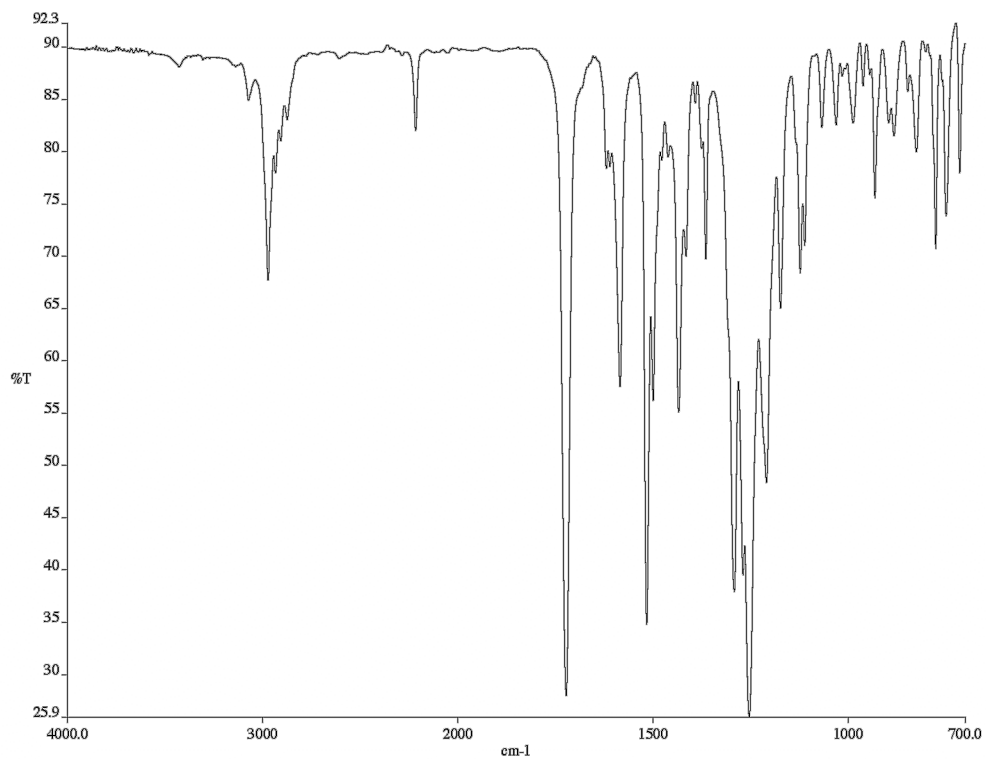
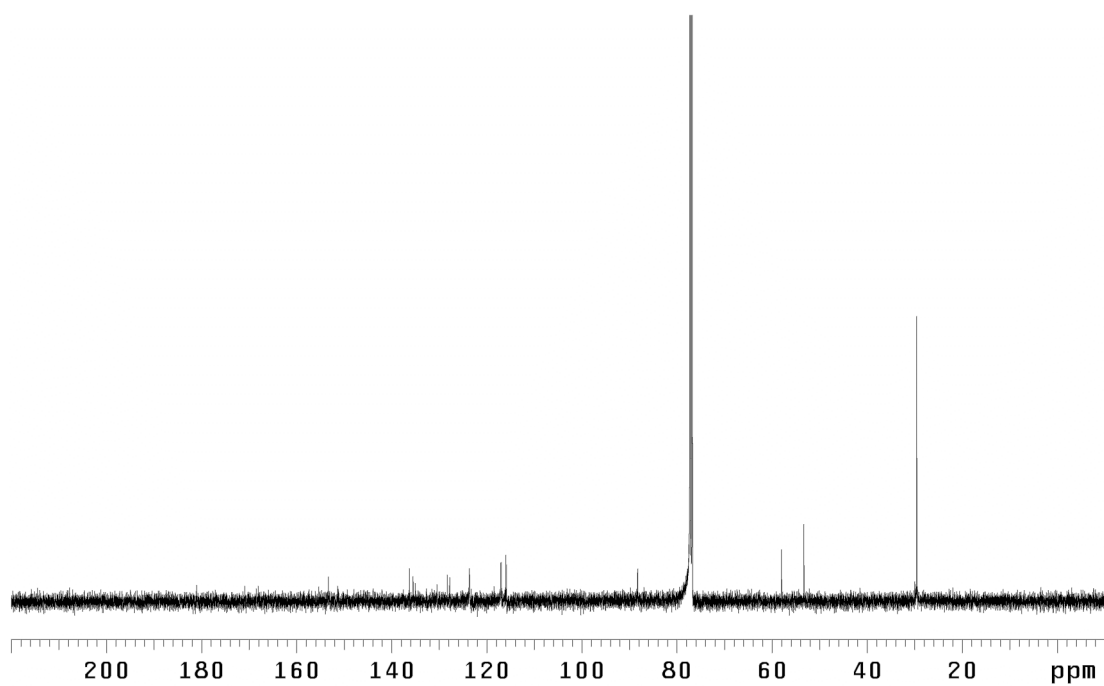
Figure A3.41.1 ¹H NMR (500 MHz, CDCl₃) of compound 566g

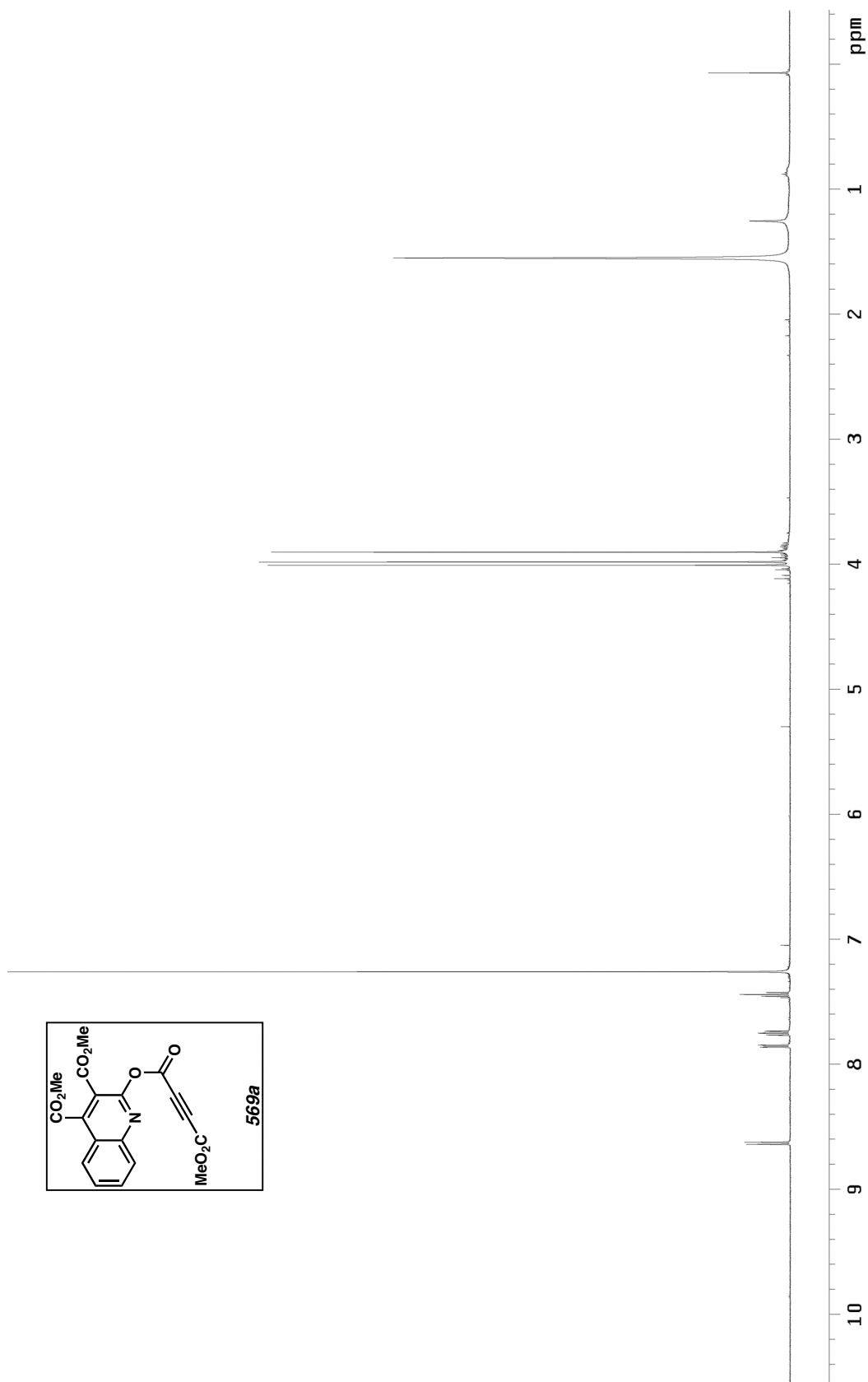
Figure A3.41.2 Infrared spectrum (thin film/NaCl) of compound **566g**Figure A3.41.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566g**

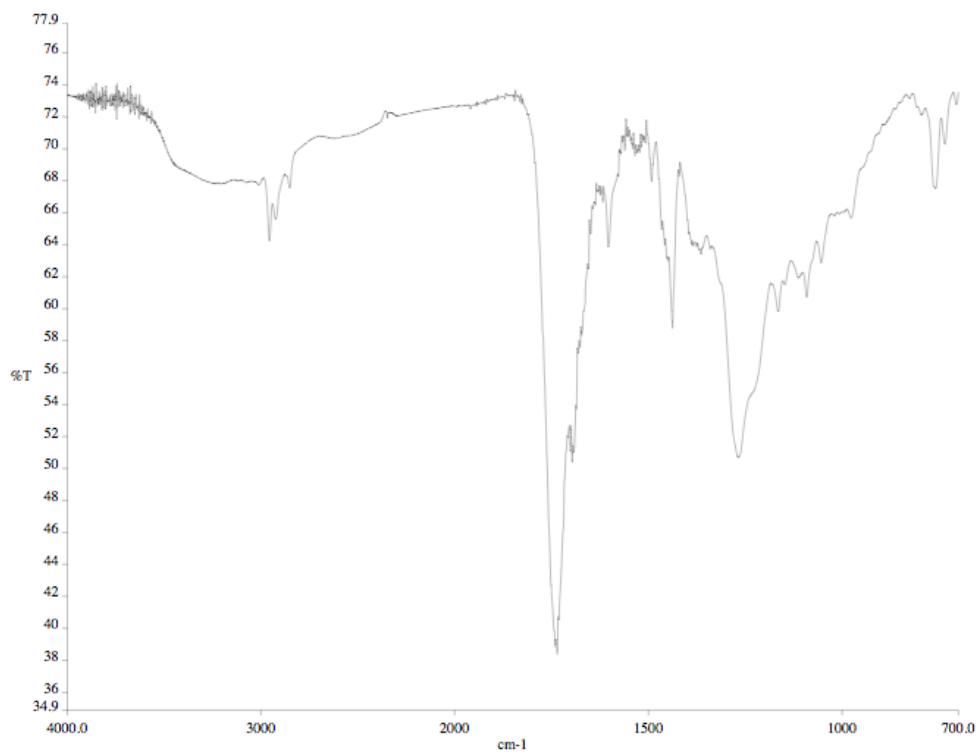
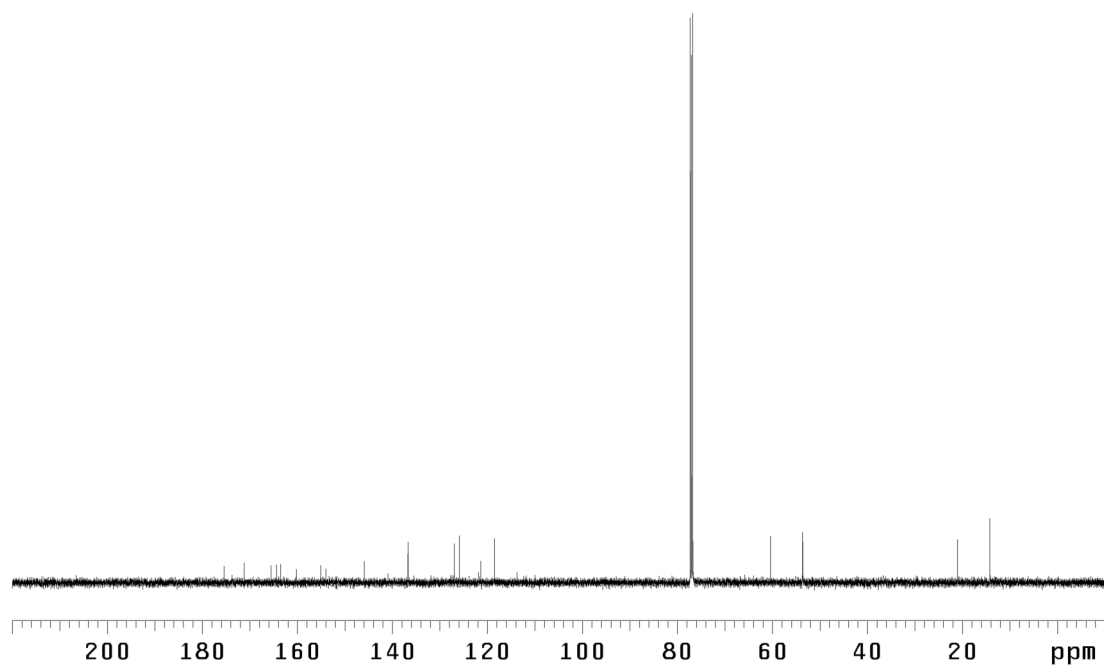
Figure A3.41.1 ¹H NMR (500 MHz, CDCl₃) of compound 566h

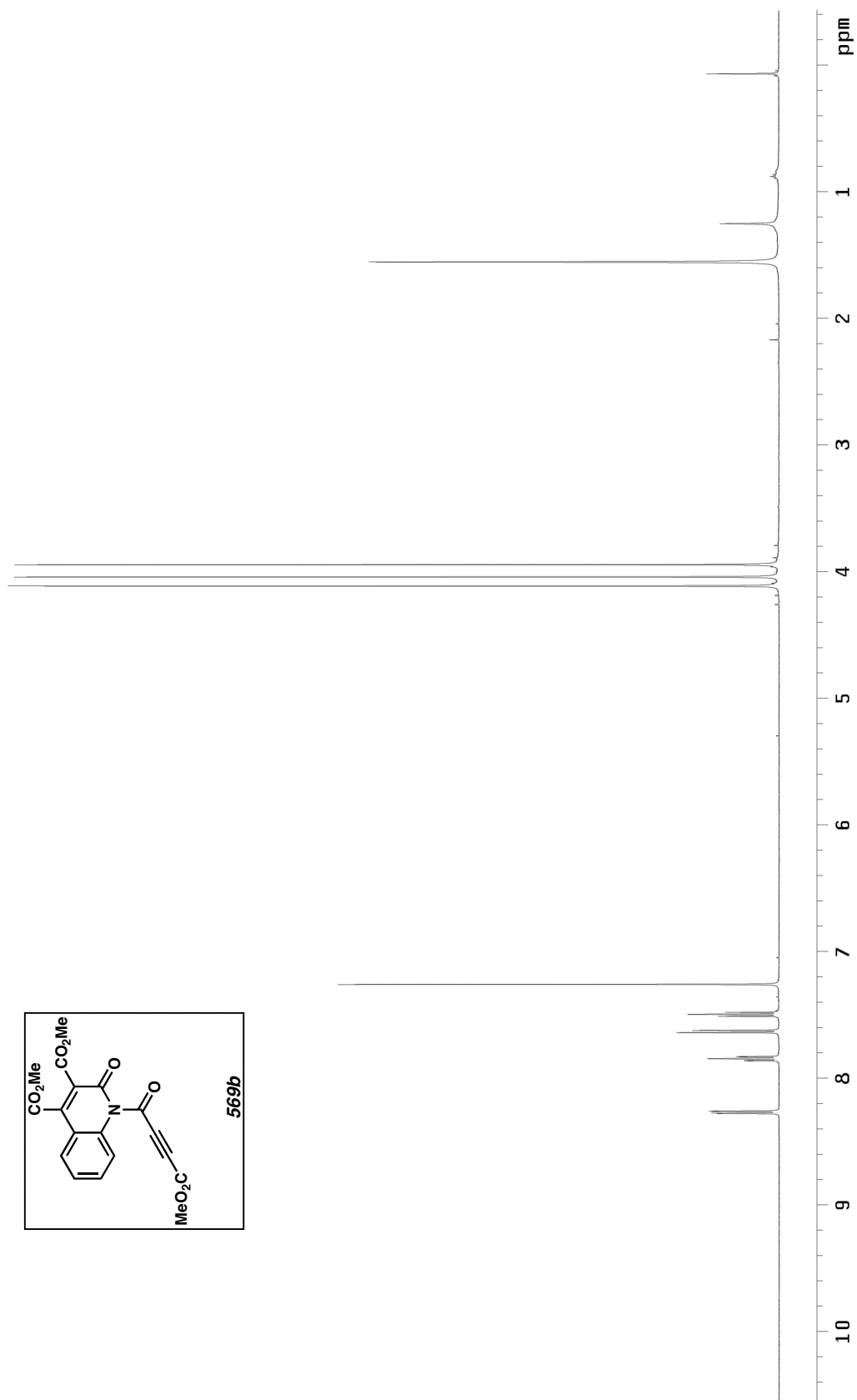
Figure A3.42.2 Infrared spectrum (thin film/NaCl) of compound **566h**Figure A3.42.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566h**

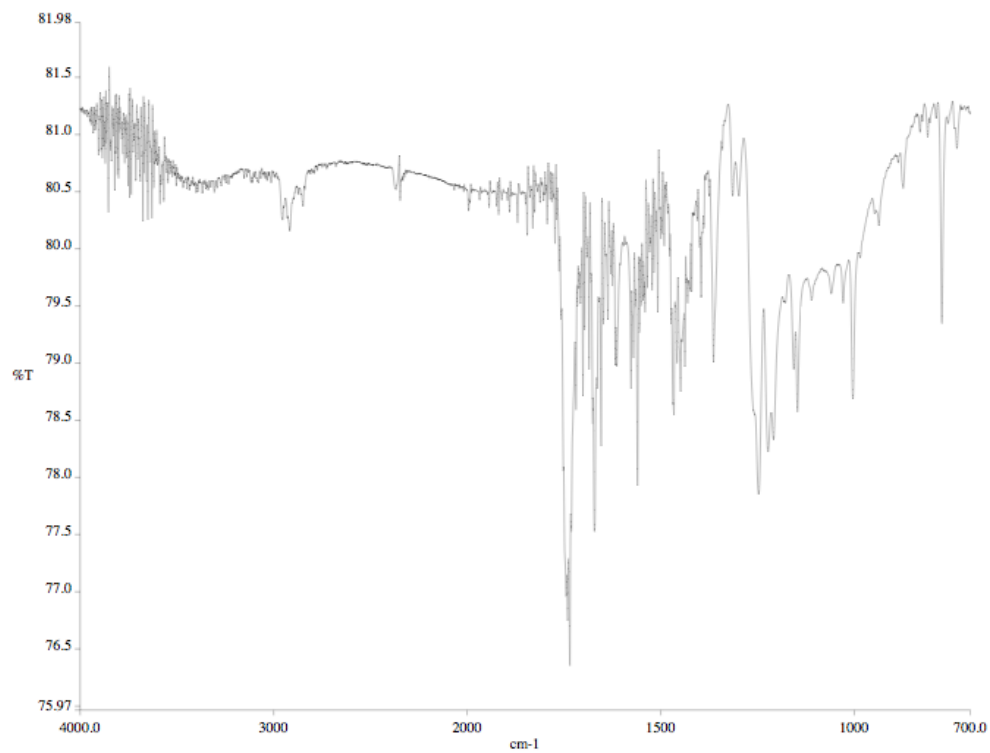
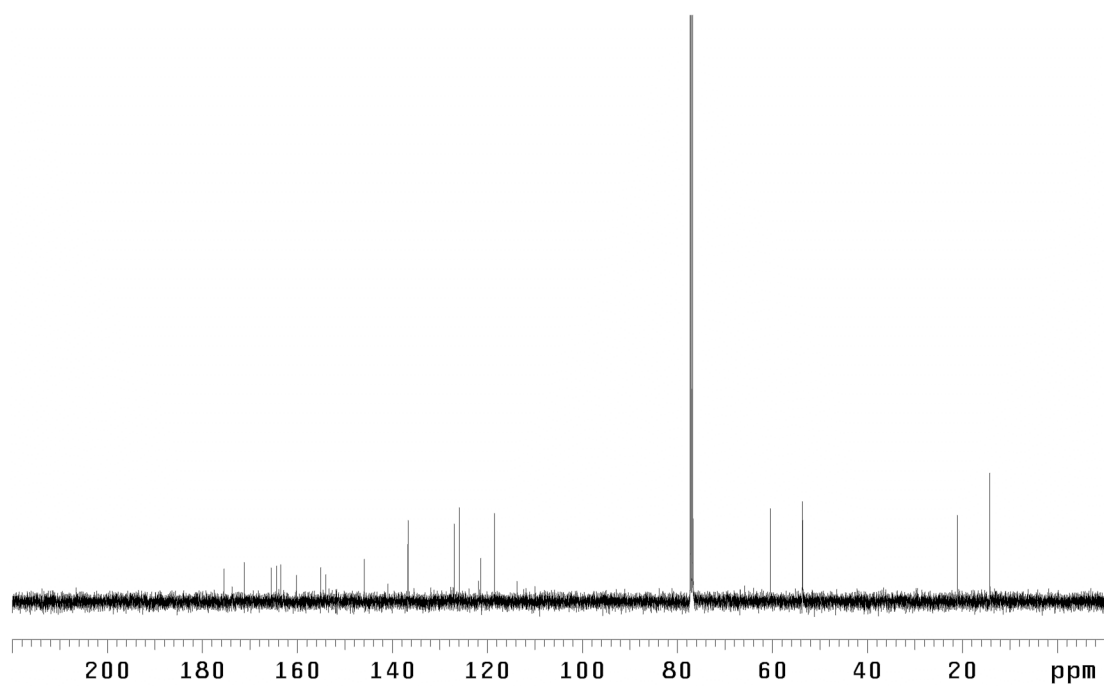
Figure A3.44.1 ^1H NMR (500 MHz, CDCl_3) of compound 566i

Figure A3.43.2 Infrared spectrum (thin film/NaCl) of compound **566i**Figure A3.43.3 ¹³C NMR (125 MHz, CDCl₃) of compound **566i**

Figure A3.44.1 ¹H NMR (500 MHz, CDCl₃) of compound 569a

Figure A3.44.2 Infrared spectrum (thin film/NaCl) of compound **569a**Figure A3.44.3 ¹³C NMR (125 MHz, CDCl₃) of compound **569a**

Figure A3.45.1 ^1H NMR (500 MHz, CDCl_3) of compound **569b**

Figure A3.45.2 Infrared spectrum (thin film/NaCl) of compound **569b**Figure A3.45.3 ¹³C NMR (125 MHz, CDCl₃) of compound **569b**