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SUPPORTING INFORMATION

Palladium-Catalyzed Synthesis of α-Aryl Acetophenones from Styryl Ethers and Aryl diazonium salts *via* Regioselective Heck Arylation at Room Temperature

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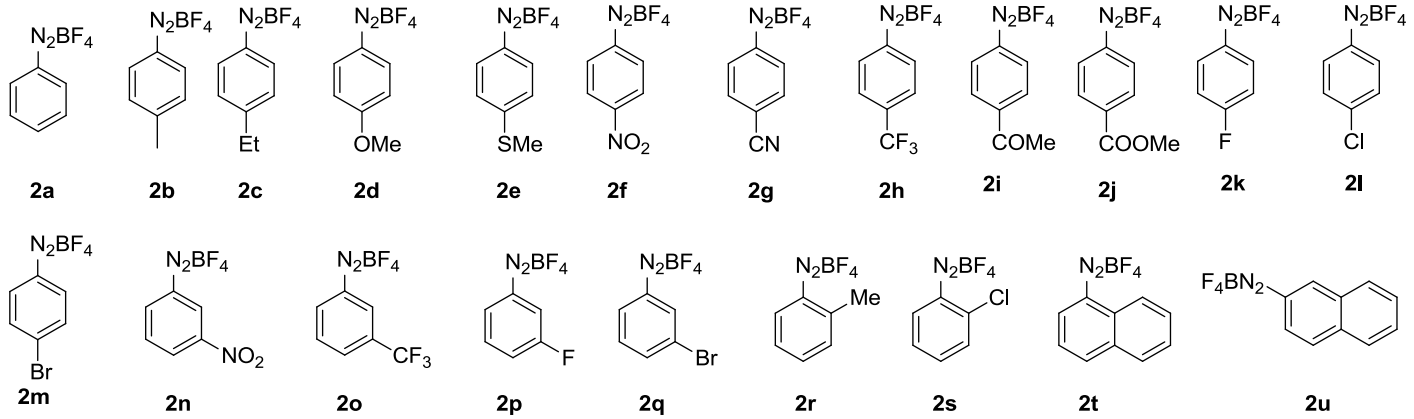
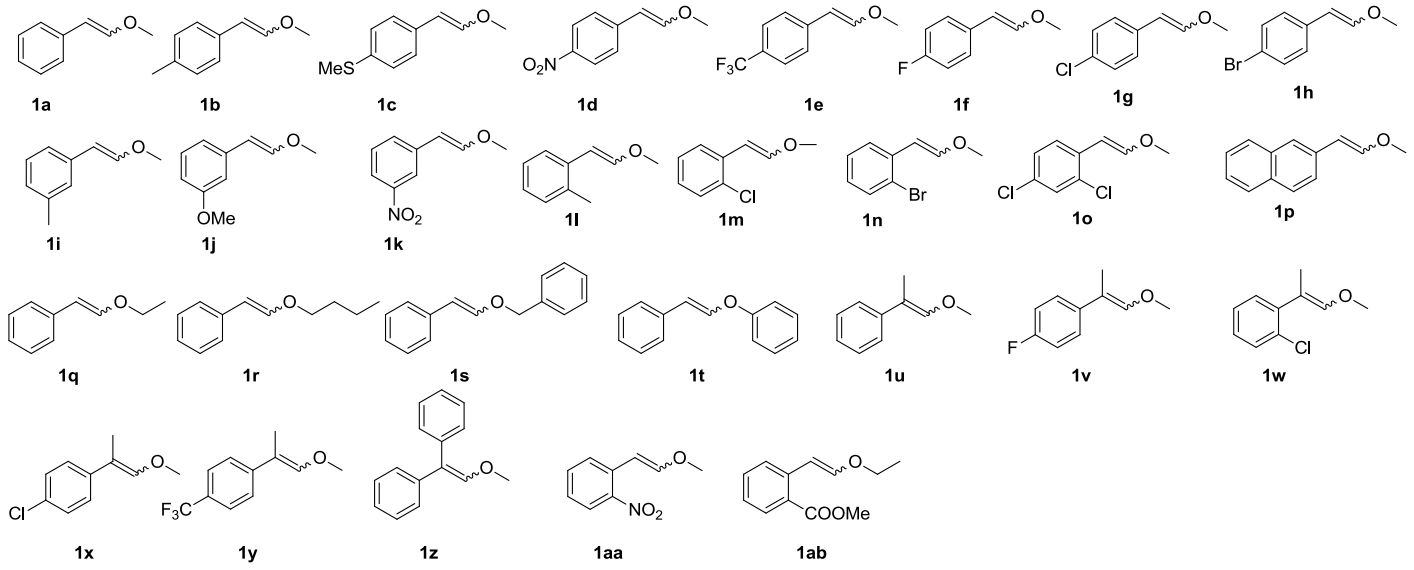
1. Experimental Section: General information

All the reactions were carried out using oven dried glasswares. Solvents were evaporated with the help of rotary evaporator. Thin layer chromatography was performed using pre-coated plates obtained from E. Merck (TLC silica gel 60 F254). TLC plates were visualized by exposure to ultraviolet light (UV). The column chromatography was performed on silica gel (100-200 mesh) using a mixture of ethyl acetate and hexane as an eluent. The NMR spectra were recorded on Bruker Avence 500 MHz NMR spectrometer. The TMS signals were taken as the reference 0.00 ppm for 1H NMR spectra and 77.0 ppm for 13C NMR spectra in $CDCl_3$. Starting materials were prepared using literature procedures as stated below. Solvents and chemicals were purchased from commercial sources and used without further purification. The palladium catalysts were purchased from Sigma Aldrich. Aryl diazonium salts[1] and enol-ethers[2-6] were prepared using literature procedures.

Structures of aryl diazonium salts used in this study



Structures of vinyl ethers used in this study



2. Experimental procedures:

2.1 General procedure for the synthesis of enol ethers 1a-1p, 1u-1y, 1aa and 1ab:

The title compounds were prepared using literature procedures.[2–3] To the solution of (methoxymethyl)triphenylphosphonium chloride (4.85 g, 14.13 mmol) in dry THF (15 mL) at 0 °C, was added a solution of potassium *tert*-butoxide (1.85 g, 15.08 mmol, 1.6 equiv.) in THF (15 mL) drop wise. The resulting solution was stirred for 40 minutes at room temperature. After that, the reaction was cooled to 0 °C to which a solution of aryl aldehyde or ketone (10.0 mmol) in THF (10 mL) was added. The resulting mixture was allowed to stir at room temperature for 2 to 24 hrs and the progress of the reaction was monitored by TLC. After completion, the reaction mixture was quenched with water (5 mL) and the solvent was evaporated. The resulting residue was diluted ethyl acetate (100 mL) and washed with brine and dried over anhydrous Na_2SO_4. The organic layer was concentrated under reduced pressure and purified by column chromatography on silica gel (100-200 mess) using 2% ethyl acetate in hexane to afford enol ethers **1a-1p, 1u-1y, 1aa** and **1ab** as a mixture of E/Z isomers in good yields.

2.2. Synthesis of enol ether 1z:

The title compound was prepared using a literature procedure.[4] To the solution of (methoxymethyl)triphenylphosphonium chloride (4.85 g, 14.13 mmol) in dry THF (15 mL) at 0 °C, was added 1.0 M THF solution of lithium bis(trimethylsilyl)amide (2.0 equiv). The resulting dark red solution was stirred at 0 °C for 30 min after which a solution of the benzophenone (1.8 g, 10 mmol) in THF (10 mL) was added drop wise at 0 °C over 15 min. The resulting reaction mixture was allowed to warm to room temperature. After 16 h, an aqueous saturated solution of NH_4Cl was added and the resulting mixture was stirred for 15 min. Layers were separated and the aqueous phase was extracted with EtOAc (3 x 100 mL). The combined organic extracts were washed with H_2O, brine and dried over anhydrous Na_2SO_4. The organic layer was concentrated and purified by column chromatography on silica gel (100-200 mess) using 2% ethyl acetate in hexane to afford the title compound **1z** as a mixture of E/Z isomer.

2. 3. Synthesis of benzyl styryl ether (1s):

The title compound was prepared using a literature procedure.[5] A solution of benzyl alcohol (3 g, 27.74 mmol), phenol (0.522 mg, 5.55 mmol, 0.2 equiv.) and potassium hydroxide (3.42 g, 61.03 mmol, 2.2 equiv.) were taken in DMSO (40 mL) and stirred at 80 °C under air for 12 hours. After completion, the reaction mixture was treated with saturated NaCl (30 mL) and pH was adjusted to 7 using 1 *N* HCl. The resulting solution was extracted by ethyl acetate (3 × 100 mL) and the combined organic layers were dried over anhydrous Na_2SO_4. The solvent was removed using rotary evaporator and the residue was purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate (90:10) to afford the desired product **1s** as a mixture of E/Z isomer.

2.4. Synthesis of enol ethers 1q, 1r and 1t:

The title compounds were prepared using a literature procedure.[6] To a solution of alcohol (5 mmol) in DMSO (10.0 mL), KOH (10 mmol, 561 mg) and ethynylbenzene (5 mmol, 0.6 mL) were added under a nitrogen atmosphere. The resulting reaction mixture was stirred at 120 °C for 30 min. The progress of the reaction was monitored by TLC. After complete consumption of the ethynylbenzene, the reaction mixture was cooled to room temperature and diluted with ethyl acetate and washed with water for several times. The organic layer was dried over Na_2SO_4, concentrated under reduced pressure and purified by column chromatography on silica gel (100-200 mess) using hexane-ethyl acetate as an eluent to give **1q, 1r** and **1t** as a mixture of E/Z isomer.

2.5. General procedure for the Synthesis of α-aryl acetophenones 3a-3u, 4a-4o, 5a-h, and 6a-6d:

To the solution of styryl ether (0.5 mmol) in THF (4 mL), aryl diazonium tetrafluoroborate (0.6 mmol) and palladium acetate (11.2 mg, 10 mol%) were added sequentially at room temperature under open air atmosphere. The mixture was stirred and monitored by TLC. After completion, the reaction mixture was diluted with ethyl acetate (50 mL) and washed with water (20 mL) and filtered, dried over anhydrous Na_2SO_4. The organic layer was concentrated and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to afford α-aryl acetophenones.

2.6. General Procedure for the synthesis of indoles (7a – 7c)[7]:

Zinc dust (130 mg, 1.99 mmol) and glacial acetic acid (239 mg, 3.98 mmol) were taken in a 50 mL RB flask. Ethanol (2 mL) and aryl ketone **6a-6c** (0.33 mmol) were sequentially added by syringe at ambient temperature. The mixture was stirred at 70 °C for 4 hours. After that the reaction mixture was diluted with water (10 mL) and extracted with ethyl acetate (3 × 10 mL). The combined organic layer was washed with brine, dried over Na_2SO_4, and concentrated in vacuum. The residue was purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to provide the title compounds **7a-7c**.

2.7. Procedure for the Synthesis of 3-phenyl-1H-isochromen-1-one (7d)[8]: To a solution of the aryl ketone (**6d**, 83 mg, 0.33 mmol.) in dry DCM (4 mL), DBU (2 equiv.) was added under an inert atmosphere. The resulting mixture was stirred for 12 h at room temperature and diluted with DCM (20 mL) and was washed with 20% HCl (4 × 20 mL), water (20 mL) and dried over Na_2SO_4. The organic layer was concentrated under reduced pressure, and purified by column chromatography (100-200 mess) on silica gel (100-200 mess) using hexane/ethyl acetate to yield the corresponding 3-aryliso-coumarin **7d**.

2.8. Procedure for the Synthesis of 6-methyl-2,3-diphenyl-1H-indole (8a):

The title compound was prepared using a literature procedure.[9] A mixture of *p*-methyl phenylhydrazine hydrochloride (0.55 mmol, 1.1 equiv.), 2-phenylacetophenone **3a** (98 mg, 0.5 mmol, 1.0 equiv.) and acetic acid (2 mL) was refluxed at 120 ^oC for 12 h in a 100 mL round-bottomed flask under N_2 atmosphere. The reaction mixture was cooled to room temperature and AcOH was removed by rotary evaporator. The resulting residue was portioned diluted with water (20 mL) and extracted with EtOAc (3*20 mL). The combined organic layer was washed with a saturated solution of sodium bicarbonate (20 mL) and brine (20 mL) and dried with Na_2SO_4. The solvent was evaporated and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to afford the desired product **8a.**

2.9. Procedure for the synthesis of 2-hydroxy-1,2-diphenylethan-1-one (8b):

The title compound was prepared using a literature procedure.[10] A solution of 2-phenylacetophenone **3a** (98 mg, 0.5 mmol) and I_2 (25 mg, 20 mol%) in DMSO (1 mL) were stirred at 60 °C for 24 h. After that the reaction mixture was cooled down to room temperature and diluted with ethyl acetate (30 mL) and washed with aqueous $Na_2S_2O_3$ (5 mL) solution. The ethyl acetate layer was evaporated under reduced pressure and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to afford the title compound **8b**.

2.10. Procedure for the synthesis of 1,2-diphenylethan-1-ol (8c):

The title compound was prepared using a literature procedure.[11] To a solution of 2-phenylacetophenone **3a** (98 mg, 0.5 mmol) in MeOH (4 mL) was added $NaBH_4$ (11.3 mg, 0.3 mmol) at 0

°C. The mixture was warmed to room temperature and stirred overnight. The resulting reaction mixture was concentrated in vacuo and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to give **8c.**

2.11. Procedure for the synthesis of benzil (8d):

The title compound was prepared using a literature procedure.[12] 2-Phenylacetophenone **3a** (98 mg, 0.5 mmol) and iodine (0.25 mmol, 63 mg) were dissolved in DMSO (1 mL) and stirred at 100 °C for 2 h. After that the reaction mixture was cooled down to room temperature and diluted with aqueous $Na_2S_2O_3$ and extracted with dichloromethane and dried over anhydrous Na_2SO_4. The organic layer was evaporated under vacuum and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to give benzil **8d.**

2.12. Procedure for the synthesis of benzophenone (8e):

The title compound was prepared using a literature procedure.[13] In a pressure tube, 2-phenylacetophenone **3a** (98 mg, 0.5 mmol), *p*-toluidine (0.6 mmol, 64.2 mg), Na_2SO_4 (2 mmol, 283 mg), anhydrous $Cu(OAc)_2$ (20 mol%, 18 mg) and K_3PO_4 (1.5 mmol, 159 mg) were suspended in 3 mL of DMSO. The tube was sealed under oxygen (O_2) and stirred at 140 °C for 12 hours. After that the reaction mixture was diluted with ethyl acetate (3 x 10 mL) filtered on celite pad. The filtrate was washed with water (15 mL) and dried over Na_2SO_4 and evaporated. The residue was purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to obtain **8e**.

2.13. Procedure for the synthesis of benzyl benzoate (8f):

The title compound was prepared using a literature procedure.[14] 2-Phenylacetophenone **3a** (98 mg, 0.5 mmol), *m*-CPBA (172 mg, 1 mmol) and $NaHCO_3$ (83 mg, 1 mmol) were stirred in CH_2Cl_2 (3 mL) at 0 °C and the reaction was monitored by TLC for 30 minutes. After completion, the reaction mixture was diluted with DCM (50 mL) and washed with water (50 mL) and dried over anhydrous Na_2SO_4. The organic layer was concentrated and purified column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to furnish **8f.**

2.14. Procedure for Gram-Scale synthesis of 3a:

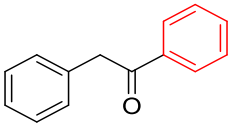
To the solution of Benzyl styryl ether **1s** (1.4 g, 6.6 mmol) in THF (40 mL), were added benzenediazonium tetrafluoroborate (1.53 g, 7.99 mmol) and palladium acetate (150 mg, 10 mol%) at room temperature under open air atmosphere. The resulting mixture was stirred for 4 h and diluted with ethyl acetate (2 × 250 mL) and washed with water (2 × 200 mL). The organic layer was dried over anhydrous Na_2SO_4 and concentrated and purified by column chromatography on silica gel (100-200 mess) using hexane/ethyl acetate to afford the **3a** as a white solid (Yield 80%, 1.05 g).

2.15. Procedure for one-pot synthesis of 3b, 3d and 3f.

Aniline (1 mmol) was dissolved in THF (5 mL) and stirred at ~ 0-5 °C (ice bath) then 48% aq. HBF_4 (2.0 equiv.) was added. After 5 mins, tBuONO (2.0 equiv.) was added and the resulting mixture was allowed to attain room temperature. After 30 mins, styryl ether **1a** (67 mg, 0.5 mmol) and palladium acetate (11.2 mg, 10 mol%) were added stirred for 6h at room temperature. After completion, the reaction mixture was diluted with ethyl acetate and washed with water. The organic layer was dried over Na_2SO_4, concentrated and purified by column chromatography on silica gel with ethyl acetate and hexane to obtain **3b, 3d** and **3f**.

3. Analytical data for the products

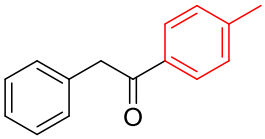
1,2-Diphenylethan-1-one(3a)[15]:



3a

The title compound was obtained as white solid using the general procedure 2.5. Yield 92% (91 mg). RF (Hexane/EtOAc 100:1): 0.21. ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.00 (d, *J* = 8.3 Hz, 2H), 7.56 – 7.51 (m, 1H), 7.45 – 7.42 (m, 2H), 7.33 – 7.22 (m, 5H), 4.27 (s, 2H).^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.5, 136.5, 134.5, 133.1, 129.4, 128.6, 128.5, 128.5, 126.8, 45.4.

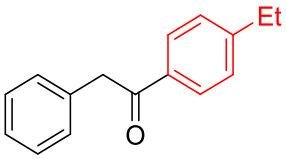
2-Phenyl-1-(p-tolyl)ethan-1-one(3b)[15]:



3b

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.22. Yield 78% (82 mg).^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.91 (d, *J* = 7.7 Hz, 2H), 7.31 (t, *J* = 7.5 Hz, 2H), 7.29 – 7.20 (m, 5H), 4.24 (s, 2H), 2.38 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.2, 143.9, 134.7, 134.0, 129.3, 129.2, 128.7, 128.5, 126.7, 45.3, 21.5.

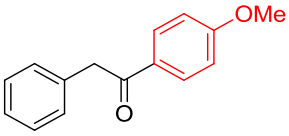
1-(4-Ethylphenyl)-2-phenylethan-1-one (3c)[16]:



3c

The title compound was obtained as light yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.18. Yield 77% (86 mg). 1H NMR (500 MHz, CDCl3) δ = 7.94 (d, J = 8.3 Hz, 2H), 7.34 – 7.28 (m, 2H), 7.27 – 7.22 (m, 5H), 4.25 (s, 2H), 2.68 (q, J = 7.6 Hz, 2H), 1.24 (t, J = 7.6 Hz, 3H).13C {1H} NMR (125 MHz, CDCl3) δ = 197.2, 150.0, 134.7, 134.2, 129.3, 128.8, 128.5, 128.0, 126.7, 45.3, 28.8, 15.1.

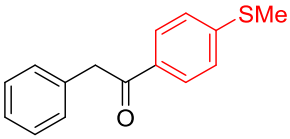
1-(4-Methoxyphenyl)-2-phenylethan-1-one(3d)[15]:



3d

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 32:1): 0.26. Yield 92% (104 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.91 (d, *J* = 9.0 Hz, 2H), 7.27 – 7.19 (m, 2H), 7.16 (dd, *J* = 15.8, 9.0 Hz, 3H), 6.83 (d, *J* = 9.0 Hz, 2H), 4.14 (s, 2H), 3.76 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.2, 163.4, 134.9, 130.8, 129.5, 129.3, 128.5, 126.7, 113.7, 55.4, 45.1.

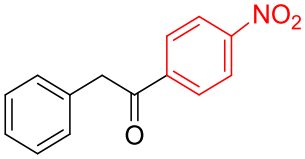
1-(4-(Methylthio)phenyl)-2-phenylethan-1-one (3e)[17]:



3e

The title compound was obtained as light yellow using the general procedure 2.5. RF (Hexane/EtOAc 50:1): 0.25. Yield 85% (103 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.92 (dd, J = 8.7, 2.0 Hz, 2H), 7.34 – 7.30 (m, 2H), 7.26 – 7.24 (m, 5H), 4.24 (s, 2H), 2.51 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.6, 146.0, 134.6, 132.7, 129.3, 129.0, 128.6, 126.8, 124.9, 45.3, 14.6.

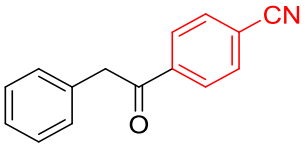
1-(4-Nitrophenyl)-2-phenylethan-1-one (3f)[18]:



3f

The title compound was obtained as light yellow using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.22. Yield 70% (84 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.34 – 8.24 (m, 2H), 8.16 – 8.11 (m, 2H), 7.39 – 7.31 (m, 2H), 7.30 – 7.27 (m, 1H), 7.25 (dd, *J* = 7.5, 1.1 Hz, 2H), 4.33 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.0, 150.2, 140.9, 133.3, 129.5, 129.3, 128.9, 127.3, 123.8, 46.0.

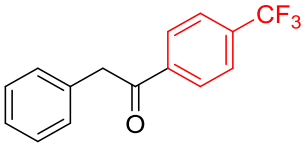
4-(2-Phenylacetyl)benzonitrile (3g)[15]:



3g

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.20. Yield 80% (88 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.04 – 7.95 (m, 2H), 7.73 – 7.63 (m, 2H), 7.27 (t, *J* = 7.3 Hz, 2H), 7.22 – 7.15 (m, 3H), 4.22 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.2, 139.4, 133.4, 132.4, 129.3, 128.9, 128.8, 127.2, 117.8, 116.3, 45.7

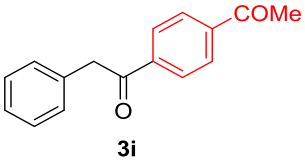
2-Phenyl-1-(4-(trifluoromethyl)phenyl)ethan-1-one (3h)[18]:



3h

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.21. Yield 75% (99 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.02 (d, *J* = 8.1 Hz, 2H), 7.64 (d, *J* = 8.2 Hz, 2H), 7.27 – 7.24(m, 2H), 7.21 – 7.16 (m, 3H), 4.23 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.6, 139.1, 134.3 (q, $J_{C\text{-}F}$ = 36.2 Hz), 133.7, 129.3, 128.9, 128.8, 127.1, 125.7 (q, $J_{C\text{-}F}$ = 3.7 Hz), 123.5 (q, $J_{C\text{-}F}$ = 274 Hz), 45.8.

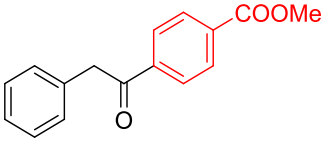
1-(4-Acetylphenyl)-2-phenylethan-1-one (3i)[19]:



3i

The title compound was obtained as oil using the general procedure 2.5. Yield 74% (88 mg). RF (Hexane/EtOAc 32:1): 0.24. ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.09 – 8.04 (m, 2H), 8.04 – 7.98 (m, 2H), 7.36 – 7.28 (m, 2H), 7.27 – 7.24 (m, 3H), 4.30 (s, 2H), 2.62 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.3, 197.0, 140.1, 139.7, 133.9, 129.3, 128.7, 128.4, 127.0, 45.8, 26.8.

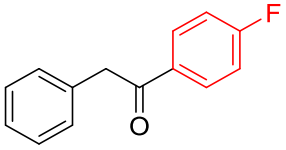
Methyl 4-(2-phenylacetyl)benzoate (3j)[18]:



3j

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 16:1): 0.23; Yield 72% (92 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.08 – 8.00 (m, 2H), 8.00 – 7.93 (m, 2H), 7.32 – 7.21 (m, 2H), 7.18 (dd, *J* = 7.2, 5.3 Hz, 3H), 4.23 (s, 2H), 3.86 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.1, 166.1, 139.7, 133.9, 133.8, 129.8, 129.4, 128.7, 128.4, 127.0, 52.4, 45.7.

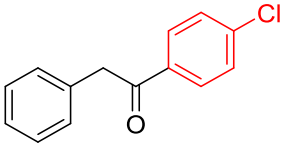
1-(4-Fluorophenyl)-2-phenylethan-1-one (3k)[15]:



3k

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.20. Yield 73% (78 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.99 – 7.91 (m, 2H), 7.24 (dd, *J* = 8.7, 6.1 Hz, 2H), 7.19 – 7.14 (m, 3H), 7.06 – 6.99 (m, 2H), 4.16 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.0, 165.7 (d, $J_{C\text{-}F}$ = 254.2 Hz), 134.2, 132.9 (d, $J_{C\text{-}F}$ = 2.5 Hz), 131.2 (d, $J_{C\text{-}F}$ = 9.1 Hz), 129.3, 128.6, 126.9, 115.7 (d, $J_{C\text{-}F}$ = 22.2 Hz), 45.4.

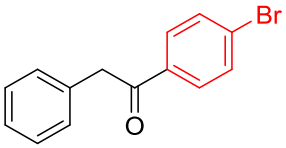
1-(4-Chlorophenyl)-2-phenylethan-1-one (3l)[15]:



3l

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.21. Yield 78% (90 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.88–7.81 (m, 2H), 7.35 – 7.29 (m, 2H), 7.25 – 7.21 (m, 2H), 7.18 – 7.13 (m, 3H), 4.15 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.3, 139.5, 134.7, 134.1, 129.9, 129.3, 128.8, 128.7, 126.9, 45.4.

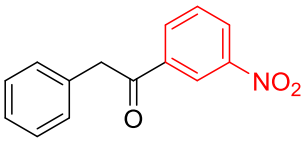
1-(4-Bromophenyl)-2-phenylethan-1-one (3m)[15]:



3m

The title compound was obtained as yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.23. Yield 76% (105 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.80 – 7.74 (m, 2H), 7.53 – 7.46 (m, 2H), 7.23 (d, *J* = 7.2 Hz, 2H), 7.16 (dd, *J* = 4.8, 3.4 Hz, 3H), 4.15 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.5, 135.1, 134.0, 131.8, 130.0, 129.2, 128.6, 128.2, 126.9, 45.4.

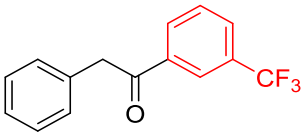
1-(3-Nitrophenyl)-2-phenylethan-1-one (3n)[20]:



3n

The title compound was obtained as yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.20. Yield 71% (86 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.76 (t, *J* = 1.9 Hz, 1H), 8.35 – 8.20 (m, 2H), 7.59 (t, *J* = 8.0 Hz, 1H), 7.30 – 7.16 (m, 5H), 4.27 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 195.3, 148.3, 137.6, 134.1, 133.3, 129.9, 129.3, 128.9, 127.4, 127.3, 123.4, 45.7.

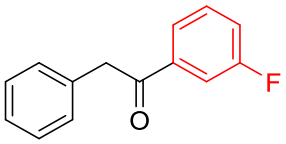
2-Phenyl-1-(3-(trifluoromethyl)phenyl)ethan-1-one (3o)[21]:



3o

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 90:10): 0.24. Yield 82% (108 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.18 (d, *J* = 0.5 Hz, 1H), 8.09 (d, *J* = 7.9 Hz, 1H), 7.71 (d, *J* = 7.8 Hz, 1H), 7.50 (t, *J* = 7.8 Hz, 1H), 7.25 (dd, *J* = 8.2, 7.1 Hz, 2H), 7.18 (dd, *J* = 12.5, 4.5 Hz, 3H), 4.22 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.1, 136.9, 133.7, 131.7, 131.2 (q, J_{C-F} = 32.9 Hz), 129.5 (q, J_{C-F} = 3.5 Hz), 129.39, 129.31, 128.7, 127.1, 125.3 (q, J_{C-F} = 3.8 Hz), 123.6 (d, J_{C-F} = 272.5 Hz), 45.5.

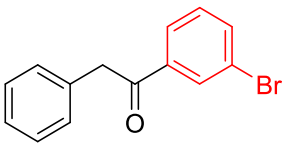
1-(3-Fluorophenyl)-2-phenylethan-1-one (3p)[21]:



3p

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 60:1): 0.22. Yield 76% (81 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.73 – 7.69 (m, 1H), 7.61 – 7.58 (m, 1H), 7.37 –7.33 (m, 1H), 7.28 – 7.23 (m, 2H), 7.19 – 7.16 (m, 4H), 4.18 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.3, 163.0 (d, J_{C-F} = 248 Hz), 138.6 (d, J_{C-F} = 5.9 Hz), 134.0, 130.3 (d, J_{C-F} = 7.7 Hz), 129.4, 128.7, 127.0, 124.3 (d, J_{C-F} = 3.3 Hz), 120.1 (d, J_{C-F} = 21.6 Hz), 115.3 (d, J_{C-F} = 22.3 Hz), 45.6.

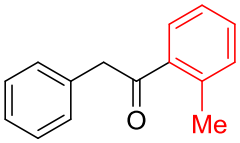
1-(3-Bromophenyl)-2-phenylethan-1-one (3q)[15]:



3q

The title compound was obtained as yellow solid using general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.23. Yield 75% (103 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.98 (t, *J* = 1.8 Hz, 1H), 7.90 – 7.86 (m, 1H), 7.53 – 7.51 (m, 1H), 7.40 (t, *J* = 7.9 Hz, 1H), 7.36 – 7.32 (m, 2H), 7.28 – 7.24 (m, 3H), 4.26 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.3, 138.0, 134.9, 133.9, 133.0, 129.9, 129.4, 128.7, 128.6, 127.0, 126.6, 45.5.

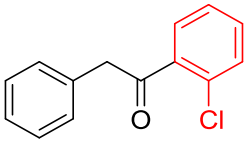
2-Phenyl-1-(o-tolyl)ethan-1-one (3r)[15]:



3r

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.20. Yield 78% (82 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.71 (dd, *J* = 7.7, 1.0 Hz, 1H), 7.37 – 7.29 (m, 3H), 7.27 – 7.20 (m, 5H), 4.20 (s, 2H), 2.44 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 201.3, 138.4, 137.5, 134.3, 131.9, 131.2, 129.4, 128.5, 128.5, 126.8, 125.5, 48.3, 21.2.

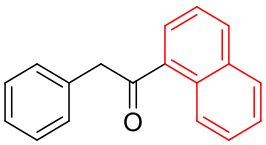
1-(2-Chlorophenyl)-2-phenylethan-1-one (3s)[15]:



3s

The title compound was obtained as oil using the general procedure 2.5. Yield 80% (92 mg). RF (Hexane/EtOAc 25:1): 0.21. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.44 – 7.21 (m, 9H), 4.29 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 200.9, 139.2, 133.5, 131.5, 130.6, 130.3, 129.6, 128.9, 128.5, 127.0, 126.8, 49.5.

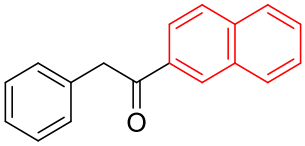
1-(Naphthalen-1-yl)-2-phenylethan-1-one (3t)[22]:



3t

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 60:1): 0.23. Yield 82% (101 mg). Yield 78% (96 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.56 (d, *J* = 8.6 Hz, 1H), 7.98 – 7.85 (m, 2H), 7.86 (d, *J* = 7.9 Hz, 1H), 7.58 – 7.47 (m, 3H), 7.33 – 7.24 (m, 5H), 4.37 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 201.5, 135.5, 134.5, 133.9, 132.7, 130.3, 129.4, 128.6, 128.3, 127.9, 127.8, 126.9, 126.4, 125.8, 124.2, 48.9.

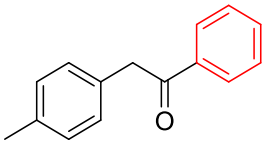
1-(Naphthalen-2-yl)-2-phenylethan-1-one (3u)[18]:



3u

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.21. Yield 82% (101 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.55 (s, 1H), 8.07 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.97 (d, *J* = 8.1 Hz, 1H), 7.91 – 7.86 (m, 2H), 7.63 – 7.53 (m, 2H), 7.35 – 7.32 (m, 3H), 7.24 – 7.27 (m, 2H), 4.43 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.6, 135.5, 134.6, 133.9, 132.4, 130.4, 129.6, 129.4, 128.7, 128.5, 128.5, 127.7, 126.9, 126.7, 124.2, 45.5.

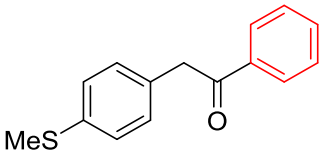
1-Phenyl-2-(p-tolyl)ethan-1-one (4a)[19]:



4a

The title compound was obtained as yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.25. Yield 82% (101 mg). Yield 88% (92 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.99 (d, *J* = 8.4 Hz, 2H), 7.54 – 7.49 (m, 1H), 7.42 (t, *J* = 7.7 Hz, 2H), 7.20 – 7.10 (m, 4H), 4.22 (s, 2H), 2.30 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.7, 136.5, 136.3, 132.9, 131.3, 129.3, 129.2, 128.5, 128.5, 45.0, 20.9.

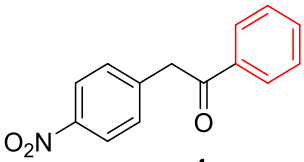
2-(4-(Methylthio)phenyl)-1-phenylethan-1-one (4b)[23]:



4b

Yield 82% (99 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.00 (dd, *J* = 8.4, 1.2 Hz, 2H), 7.59 – 7.54 (m, 1H), 7.46 (t, *J* = 7.7 Hz, 2H), 7.21 (dd, *J* = 19.1, 8.5 Hz, 4H), 4.25 (s, 2H), 2.46 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.4, 136.9, 133.1, 131.3, 129.9, 128.6, 128.5, 127.0, 125.0, 44.8, 15.9.

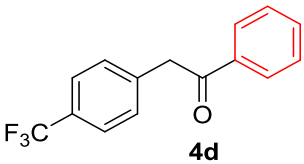
2-(4-Nitrophenyl)-1-phenylethan-1-one (4c)[18]:



4c

The title compound was obtained as pale yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.21. Yield 85% (102 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.22 (d, *J* = 8.5 Hz, 2H), 8.06 – 8.00 (m, 2H), 7.63 (dd, *J* = 11.2, 3.7 Hz, 1H), 7.53 (d, *J* = 7.9 Hz, 2H), 7.45 (d, *J* = 8.4 Hz, 2H), 4.44 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 195.9, 147.0, 141.9, 136.0, 133.7, 130.6, 128.8, 128.4, 123.7, 44.9.

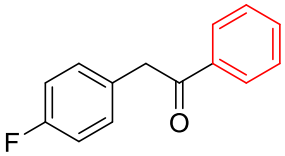
1-Phenyl-2-(4-(trifluoromethyl)phenyl)ethan-1-one (4d)[15]:



4d

The title compound was obtained as white solid using the general procedure 2.5. Yield 83% (109 mg). RF (Hexane/EtOAc 64:1): 0.23. ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.01 (dd, *J* = 8.3, 1.1 Hz, 2H), 7.63 – 7.56 (m, 3H), 7.49 (t, *J* = 7.8 Hz, 2H), 7.38 (d, *J* = 8.0 Hz, 2H), 4.36 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.6, 138.5, 136.3, 133.5, 129.9, 129.5 (q, $J_{C\text{-}F}$ = 32.4 Hz), 128.7, 128.4, 125.5 (q, $J_{C\text{-}F}$ = 4.5 Hz), 124.2 (q, $J_{C\text{-}F}$ = 272.0 Hz), 45.0.

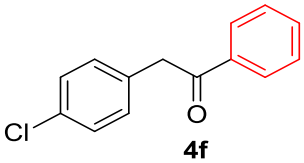
2-(4-Fluorophenyl)-1-phenylethan-1-one (4e)[15]:



4e

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.21. Yield 92% (98 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.99 (dd, *J* = 8.4, 1.3 Hz, 2H), 7.54 (d, *J* = 7.4 Hz, 1H), 7.44 (dd, *J* = 11.6, 4.3 Hz, 2H), 7.20 (dd, *J* = 8.8, 5.3 Hz, 2H), 6.99 (t, *J* = 8.7 Hz, 2H), 4.24 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.2, 161.8 (d, $J_{C\text{-}F}$ = 243.7 Hz), 136.3, 133.2, 131.0 (d, $J_{C\text{-}F}$ = 7.3 Hz), 130.1 (d, $J_{C\text{-}F}$ = 2.9 Hz), 128.6, 128.4, 115.4 (d, $J_{C\text{-}F}$ = 21.2 Hz), 44.3.

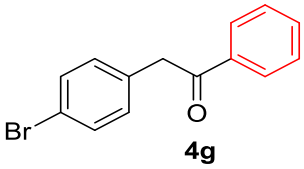
2-(4-Chlorophenyl)-1-phenylethan-1-one (4f)[15]:



4f

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 20:1): 0.25. Yield 89% (102 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.01 – 7.95 (m, 2H), 7.58 – 7.53 (m, 1H), 7.48 – 7.42 (m, 2H), 7.31 – 7.26 (m, 2H), 7.21 – 7.15 (m, 2H), 4.24 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.0, 136.3, 133.2, 132.8, 132.7, 130.8, 128.7, 128.6, 128.4, 44.6.

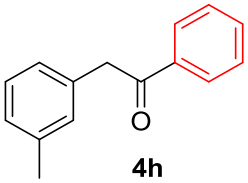
2-(4-Bromophenyl)-1-phenylethan-1-one (4g)[18]:



4g

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 64:1): 0.23. Yield 85% (116 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.05 (d, *J* = 7.8 Hz, 2H), 7.58 (t, *J* = 7.6 Hz, 2H), 7.48 (t, *J* = 7.7 Hz, 2H), 7.28 (t, *J* = 7.4 Hz, 1H), 7.26 – 7.22 (m, 1H), 7.16 – 7.12 (m, 1H), 4.45 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.9, 136.3, 133.4, 133.3, 131.7, 131.2, 128.7, 128.5, 120.9, 44.7.

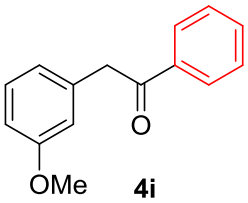
1-Phenyl-2-(m-tolyl)ethan-1-one (4h)[18]:



4h

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.20. Yield 80% (84 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.05 – 7.96 (m, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.43 (t, *J* = 7.7 Hz, 2H), 7.20 (t, *J* = 6.6 Hz, 1H), 7.14 – 7.00 (m, 3H), 4.22 (s, 2H), 2.31 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.6, 138.1, 136.4, 134.3, 133.0, 130.0, 128.5, 128.4, 127.5, 126.3, 45.3, 21.3.

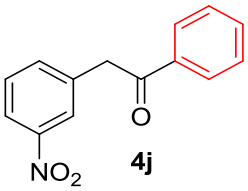
2-(3-Methoxyphenyl)-1-phenylethan-1-one (4i)[24]:



4i

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 20:1): 0.21. Yield 85% (96 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.99 (d, *J* = 7.5 Hz, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.42 (t, *J* = 7.7 Hz, 2H), 7.22 (dd, *J* = 9.5, 6.3 Hz, 1H), 6.86 – 6.75 (m, 3H), 4.23 (s, 2H), 3.74 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.3, 159.6, 136.4, 135.9, 133.0, 129.5, 128.5, 128.5, 121.7, 115.0, 112.2, 55.0, 45.4.

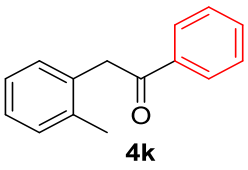
2-(3-Nitrophenyl)-1-phenylethan-1-one (4j)[25]:



4j

The title compound was obtained as yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 15:1): 0.24. Yield 76% (91 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.14 (d, *J* = 1.9 Hz, 2H), 8.03 (d, *J* = 7.9 Hz, 2H), 7.65 – 7.58 (m, 2H), 7.53 – 7.49 (m, 3H), 4.43 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.0, 148.2, 136.2, 136.0, 136.0, 133.6, 129.3, 128.8, 128.3, 124.7, 122.0, 44.5.

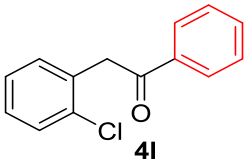
1-Phenyl-2-(o-tolyl)ethan-1-one (4k)[27]:



4k

The title compound was obtained as yellow power using the general procedure 2.5. RF (Hexane/EtOAc 20:1): 0.19. Yield 78% (82 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.93 (d, *J* = 7.7 Hz, 2H), 7.46 (t, *J* = 7.4 Hz, 1H), 7.37 (t, *J* = 7.7 Hz, 2H), 7.13 – 7.00 (m, 4H), 4.20 (s, 2H), 2.16 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.3, 136.8, 136.7, 133.3, 133.0, 130.2, 130.2, 128.5, 128.2, 127.1, 126.0, 43.3, 19.7.

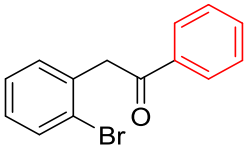
2-(2-Chlorophenyl)-1-phenylethan-1-one (4l)[15]:



4l

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 20:1): 0.19. Yield 82% (94 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.10 – 7.99 (m, 2H), 7.63 – 7.53 (m, 1H), 7.51 – 7.43 (m, 2H), 7.39 (dd, *J* = 5.1, 3.8 Hz, 1H), 7.23 – 7.19 (m, 3H), 4.41 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.2, 136.4, 134.3, 133.2, 133.0, 131.6, 129.3, 128.5, 128.4, 128.2, 126.8, 43.1.

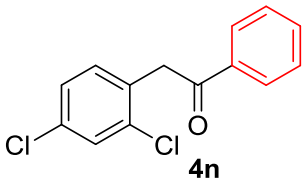
2-(2-Bromophenyl)-1-phenylethan-1-one (4m)[26]:



4m

The title compound was obtained as yellow solid using the general procedure 2.5. RF (Hexane/EtOAc 20:1): 0.25. Yield 72% (99 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.00 (dd, *J* = 8.3, 1.2 Hz, 2H), 7.57 (d, *J* = 7.4 Hz, 1H), 7.51 – 7.43 (m, 4H), 7.14 (d, *J* = 8.4 Hz, 2H), 4.25 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.2, 136.5, 134.9, 133.2, 132.7, 131.6, 128.7, 128.6, 128.2, 127.4, 125.0, 45.7.

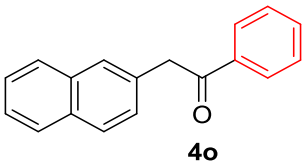
2-(2,4-Dichlorophenyl)-1-phenylethan-1-one (4n)[15]:



4n

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 15:1): 0.22. Yield 74% (98 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.05 – 8.00 (m, 2H), 7.62 – 7.57 (m, 1H), 7.52 – 7.46 (m, 2H), 7.42 (d, *J* = 2.1 Hz, 1H), 7.22 (dd, *J* = 8.2, 2.0 Hz, 1H), 7.17 (d, *J* = 8.2 Hz, 1H), 4.40 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 195.7, 136.3, 135.1, 133.5, 133.4, 132.4, 131.6, 129.2, 128.7, 128.2, 127.1, 42.5.

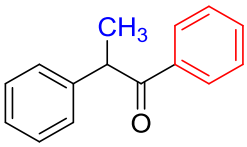
2-(Naphthalen-2-yl)-1-phenylethan-1-one (4o)[18]:



4o

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 32:1): 0.20. Yield 73% (90 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.04 (dd, *J* = 8.4, 1.0 Hz, 2H), 7.83 – 7.70 (m, 4H), 7.57 – 7.51 (m, 1H), 7.48–7.37 (m, 5H), 4.43 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.6, 136.5, 133.5, 133.1, 132.3, 132.0, 128.6, 128.6, 128.2, 128.0, 127.6, 127.5, 127.5, 126.0, 125.7, 45.6.

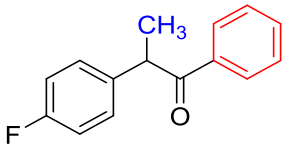
1,2-Diphenylpropan-1-one (5a)[28]:



5a

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 25:1): 0.20. Yield 74% (78 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.95 (dd, *J* = 8.4, 1.3 Hz, 2H), 7.49 – 7.43 (m, 1H), 7.39 – 7.35 (m, 2H), 7.30 – 7.28 (m, 3H), 7.25 (d, *J* = 5.5 Hz, 1H), 7.20 (dd, *J* = 9.3, 4.5 Hz, 1H), 4.69 (q, *J* = 6.9 Hz, 1H), 1.53 (d, *J* = 6.9 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 200.3, 141.4, 136.4, 132.7, 128.9, 128.7, 128.4, 127.7, 126.87, 47.8, 19.4.

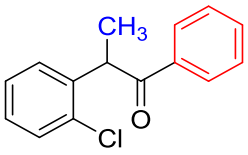
2-(4-Fluorophenyl)-1-phenylpropan-1-one (5b)[29]:



5b

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.35. Yield 74% (84 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.94 (dd, *J* = 8.2, 0.8 Hz, 2H), 7.46 (t, *J* = 7.2 Hz, 1H), 7.37 (t, *J* = 7.7 Hz, 2H), 7.27 – 7.22 (m, 2H), 6.99 – 6.93 (m, 2H), 4.68 (q, *J* = 6.9 Hz, 1H), 1.51 (d, *J* = 6.9 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 200.1, 161.7 (d, J_{C-F} = 245.3 Hz), 137.0, 136.2, 132.8, 129.2 (d, J_{C-F} = 8.6 Hz), 128.6, 128.4, 115.7 (d, J_{C-F} = 22.1 Hz), 46.8, 19.4.

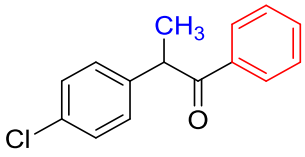
2-(2-Chlorophenyl)-1-phenylpropan-1-one (5c)[28]:



5c

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.42. Yield 62% (76 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.99 (d, *J* = 7.7 Hz, 2H), 7.48 (t, *J* = 7.3 Hz, 1H), 7.45 – 7.37 (m, 3H), 7.23 – 7.13 (m, 3H), 5.19 (q, *J* = 6.8 Hz, 1H), 1.54 (d, *J* = 6.8 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 199.8, 139.1, 135.9, 132.8, 132.8, 129.7, 128.4, 128.4, 128.1, 127.3, 44.0, 17.6.

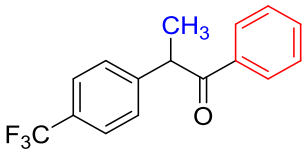
2-(4-Chlorophenyl)-1-phenylpropan-1-one (5d)[30]:



5d

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.39. Yield 62% (76 mg). Yield 69% (84 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.92 (dd, *J* = 4.2, 3.7 Hz, 2H), 7.50 – 7.45 (m, 1H), 7.37 (dd, *J* = 11.5, 4.2 Hz, 2H), 7.29 – 7.02 (m, 4H), 4.66 (q, *J* = 6.9 Hz, 1H), 1.50 (d, *J* = 6.9 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 199.9, 139.8, 136.1, 132.9, 132.7, 129.0, 129.0, 128.6, 128.5, 47.0, 19.3.

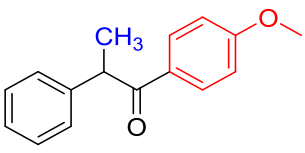
1-Phenyl-2-(4-(trifluoromethyl)phenyl)propan-1-one (5e)[28]:



5e

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 50:1): 0.47. Yield 65% (91 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.94 (dd, *J* = 8.4, 1.2 Hz, 2H), 7.55 (d, *J* = 8.1 Hz, 2H), 7.53 – 7.48 (m, 1H), 7.45 – 7.38 (m, 4H), 4.77 (q, *J* = 6.9 Hz, 1H), 1.55 (d, *J* = 6.9 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 199.6, 145.3, 136.0, 133.1, 129.0 (q, J_{C-F}= 5.4 Hz), 128.67, 128.63, 128.1, 125.8 (q, J_{C-F}= 4.5Hz), 124.20 (d, J_{C-F} = 272.0 Hz), 47.4, 19.3.

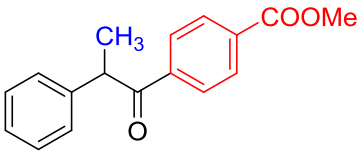
1-(4-Methoxyphenyl)-2-phenylpropan-1-one (5f)[15]:



5f

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.35. Yield 75% (90 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.98 – 7.90 (m, 2H), 7.28 (t, *J* = 4.3 Hz, 4H), 7.19 (dd, *J* = 8.7, 4.4 Hz, 1H), 6.89 – 6.81 (m, 2H), 4.64 (q, *J* = 6.9 Hz, 1H), 3.80 (s, 3H), 1.51 (d, *J* = 6.9 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 198.8, 163.1, 141.9, 131.0, 129.4, 128.8, 127.6, 126.7, 113.6, 55.3, 47.4, 19.5.

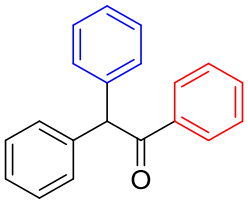
Methyl 4-(2-phenylpropanoyl)benzoate (5g)[31]:



5g

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 75:1): 0.29. Yield 67% (90 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.08 – 8.00 (m, 2H), 8.00 – 7.94 (m, 2H), 7.32 – 7.17 (m, 5H), 4.67 (q, *J* = 6.8 Hz, 1H), 3.90 (s, 3H), 1.54 (d, *J* = 6.8 Hz, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 199.6, 166.0, 140.8, 139.6, 133.3, 129.5, 128.9, 128.5, 127.6, 126.9, 52.2, 48.3, 19.2.

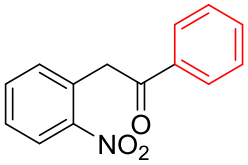
1,2,2-Triphenylethan-1-one (5h)[29]:



5h

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 100:1): 0.25. Yield 61% (83 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.00 (dd, *J* = 8.5, 1.0 Hz, 2H), 7.53 – 7.49 (m, 1H), 7.41 (t, *J* = 7.8 Hz, 2H), 7.35 – 7.26 (m, 10H), 6.04 (s, 1H).^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 198.1, 139.0, 136.7, 133.0, 129.1, 128.9, 128.7, 128.6, 127.1, 59.4.

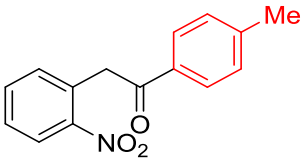
2-(2-Nitrophenyl)-1-phenylethan-1-one (6a)[32]:



6a

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 90:10): 0.21. Yield 82% (100 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.16 (d, *J* = 8.2 Hz, 1H), 8.04 (d, *J* = 7.3 Hz, 2H), 7.61 (t, *J* = 7.6 Hz, 2H), 7.50 (dd, *J* = 15.8, 7.9 Hz, 3H), 7.35 (d, *J* = 7.5 Hz, 1H), 4.74 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 195.3, 148.9, 136.4, 133.6, 133.4, 133.4, 130.6, 128.7, 128.3, 128.2, 125.2, 44.1.

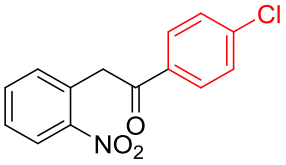
2-(2-Nitrophenyl)-1-(p-tolyl)ethan-1-one (6b)[32]:



6b

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 90:10): 0.30. Yield 82% (100 mg). Yield 78% (100 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.13 (d, *J* = 8.2 Hz, 1H), 7.93 (d, *J* = 8.1 Hz, 2H), 7.59 (t, *J* = 7.5 Hz, 1H), 7.46 (t, *J* = 7.8 Hz, 1H), 7.33 (d, *J* = 7.6 Hz, 1H), 7.29 (d, *J* = 8.0 Hz, 2H), 4.70 (s, 2H), 2.42 (s, 3H) ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 194.8, 148.9, 144.2, 133.8, 133.5, 133.3, 130.6, 129.2, 128.2, 128.1, 125.0, 43.8, 21.5.

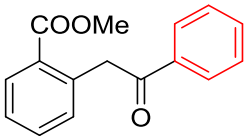
1-(4-Chlorophenyl)-2-(2-nitrophenyl)ethan-1-one (6c)[32]:



6c

The title compound was obtained as oil using the general procedure 2.5. RF (Hexane/EtOAc 90:10): 0.28. Yield 82% (100 mg). Yield 80% (110 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.13 (dd, *J* = 8.2, 1.1 Hz, 1H), 7.98 – 7.92 (m, 2H), 7.61 –7.58 (m, 1H), 7.51 – 7.43 (m, 3H), 7.32 (dd, *J* = 7.6, 0.8 Hz, 1H), 4.68 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 194.1, 148.7, 139.7, 134.6, 133.5, 133.5, 130.2, 129.5, 128.9, 128.4, 125.2, 44.0.

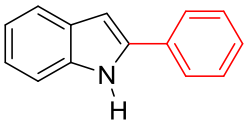
Methyl 2-(2-(4-chlorophenyl)-2-oxoethyl)benzoate (6d)[8]:



6d

The title compound was obtained as white solid using the general procedure 2.5. RF (Hexane/EtOAc 80:20): 0.58. Yield 68% (86 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.16 – 7.94 (m, 3H), 7.57 (dd, *J* = 10.9, 3.8 Hz, 1H), 7.51 – 7.47 (m, 3H), 7.37 (t, *J* = 7.6 Hz, 1H), 7.27 – 7.22 (m, 1H), 4.72 (s, 2H), 3.74 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 197.2, 167.3, 137.0, 136.8, 132.9, 132.5, 132.3, 131.0, 129.5, 128.5, 128.1, 127.1, 51.8, 44.8.

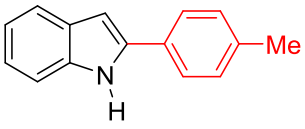
2-Phenyl-1*H*-indole (7a)[33]:



7a

The title compound was obtained as white solid using the general procedure 2.6. RF (Hexane/EtOAc 90:10): 0.18. Yield 70% (45 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.35 (s, 1H), 7.67 (d, *J* = 19.8 Hz, 3H), 7.48 – 7.34 (m, 4H), 7.29 – 7.14 (m, 2H), 6.88 (s, 1H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 137.8, 136.7, 132.2, 129.2, 128.9, 127.6, 125.1, 122.3, 120.6, 120.2, 110.8, 99.9.

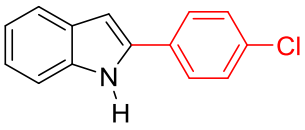
2-(p-Tolyl)-1*H*-indole (7b)[33]:



7b

The title compound was obtained as white solid using the general procedure 2.6. RF (Hexane/EtOAc 80:20): 0.21. Yield 75% (51 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.25 (s, 1H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.53 (d, *J* = 8.0 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 1H), 7.23 (d, *J* = 7.8 Hz, 2H), 7.20 – 7.15 (m, 1H), 7.13 – 7.09 (m, 1H), 6.77 (s, 1H), 2.38 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 138.0, 137.6, 136.6, 129.6, 129.4, 129.2, 125.0, 122.0, 120.4, 120.1, 110.8, 99.3, 21.2.

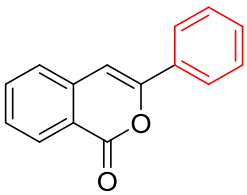
2-(4-Chlorophenyl)-1*H*-indole (7c)[34]:



7c

The title compound was obtained as white solid using the general procedure 2.6. RF (Hexane/EtOAc 90:10): 0.20. Yield 68% (51 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.28 (s, 1H), 7.62 (d, *J* = 7.9 Hz, 1H), 7.57 (d, *J* = 8.5 Hz, 2H), 7.45 – 7.35 (m, 3H), 7.23 – 7.18 (m, 1H), 7.16 – 7.10 (m, 1H), 6.80 (d, *J* = 1.5 Hz, 1H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 136.8, 136.6, 133.3, 130.8, 129.1, 129.1, 126.2, 122.6, 120.7, 120.4, 110.9, 100.4.

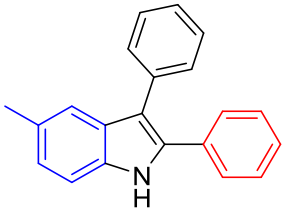
3-Phenyl-1*H*-isochromen-1-one (7d)[8]:



7d

The title compound was obtained as white solid using the general procedure 2.7. RF (Hexane/EtOAc 80:20): 0.61. Yield 95% (63 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.30 (d, *J* = 7.7 Hz, 1H), 7.88 (dd, *J* = 8.1, 1.2 Hz, 2H), 7.73 – 7.69 (m, 1H), 7.53 – 7.39 (m, 5H), 6.95 (s, 1H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 162.3, 153.5, 137.4, 134.8, 131.8, 129.9, 129.6, 128.7, 128.1, 125.9, 125.1, 120.4, 101.7.

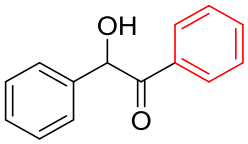
6-Methyl-2,3-diphenyl-1*H*-indole (8a)[35]:



8a

The title compound was obtained as white solid using the general procedure 2.8. RF (Hexane/EtOAc 100:1): 0.26. Yield 70% (100 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.11 (s, 1H), 7.46 – 7.35 (m, 7H), 7.33 – 7.25 (m, 5H), 7.06 (d, *J* = 8.2 Hz, 1H), 2.43 (s, 3H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 135.2, 134.2, 134.1, 132.8, 130.1, 129.7, 129.0, 128.6, 128.4, 128.0, 127.5, 126.1, 124.2, 119.2, 114.6, 110.5, 21.5.

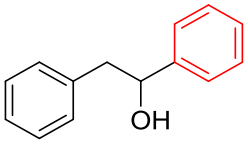
2-Hydroxy-1,2-diphenylethan-1-one (8b)[10]:



8b

The title compound was obtained as white solid using the general procedure 2.9. RF (Hexane/EtOAc 95:5): 0.50. Yield 70% (74 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.92 (dd, *J* = 8.4, 1.2 Hz, 2H), 7.56 – 7.47 (m, 1H), 7.40 – 7.37 (m, 2H), 7.37 – 7.29 (m, 4H), 7.27 (dd, *J* = 7.3, 1.4 Hz, 1H), 5.96 (s, 1H), 4.55 (s, 1H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 198.9, 138.9, 133.8, 133.4, 129.1, 129.0, 128.6, 128.5, 127.7, 76.1.

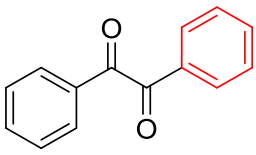
1,2-Diphenylethan-1-ol (8c)[11]:



8c

The title compound was obtained as white solid using the general procedure 2.10. RF (Hexane/EtOAc 80:20): 0.55. Yield 86% (85mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.32 (d, *J* = 4.1 Hz, 4H), 7.28 – 7.25 (m, 3H), 7.21 (dd, *J* = 10.4, 3.9 Hz, 1H), 7.16 (d, *J* = 7.2 Hz, 2H), 4.84 (dd, *J* = 8.3, 5.1 Hz, 1H), 3.02 – 2.93 (m, 2H), 2.03 (s, 1H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 143.7, 137.9, 129.4, 128.4, 128.3, 127.5, 126.5, 125.8, 75.2, 45.9.

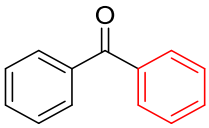
Benzil (8d)[12]:



8d

The title compound was obtained as yellow solid using the general procedure 2.11. RF (Hexane/EtOAc 90:10): 0.50. Yield 94% (99 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.03 – 7.93 (m, 4H), 7.67 – 7.62 (m, 2H), 7.52 – 7.46 (m, 4H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 194.5, 134.8, 132.9, 129.8, 128.9.

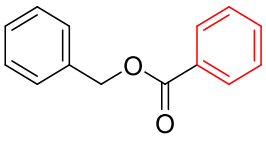
Benzophenone (8e)[13]:



8e

The title compound was obtained as white solid using the general procedure 2.12. RF (Hexane/EtOAc 90:10): 0.41. Yield 81% (74 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.87 – 7.78 (m, 4H), 7.60 – 7.57 (m, 2H), 7.51 – 7.43 (m, 4H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 196.7, 137.5, 132.3, 130.0, 128.2.

Benzyl benzoate (8f)[14]:



8f

The title compound was obtained as white solid using the general procedure 2.13. RF (Hexane/EtOAc 95:05): 0.35. Yield 76% (81 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ = 8.12 – 8.03 (m, 2H), 7.59 – 7.51 (m, 1H), 7.48 – 7.30 (m, 7H), 5.36 (s, 2H). ^{13}C {^{1}H} NMR (125 MHz, $CDCl_3$) δ = 166.3, 136.0, 132.9, 130.0, 129.6, 128.5, 128.3, 128.1, 128.1, 66.6.

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4. ^{1}H and ^{13}C NMRs of the Product

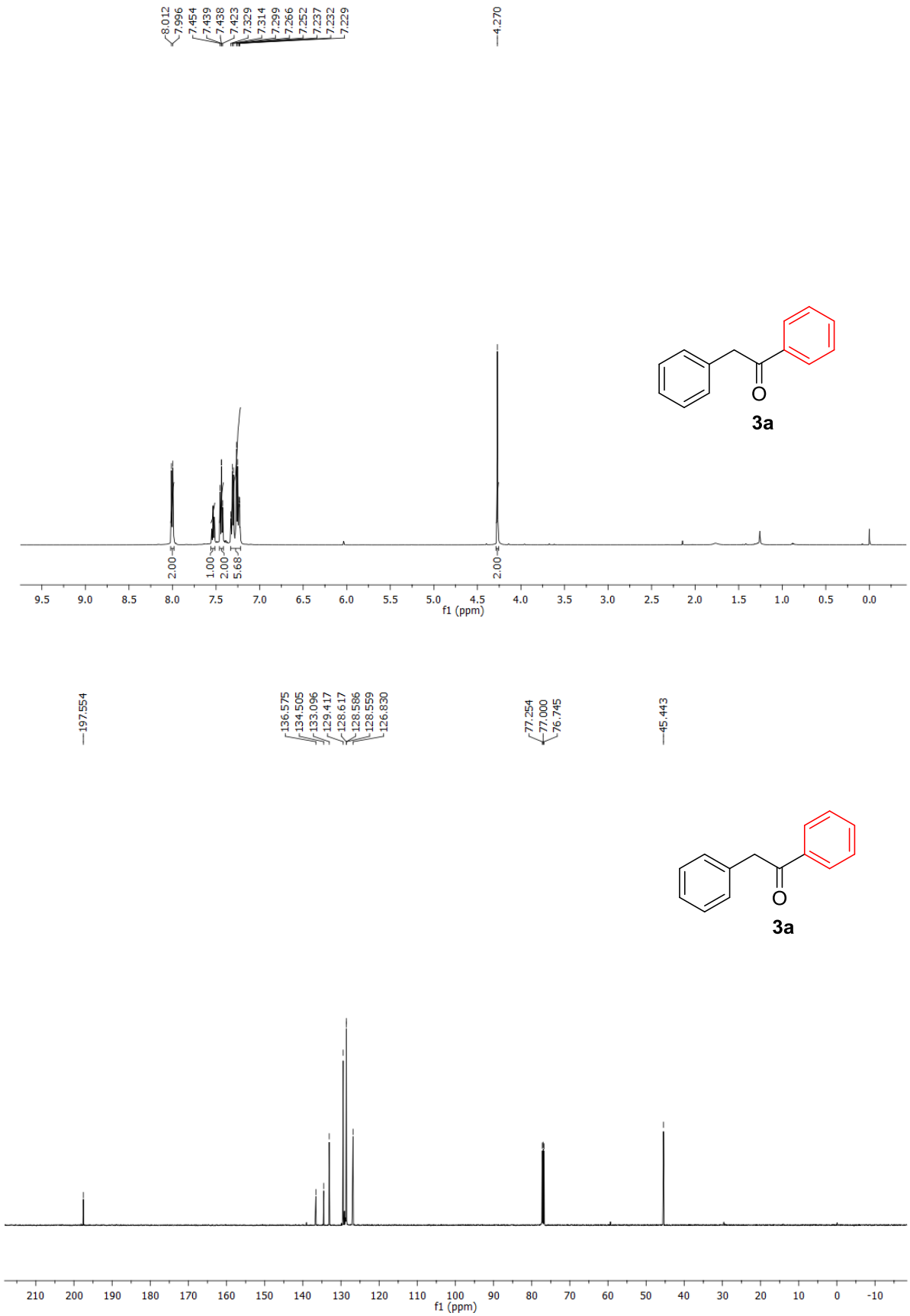


Figure 5.1 ^{1}H and ^{13}C NMR of product **(3a)** in **$CDCl_3$**.

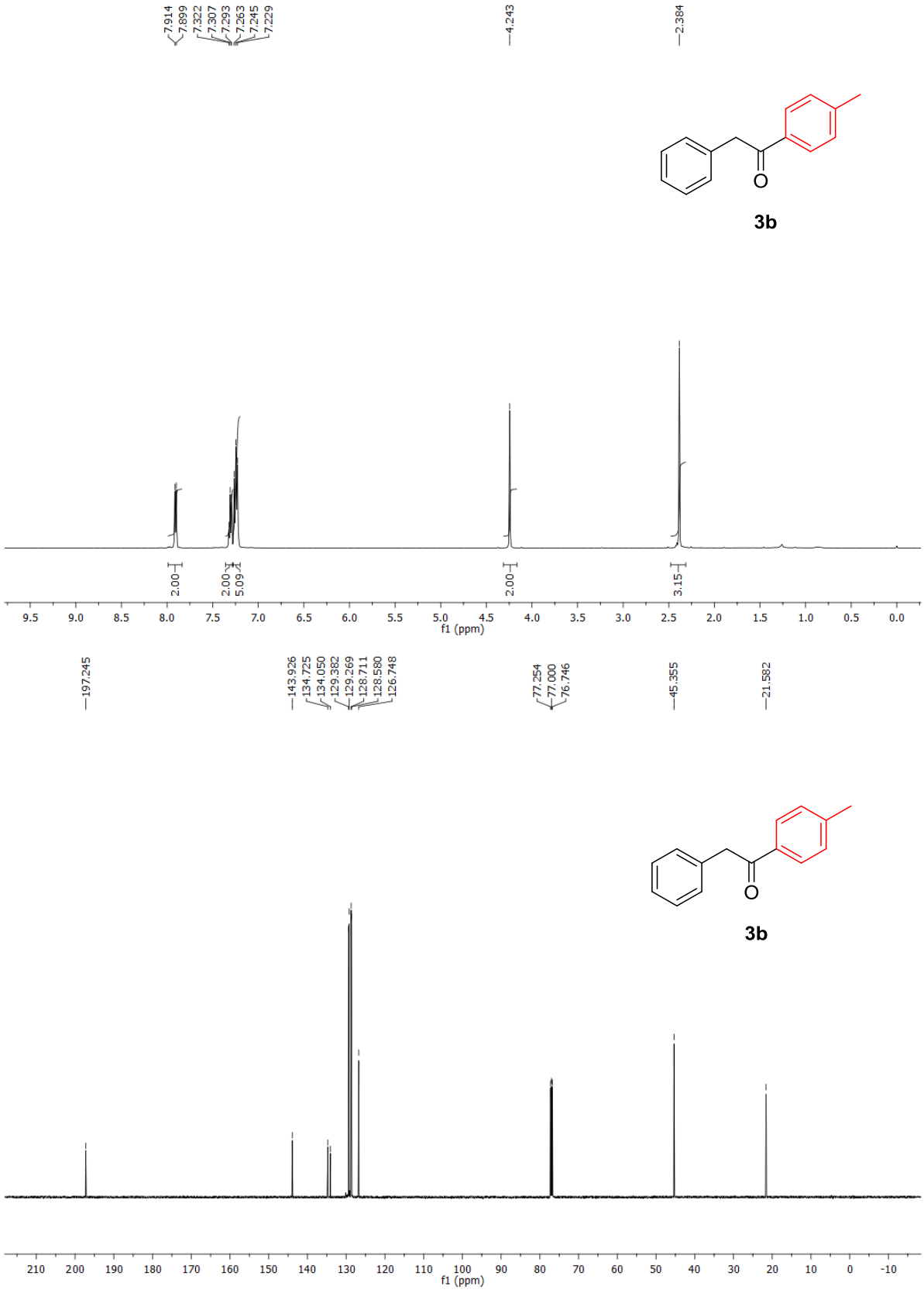


Figure 5.2 ^{1}H and ^{13}C NMR of product **(3b)** in **$CDCl_3$**.

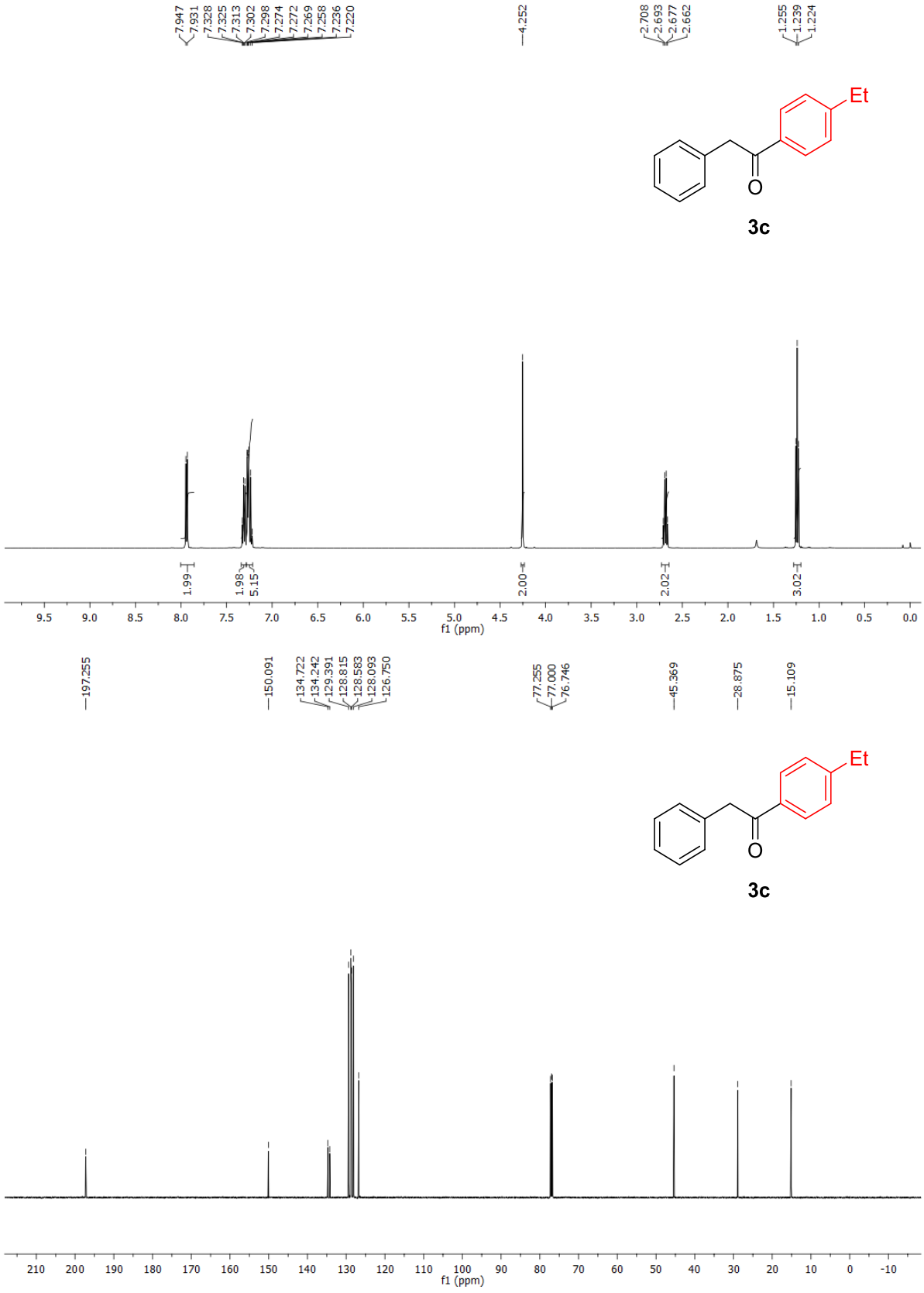


Figure 5.3 ^{1}H and ^{13}C NMR of product **(3c)** in **$CDCl_3$**.

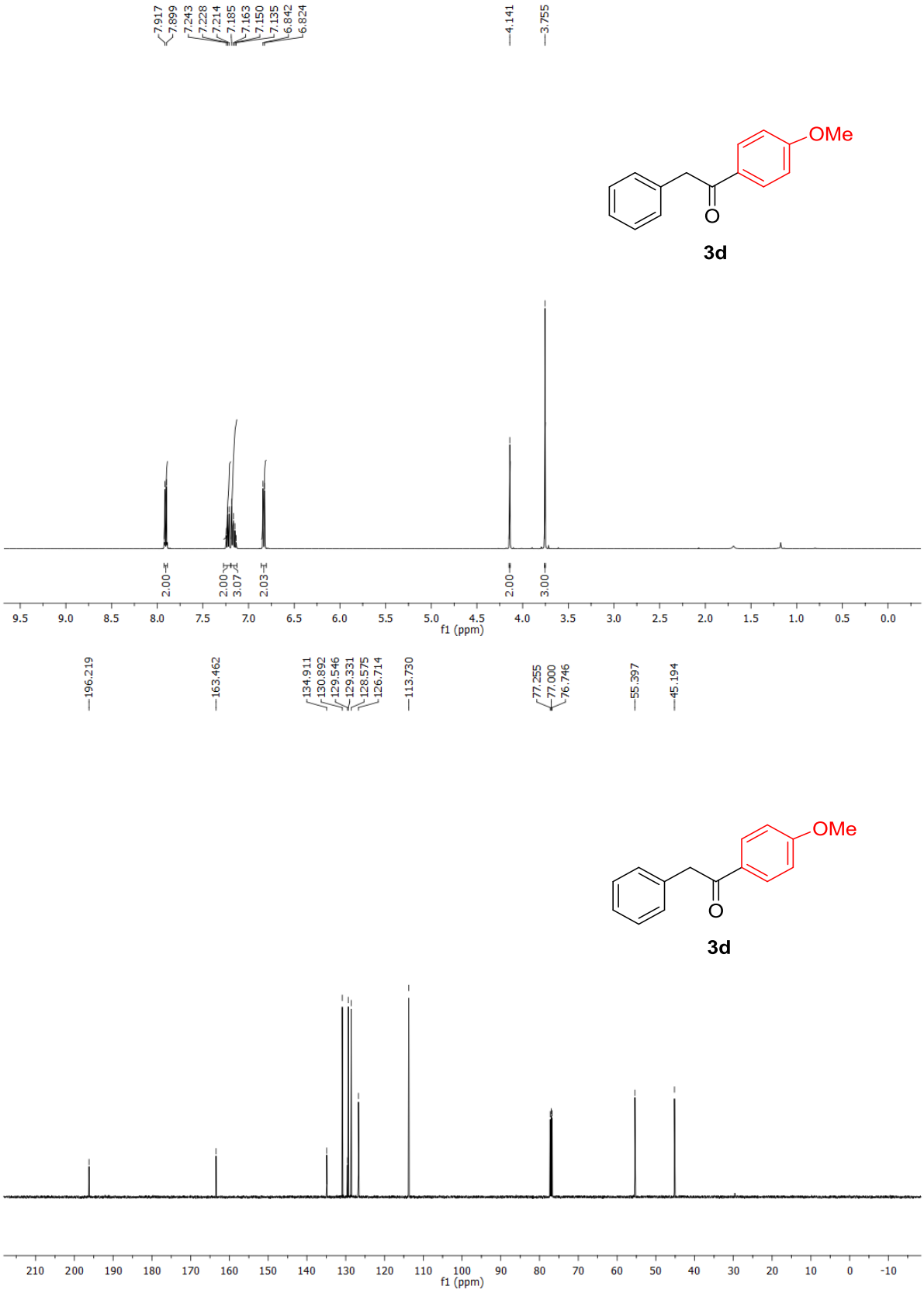


Figure 5.4 ^{1}H and ^{13}C NMR of product **(3d)** in **$CDCl_3$**.

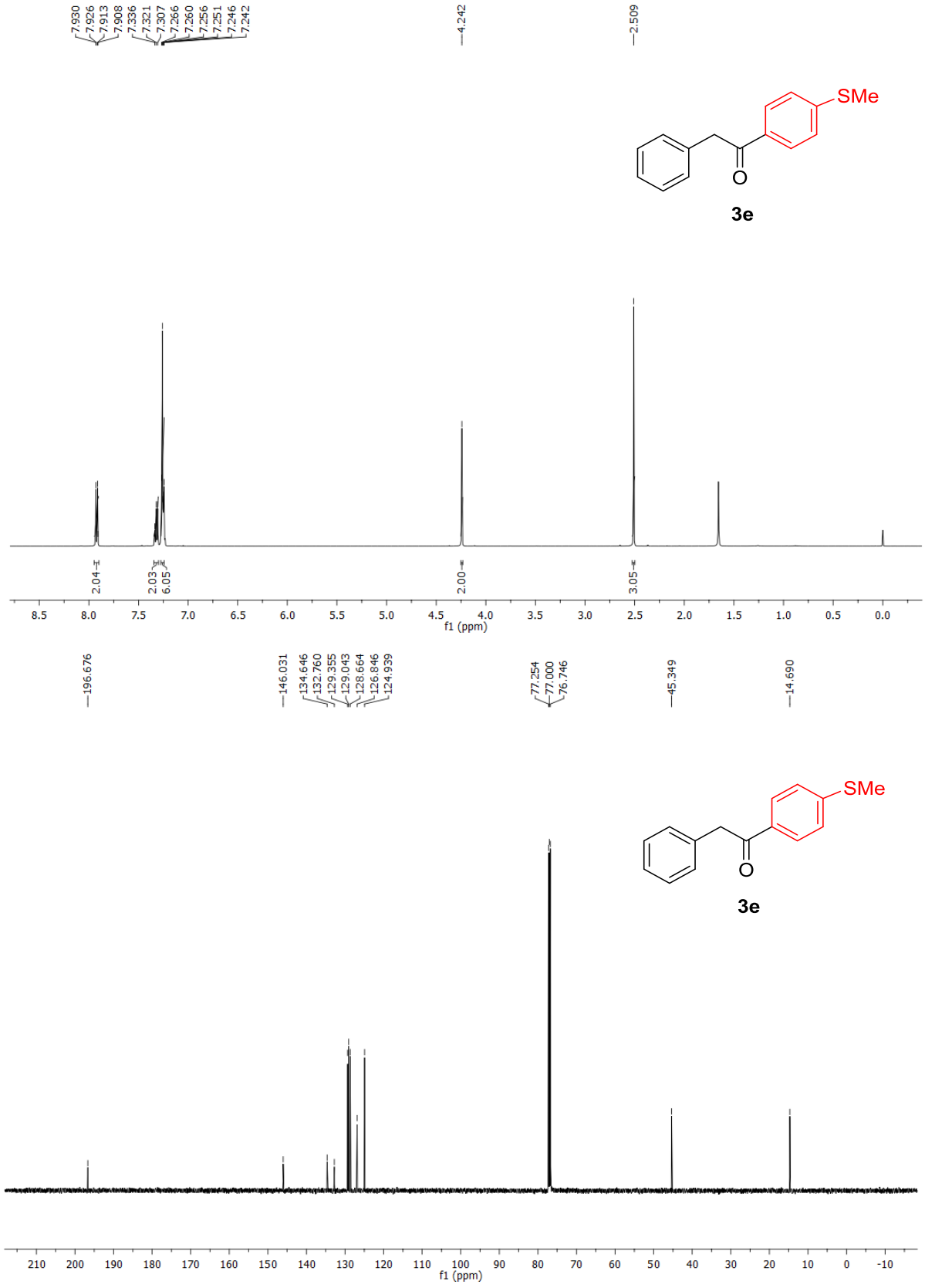


Figure 5.5 ^{1}H and ^{13}C NMR of product **(3e)** in **$CDCl_3$**.

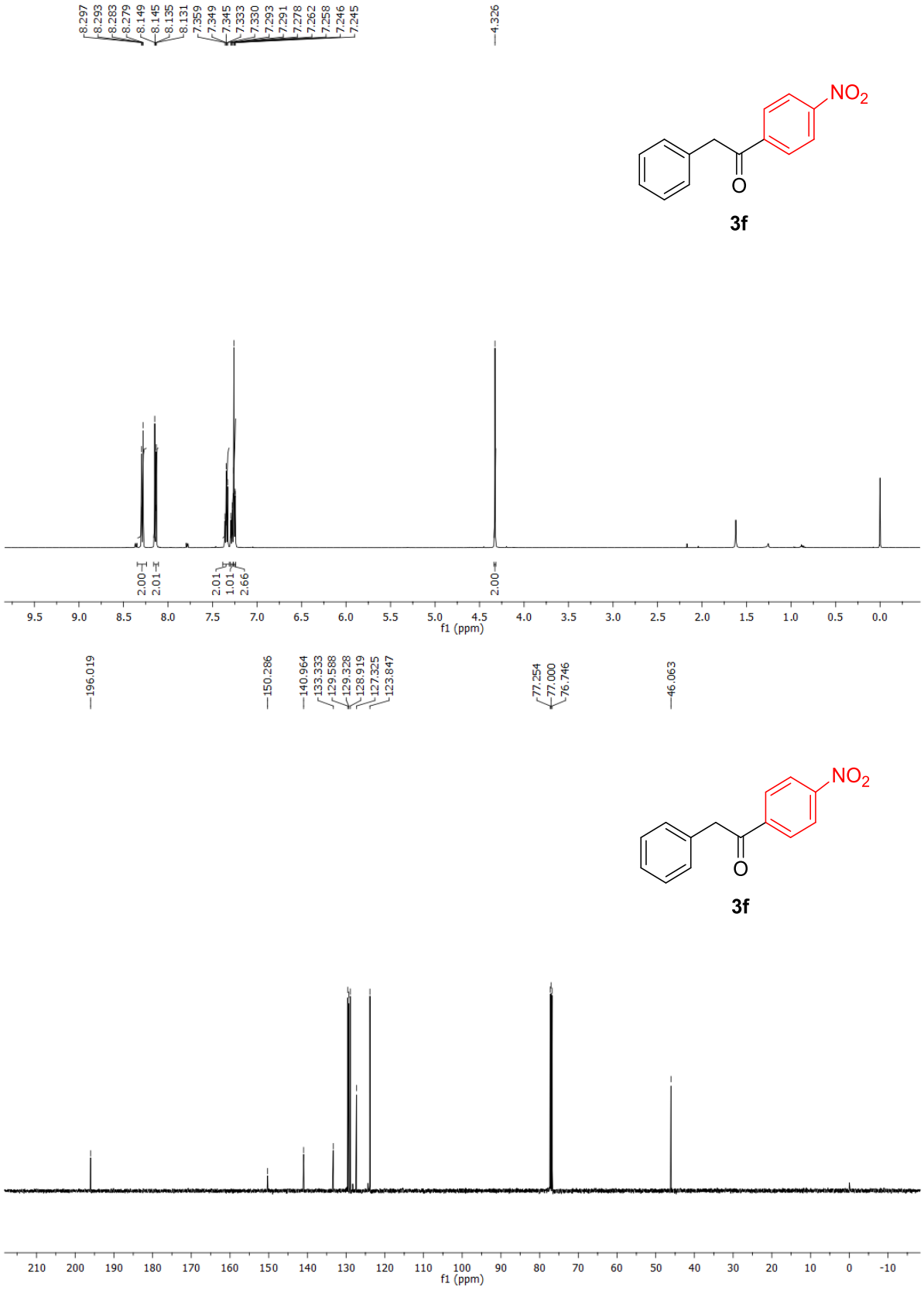
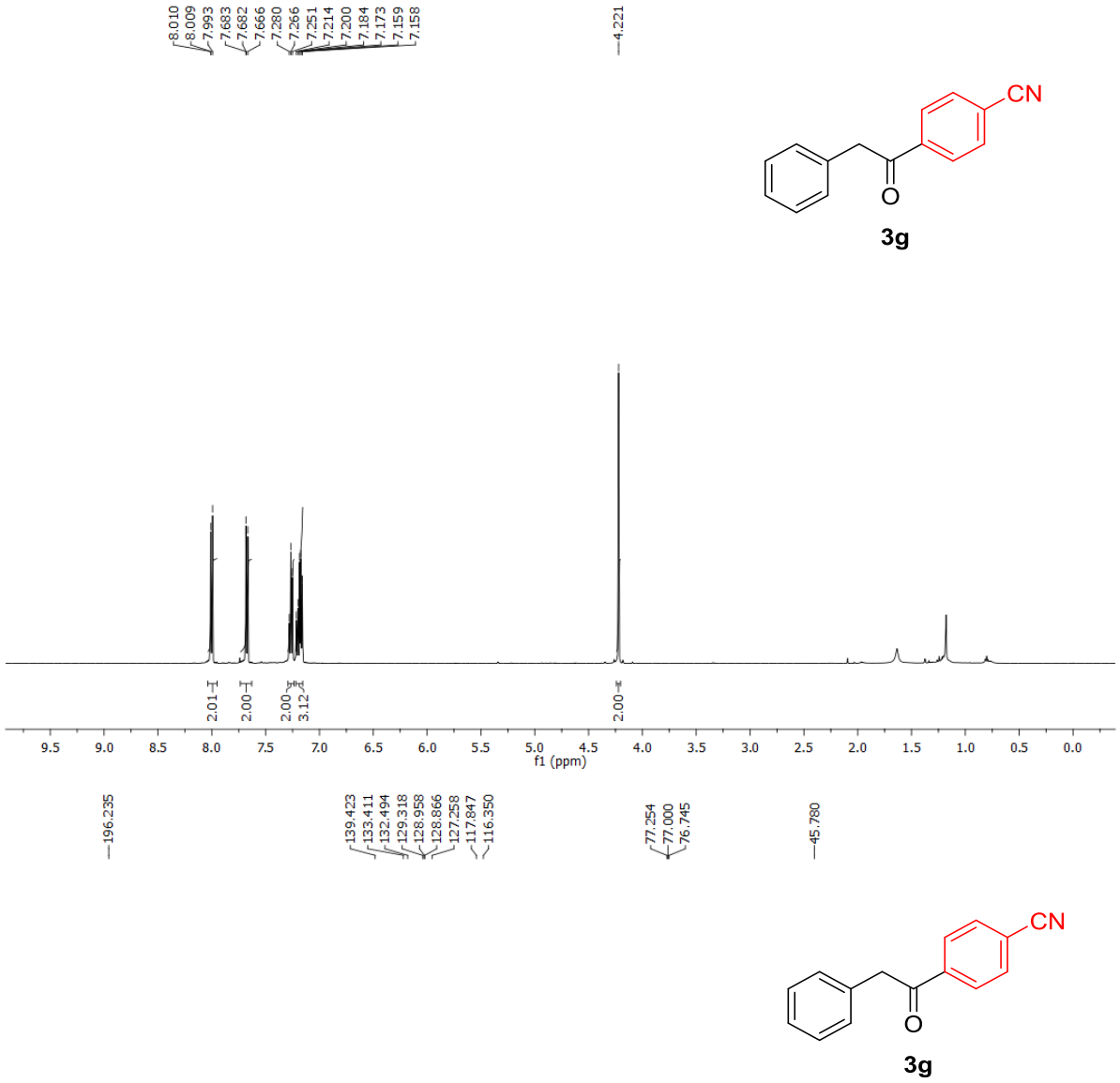


Figure 5.6 ^{1}H and ^{13}C NMR of product **(3f)** in **$CDCl_3$**.



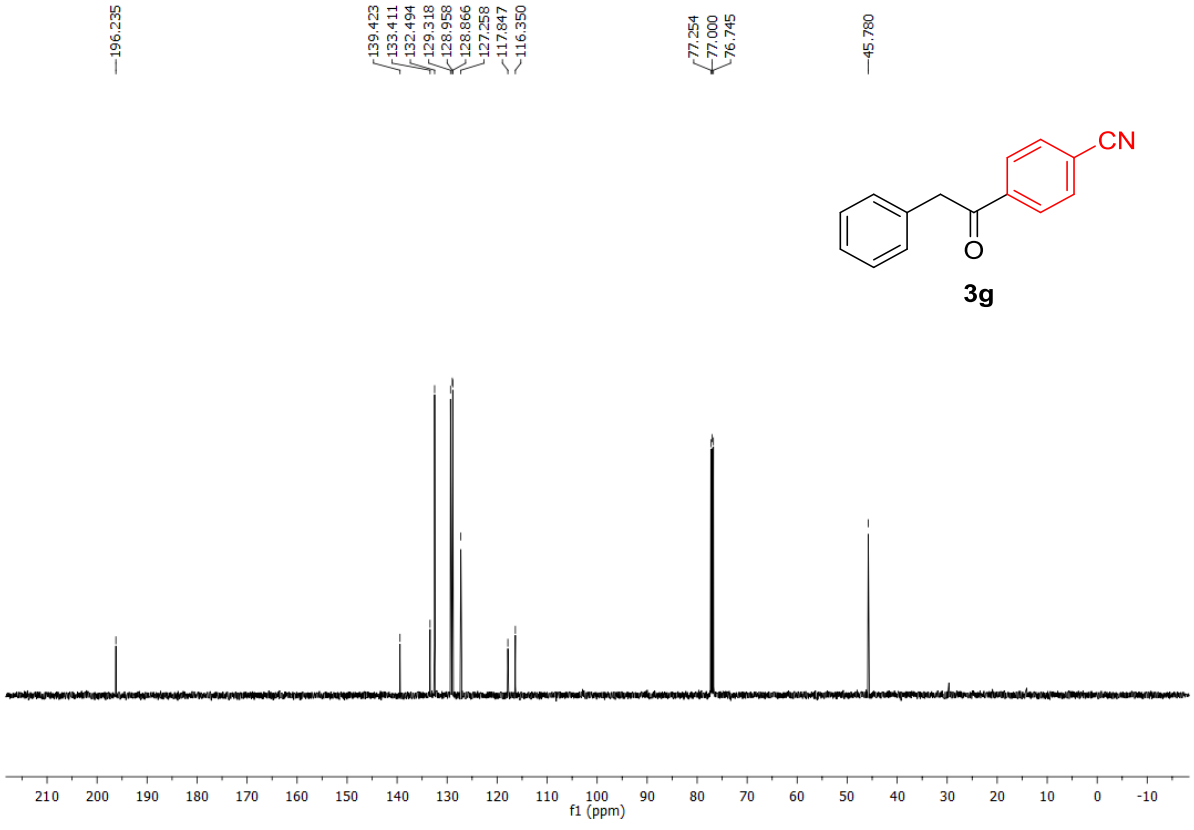


Figure 5.7 ^{1}H and ^{13}C NMR of product **(3g)** in **$CDCl_3$**.

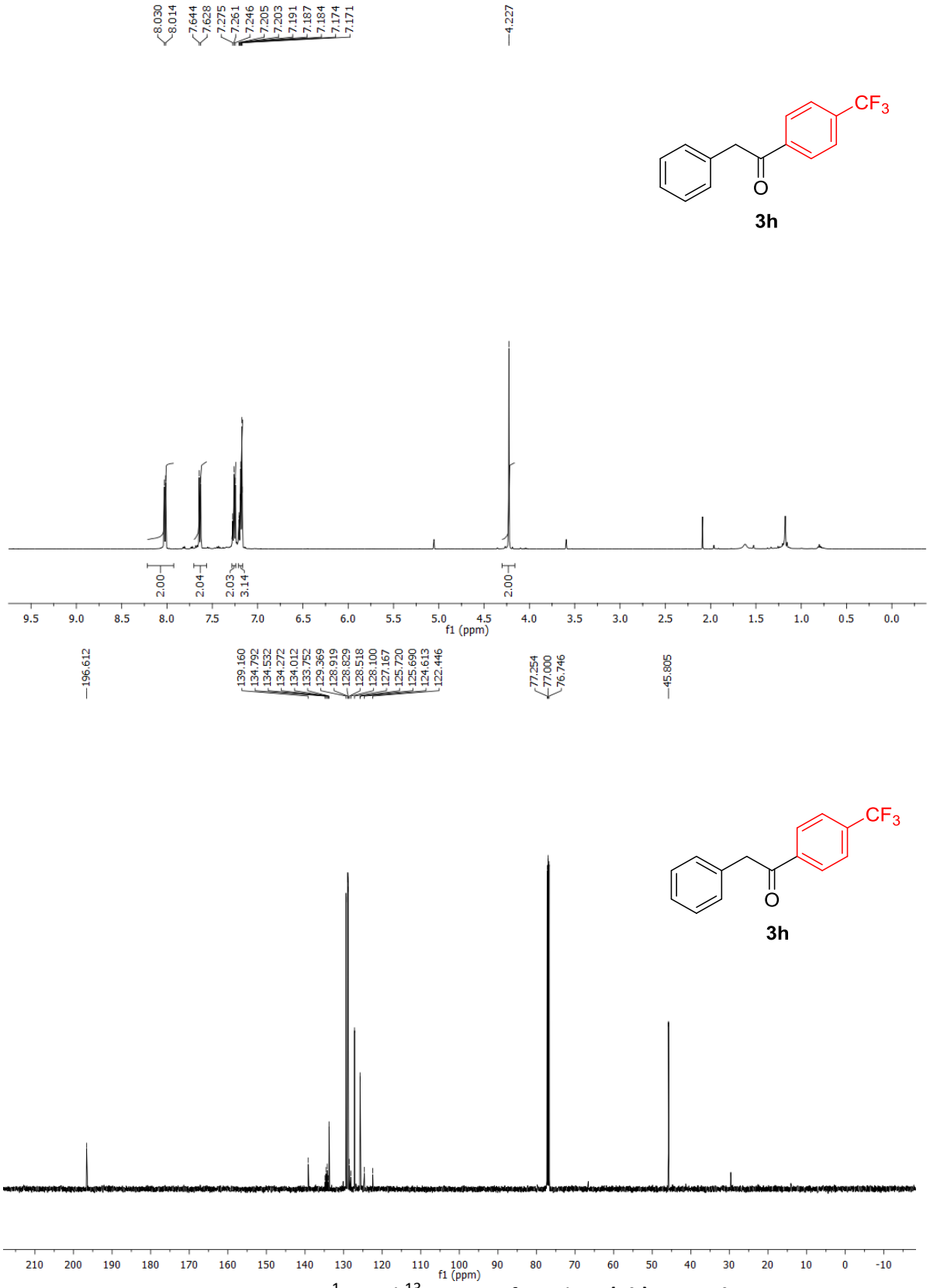


Figure 5.8 ^{1}H and ^{13}C NMR of product **(3h)** in **$CDCl_3$**.

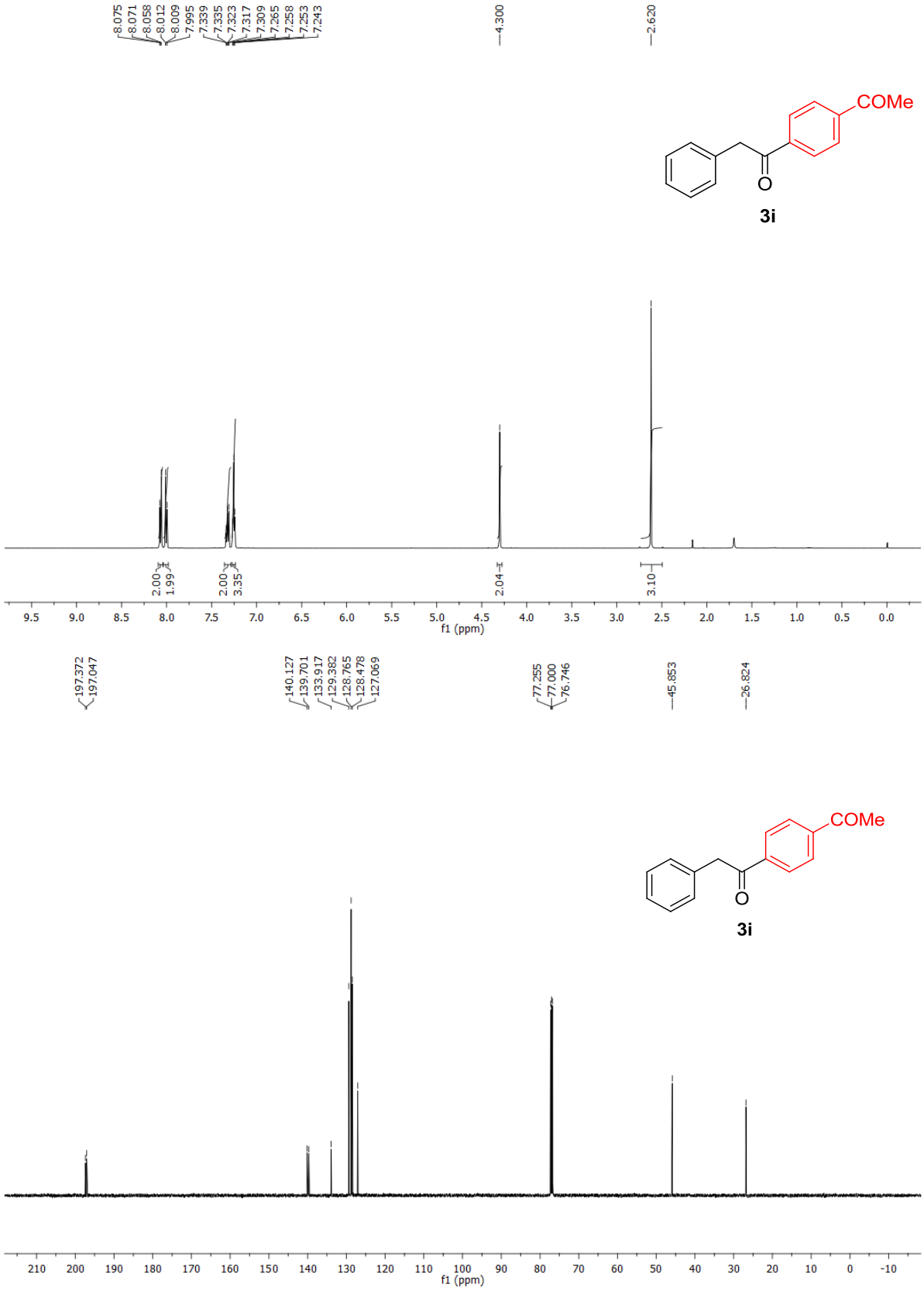


Figure 5.9 ^{1}H and ^{13}C NMR of product **(3i)** in **$CDCl_3$**.

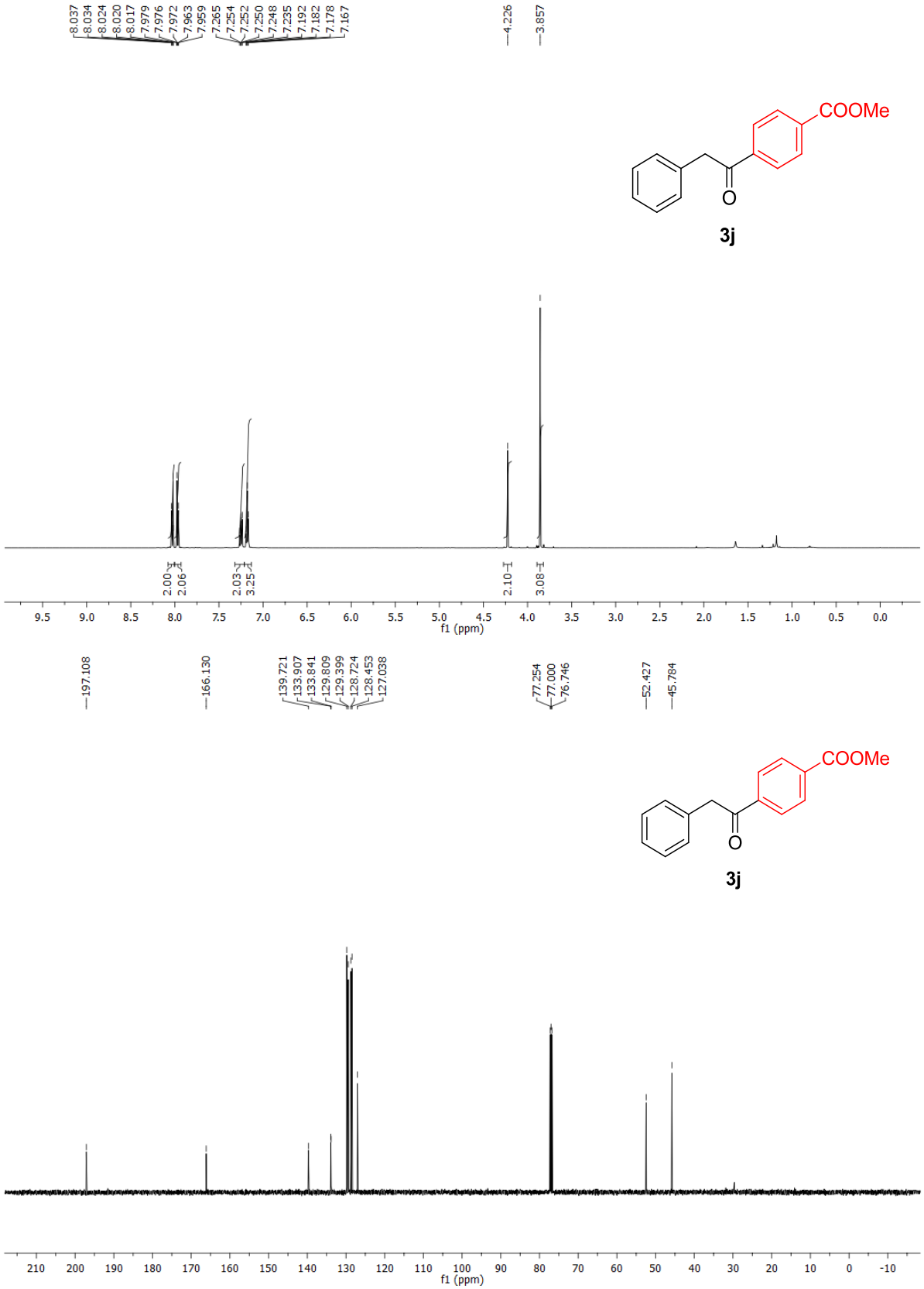


Figure 5.10 ^{1}H and ^{13}C NMR of product **(3j)** in **$CDCl_3$**.

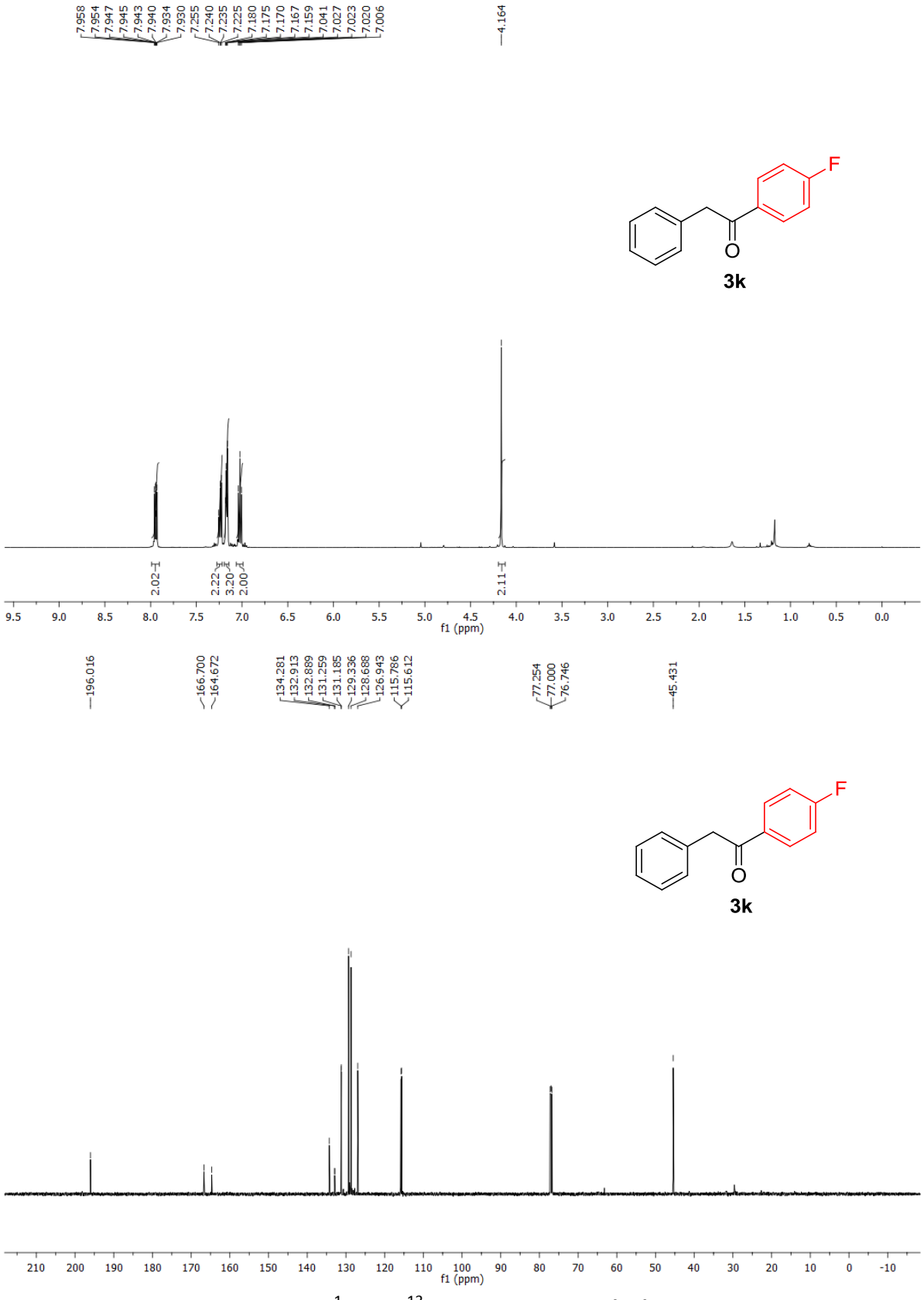


Figure 5.11 ^{1}H and ^{13}C NMR of product **(3k)** in **$CDCl_3$**.

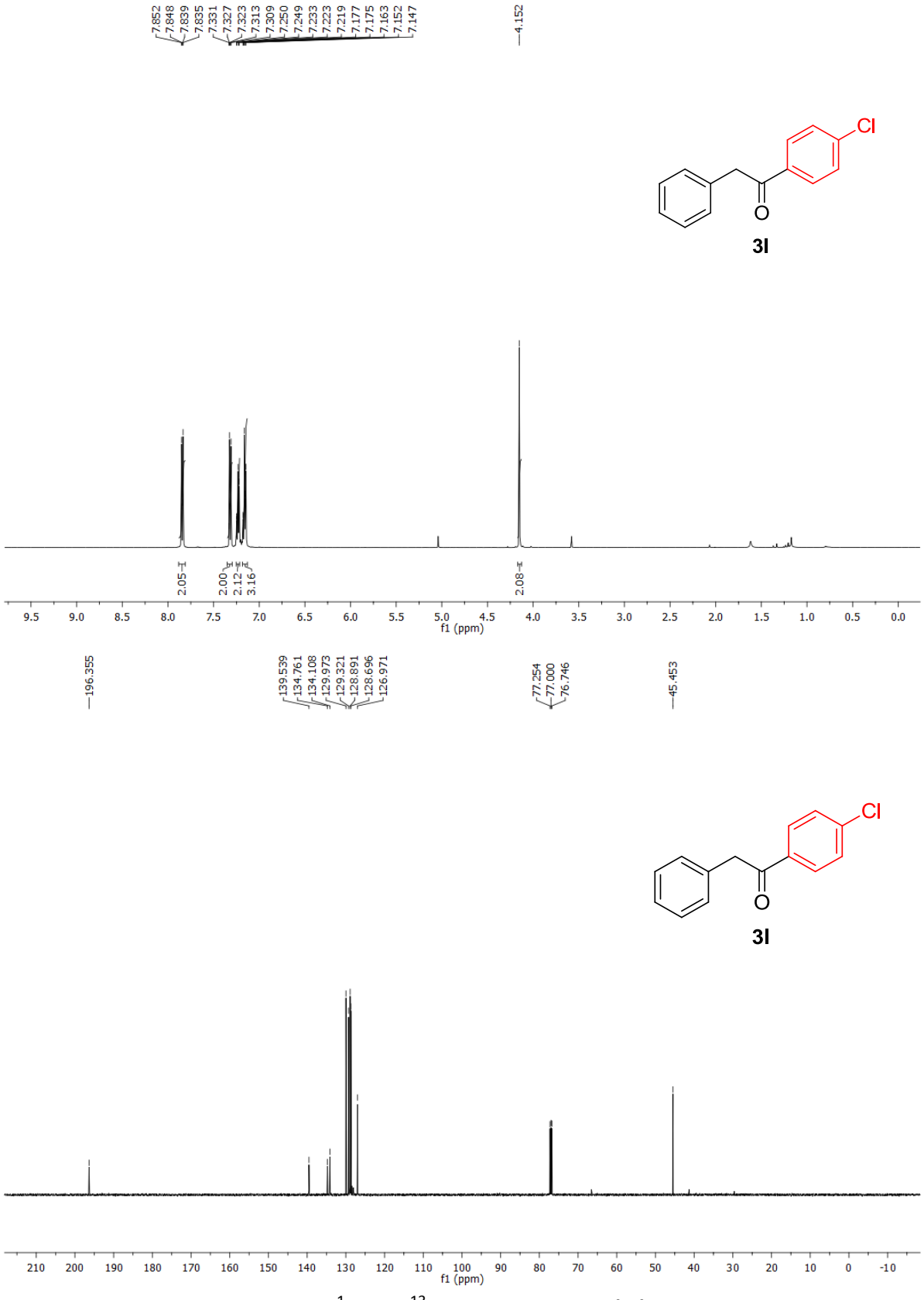


Figure 5.12 ^{1}H and ^{13}C NMR of product **(3l)** in **$CDCl_3$**.

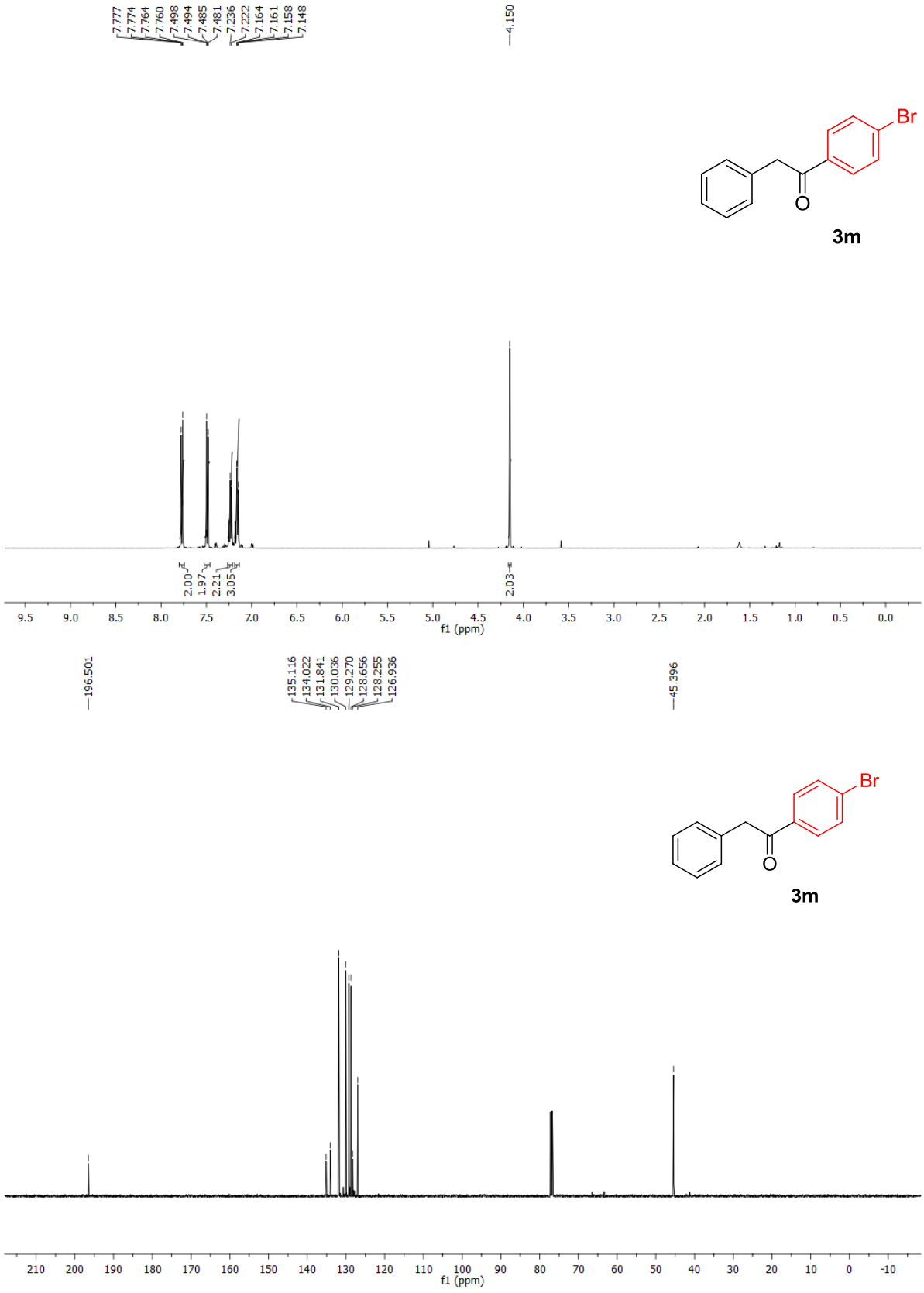


Figure 5.13 ^{1}H and ^{13}C NMR of product **(3m)** in **$CDCl_3$**.

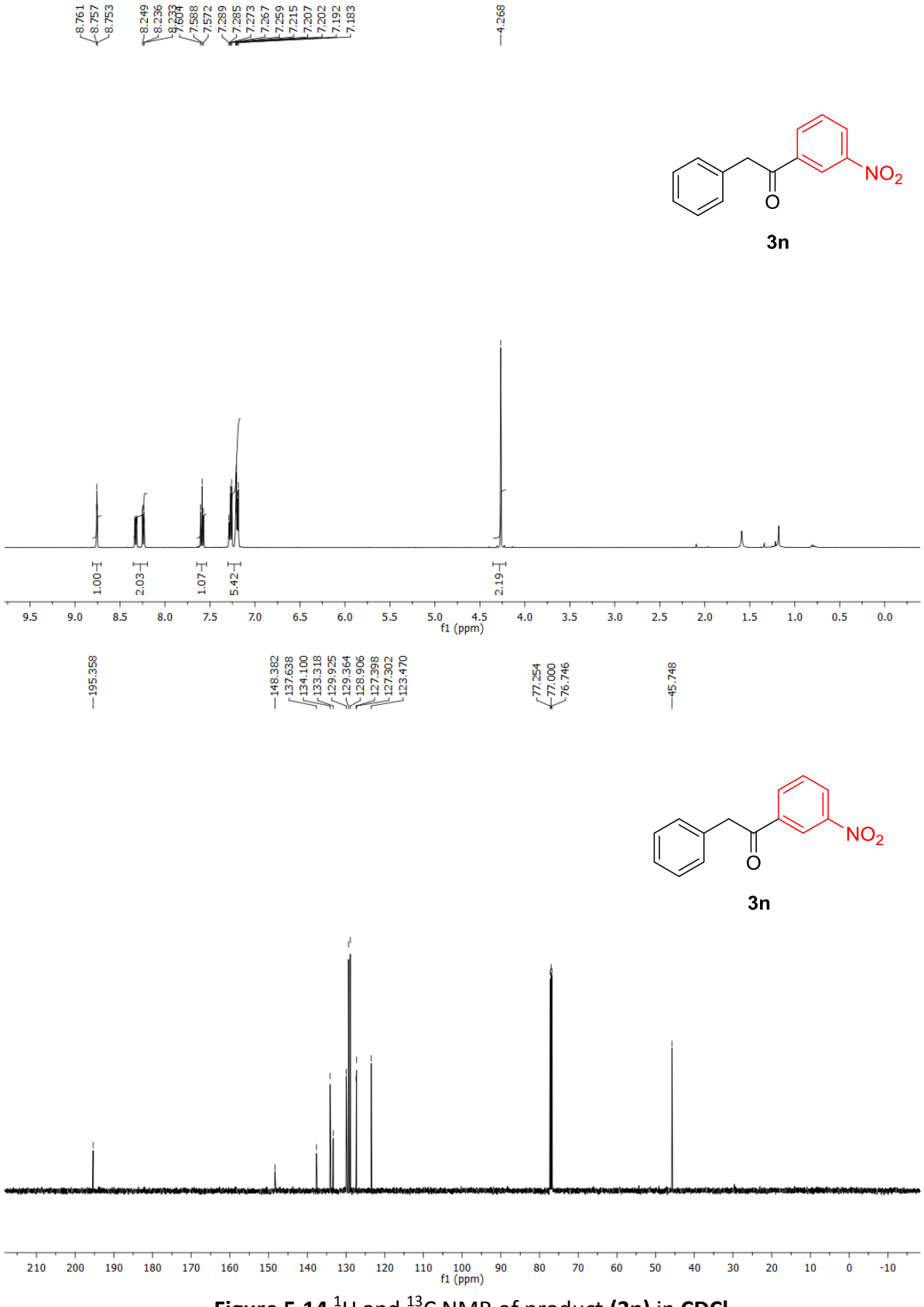


Figure 5.14 ^{1}H and ^{13}C NMR of product **(3n)** in **$CDCl_3$**.

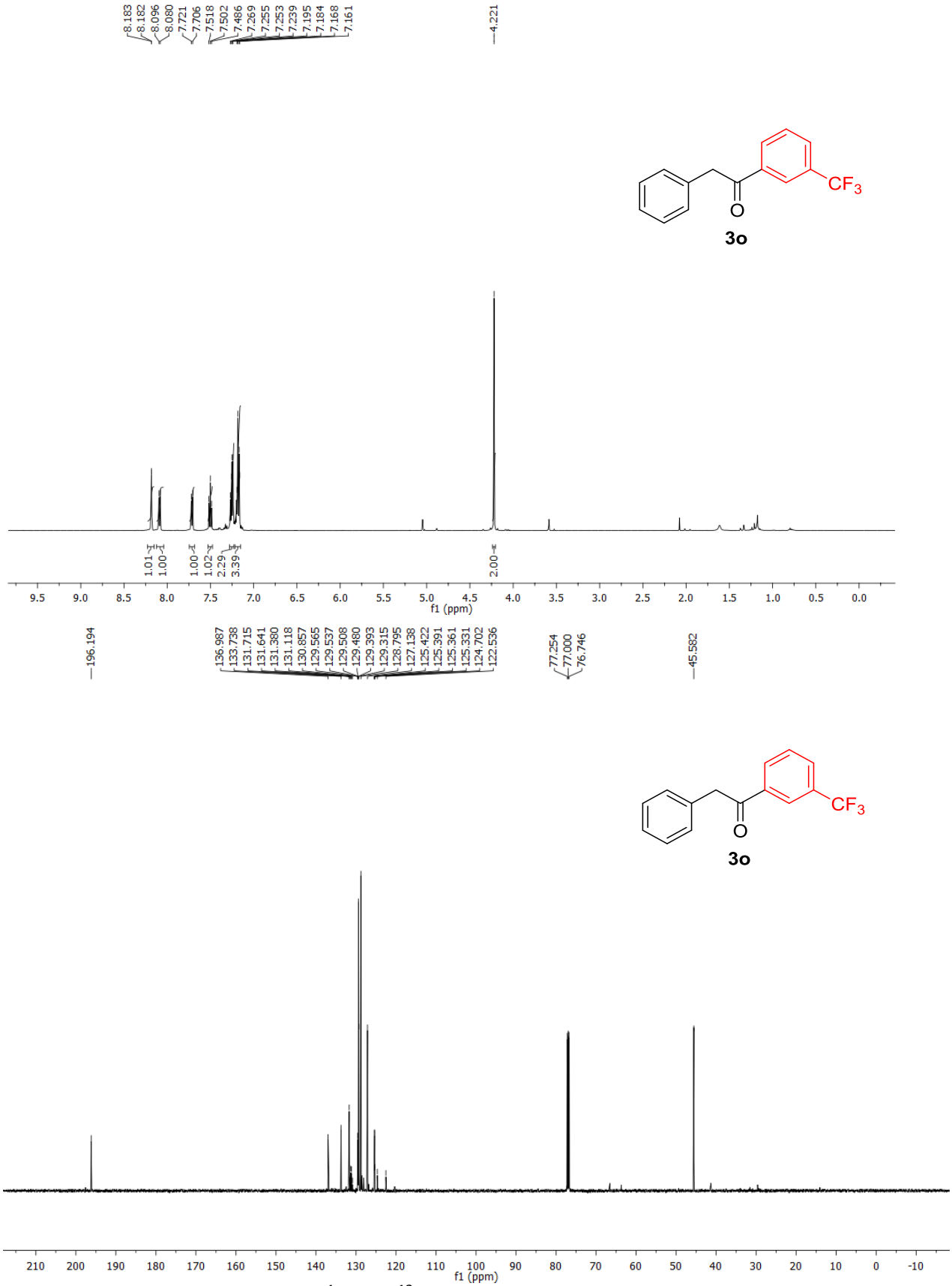


Figure 5.15 ^{1}H and ^{13}C NMR of product **(3o)** in **$CDCl_3$**.

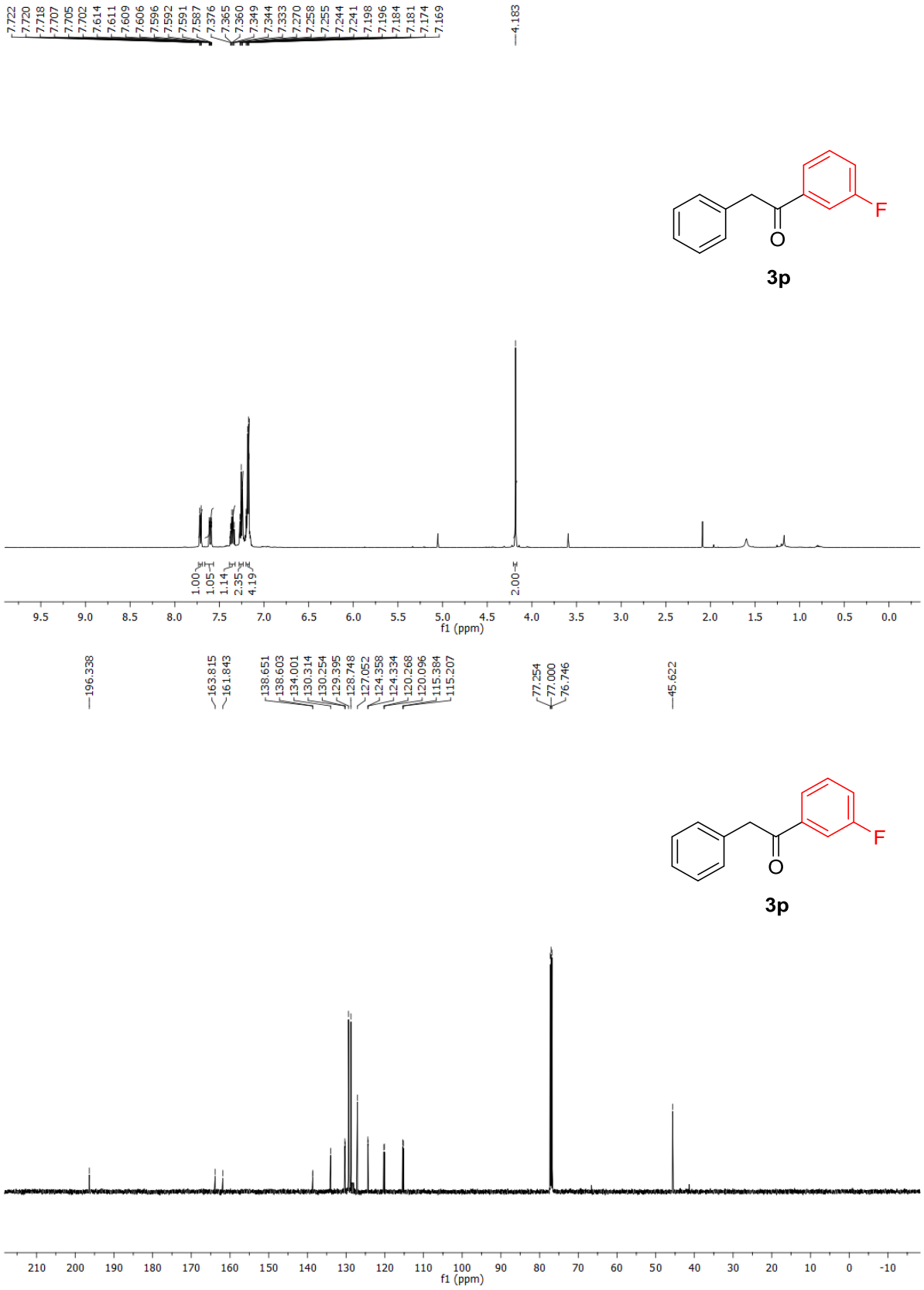


Figure 5.16 ^{1}H and ^{13}C NMR of product **(3p)** in **$CDCl_3$**.

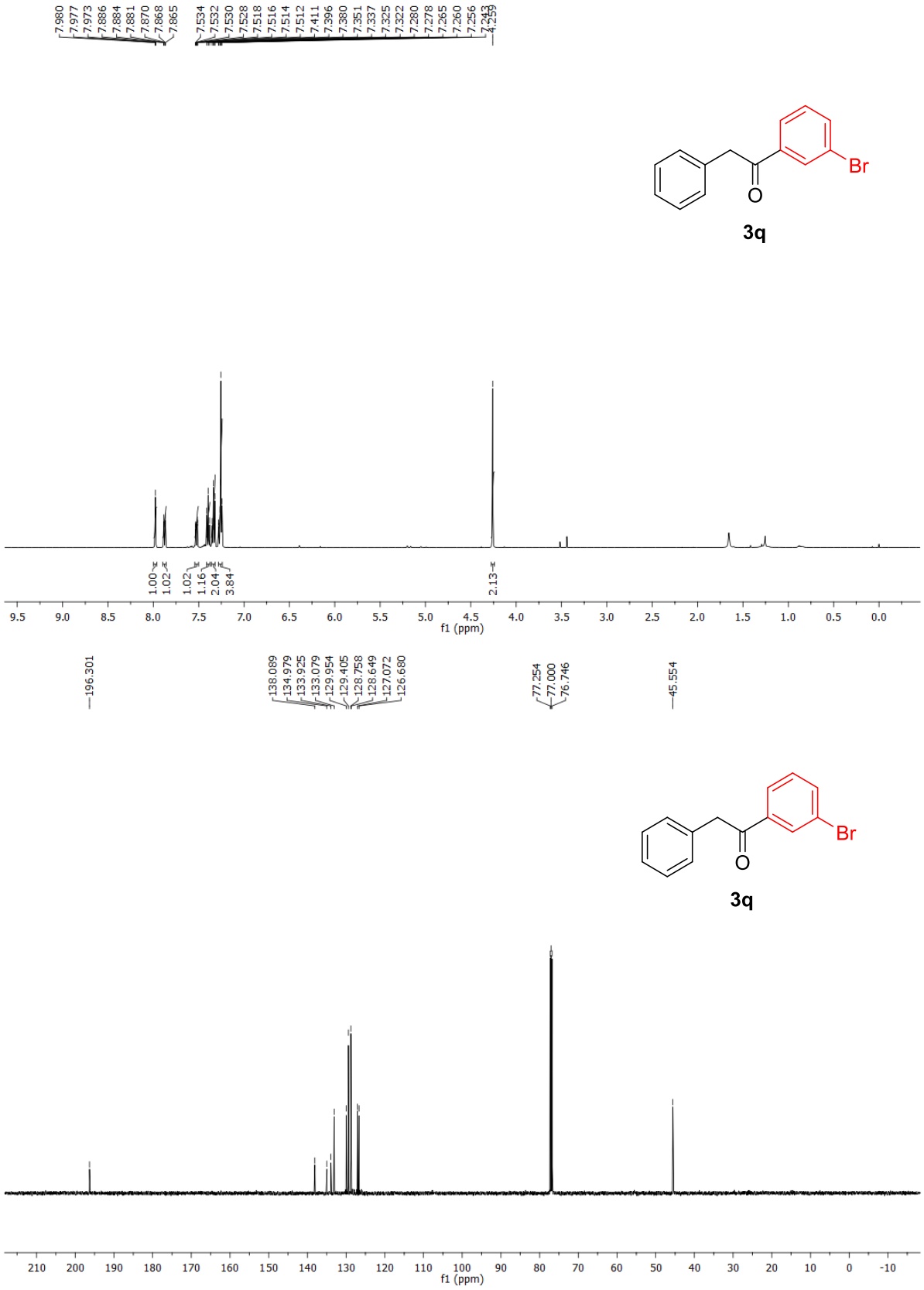


Figure 5.17 ^{1}H and ^{13}C NMR of product **(3q)** in **$CDCl_3$**.

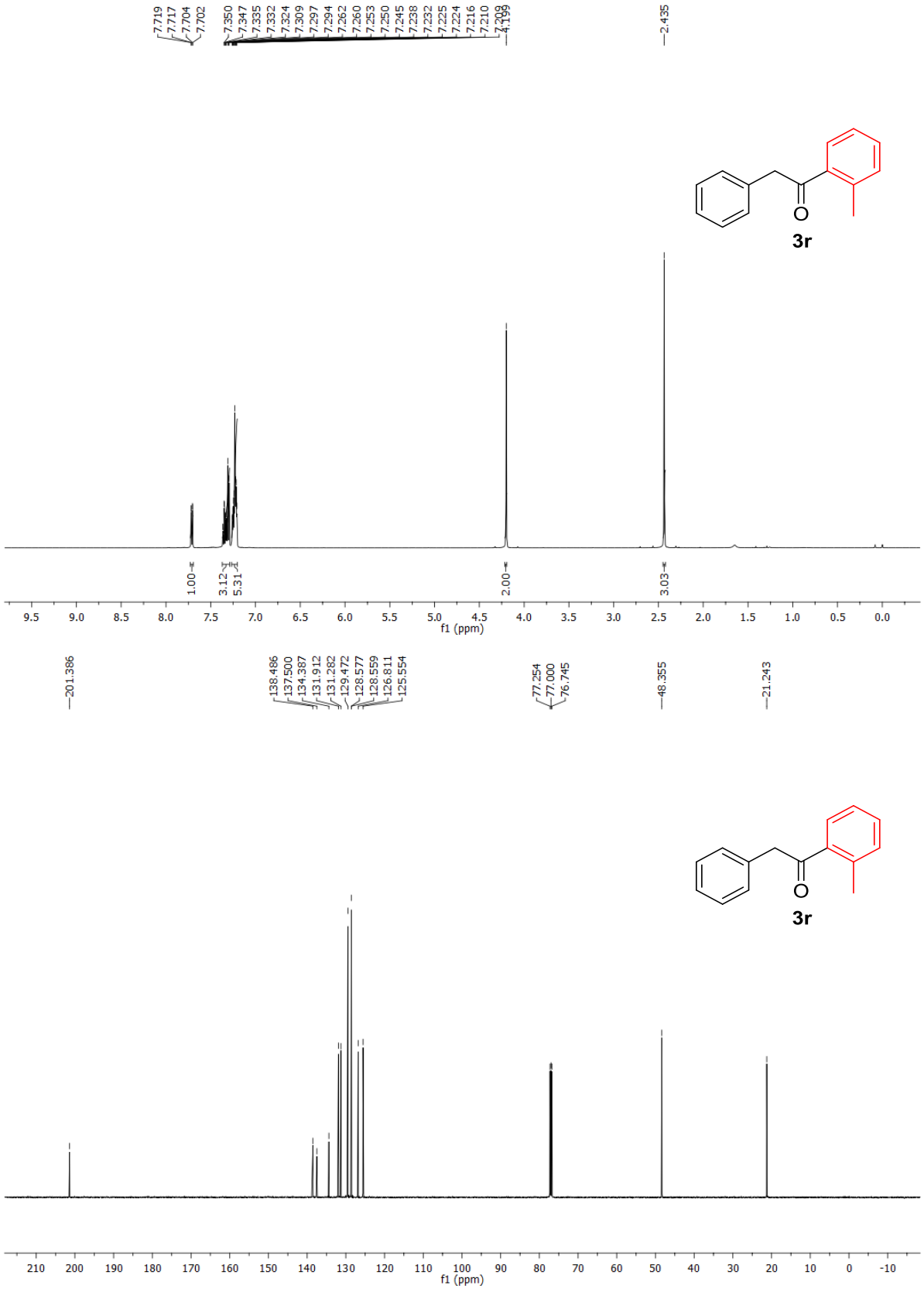


Figure 5.18 ^{1}H and ^{13}C NMR of product **(3r)** in **$CDCl_3$**.

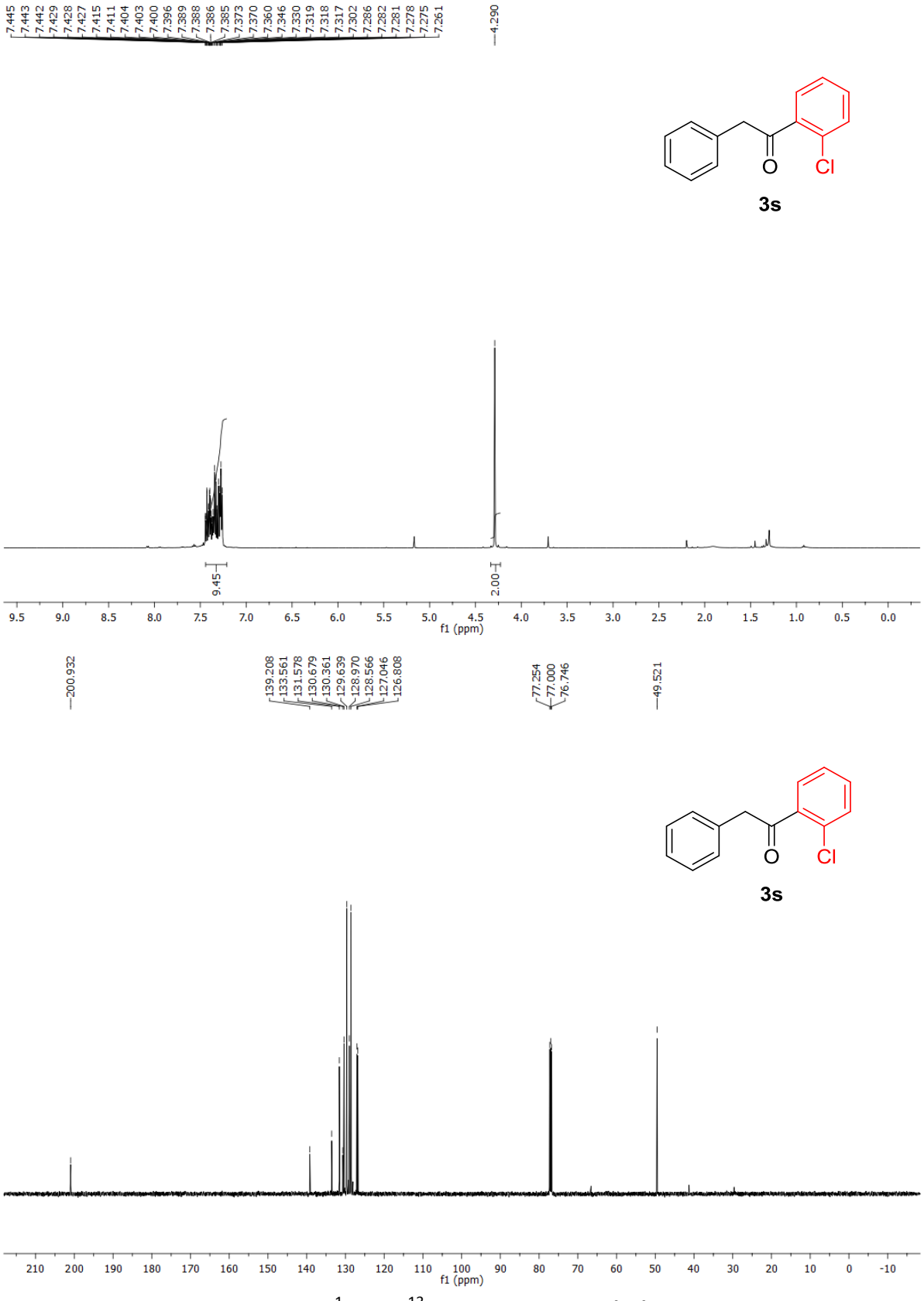


Figure 5.19 ^{1}H and ^{13}C NMR of product **(3s)** in **$CDCl_3$**.

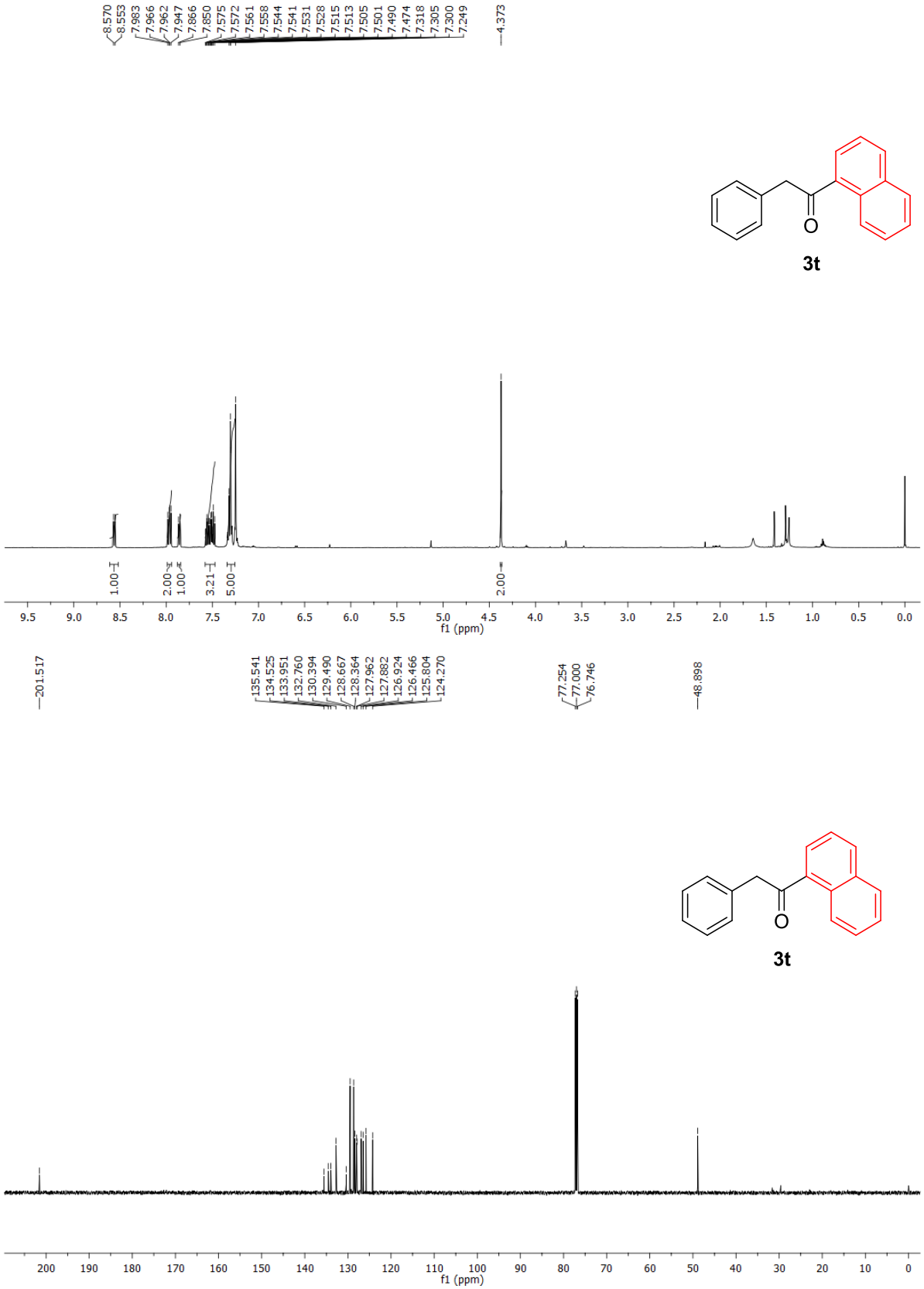


Figure 5.20 ^{1}H and ^{13}C NMR of product **(3t)** in **$CDCl_3$**.

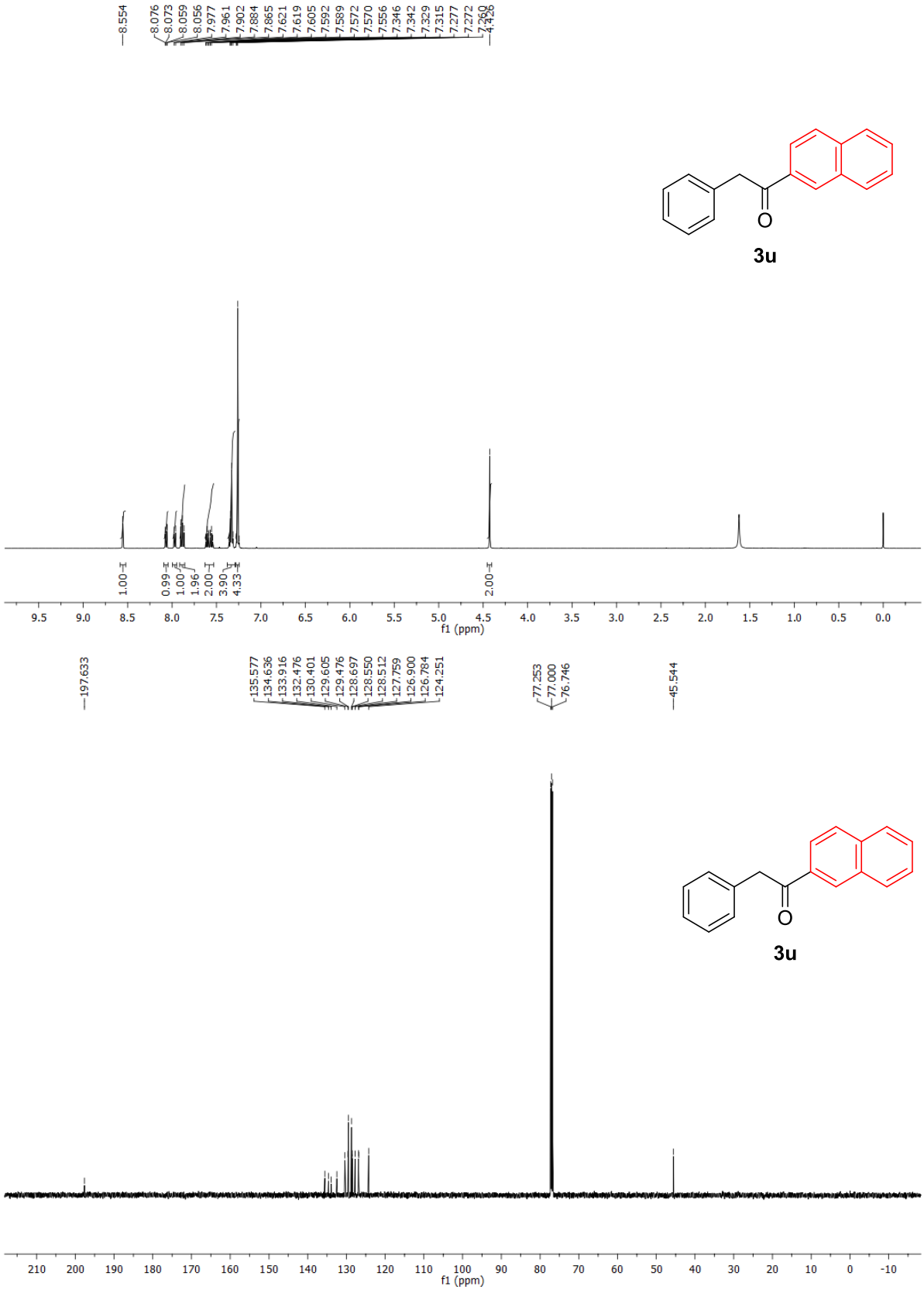


Figure 5.21 ^{1}H and ^{13}C NMR of product **(3u)** in **$CDCl_3$**.

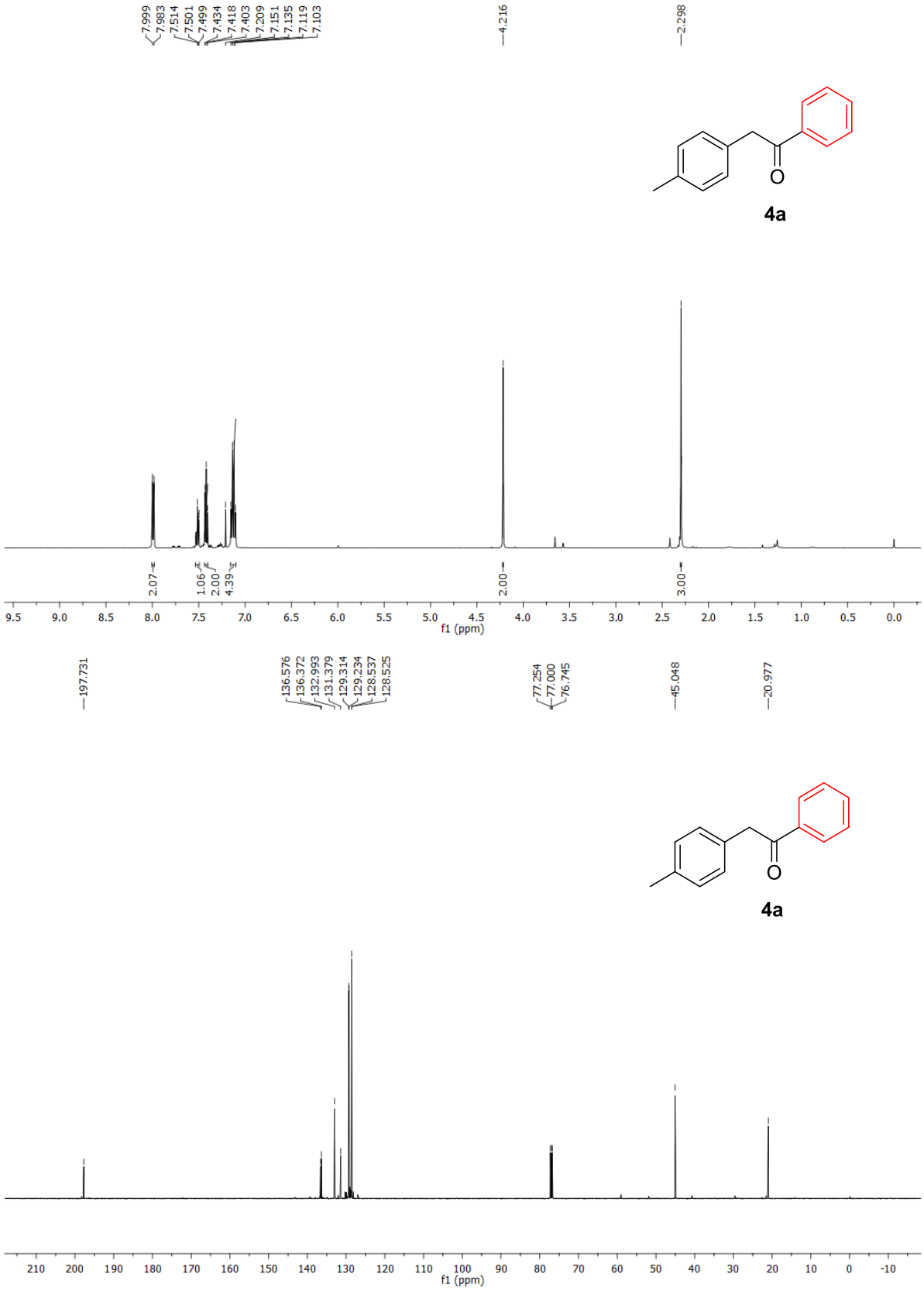


Figure 5.22 ^{1}H and ^{13}C NMR of product **(4a)** in **$CDCl_3$**.

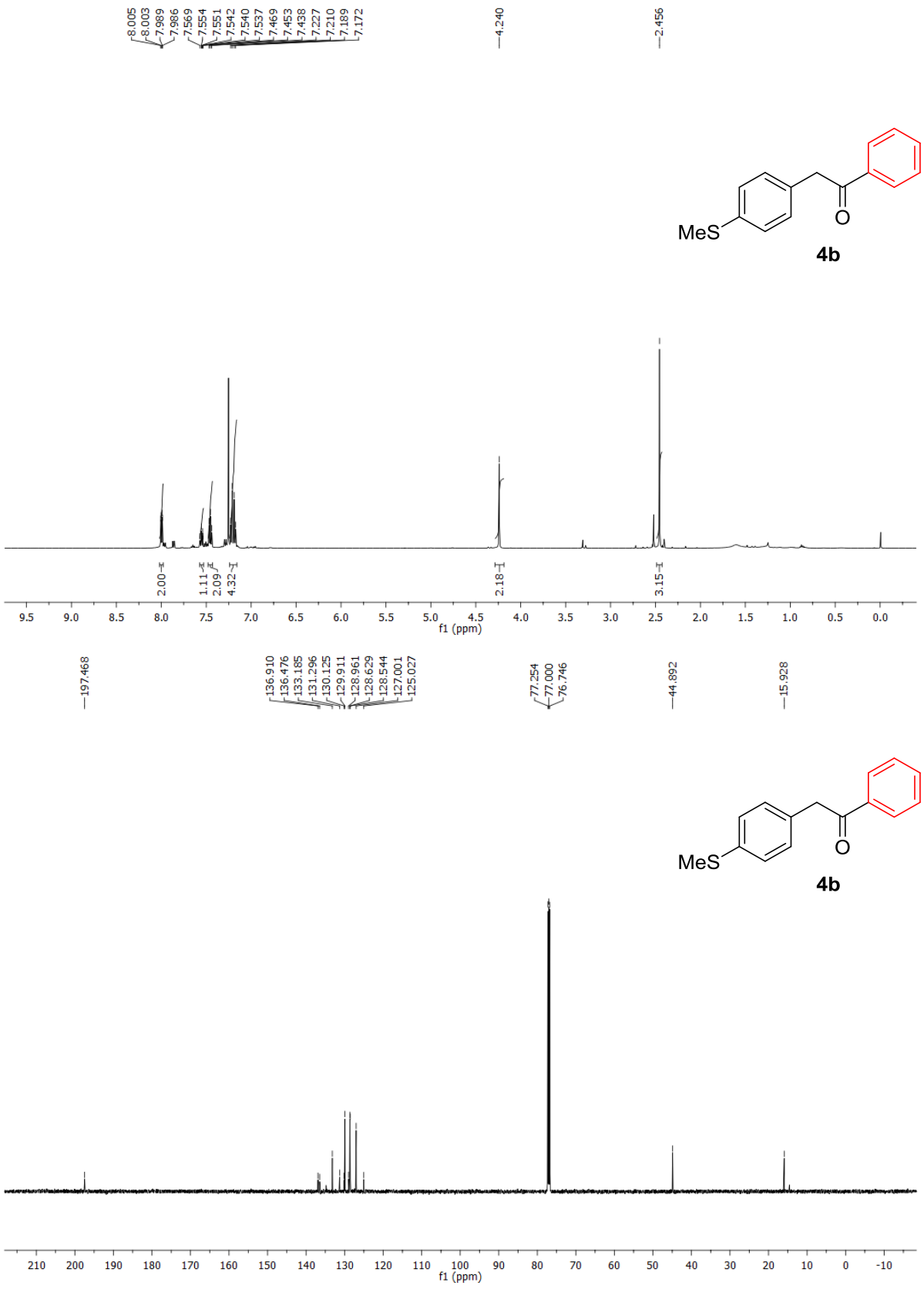


Figure 5.23 ^{1}H and ^{13}C NMR of product **(4b)** in **$CDCl_3$**.

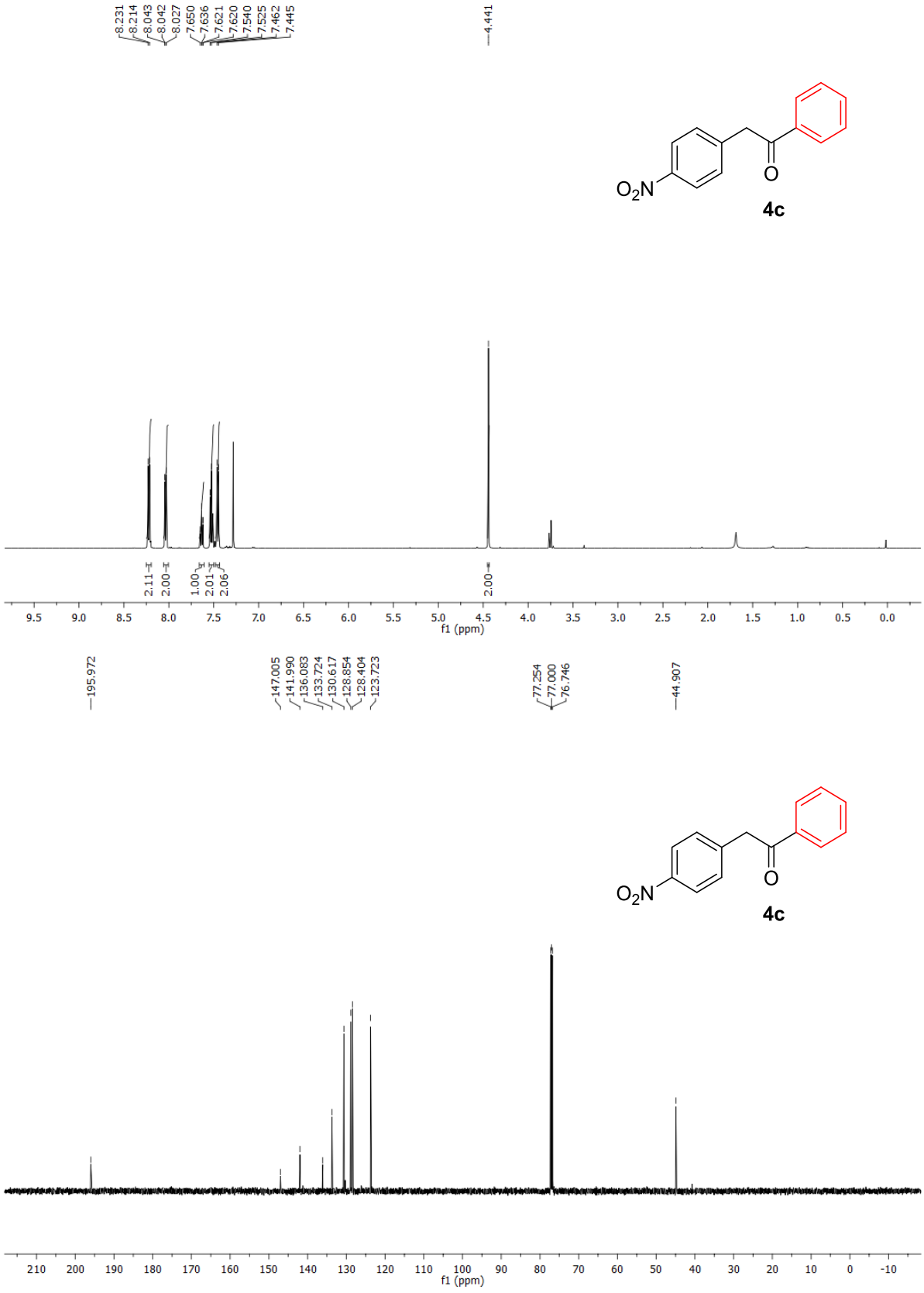


Figure 5.24 ^{1}H and ^{13}C NMR of product **(4c)** in **$CDCl_3$**.

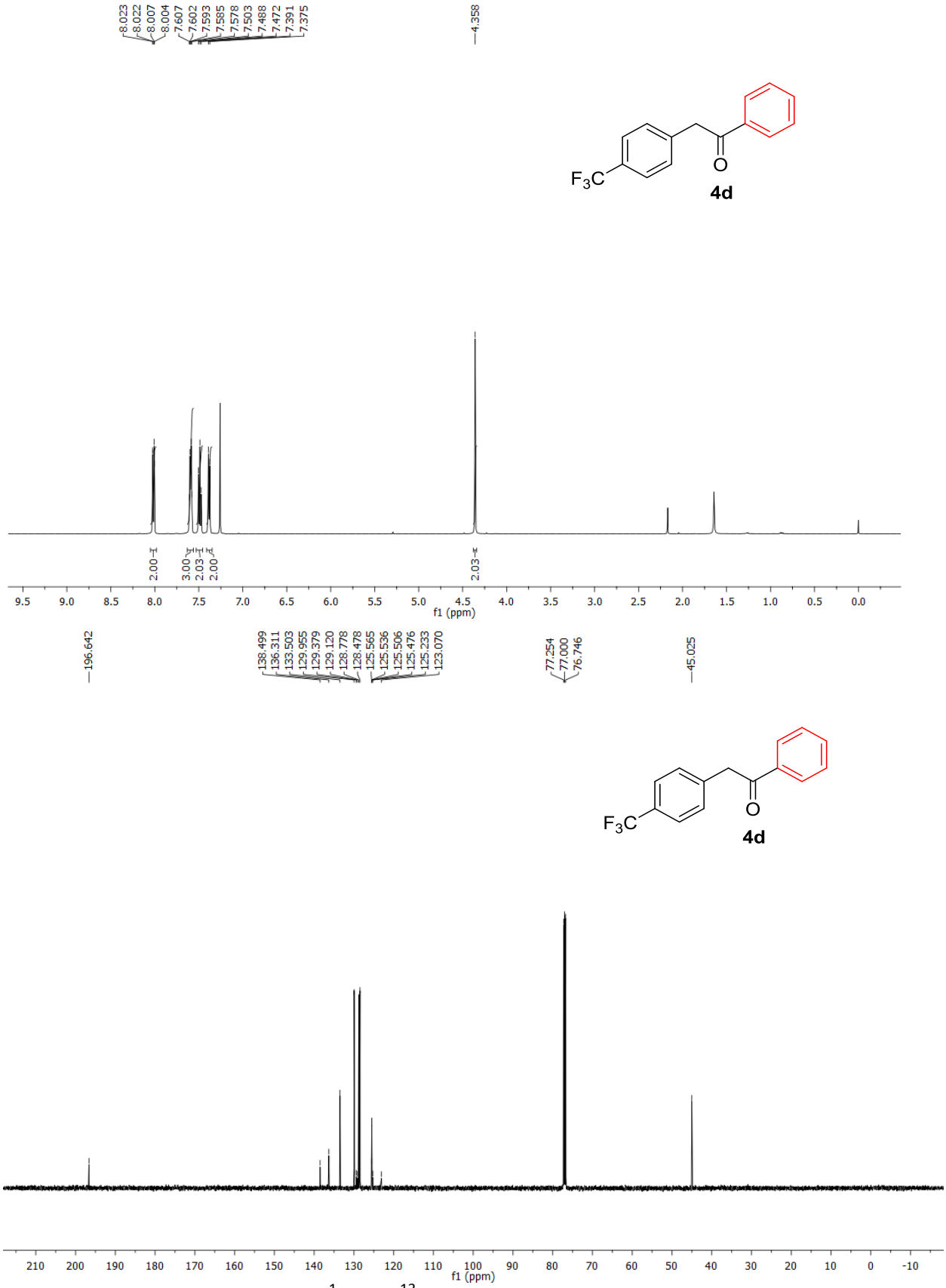


Figure 5.25 ^{1}H and ^{13}C NMR of product **(4d)** in **$CDCl_3$**.

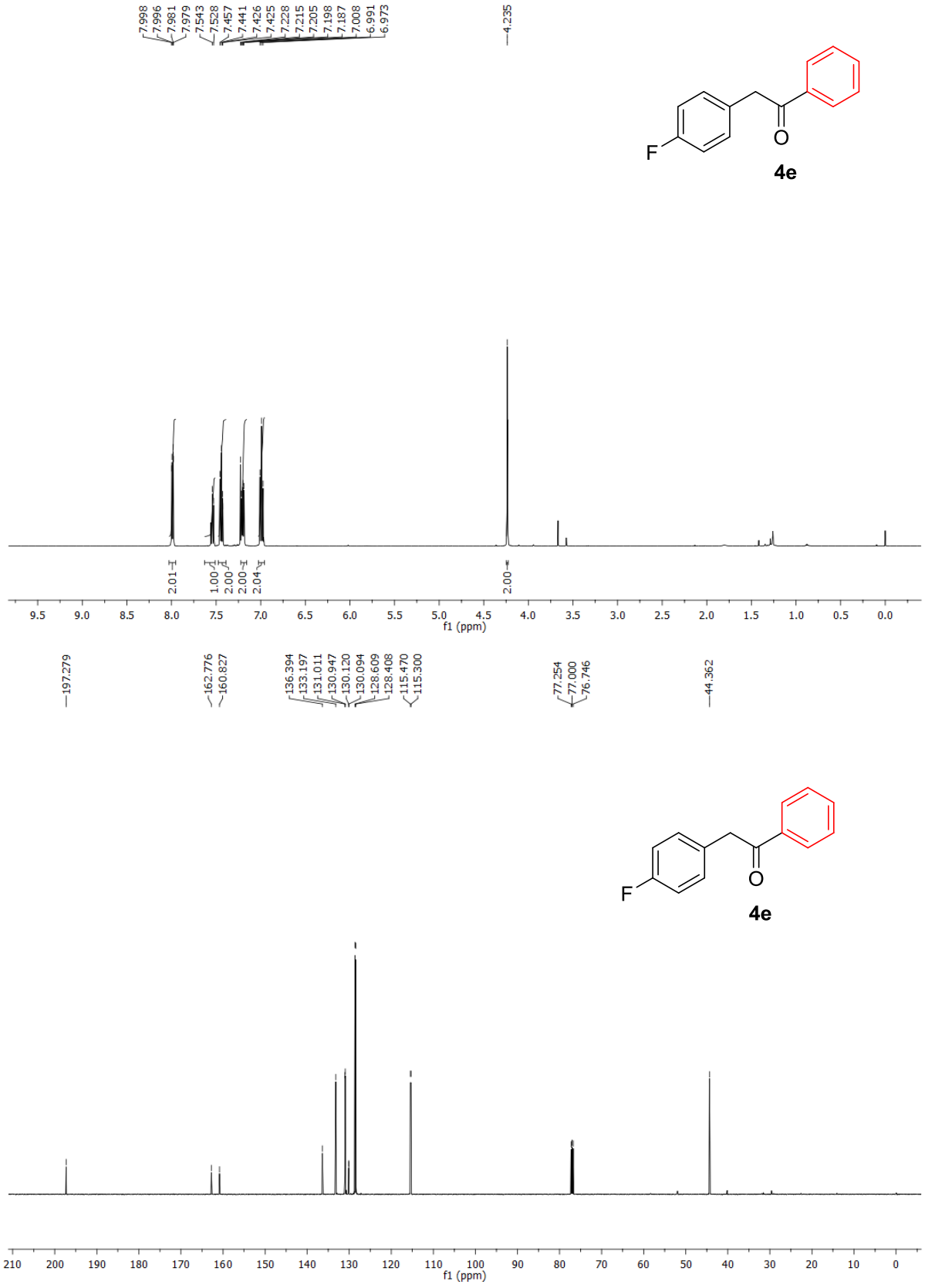
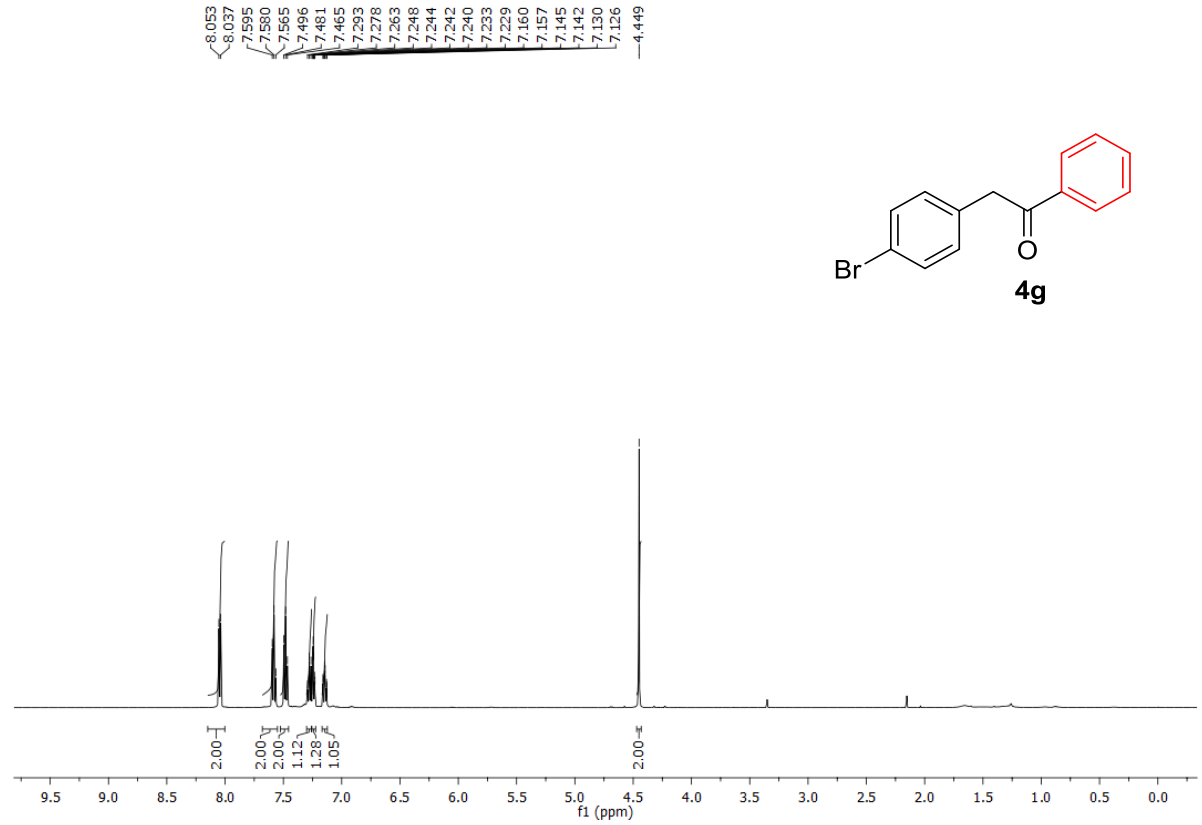


Figure 5.26 ^{1}H and ^{13}C NMR of product **(4e)** in **$CDCl_3$**.

Figure 5.27 ^{1}H and ^{13}C NMR of product **(4f)** in **$CDCl_3$**.



4h

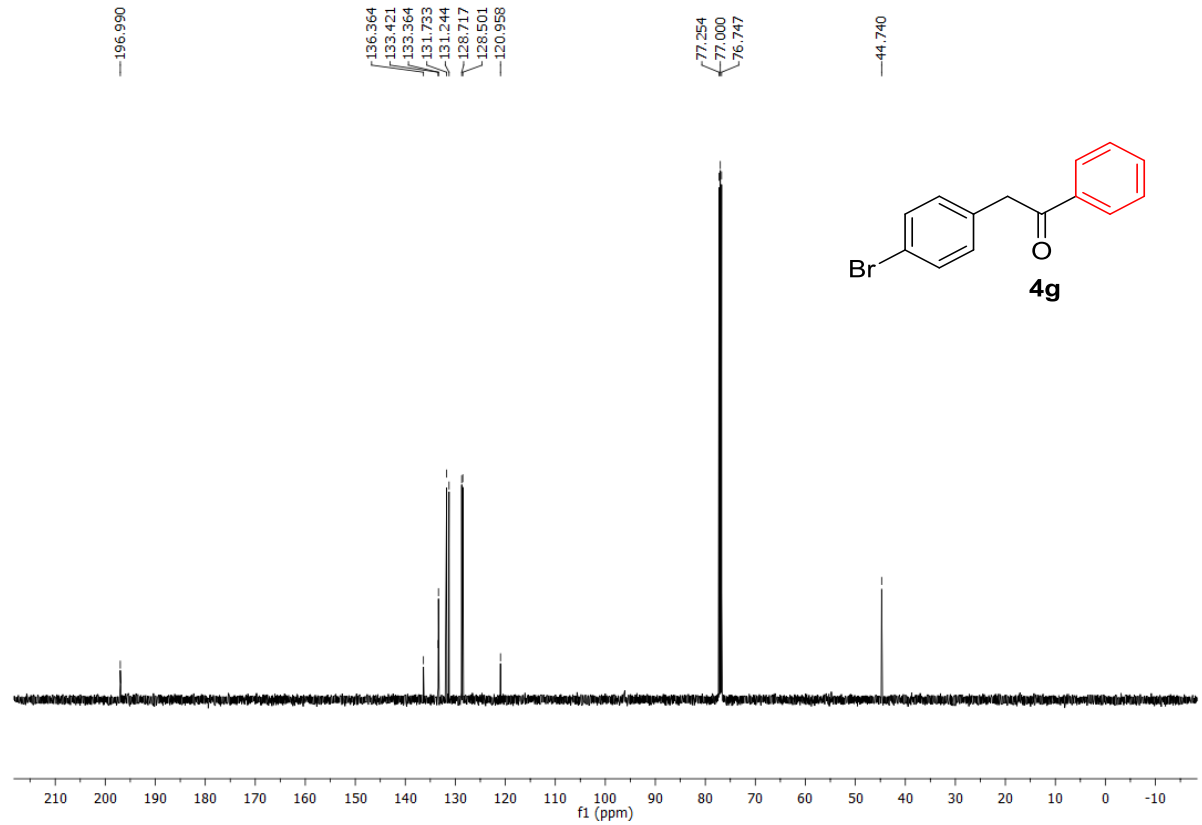


Figure 5.28 ^{1}H and ^{13}C NMR of product **(4g)** in **$CDCl_3$**.

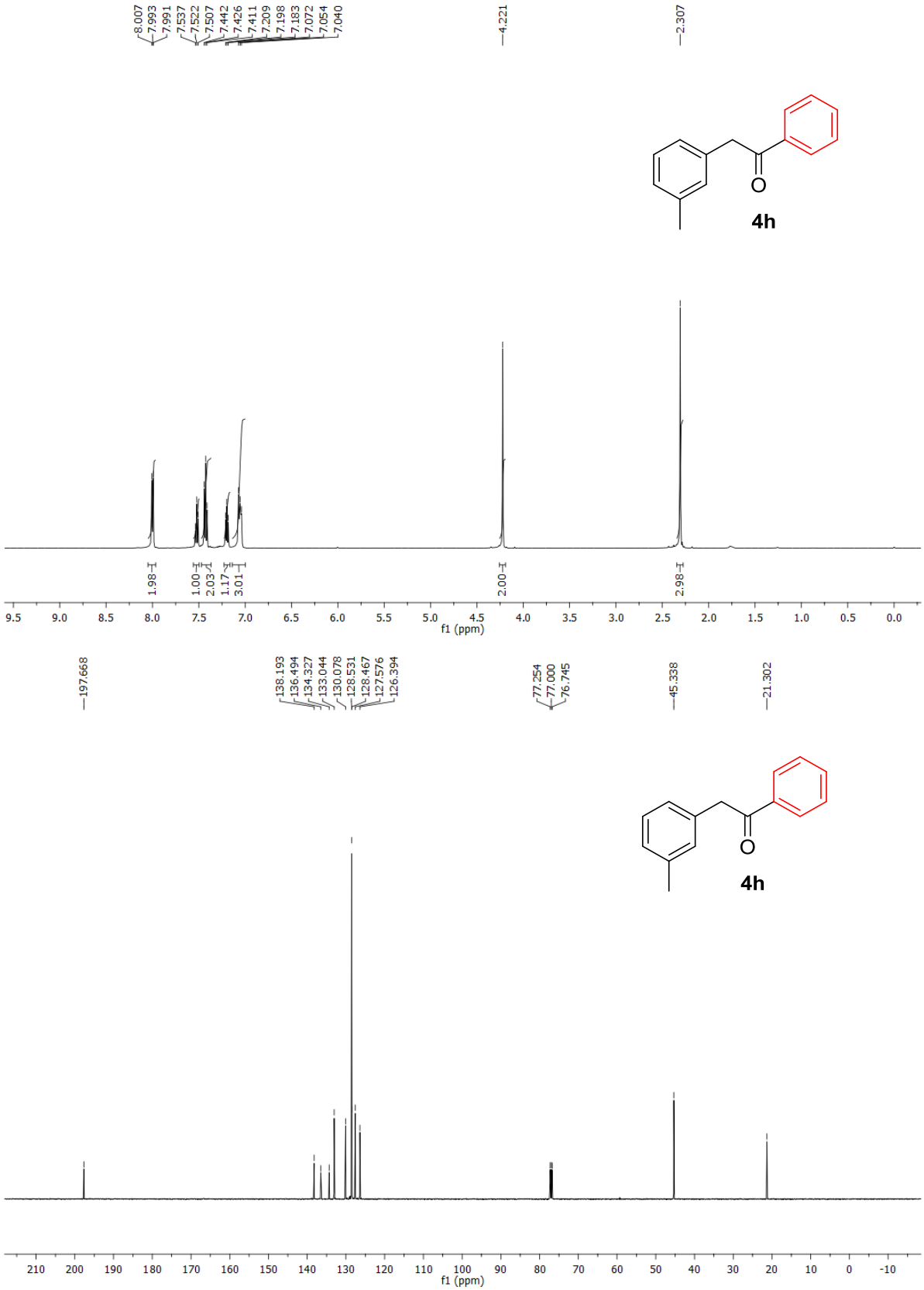


Figure 5.29 ^{1}H and ^{13}C NMR of product **(4h)** in **$CDCl_3$**.

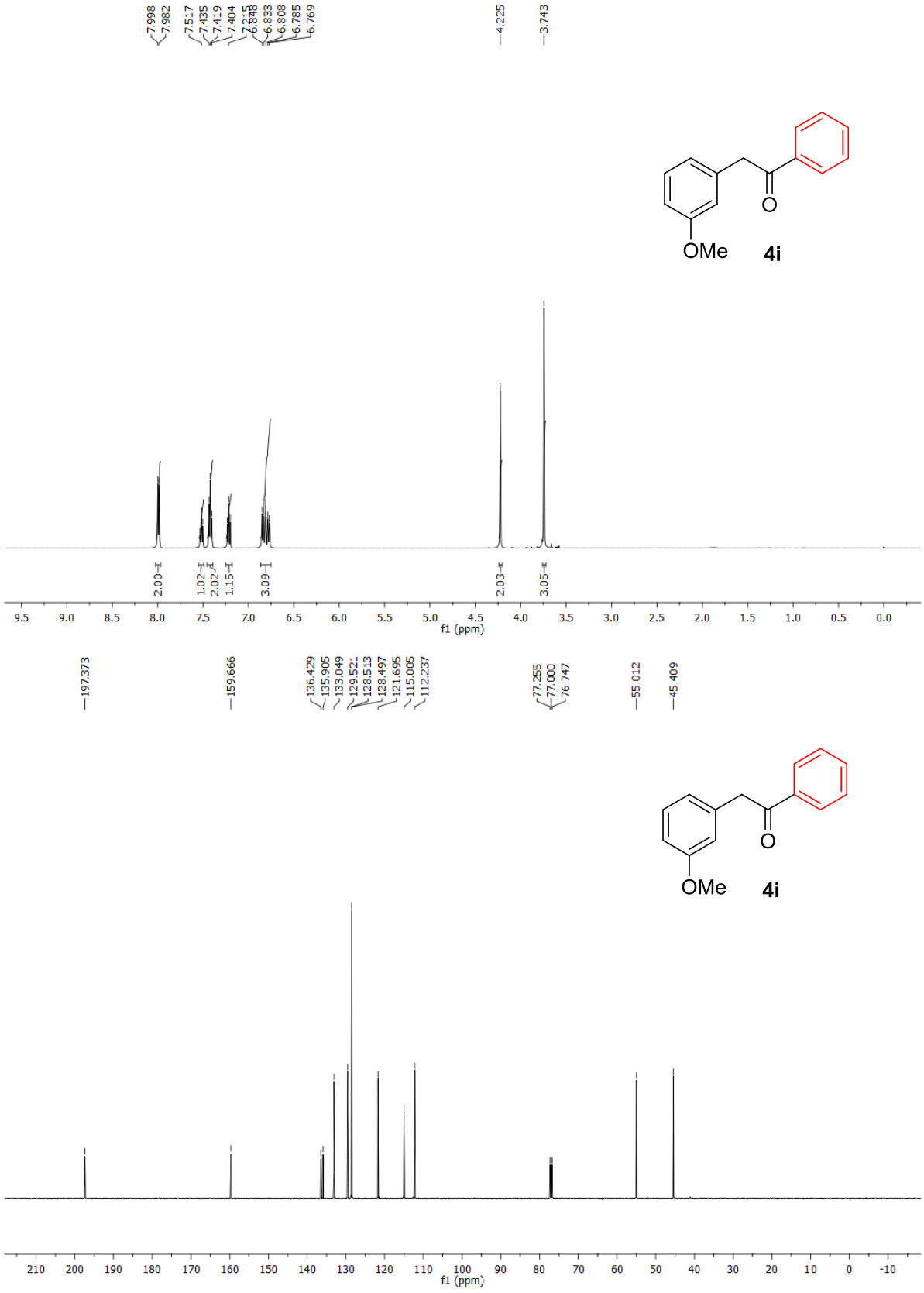


Figure 5.30 ^{1}H and ^{13}C NMR of product **(4i)** in **$CDCl_3$**.

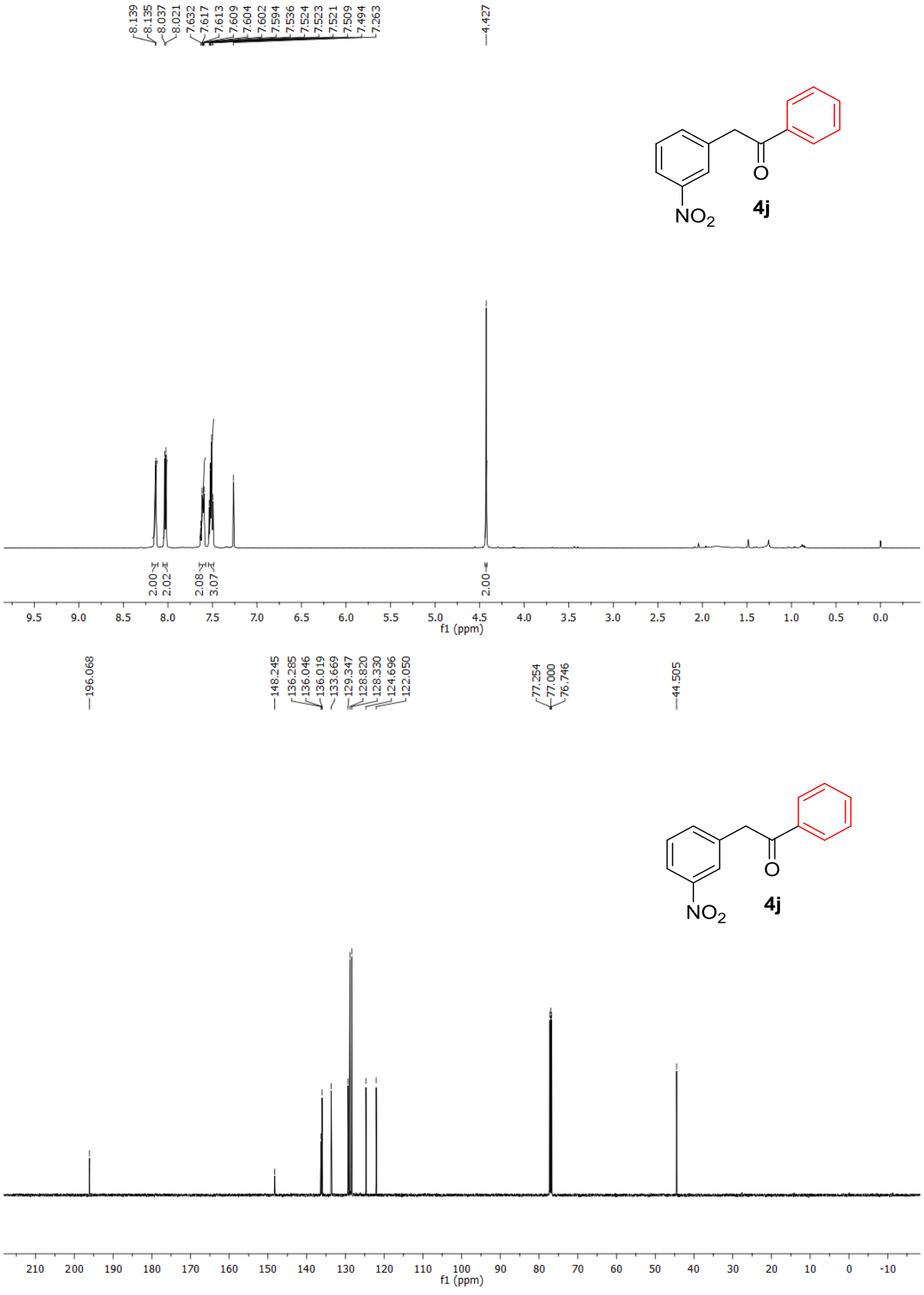


Figure 5.31 ^{1}H and ^{13}C NMR of product **(4j)** in **$CDCl_3$**.

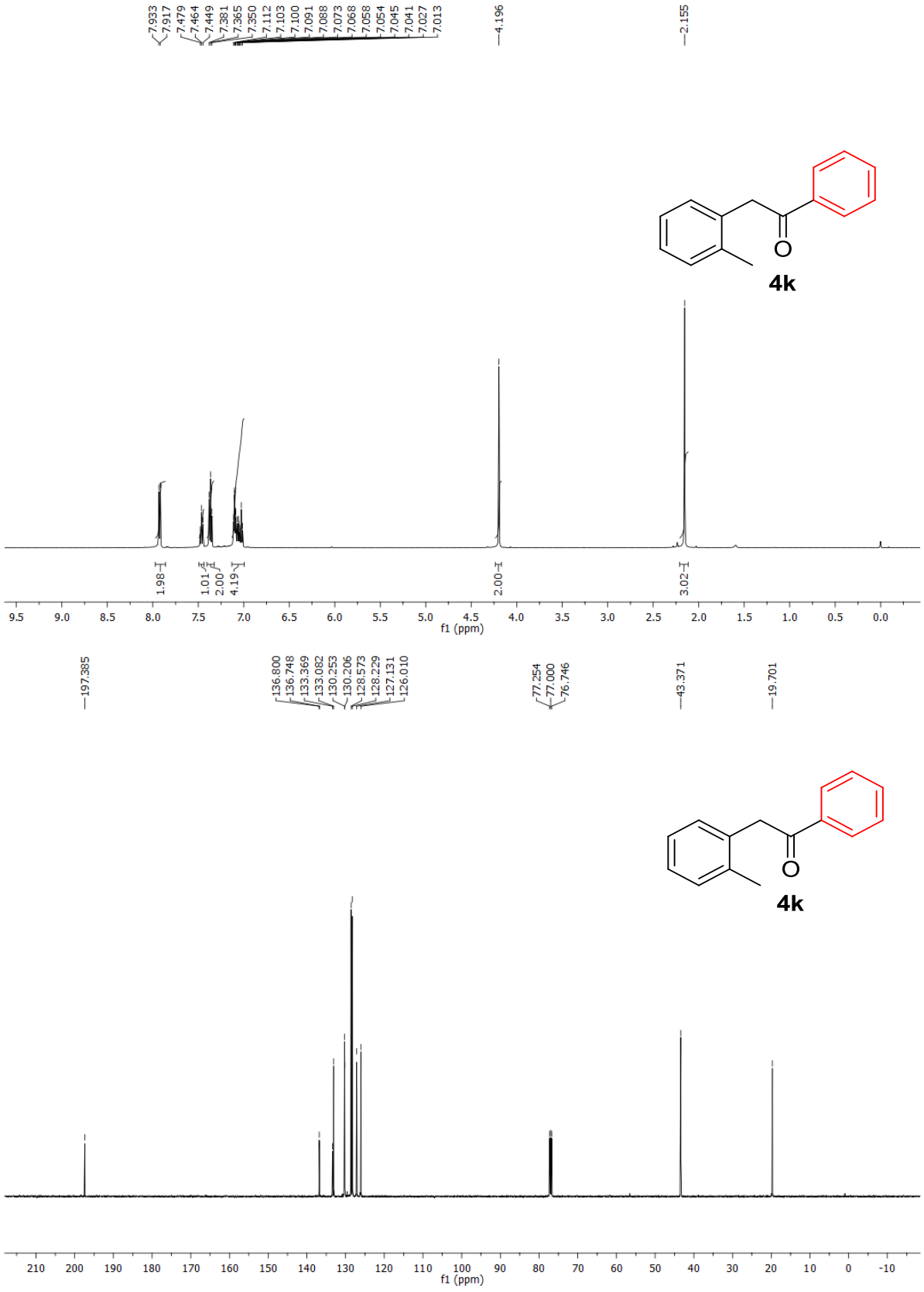


Figure 5.32 ^{1}H and ^{13}C NMR of product **(4k)** in **$CDCl_3$**.

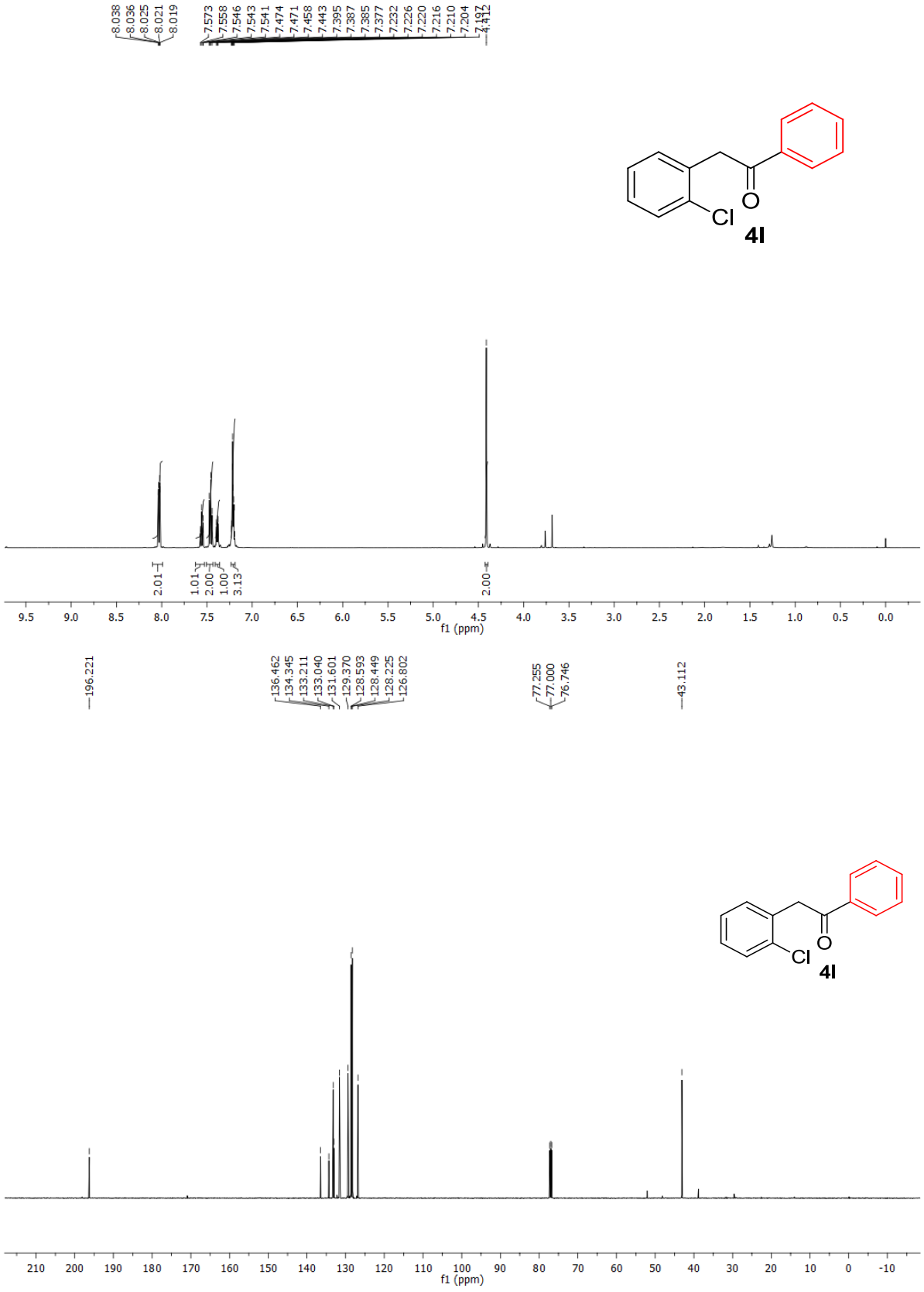


Figure 5.33 ^{1}H and ^{13}C NMR of product **(4l)** in **$CDCl_3$**.

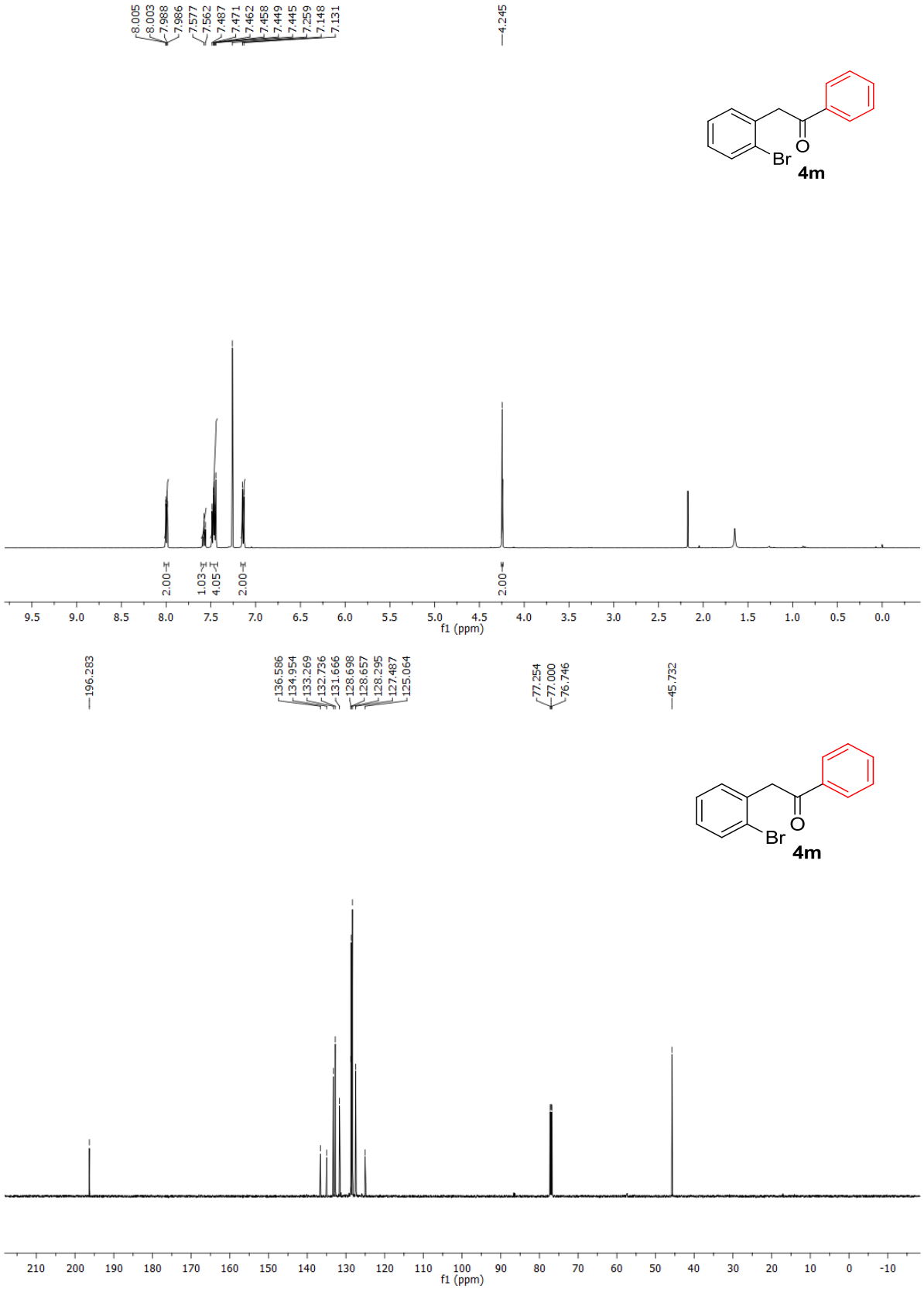


Figure 5.34 ^{1}H and ^{13}C NMR of product **(4m)** in **$CDCl_3$**.

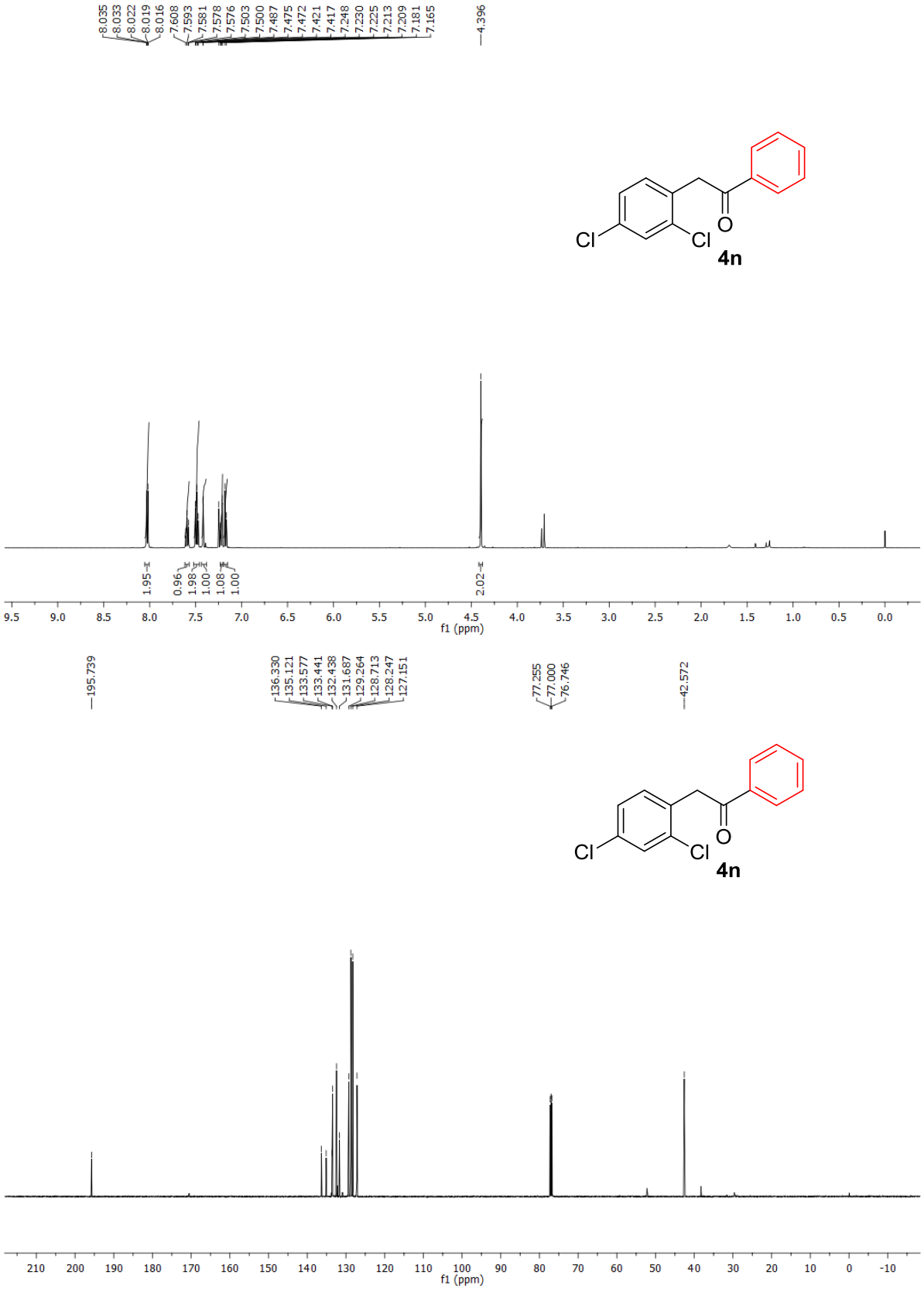


Figure 5.35 ^{1}H and ^{13}C NMR of product **(4n)** in **$CDCl_3$**.

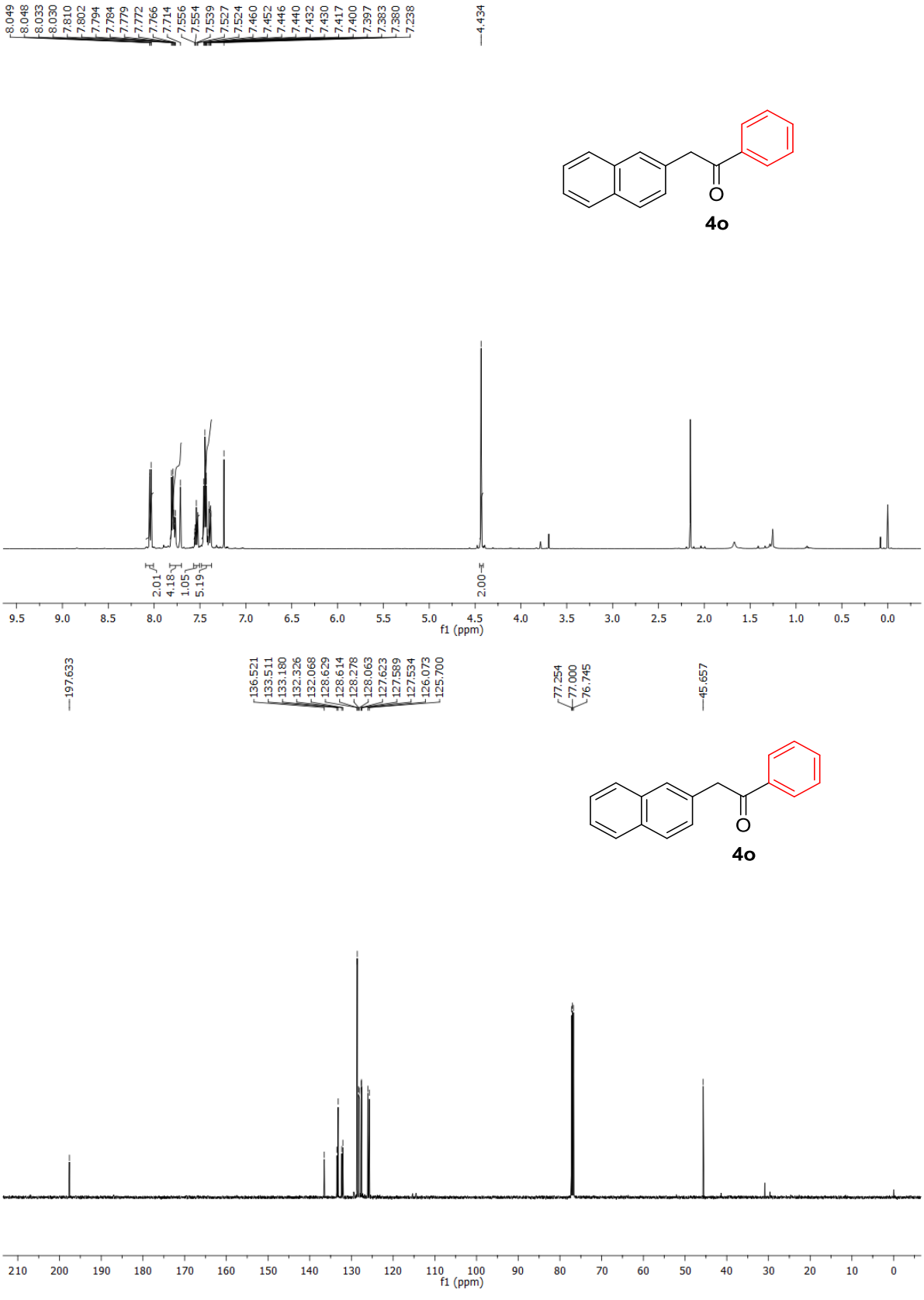
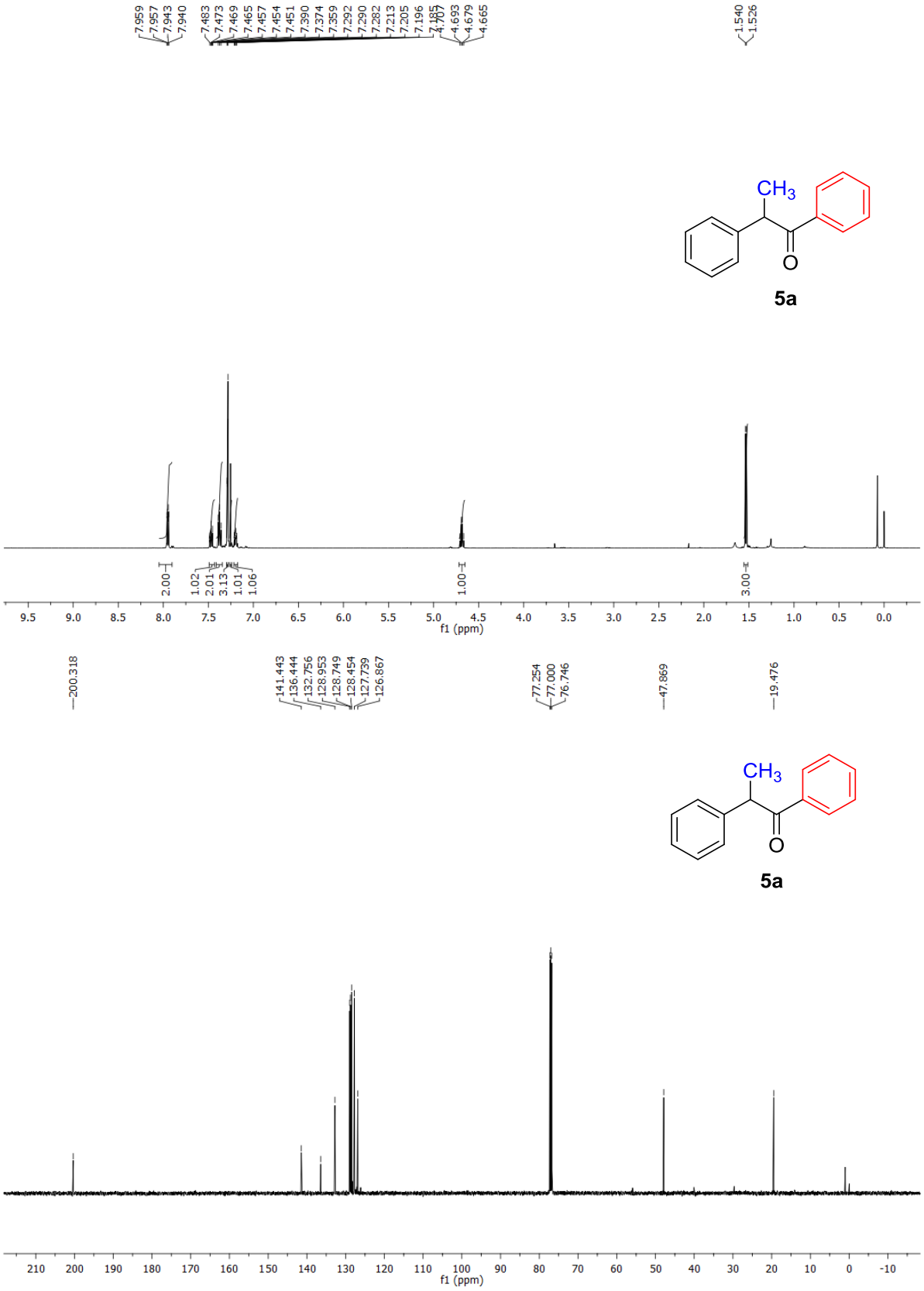


Figure 5.36 ^{1}H and ^{13}C NMR of product **(4o)** in **$CDCl_3$**.



5a **Figure 5.37** ^{1}H and ^{13}C NMR of product **(5a)** in **$CDCl_3$**.

Figure 5.38 ^{1}H and ^{13}C NMR of product **(5b)** in **$CDCl_3$**.

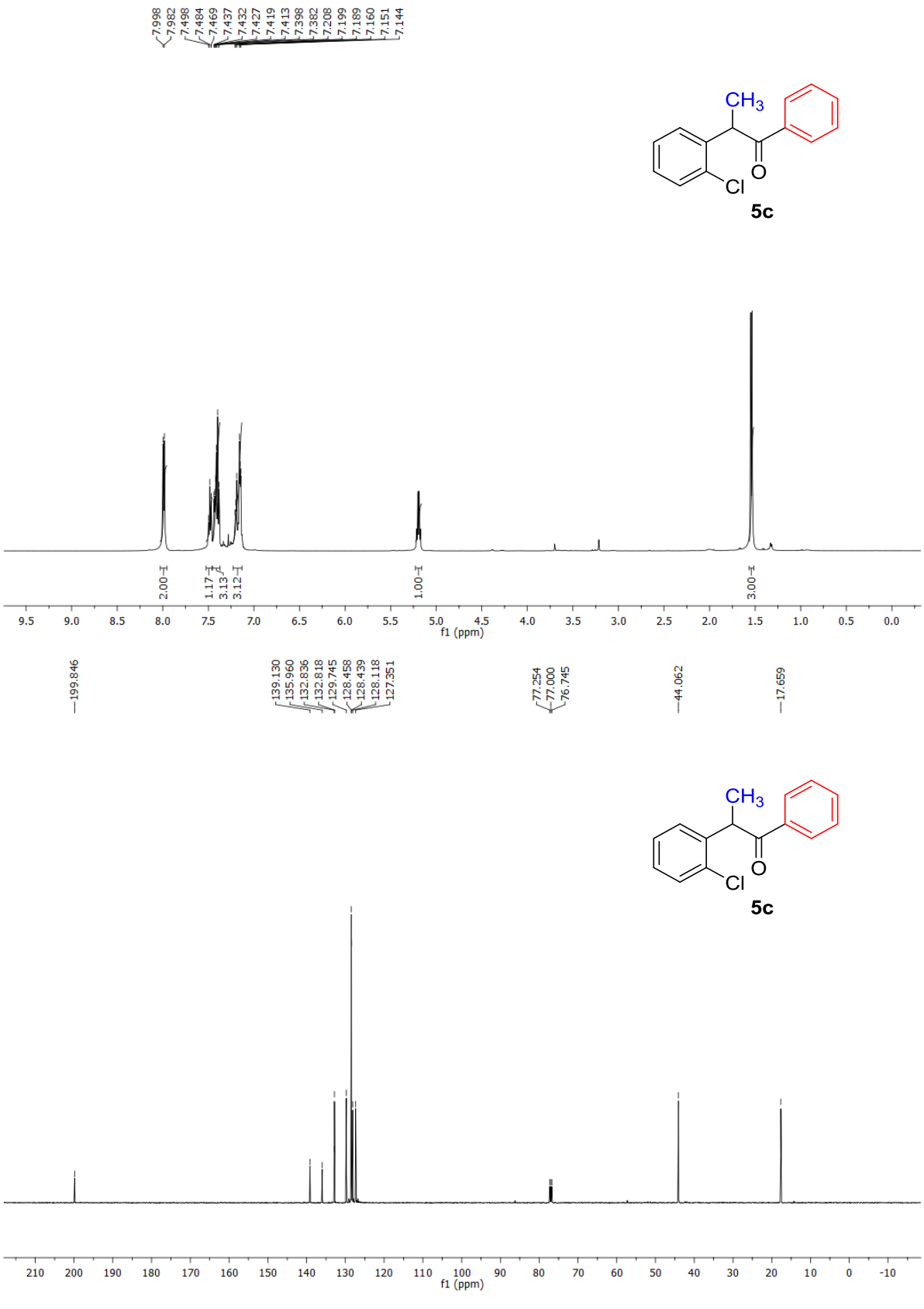


Figure 5.39 ^{1}H and ^{13}C NMR of product **(5c)** in **$CDCl_3$**.

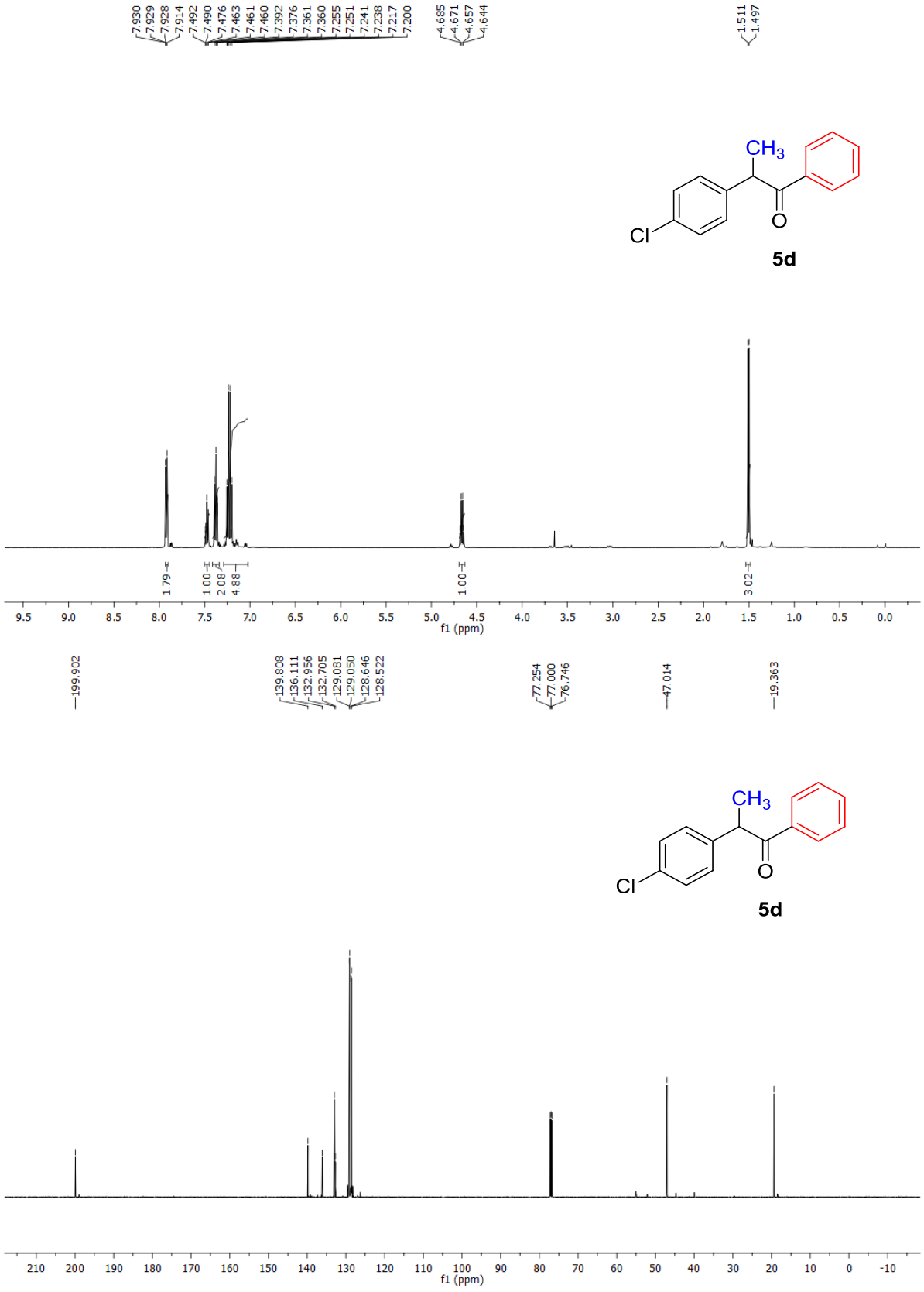


Figure 5.40 ^{1}H and ^{13}C NMR of product **(5d)** in **$CDCl_3$**.

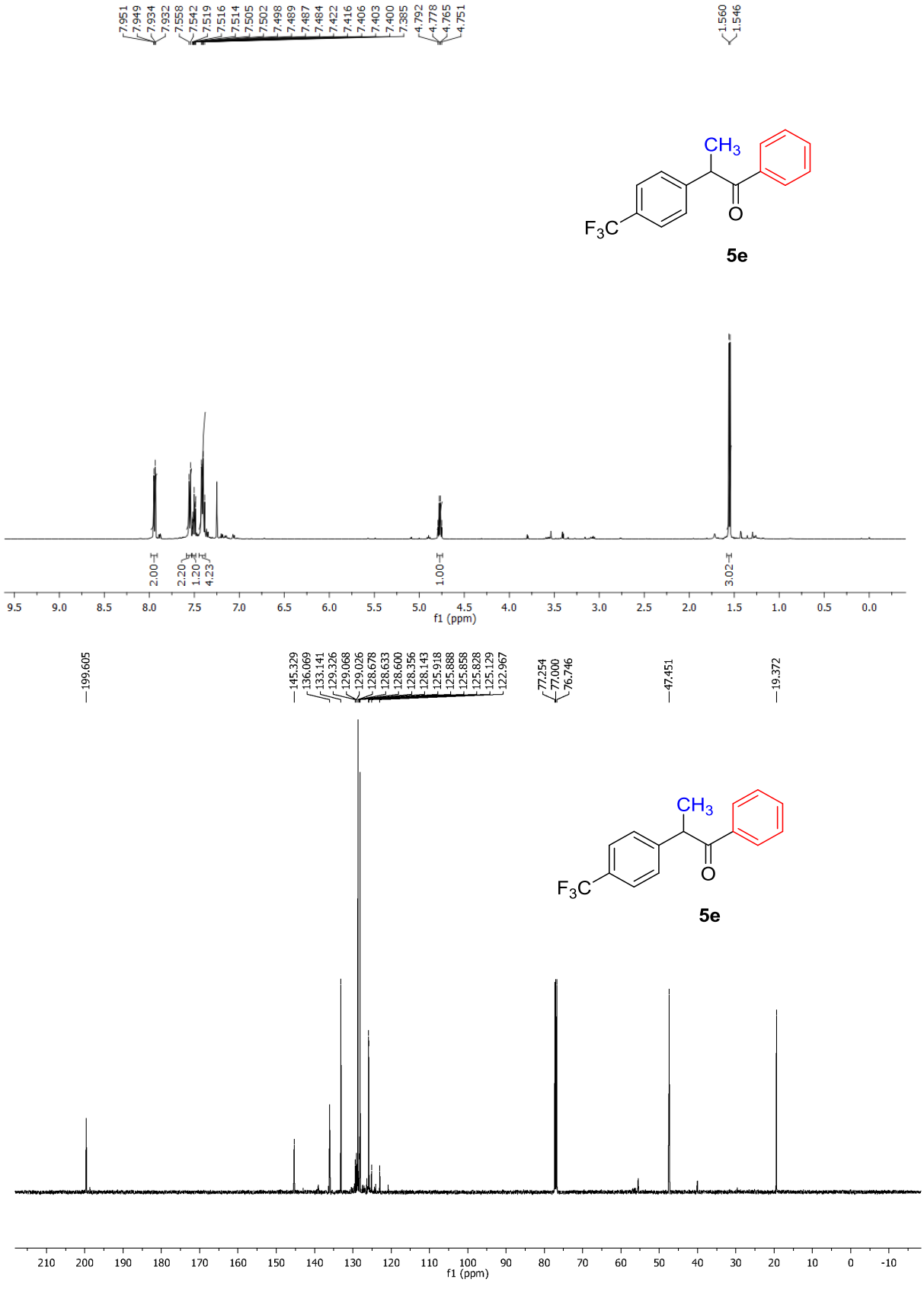


Figure 5.41 ^{1}H and ^{13}C NMR of product **(5e)** in **$CDCl_3$**.

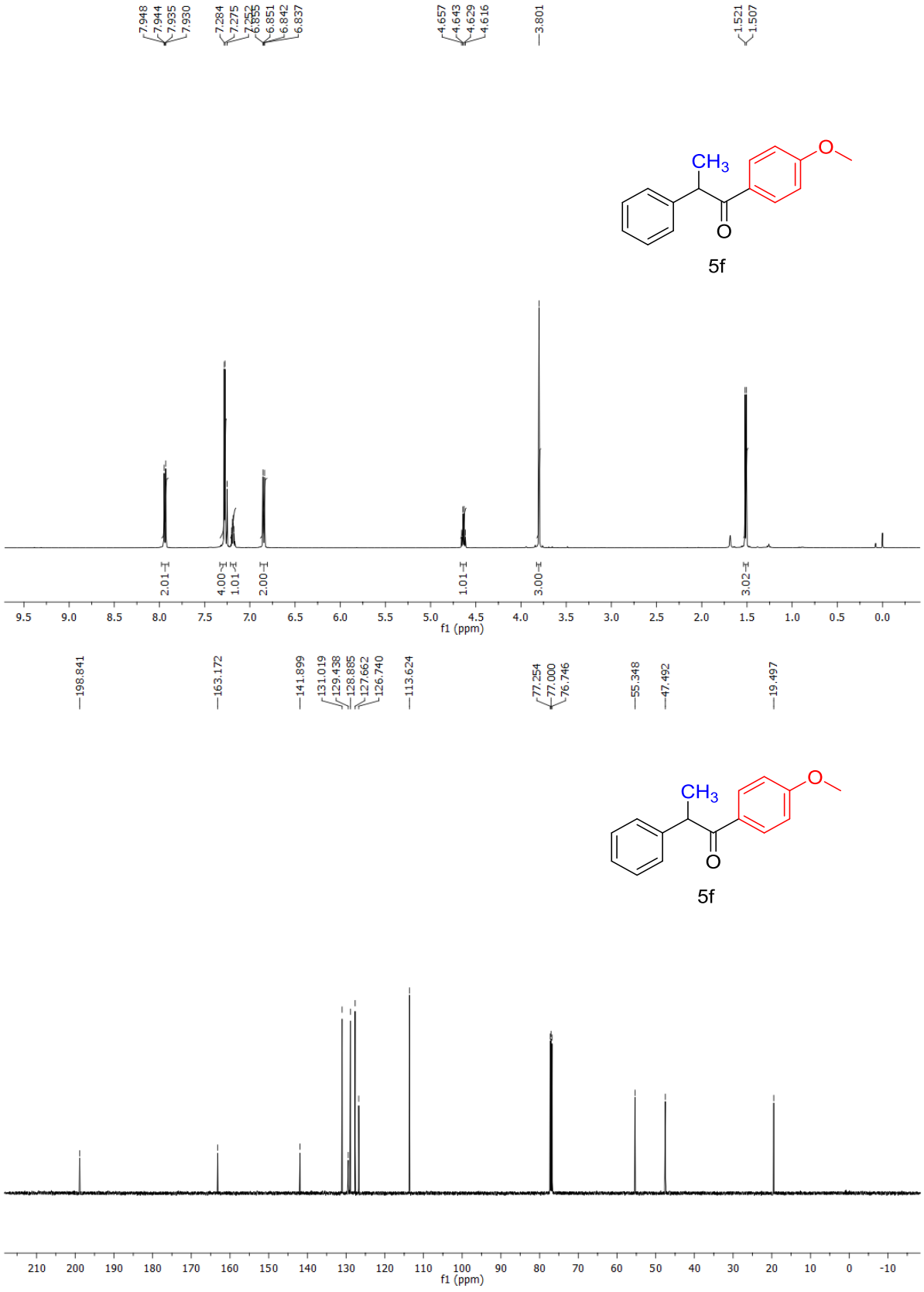


Figure 5.42 ^{1}H and ^{13}C NMR of product **(5f)** in **$CDCl_3$**.

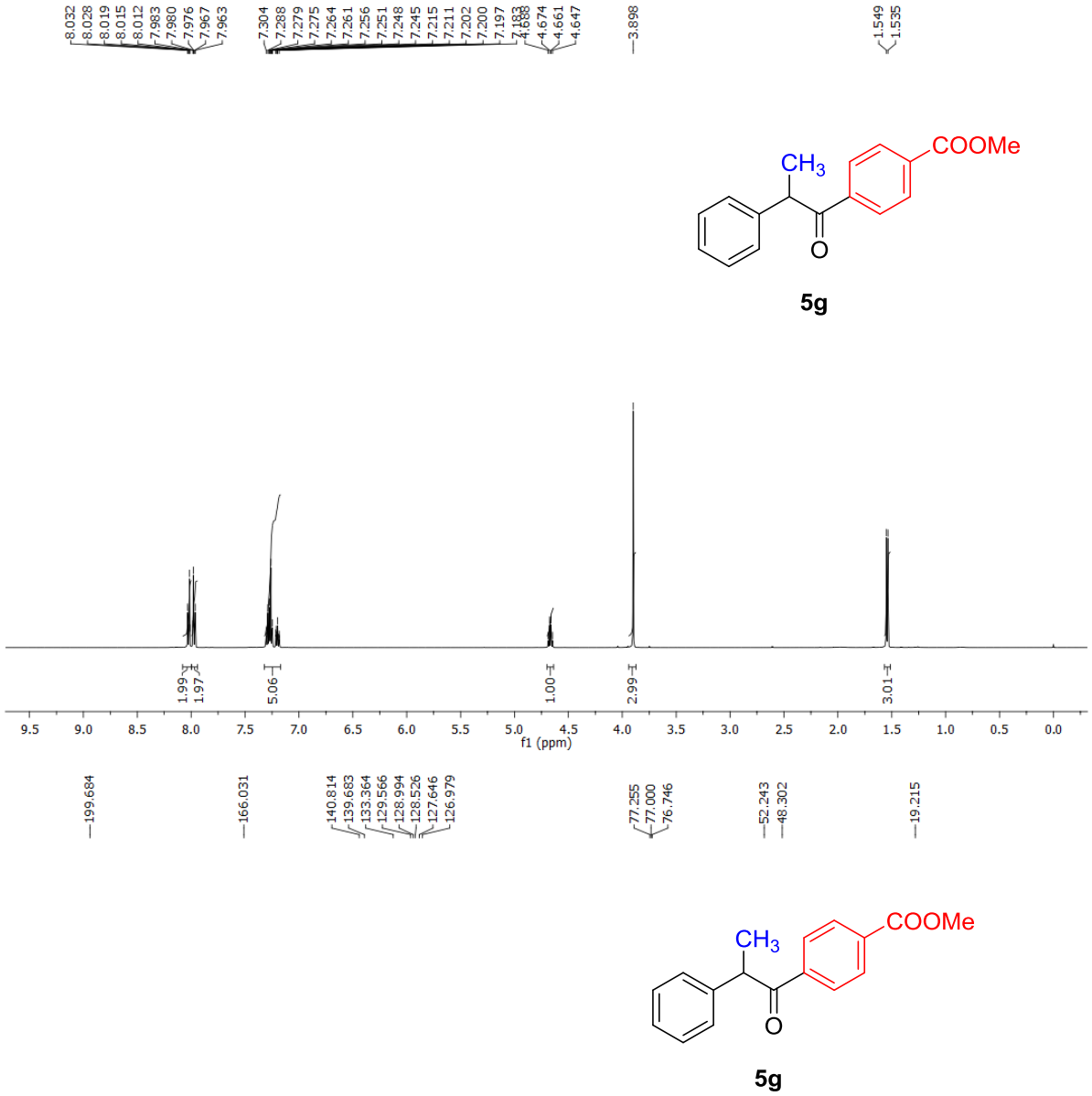


Figure 5.43 ^{1}H and ^{13}C NMR of product **(5g)** in **$CDCl_3$**.

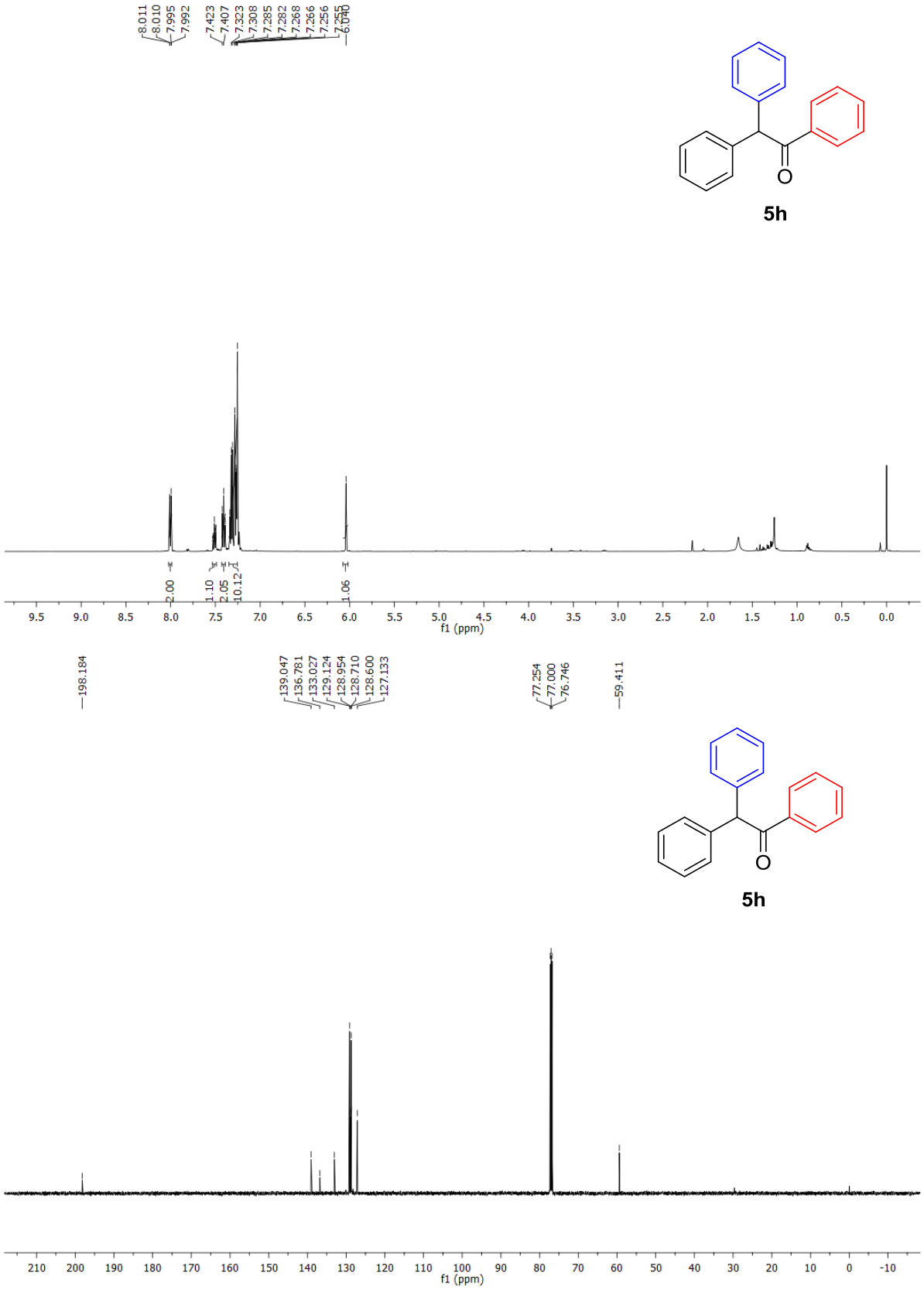


Figure 5.44 ^{1}H and ^{13}C NMR of product **(5h)** in **$CDCl_3$**.

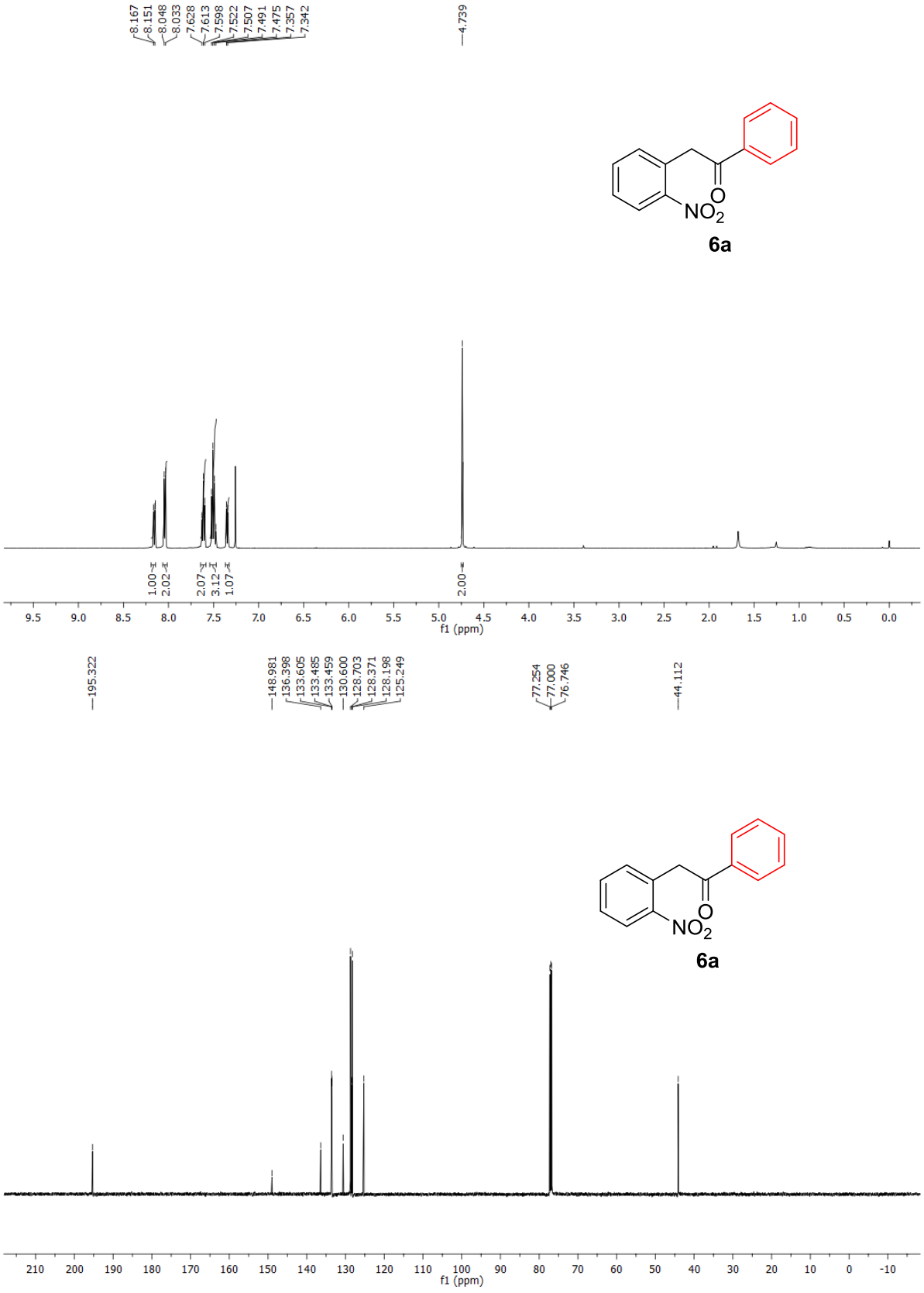


Figure 5.45 ^{1}H and ^{13}C NMR of product **(6a)** in **$CDCl_3$**.

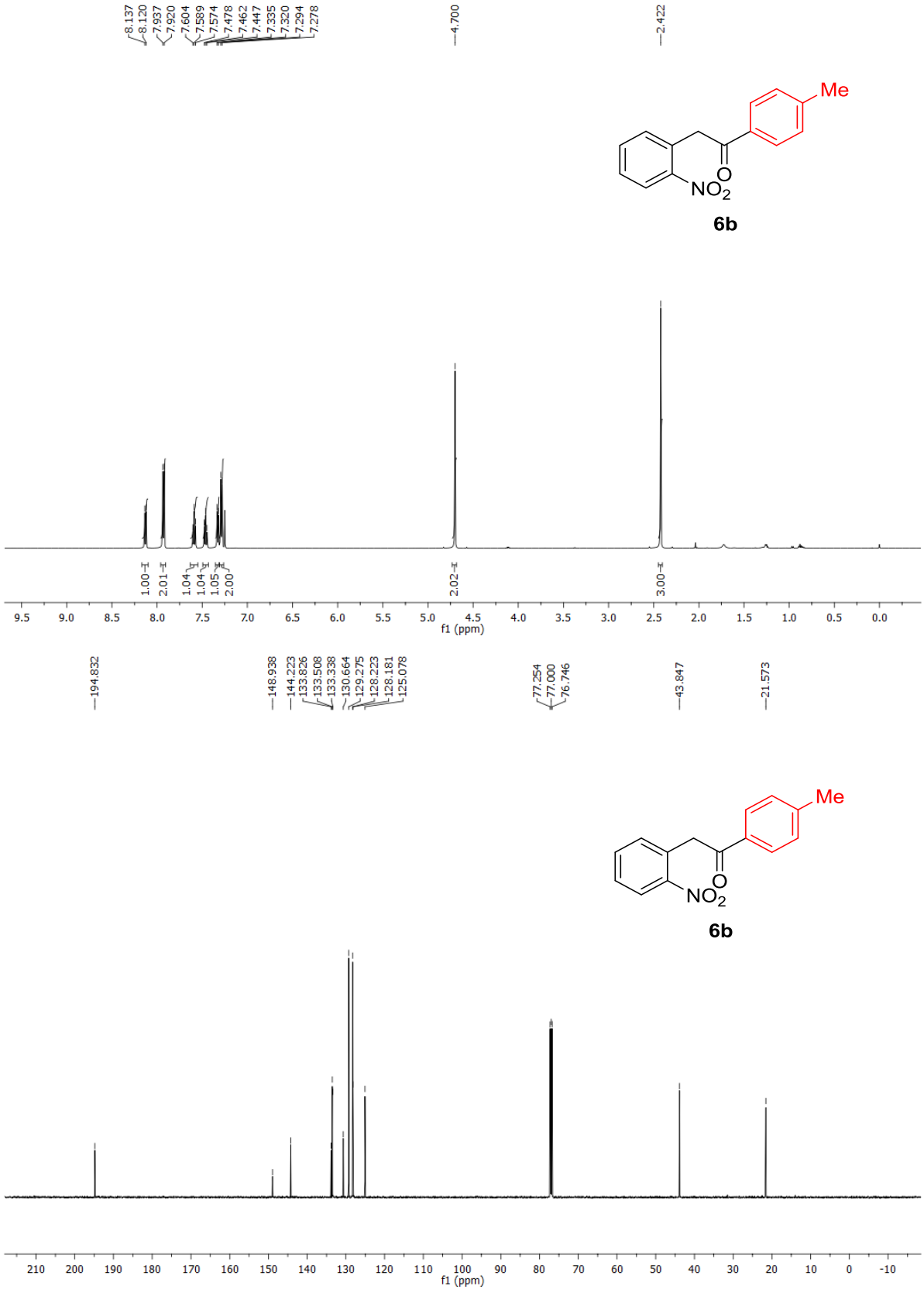


Figure 5.46 ^{1}H and ^{13}C NMR of product **(6b)** in **$CDCl_3$**.

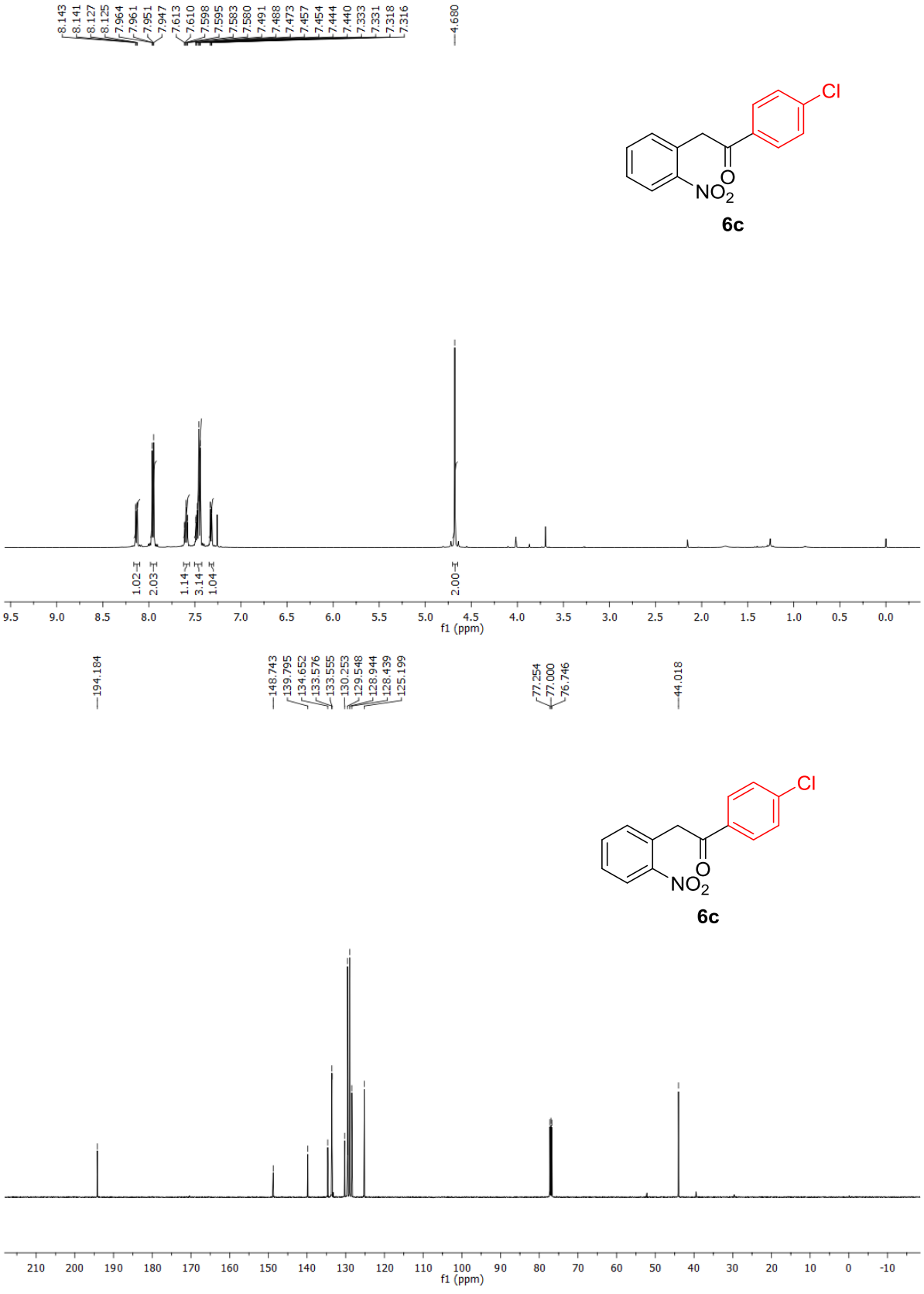


Figure 5.47 ^{1}H and ^{13}C NMR of product **(6c)** in **$CDCl_3$**.

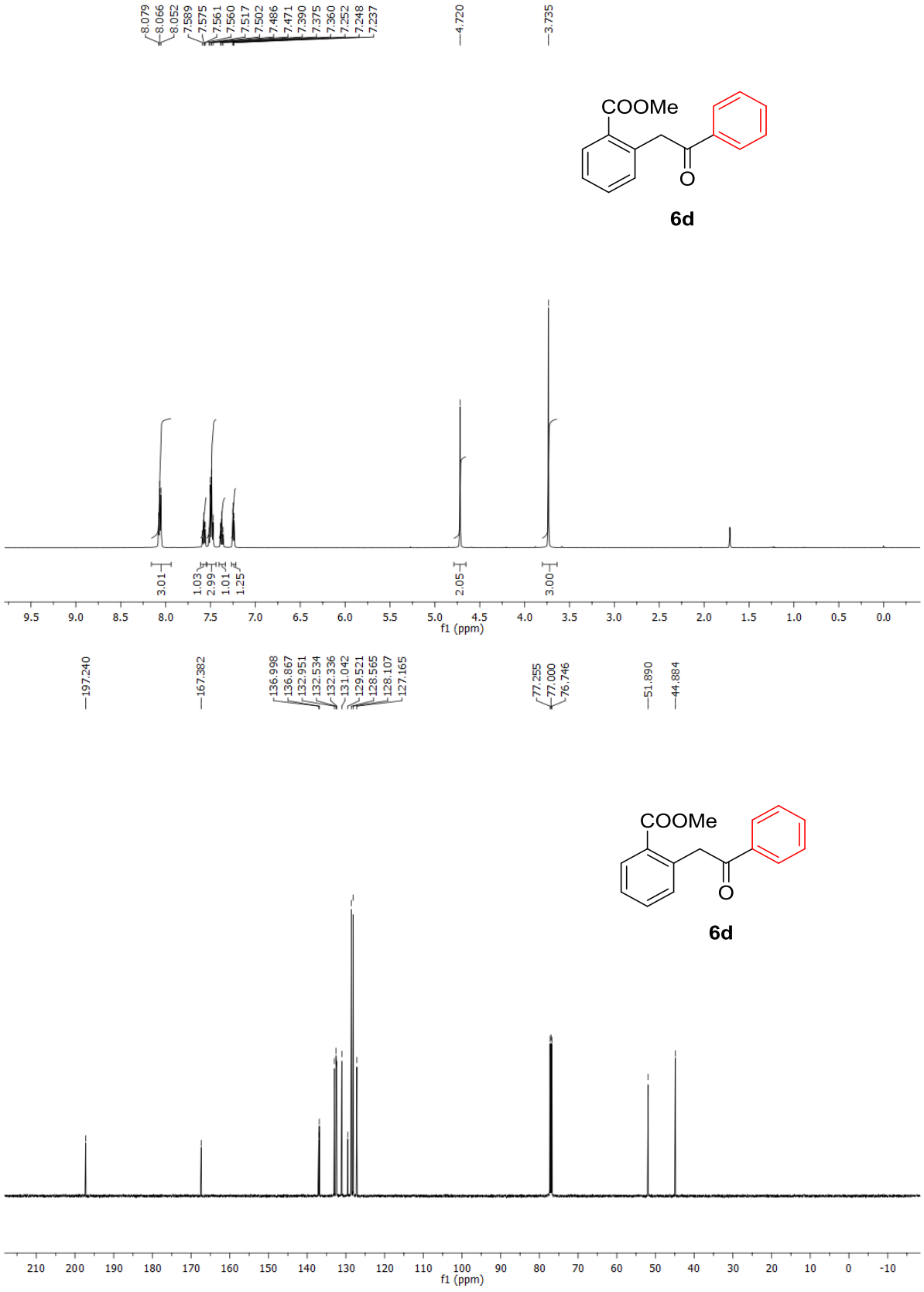


Figure 5.48 ^{1}H and ^{13}C NMR of product **(6d)** in **$CDCl_3$**.

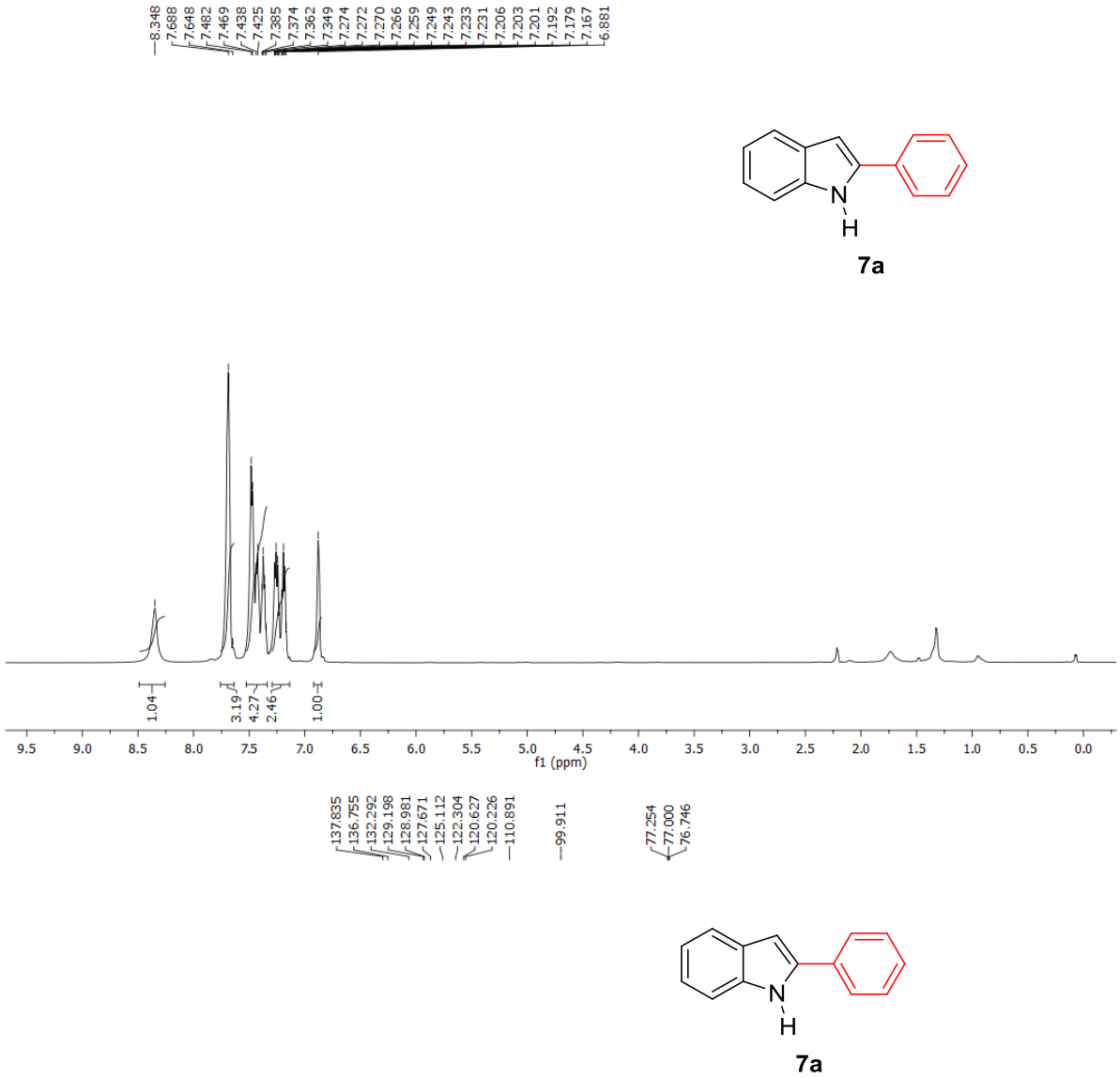


Figure 5.49 ^{1}H and ^{13}C NMR of product **(7a)** in **$CDCl_3$**.

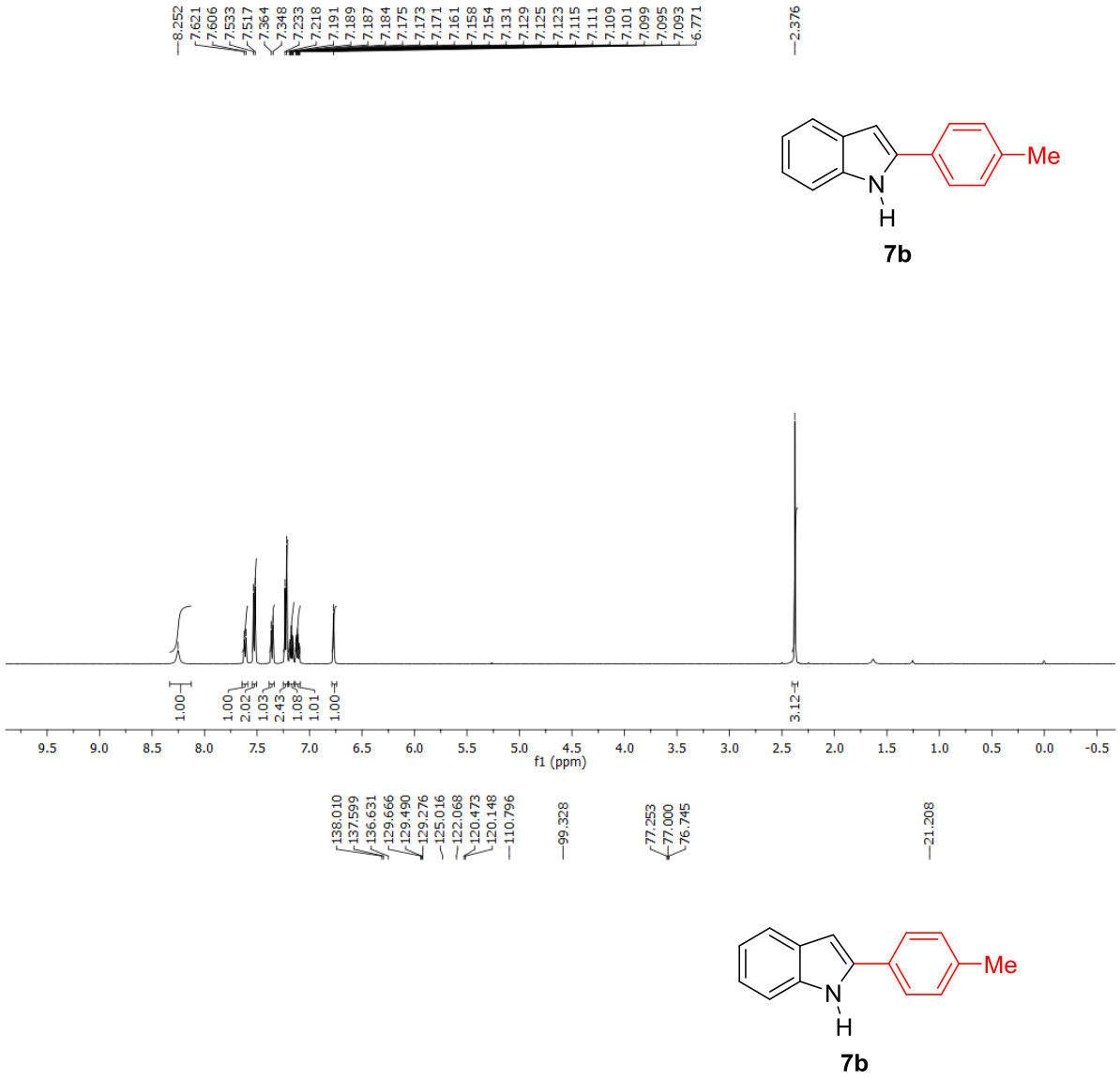


Figure 5.50 ^{1}H and ^{13}C NMR of product **(7b)** in **$CDCl_3$**.

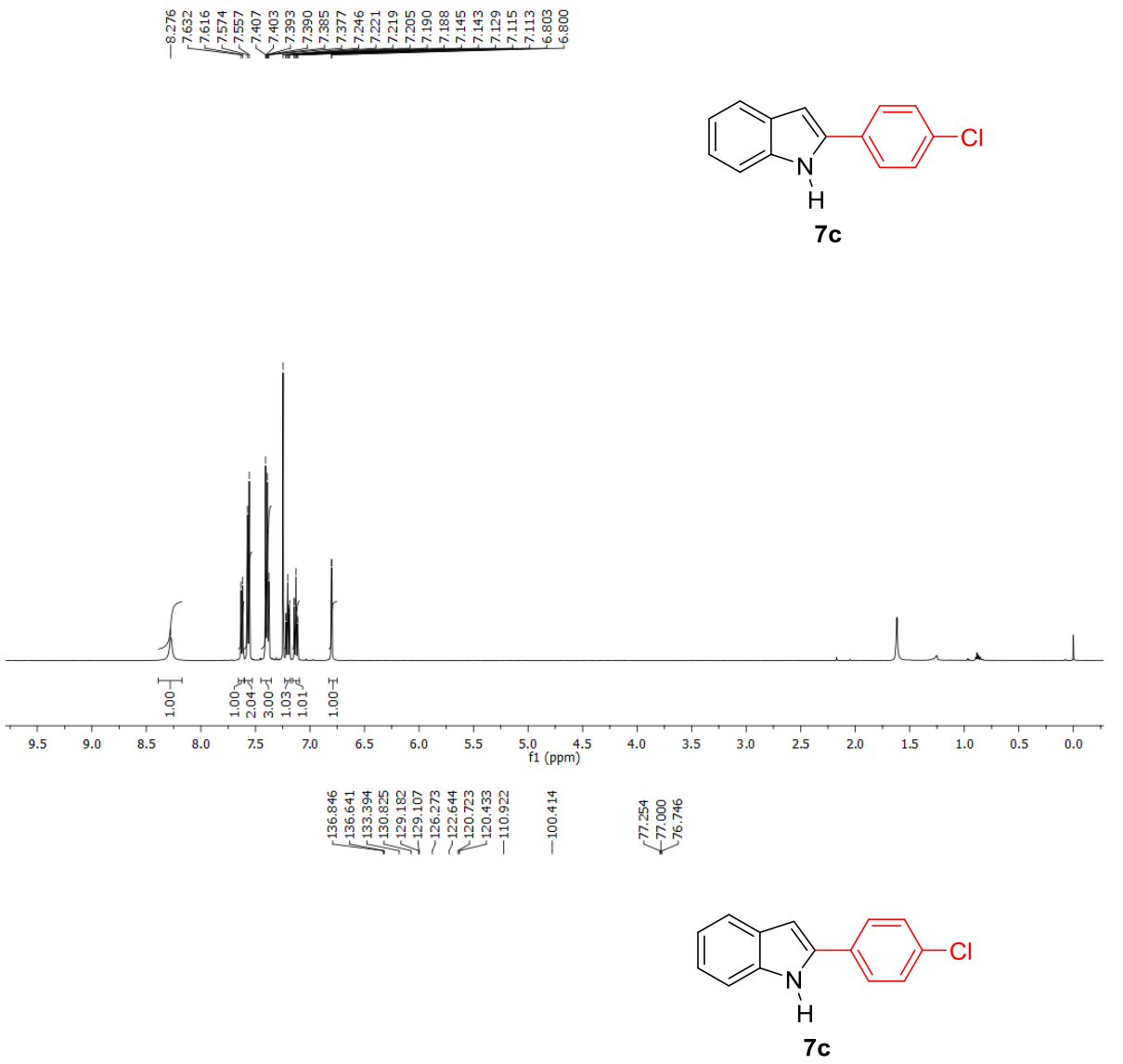


Figure 5.51 ^{1}H and ^{13}C NMR of product **(7c)** in **$CDCl_3$**.

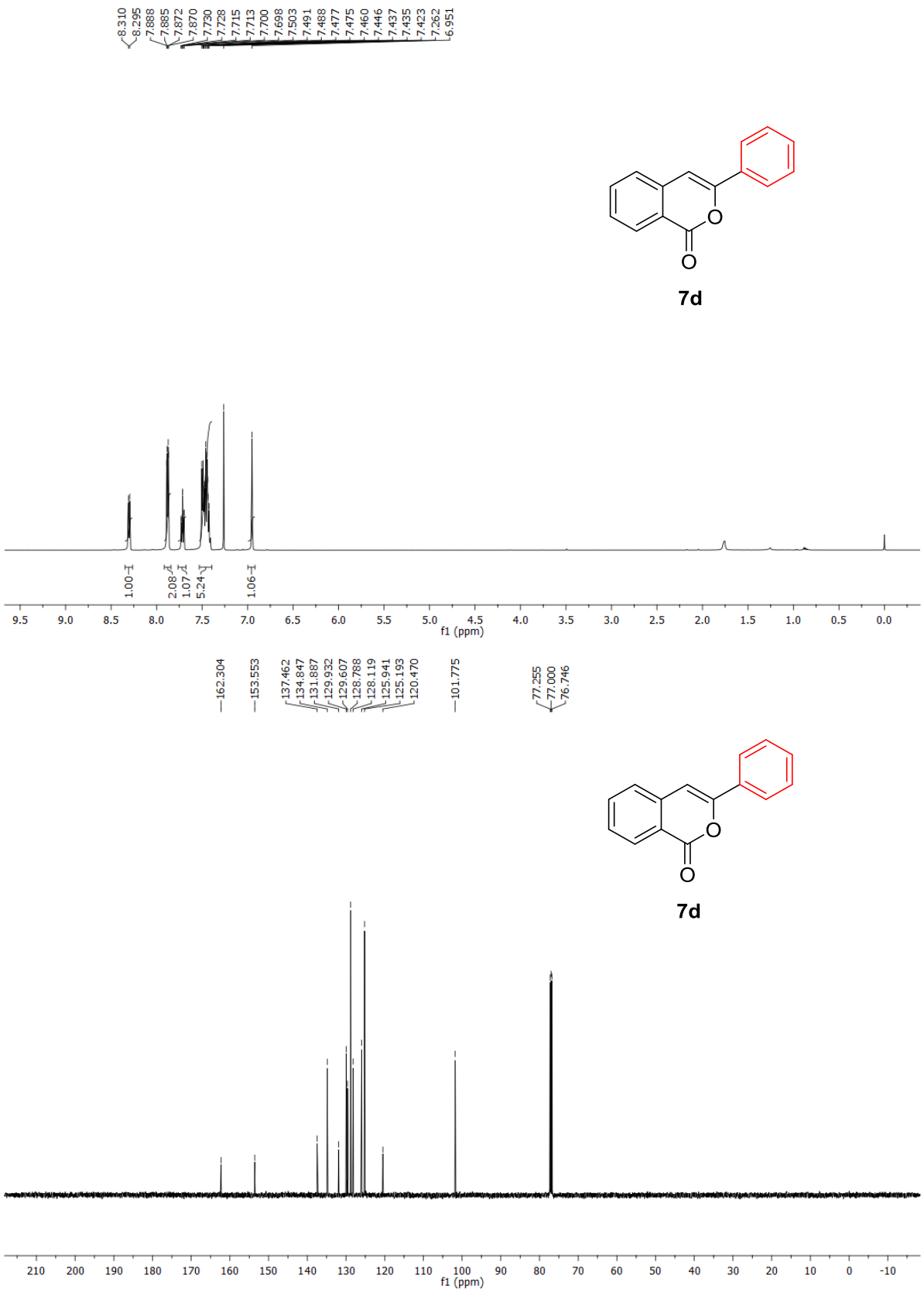


Figure 5.52 ^{1}H and ^{13}C NMR of product **(7d)** in **$CDCl_3$**.

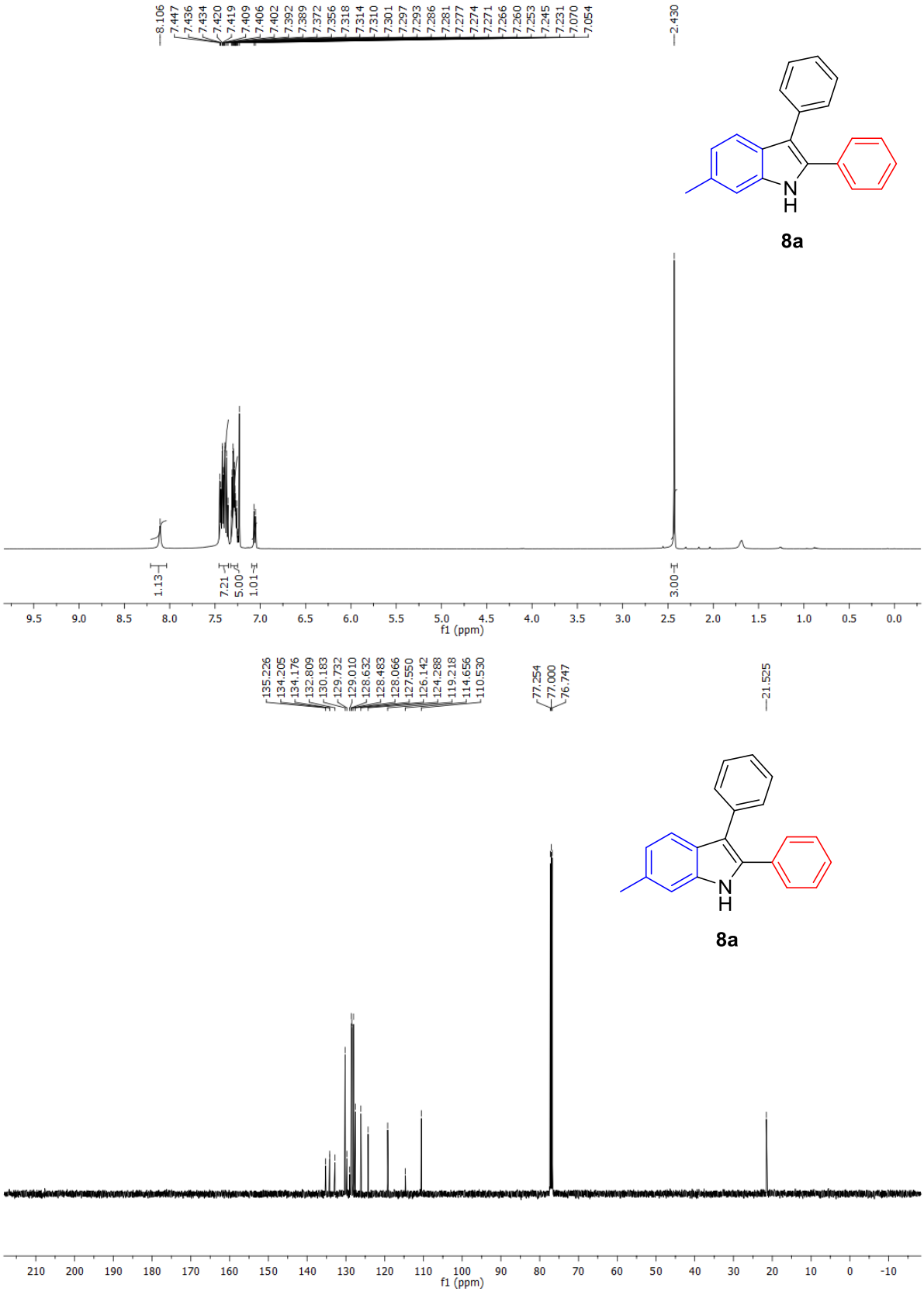


Figure 5.53 ^{1}H and ^{13}C NMR of product **(8a)** in **$CDCl_3$**.

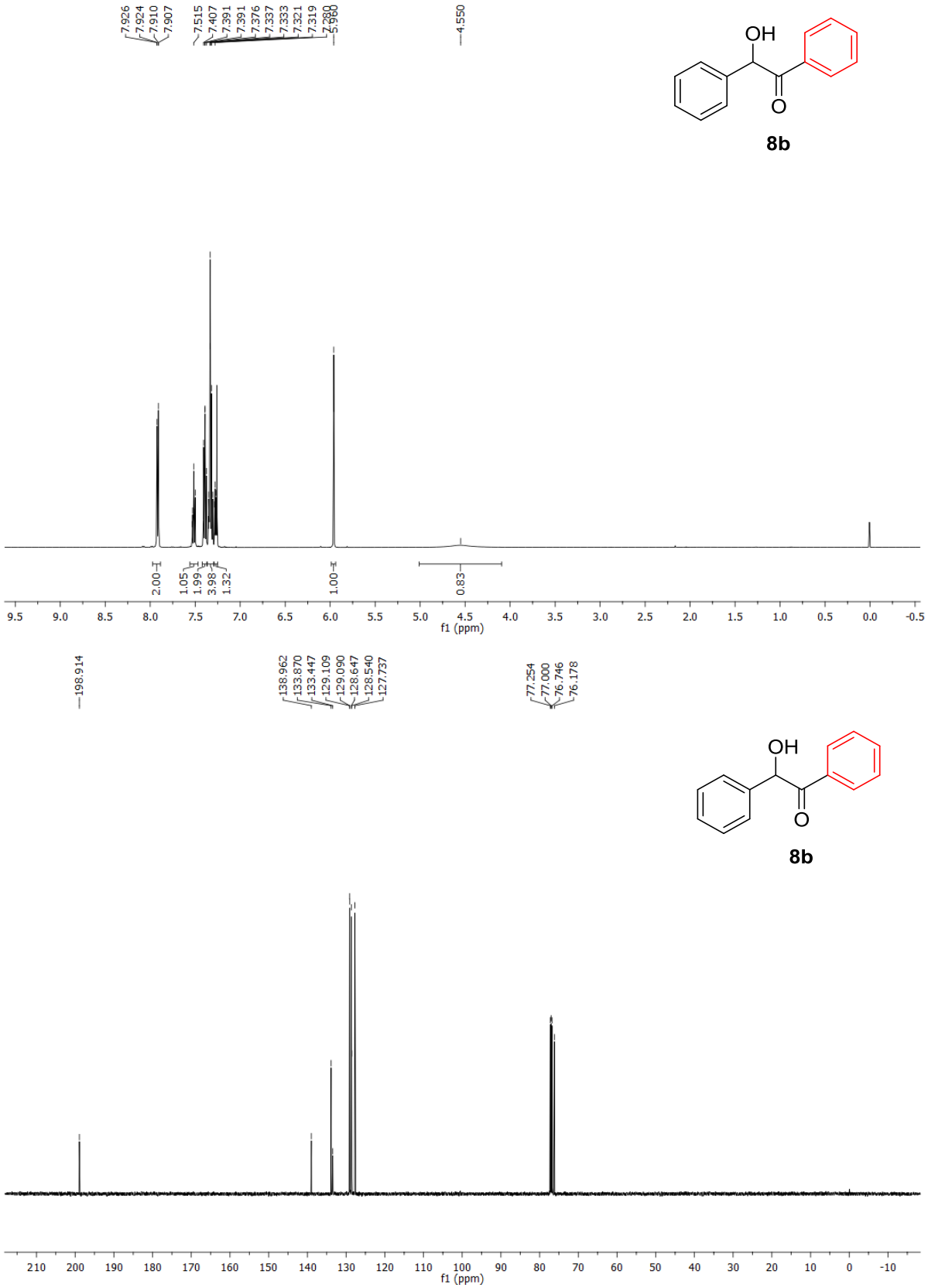


Figure 5.54 ^{1}H and ^{13}C NMR of product **(8b)** in **$CDCl_3$**.

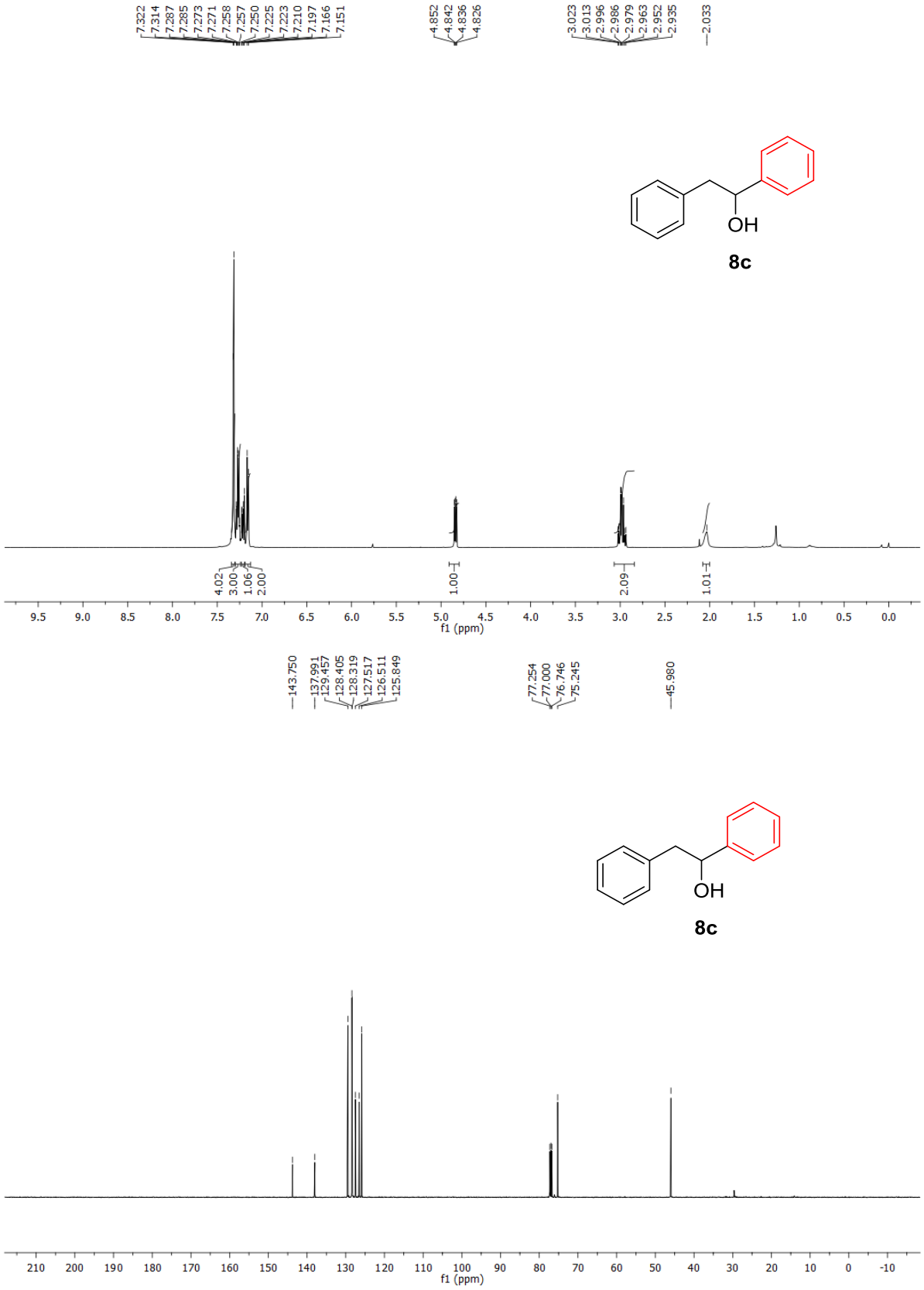


Figure 5.55 ^{1}H and ^{13}C NMR of product **(8c)** in **$CDCl_3$**.

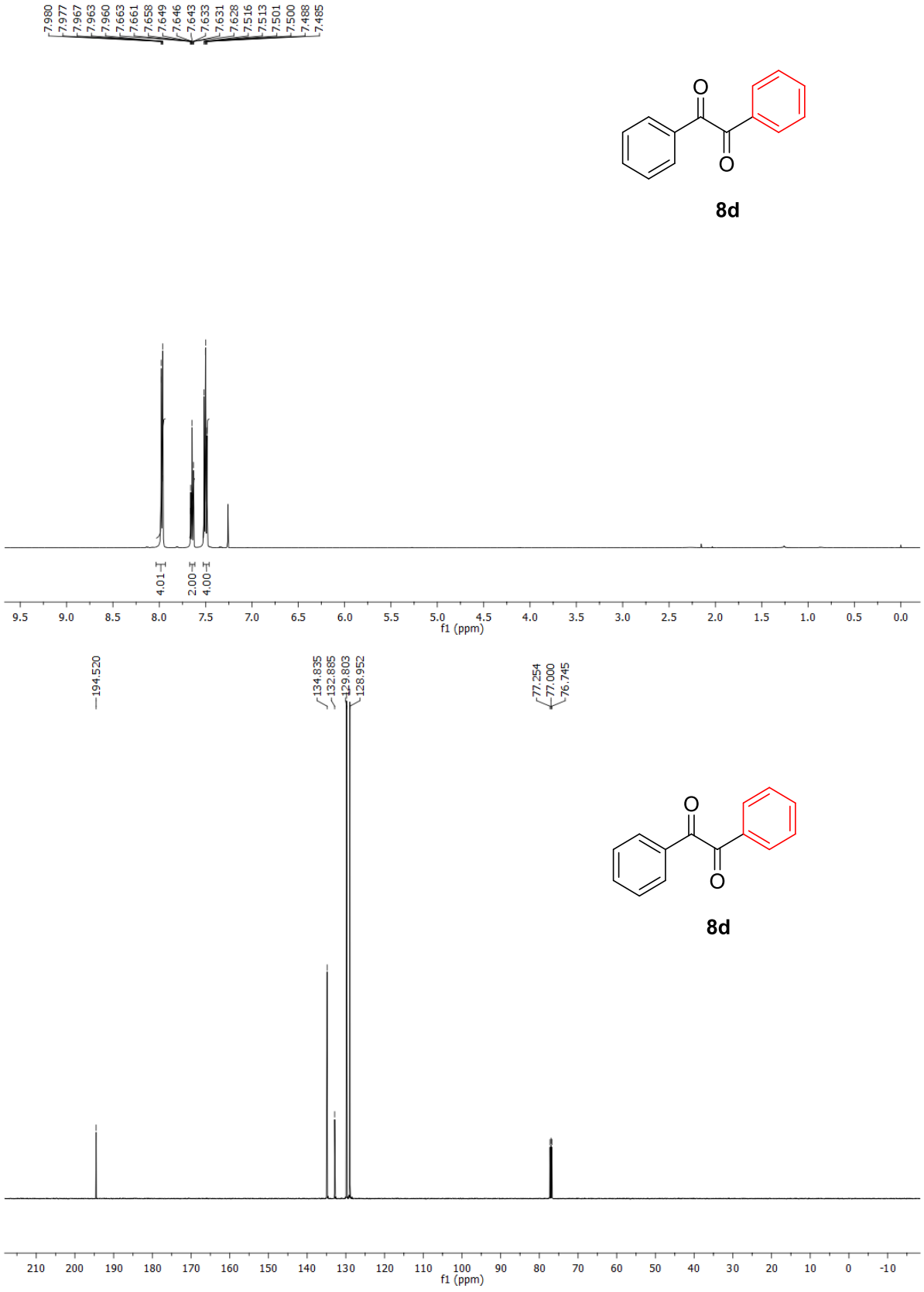


Figure 5.56 ^{1}H and ^{13}C NMR of product **(8d)** in **$CDCl_3$**.

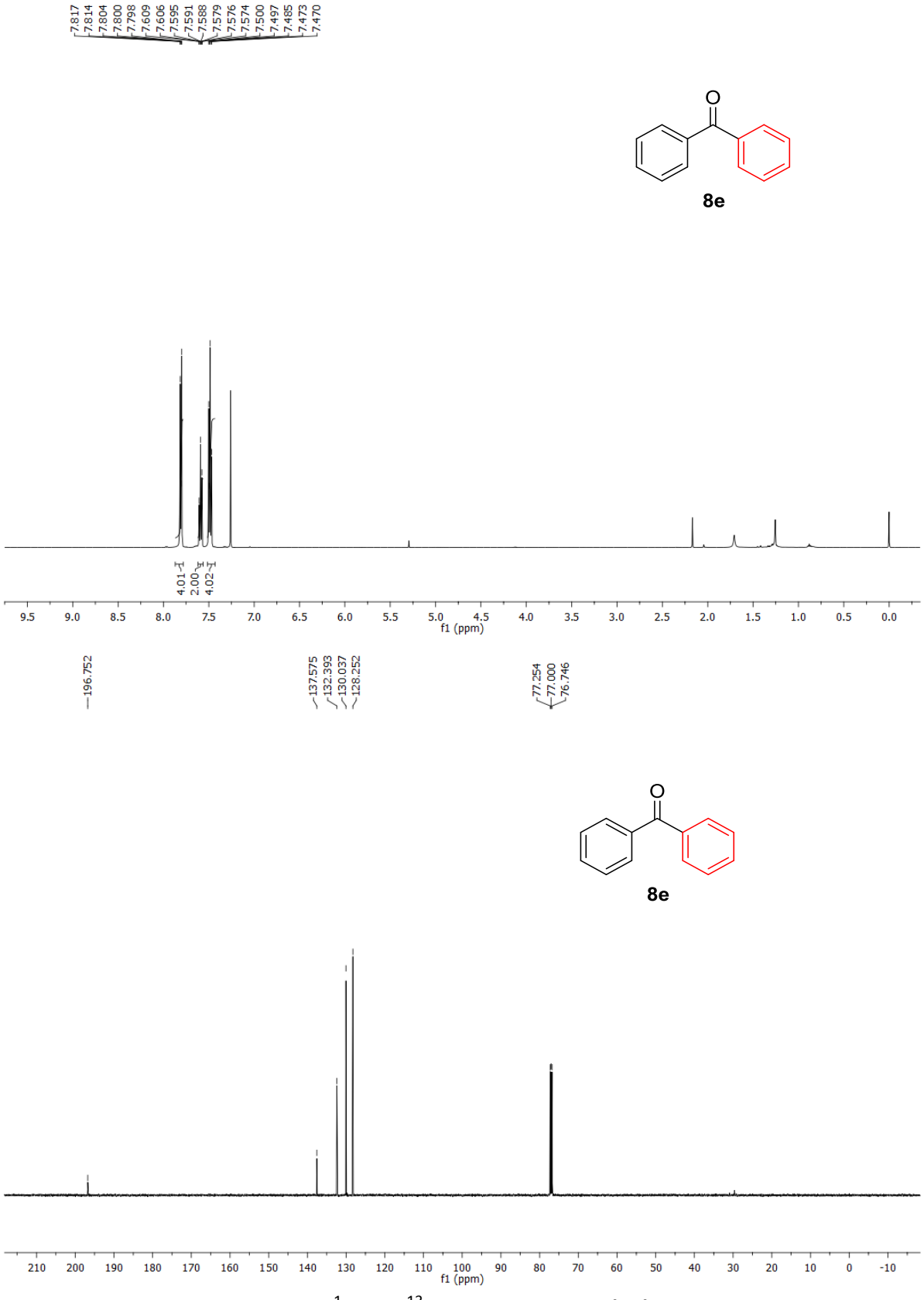


Figure 5.57 ^{1}H and ^{13}C NMR of product **(8e)** in **$CDCl_3$**.

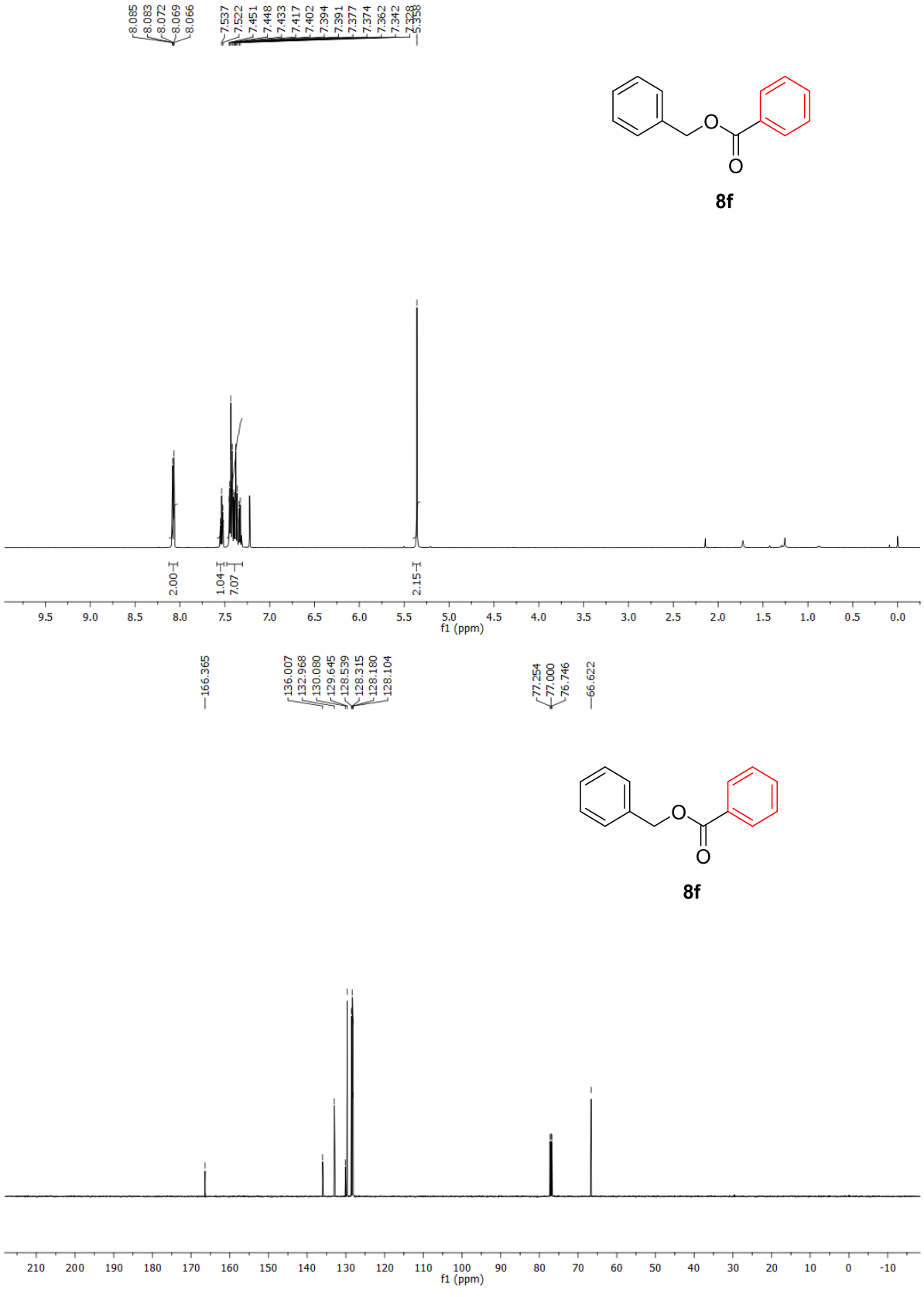


Figure 5.58 ^{1}H and ^{13}C NMR of product **(8f)** in **$CDCl_3$**.