Electronic Supplementary Material (ESI) for ChemComm.

Tropylium-Promoted Ritter Reactions

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Supporting Information

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General Methods

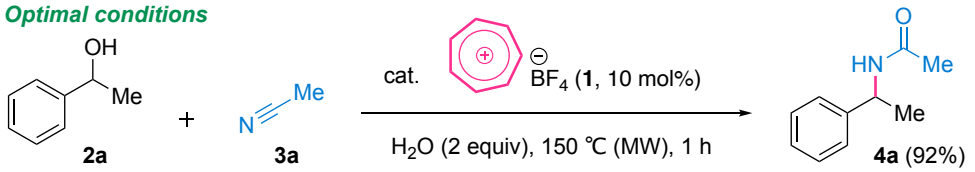
Commercially available solvents and reagents were used as purchased unless otherwise noted. Tropylium bromide was prepared according to a literature procedure.[1] Analytical thin layer chromatography was performed using aluminium plates precoated with silica gel 60 F_{254} (0.2 mm). Flash chromatography employed 230-400 mesh silica gel. Solvents used for chromatography are quoted as volume/volume ratios.

Microwave reactions were carried out on a CEM microwave reactor. Flow reactions were conducted on a Vapourtec R-Series flow reactor.

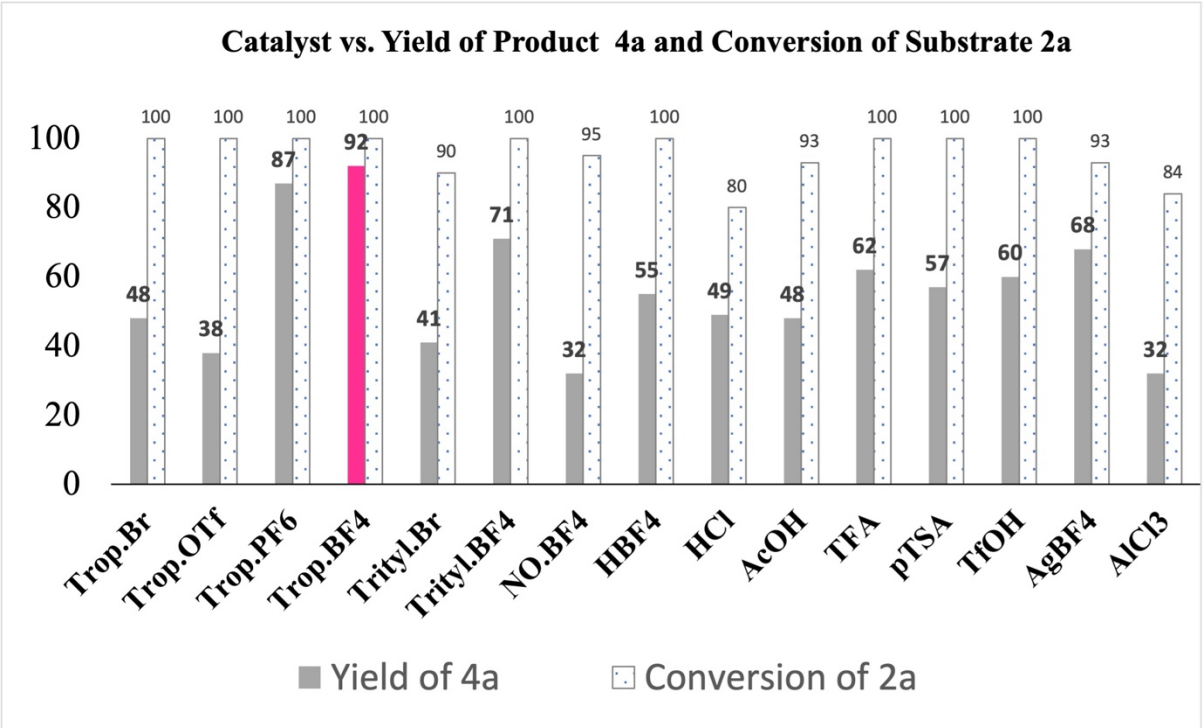
NMR spectroscopy was performed at 298 K using an Avance III HD 400 (400.1 MHz, ^{1}H; 100.6 MHz, ^{13}C, 376.5 MHz, ^{19}F) or an Avance III 300 (300 MHz, ^{1}H; 75 MHz, ^{13}C; 282.5 MHz, ^{19}F). Data is expressed in parts per million (ppm) downfield shift from tetramethylsilane with residual solvent as an internal reference (δ 7.26 ppm for chloroform, 5.27 ppm for dichloromethane) and is reported as position (δ in ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constant (J in Hz) and integration (number of protons). ^{13}C NMR spectra were recorded at 298 K with complete proton decoupling. Data is expressed in parts per million (ppm) downfield shift relative to the internal reference (δ 77.2 ppm for the central peak of deuterated chloroform).

Infrared spectra were obtained on a ThermoNicolet Avatar 370 FT-IR spectrometer and are reported in wavenumbers (cm^{-1}). HRMS were performed at the Bioanalytical Mass Spectrometry Facility within the Mark Wainwright Analytical Centre at the University of New South Wales on an Orbitrap LTQ XL (Thermo Fisher Scientific, San Jose, CA, USA) ion trap mass spectrometer.

Table S1. Optimization Studies



Entry	*Variations from optimal conditions*	Conversion of **2a** (%)	Yield of **4a** (%)[b]
1	no catalyst (also see entry 8)	< 10	traces
2	30 min	92	68
3	1 mol% catalyst **1**	95	78
4	5 mol% catalyst **1a**	100	86
5	100 °C (conventional heating)	68	40
6	120 °C (conventional heating)	84	63
7	150 °C (conventional heating)	100	89
8	100 °C (MW)	75	49
9	120 °C (MW)	92	71
10	no water	100	82
11	1 equiv of water	100	89
12[c]	variation of catalyst (10 mol%)		*see below*



[a] Reaction conditions: 2 mmol **2a** in MeCN **3a** (5 mL) and catalyst **1** in a pressurized reaction vial at the indicated temperature for the indicated time. [b] Yield of the isolated **4a**. [c] All catalysts are anhydrous.

General Procedure - Substrate Scope

Procedure A for substrates in Scheme 1

To a 10 mL microwave reaction tube loaded with a stirring bar containing the nitrile **3** (5 mL) was added alcohol **2** (2.0 mmol), tropylium tetrafluoroborate **1** (0.2 mmol, 10 mol%), and deionized water (2 mmol, 36 mg). If the nitrile substrate was a solid state, a solution of the nitrile (4 mmol) in 1,2-dichloroethane (5 mL) was added instead. The resulting mixture was then heated to 150 °C in the pressurized microwave reactor for 1 hour. After that, the reaction was cooled to room temperature and quenched with distilled water (5 mL). The organic components were extracted with ethyl acetate (3 x 10 mL), dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The target product was isolated from the crude mixture by column chromatography (silica-gel, hexane/ethyl acetate).

Procedure B for fluorine-containing nitrile (Scheme 1) and lactamization (Scheme 2)

To a 10 mL microwave reaction tube loaded with a stirring bar containing 1,2-dichloroethane (2.5 mL) was added either a mixture of fluoroacetonitrile **5** (2 mmol) and alcohol **2** (1 mmol) or γ-hydroxy nitrile **7** (1.0 mmol). Tropylium tetrafluoroborate (0.1 mol, 10 mol%) and deionized water (1 mmol, 18 mg) were subsequently added. The resulting mixture was then heated to 150 °C in the pressurized microwave reactor for 1 hour. After that, the mixture was cooled to room temperature and quenched with distilled water (5 mL). The organic components were extracted with ethyl acetate (3 x 10 mL), dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The target product was isolated from the crude mixture by column chromatography (silica-gel, hexane/ethyl acetate).

Procedure C for the synthesis of quinazoline derivatives (Scheme 2)

To a 10 mL microwave reaction tube loaded with a stirring bar containing nitrile **3** (2.5 mL) was added (2-aminophenyl)(phenyl)methanol (1.0 mmol), DMSO (1.0 mmol), tropylium tetrafluoroborate (0.1 mmol, 10 mol%) and deionized water (1 mmol, 18 mg). The resulting mixture was then heated to 150 °C in the pressurized microwave reactor for 1 hour. After that, the mixture was cooled to room temperature and quenched distilled water (5 mL). The organic components were extracted with ethyl acetate (3 x 10 mL), dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The target product was isolated from the crude mixture by column chromatography (silica-gel, hexane/ethyl acetate).

Procedure D for the Piancatelli-Ritter sequence (Scheme 2)

To a 10 mL microwave reaction tube loaded with a stirring bar containing deionized water (0.1 mL) was added 1-phenyl furfuryl alcohol **11** (1 mmol). The resulting mixture was heated to 200 °C in the pressurized microwave reactor for 2 minutes. Subsequently, nitrile **3** (2.5 mL if liquid, or 4 mmol in 2.5 mL DCE if solid), tropylium tetrafluoroborate (0.1 mmol, 10 mol%) were added. The resulting mixture was then heated to 150 °C in the pressurized microwave reactor for 1 hour. After that, the mixture was cooled to room temperature and quenched distilled water (5 mL). The organic components were extracted with ethyl acetate (3 x 10 mL), dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The target product was isolated from the crude mixture by column chromatography (silica-gel, hexane/ethyl acetate).

Optimization of catalyst loading for flow chemistry

Flow reactions were conducted on a Vapourtec R-Series flow reactor with a 10 mL tubular (coil) reactor. The Ritter reaction of substrates **2a** and **3a** to form **4a** with 10, 5, 2.5 and 1 mol% tropylium tetrafluoroborate **1** in continuous flow indicated that 1 mol% catalyst loading is optimal for the reaction.

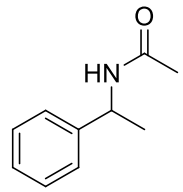
Catalyst loading	Yield of **4c**
10 mol%	93%
5 mol%	92%
2.5 mol%	91%
1 mol%	90% at 2 mmol scale 91% at 100 mmol scale

Procedure E for the Ritter reaction in continuous flow (Scheme 3)

A solution of alcohol **2** (0.2 M) and tropylium tetrafluoroborate **1** (2 mM, 1 mol%) in nitrile **3** were prepared as stock solutions. The flow system was fitted with a high temperature 10 mL tubular (coil) reactor and a (8 + 8 = 16) bar back-pressure regulator. The stock solution of reagents and catalyst was injected at flow rates corresponding to the residence time of 50 minutes (0.2 mL/min). The resulting reaction mixture was collected and concentrated under reduced pressure before being worked up in similar fashion to batch reactions.

Characterization Data of Products in Scheme 1

***N*-(1-phenylethyl)acetamide (**compound **4a)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4a** as a colorless oil (149 mg, 92% yield).



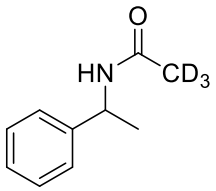
4a

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 7.17 (m, 5H), 7.05 (d, J = 7.2 Hz, 1H), 5.00 (p, J = 7.4 Hz, 1H), 1.87 (s, 3H), 1.39 (d, J = 6.9 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.5, 143.5, 128.3, 126.9, 126.0, 48.6, 22.9, 21.8 ppm.

Characterization data matches the literature report[1].

***N*-(1-phenylethyl)acetamide-2,2,2-d_3 (**compound **4aD)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and acetonitrile-d_3 as nitrile group source to give compound **4aD** as a white solid (160 mg, 96% yield).



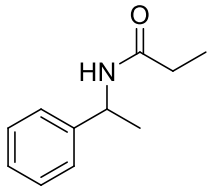
4aD

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 – 7.22 (m, 5H), 6.53 (d, J = 6.0 Hz, 1H), 5.08 (p, J = 7.0 Hz, 1H), 1.45 (d, J =6.9 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.4, 143.4, 128.5, 127.2, 126.2, 48.7, 22.9 – 22.1 (m), 21.8 ppm.

Characterization data matches the literature report[2].

***N*-(1-phenylethyl)propionamide (**compound **4b)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and propionitrile as nitrile group source to give compound **4b** as a white powder (150 mg, 85% yield).



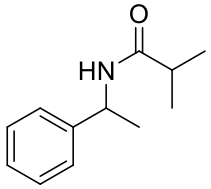
4b

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.31 – 7.19 (m, 5H), 6.58 (d, J = 7.2 Hz, 1H), 5.05 (p, J = 6.6 Hz, 1H), 2.19 – 2.12 (m, 2H), 1.42 (d, J = 7.0 Hz, 3H), 1.08 (t, J = 7.5 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.1, 143.7, 128.5, 127.1, 126.1, 48.5, 29.6, 21.9, 9.9 ppm.

Characterization data matches the literature report[1].

***N*-(1-phenylethyl)isobutyramide (**compound **4c)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and isobutyronitrile as nitrile group source to give compound **4c** as a white solid (149 mg, 78% yield).



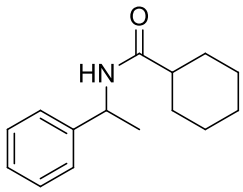
4c

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 – 7.23 (m, 5H), 6.13 (d, J = 7.2 Hz, 1H), 5.09 (sext, J = 7.2 Hz, 1H), 2.34 (p, J = 6.8 Hz, 1H), 1.47 (d, J = 6.8 Hz, 3H), 1.12 (t, J = 6.8 Hz, 6H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 176.1, 143.5, 128.5, 127.1, 126.1, 48.3, 35.5, 21.8, 19.6, 19.5 ppm.

Characterization data matches the literature report[3].

***N*-(1-phenylethyl)cyclohexanecarboxamide (**compound **4d)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and cyclohexanecarbonitrile as nitrile group source to give compound **4d** as a yellow solid (194 mg, 84% yield).



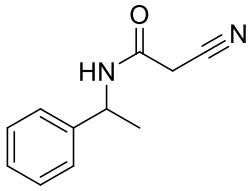
4d

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 – 7.27 (m, 5H), 5.74 (d, J = 7.6 Hz, 1H), 5.18 – 5.13 (m, 1H), 2.12 – 2.06 (m, 1H), 1.90 – 1.80 (m, 4H), 1.67 (d, J = 8.8 Hz, 1H), 1.50 – 1.40 (m, 5H), 1.32 – 1.21 (m, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 175.1, 143.4, 128.6, 127.2, 126.1, 48.2, 45.5, 29.7, 29.6, 25.7, 21.7 ppm.

Characterization data matches the literature report[4].

2-cyano-*N*-(1-phenylethyl)acetamide (compound **4e)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and malononitrile as nitrile group source to give compound **4e** as a white solid (132 mg, 70% yield).



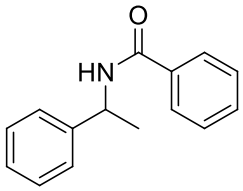
4e

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 – 7.26 (m, 5H), 6.73 (d, J = 7.0 Hz, 1H), 5.00 (p, J = 7.0 Hz, 1H), 3.27 (s, 2H), 1.49 (d, J = 7.0 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 160.5, 142.1, 128.9, 127.8, 126.2, 114.9, 50.1, 25.9, 21.6 ppm.

Characterization data matches the literature report[5].

***N*-(1-phenylethyl)benzamide (**compound **4f)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and benzonitrile as nitrile group source to give compound **4f** as a white solid (154 mg, 68% yield).



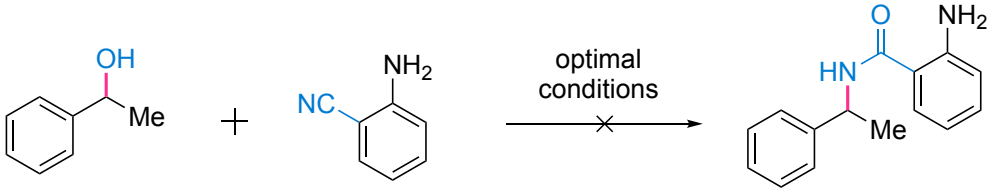
4f

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 (d, J = 8.0 Hz, 2H), 7.51 – 7.30 (m, 8H), 6.50 (d, J = 8.0 Hz, 1H), 5.33 (p, J = 8.0 Hz, 1H), 1.62 (d, J = 4.0 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.6, 143.2, 134.6, 131.4, 128.7, 128.5, 127.4, 126.9, 126.2, 49.2, 21.7 ppm.

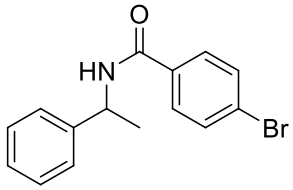
Characterization data matches the literature report[6].

Product **4g** from the following reaction was not detected, as we isolated unidentifiable products from the reaction mixture:



4g

4-bromo-*N*-(1-phenylethyl)benzamide (compound **4h)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and 4-bromobenzonitrile as nitrile group source to give compound **4h** as a white solid (245 mg, 81% yield).



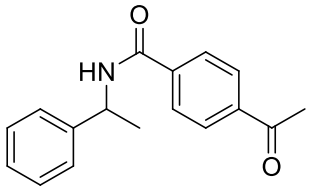
4h

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 – 7.64 (m, 2H), 7.59 – 7.57 (m, 2H), 7.42 – 7.30 (m, 5H), 6.31 (d, J = 7.6 Hz, 1H), 5.30 (p, J = 7.6 Hz, 1H), 1.62 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 165.6, 142.8, 133.4, 131.8, 128.8, 128.5, 127.6, 126.2, 126.1, 49.4, 21.6 ppm.

Characterization data matches the literature report[7].

4-acetyl-*N*-(1-phenylethyl)benzamide (compound **4i)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and 4-acetylbenzonitrile as nitrile group source to give compound **4i** as a white solid (189 mg, 71% yield).



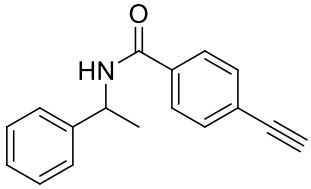
4i

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, J = 8.4 Hz, 2H), 7.85 (d, J = 8.4 Hz, 2H), 7.42 – 7.35 (m, 4H), 7.32 – 7.30 (m, 1H), 6.56 (d, J = 7.6 Hz, 1H), 5.32 (p, J = 7.2 Hz, 1H), 2.63 (s, 3H), 1.63 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 197.4, 165.6, 142.8, 139.1, 138.5, 128.8, 128.4, 127.6, 127.3, 126.2, 49.5, 26.8, 21.6 ppm.

Characterization data matches the literature report[9].

4-ethynyl-*N*-(1-phenylethyl)benzamide (compound **4j)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and 4-ethynylbenzonitrile as nitrile group source to give compound **4j** as a white solid (194 mg, 78% yield).



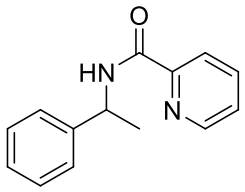
4j

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 – 7.73 (m, 2H), 7.57 – 7.54 (m, 2H), 7.42 – 7.36 (m, 4H), 7.33 – 7.29 (m, 1H), 6.36 (d, J = 8.0 Hz, 1H), 5.31 (p, J = 7.2 Hz, 1H), 3.21 (s, 1H), 1.62 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 165.7, 142.9, 134.5, 132.2, 128.8, 127.5, 126.9, 126.2, 125.3, 82.7, 79.4, 49.3, 21.6 ppm.

Characterization data matches the literature report[10].

***N*-(1-phenylethyl)picolinamide (**compound **4k)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and picolinonitrile as nitrile group source to give compound **4k** as a white solid (127 mg, 56% yield).



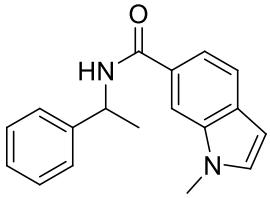
4k

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (d, J = 8.0 Hz, 1H), 8.36 (d, J = 8.0 Hz, 1H), 8.21 (d, J = 8.0 Hz, 1H), 7.84 (td, J_1 = 8.0 Hz, J_2 = 2.0 Hz, 1H), 7.46 – 7.26 (m, 6H), 5.38 – 5.30 (m, 1H), 1.64 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 163.3, 149.8, 147.9, 143.3, 137.0, 128.6, 127.3, 126.9, 126.2, 122.3, 48.8, 22.1 ppm.

Characterization data matches the literature report[11].

1-methyl-*N*-(1-phenylethyl)-1*H*-indole-6-carboxamide (compound **4l)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and 1-methyl-1*H*-indole-6-carbonitrile as nitrile group source to give compound **4l** as a yellow oil (120 mg, 43% yield).



4l

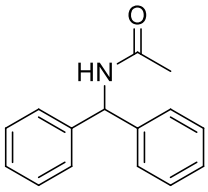
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, J = 1.2 Hz, 1H), 7.39 – 7.17 (m, 9H), 7.07 (d, J = 1.2 Hz, 1H), 4.31 (q, J = 9.5 Hz, 1H), 3.81 (s, 3H), 1.68 (d, J = 9.5 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.4, 146.6, 143.4, 137.0, 128.7, 128.6, 128.3, 127.3, 126.2, 119.4, 116.2, 109.7, 101.1, 49.1, 32.9, 22.4 ppm;

ESI-HRMS: calcd for $C_{18}H_{18}N_2ONa^+$: m/z = 301.1311, found: m/z = 301.1312;

FTIR (neat): 3379, 3258, 3065, 2968, 2929, 1673, 1515, 1434, 1239 cm^{-1}.

***N*-benzhydrylacetamide (**compound **4m)** Prepared by procedure **A** from diphenylmethanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4m** as a white solid (205 mg, 91% yield).



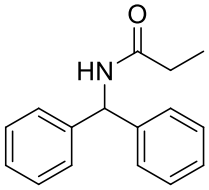
4m

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 – 7.22 (m, 10H), 6.21 (d, J = 8.3 Hz, 1H), 1.89 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.5, 141.6, 128.4, 127.4, 127.2, 56.8, 22.8 ppm.

Characterization data matches the literature report[1].

***N*-benzhydrylpropionamide (**compound **4n)** Prepared by procedure **A** from diphenylmethanol, tropylium tetrafluoroborate and propiononitrile as nitrile group source to give compound **4n** as a white solid (205 mg, 86% yield).



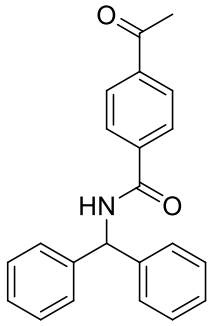
4n

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 – 7.22 (m, 10H), 6.86 (d, J = 8.1 Hz, 1H), 6.25 (d, J = 8.2 Hz, 1H), 2.17 (q, J = 7.7 Hz, 2H), 1.10 (t, J =7.5 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.1, 141.7, 128.5, 127.4, 127.2, 56.6, 29.4, 9.8 ppm.

Characterization data matches the literature report[1].

4-acetyl-*N*-benzhydrylbenzamide (compound **4o)** Prepared by procedure **A** from diphenylmethanol, tropylium tetrafluoroborate and 4-ethynylbenzonitrile as nitrile group source to give compound **4o** as a white solid (233 mg, 71% yield).



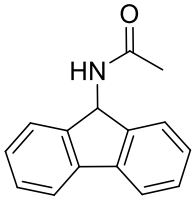
4o

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (d, J = 7.6 Hz, 2H), 7.91 (d, J = 8.4 Hz, 2H), 7.41 – 7.31 (m, 10H), 6.79 (d, J = 7.6 Hz, 1H), 6.47 (d, J = 7.6 Hz, 1H), 2.65 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 197.3, 165.5, 141.1, 139.3, 138.0, 128.8, 128.5, 127.7, 127.5, 127.4, 57.6, 26.8 ppm.

Characterization data matches the literature report[12].

***N*-(9*H*-fluoren-9-yl)acetamide (**compound **4p)** Prepared by procedure **A** from 9*H*-fluoren-9-ol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4p** as a white solid (202 mg, 90% yield).



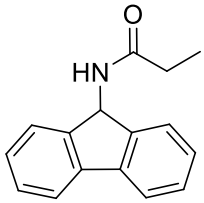
4p

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 7.4 Hz, 2H), 7.59 (d, J = 7.4 Hz, 2H), 7.40 (t, J = 7.4 Hz, 2H), 7.31 (t, J = 7.4 Hz, 2H), 6.24 (d, J = 8.9 Hz, 1H), 5.72 (d, J = 7.1 Hz, 1H), 2.13 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 170.8, 144.4, 140.7, 128.8, 127.9, 125.2, 120.1, 54.9, 23.6 ppm.

Characterization data matches the literature report[13].

***N*-(9*H*-fluoren-9-yl)propionamide (**compound **4q)** Prepared by procedure **A** from 9*H*-fluoren-9-ol, tropylium tetrafluoroborate and propiononitrile as nitrile group source to give compound **4q** as a white solid (207 mg, 87% yield).



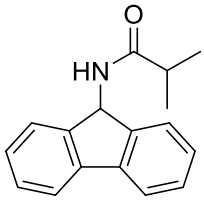
4q

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 7.4 Hz, 2H), 7.58 (d, J = 7.4 Hz, 2H), 7.40 (t, J = 7.4 Hz, 2H), 7.31 (t, J = 7.4 Hz, 2H), 6.26 (d, J = 9.0 Hz, 1H), 5.69 (d, J = 8.4 Hz, 1H), 2.32 (q, J = 7.6 Hz, 2H), 1.25 (t, J = 7.6 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 174.4, 144.4, 140.6, 128.6, 127.7, 125.1, 120.0, 54.6, 29.9, 10.0 ppm.

Characterization data matches the literature report[13].

***N*-(9*H*-fluoren-9-yl)isobutyramide (**compound **4r)** Prepared by procedure **A** from 9*H*-fluoren-9-ol, tropylium tetrafluoroborate and isobutyronitrile as nitrile group source to give compound **4r** as a white solid (214 mg, 85% yield).



4r

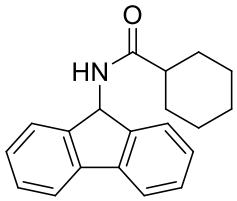
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 7.6 Hz, 2H), 7.55 (d, J = 7.6 Hz, 2H), 7.40 (t, J = 7.6 Hz, 2H), 7.31 (td, J_1 = 7.4 Hz, J_2 = 1.2 Hz, 2H), 6.26 (d, J = 8.8 Hz, 1H), 5.69 (d, J = 9.2 Hz, 1H), 2.43 (p, J = 6.8 Hz, 1H), 1.26 (d, J = 6.8 Hz, 6H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 177.7, 144.5, 140.6, 128.6, 127.8, 125.0, 120.0, 54.5, 35.8, 19.7 ppm;

ESI-HRMS: calcd for $C_{17}H_{17}NONa^+$: m/z = 274.1202, found: m/z = 274.1202;

FTIR (neat): 3347, 2972, 2872, 1637, 1535, 1449, 1384, 1235 cm^{-1}.

***N*-(9*H*-fluoren-9-yl)cyclohexanecarboxamide (**compound **4s)** Prepared by procedure **A** from 9*H*-fluoren-9-ol, tropylium tetrafluoroborate and cyclohexanecarbonitrile as nitrile group source to give compound **4s** as a white solid (250 mg, 86% yield).



4s

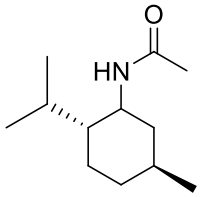
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 7.6 Hz, 2H), 7.55 (d, J = 7.6 Hz, 2H), 7.40 (t, J = 7.6 Hz, 2H), 7.31 (td, J_1 = 7.6 Hz, J_2 = 1.2 Hz, 2H), 6.27 (d, J = 9.2 Hz, 1H), 5.67 (d, J = 9.2 Hz, 1H), 2.24 – 1.27 (m, 11H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 174.9, 144.6, 140.6, 128.6, 127.7, 125.0, 119.9, 54.4, 45.7, 29.8, 25.7, 25.7 ppm;

ESI-HRMS: calcd for $C_{20}H_{21}NONa^+$: m/z = 314.1515, found: m/z = 314.1515;

FTIR (neat): 3349, 3270, 2980, 2882, 1637, 1542, 1450, 1233 cm^{-1}.

***N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)acetamide (**compound **4t)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4t** as a white solid (145 mg, 73% yield).



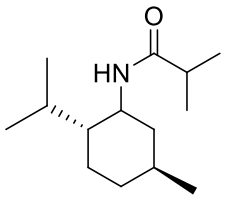
4t

^{1}H NMR (400 MHz, $CDCl_3$) δ 5.38 (s, 1H), 3.81 – 3.72 (m, 1H), 2.03 – 1.86 (m, 2H), 1.97 (s, 3H), 1.73 – 1.64 (m, 2H), 1.53 – 1.41 (m, 1H), 1.11 – 1.00 (m, 2H), 0.90 – 0.84 (m, 1H), 0.84 (d, J = 7.2 Hz, 6H), 0.81 – 0.73 (m, 1H), 0.76 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.2, 49.9, 48.0, 43.1, 34.5, 31.8, 26.7, 23.7, 23.5, 22.1, 21.1, 16.1 ppm.

Characterization data matches the literature report[14].

***N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)isobutyramide (**compound **4u)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and isobutyronitrile as nitrile group source to give compound **4u** as a white solid (162 mg, 72% yield).



4u

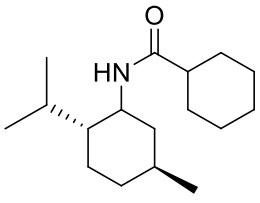
^{1}H NMR (400 MHz, $CDCl_3$) δ 5.13 (d, J = 9.2 Hz, 1H), 3.81 – 3.72 (m, 1H), 2.29 (p, J = 6.8 Hz, 1H), 1.99 – 1.84 (m, 2H), 1.74 – 1.65 (m, 2H), 1.53 – 1.45 (m, 1H), 1.18 – 1.15 (m, 6H), 1.13 – 1.05 (m, 2H), 0.88 (d, J = 6.4 Hz, 6H), 0.88 – 0.85 (m, 1H), 0.83 – 0.81 (m, 1H), 0.79 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 176.0, 49.5, 48.2, 43.2, 35.9, 34.5, 31.8, 26.8, 23.8, 22.1, 21.1, 19.8, 19.6, 16.1 ppm;

ESI-HRMS: calcd for $C_{14}H_{27}NONa^+$: m/z = 248.1985, found: m/z = 248.1985;

FTIR (neat): 3285, 2980, 1634, 1376, 1215 cm^{-1}.

***N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)cyclohexanecarboxamide (**compound **4v)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and cyclohexanecarbonitrile as nitrile group source to give compound **4v** as a white solid (204 mg, 77% yield).



4v

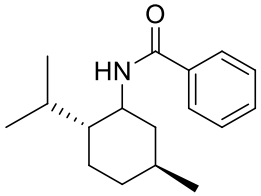
^{1}H NMR (400 MHz, $CDCl_3$) δ 5.07 (d, J = 9.2 Hz, 1H), 3.83 – 3.74 (m, 1H), 2.09 – 2.02 (m, 1H), 1.99 – 1.94 (m, 1H), 1.91 – 1.79 (m, 5H), 1.72 – 1.66 (m, 5H), 1.52 – 1.40 (m, 3H), 1.31 – 1.23 (m, 3H), 1.13 – 1.03 (m, 2H), 0.88 (d, J = 7.2 Hz, 6H), 0.79 (d, J = 7.2 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 176.2, 49.4, 48.3, 45.9, 43.3, 34.6, 31.8, 30.0, 29.6, 26.8, 25.7, 23.8, 22.1, 21.2, 16.1 ppm;

ESI-HRMS: calcd for $C_{17}H_{31}NONa^+$: m/z = 288.2298, found: m/z = 288.2297;

FTIR (neat): 3286, 2933, 2867, 1633, 1277 cm^{-1}.

***N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (**compound **4w)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and benzonitrile as nitrile group source to give compound **4w** as a white solid (189 mg, 73% yield).



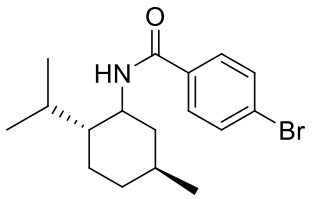
4w

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 – 7.76 (m, 2H), 7.52 – 7.42 (m, 3H), 5.84 (d, J = 9.2 Hz, 1H), 4.04 – 4.00 (m, 1H), 2.13 – 1.91 (m, 2H), 1.80 – 1.71 (m, 3H), 1.61 – 1.51 (m, 1H), 1.24 – 1.12 (m, 2H), 1.02 – 0.97 (m, 1H), 0.92 (d, J = 6.8 Hz, 6H), 0.86 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.7, 135.1, 131.2, 128.5, 126.8, 50.4, 48.4, 43.1, 34.5, 31.9, 27.0, 23.9, 22.1, 21.2, 16.2 ppm.

Characterization data matches the literature report[14].

4-bromo-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (compound **4x)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and 4-bromobenzonitrile as nitrile group source to give compound **4x** as a white solid (266 mg, 79% yield).



4x

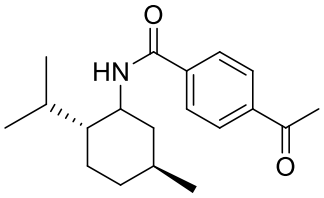
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 – 7.62 (m, 2H), 7.61 – 7.56 (m, 2H), 5.72 (d, J = 9.2 Hz, 1H), 4.05 – 3.96 (m, 1H), 2.12 – 2.07 (m, 1H), 1.99 – 1.91 (m, 1H), 1.80 – 1.70 (m, 2H), 1.59 – 1.51 (m, 2H), 1.30 – 1.16 (m, 3H), 0.91 (d, J = 6.8 Hz, 6H), 0.85 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 165.7, 133.9, 131.7, 128.4, 125.8, 50.5, 48.3, 43.1, 31.9, 27.0, 25.6, 23.9, 22.1, 21.1, 16.2 ppm;

ESI-HRMS: calcd for $C_{17}H_{24}BrNONa^+$: m/z = 360.0933, found: m/z = 360.0933;

FTIR (neat): 3275, 2931, 2975, 1630, 1542, 1209 cm^{-1}.

4-acetyl-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (compound **4y)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and 4-acetylbenzonitrile as nitrile group source to give compound **4y** as a white solid (213 mg, 71% yield).



4y

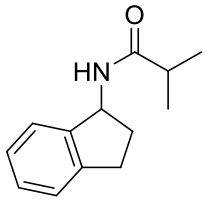
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 – 8.00 (m, 2H), 7.86 – 7.83 (m, 2H), 5.85 (d, J = 9.6 Hz, 1H), 4.07 – 3.98 (m, 1H), 2.65 (s, 3H), 2.14 – 2.08 (m, 1H), 1.99 – 1.94 (m, 1H), 1.80 – 1.73 (m, 2H), 1.59 – 1.54 (m, 2H), 1.31 – 1.13 (m, 3H), 0.92 (d, J = 6.8 Hz, 6H), 0.86 (d, J = 6.8 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 184.3, 165.7, 139.0, 134.2, 128.5, 127.1, 50.6, 48.3, 43.1, 34.5, 31.9, 27.1, 26.8, 23.9, 22.1, 21.1, 16.2 ppm;

ESI-HRMS: calcd for $C_{19}H_{27}NO_2Na^+$: m/z = 324.1934, found: m/z = 324.1934;

FTIR (neat): 3369, 3261, 3004, 2854, 1710, 1659, 1450, 1245 cm^{-1}.

***N*-(2,3-dihydro-1*H*-inden-1-yl)isobutyramide (**compound **4z)** Prepared by procedure **A** from 2,3-dihydro-1*H*-inden-1-ol, tropylium tetrafluoroborate and isobutyronitrile as nitrile group source to give compound **4z** as a white solid (146 mg, 72% yield).



4z

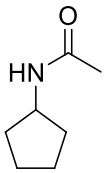
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 7.23 (m, 4H), 5.66 (d, J = 6.4 Hz, 1H), 5.49 (q, J = 8.0 Hz, 1H), 3.04 – 2.85 (m, 2H), 2.67 – 2.59 (m, 1H), 2.44 – 2.37 (m, 1H), 1.84 – 1.75 (m, 1H), 1.21 (d, J = 6.8 Hz, 6H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 176.7, 143.4, 127.9, 126.7, 124.8, 123.9, 54.3, 35.7, 34.1, 30.2, 19.8, 19.6 ppm;

ESI-HRMS: calcd for $C_{13}H_{17}NONa^+$: m/z = 226.1202, found: m/z = 226.1203;

FTIR (neat): 3273, 3024, 1636, 1541, 1368, 1275 cm^{-1}.

***N*-cyclopentylacetamide (**compound **4aa)** Prepared by procedure **A** from cyclopentanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4aa** as a white solid (105 mg, 83% yield).



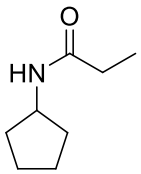
4aa

^{1}H NMR (400 MHz, $CDCl_3$) δ 5.68 (s, 1H), 4.15 (p, J = 7.0 Hz, 1H), 2.02 – 1.96 (m, 2H), 1.95 (s, 3H), 1.72 – 1.54 (m, 4H), 1.41 – 1.33 (m, 2H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.6, 51.2, 33.0, 23.6, 23.4 ppm.

Characterization data matches the literature report[15].

***N*-cyclopentylpropionamide (**compound **4bb)** Prepared by procedure **A** from cyclopentanol, tropylium tetrafluoroborate and propiononitrile as nitrile group source to give compound **4bb** as a white solid (102 mg, 73% yield).



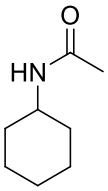
4bb

^{1}H NMR (400 MHz, $CDCl_3$) δ 5.51 (s, 1H), 4.23 – 4.14 (m, 1H), 2.12 (q, J = 7.6 Hz, 2H), 2.01 – 1.92 (m, 2H), 1.67 – 1.54 (m, 4H), 1.38 – 1.29 (m, 2H), 1.10 (t, J = 7.6 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.4, 51.1, 33.2, 29.9, 23.8, 10.0 ppm.

Characterization data matches the literature report[20].

***N*-cyclohexylacetamide (**compound **4cc)** Prepared by procedure **A** from cyclohexanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4cc** as a white solid (112 mg, 79% yield).



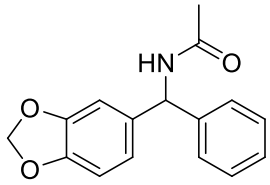
4cc

^{1}H NMR (400 MHz, $CDCl_3$) δ 5.43 (s, 1H), 3.82 – 3.73 (m, 1H), 1.98 (s, 3H), 1.96 – 1.91 (m, 2H), 1.75 – 1.69 (m, 2H), 1.67 – 1.60 (m, 1H), 1.44 – 1.33 (m, 2H), 1.22 – 1.08 (m, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.1, 48.3, 33.2, 25.5, 24.8, 23.5 ppm.

Characterization data matches the literature report[15].

***N*-(benzo[*d*][1,3]dioxol-5-yl(phenyl)methyl)acetamide (**compound **4dd)** Prepared by procedure **A** from benzo[*d*][1,3]dioxol-5-yl(phenyl)methanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **4dd** as a white solid (193 mg, 72% yield).



4dd

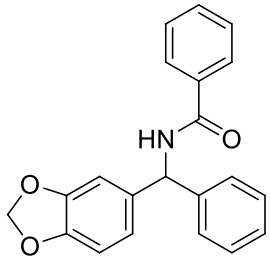
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 – 7.22 (m, 5H), 6.77 – 6.70 (m, 3H), 6.31 (d, J = 8.0 Hz, 1H), 6.14 (d, J = 8.0 Hz, 1H), 5.94 (s, 2H), 2.03 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 169.1, 147.9, 146.8, 141.5, 135.6, 128.6, 127.4, 127.3, 120.7, 108.2, 108.0, 101.1, 56.7, 23.2 ppm;

FTIR (neat): 3266, 3031, 2912, 1653, 1552, 1487, 1247 cm^{-1};

ESI-HRMS: calcd for $C_{16}H_{15}NO_3Na^+$: m/z = 292.0944, found: m/z = 292.0943.

***N*-(benzo[*d*][1,3]dioxol-5-yl(phenyl)methyl)benzamide** (compound **4ee)** Prepared by procedure **A** from benzo[*d*][1,3]dioxol-5-yl(phenyl)methanol, tropylium tetrafluoroborate and benzonitrile as nitrile group source to give compound **4ee** as a white solid (225 mg, 68% yield).



4ee

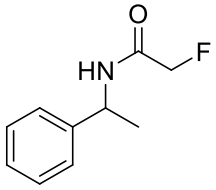
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (d, J = 8.0 Hz, 2H), 7.55 – 7.51 (m, 1H), 7.47 – 7.43 (m, 2H), 7.39 – 7.31 (m, 5H), 6.79 (d, J = 4.0 Hz, 3H), 6.71 (d, J = 8.0 Hz, 1H), 6.36 (d, J = 8.0 Hz, 1H), 5.96 (s, 2H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.4, 148.0, 147.0, 141.4, 135.5, 134.2, 131.7, 128.7, 128.6, 127.6, 127.3, 127.0, 120.9, 108.3, 108.0, 101.1, 57.2 ppm;

FTIR (neat): 3309, 3059, 1635, 1530, 1502, 1487, 1248 cm^{-1};

ESI-HRMS: calcd for $C_{21}H_{17}NO_3Na^+$: m/z = 354.1101, found: m/z = 354.1102.

2-fluoro-*N*-(1-phenylethyl)acetamide (compound **6a)** Prepared by procedure **A** from 1-phenylethanol, tropylium tetrafluoroborate and 2-fluoroacetonitrile as nitrile group source to give compound **6a** as a white solid (128 mg, 71% yield).



6a

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 – 7.31 (m, 5H), 6.53 (s, 1H), 5.20 (p, J = 7.2 Hz, 1H), 4.72 (dd, J_1 = 47.2 Hz, J_2 = 5.6 Hz, 2H), 1.57 (d, J = 6.8 Hz, 3H) ppm;

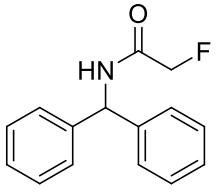
^{13}C NMR (101 MHz, $CDCl_3$) δ 166.5 (d, J = 16.7 Hz, 1C), 142.3, 128.8, 127.6, 126.1, 79.3 (d, J = 185.0 Hz, 1C), 48.3, 21.7 ppm;

^{19}F NMR (376 MHz, $CDCl_3$) δ -224.4 ppm;

ESI-HRMS: calcd for $C_{10}H_{12}FNONa^+$: m/z = 204.0795, found: m/z = 204.0795;

FTIR (neat): 3314, 3040, 2947, 2869, 1687, 1536, 1446 cm^{-1}.

***N*-benzhydryl-2-fluoroacetamide (**compound **6b)** Prepared by procedure **A** from diphenylmethanol, tropylium tetrafluoroborate and 2-fluoroacetonitrile as nitrile group source to give compound **6b** as a white solid (189 mg, 78% yield).



6b

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 – 7.27 (m, 10H), 6.97 (d, J = 7.6 Hz, 1H), 6.36 (d, J = 8.4 Hz, 1H), 4.83 (d, J = 47.2 Hz, 2H) ppm;

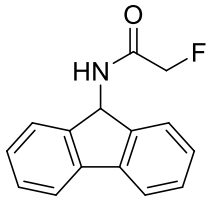
^{13}C NMR (101 MHz, $CDCl_3$) δ 166.6 (d, J = 17.3 Hz, 1C), 140.8, 128.8, 127.7, 127.4, 79.4 (d, J = 184.8 Hz, 1C), 56.3 ppm;

^{19}F NMR (376 MHz, $CDCl_3$) δ -224.6 ppm;

ESI-HRMS: calcd for $C_{15}H_{14}FNONa^+$: m/z = 266.0952, found: m/z = 266.0950;

FTIR (neat): 3324, 3169, 3020, 2946, 2894, 1669, 1604 cm^{-1}.

***N*-(9*H*-fluoren-9-yl)-2-fluoroacetamide (**compound **6c)** Prepared by procedure **A** from 9*H*-fluoren-9-ol, tropylium tetrafluoroborate and 2-fluoroacetonitrile as nitrile group source to give compound **6c** as a white solid (164 mg, 68% yield).



6c

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 7.6 Hz, 2H), 7.60 (d, *J* = 7.6 Hz, 2H), 7.43 (t, *J* = 7.6 Hz, 2H), 7.34 (t, *J* = 7.6 Hz, 2H), 6.55 (s, 1H), 6.28 (d, *J* = 9.2 Hz, 1H), 4.94 (d, *J* = 47.2 Hz, 2H) ppm;

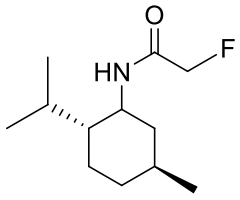
^{13}C NMR (101 MHz, $CDCl_3$) δ 164.6 (d, *J* = 17.3 Hz, 1C), 142.9, 140.7, 129.0, 127.9, 125.1, 120.1, 79.4 (d, *J* = 184.8 Hz, 1C), 54.0 ppm;

^{19}F NMR (376 MHz, $CDCl_3$) δ -224.9 ppm;

ESI-HRMS: calcd for $C_{15}H_{12}FNONa^+$: m/z = 264.0795, found: m/z = 264.0795;

FTIR (neat): 3342, 3240, 3150, 3068, 2840, 1660, 1543 cm^{-1}.

2-fluoro-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)acetamide (compound **6d)** Prepared by procedure **A** from (*2R,5S*)-2-isopropyl-5-methylcyclohexanol, tropylium tetrafluoroborate and 2-fluoroacetonitrile as nitrile group source to give compound **6d** as a white solid (129 mg, 60% yield).



6d

^{1}H NMR (400 MHz, $CDCl_3$) δ 5.98 (br, 1H), 4.71 (dd, J_1 = 47.2 Hz, J_2 = 2.0 Hz, 2H), 3.83 (q, J = 9.8 Hz, 1H), 2.01 – 1.97 (m, 1H), 1.92 – 1.83 (m, 1H), 1.77 – 1.69 (m, 2H), 1.54 – 1.48 (m, 2H), 1.16 – 1.08 (m, 3H), 0.94 – 0.91 (m, 6H), 0.81 (d, J = 6.8 Hz, 3H) ppm;

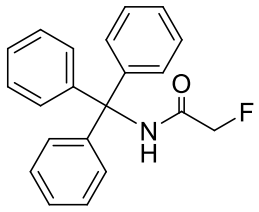
^{13}C NMR (101 MHz, $CDCl_3$) δ 173.0 (d, J = 31.6 Hz, 1C), 79.3 (d, J = 183.4 Hz, 1C), 49.5, 47.9, 42.9, 34.4, 31.8, 26.8, 23.7, 22.1, 21.1, 16.0 ppm;

^{19}F NMR (376 MHz, $CDCl_3$) δ -223.8 ppm;

ESI-HRMS: calcd for $C_{12}H_{22}FNONa^+$: m/z = 238.1578, found: m/z = 238.1578;

FTIR (neat): 3411, 3218, 2920, 2852, 1669, 1545, 1459, 1262 cm^{-1}.

2-fluoro-*N*-tritylacetamide (compound **6e)** Prepared by procedure **A** from triphenylmethanol, tropylium tetrafluoroborate and 2-fluoroacetonitrile as nitrile group source to give compound **6e** as a white solid (261 mg, 82% yield).



6e

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (br, 1H), 7.37 – 7.22 (m, 15H), 4.77 (d, J = 47.6 Hz, 2H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.3 (d, J = 15.8 Hz, 1C), 144.2, 128.6, 128.1, 127.3, 79.7 (d, J = 187.5 Hz, 1C), 70.4 ppm;

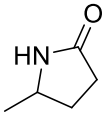
^{19}F NMR (376 MHz, $CDCl_3$) δ -220.4 ppm;

ESI-HRMS: calcd for $C_{21}H_{18}FNONa^+$: m/z = 342.1265, found: m/z = 342.1265;

FTIR (neat): 3276, 3263, 3087, 3025, 2912, 2817, 1671, 1533, 1492, 1260 cm^{-1}.

Characterization Data of Products in Scheme 2

5-methylpyrrolidin-2-one (compound **8a)** Prepared by procedure **B** from 4-hydroxypentanenitrile and tropylium tetrafluoroborate to give compound **8a** as colorless oil (70 mg, 71% yield).



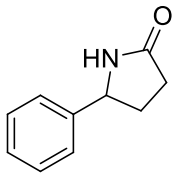
8a

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.78 (br, 1H), 3.82 – 3.74 (m, 1H), 2.40 – 2.22 (m, 3H), 1.70 – 1.61 (m, 1H), 1.22 (d, J = 6.4 Hz, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 178.4, 50.1, 30.6, 29.1, 22.1 ppm.

Characterization data matches the literature report[16].

5-phenylpyrrolidin-2-one (compound **8b)** Prepared by procedure **B** from 4-hydroxy-4-phenylbutanenitrile and tropylium tetrafluoroborate to give compound **8b** as a white solid (127 mg, 79% yield).



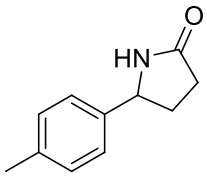
8b

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 – 7.19 (m, 5H), 6.54 (s, 1H), 4.76 (t, J = 7.2 Hz, 1H), 2.63 – 2.38 (m, 3H), 2.03 – 1.94 (m, 1H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 178.6, 142.4, 128.9, 127.9, 125.6, 58.1, 31.3, 30.3 ppm.

Characterization data matches the literature report[16].

5-*p*-tolylpyrrolidin-2-one (compound **8c)** Prepared by procedure **B** from 4-hydroxy-4-*p*-tolylbutanenitrile and tropylium tetrafluoroborate to give compound **8c** as a white solid (140 mg, 80% yield).



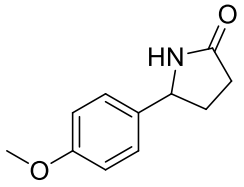
8c

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20 – 7.16 (m, 4H), 6.95 (s, 1H), 4.70 (t, J = 7.2 Hz, 1H), 2.58 – 2.49 (m, 1H), 2.48 – 2.38 (m, 2H), 2.35 (s, 3H), 1.98 – 1.89 (m, 1H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 178.8, 139.6, 137.5, 129.5, 125.6, 57.9, 31.3, 30.4, 21.0 ppm.

Characterization data matches the literature report[16].

5-(4-methoxyphenyl)pyrrolidin-2-one (compound **8d)** Prepared by procedure **B** from 4-hydroxy-4-(4-methoxyphenyl)butanenitrile and tropylium tetrafluoroborate to give compound **8d** as a white solid (158 mg, 83% yield).



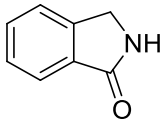
8d

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.22 (d, J = 8.4 Hz, 2H), 6.89 (d, J = 8.8 Hz, 2H), 6.39 (br, 1H), 4.70 (t, J = 7.2 Hz, 1H), 3.82 (s, 3H), 2.59 – 2.37 (m, 3H), 2.01 – 1.93 (m, 1H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 178.5, 159.3, 134.4, 126.9, 114.2, 57.7, 55.3, 31.5, 30.4 ppm.

Characterization data matches the literature report[16].

Isoindolin-1-one (compound **8e)** Prepared by procedure **B** from 2-(hydroxymethyl)benzonitrile and tropylium tetrafluoroborate to give compound **8e** as a white solid (90 mg, 68% yield).



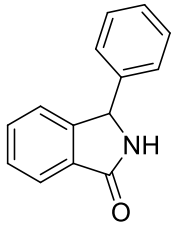
8e

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 (d, J = 8.0 Hz, 1H), 7.62 – 7.57 (m, 1H), 7.52 – 7.49 (m, 2H), 7.44 (d, J = 8.0 Hz, 1H), 4.50 (s, 2H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.9, 143.6, 131.9, 131.7, 128.0, 123.8, 123.2, 45.7 ppm.

Characterization data matches the literature report[17].

3-phenylisoindolin-1-one (compound **8f)** Prepared by procedure **B** from 2-(hydroxy(phenyl)methyl)benzonitrile and tropylium tetrafluoroborate to give compound **8f** as a white solid (150 mg, 72% yield).



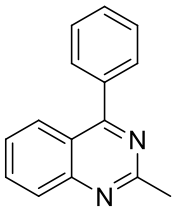
8f

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.91 – 7.89 (m, 1H), 7.54 – 7.46 (m, 2H), 7.40 – 7.33 (m, 3H), 7.32 – 7.25 (m, 3H), 7.09 (s, 1H), 5.65 (s, 1H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 147.9, 138.3, 132.3, 130.7, 129.0, 128.5, 128.3, 126.8, 123.8, 123.3, 60.9 ppm.

Characterization data matches the literature report[18].

2-methyl-4-phenylquinazoline (compound **10a)** Prepared by procedure **C** from (2-aminophenyl)(phenyl)methanol, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **10a** as a yellow oil (43 mg, 39% yield).



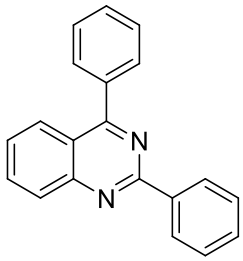
10a

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 – 8.03 (m, 2H), 7.90 – 7.86 (m, 1H), 7.78 – 7.76 (m, 2H), 7.60 – 7.52 (m, 4H), 2.97 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 168.6, 163.8, 151.3, 137.2, 133.7, 129.9, 129.8, 128.6, 128.0, 127.0, 126.7, 121.0, 26.6 ppm.

Characterization data matches the literature report[19].

2,4-diphenylquinazoline (compound **10b)** Prepared by procedure **C** from (2-aminophenyl)(phenyl)methanol, tropylium tetrafluoroborate and benzonitrile as nitrile group source to give compound **10b** as a white solid (46 mg, 33% yield).



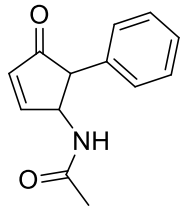
10b

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.76 – 8.73 (m, 2H), 8.24 (d, J = 8.4 Hz, 1H), 8.16 (d, J = 8.4 Hz, 1H), 7.95 – 7.90 (m, 3H), 7.65 – 7.53 (m, 7H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 168.5, 160.1, 151.6, 137.9, 137.6, 133.7, 130.6, 130.2, 130.0, 128.9, 128.8, 128.5, 127.1, 127.0, 121.7 ppm.

Characterization data matches the literature report[19].

***N*-(4-oxo-5-phenylcyclopent-2-enyl)acetamide (**compound **13a)** Prepared by procedure **A** from 4-hydroxy-5-phenylcyclopent-2-enone, tropylium tetrafluoroborate and acetonitrile as nitrile group source to give compound **13a** as a brown oil (170 mg, 79% yield).



13a

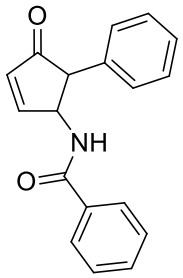
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 – 7.67 (m, 2H), 7.59 (d, J = 2.8 Hz, 1H), 7.40 – 7.36 (m, 3H), 6.19 (d, J = 8.0 Hz, 1H), 5.27 – 5.22 (m, 1H), 3.02 (dd, J_1 = 18.8 Hz, J_2 = 7.2 Hz, 1H), 2.33 (dd, J_1 = 18.8 Hz, J_2 = 2.8 Hz, 1H), 2.03 (s, 3H) ppm;

^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 170.1, 155.4, 144.2, 130.3, 129.2, 128.5, 127.3, 47.1, 43.5, 23.1 ppm;

ESI-HRMS: calcd for $C_{13}H_{13}NO_2Na^+$: m/z = 238.0838, found: m/z = 238.0838;

FTIR (neat): 3350, 3284, 3042, 2926, 2852, 1655, 1530, 1494, 1262 cm^{-1}.

***N*-(4-oxo-5-phenylcyclopent-2-enyl)benzamide (**compound **13b)** Prepared by procedure **A** from 4-hydroxy-5-phenylcyclopent-2-enone, tropylium tetrafluoroborate and benzonitrile as nitrile group source to give compound **13b** as a brown oil (224 mg, 81% yield).



13b

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 – 7.80 (m, 2H), 7.74 – 7.70 (m, 3H), 7.57 – 7.52 (m, 1H), 7.48 – 7.42 (m, 2H), 7.41 – 7.36 (m, 3H), 6.57 (d, J = 8.0 Hz, 1H), 5.51 – 5.47 (m, 1H), 3.14 (dd, J_1 = 18.8 Hz, J_2 = 6.8 Hz, 1H), 2.47 (dd, J_1 = 18.8 Hz, J_2 = 2.4 Hz, 1H) ppm;

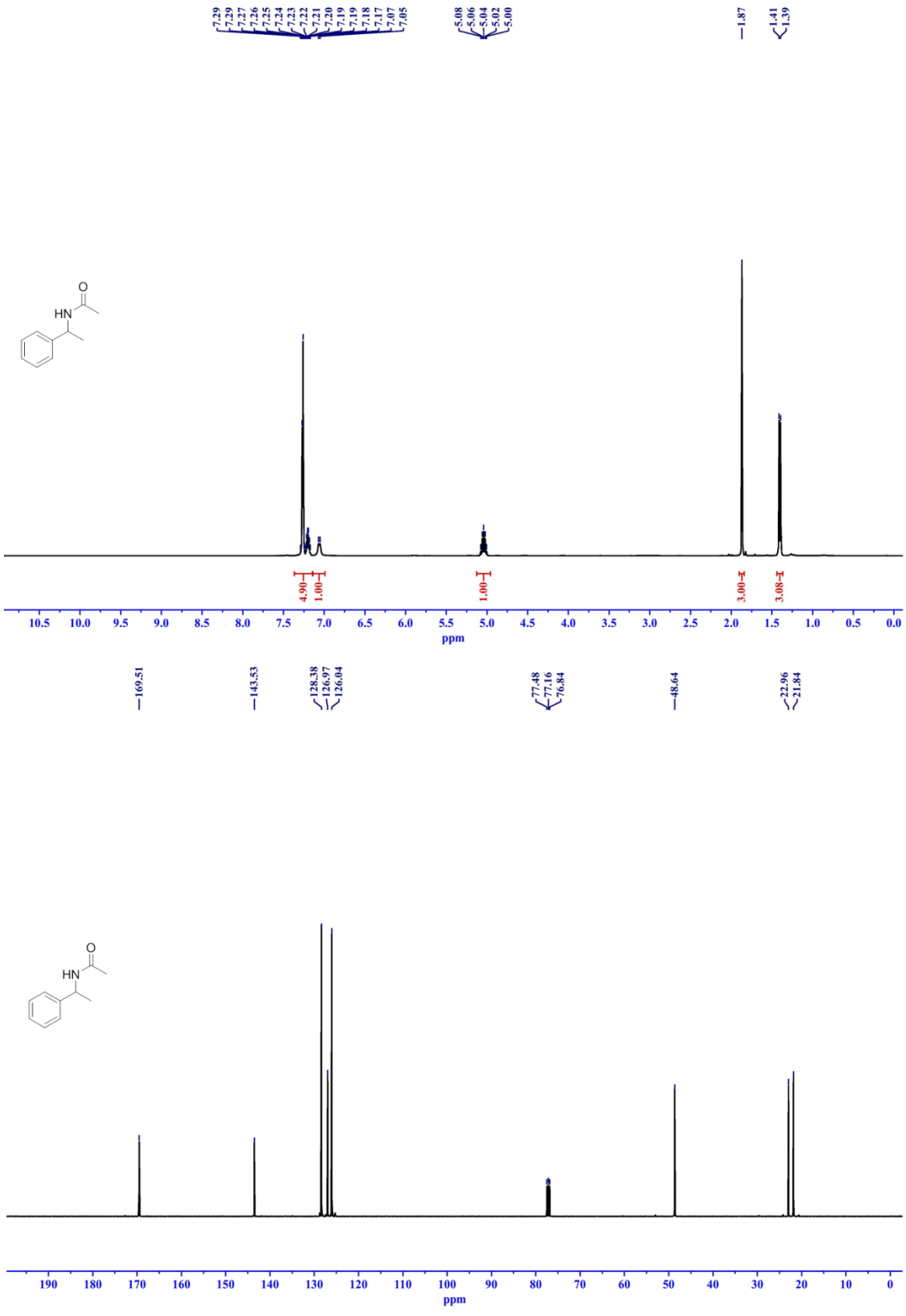
^{13}C NMR (101 MHz, $CDCl_3$) δ 204.2, 167.4, 155.1, 144.5, 133.6, 131.9, 130.3, 129.2, 128.7, 128.6, 127.4, 127.0, 47.5, 43.7 ppm;

ESI-HRMS: calcd for $C_{18}H_{15}NO_2Na^+$: m/z = 300.0995, found: m/z = 300.0993;

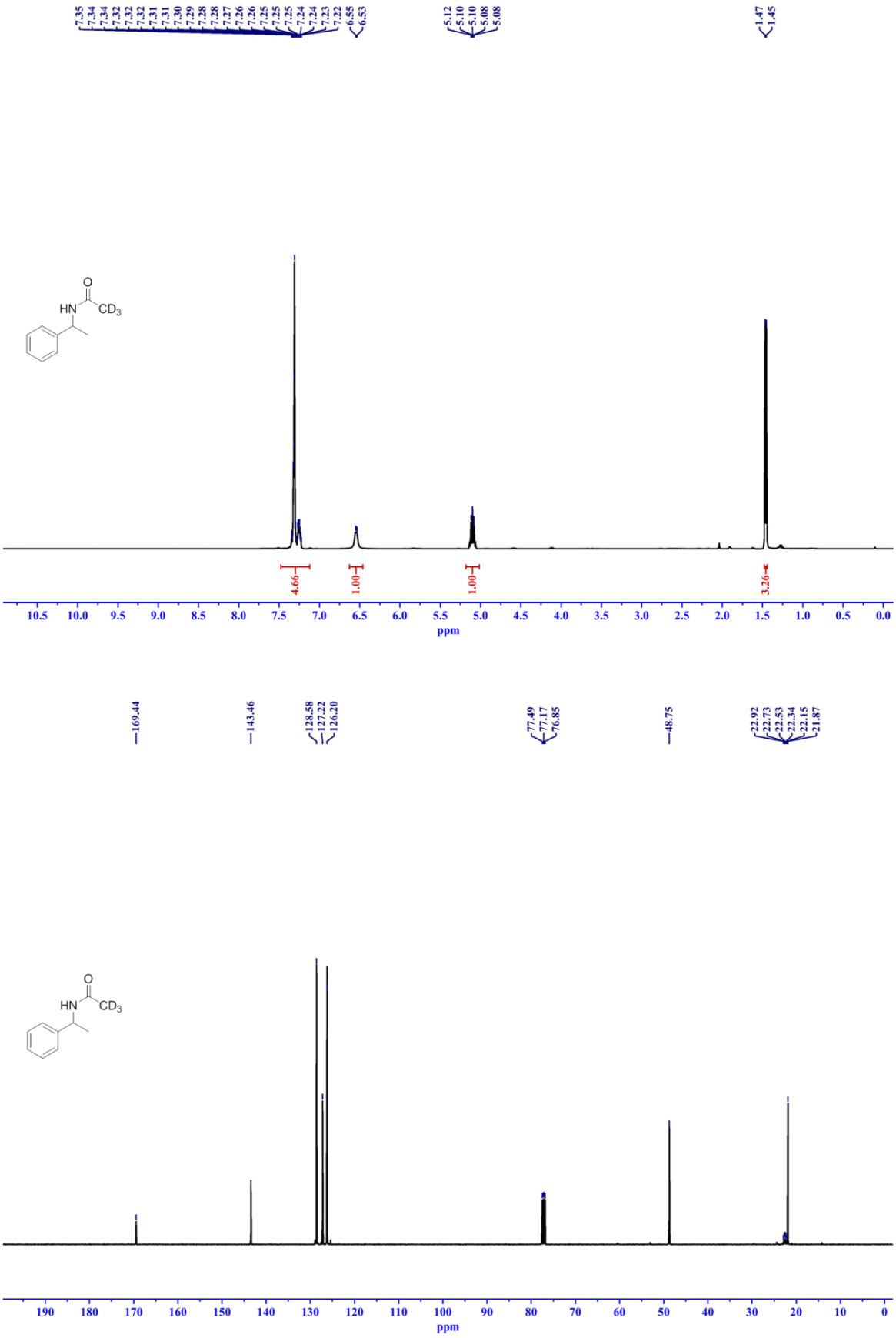
FTIR (neat): 3311, 3257, 3062, 2928, 2858, 1638, 1524, 1302, 1270 cm^{-1}.

NMR Spectra

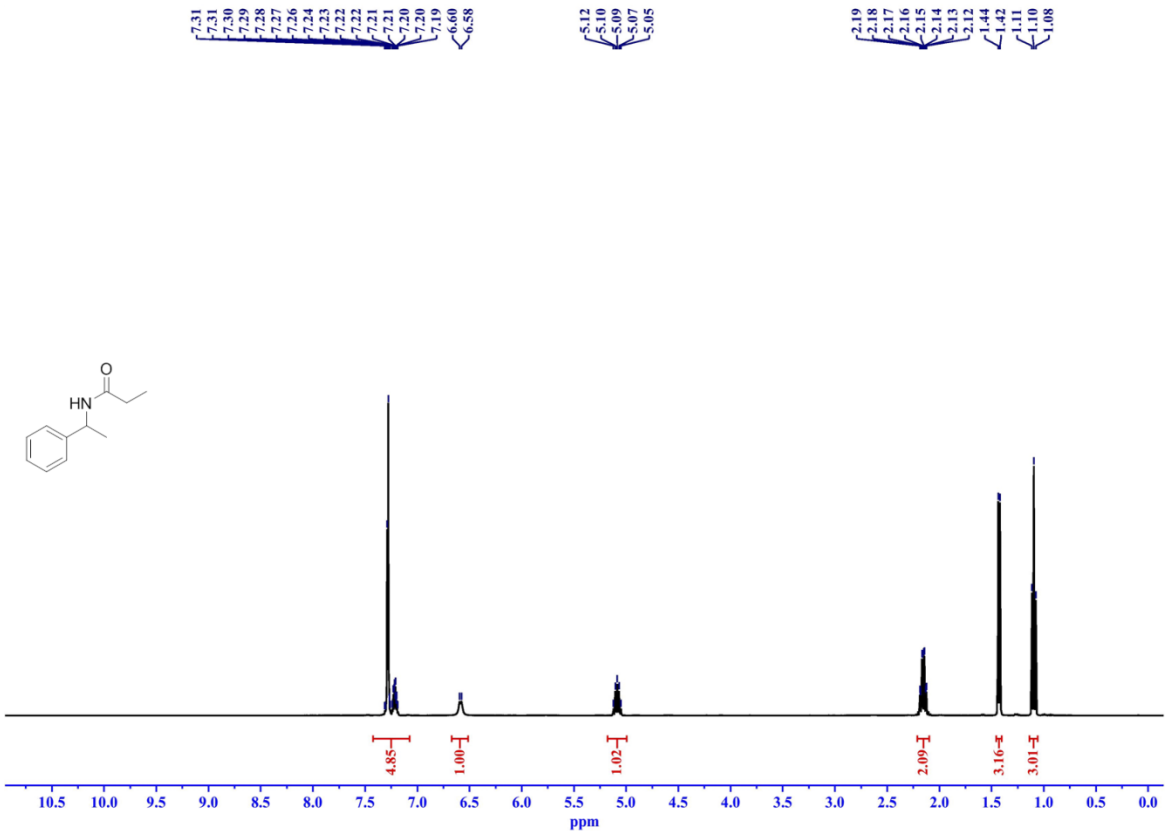
N-(1-phenylethyl)acetamide (**4a**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

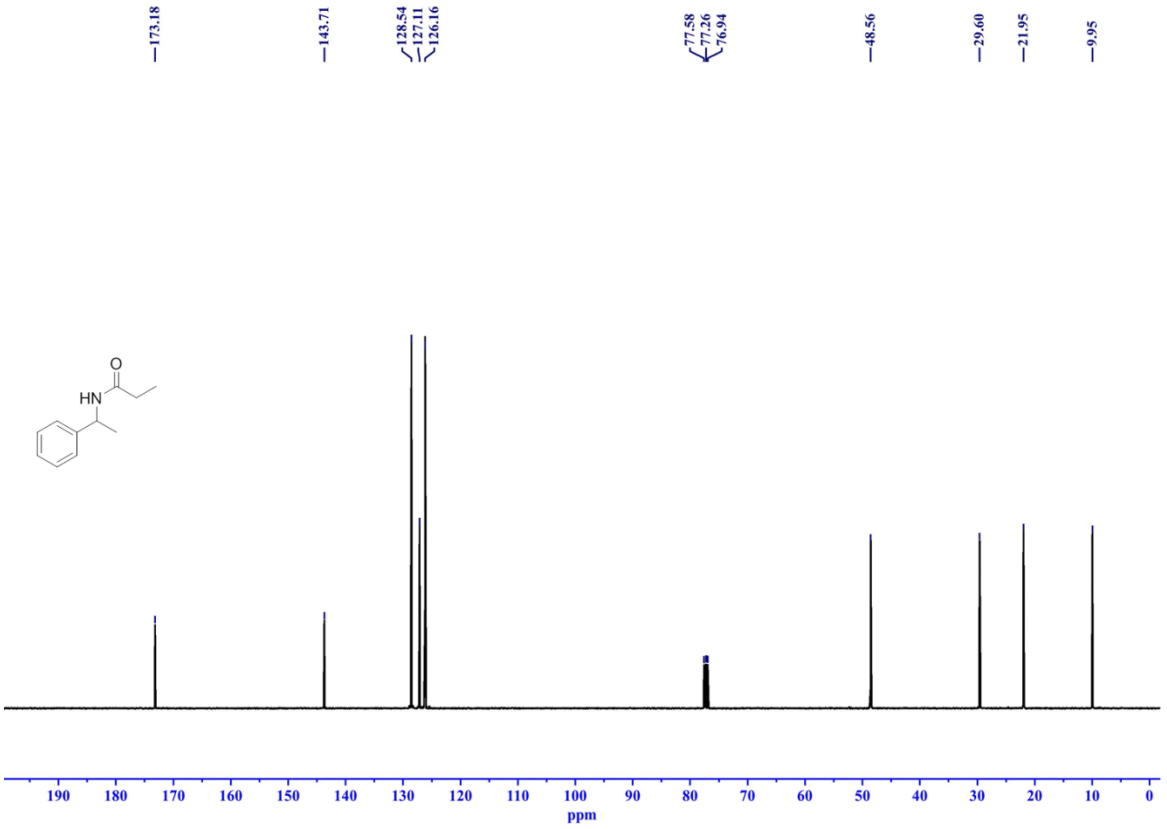


N-(1-phenylethyl)acetamide-2,2,2-d_3 (**4aD**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

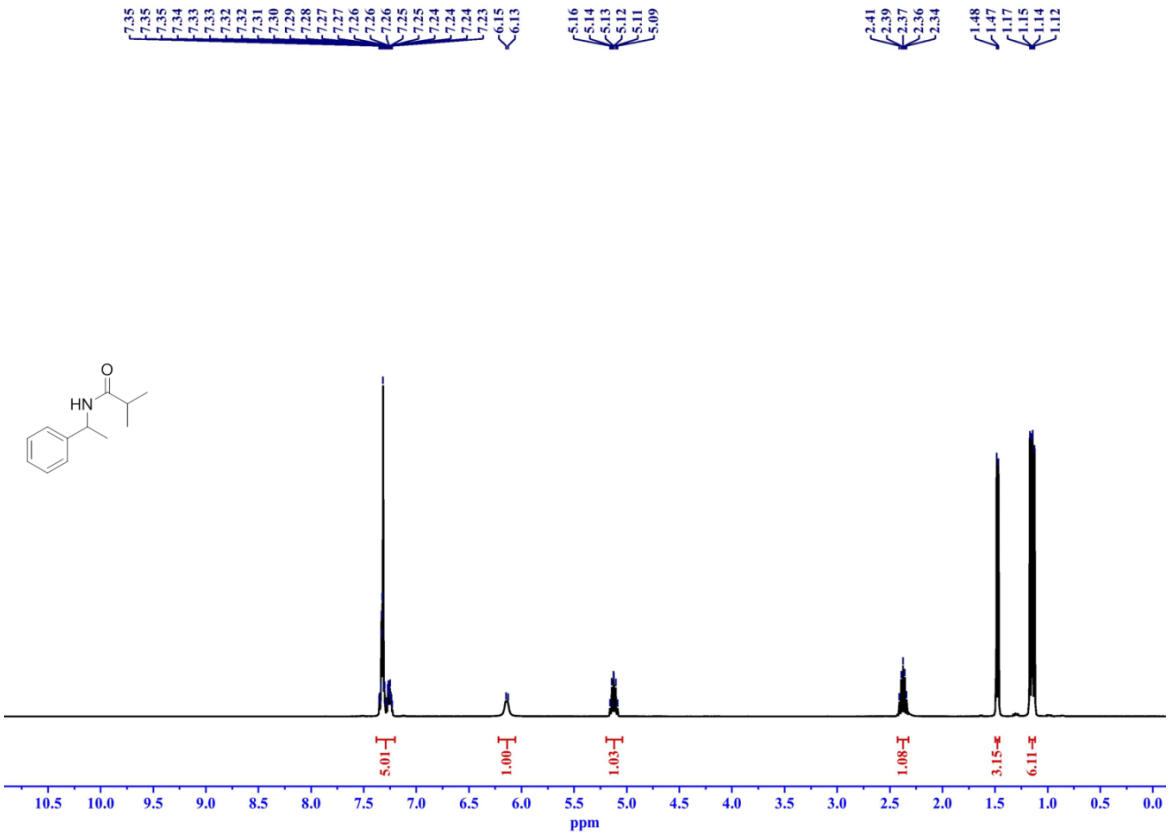


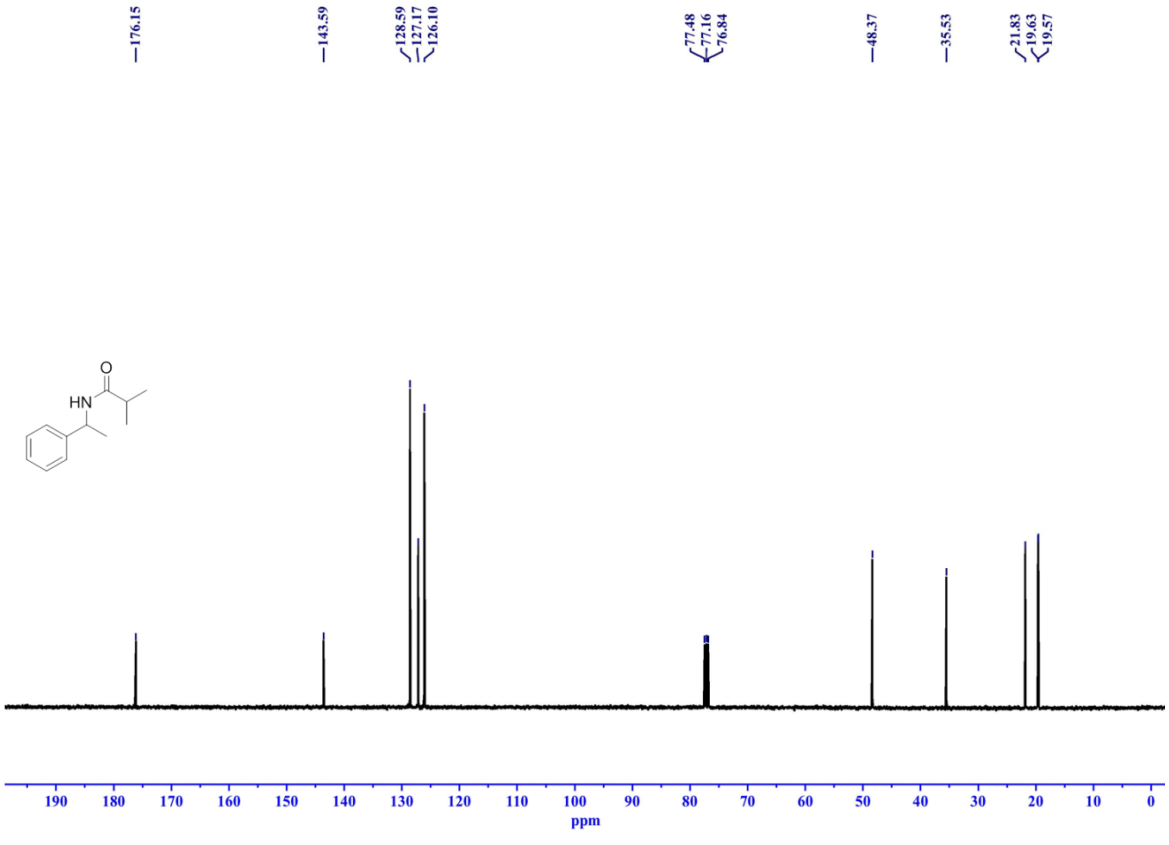
N-(1-phenylethyl)propionamide (**4b**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



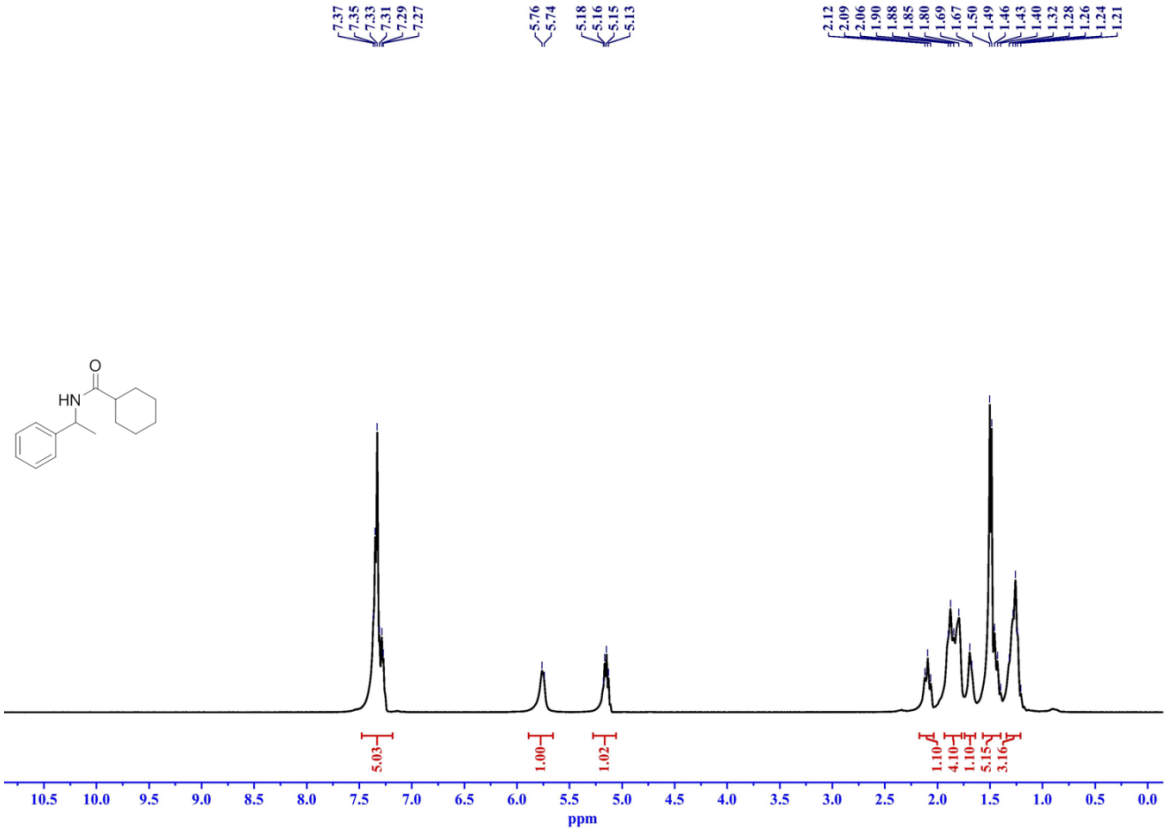


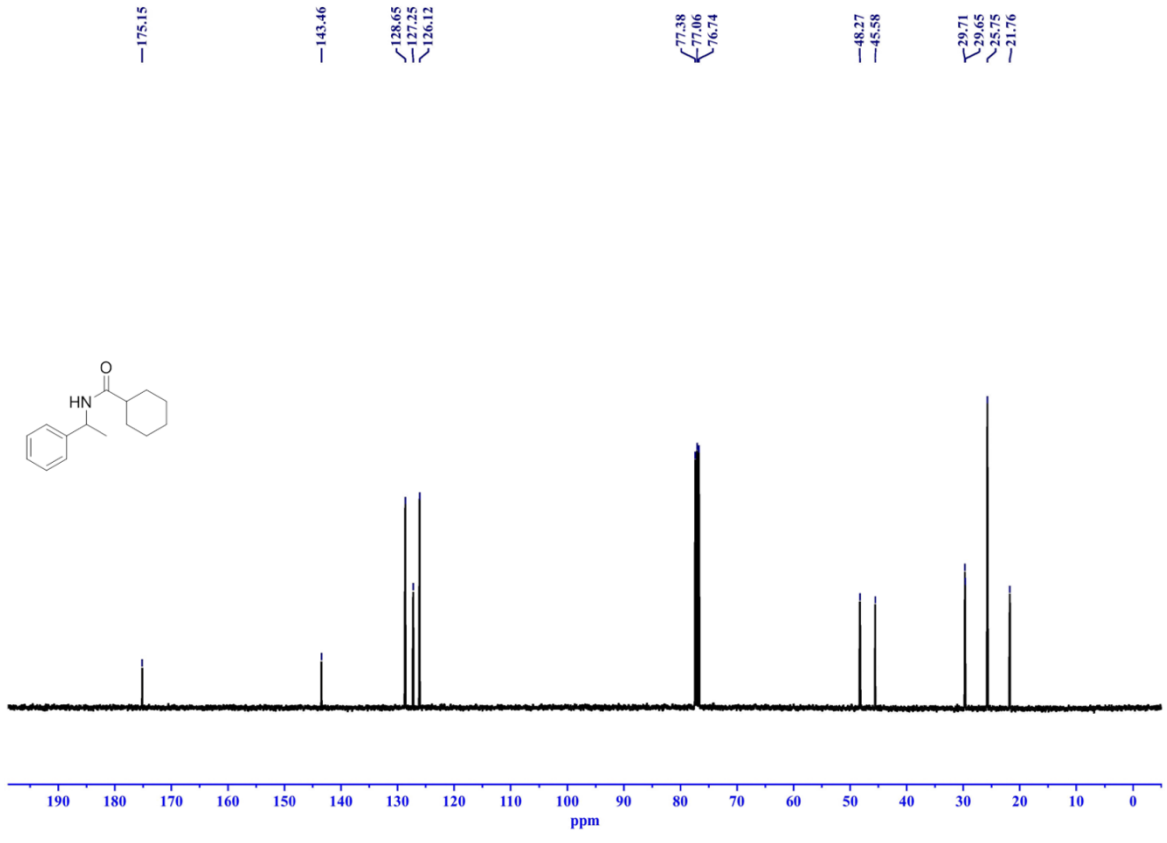
N-(1-phenylethyl)isobutyramide (**4c**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



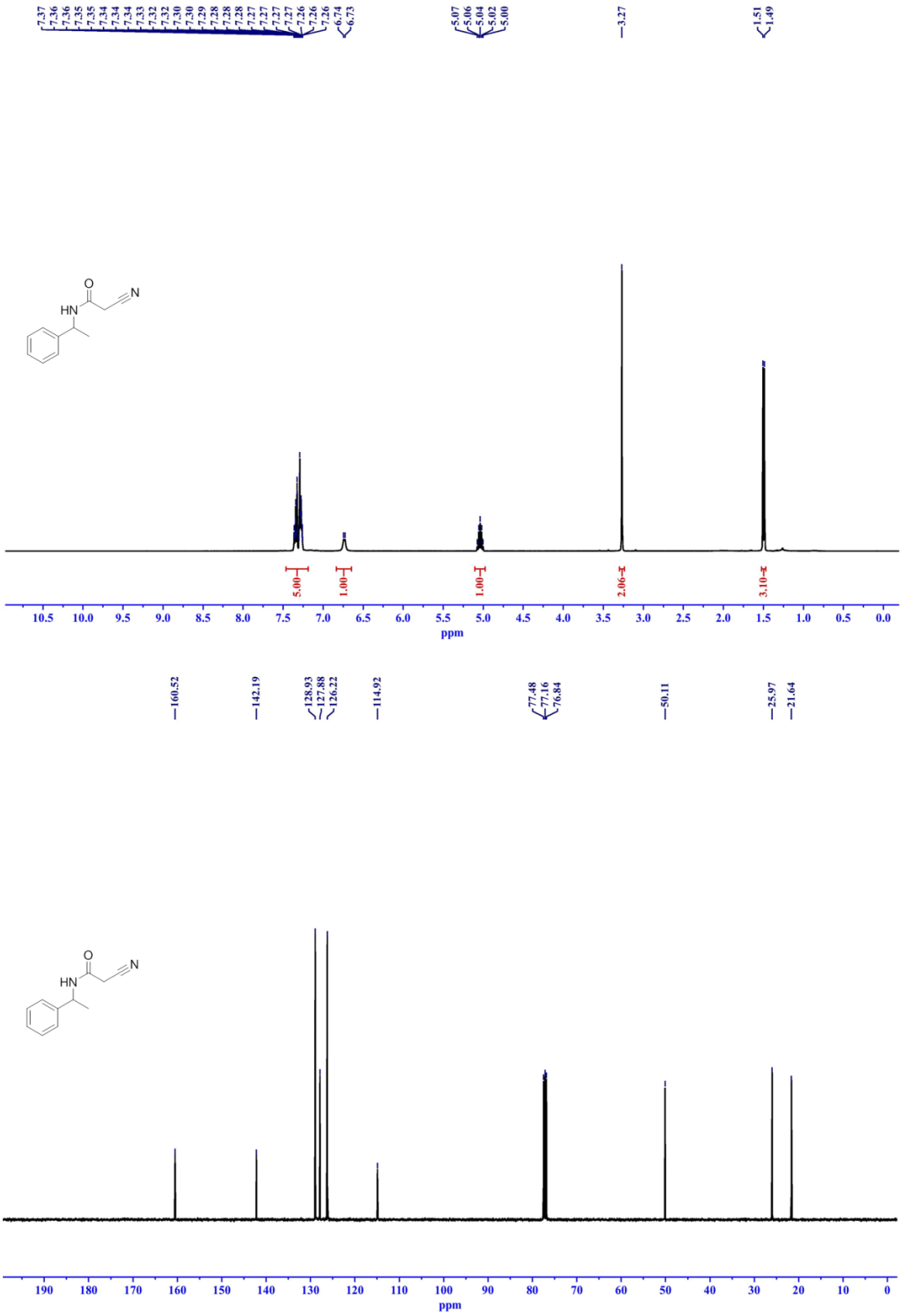


N-(1-phenylethyl)cyclohexanecarboxamide (**4d**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

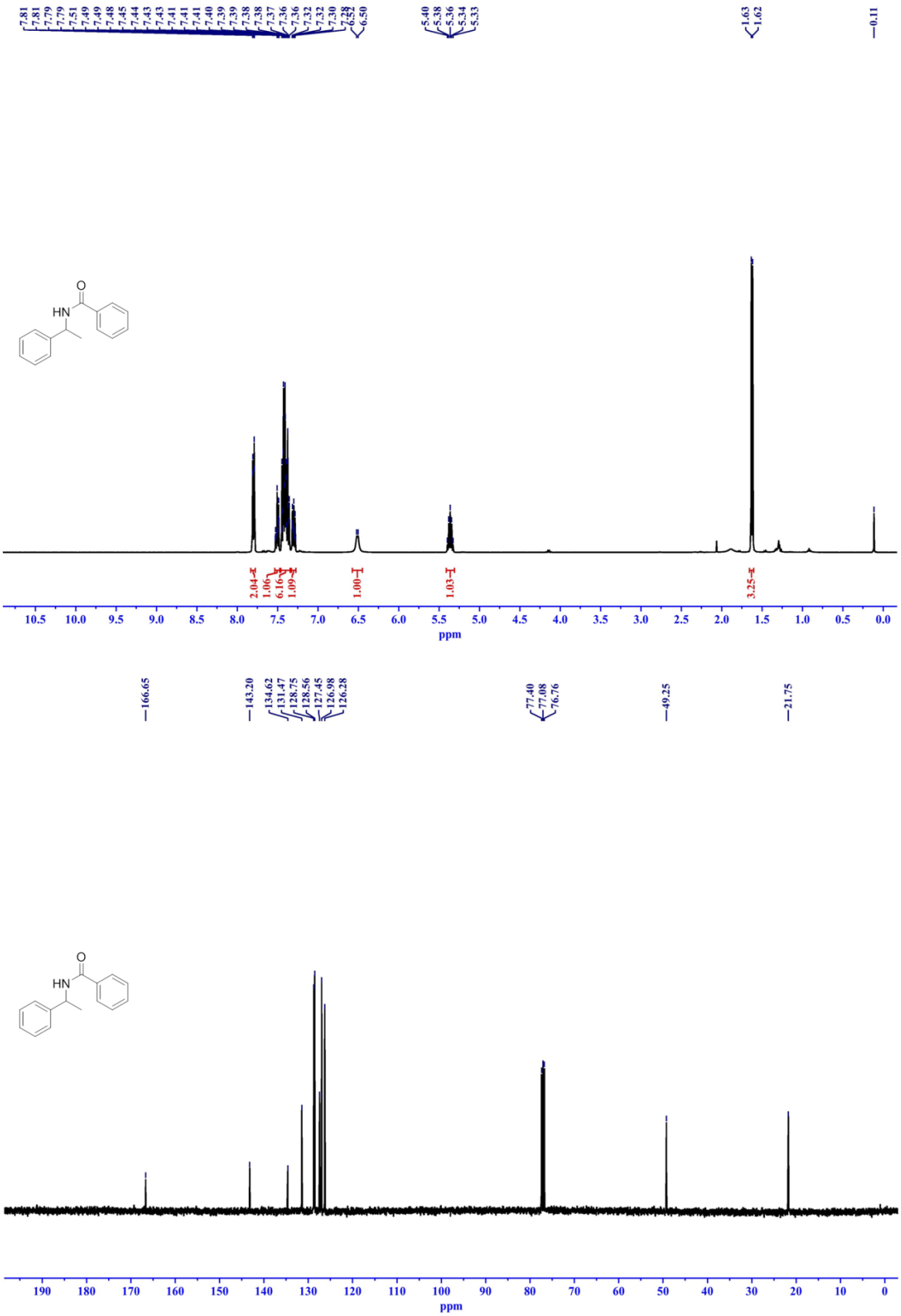




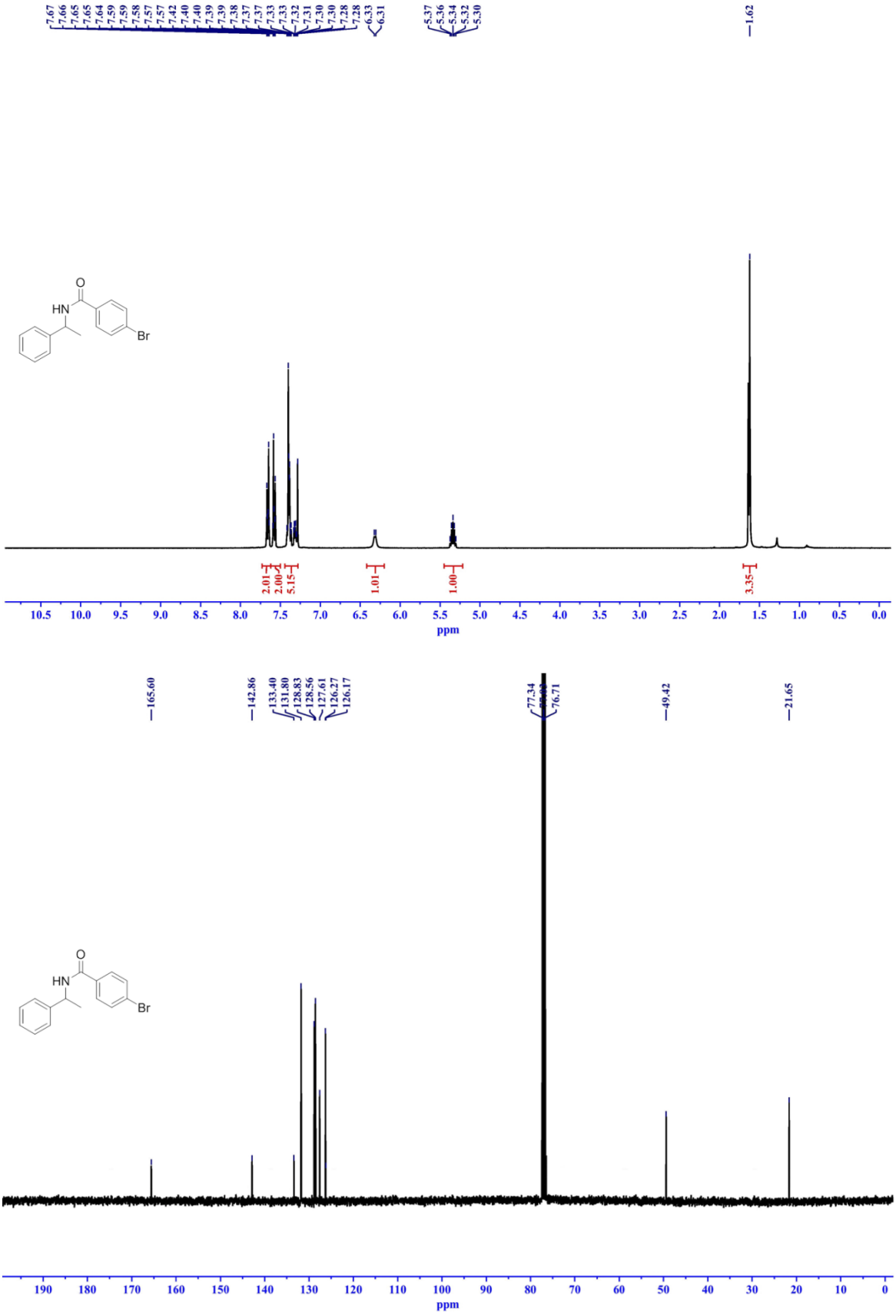
2-cyano-*N*-(1-phenylethyl)acetamide (**4e**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



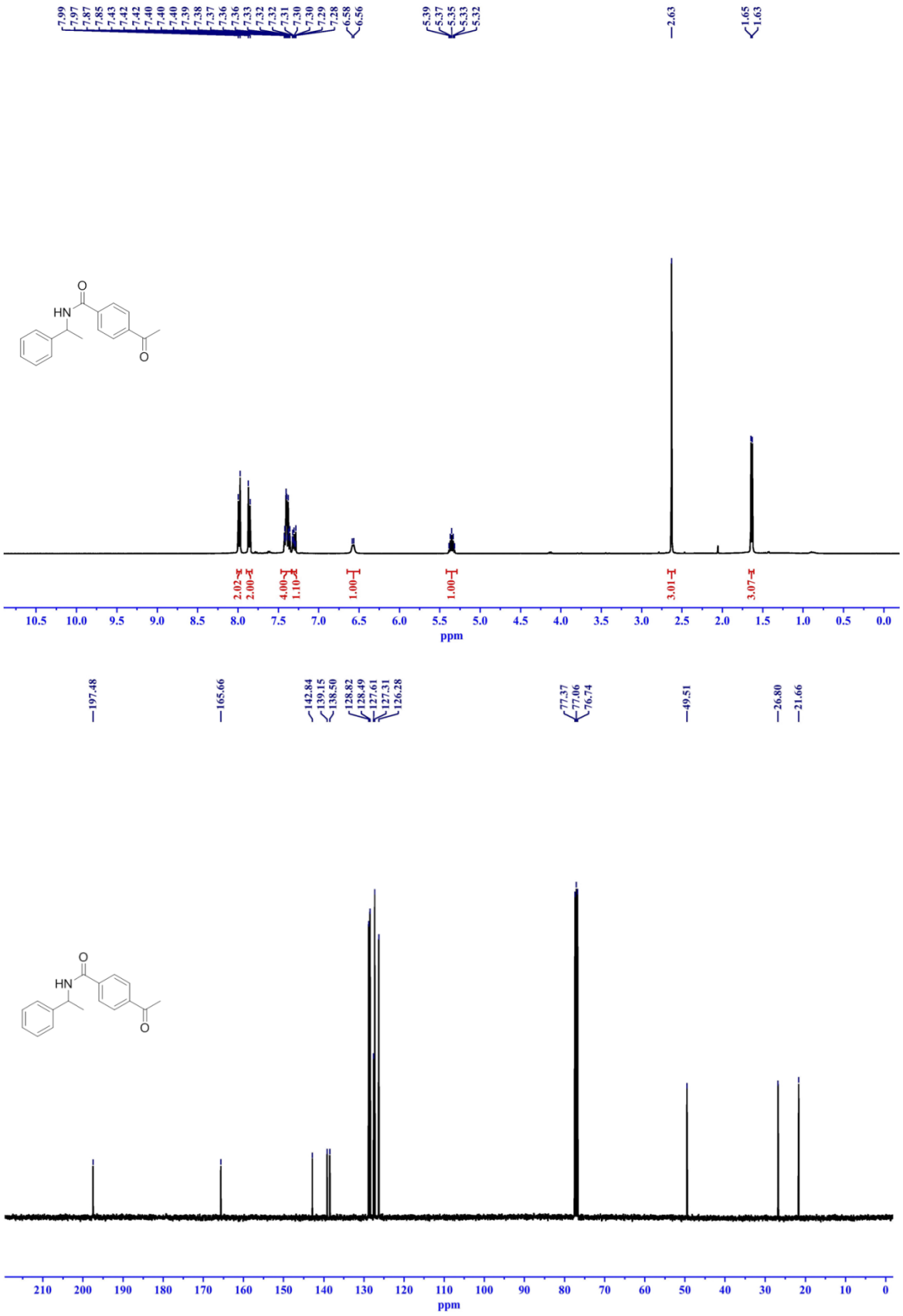
N-(1-phenylethyl)benzamide (**4f**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



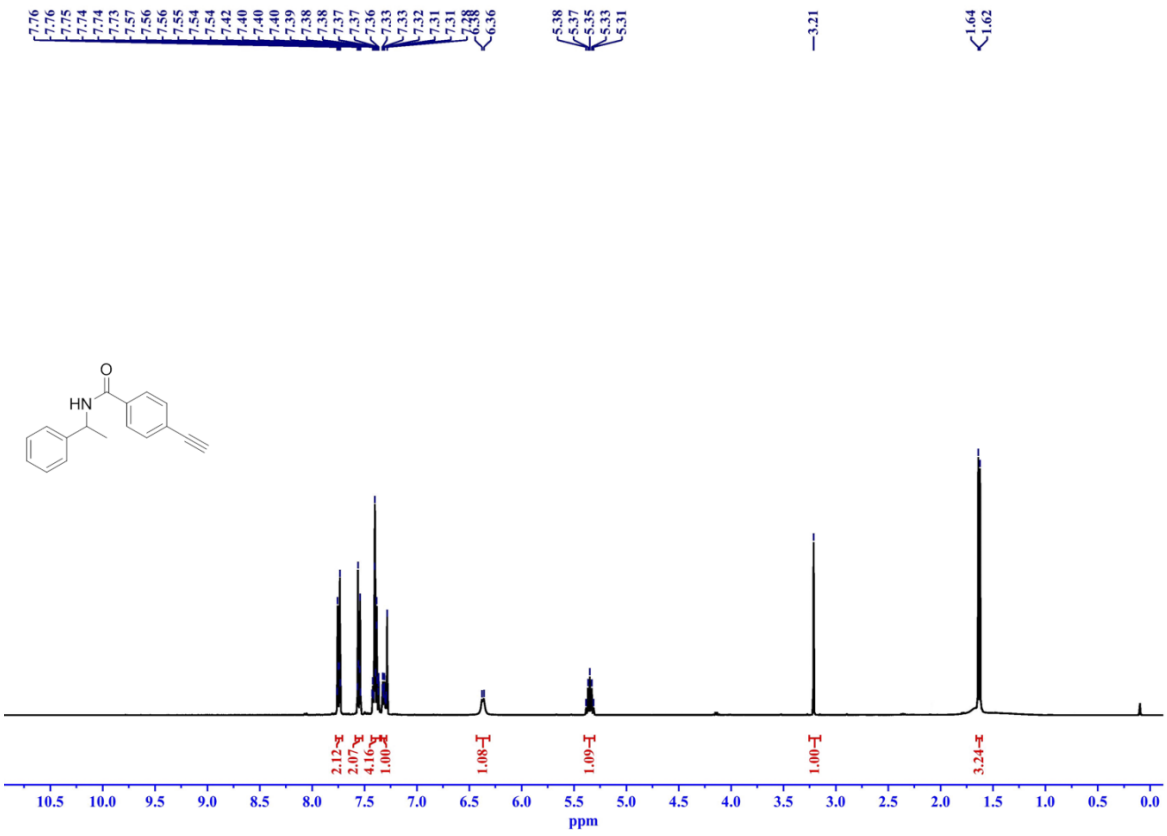
4-bromo-*N*-(1-phenylethyl)benzamide (**4h**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

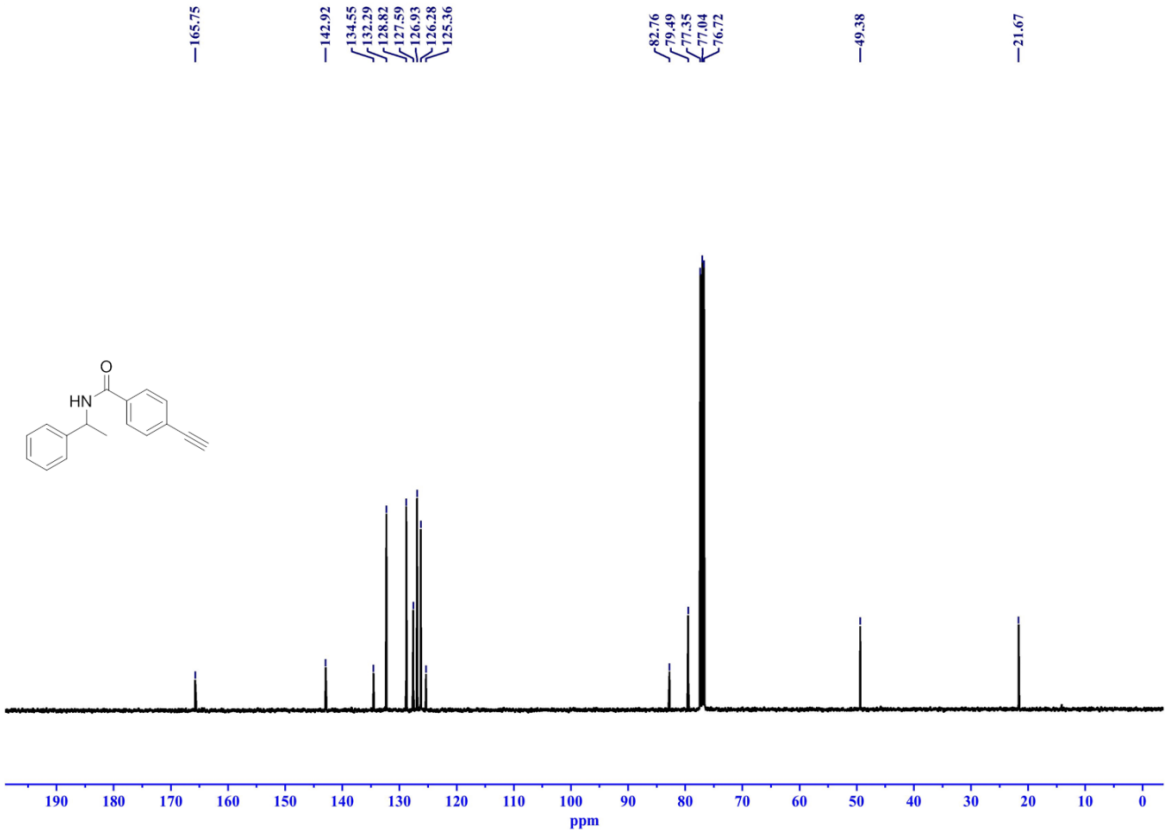


4-acetyl-*N*-(1-phenylethyl)benzamide (**4i**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

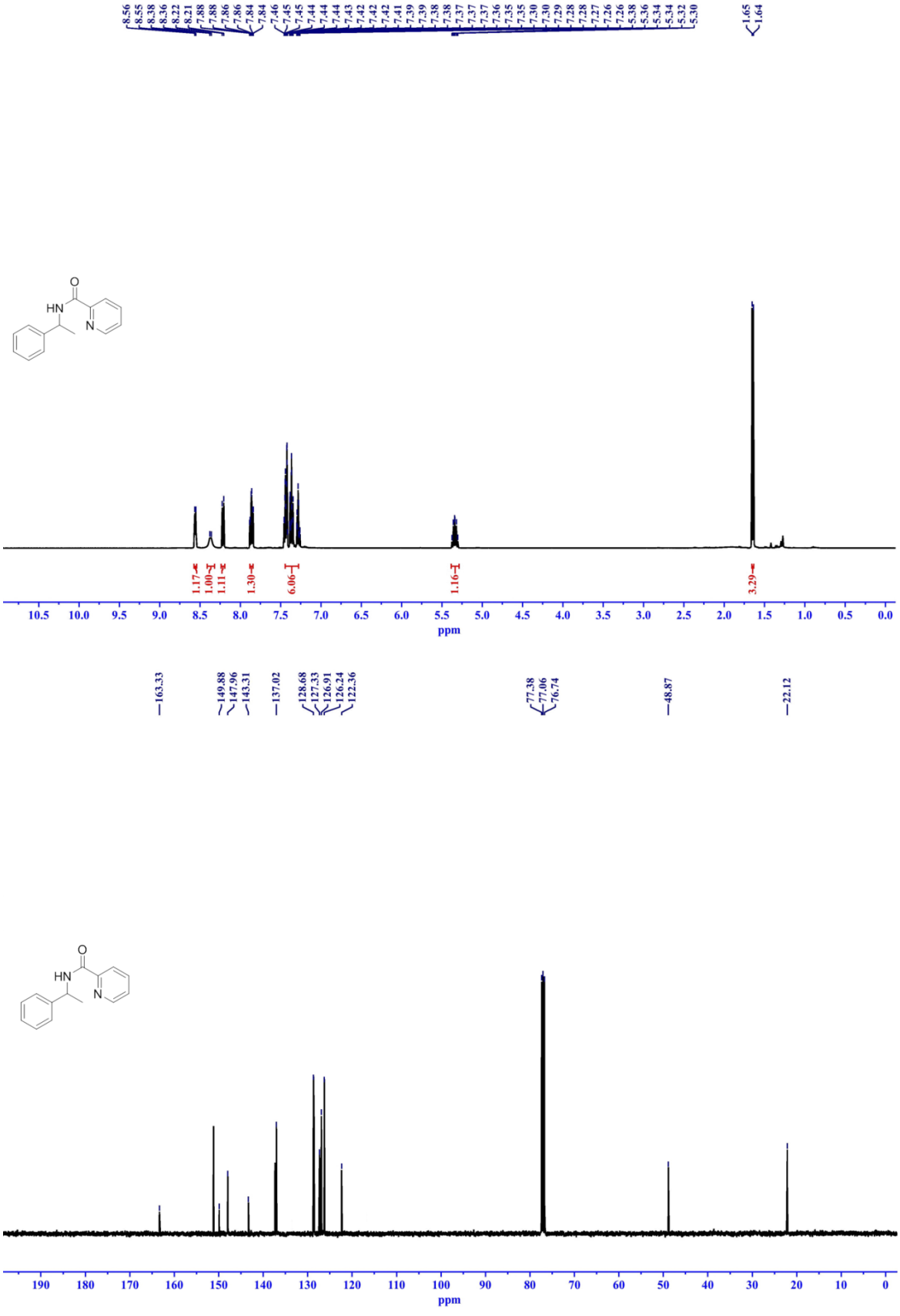


4-ethynyl-*N*-(1-phenylethyl)benzamide (**4j**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

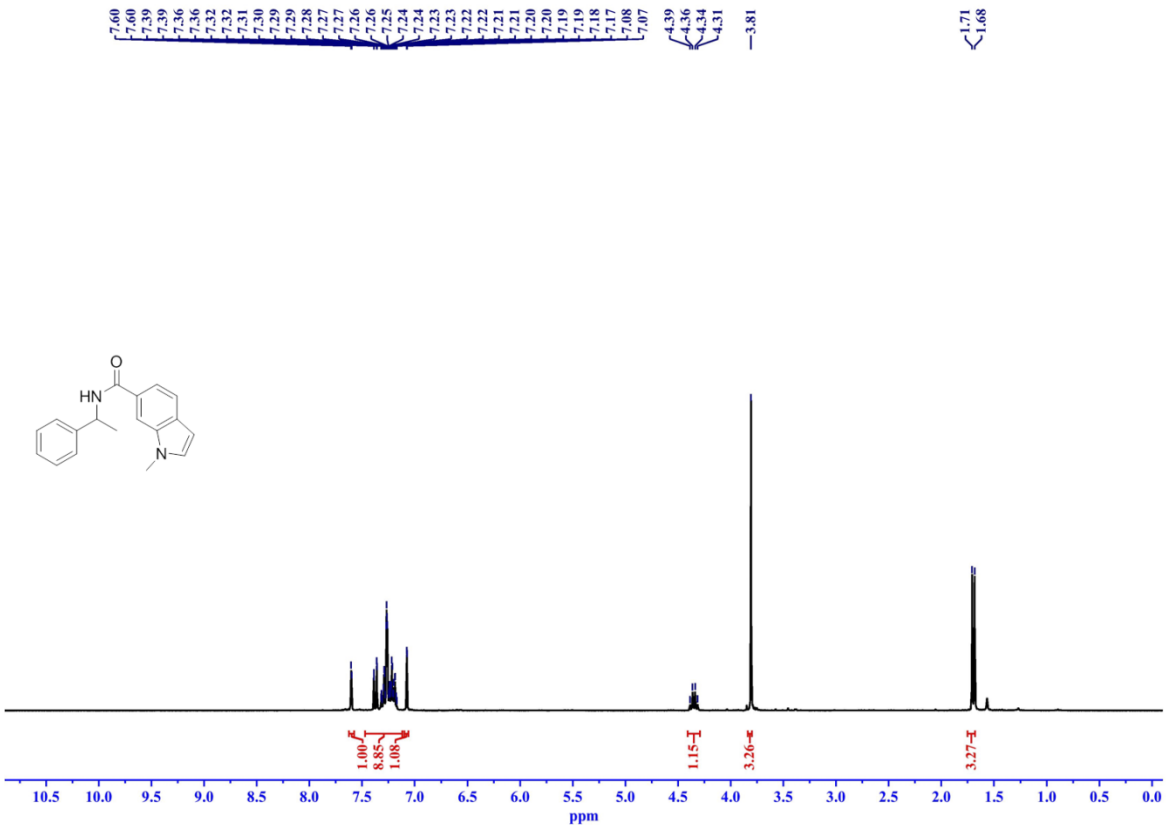


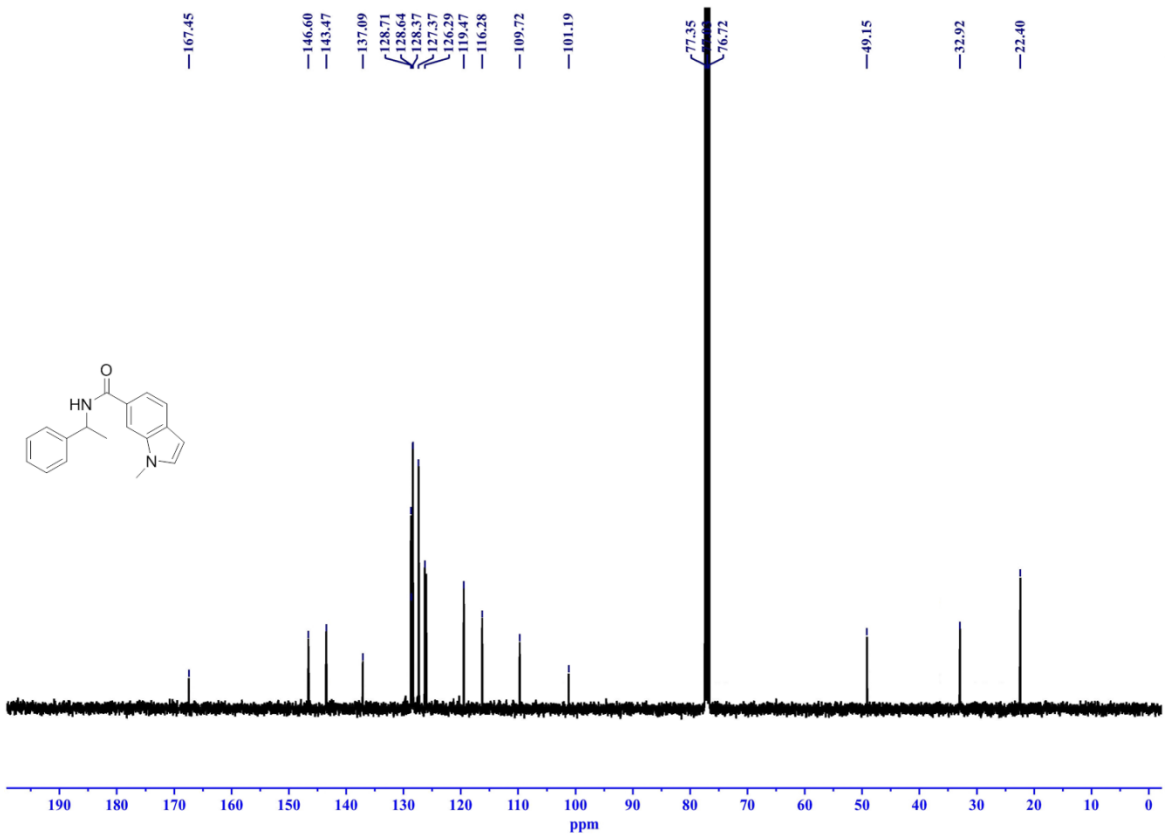


N-(1-phenylethyl)picolinamide (**4k**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

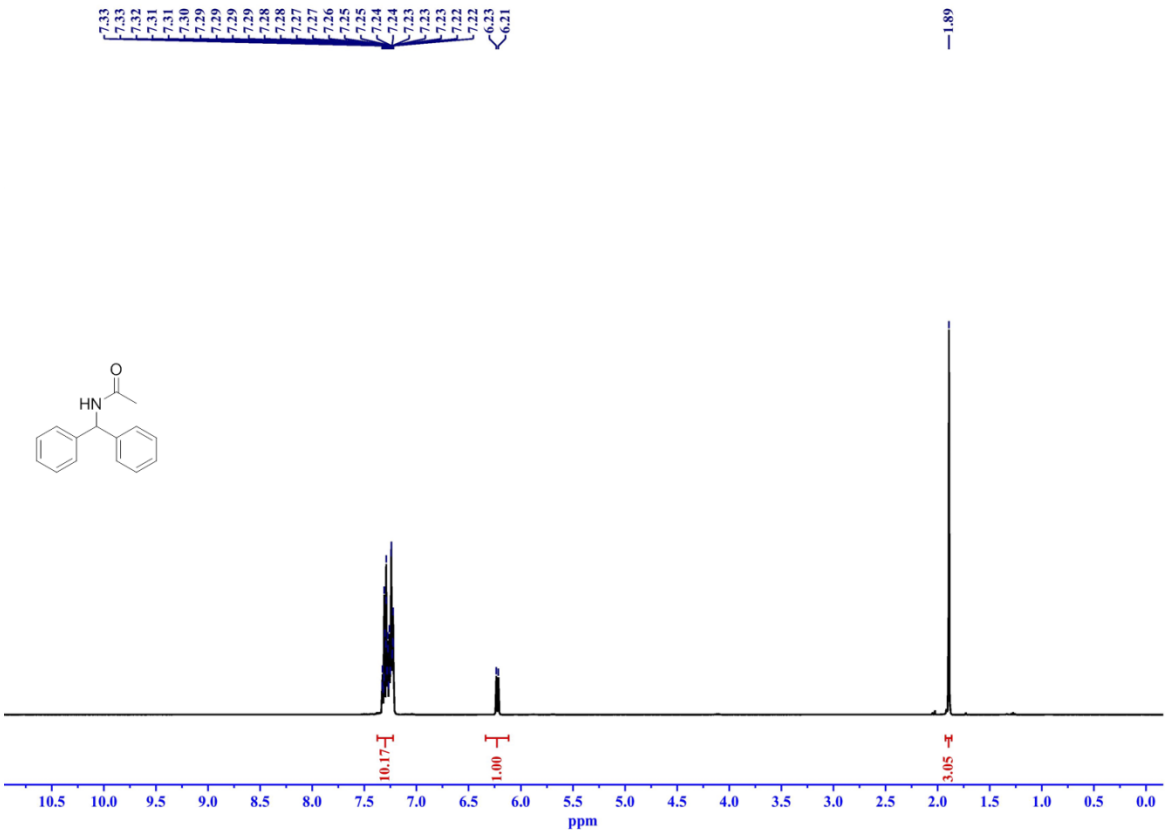


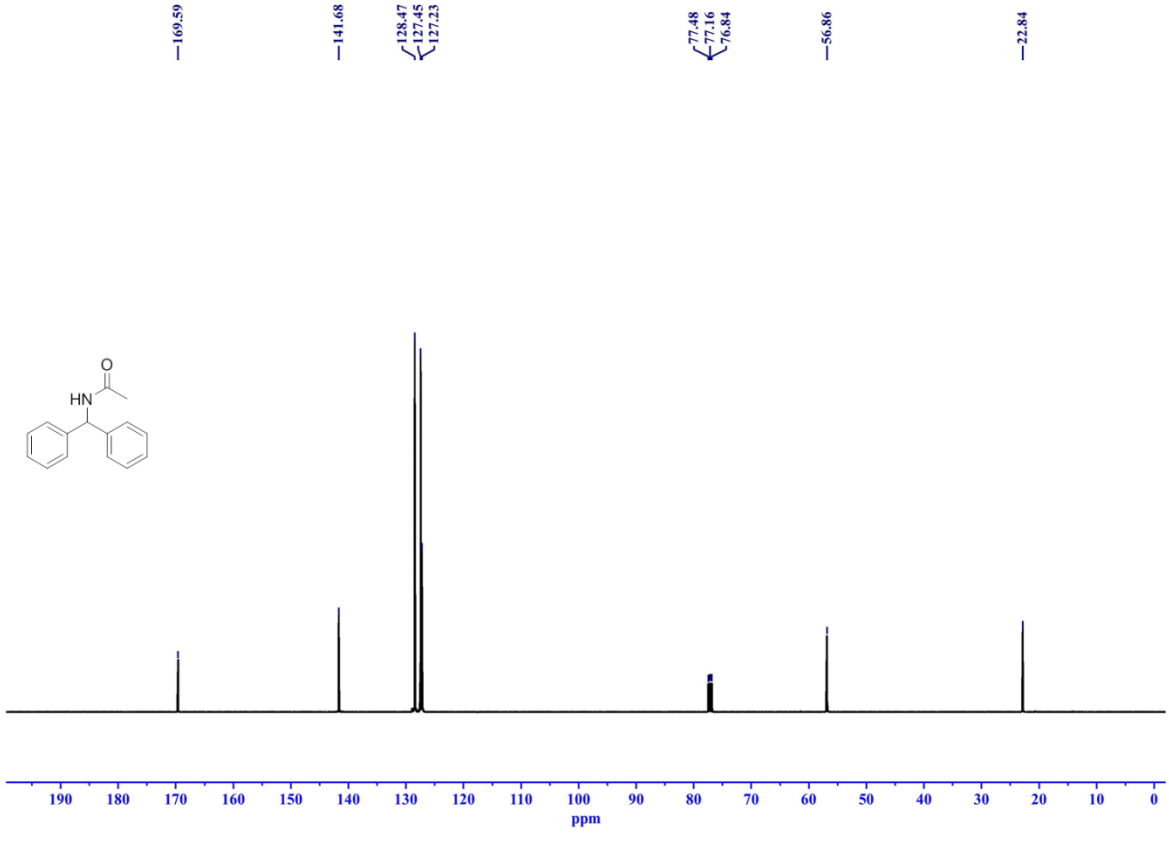
1-methyl-*N*-(1-phenylethyl)-1*H*-indole-6-carboxamide (**4l**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



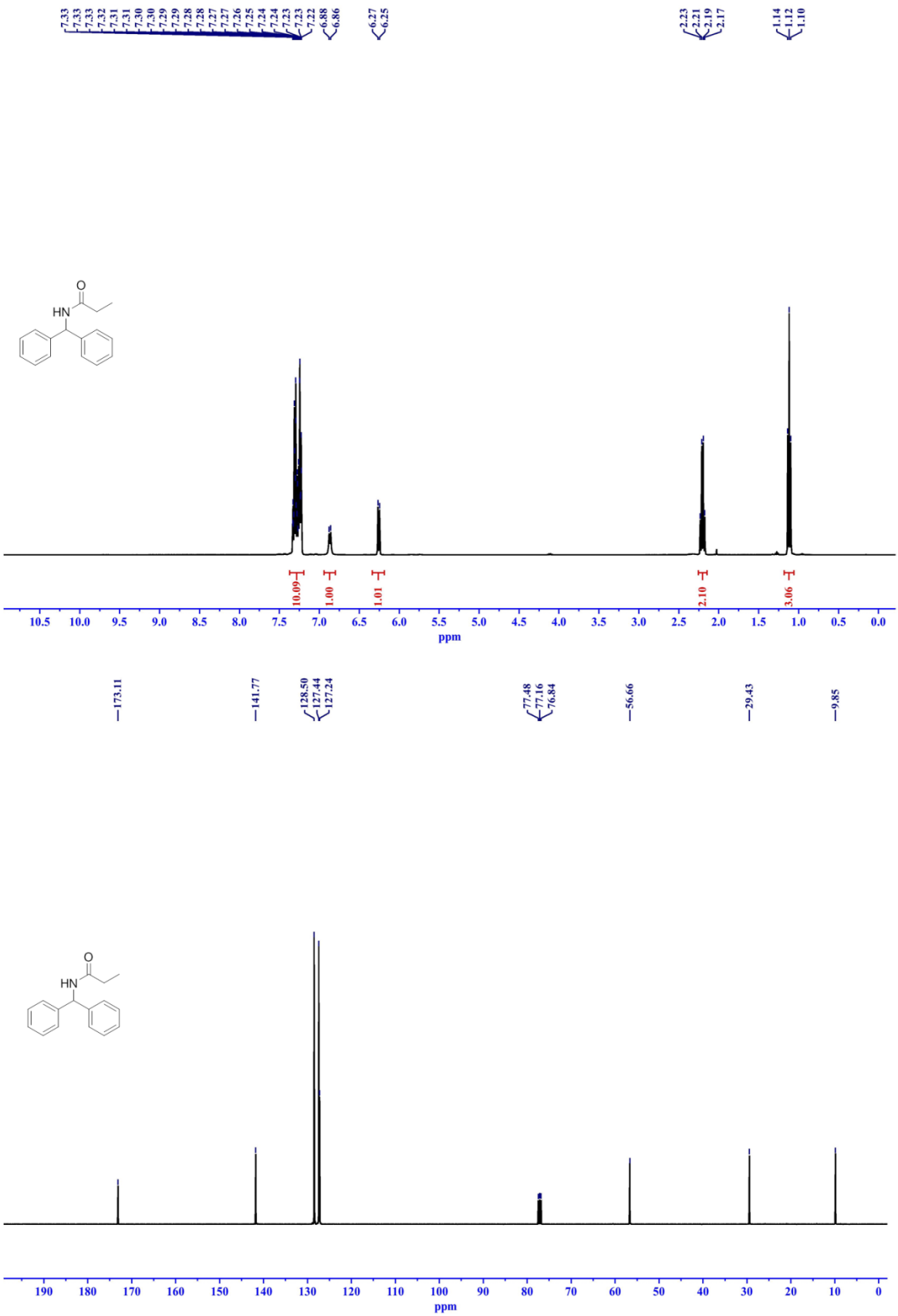


N-benzhydrylacetamide (**4m**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

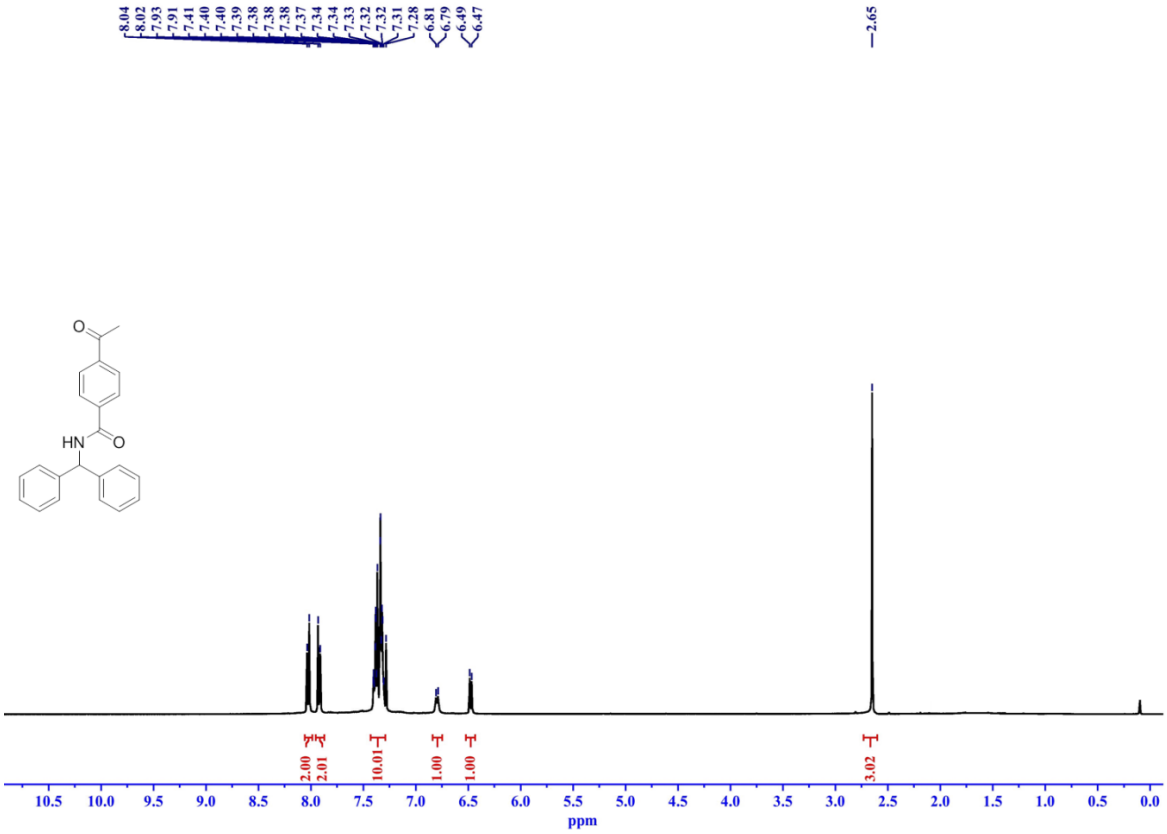


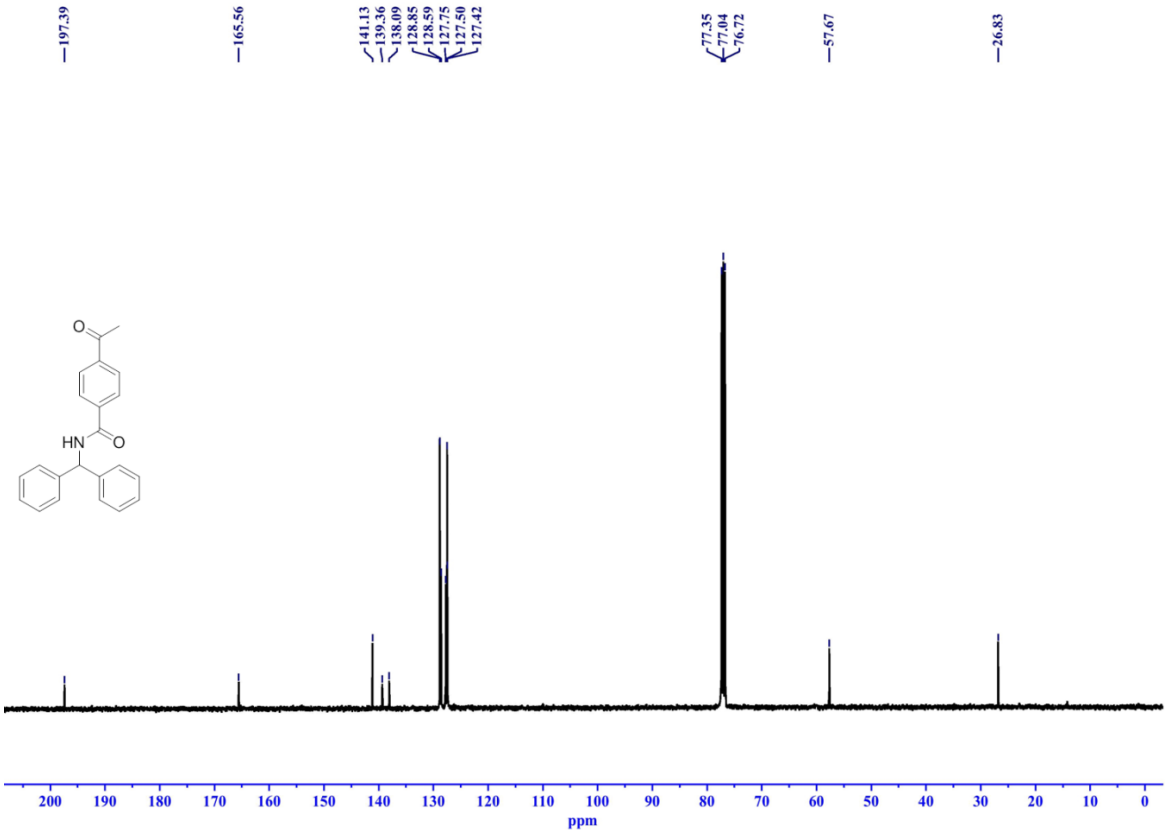


N-benzhydrylpropionamide (**4n**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

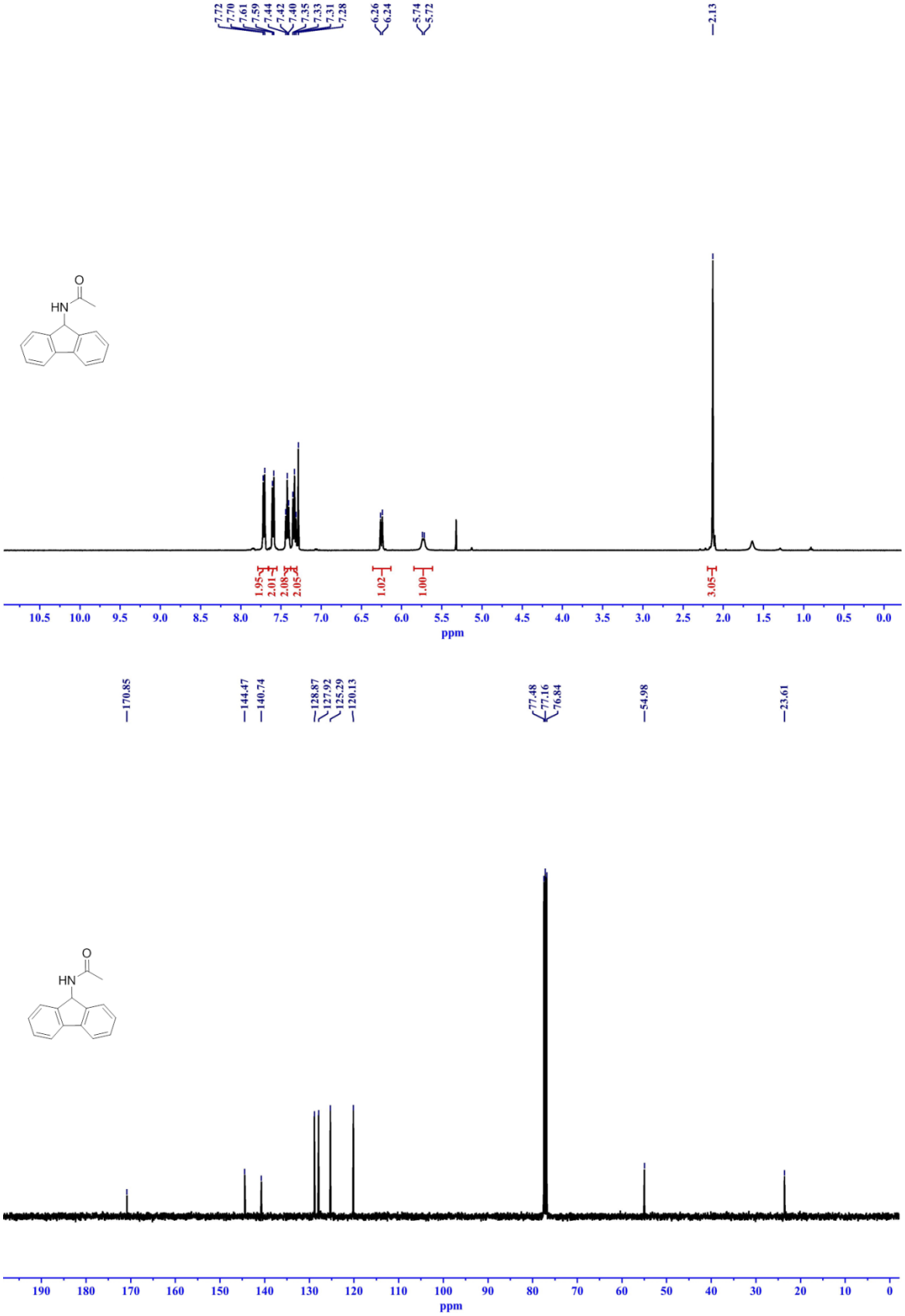


4-acetyl-*N*-benzhydrylbenzamide (**4o**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

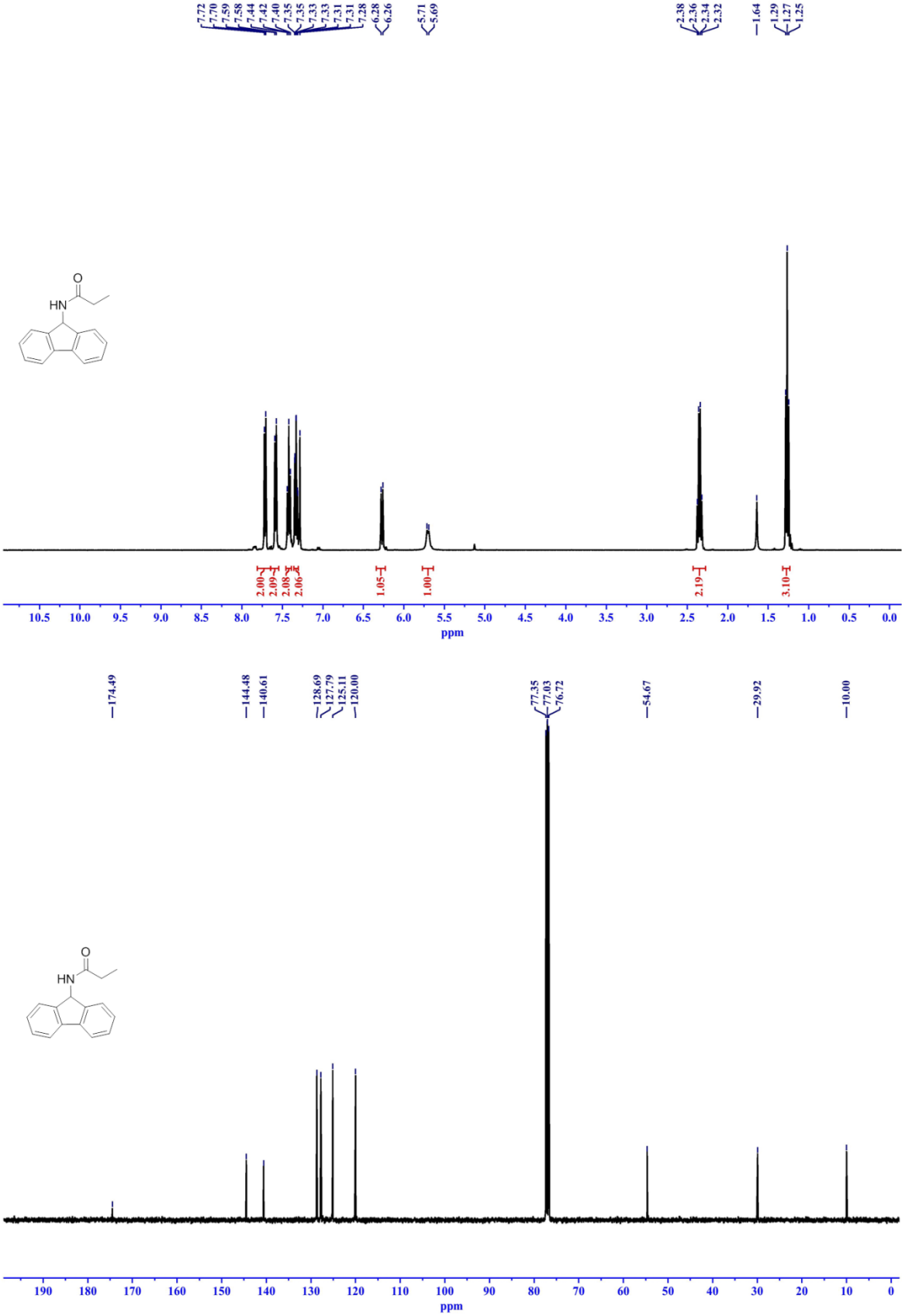




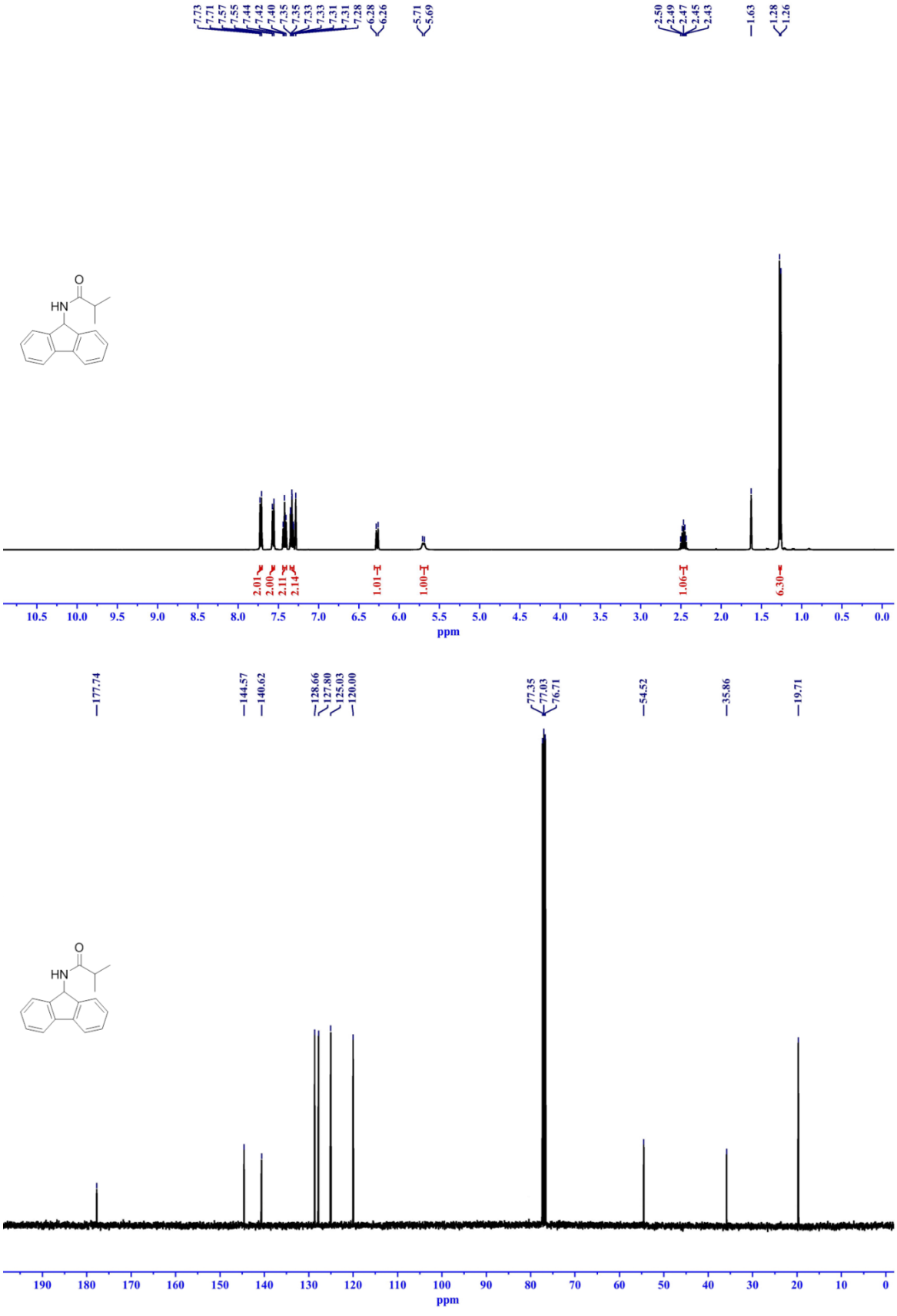
N-(9*H*-fluoren-9-yl)acetamide (**4p**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



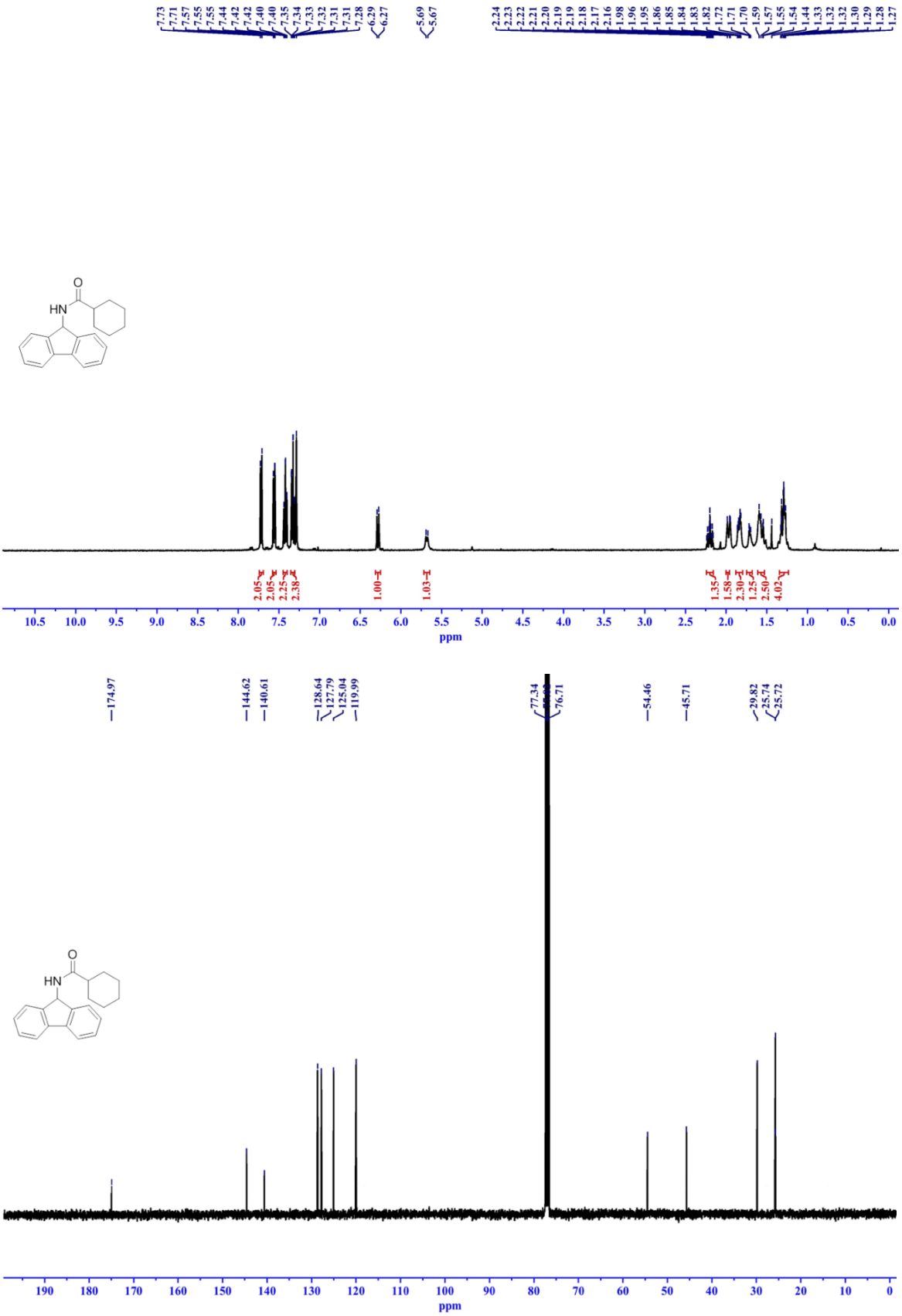
N-(9*H*-fluoren-9-yl)propionamide (**4q**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



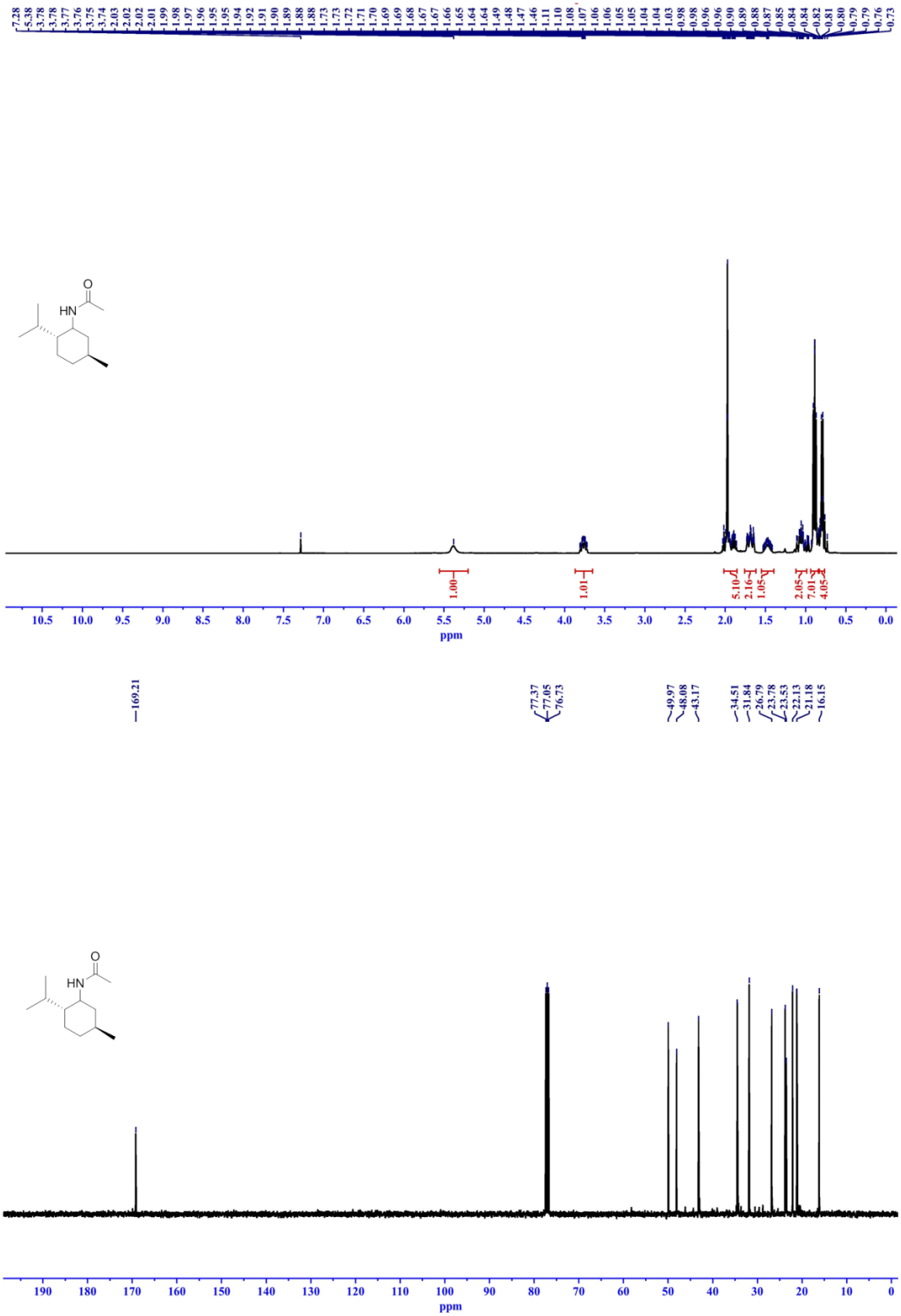
N-(9*H*-fluoren-9-yl)isobutyramide (**4r**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



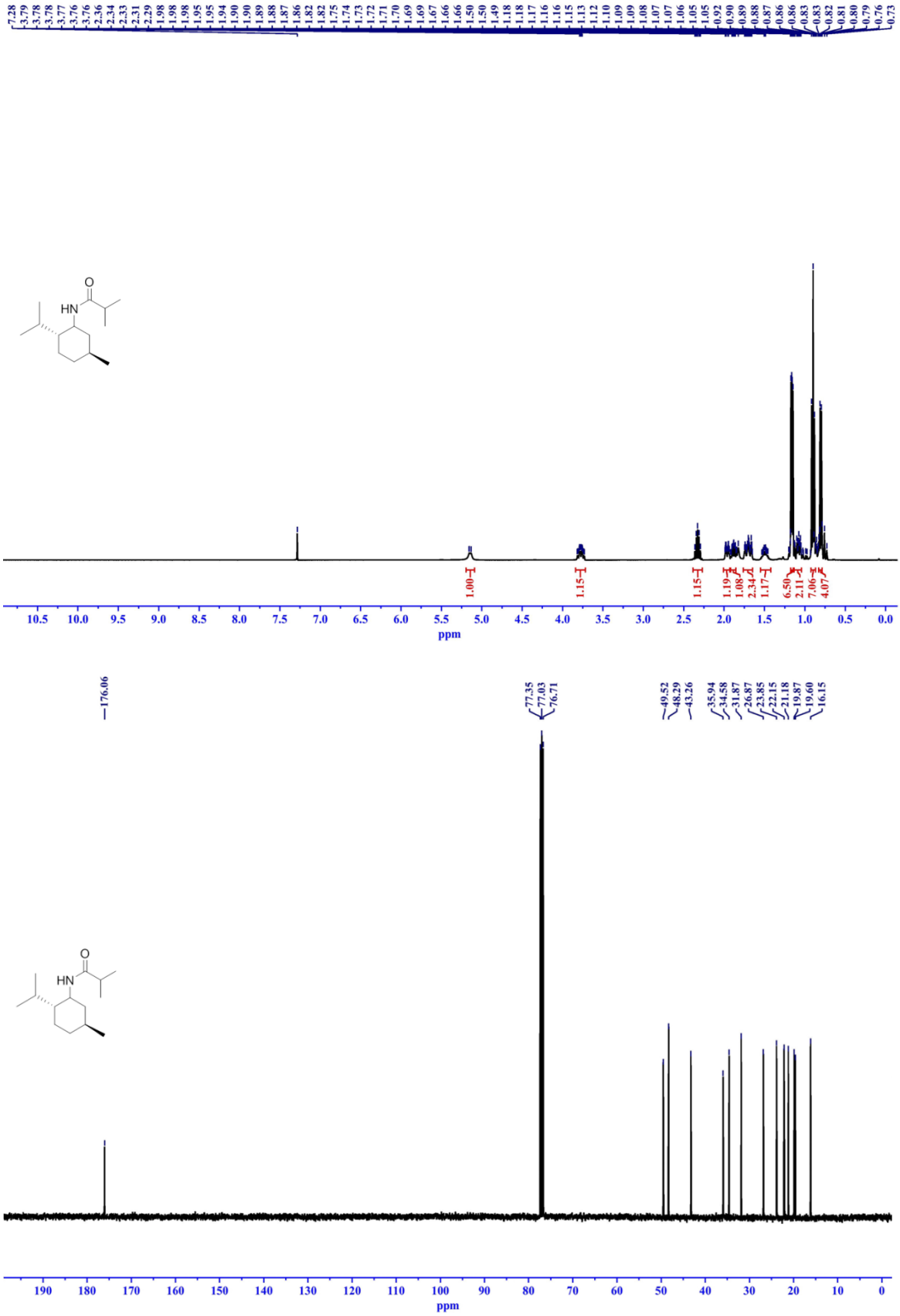
N-(9*H*-fluoren-9-yl)cyclohexanecarboxamide (**4s**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



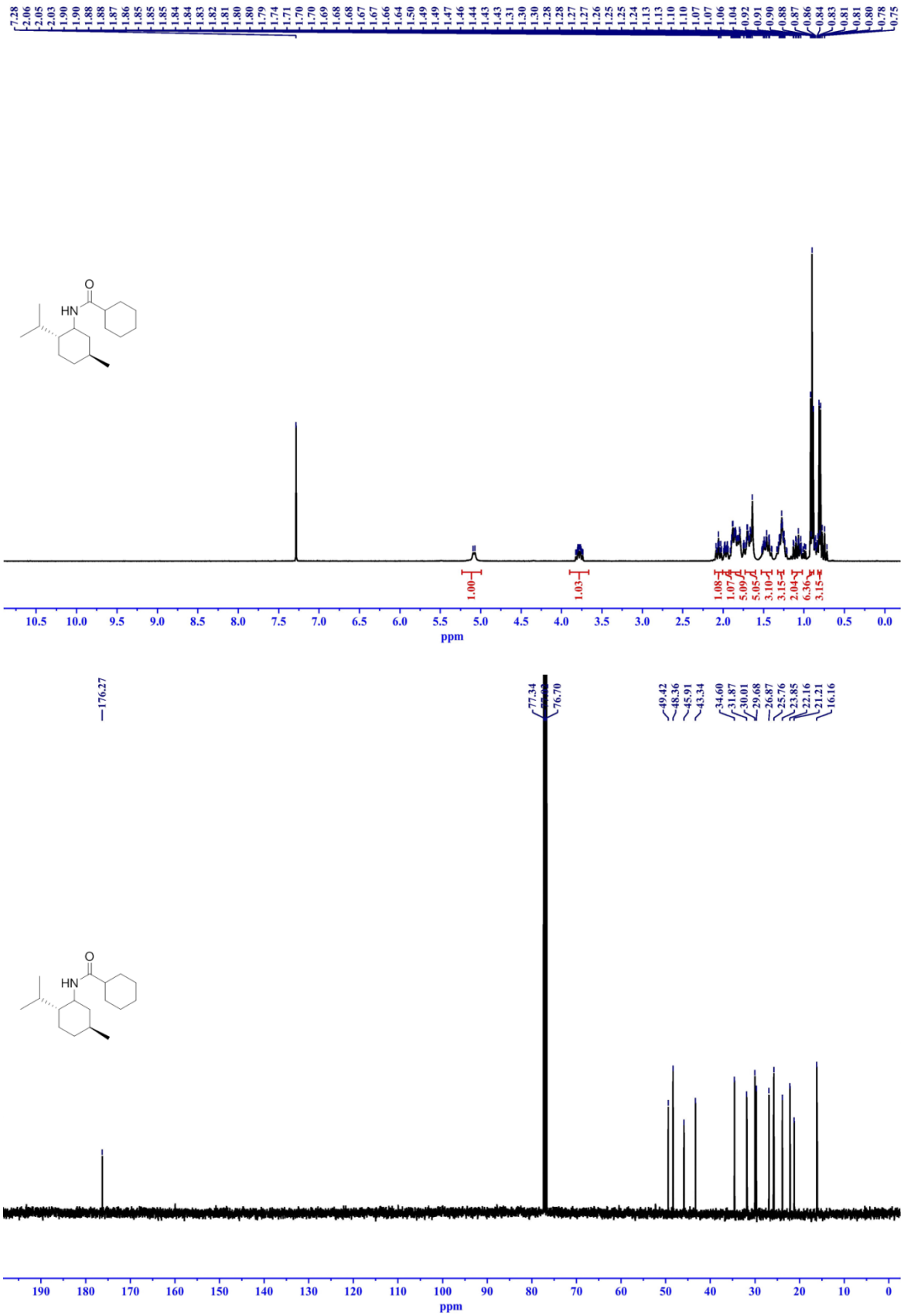
N-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)acetamide (**4t**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



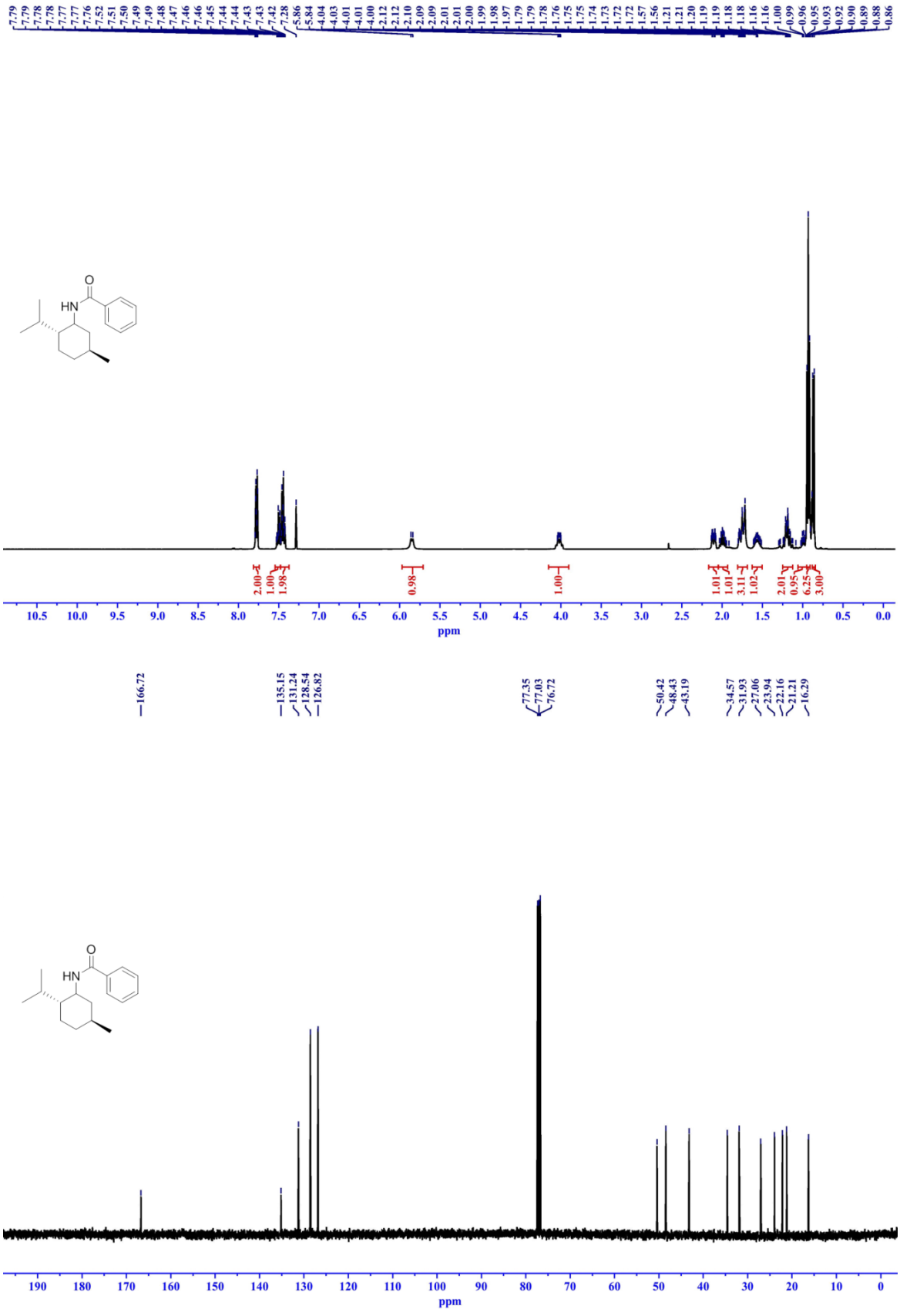
N-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)isobutyramide (**4u**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



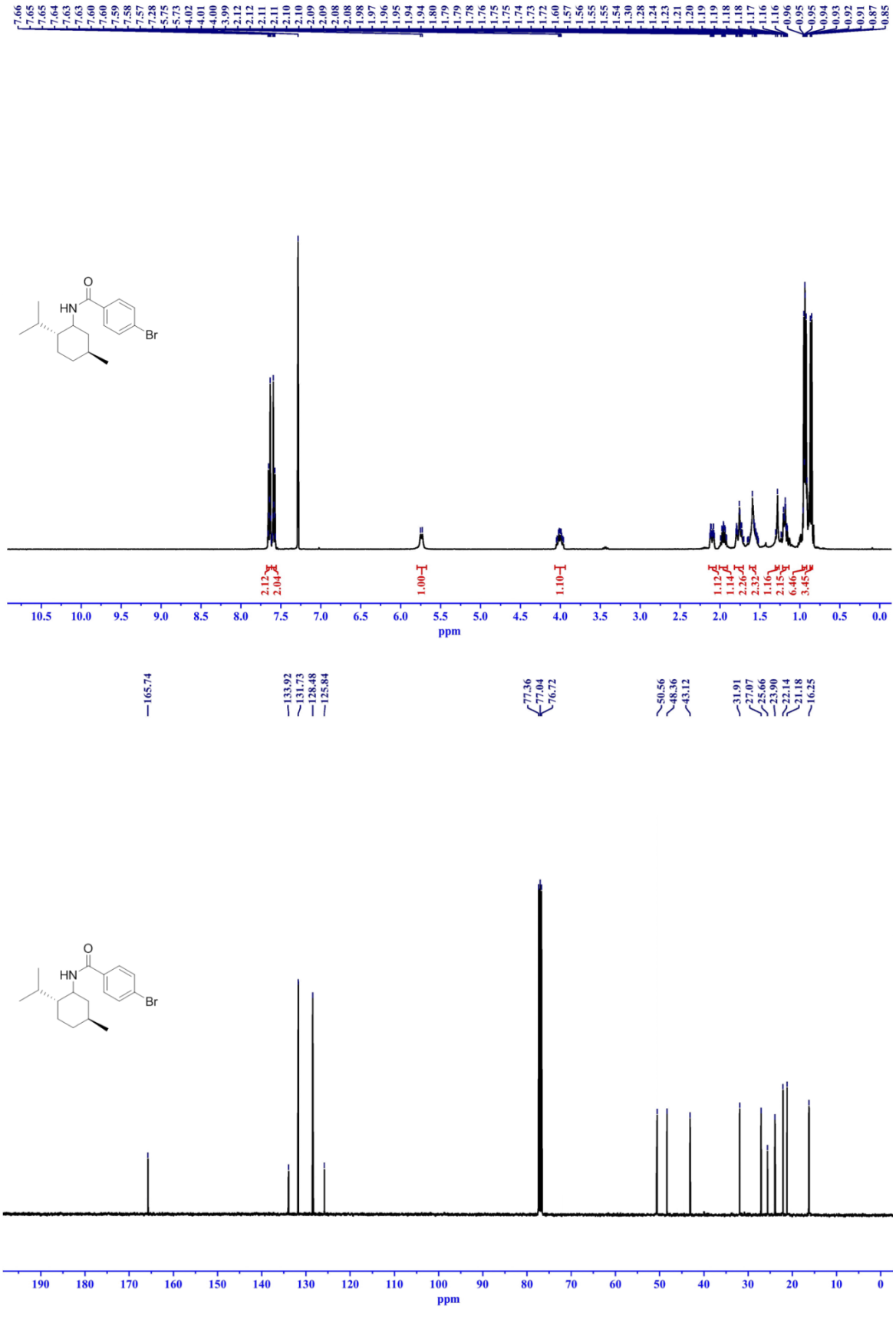
N-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)cyclohexanecarboxamide (**4v**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



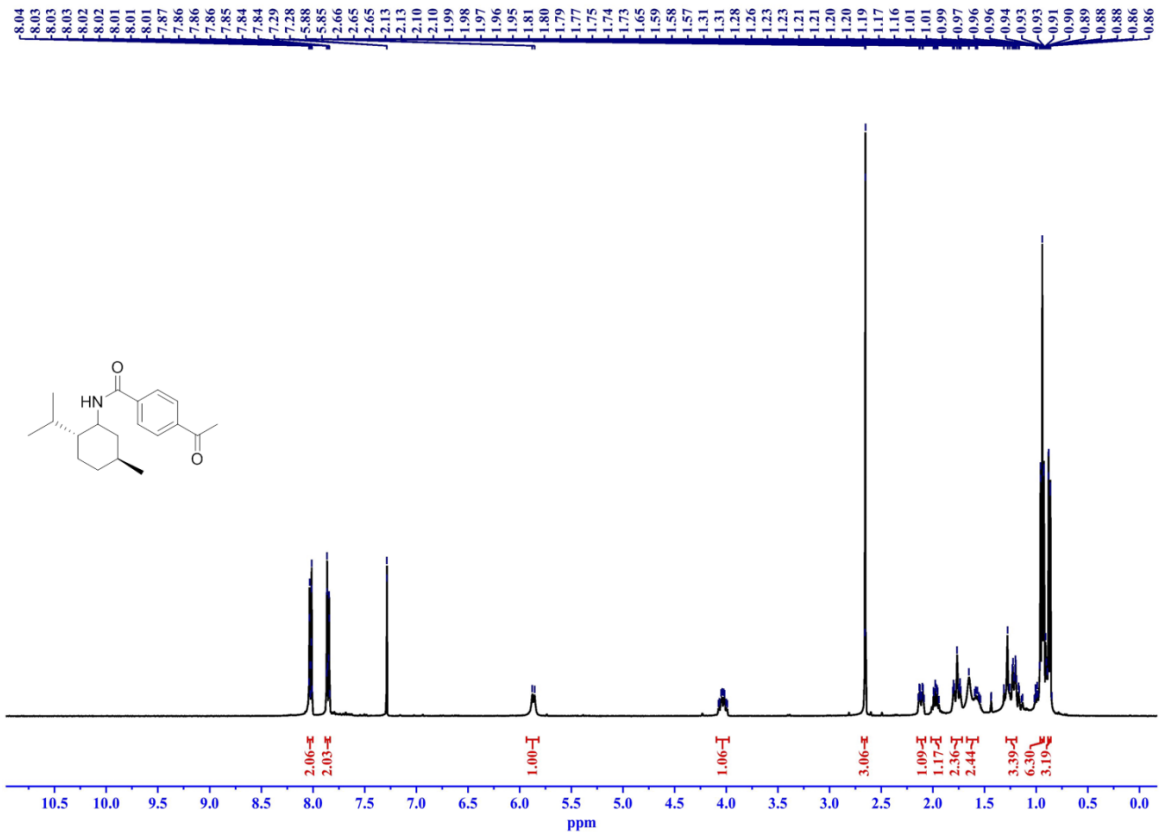
N-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (**4w**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

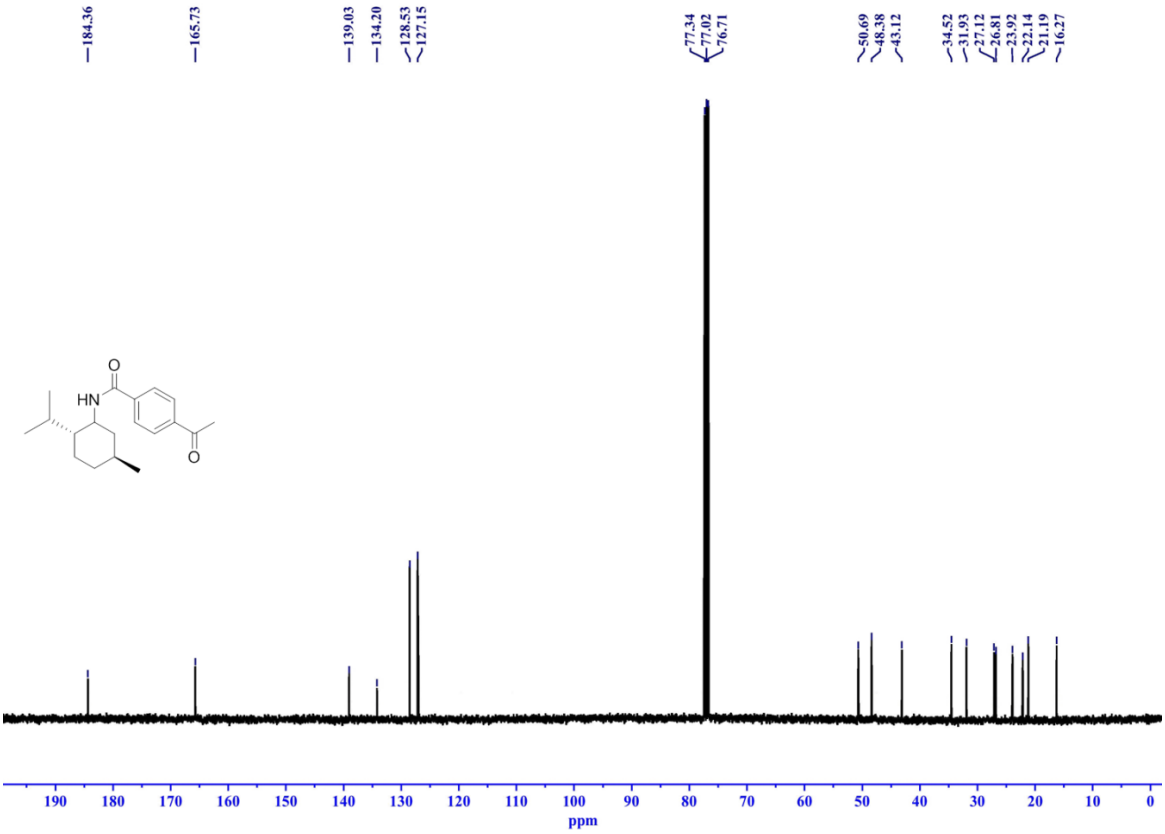


4-bromo-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (**4x**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

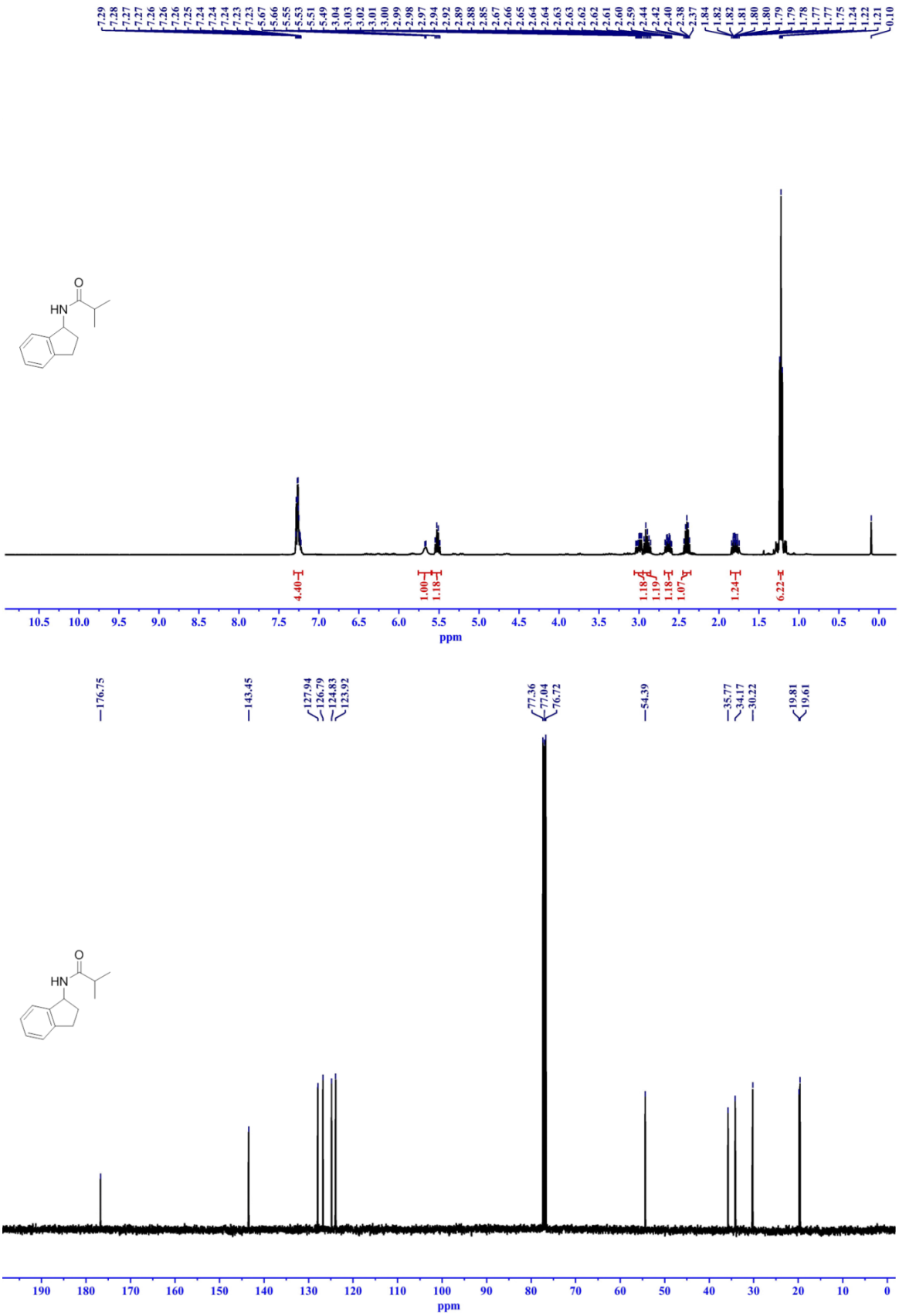


4-acetyl-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)benzamide (**4y**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

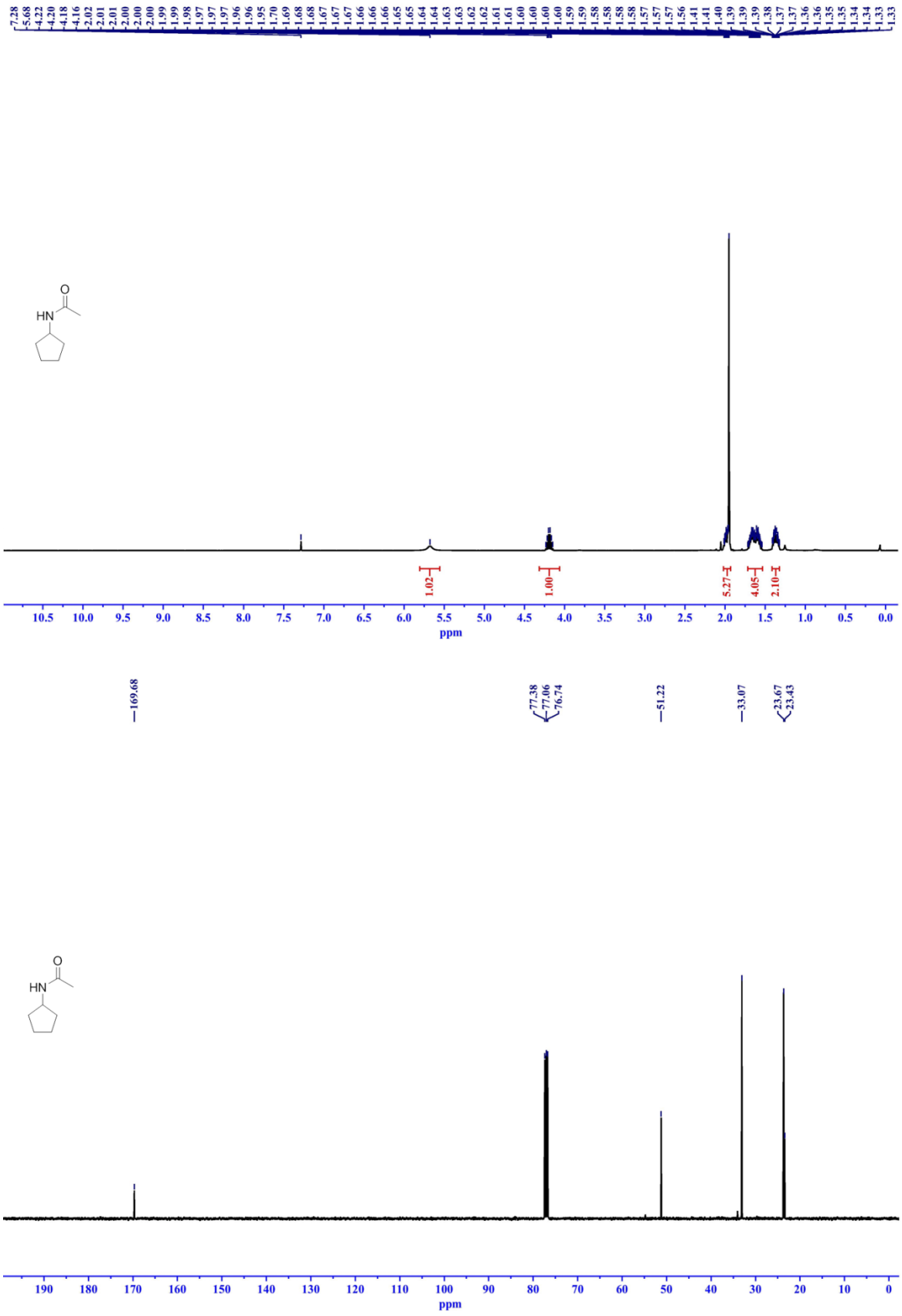




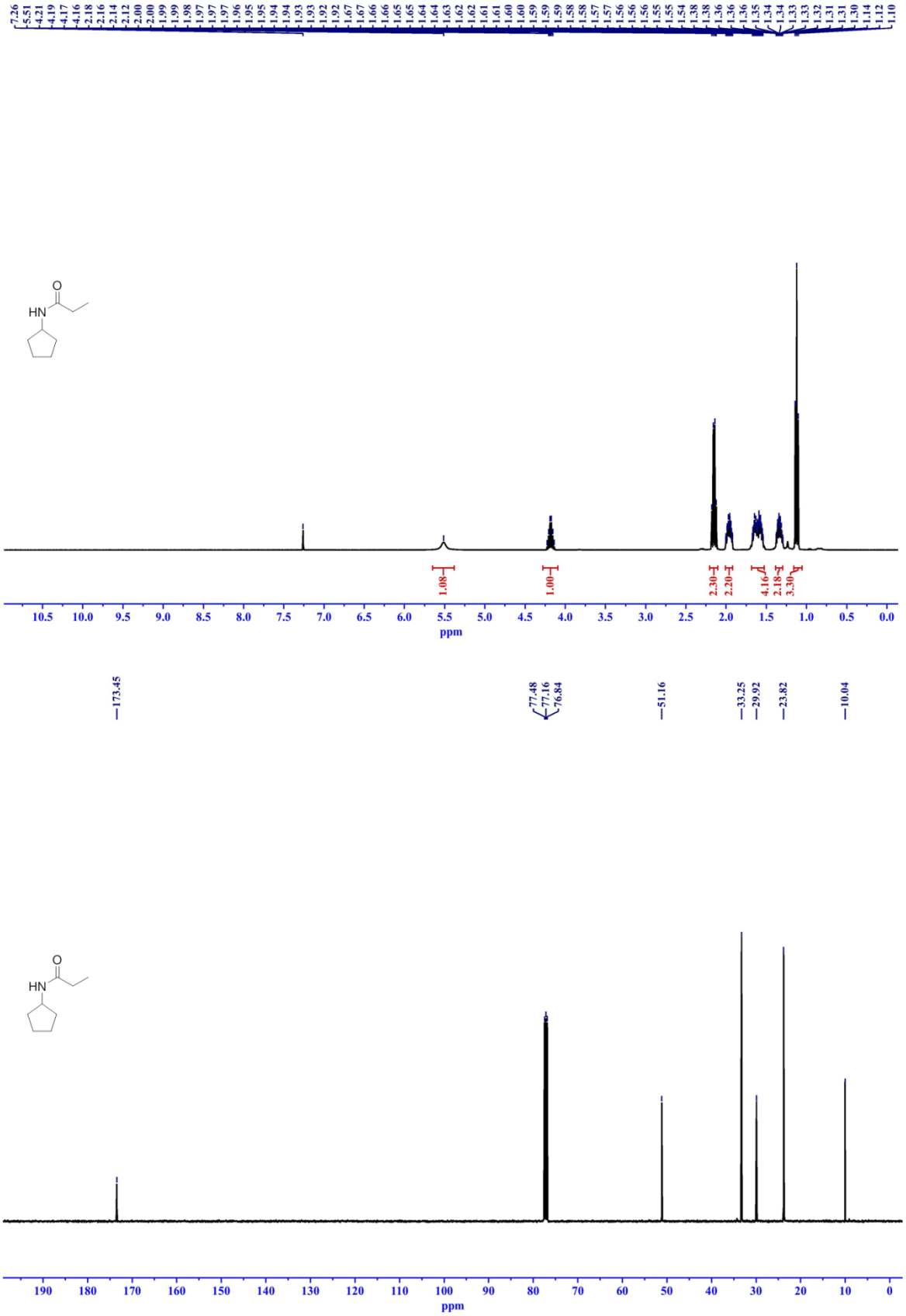
N-(2,3-dihydro-1*H*-inden-1-yl)isobutyramide (**4z**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



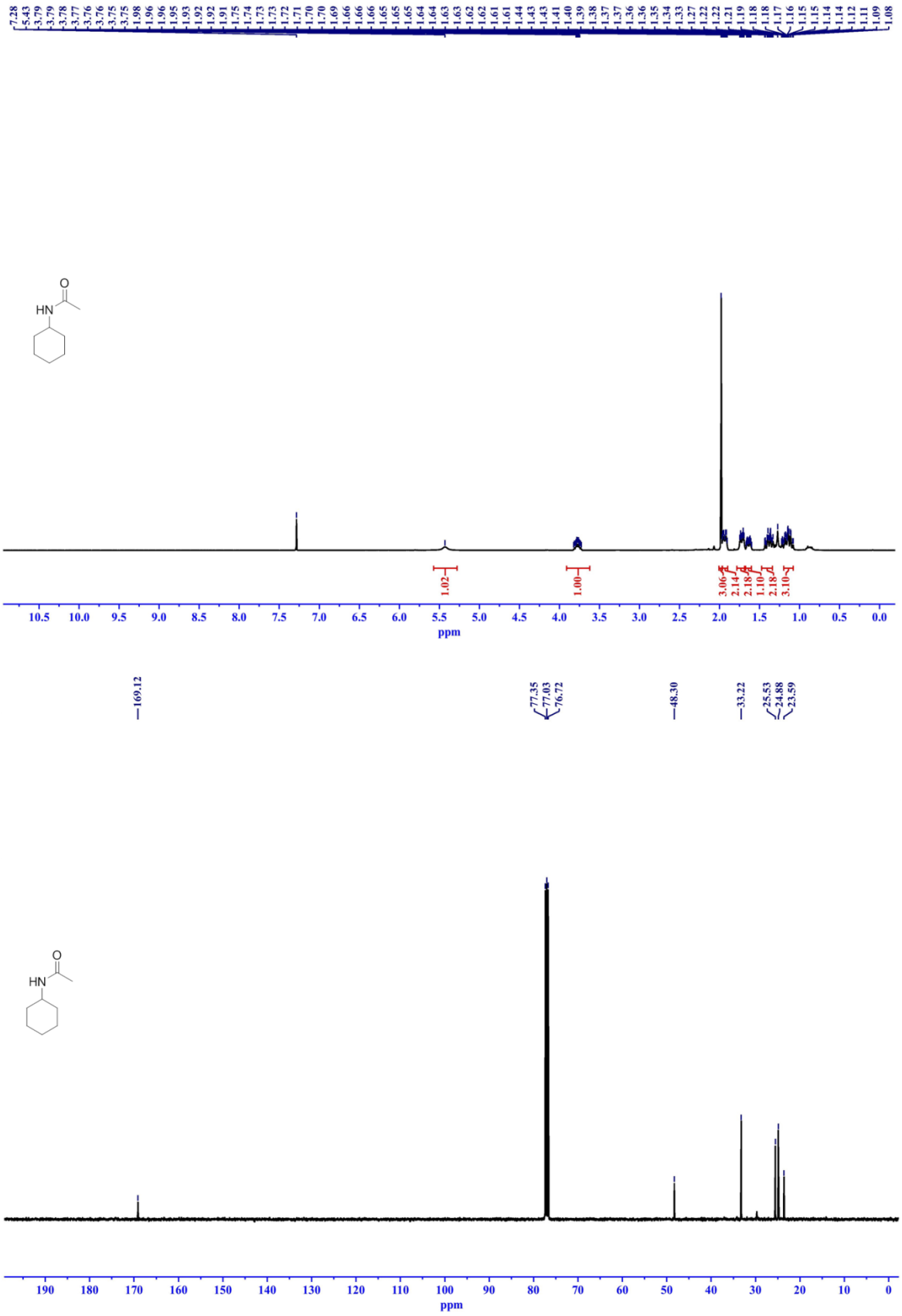
N-cyclopentylacetamide (**4aa**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



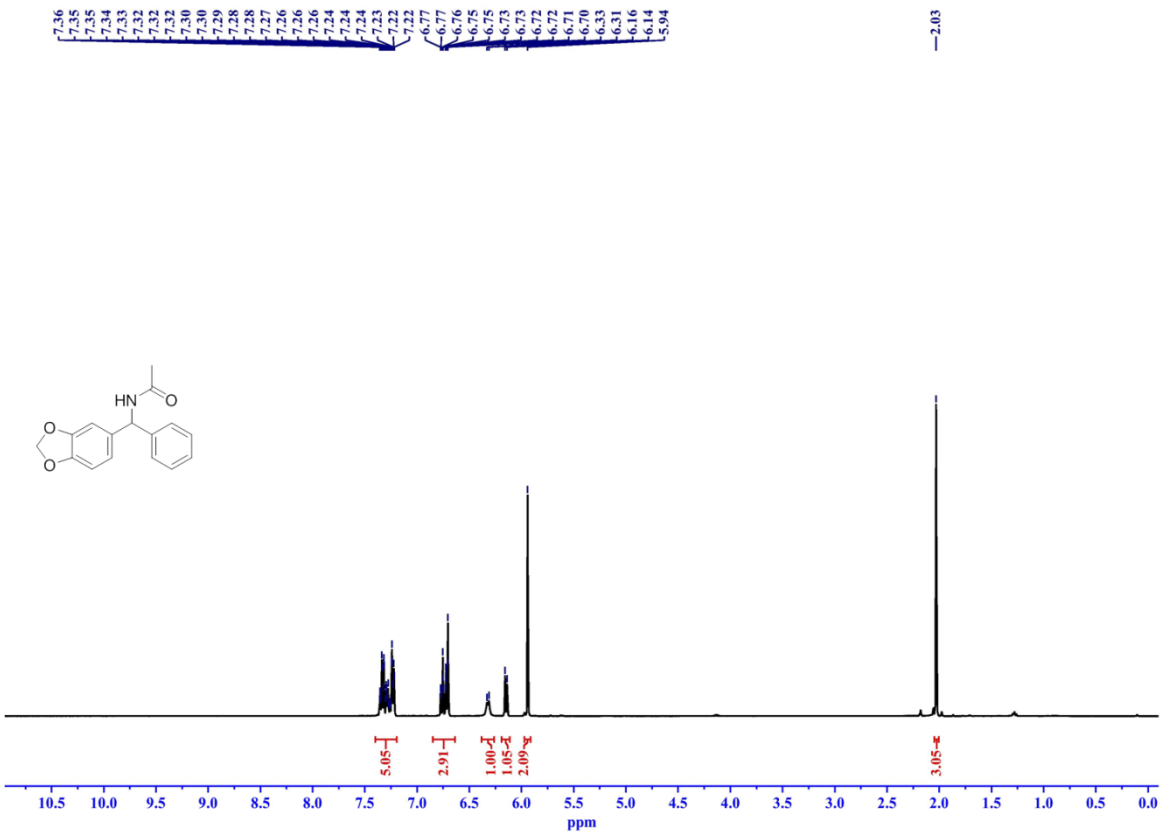
N-cyclopentylpropionamide (**4bb**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

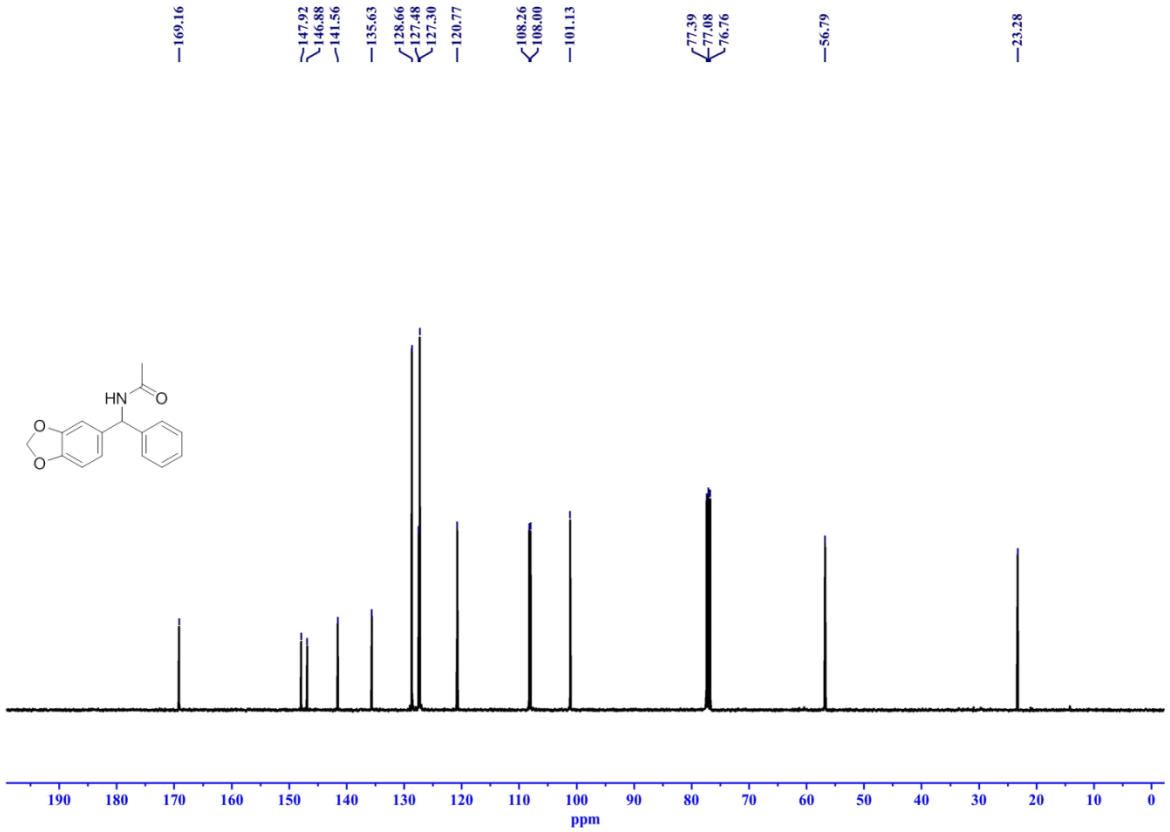


N-cyclohexylacetamide (**4cc**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

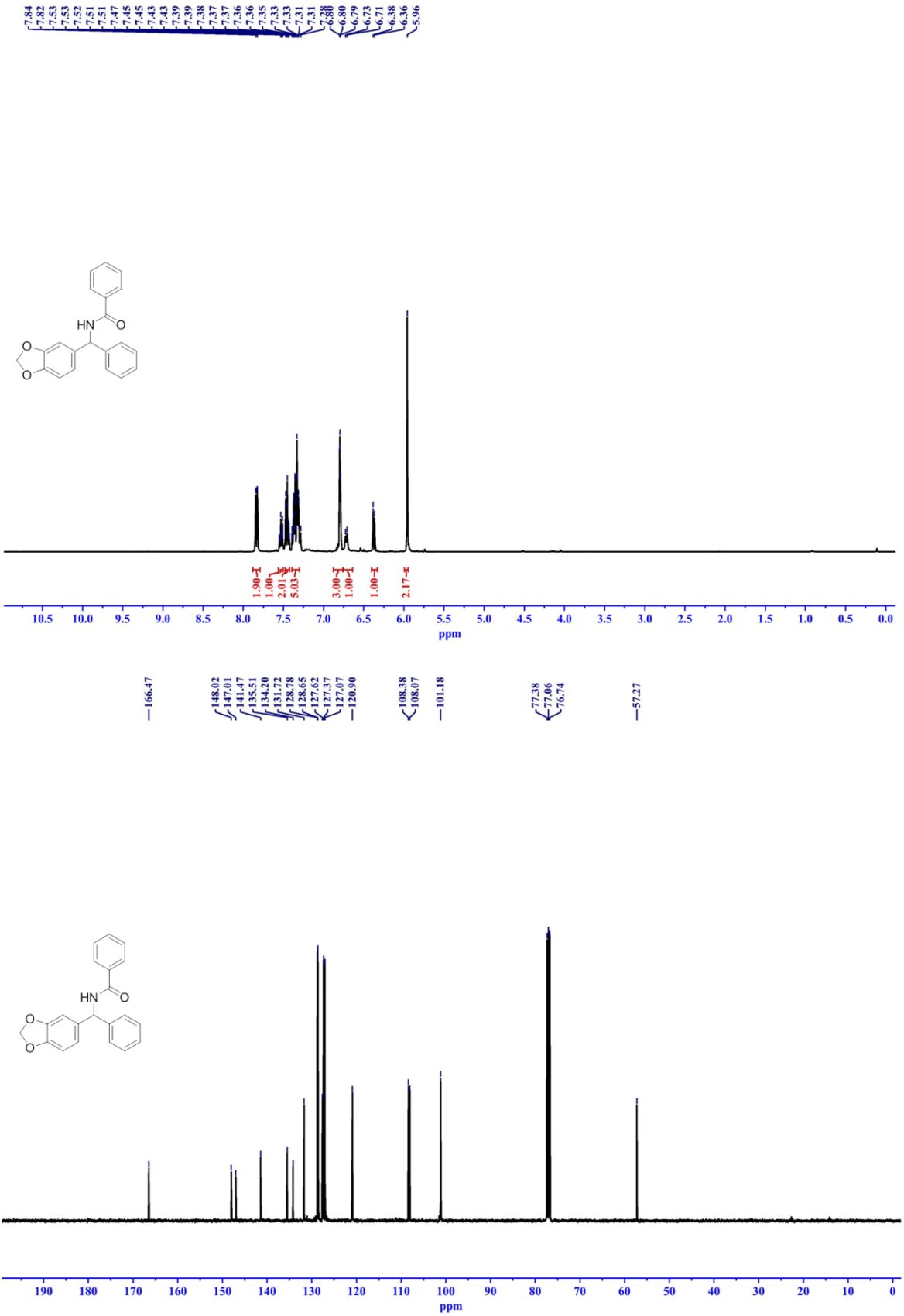


N-(benzo[*d*][1,3]dioxol-5-yl(phenyl)methyl)acetamide (**4dd**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**

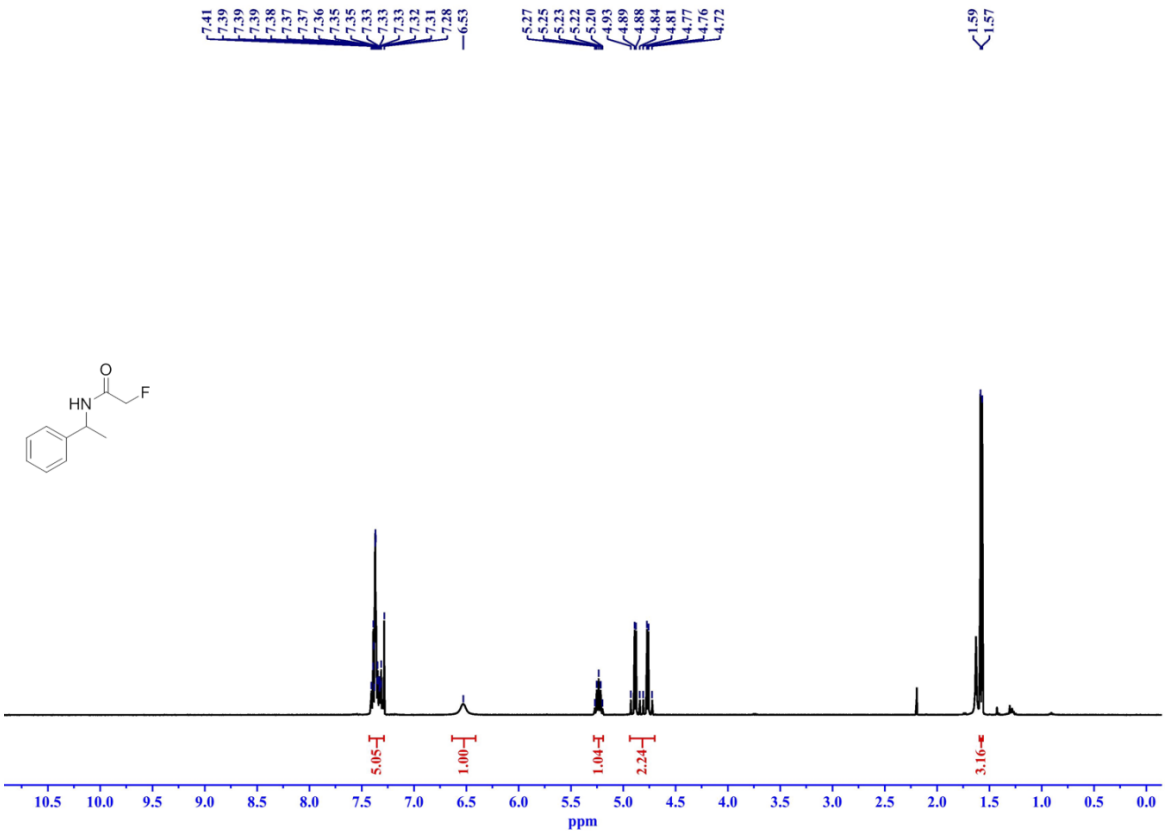


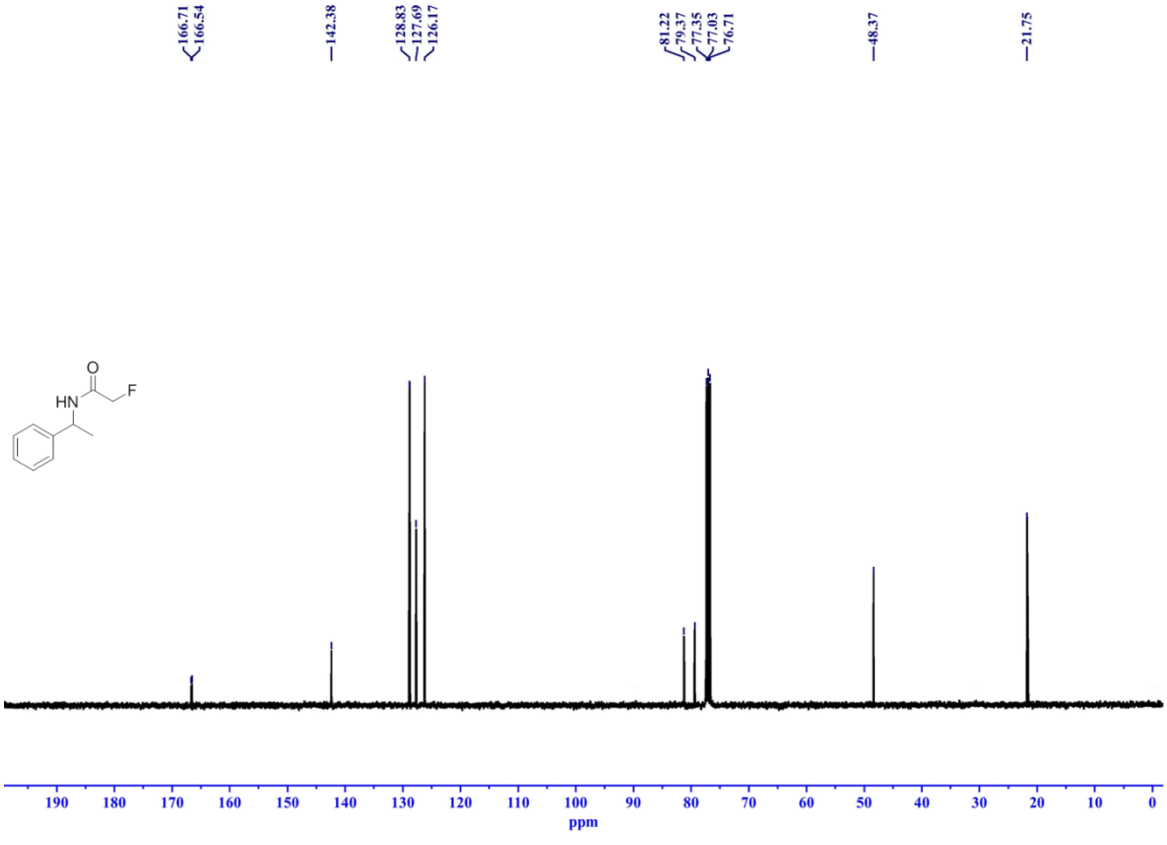


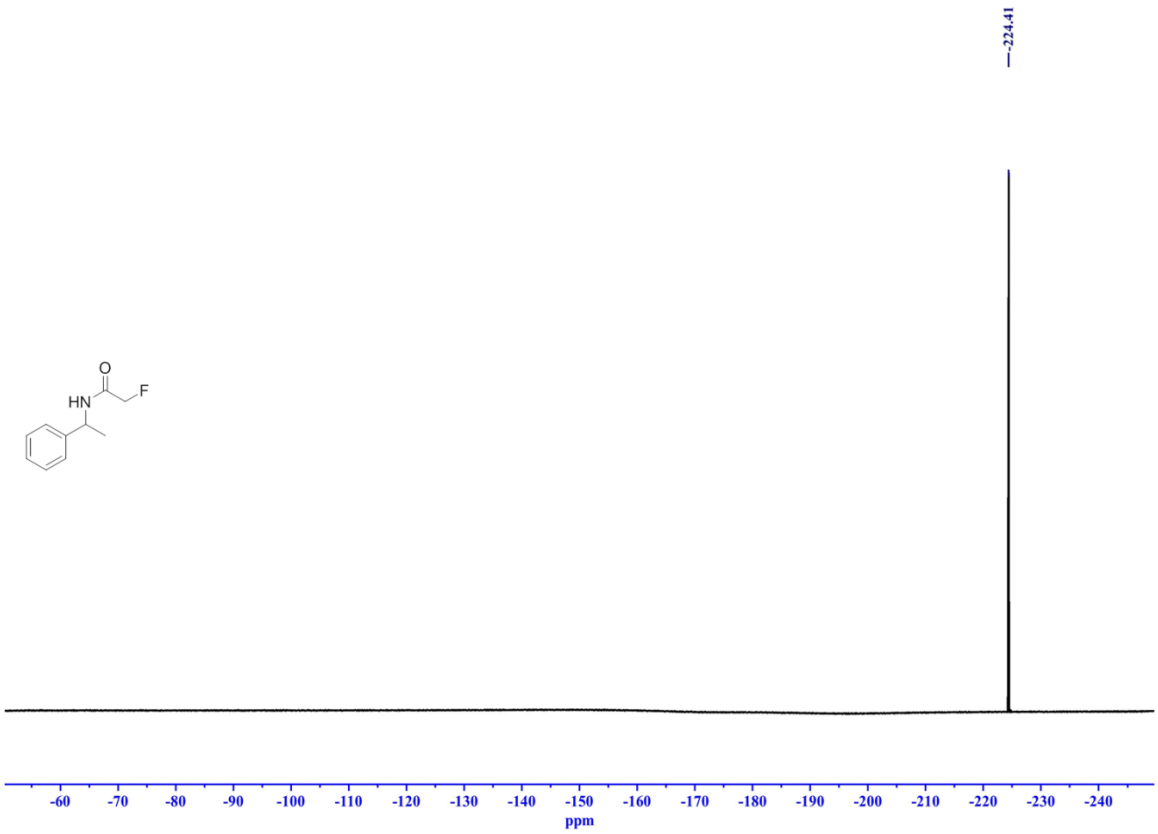
N-(benzo[*d*][1,3]dioxol-5-yl(phenyl)methyl)benzamide (**4ee**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



2-fluoro-*N*-(1-phenylethyl)acetamide (**6a**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$), ^{19}F NMR (376 MHz, $CDCl_3$).**



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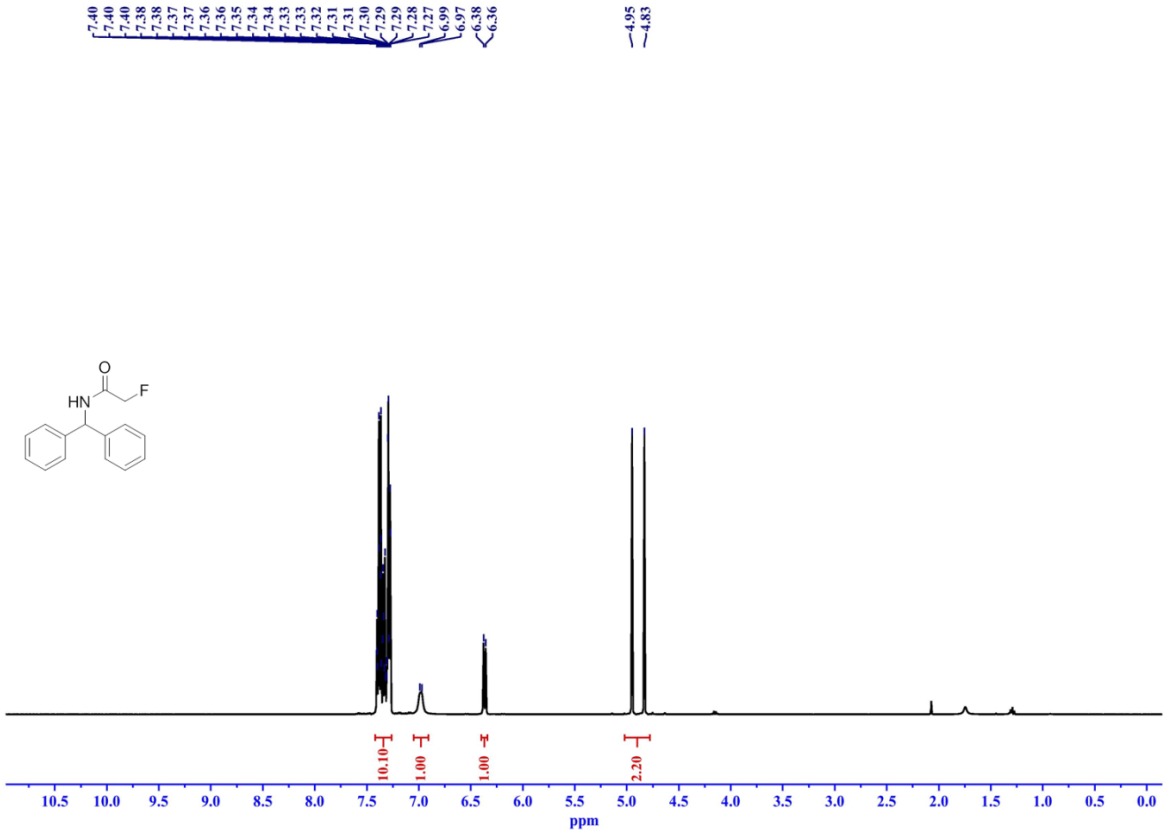
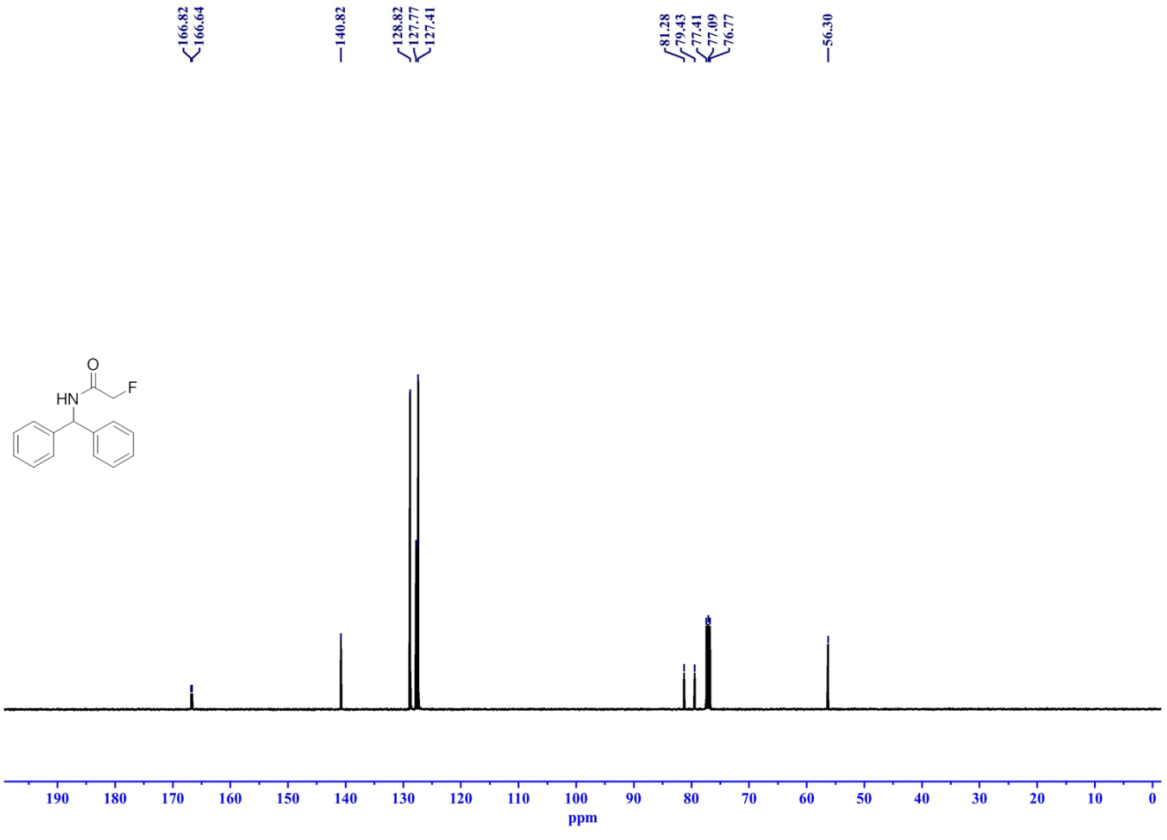
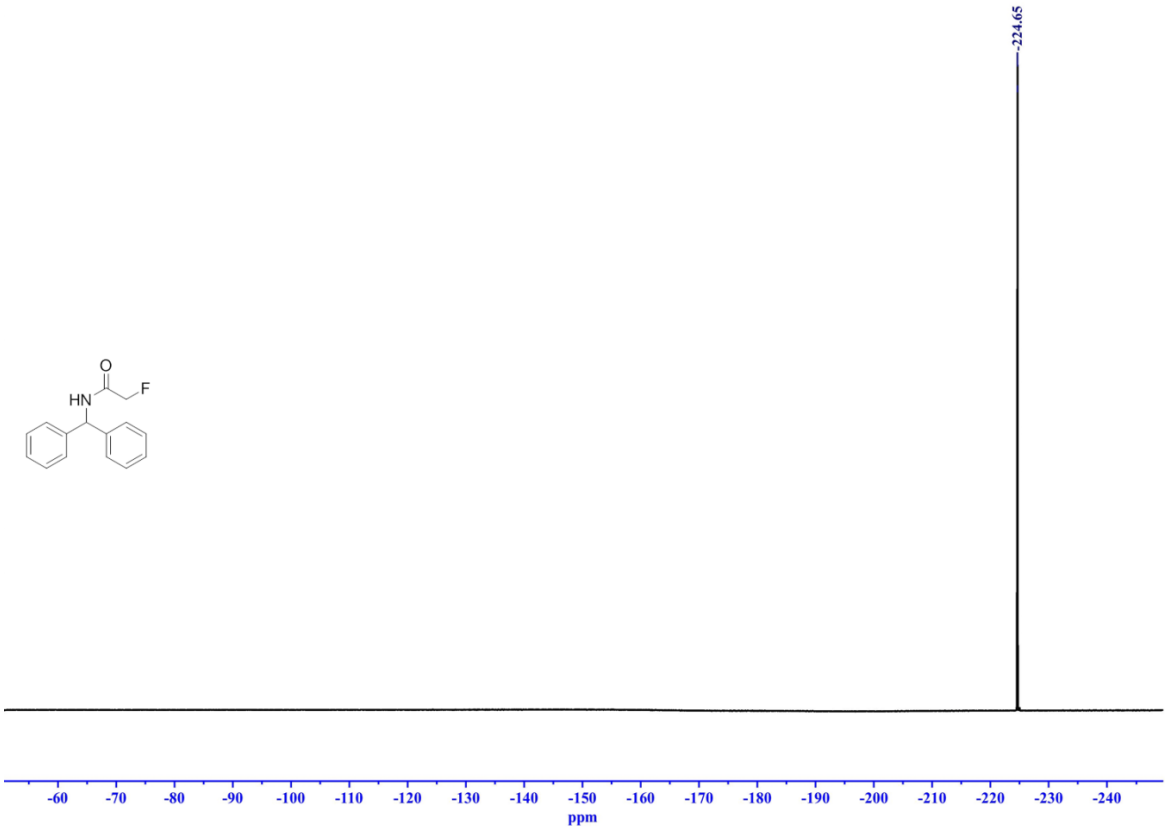
ppm

N-benzhydryl-2-fluoroacetamide (**6b**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$), ^{19}F NMR (376 MHz, $CDCl_3$).**



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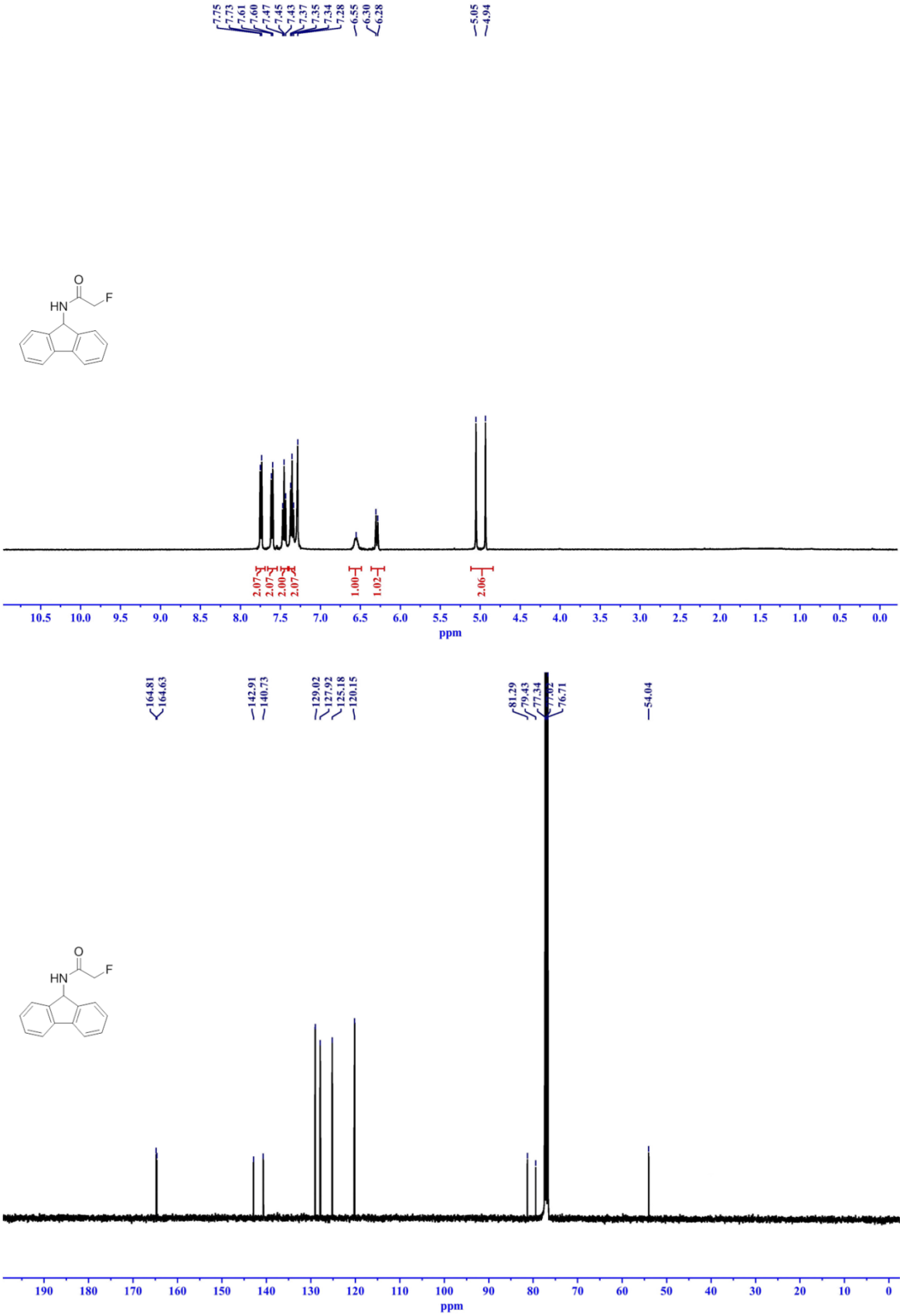
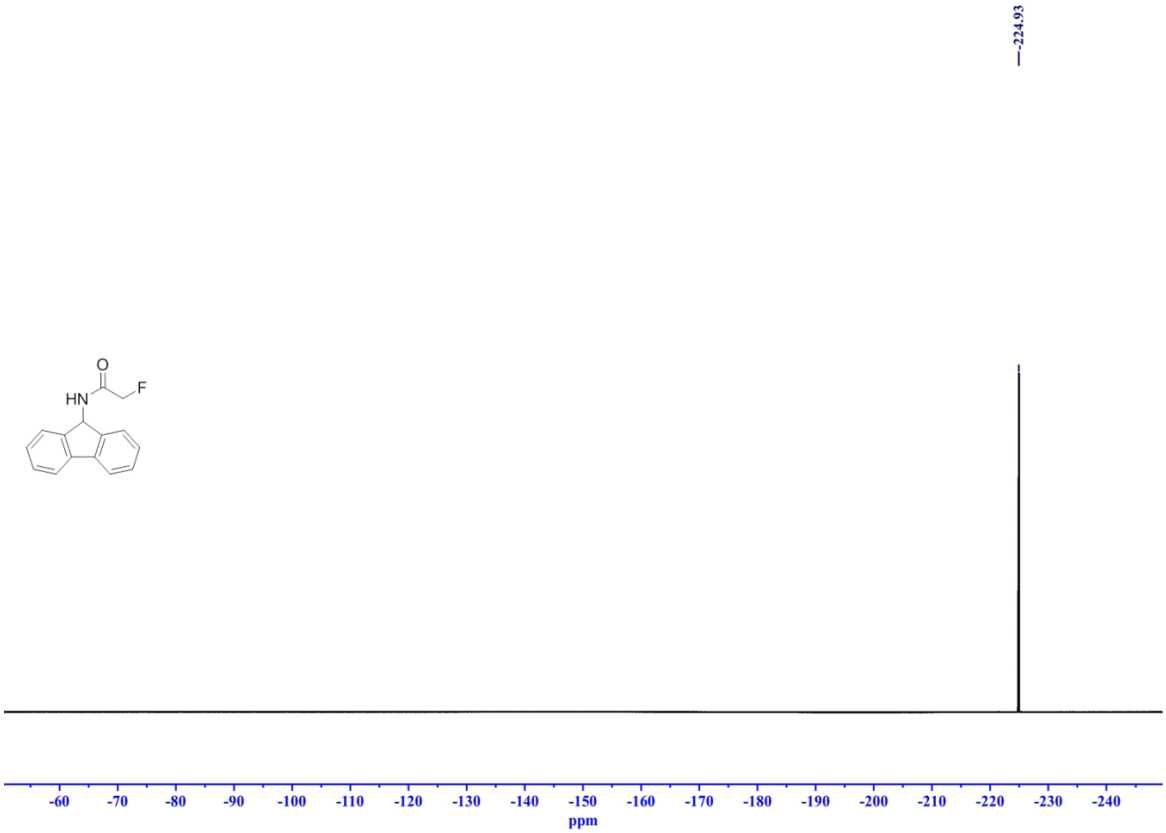
N-(9*H*-fluoren-9-yl)-2-fluoroacetamide (**6c**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$), ^{19}F NMR (376 MHz, $CDCl_3$).**

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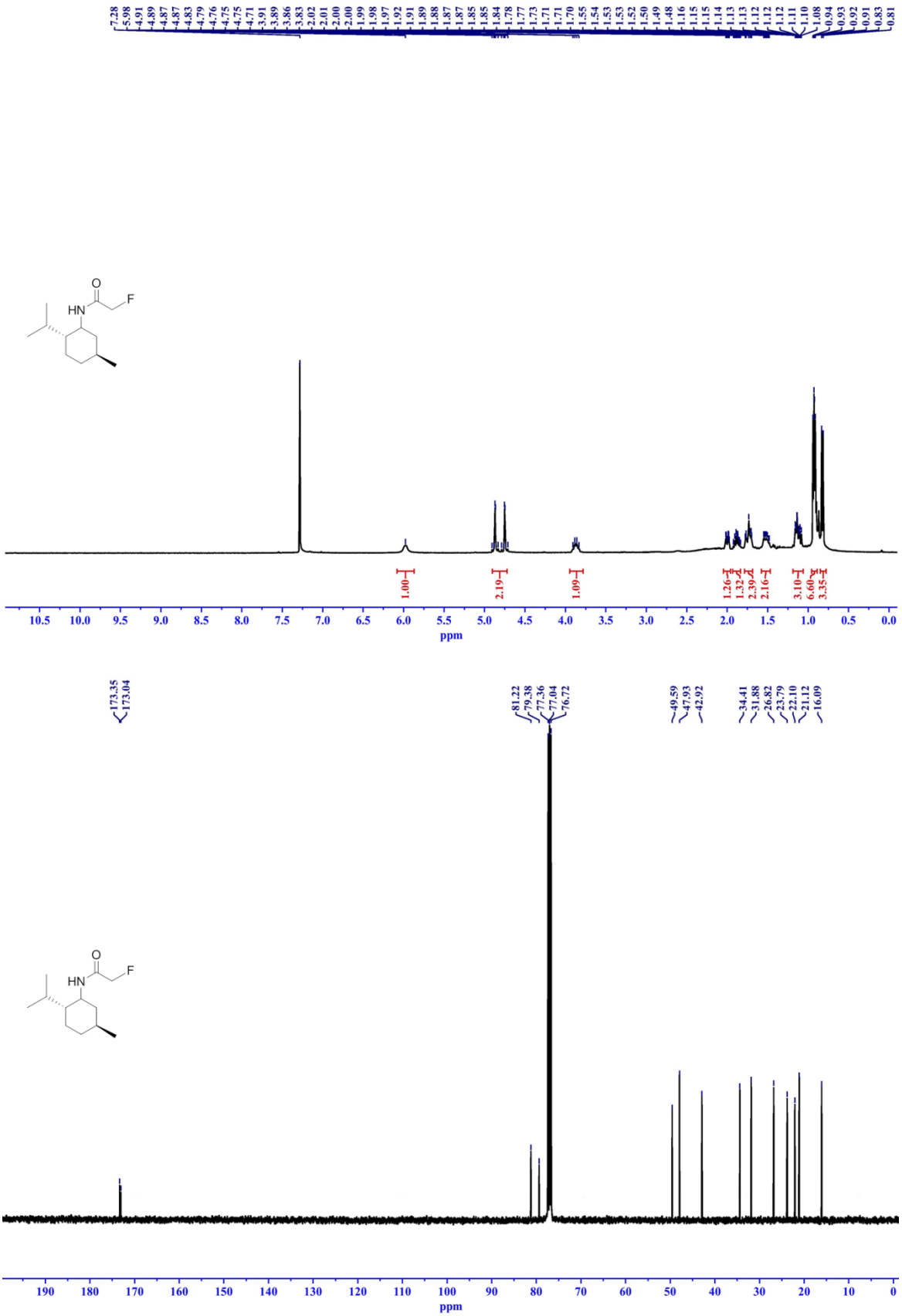
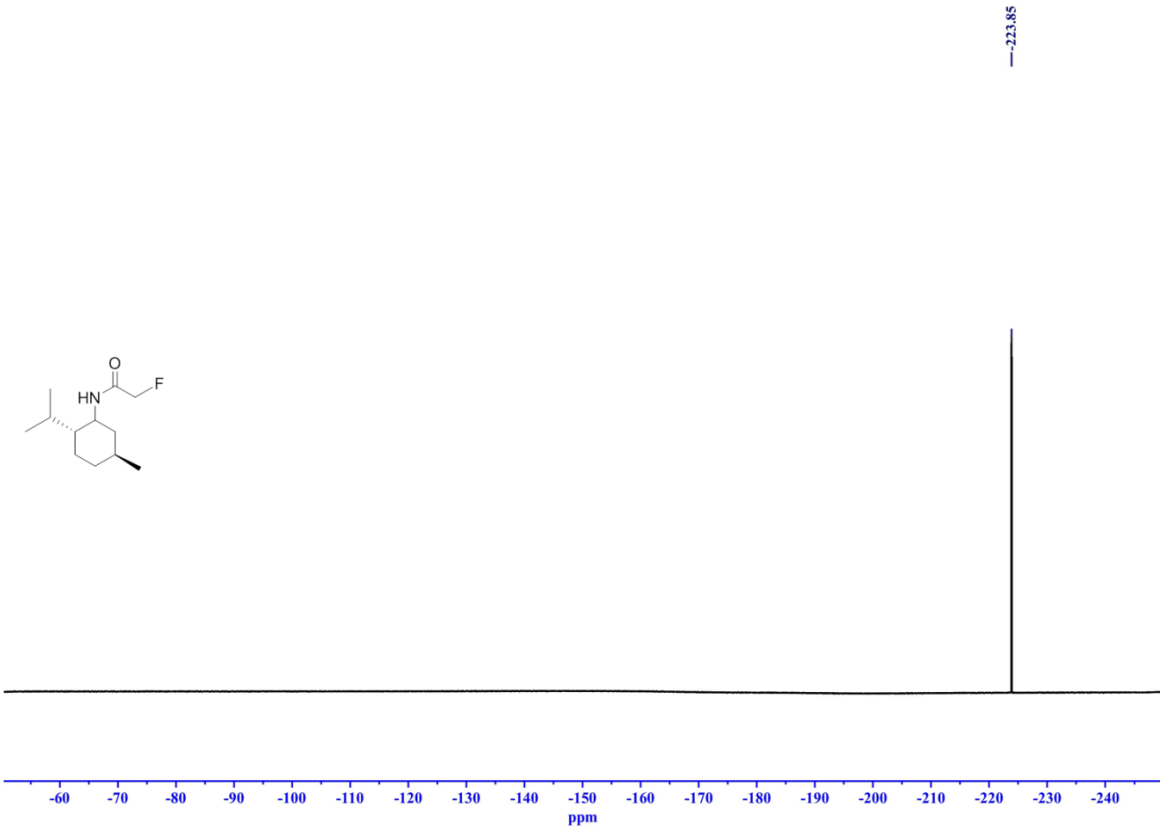
-240
ppm

2-fluoro-*N*-((*2R,5S*)-2-isopropyl-5-methylcyclohexyl)acetamide (**6d**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$), ^{19}F NMR (376 MHz, $CDCl_3$).**

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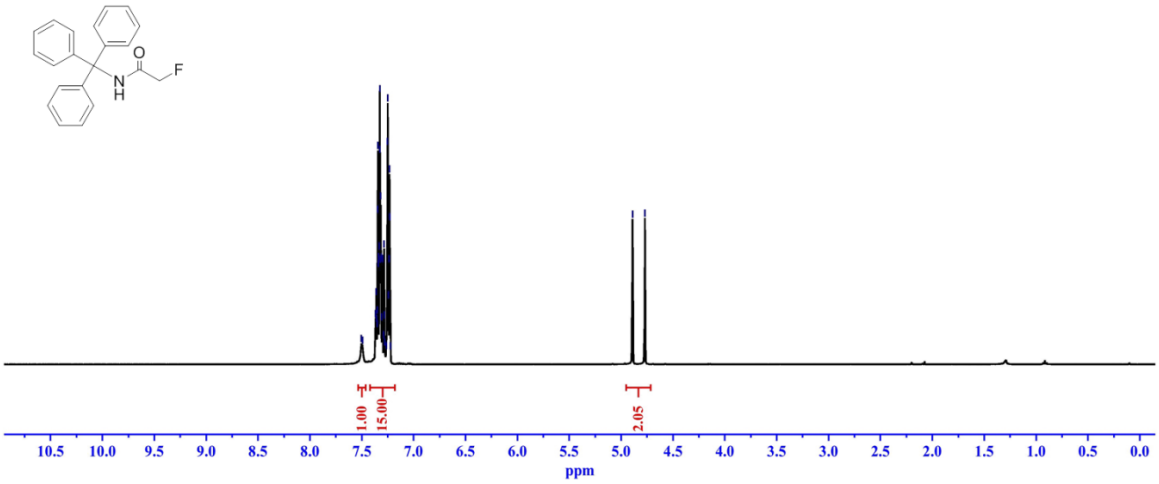
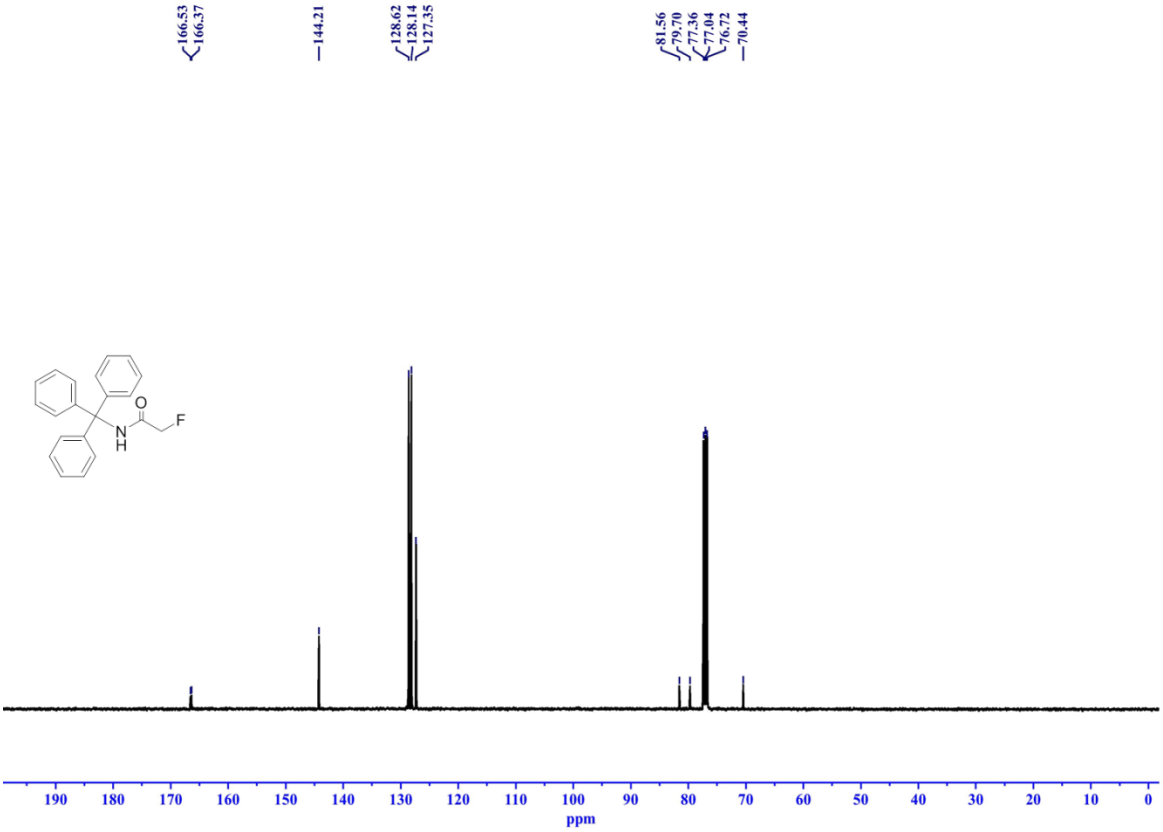
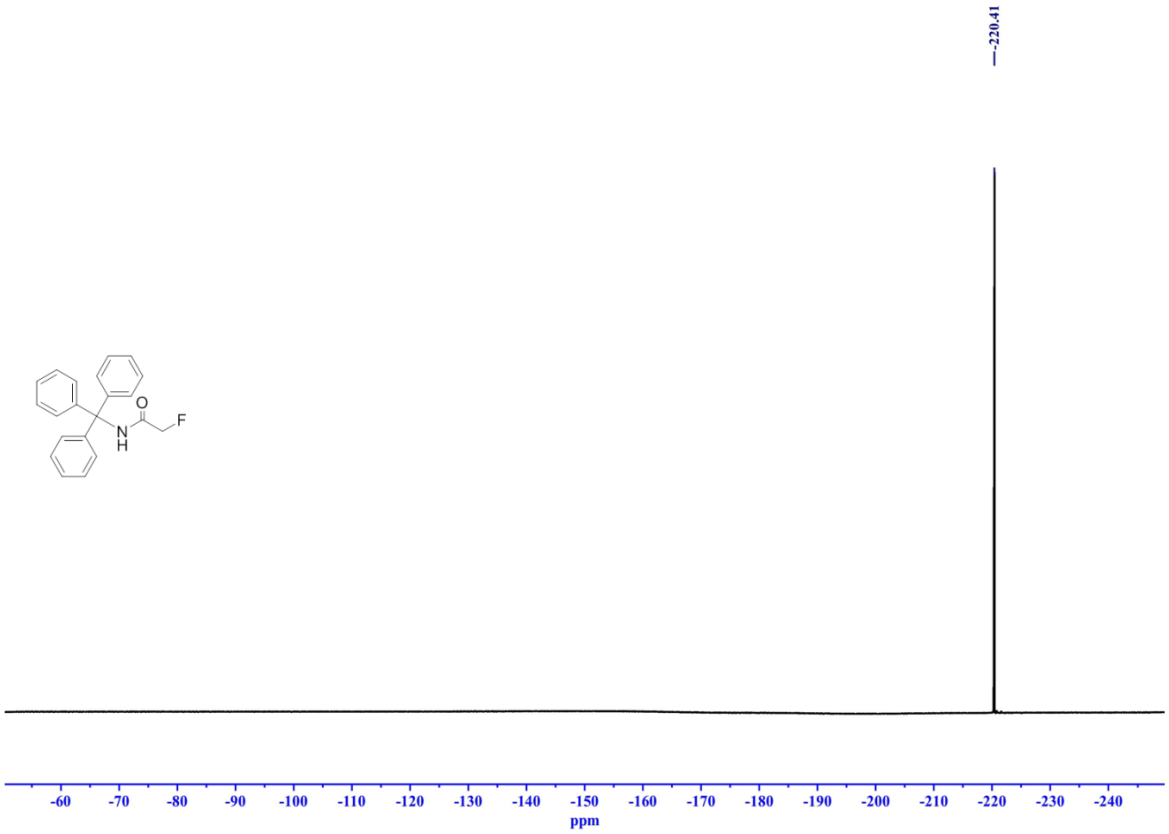
ppm

2-fluoro-*N*-tritylacetamide (**6e**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$), ^{19}F NMR (376 MHz, $CDCl_3$).**



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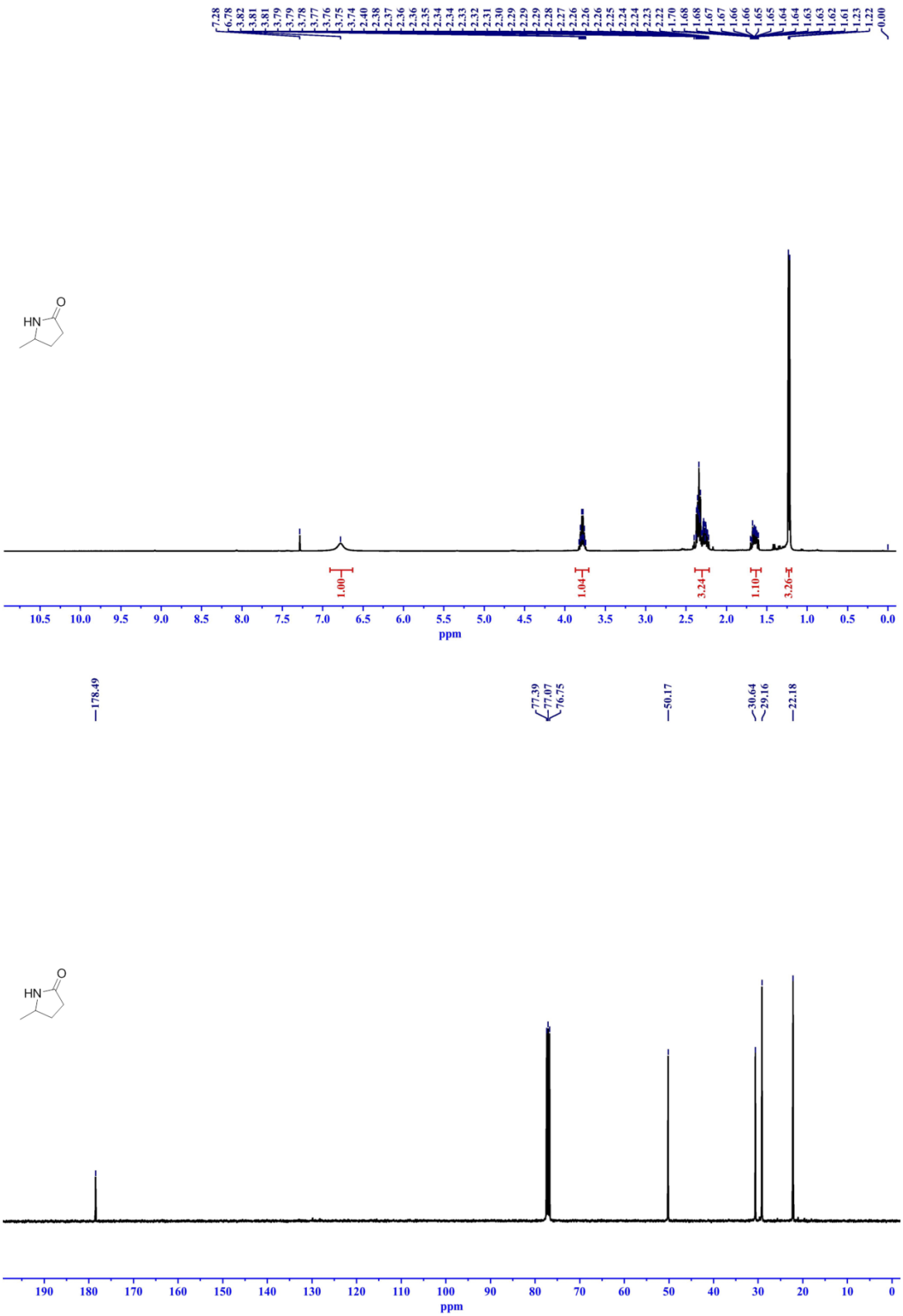
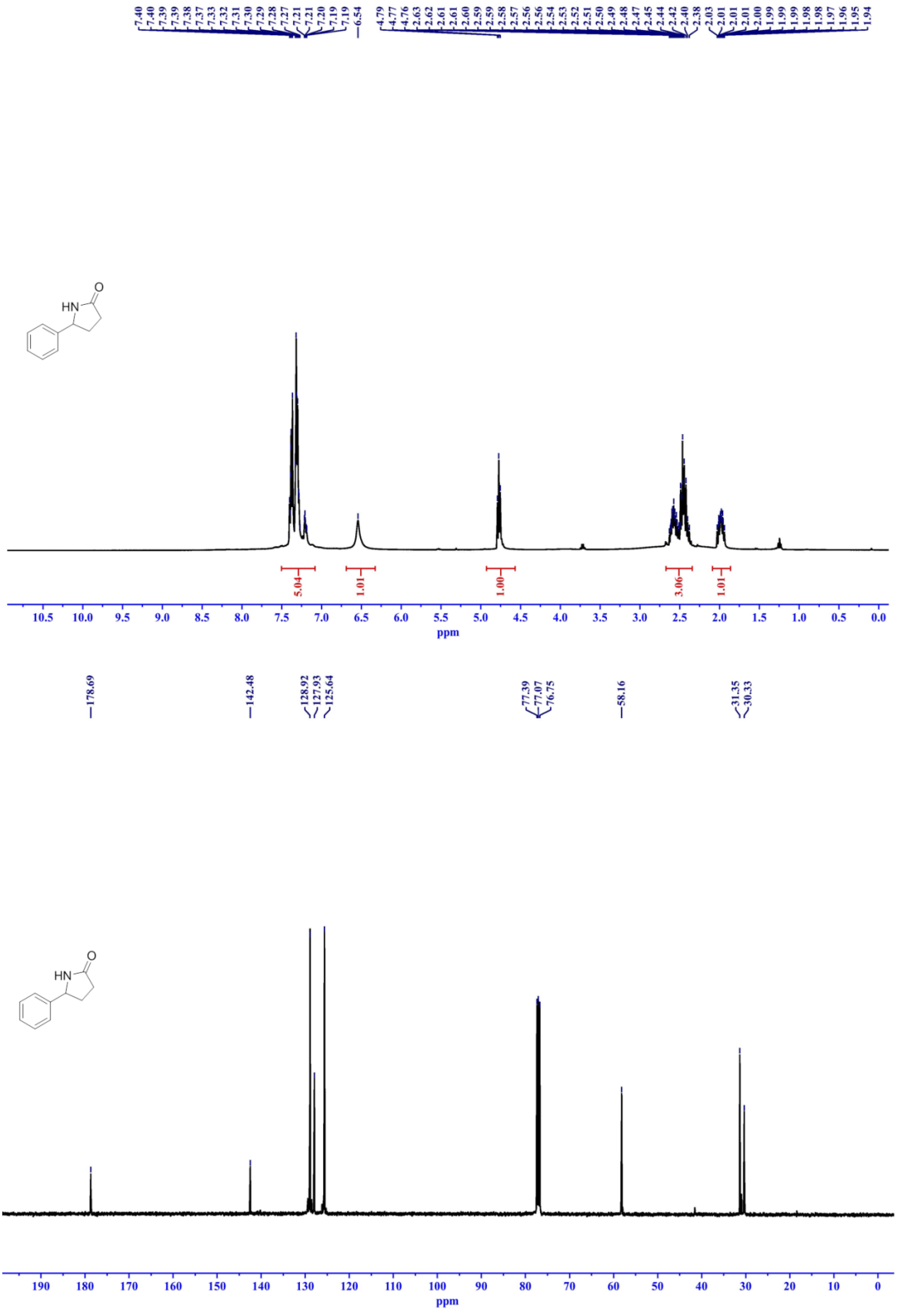
-180
-190
-200
-210
-220
-230
-240
ppm

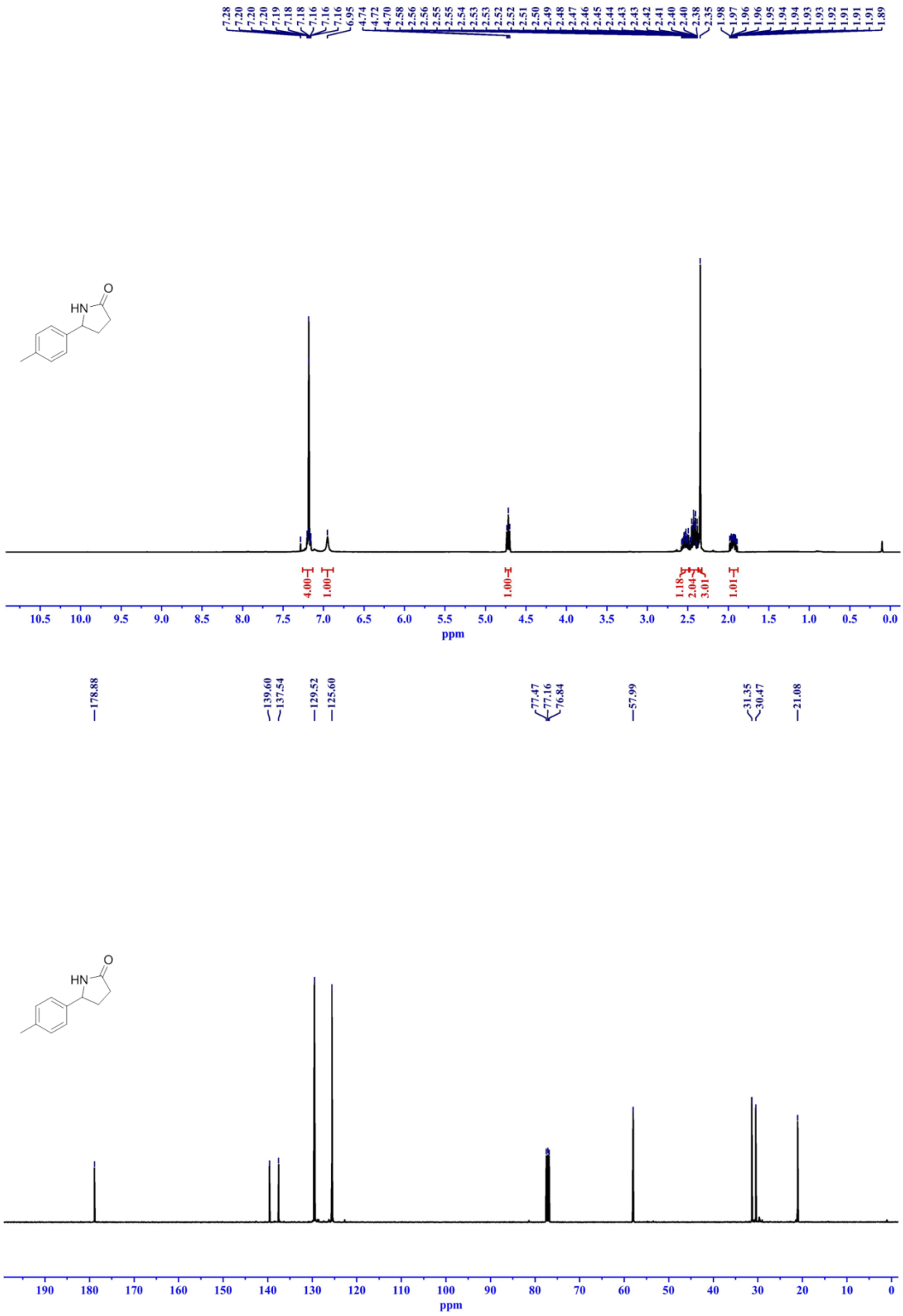
5-methylpyrrolidin-2-one (**8a**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



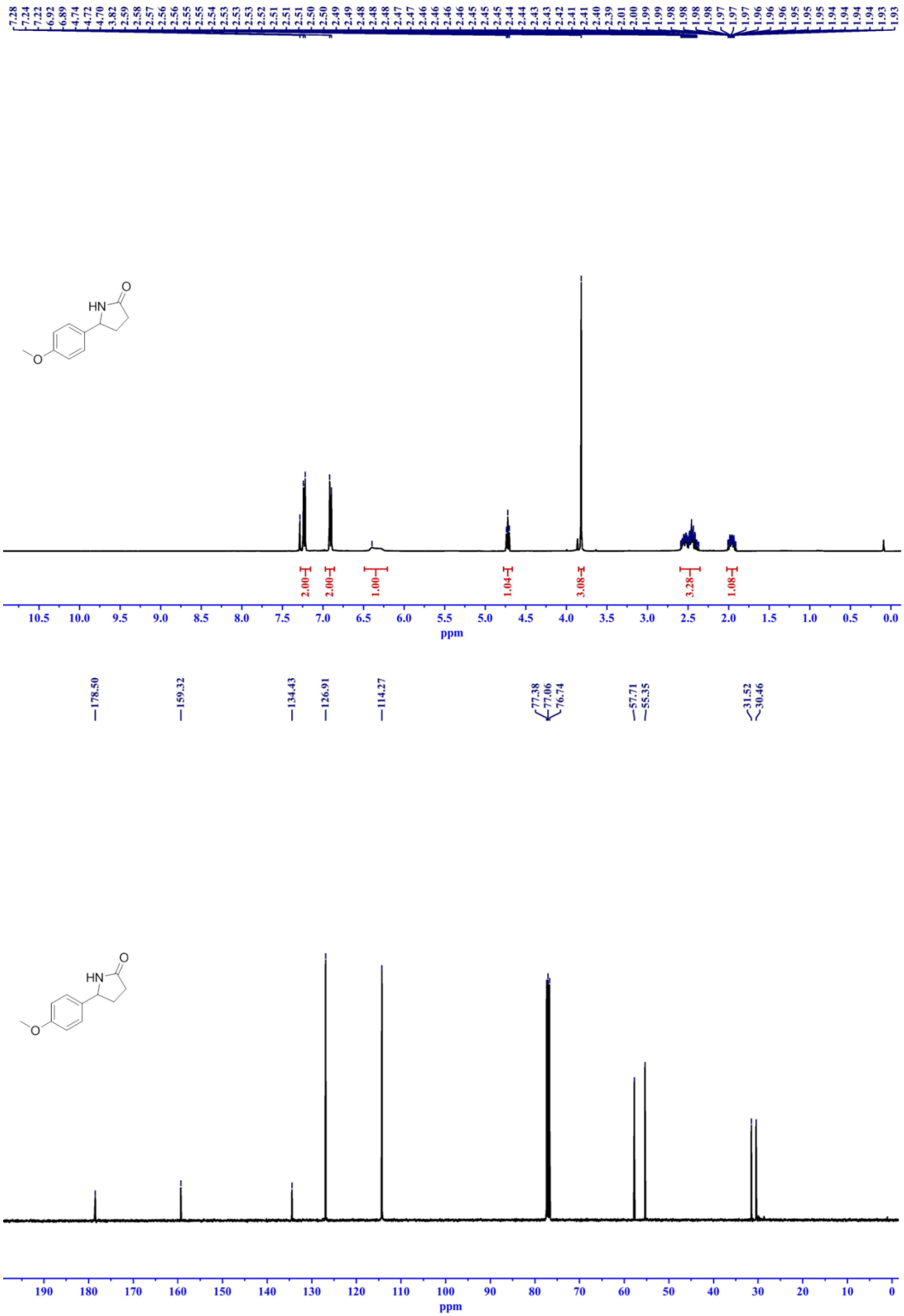
5-phenylpyrrolidin-2-one (**8b**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



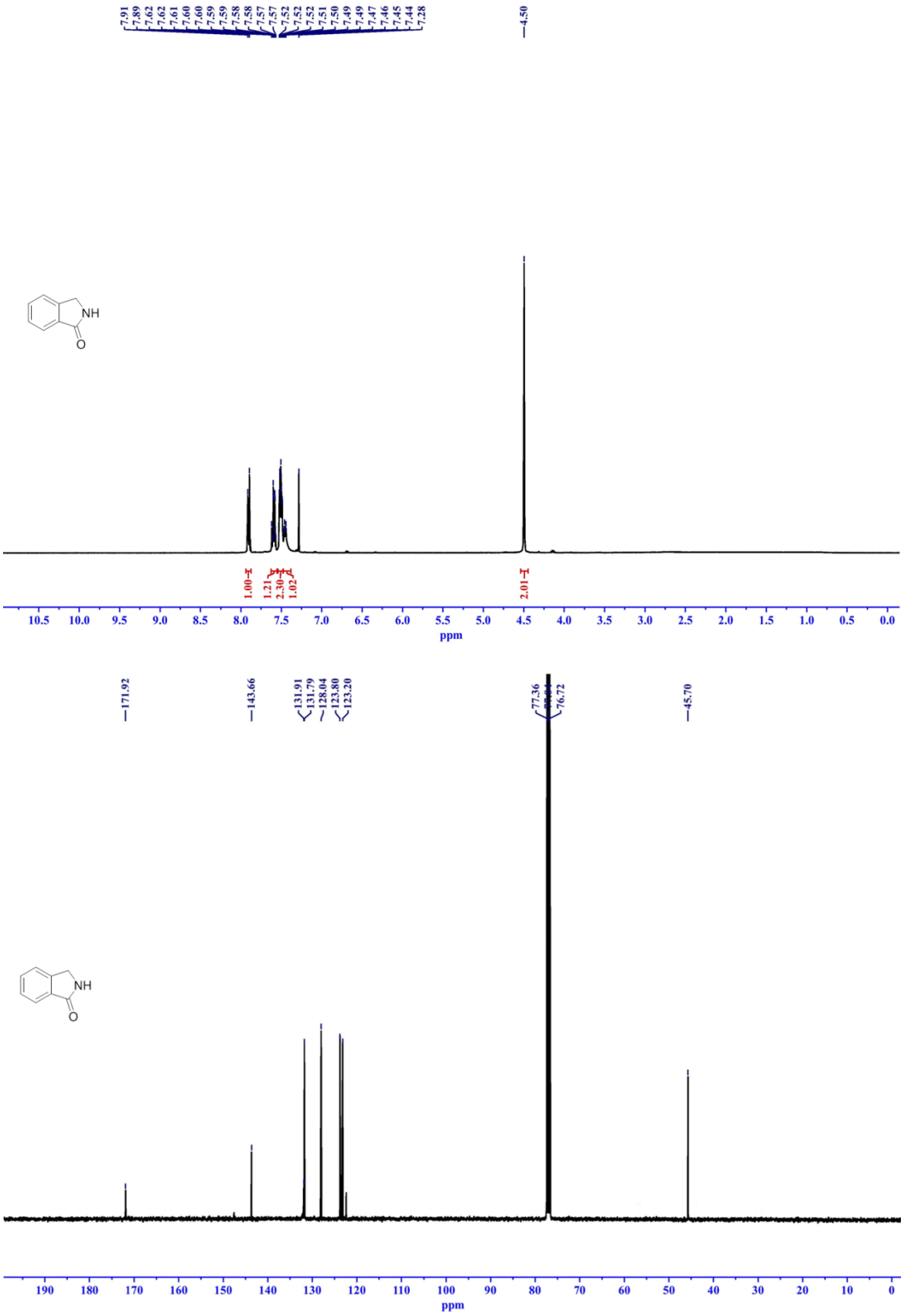
5-*p*-tolylpyrrolidin-2-one (**8c**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



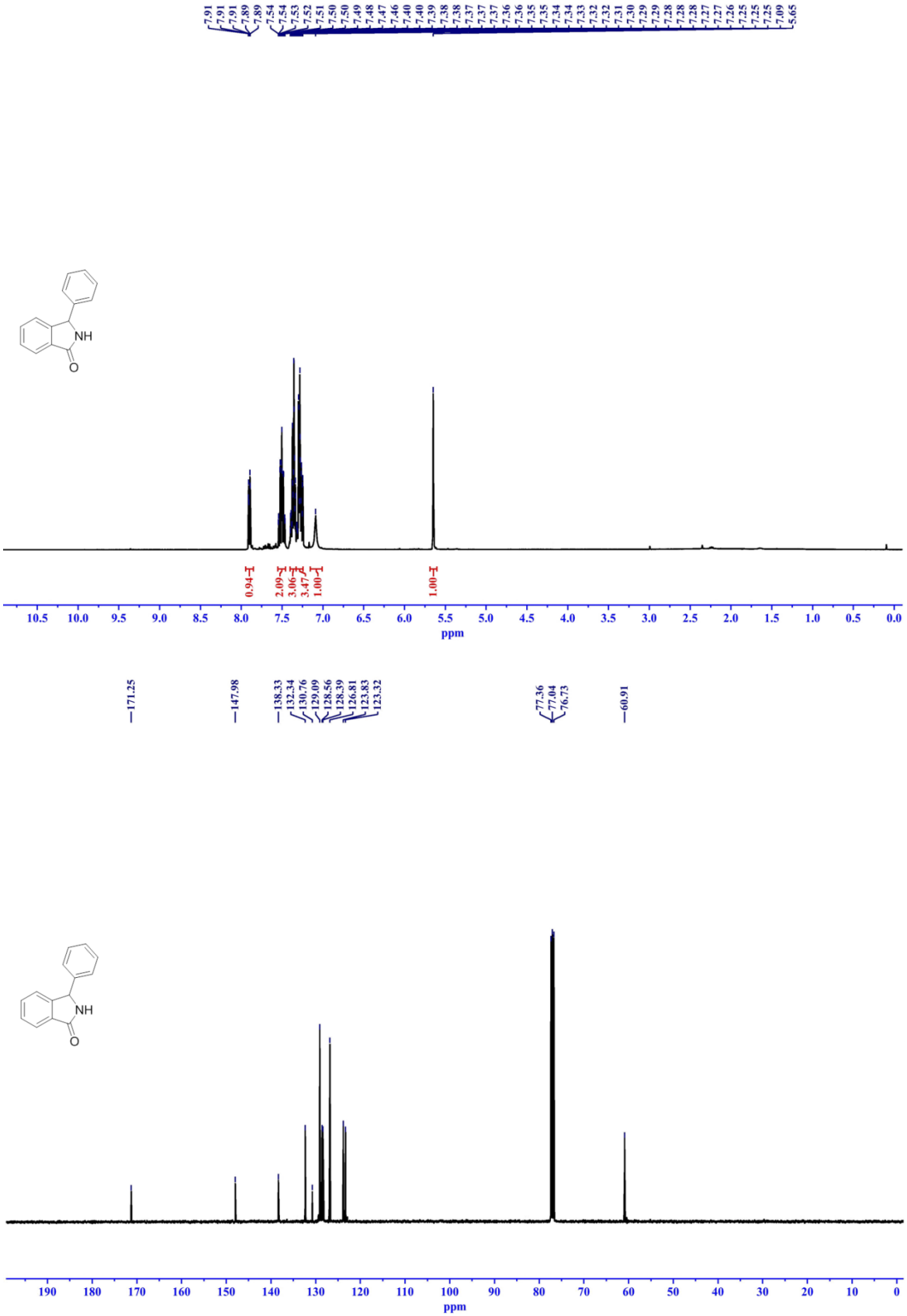
5-(4-methoxyphenyl)pyrrolidin-2-one (**8d**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



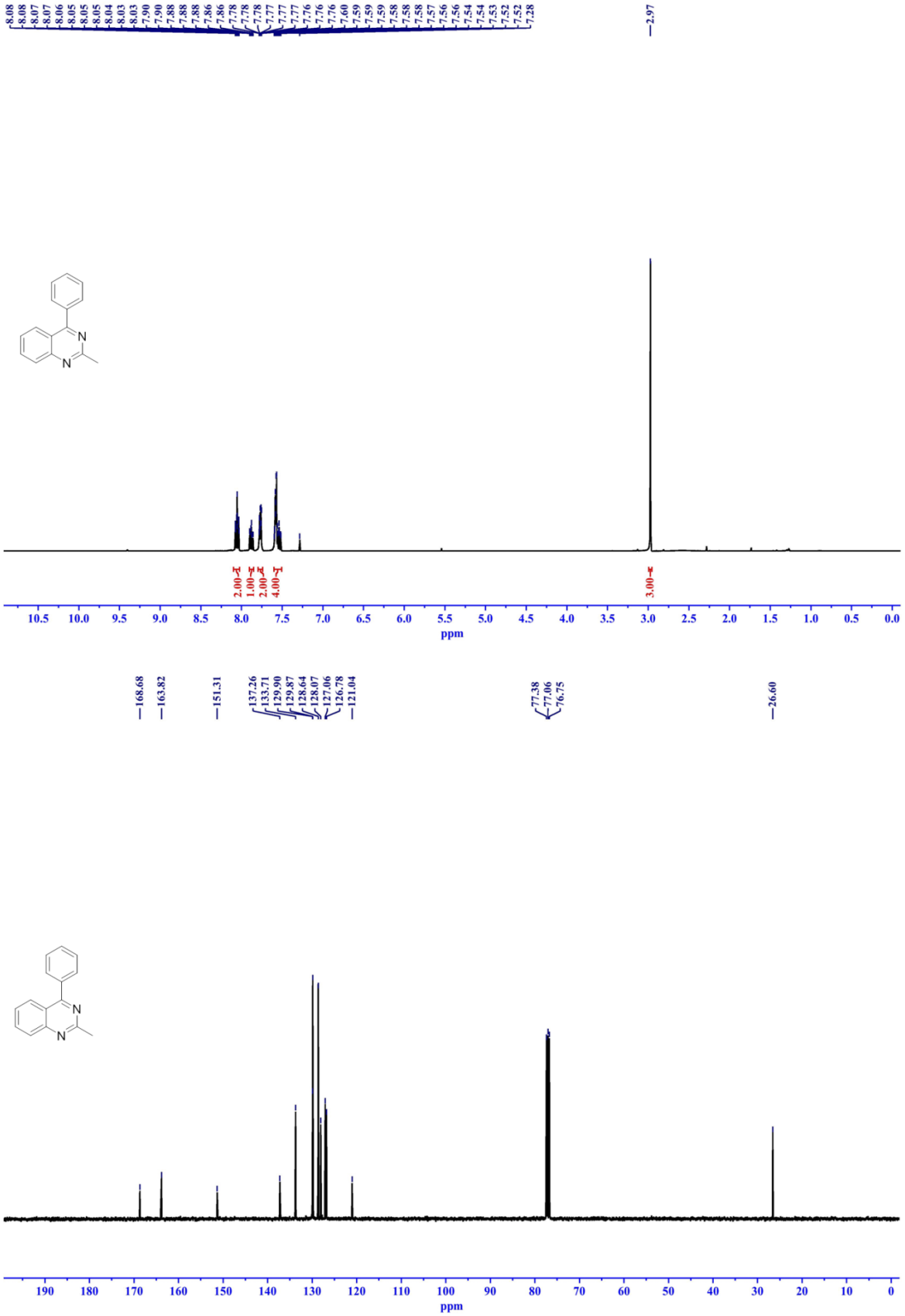
Isoindolin-1-one (**8e**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



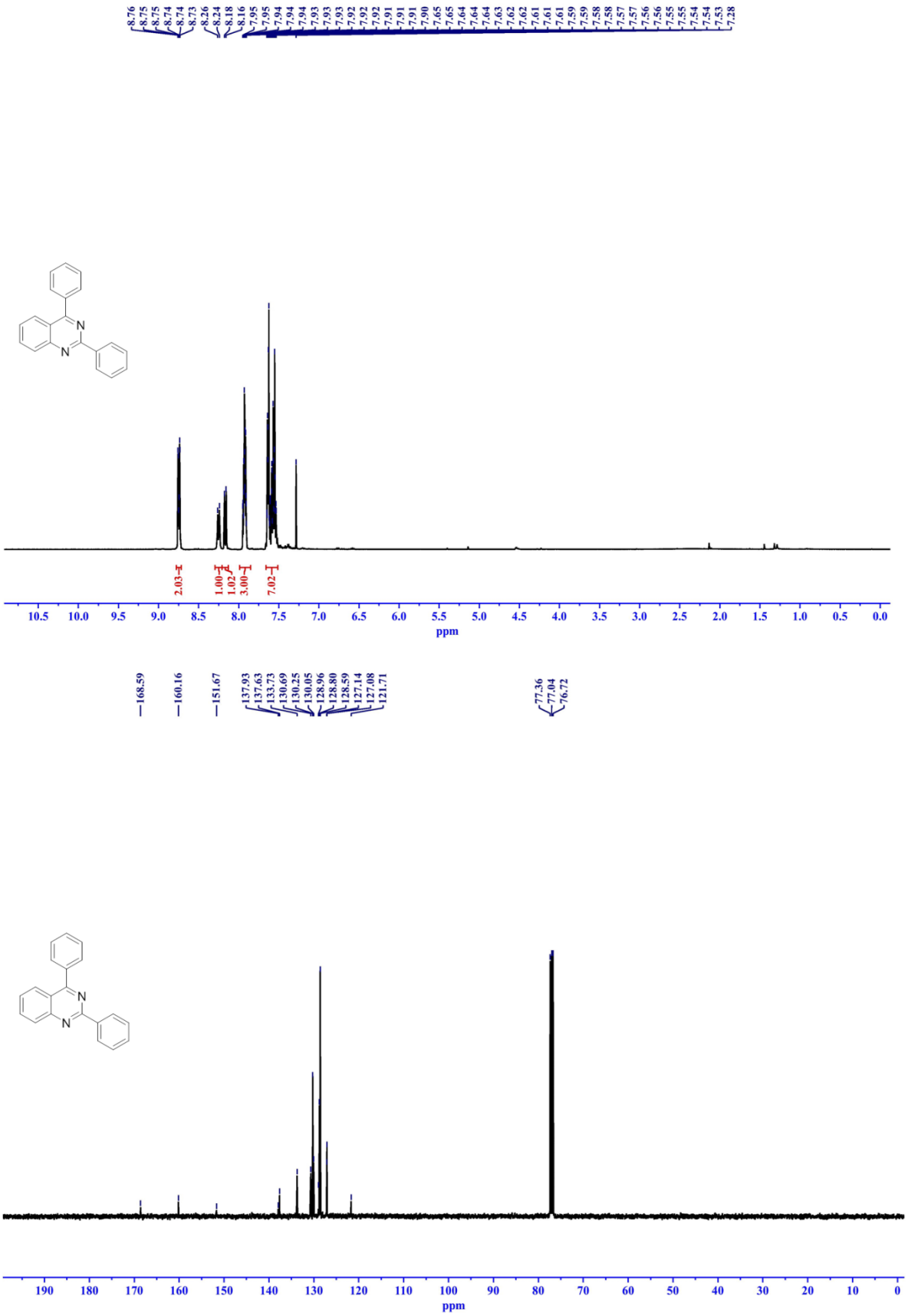
3-phenylisoindolin-1-one (**8f**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



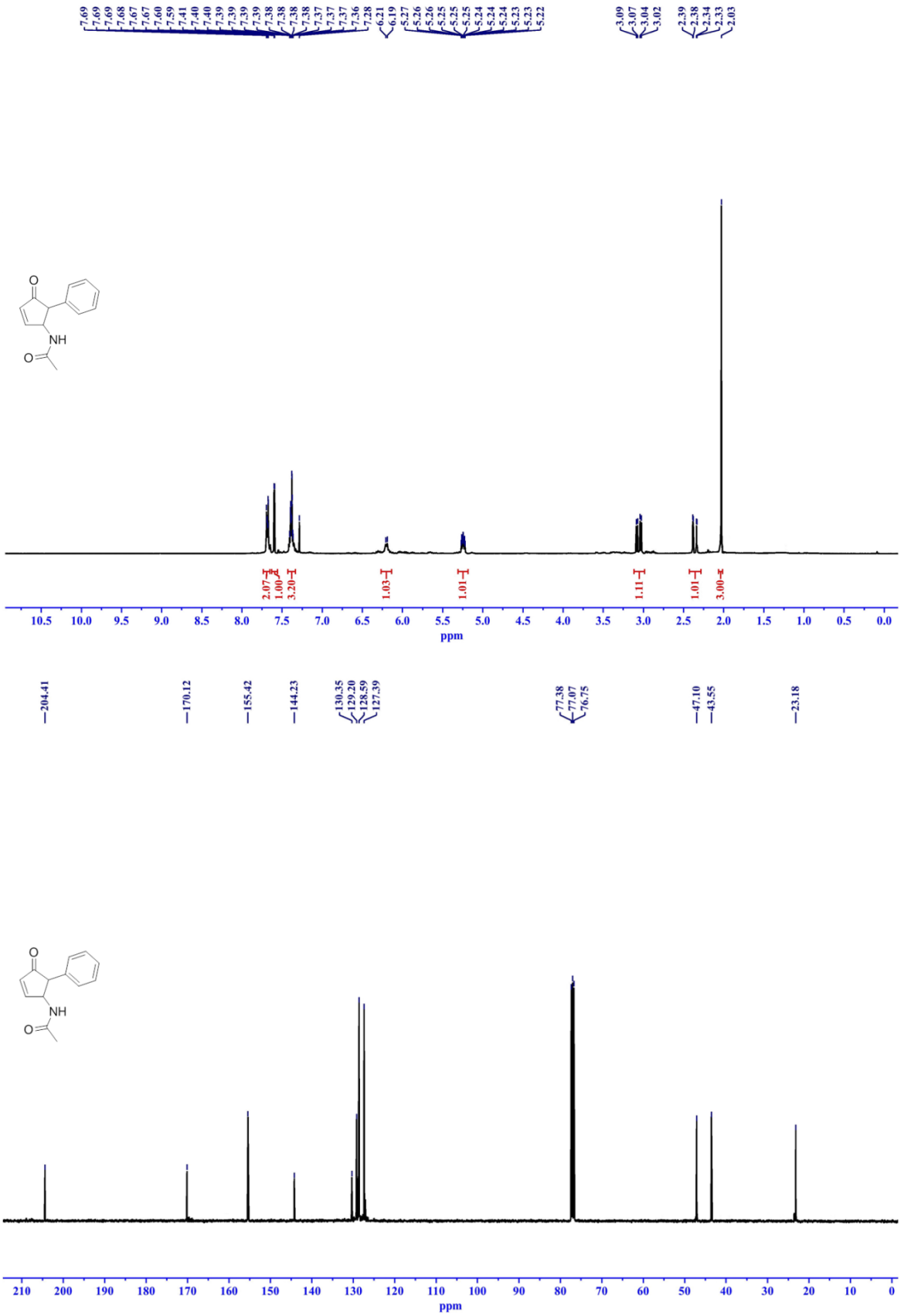
2-methyl-4-phenylquinazoline (**10a**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



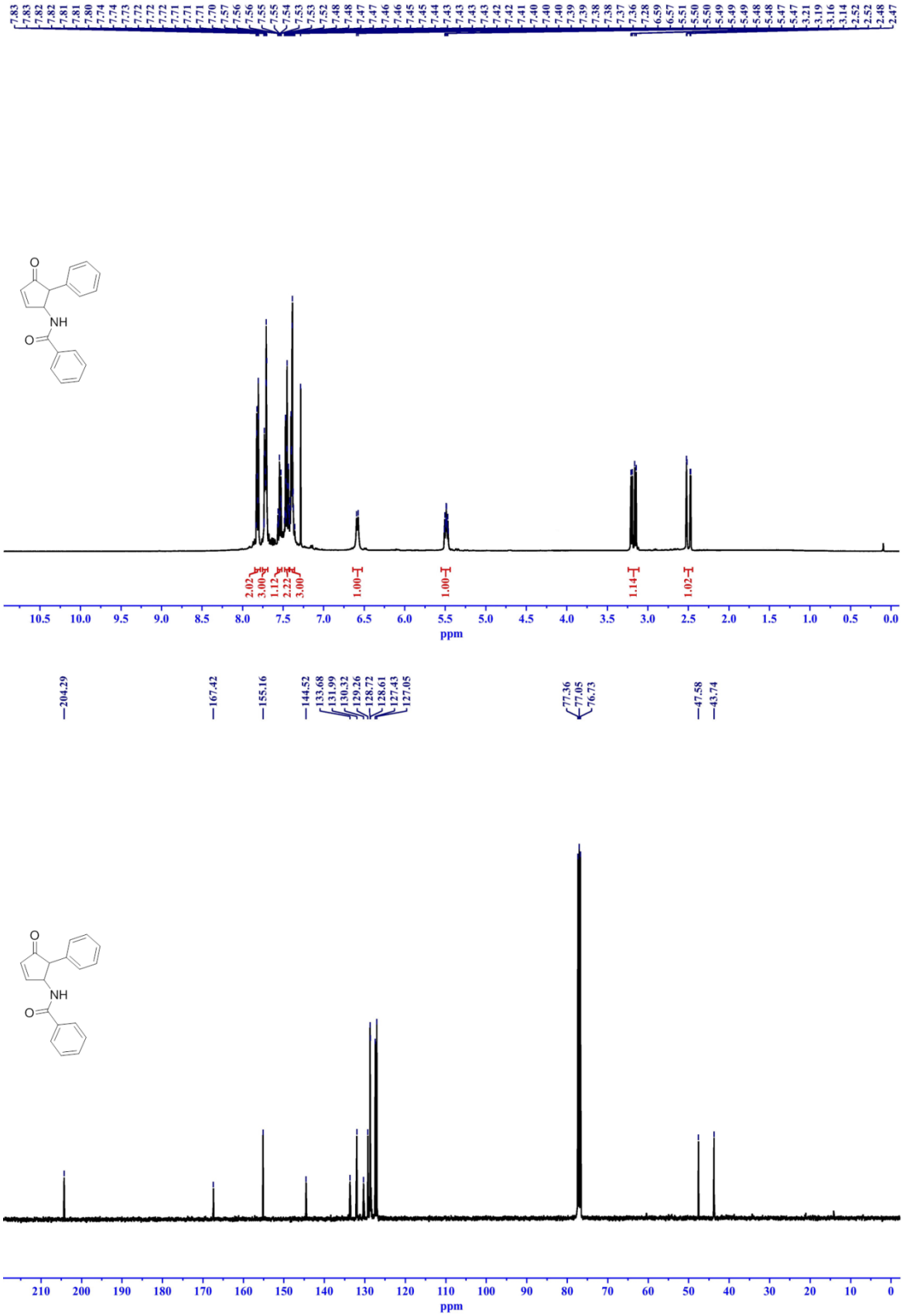
2,4-diphenylquinazoline (**10b**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



N-(4-oxo-5-phenylcyclopent-2-enyl)acetamide (**13a**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



N-(4-oxo-5-phenylcyclopent-2-enyl)benzamide (**13b**); **^{1}H NMR (400 MHz, $CDCl_3$), ^{13}C NMR (101 MHz, $CDCl_3$).**



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