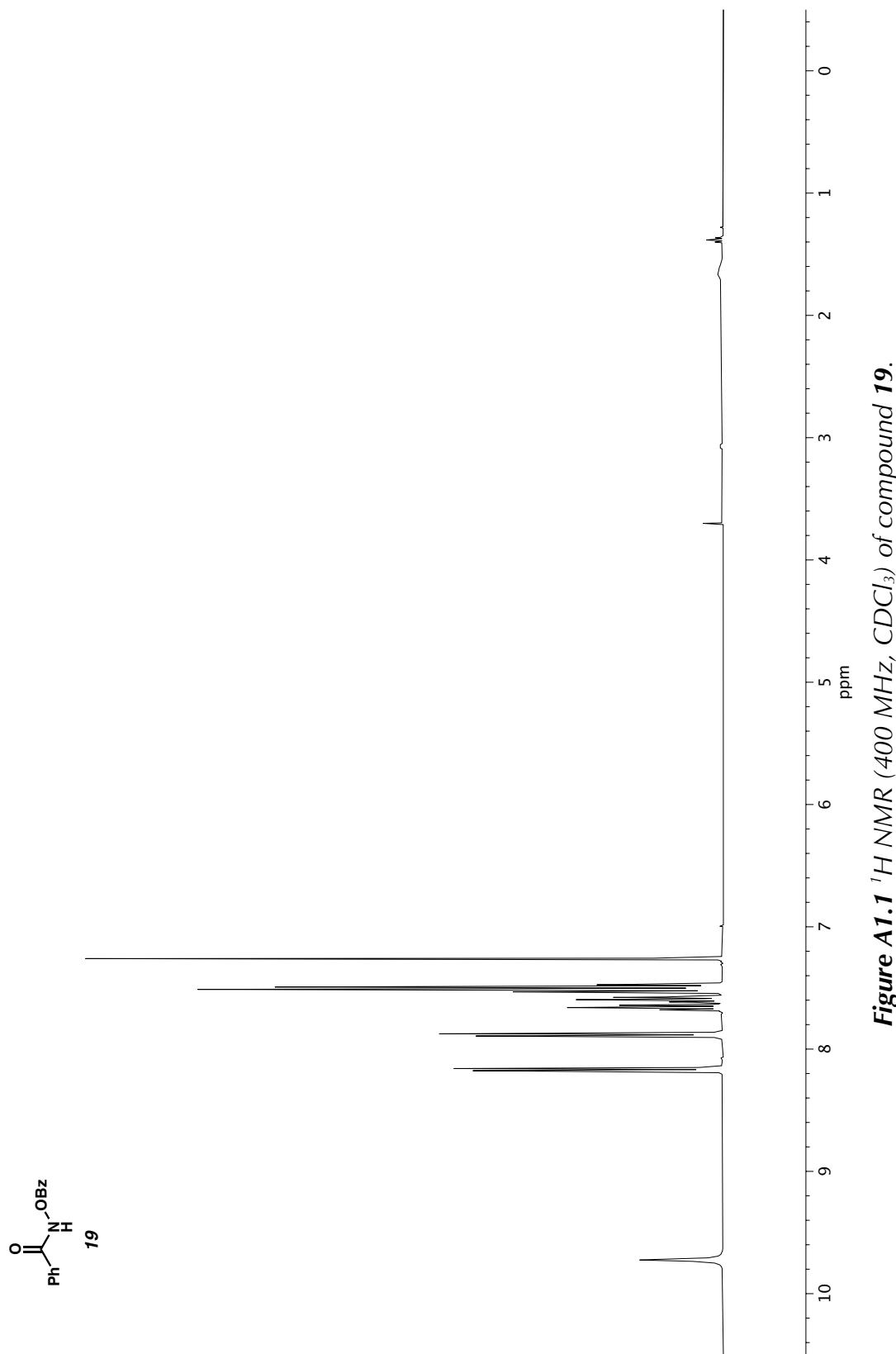
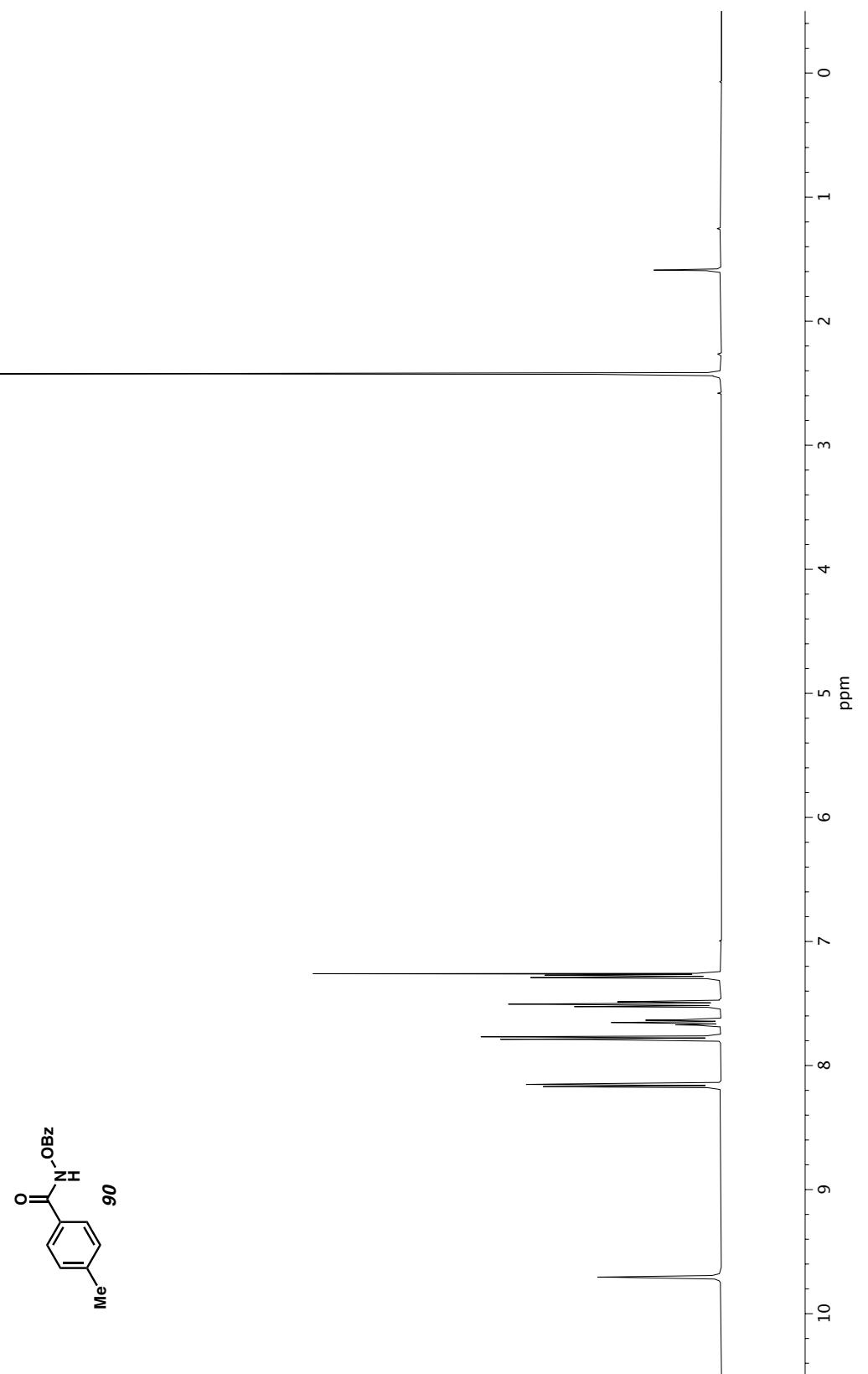


## **APPENDIX 1**

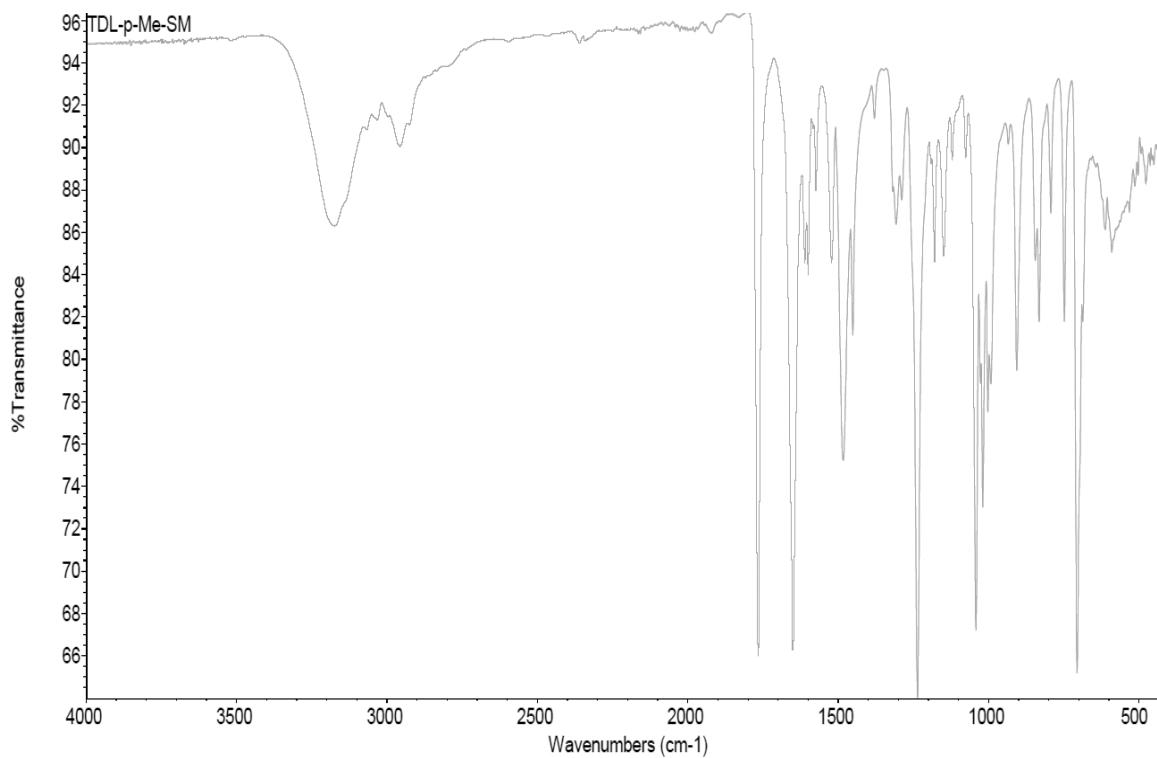
*Spectra Relevant to Chapter 1: Development of a Ni-Catalyzed N–N Cross-Coupling for the Synthesis of Hydrazides*



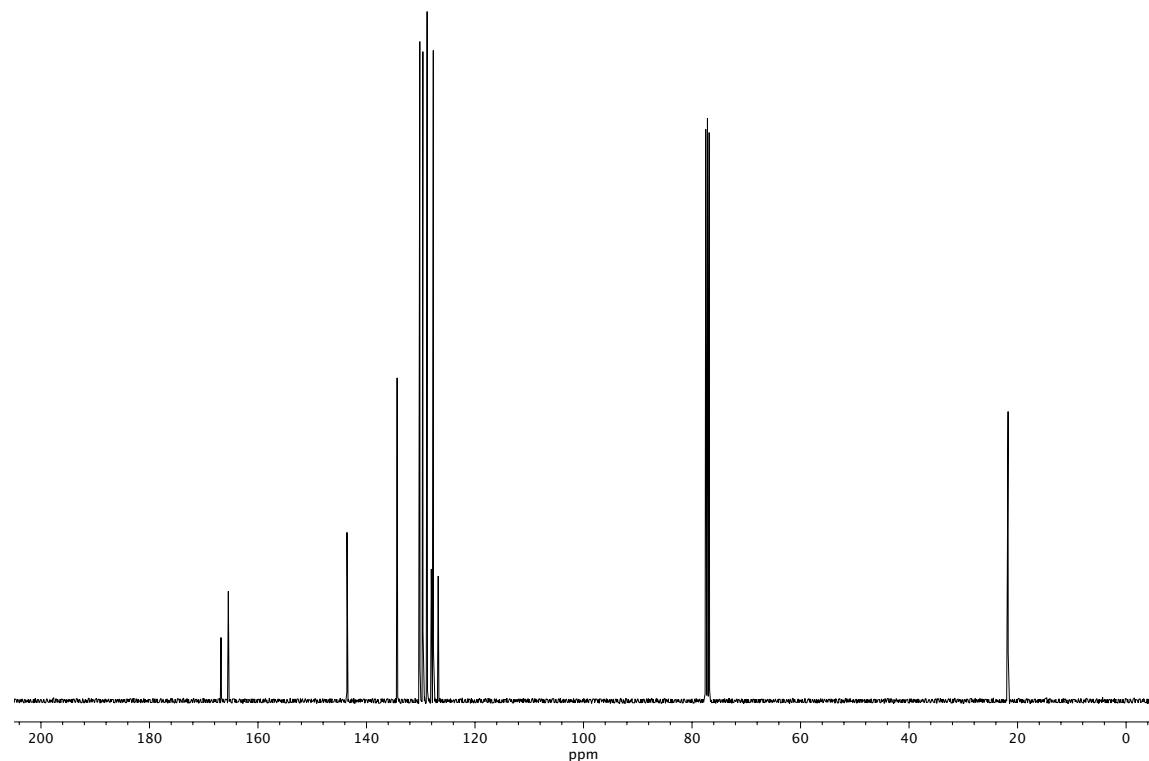
**Figure A1.1**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 19.



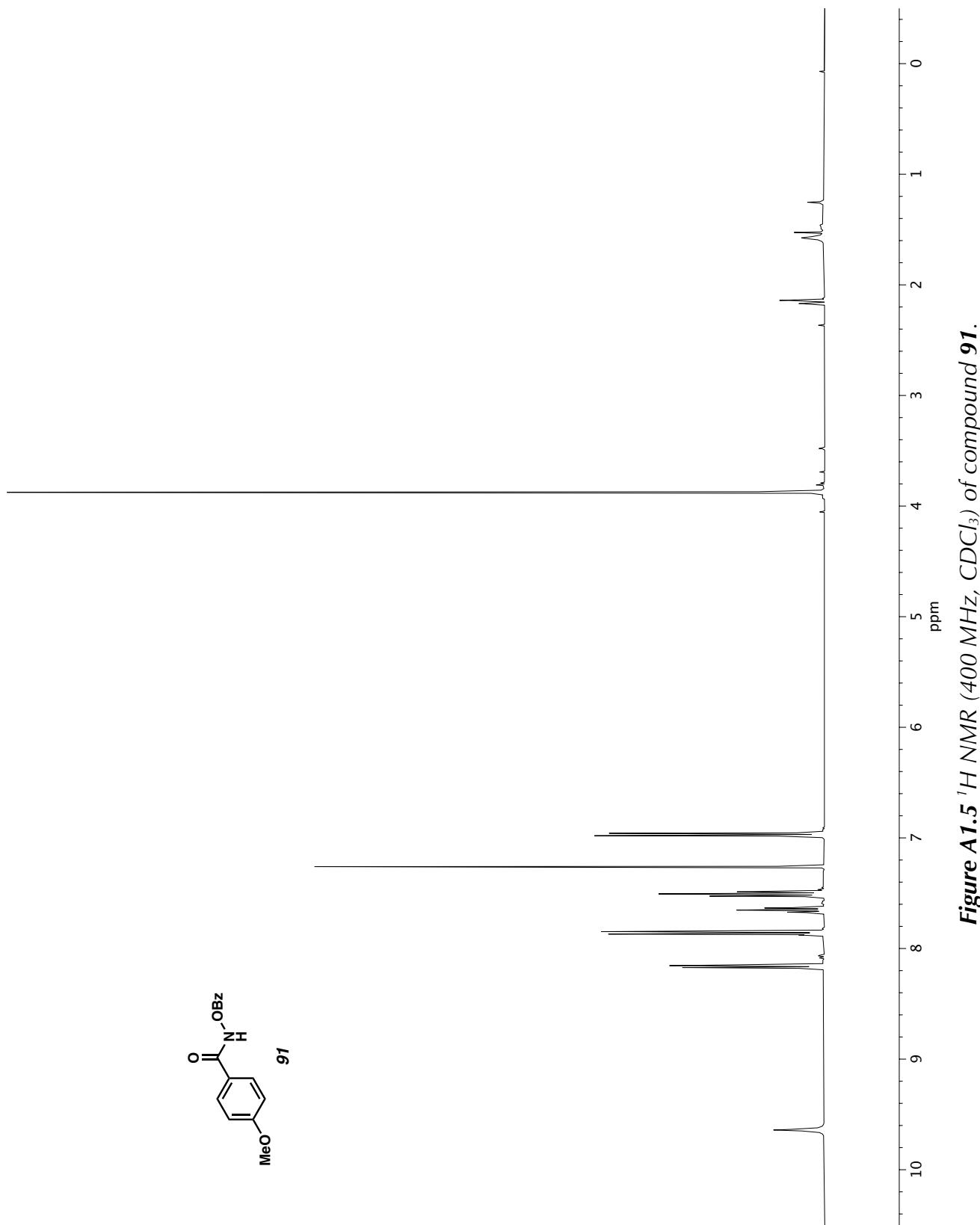
**Figure A1.2**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 90.

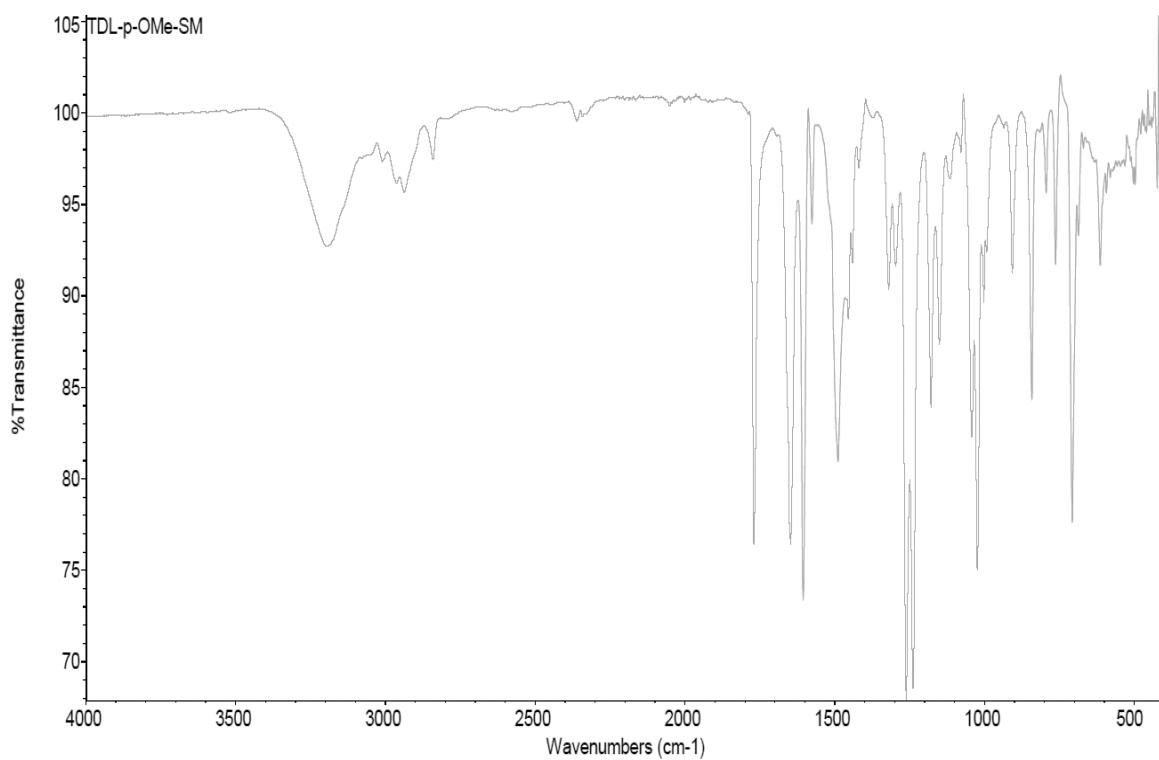


**Figure A1.3** Infrared spectrum (Thin Film) of compound **90**.

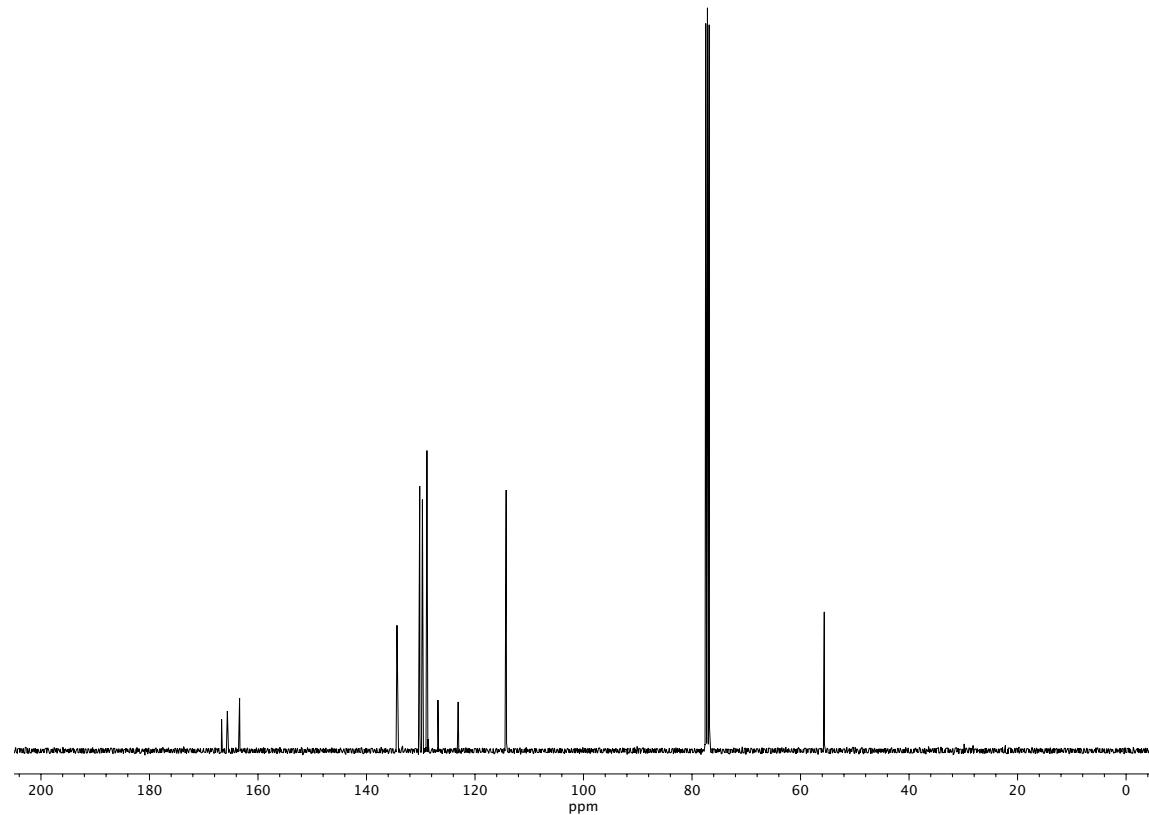


**Figure A1.4**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **90**.

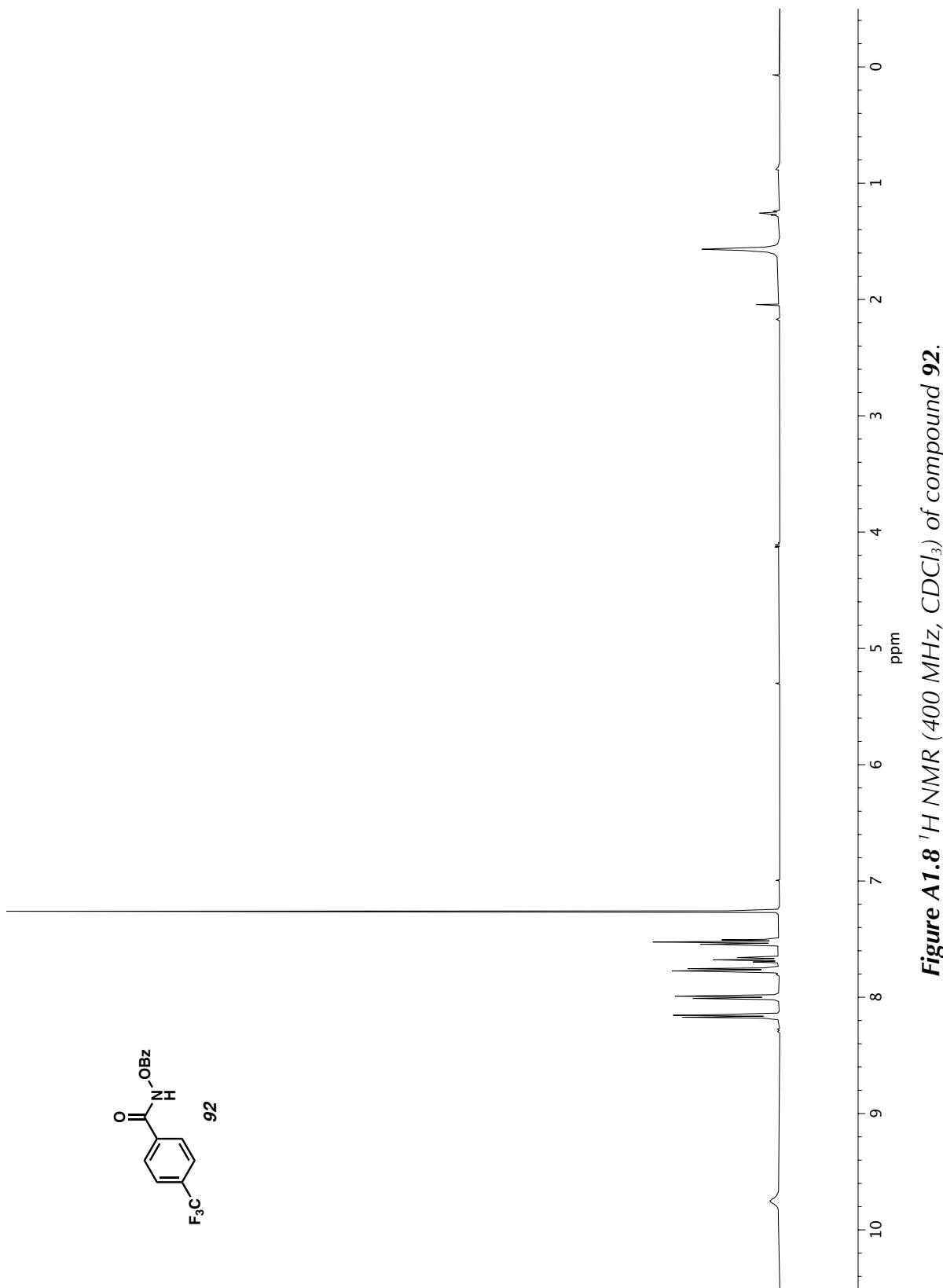




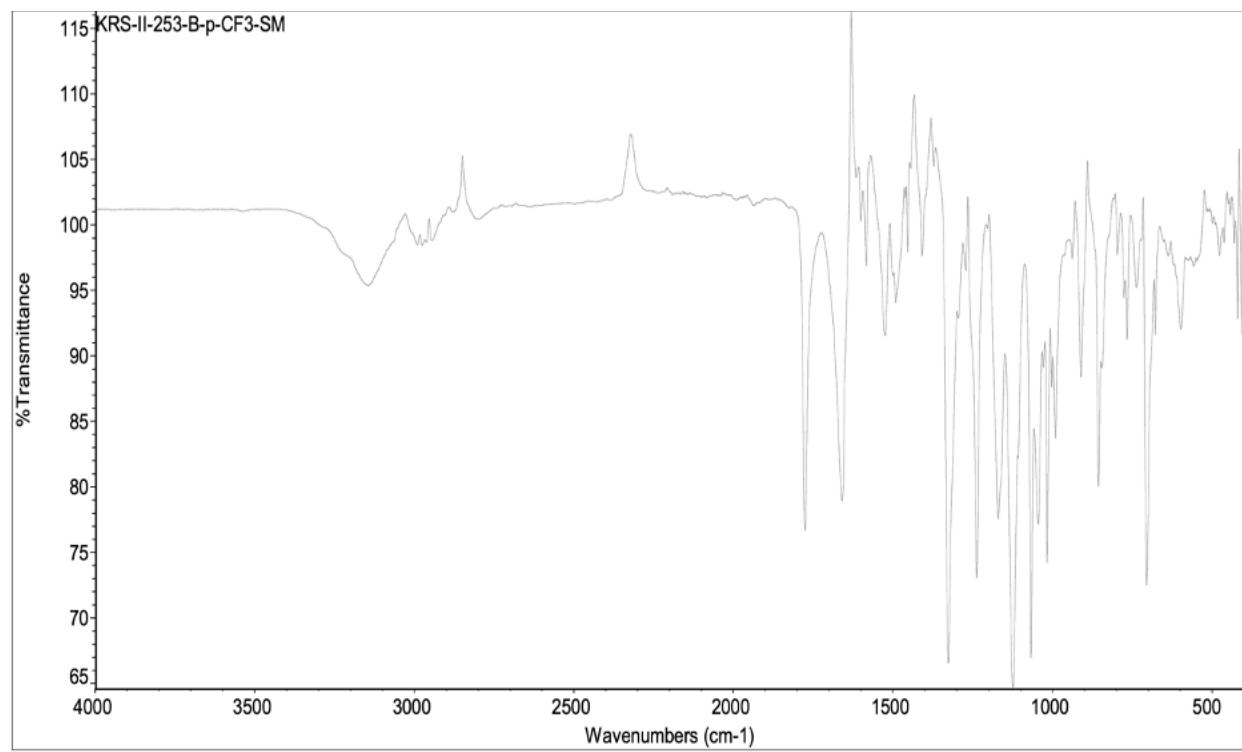
**Figure A1.6** Infrared spectrum (Thin Film) of compound **91**.



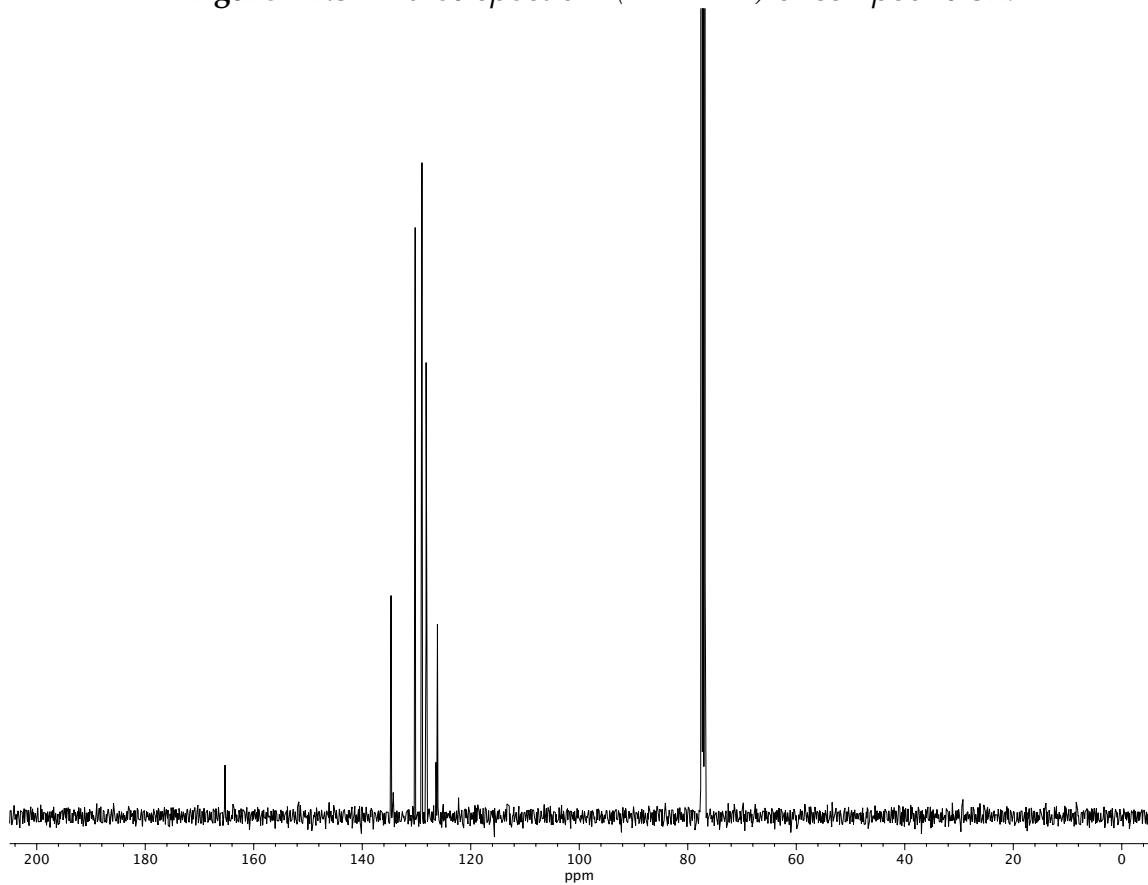
**Figure A1.7**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **91**.



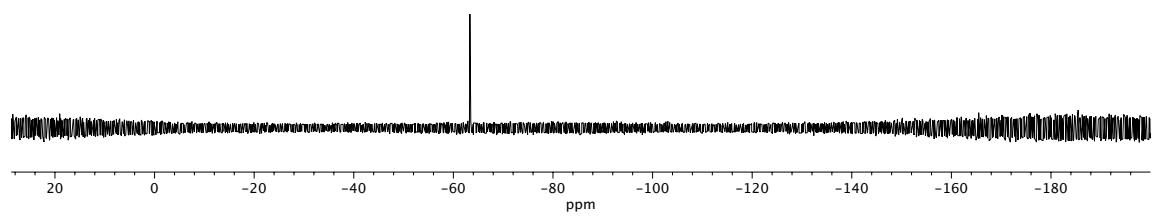
**Figure A1.8**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 92.



**Figure A1.9** Infrared spectrum (Thin Film) of compound **92**.



**Figure A1.10**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **92**.



**Figure A1.11**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ) of compound 92.

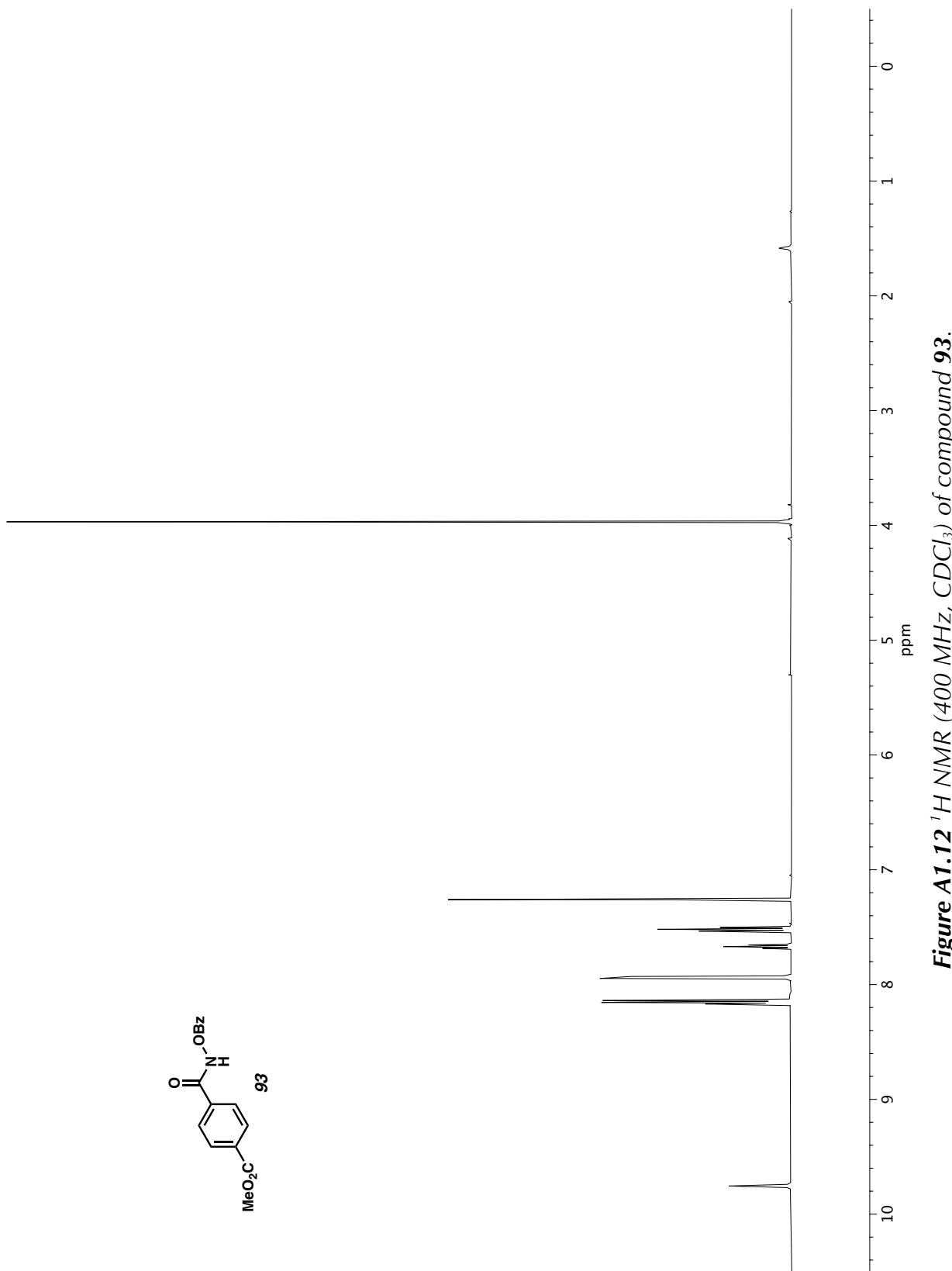
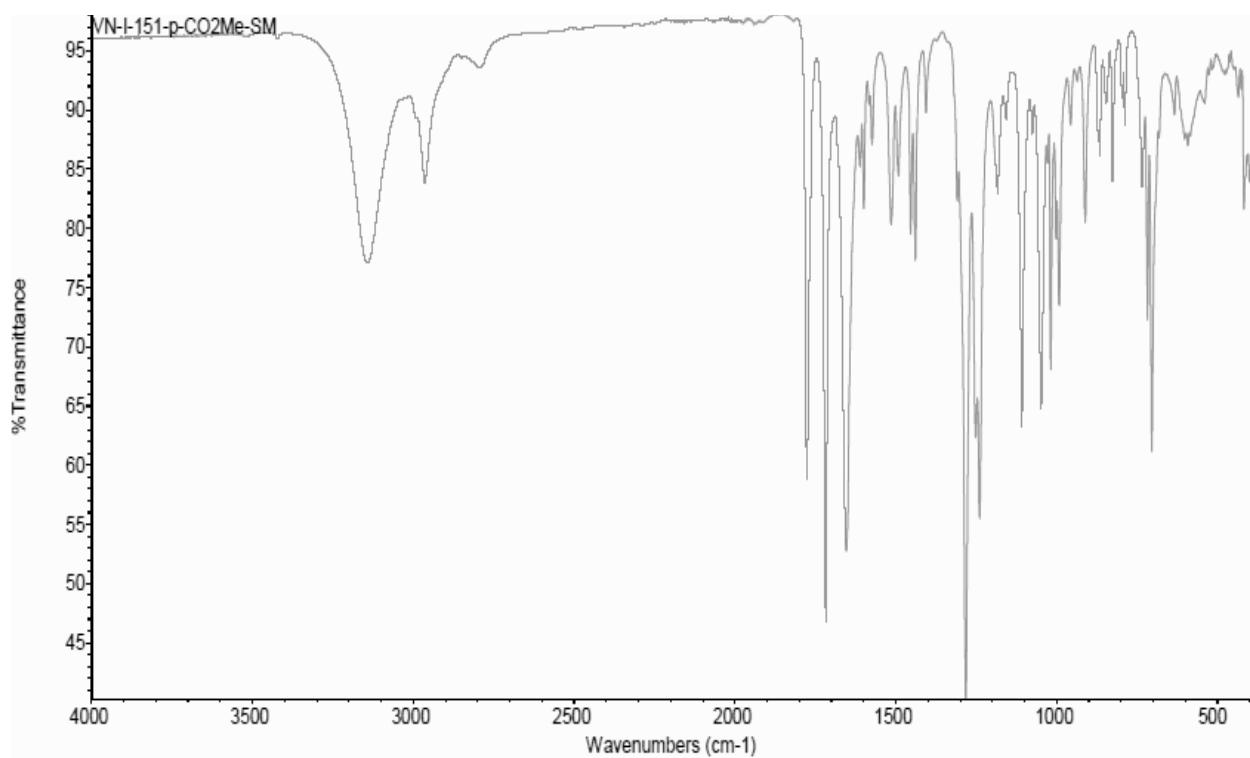
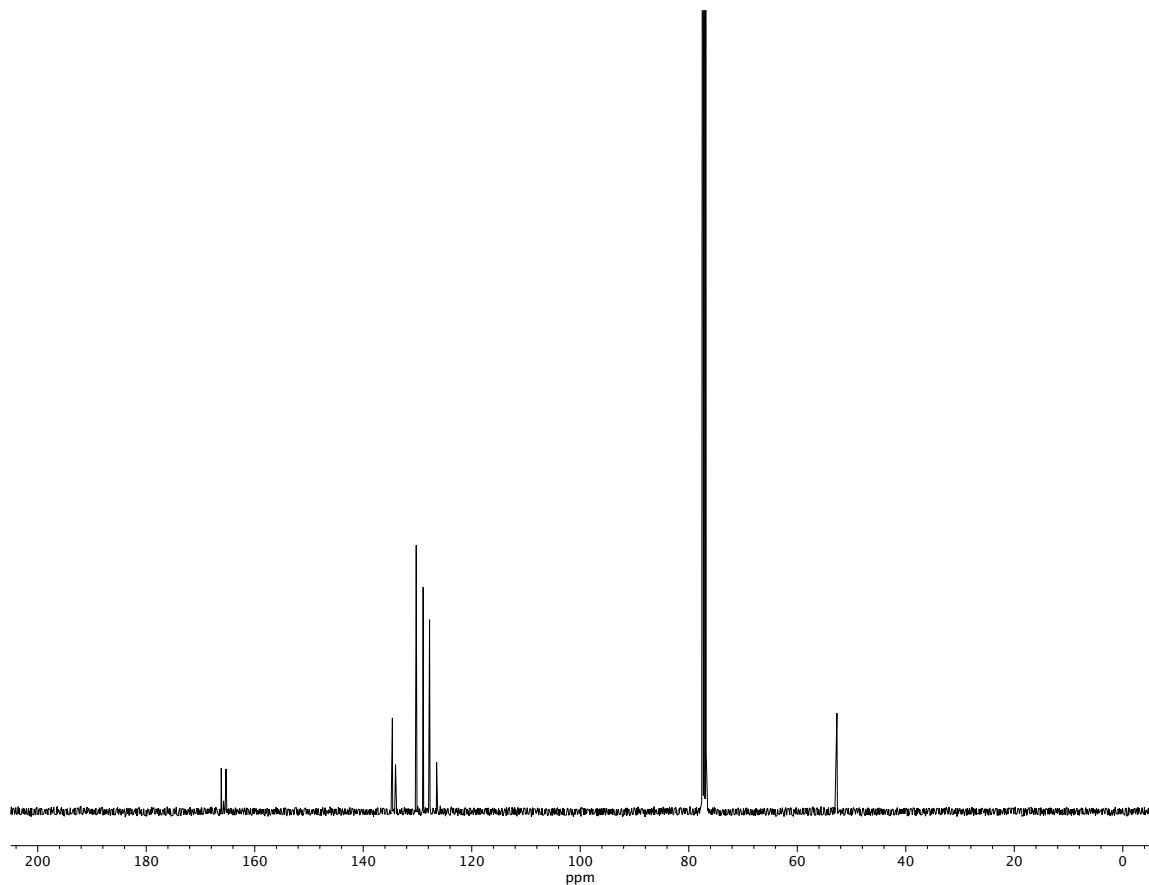


Figure A1.12  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 93.



**Figure A1.13** Infrared spectrum (Thin Film) of compound **93**.



**Figure A1.14**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **93**.

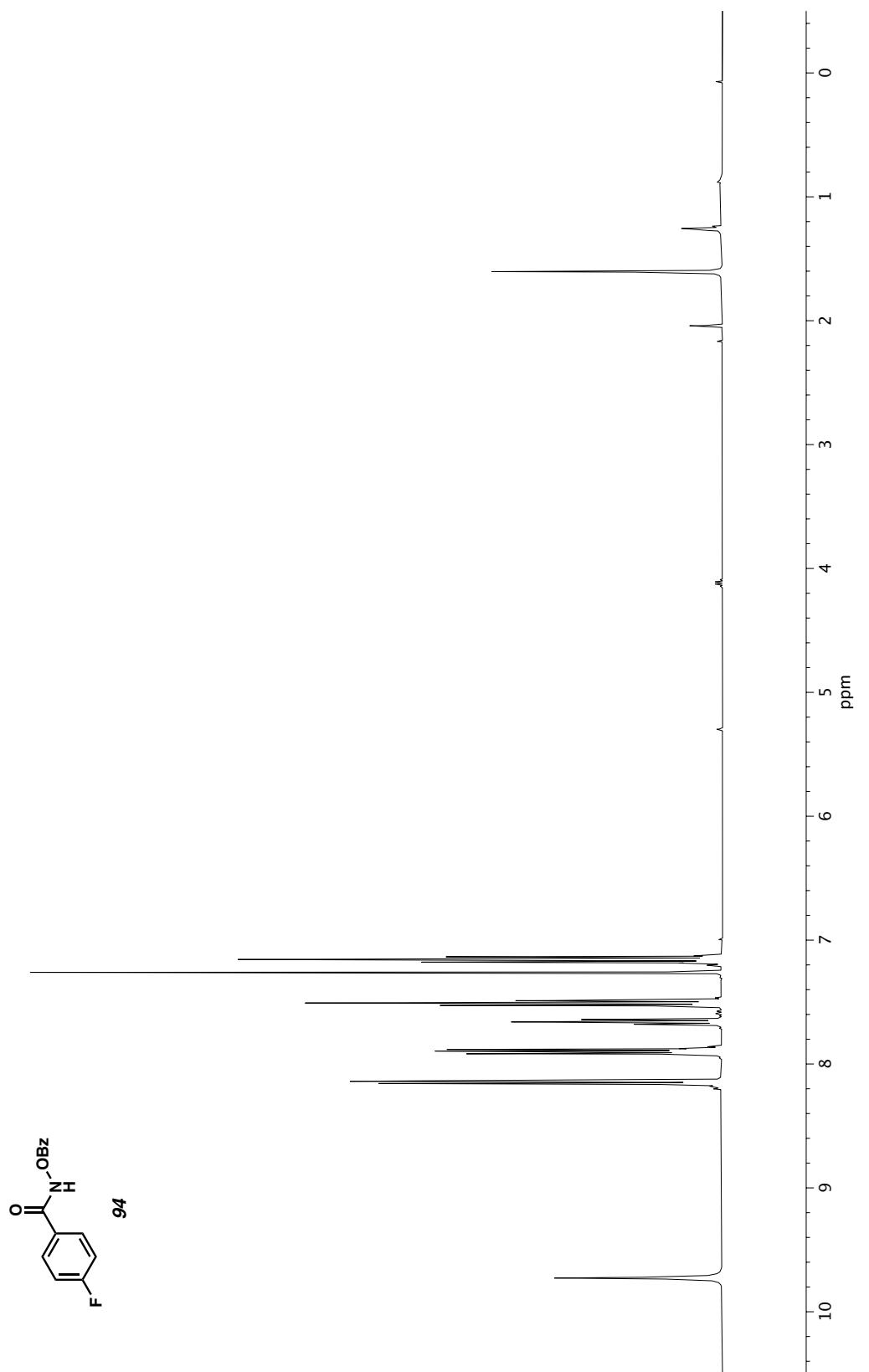
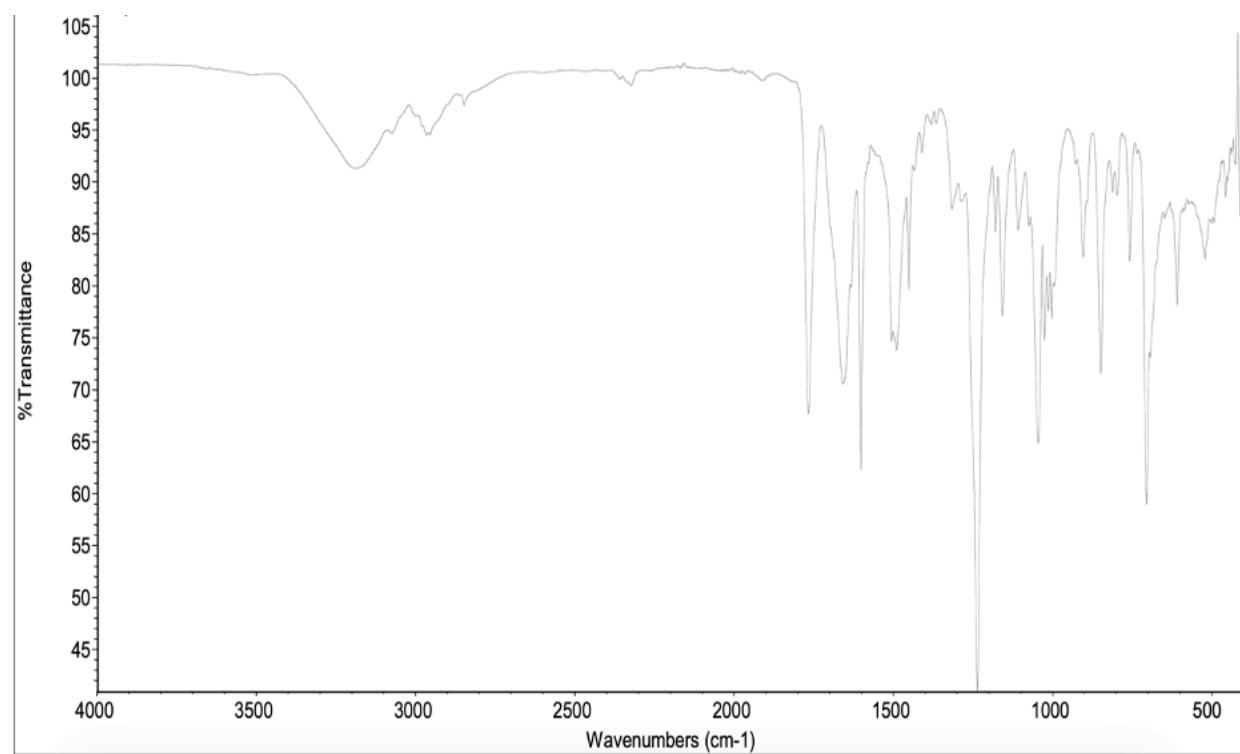
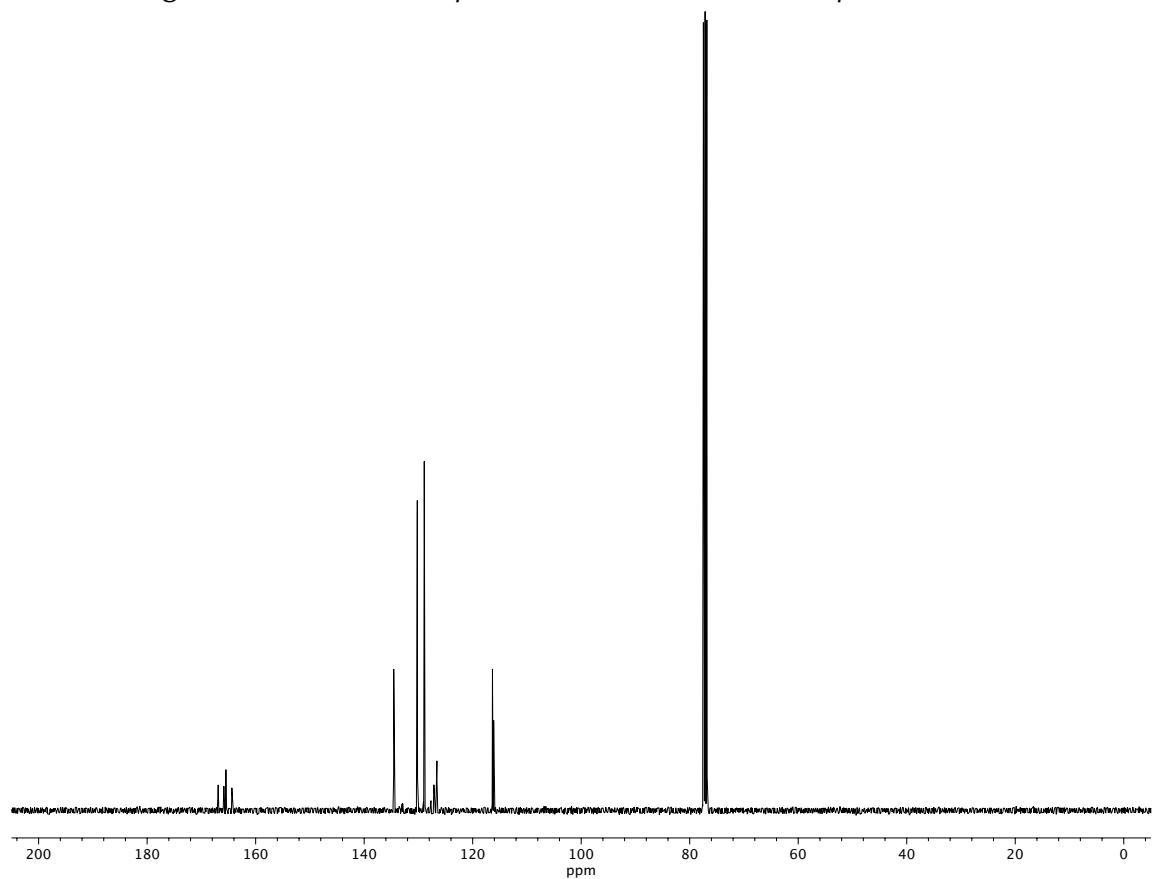


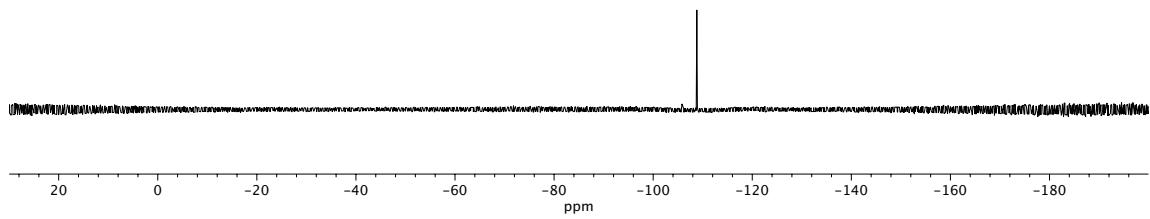
Figure A1.15  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 94.



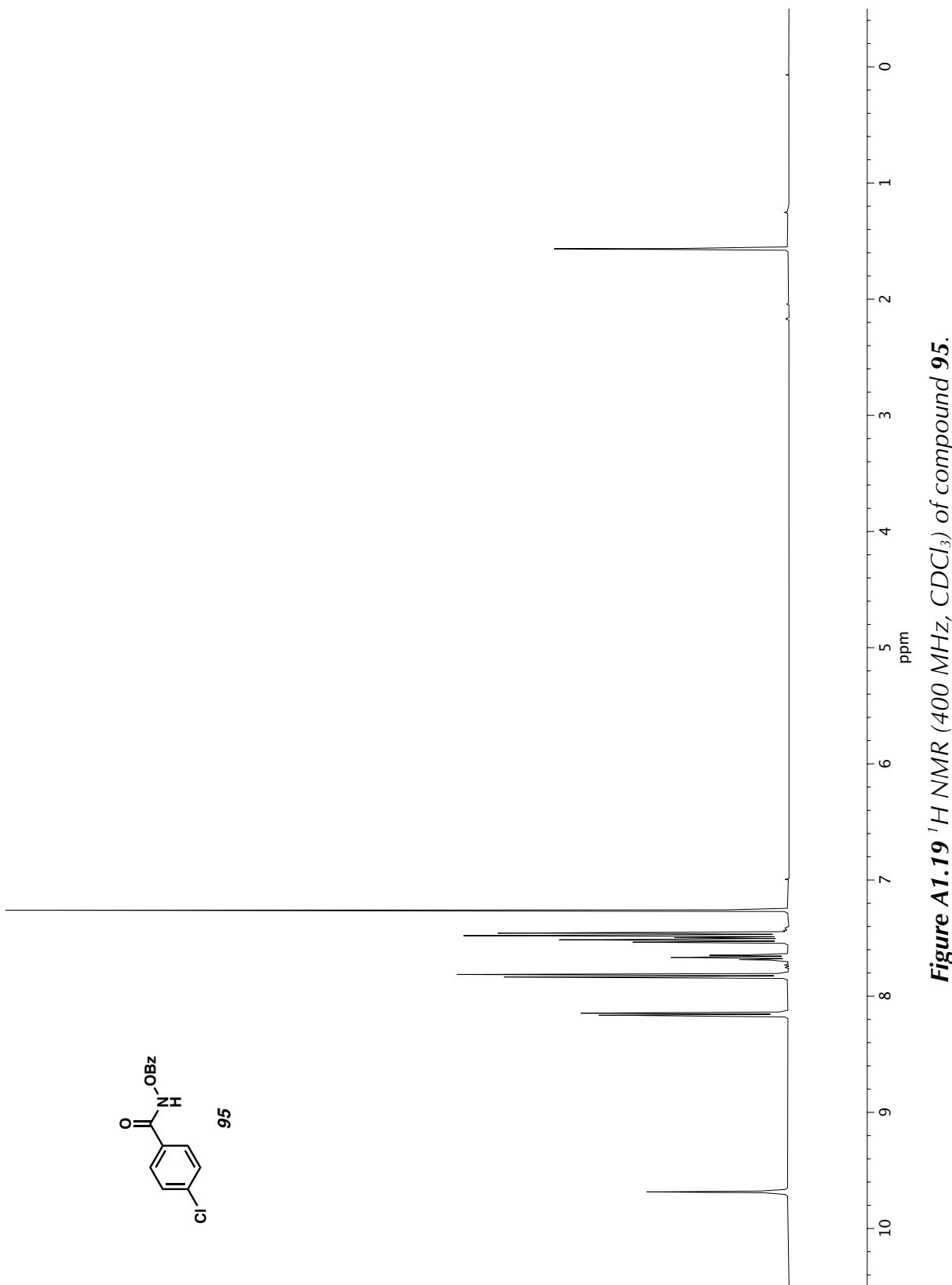
**Figure A1.16** Infrared spectrum (Thin Film) of compound **94**.



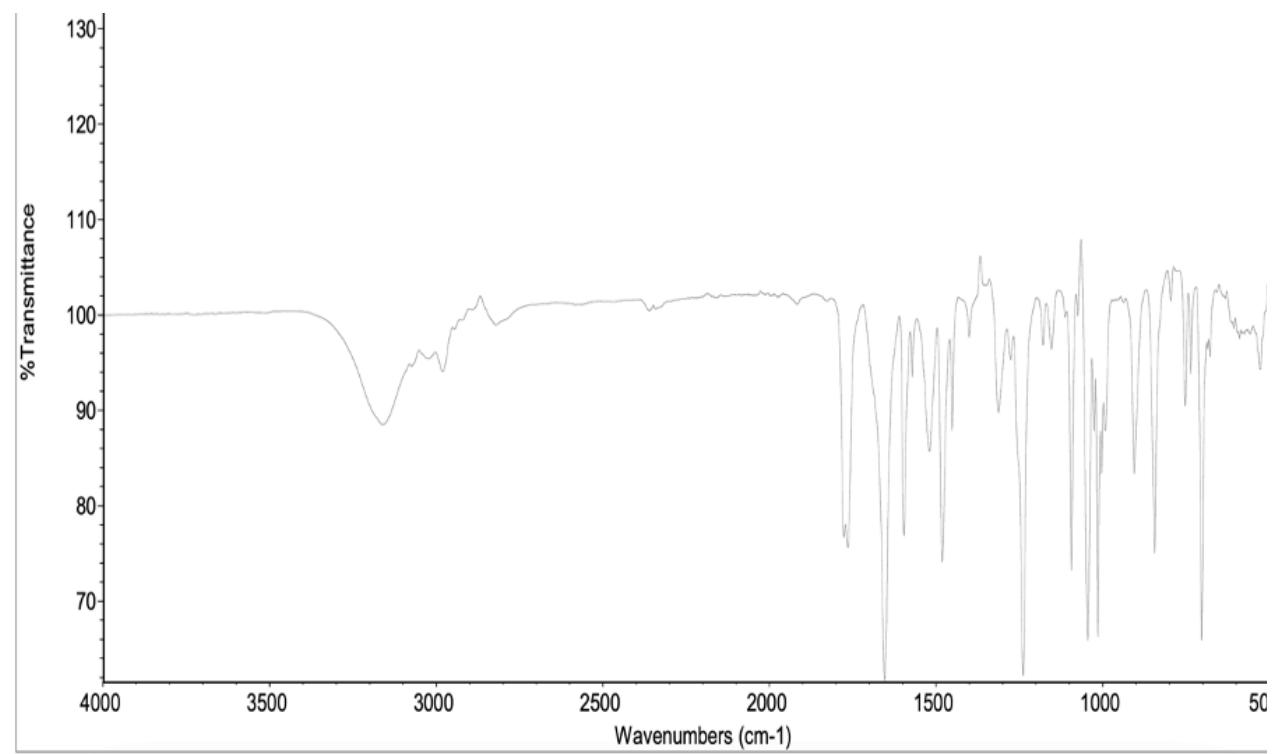
**Figure A1.17**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **94**.



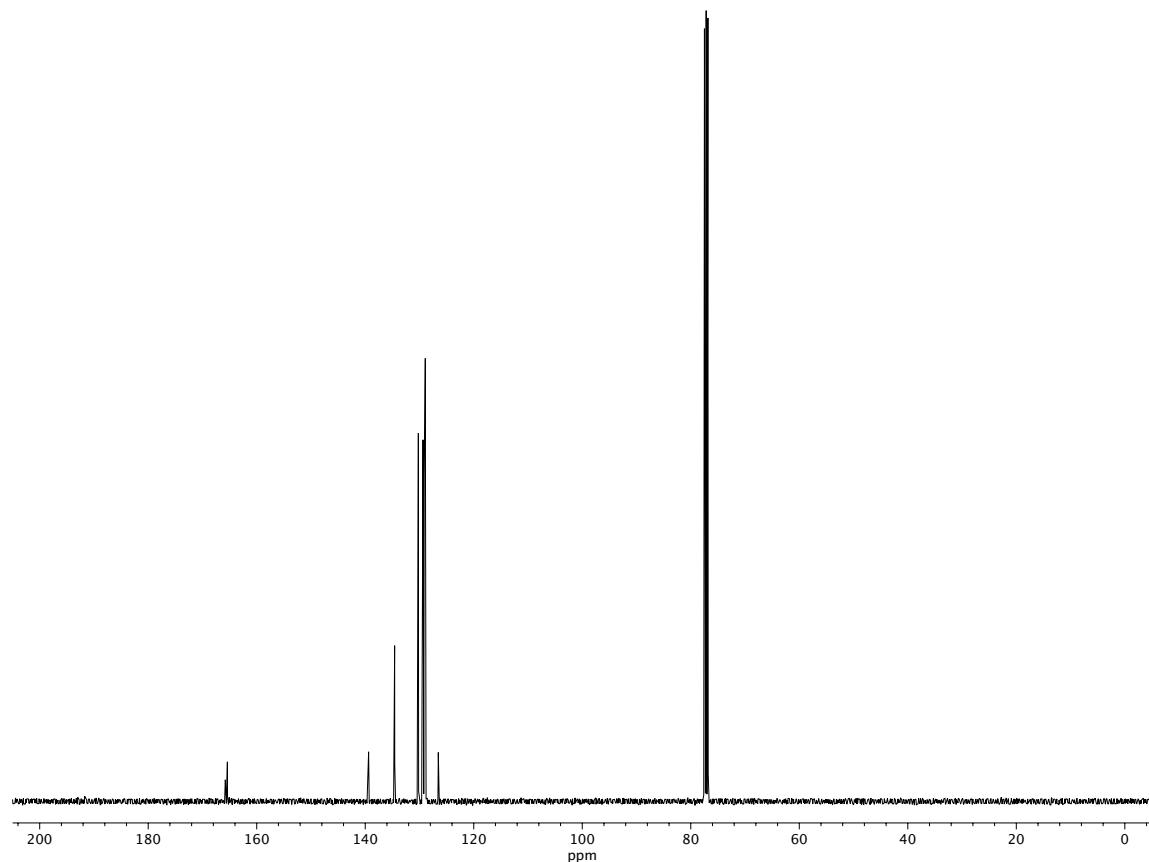
**Figure A1.18**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CD}_3\text{OD}$ ) of compound **94**.



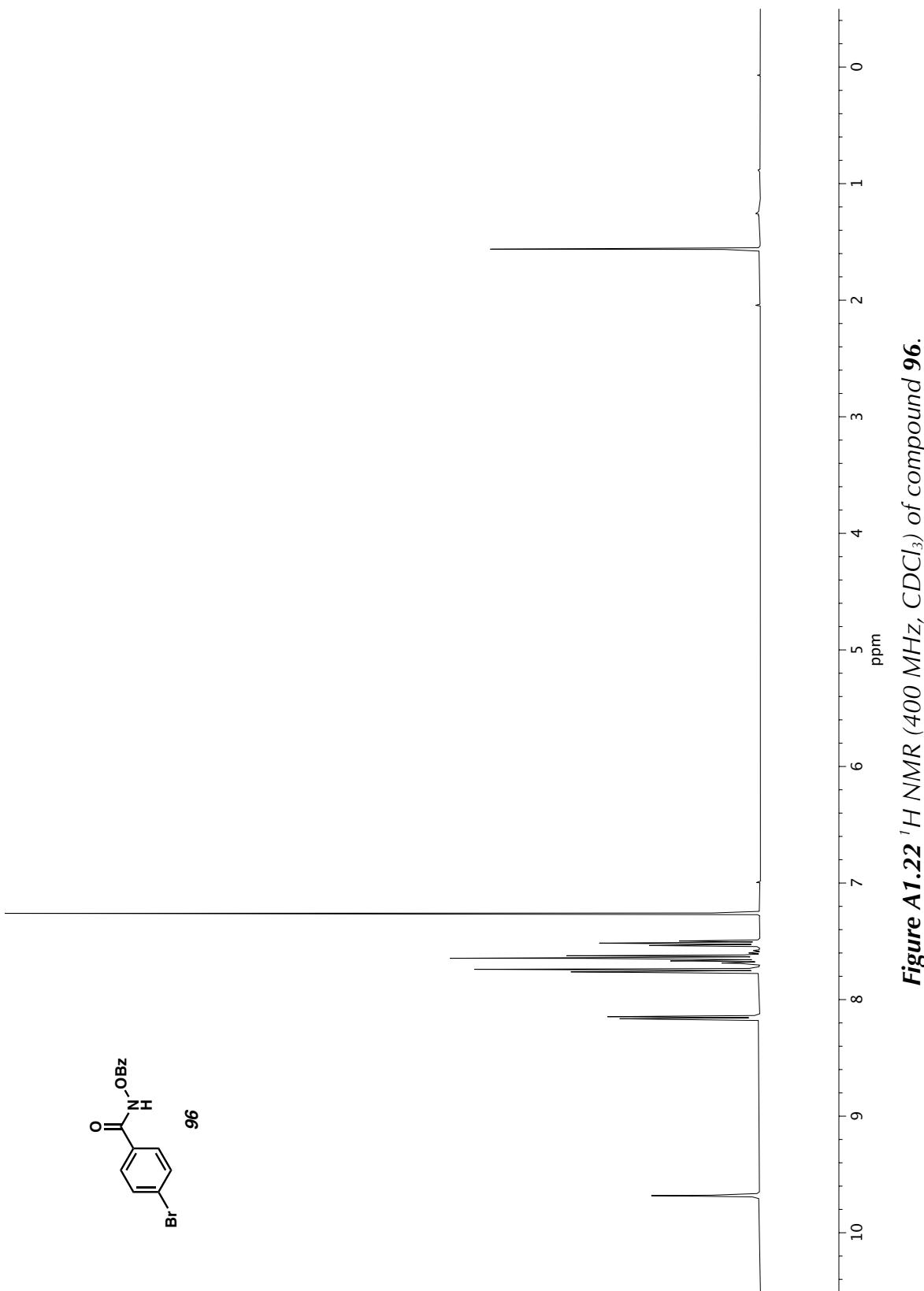
**Figure A1.19**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 95.



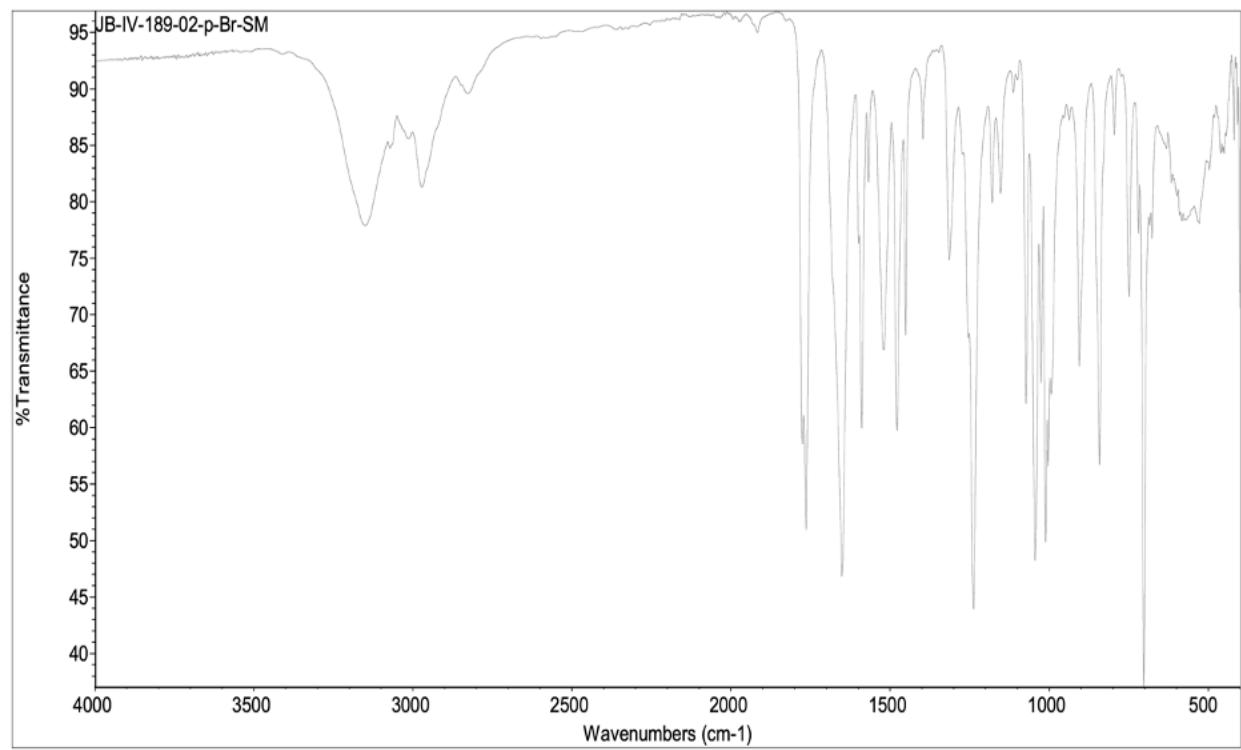
**Figure A1.20** Infrared spectrum (Thin Film) of compound **95**.



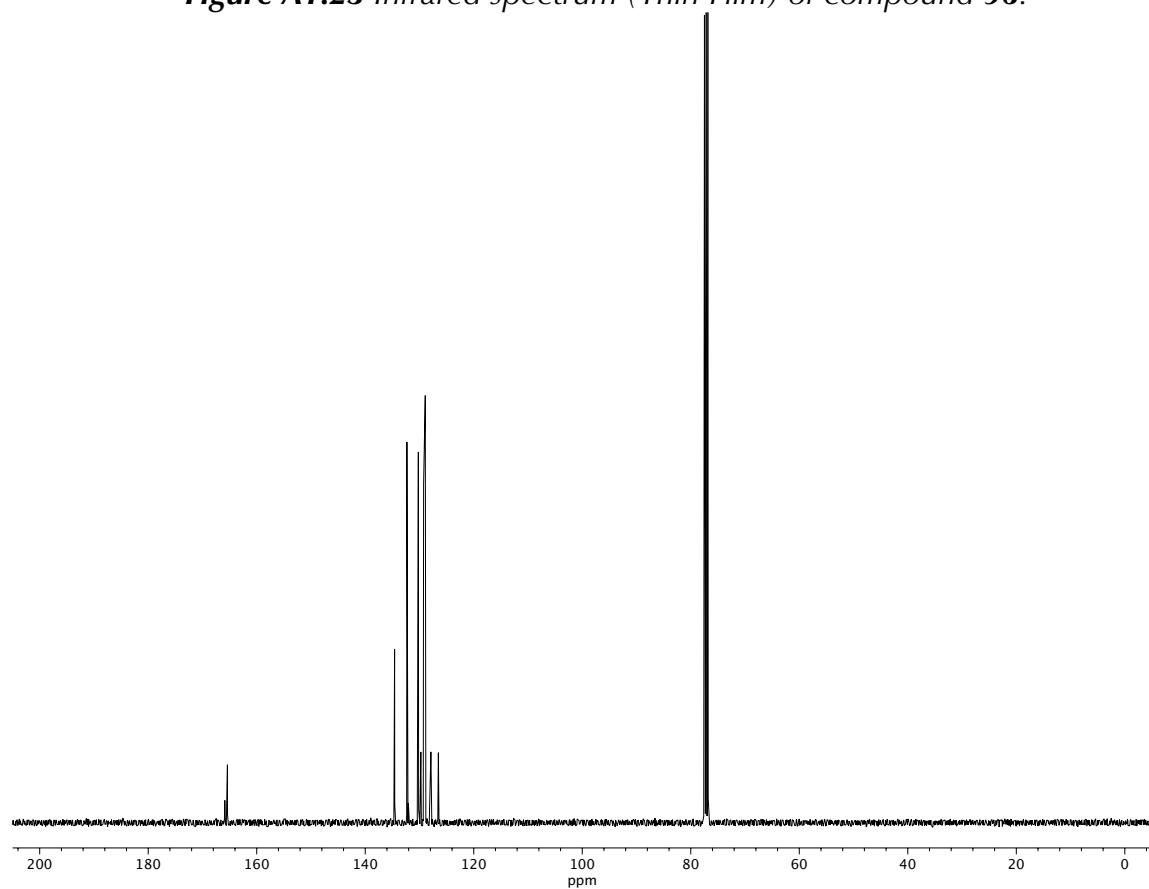
**Figure A1.21**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **95**.



**Figure A1.22**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 96.



**Figure A1.23** Infrared spectrum (Thin Film) of compound **96**.



**Figure A1.24**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **96**.

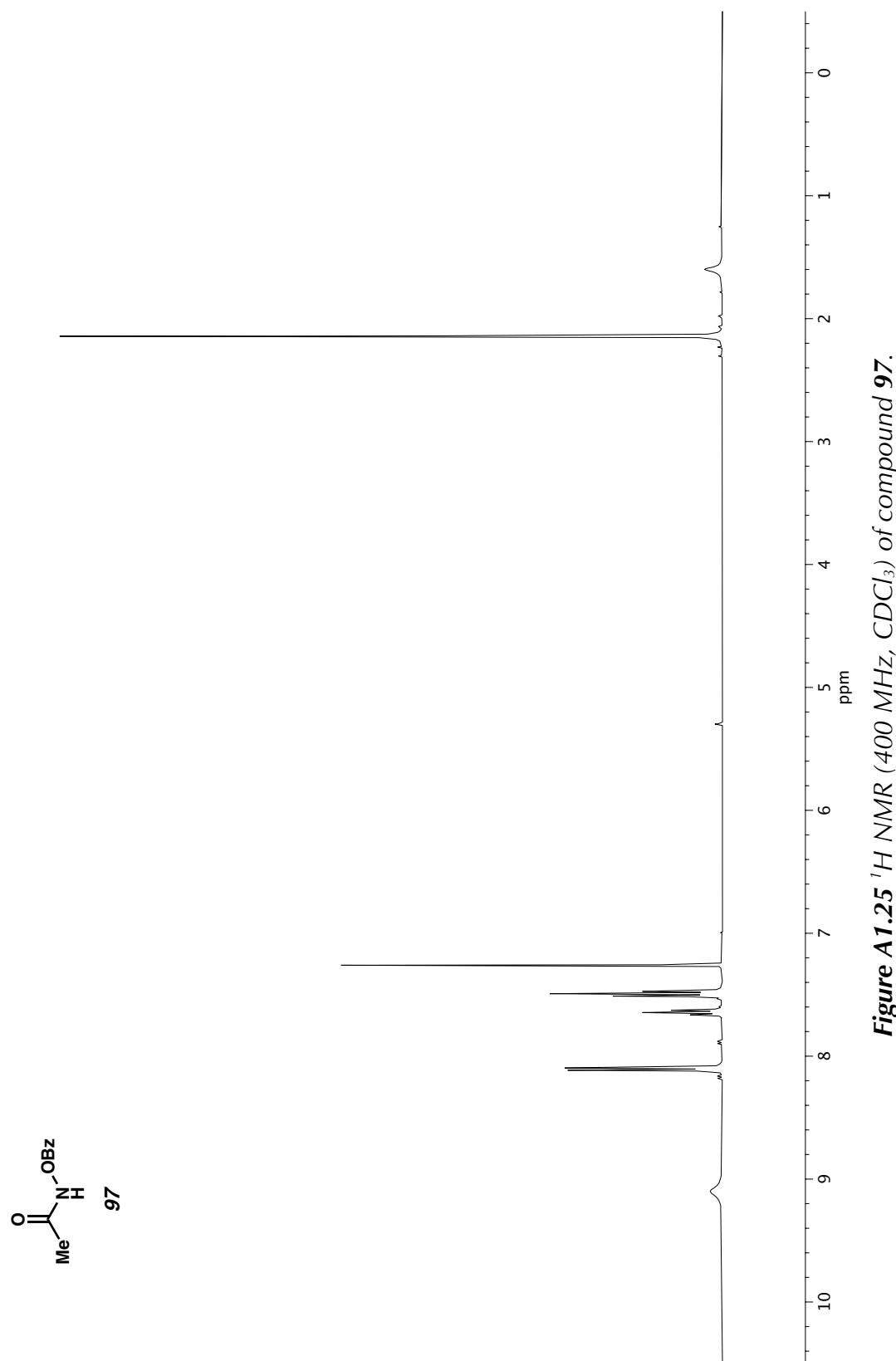
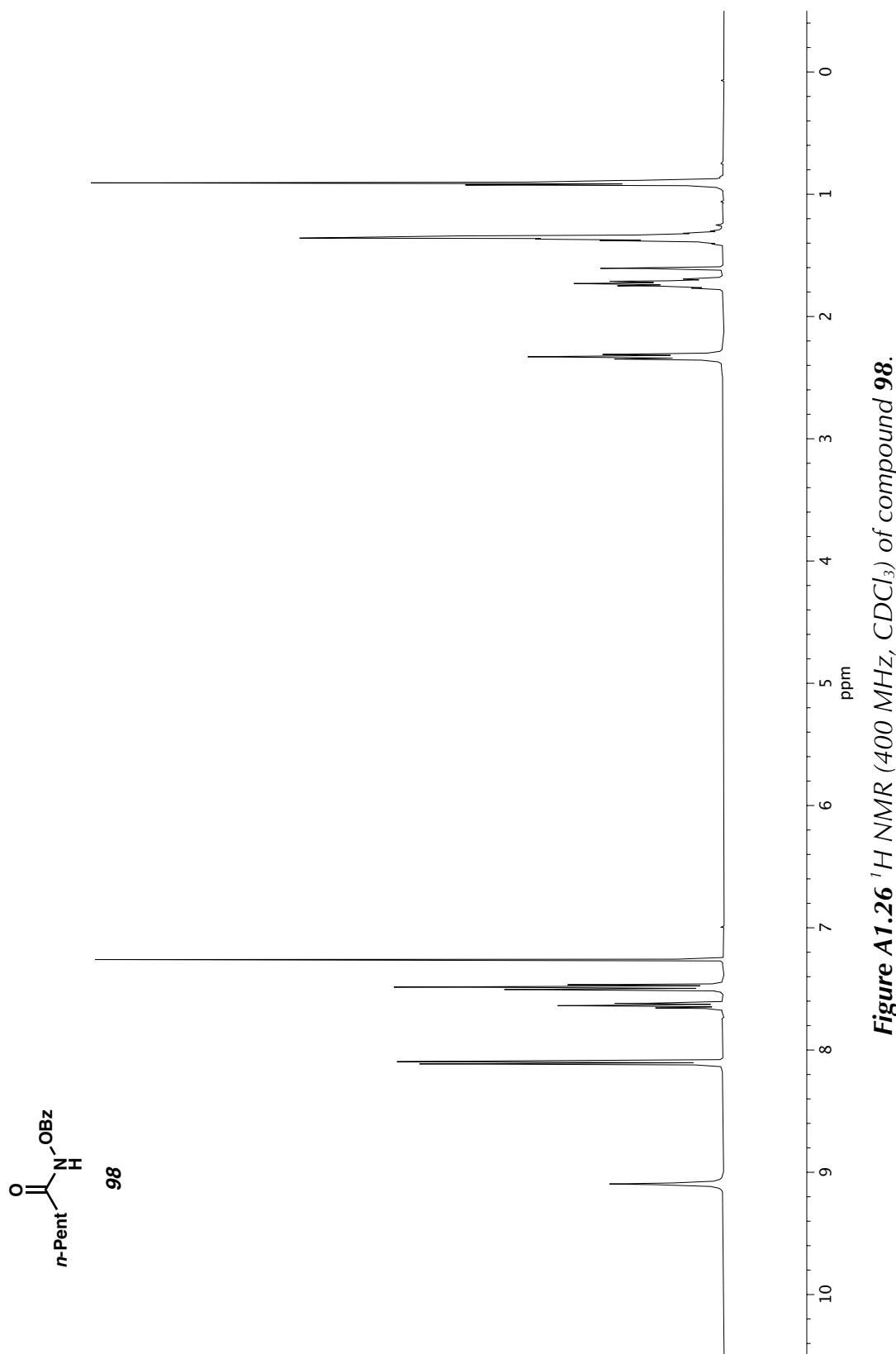
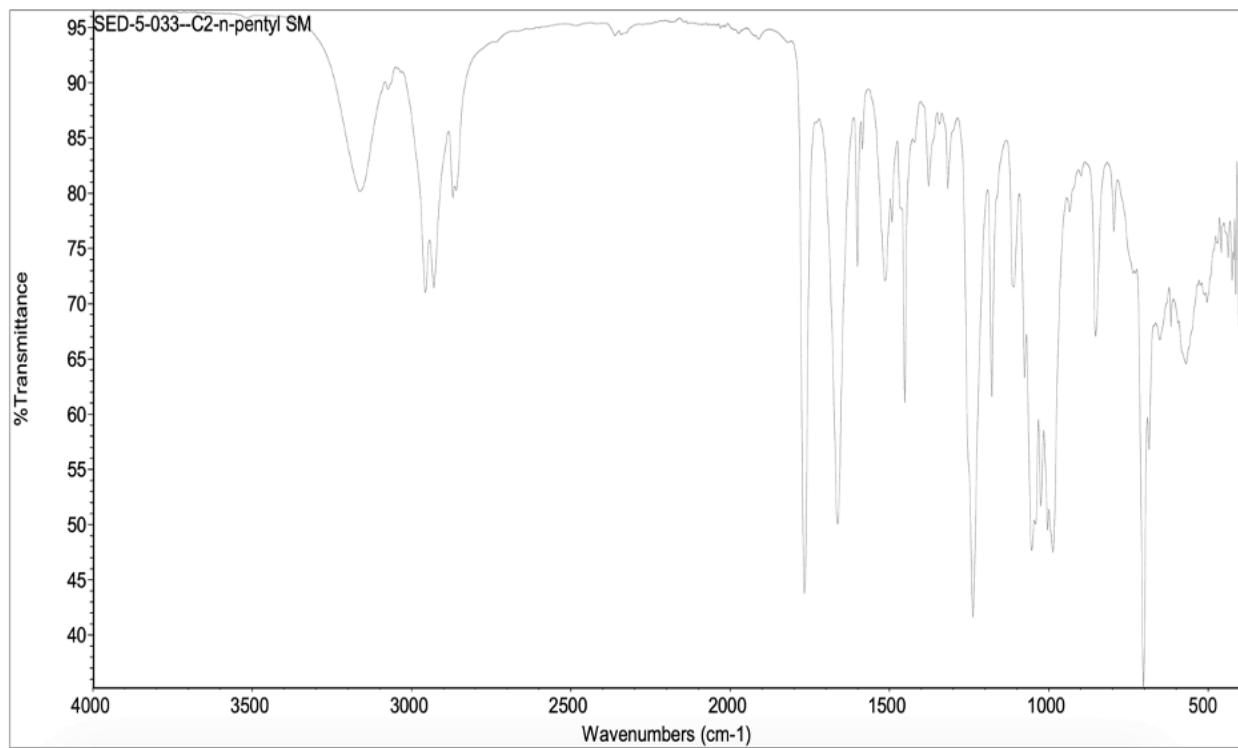


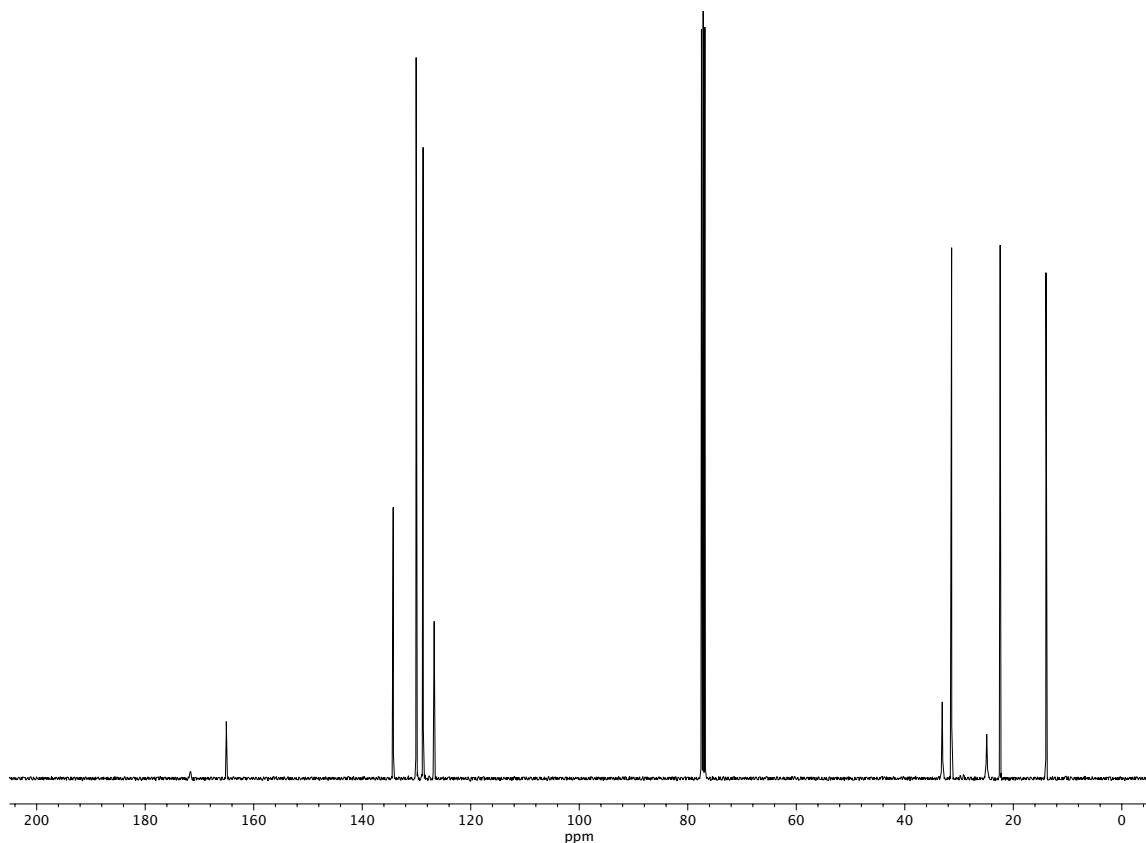
Figure A1.25  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 97.



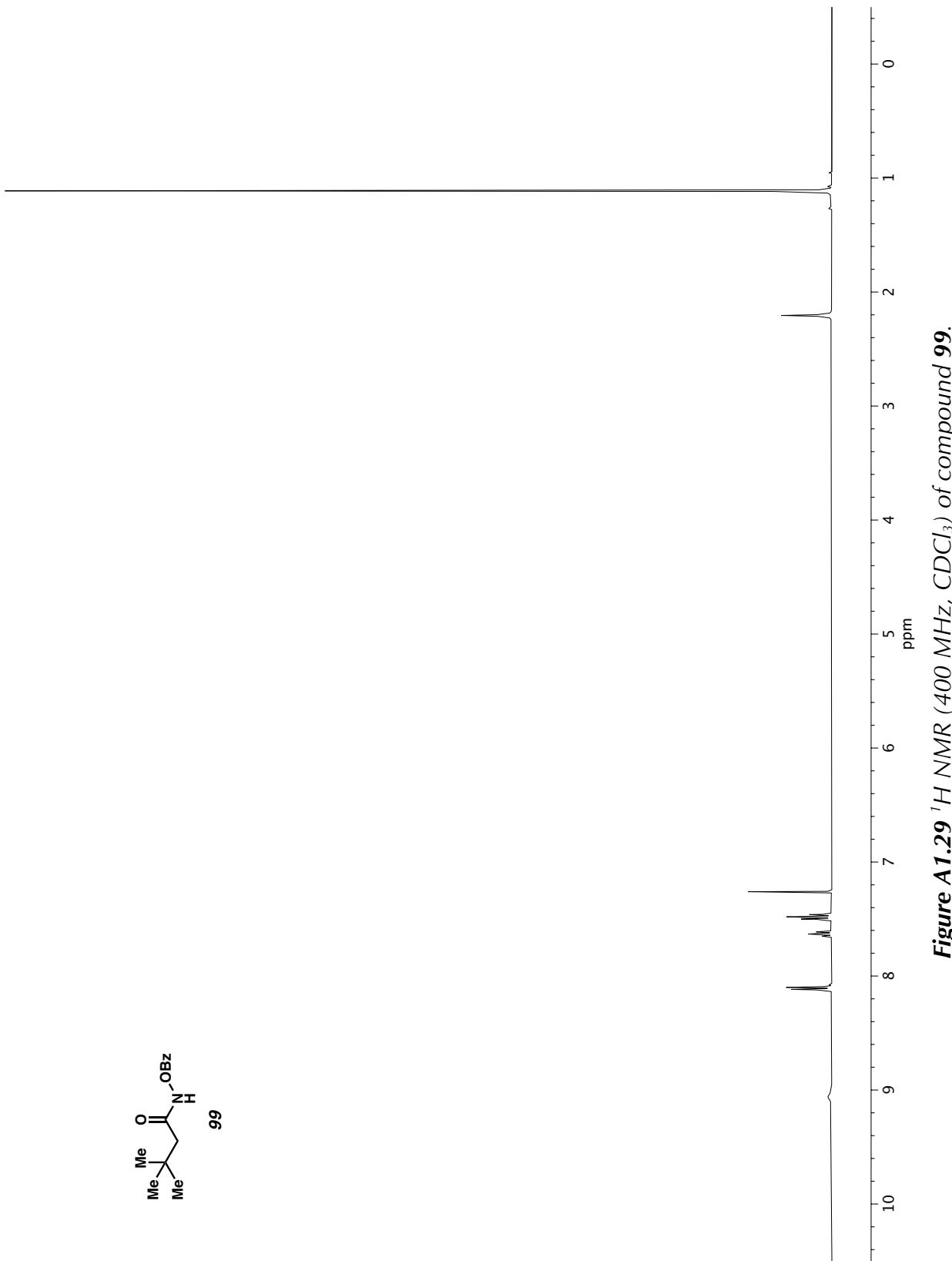
**Figure A1.26**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 98.



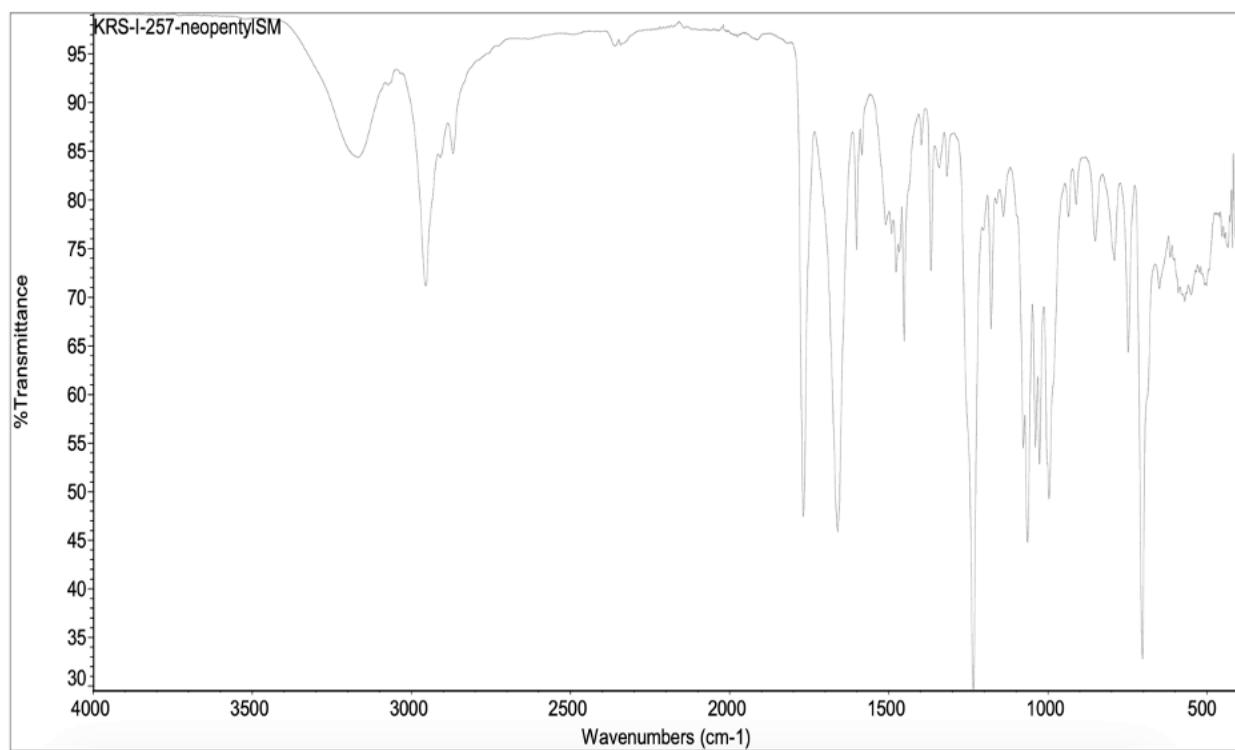
**Figure A1.27** Infrared spectrum (Thin Film) of compound **98**.



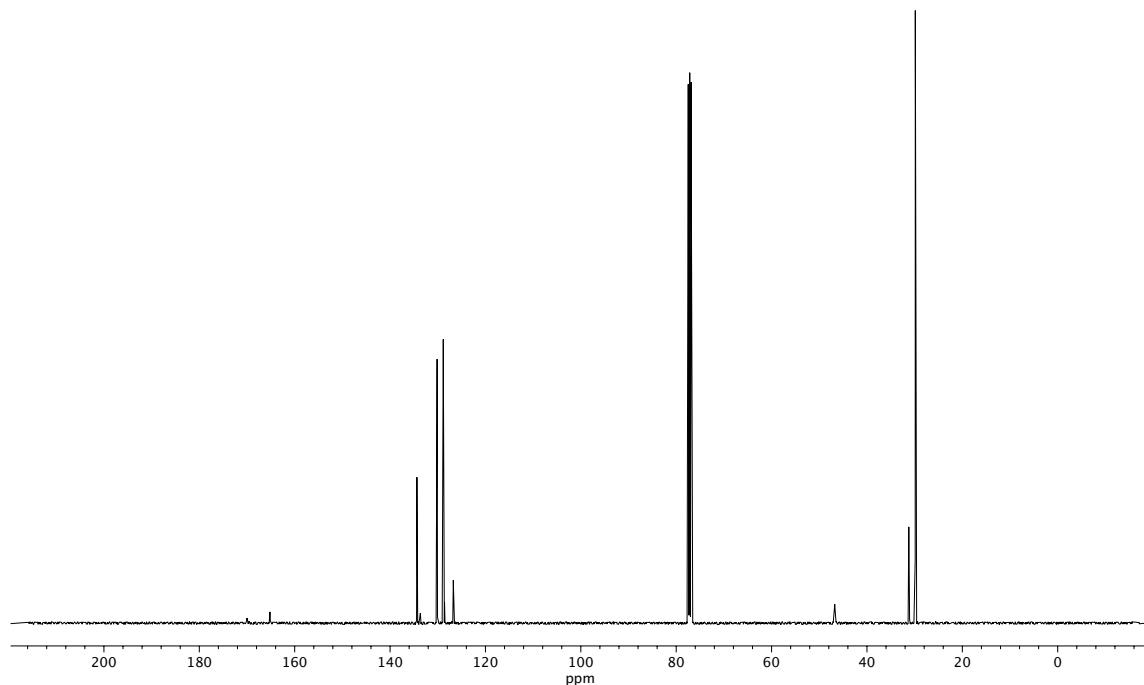
**Figure A1.28**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **98**.



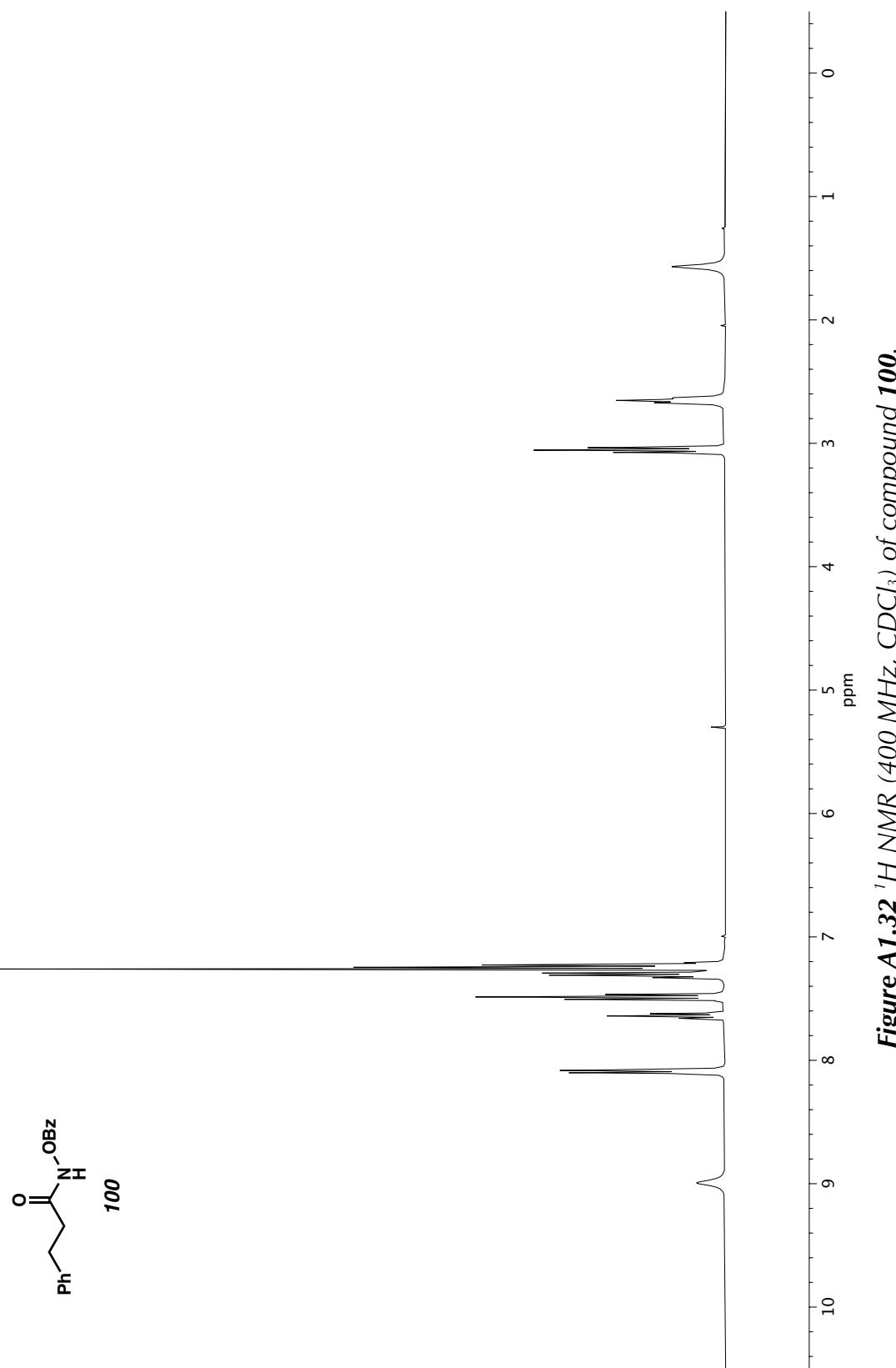
**Figure A1.29**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 99.



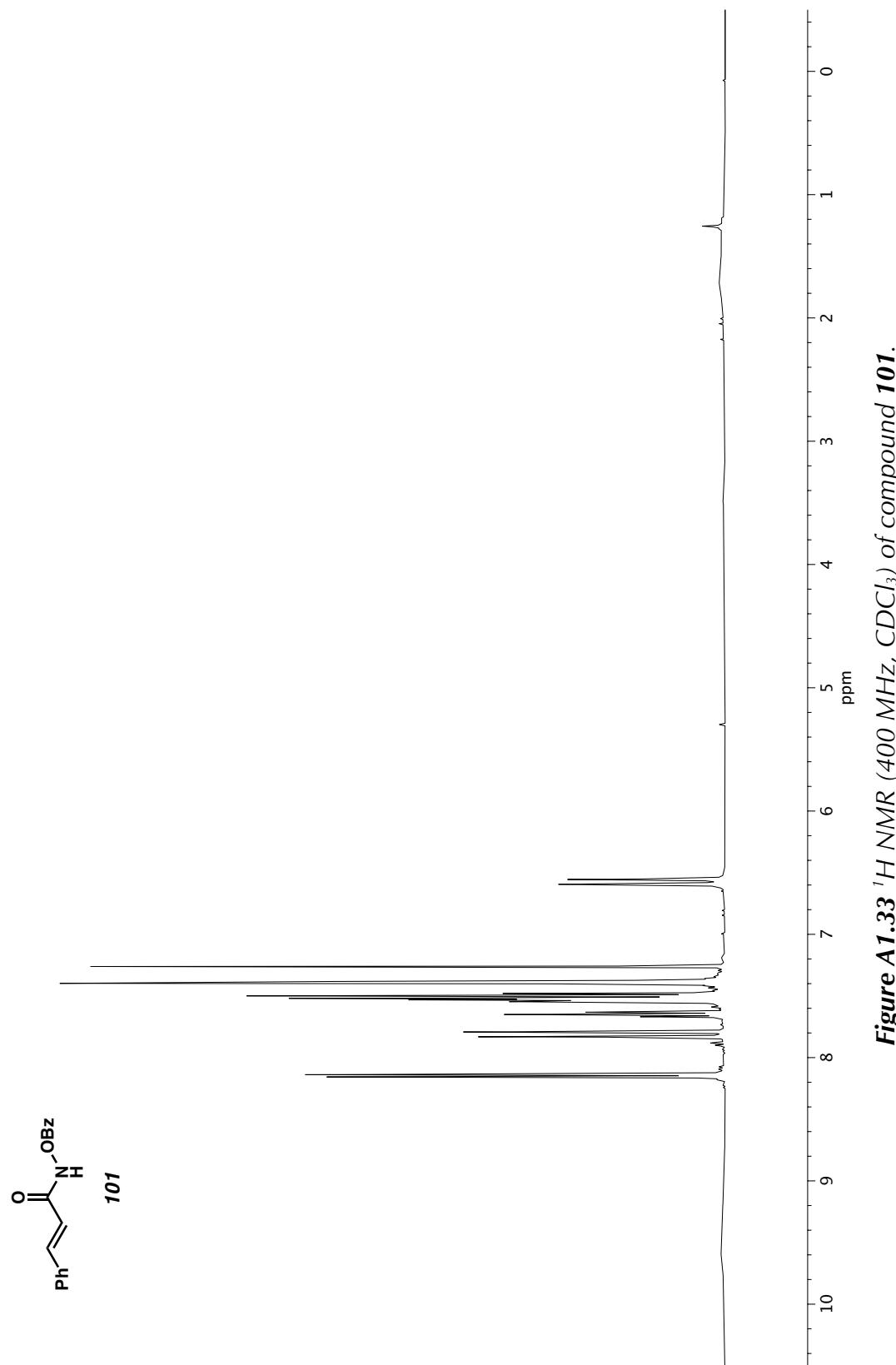
**Figure A1.30** Infrared spectrum (Thin Film) of compound **99**.



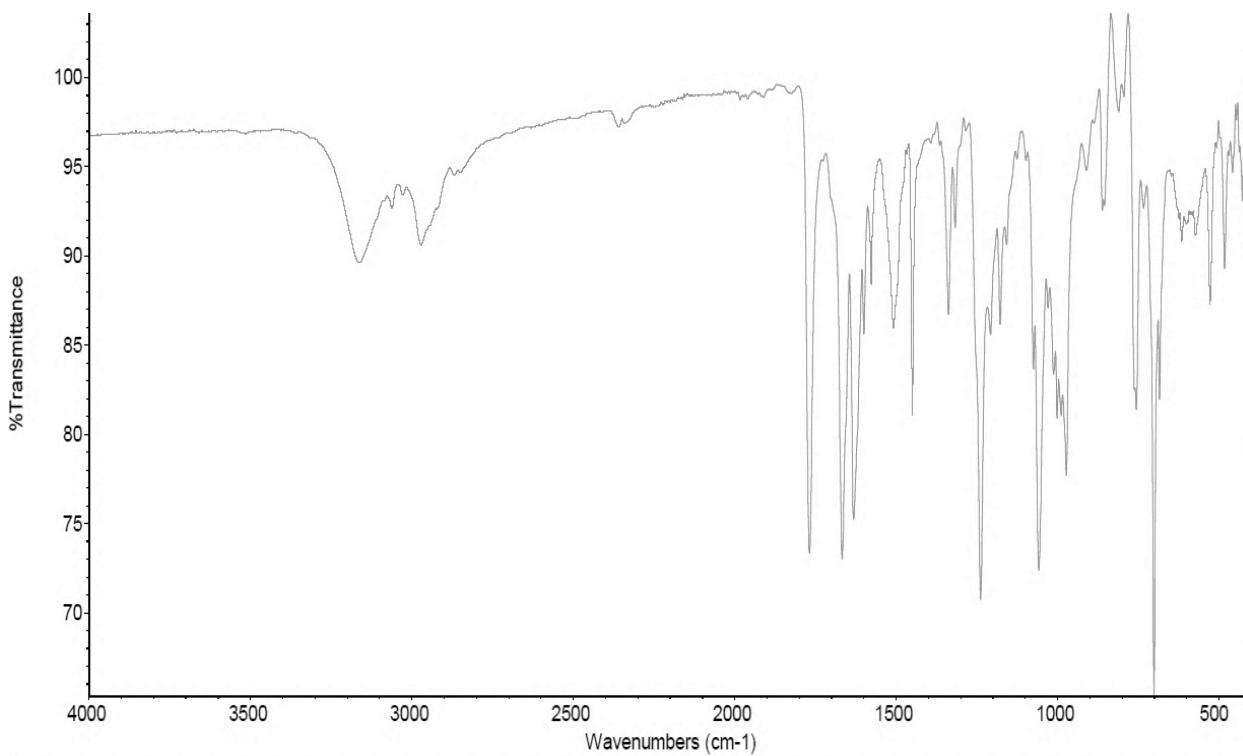
**Figure A1.31** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **99**.



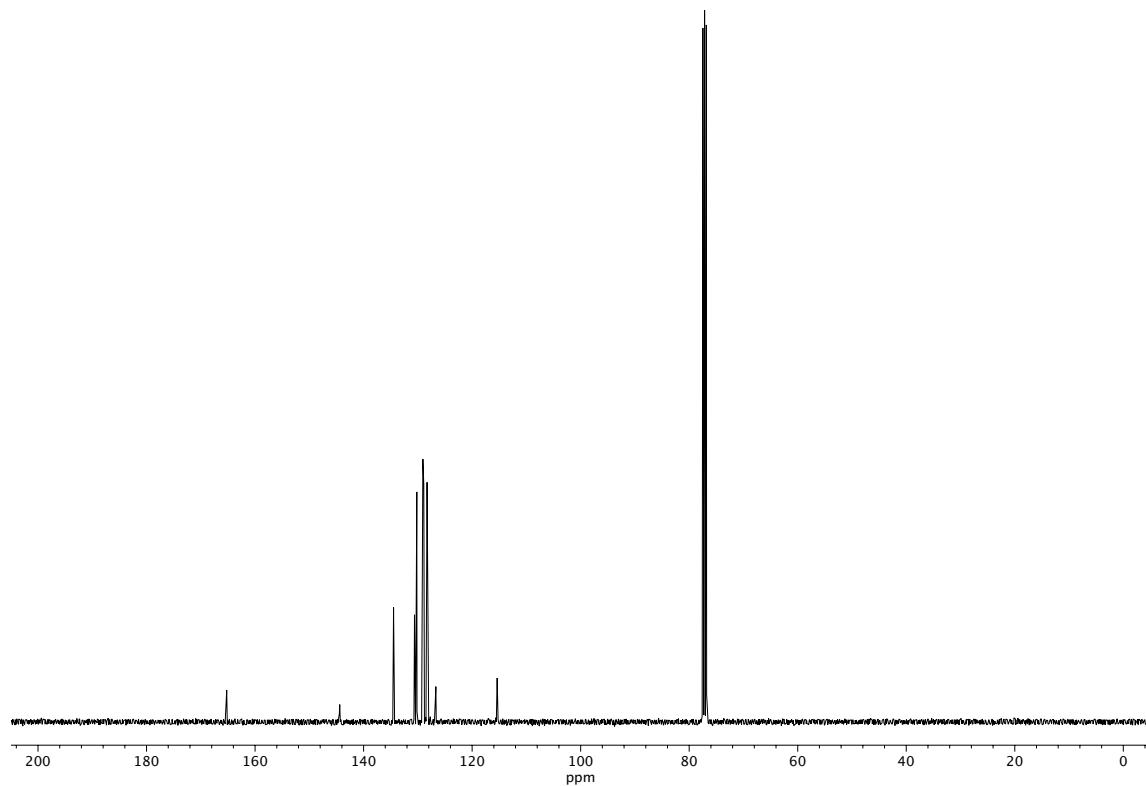
**Figure A1.32**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 100.



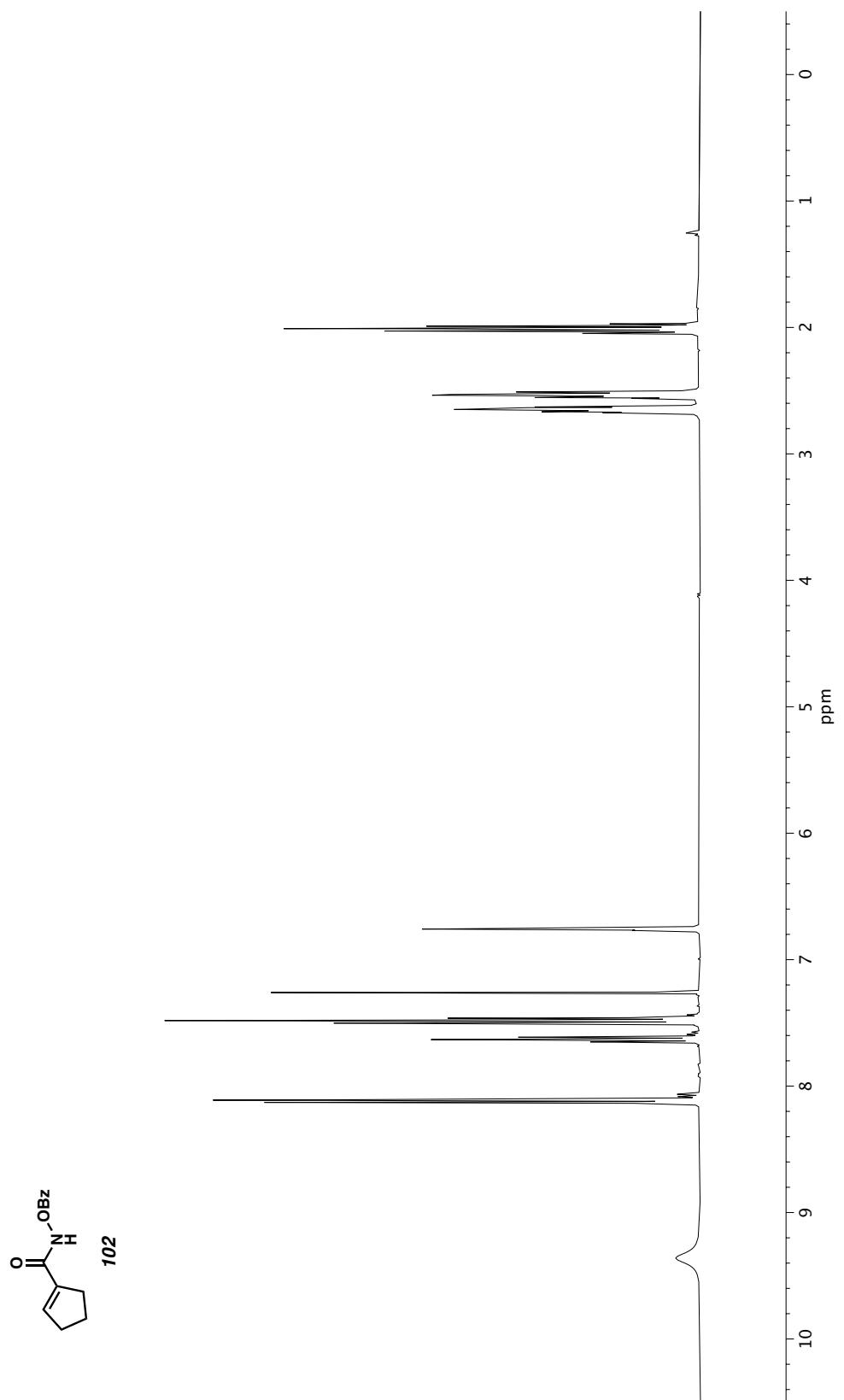
**Figure A1.33**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 101.



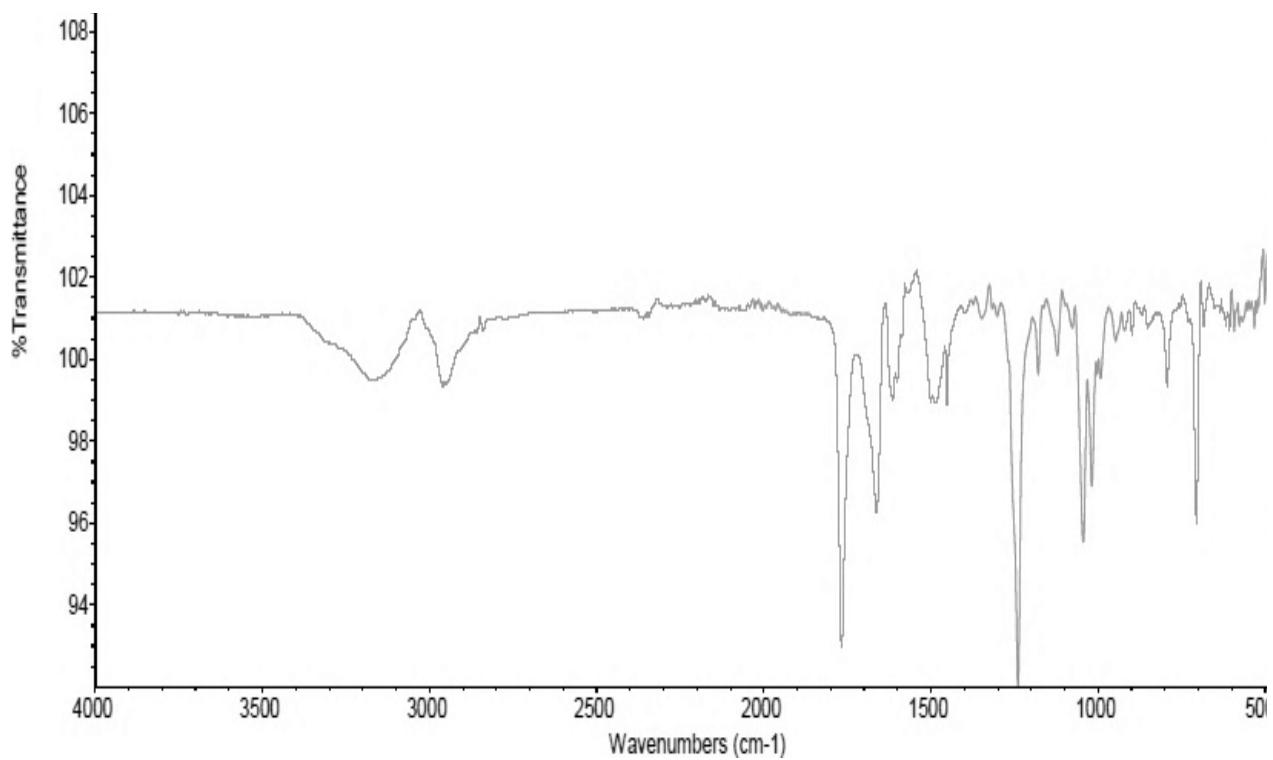
**Figure A1.34** Infrared spectrum (Thin Film) of compound **101**.



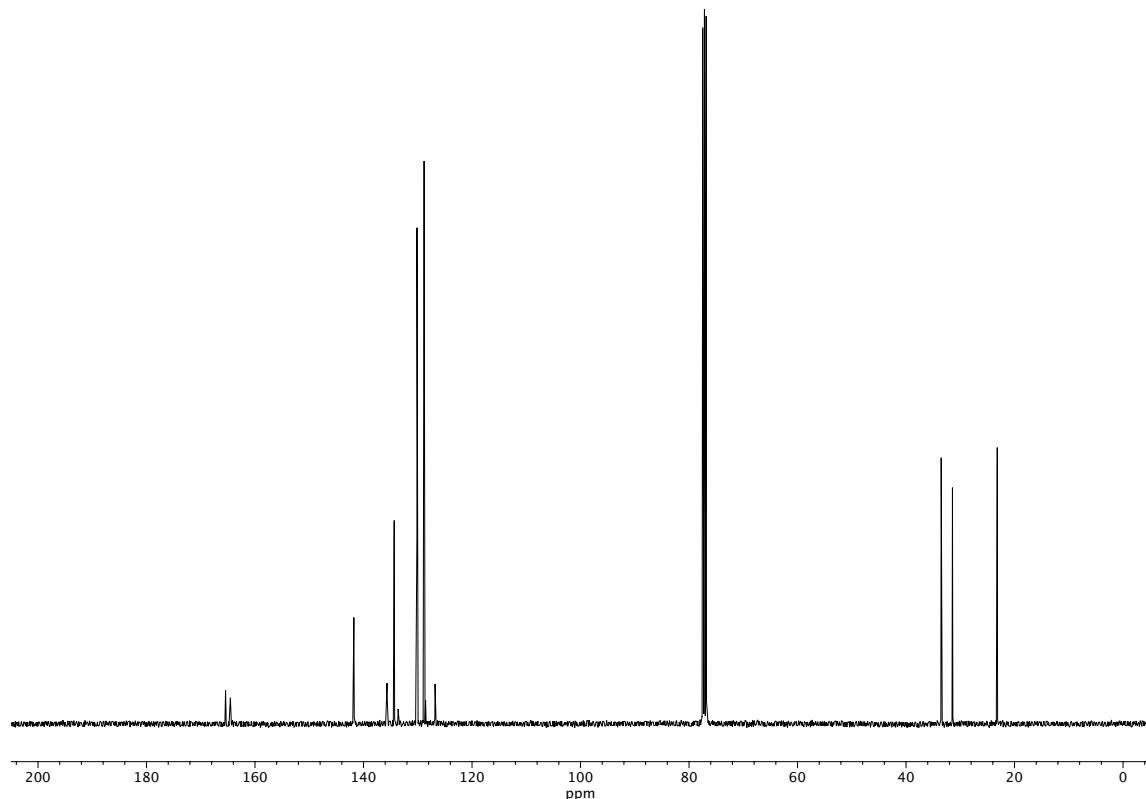
**Figure A1.35**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **101**.



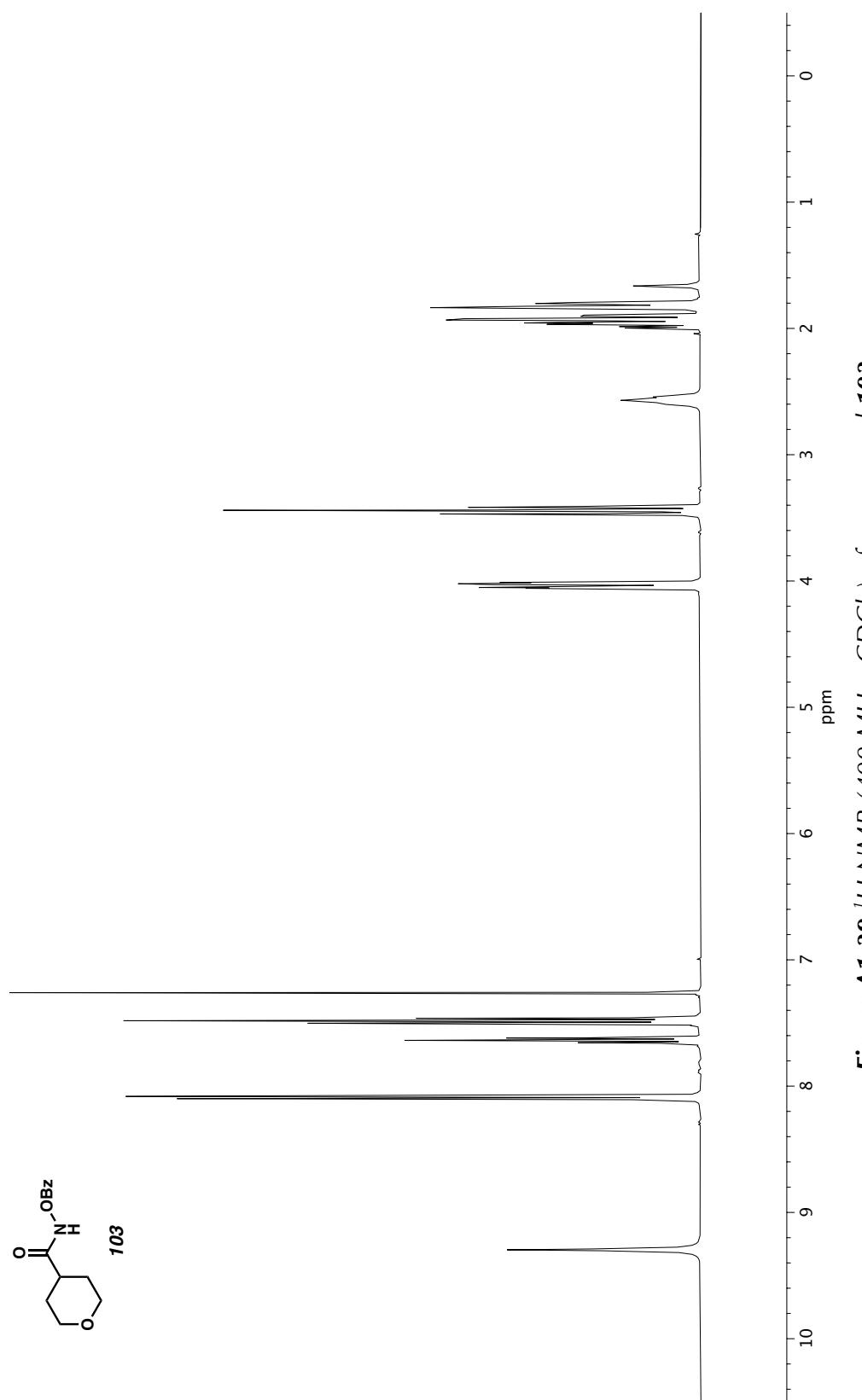
**Figure A1.36**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 102.



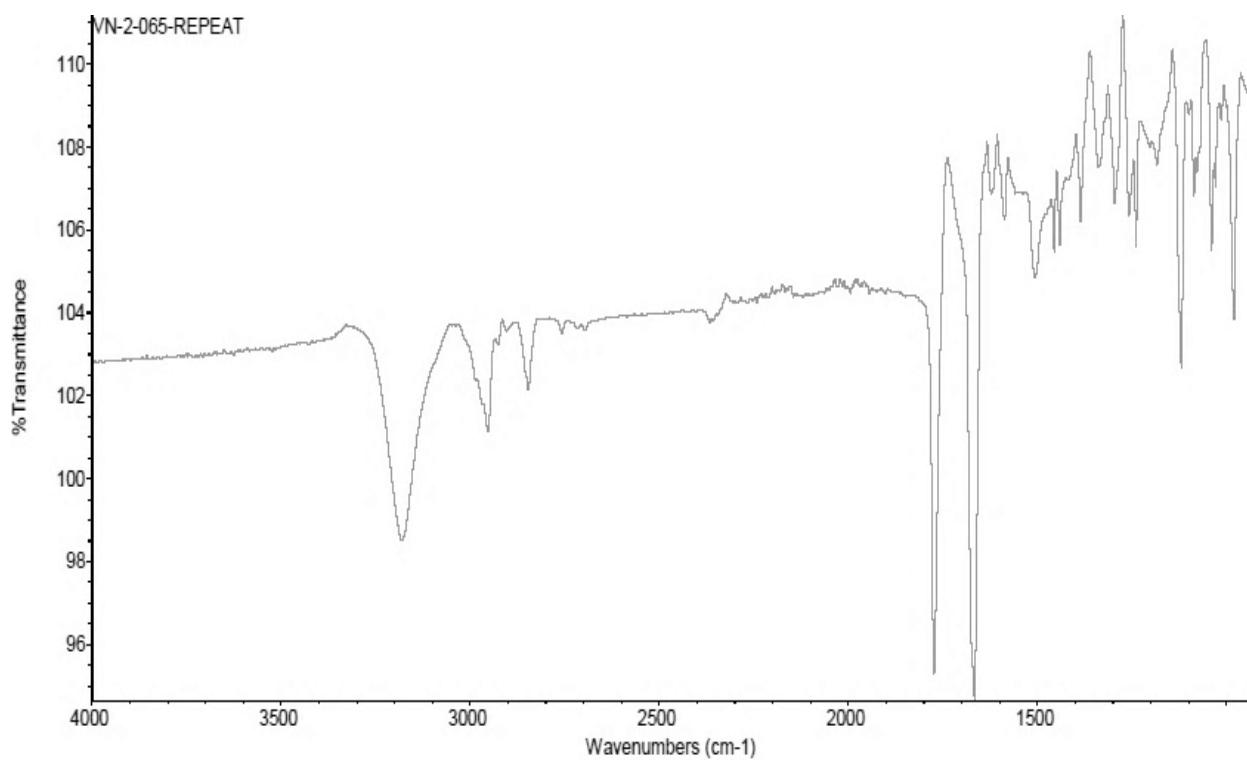
**Figure A1.37** Infrared spectrum (Thin Film) of compound **102**.



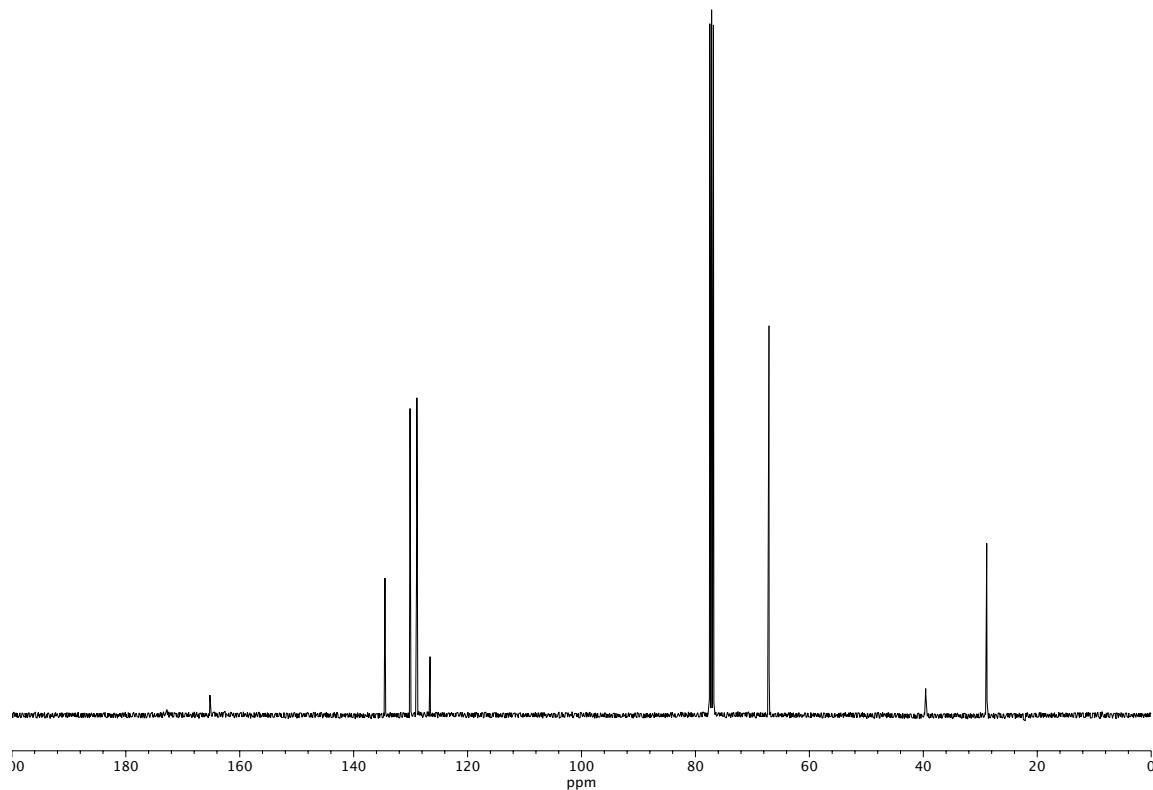
**Figure A1.38**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **102**.



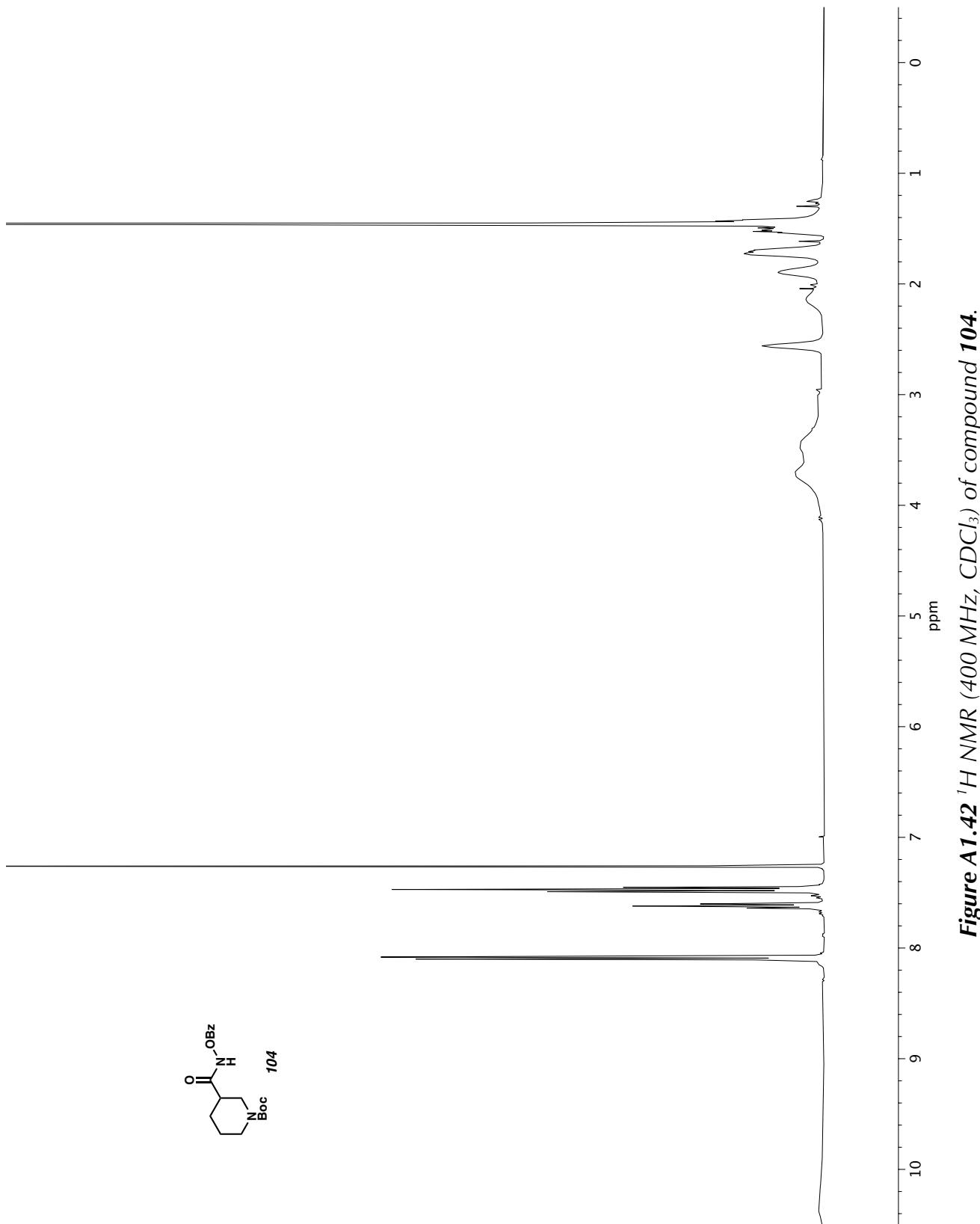
**Figure A1.39**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 103.



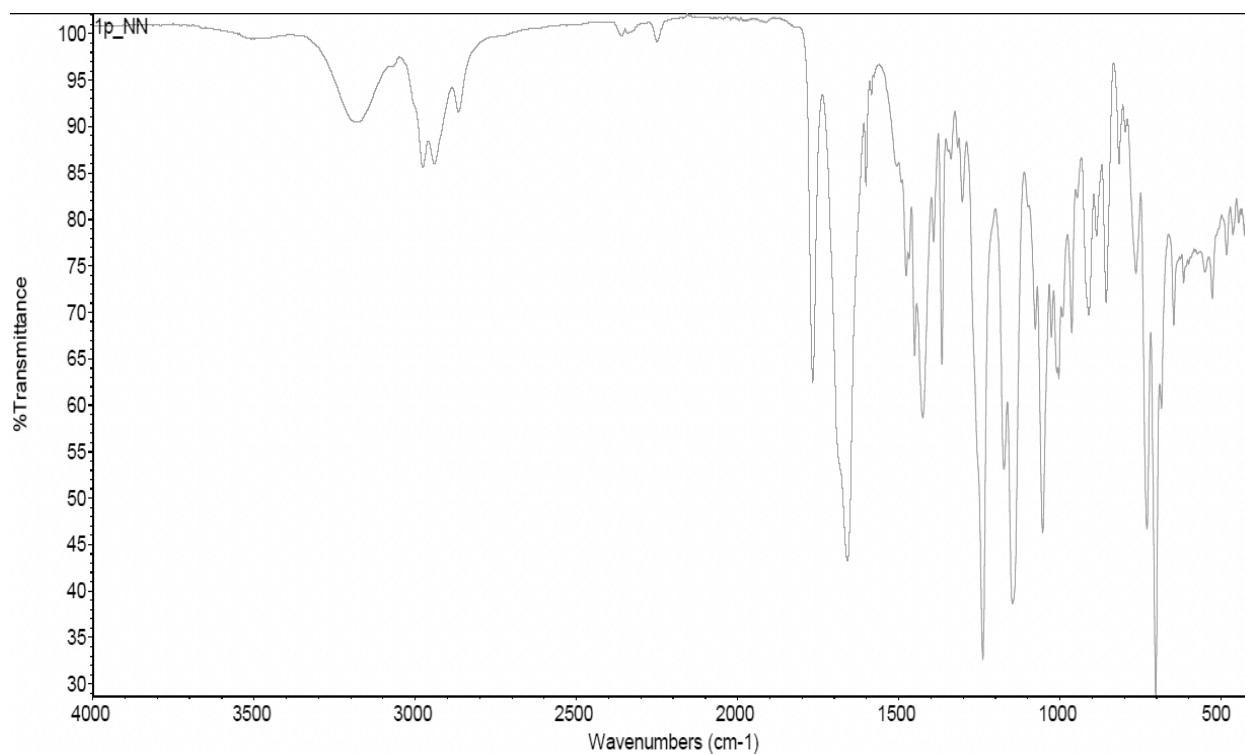
**Figure A1.40** Infrared spectrum (Thin Film) of compound **103**.



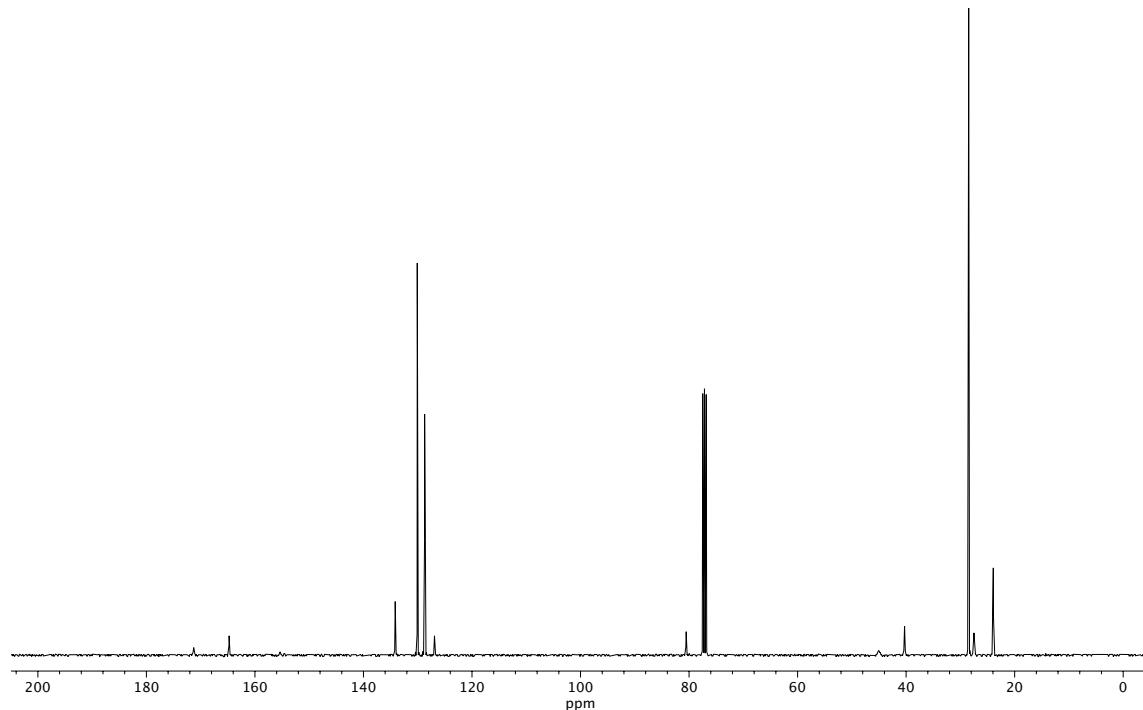
**Figure A1.41**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **103**.



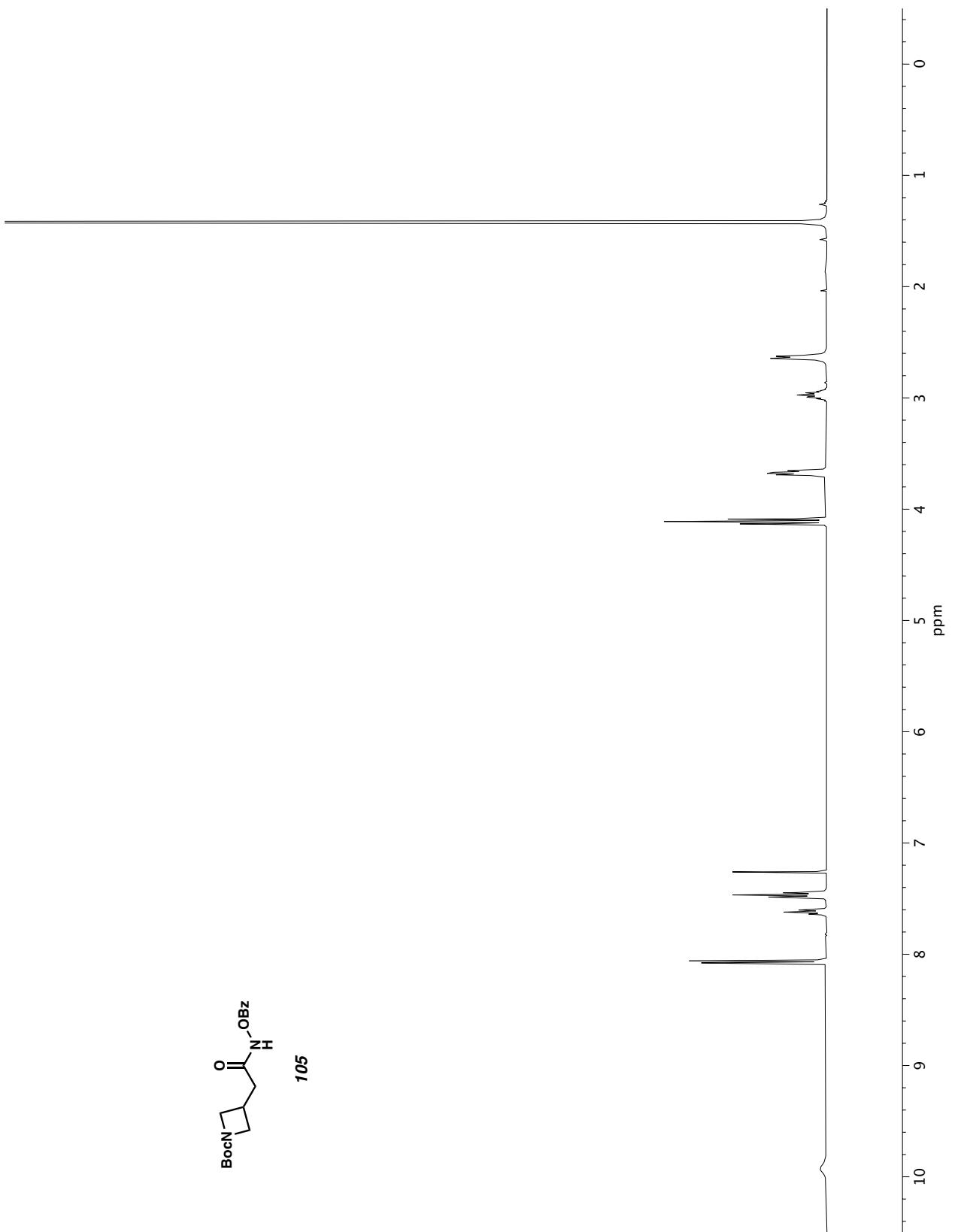
**Figure A1.42**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound **104**.



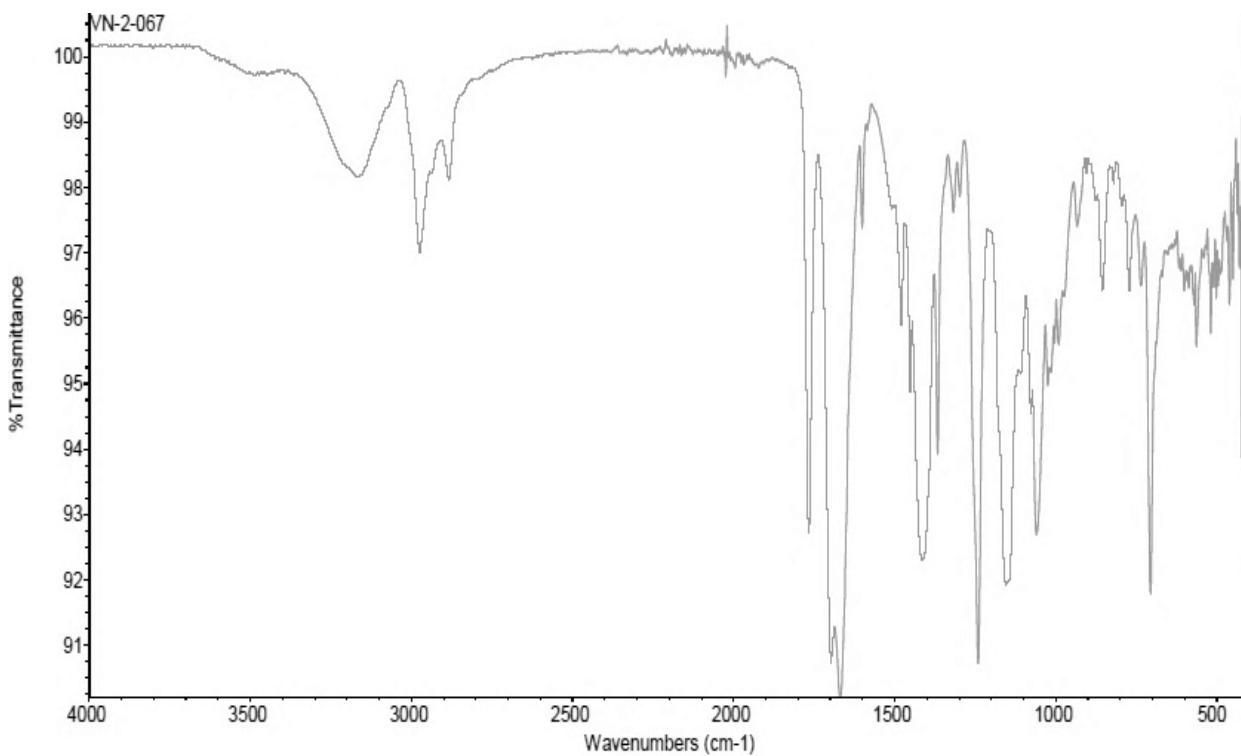
**Figure A1.43** Infrared spectrum (Thin Film) of compound **104**.



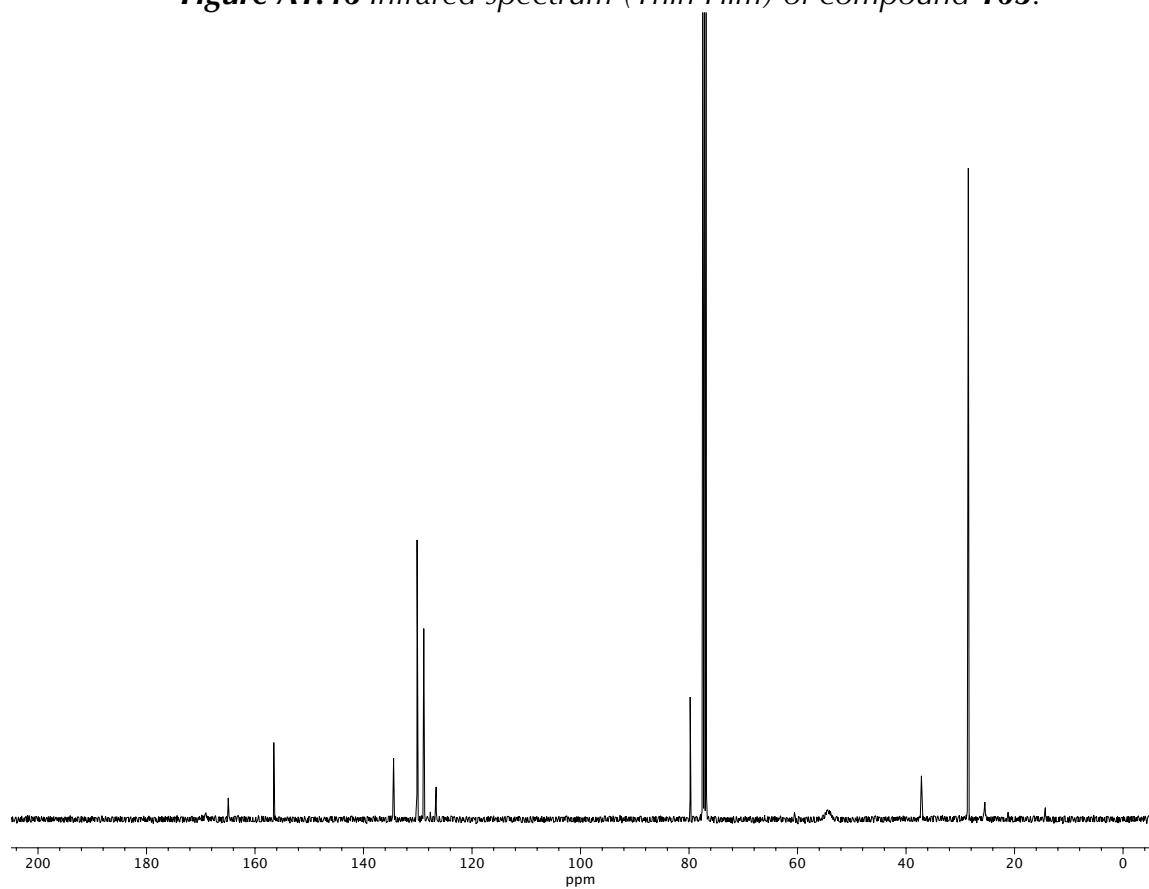
**Figure A1.44**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **104**.



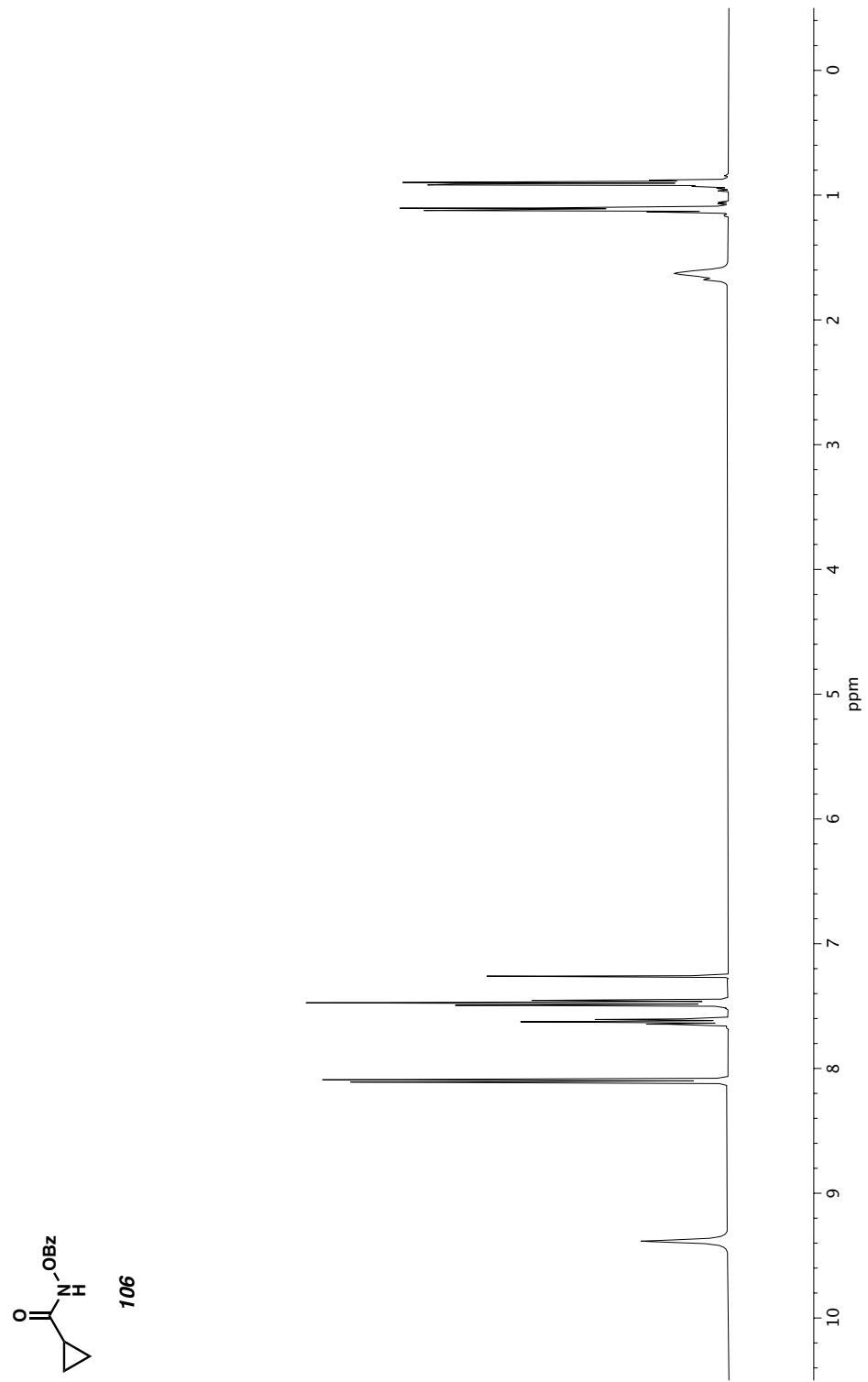
**Figure A1.45**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 105.



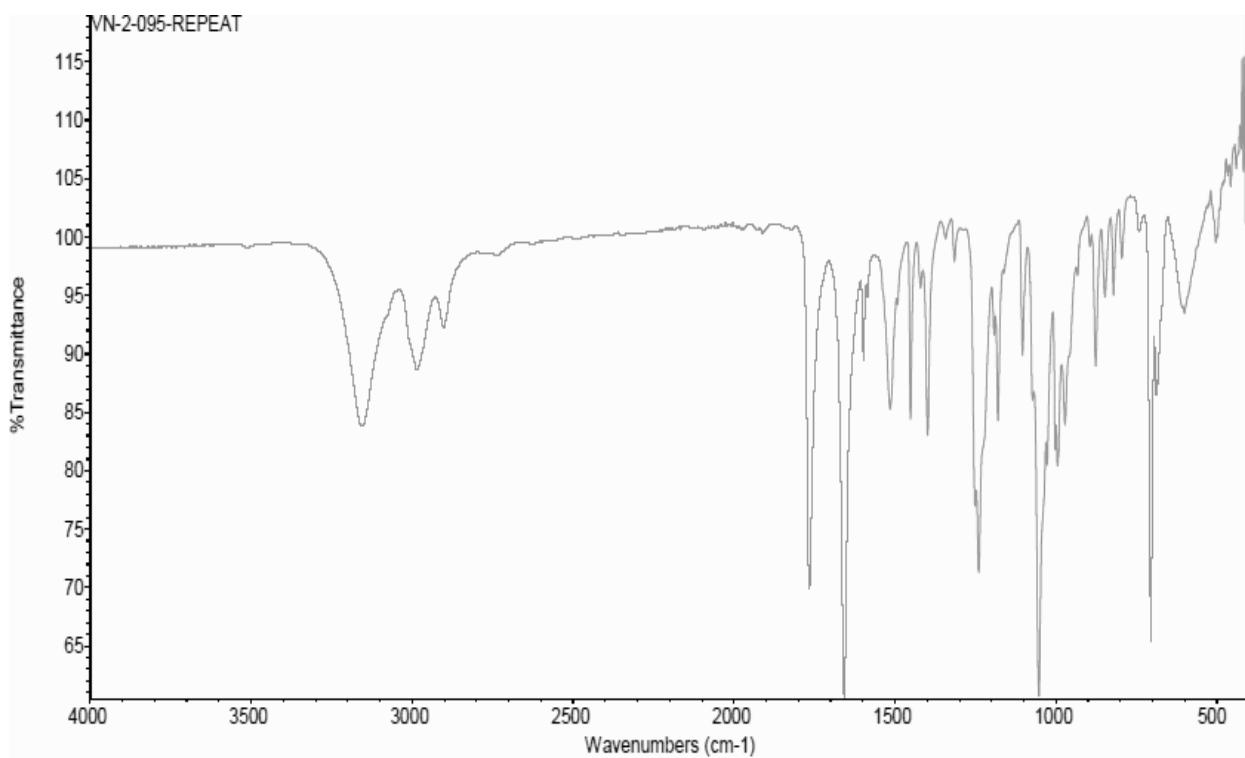
**Figure A1.46** Infrared spectrum (Thin Film) of compound **105**.



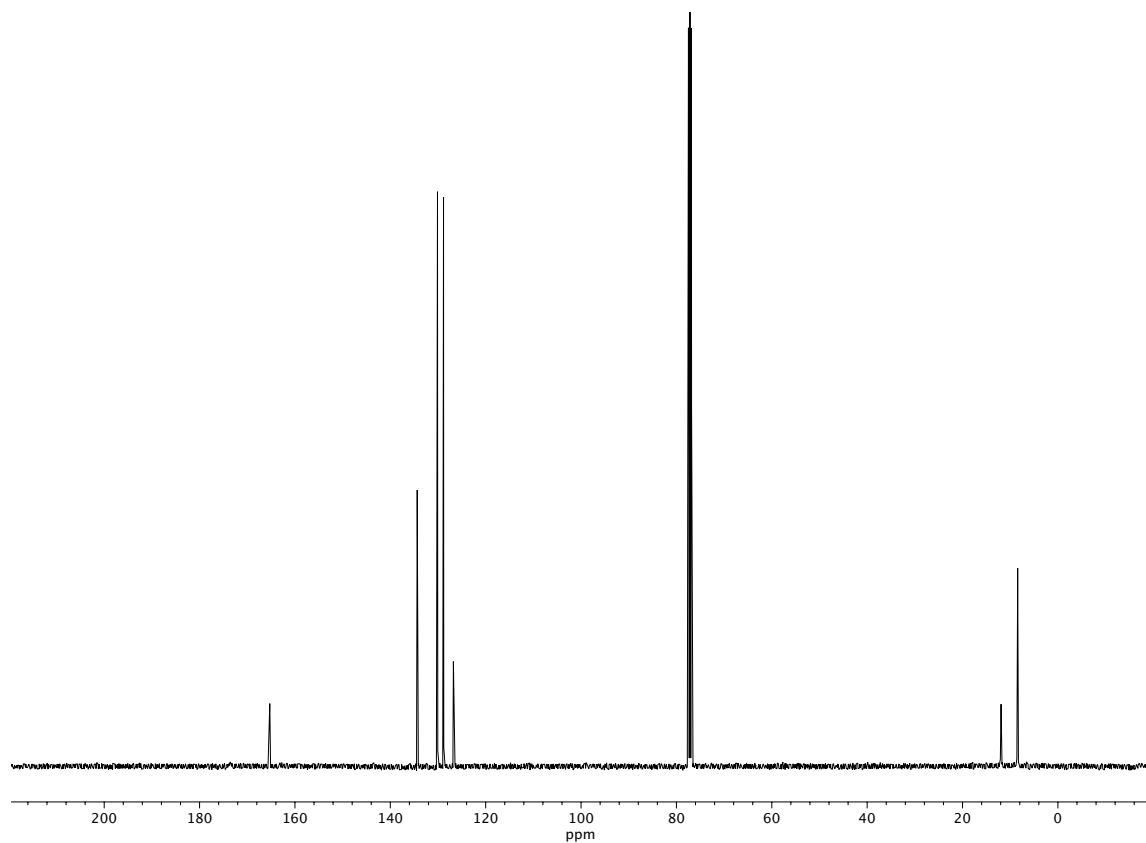
**Figure A1.47** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **105**.



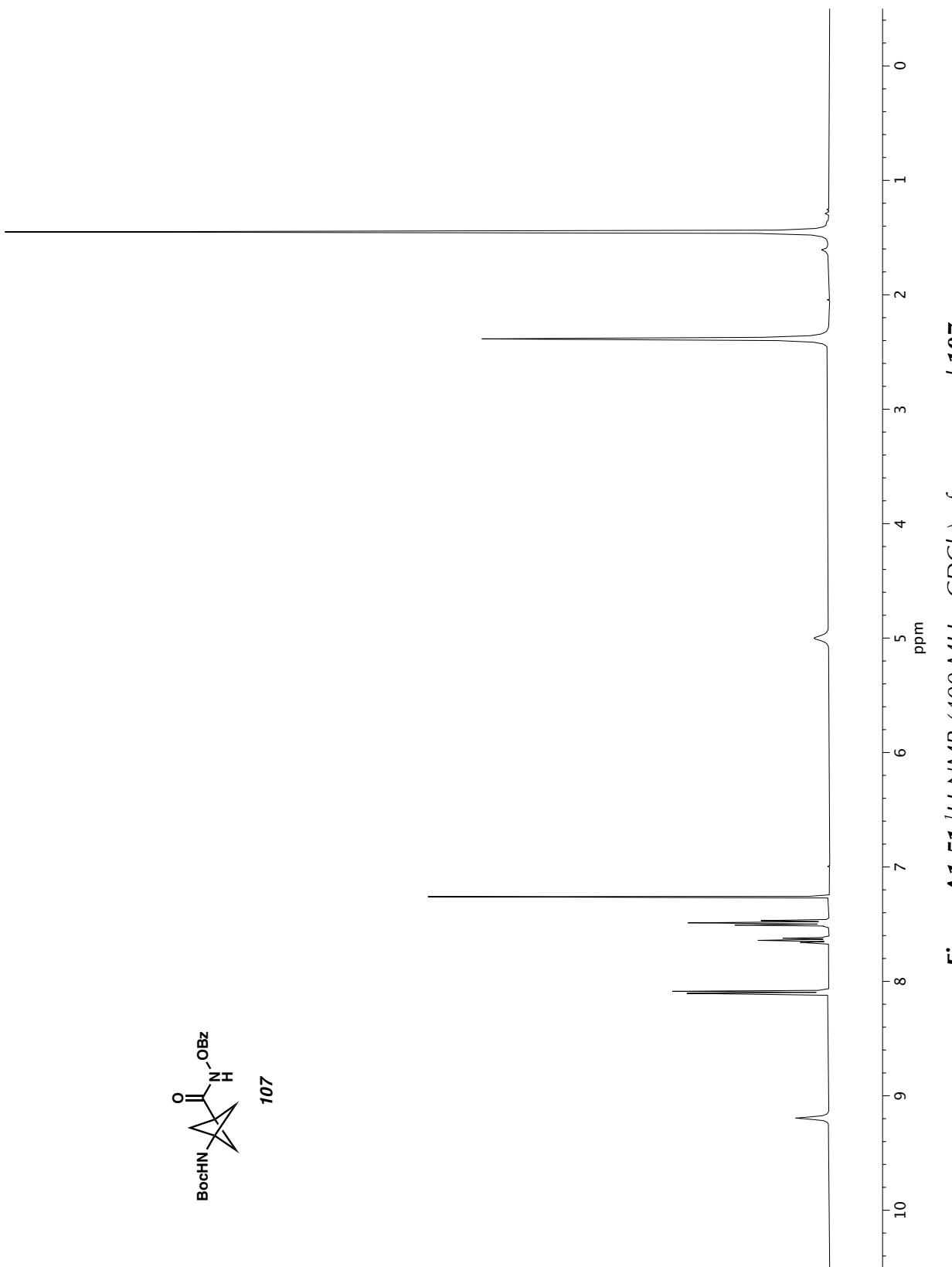
**Figure A1.48**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound **106**.



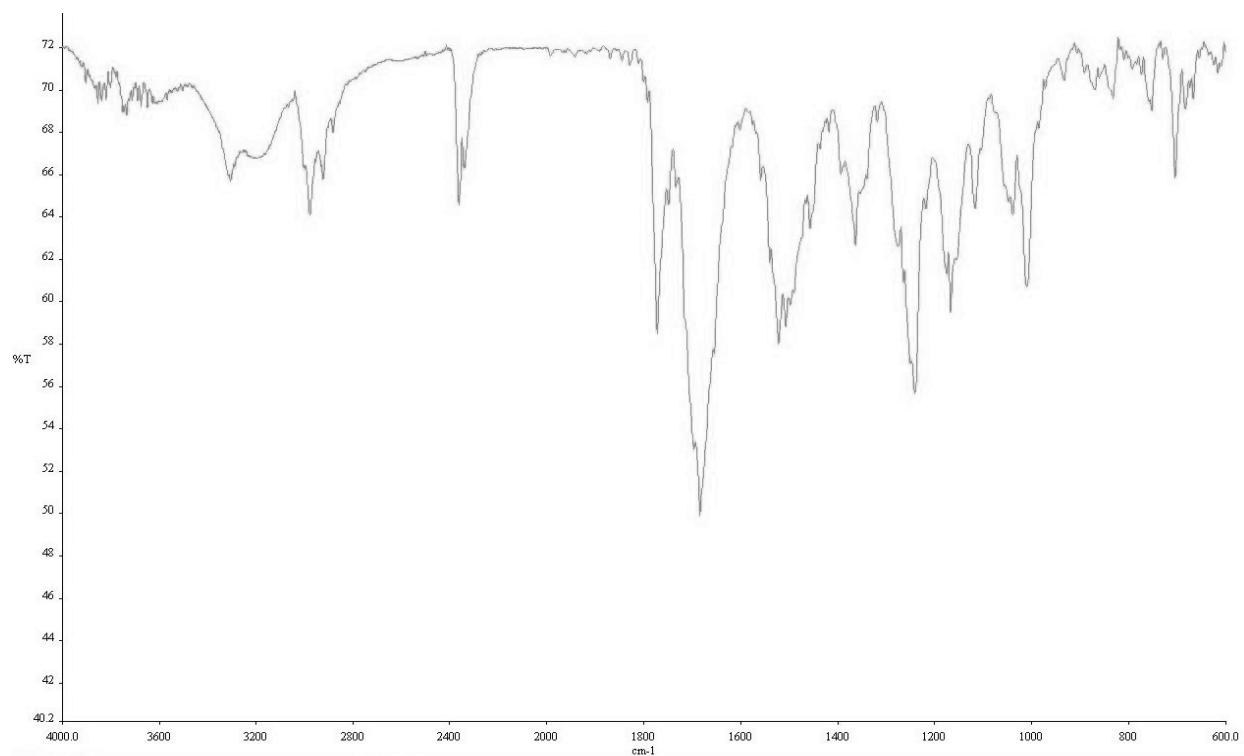
**Figure A1.49** Infrared spectrum (Thin Film) of compound **106**.



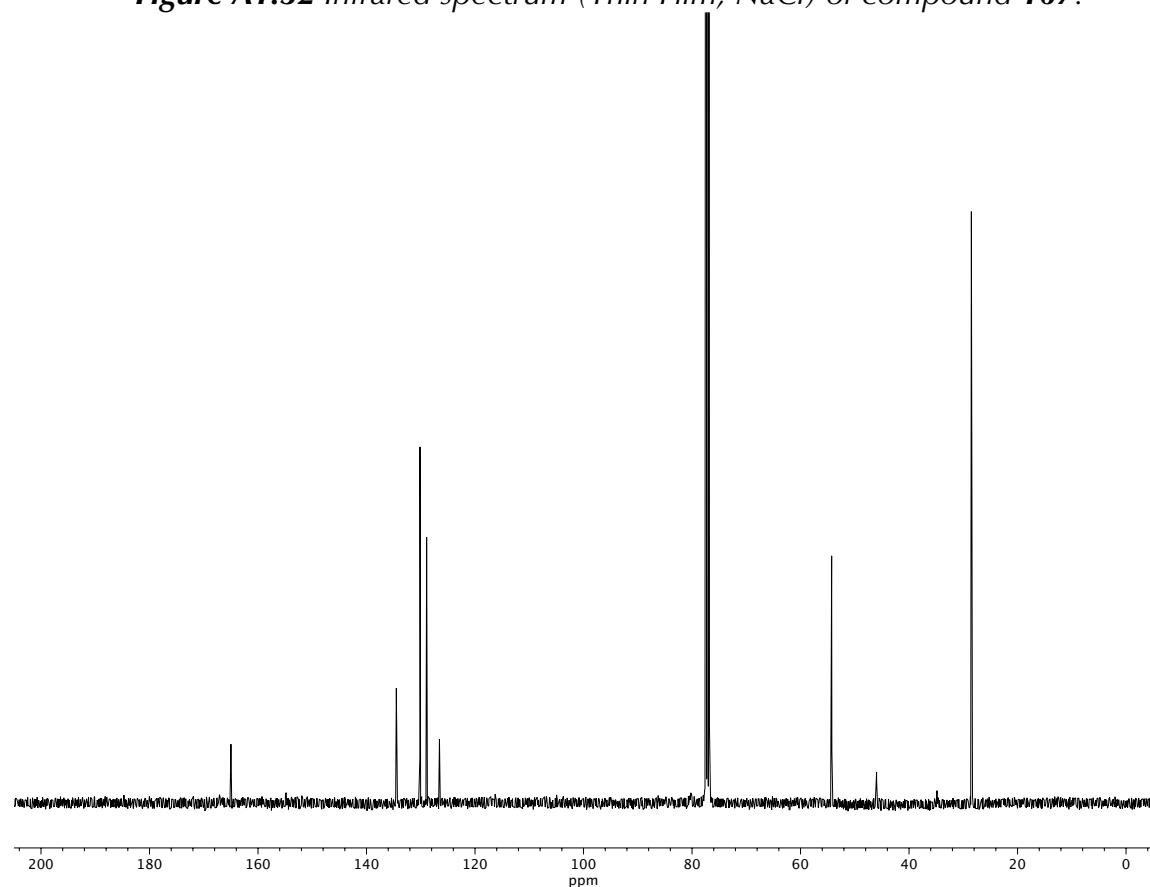
**Figure A1.50**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **106**.



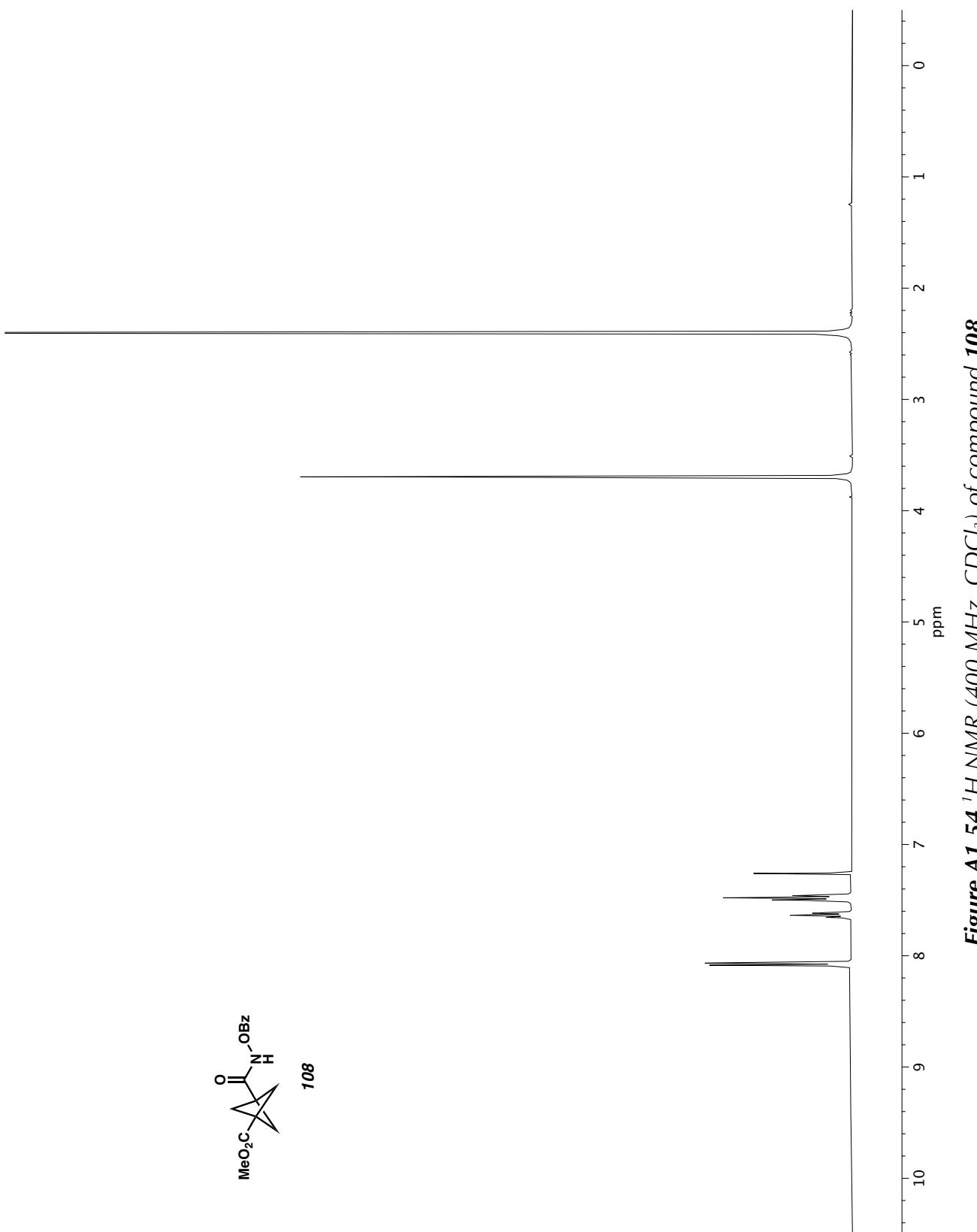
**Figure A1.51**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 107.



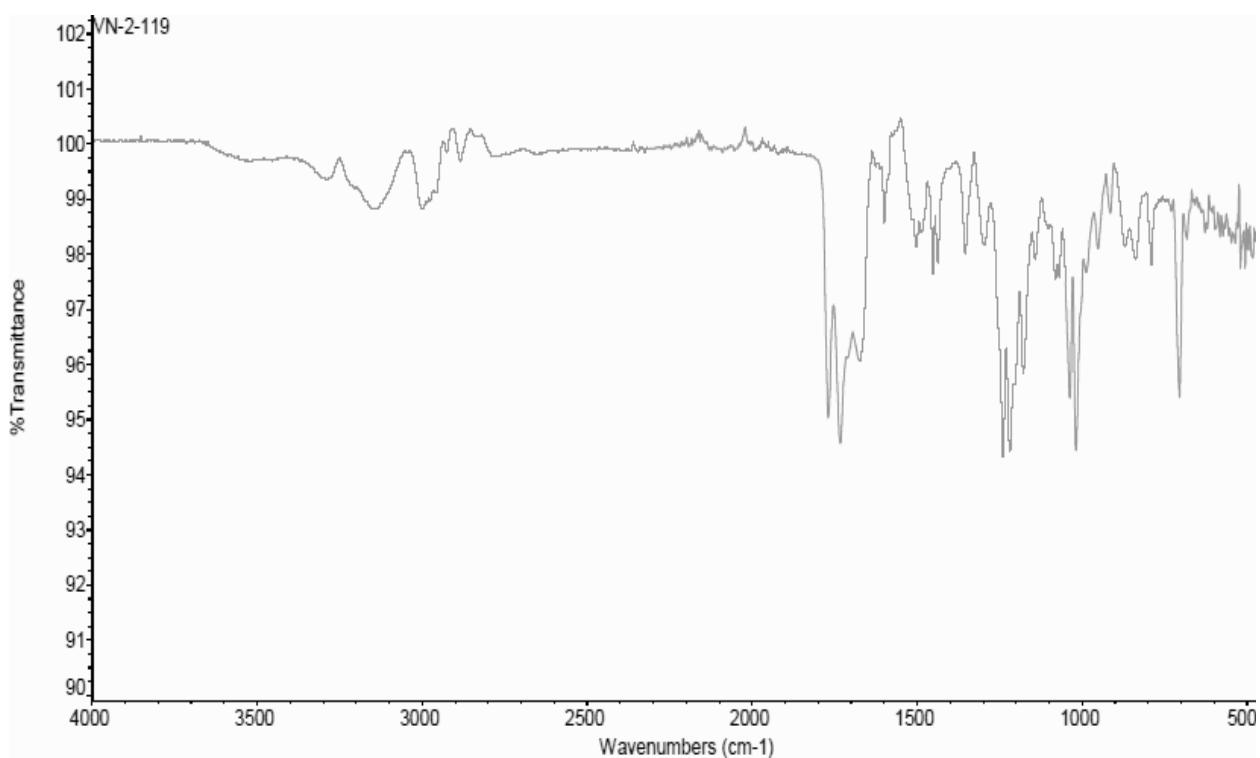
**Figure A1.52** Infrared spectrum (Thin Film, NaCl) of compound **107**.



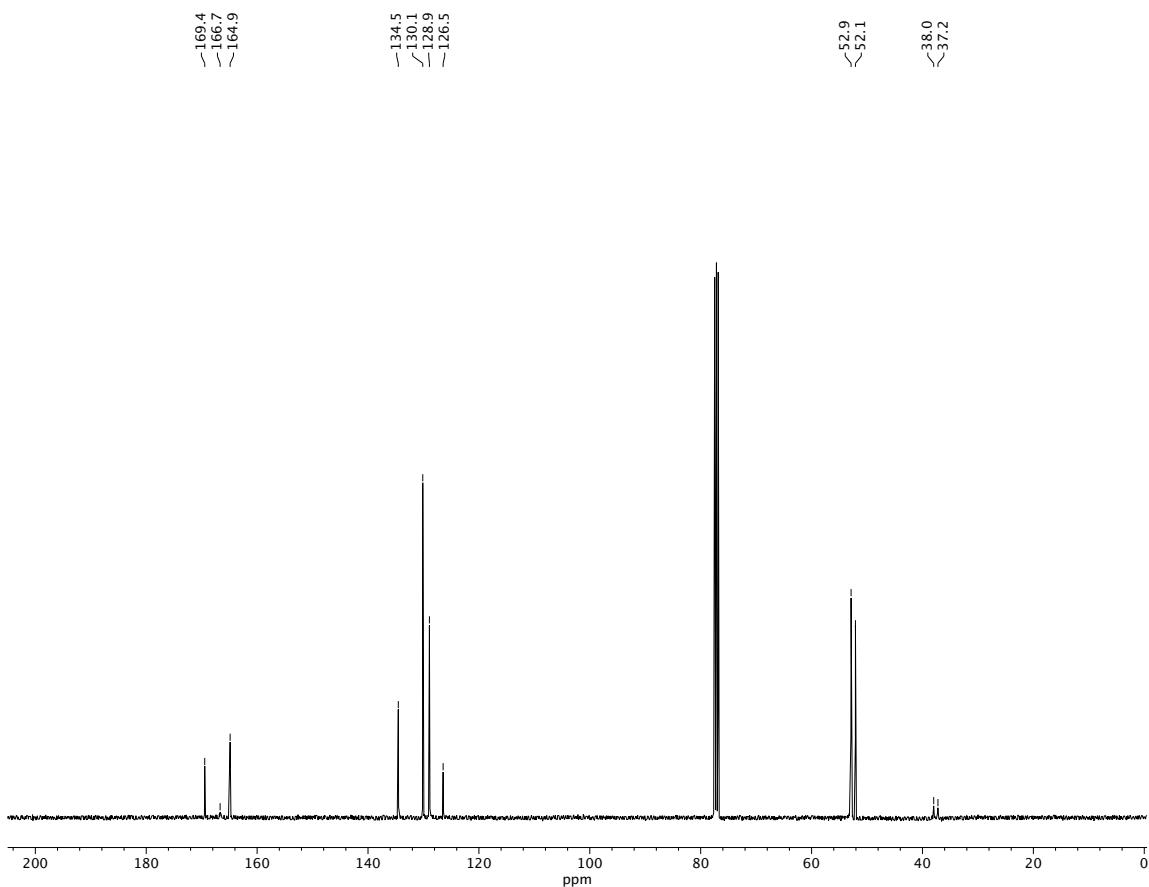
**Figure A1.53**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **107**.



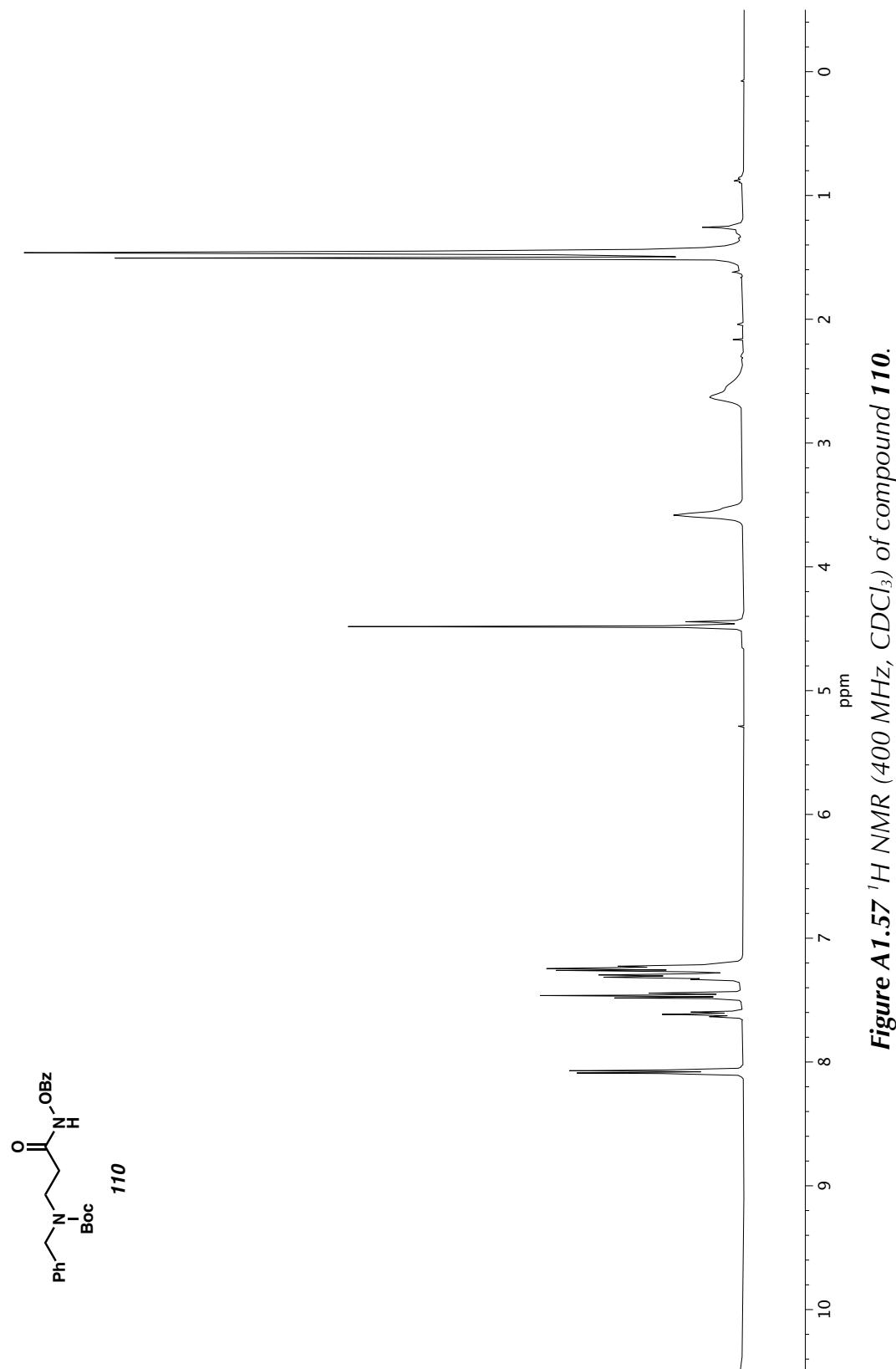
**Figure A1.54**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound **108**.



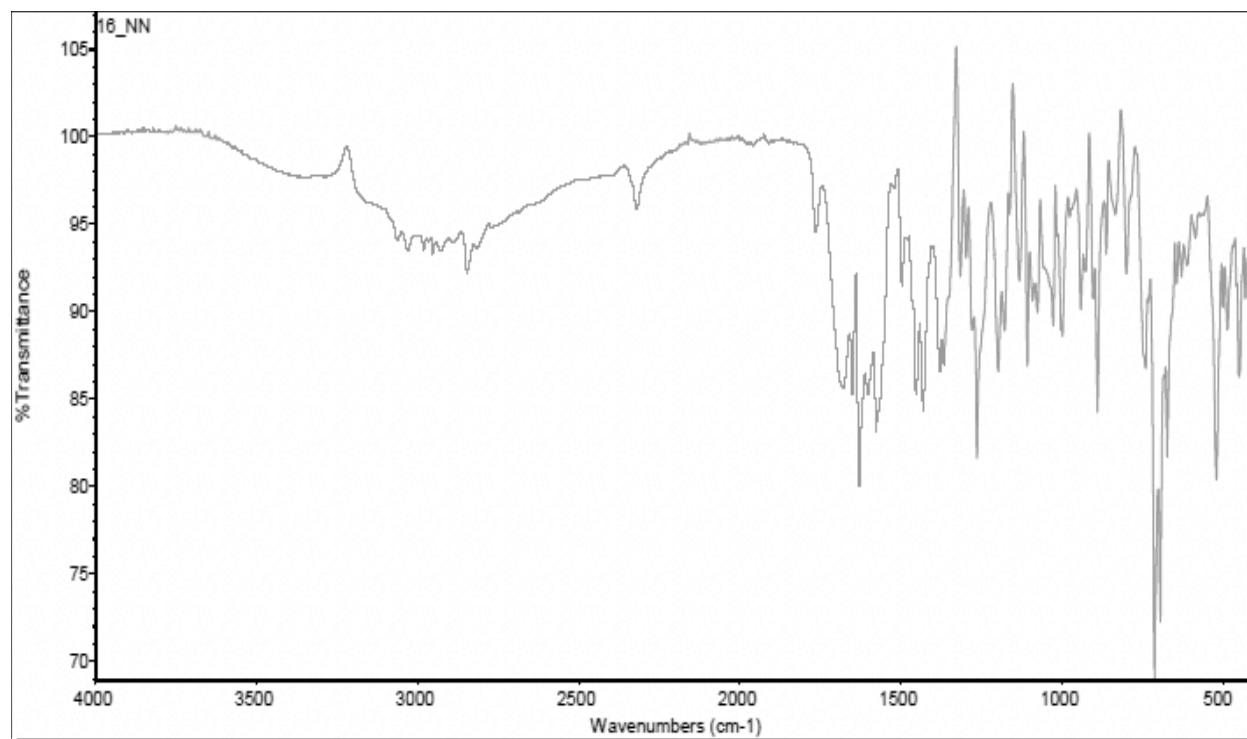
**Figure A1.55** Infrared spectrum (Thin Film) of compound **108**.



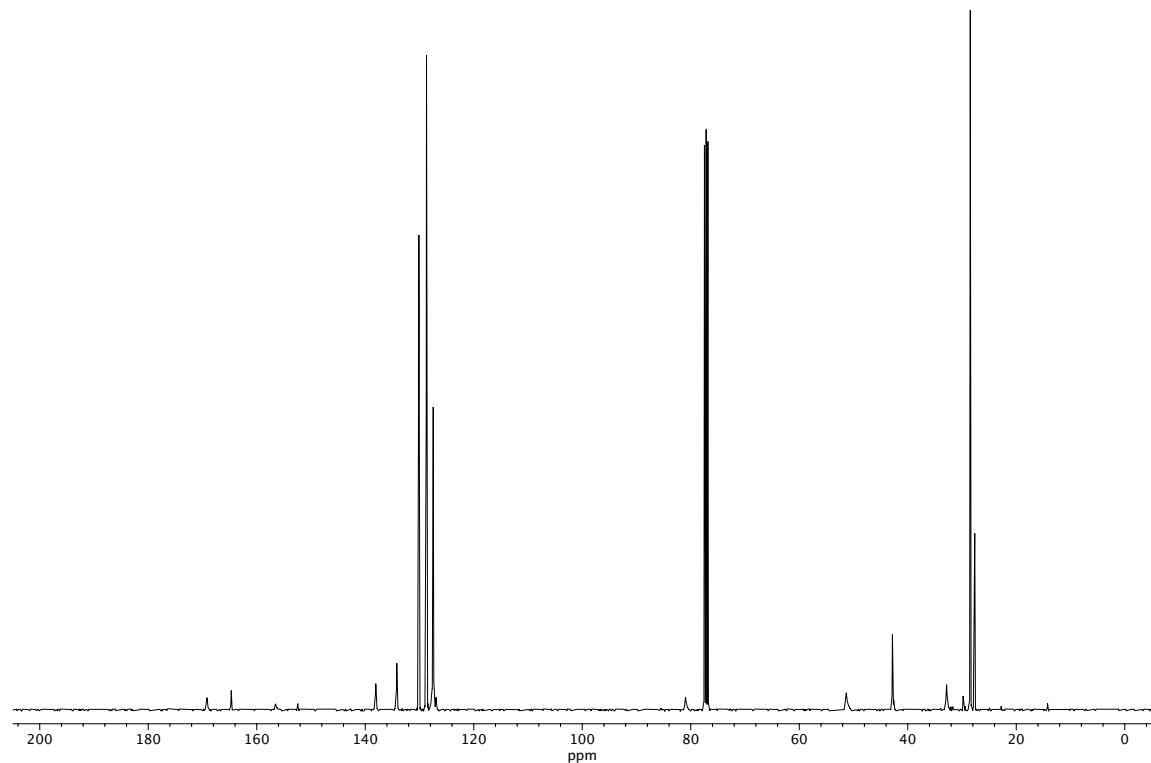
**Figure A1.56**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **108**.



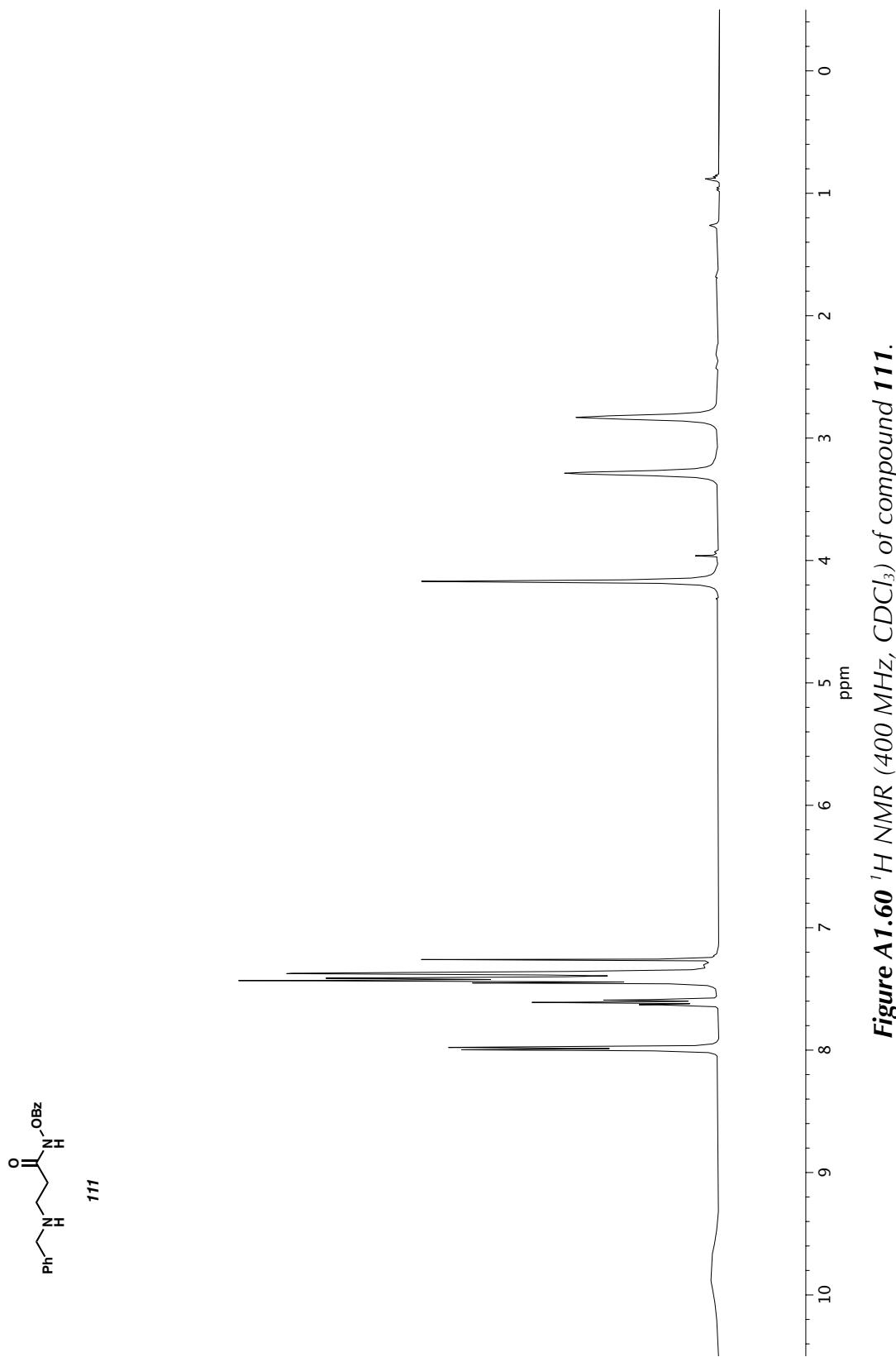
**Figure A1.57**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 110.



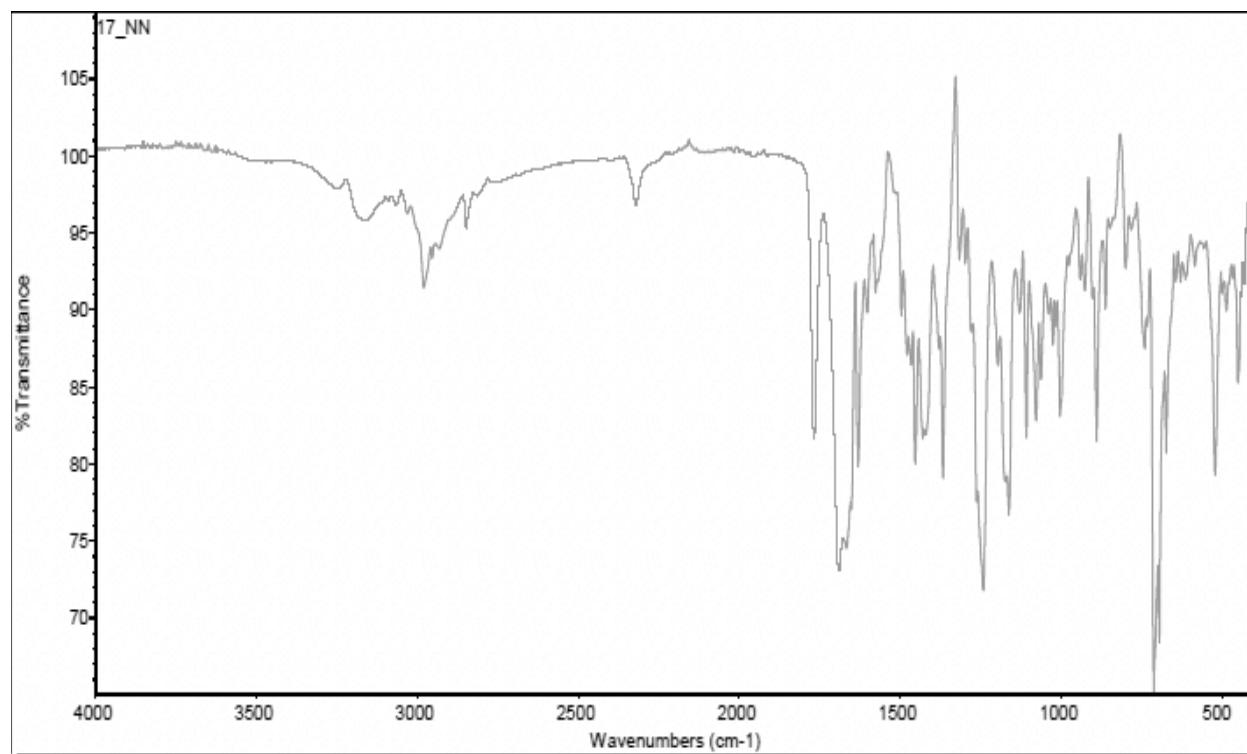
**Figure A1.58** Infrared spectrum (Thin Film) of compound **110**.



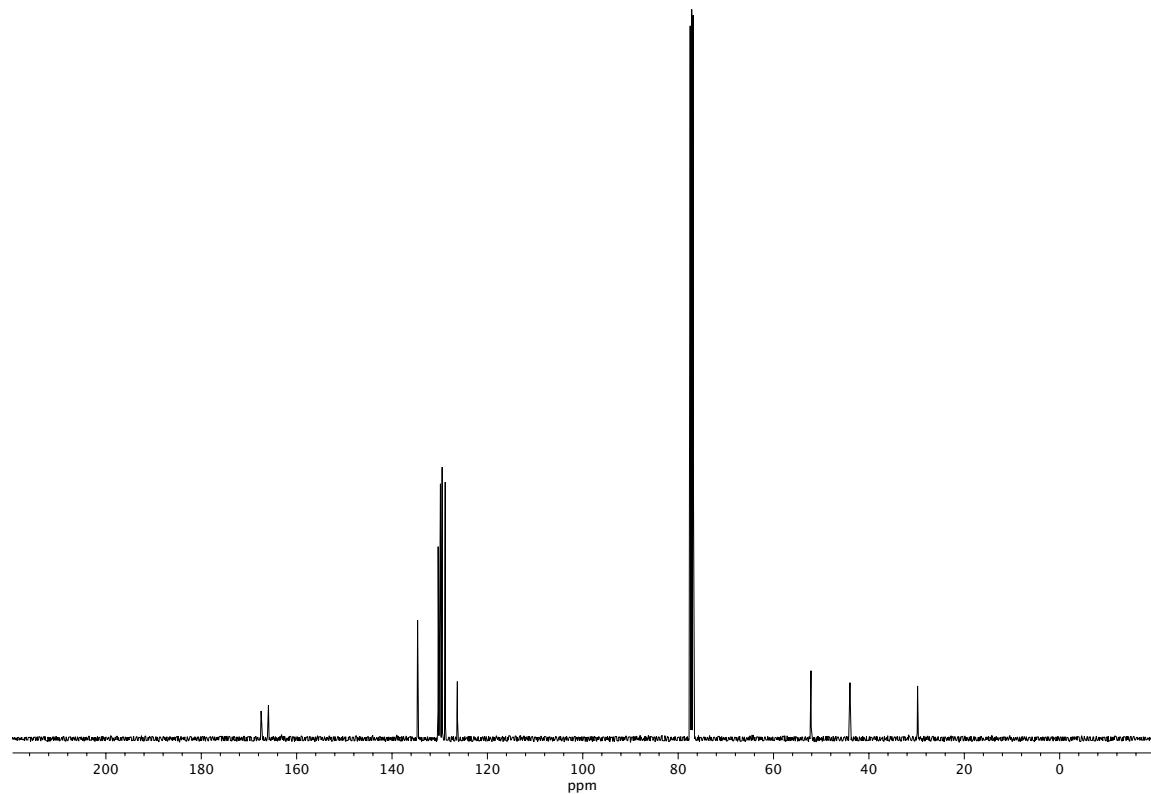
**Figure A1.59**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **110**.



**Figure A1.60**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 111.



**Figure A1.61** Infrared spectrum (Thin Film) of compound **111**.



**Figure A1.62**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **111**.

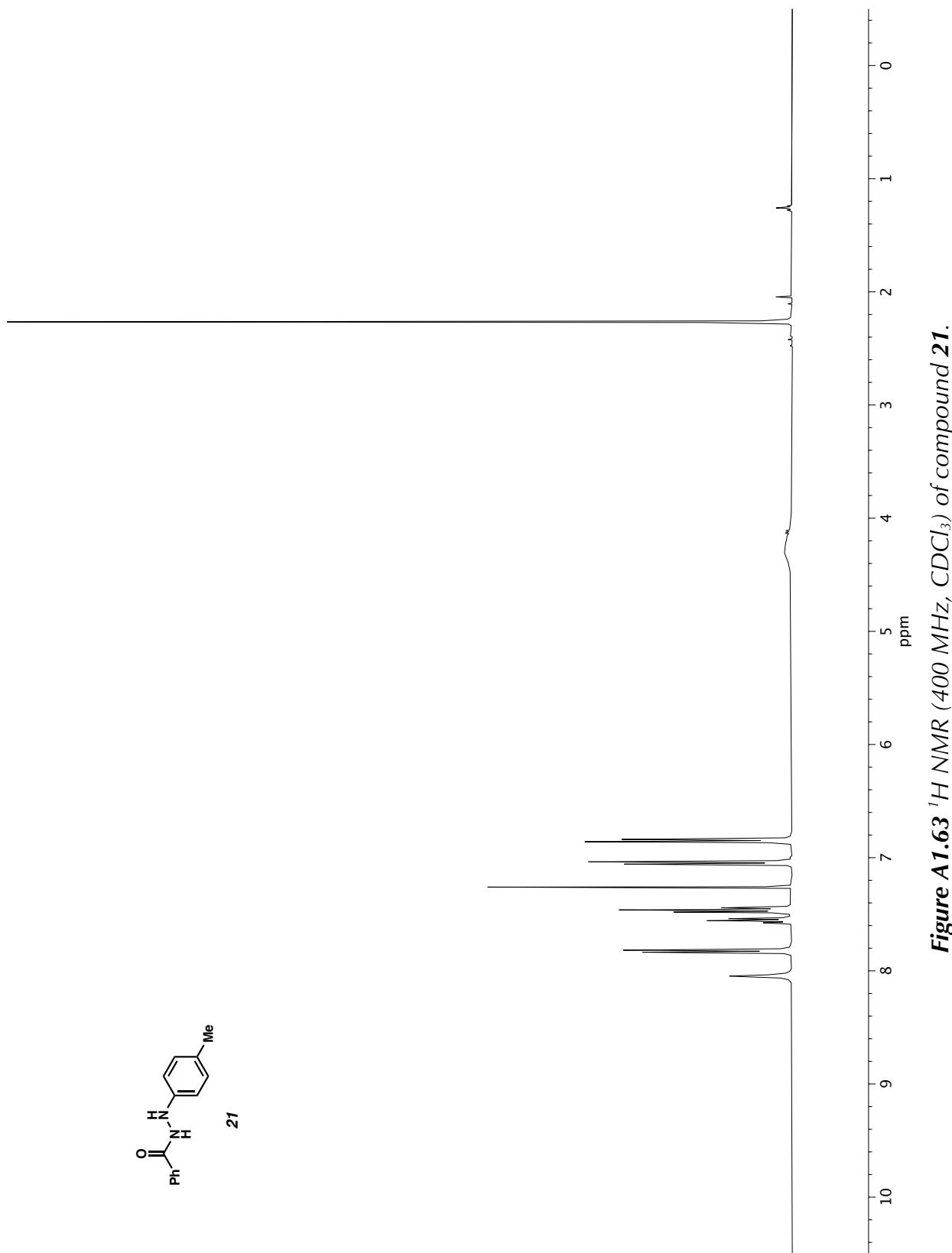
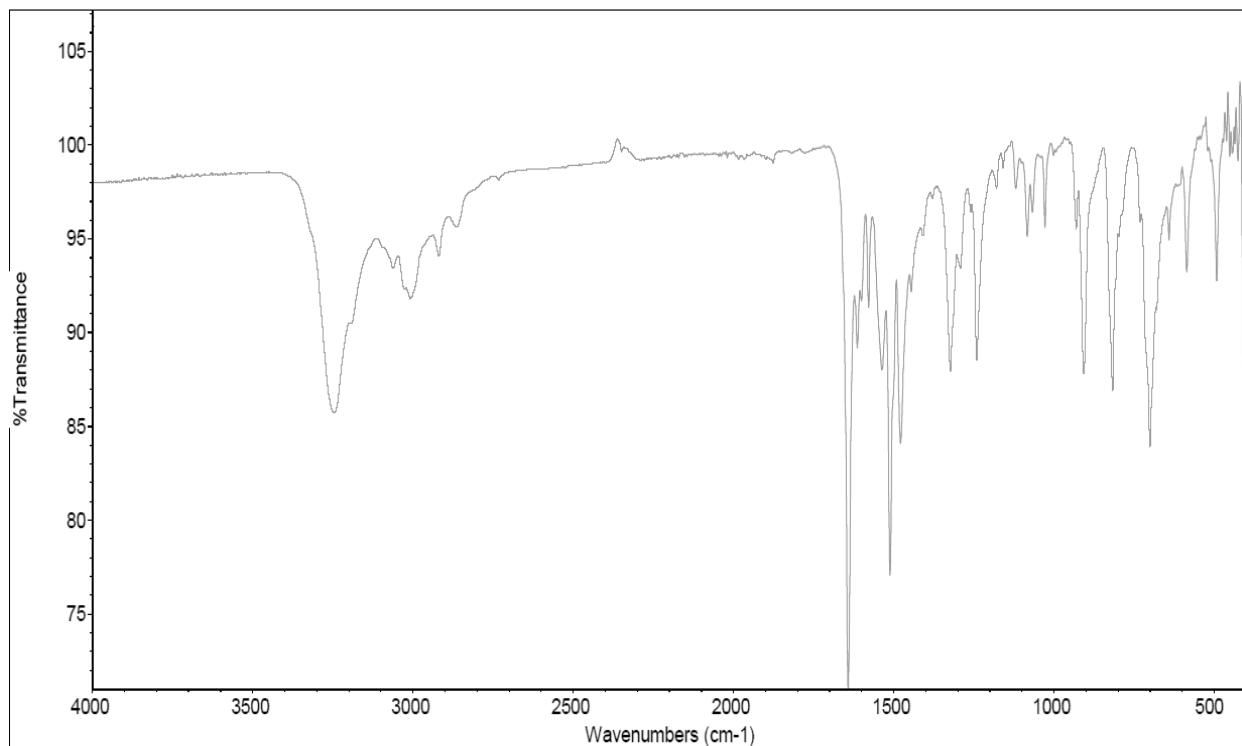
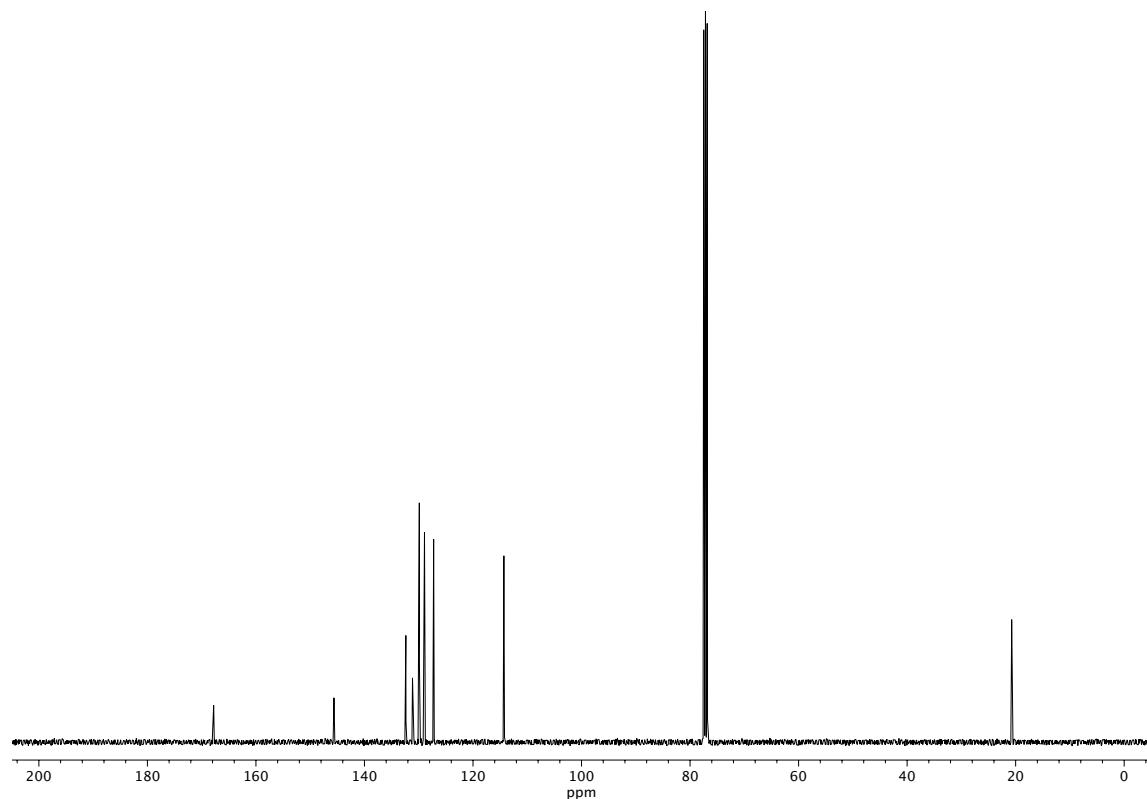


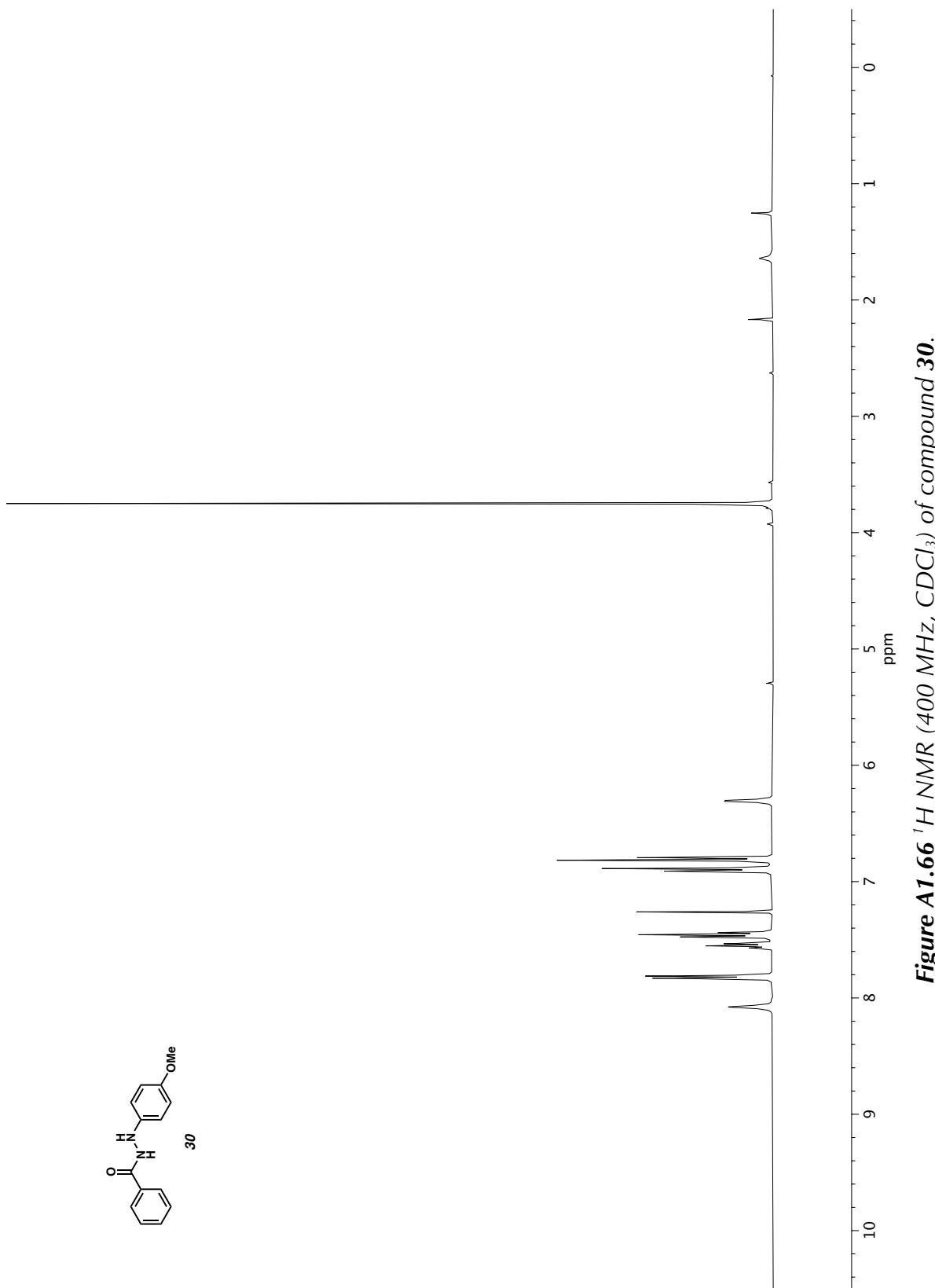
Figure A1.63  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 21.



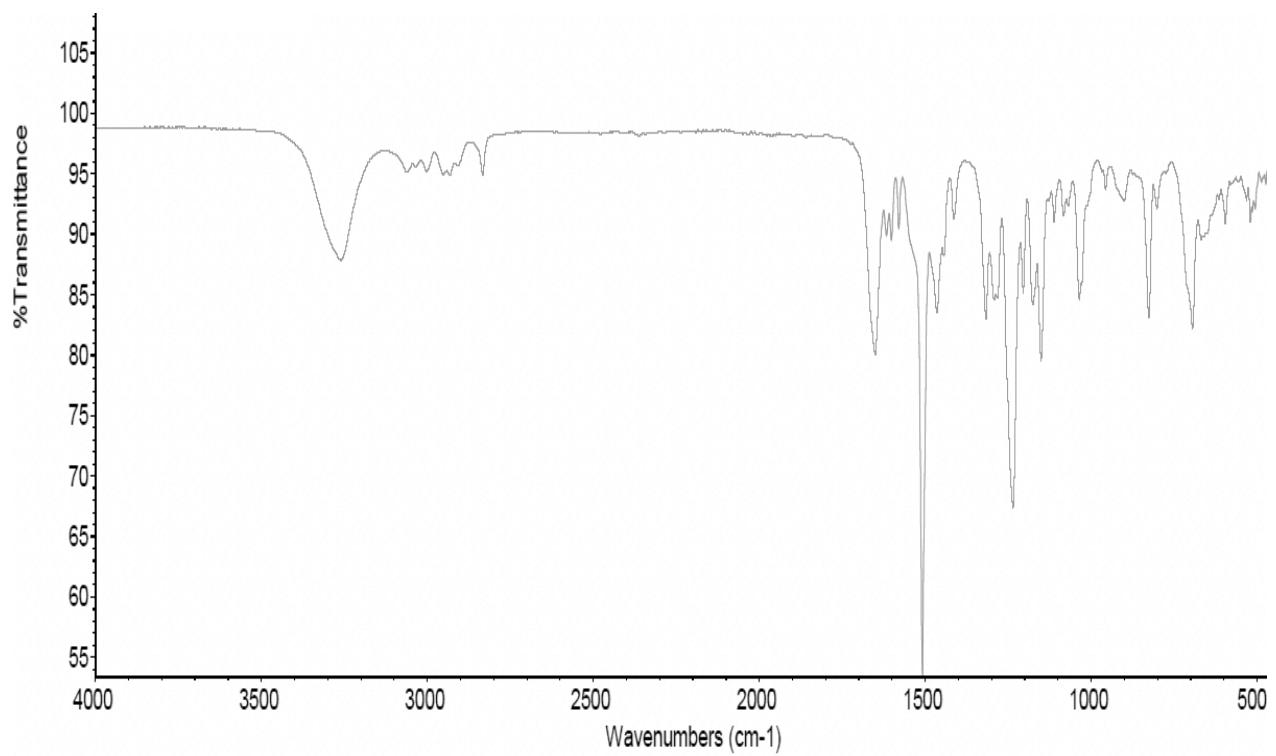
**Figure A1.64** Infrared spectrum (Thin Film) of compound **21**.



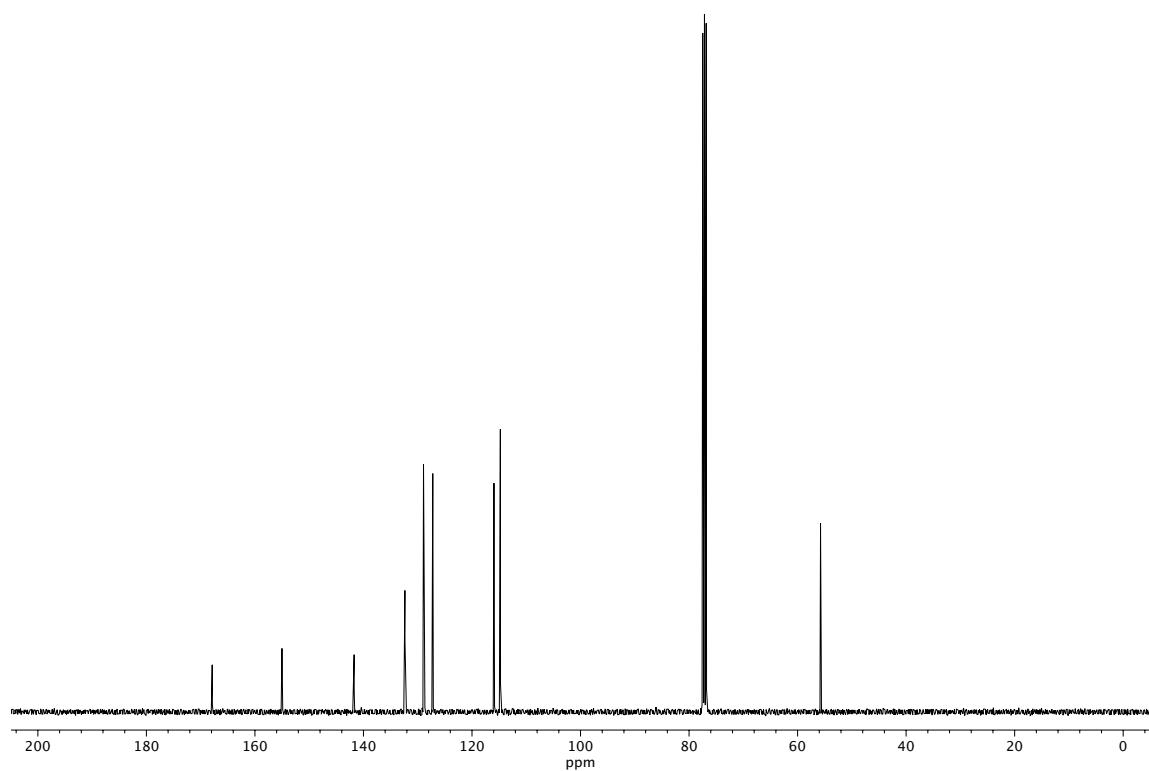
**Figure A1.65**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **21**.



**Figure A1.66**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 30.



**Figure A1.67** Infrared spectrum (Thin Film) of compound **30**.



**Figure A1.68**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **30**.

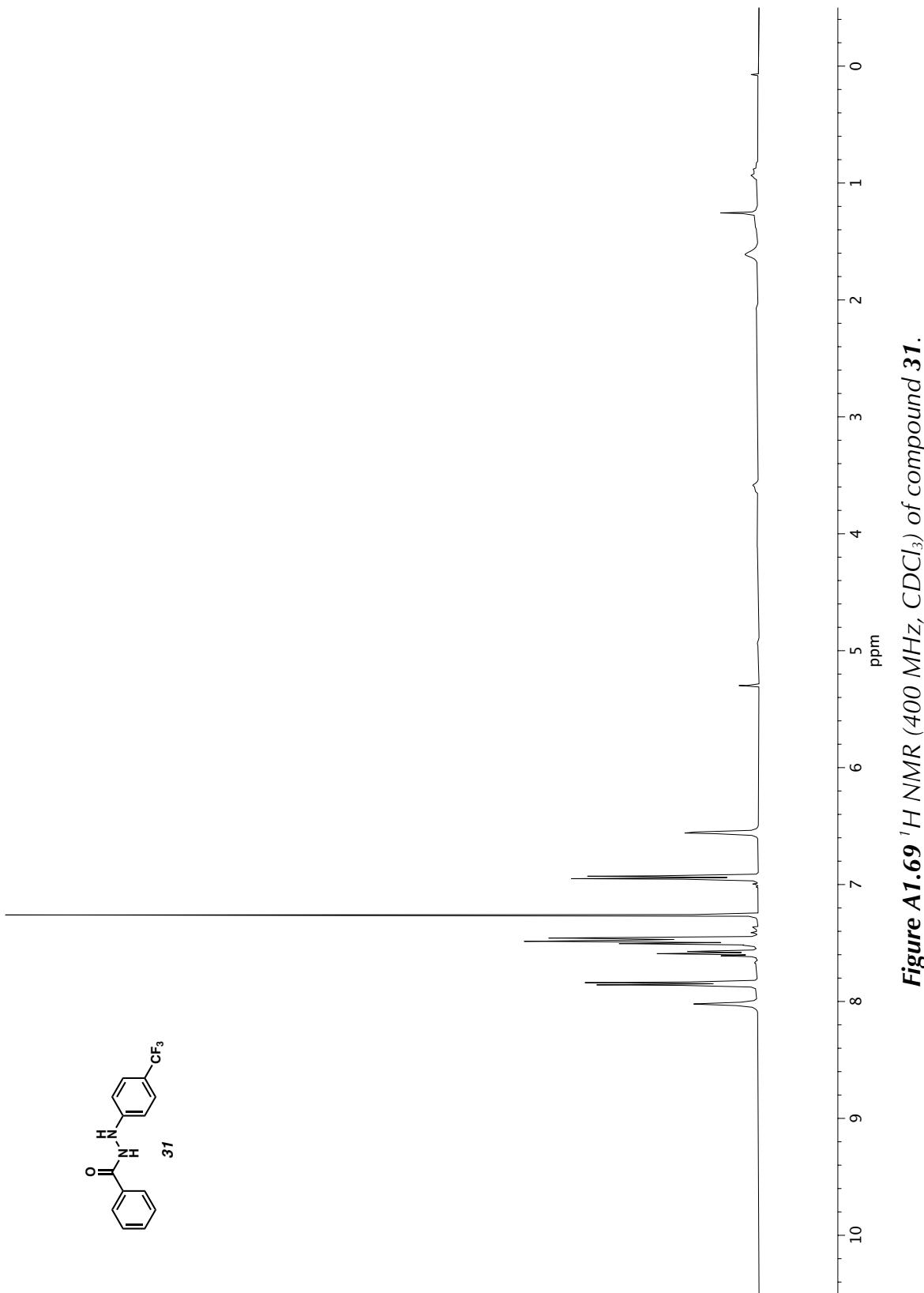
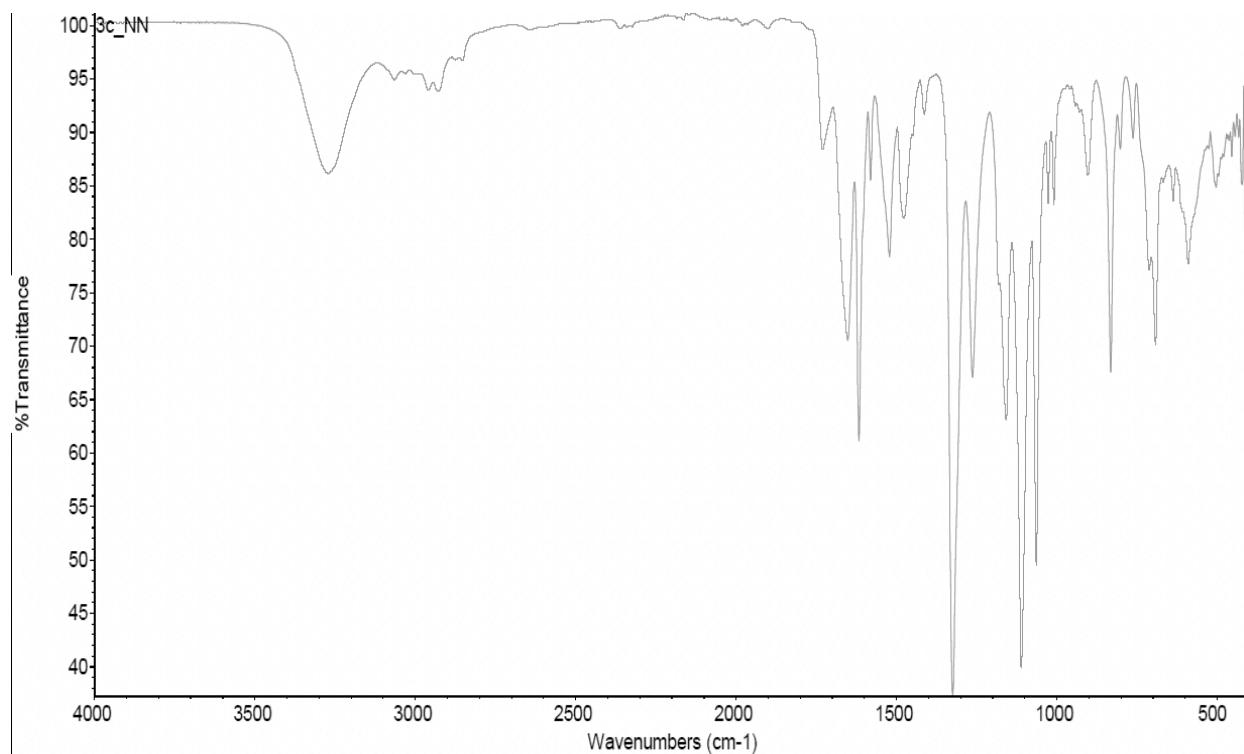
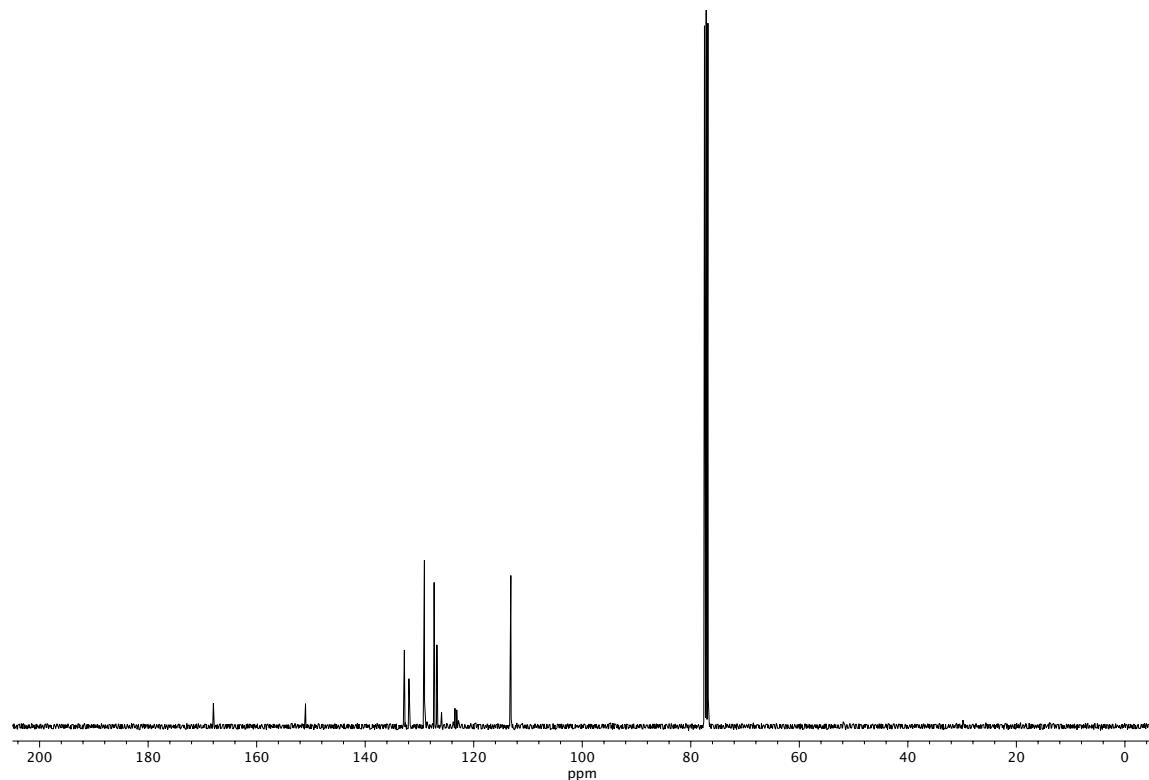


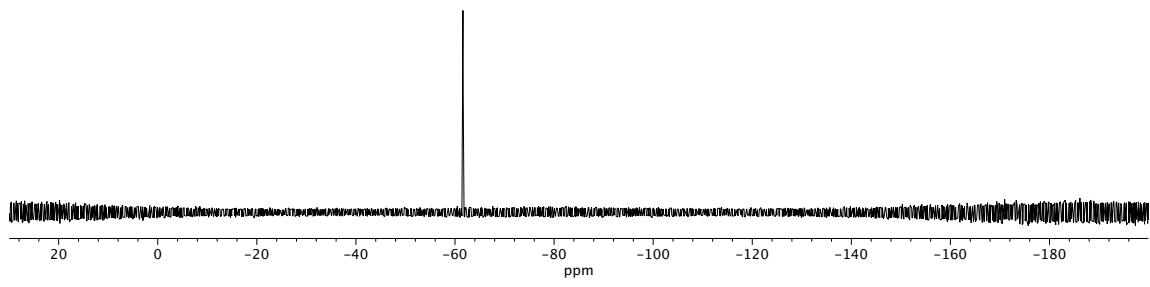
Figure A1.69  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 31.



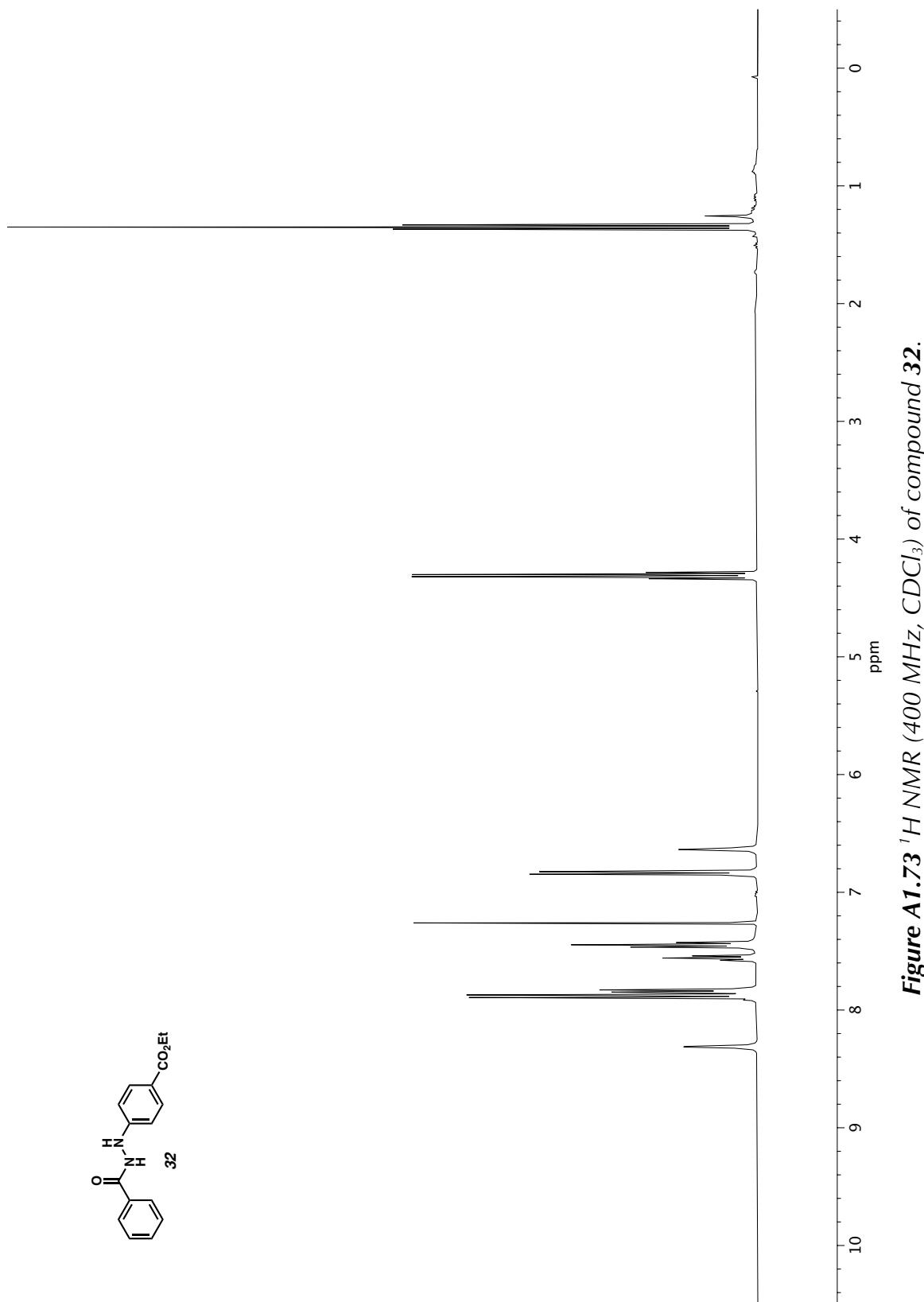
**Figure A1.70** Infrared spectrum (Thin Film) of compound **31**.



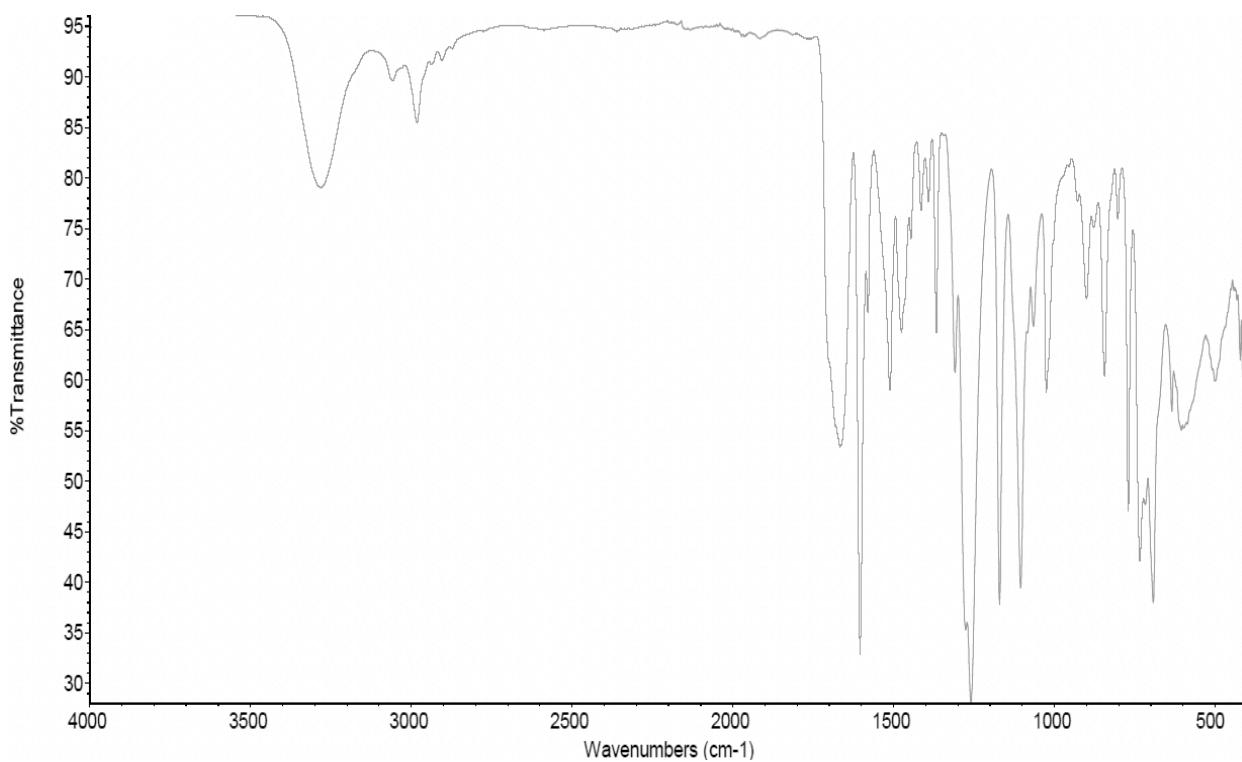
**Figure A1.71** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **31**.



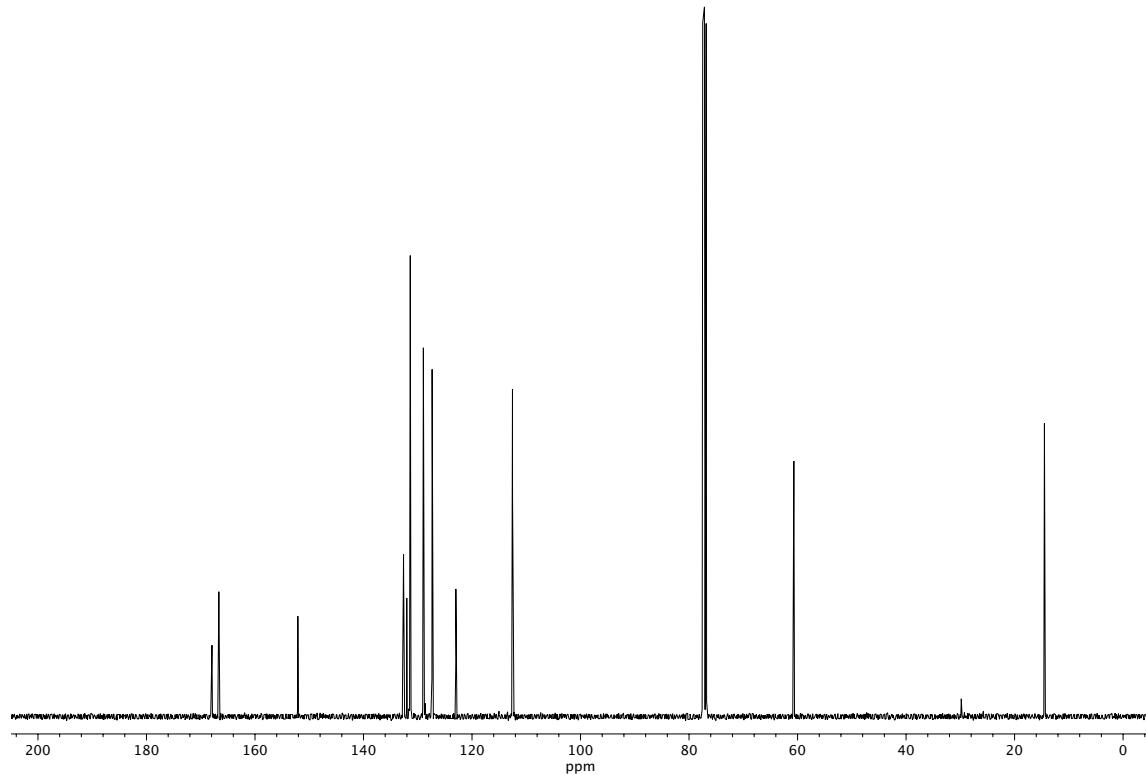
**Figure A1.72**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ) of compound 31.



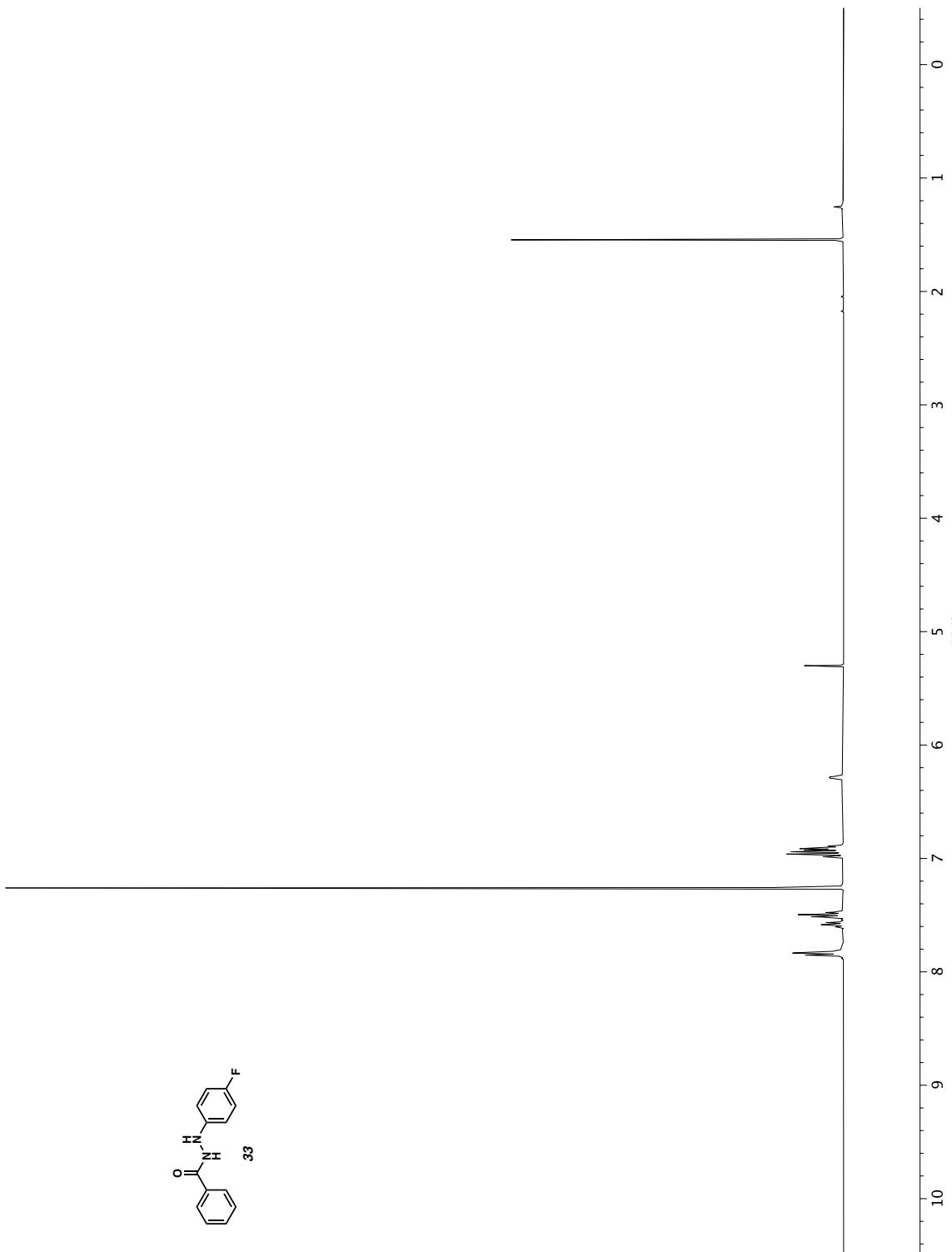
**Figure A1.73**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 32.



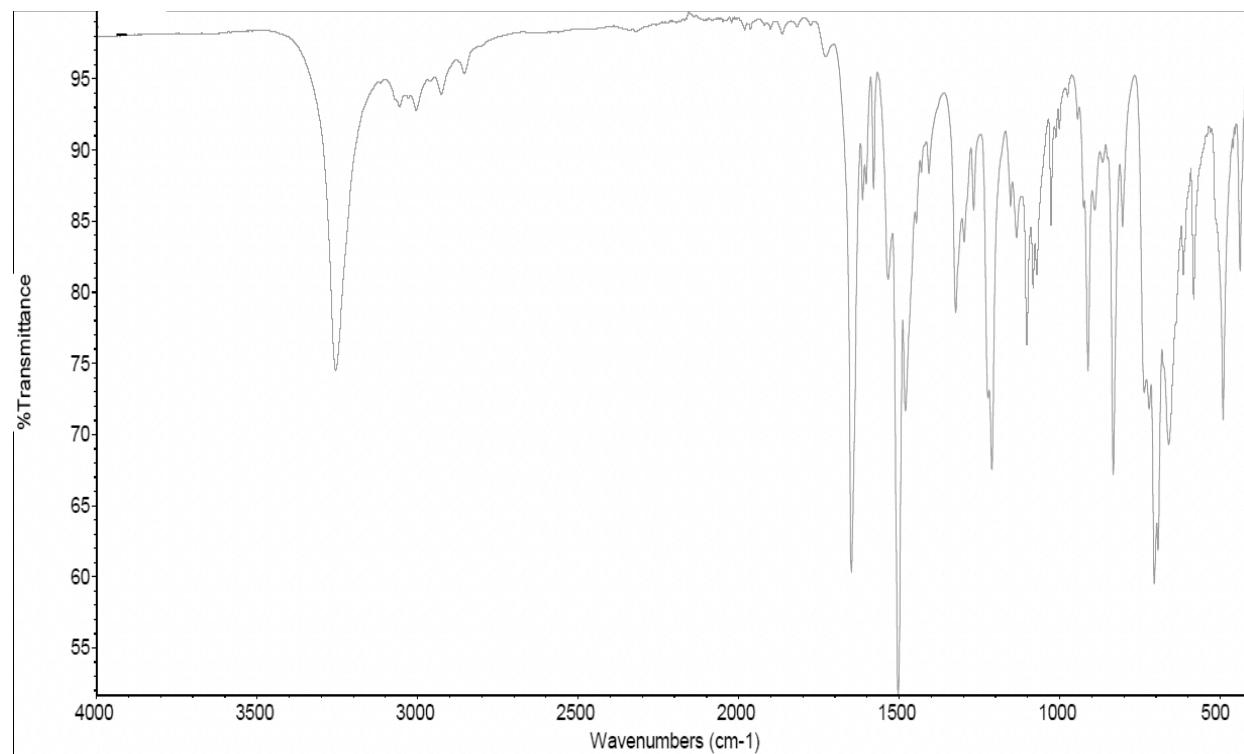
**Figure A1.74** Infrared spectrum (Thin Film) of compound **32**.



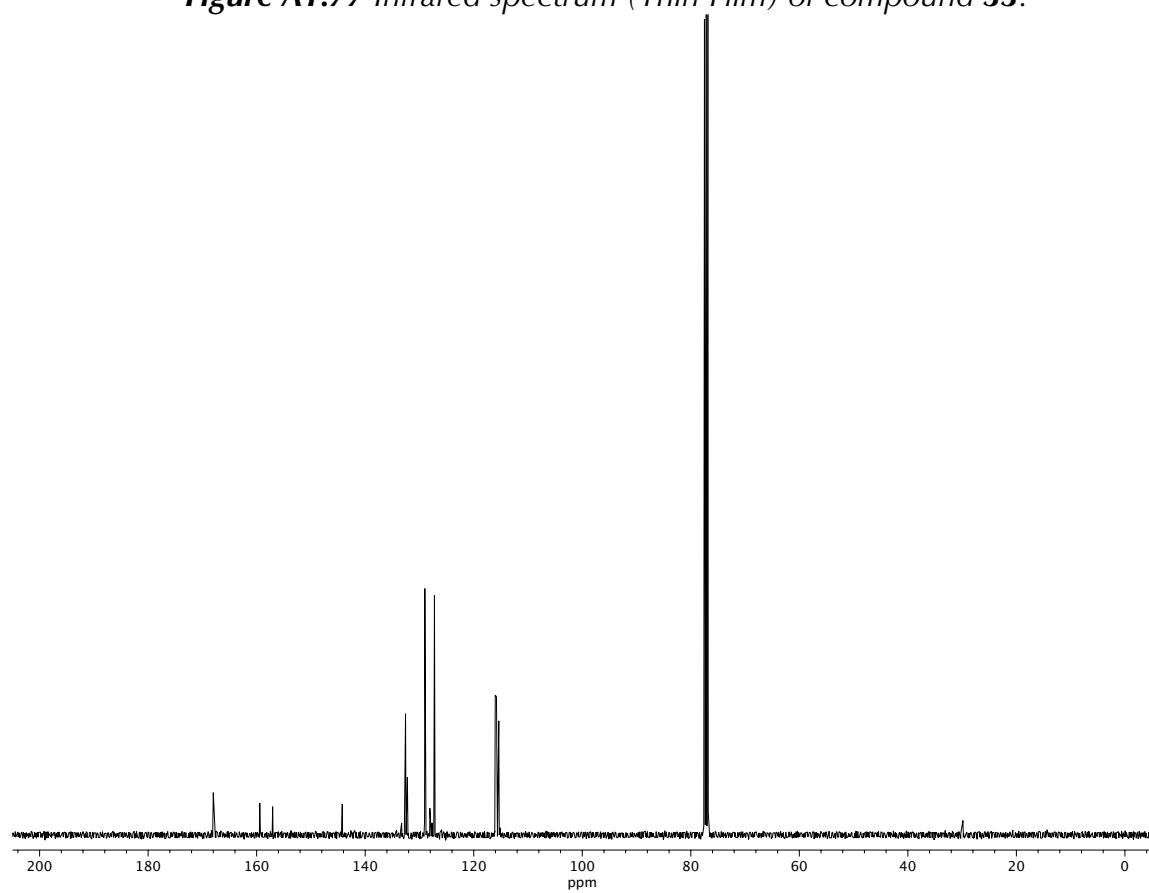
**Figure A1.75**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **32**.



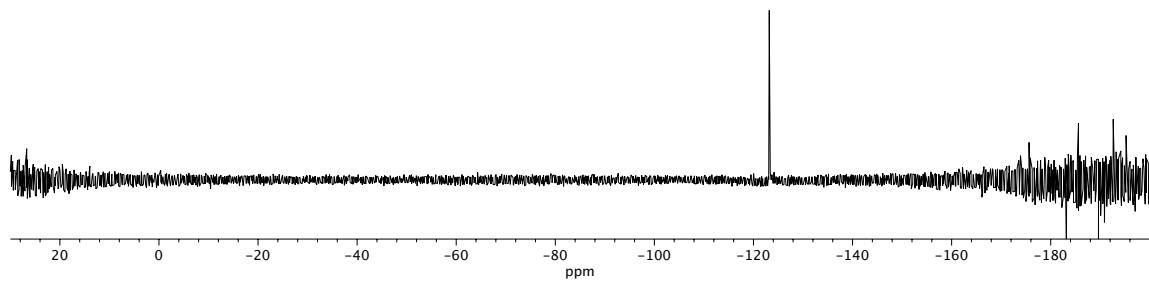
**Figure A1.76**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 33.



**Figure A1.77** Infrared spectrum (Thin Film) of compound **33**.



**Figure A1.78** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **33**.



**Figure A1.79**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ) of compound 33.

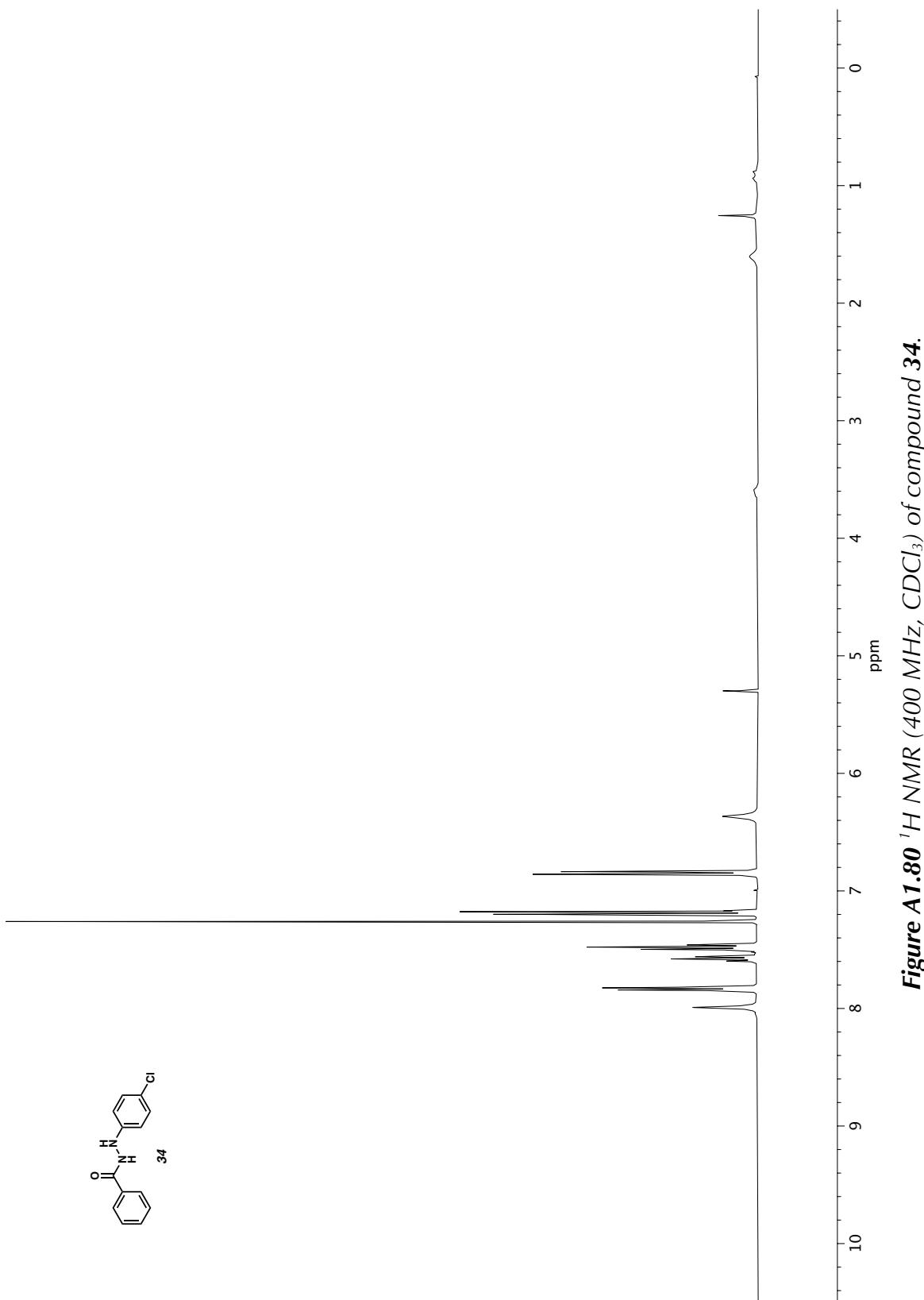
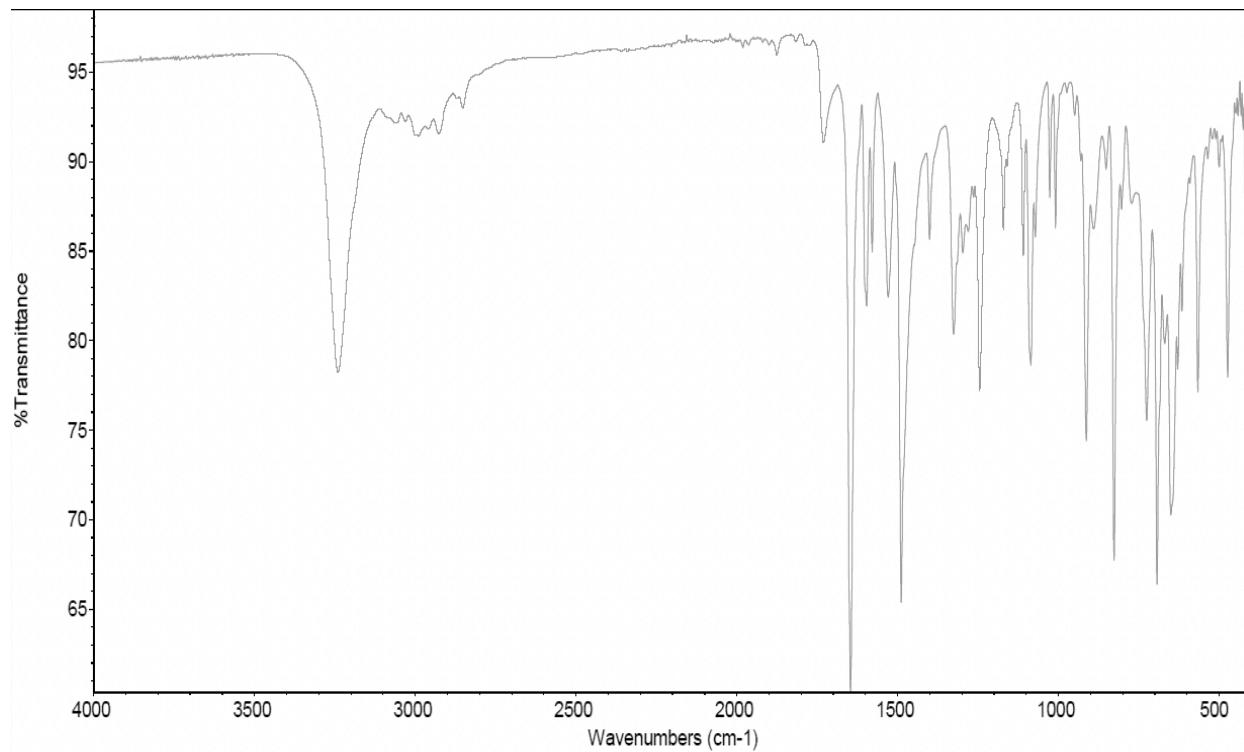
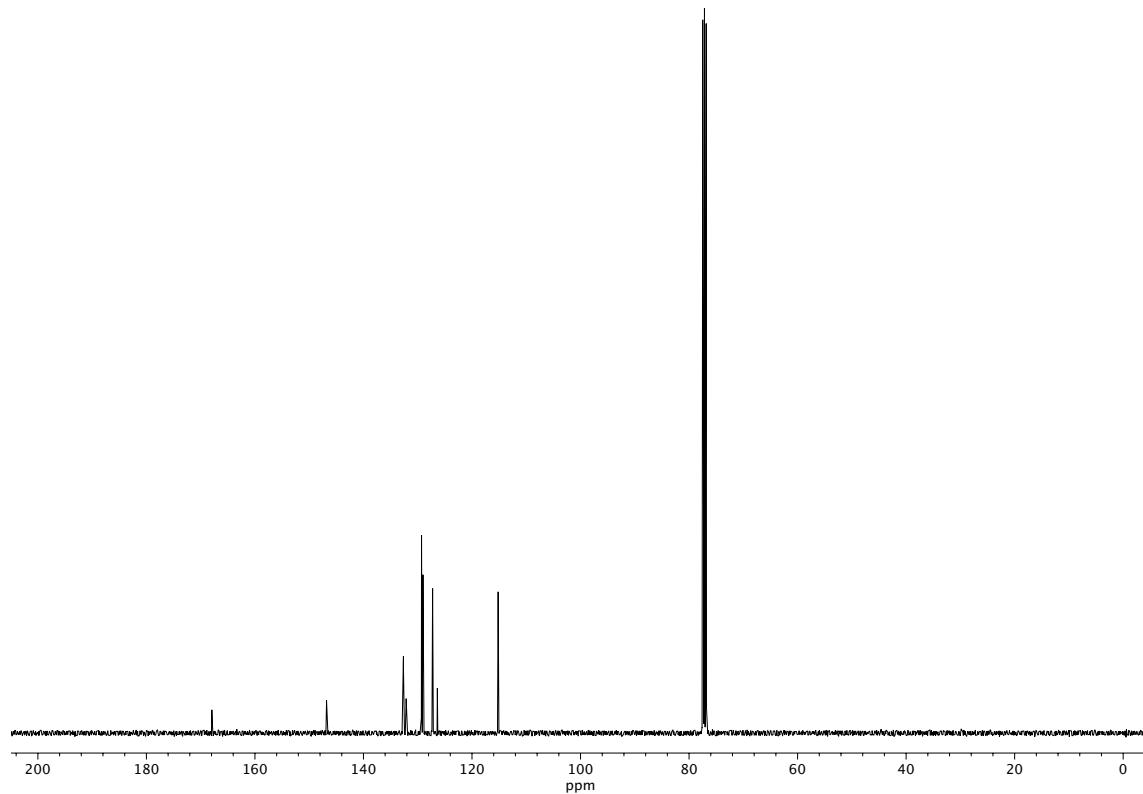


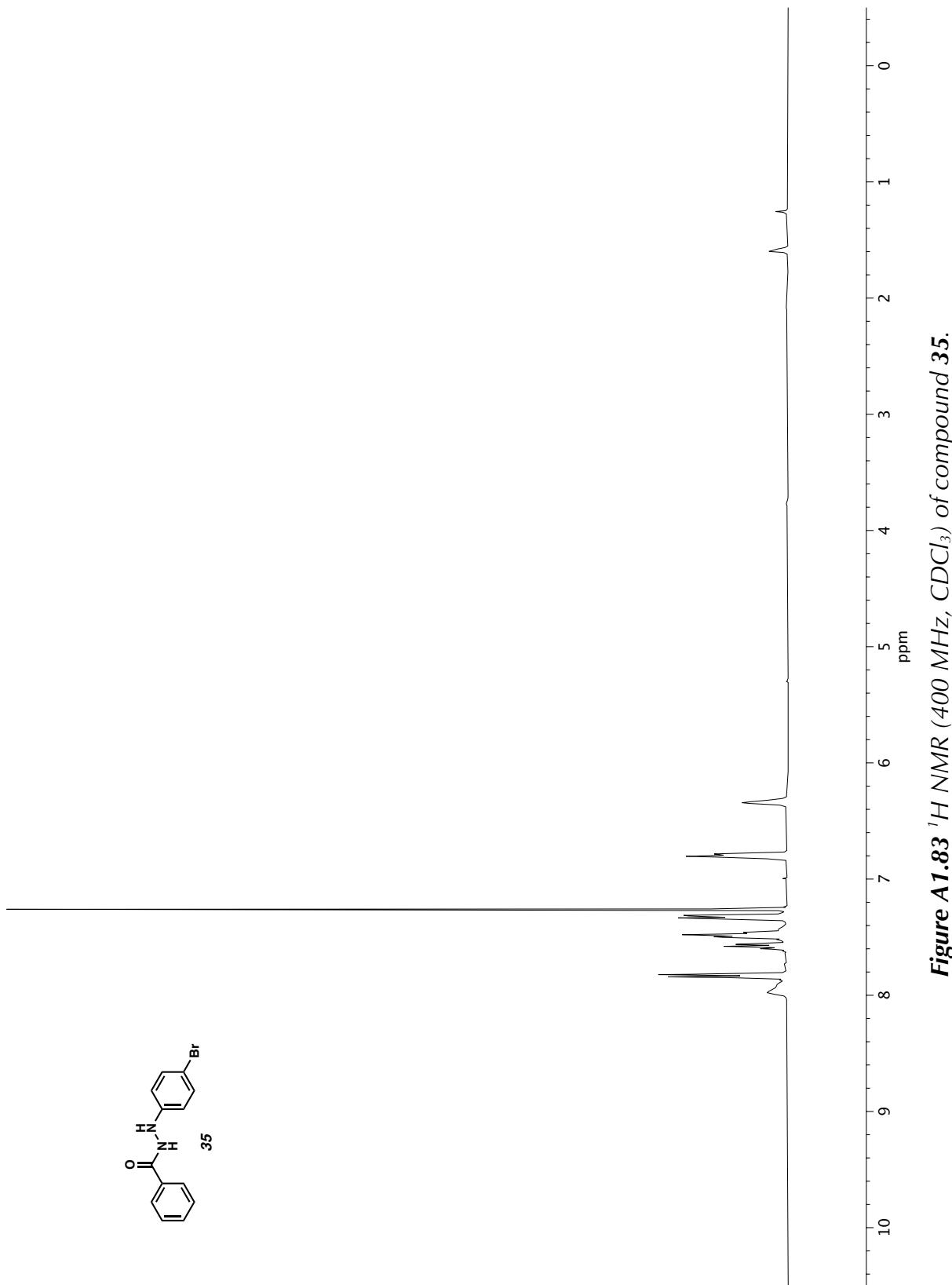
Figure A1.80  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 34.



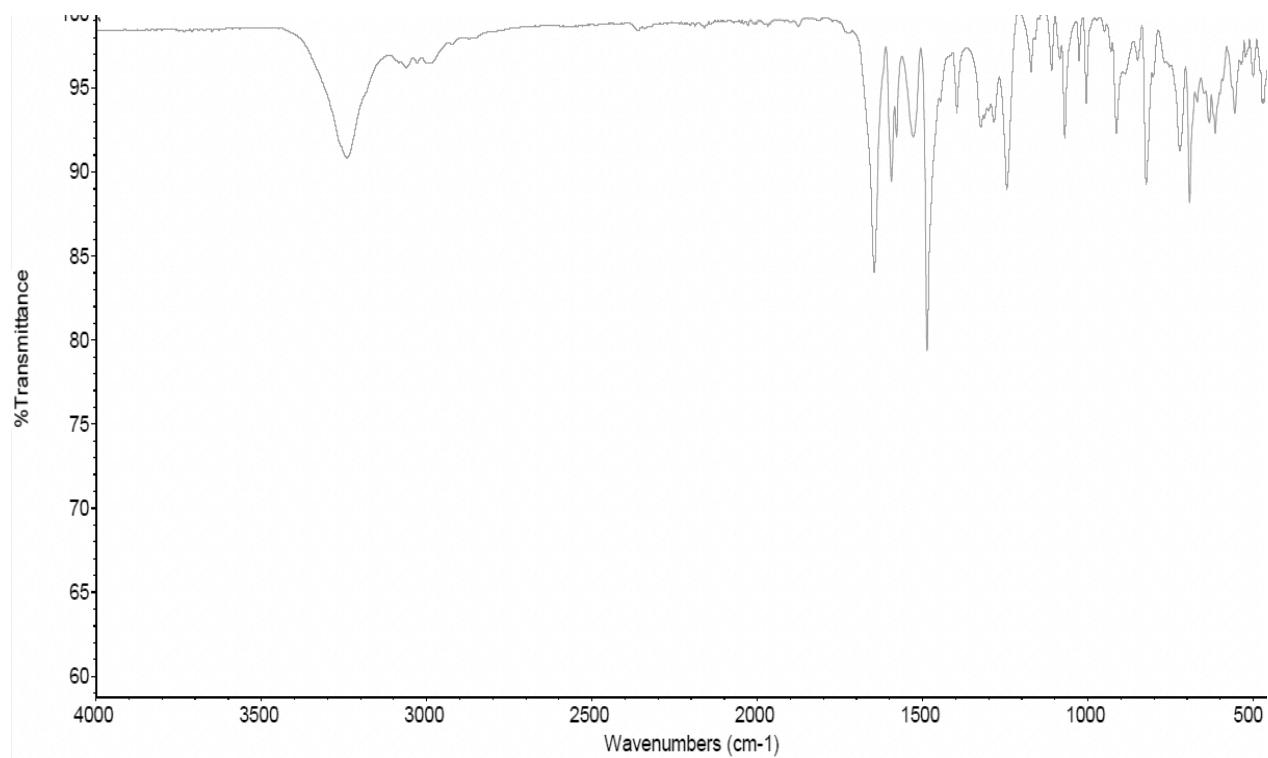
**Figure A1.81** Infrared spectrum (Thin Film) of compound **34**.



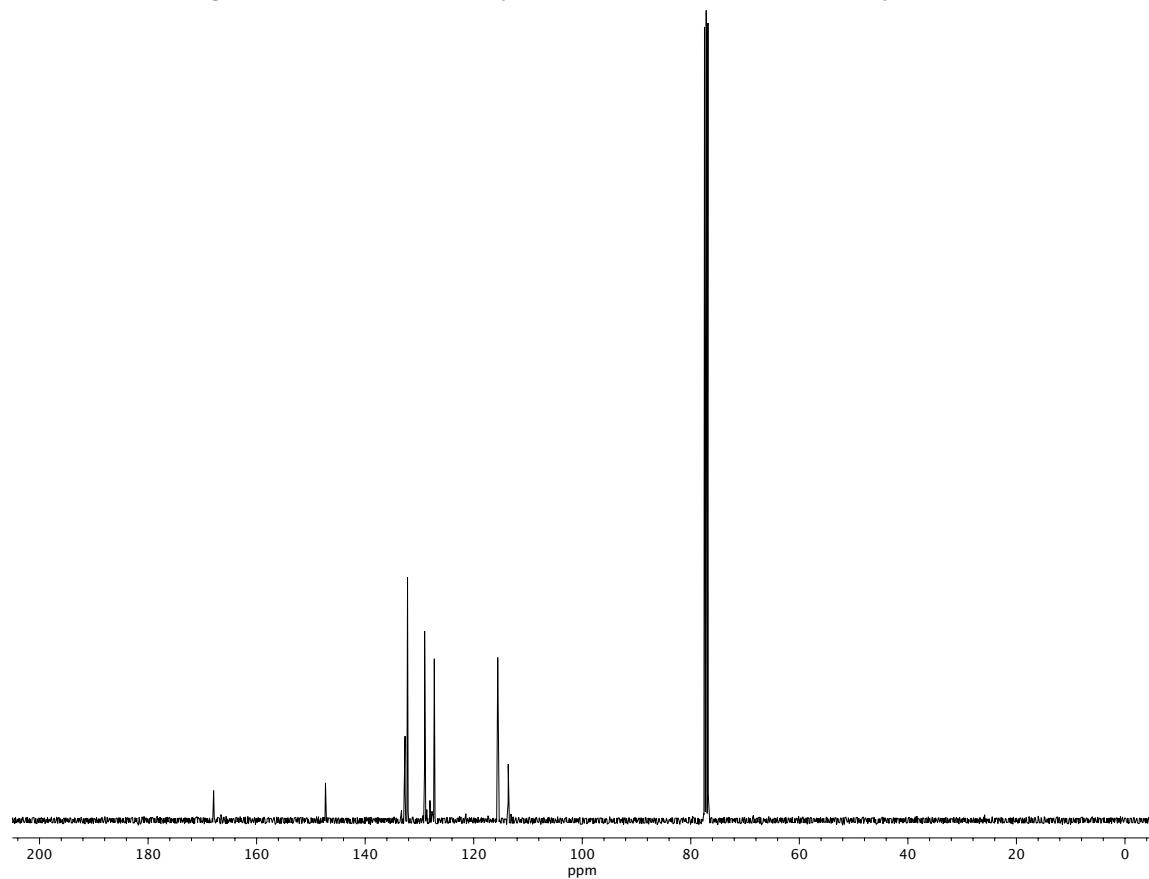
**Figure A1.82** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **34**.



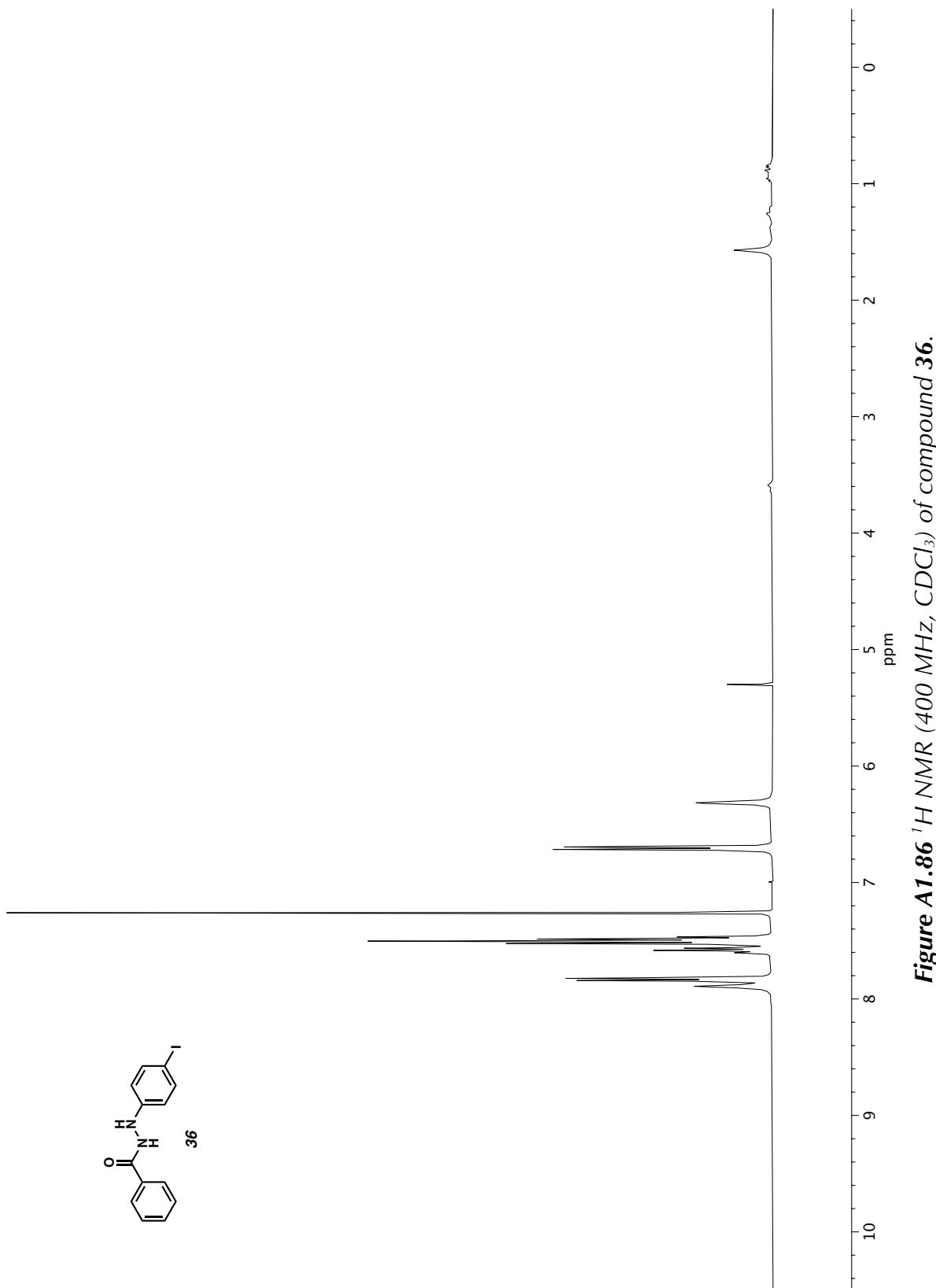
**Figure A1.83**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 35.



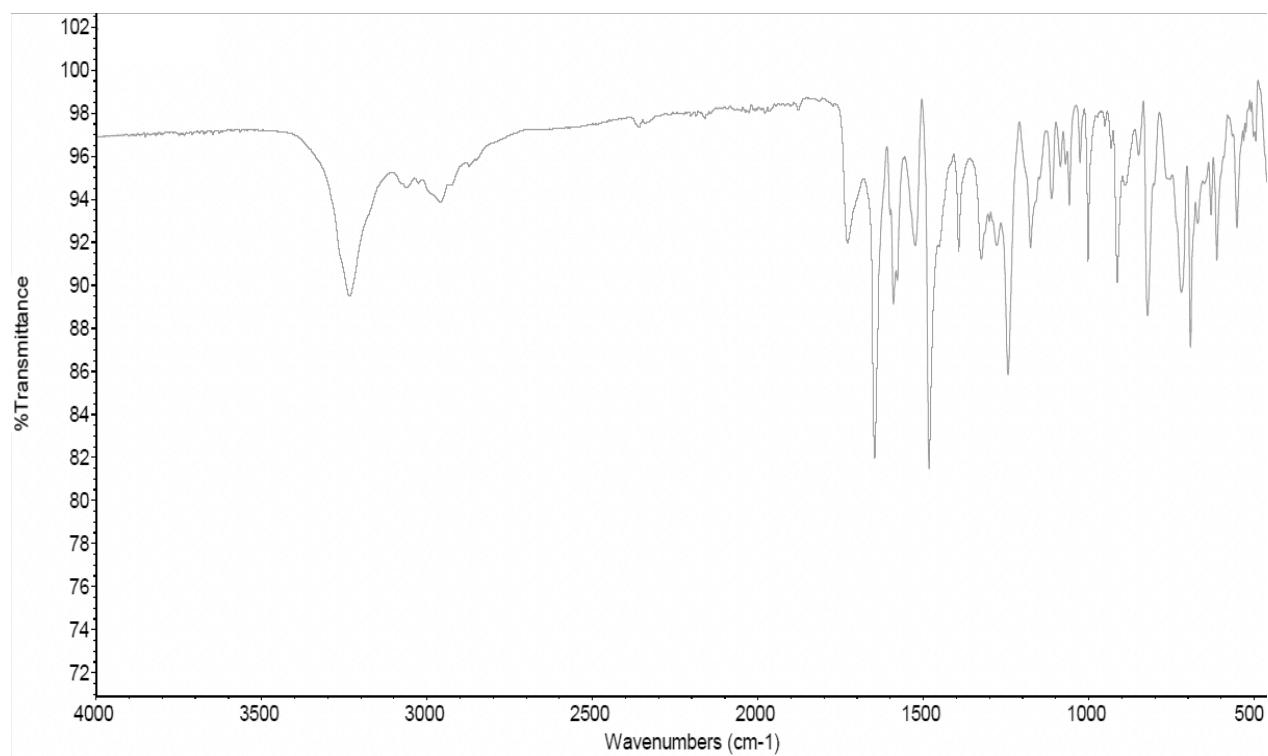
**Figure A1.84** Infrared spectrum (Thin Film) of compound **35**.



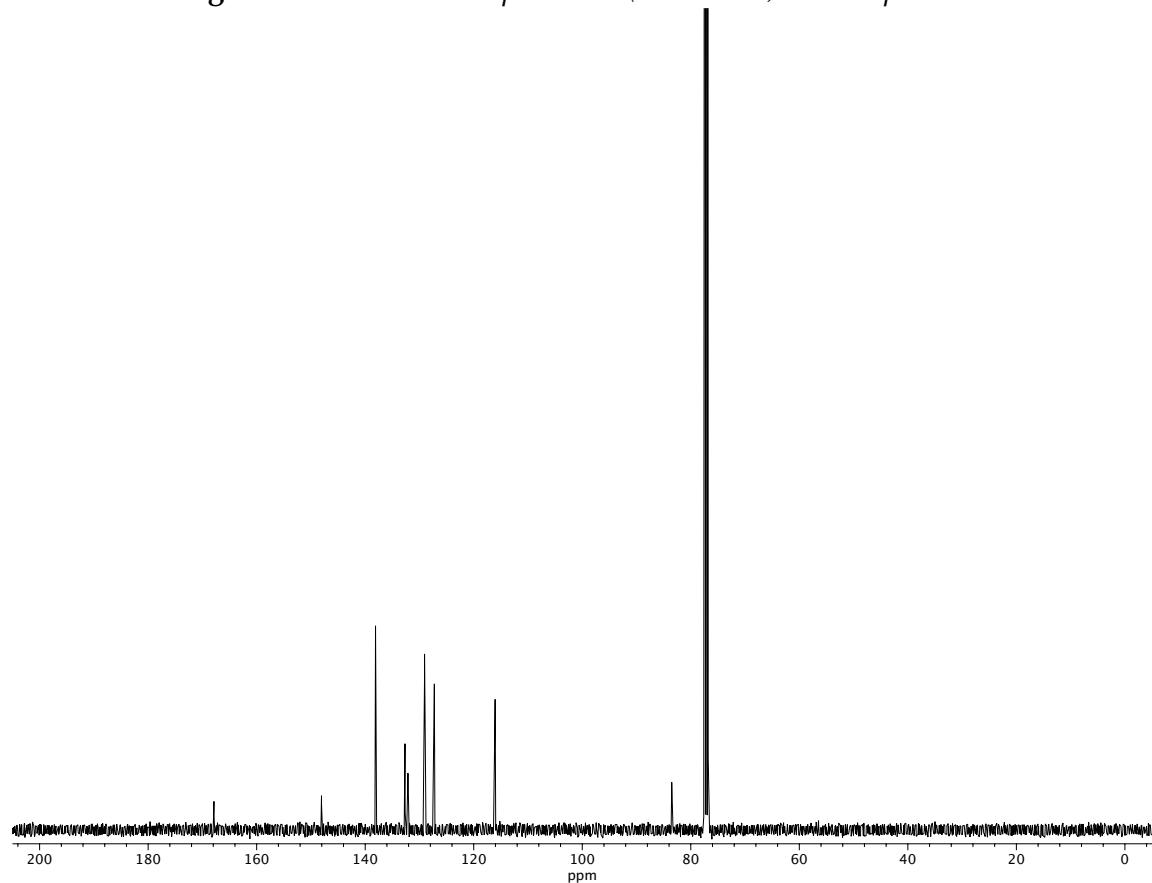
**Figure A1.85**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **35**.



**Figure A1.86**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 36.



**Figure A1.87** Infrared spectrum (Thin Film) of compound **36**.



**Figure A1.88**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **36**.

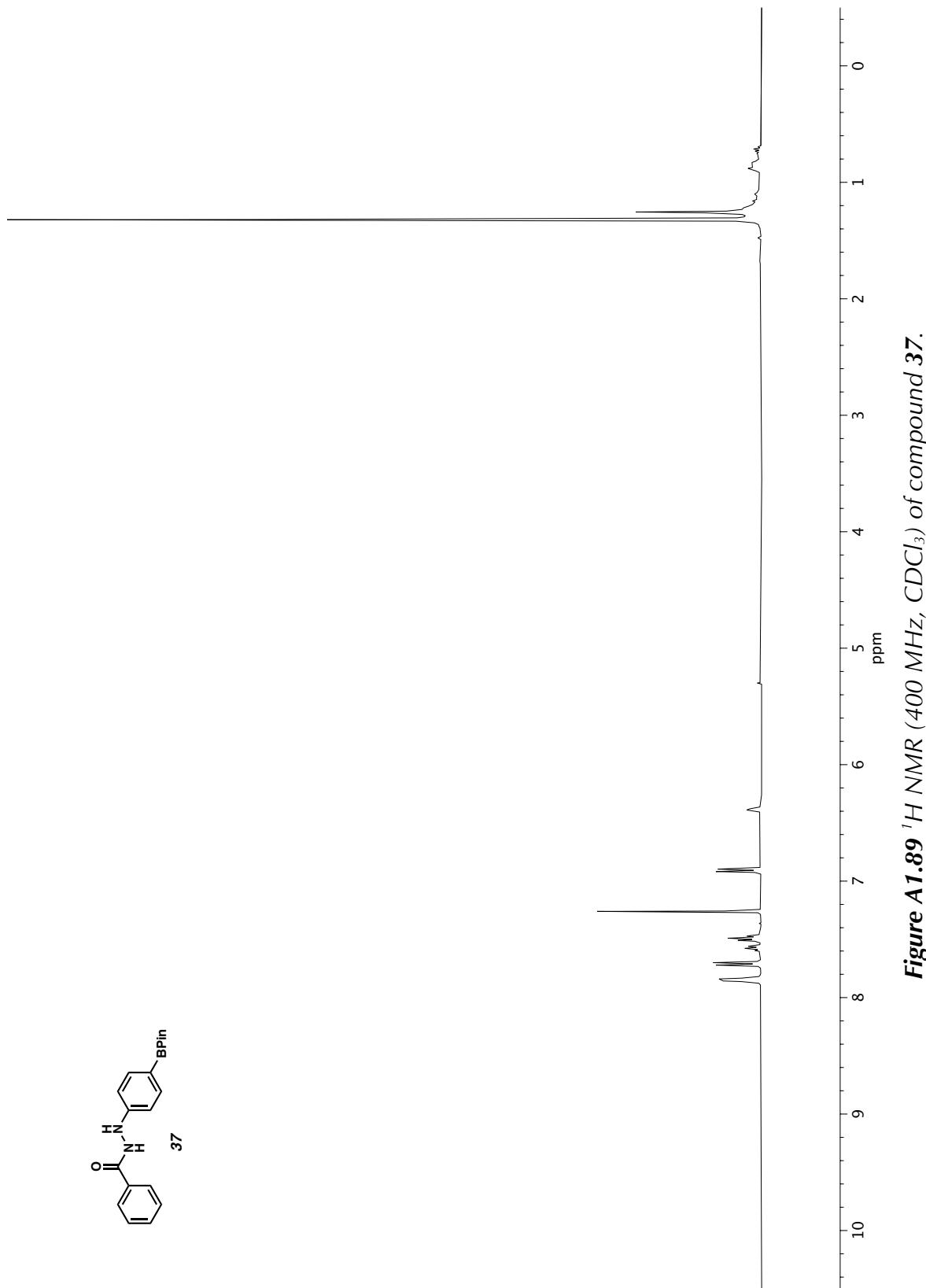
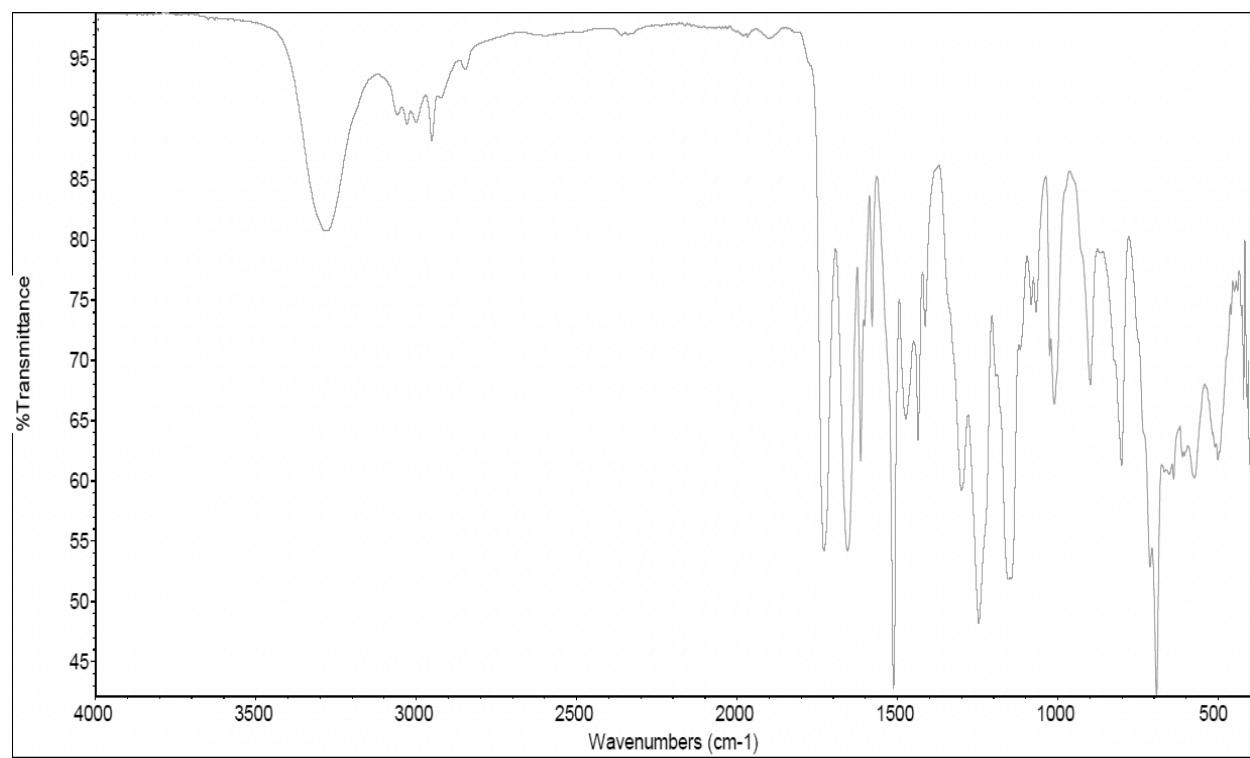
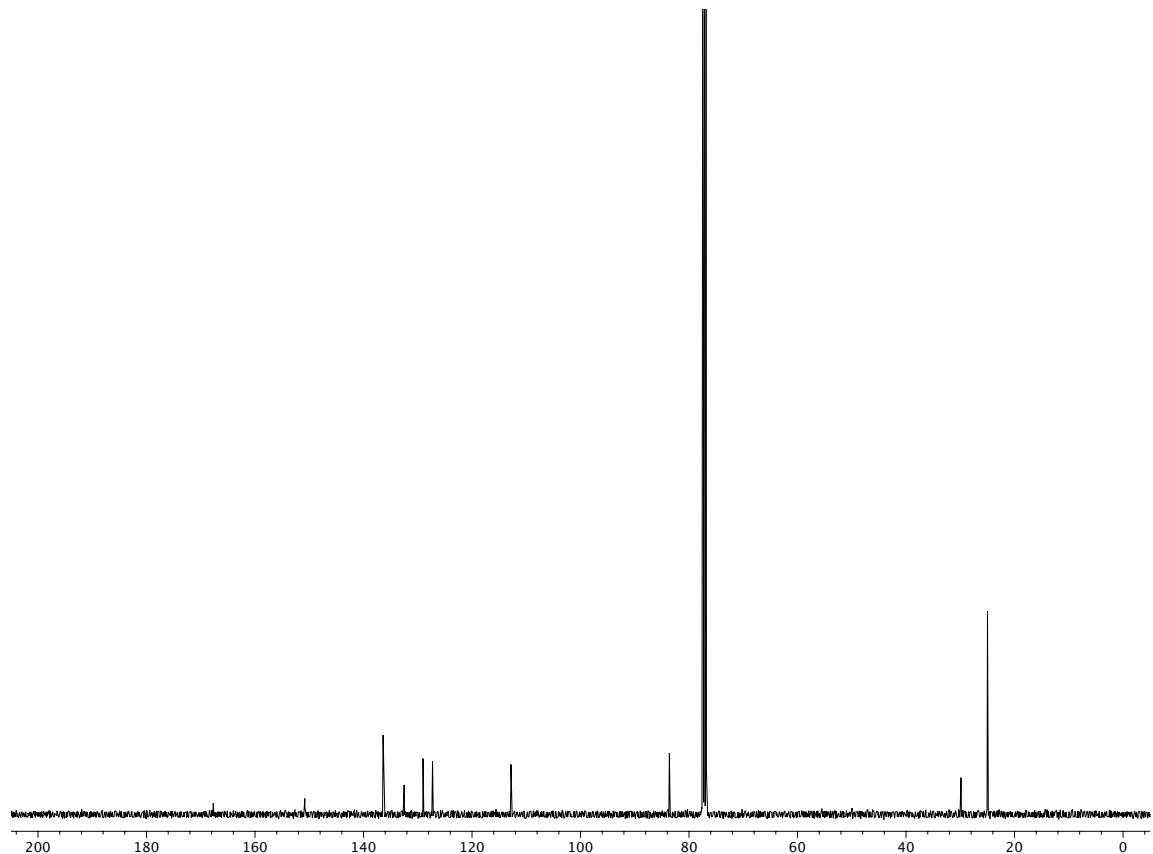


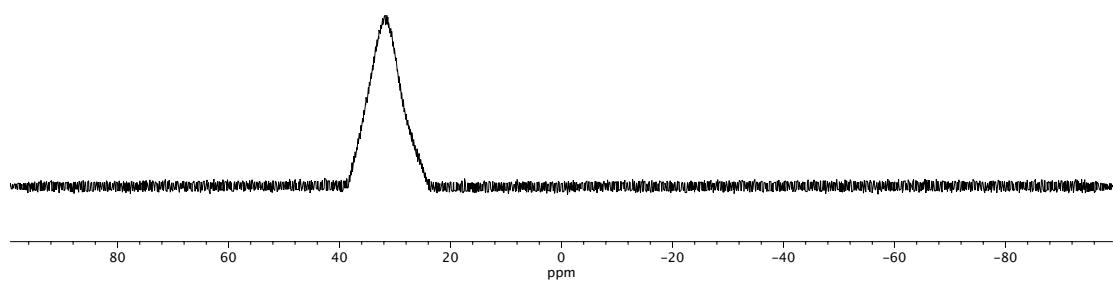
Figure A1.89  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 37.



**Figure A1.90** Infrared spectrum (Thin Film) of compound 37.



**Figure A1.91** <sup>13</sup>C NMR (101 MHz,  $CDCl_3$ ) of compound 37.



**Figure A1.92**  $^{11}\text{B}$  NMR (128 MHz,  $\text{CDCl}_3$ ) of compound 37.

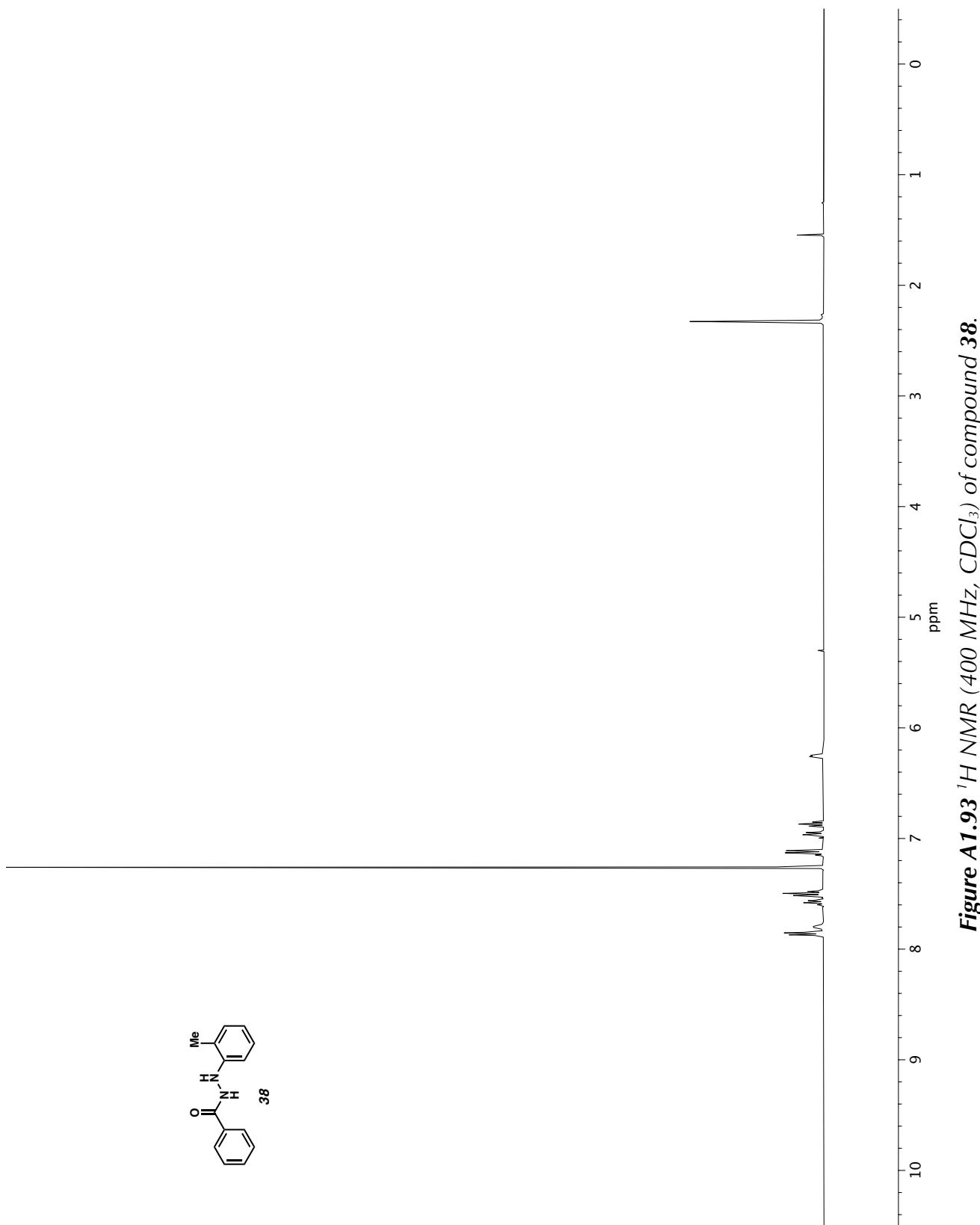
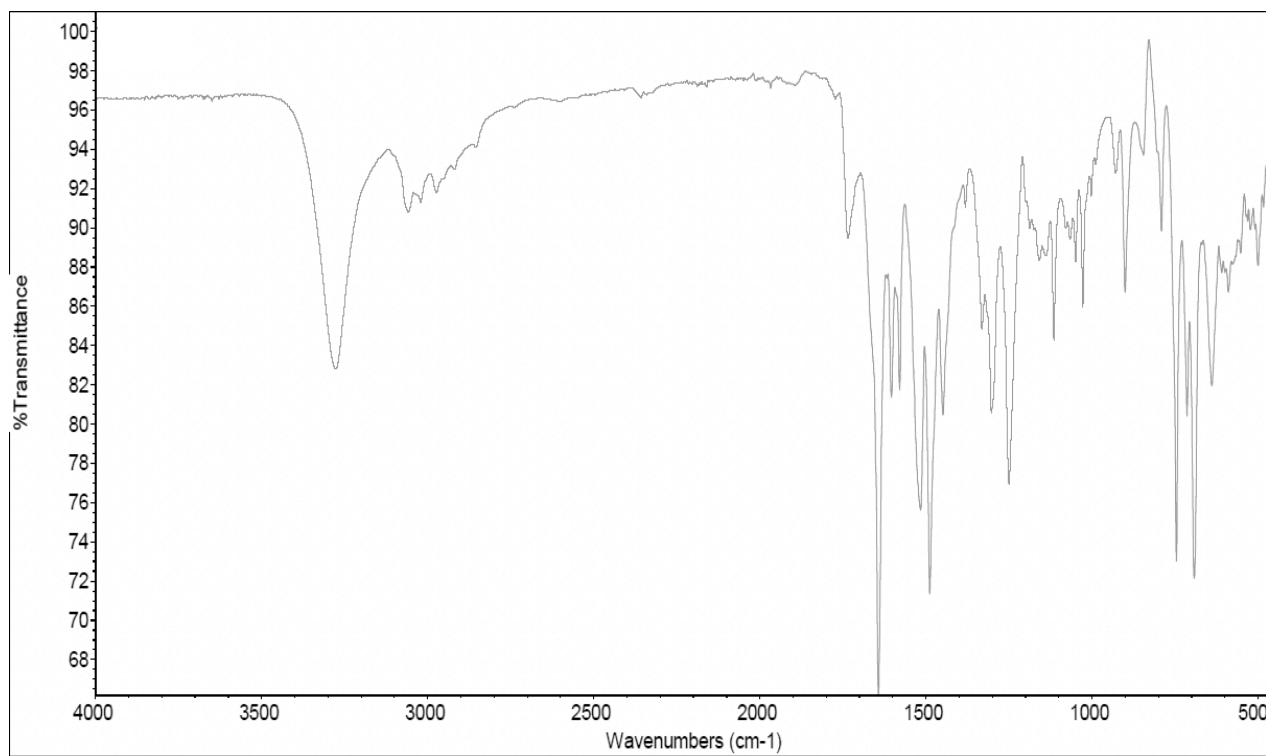
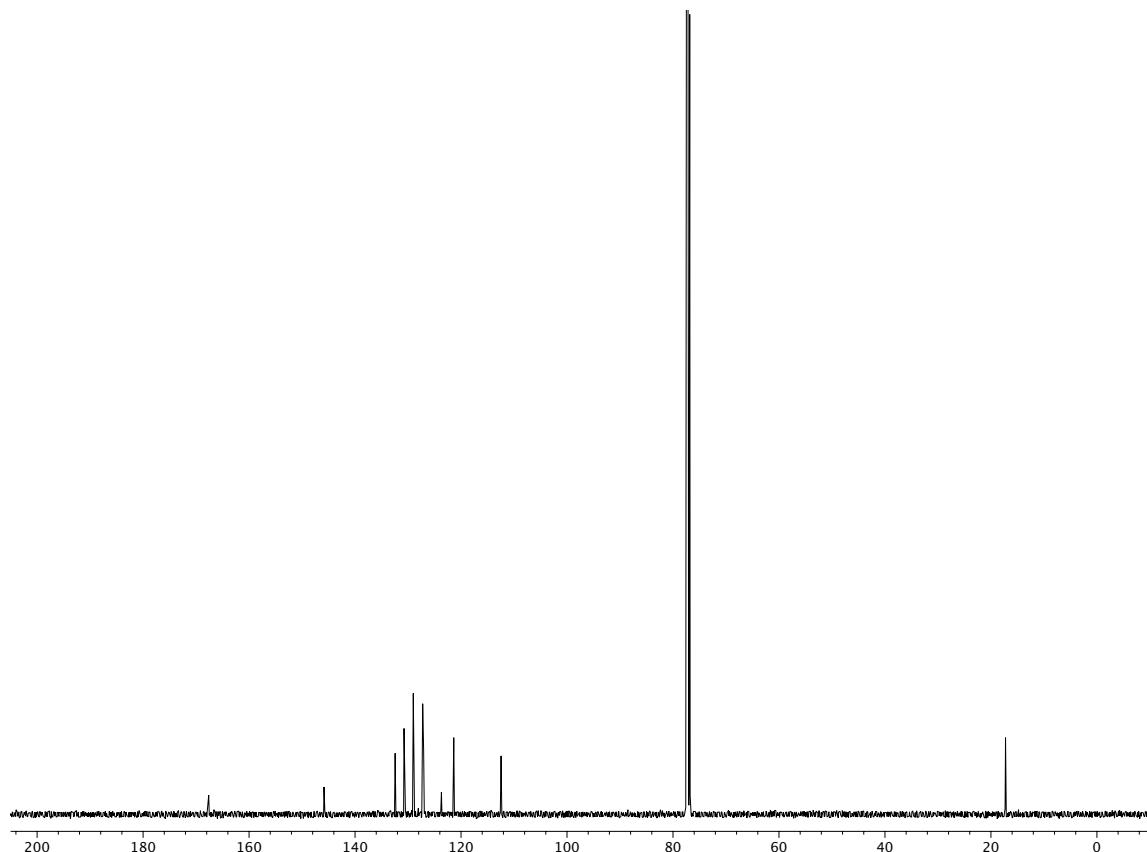


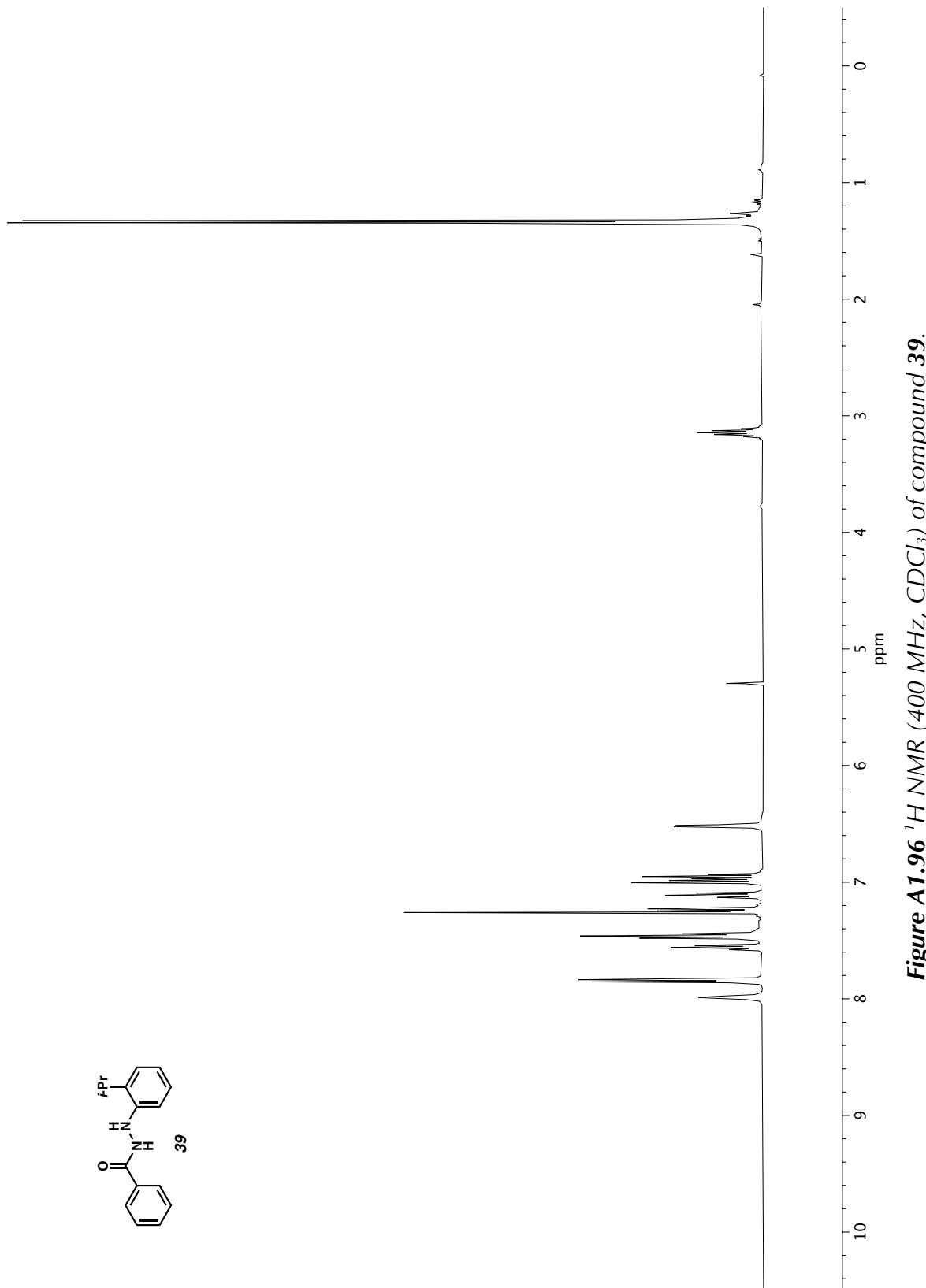
Figure A1.93  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 38.



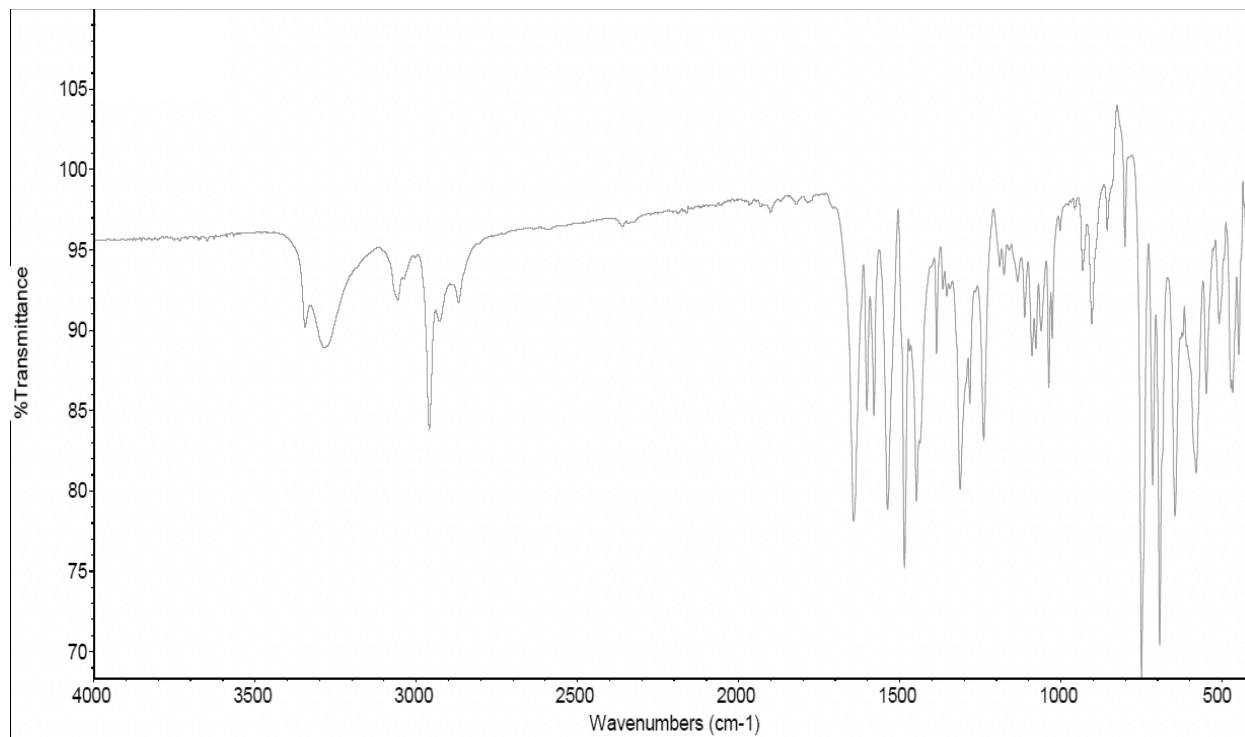
**Figure A1.94** Infrared spectrum (Thin Film) of compound 38.



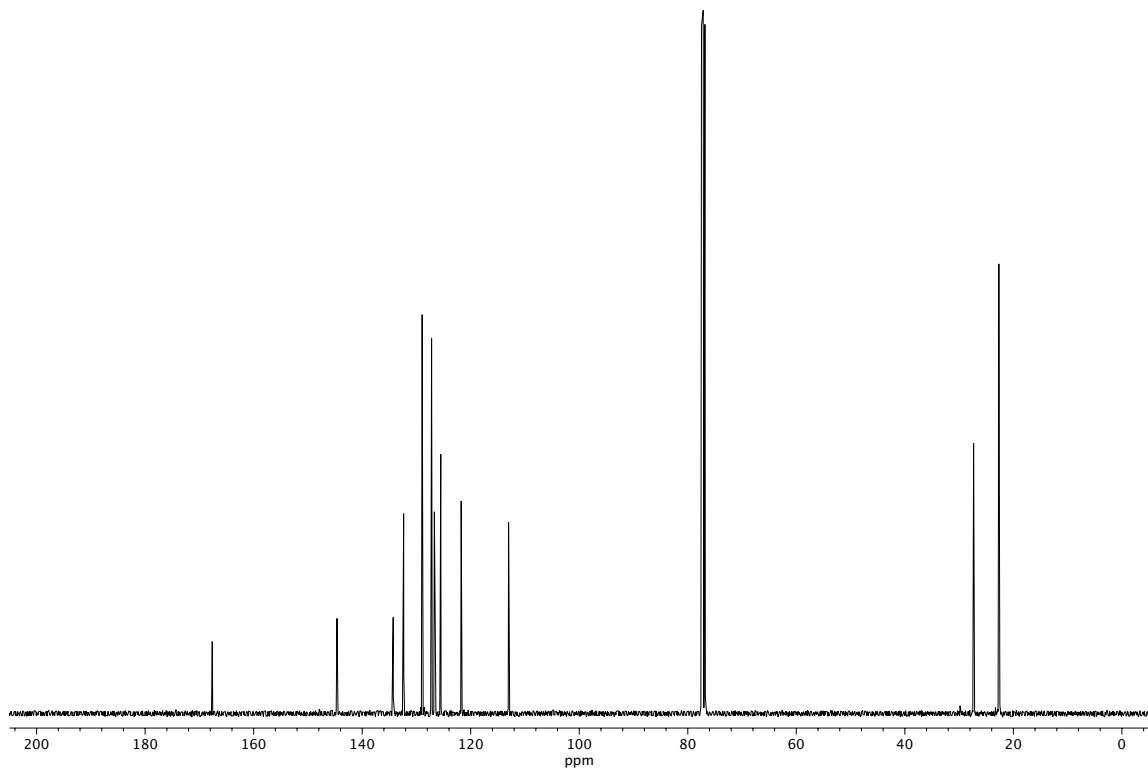
**Figure A1.95** <sup>13</sup>C NMR (101 MHz,  $CDCl_3$ ) of compound 38.



**Figure A1.96**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 39.



**Figure A1.97** Infrared spectrum (Thin Film) of compound **39**.



**Figure A1.98**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **39**.

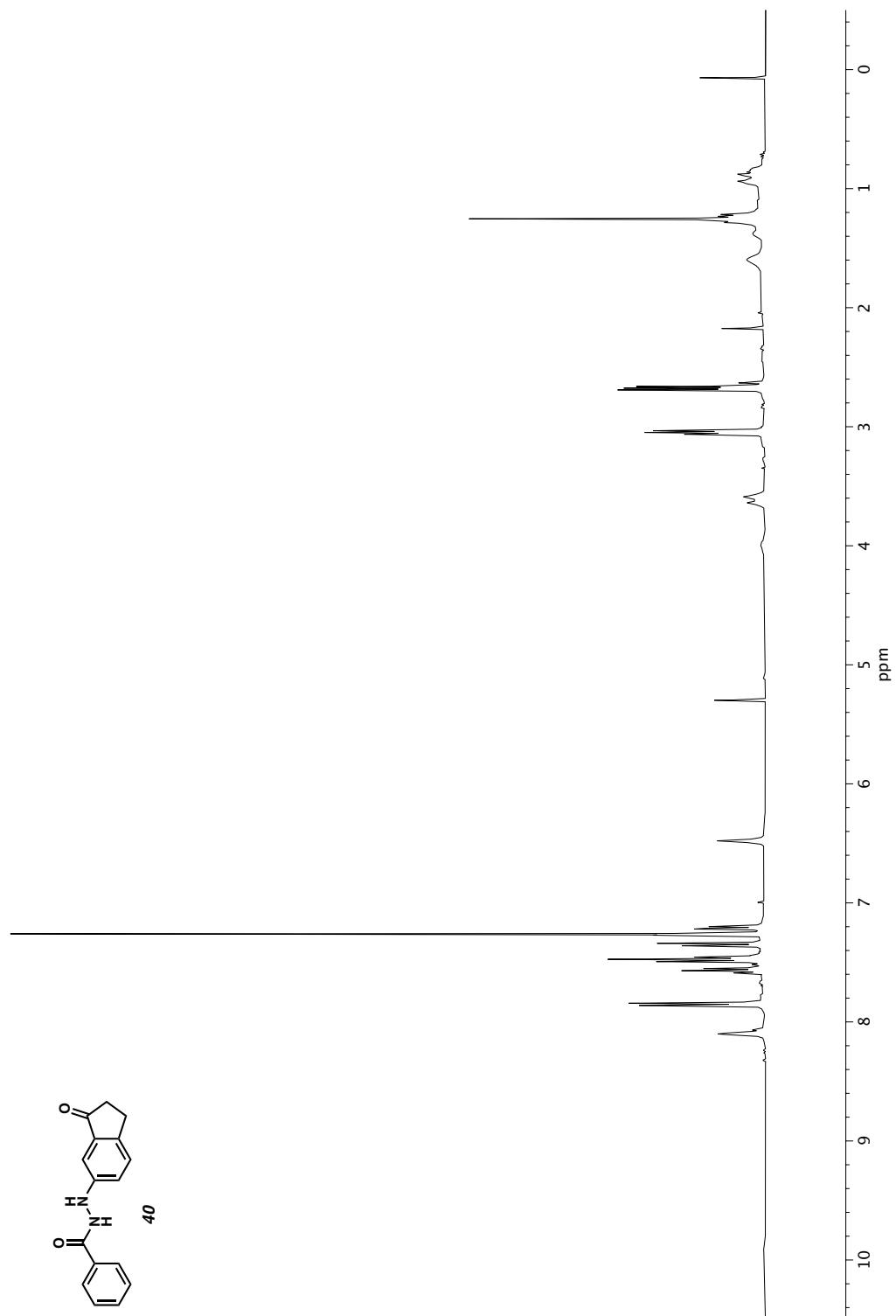
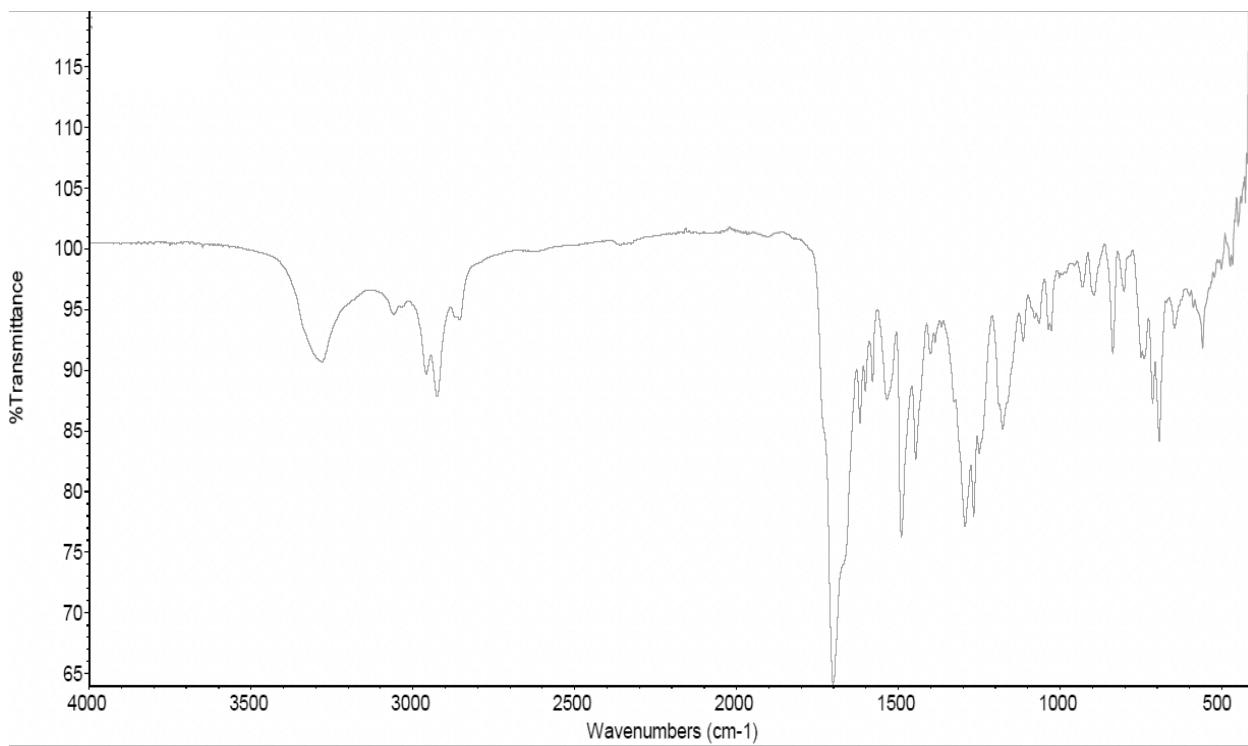
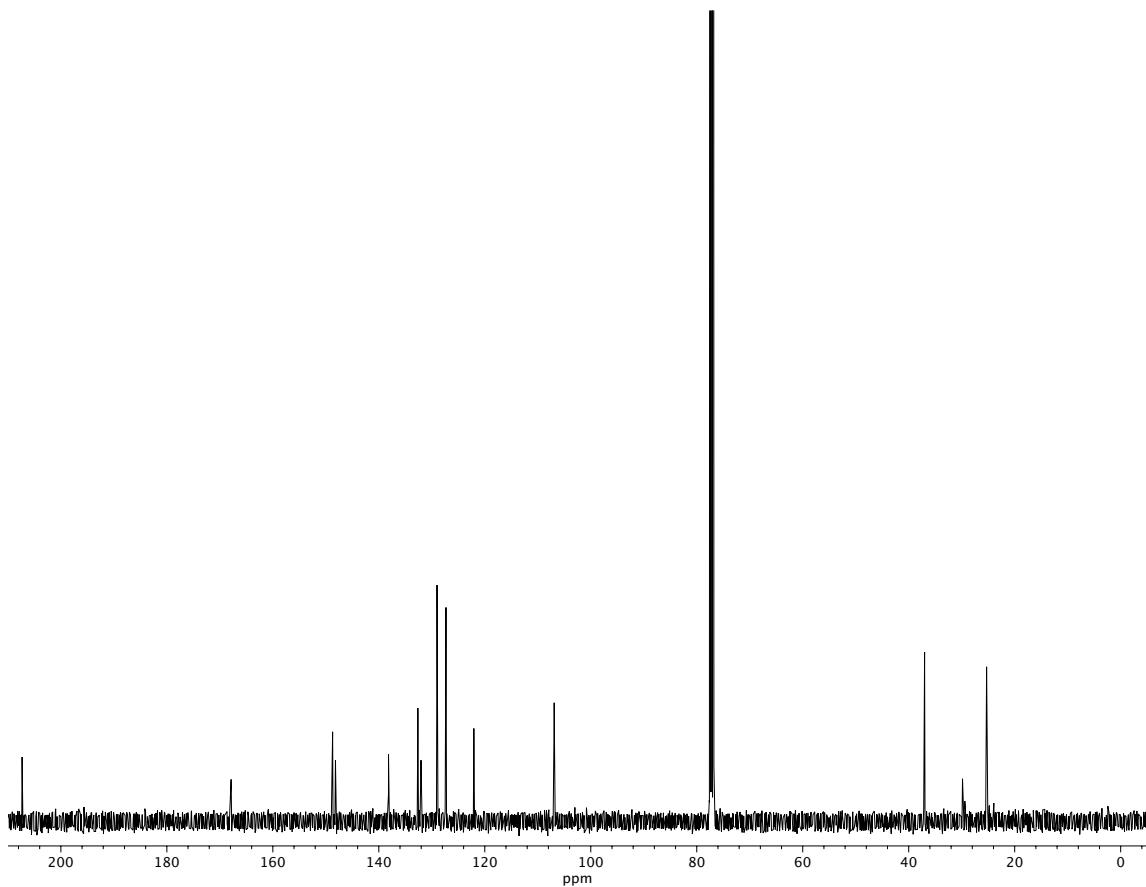


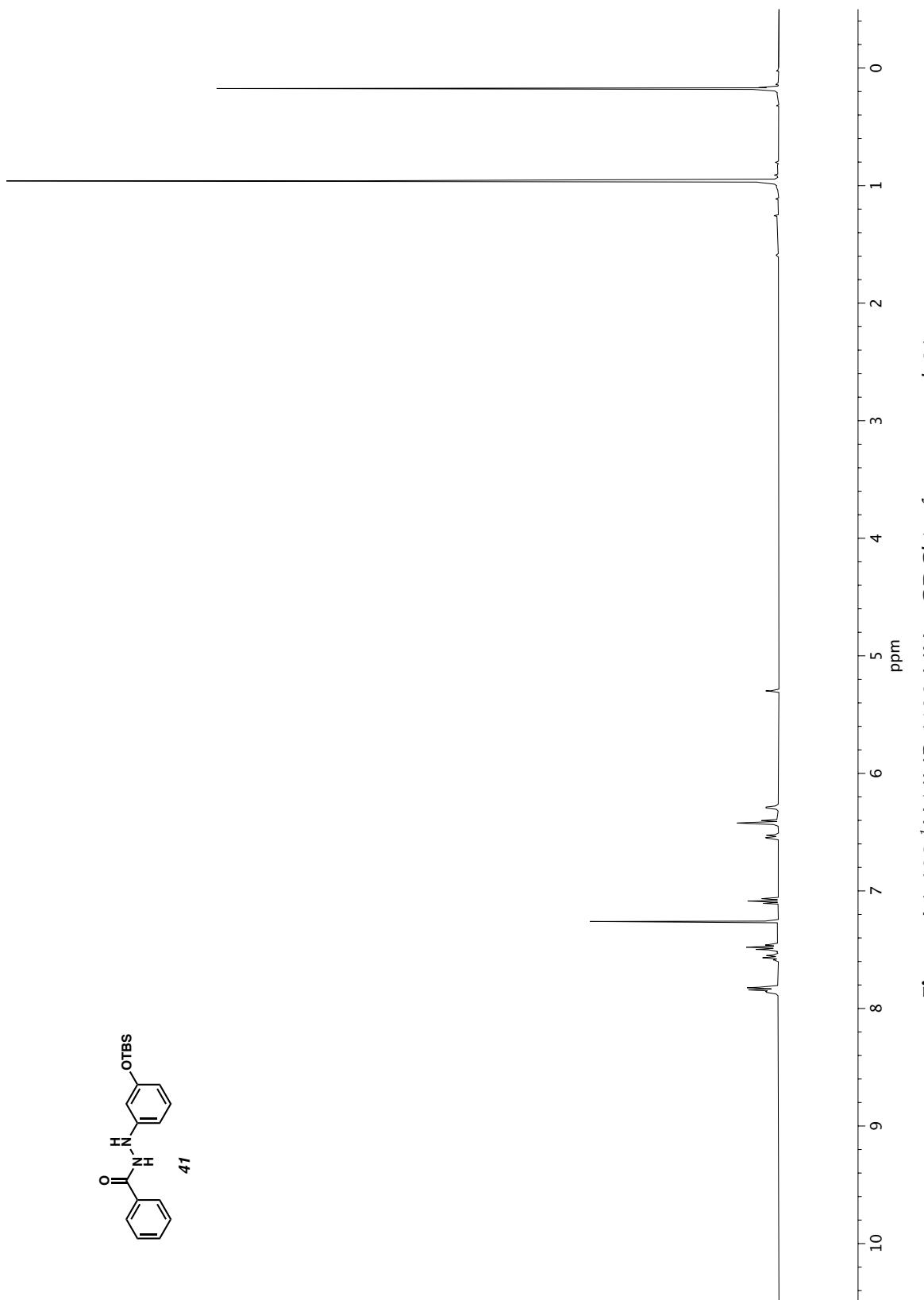
Figure A1.99  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 40.



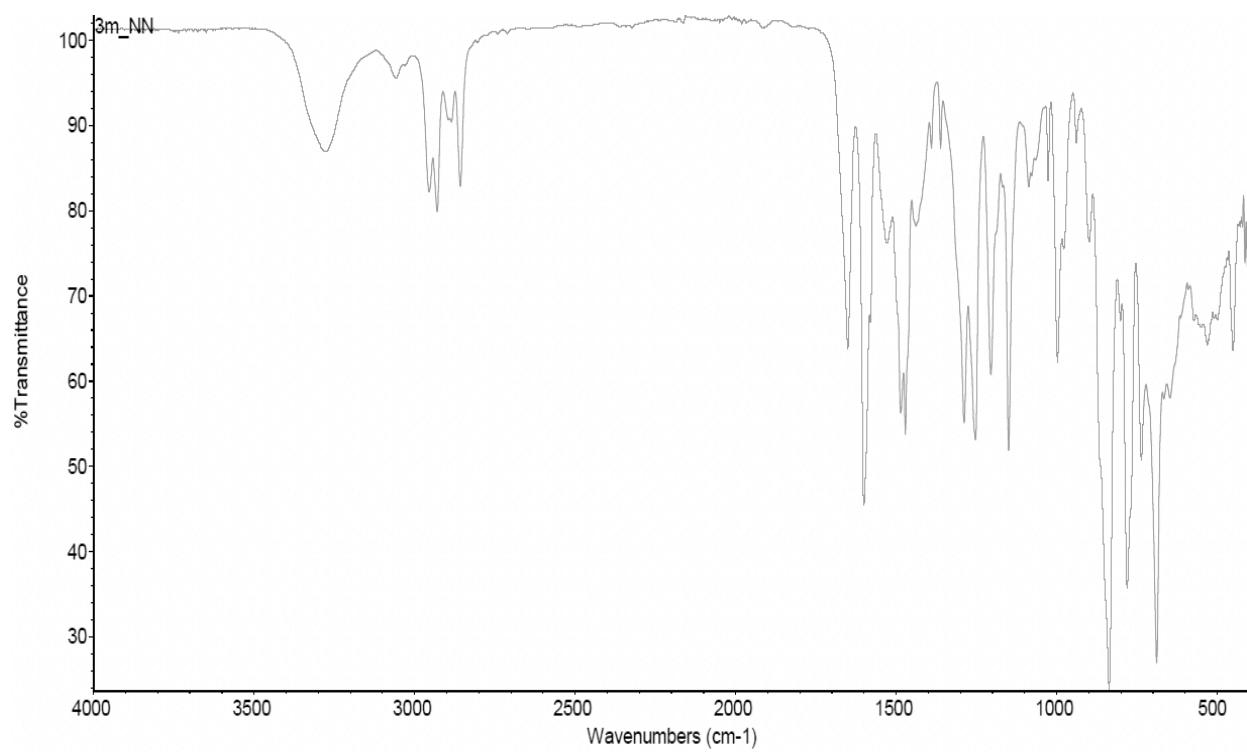
**Figure A1.100** Infrared spectrum (Thin Film) of compound **40**.



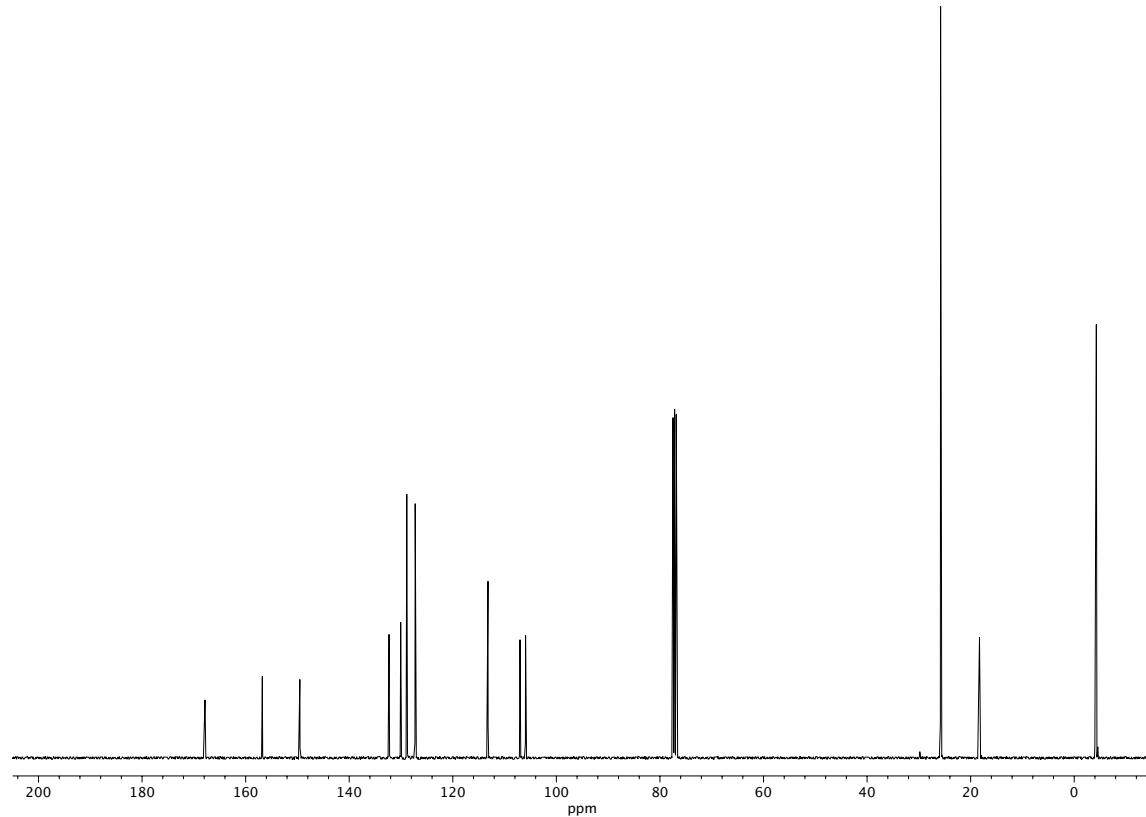
**Figure A1.101**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **40**.



**Figure A1.102**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound **41**.



**Figure A1.103** Infrared spectrum (Thin Film) of compound **41**.



**Figure A1.104**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **41**.

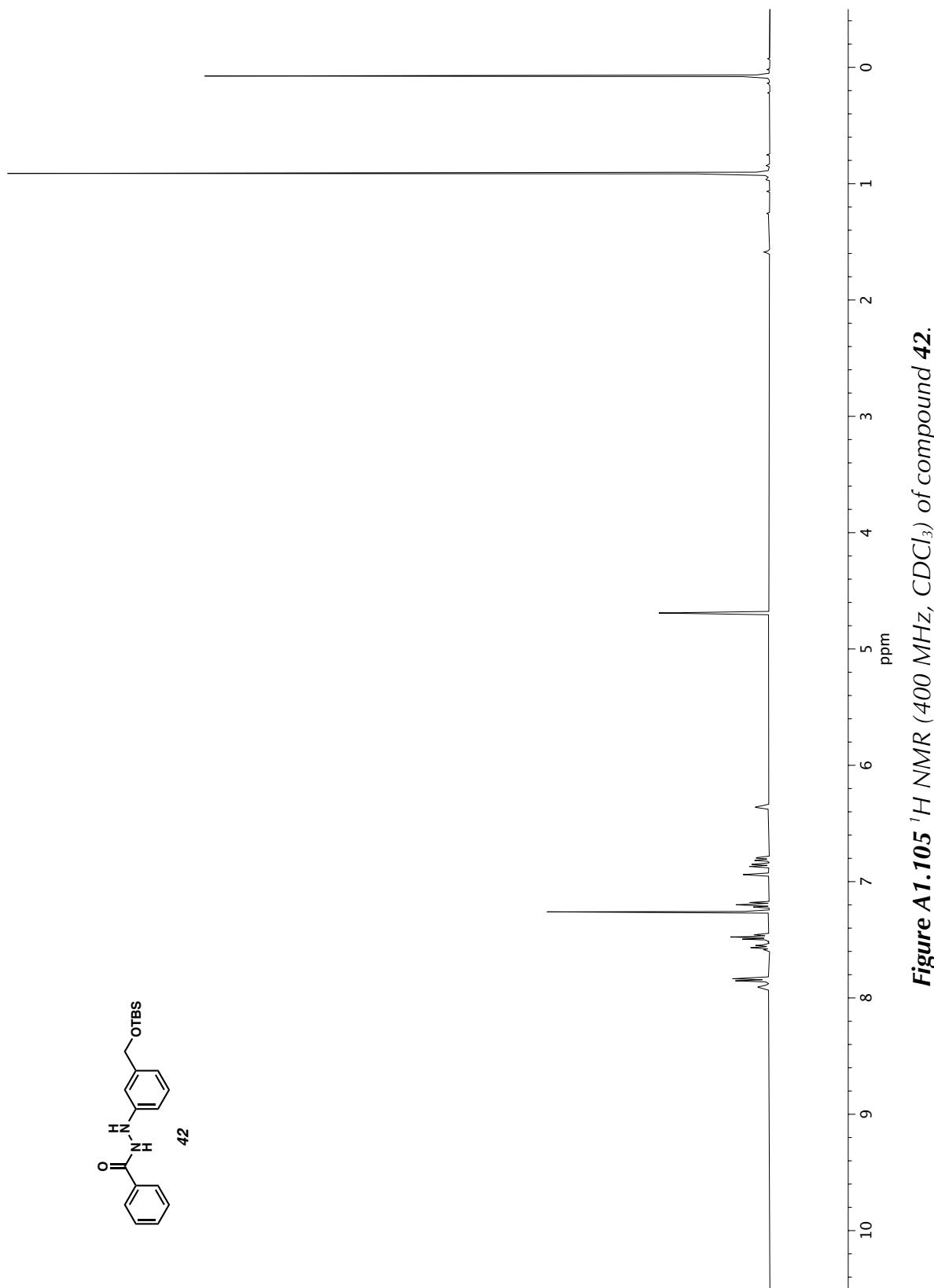
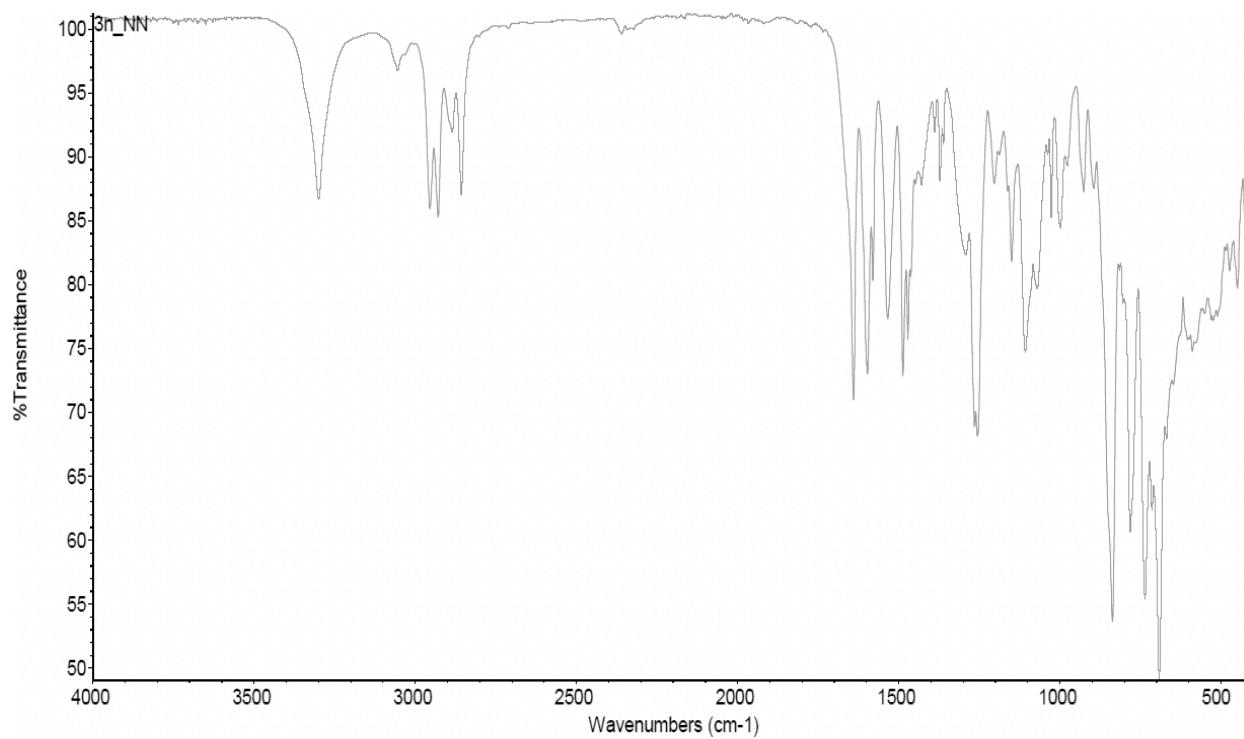
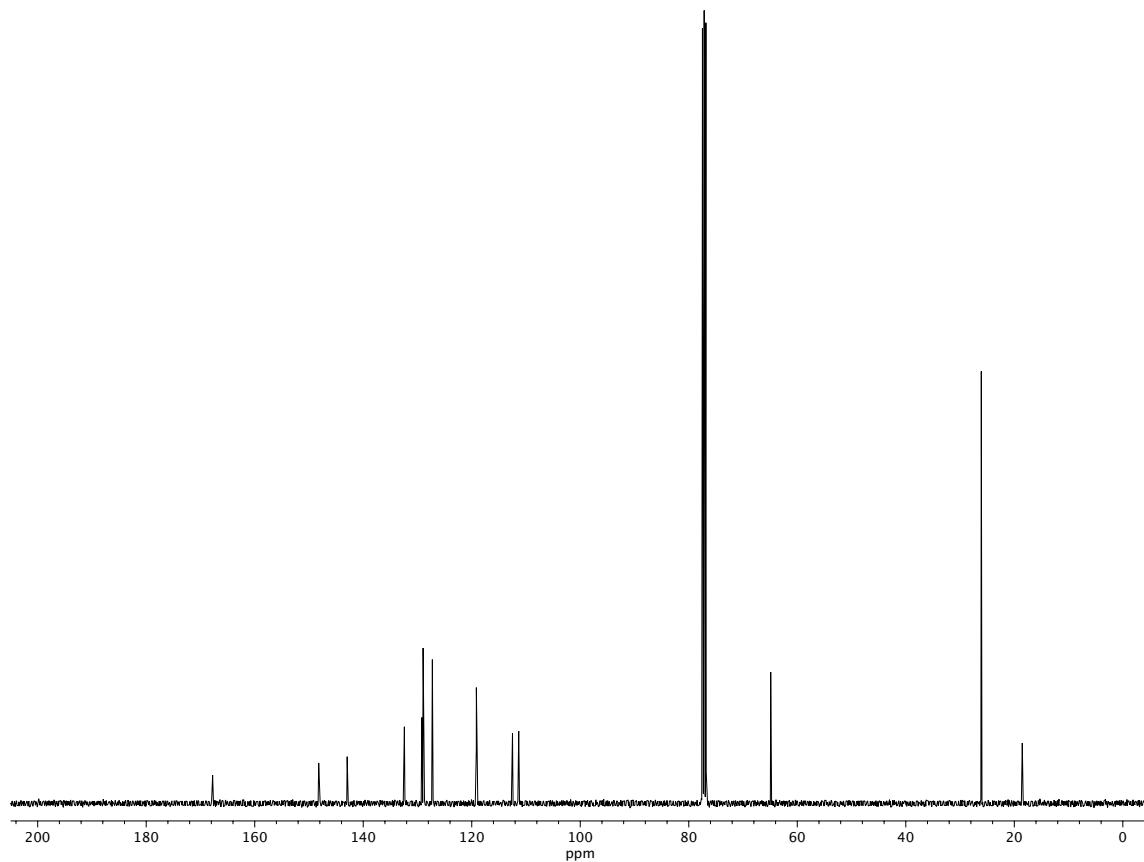


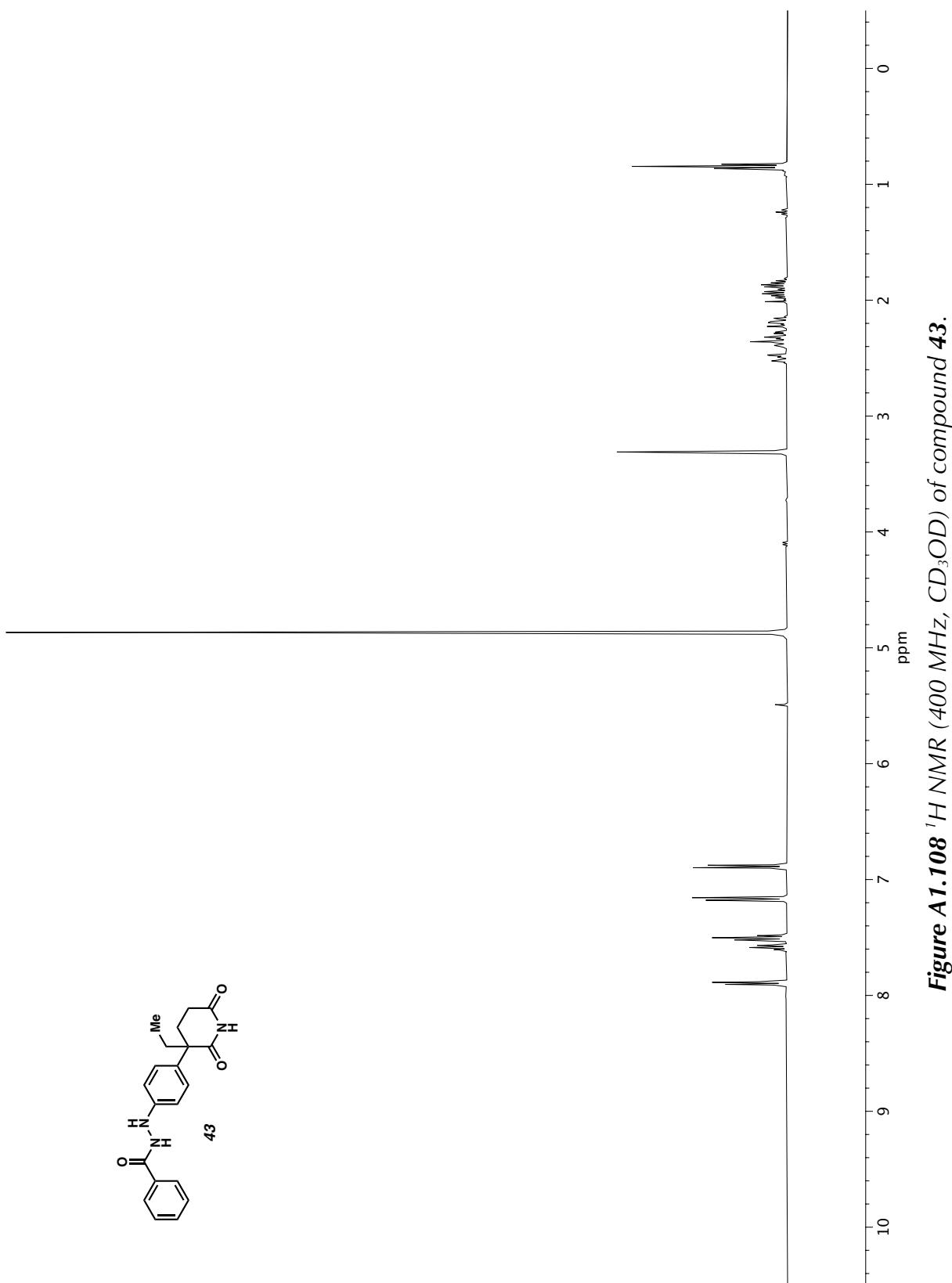
Figure A1.105  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 42.



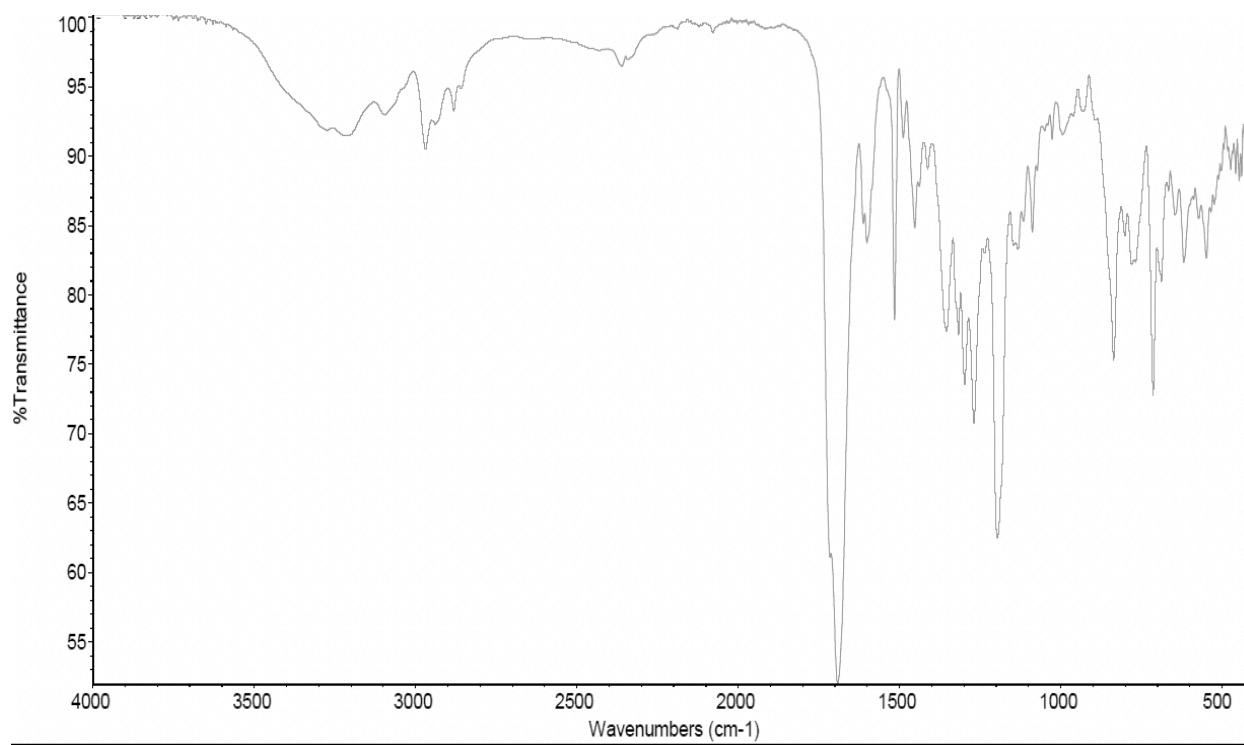
**Figure A1.106** Infrared spectrum (Thin Film) of compound **42**.



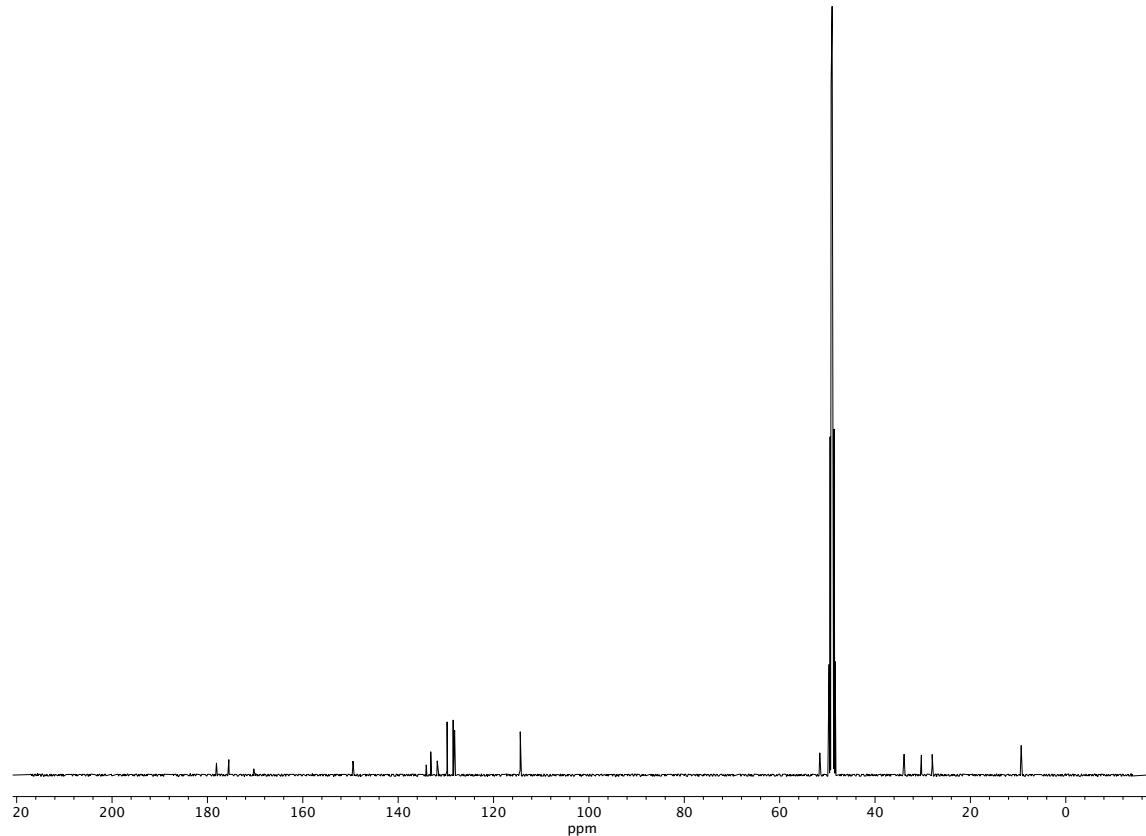
**Figure A1.107** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **42**.



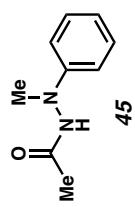
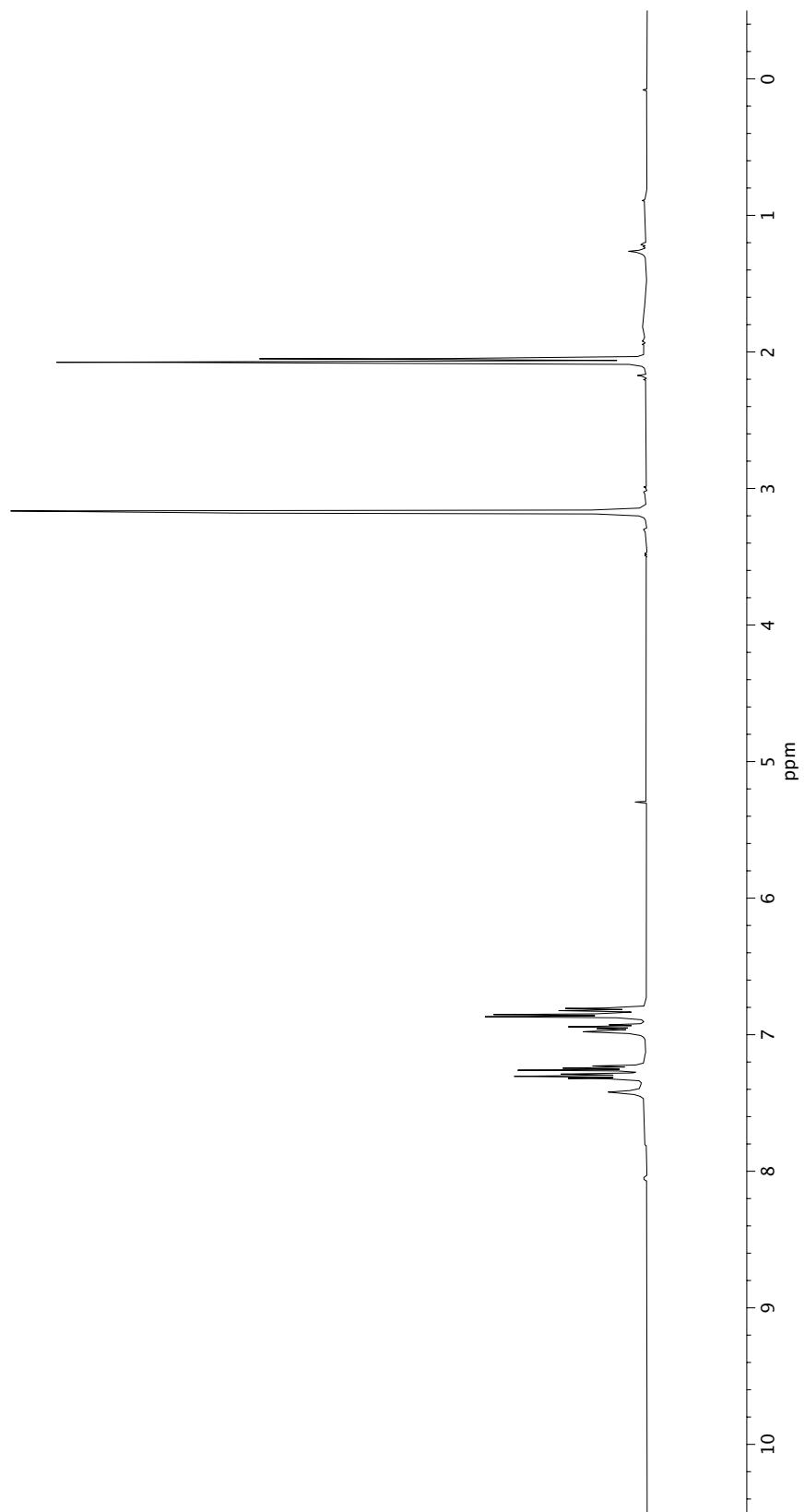
**Figure A1.108**  $^1\text{H}$  NMR (400 MHz,  $\text{CD}_3\text{OD}$ ) of compound 43.



**Figure A1.109** Infrared spectrum (Thin Film) of compound **43**.



**Figure A1.110**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CD}_3\text{OD}$ ) of compound **43**.



**Figure A1.111**  $^1\text{H}$  NMR ( $400 \text{ MHz}, \text{CDCl}_3$ ) of compound 45.

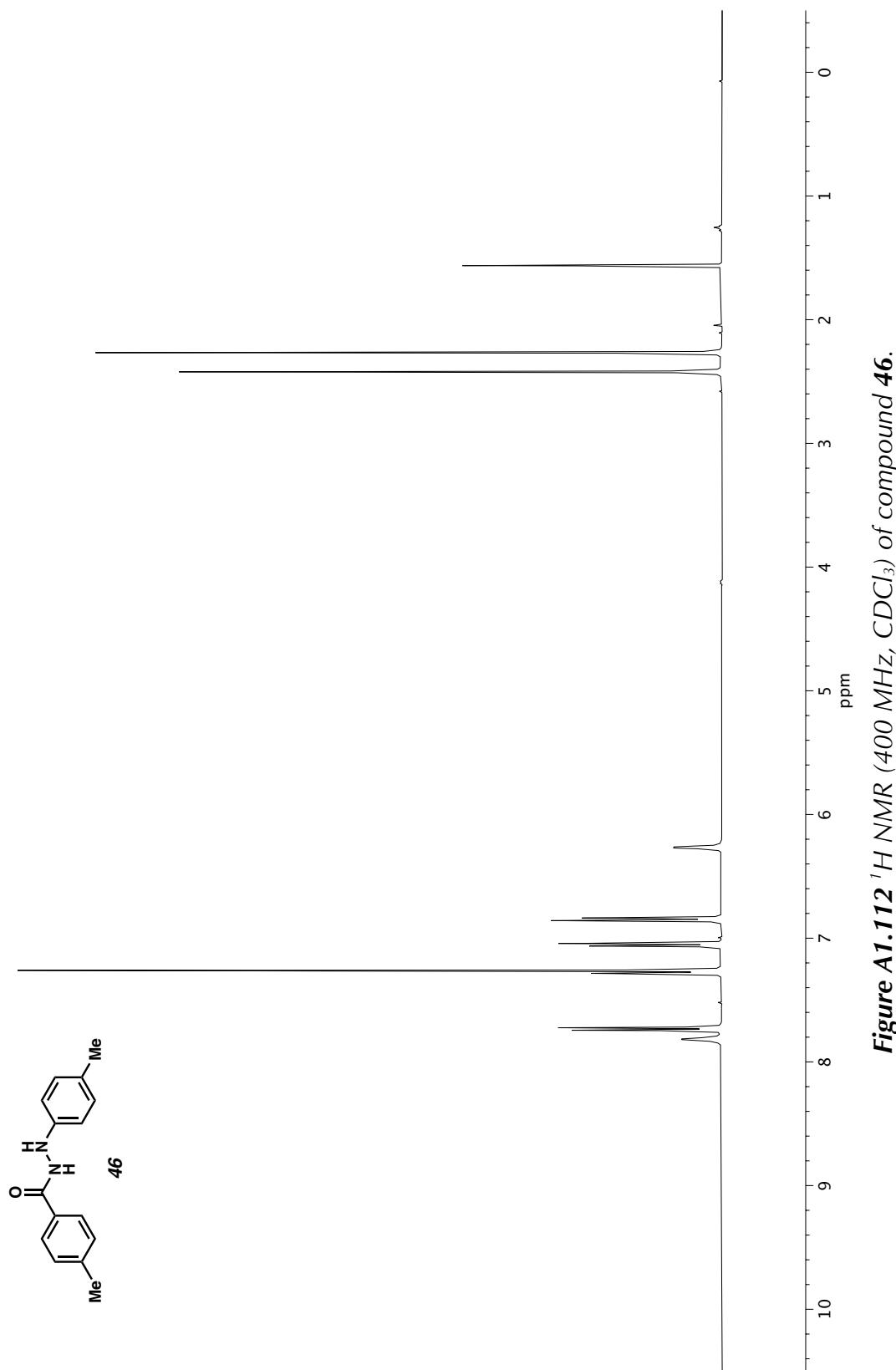
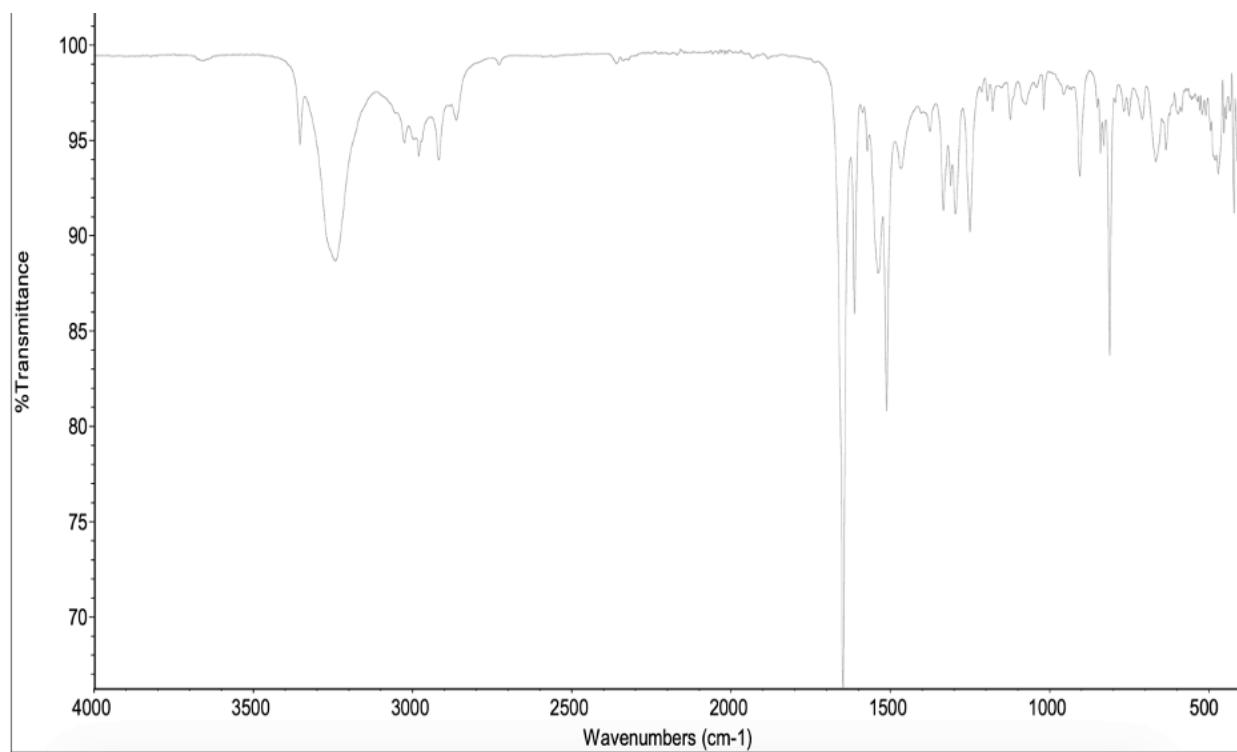
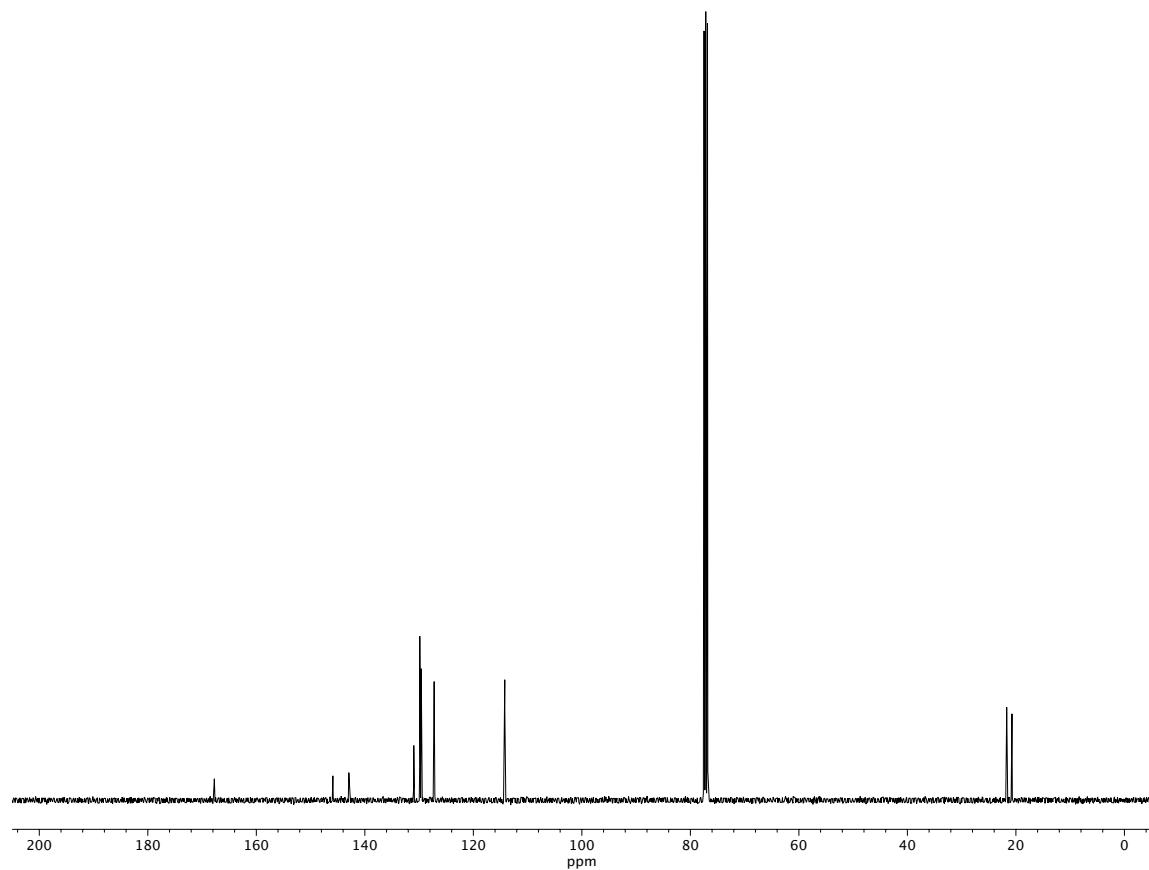


Figure A1.112  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 46.



**Figure A1.113** Infrared spectrum (Thin Film) of compound **46**.



**Figure A1.114** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **46**.

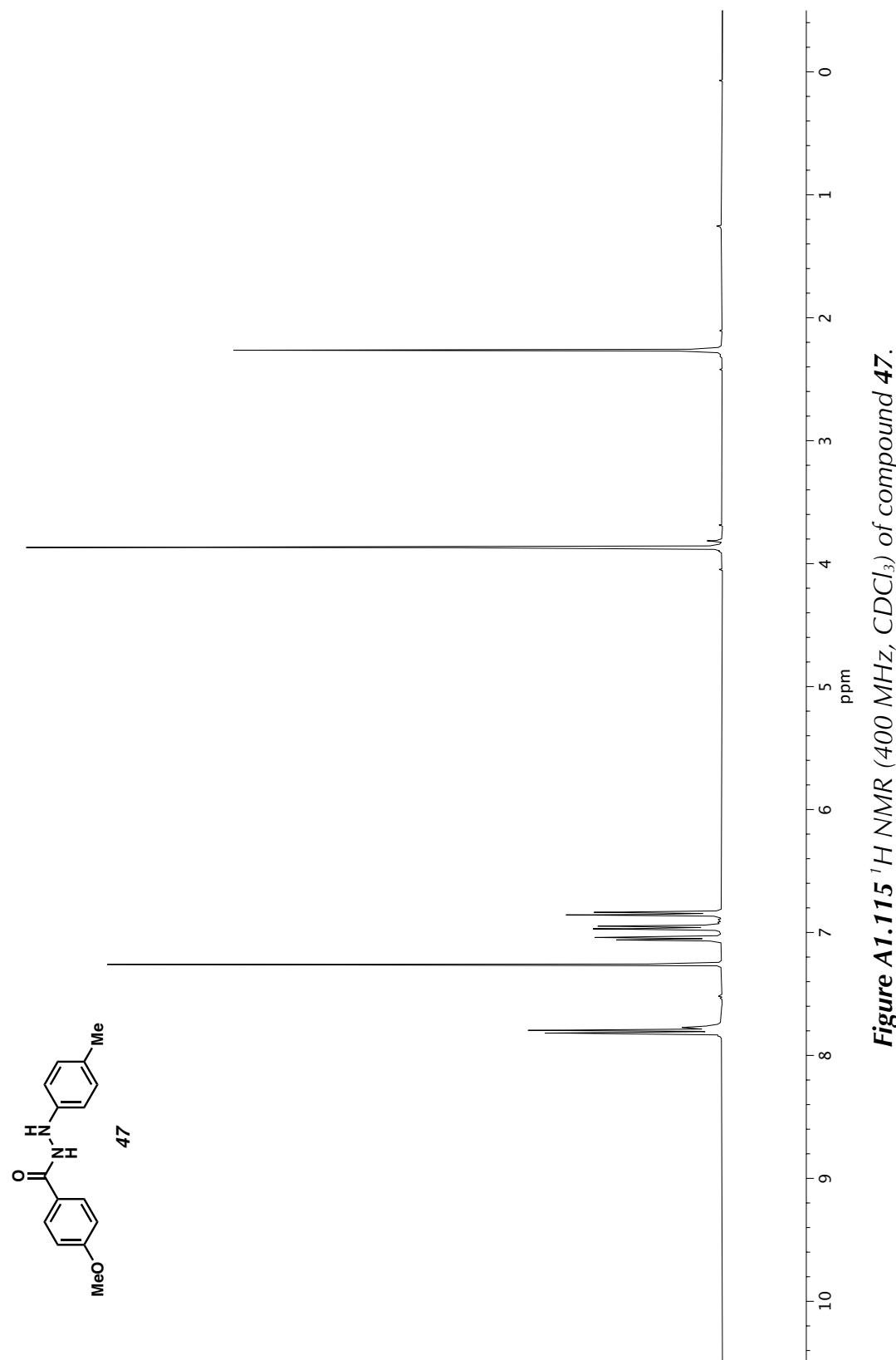
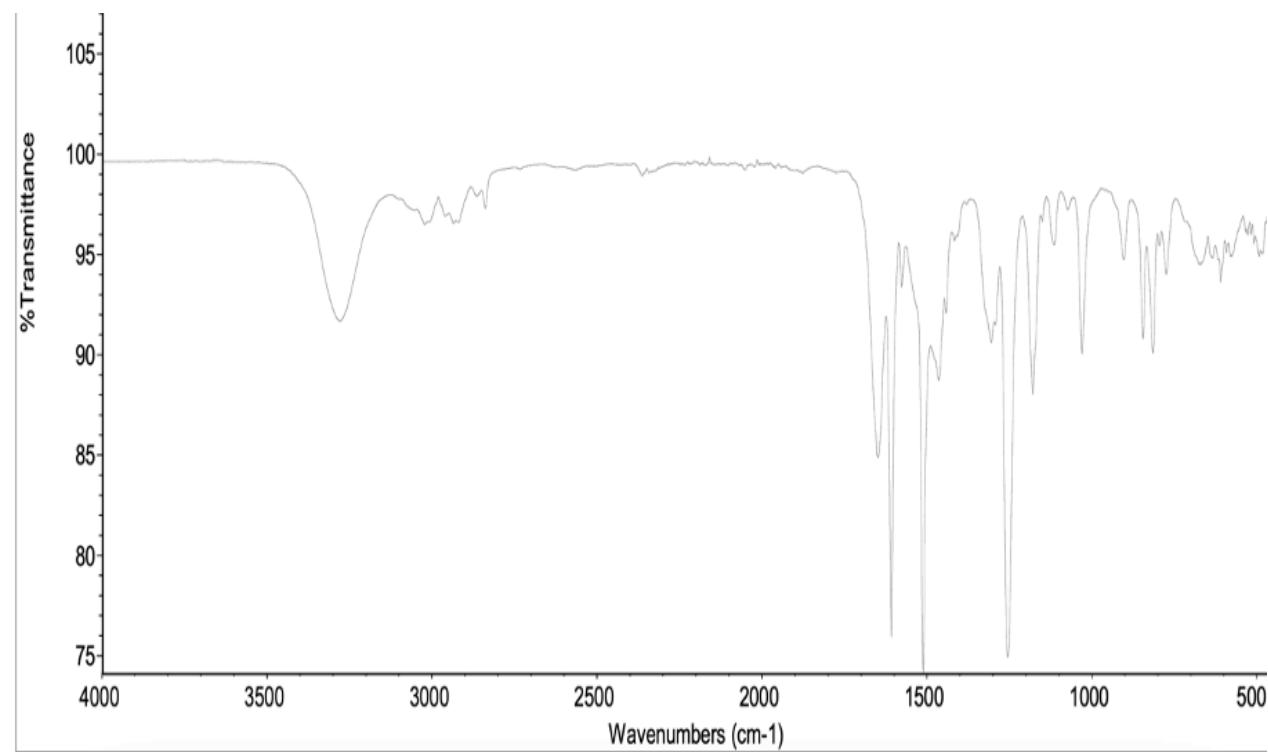
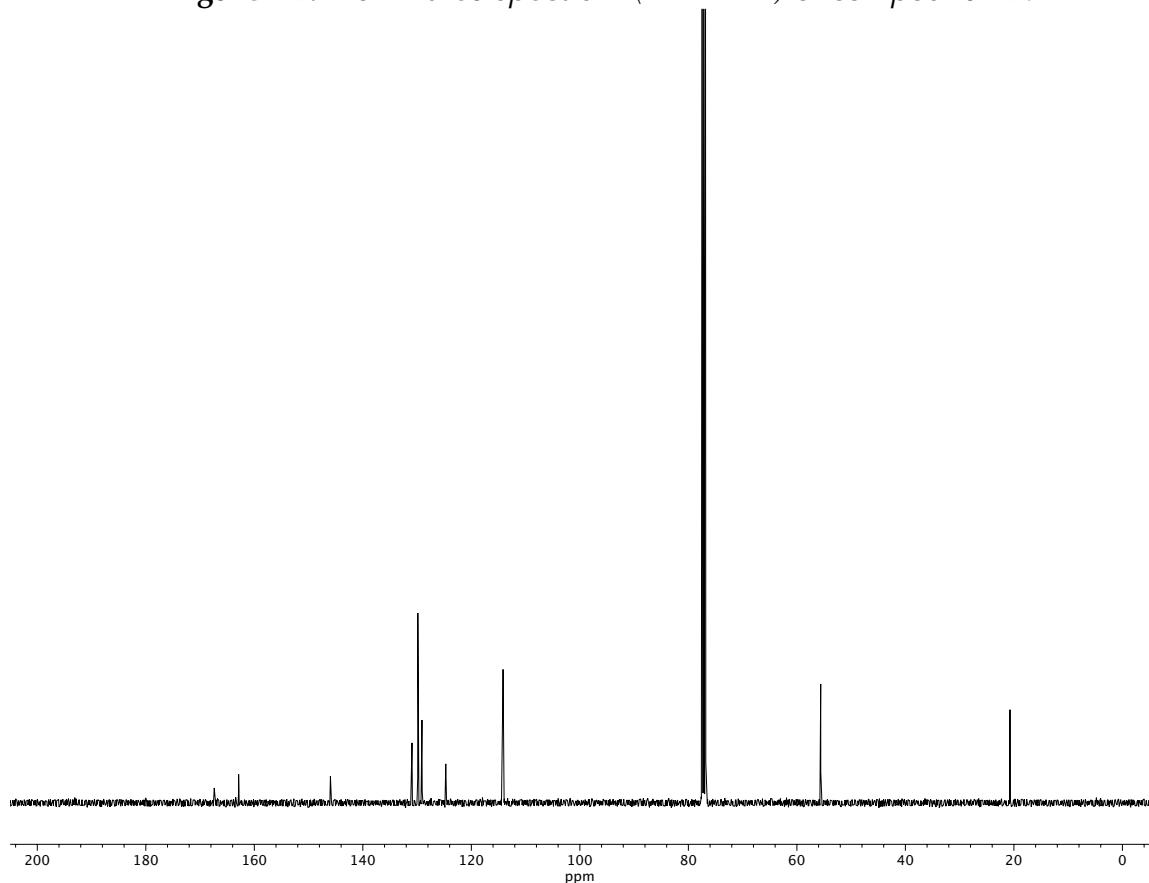


Figure A1.115  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 47.



**Figure A1.116** Infrared spectrum (Thin Film) of compound **47**.



**Figure A1.117**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **47**.

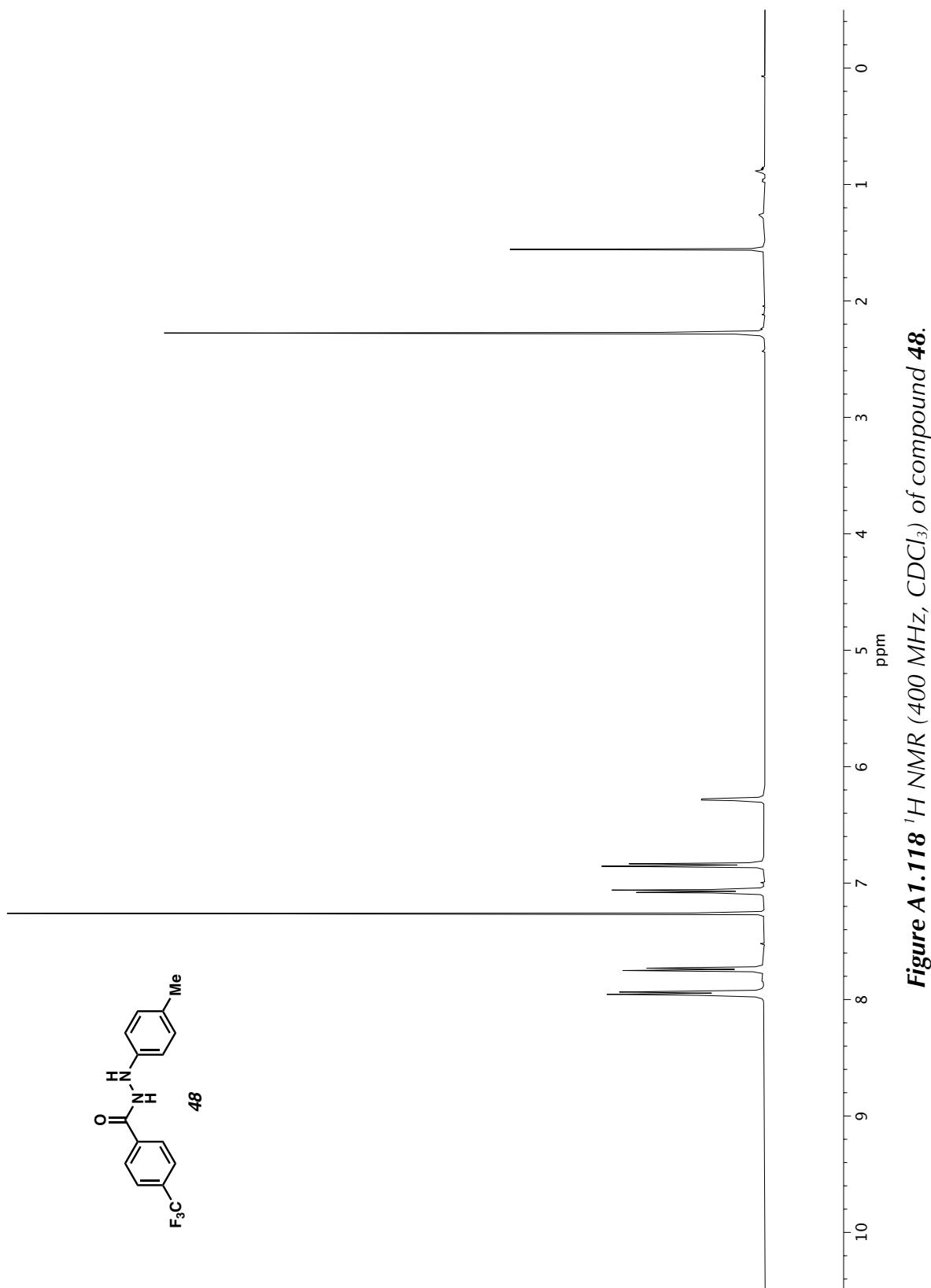
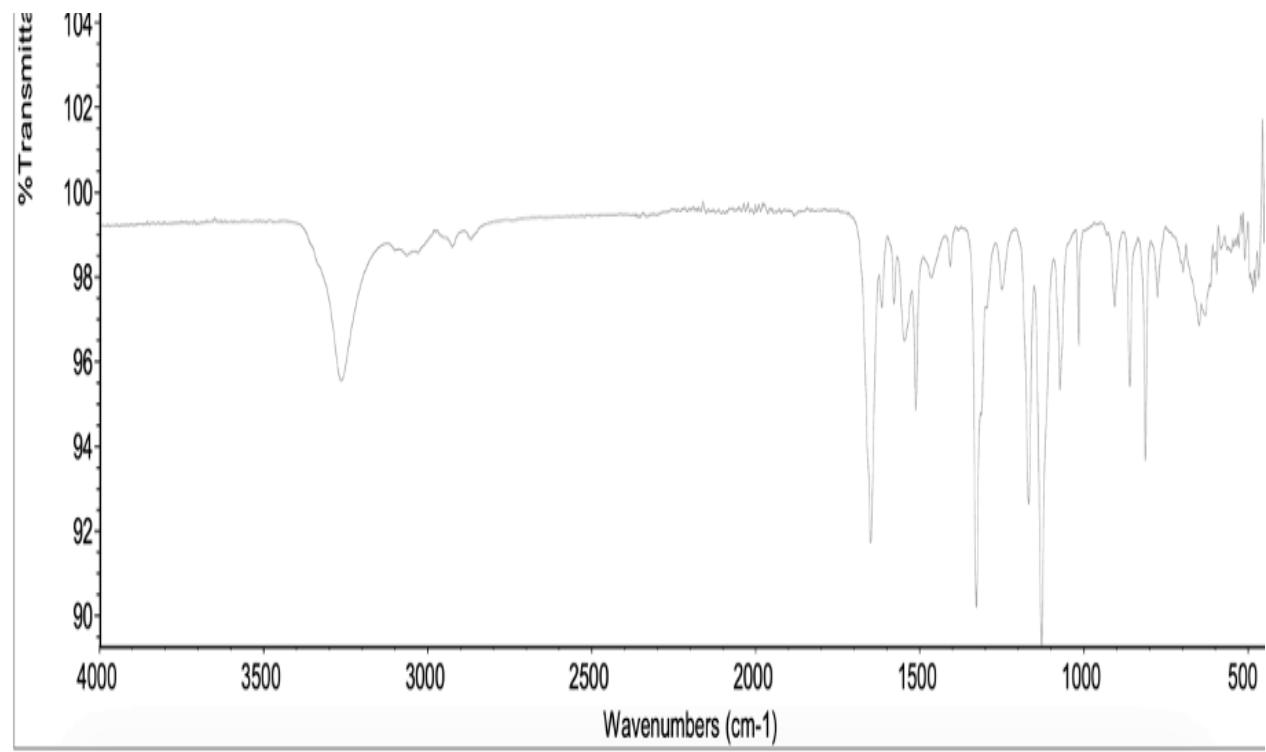
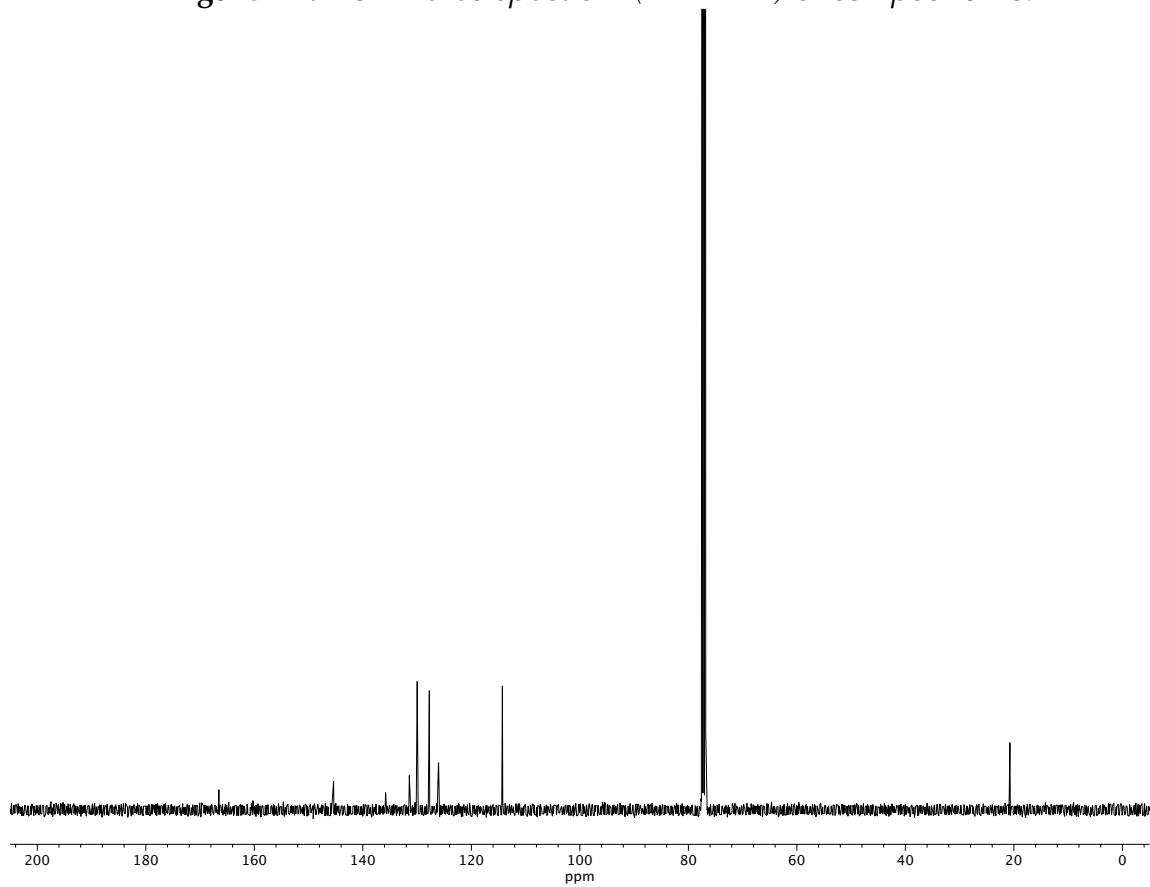


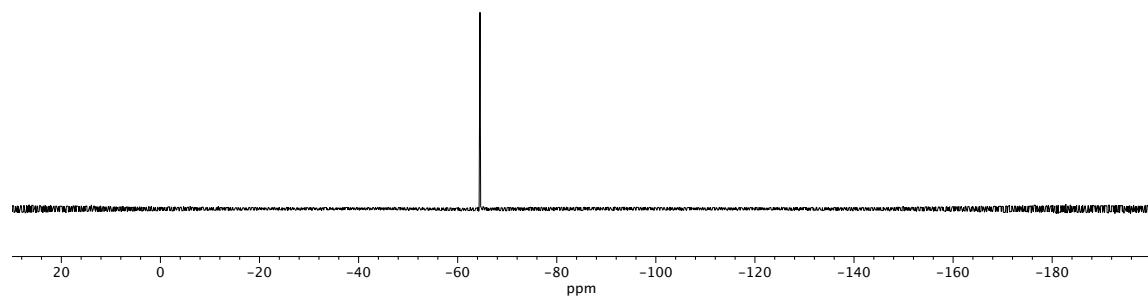
Figure A1.118  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 48.



**Figure A1.119** Infrared spectrum (Thin Film) of compound **48**.



**Figure A.1.120**  $^{13}\text{C}$  NMR (101 MHz,  $(\text{CD}_3)_2\text{CO}$ ) of compound **48**.



**Figure A1.121**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CD}_3\text{OD}$ ) of compound **48**.

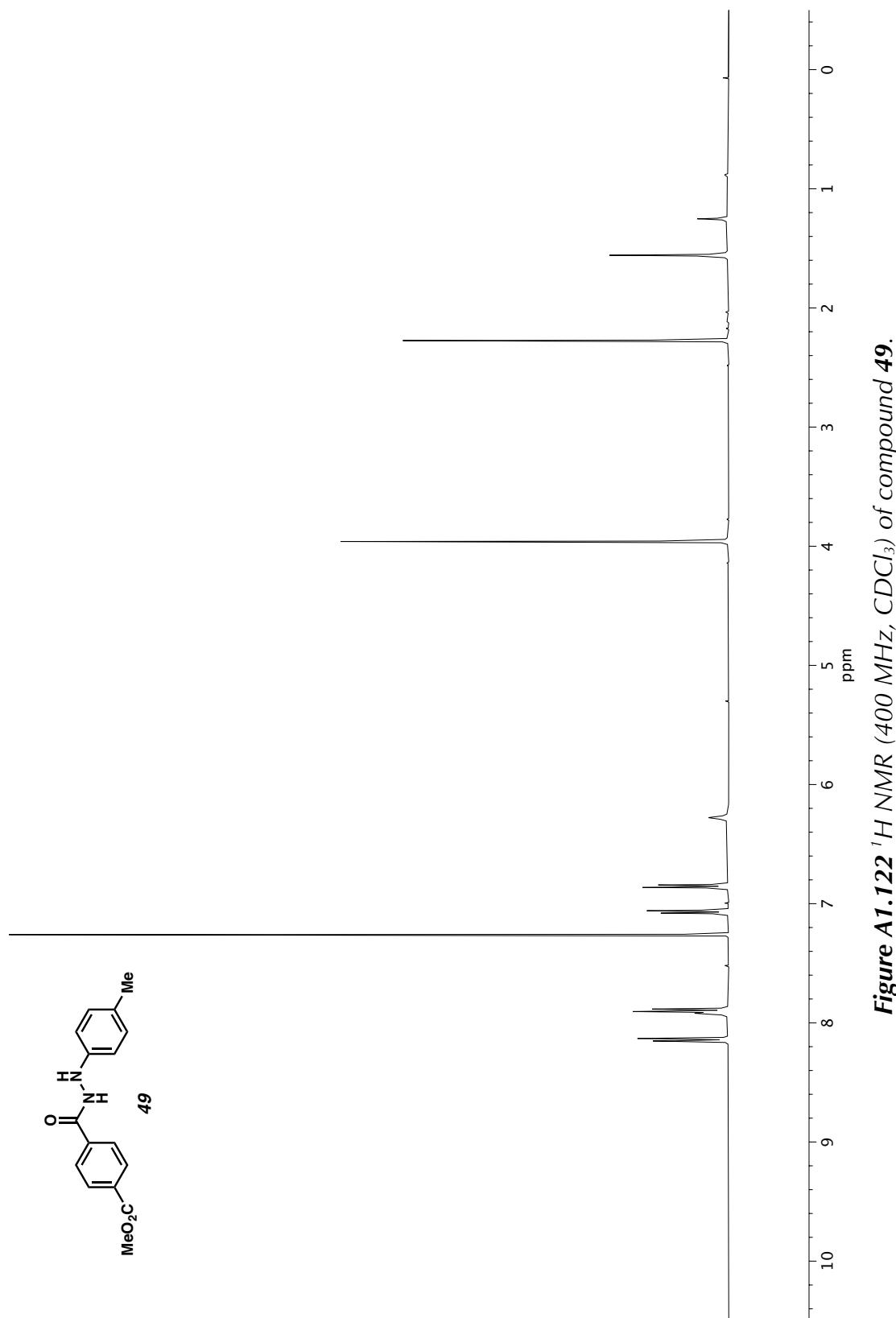
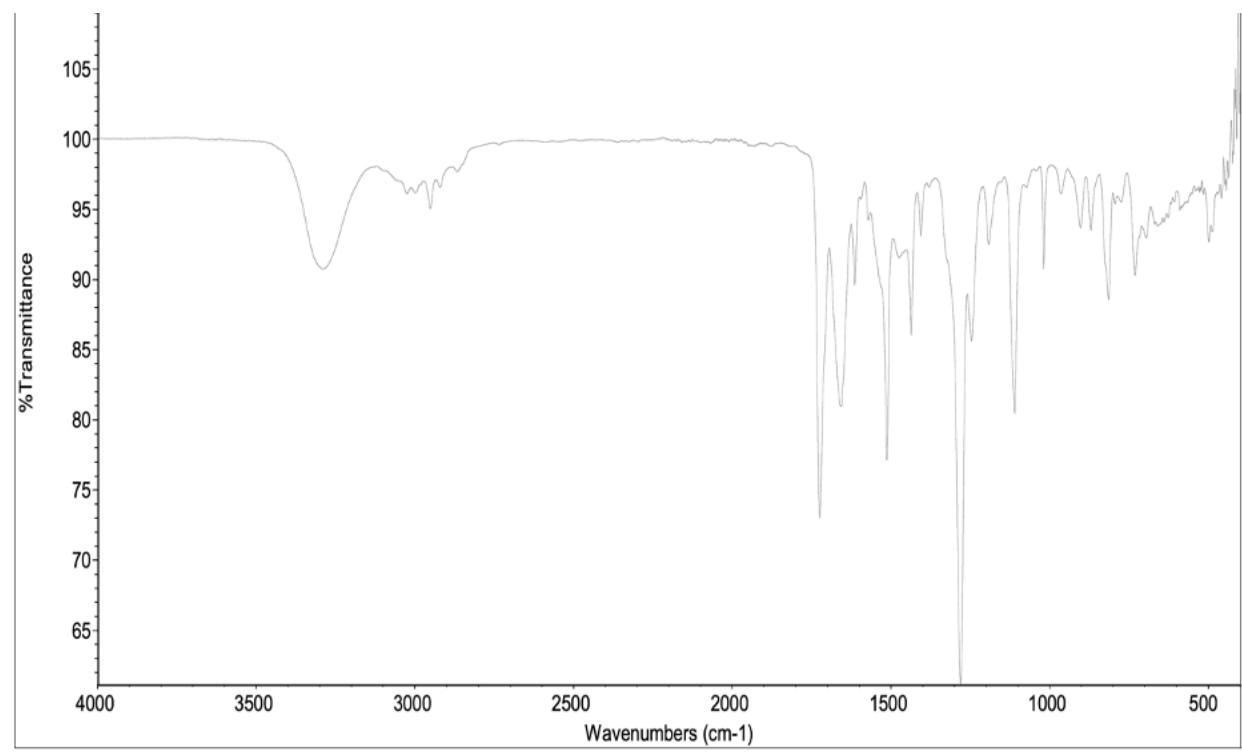
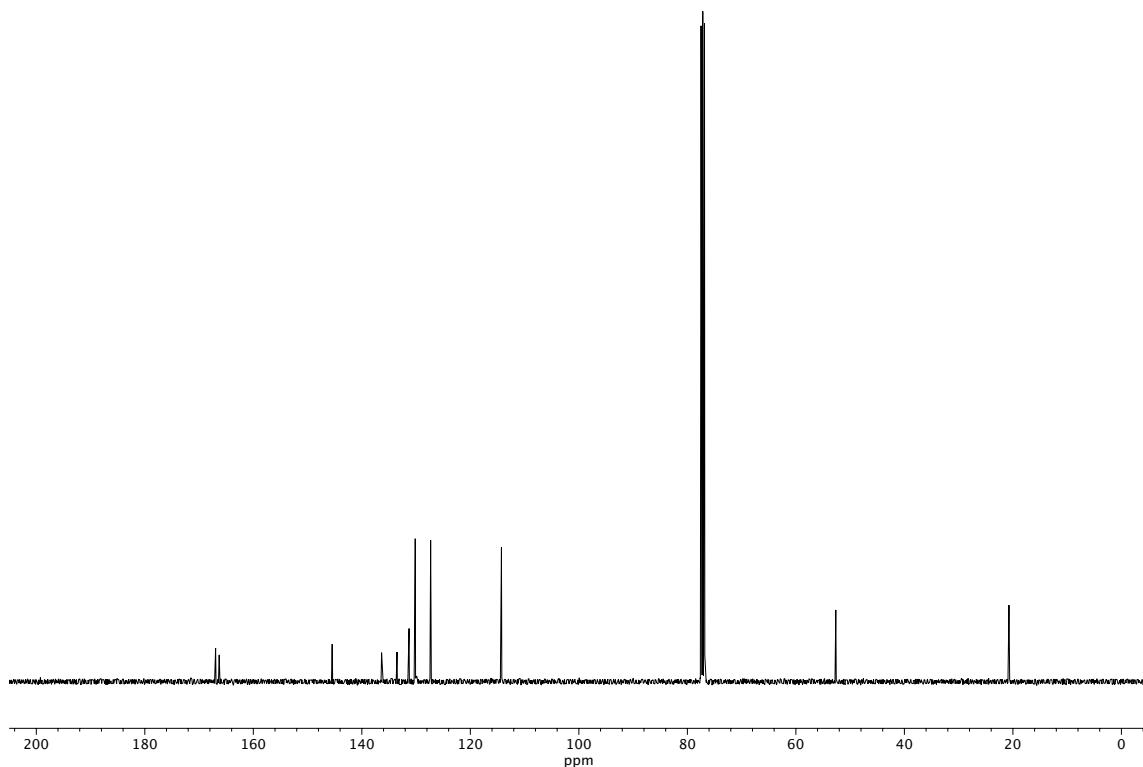


Figure A1.122  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 49.



**Figure A1.123** Infrared spectrum (Thin Film) of compound **49**.



**Figure A1.124**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **49**.

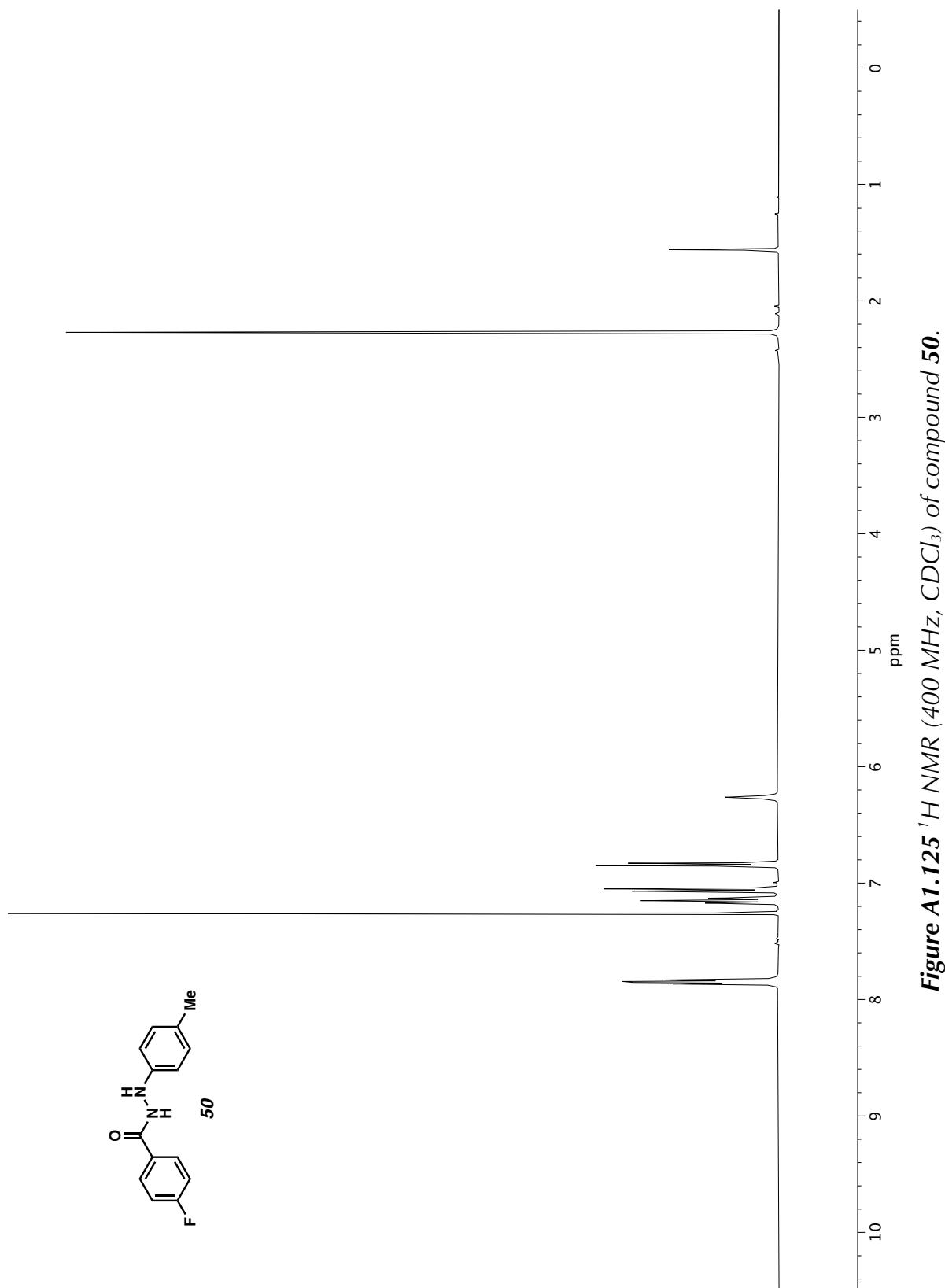
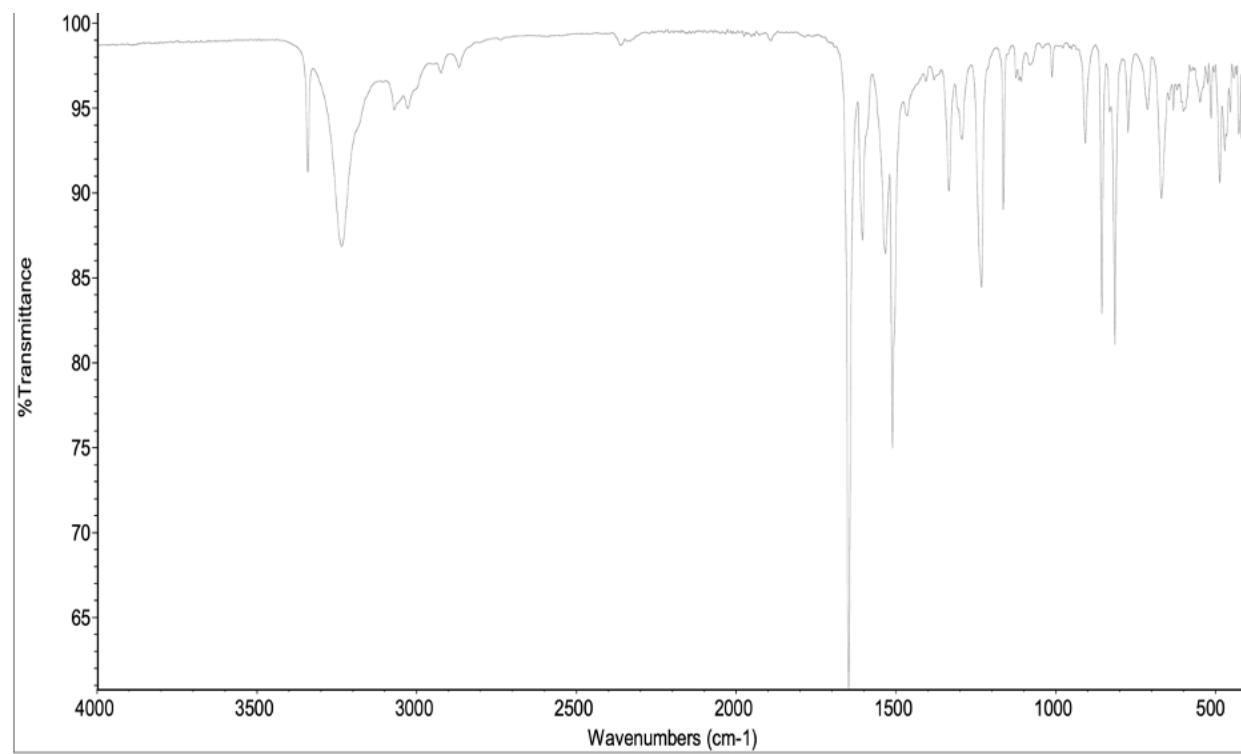
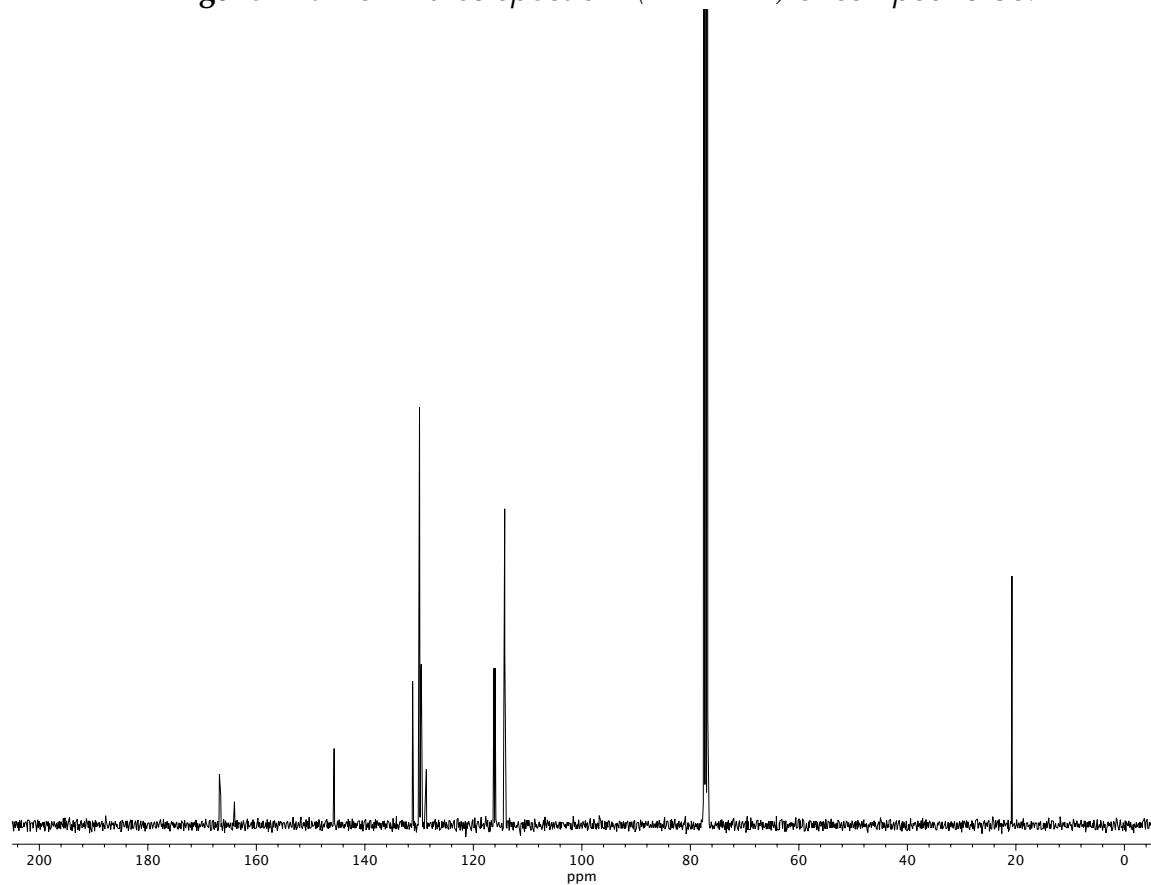


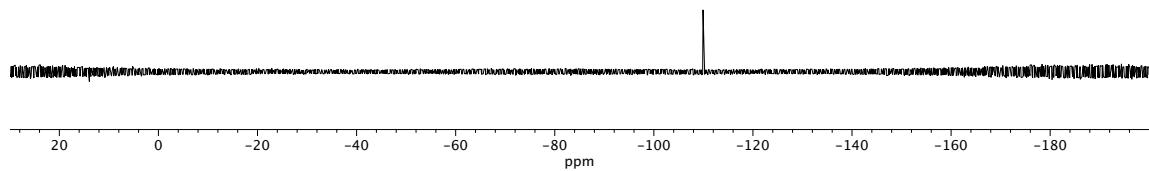
Figure A1.125  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 50.



**Figure A1.126** Infrared spectrum (Thin Film) of compound **50**.



**Figure A1.127**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **50**.



**Figure A1.128**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ) of compound 50.

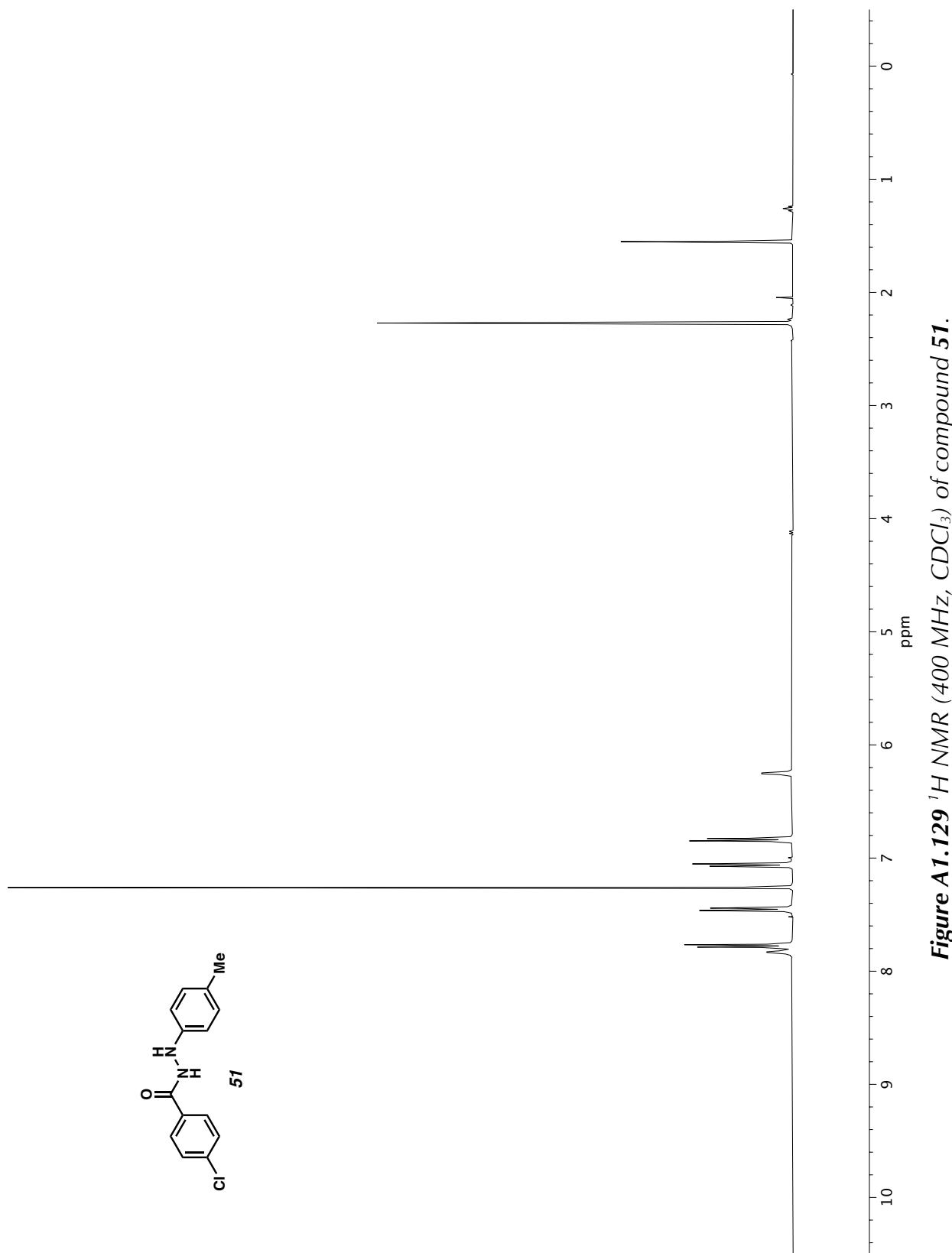
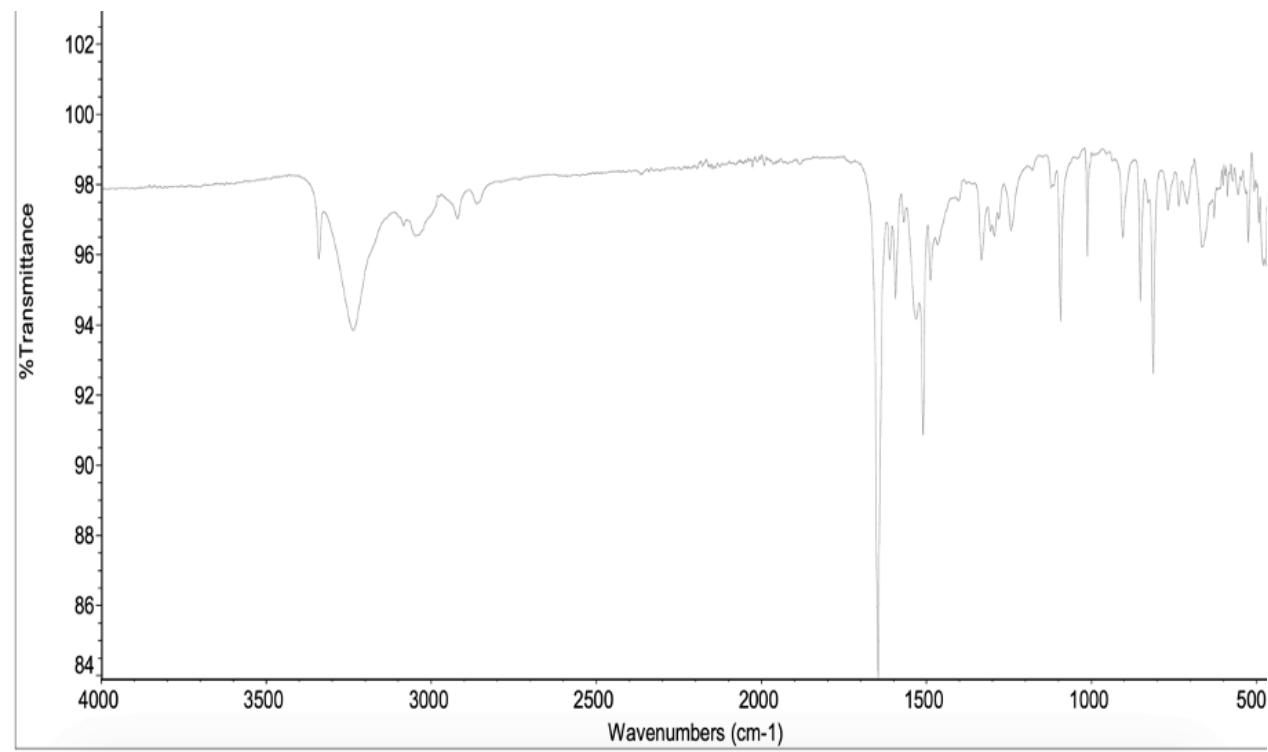
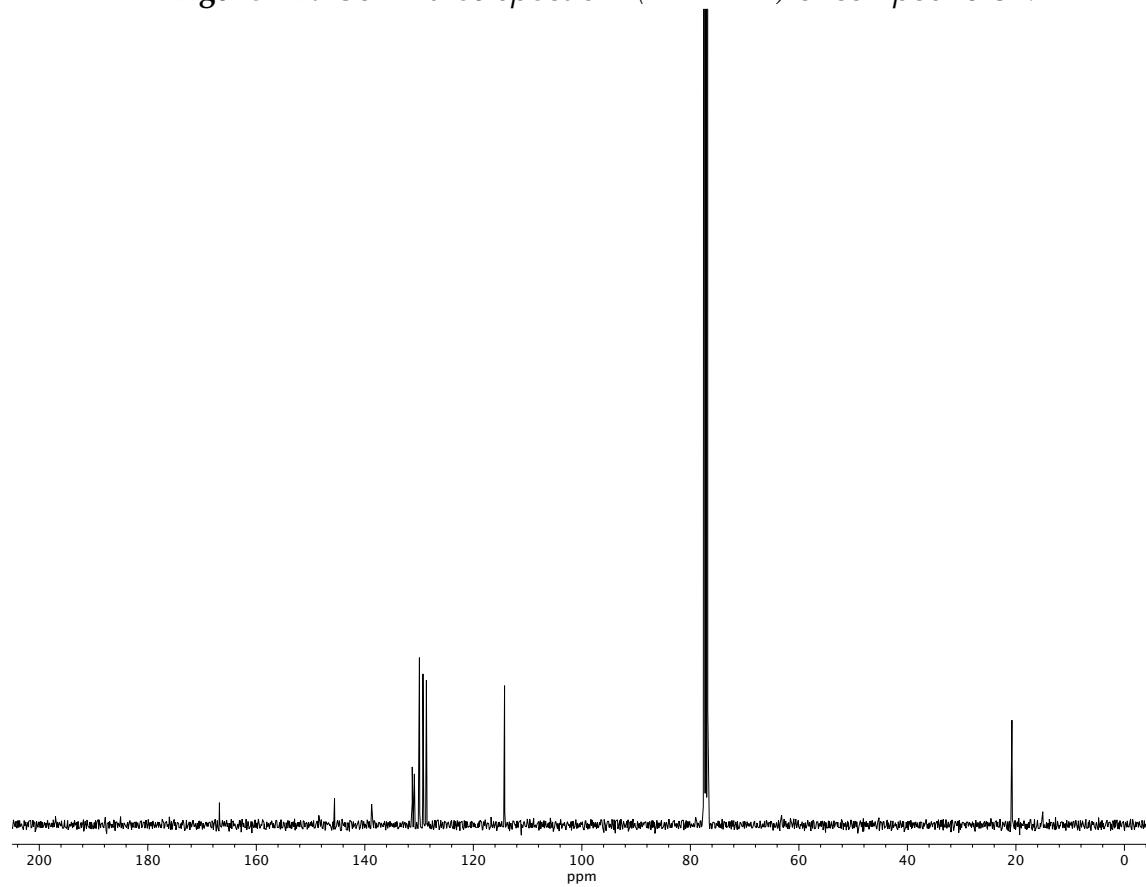


Figure A1.129  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 51.



**Figure A1.130** Infrared spectrum (Thin Film) of compound **51**.



**Figure A1.131**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **51**.

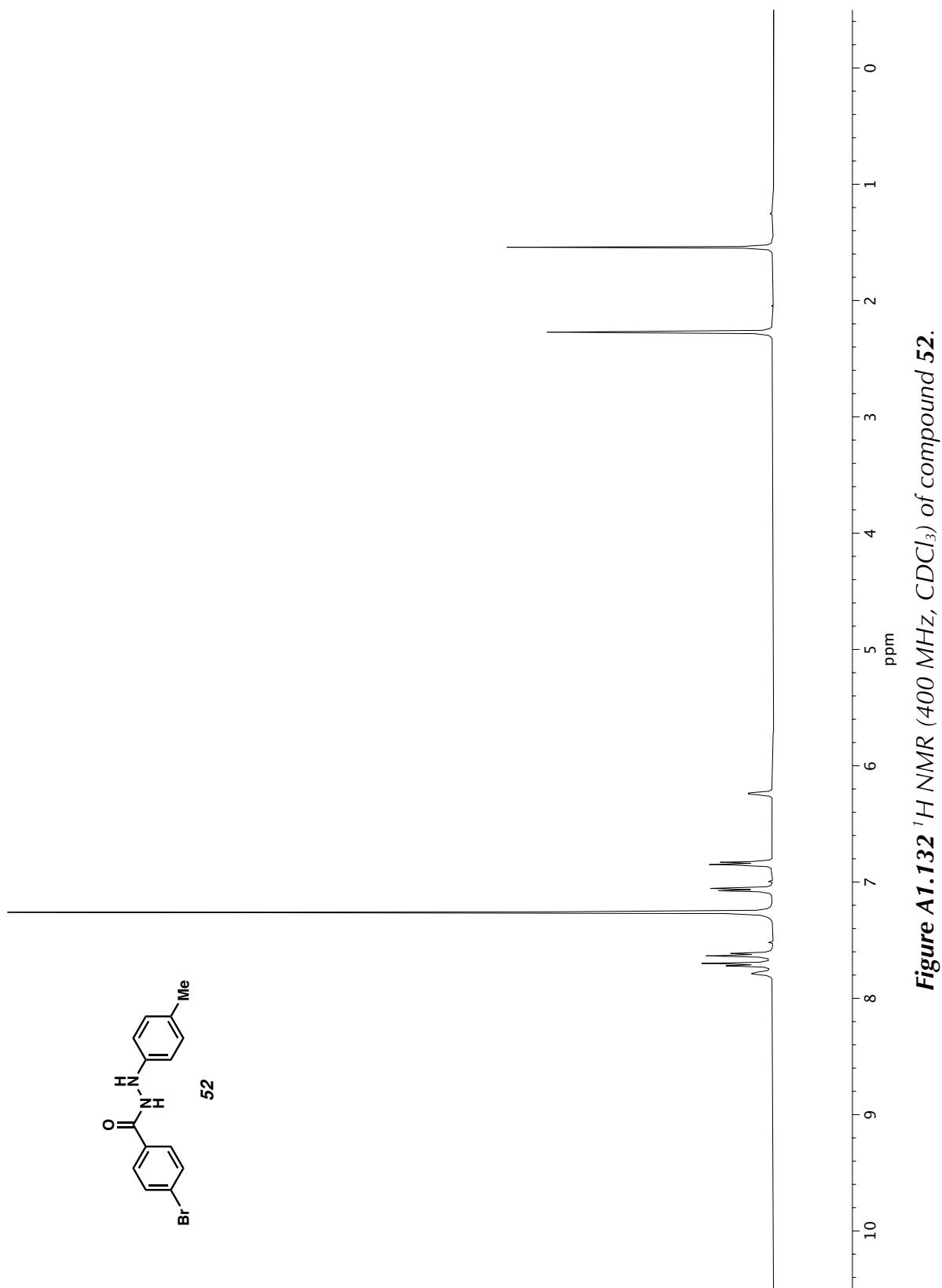
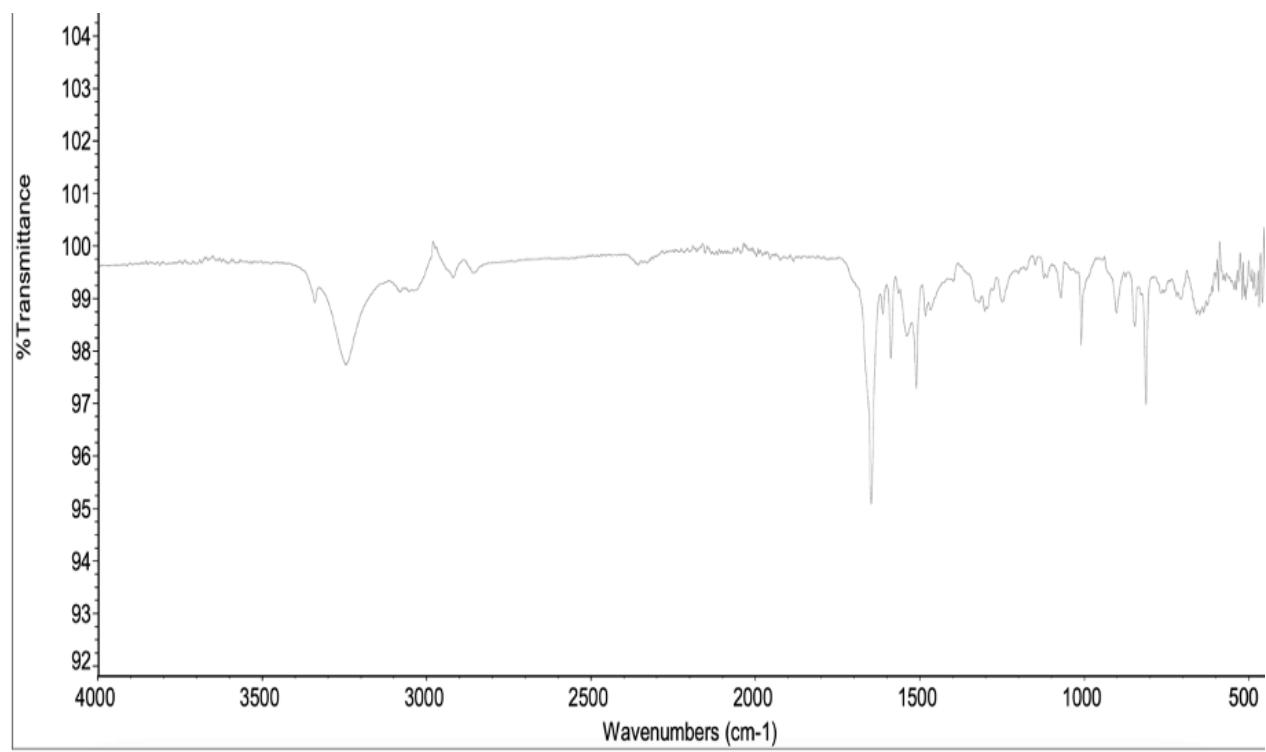
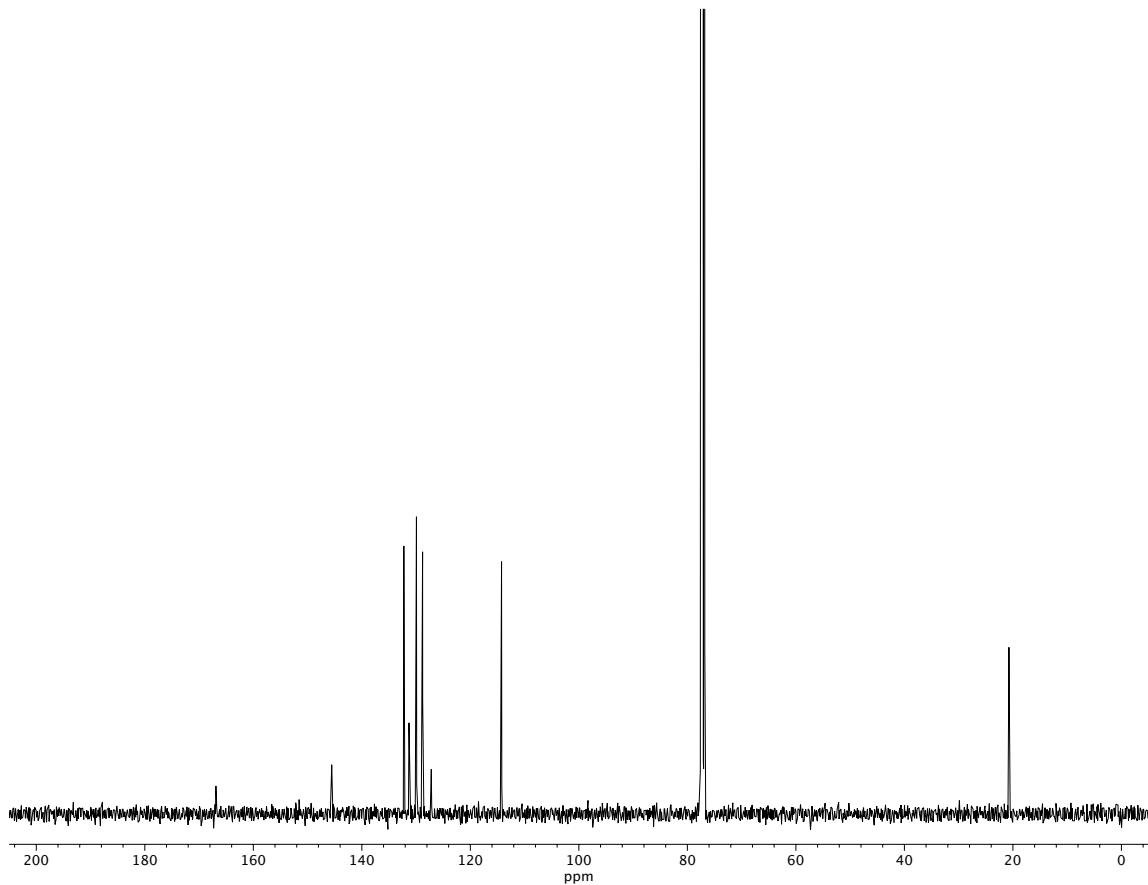


Figure A1.132  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 52.



**Figure A1.133** Infrared spectrum (Thin Film) of compound 52.



**Figure A1.134**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 52.

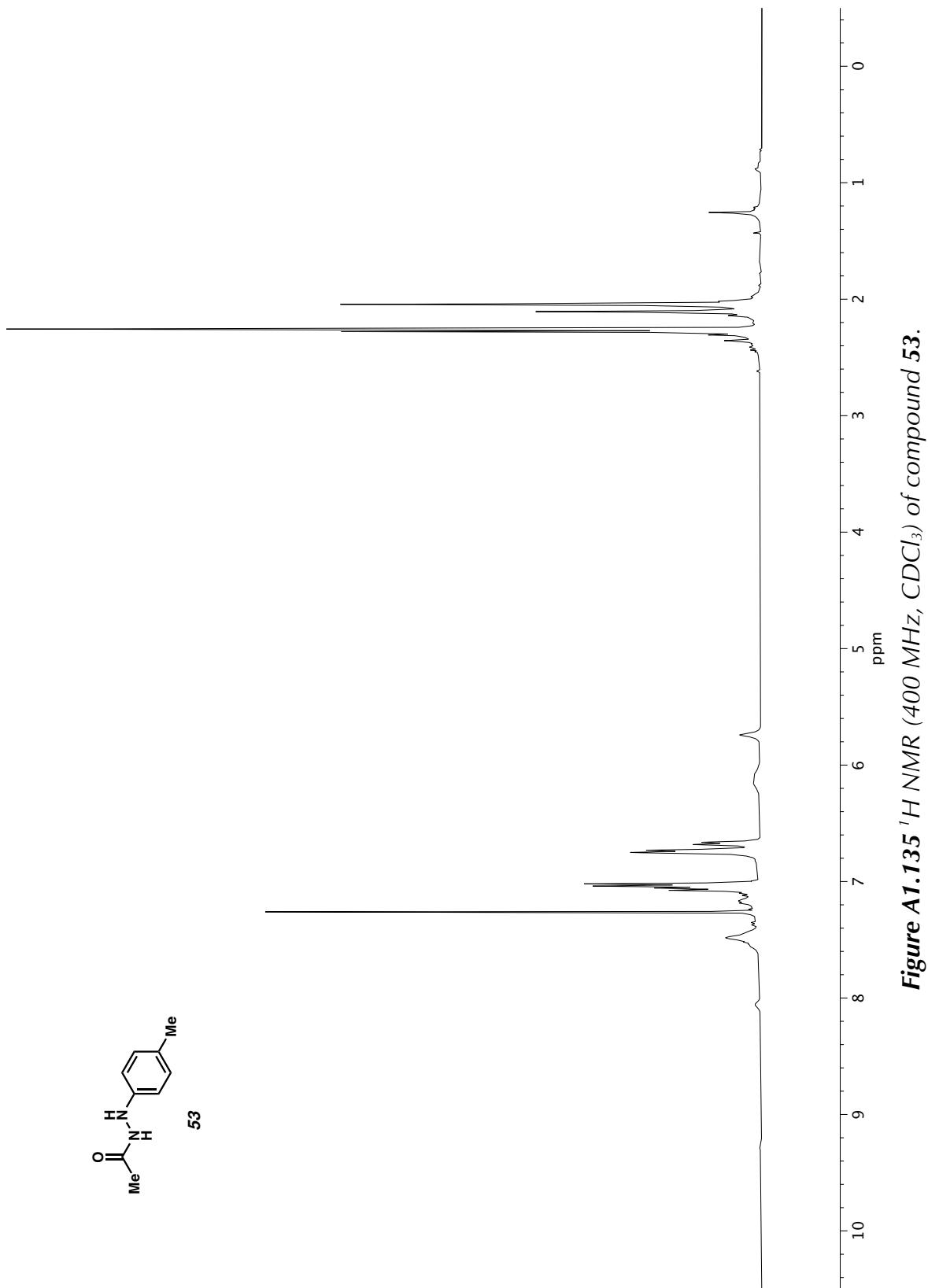
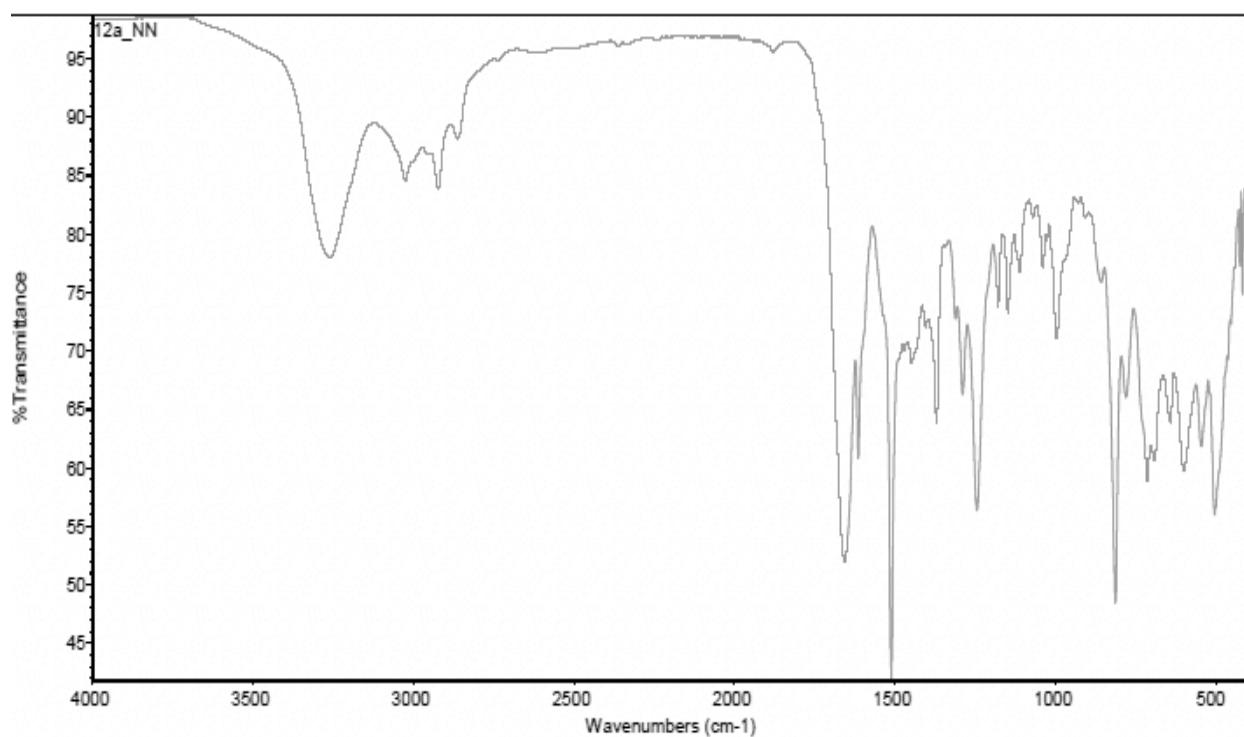
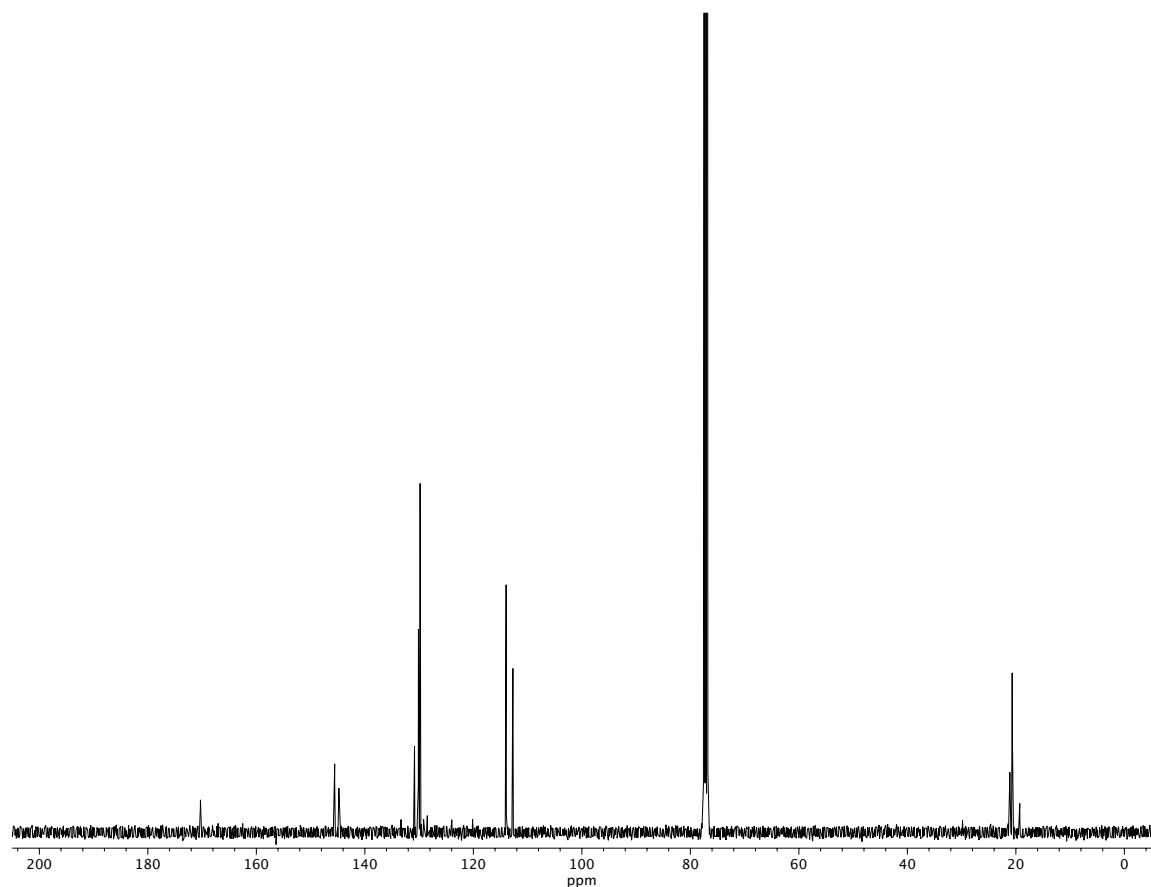


Figure A1.135  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 53.



**Figure A1.136** Infrared spectrum (Thin Film) of compound 53.



**Figure A1.137**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 53.

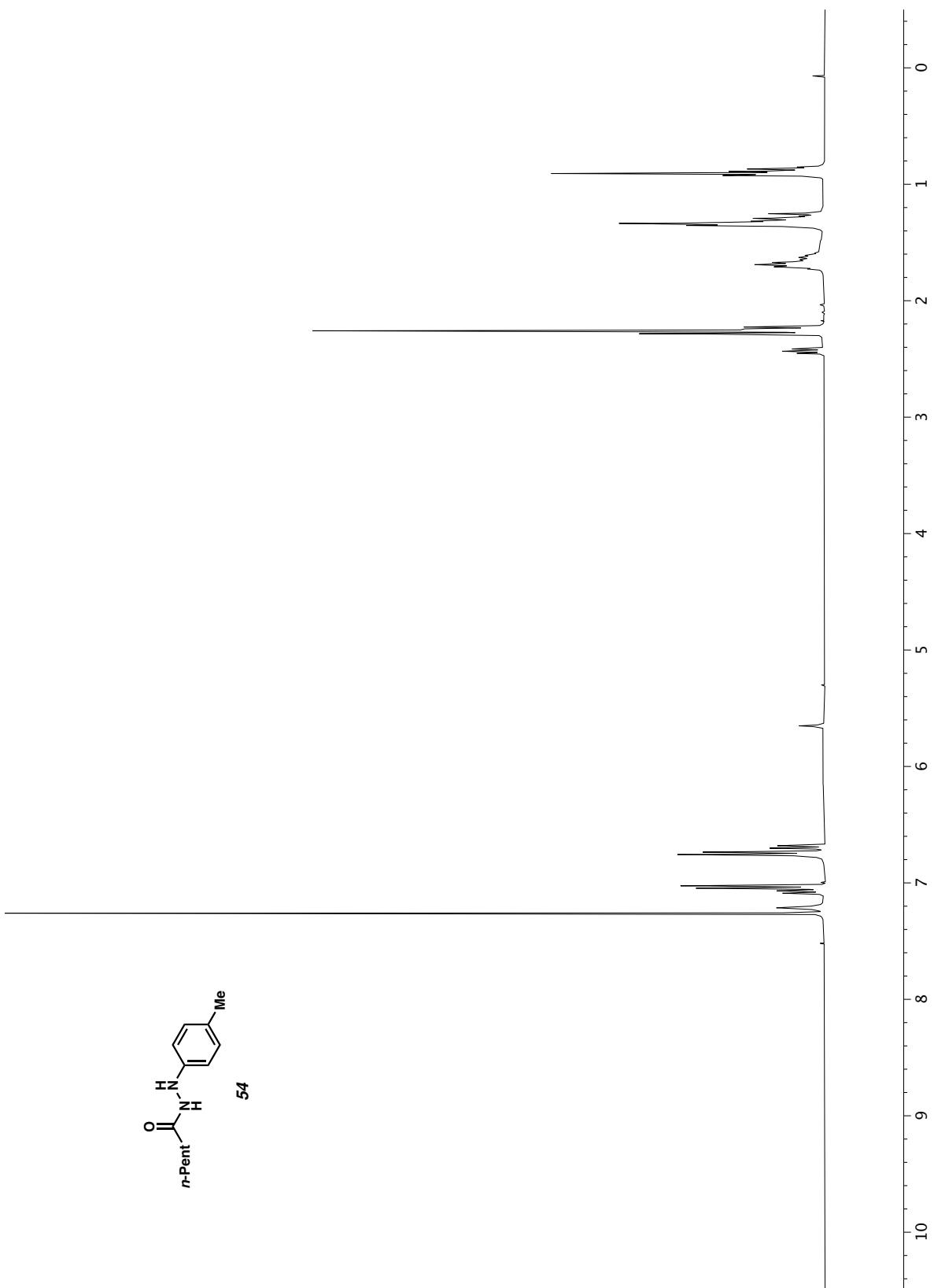
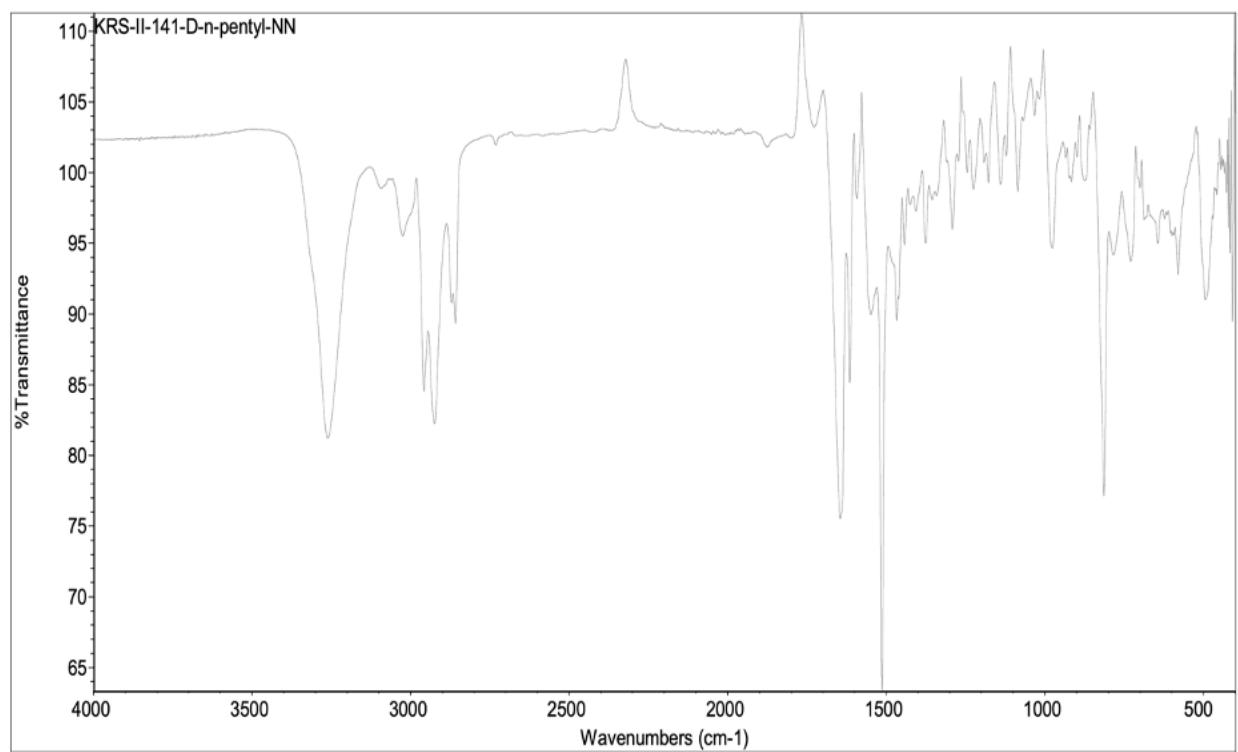
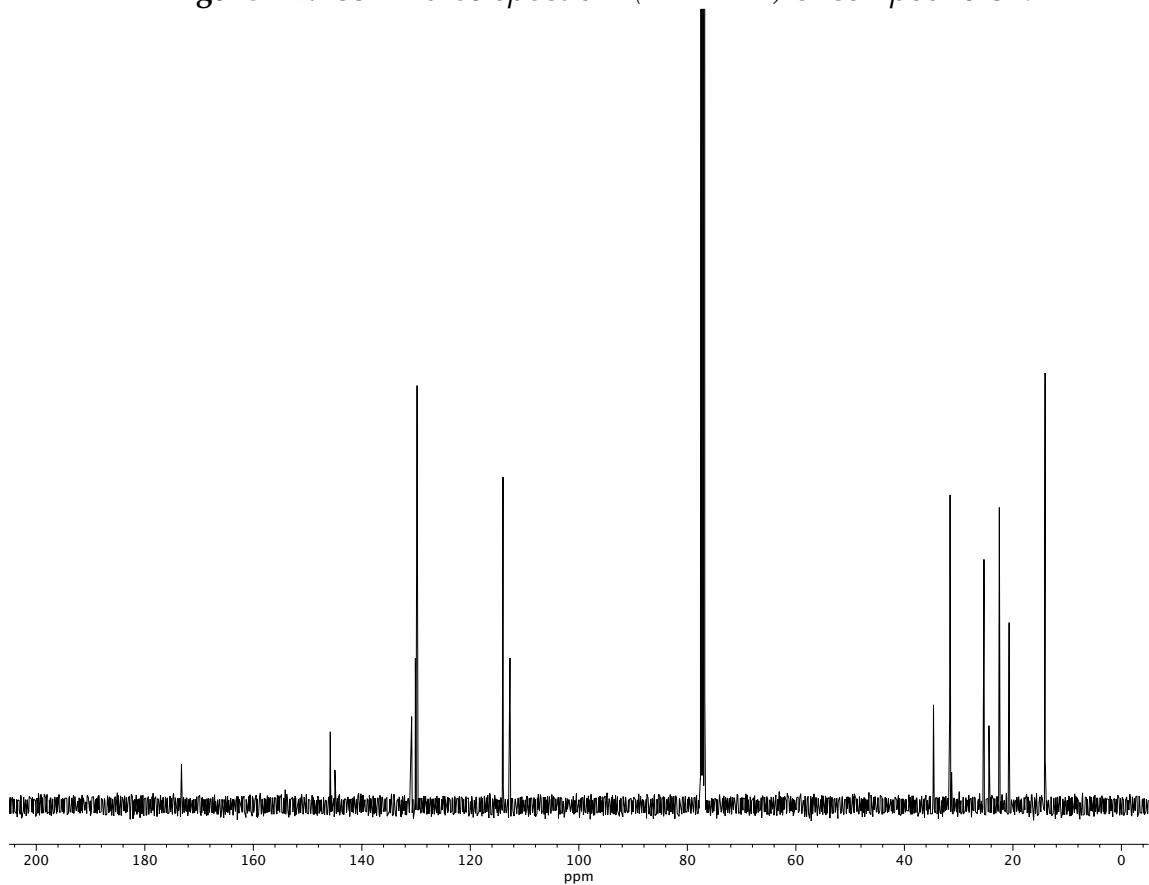


Figure A1.138  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 54.



**Figure A1.139** Infrared spectrum (Thin Film) of compound 54.



**Figure A1.140**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 54.

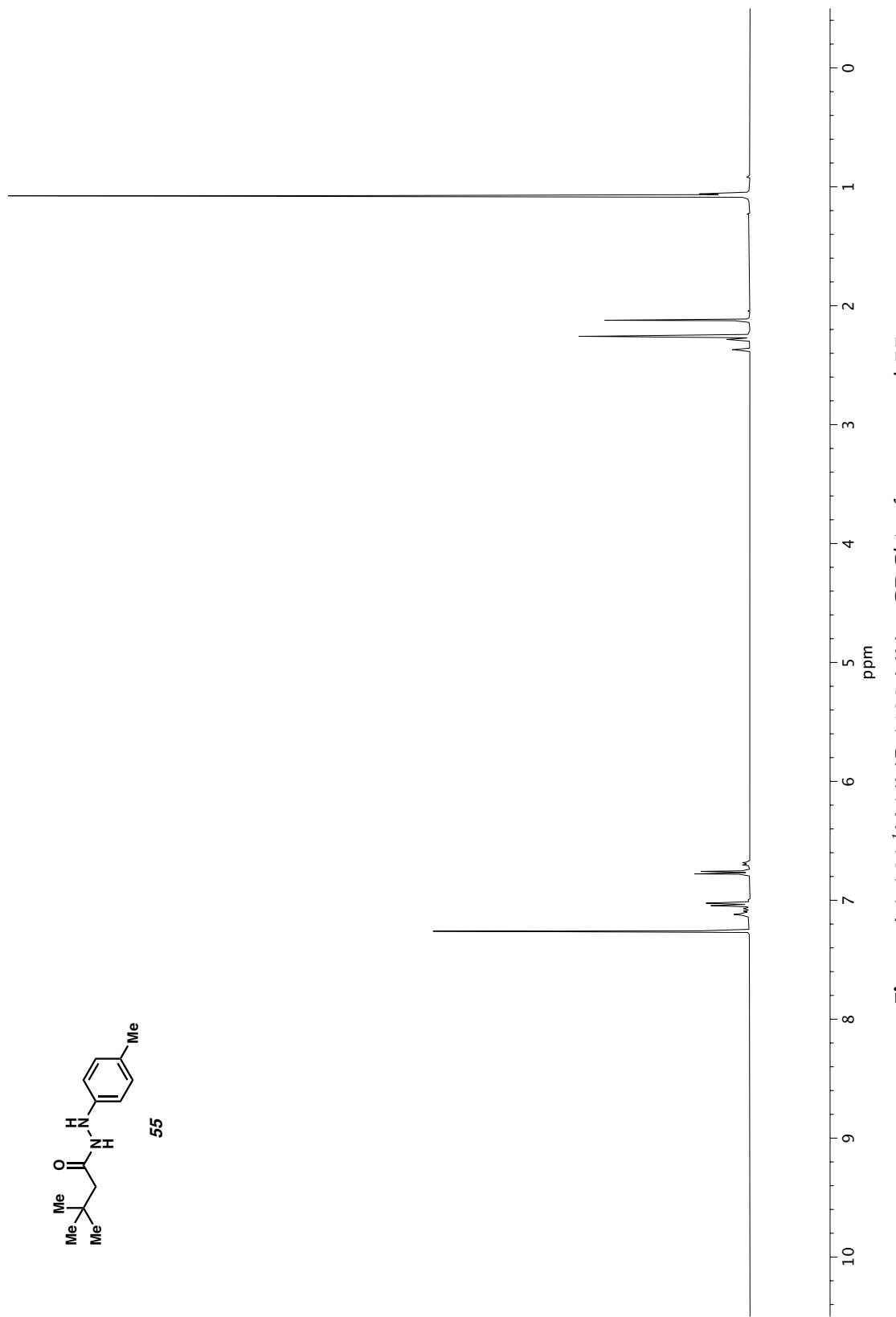
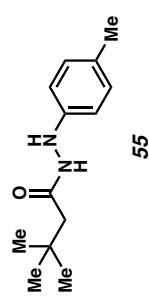
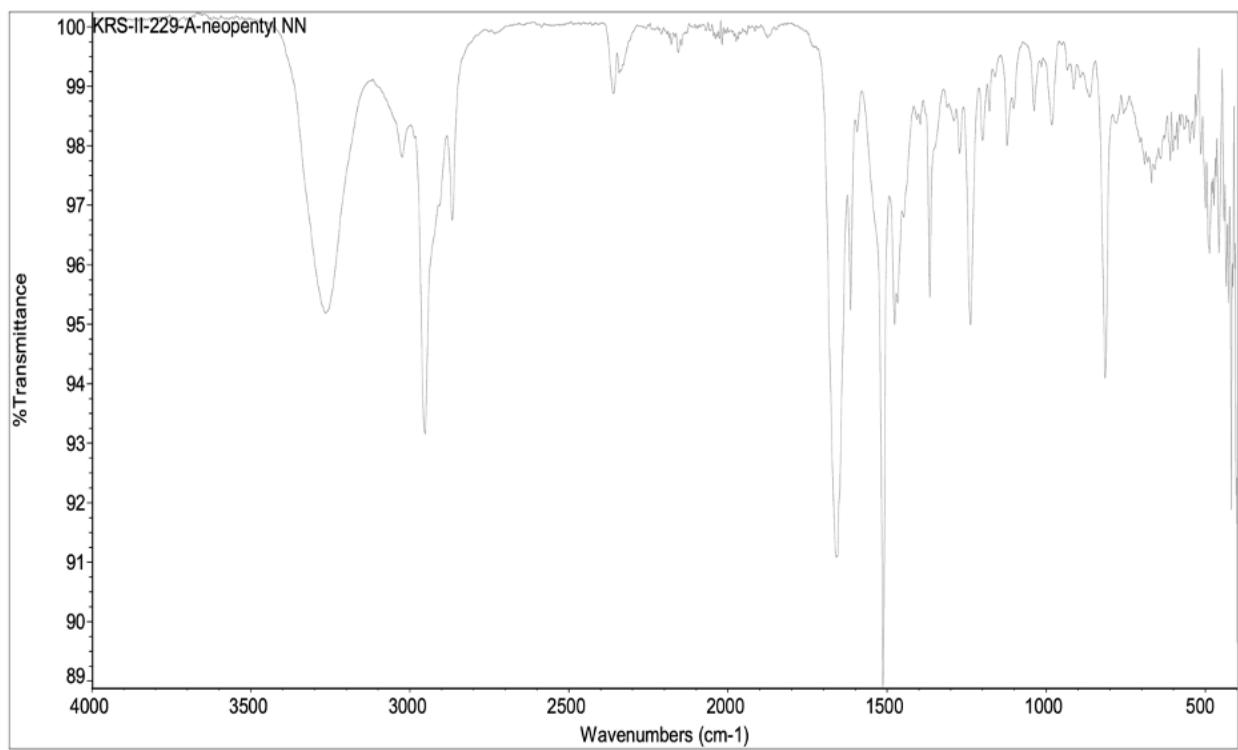
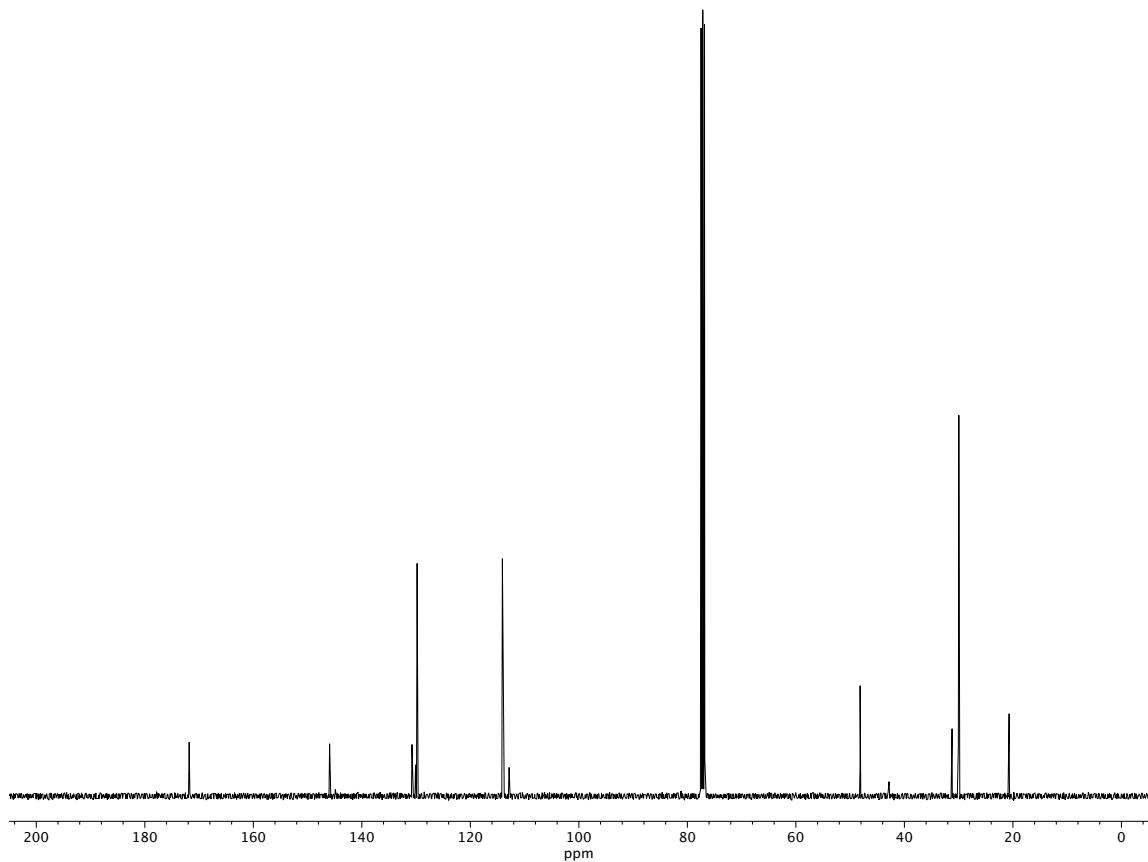


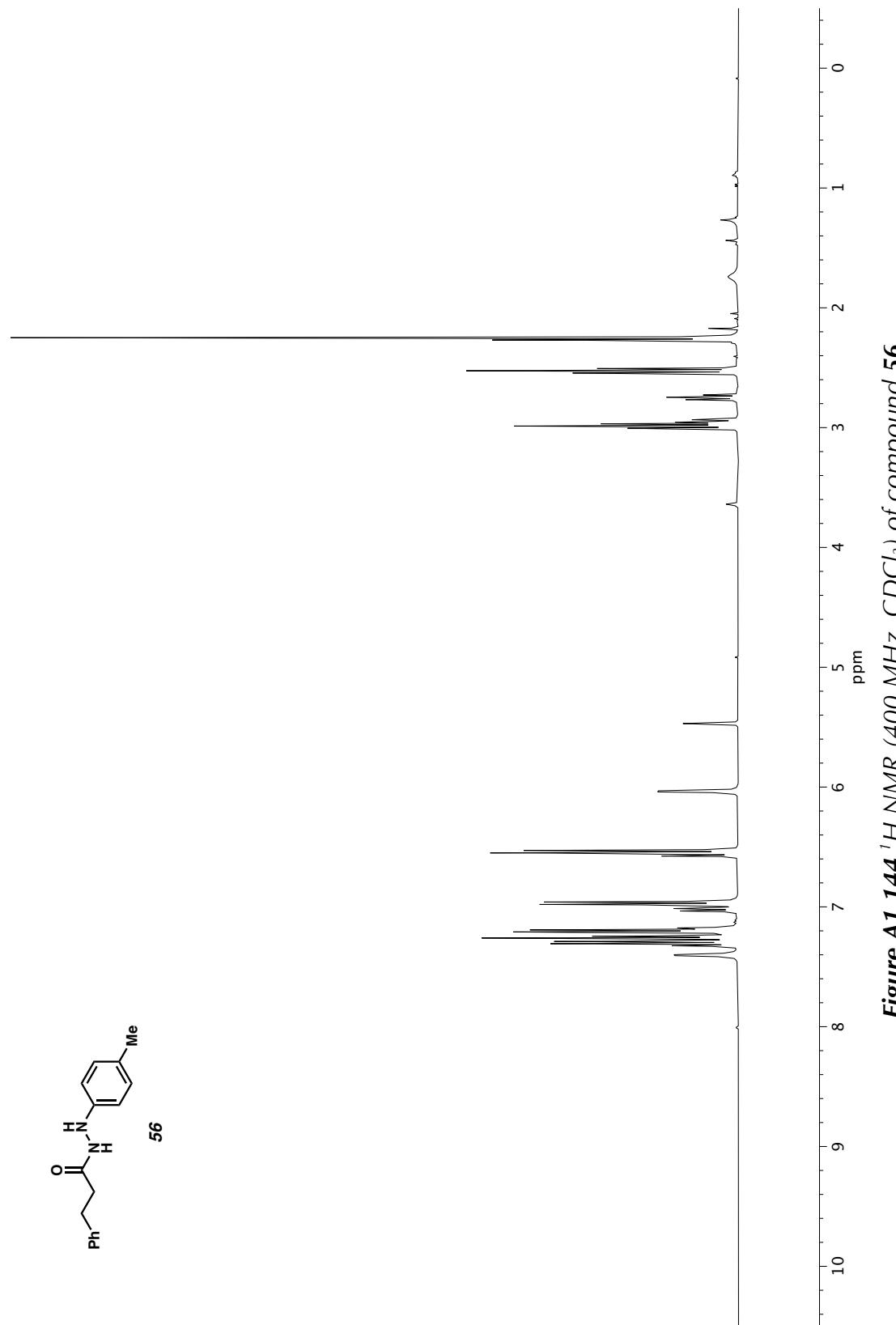
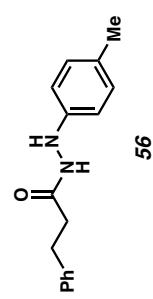
Figure A1.141  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 55.



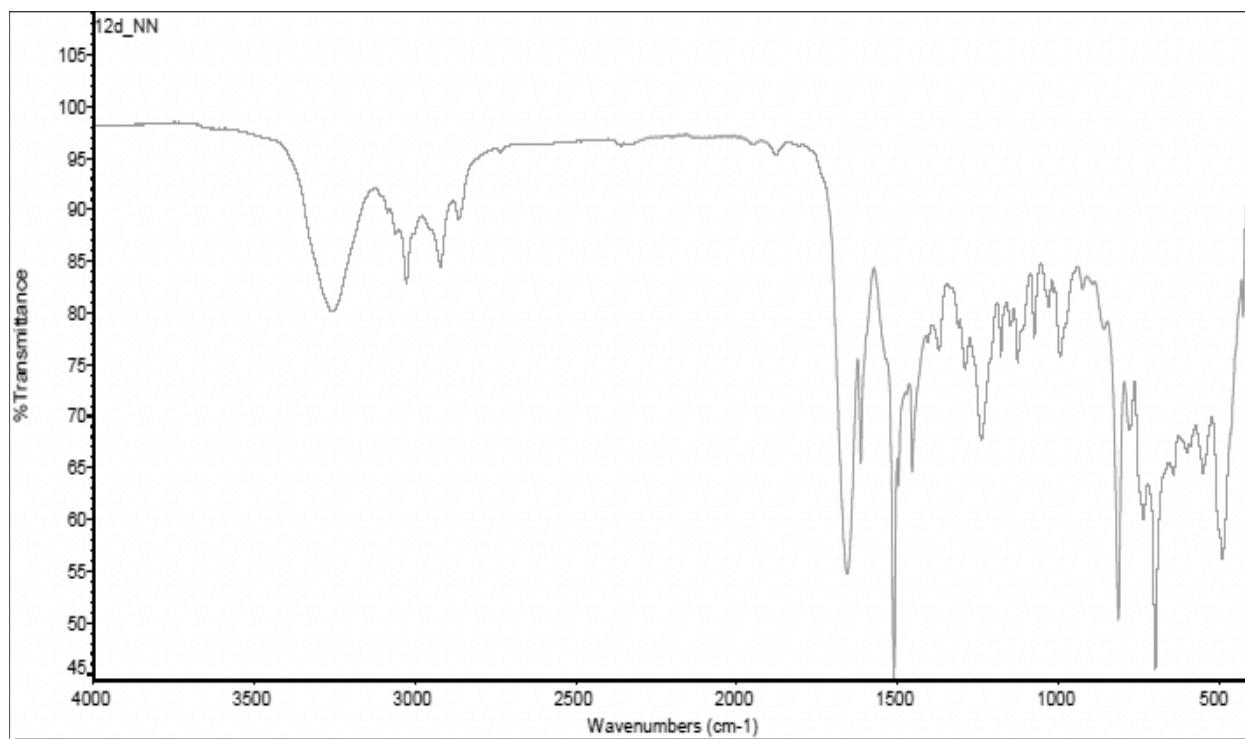
**Figure A1.142** Infrared spectrum (Thin Film) of compound 55.



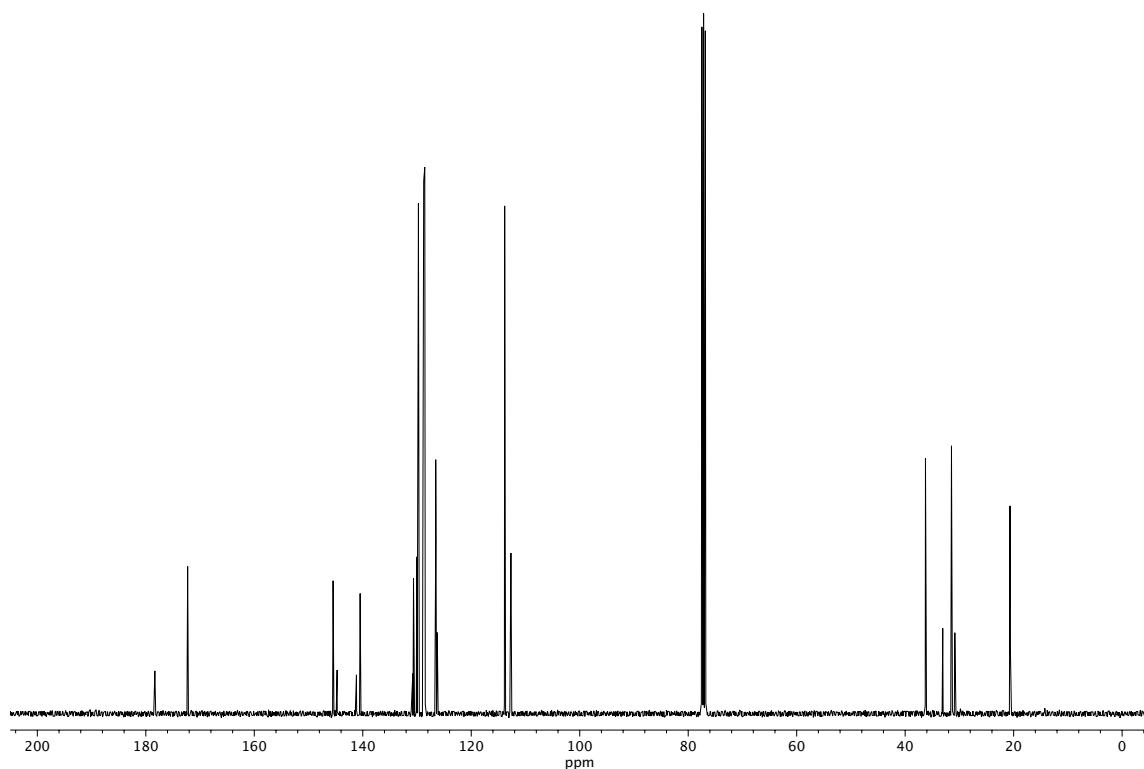
**Figure A1.143** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound 55.



**Figure A1.144**  $^1\text{H}$  NMR ( $400 \text{ MHz}, \text{CDCl}_3$ ) of compound 56.



**Figure A1.145** Infrared spectrum (Thin Film) of compound **56**.



**Figure A1.146**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **56**.

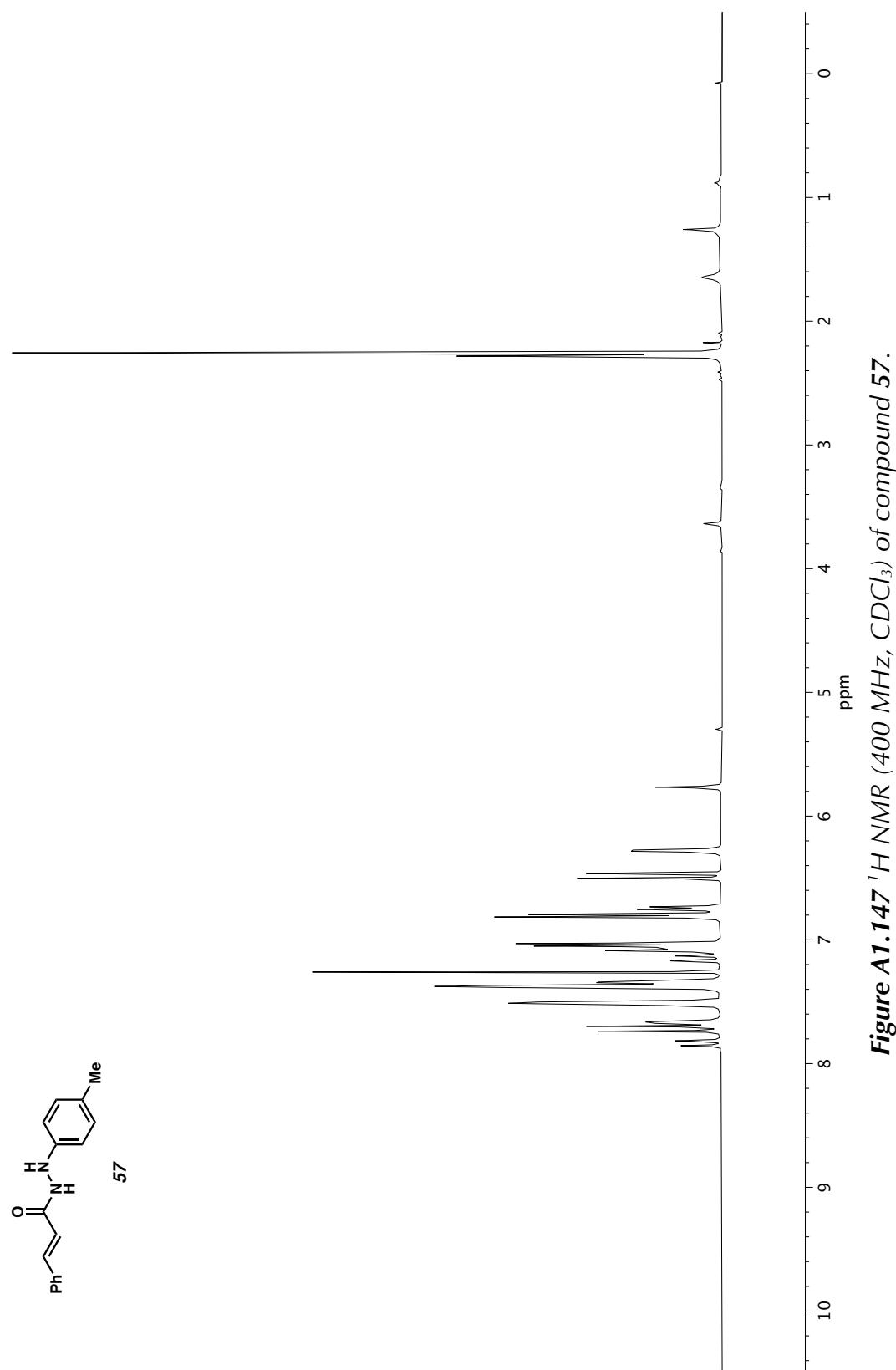
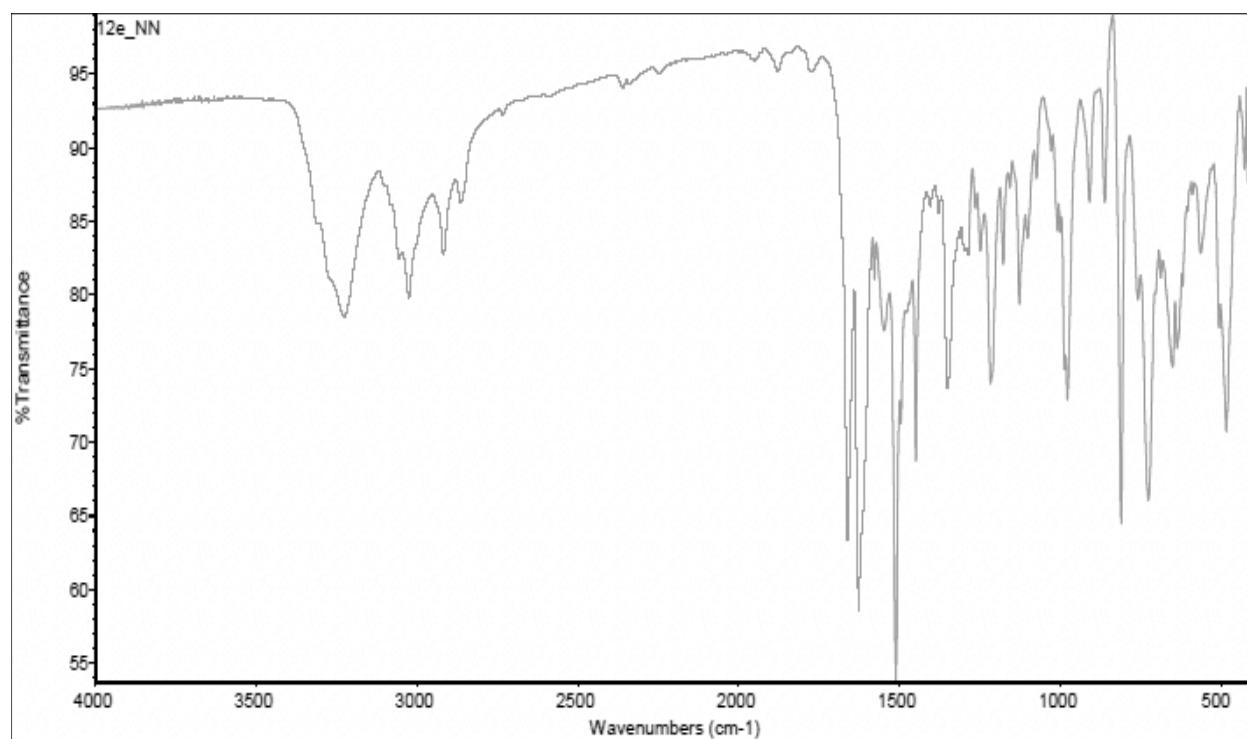
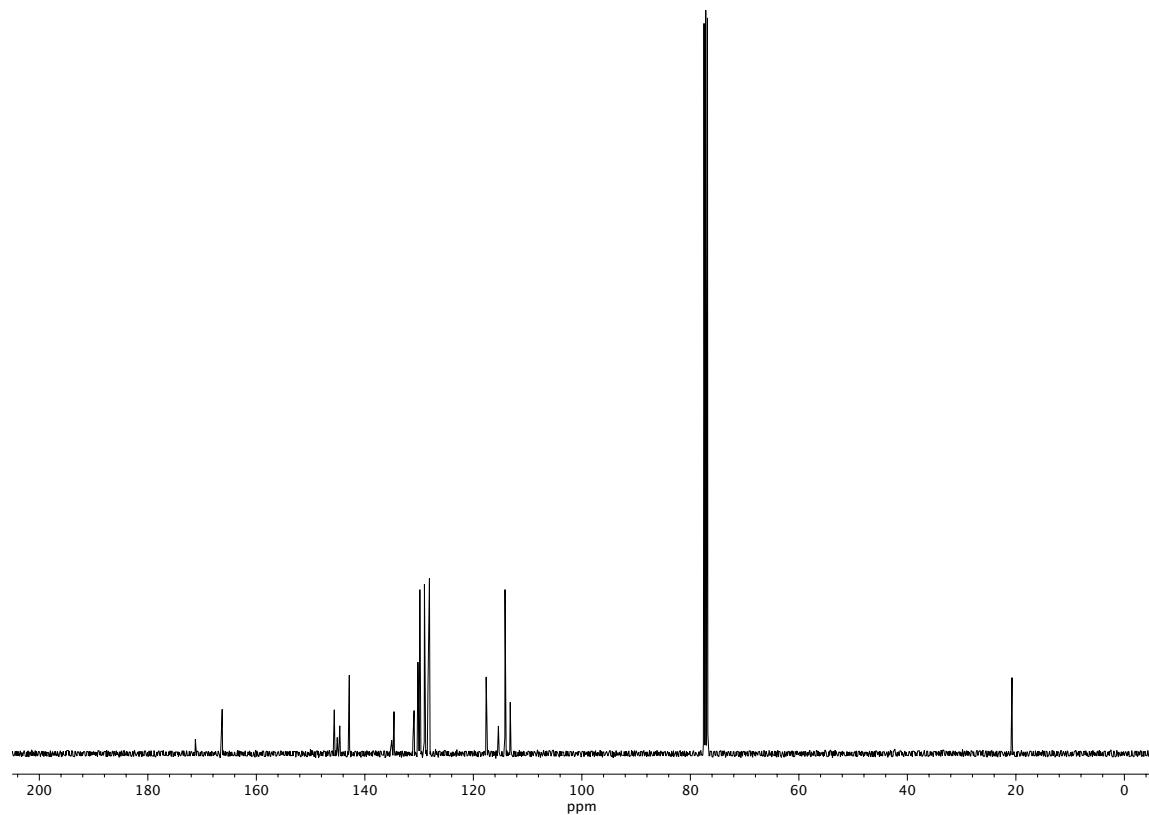


Figure A1.147  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 57.



**Figure A1.148** Infrared spectrum (Thin Film) of compound 57.



**Figure A1.149**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 57.

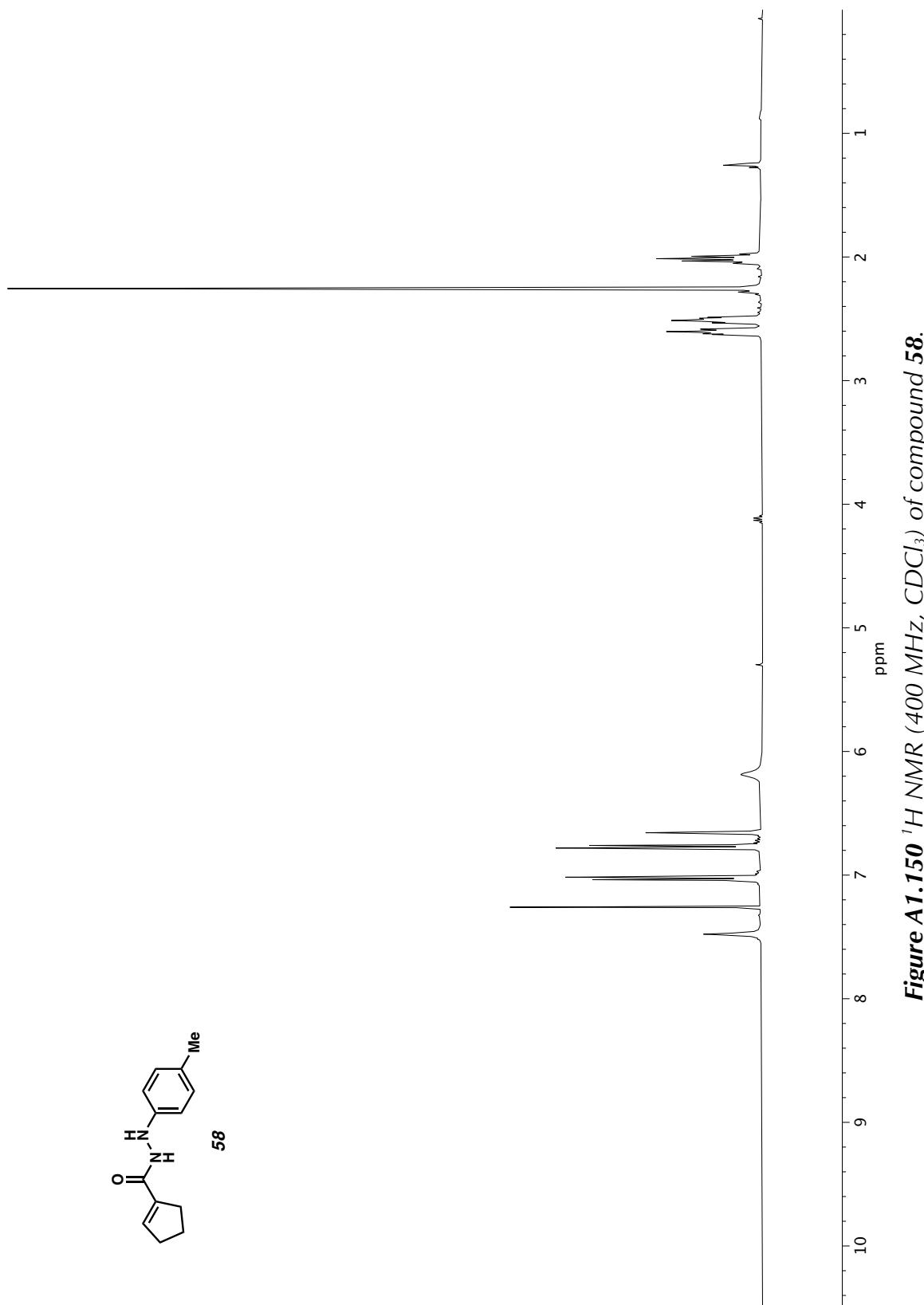
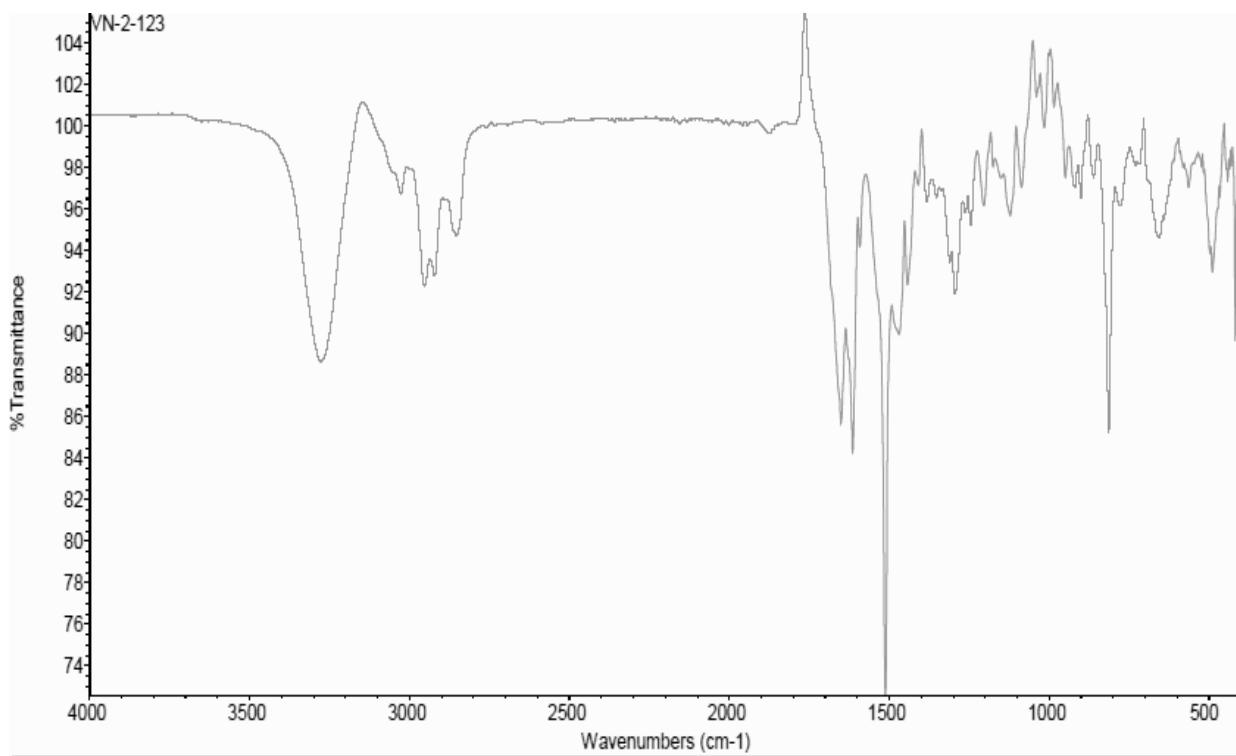
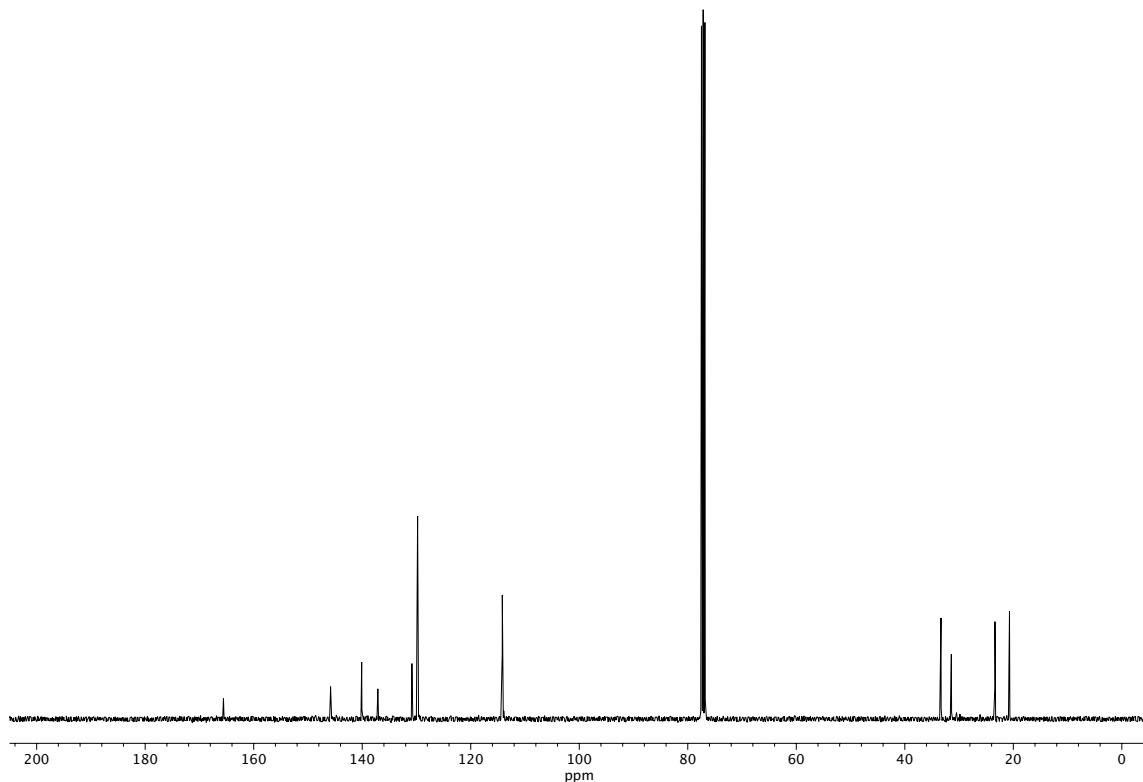


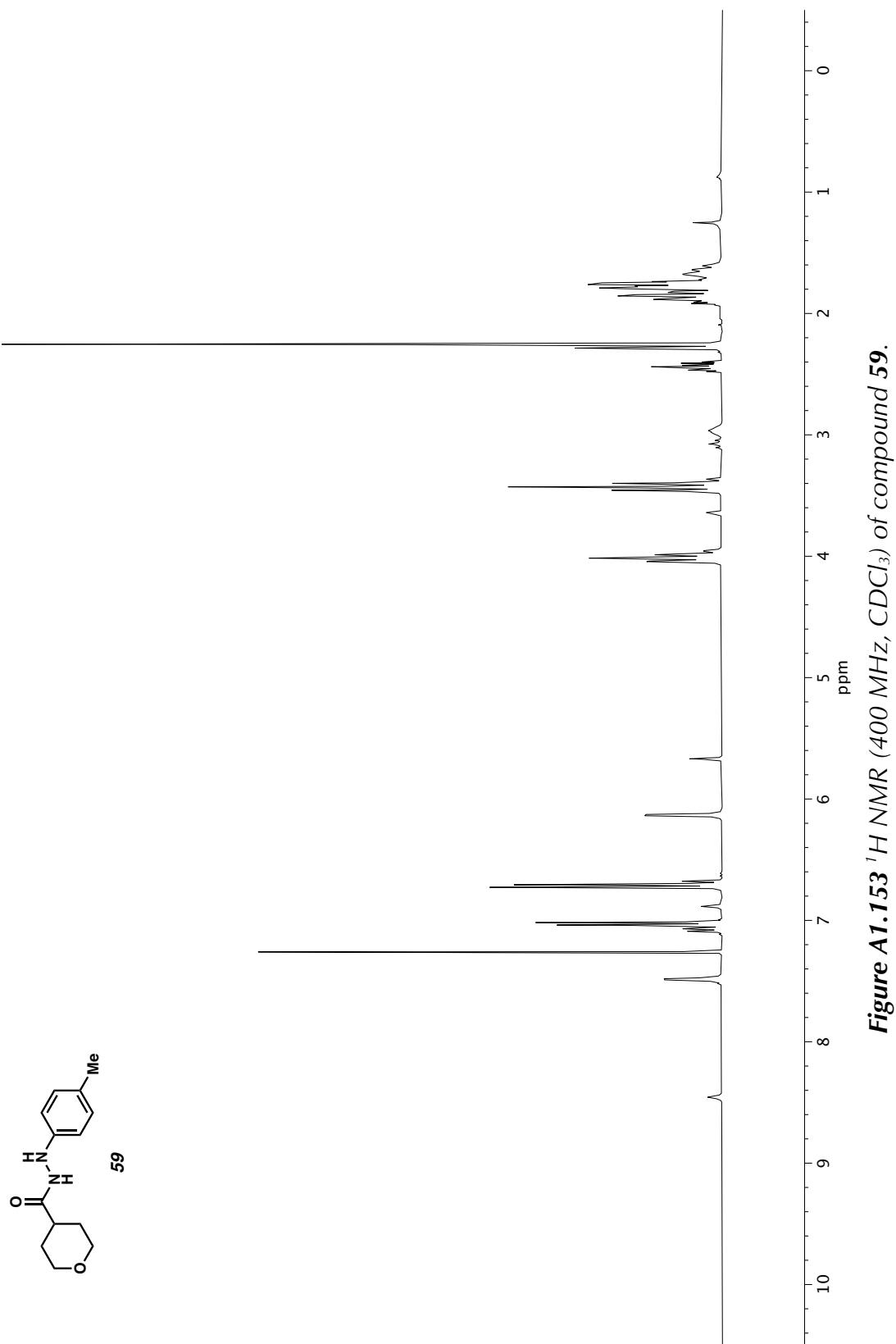
Figure A1.150  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 58.



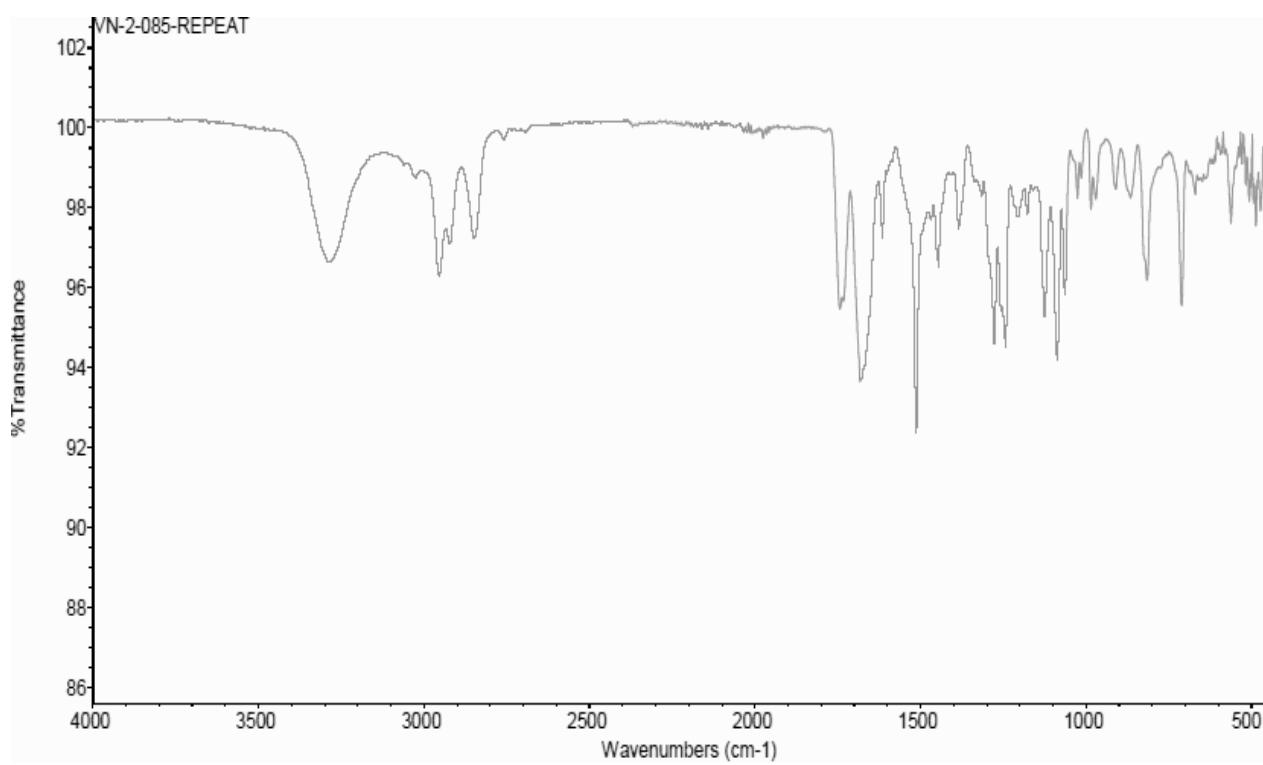
**Figure A1.151** Infrared spectrum (Thin Film) of compound **58**.



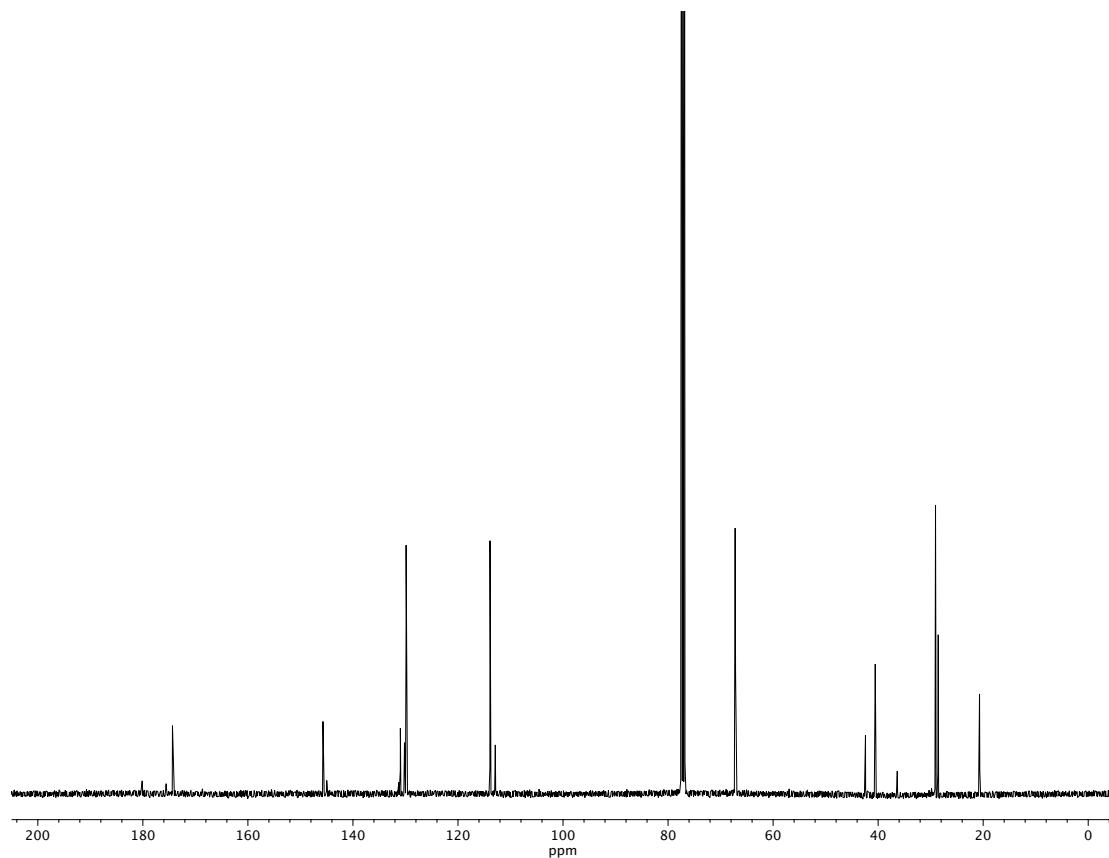
**Figure A1.152** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **58**.



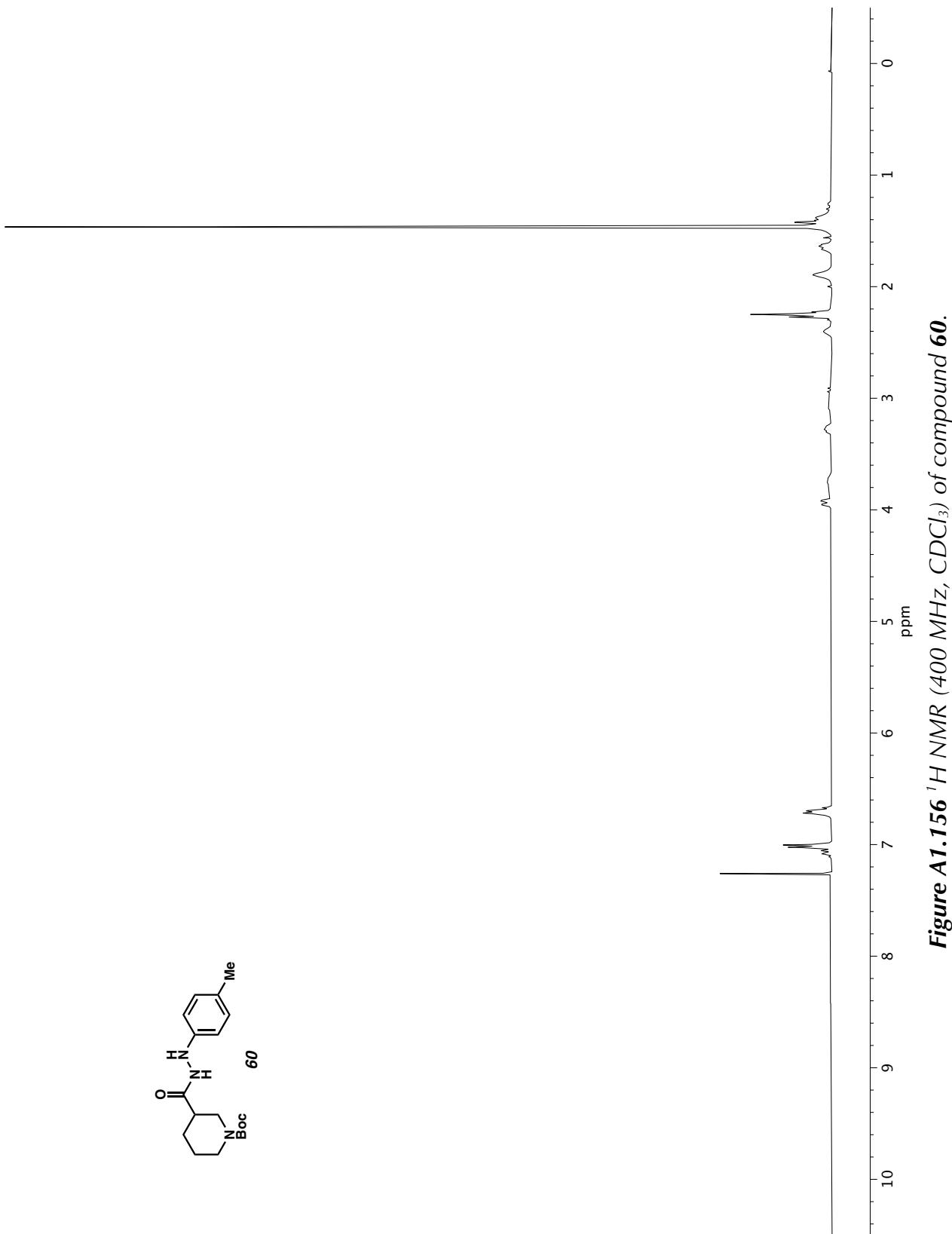
**Figure A1.153**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 59.



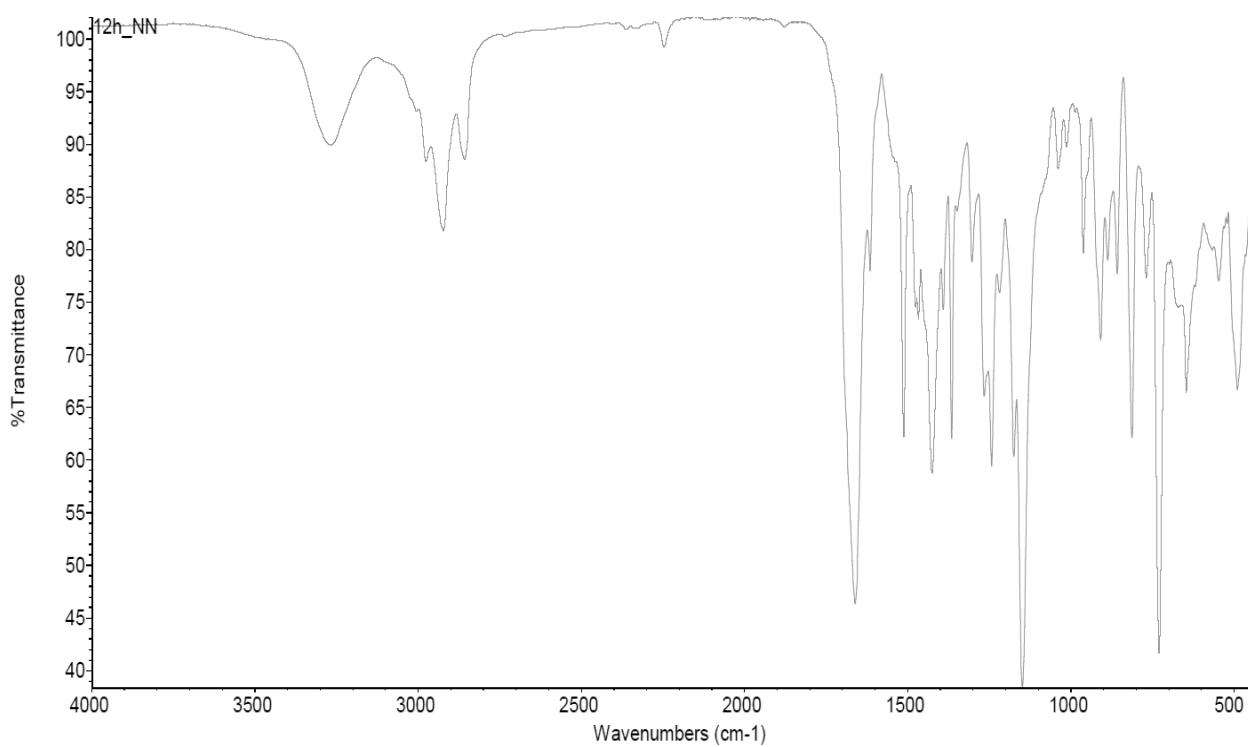
**Figure A1.154** Infrared spectrum (Thin Film) of compound **59**.



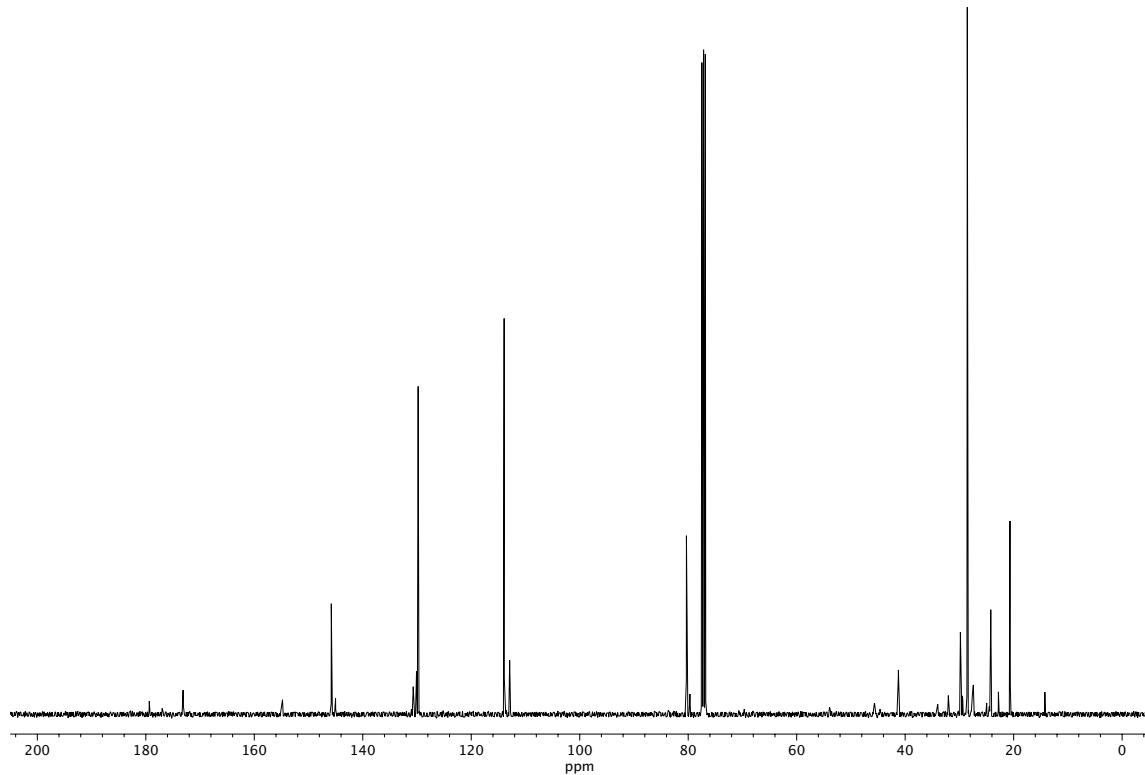
**Figure A1.155** <sup>13</sup>C NMR (101 MHz,  $CDCl_3$ ) of compound **59**.



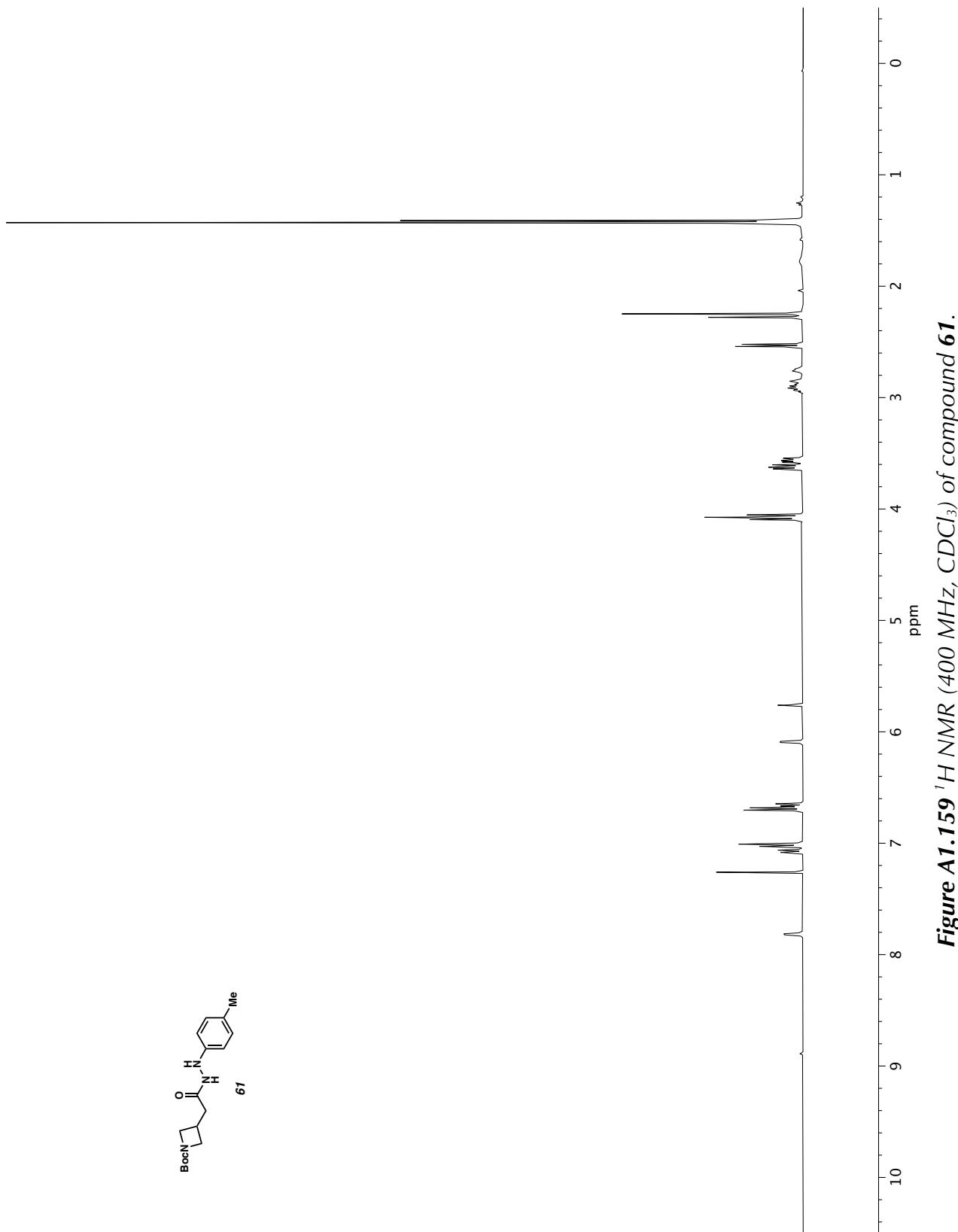
**Figure A1.156**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 60.



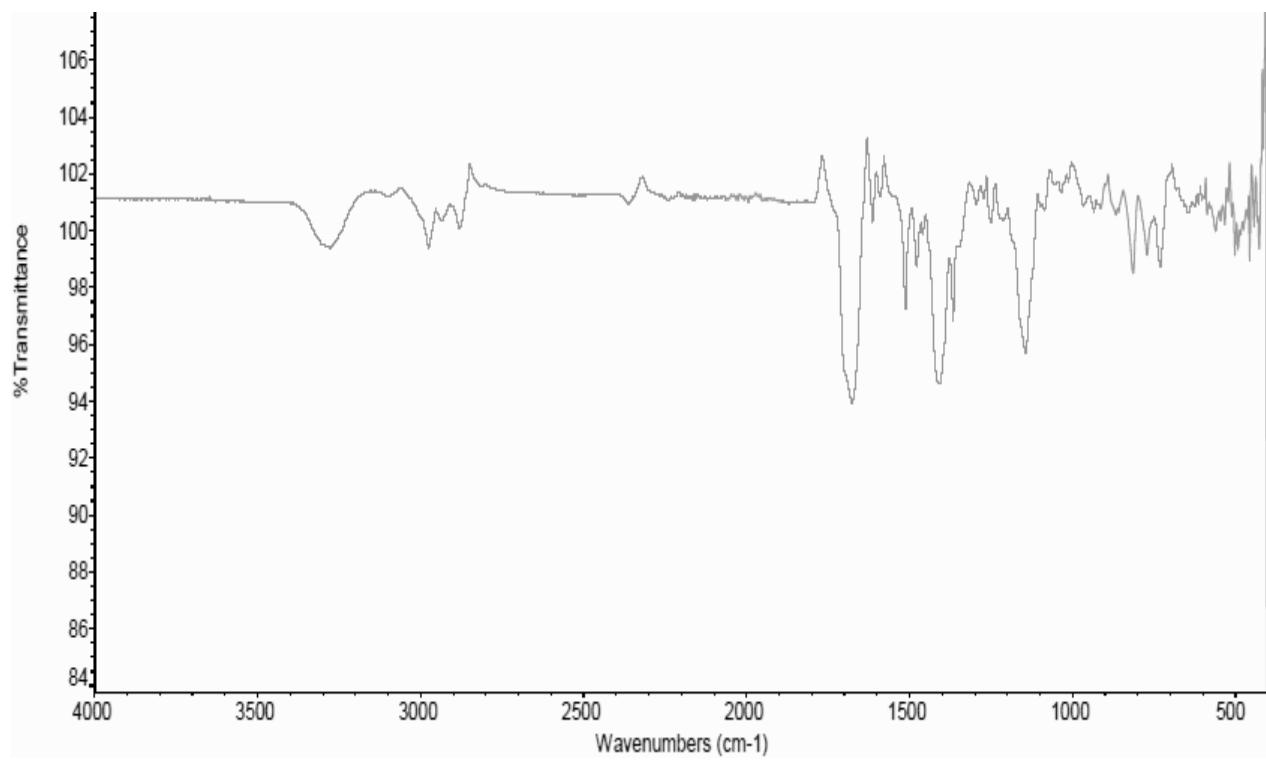
**Figure A1.157** Infrared spectrum (Thin Film) of compound **60**.



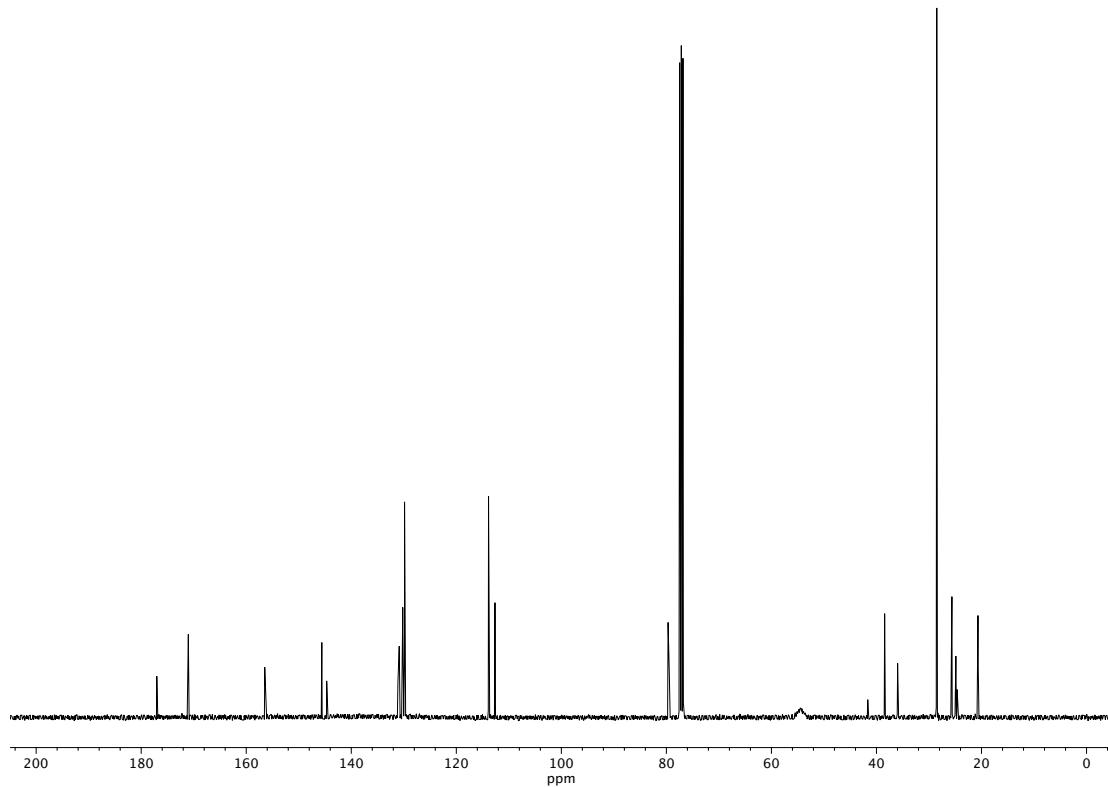
**Figure A1.158** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **60**.



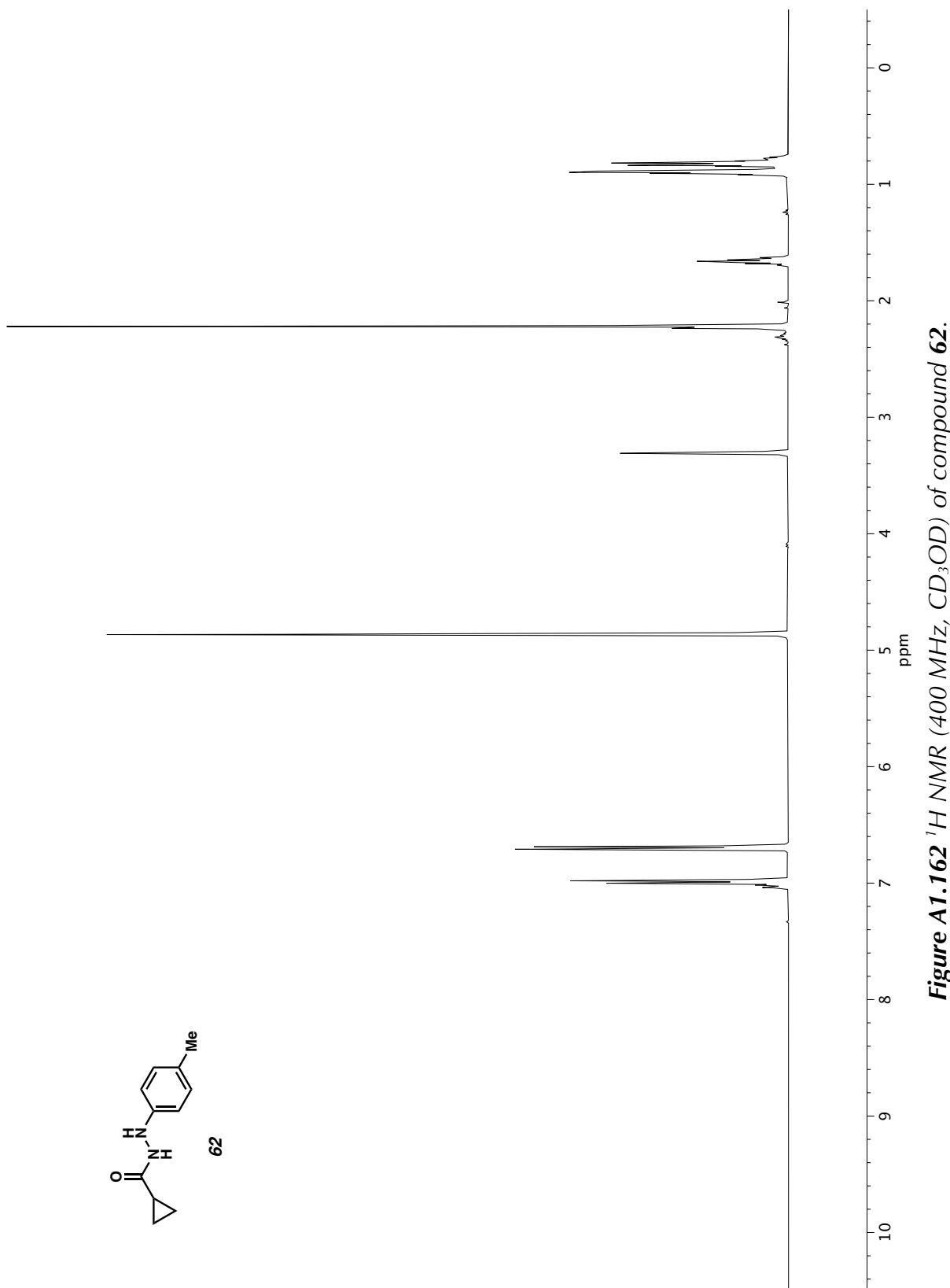
**Figure A1.159**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound **61**.



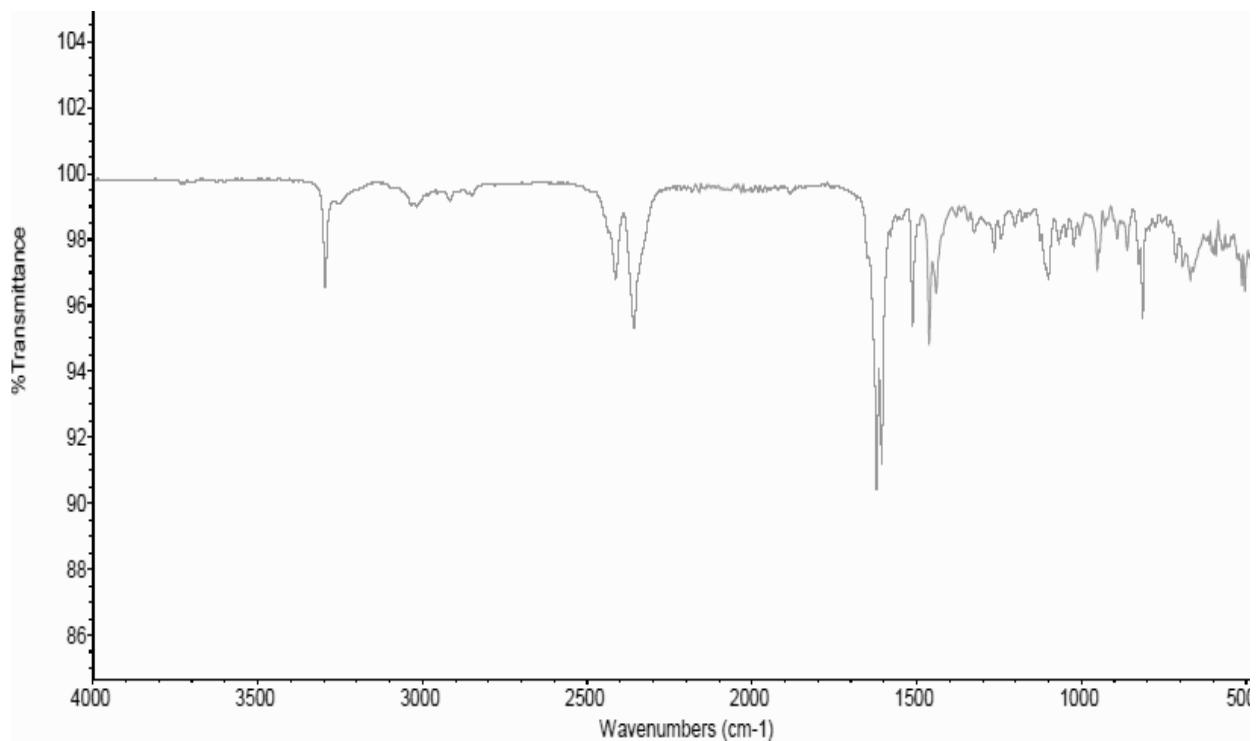
**Figure A1.160** Infrared spectrum (Thin Film) of compound **61**.



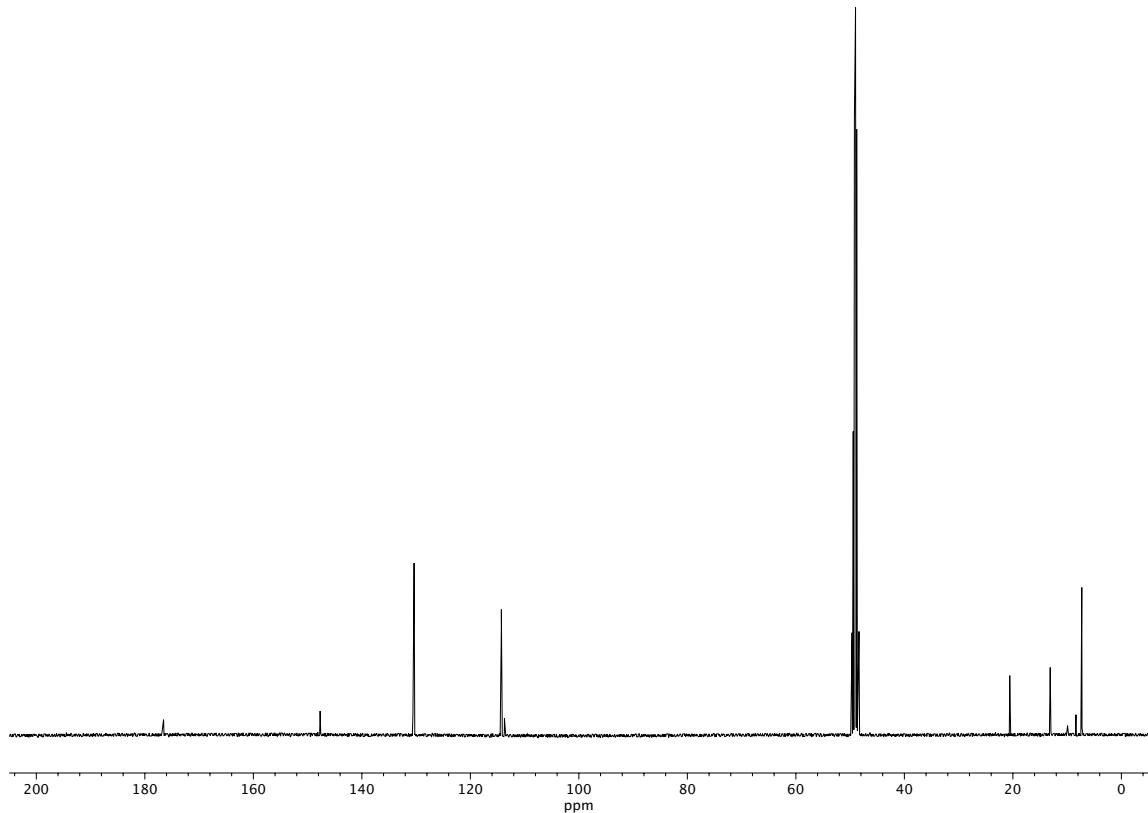
**Figure A1.161** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound **61**.



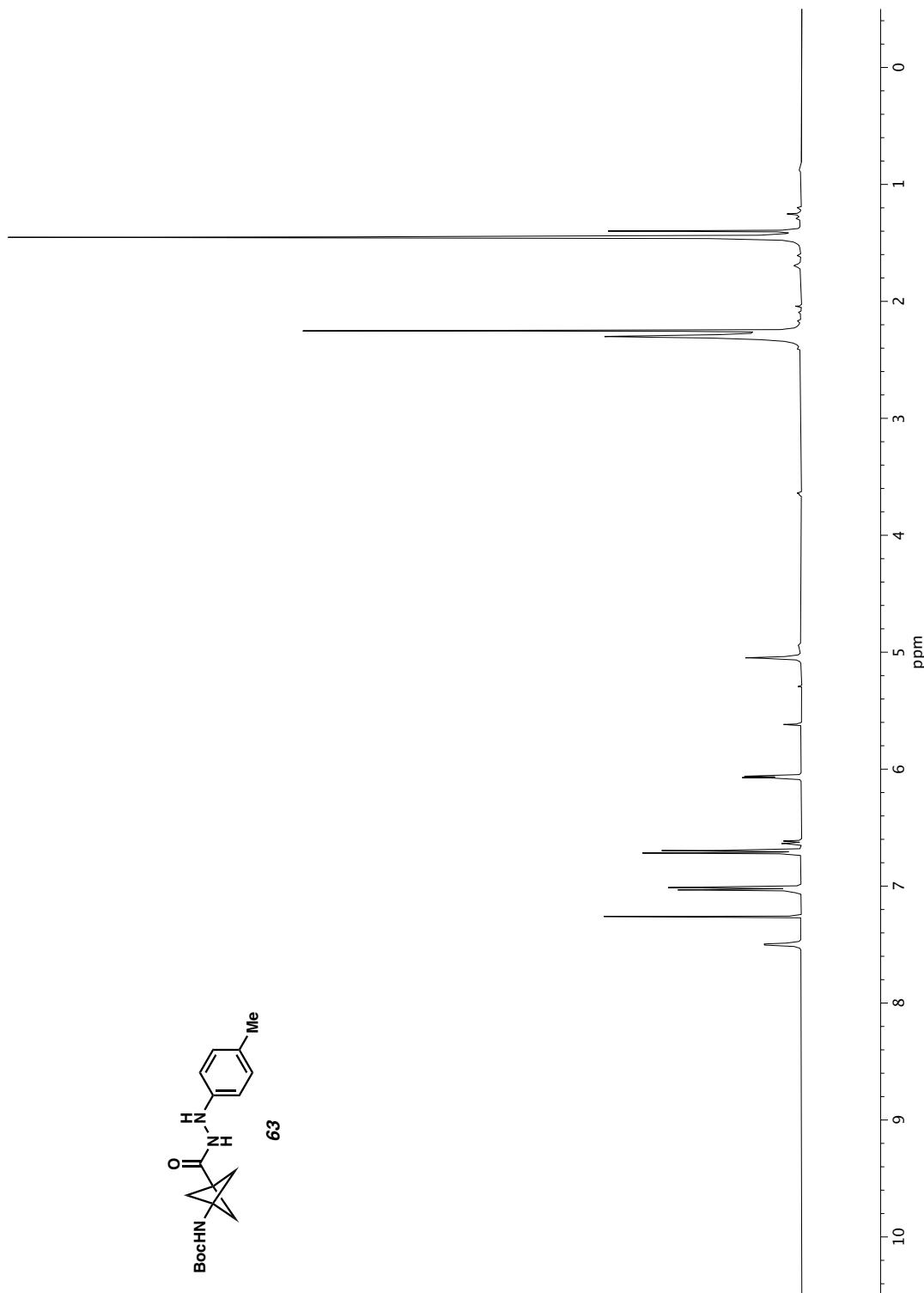
**Figure A1.162**  $^1\text{H}$  NMR (400 MHz,  $\text{CD}_3\text{OD}$ ) of compound 62.



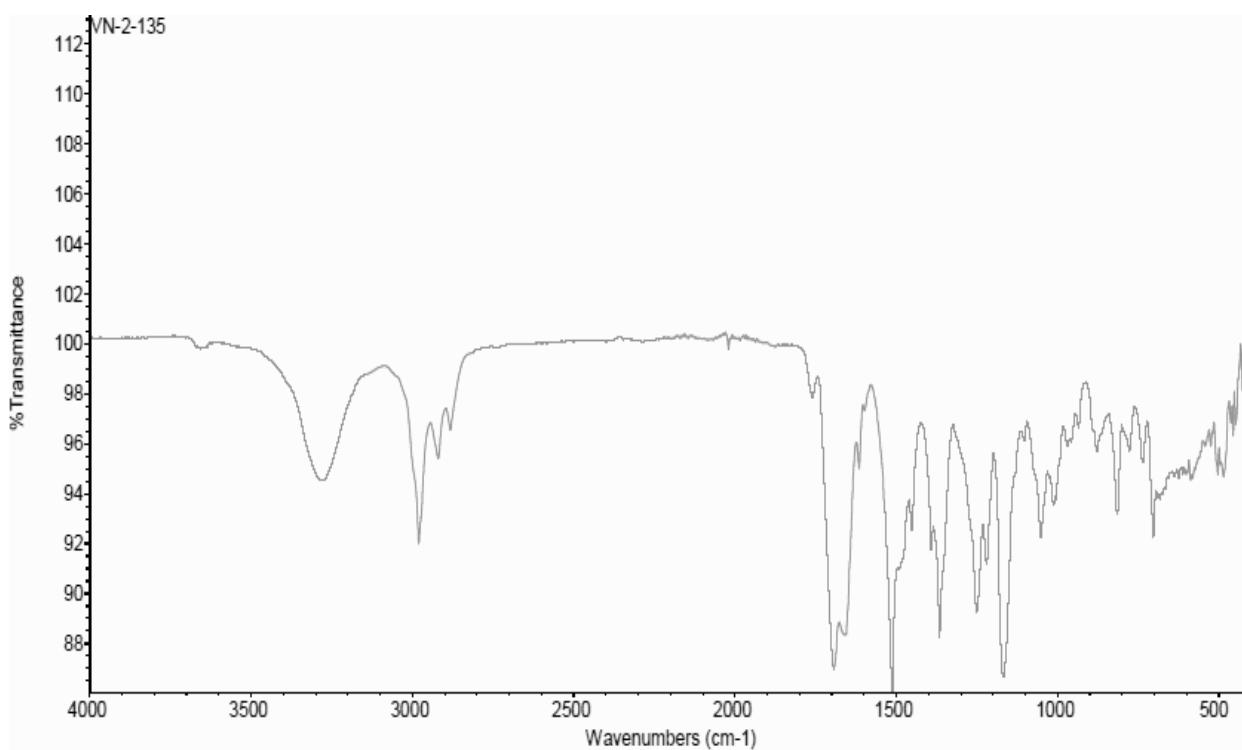
**Figure A1.163** Infrared spectrum (Thin Film) of compound **62**.



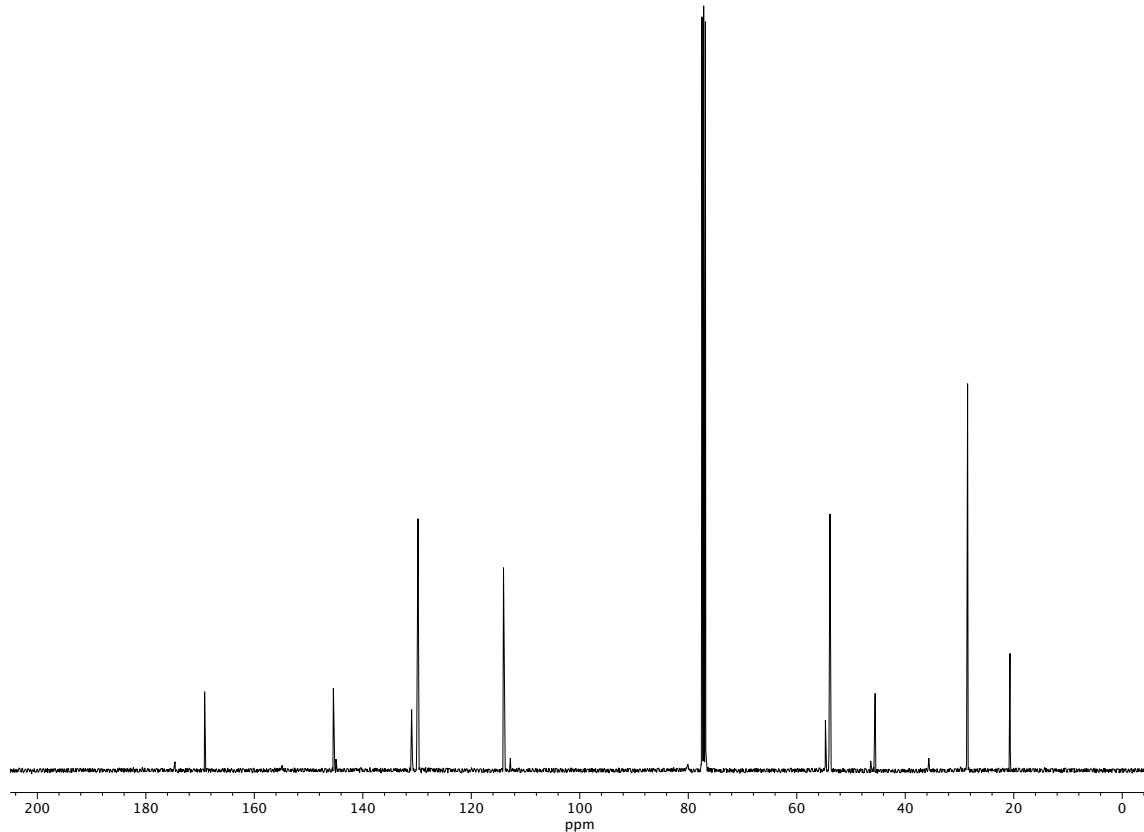
**Figure A1.164**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CD}_3\text{OD}$ ) of compound **62**.



**Figure A1.165**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 63.



**Figure A1.166** Infrared spectrum (Thin Film) of compound **63**.



**Figure A1.167**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **63**.

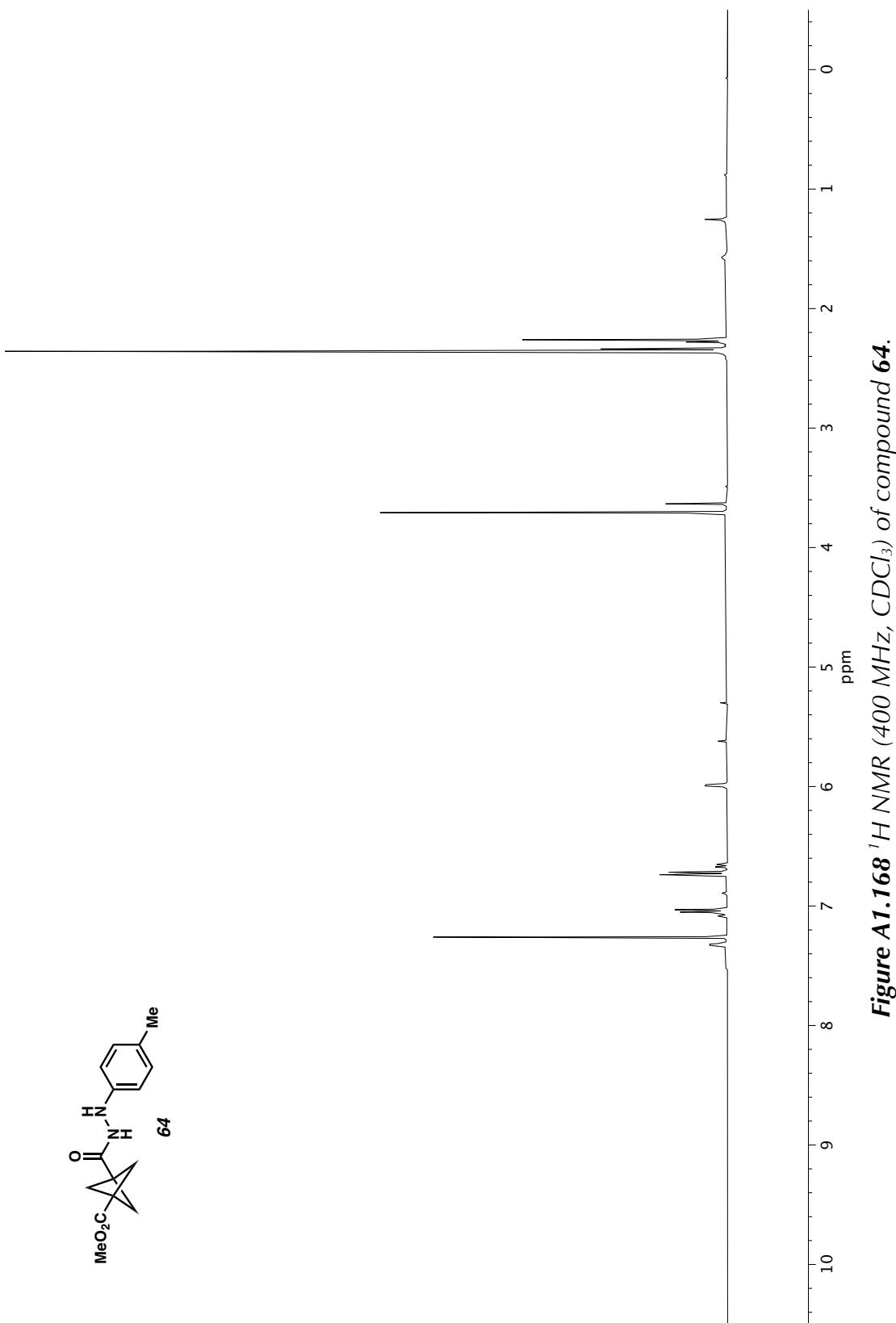
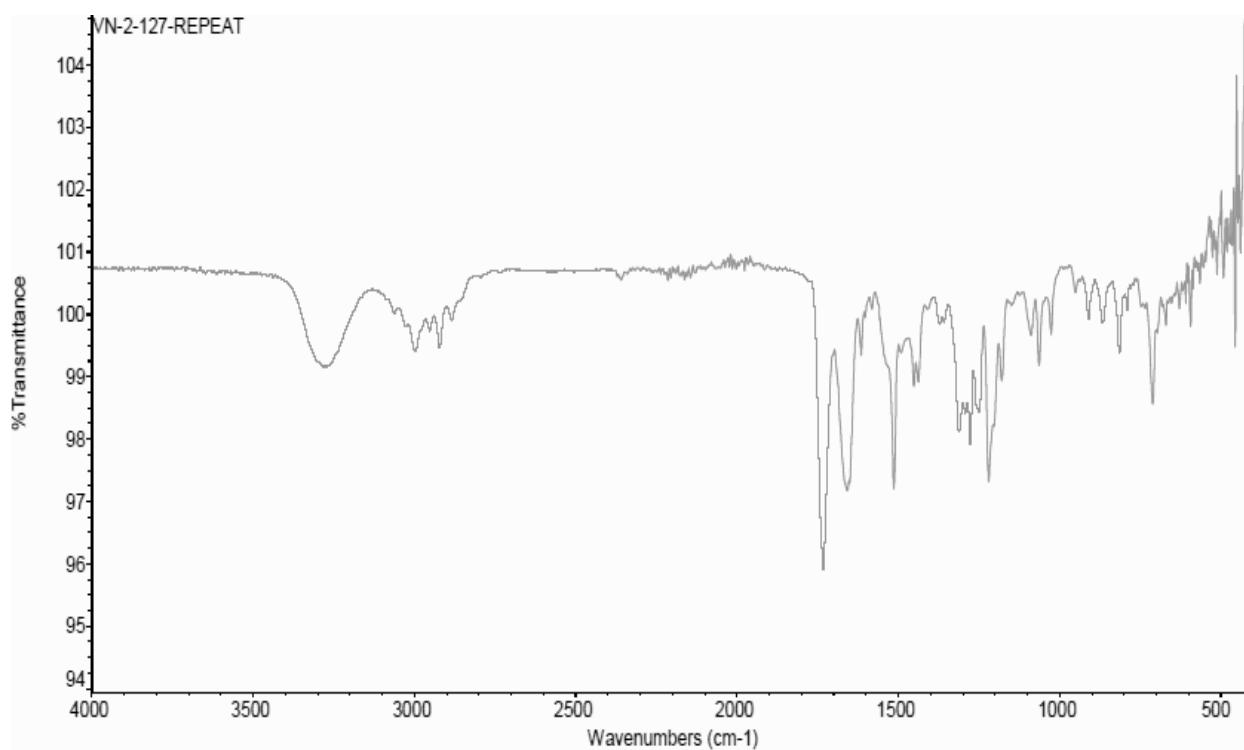
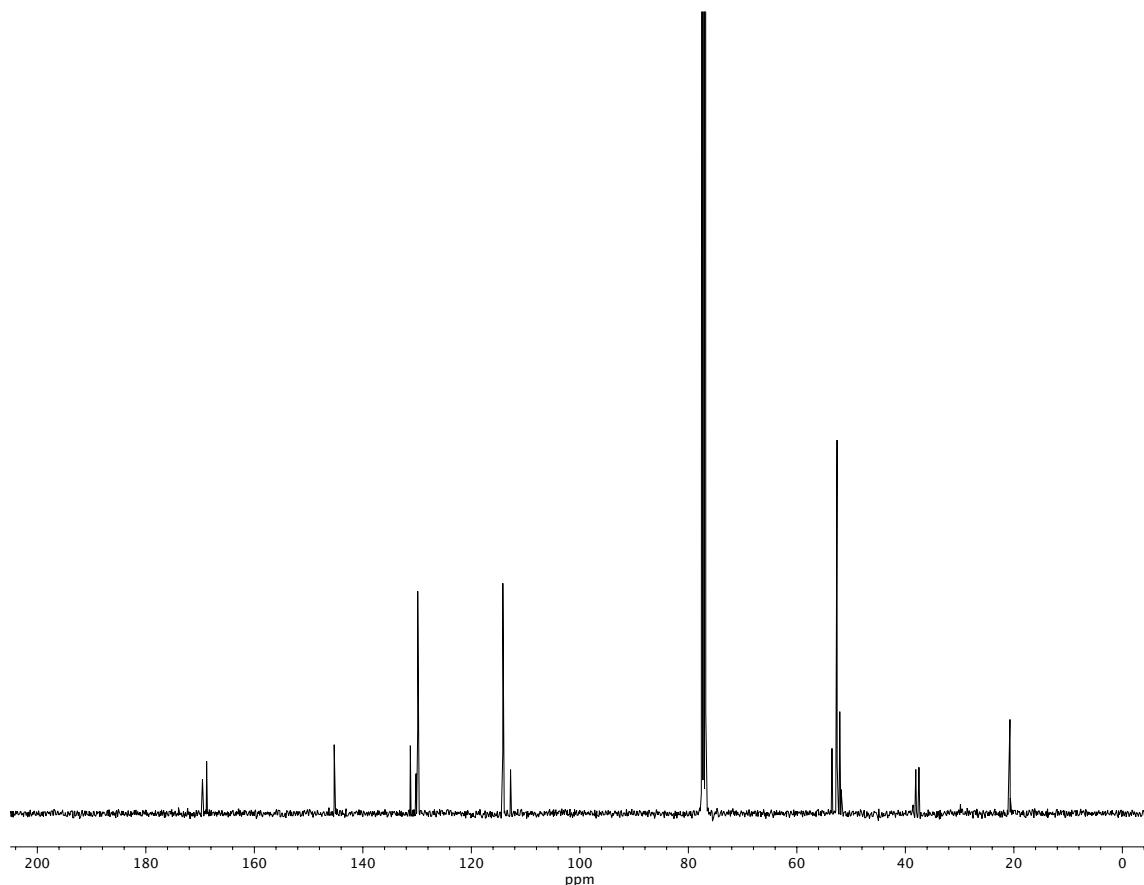


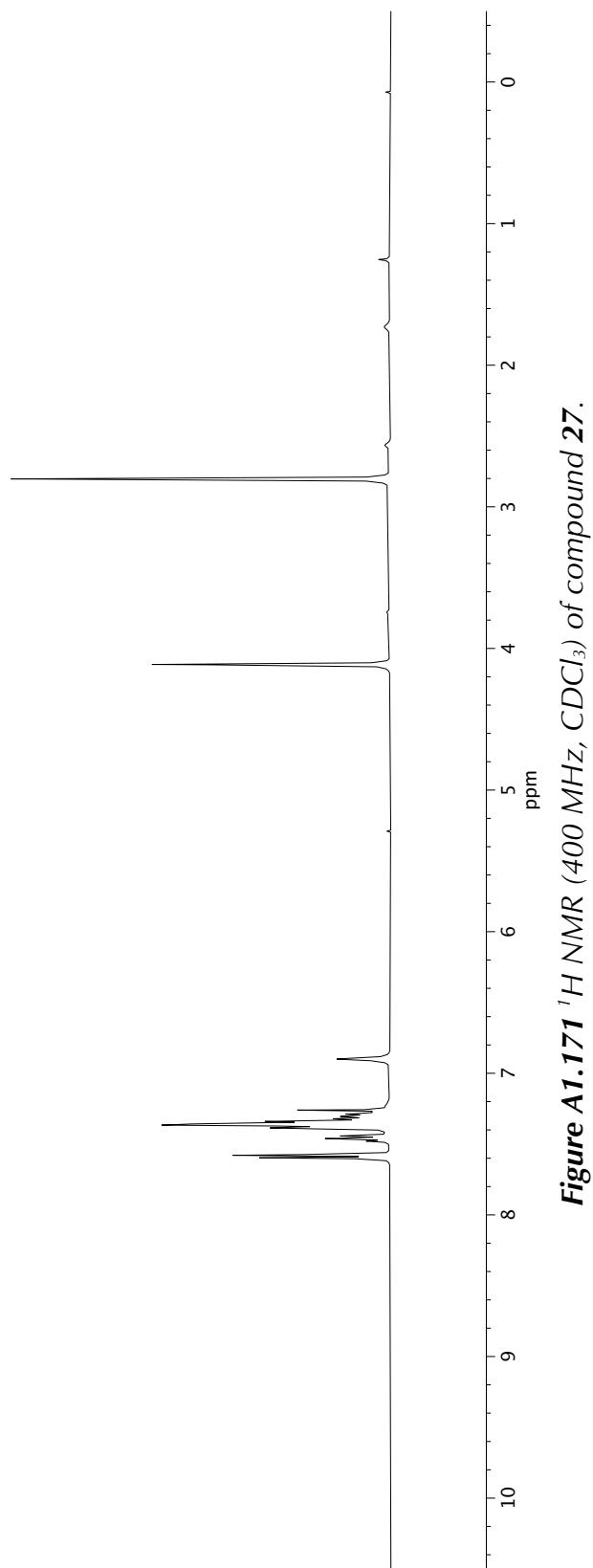
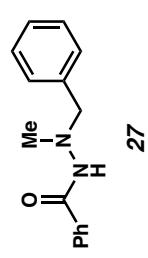
Figure A1.168  $^1\text{H}$  NMR ( $400 \text{ MHz}, \text{CDCl}_3$ ) of compound 64.



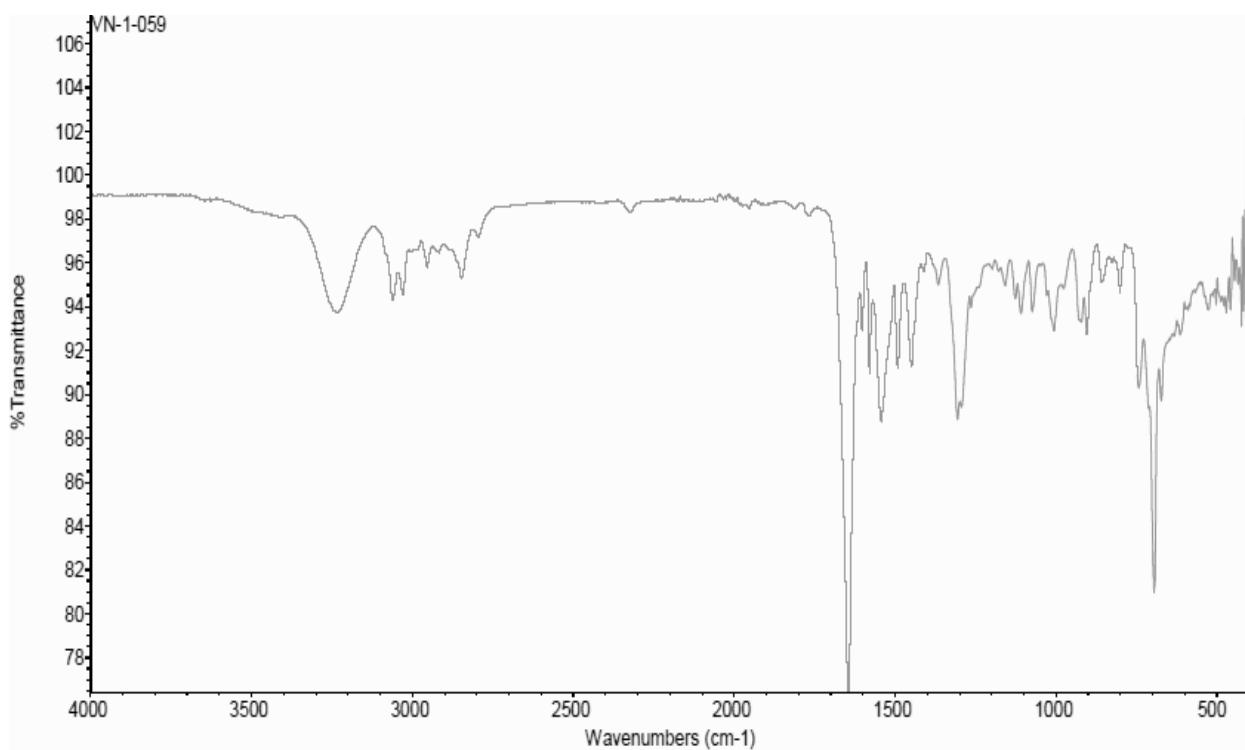
**Figure A1.169** Infrared spectrum (Thin Film) of compound **64**.



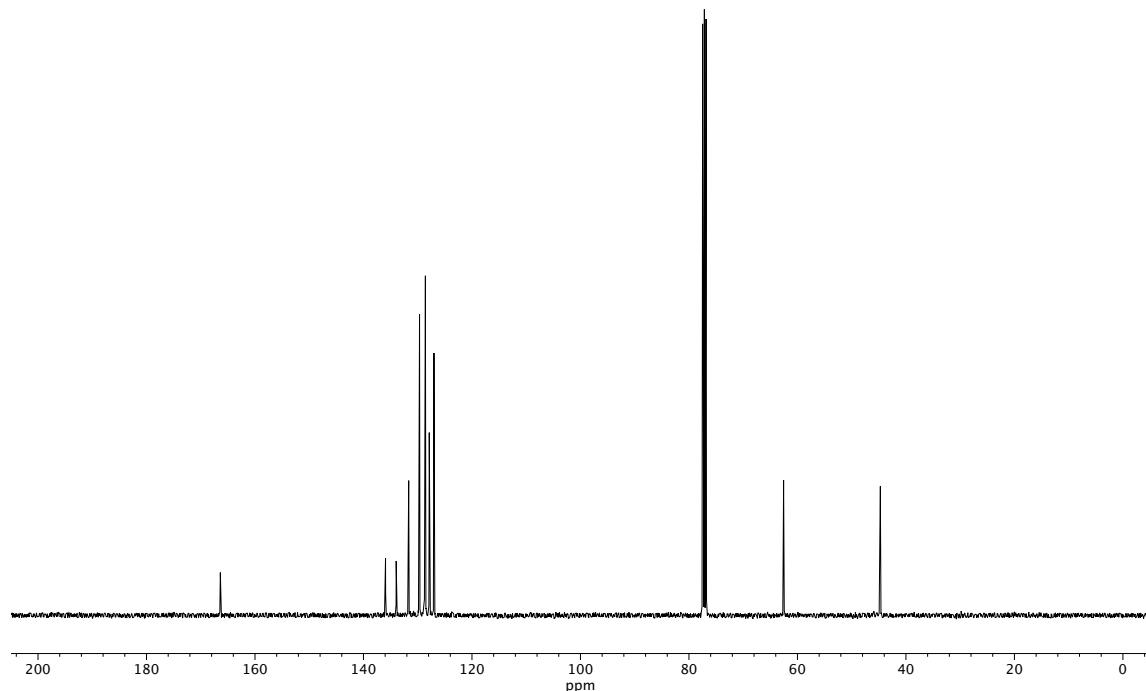
**Figure A1.170**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **64**.



**Figure A1.171**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 27.



**Figure A1.172** Infrared spectrum (Thin Film) of compound 27.



**Figure A1.173**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 27.

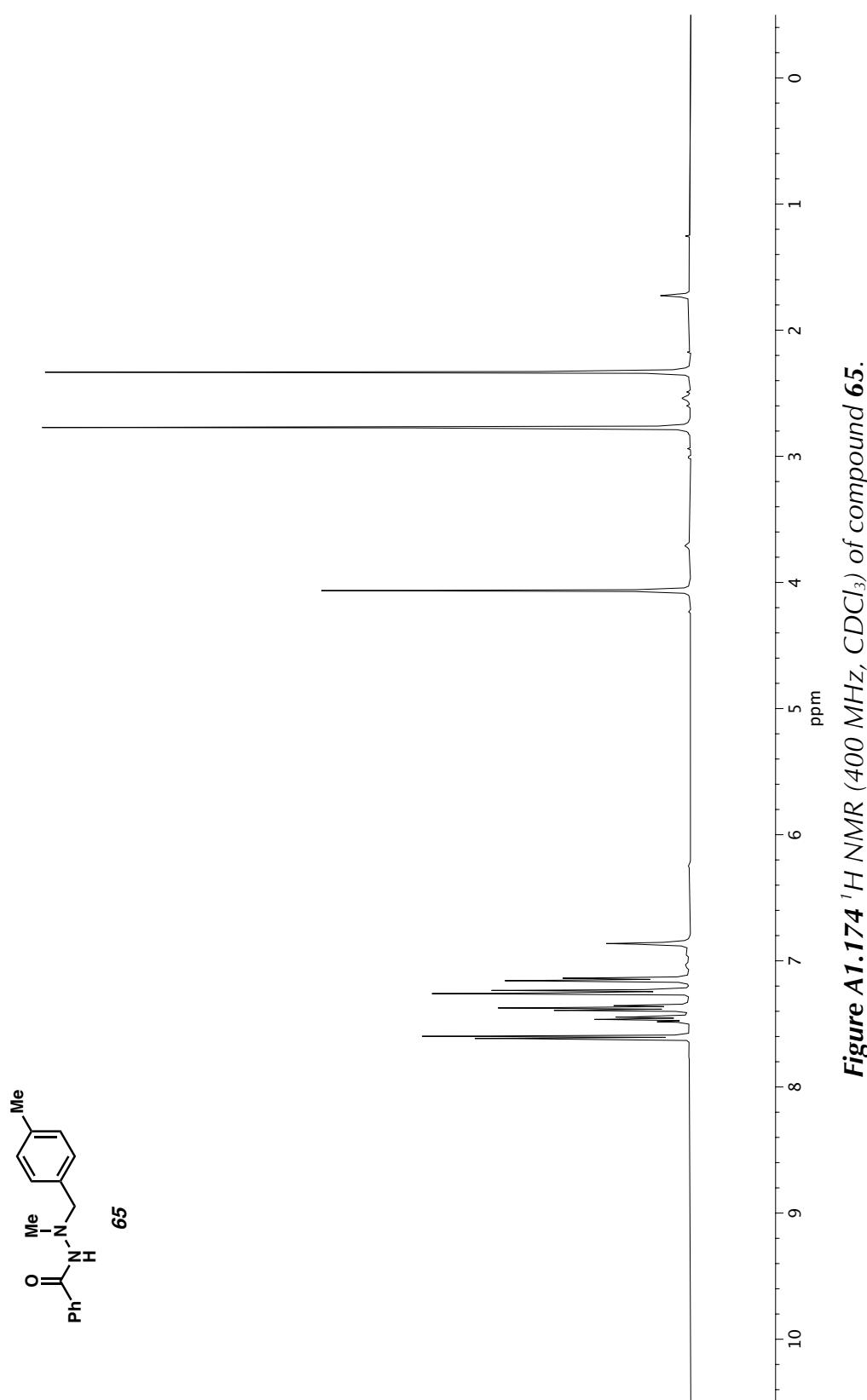
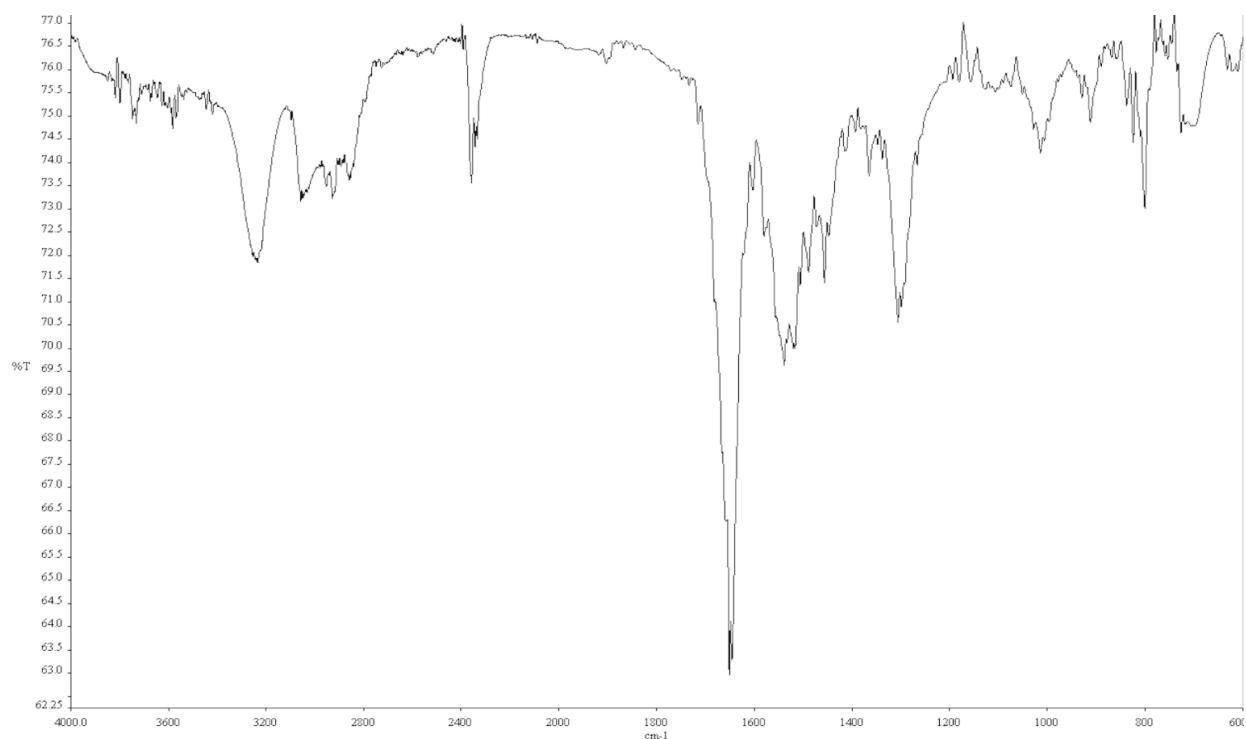
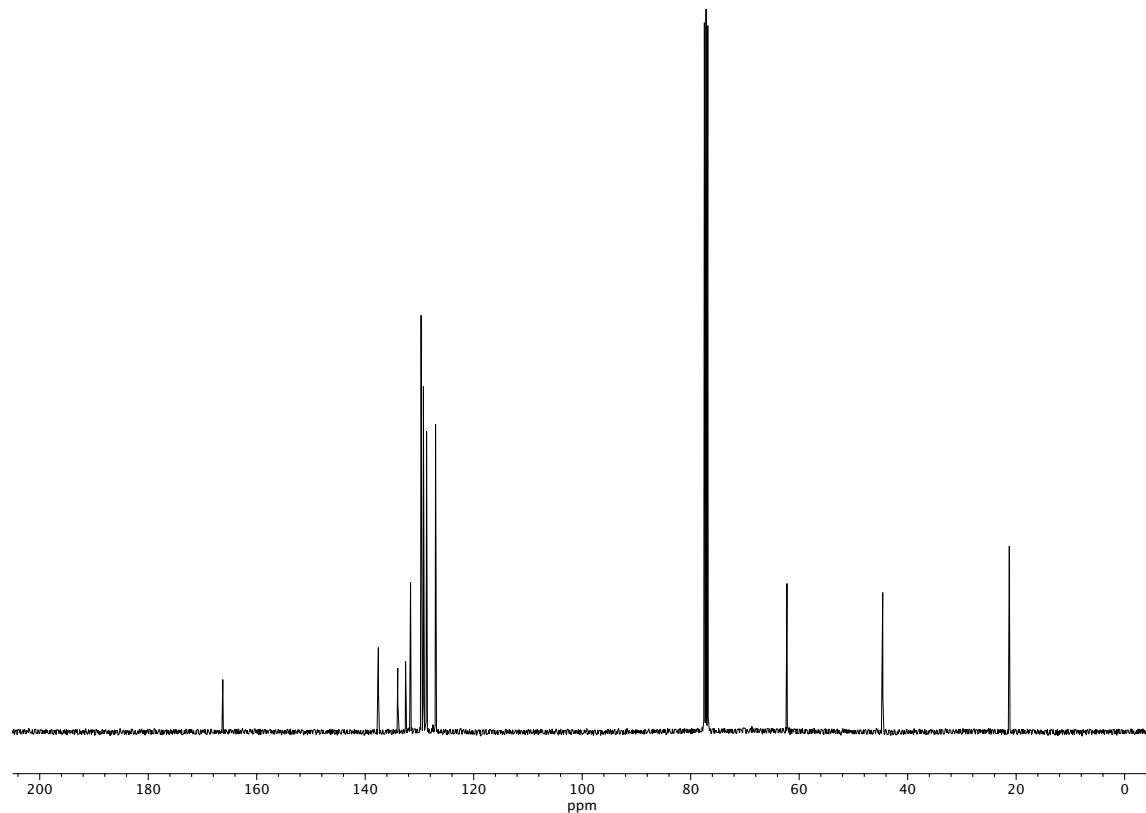


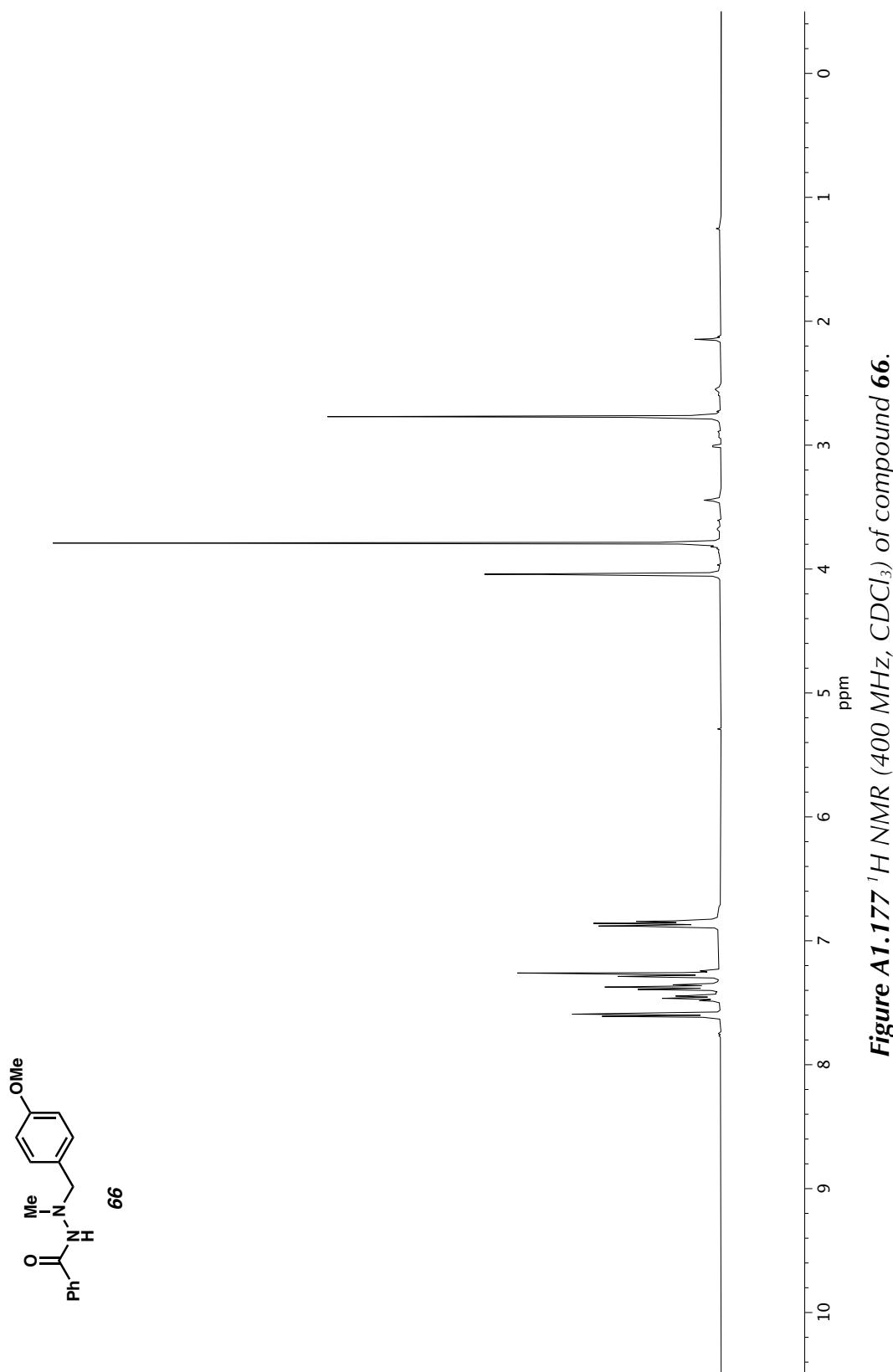
Figure A1.174  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 65.



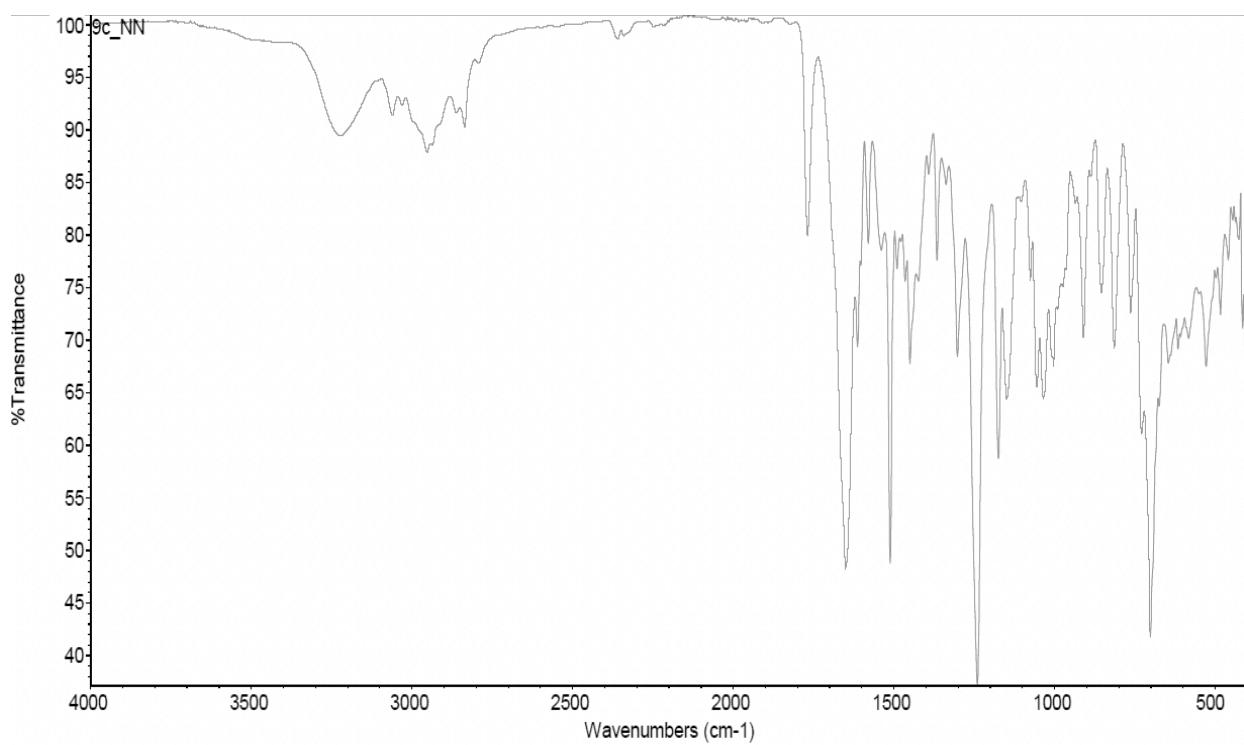
**Figure A1.175** Infrared spectrum (Thin Film, NaCl) of compound **65**.



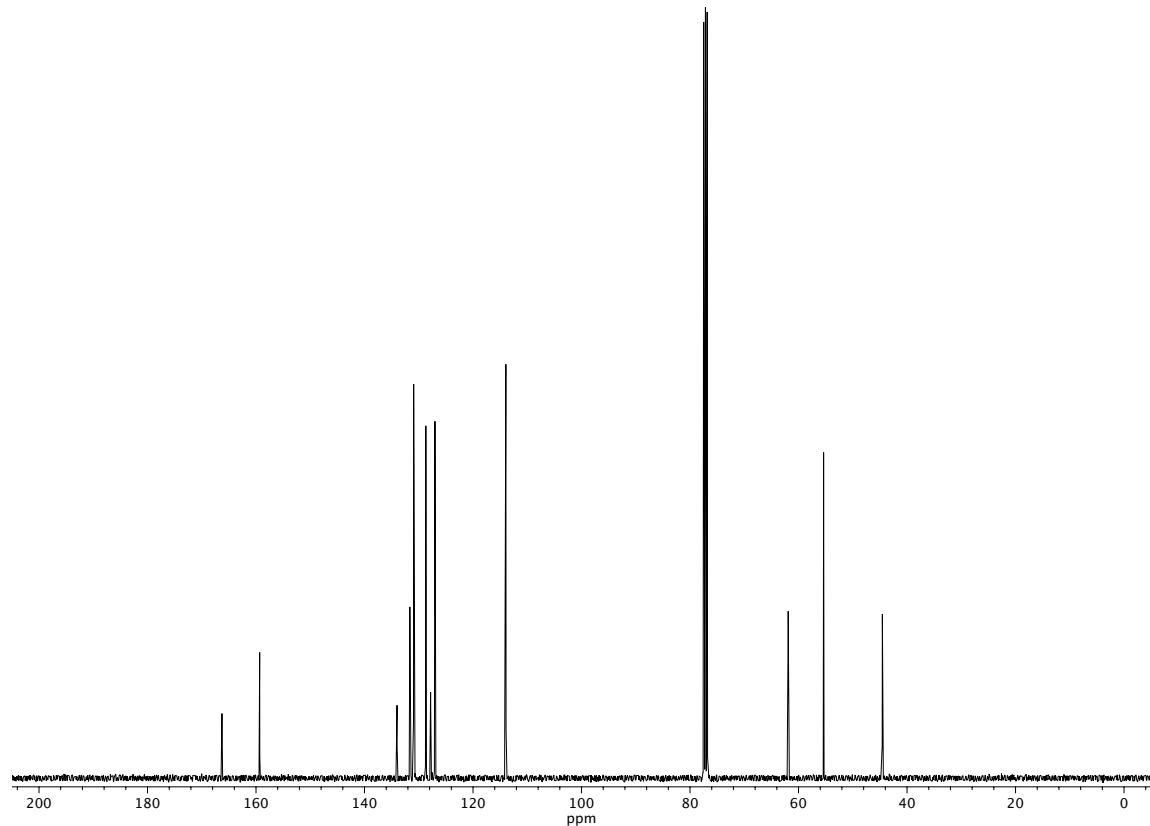
**Figure A1.176**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **65**.



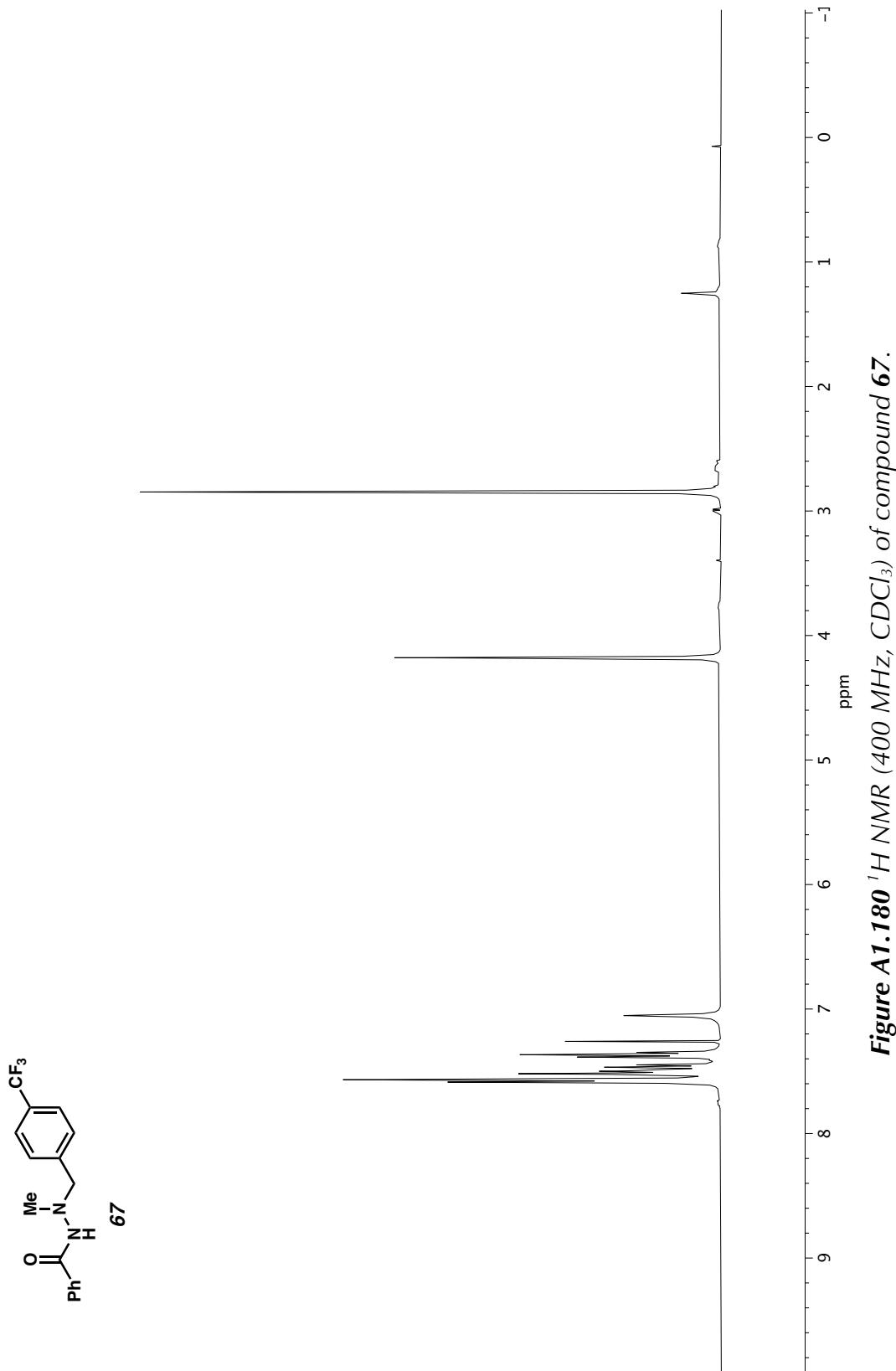
**Figure A1.177**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 66.



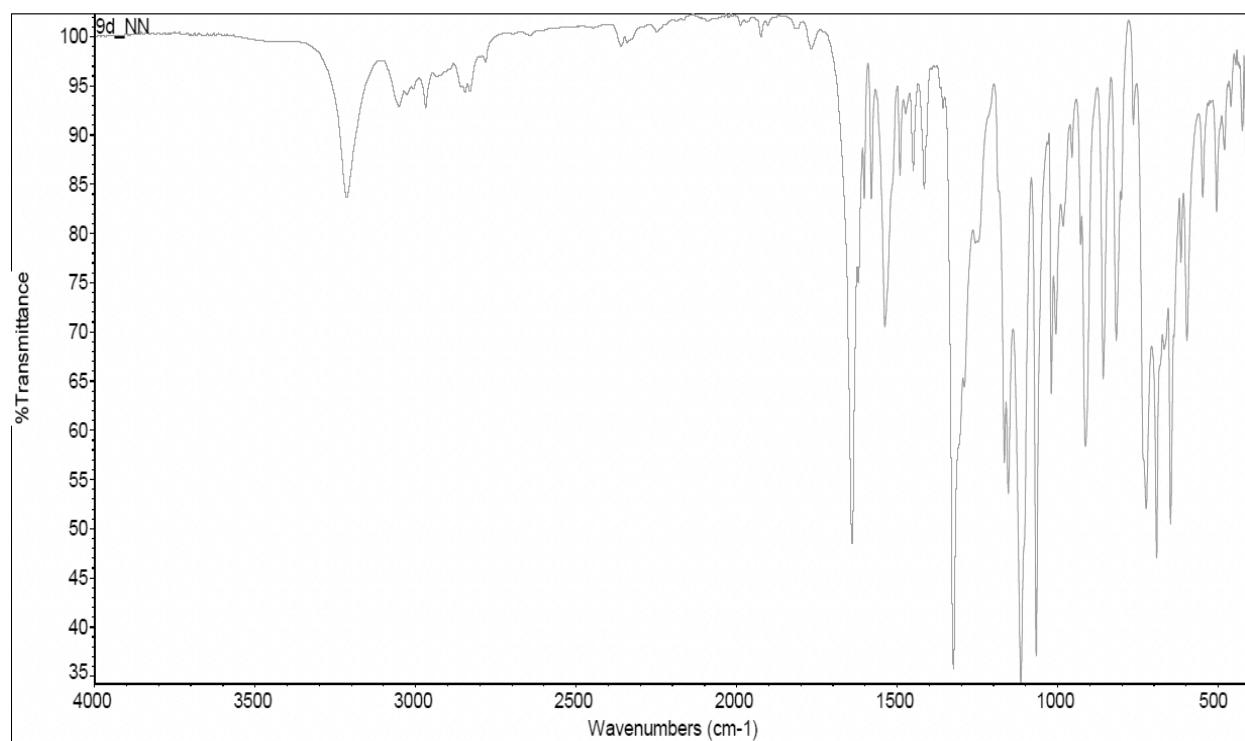
**Figure A1.178** Infrared spectrum (Thin Film) of compound **66**.



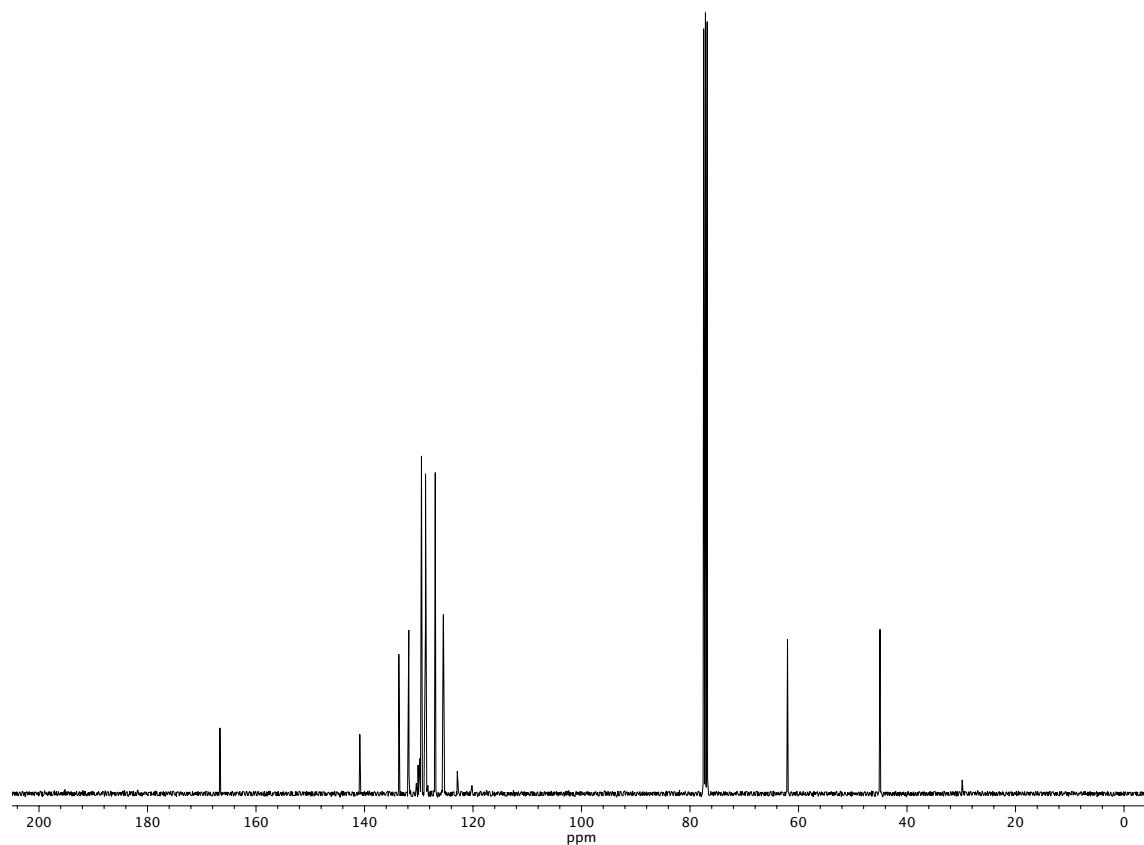
**Figure A1.179**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **66**.



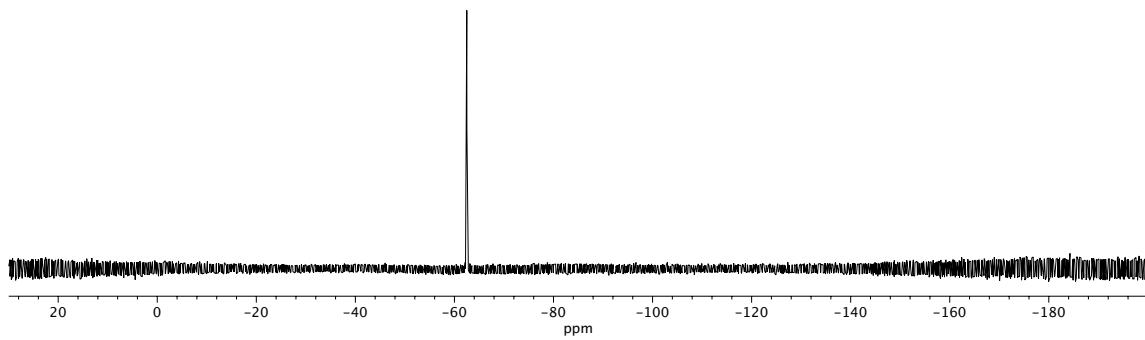
**Figure A1.180**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 67.



**Figure A1.181** Infrared spectrum (Thin Film) of compound **67**.



**Figure A1.182**  $^{13}\text{C}$  NMR ( $101\text{ MHz}, \text{CDCl}_3$ ) of compound **67**.



**Figure A1.183**  $^{19}\text{F}$  NMR (282 MHz,  $\text{CDCl}_3$ ) of compound **67**.

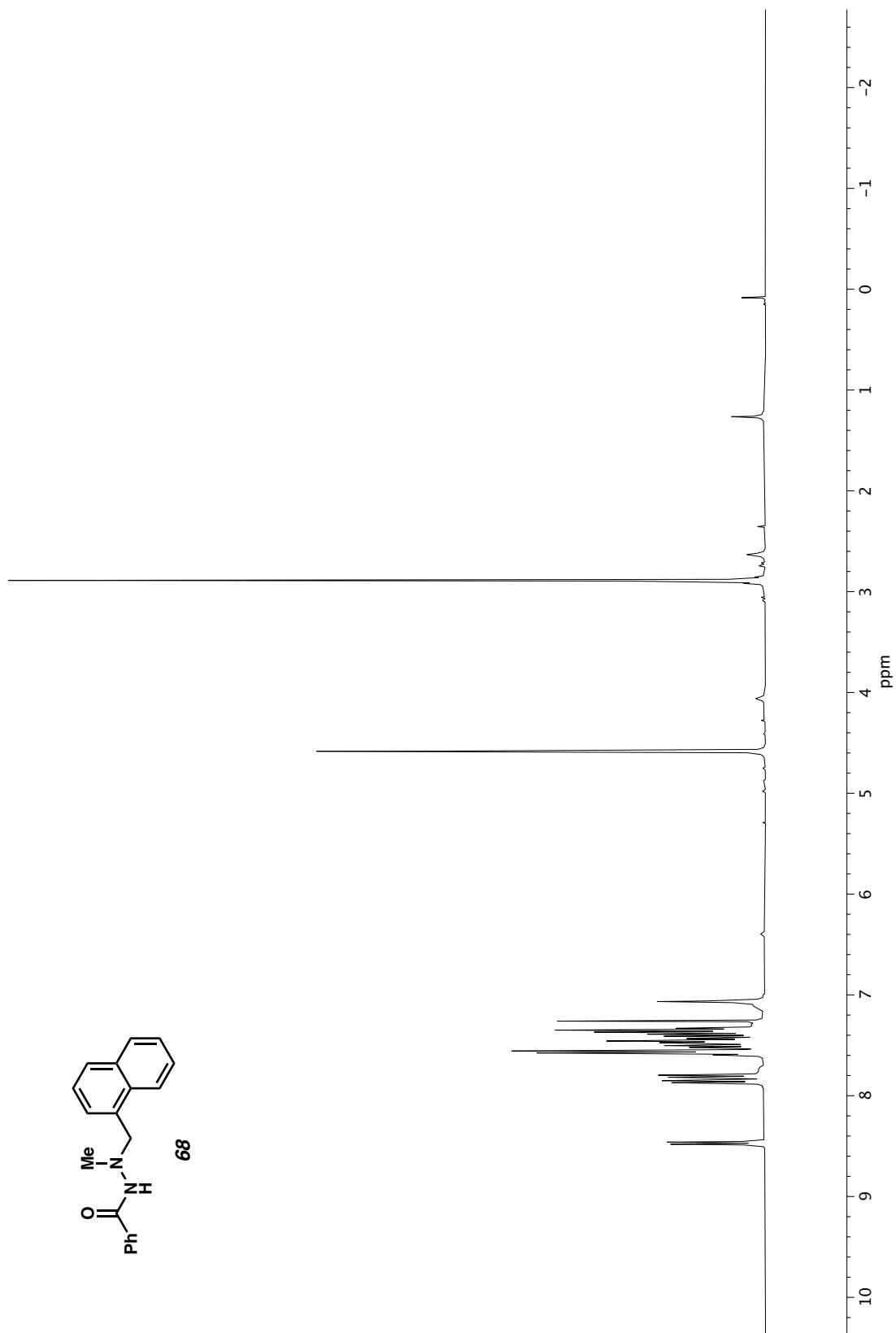
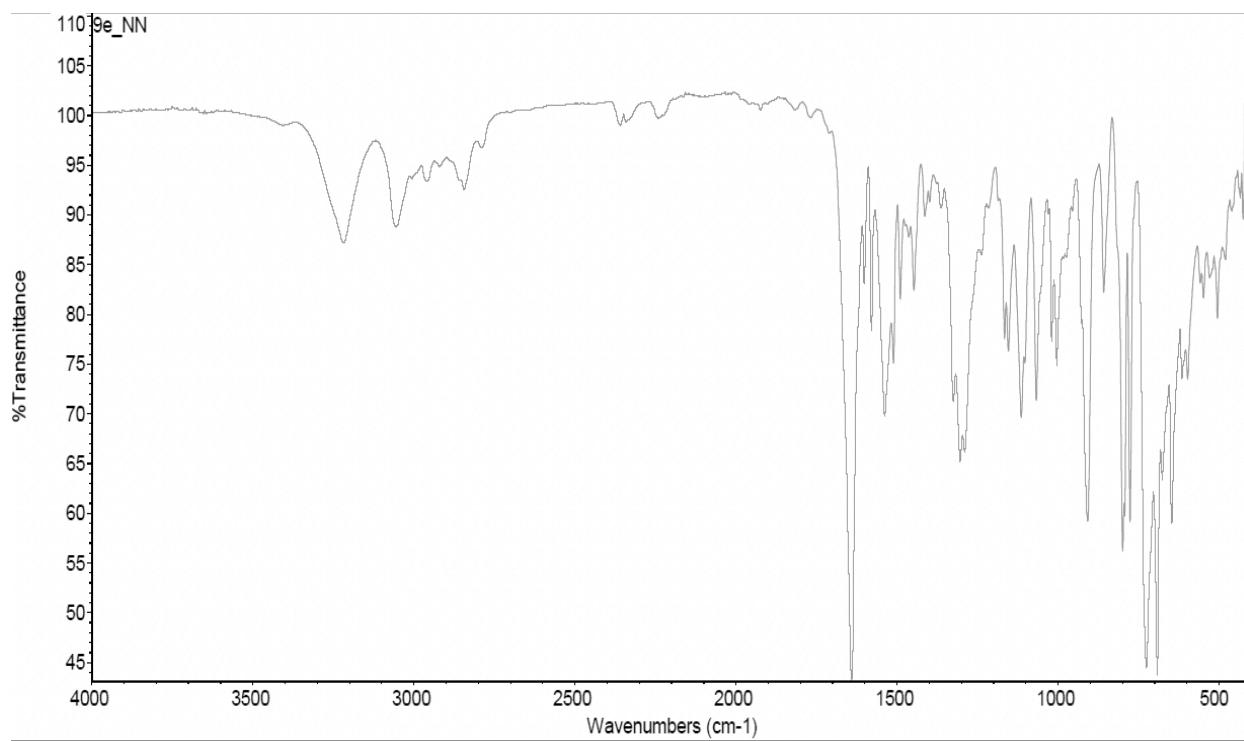
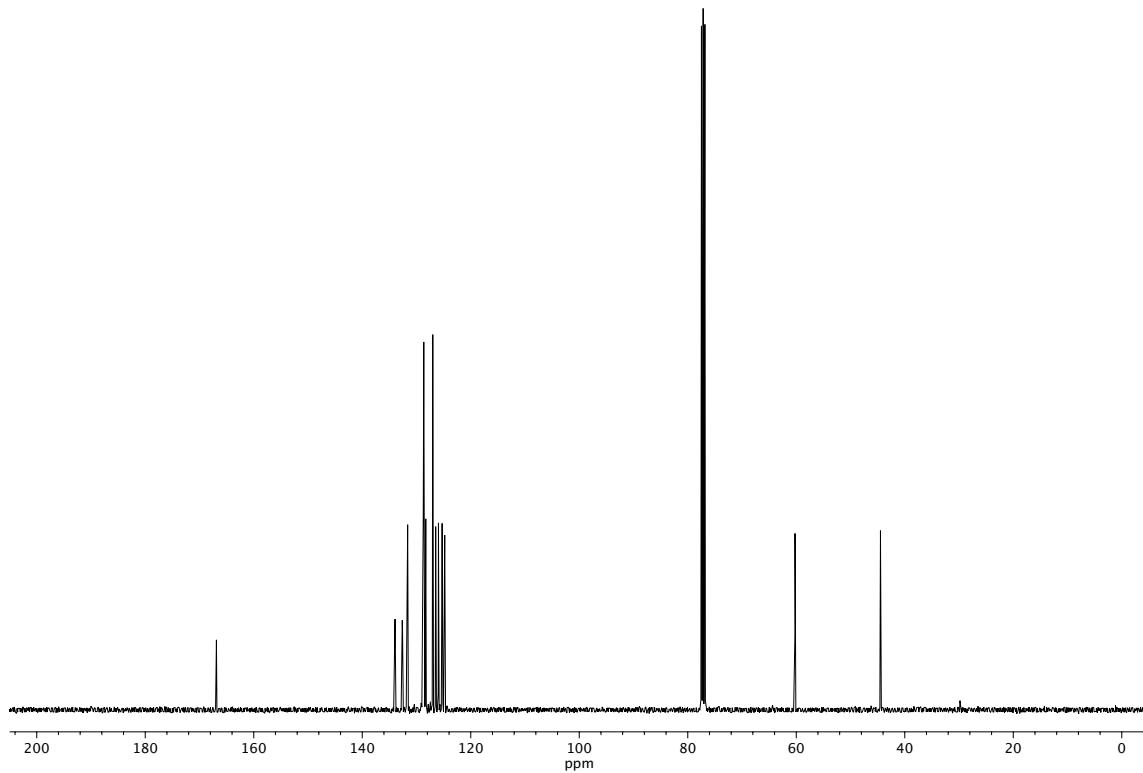


Figure A1.184  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 68.



**Figure A1.185** Infrared spectrum (Thin Film) of compound **68**.



**Figure A1.186**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **68**.

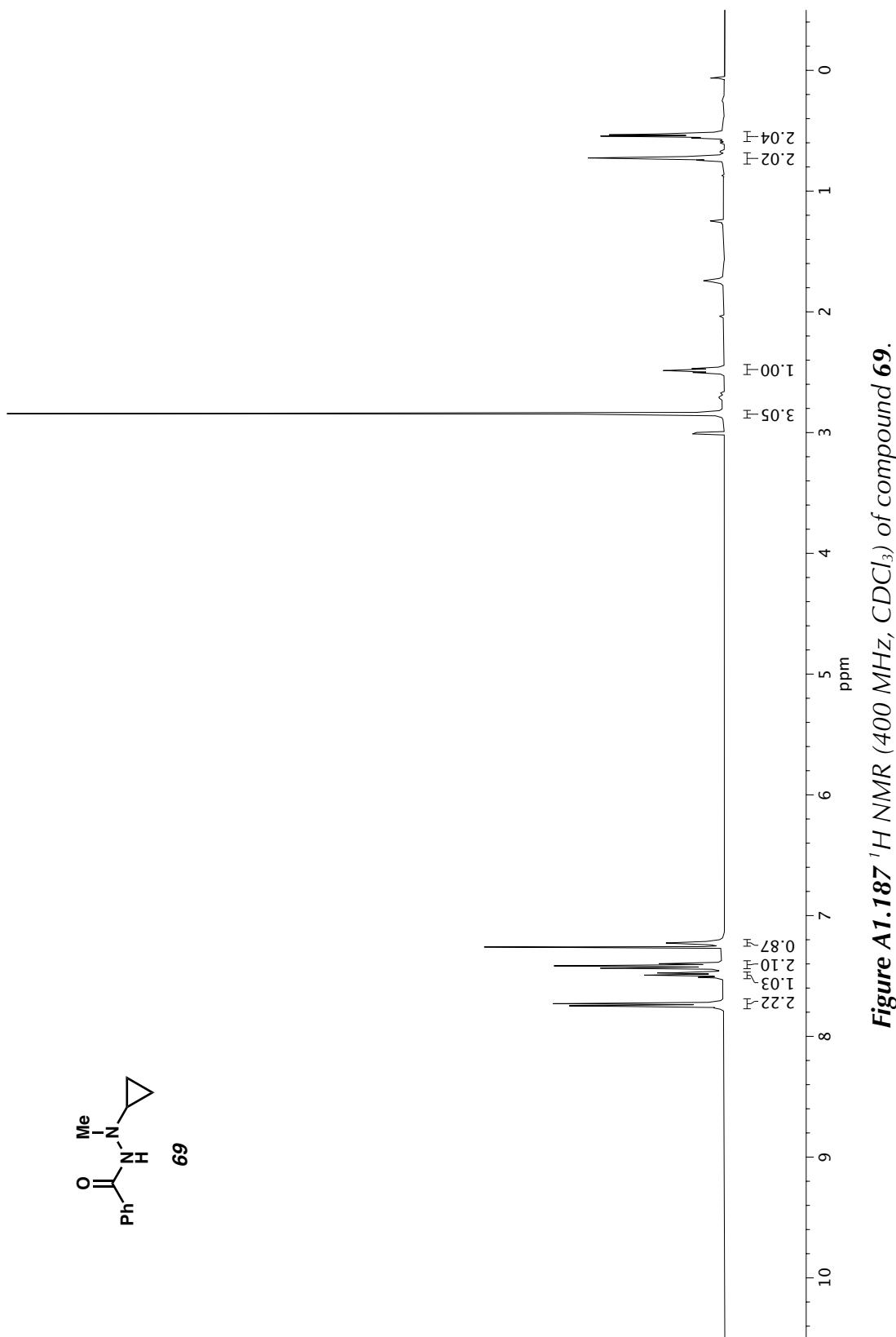
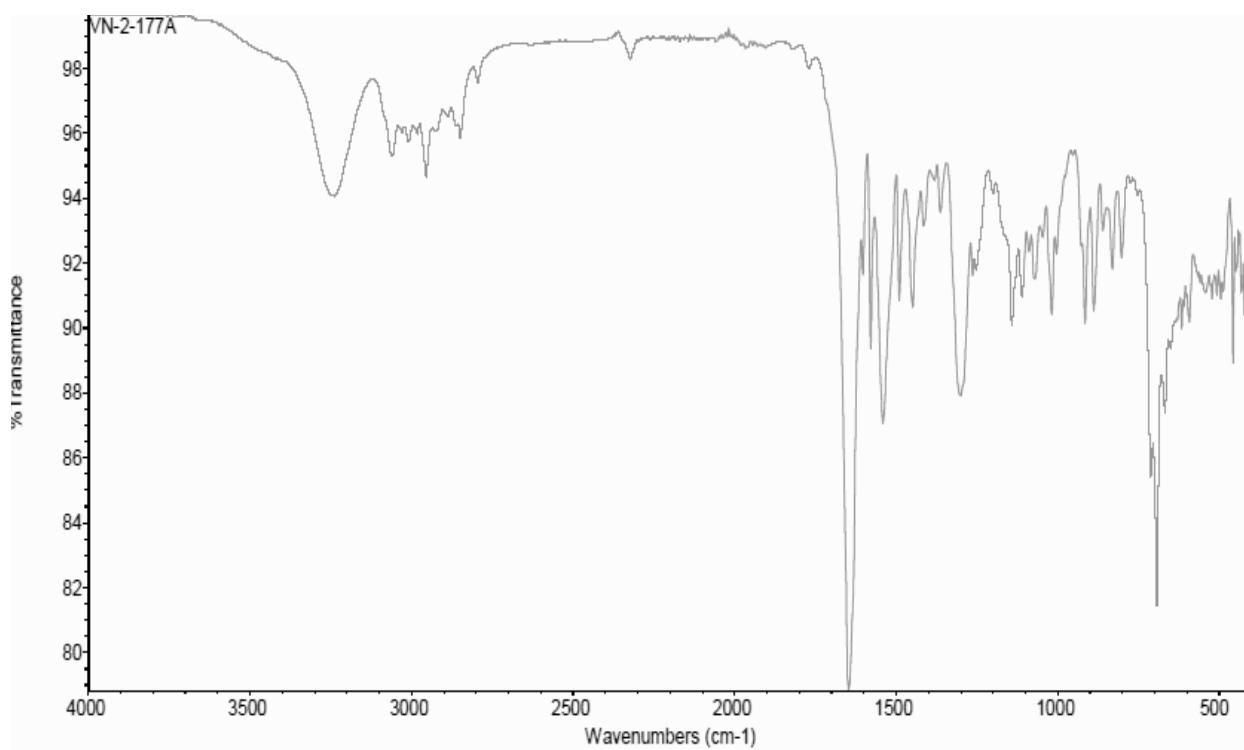
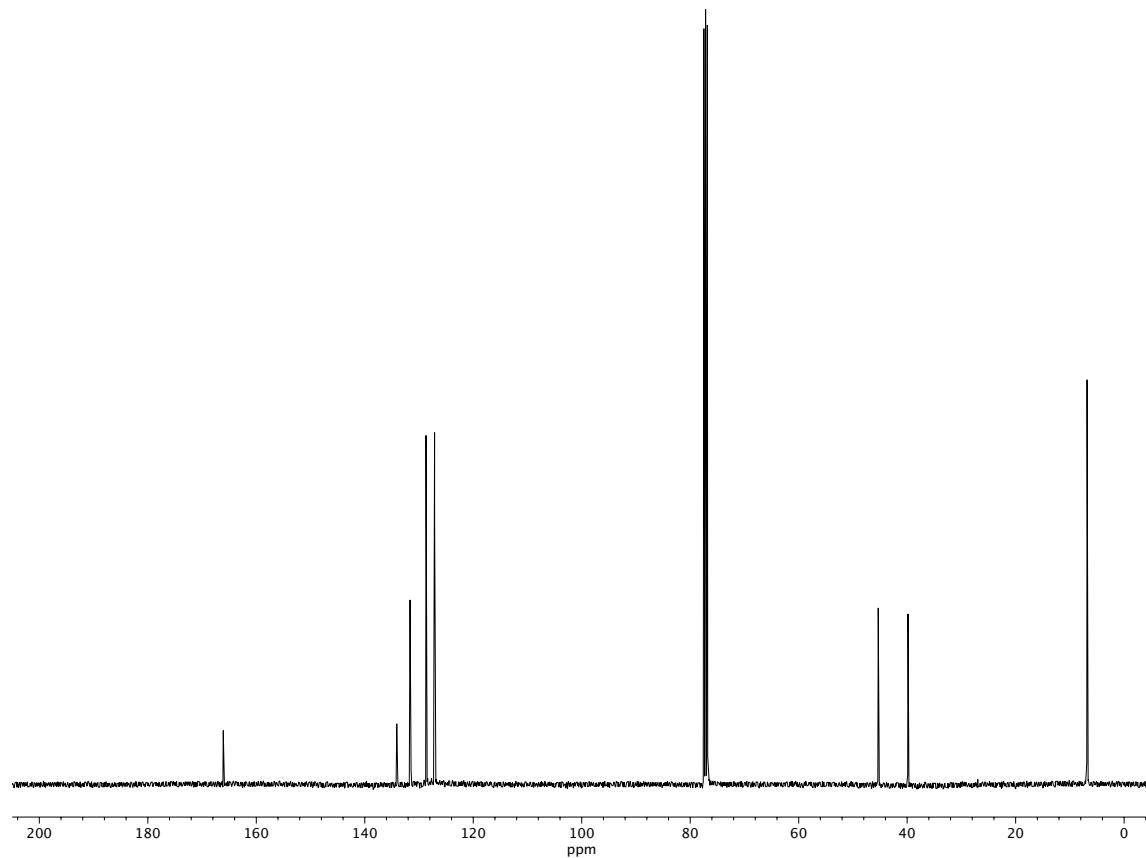


Figure A1.187  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 69.



**Figure A1.188** Infrared spectrum (Thin Film) of compound **69**.



**Figure A1.189**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **69**.

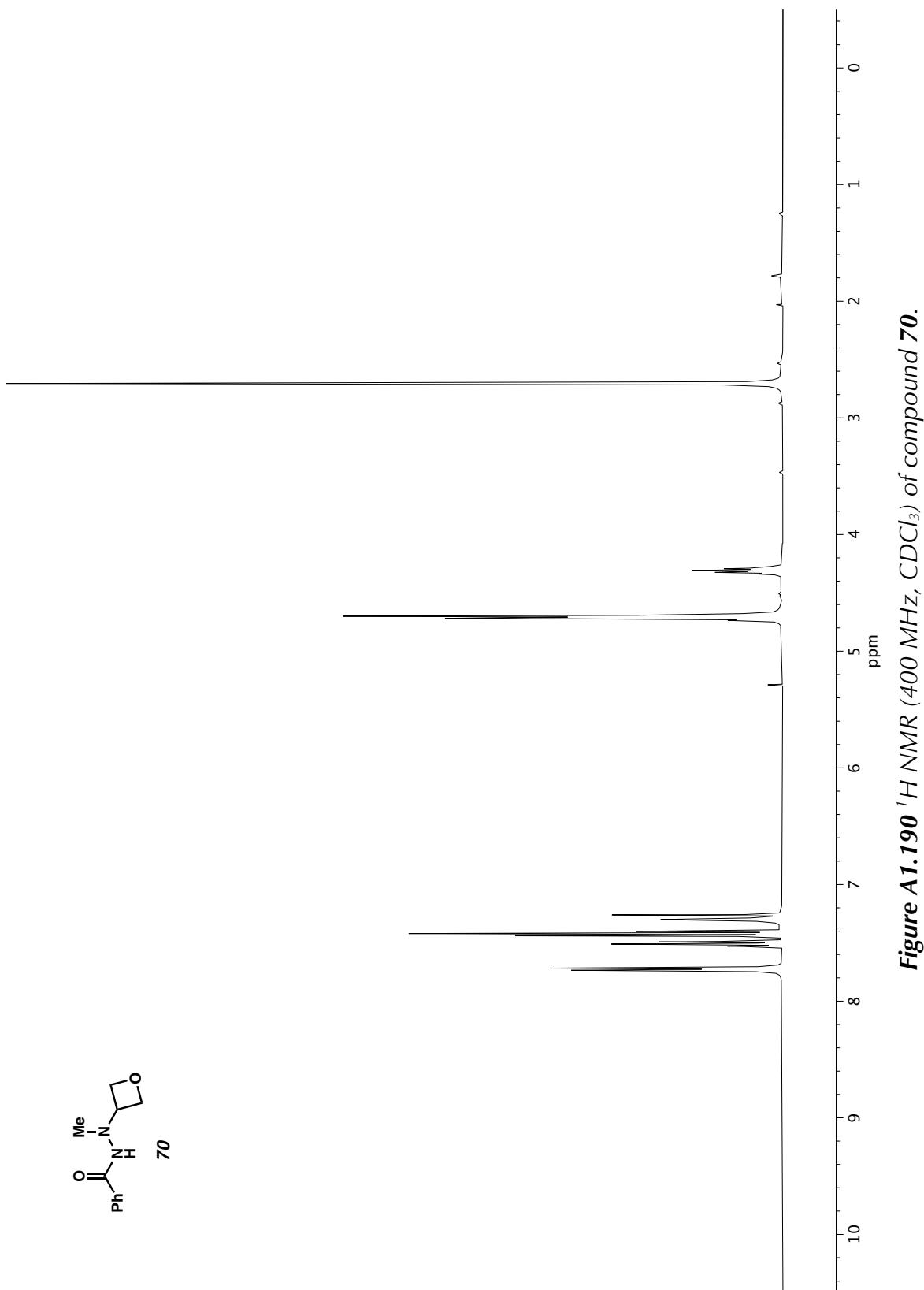
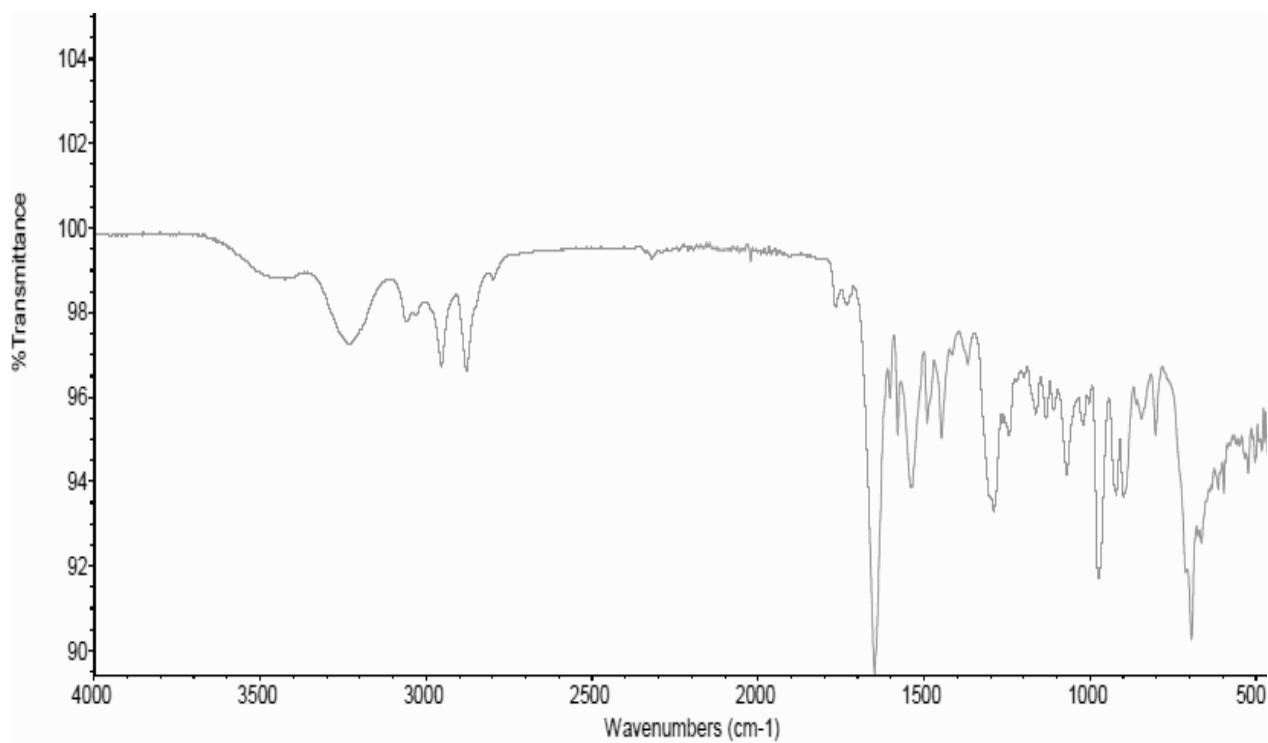
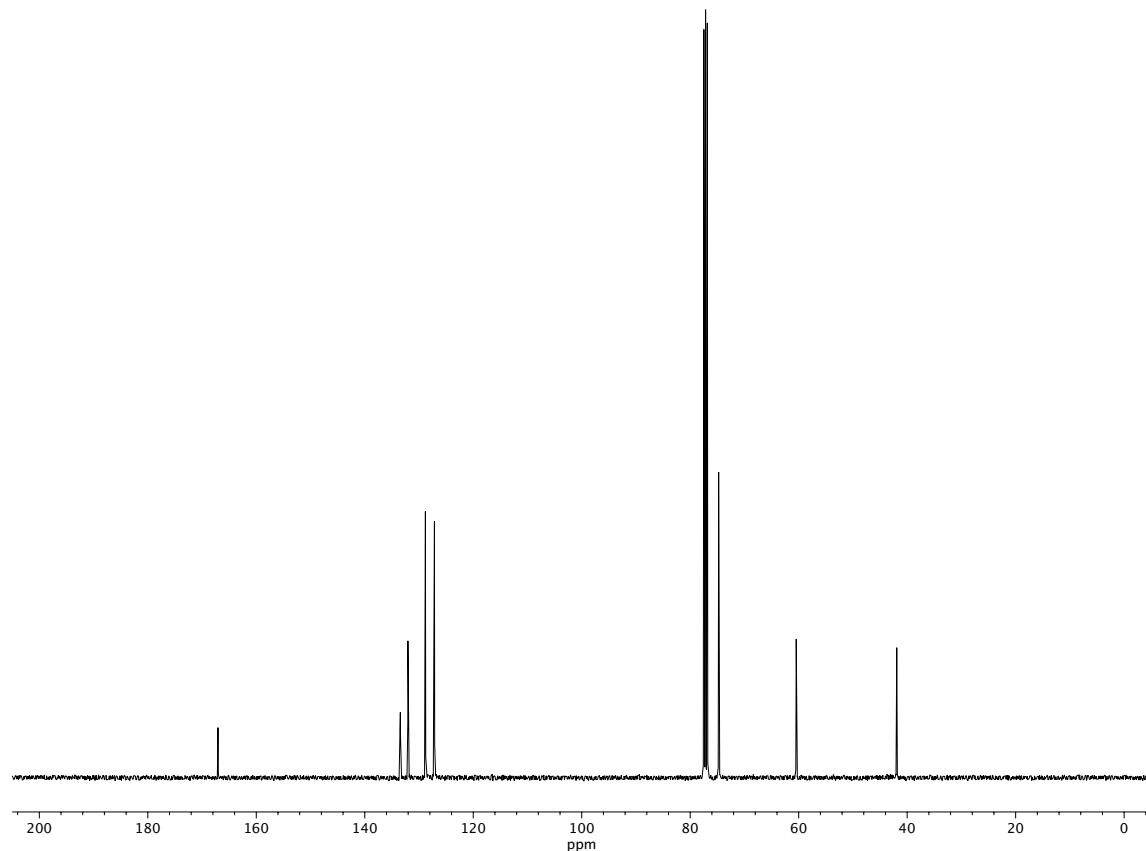


Figure A1.190  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 70.



**Figure A1.191** Infrared spectrum (Thin Film) of compound **70**.



**Figure A1.192**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **70**.

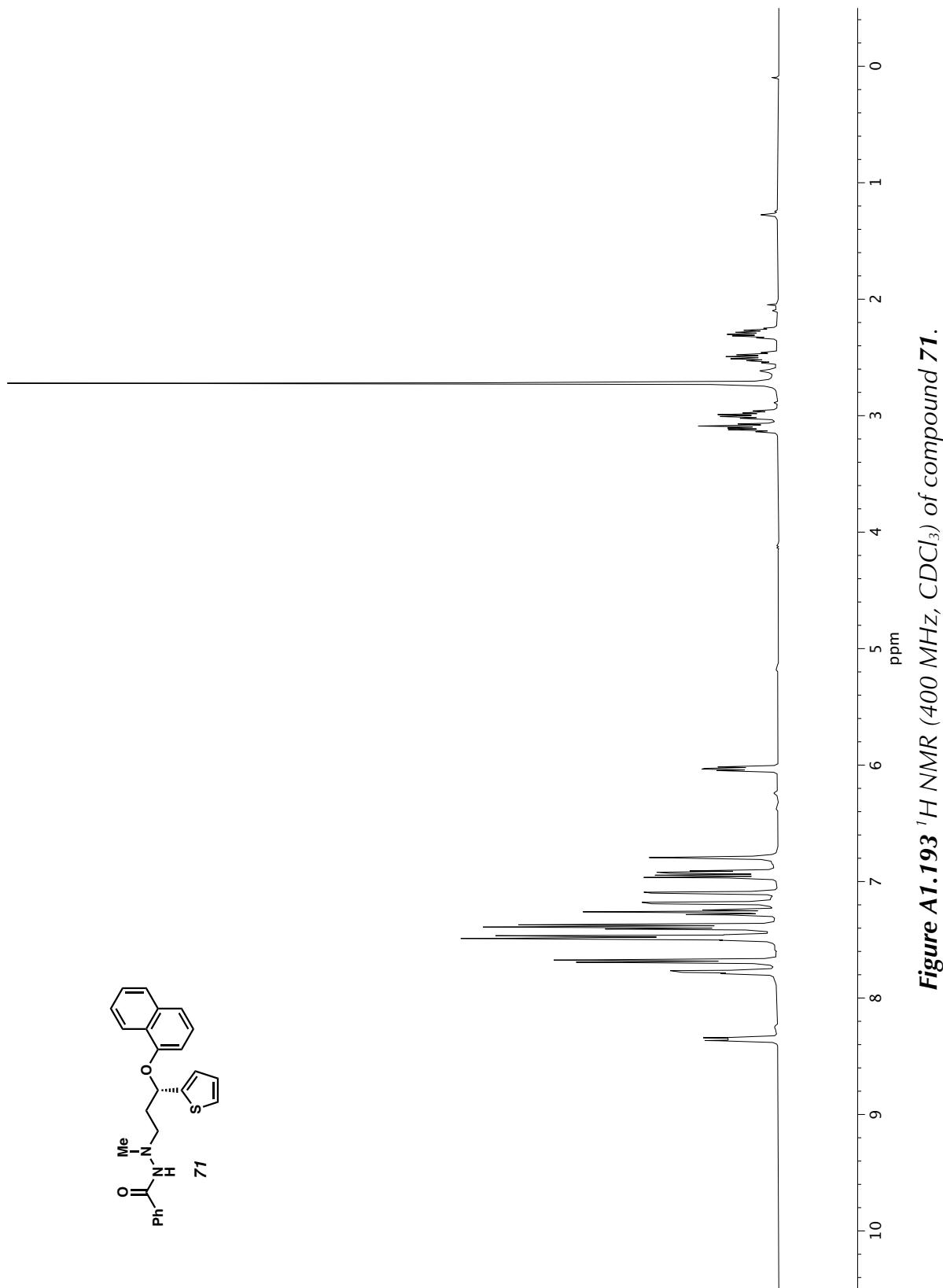
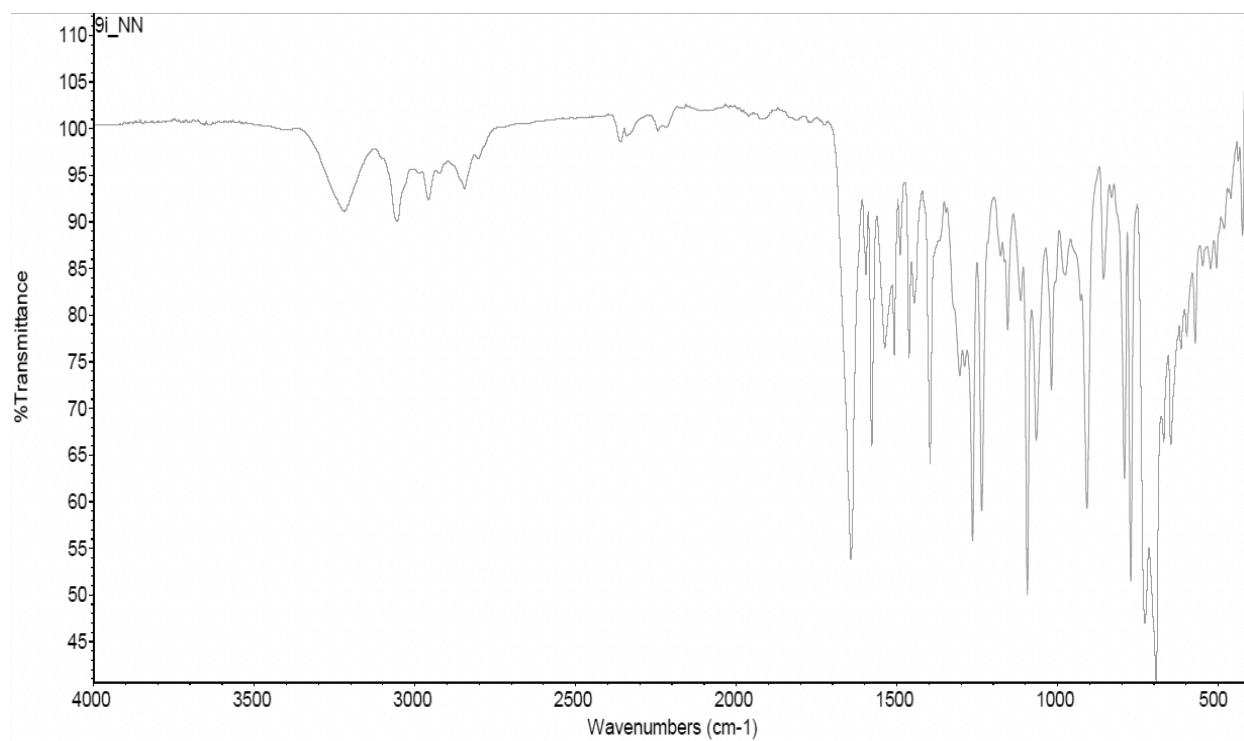
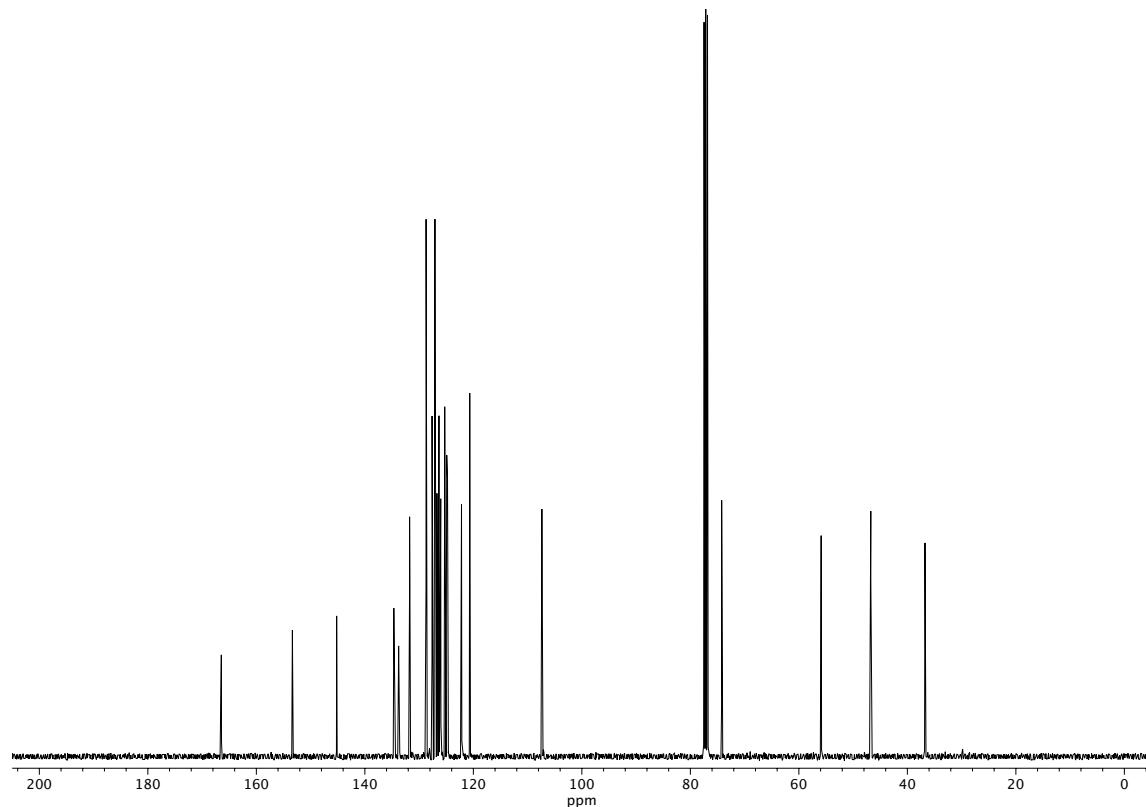


Figure A1.193  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 71.



**Figure A1.194** Infrared spectrum (Thin Film) of compound 71.



**Figure A1.195**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 71.

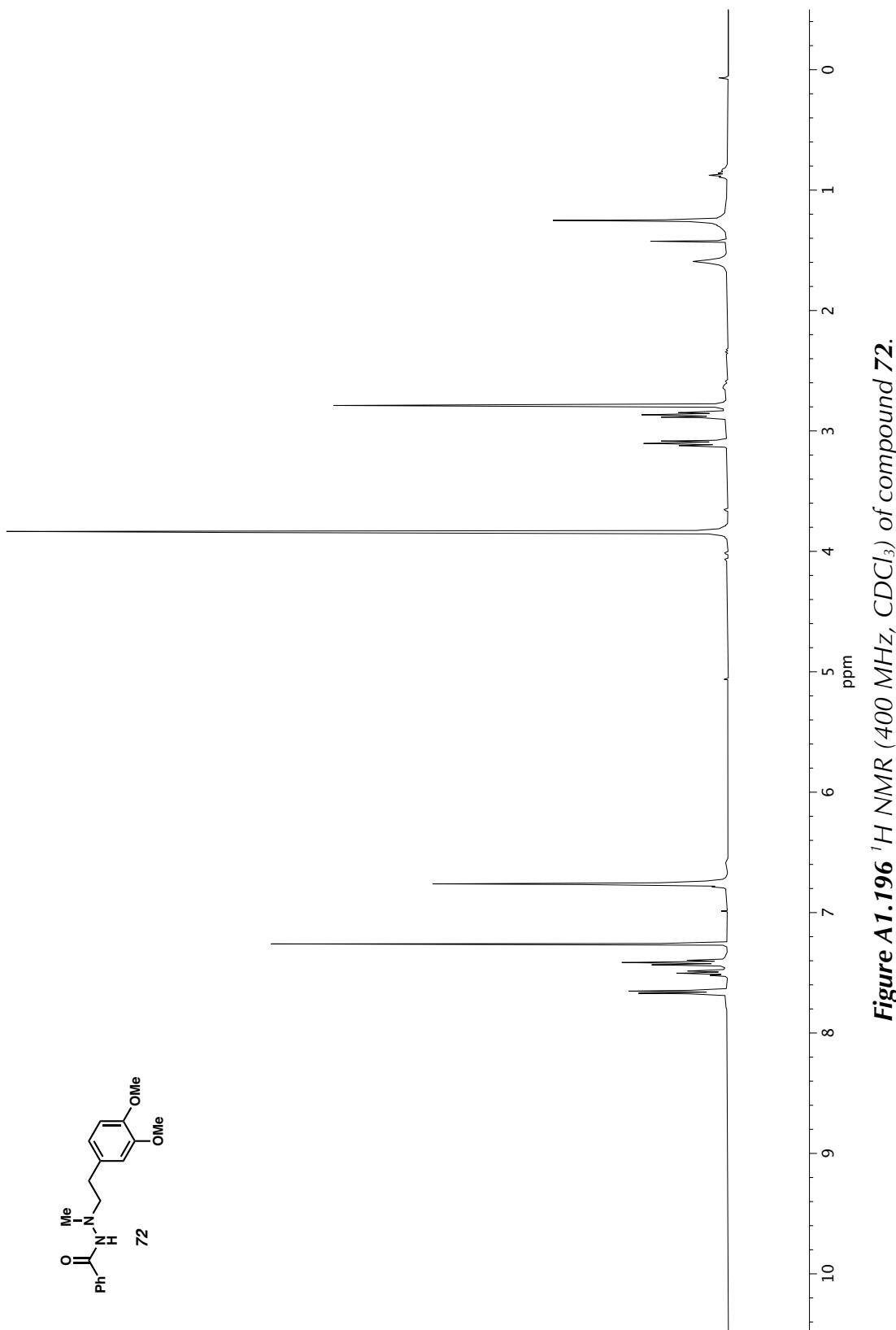
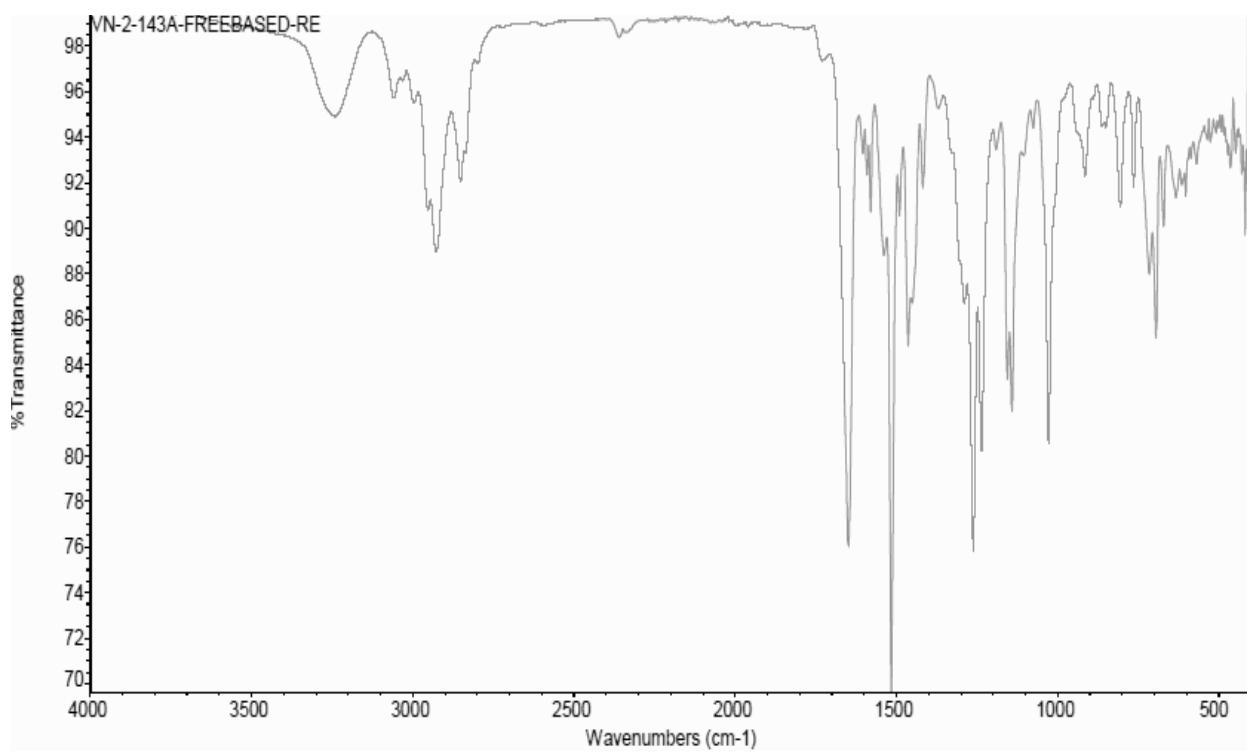
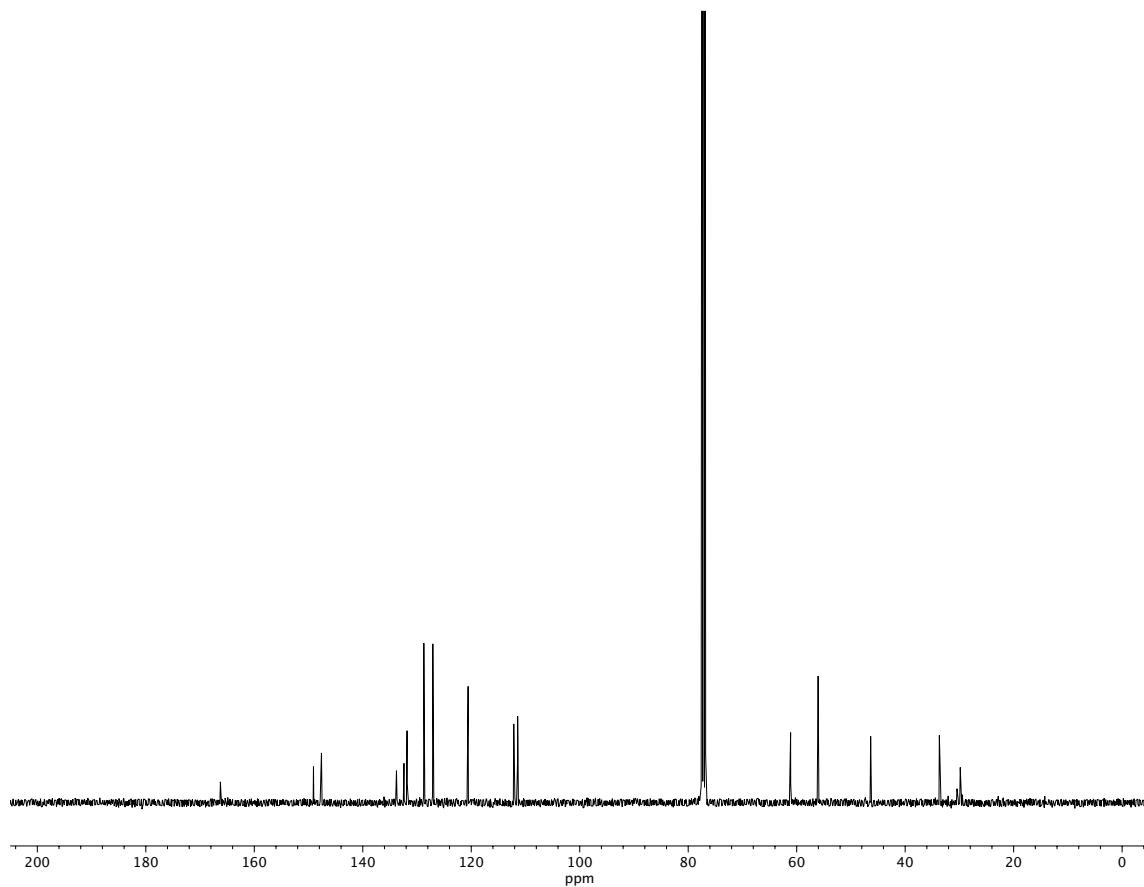


Figure A1.196  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 72.



**Figure A1.197** Infrared spectrum (Thin Film) of compound 72.



**Figure A1.198** <sup>13</sup>C NMR (101 MHz,  $CDCl_3$ ) of compound 72.

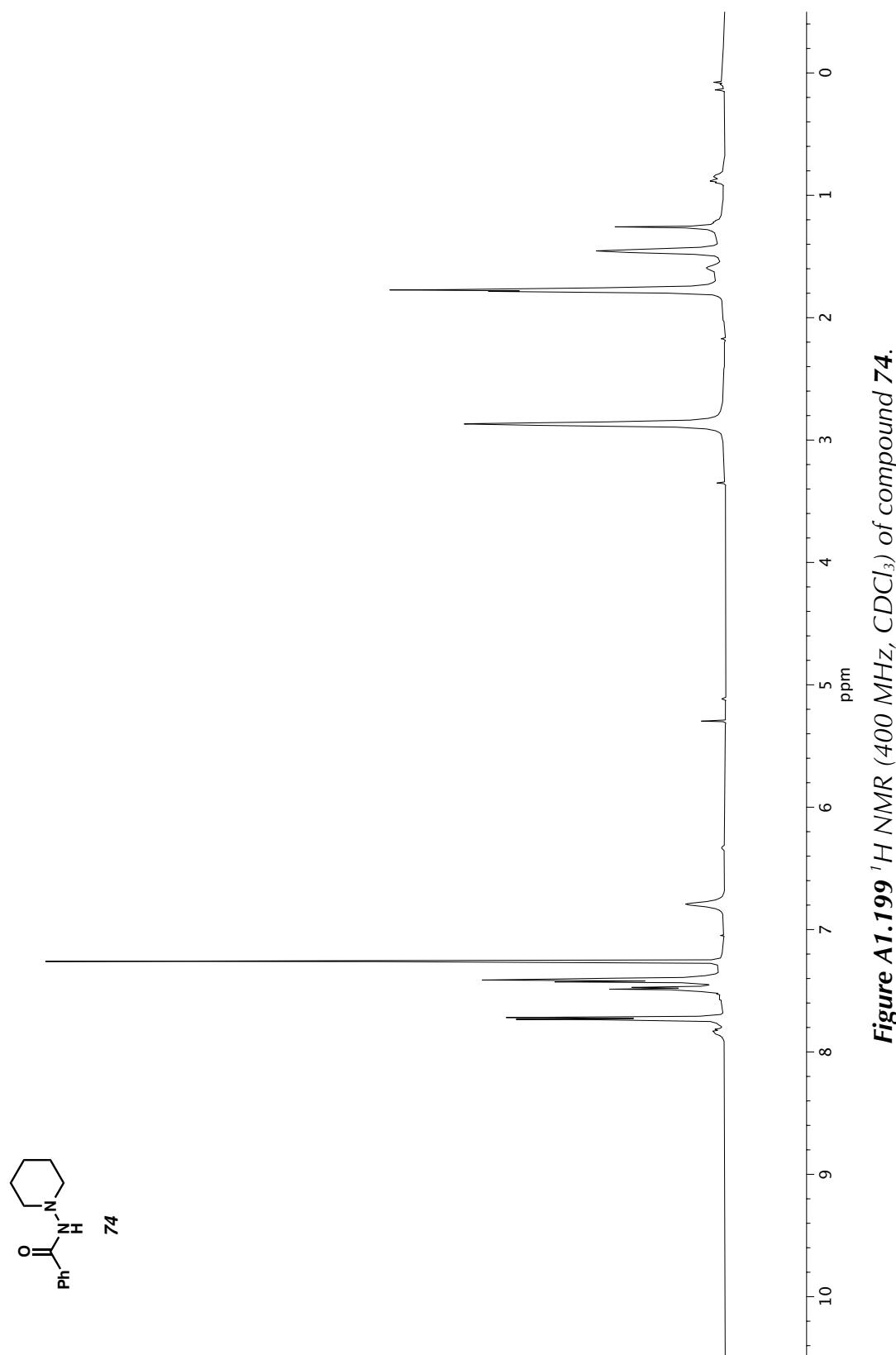
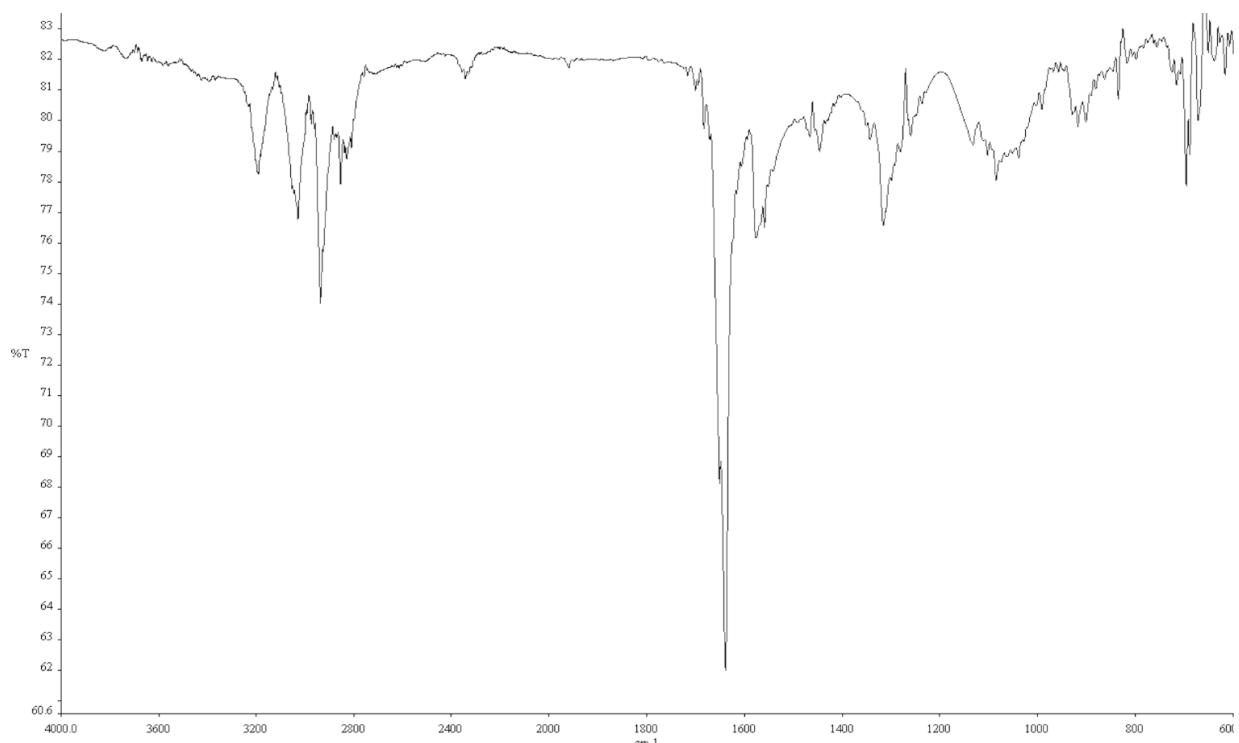
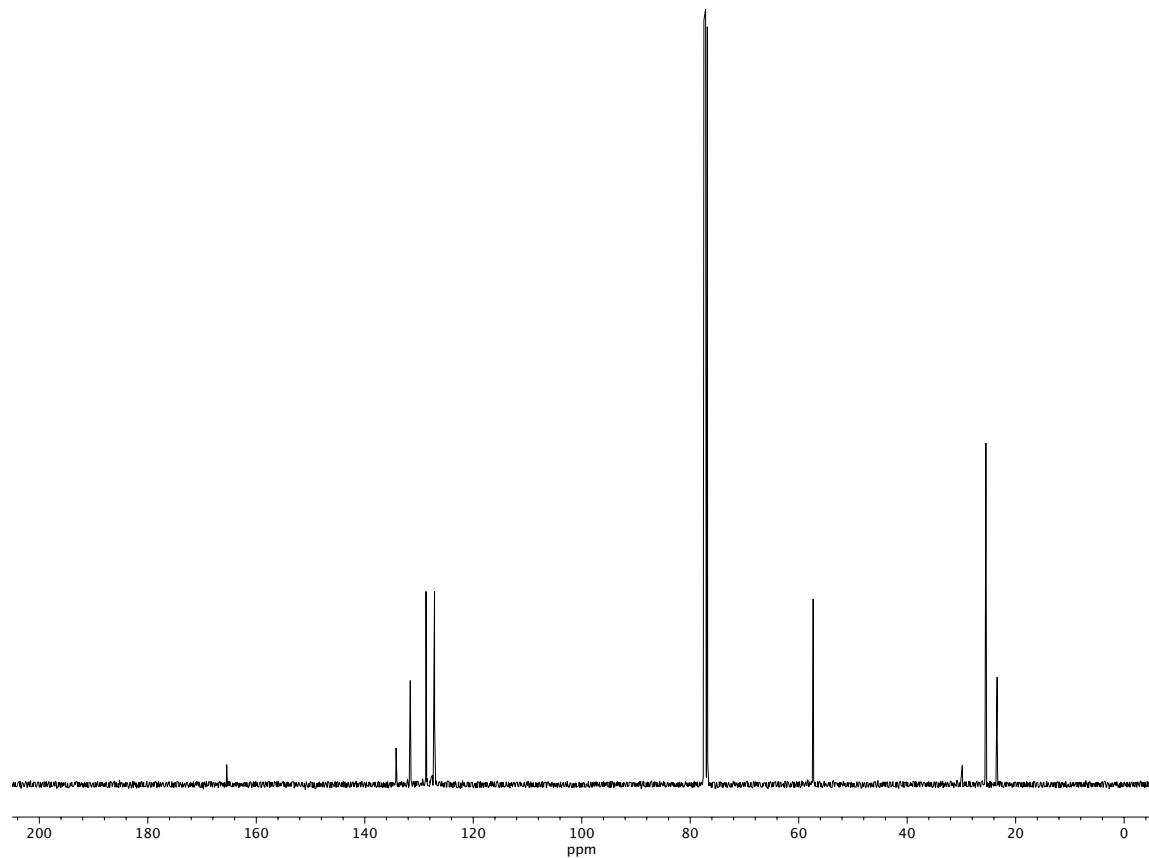


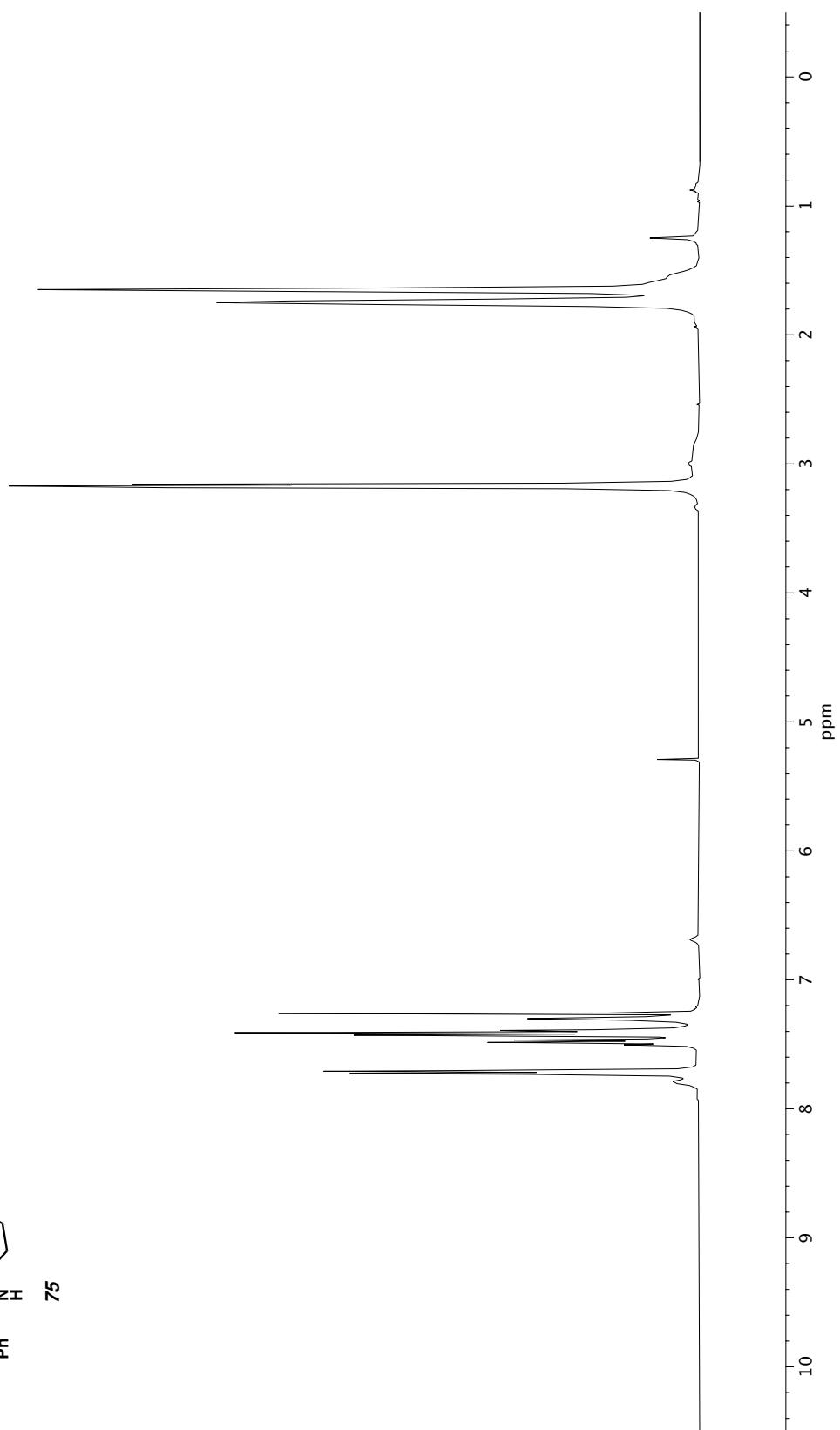
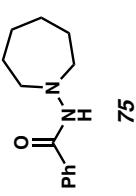
Figure A1.199  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 74.



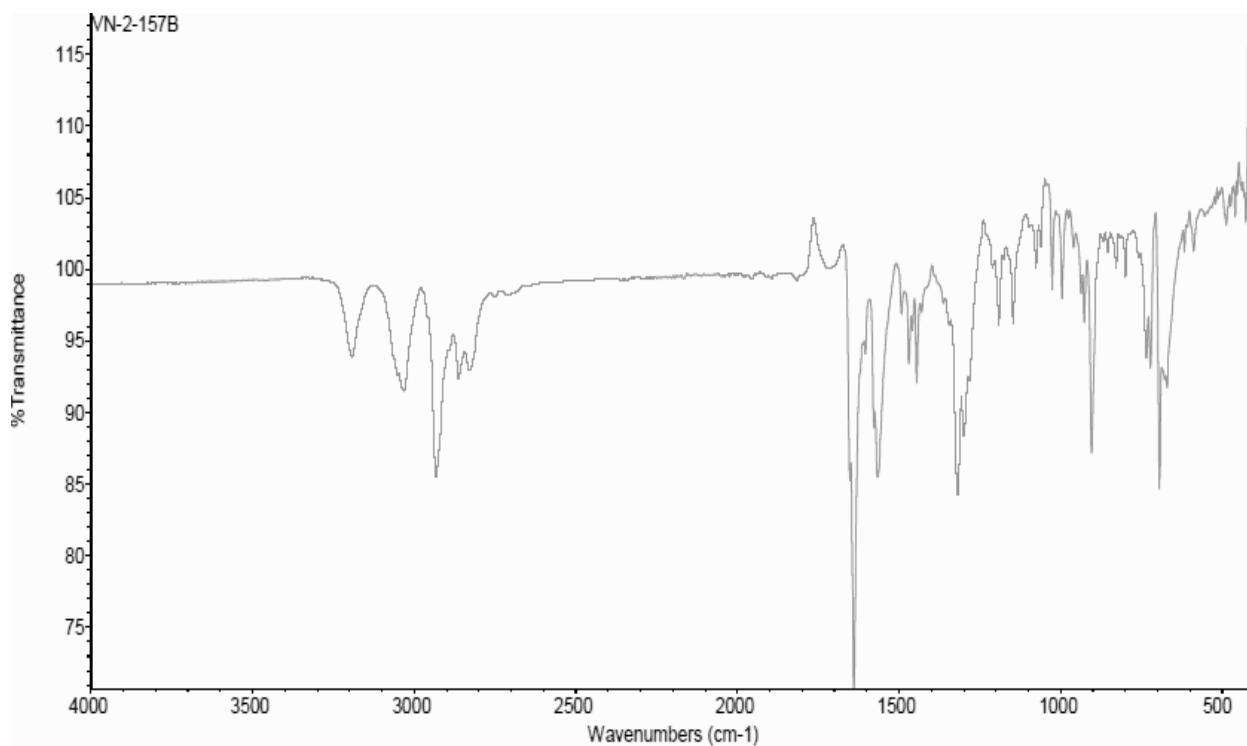
**Figure A1.200** Infrared spectrum (Thin Film, NaCl) of compound 74.



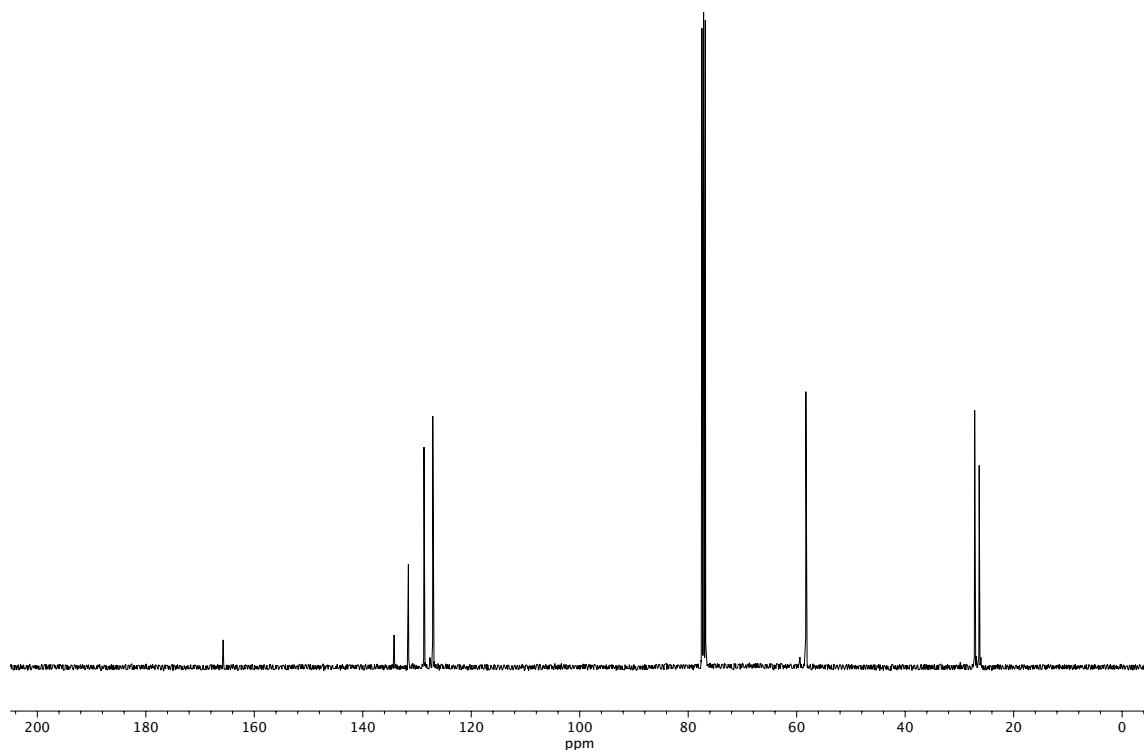
**Figure A1.201**  $^{13}C$  NMR (101 MHz,  $CDCl_3$ ) of compound 74.



**Figure A1.202**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 75.



**Figure A1.203** Infrared spectrum (Thin Film) of compound 75.



**Figure A1.204**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 75.

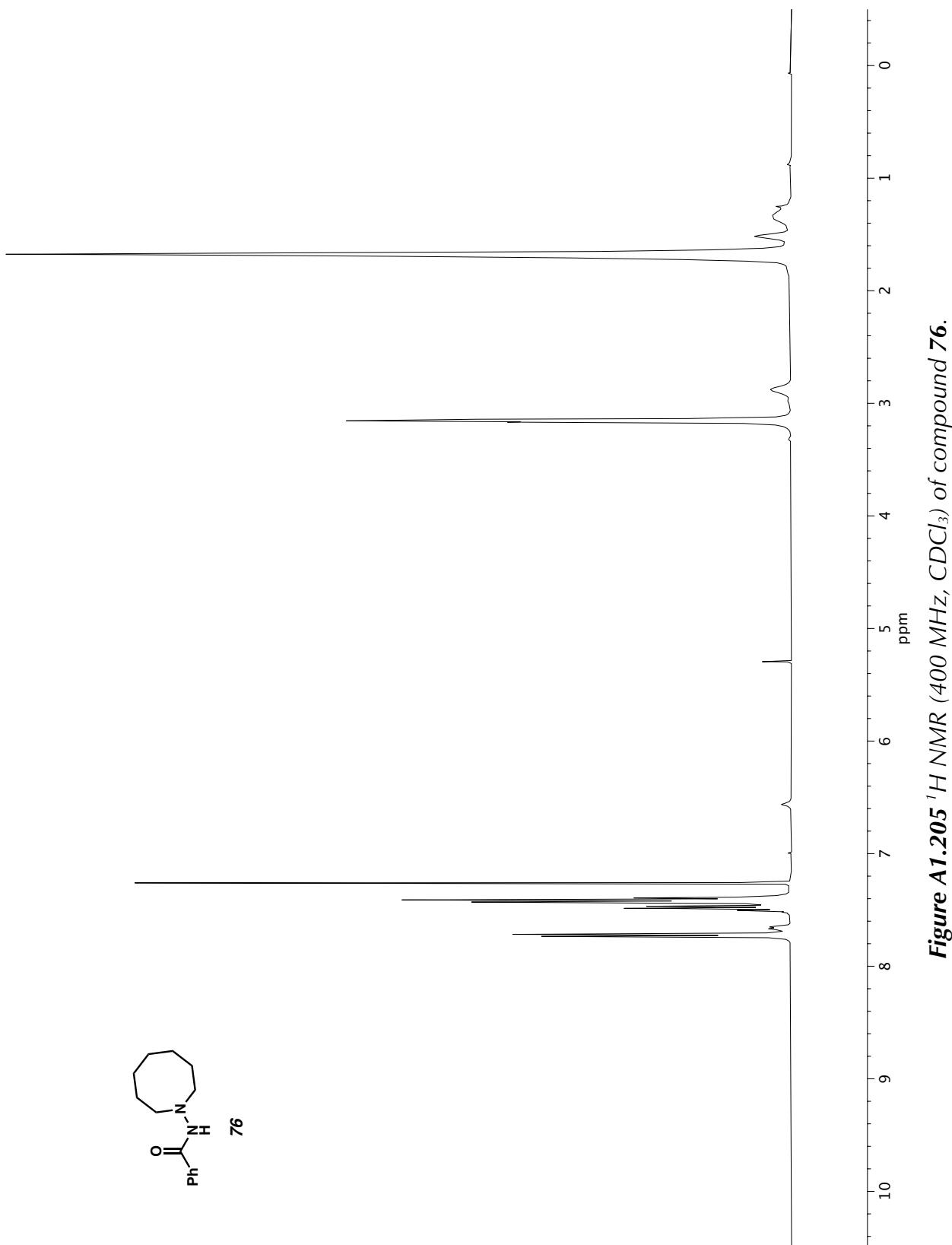
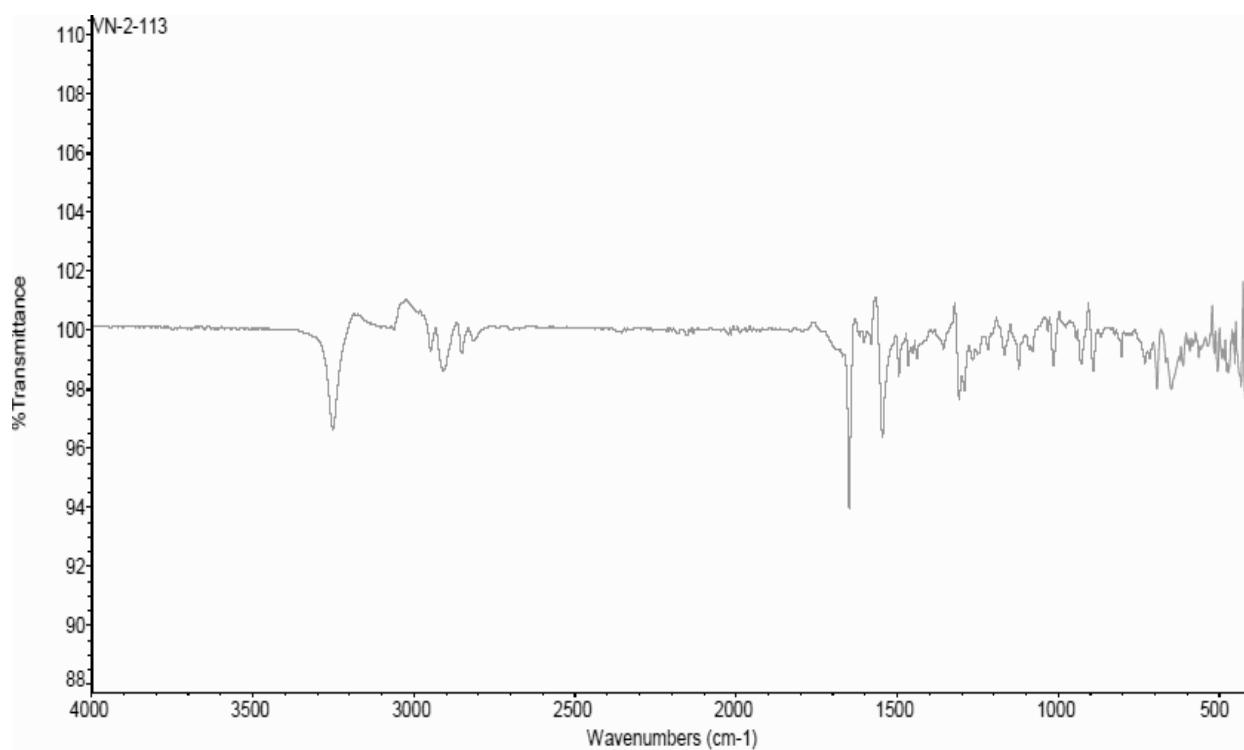
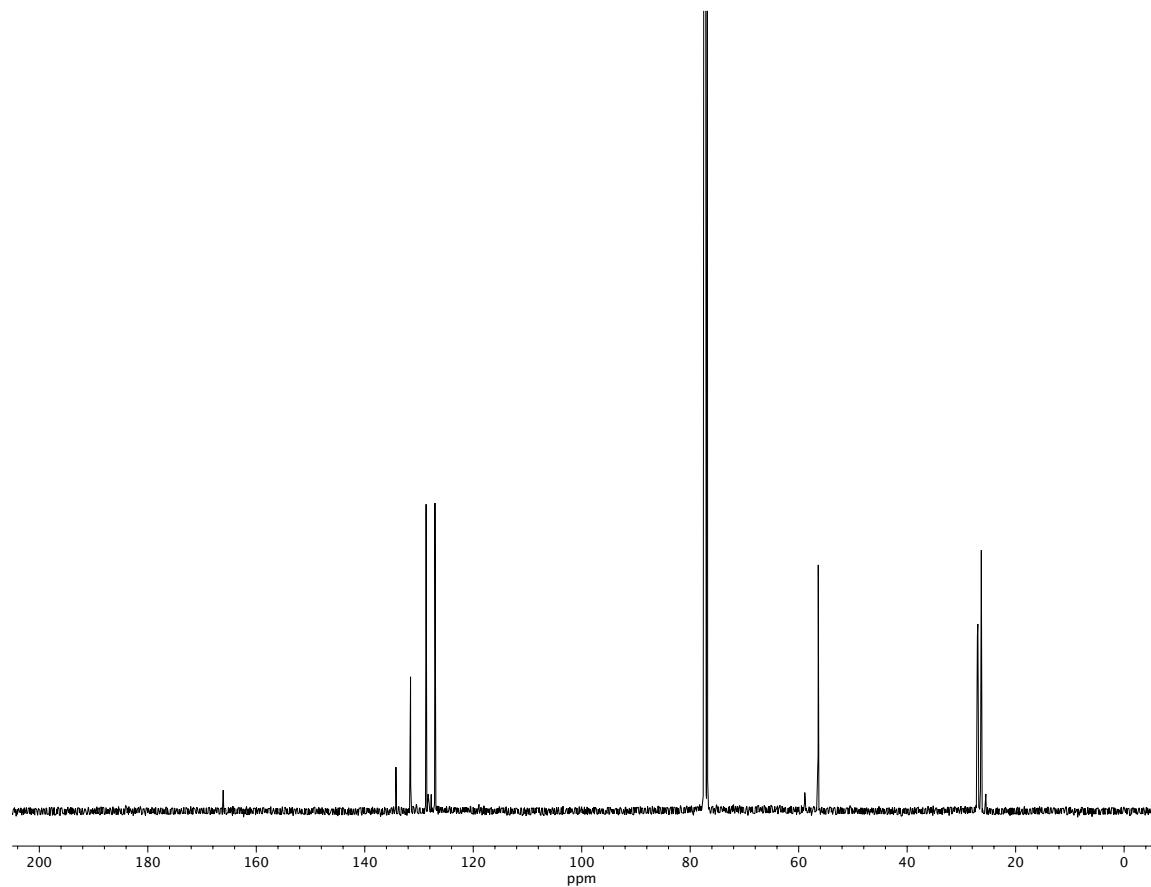


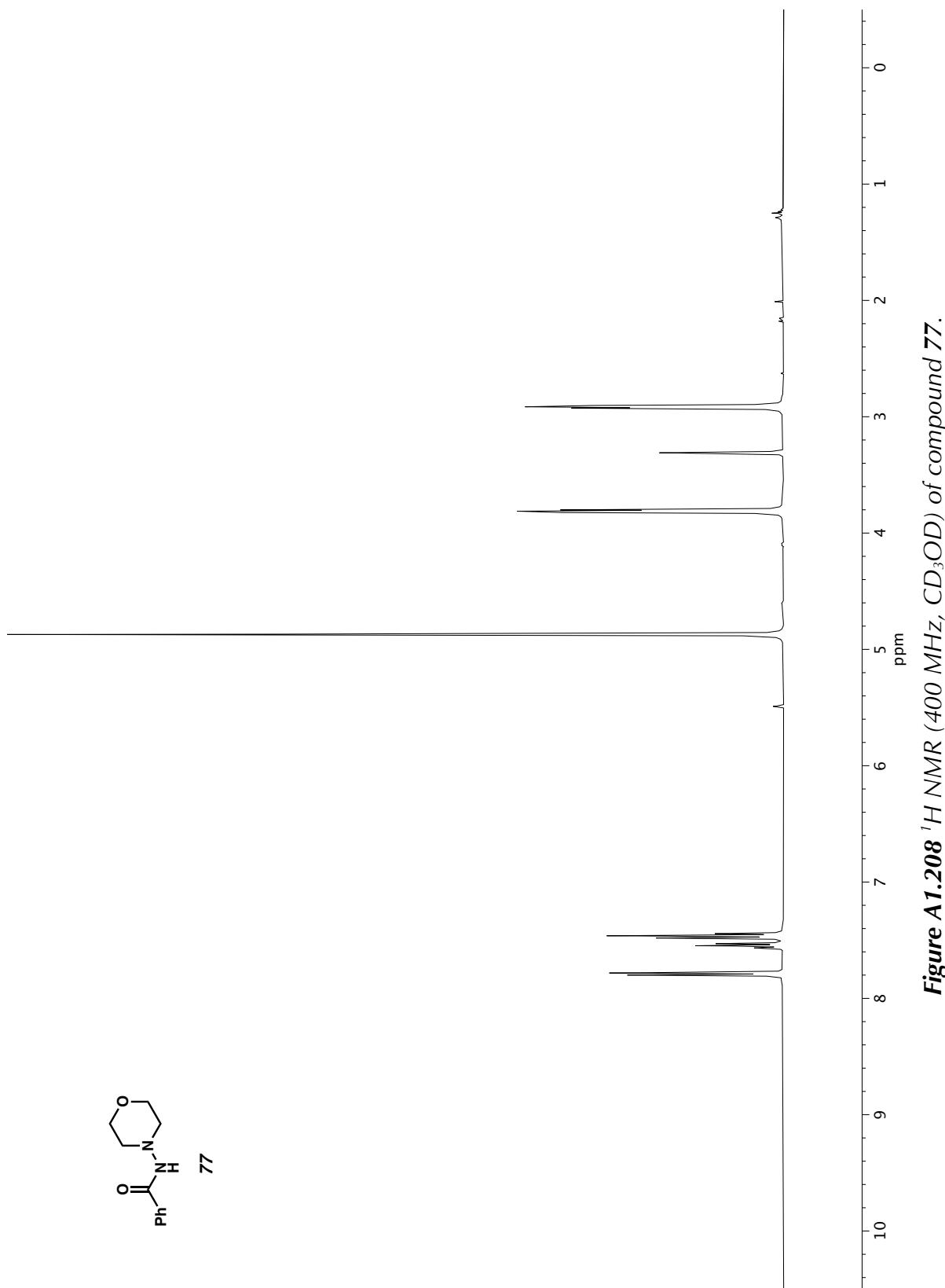
Figure A1.205  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 76.



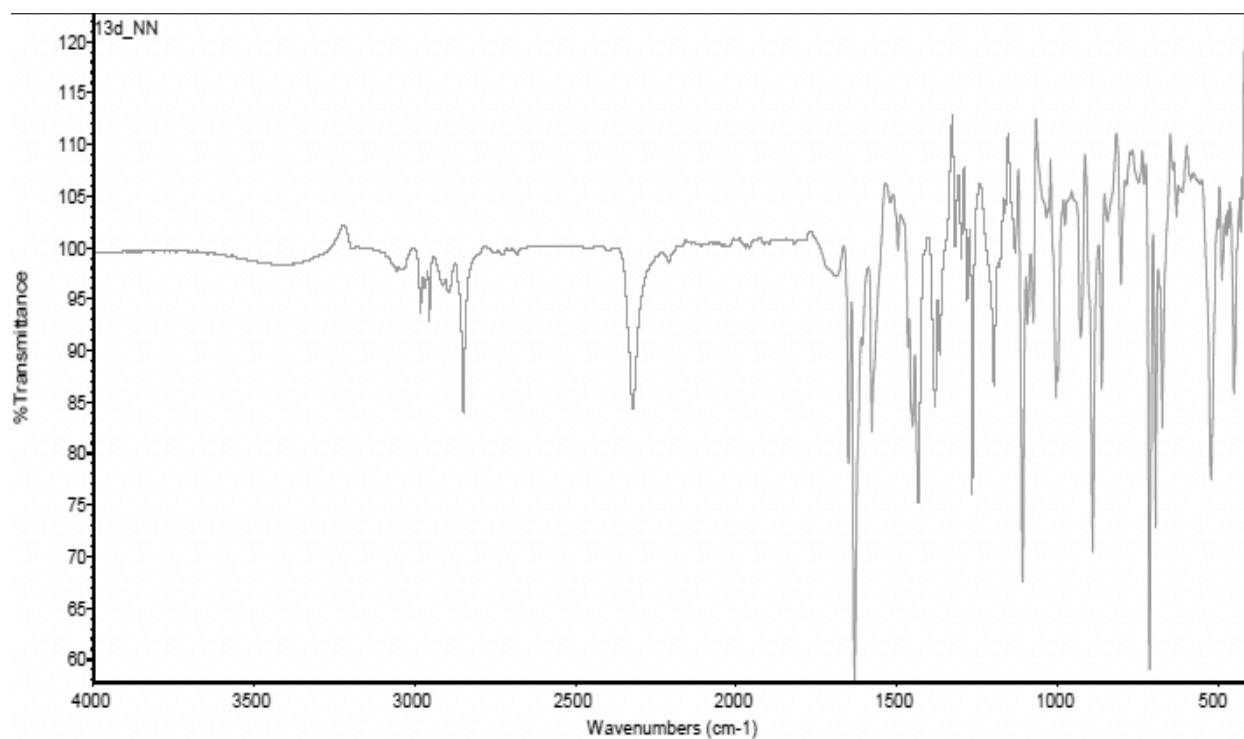
**Figure A1.206** Infrared spectrum (Thin Film) of compound 76.



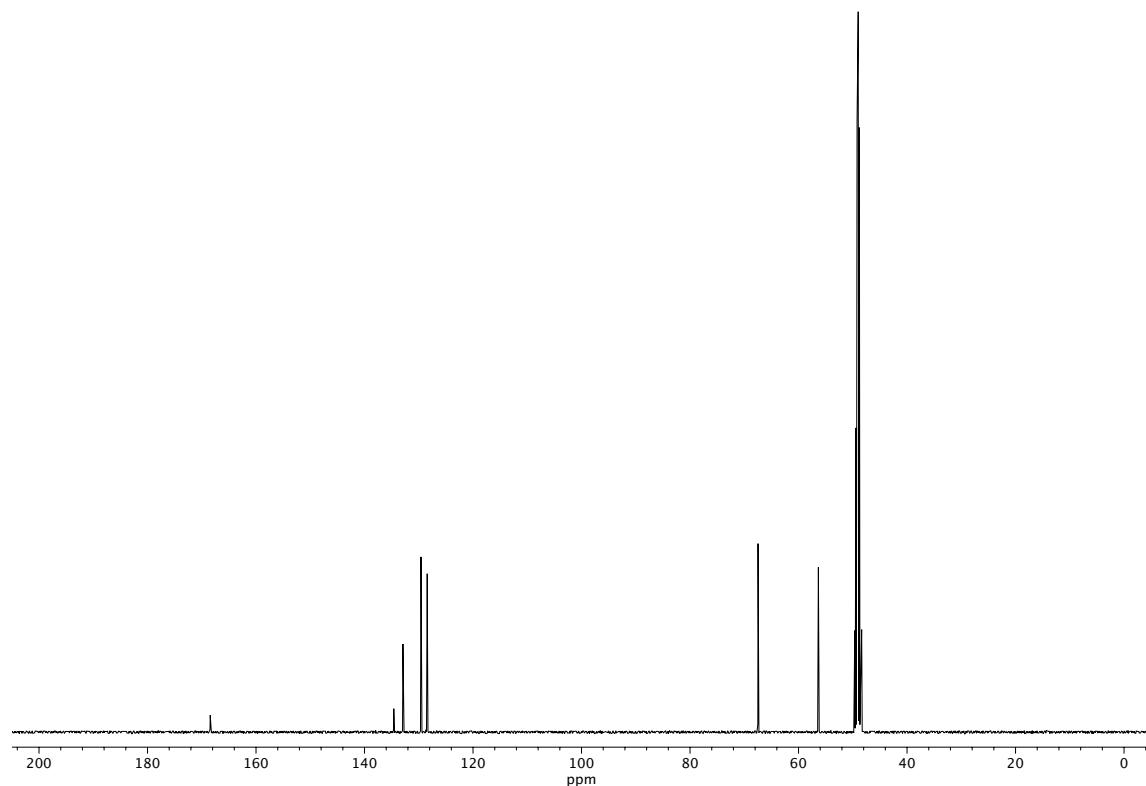
**Figure A1.207** <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) of compound 76.



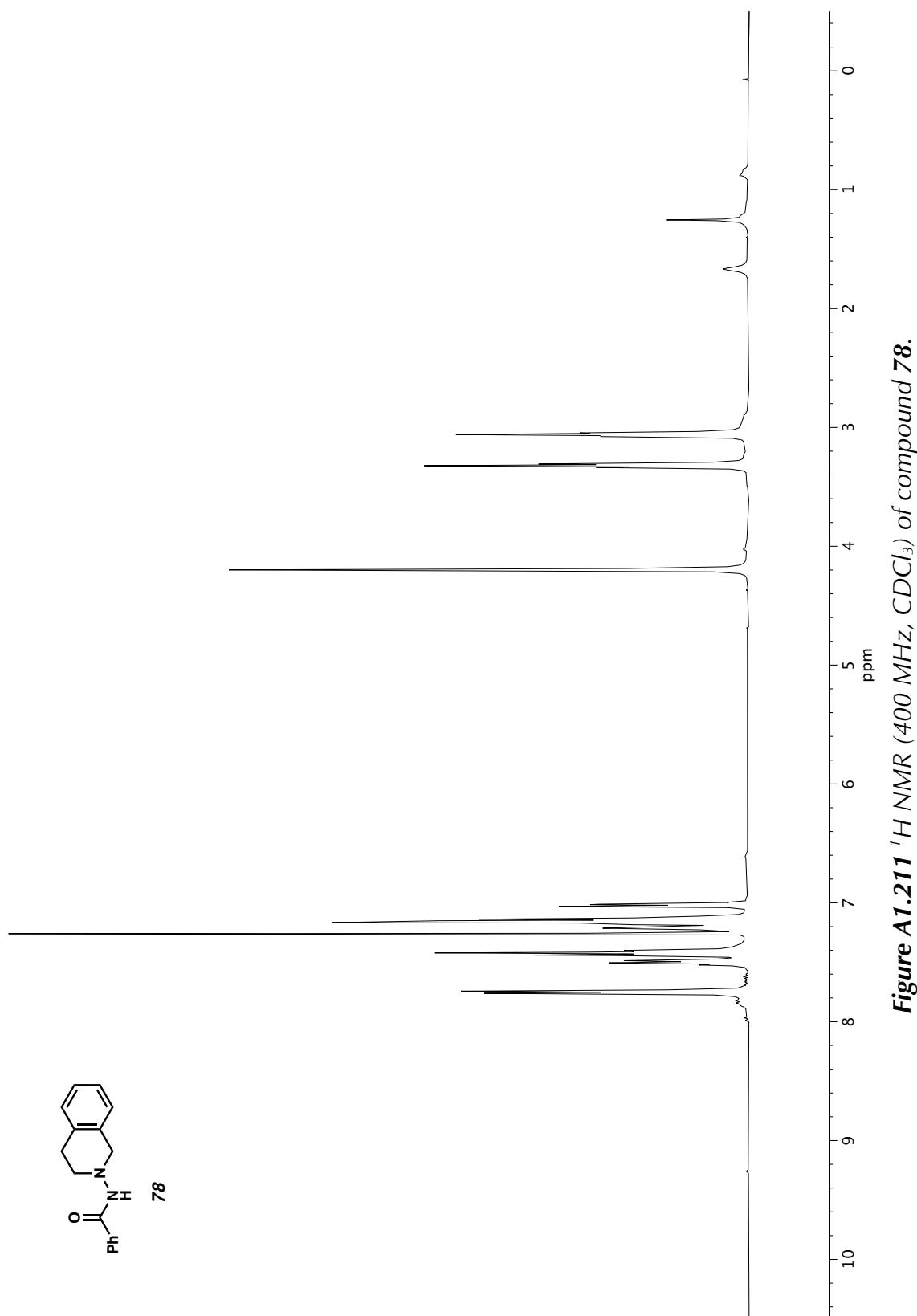
**Figure A1.208**  $^1\text{H}$  NMR (400 MHz,  $\text{CD}_3\text{OD}$ ) of compound 77.



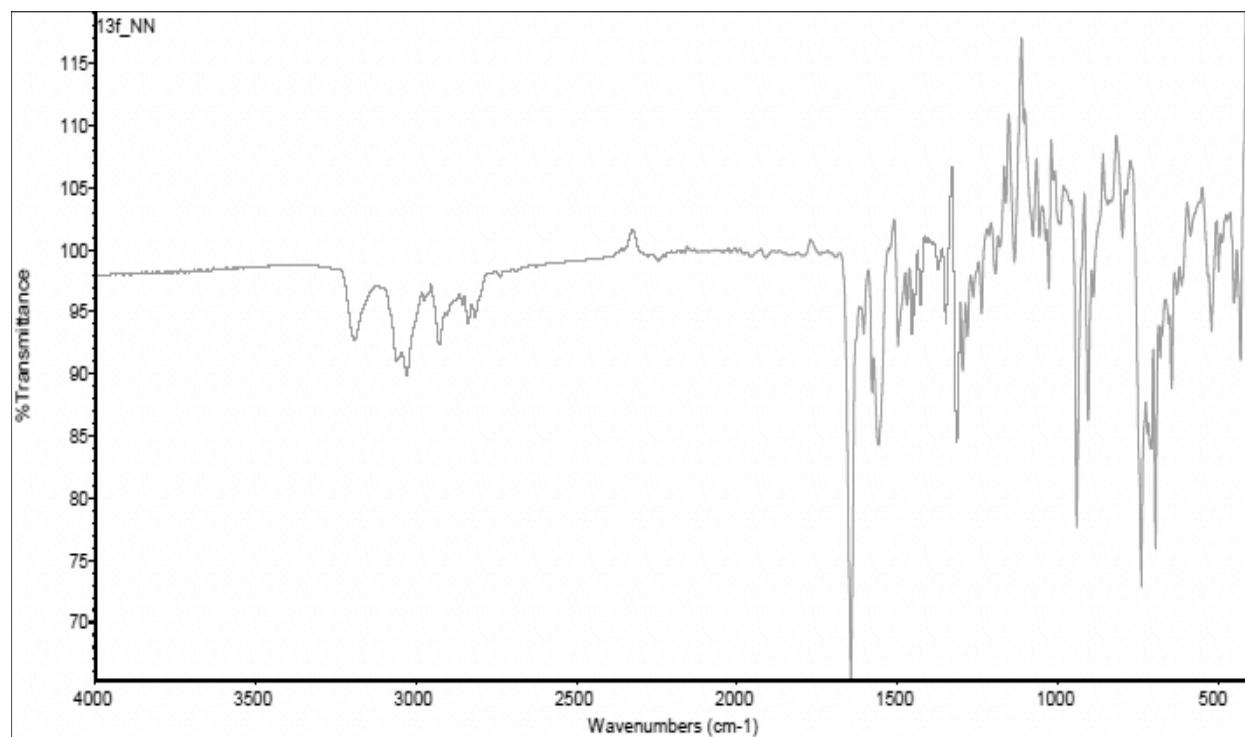
**Figure A1.209** Infrared spectrum (Thin Film) of compound 77.



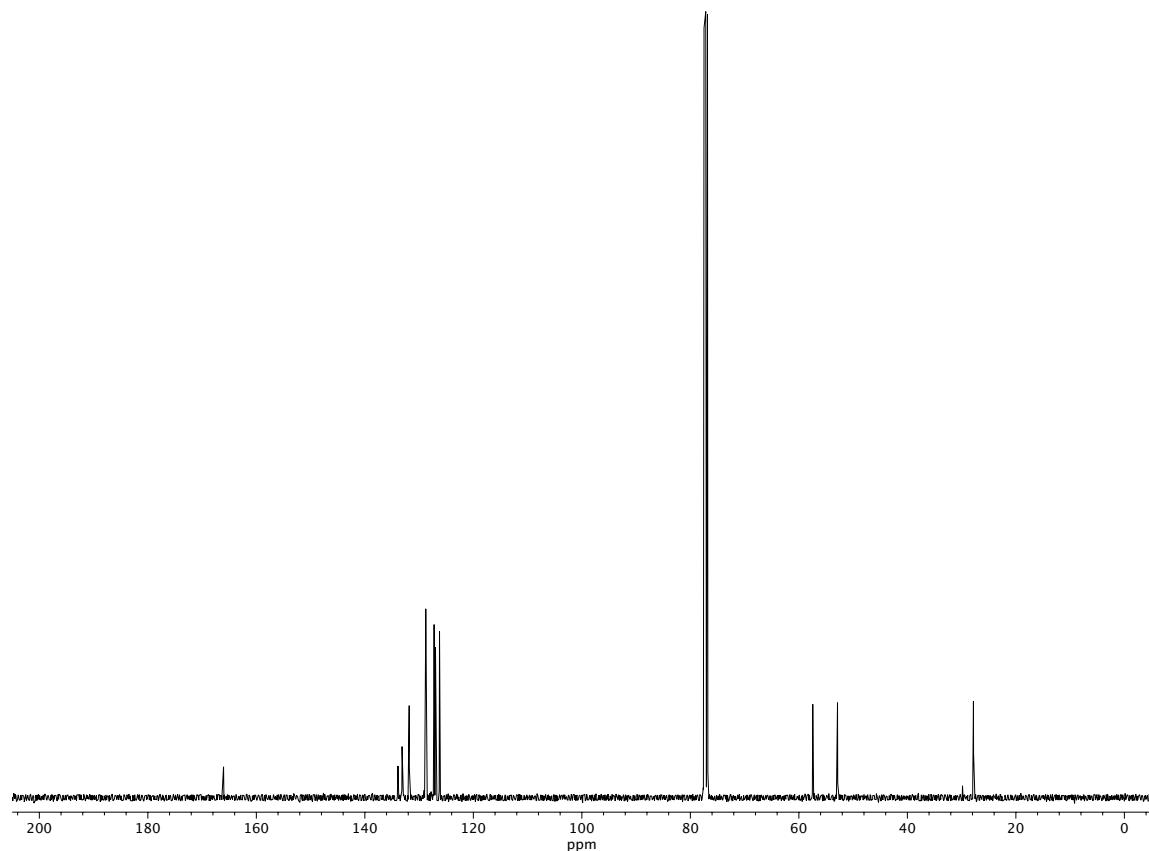
**Figure A1.210**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CD}_3\text{OD}$ ) of compound 77.



**Figure A1.211**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 78.



**Figure A1.212** Infrared spectrum (Thin Film) of compound **78**.



**Figure A1.213**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **78**.

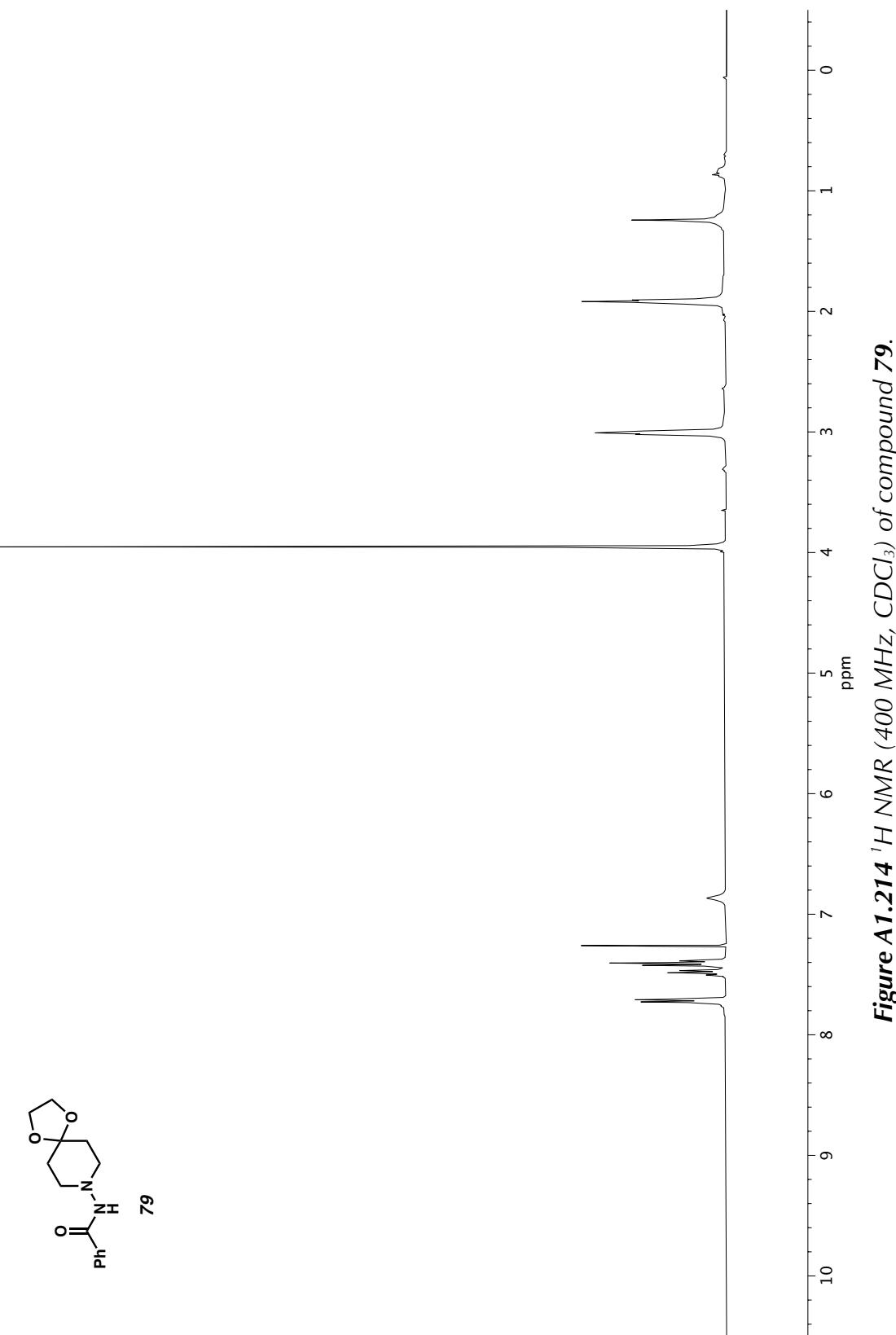
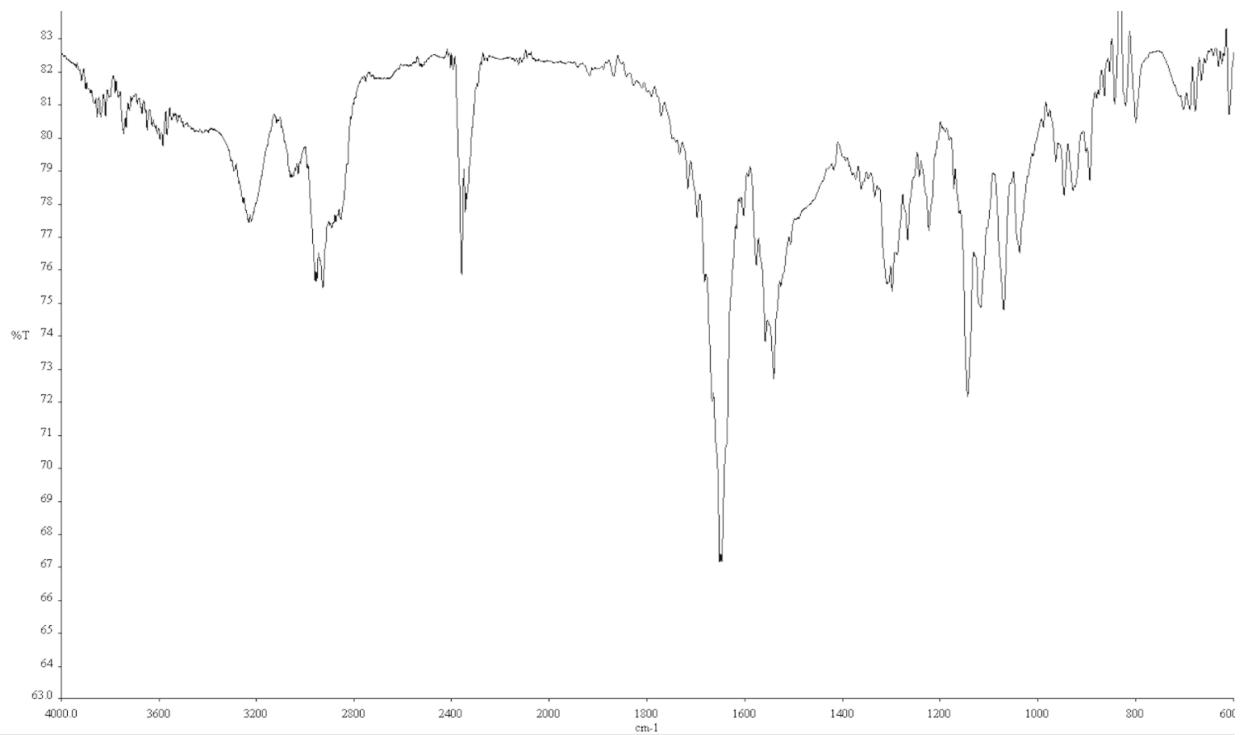
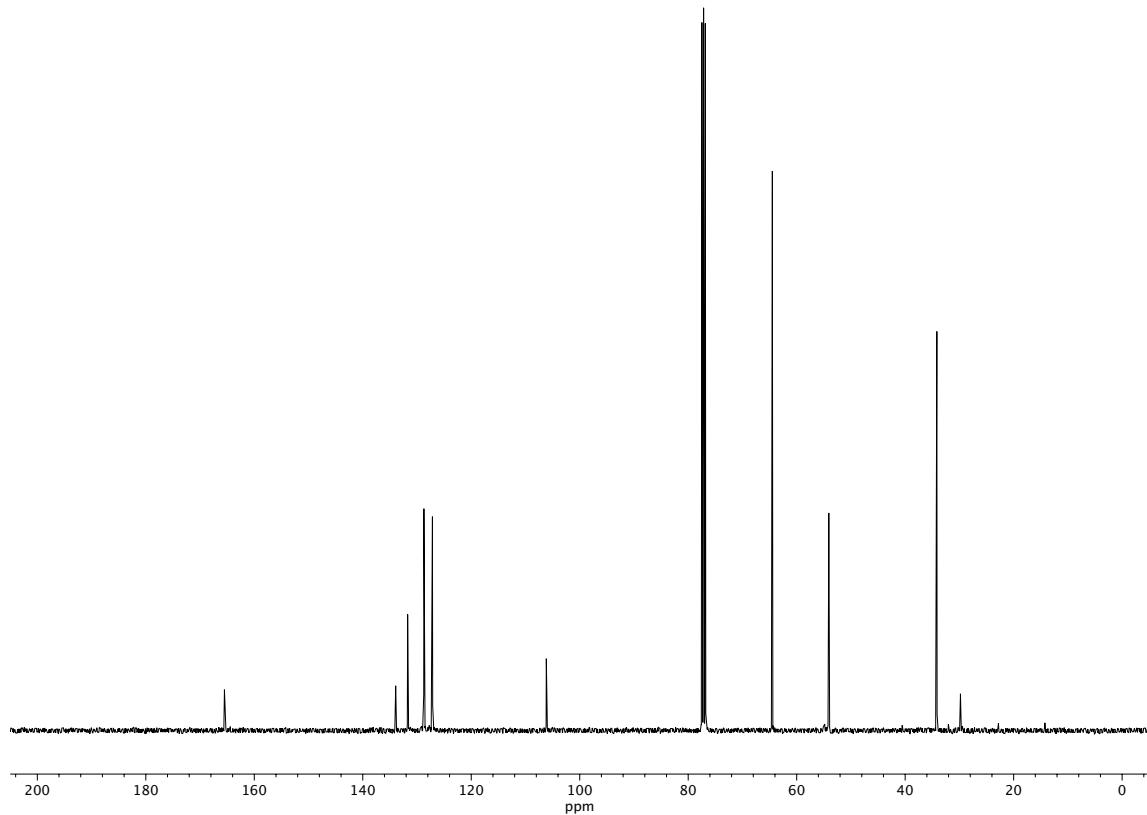


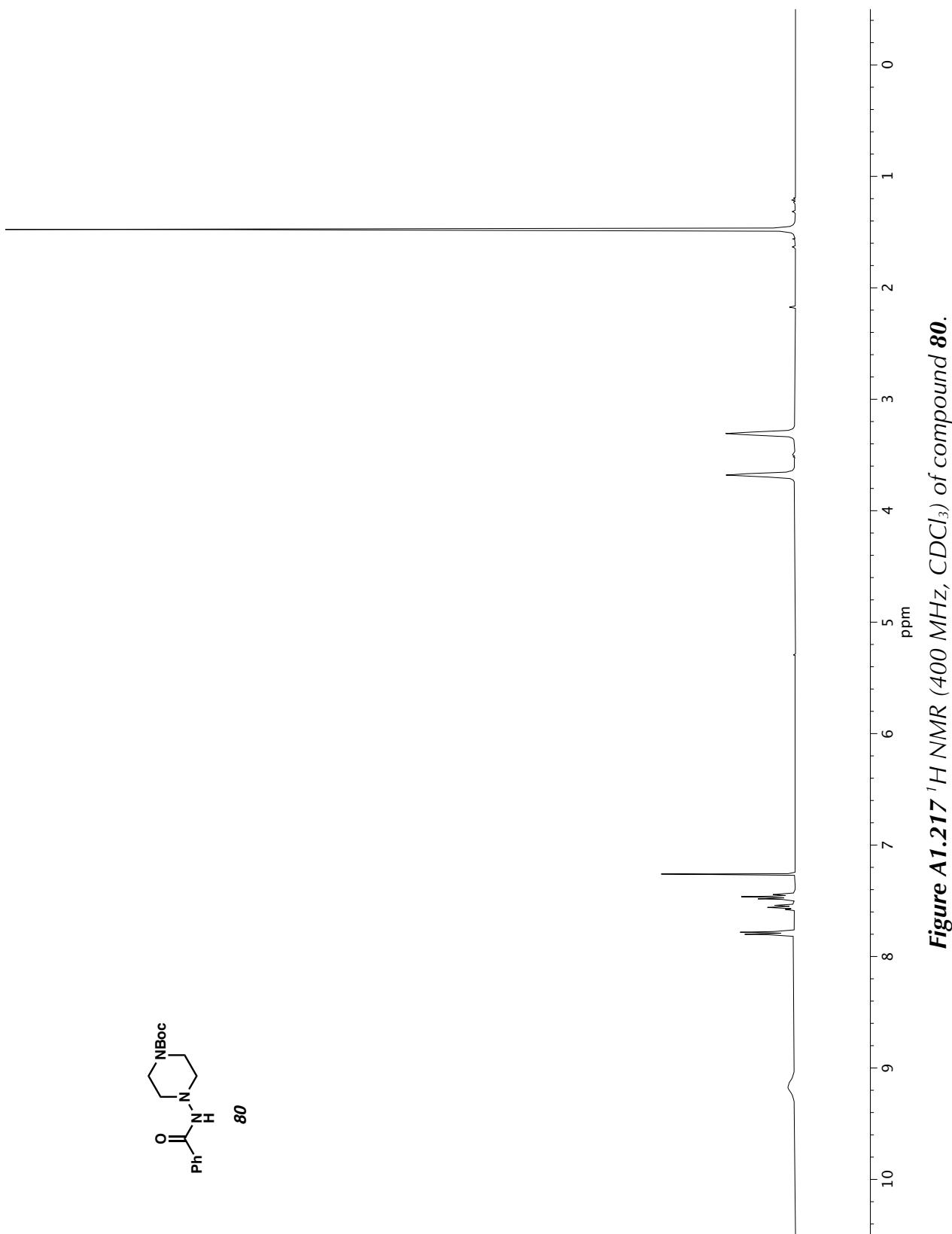
Figure A1.214  $^1\text{H}$  NMR (400 MHz, CDCl<sub>3</sub>) of compound 79.



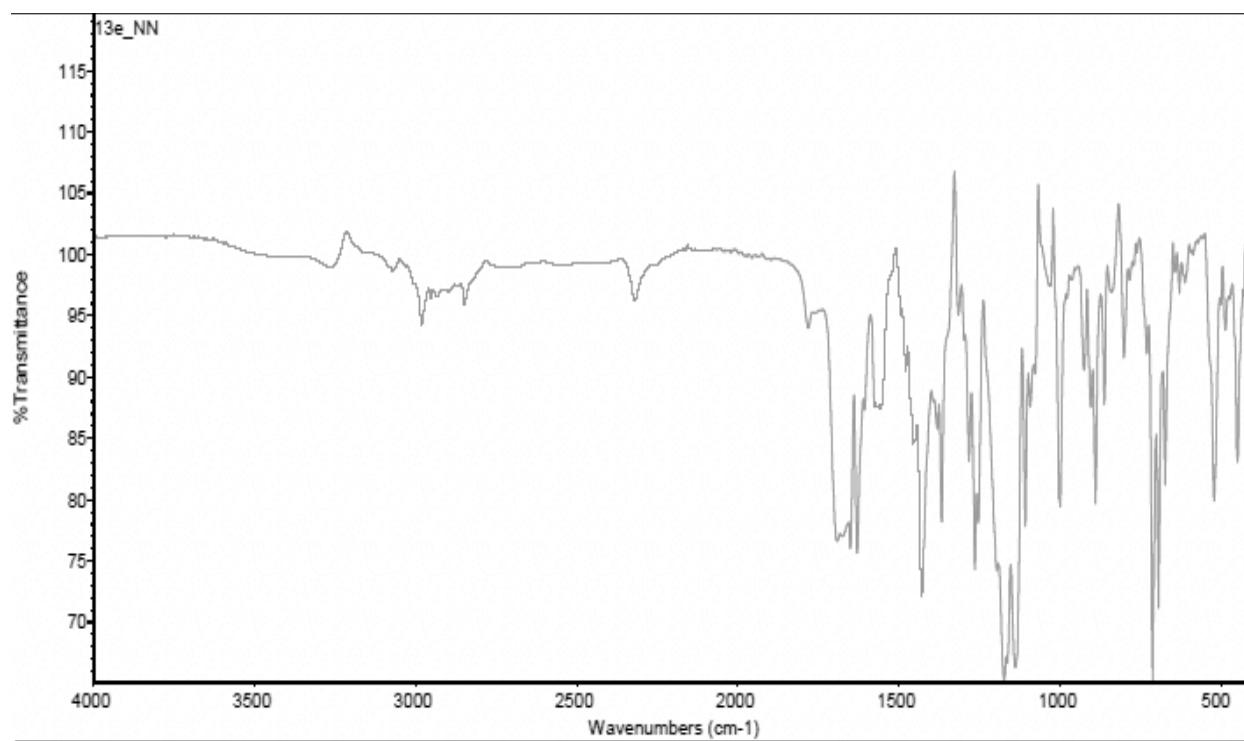
**Figure A1.215** Infrared spectrum (Thin Film) of compound 79.



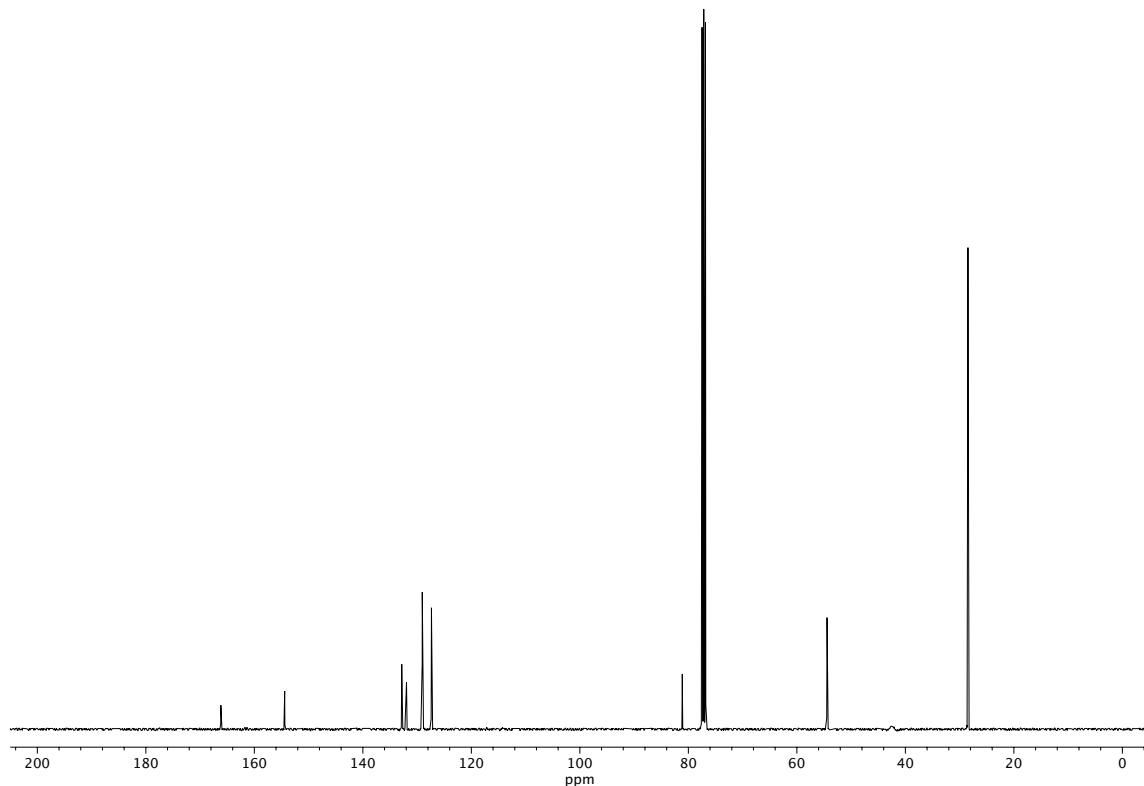
**Figure A1.216**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound 79.



**Figure A1.217**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 80.



**Figure A1.218** Infrared spectrum (Thin Film) of compound **80**.



**Figure A1.219**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **80**.

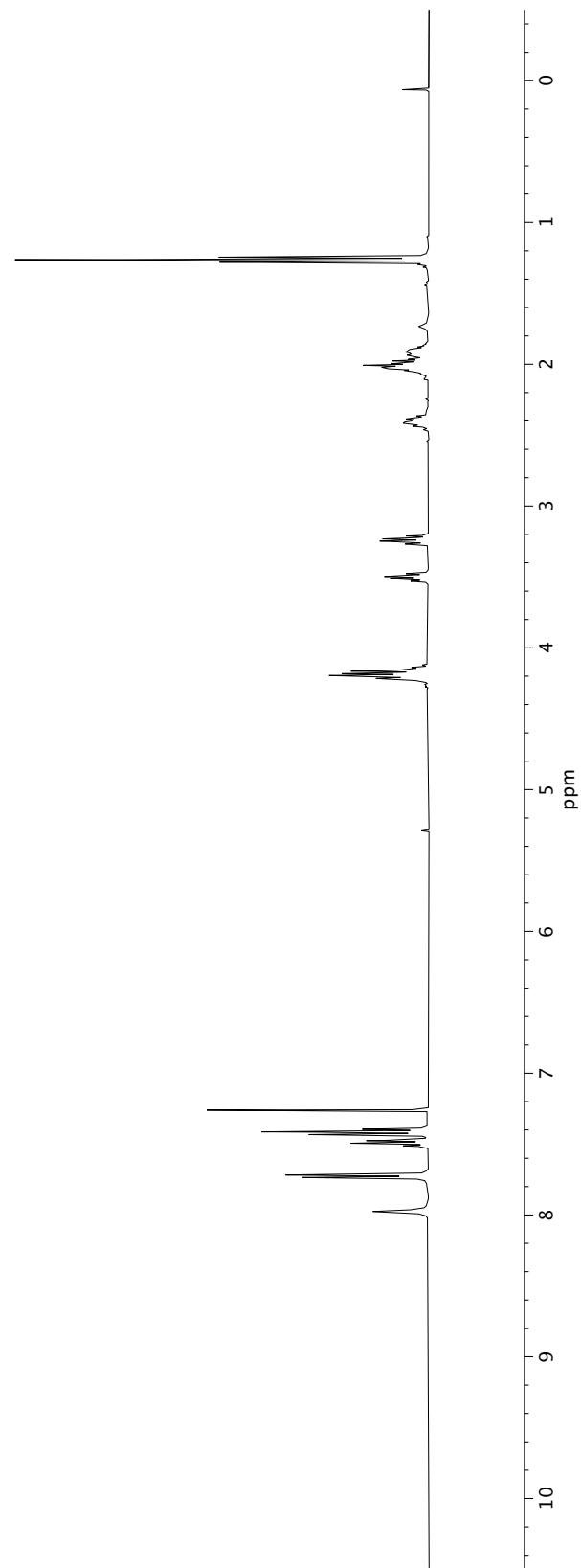
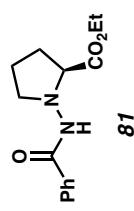
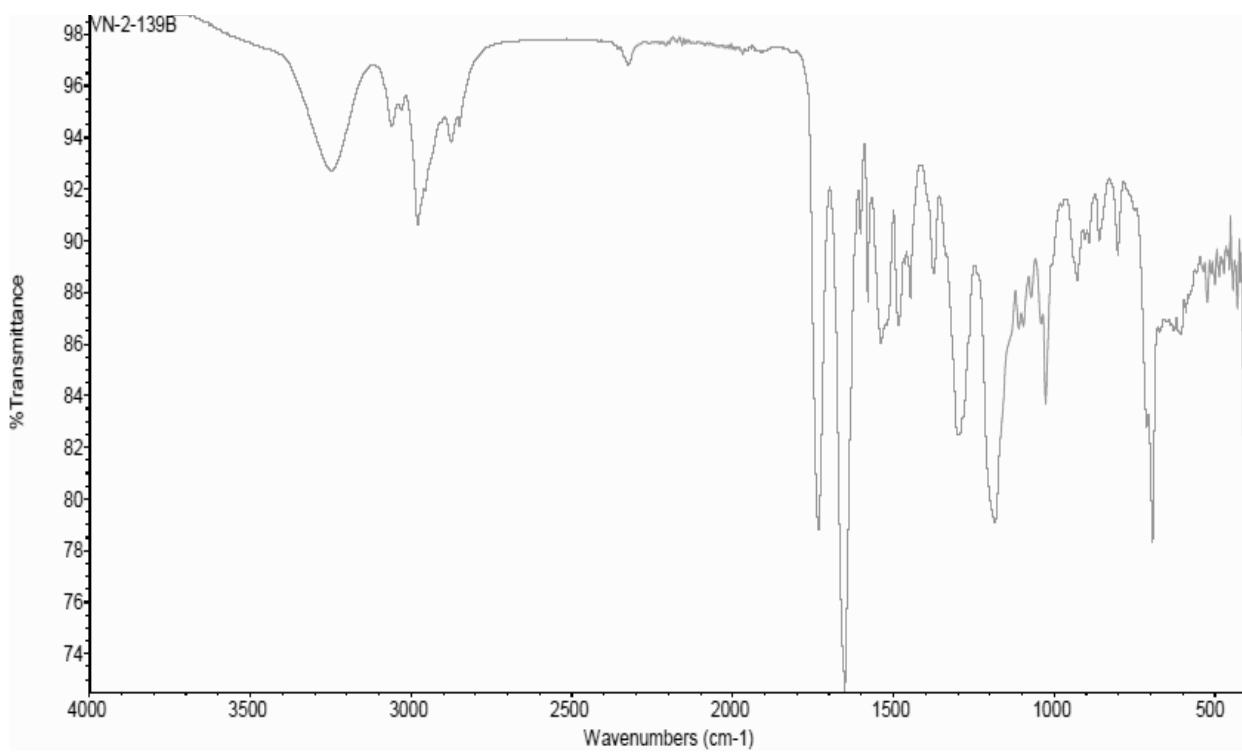
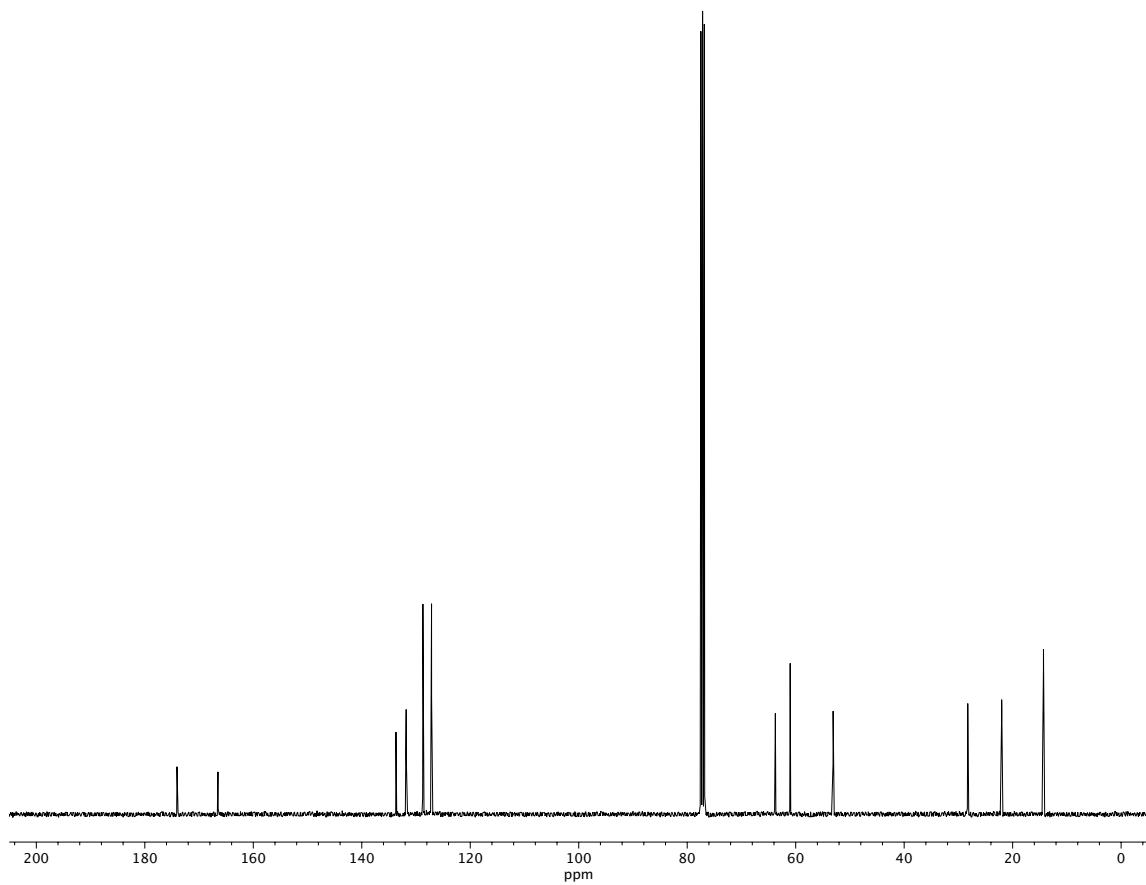


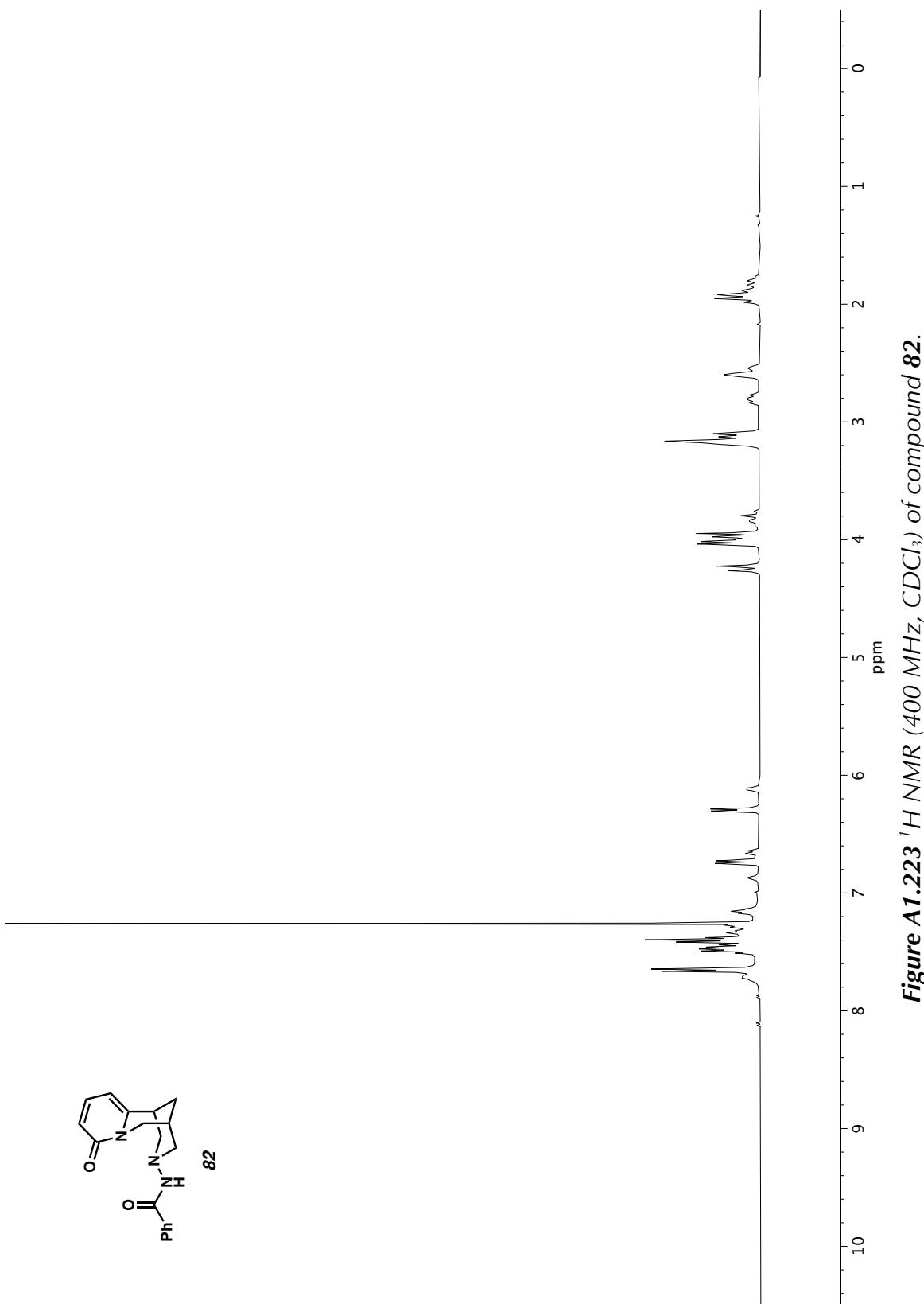
Figure A1.220  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 81.



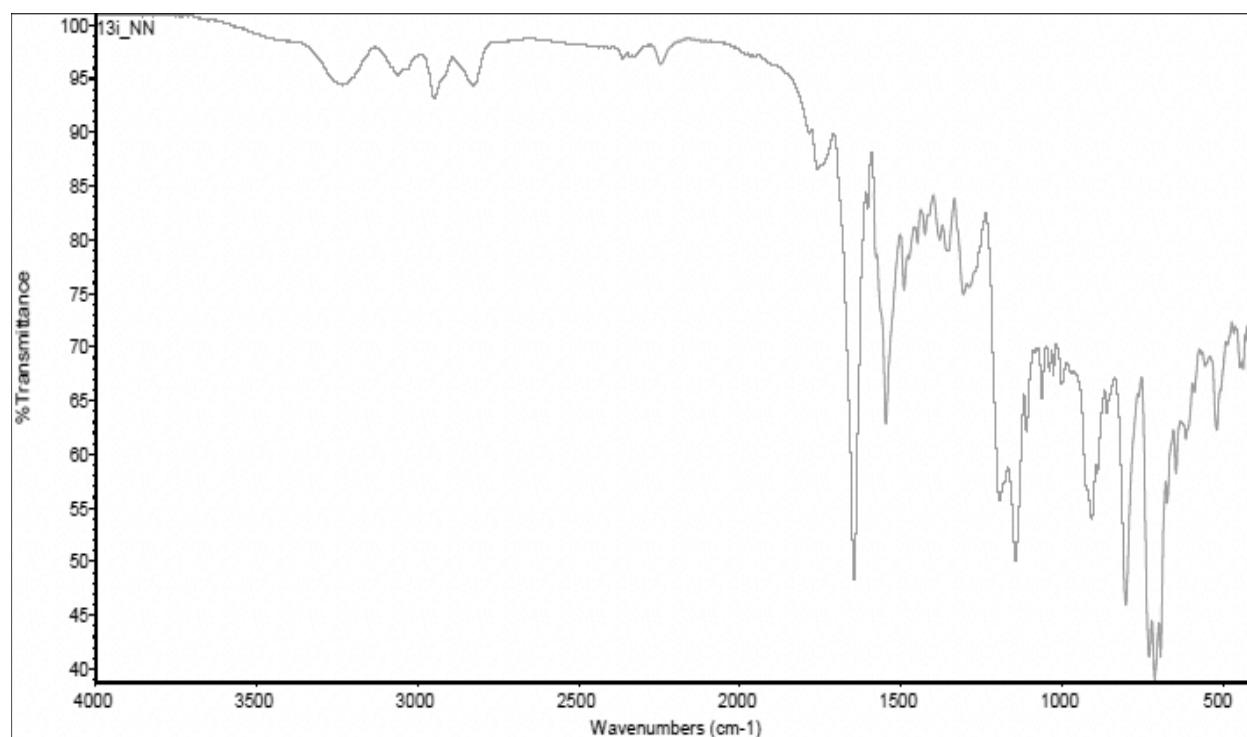
**Figure A1.221** Infrared spectrum (Thin Film) of compound **81**.



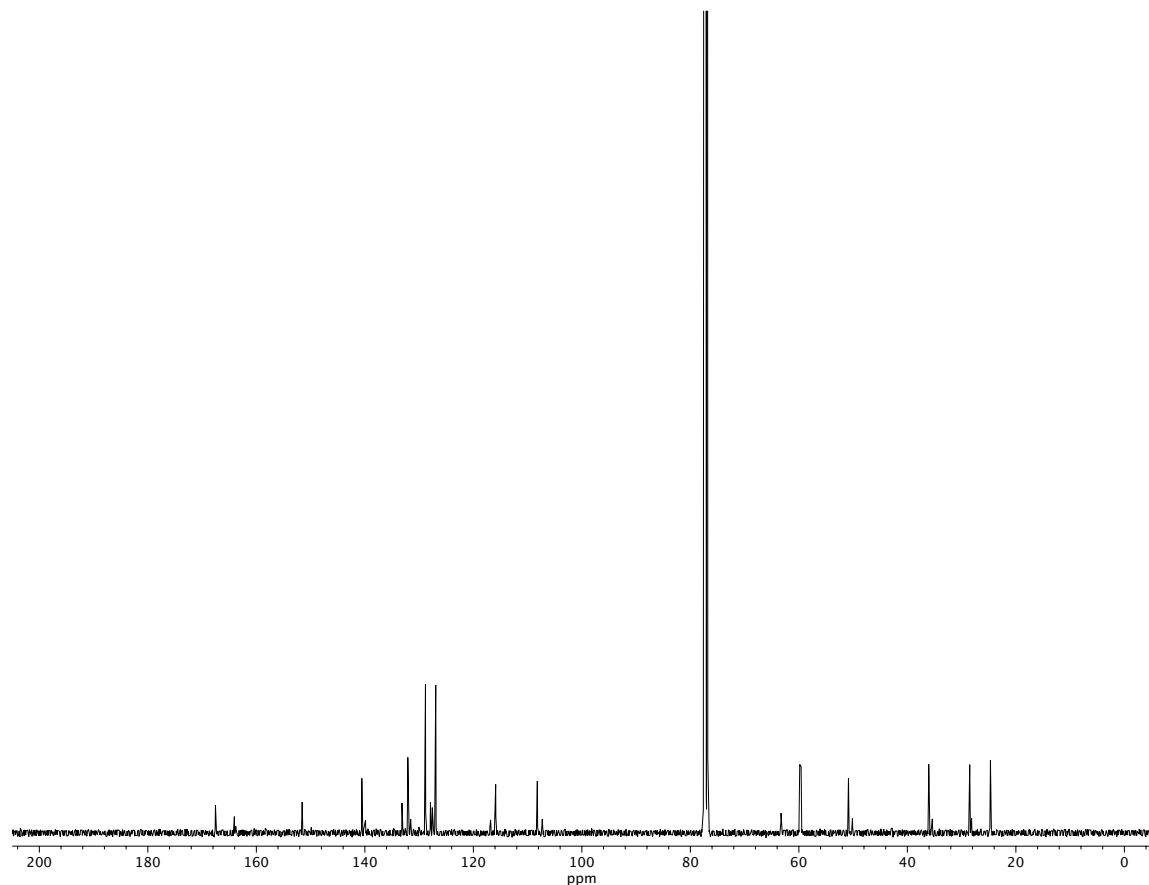
**Figure A1.222**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **81**.



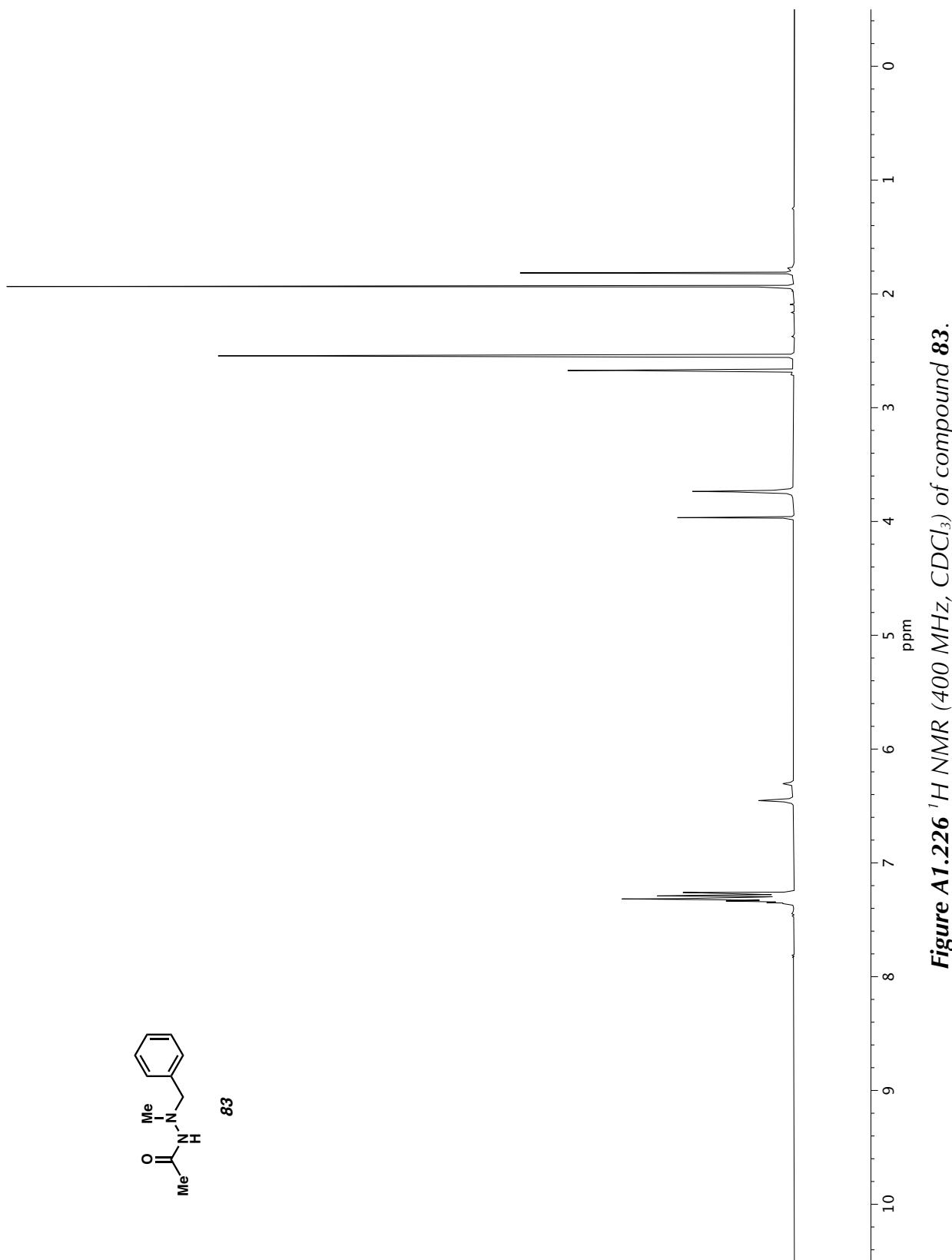
**Figure A1.223**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 82.



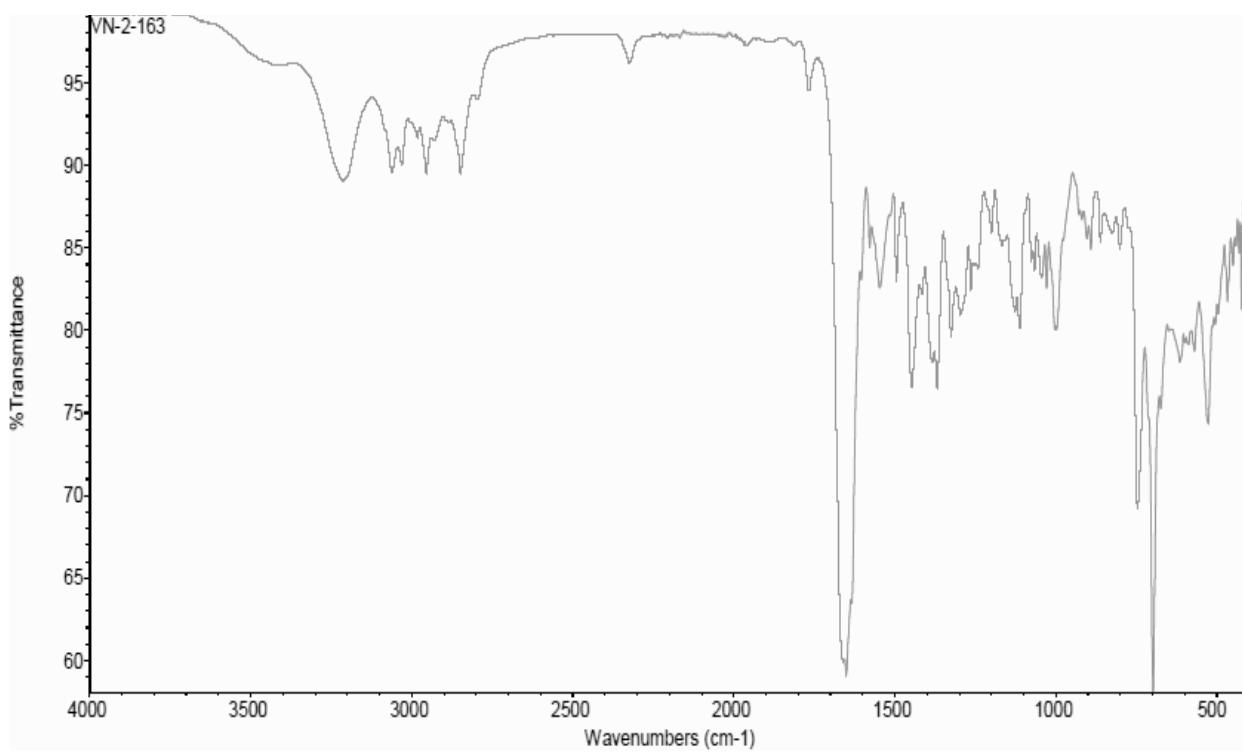
**Figure A1.224** Infrared spectrum (Thin Film) of compound **82**.



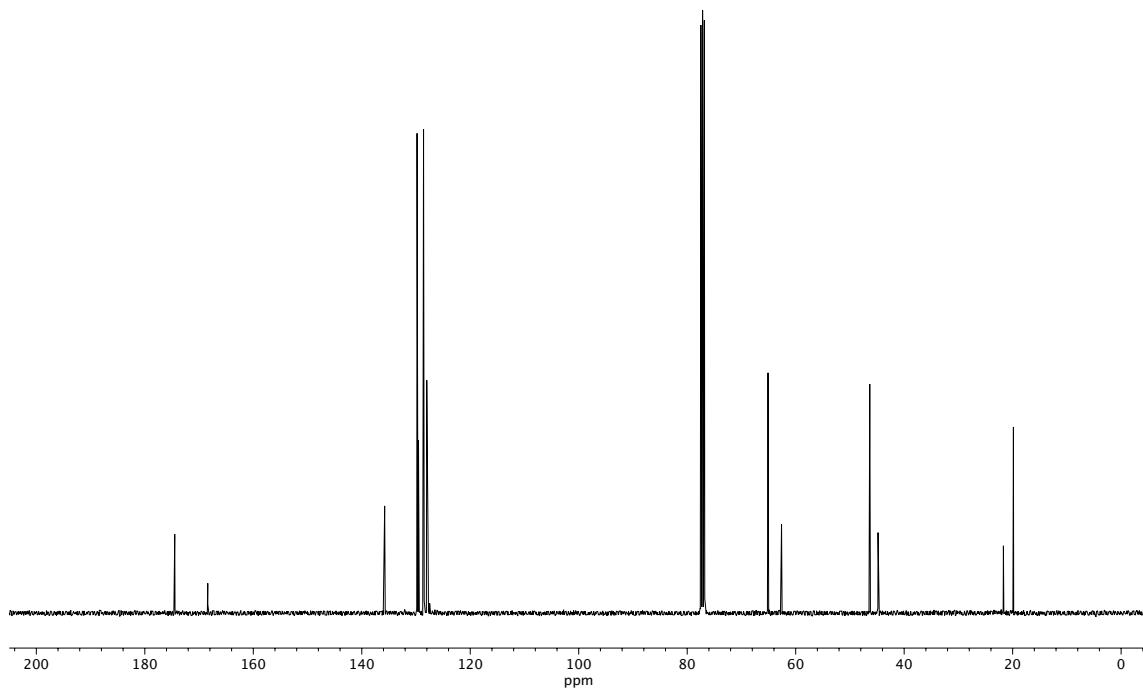
**Figure A1.225**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **82**.



**Figure A1.226**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 83.



**Figure A1.227** Infrared spectrum (Thin Film) of compound **83**.



**Figure A1.228**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **83**.

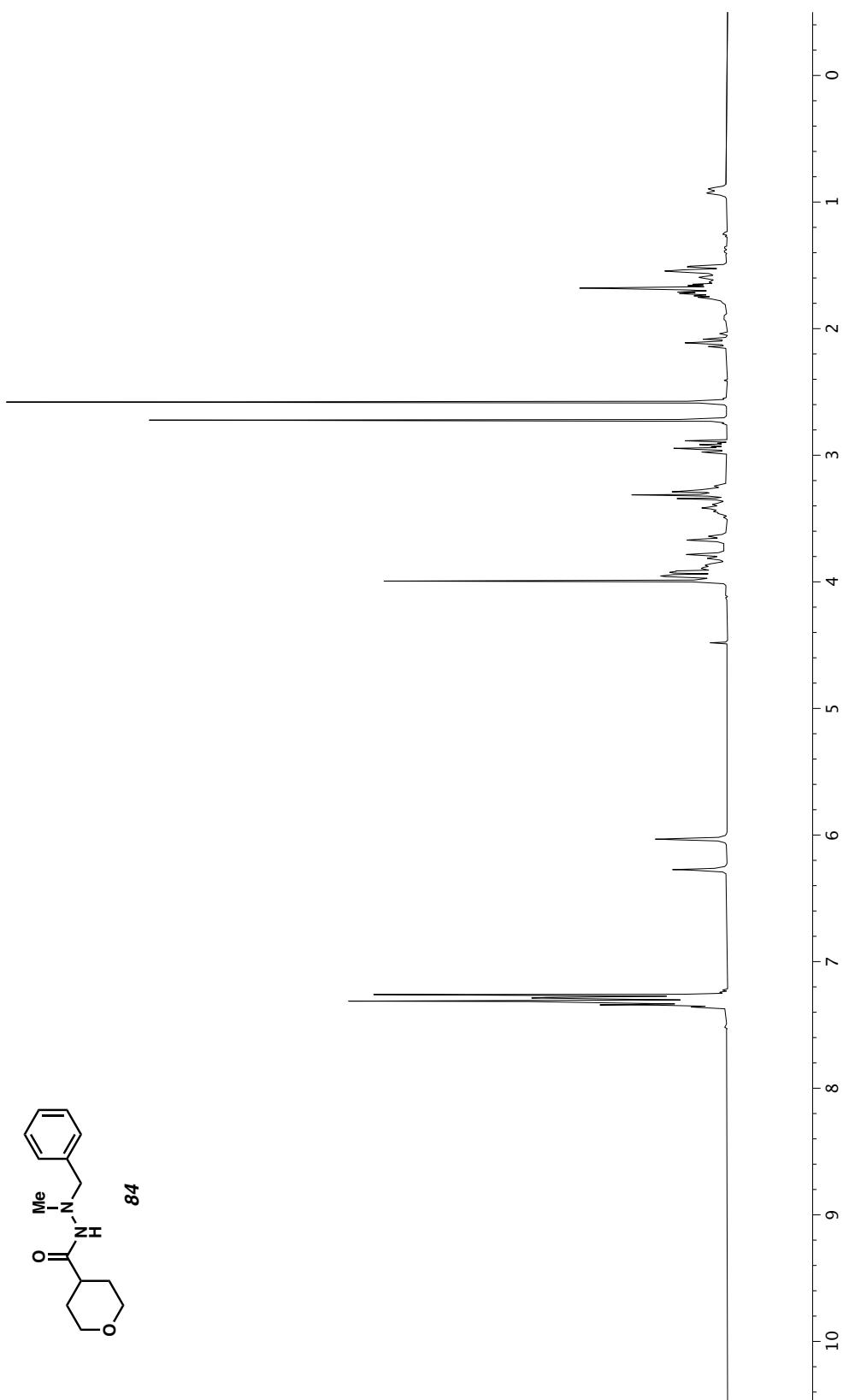
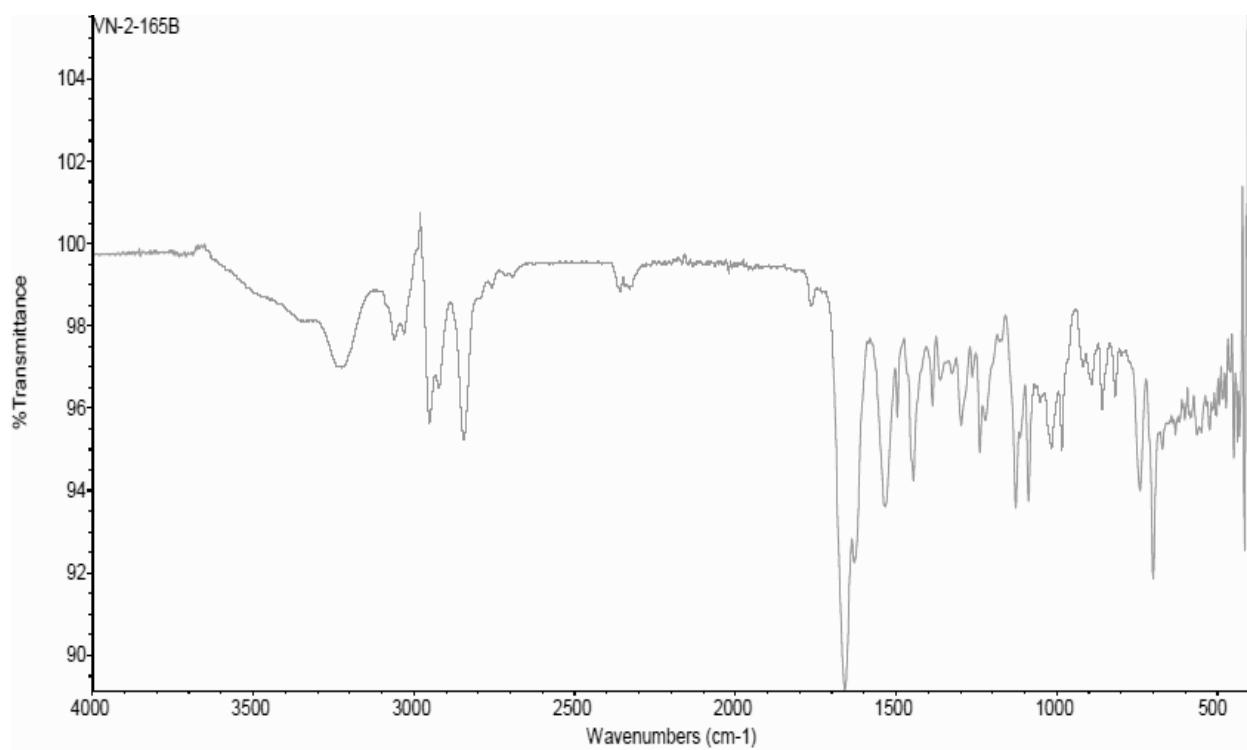
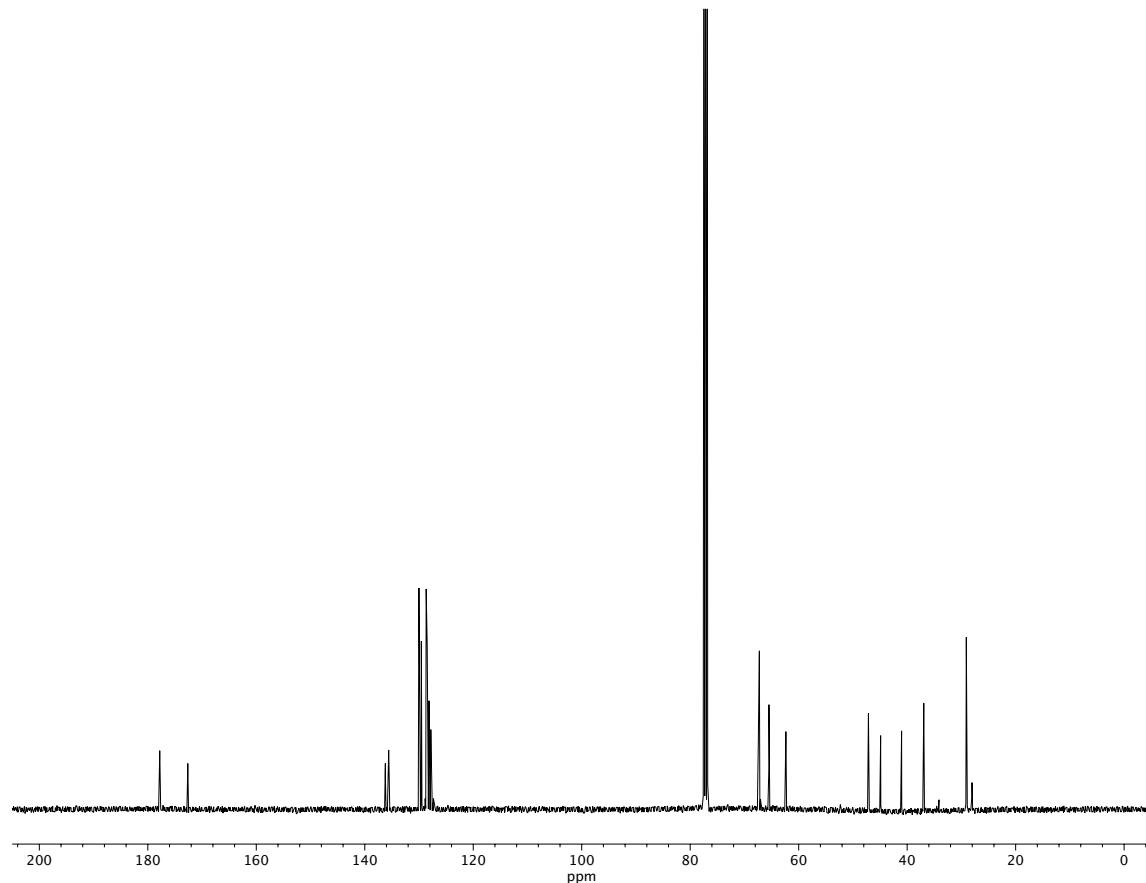


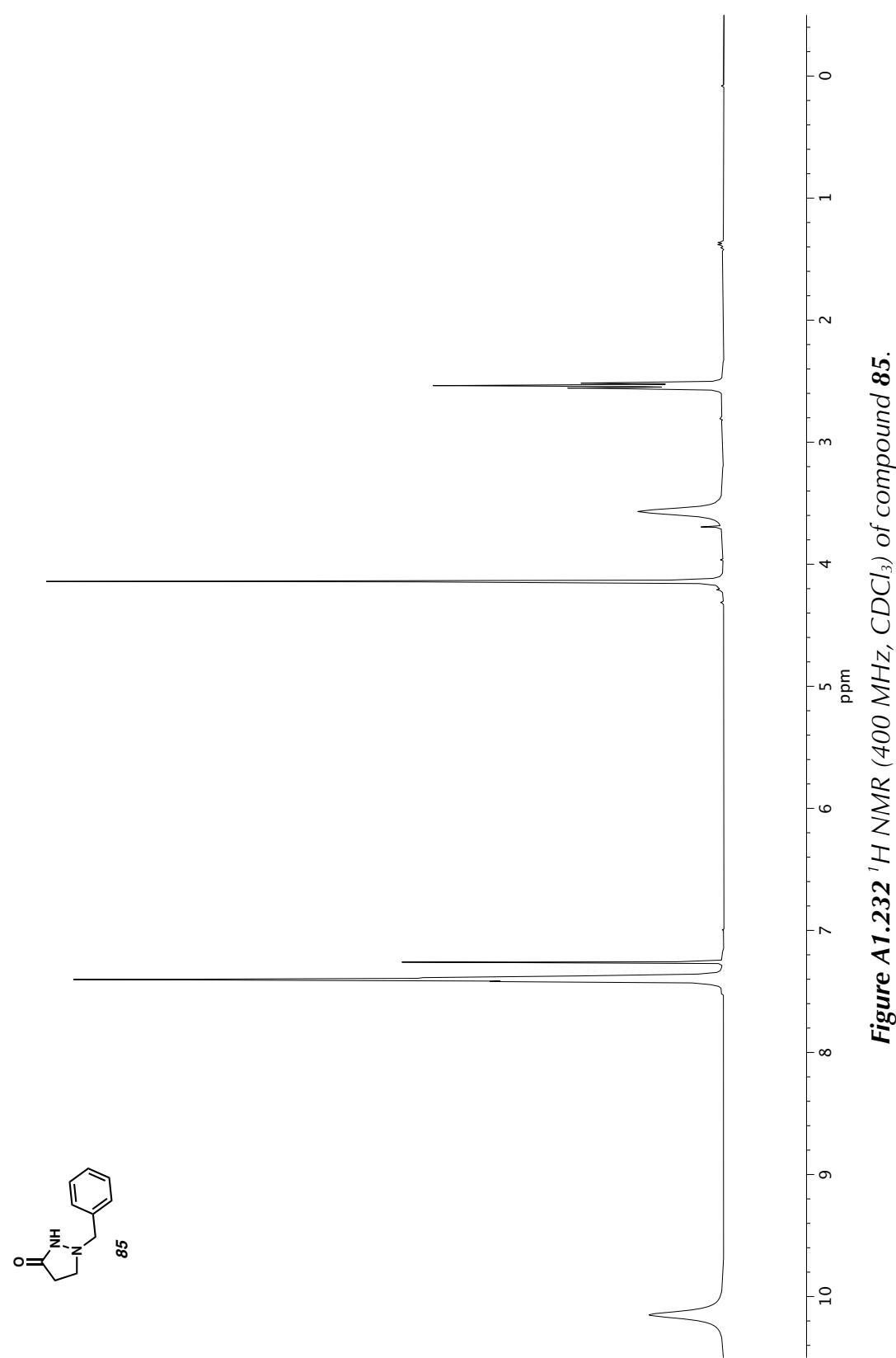
Figure A1.229  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 84.



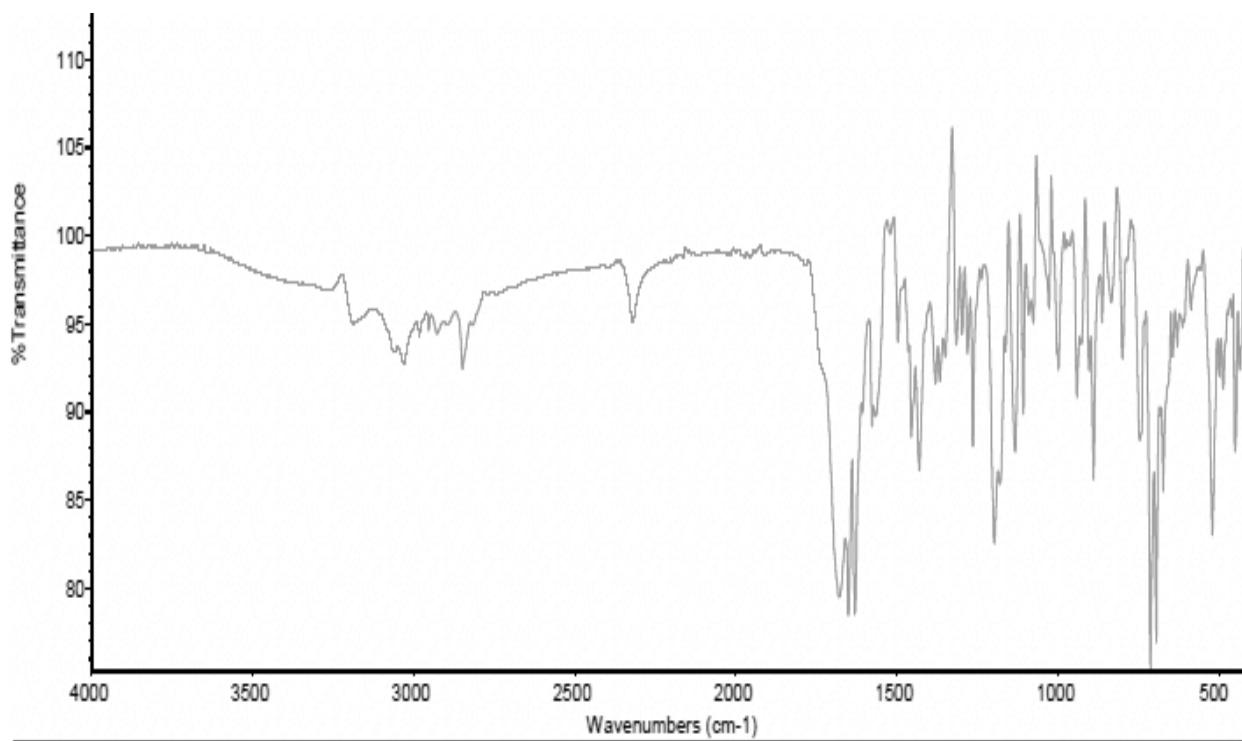
**Figure A1.230** Infrared spectrum (Thin Film) of compound **84**.



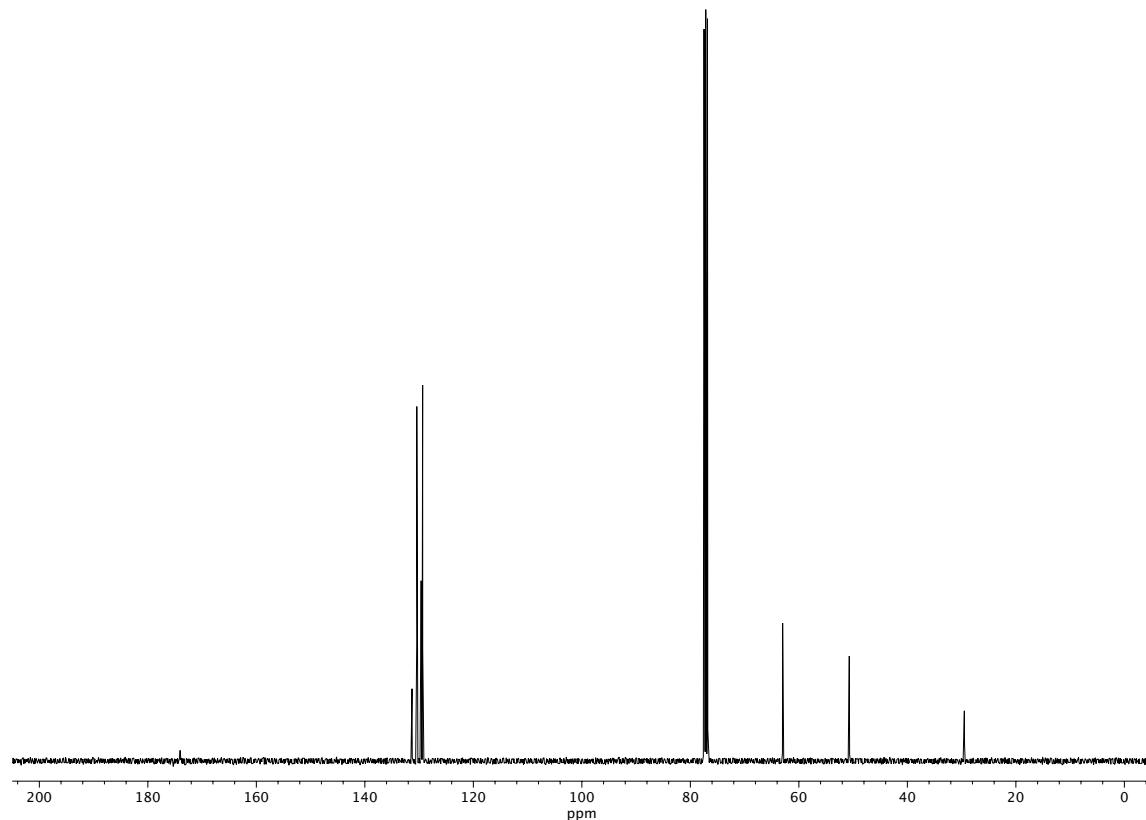
**Figure A1.231**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **84**.



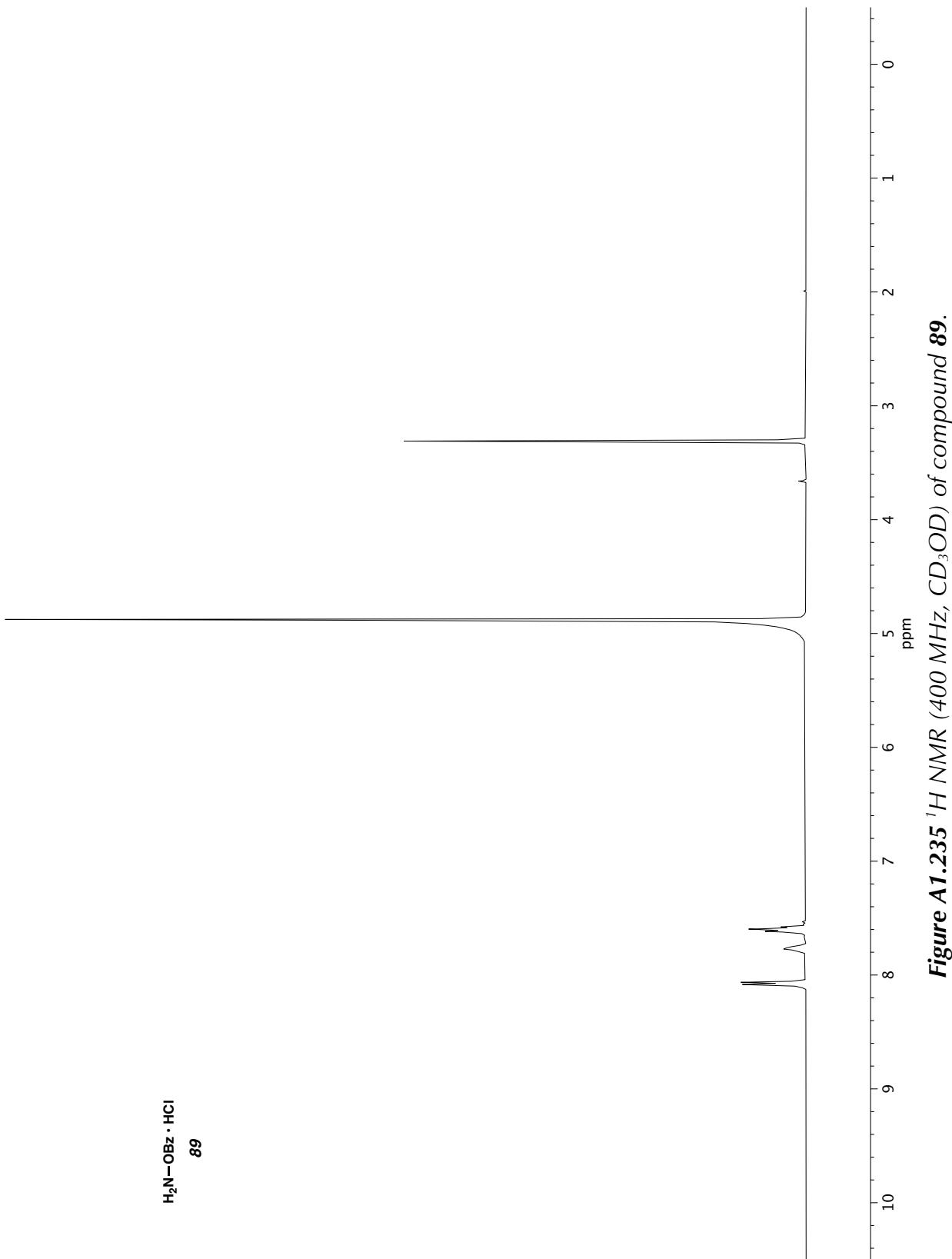
**Figure A1.232**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 85.



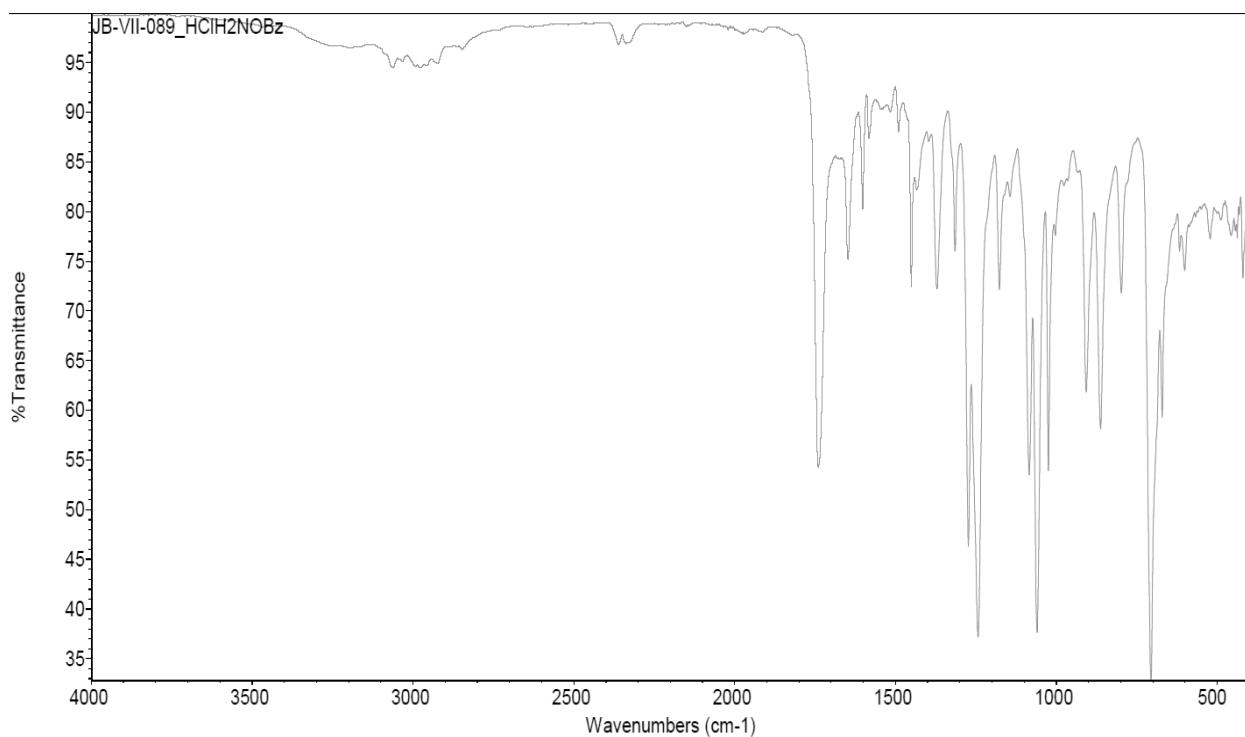
**Figure A1.233** Infrared spectrum (Thin Film) of compound **85**.



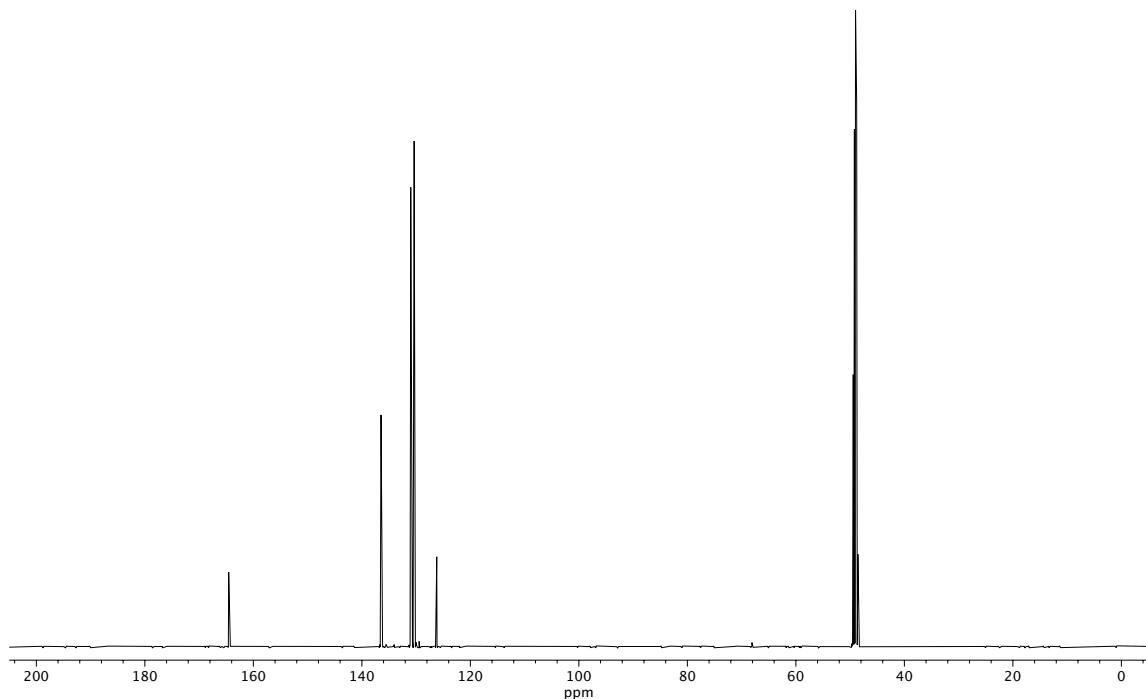
**Figure A1.234**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **85**.



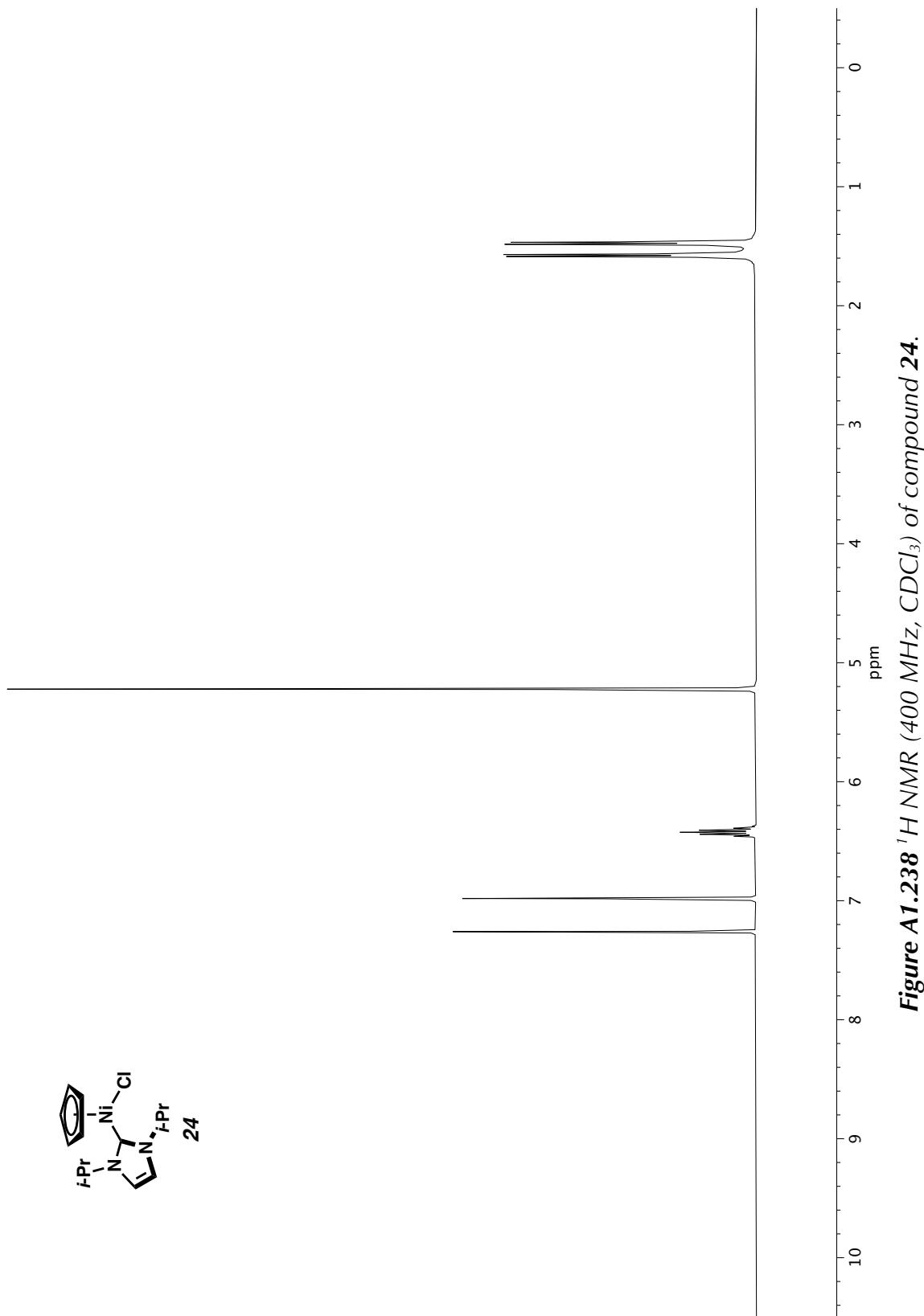
**Figure A1.235**  $^1\text{H}$  NMR ( $400\text{ MHz}$ ,  $\text{CD}_3\text{OD}$ ) of compound **89**.



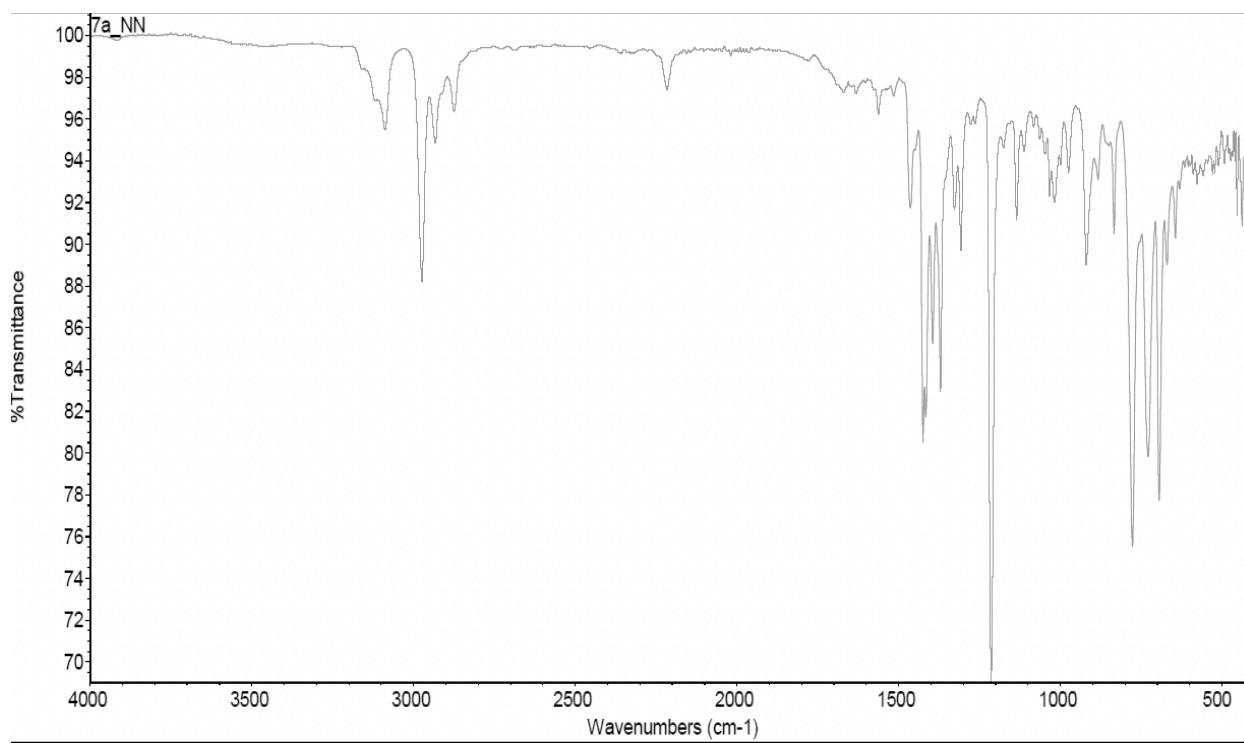
**Figure A1.236** Infrared spectrum (Thin Film) of compound **89**.



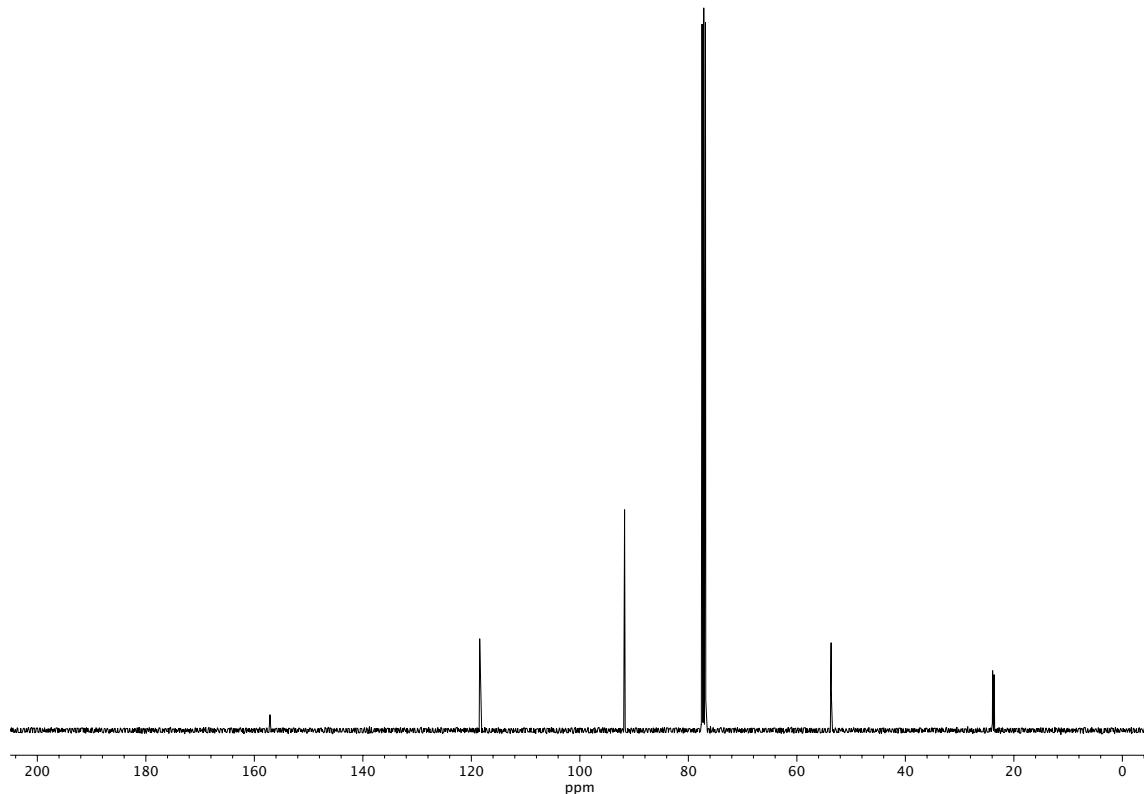
**Figure A1.237**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CD}_3\text{OD}$ ) of compound **89**.



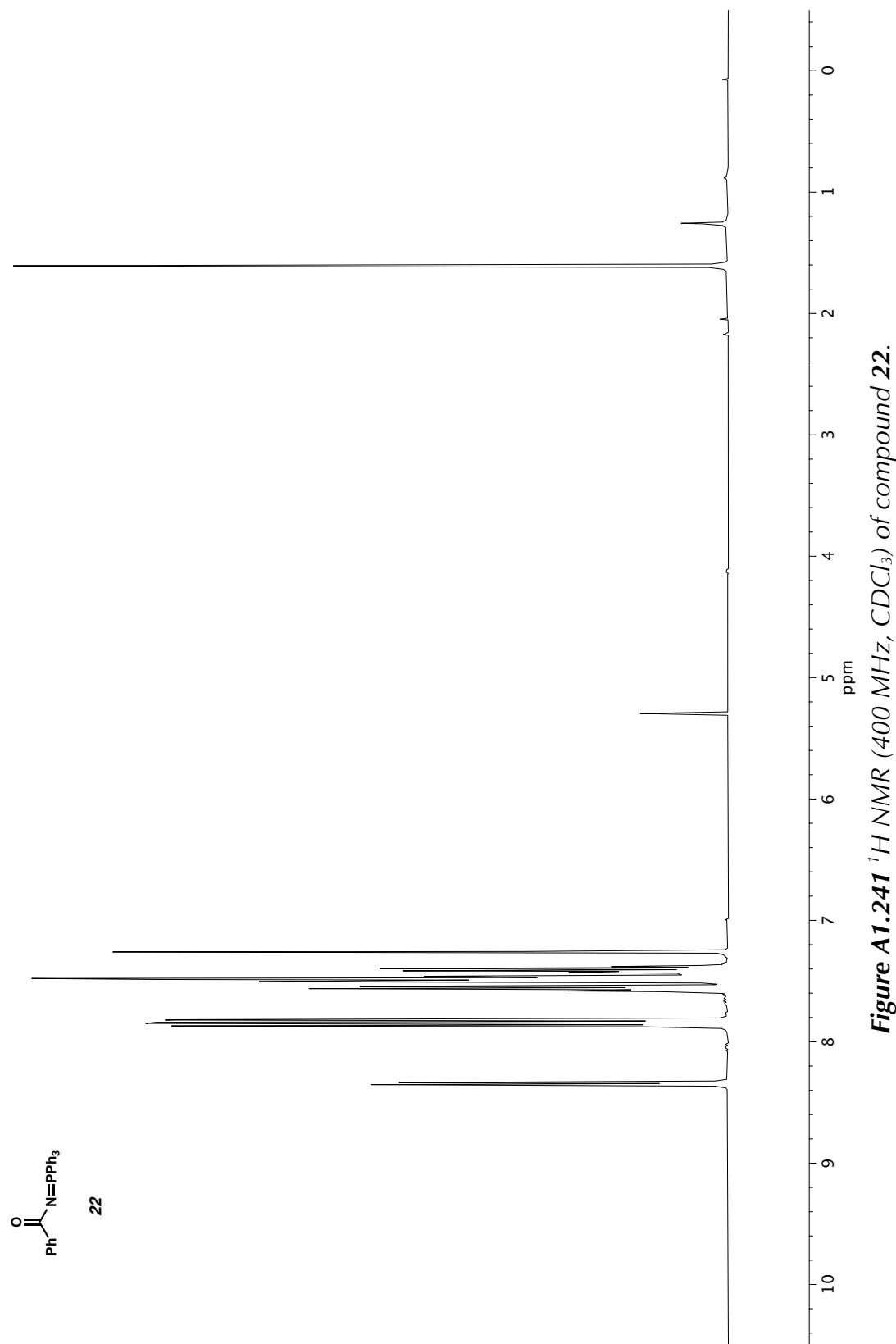
**Figure A1.238**  $^1\text{H}$  NMR ( $400 \text{ MHz}, \text{CDCl}_3$ ) of compound 24.



**Figure A1.239** Infrared spectrum (Thin Film) of compound **24**.



**Figure A1.240**  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **24**.



**Figure A1.241**  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of compound 22.