

Supporting Information

Iron-catalyzed Conjugate Addition of Aryl Iodides onto Activated Alkenes under Air in Water

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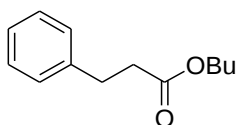
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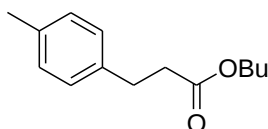
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¹H and ¹³C NMR spectral data of products



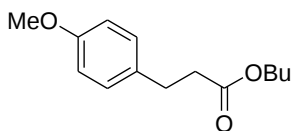
Butyl 3-phenylpropanoate (3a)

Colorless oil.^[1] ¹H NMR (CDCl₃, 300 MHz) δ 0.91 (t, *J* = 7.0 Hz, 3H), 1.30–1.40 (m, 2H), 1.53–1.62 (m, 2H), 2.62 (t, *J* = 7.8 Hz, 2H), 2.95 (t, *J* = 7.8 Hz, 2H), 4.07 (t, *J* = 6.8 Hz, 2H), 7.16–7.21 (m, 2H), 7.24–7.30 (m, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ 13.7, 19.1, 30.7, 31.0, 35.9, 64.3, 126.2, 128.3 (2C), 128.5 (2C), 140.6, 173.0.



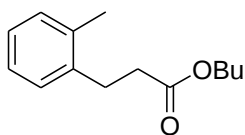
Butyl 3-*p*-tolylpropanoate (3b)

Colorless oil.^[2] ¹H NMR (CDCl₃, 300 MHz) δ 0.91 (t, *J* = 7.4 Hz, 3H), 1.26–1.43 (m, 2H), 1.55–1.65 (m, 2H), 2.31 (s, 3H), 2.60 (t, *J* = 7.4 Hz, 2H), 2.91 (t, *J* = 7.4 Hz, 2H), 4.07 (t, *J* = 6.6 Hz, 2H), 7.09 (s, 4H); ¹³C NMR (CDCl₃, 75 MHz) δ 13.7, 19.1, 21.0, 30.6, 30.7, 36.1, 64.3, 128.2 (2C), 129.2 (2C), 135.7, 137.5, 173.1.



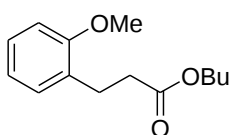
Butyl 3-(4-methoxyphenyl)propanoate (3c)

Colorless oil.^[2] ¹H NMR (CDCl₃, 300 MHz) δ 0.95 (t, *J* = 7.4 Hz, 3H), 1.26–1.43 (m, 2H), 1.45–1.65 (m, 2H), 2.58 (t, *J* = 7.5 Hz, 2H), 2.89 (t, *J* = 7.5 Hz, 2H), 3.78 (s, 3H), 4.06 (t, *J* = 6.6 Hz, 2H), 6.82 (d, *J* = 8.4 Hz, 2H), 7.12 (d, *J* = 8.4 Hz, 2H); ¹³C NMR (CDCl₃, 75 MHz) δ 13.7, 19.1, 30.2, 30.7, 36.2, 55.2, 64.3, 113.9 (2C), 129.2 (2C), 132.7, 158.1, 173.1.



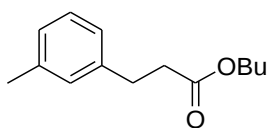
Butyl 3-*o*-tolylpropanoate (3d)

Colorless oil.^[3] ¹H NMR (CDCl₃, 300 MHz) δ 0.93 (t, J = 7.4 Hz, 3H), 1.34–1.41 (m, 2H), 1.57–1.64 (m, 2H), 2.33 (s, 3H), 2.58 (t, J = 7.8 Hz, 2H), 2.95 (t, J = 7.8 Hz, 2H), 4.09 (t, J = 6.8 Hz, 2H), 7.10–7.16 (m, 4H); ¹³C NMR (CDCl₃, 100 MHz) δ 13.7, 19.2, 28.4, 30.7, 34.7, 64.4, 126.1, 126.4, 128.5, 130.3, 130.3, 135.9, 138.7, 173.1.



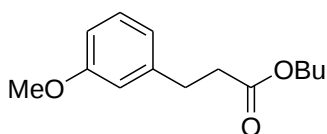
Butyl 3-(2-methoxyphenyl)propanoate (3e)

Colorless oil.^[4] ¹H NMR (CDCl₃, 300 MHz) δ 0.91 (t, J = 7.2 Hz, 3H), 1.29–1.39 (m, 2H), 1.54–1.61 (m, 2H), 2.59 (t, J = 7.8 Hz, 2H), 2.93 (t, J = 7.8 Hz, 2H), 3.81 (s, 3H), 4.05 (t, J = 6.8 Hz, 2H), 6.81–6.88 (m, 2H), 7.12–7.20 (m, 2H); ¹³C NMR (CDCl₃, 100 MHz) δ 13.7, 19.1, 26.1, 30.7, 34.3, 55.2, 64.2, 110.2, 120.4, 127.5, 128.9, 129.9, 157.5, 173.5.



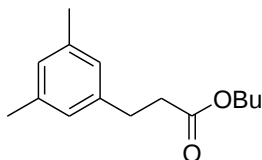
Butyl 3-*m*-tolylpropanoate (3f)

Colorless oil.^[4] ¹H NMR (CDCl₃, 300 MHz) δ 0.93 (t, J = 7.4 Hz, 3H), 1.31–1.41 (m, 2H), 1.56–1.63 (m, 2H), 2.33 (s, 3H), 2.62 (t, J = 7.8 Hz, 2H), 2.93 (t, J = 7.8 Hz, 2H), 4.09 (t, J = 6.6 Hz, 2H), 7.00–7.03 (m, 3H), 7.16–7.20 (m, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 13.7, 19.1, 21.4, 30.7, 36.0, 64.3, 125.3, 127.0, 128.4, 129.1, 138.0, 140.6, 173.1.

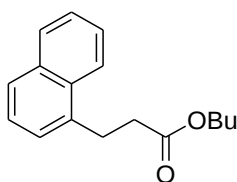


Butyl 3-(3-methoxyphenyl)propanoate (3g)

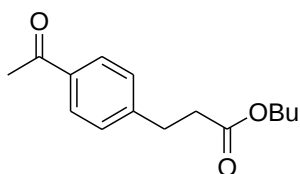
Colorless oil.^[4] ^1H NMR (CDCl_3 , 300 MHz) δ 0.90 (t, J = 7.4 Hz, 3H), 1.29–1.38 (m, 2H), 1.54–1.61 (m, 2H), 2.60 (t, J = 7.8 Hz, 2H), 2.91 (t, J = 7.8 Hz, 2H), 3.77 (s, 3H), 4.06 (t, J = 6.8 Hz, 2H), 6.72–6.78 (m, 3H), 7.16–7.20 (m, 1H); ^{13}C NMR (CDCl_3 , 75 MHz) δ 13.7, 19.1, 30.7, 31.1, 35.8, 55.1, 64.3, 111.6, 114.1, 120.6, 129.5, 142.2, 159.7, 173.0.

**Butyl 3-(3,5-dimethylphenyl)propanoate (3h)**

Colorless oil. ^1H NMR (CDCl_3 , 300 MHz) δ 0.93 (t, J = 7.4 Hz, 3H), 1.32–1.39 (m, 2H), 1.55–1.64 (m, 2H), 2.29 (s, 6H), 2.60 (t, J = 7.8 Hz, 2H), 2.88 (t, J = 7.8 Hz, 2H), 4.08 (t, J = 6.6 Hz, 2H), 6.83 (s, 2H), 6.84 (s, 1H); ^{13}C NMR (CDCl_3 , 75 MHz) δ 13.8, 19.2, 21.3 (2C), 30.7, 30.9, 36.1, 64.3, 126.1 (2C), 127.9, 138.0 (2C), 140.5, 173.2. HRMS (EI) calcd for $\text{C}_{15}\text{H}_{22}\text{O}_2$ 234.1620; found 234.1617.

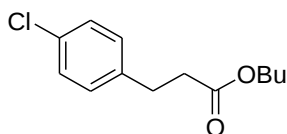
**Butyl 3-(naphthalen-1-yl)propanoate (3i)**

Colorless oil.^[4] ^1H NMR (CDCl_3 , 300 MHz) δ 0.92 (t, J = 7.4 Hz, 3H), 1.30–1.39 (m, 2H), 1.55–1.63 (m, 2H), 2.76 (t, J = 7.8 Hz, 2H), 3.42 (t, J = 7.8 Hz, 2H), 4.10 (t, J = 6.6 Hz, 2H), 7.34–7.37 (m, 2H), 7.39–7.53 (m, 2H), 7.73 (d, J = 8 Hz, 1H), 7.84 (d, J = 8 Hz, 1H), 8.03 (d, J = 8.4 Hz, 1H); ^{13}C NMR (CDCl_3 , 75 MHz) δ 13.7, 19.1, 28.2, 30.7, 35.3, 64.5, 123.4, 125.6, 125.6, 125.9, 126.1, 127.1, 128.9, 131.7, 133.9, 136.6, 173.1.



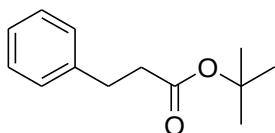
Butyl 3-(4-acetylphenyl)propanoate (3j)

Colorless oil.^[4] ^1H NMR (CDCl_3 , 300 MHz) δ 0.88 (t, J = 7.4 Hz, 3H), 1.23–1.33 (m, 2H), 1.49–1.59 (m, 2H), 2.56 (s, 3H), 2.62 (t, J = 7.8 Hz, 2H), 2.98 (t, J = 7.8 Hz, 2H), 4.04 (t, J = 6.6 Hz, 2H), 7.27 (d, J = 8.2 Hz, 2H), 7.82 (d, J = 8.2 Hz, 2H); ^{13}C NMR (CDCl_3 , 75 MHz) δ 13.7, 19.1, 26.5, 30.6, 30.9, 35.3, 64.5, 128.5 (2C), 128.6 (2C), 135.5, 146.3, 172.6, 197.7.



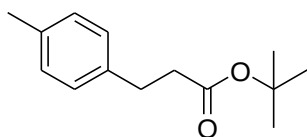
Butyl 3-(4-chlorophenyl)propanoate (3k)

Colorless oil.^[2] ^1H NMR (CDCl_3 , 300 MHz) δ 0.90 (t, J = 7.4 Hz, 3H), 1.24–1.38 (m, 2H), 1.45–1.61 (m, 2H), 2.58 (t, J = 7.6 Hz, 2H), 2.90 (t, J = 7.6 Hz, 2H), 4.05 (t, J = 6.6 Hz, 2H), 7.12 (d, J = 8.6 Hz, 2H), 7.23 (d, J = 8.6 Hz, 2H); ^{13}C NMR (CDCl_3 , 75 MHz) δ 13.6, 19.0, 30.2, 30.6, 35.7, 64.4, 128.5 (2C), 129.6 (2C), 131.9, 138.9, 172.7.



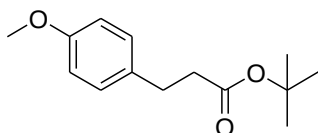
tert-Butyl 3-phenylpropanoate (4a)

Colorless oil.^[6] ^1H NMR (CDCl_3 , 400 MHz) δ 1.45 (s, 9H), 2.57 (t, J = 7.8 Hz, 2H), 2.94 (t, J = 7.8 Hz, 2H), 7.23–7.32 (m, 5H); ^{13}C NMR (CDCl_3 , 100 MHz) δ 28.1 (3C), 31.4, 37.1, 80.2, 126.1, 128.3 (2C), 128.4 (2C), 140.8, 172.3.

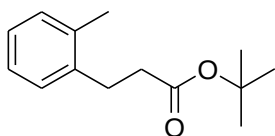


tert-Butyl 3-p-tolylpropanoate (4b)

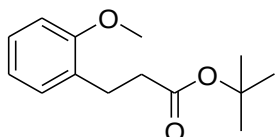
Colorless oil.^[7] ¹H NMR (CDCl₃, 400 MHz) δ 1.48 (s, 9H), 2.36 (s, 3H), 2.56 (t, *J* = 7.8 Hz, 2H), 2.92 (t, *J* = 7.8 Hz, 2H), 7.13 (s, 4H); ¹³C NMR (CDCl₃, 100 MHz) δ 21.0, 28.1 (3C), 30.8, 37.3, 80.3, 128.2 (2C), 129.1 (2C), 135.5, 137.8, 172.4.

**tert-Butyl 3-(4-methoxyphenyl)propanoate (4c)**

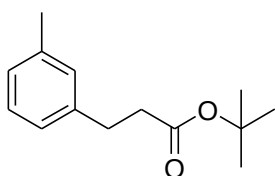
Colorless oil.^[7] ¹H NMR (CDCl₃, 400 MHz) δ 1.40 (s, 9H), 2.48 (t, *J* = 7.7 Hz, 2H), 2.83 (t, *J* = 7.7 Hz, 2H), 3.76 (s, 3H), 6.80 (d, *J* = 8.6 Hz, 2H), 7.09 (d, *J* = 8.6 Hz, 2H); ¹³C NMR (CDCl₃, 100 MHz) δ 28.1 (3C), 30.3, 37.4, 55.2, 80.2, 113.8 (2C), 129.2 (2C), 132.9, 158.0, 172.3.

**tert-Butyl 3-o-tolylpropanoate (4d)**

Colorless oil.^[8] ¹H NMRz (CDCl₃, 400 MHz) δ 1.43 (s, 9H), 2.31 (s, 3H), 2.49 (t, *J* = 8.0 Hz, 2H), 2.89 (t, *J* = 8.0 Hz, 2H), 7.09–7.13 (m, 4H); ¹³C NMR (CDCl₃, 100 MHz) δ 19.2, 28.0, 28.3, 35.6, 80.3, 125.9, 126.2, 128.4, 130.1, 137.0, 138.8, 172.4.

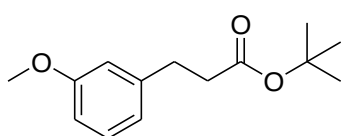
**tert-Butyl 3-(2-methoxyphenyl)propanoate (4e)**

Colorless oil.^[8] ¹H NMR (CDCl₃, 300 MHz) δ 1.41 (s, 9H), 2.50 (t, *J* = 7.8 Hz, 2H), 2.88 (t, *J* = 7.8 Hz, 2H), 3.80 (s, 3H), 6.80–6.87 (m, 2H), 7.11–7.19 (m, 2H); ¹³C NMR (CDCl₃, 75 MHz) δ 26.2, 28.1 (3C), 35.4, 55.2, 80.1, 110.1, 120.3, 127.4, 129.1, 129.9, 157.5, 172.8.



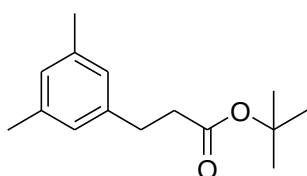
tert-Butyl 3-(3-methylphenyl)propanoate (4f)

Colorless oil.^[8] ¹H NMR (CDCl₃, 400 MHz) δ 1.42 (s, 9H), 2.32 (s, 3H), 2.52 (t, *J* = 7.8 Hz, 2H), 2.87 (t, *J* = 7.8 Hz, 2H), 6.99–7.01 (m, 3H), 7.14–7.18 (m, 1H); ¹³C NMR (CDCl₃, 100 MHz) δ 21.4, 28.1 (3C), 31.1, 37.2, 80.3, 125.3, 126.8, 128.3, 129.2, 137.9, 140.7, 172.3.



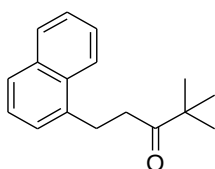
tert-Butyl 3-(3-methoxyphenyl)propanoate (4g)

Colorless oil.^[9] ¹H NMR (CDCl₃, 300 MHz) δ 1.41 (s, 9H), 2.52 (t, *J* = 7.8 Hz, 2H), 2.87 (t, *J* = 7.8 Hz, 2H), 3.76 (s, 3H), 6.71–6.79 (m, 3H), 7.15–7.20 (m, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 28.1 (3C), 31.2, 37.0, 55.1, 80.3, 111.6, 114.0, 120.7, 129.4, 142.4, 159.7, 172.3.



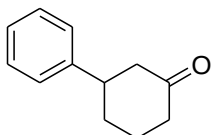
tert-Butyl 3-(3,5-dimethylphenyl)propanoate (4h)

Colorless oil. ¹H NMR (CDCl₃, 400 MHz) δ 1.44 (s, 9H), 2.29 (s, 6H), 2.52 (t, *J* = 7.9 Hz, 2H), 2.84 (t, *J* = 7.9 Hz, 2H), 6.82 (s, 2H), 6.83 (s, 1H); ¹³C NMR (CDCl₃, 100 MHz) δ 21.2 (2C), 28.1 (3C), 31.0, 37.2, 80.2, 126.2 (2C), 127.7, 137.8 (2C), 140.7, 172.4. HRMS (EI) calcd for C₁₅H₂₂O₂ 234.1620; found 234.1615.

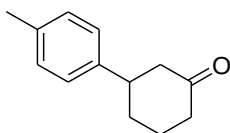


tert-Butyl 3-(naphthalen-1-yl)propanoate (4i)

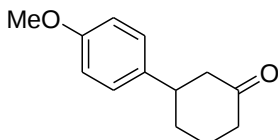
Colorless oil.^[8] ¹H NMR (CDCl₃, 400 MHz) δ 1.47t (s, 9H), 2.70 (t, *J* = 7.9 Hz, 2H), 3.40 (t, *J* = 7.9 Hz, 2H), 7.34–7.40 (m, 2H), 7.41–7.54 (m, 2H), 7.74 (d, *J* = 6.8 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 1H), 8.03 (d, *J* = 8.4 Hz, 1H); ¹³C NMR (CDCl₃, 100 MHz) δ 28.2 (3C), 29.7, 34.8, 36.4, 80.5, 123.5, 125.6, 125.9, 126.0, 127.0, 128.9, 131.7, 133.9, 136.8, 172.5.

**3-Phenylcyclohexanone (5a)**

Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.73–1.90 (m, 2H), 2.03–2.16 (m, 2H), 2.35–2.57 (m, 4H), 2.96–3.03 (m, 1H), 7.19–7.34 (m, 5H); ¹³C NMR (CDCl₃, 75 MHz) δ 25.5, 32.7, 41.1, 44.7, 48.9, 126.5 (2C), 126.6, 128.6 (2C), 144.3, 211.1.

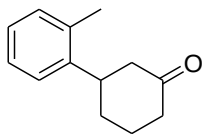
**3-p-Tolylcyclohexanone (5b)**

Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.77–1.88 (m, 2H), 2.03–2.15 (m, 2H), 2.31 (s, 3H), 2.36–2.55 (m, 4H), 2.91–3.00 (m, 1H), 7.08–7.14 (m, 4H); ¹³C NMR (CDCl₃, 75 MHz) δ 21.0, 25.5, 32.8, 41.2, 44.4, 49.0, 126.4 (2C), 129.3 (2C), 136.2, 141.4, 211.3.

**3-(4-Methoxyphenyl)cyclohexanone (5c)**

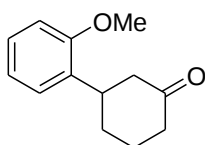
Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.66–1.85 (m, 2H), 2.00–2.44 (m, 2H), 2.29–2.58 (m, 4H), 2.88–2.98 (m, 1H), 3.76 (s, 3H), 6.85 (d, *J* = 7.8 Hz, 2H), 7.12 (d, *J* = 7.8 Hz, 2H); ¹³C

NMR (CDCl₃, 75 MHz) δ 25.5, 33.0, 41.2, 43.9, 49.2, 55.2, 114.0 (2C), 127.5 (2C), 136.5, 158.2, 211.3.



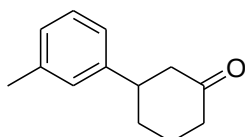
3-o-Tolylcyclohexanone (5d)

Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.73–1.92 (m, 2H), 1.97–2.03 (m, 1H), 2.15–2.18 (m, 1H), 2.30 (s, 3H), 2.38–2.51 (m, 4H), 3.14–3.23 (m, 1H), 7.09–7.21 (m, 4H); ¹³C NMR (CDCl₃, 75 MHz) δ 19.3, 25.8, 32.0, 40.3, 41.3, 48.3, 125.0, 126.3 (2C), 130.6, 135.1, 142.2, 211.4.



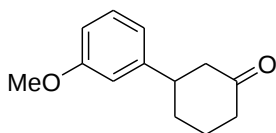
3-(2-Methoxyphenyl)cyclohexanone (5e)

Colorless oil.^[11] ¹H NMR (CDCl₃, 300 MHz) δ 1.75–1.92 (m, 2H), 1.99–2.13 (m, 2H), 2.30–2.58 (m, 4H), 3.36–3.44 (m, 1H), 3.80 (s, 3H), 6.85 (d, J = 7.8 Hz, 1H), 6.93 (dd, J = 7.8, 7.2 Hz, 1H), 7.16–7.23 (m, 2H); ¹³C NMR (CDCl₃, 75 MHz) δ 25.6, 30.9, 37.9, 41.4, 47.5, 55.2, 110.5, 120.6, 126.5, 127.5, 132.4, 156.6, 211.8.



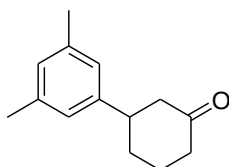
3-m-Tolylcyclohexanone (5f)

Colorless oil.^[11] ¹H NMR (CDCl₃, 300 MHz) δ 1.71–1.90 (m, 2H), 2.03–2.16 (m, 2H), 2.33 (s, 3H), 2.37–2.56 (m, 4H), 2.90–3.01 (m, 1H), 6.99–7.05 (m, 3H), 7.18–7.21 (m, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 21.4, 25.6, 32.8, 41.2, 44.7, 48.9, 123.5, 127.3, 127.4, 128.5, 138.2, 144.3, 211.2.



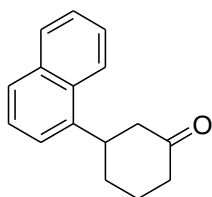
3-(3-Methoxyphenyl)cyclohexanone (5g)

Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.71–1.89 (m, 2H), 2.04–2.16 (m, 2H), 2.30–2.60 (m, 4H), 2.91–3.01 (m, 1H), 3.79 (s, 3H), 6.74–6.81 (m, 3H), 7.20–7.26 (m, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 25.5, 32.6, 41.2, 44.7, 48.9, 55.2, 111.6, 112.6, 118.9, 129.6, 146.0, 159.8, 211.1.



3-(3,5-Dimethylphenyl)cyclohexanone (5h)

Colorless oil.^[10] ¹H NMR (CDCl₃, 300 MHz) δ 1.71–1.89 (m, 2H), 2.02–2.16 (m, 2H), 2.29 (s, 6H), 2.34–2.54 (m, 4H), 2.87–2.95 (m, 1H), 6.82 (s, 2H), 6.86 (s, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 21.3 (2C), 25.6, 32.8, 41.2, 44.7, 49.0, 124.4 (2C), 128.3, 138.1 (2C), 144.3, 211.4.



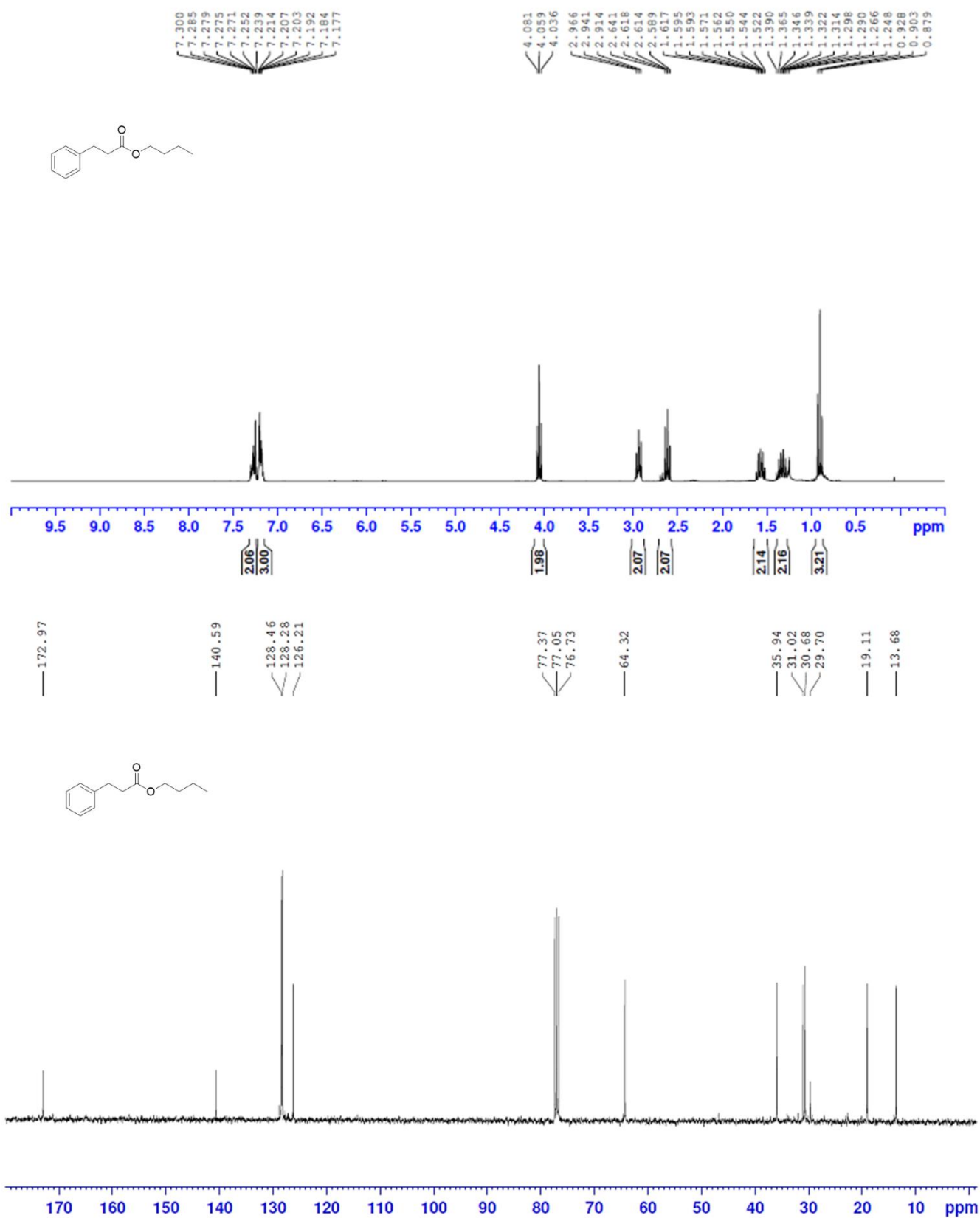
3-(Naphthalen-1-yl)cyclohexanone (5i)

Colorless oil.^[12] ¹H NMR (CDCl₃, 300 MHz) δ 1.88–2.05 (m, 2H), 2.16–2.25 (m, 2H), 2.39–2.77 (m, 4H), 3.79–3.88 (m, 1H), 7.37–7.54 (m, 4H), 7.74 (d, J = 7.8 Hz, 1H), 7.81–7.93 (m, 1H), 8.02 (d, J = 8.1 Hz, 1H); ¹³C NMR (CDCl₃, 75 MHz) δ 25.5, 32.2, 39.3, 41.4, 48.5, 122.4, 122.7, 125.5, 125.6, 126.2, 127.2, 129.0, 130.8, 133.9, 140.0, 211.4.

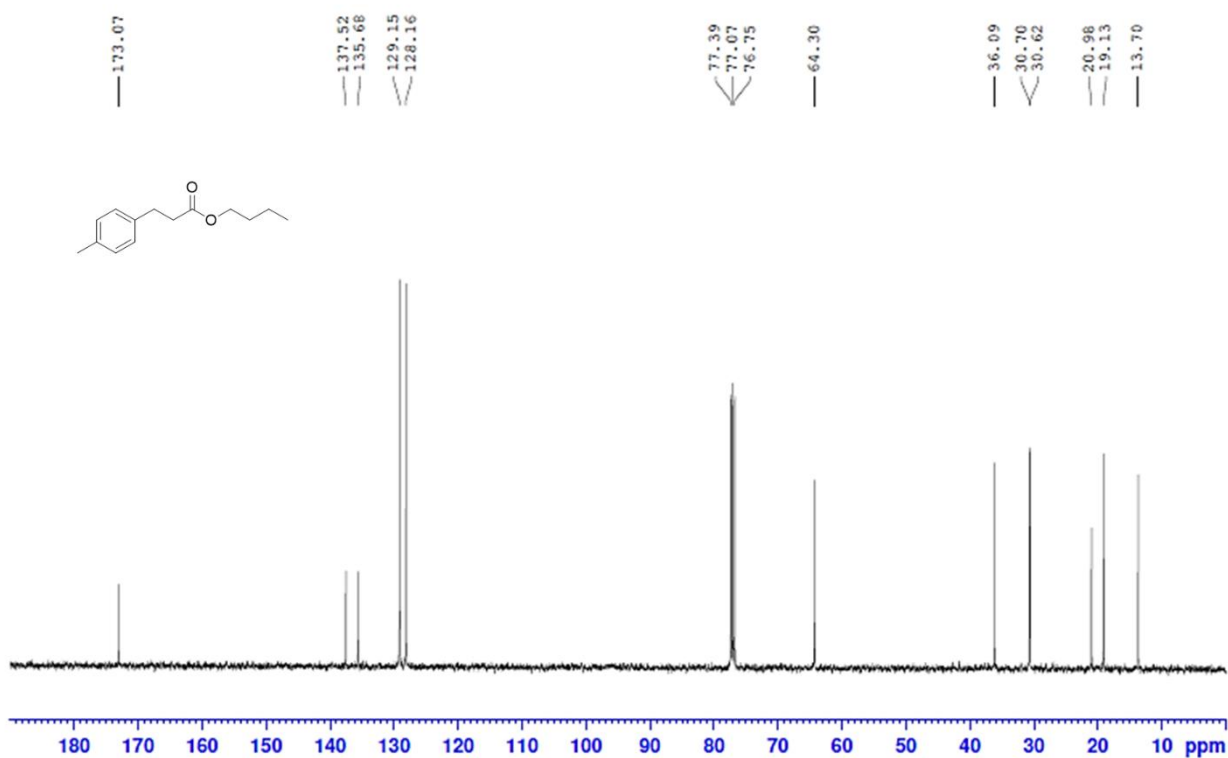
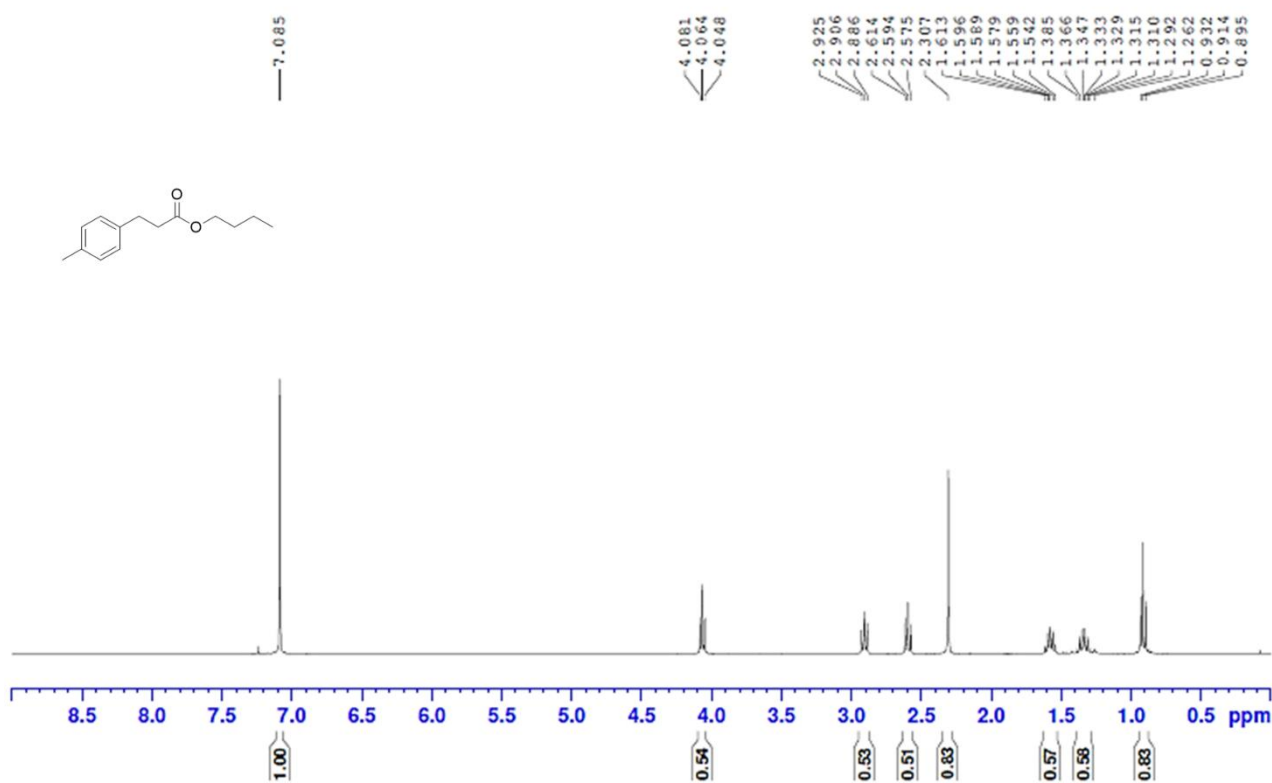
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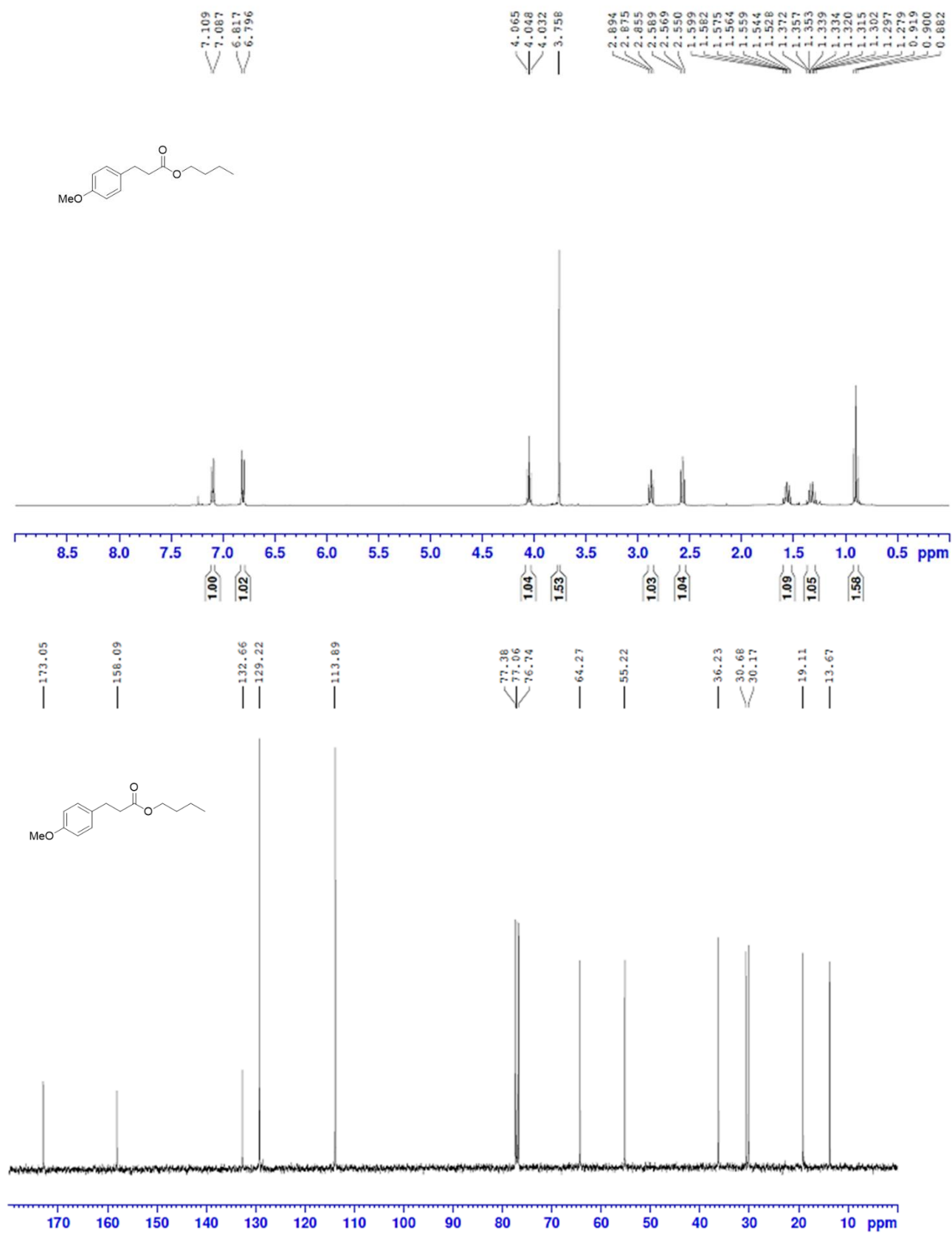
^1H and ^{13}C NMR spectrum of compound **3a**



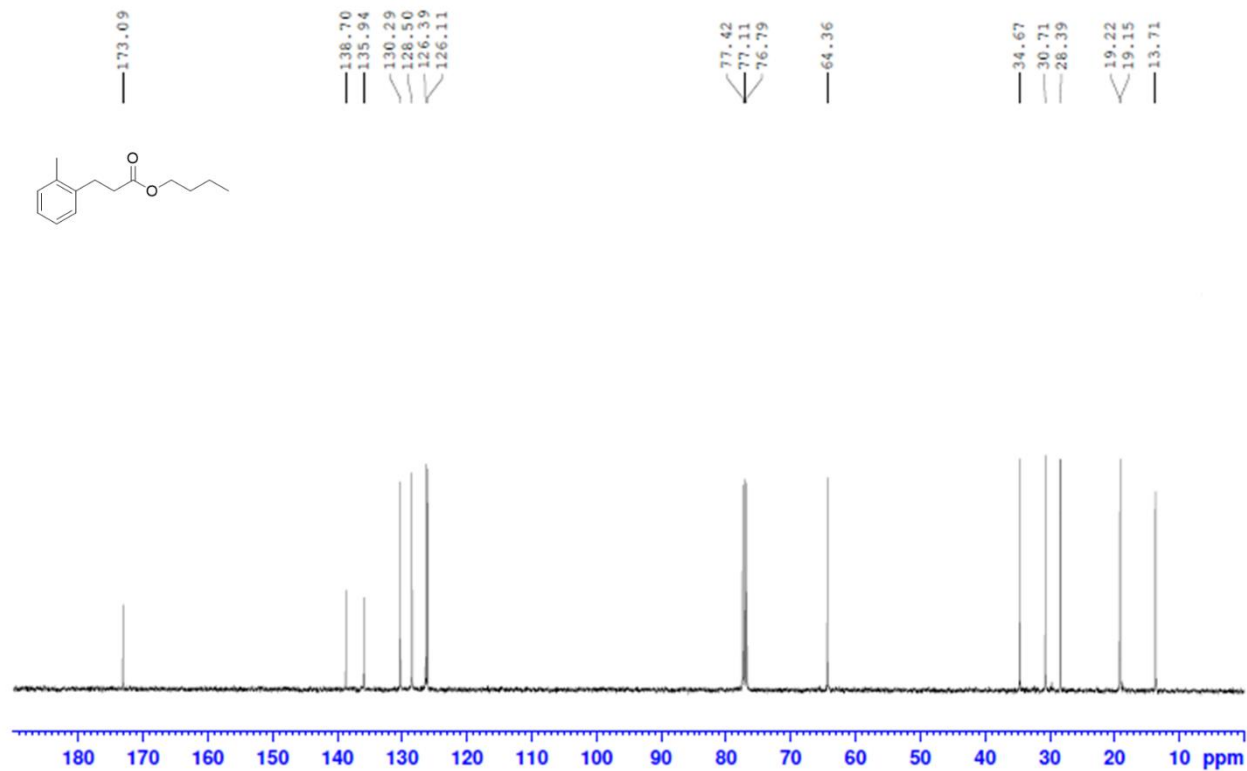
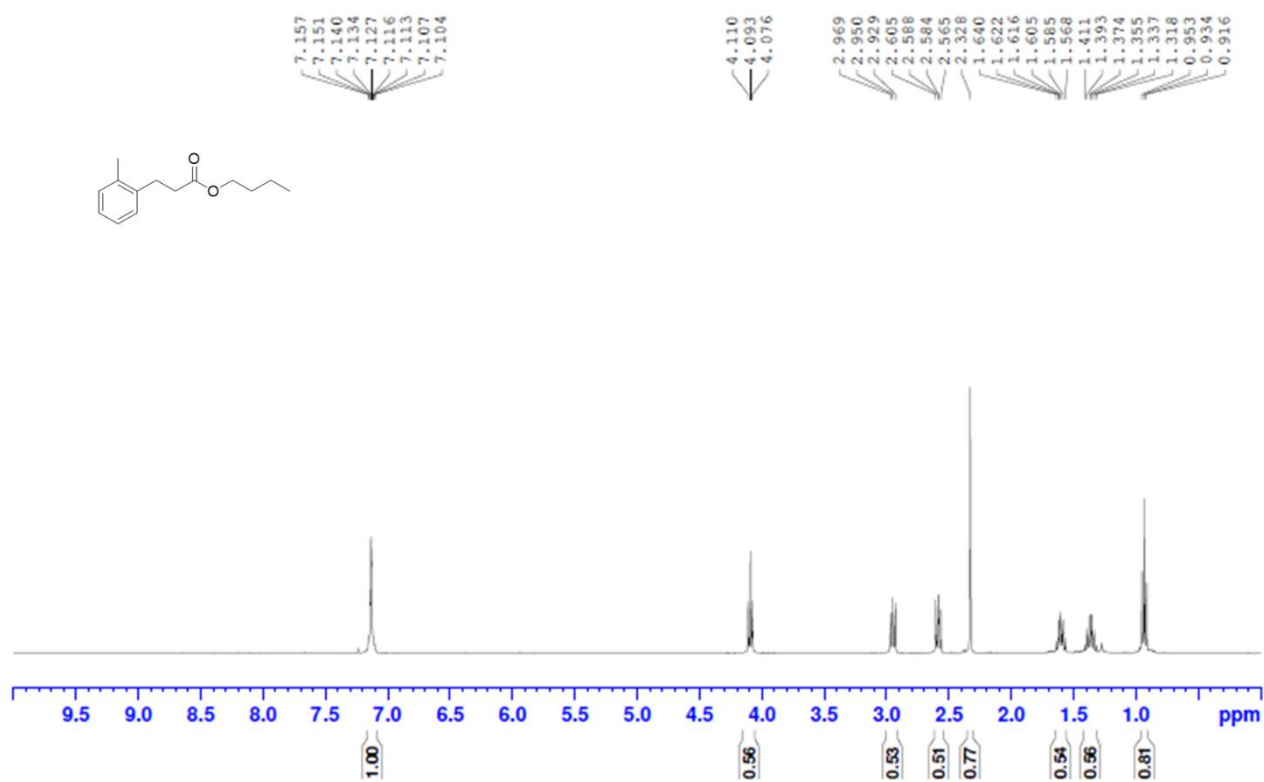
^1H and ^{13}C NMR spectrum of compound **3b**



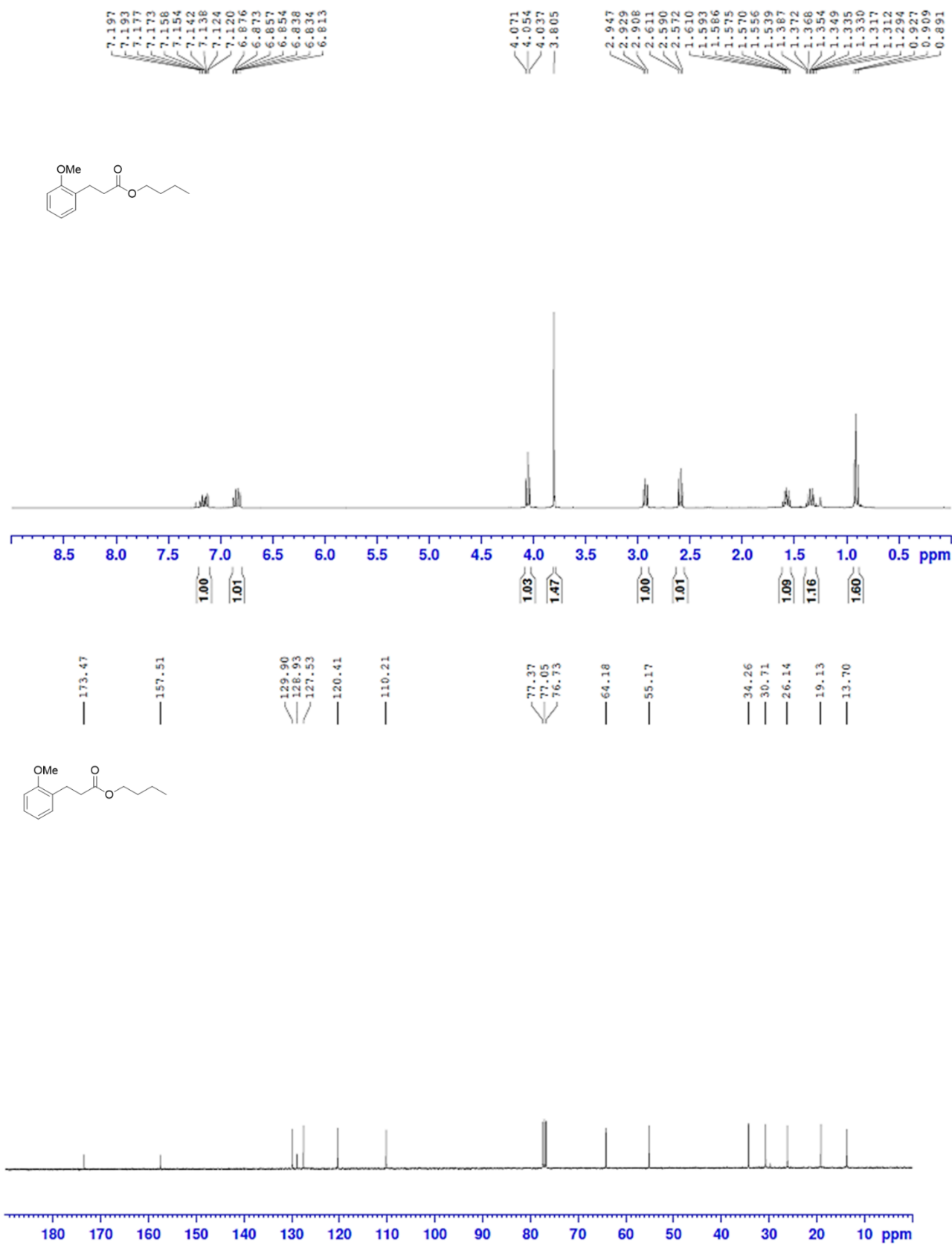
^1H and ^{13}C NMR spectrum of compound **3c**



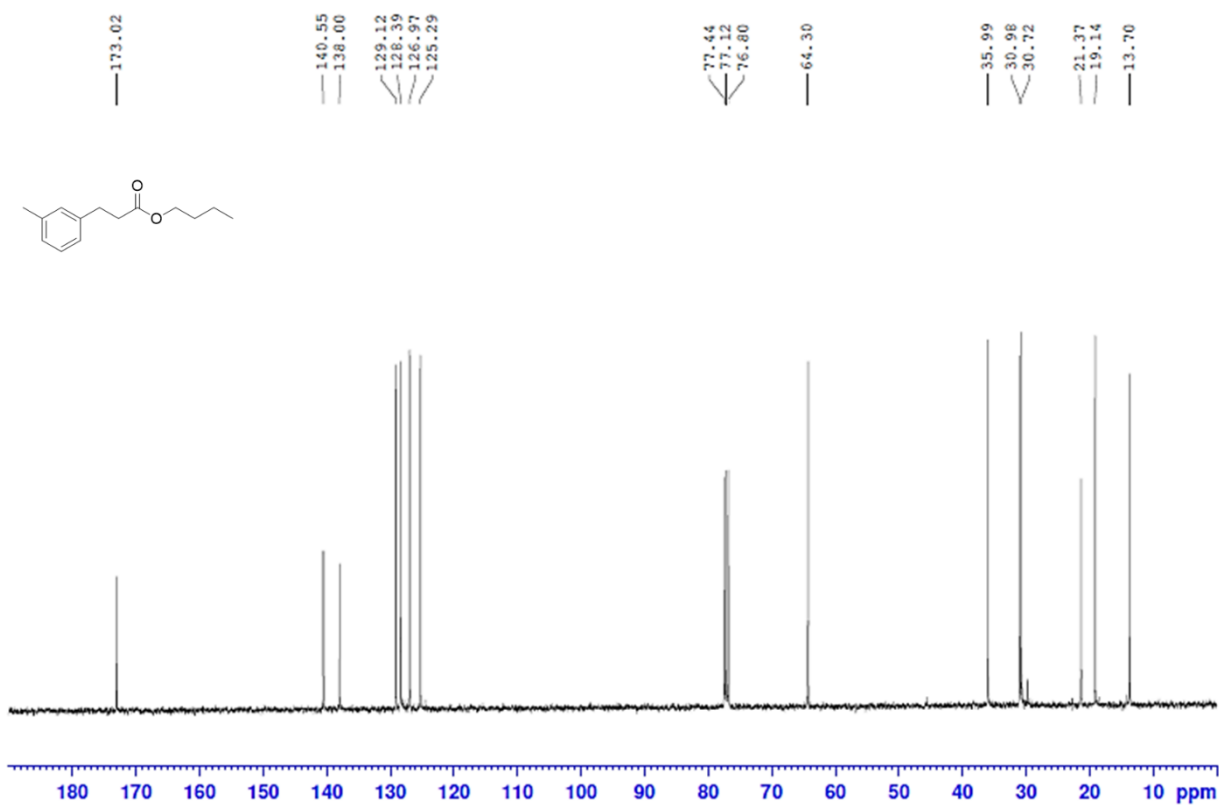
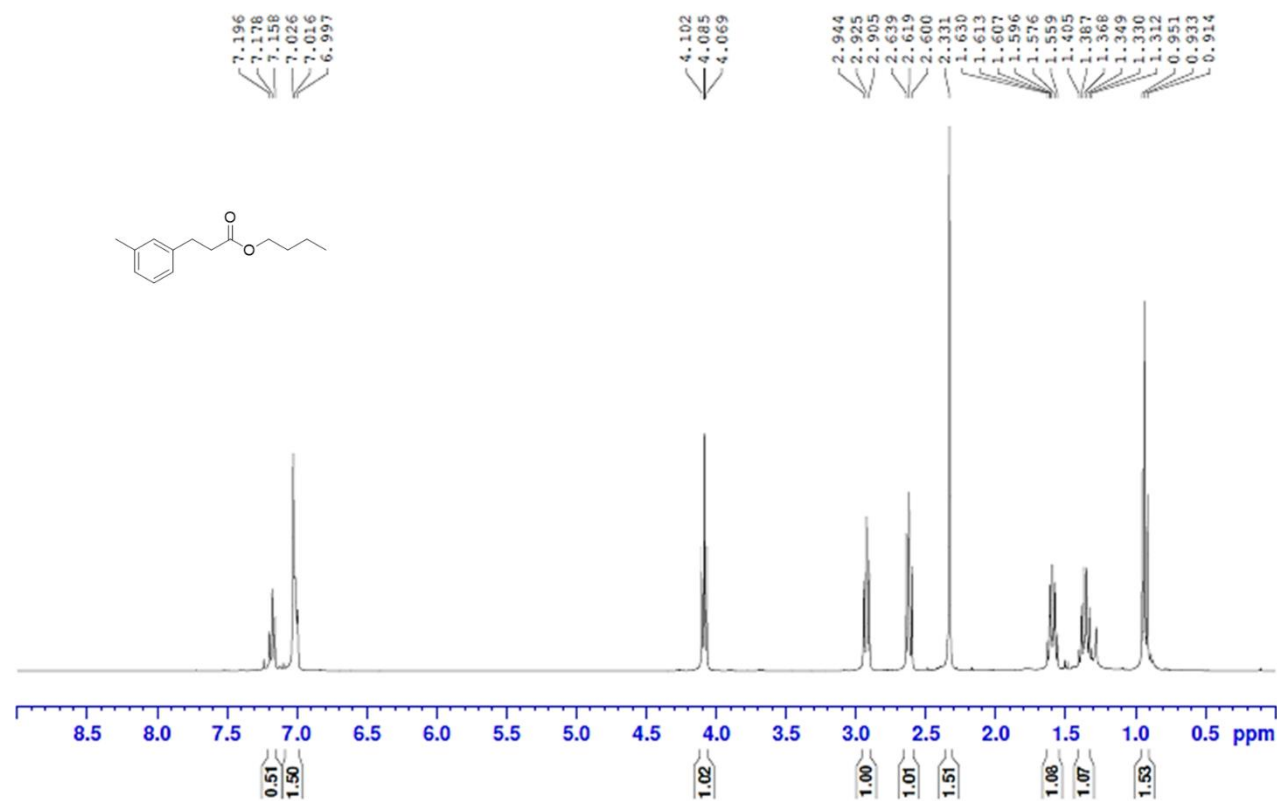
^1H and ^{13}C NMR spectrum of compound **3d**



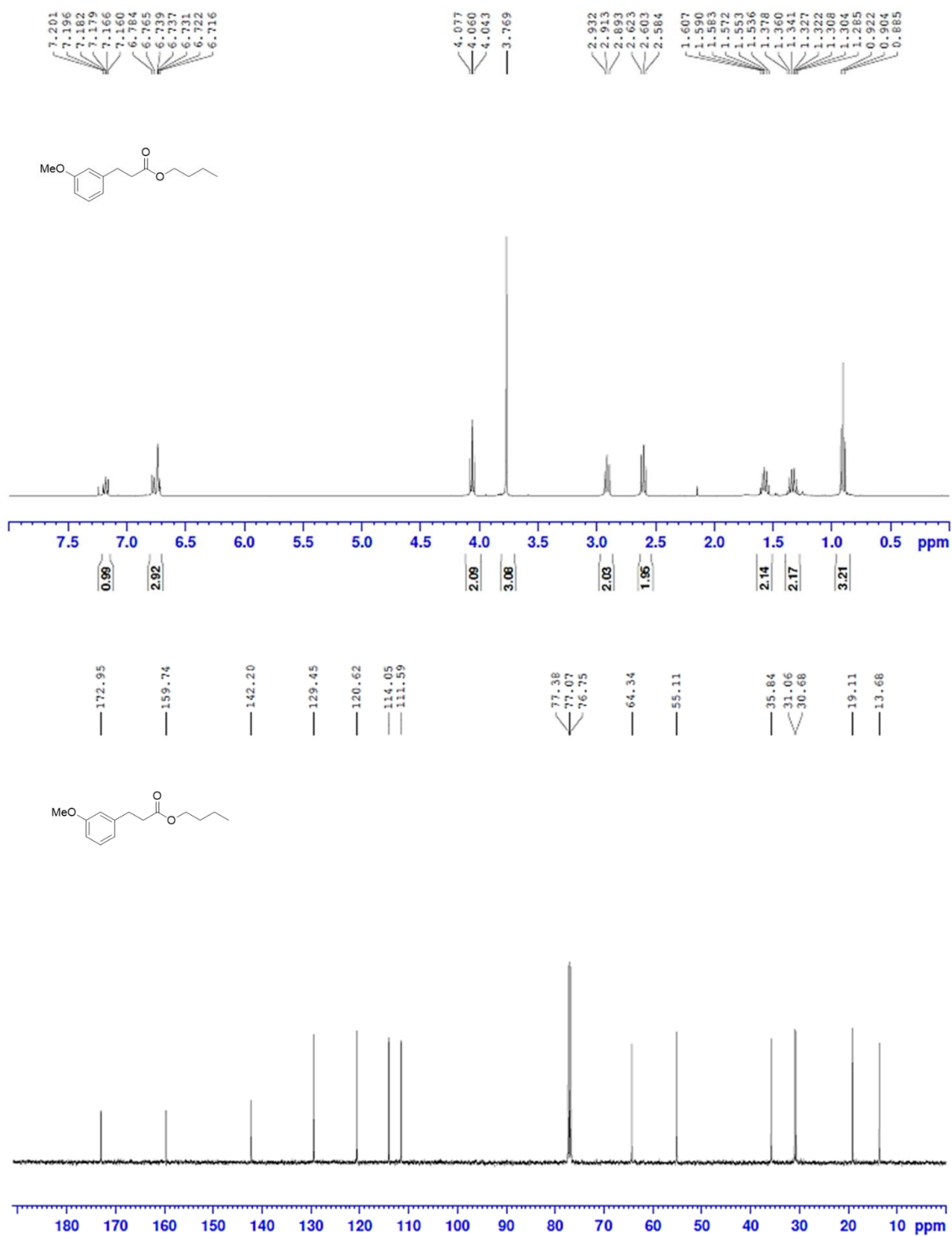
^1H and ^{13}C NMR spectrum of compound **3e**



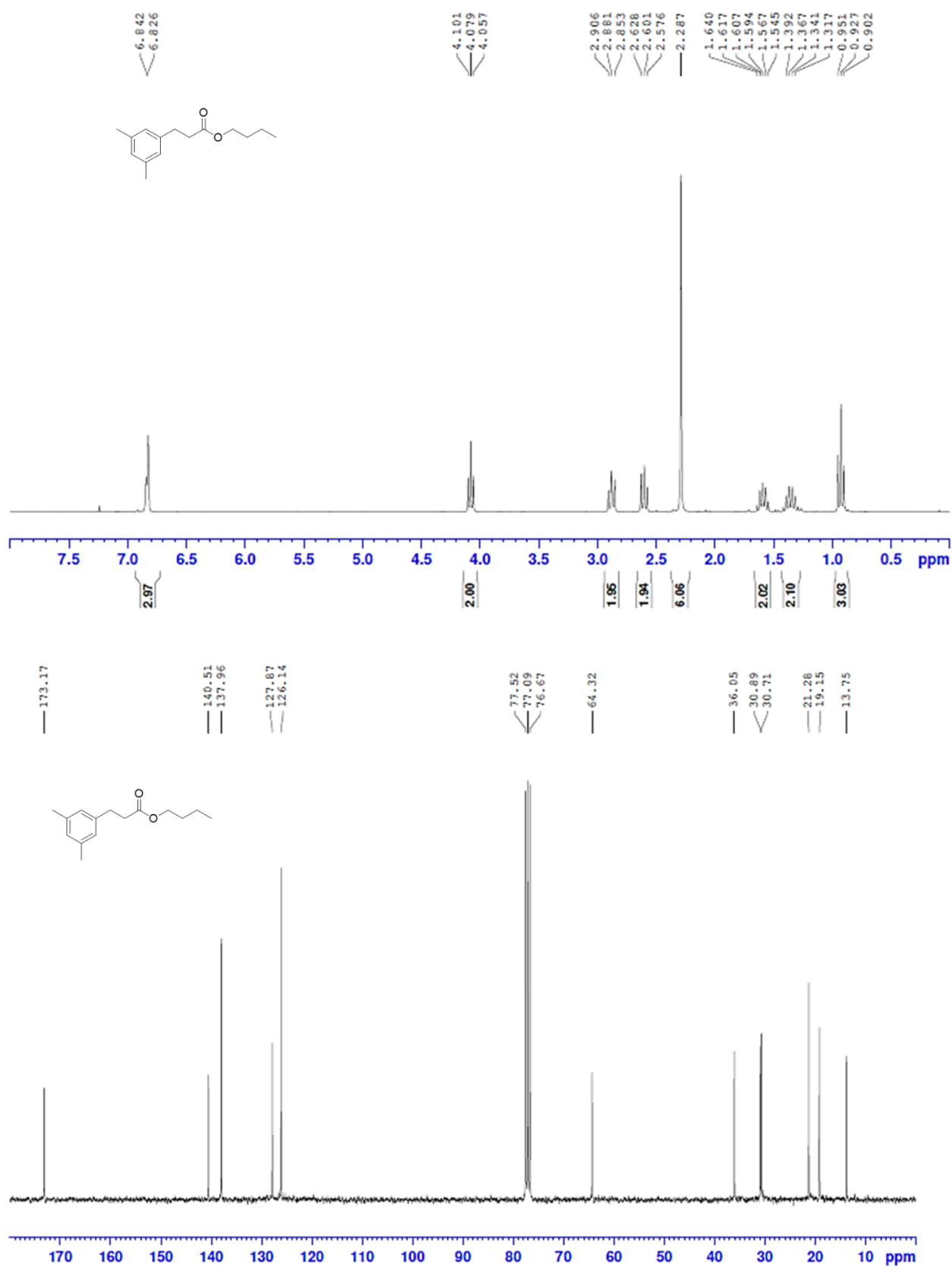
^1H and ^{13}C NMR spectrum of compound **3f**



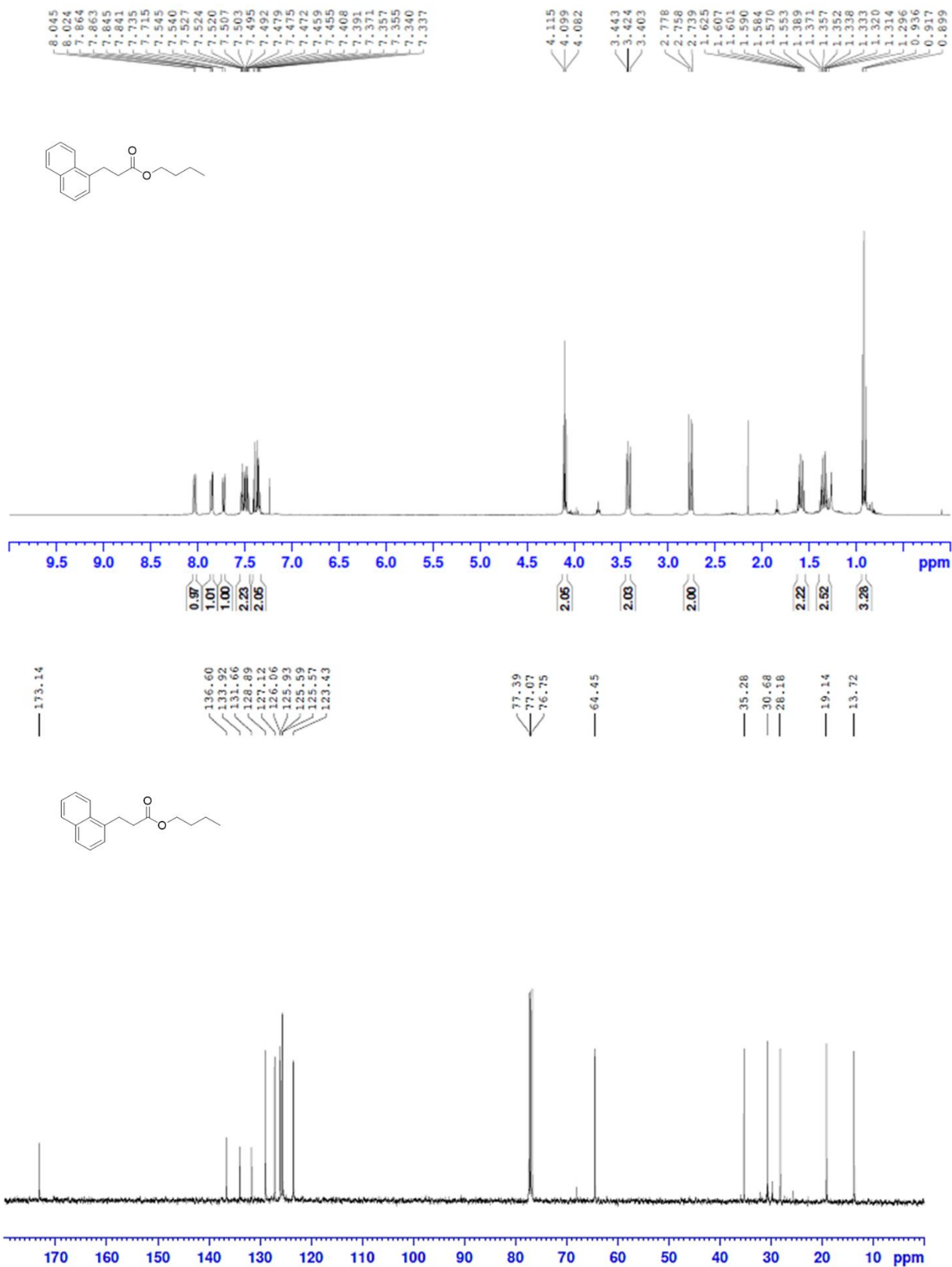
^1H and ^{13}C NMR spectrum of compound **3g**



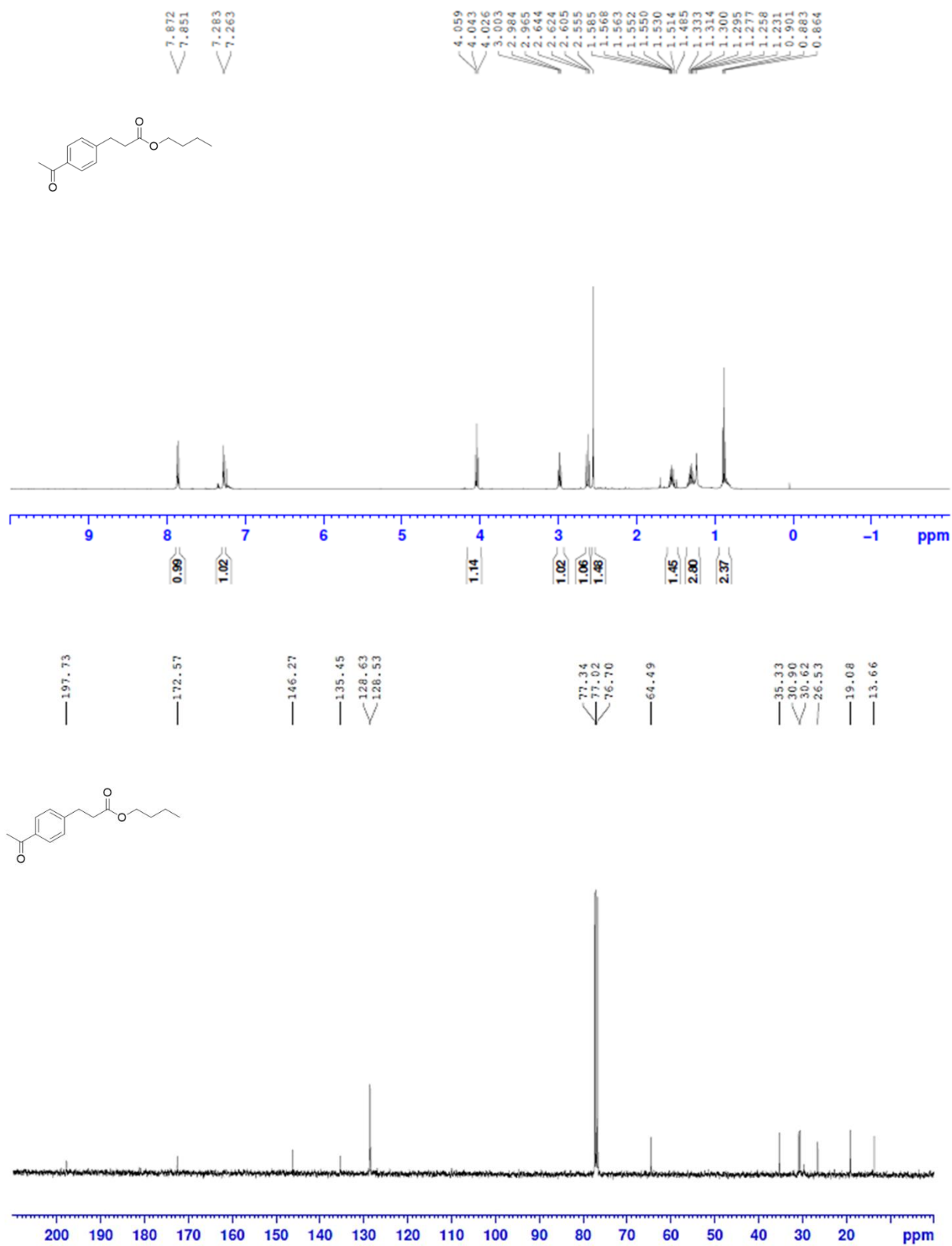
^1H and ^{13}C NMR spectrum of compound **3h**



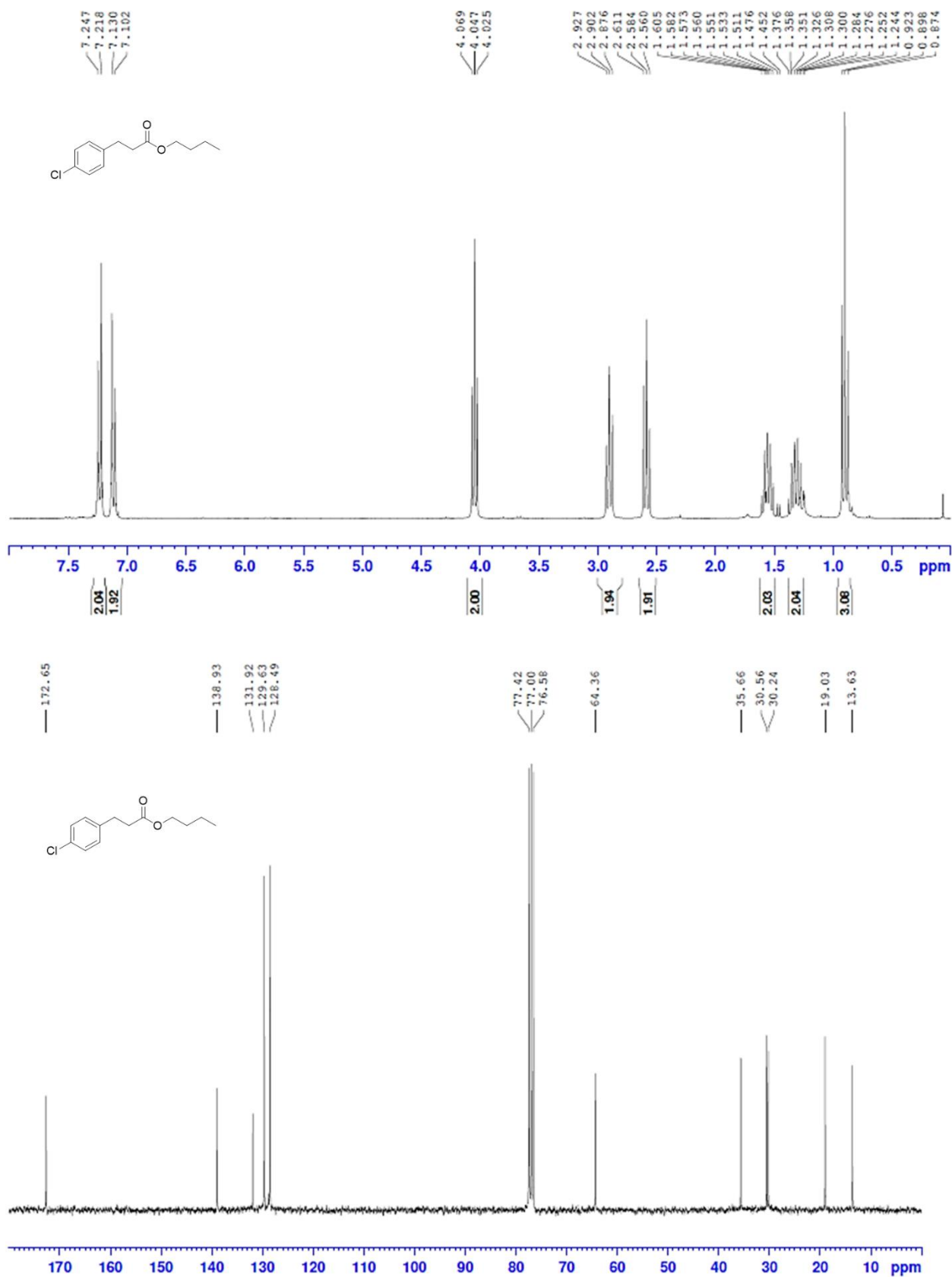
^1H and ^{13}C NMR spectrum of compound **3i**



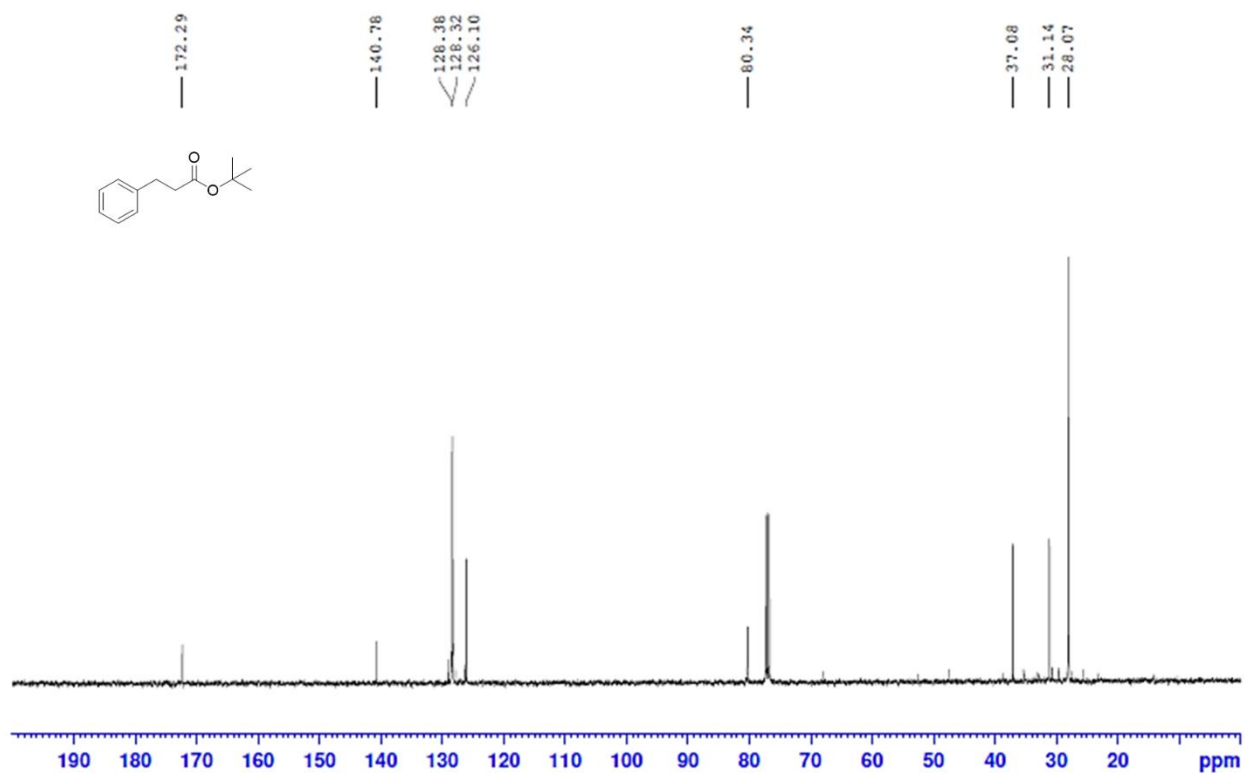
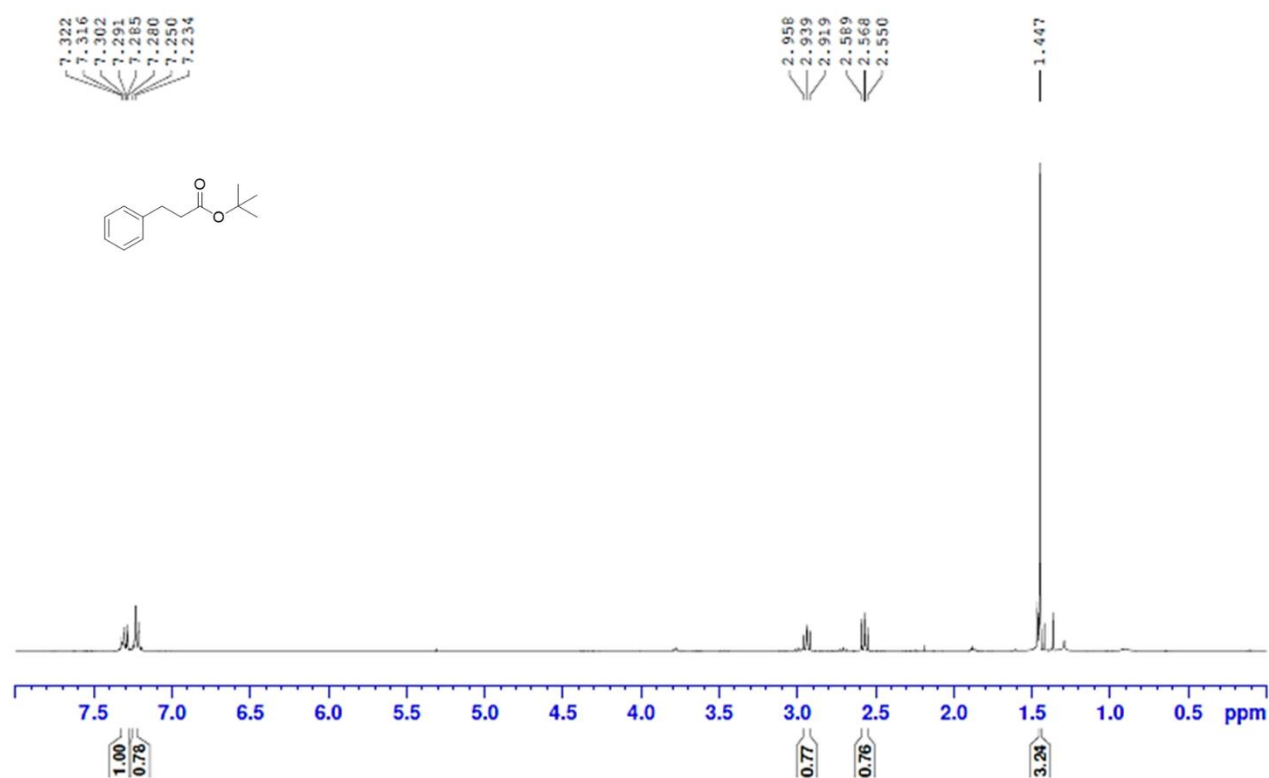
^1H and ^{13}C NMR spectrum of compound **3j**



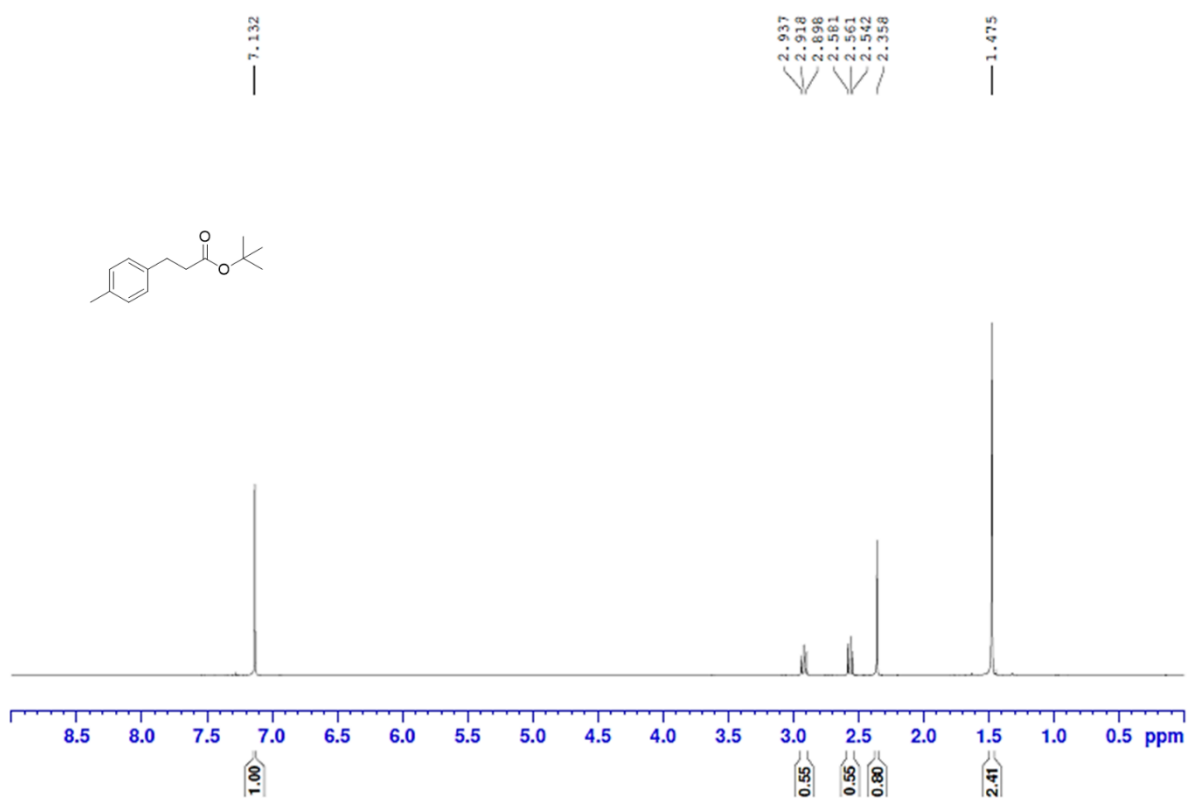
^1H and ^{13}C NMR spectrum of compound **3k**



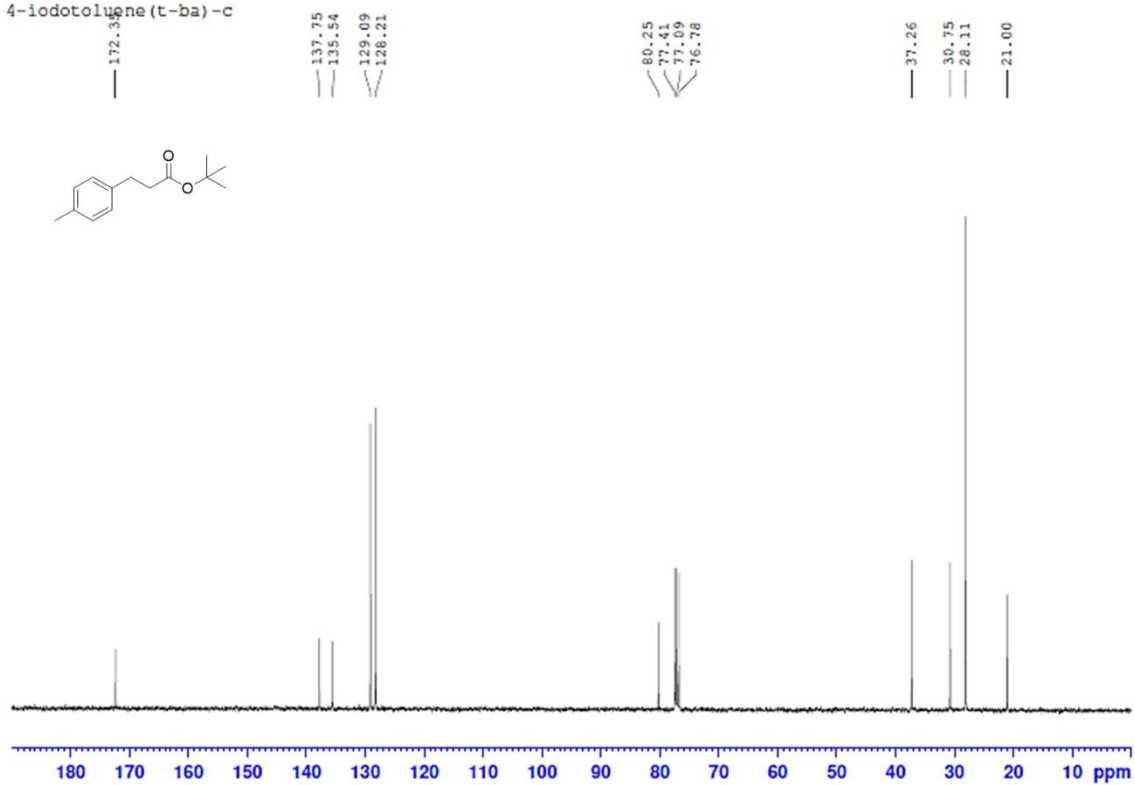
^1H and ^{13}C NMR spectrum of compound **4a**



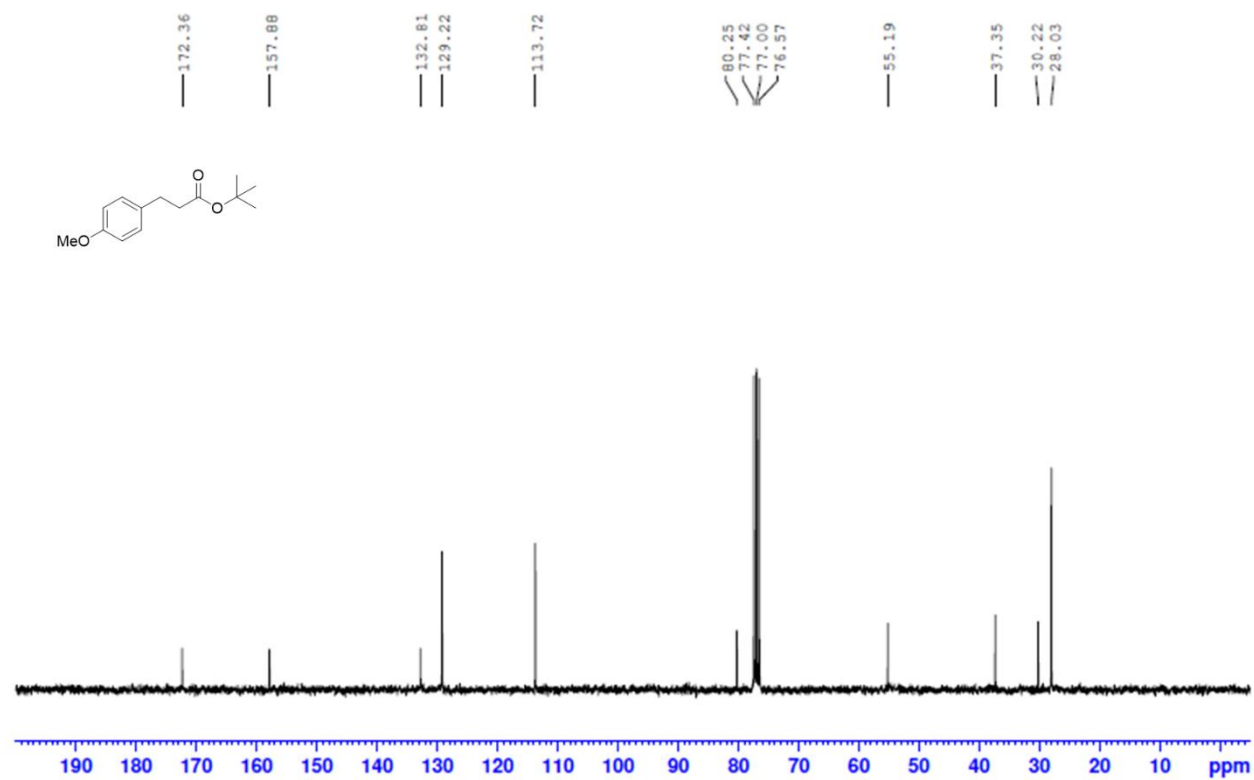
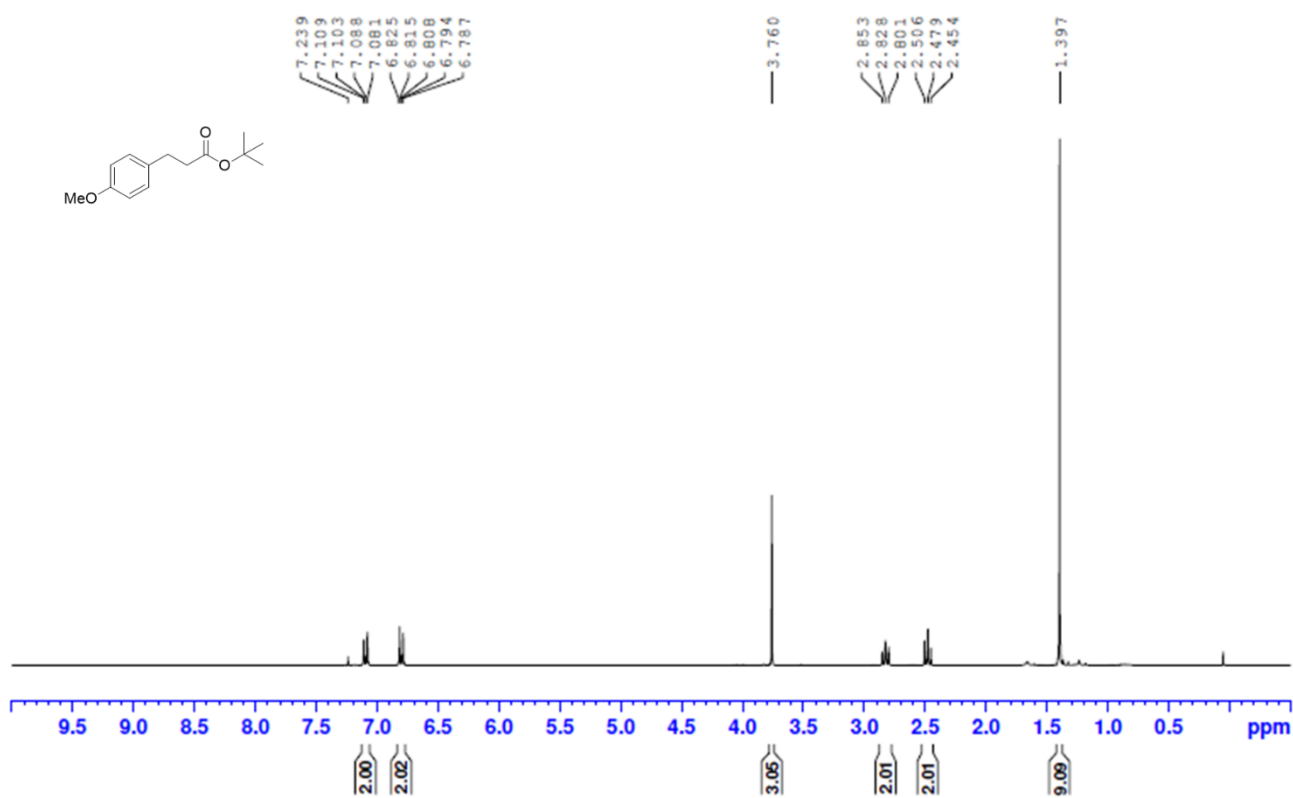
^1H and ^{13}C NMR spectrum of compound **4b**



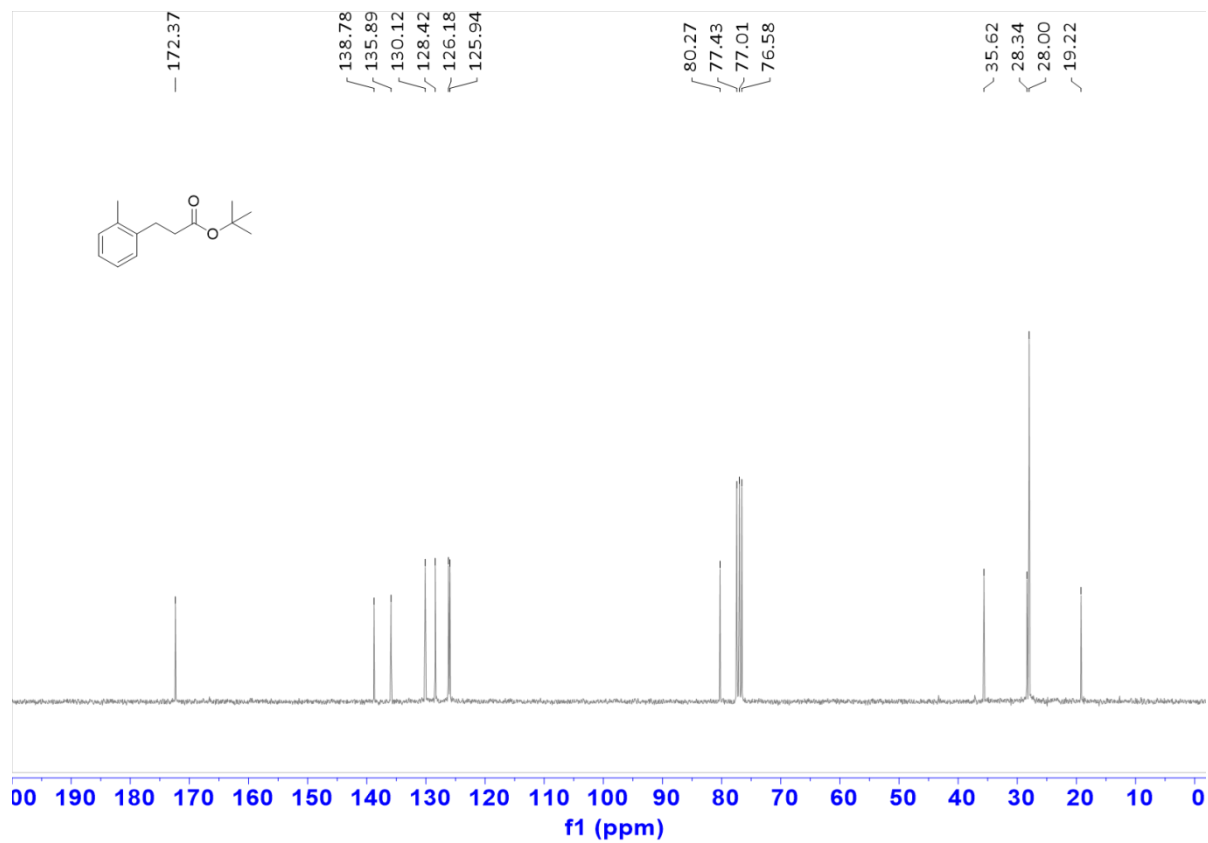
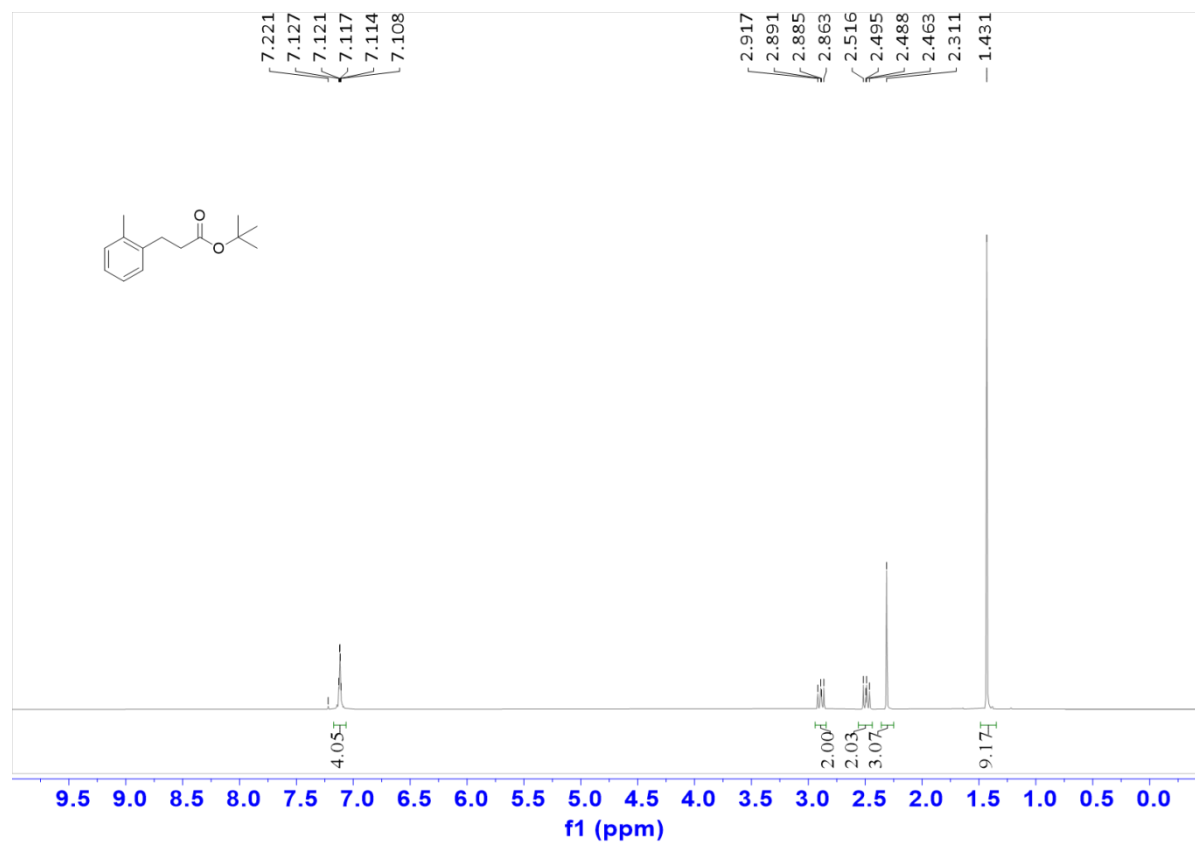
4-iodotoluene (t-ba)-c



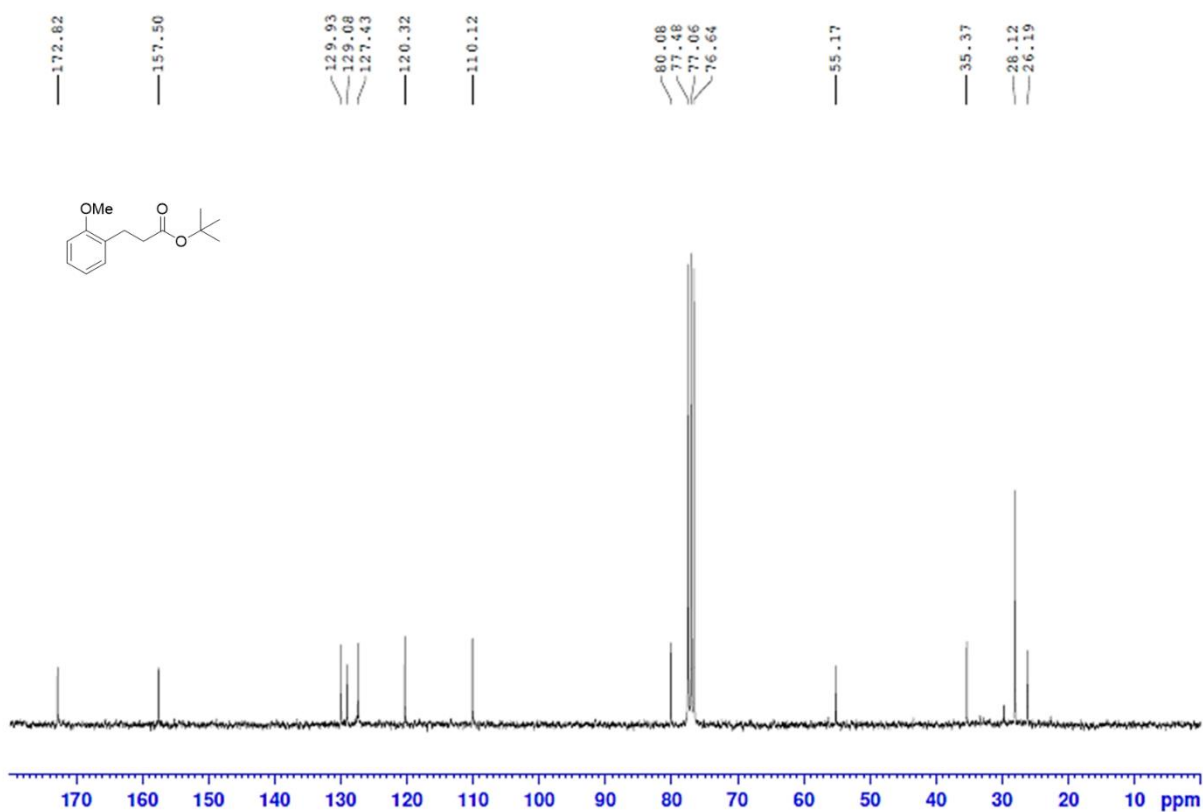
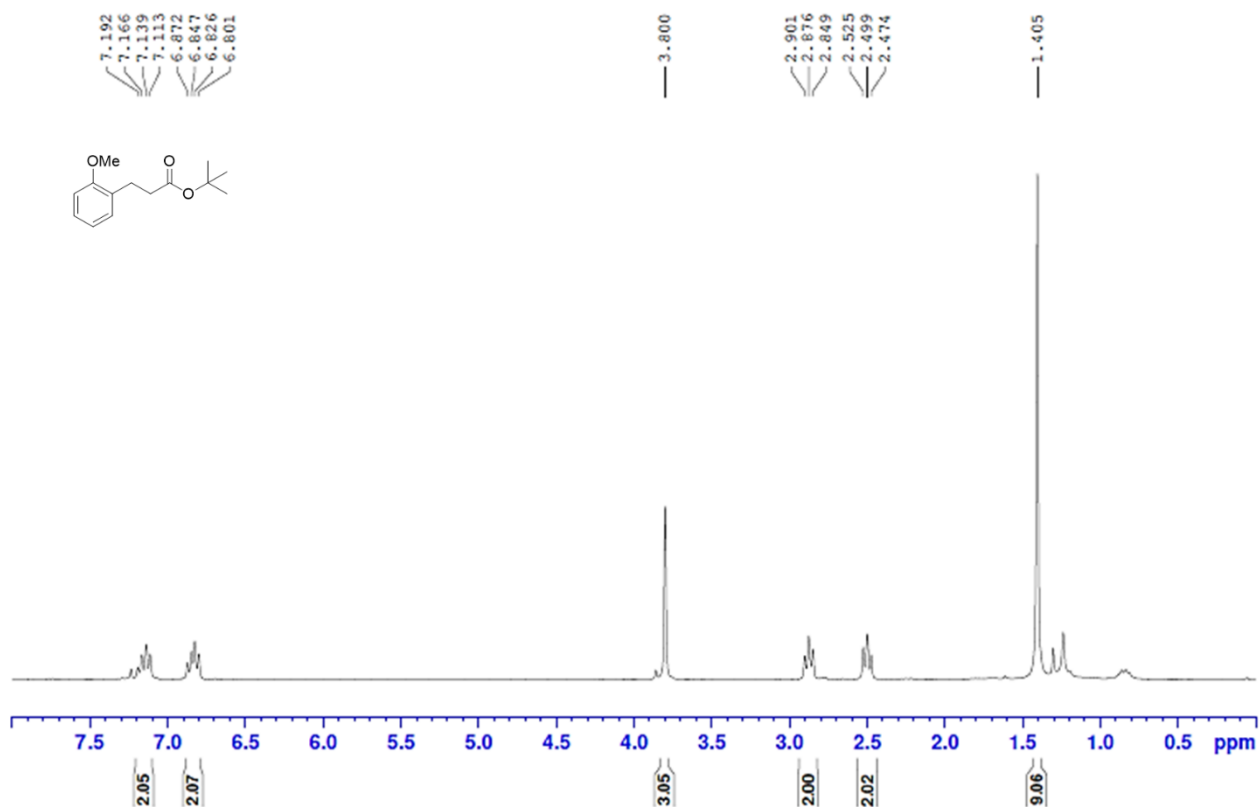
^1H and ^{13}C NMR spectrum of compound **4c**



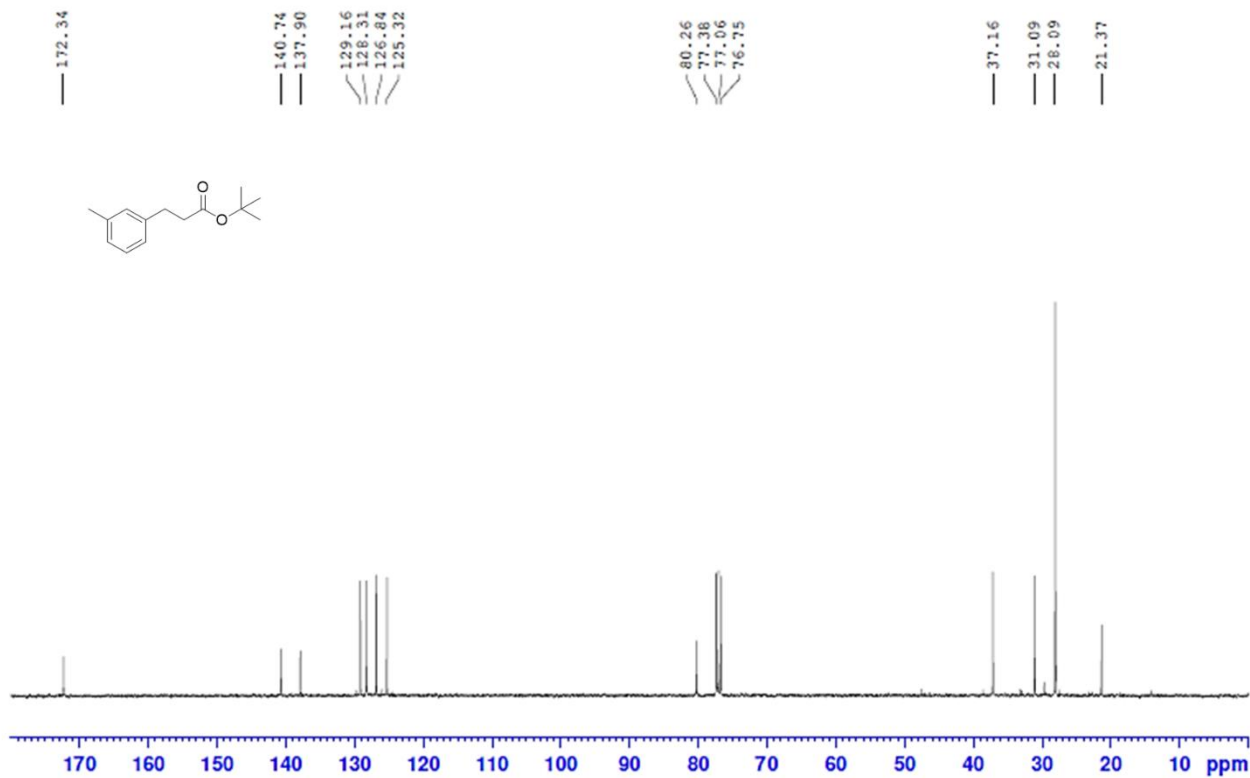
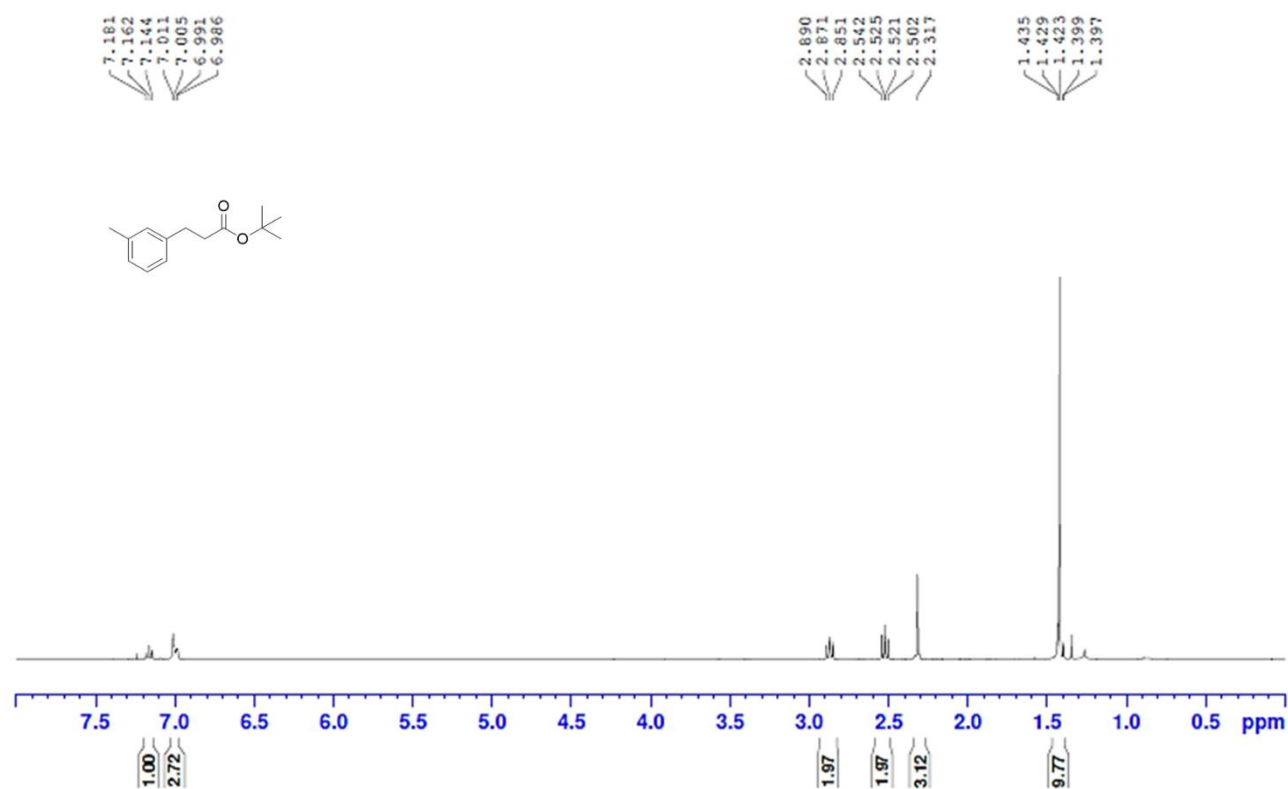
^1H and ^{13}C NMR spectrum of compound **4d**



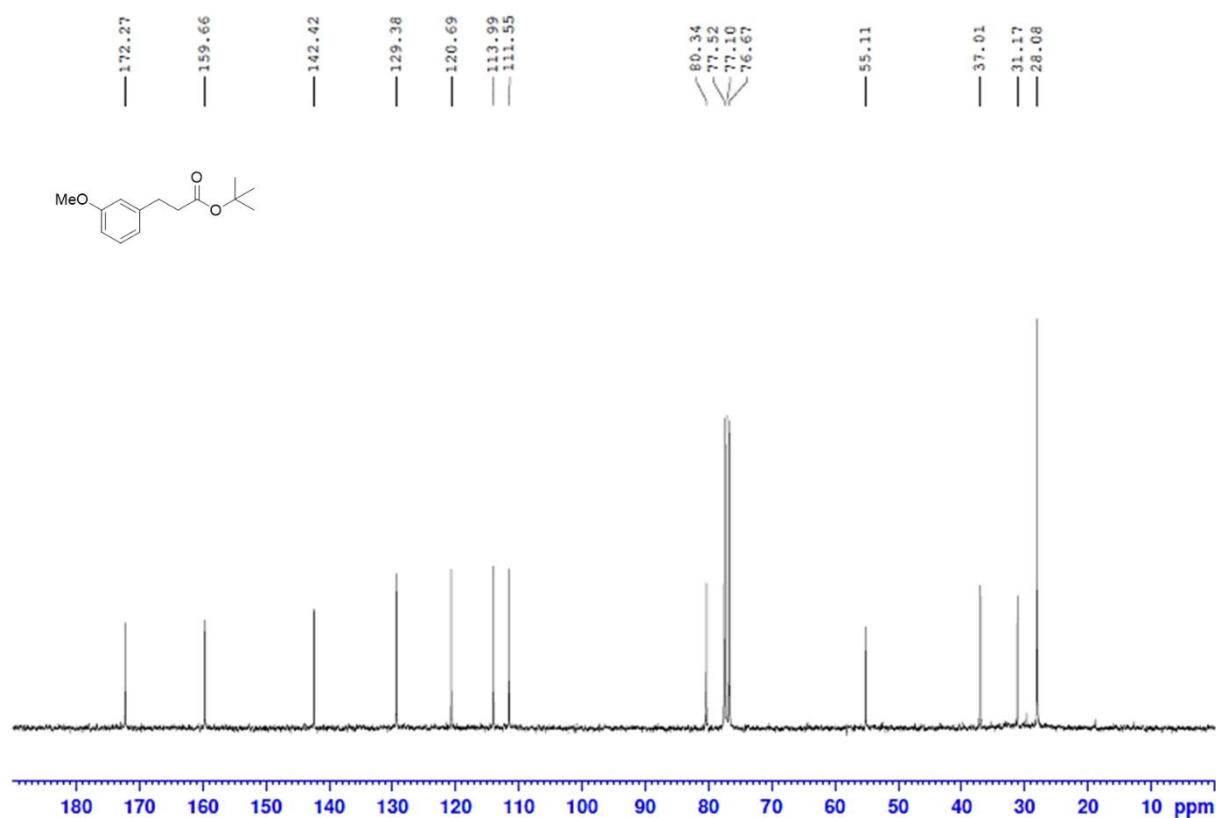
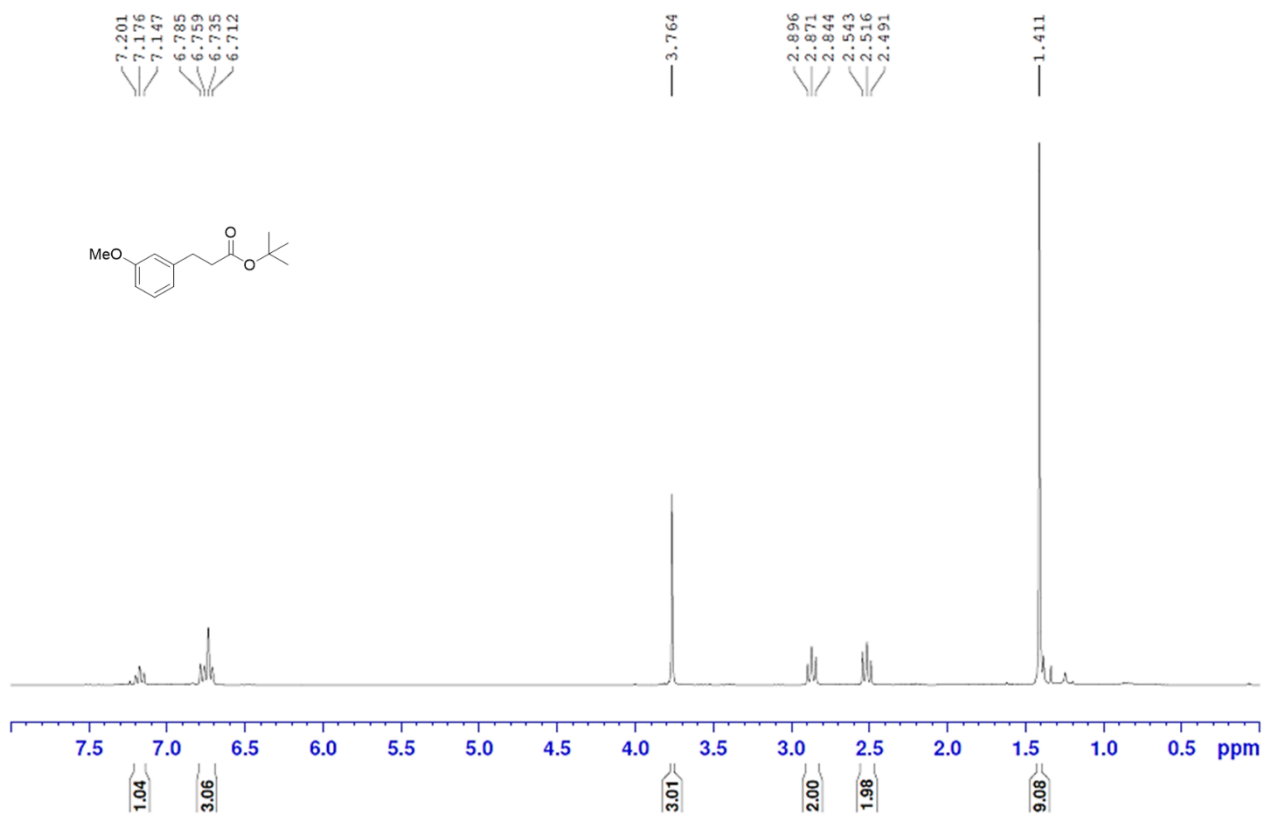
^1H and ^{13}C NMR spectrum of compound **4e**



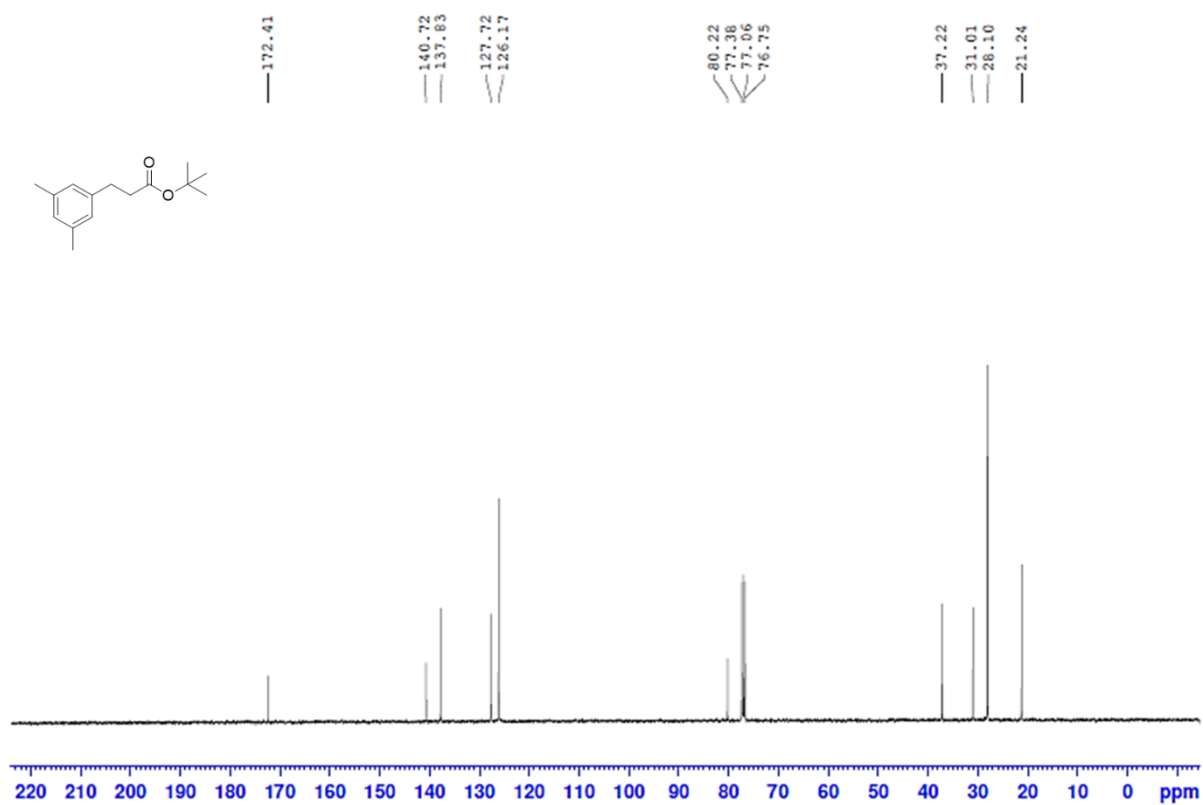
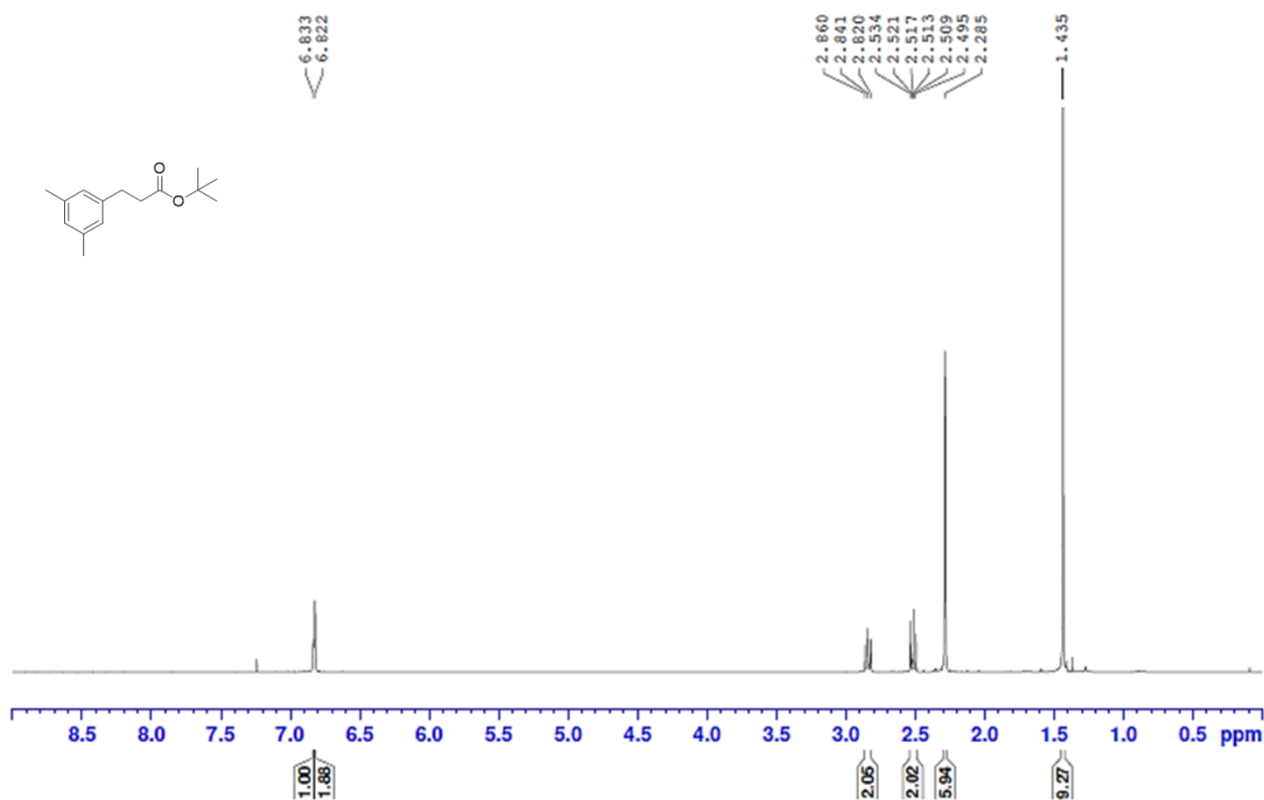
^1H and ^{13}C NMR spectrum of compound **4f**



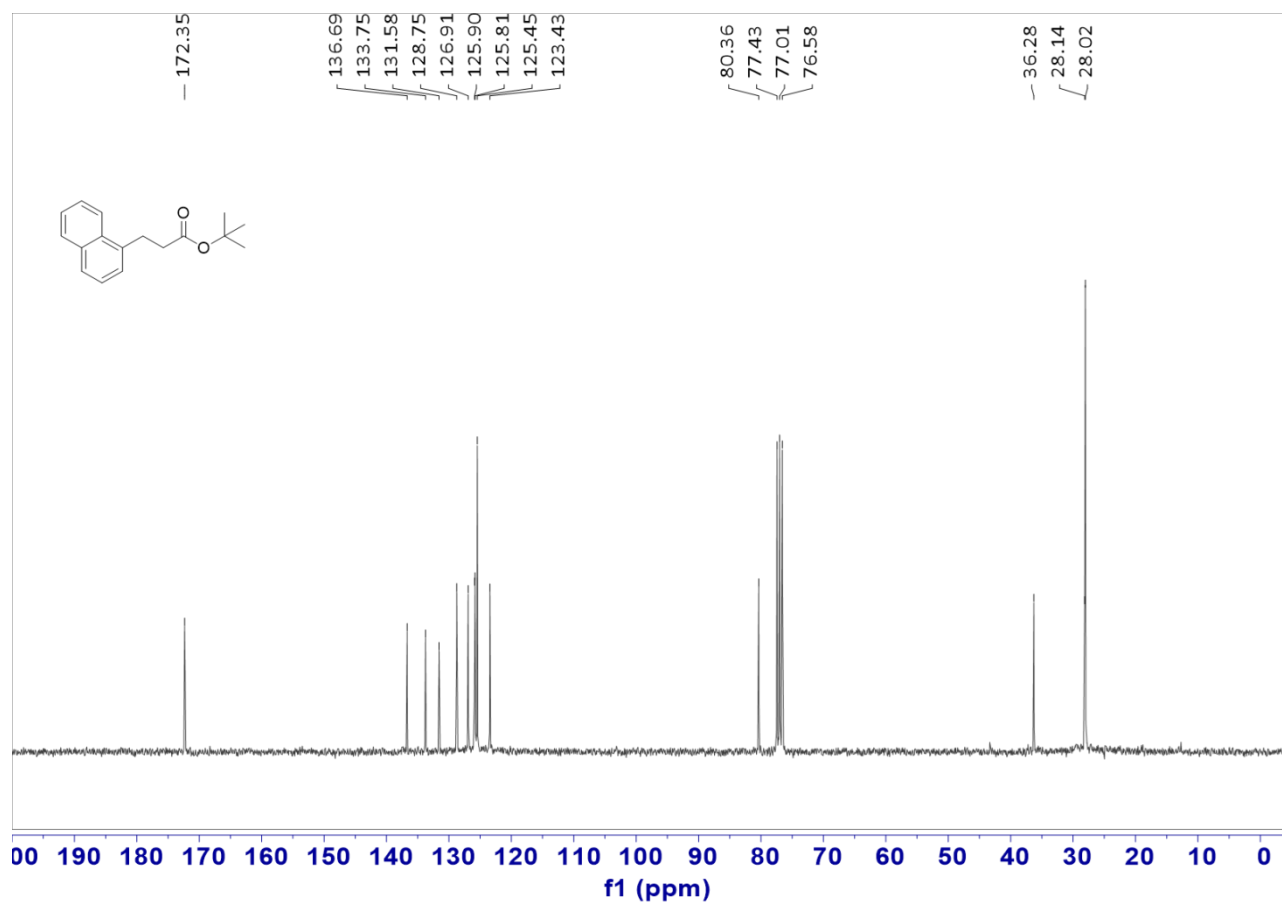
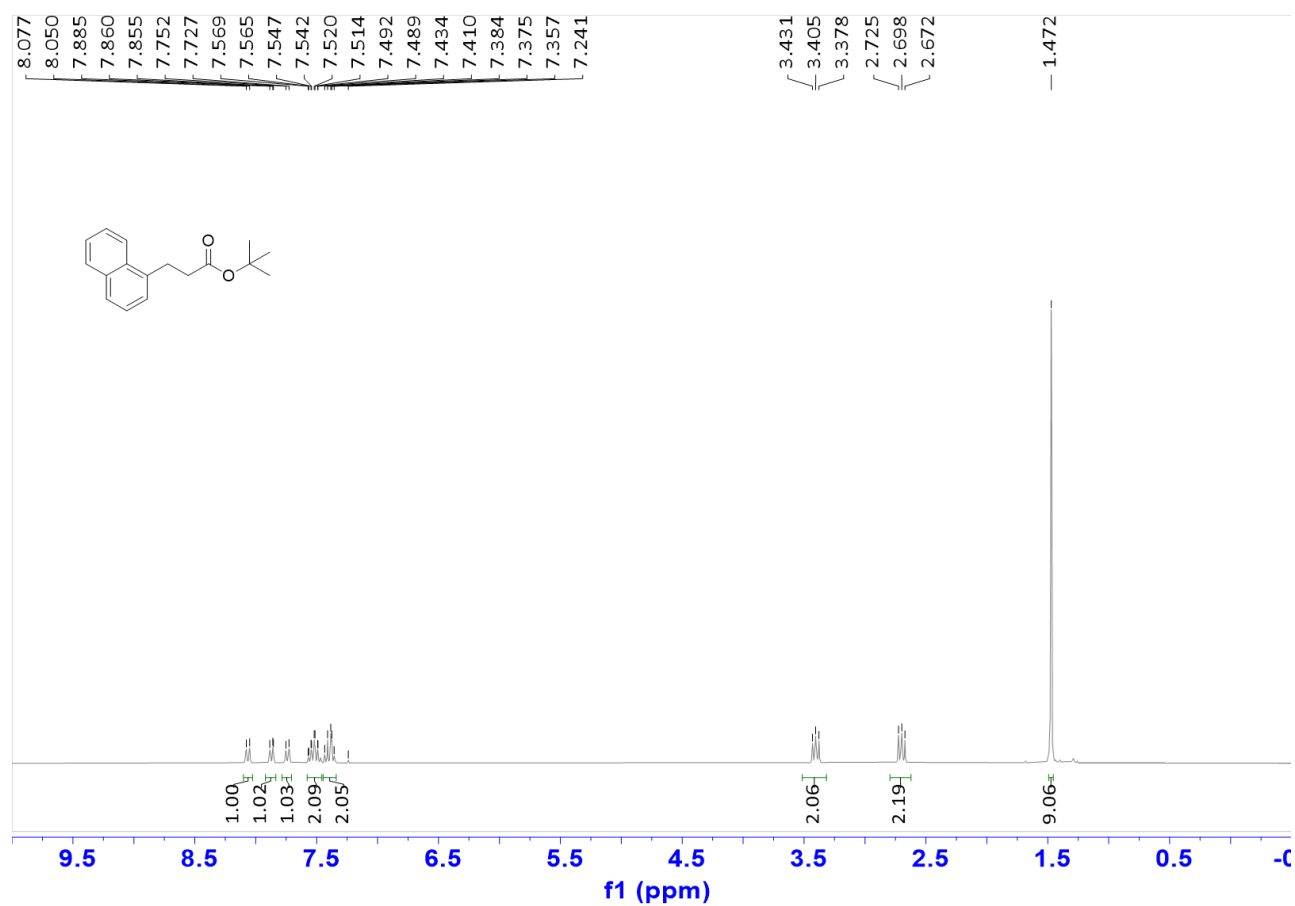
^1H and ^{13}C NMR spectrum of compound **4g**



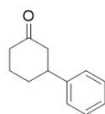
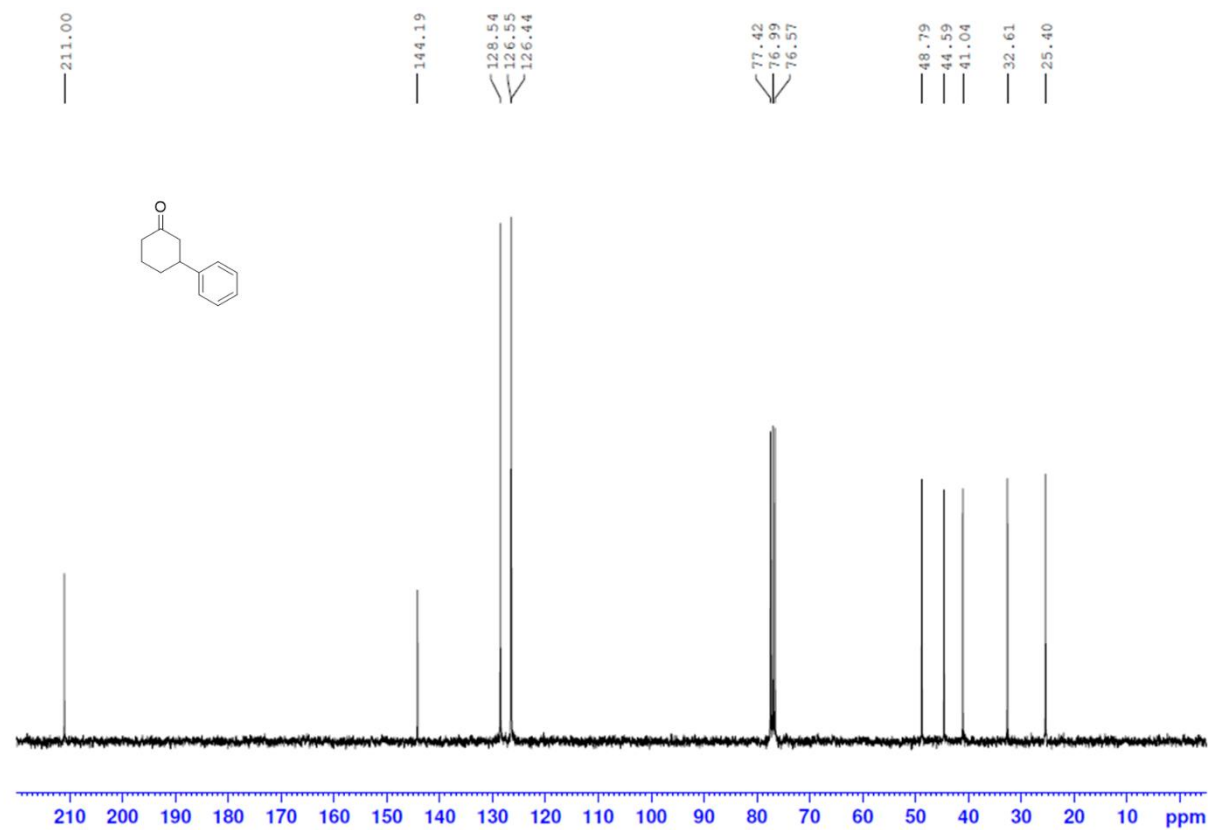
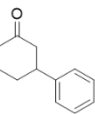
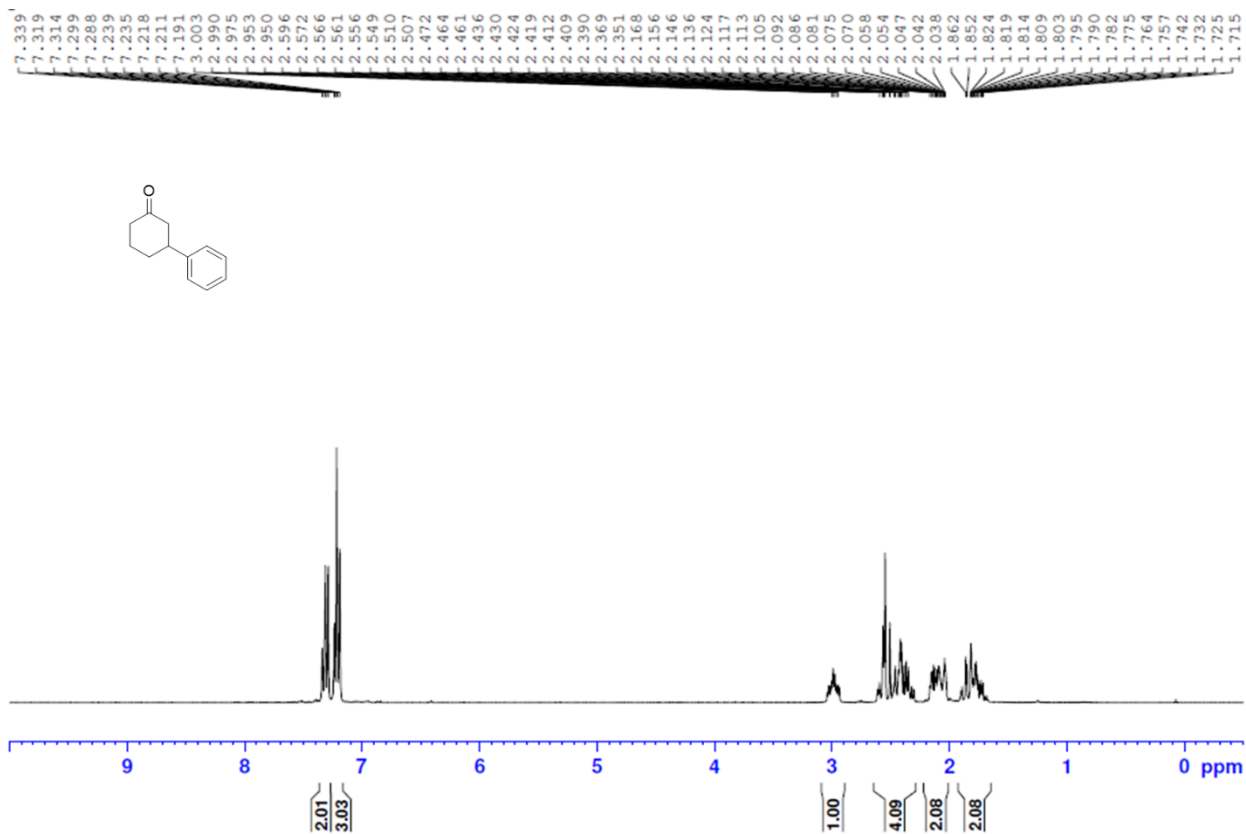
^1H and ^{13}C NMR spectrum of compound **4h**



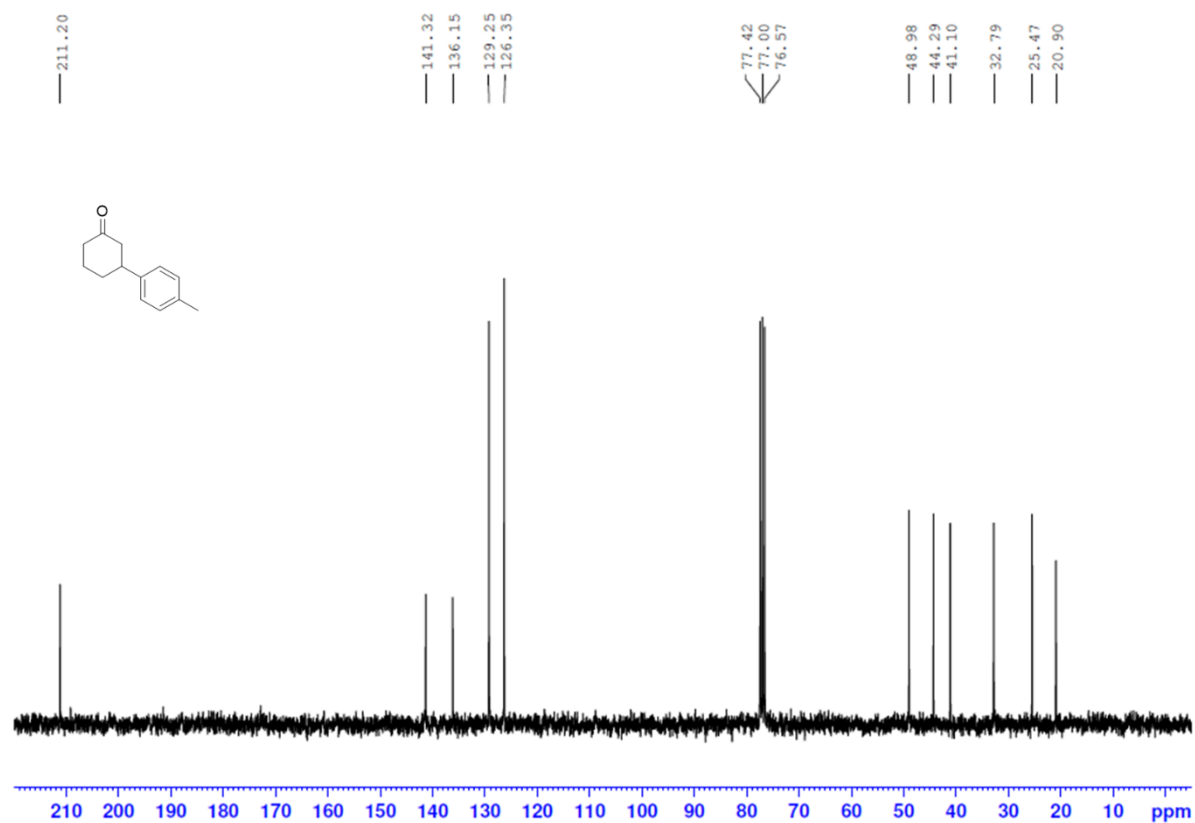
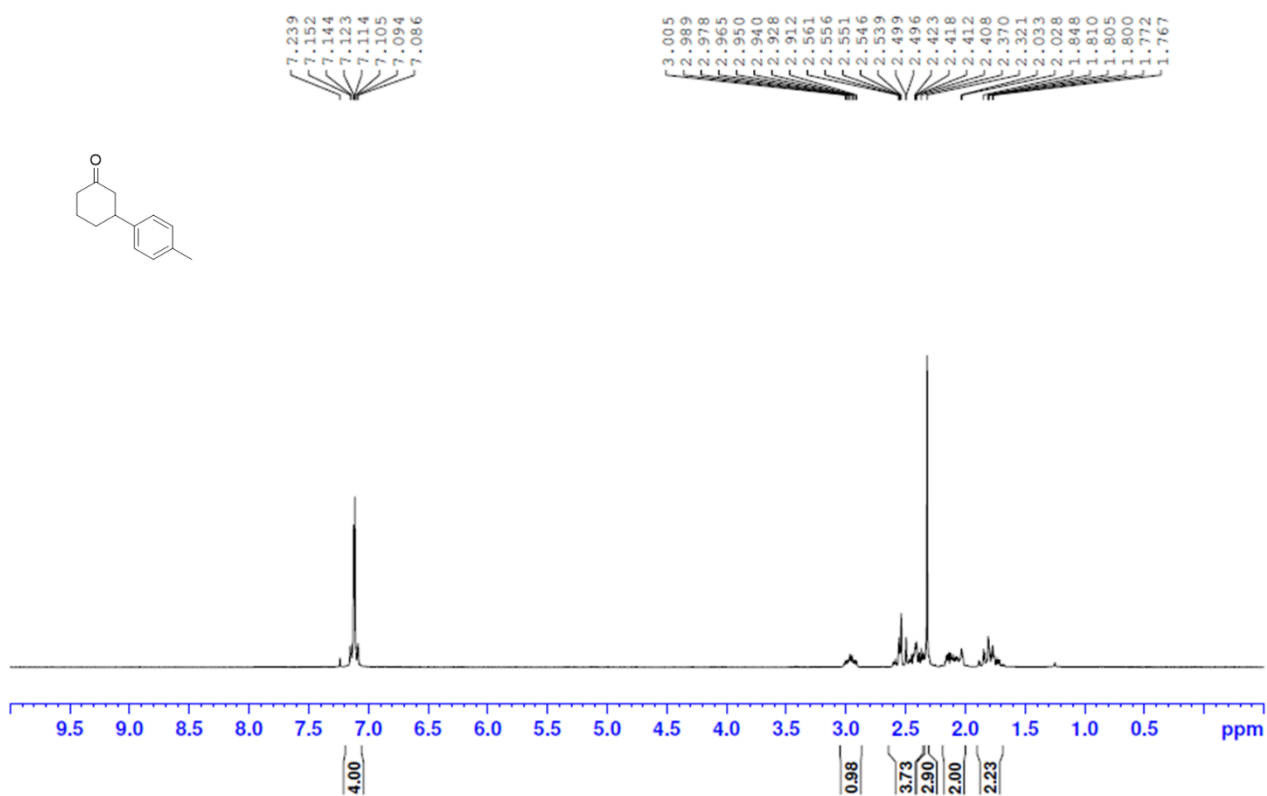
^1H and ^{13}C NMR spectrum of compound **4i**



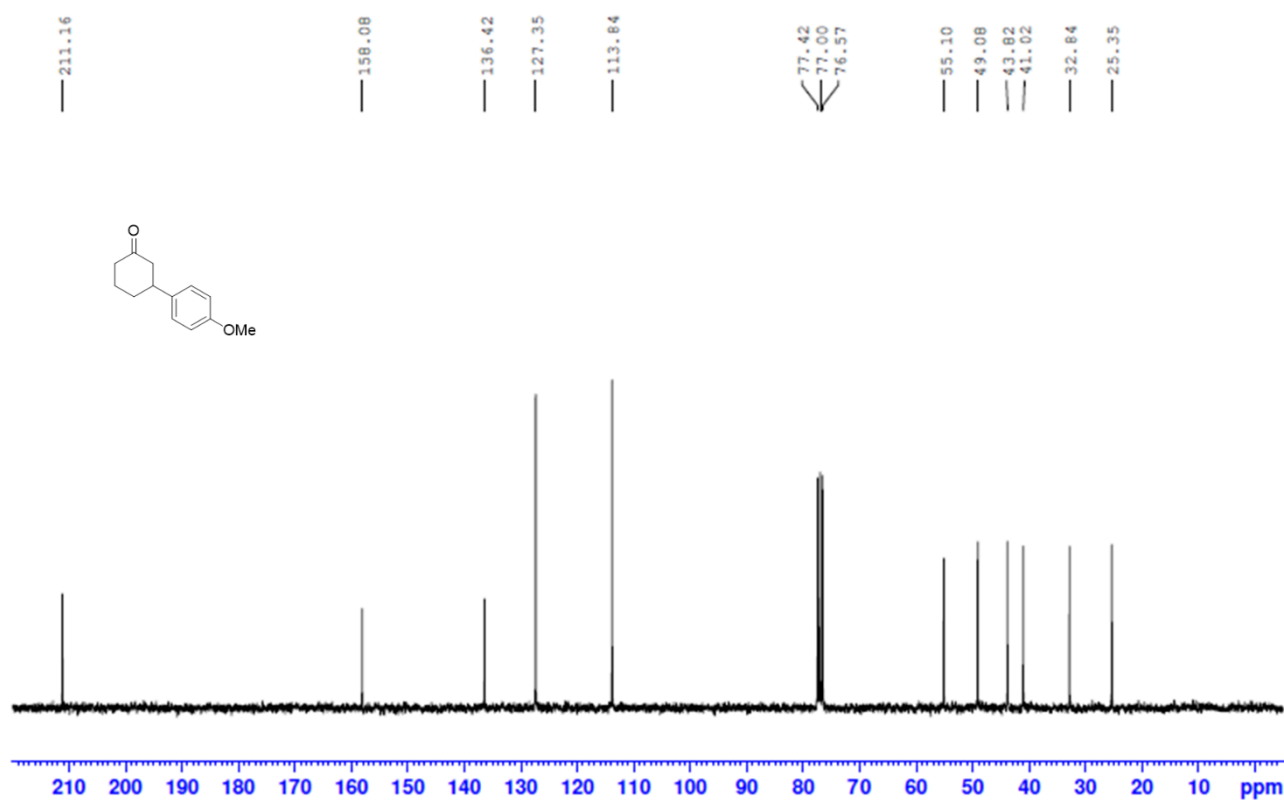
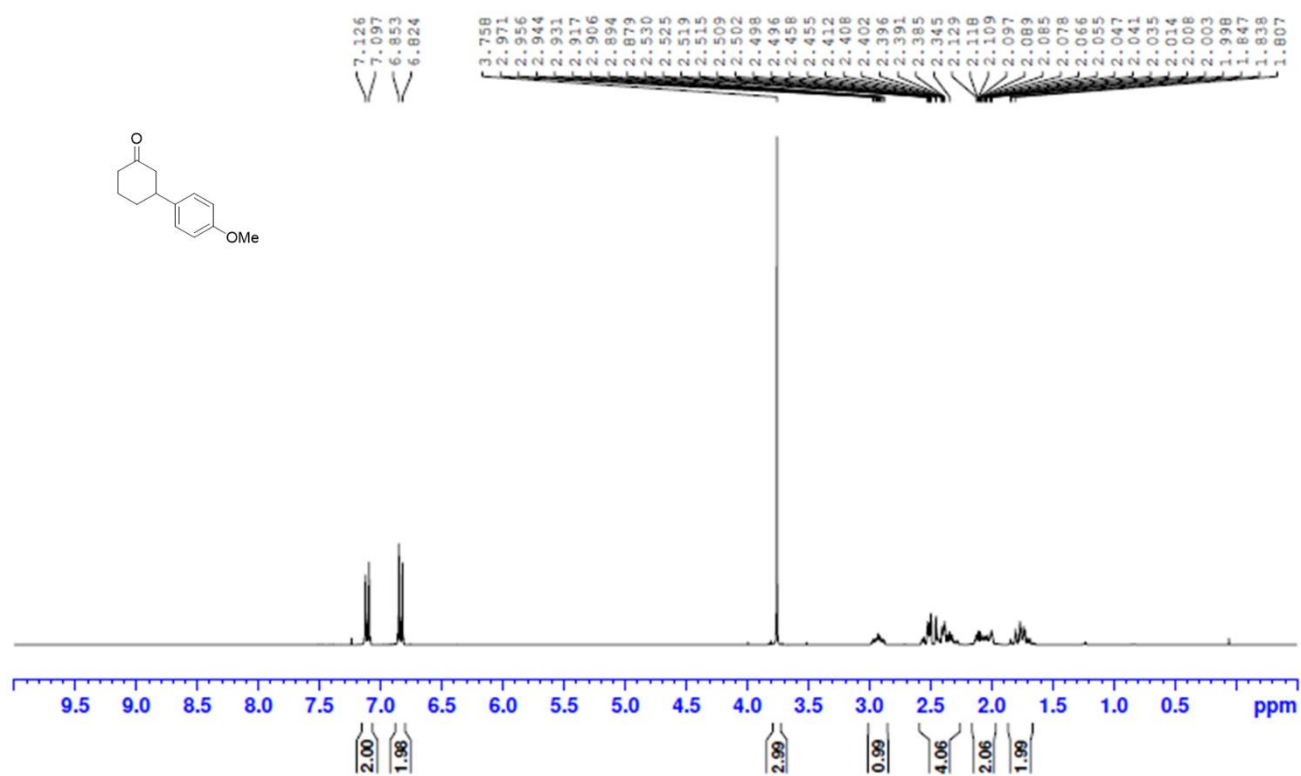
^1H and ^{13}C NMR spectrum of compound **5a**



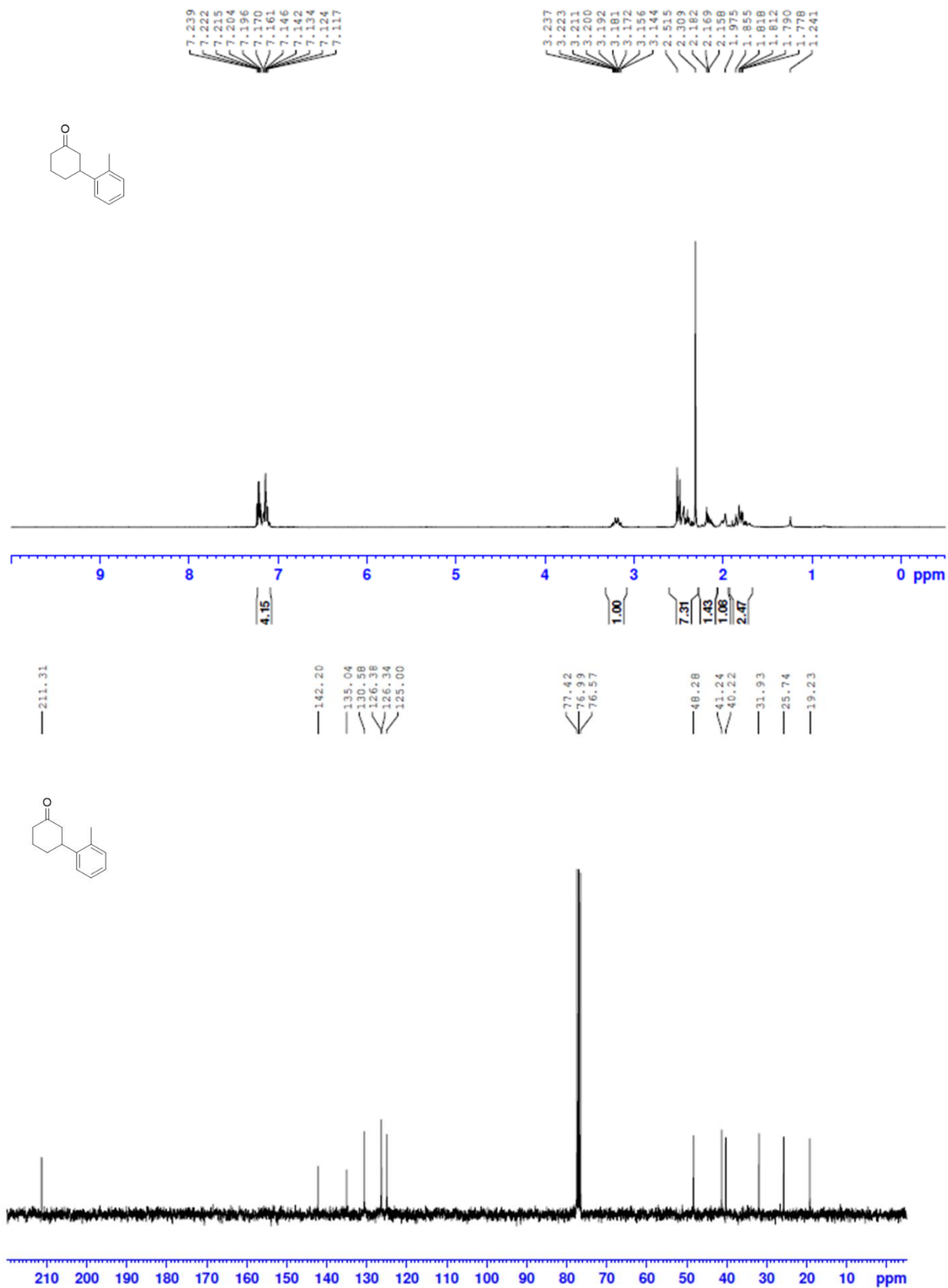
^1H and ^{13}C NMR spectrum of compound **5b**



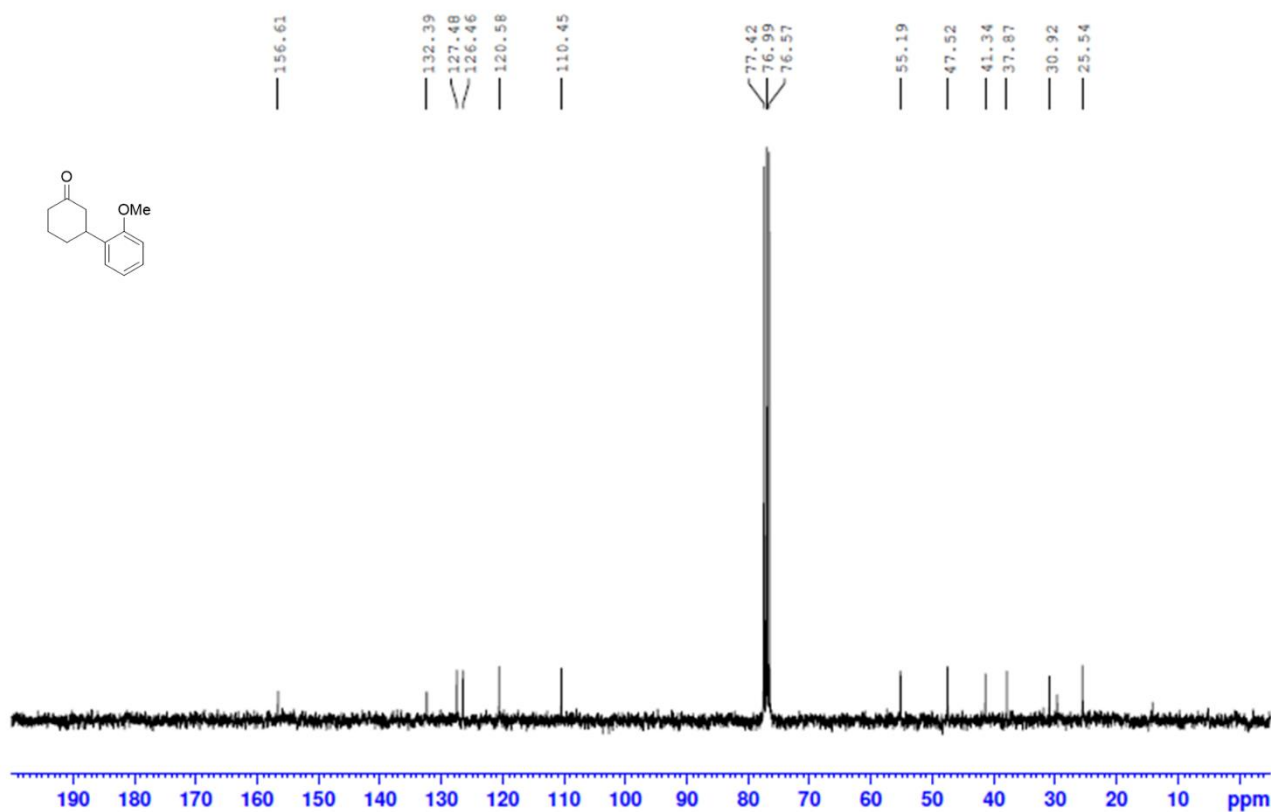
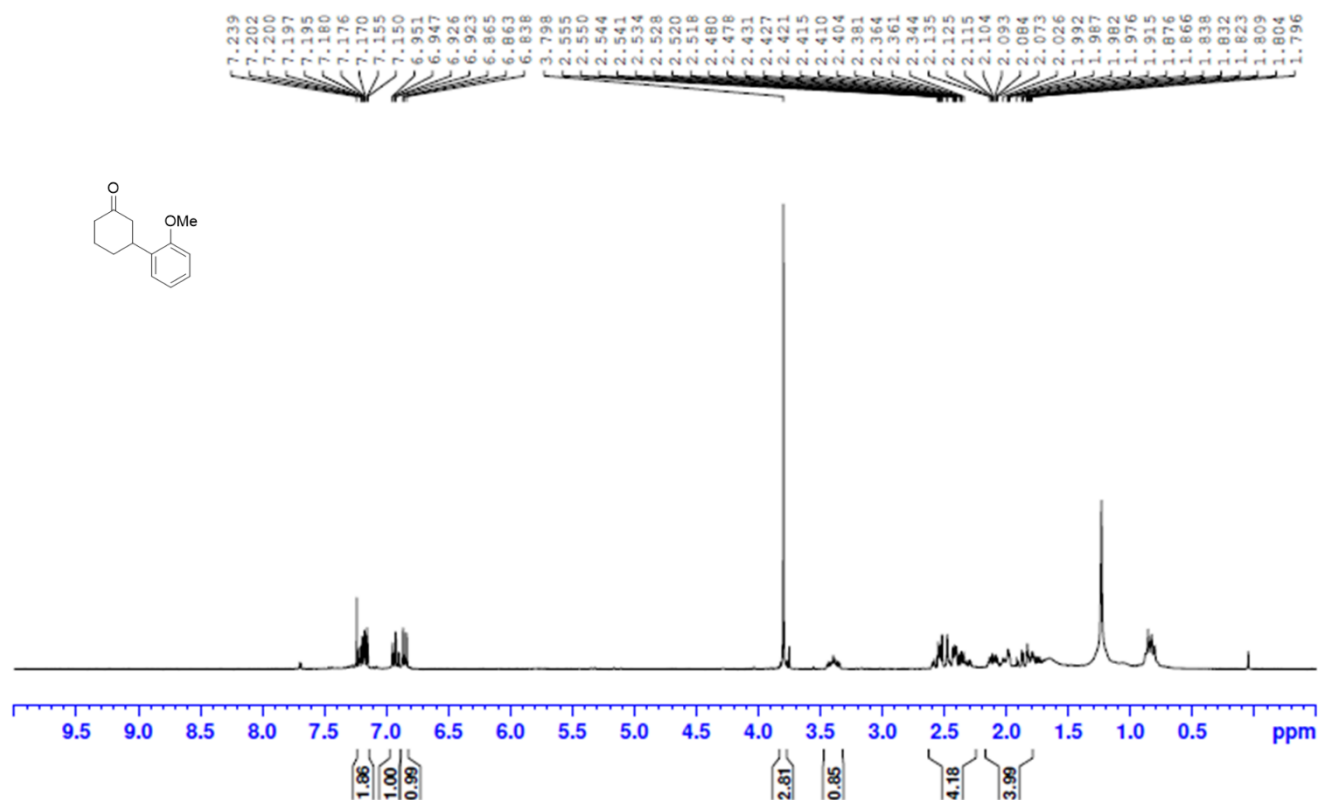
^1H and ^{13}C NMR spectrum of compound **5c**



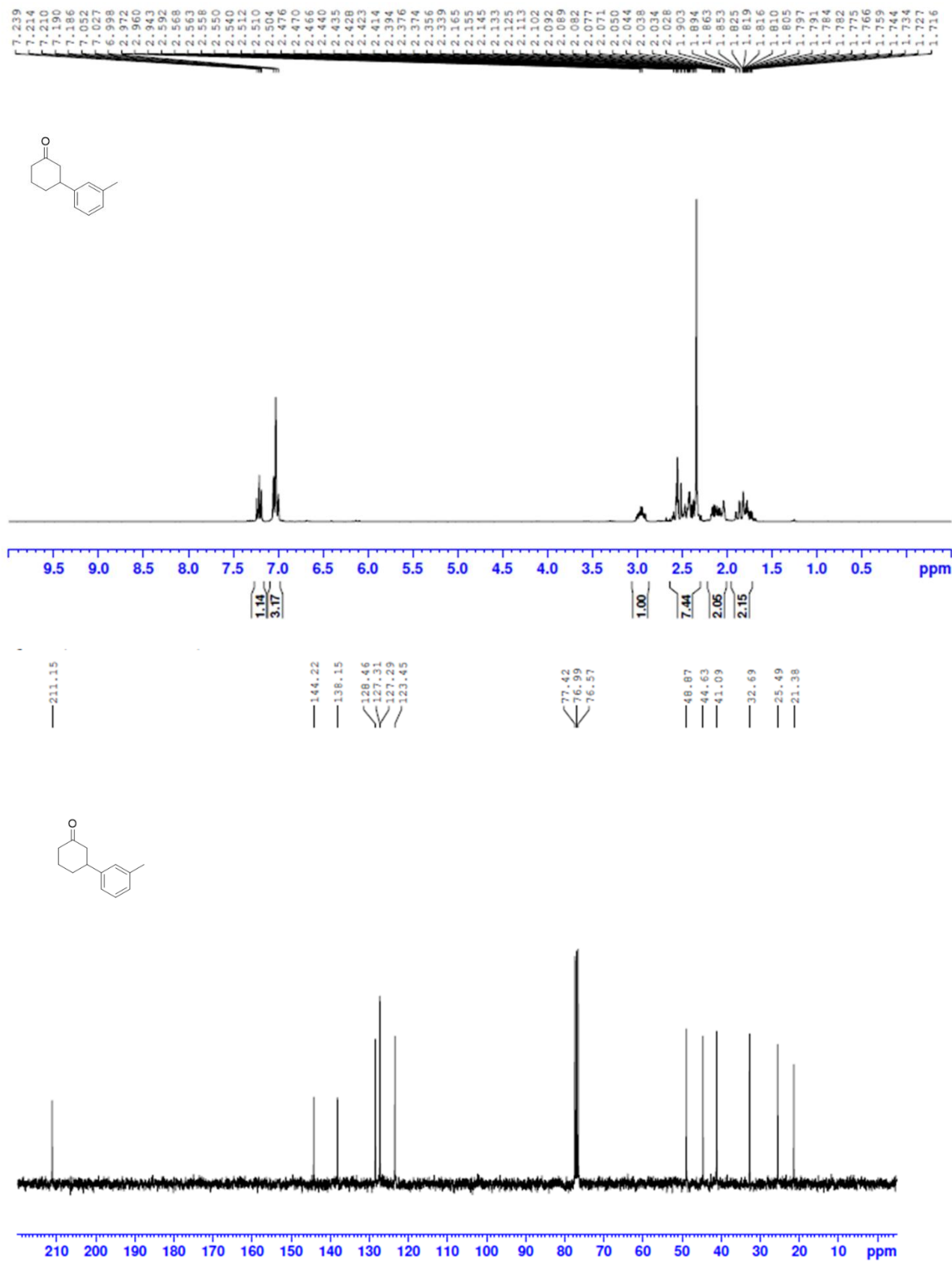
^1H and ^{13}C NMR spectrum of compound **5d**



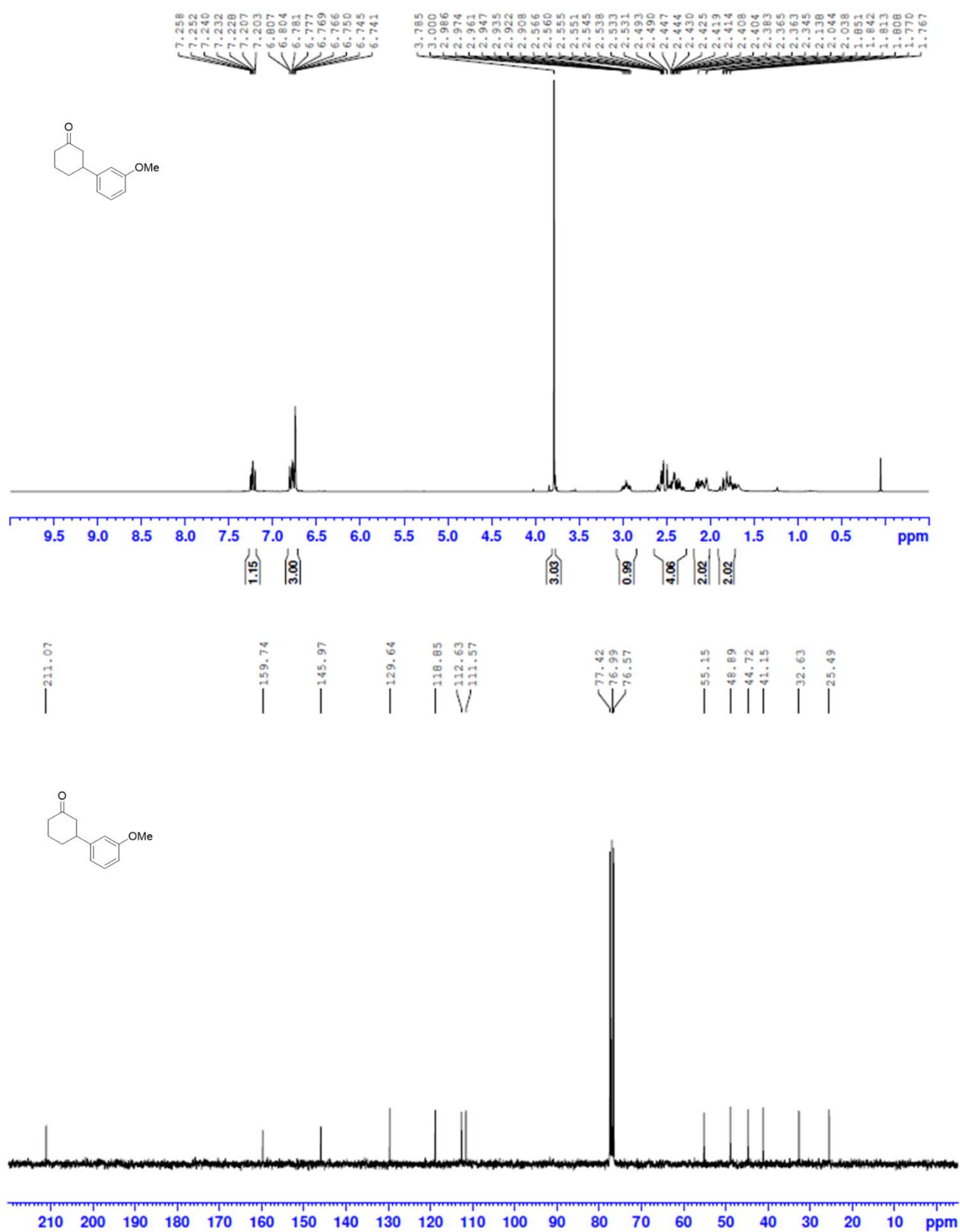
^1H and ^{13}C NMR spectrum of compound **5e**



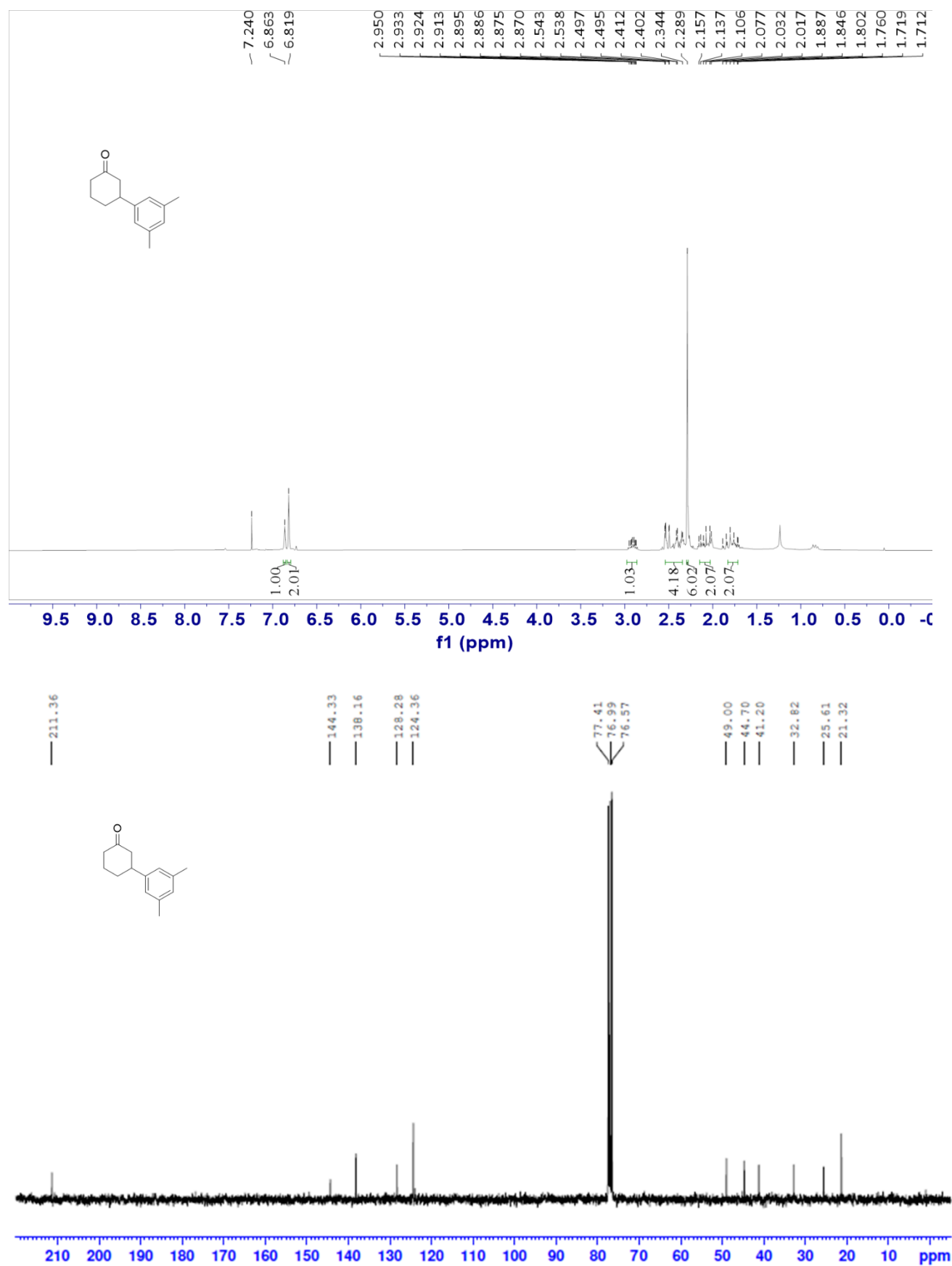
^1H and ^{13}C NMR spectrum of compound **5f**



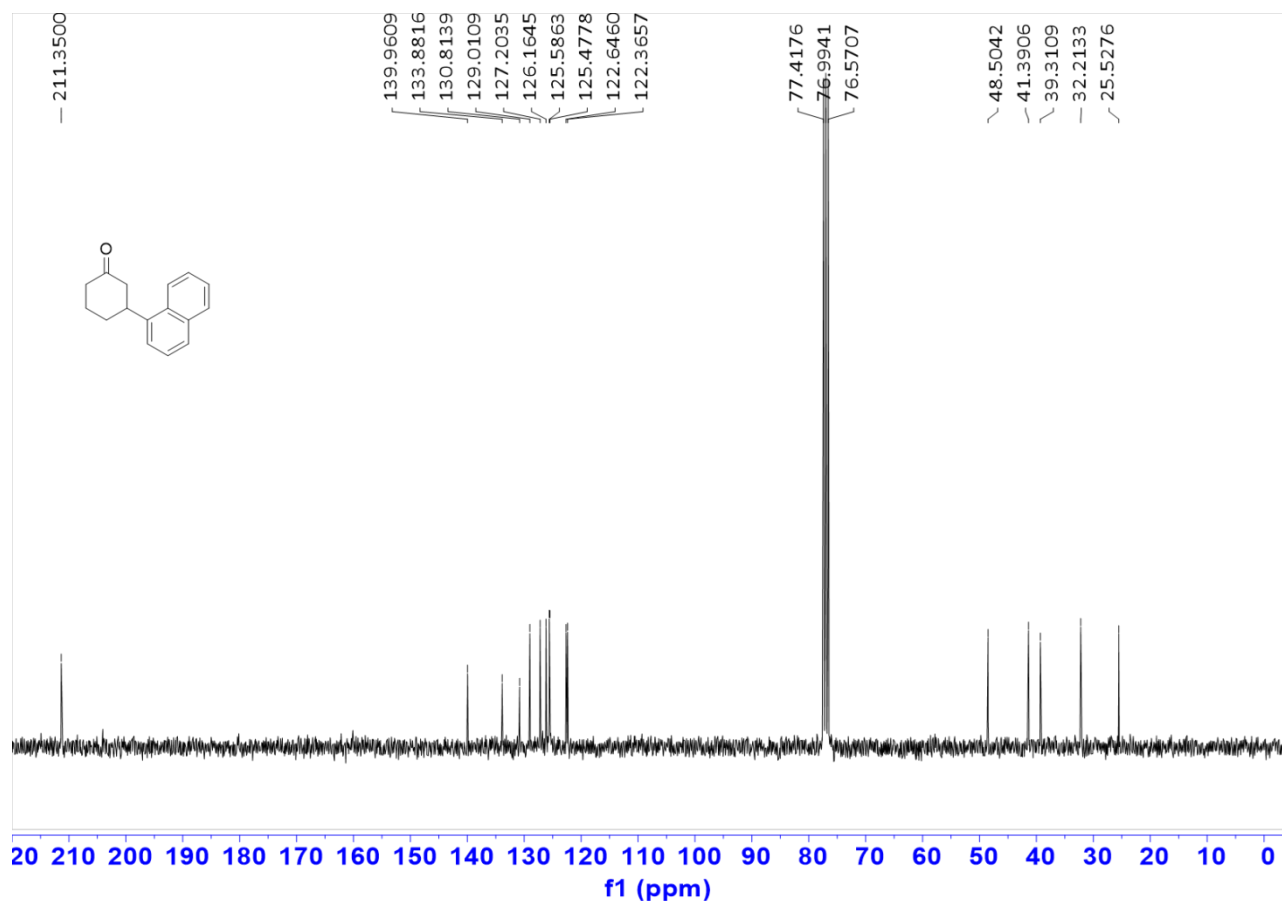
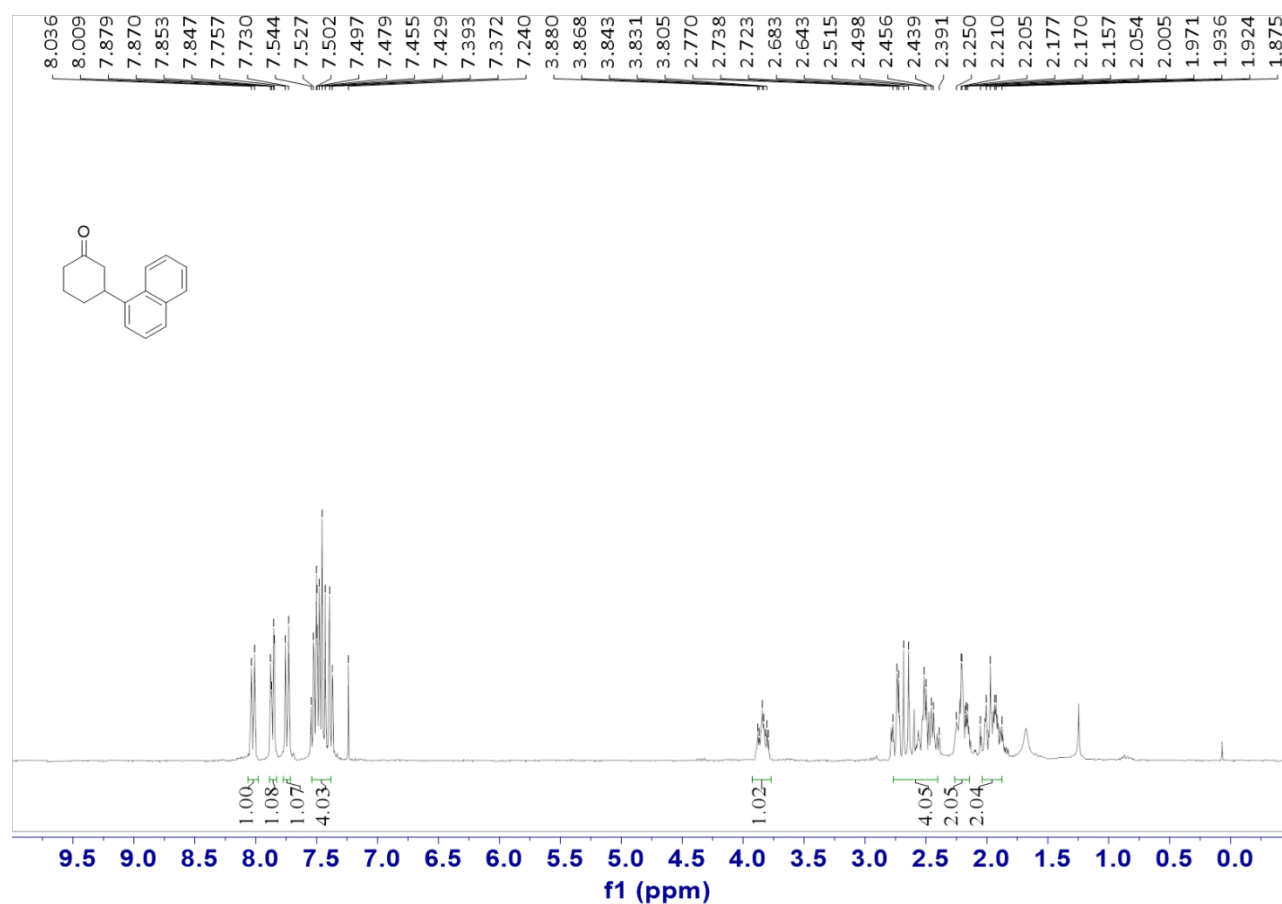
^1H and ^{13}C NMR spectrum of compound **5g**



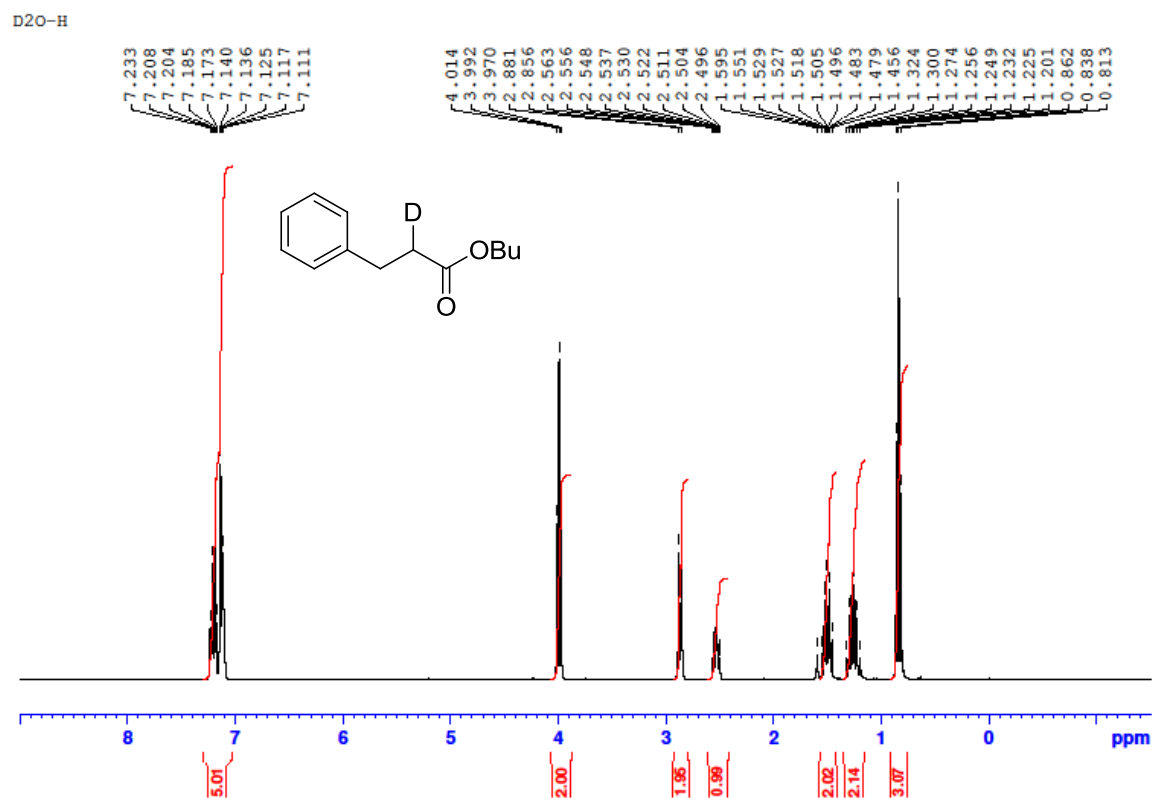
^1H and ^{13}C NMR spectrum of compound **5h**



^1H and ^{13}C NMR spectrum of compound **5i**



¹H NMR spectrum of compound D-3a



¹³C NMR spectrum of compound D-3a

