

Supporting information

for

1-Imidoalkylphosphonium salts with modulated C α –P $^+$ bond strength: synthesis and application as new active α -imidoalkylating agents

Jakub Adamek^{*1,2,§}, Roman Mazurkiewicz^{1,2}, Anna Węgrzyk^{1,2}, and Karol Erfurt³

Address: ¹Department of Organic Chemistry, Bioorganic Chemistry and Biotechnology, Silesian University of Technology, B. Krzywoustego 4, 44-100 Gliwice, Poland, ²Biotechnology Centre of Silesian University of Technology, B. Krzywoustego 8, 44-100 Gliwice, Poland and ³Department of Chemical Organic Technology and Petrochemistry, Silesian University of Technology, B. Krzywoustego 4, 44-100 Gliwice, Poland

Email: Jakub Adamek - jakub.adamek@polsl.pl

*Corresponding author:

§Tel: +48 32 237 10 81; Fax: +48 32 237 20 94

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Phthalimidoacetic acid¹ (6a). Colorless crystals (1.03 g, 50% yield), mp 188.5-190.5°C. ¹H NMR (400 MHz, DMSO-d₆) δ 7.98-7.85 (m, 4H), 4.32 (s, 2H) ppm; ¹³C NMR (100 MHz, DMSO-d₆) δ 168.8, 167.2, 134.8, 131.4, 123.4, 38.9 ppm; IR (ATR) 2937, 1772, 1706, 1409, 1389, 1244 cm⁻¹.

2-Phthalimidopropionic acid¹ (6b). Colorless crystals (2.06 g, 94% yield), mp 166.0-168.0°C. ¹H NMR (400 MHz, DMSO-d₆) δ 7.95-7.85 (m, 4H), 4.87 (q, *J* = 7.3 Hz, 1H), 1.56 (d, *J* = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, DMSO-d₆) δ 171.0, 167.1, 134.7, 131.3, 123.3, 46.1, 14.8 ppm; IR (ATR) 2557, 1764, 1704, 1387 cm⁻¹.

3-Phenyl-2-phthalimidopropionic acid¹ (6c). Colorless crystals (2.75 g, 93% yield), mp 176.0-177.0°C. ¹H NMR (400 MHz, CDCl₃) δ 9.73 (s, 1H), 7.81-7.62 (m, 4H), 7.21-7.09 (m, 5H), 5.23 (dd, *J*₁ = 8.8 Hz, *J*₂ = 7.8 Hz, 1H), 3.59 (d, *J* = 8.5 Hz, 2H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 174.5, 167.4, 136.4, 134.1, 131.4, 128.8, 128.6, 126.9, 123.5, 53.0, 34.4 ppm; IR (ATR) 3027, 2606, 1774, 1705, 1382, 1272, 1255 cm⁻¹.

2-Phenyl-2-phthalimidoacetic acid¹ (6d). Colorless crystals (2.11 g, 75% yield), mp 170.0-171.0°C. ¹H NMR (400 MHz, DMSO-d₆) δ 12.19 (s, 1H), 6.74-6.62 (m, 4H), 6.28-6.20 (m, 2H), 6.17-6.05 (m, 3H), 4.79 (s, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆) δ 168.9, 166.9, 135.0, 135.0, 130.1, 129.1, 128.1, 127.9, 123.5, 55.1 ppm; IR (ATR) 2599, 1773, 1705, 1378 cm⁻¹.

4-Methyl-2-phthalimidopentanoic acid¹ (6e). Colorless crystals (2.35 g, 90% yield), mp 126.5-129.0°C. ¹H NMR (400 MHz, CDCl₃) δ 10.10 (s, 1H), 7.89-7.82 (m, 2H), 7.76-7.70 (m, 2H), 4.99 (dd, *J*₁ = 11.5 Hz, *J*₂ = 4.4 Hz, 1H), 2.36 (ddd, *J*₁ = 14.3 Hz, *J*₂ = 11.5 Hz, *J*₃ = 4.2 Hz, 1H), 1.95 (ddd, *J*₁ = 14.4 Hz, *J*₂ = 10.2 Hz, *J*₃ = 4.4 Hz, 1H), 1.56-1.43 (m, 1H), 0.92 (d, *J* = 6.7 Hz, 3H), 0.94 (d, *J* = 6.6 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 175.7, 167.6, 134.2, 131.7, 123.6, 50.4, 37.0, 25.1, 23.1, 21.0 ppm; IR (ATR) 2962, 1779, 1707, 1384, 1280 cm⁻¹.

Succinimidoacetic acid¹ (6f). Colorless crystals (722.8 mg, 46% yield), mp 104.0-106.0°C. ¹H NMR (400 MHz, DMSO-d₆) δ 4.06 (s, 2H), 2.72 (s, 4H) ppm; ¹³C NMR (100 MHz, DMSO-d₆) δ 177.4, 168.8, 39.7, 28.4 ppm; IR (ATR) 2944, 1776, 1733, 1656, 1421, 1201, 1177 cm⁻¹.

2-Succinimidopropionic acid¹ (6g). Colorless crystals (1.15 g, 67% yield), mp 106.0-108.0°C. ¹H NMR (400 MHz, DMSO-d₆) δ 4.87 (q, *J* = 7.3 Hz, 1H), 2.76 (s, 4H), 1.58 (d, *J* = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, DMSO-d₆) δ 176.2, 174.0, 47.8, 28.1, 14.1 ppm; IR (ATR) 2946, 1690, 1396, 1196 cm⁻¹.

2-(1,8-Naphthalimido)propionic acid² (6h). Colorless crystals (4.52 g, 84% yield), mp 260.5-261.5°C. ¹H NMR (400 MHz, CDCl₃/DMSO-d₆) δ 8.60-8.50 (m, 2H), 8.27-8.23 (m, 2H), 7.80-7.73 (m, 2H), 5.71 (q, *J* = 6.9 Hz, 1H), 1.67 (d, *J* = 7.2 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃/DMSO-d₆) δ 171.5, 162.6, 133.5, 130.8, 130.5, 127.3, 126.2, 121.6, 48.2, 14.0 ppm; IR (ATR) 3157, 2957, 1755, 1698, 1666, 1639, 1584, 1379, 1344, 1236, 1205, 1087 cm⁻¹.

***N*-Methoxymethylphthalimide³ (7a).** Colorless crystals (160.6 mg, 28% yield), mp 118.0-120.0°C. ¹H NMR (400 MHz, CDCl₃) δ 7.95-7.89 (m, 2H), 7.80-7.74 (m, 2H), 5.10 (s, 2H), 3.42 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 167.9, 134.4, 131.9, 123.7, 68.7, 57.4 ppm; IR (ATR) 2933, 1774, 1709, 1345, 1326, 1164, 1082 cm⁻¹.

***N*-(1-Methoxyethyl)phthalimide⁴ (7b).** Colorless crystals (400.2 mg, 65% yield), mp 113.0-115.5°C. ¹H NMR (400 MHz, CDCl₃) δ 7.91-7.86 (m, 2H), 7.78-7.72 (m, 2H), 5.48 (q, *J* = 6.3 Hz, 1H), 3.34 (s, 3H), 1.79 (d, *J* = 6.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 167.9, 134.2, 131.7, 123.5, 79.7, 56.3, 19.1 ppm; IR (ATR) 2915, 1775, 1698, 1324, 1117, 1047 cm⁻¹.

***N*-(1-Methoxy-2-phenylethyl)phthalimide (7c).** Yellow oil (354.5 mg, 42% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.87-7.80 (m, 2H), 7.75-7.68 (m, 2H), 7.24-7.13 (m, 5H), 5.53 (dd, *J*₁ = 7.7 Hz, *J*₂ = 6.8 Hz, 1H), 3.56 (dd, *J*₁ = 14.5 Hz, *J*₂ = 7.3 Hz, 1H), 3.51 (dd, *J*₁ = 14.1 Hz, *J*₂ = 7.8 Hz, 1H), 3.35 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.0, 136.3, 134.2, 131.5, 129.2, 128.5, 126.7, 123.5, 84.1, 56.7, 38.6 ppm; IR (ATR) 2931, 1775, 1709, 1349, 1322, 1112, 1070 cm⁻¹; HRMS (ESI-TOF) calcd for C₁₇H₁₅NO₃Na [M + Na]⁺ 304.0950 found 304.0952.

***N*-(1-Methoxy-1-phenylmethyl)phthalimide (7d).** Yellow oil (481.1 mg, 60% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.89-7.82 (m, 2H), 7.77-7.71 (m, 2H), 7.57-7.52 (m, 2H), 7.39-7.28 (m, 3H), 6.38 (s, 1H), 3.54 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 167.4, 136.9, 134.3, 131.7, 128.4, 128.2, 126.2, 123.6, 82.8, 56.8 ppm; IR (ATR) 2935, 1773, 1712, 1317, 1088, 1074 cm⁻¹; HRMS (ESI-TOF) calcd for C₁₆H₁₃NO₃Na [M + Na]⁺ 290.0793 found 290.0797.

***N*-(1-Methoxy-3-methylbutyl)phthalimide⁴ (7e).** Yellow oil (341.3 mg, 46% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.92-7.86 (m, 2H), 7.80-7.74 (m, 2H), 5.37 (t, *J* = 7.1 Hz, 1H), 3.35 (s, 3H), 2.22-2.00 (m, 2H), 1.76-1.59 (m, 1H), 0.96 (d, *J* = 2.3 Hz, 3H), 0.94 (d, *J* = 2.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.1, 134.2, 131.7, 123.5, 82.4, 56.4, 41.0, 24.9, 22.5, 22.4 ppm; IR (ATR) 2956, 1774, 1709, 1349, 1320, 1114, 1070 cm⁻¹.

***N*-Methoxymethylsuccinimide³ (7f).** Colorless oil (141.7 mg, 33% yield). ¹H NMR (400 MHz, CDCl₃) δ 4.89 (s, 2H), 3.38 (s, 3H), 2.77 (s, 4H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 176.8, 69.2, 57.7, 28.1 ppm; IR (ATR) 2943, 1779, 1701, 1351, 1244, 1183, 1111, 1079 cm⁻¹.

***N*-(1-Methoxyethyl)succinimide (7g).** Colorless oil (400.8 mg, 85% yield). ¹H NMR (400 MHz, CDCl₃) δ 5.32 (q, *J* = 6.3 Hz, 1H), 3.30 (s, 3H), 2.72 (s, 4H), 1.67 (d, *J* = 6.4 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 176.8, 80.5, 56.5, 28.0, 18.2 ppm; IR (ATR) 2942, 1697, 1350, 1196, 1097 cm⁻¹; HRMS (ESI-TOF) calcd for C₇H₁₁NO₃Na [M + Na]⁺ 180.0637 found 180.0634.

***N*-(1-Methoxyethyl)-1,8-naphthalimide (7h).** Pale yellow crystals (398.3 mg, 52% yield), mp 123.0-125.0°C. ¹H NMR (400 MHz, CDCl₃) δ 8.62 (dd, *J*₁ = 7.3 Hz, *J*₂ = 1.1 Hz, 2H), 8.22 (dd, *J*₁ = 8.4 Hz, *J*₂ = 1.0 Hz, 2H), 7.77 (dd, *J*₁ = 8.2 Hz, *J*₂ = 7.3 Hz, 2H), 6.39 (q, *J* = 6.3 Hz, 1H), 3.42 (s, 3H), 1.90 (d, *J* = 6.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 164.3,

133.8, 131.5, 131.3, 128.4, 127.0, 122.8, 82.7, 56.7, 19.5 ppm; IR (ATR) 2941, 1698, 1656, 1586, 1334, 1237, 1099 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{15}\text{H}_{13}\text{NO}_3\text{Na}$ $[\text{M} + \text{Na}]^+$ 278.0793 found 278.0795.

1-(N-Phthalimido)methyltriphenylphosphonium tetrafluoroborate (5a). Colorless crystals (249.5 mg, 49% yield), mp 238.0-240.0°C. ^1H NMR (400 MHz, CD_3CN) δ 7.95-7.67 (m, 19H), 5.46 (d, J = 4.1 Hz, 2H) ppm; ^{13}C NMR (100 MHz, CD_3CN) δ 167.7, 136.8 (d, J = 3.1 Hz), 136.1, 135.5 (d, J = 10.3 Hz), 132.2, 131.3 (d, J = 12.8 Hz), 124.7, 117.0 (d, J = 85.4 Hz), 35.6 (d, J = 60.3 Hz) ppm; ^{31}P NMR (161.9 MHz, CD_3CN) δ 24.7 ppm; IR (ATR) 2920, 1776, 1719, 1387, 1369, 1038 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{27}\text{H}_{21}\text{NO}_2\text{P}$ $[\text{M}^+]$ 422.1310 found 422.1327.

1-(N-Phthalimido)ethyltriphenylphosphonium tetrafluoroborate (5b). Colorless crystals (481.4 mg, 92% yield), mp 200.0-201.5°C. ^1H NMR (400 MHz, CDCl_3) δ 7.91-7.60 (m, 19H), 6.22 (dq, J_1 = 10.5 Hz, J_2 = 7.5 Hz, 1H), 2.05 (dd, J_1 = 16.7 Hz, J_2 = 7.5 Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 166.6 (d, J = 1.2 Hz), 135.9 (d, J = 3.1 Hz), 135.3, 134.4 (d, J = 9.8 Hz), 130.7 (d, J = 12.6 Hz), 130.4, 124.1, 116.1 (d, J = 82.8 Hz), 44.6 (d, J = 54.0 Hz), 16.5 (d, J = 4.7 Hz) ppm; ^{31}P NMR (161.9 MHz, CDCl_3) δ 28.7 ppm; IR (ATR) 3066, 1779, 1716, 1380, 1060, 1039 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{28}\text{H}_{23}\text{NO}_2\text{P}$ $[\text{M}^+]$ 436.1466 found 436.1467.

1-(N-Phthalimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (5c). Colorless crystals (520.1 mg, 83% yield), mp 141.5-143.0°C. ^1H NMR (400 MHz, CD_3CN) δ 7.93-7.89 (m, 3H), 7.87-7.79 (m, 7H), 7.77-7.66 (m, 6H), 6.25 (dq, J_1 = 10.0 Hz, J_2 = 7.4 Hz, 1H), 2.00 (dd, J_1 = 17.2 Hz, J_2 = 7.4 Hz, 3H) ppm; ^{13}C NMR (100 MHz, CD_3CN) δ 167.9 (d, J = 1.1 Hz), 137.4 (d, J = 17.0 Hz), 137.2 (d, J = 3.0 Hz), 136.4, 134.9 (d, J = 11.3 Hz), 134.4 (d, J = 9.6 Hz), 133.2 (d, J = 13.9 Hz), 131.8, 124.9, 118.7 (d, J = 84.3 Hz), 45.4 (d, J = 54.3 Hz), 15.8 (d, J = 3.5 Hz) ppm; ^{31}P NMR (161.9 MHz, CD_3CN) δ 26.5 ppm; IR (ATR) 3067, 1774, 1707, 1381, 1040 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{28}\text{H}_{20}\text{Cl}_3\text{NO}_2\text{P}$ $[\text{M}^+]$ 538.0297 found 538.0296.

1-(N-Phthalimido)ethyltris(4-chlorophenyl)phosphonium tetrafluoroborate (5d). Colorless crystals (557.7 mg, 89% yield), mp 141.0-142.5°C. ^1H NMR (400 MHz, CDCl_3) δ 7.83-7.64 (m, 16H), 6.24 (dq, J_1 = 10.0 Hz, J_2 = 7.4 Hz, 1H), 2.02 (dd, J_1 = 17.2 Hz, J_2 = 7.4 Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 166.5 (d, J = 1.2 Hz), 143.5 (d, J = 3.7 Hz), 135.7 (d, J = 11.1 Hz), 135.5, 131.3 (d, J = 13.6 Hz), 130.4, 124.3, 113.9 (d, J = 86.0 Hz), 44.5 (d, J = 54.3 Hz), 16.2 (d, J = 3.8 Hz) ppm; ^{31}P NMR (161.9 MHz, CDCl_3) δ 28.6 ppm; IR (ATR) 3097, 1780, 1717, 1380, 1047, 1008 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{28}\text{H}_{20}\text{Cl}_3\text{NO}_2\text{P}$ $[\text{M}^+]$ 538.0297 found 538.0298.

1-(N-Phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (5e). Colorless crystals (690.9 mg, 95% yield), mp 126.0-127.5°C. ^1H NMR (400 MHz, CDCl_3) δ 8.10-8.00 (m, 6H), 7.99-7.92 (m, 6H), 7.81-7.71 (m, 4H), 6.49 (dq, J_1 = 9.6 Hz, J_2 = 7.3 Hz, 1H), 2.07 (dd, J_1 = 17.7 Hz, J_2 = 7.4 Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 166.4 (d, J = 1.2 Hz), 137.5 (qd, J_1 = 33.9 Hz, J_2 = 3.3 Hz), 135.6, 135.4 (d, J = 10.6 Hz), 130.3, 127.7 (dq, J_1 = 13.1 Hz, J_2 = 3.6 Hz), 124.3, 122.6 (qd, J_1 = 273.6 Hz, J_2 = 1.2 Hz), 119.7 (d, J = 81.8 Hz), 44.2 (d, J = 52.1 Hz), 16.3 (d, J = 3.8 Hz) ppm; ^{31}P

NMR (161.9 MHz, CDCl₃) δ 28.9 ppm; ¹⁹F NMR (376 MHz, CDCl₃) δ -63.9 (s, CF₃) ppm; IR (ATR) 3107, 1782, 1720, 1318, 1131, 1060, 1012 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₁H₂₀F₉NO₂P [M⁺] 640.1088 found 640.1088.

1-(N-Phthalimido)phenylmethyltriphenylphosphonium tetrafluoroborate (5f). Colorless crystals (550.2 mg, 94% yield), mp 226.0-228.0°C. ¹H NMR (400 MHz, CDCl₃) δ 7.91-7.80 (m, 7H), 7.75-7.61 (m, 12H), 7.43-7.23 (m, 5H), 7.18 (d, *J* = 15.4 Hz, 1H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 166.8 (d, *J* = 2.3 Hz), 135.9 (d, *J* = 3.1 Hz), 135.8, 134.5 (d, *J* = 9.7 Hz), 133.9 (d, *J* = 14.6 Hz), 130.6 (d, *J* = 12.7 Hz), 130.3, 129.7 (d, *J* = 1.5 Hz), 129.6 (d, *J* = 5.2 Hz), 129.4 (d, *J* = 2.1 Hz), 124.5, 116.8 (d, *J* = 83.6 Hz), 52.5 (d, *J* = 54.3 Hz) ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 27.0 ppm; IR (ATR) 3077, 1784, 1719, 1329, 1047 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₃H₂₅NO₂P [M⁺] 498.1623 found 498.1620.

1-(N-Phthalimido)phenylmethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (5g). Resin (606.1 mg, 88% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.90-7.83 (m, 4H), 7.82-7.72 (m, 9H), 7.51-7.40 (m, 4H), 7.37-7.30 (m, 2H), 7.28-7.20 (m, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 166.7 (d, *J* = 2.8 Hz), 136.7 (d, *J* = 16.8 Hz), 136.3 (d, *J* = 3.0 Hz), 135.8, 133.3 (d, *J* = 4.2 Hz), 133.2 (d, *J* = 5.6 Hz), 132.7 (d, *J* = 14.2 Hz), 131.2 (d, *J* = 2.7 Hz), 130.3, 129.9 (d, *J* = 1.9 Hz), 129.6 (d, *J* = 5.2 Hz), 128.7 (d, *J* = 1.2 Hz), 124.7, 118.4 (d, *J* = 83.6 Hz), 52.6 (d, *J* = 53.7 Hz) ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 26.0 ppm; IR (ATR) 3075, 1790, 1719, 1380, 1051 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₃H₂₂Cl₃NO₂P [M⁺] 600.0454 found 600.0449.

1-(N-Phthalimido)phenylmethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (5h). Colorless crystals (631.4 mg, 80% yield), mp 131.5-132.5°C. ¹H NMR (400 MHz, CDCl₃) δ 8.04-7.94 (m, 6H), 7.92-7.85 (m, 6H), 7.79 (s, 4H), 7.55 (d, *J* = 14.2 Hz, 1H), 7.43-7.37 (m, 1H), 7.31-7.23 (m, 2H), 7.17-7.10 (m, 2H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 166.4, 136.8 (qd, *J*₁ = 33.5 Hz, *J*₂ = 3.5 Hz), 135.6, 135.3 (d, *J* = 10.2 Hz), 131.1 (d, *J* = 2.7 Hz), 130.5, 129.9 (d, *J* = 2.2 Hz), 129.5 (d, *J* = 5.3 Hz), 129.0, 127.2 (dq, *J*₁ = 13.3 Hz, *J*₂ = 3.6 Hz), 124.7, 122.6 (q, *J* = 271.9 Hz), 121.7 (d, *J* = 83.8 Hz), 51.9 (d, *J* = 54.1 Hz) ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 26.4 ppm; ¹⁹F NMR (376 MHz, CDCl₃) δ -63.8 (s, CF₃) ppm; IR (ATR) 3109, 1717, 1319, 1130, 1060, 1010 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₆H₂₂F₉NO₂P [M⁺] 702.1244 found 702.1246.

3-Methyl-1-(N-phthalimido)butyltriphenylphosphonium tetrafluoroborate (5i). Colorless crystals (446.6 mg, 79% yield), mp 240.0-241.5°C. ¹H NMR (400 MHz, CDCl₃) δ 7.90-7.65 (m, 19H), 6.01 (td, *J*₁ = 12.7 Hz, *J*₂ = 2.7 Hz, 1H), 2.83-2.73 (m, 1H), 1.71-1.61 (m, 1H), 1.61-1.51 (m, 1H), 1.05 (d, *J* = 6.4 Hz, 3H), 0.93 (d, *J* = 6.5 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 166.9 (d, *J* = 1.1 Hz), 136.1 (d, *J* = 3.1 Hz), 135.7, 134.2 (d, *J* = 9.8 Hz), 130.8 (d, *J* = 12.6 Hz), 130.1, 124.3, 115.8 (d, *J* = 82.9 Hz), 47.5 (d, *J* = 53.2 Hz), 37.9 (d, *J* = 3.1 Hz), 26.0 (d, *J* = 11.5 Hz), 22.9, 20.6 ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 31.3 ppm; IR (ATR) 2970, 1782, 1719, 1372, 1050 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₁H₂₉NO₂P [M⁺] 478.1936 found 478.1938.

3-Methyl-1-(*N*-phthalimido)butyltris(3-chlorophenyl)phosphonium tetrafluoroborate (5j). Colorless crystals (501.5 mg, 75% yield), mp 192.0-194.0°C. ¹H NMR (400 MHz, CD₃CN) δ 7.95-7.66 (m, 16H), 6.03 (td, *J*₁ = 12.4 Hz, *J*₂ = 2.5 Hz, 1H), 2.75 (dddd, *J*₁ = 14.2 Hz, *J*₂ = 12.8 Hz, *J*₃ = 4.9 Hz, *J*₄ = 3.3 Hz, 1H), 1.84 (dddd, *J*₁ = 14.3 Hz, *J*₂ = 10.4 Hz, *J*₃ = 5.1 Hz, *J*₄ = 2.5 Hz, 1H), 1.71-1.58 (m, 1H), 1.03 (d, *J* = 6.5 Hz, 3H), 0.89 (d, *J* = 6.6 Hz, 3H) ppm; ¹³C NMR (100 MHz, CD₃CN) δ 168.1 (d, *J* = 1.2 Hz), 137.4 (d, *J* = 17.0 Hz), 137.2 (d, *J* = 3.0 Hz), 136.7, 134.9 (d, *J* = 11.4 Hz), 134.3 (d, *J* = 9.6 Hz), 133.3 (d, *J* = 14.0 Hz), 131.5, 125.1, 118.7 (d, *J* = 82.7 Hz), 48.7 (d, *J* = 53.1 Hz), 37.4 (d, *J* = 3.2 Hz), 26.5 (d, *J* = 12.1 Hz), 23.0, 20.7 ppm; ³¹P NMR (161.9 MHz, CD₃CN) δ 26.4 ppm; IR (ATR) 2963, 2901, 1780, 1719, 1371, 1328, 1131, 1050 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₁H₂₆Cl₃NO₂P [M⁺] 580.0767 found 580.0767.

1-(*N*-Succinimido)methyltriphenylphosphonium tetrafluoroborate (5k). Colorless crystals (299.8 mg, 65% yield), mp 215.0-217.0°C. ¹H NMR (400 MHz, CD₃CN) δ 7.96-7.88 (m, 3H), 7.81-7.70 (m, 12H), 5.20 (d, *J* = 5.2 Hz, 2H), 2.53 (d, *J* = 1.2 Hz, 4H) ppm; ¹³C NMR (100 MHz, CD₃CN) δ 177.3, 136.8 (d, *J* = 3.2 Hz), 135.4 (d, *J* = 10.3 Hz), 131.3 (d, *J* = 12.9 Hz), 117.1 (d, *J* = 85.6 Hz), 35.6 (d, *J* = 60.1 Hz), 28.8 ppm; ³¹P NMR (161.9 MHz, CD₃CN) δ 20.0 ppm; IR (ATR) 3107, 1714, 1443, 1383, 1112, 1044, 996 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₃H₂₁NO₂P [M⁺] 374.1310 found 374.1312.

1-(*N*-Succinimido)ethyltriphenylphosphonium tetrafluoroborate (5l). Colorless crystals (275.6 mg, 58% yield), mp 241.0-242.5°C. ¹H NMR (400 MHz, CD₃CN) δ 7.97-7.88 (m, 3H), 7.80-7.69 (m, 12H), 5.95 (dq, *J*₁ = 10.7 Hz, *J*₂ = 7.4 Hz, 1H), 2.59-2.39 (m, 4H), 1.82 (dd, *J*₁ = 16.6 Hz, *J*₂ = 7.4 Hz, 3H) ppm; ¹³C NMR (100 MHz, CD₃CN) δ 177.7 (d, *J* = 1.1 Hz), 136.7 (d, *J* = 3.1 Hz), 135.6 (d, *J* = 9.9 Hz), 131.4 (d, *J* = 12.8 Hz), 117.5 (d, *J* = 83.6 Hz), 45.4 (d, *J* = 55.6 Hz), 28.6, 15.3 (d, *J* = 2.5 Hz) ppm; ³¹P NMR (161.9 MHz, CD₃CN) δ 27.3 ppm; IR (ATR) 2918, 1778, 1705, 1387, 1049, 1036 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₄H₂₃NO₂P [M⁺] 388.1466 found 388.1465.

1-(*N*-Succinimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (5m). Resin (162.0 mg, 28% yield). ¹H NMR (400 MHz, CD₃CN) δ 8.00-7.89 (m, 3H), 7.85-7.60 (m, 9H), 6.01 (dq, *J*₁ = 10.2 Hz, *J*₂ = 7.4 Hz, 1H), 2.65-2.45 (m, 4H), 1.81 (dd, *J*₁ = 17.4 Hz, *J*₂ = 7.4 Hz, 3H) ppm; ¹³C NMR (100 MHz, CD₃CN) δ 177.8 (d, *J* = 1.4 Hz), 137.3 (d, *J* = 17.0 Hz), 137.2 (d, *J* = 3.0 Hz), 134.9 (d, *J* = 11.4 Hz), 134.2 (d, *J* = 9.6 Hz), 133.3 (d, *J* = 14.1 Hz), 119.0 (d, *J* = 83.5 Hz), 45.1 (d, *J* = 54.8 Hz), 28.7, 15.3 (d, *J* = 2.6 Hz) ppm; ³¹P NMR (161.9 MHz, CD₃CN) δ 27.7 ppm; IR (ATR) 3076, 1780, 1706, 1034 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₄H₂₀Cl₃NO₂P [M⁺] 490.0297 found 490.0299.

1-(*N*-Succinimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (5n). Colorless crystals (346.4 mg, 51% yield), mp 222.0-223.5°C. ¹H NMR (400 MHz, CD₃CN) δ 8.09-8.02 (m, 6H), 8.00-7.92 (m, 6H), 6.08 (dq, *J*₁ = 10.3 Hz, *J*₂ = 7.3 Hz, 1H), 2.68-2.43 (m, 4H), 1.85 (dd, *J*₁ = 17.5 Hz, *J*₂ = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CD₃CN) δ 177.7 (d, *J* = 1.5 Hz), 137.4 (qd, *J*₁ = 33.4 Hz, *J*₂ = 3.3 Hz), 136.9 (d, *J* = 10.7 Hz), 128.5-128.2 (m), 124.2 (qd, *J*₁ = 272.7 Hz, *J*₂ = 1.4 Hz), 121.4 (dq, *J*₁ = 83.1 Hz, *J*₂ = 1.1 Hz), 45.1 (d, *J* = 54.5 Hz), 28.8, 15.5 (d, *J* = 2.4 Hz) ppm; ³¹P NMR

(161.9 MHz, CD₃CN) δ 27.8 ppm; ¹⁹F NMR (376 MHz, CD₃CN) δ -64.3 (s, CF₃) ppm; IR (ATR) 3108, 1790, 1713, 1400, 1320, 1061, 1036 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₇H₂₀F₉NO₂P [M⁺] 592.1088 found 592.1083.

1-Methoxyethyltriphenylphosphonium tetrafluoroborate⁵ (8). Resin (298.0 mg, 73% yield). ¹H NMR (400 MHz, CDCl₃) δ 7.89-7.60 (m, 15H), 5.69 (dq, J_1 = 6.7 Hz, J_2 = 4.7 Hz, 1H), 3.56 (s, 3H), 1.66 (dd, J_1 = 18.2 Hz, J_2 = 6.7 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 135.3 (d, J = 3.0 Hz), 134.4 (d, J = 9.3 Hz), 130.5 (d, J = 12.3 Hz), 116.7 (d, J = 83.2 Hz), 73.0 (d, J = 68.2 Hz), 59.6 (d, J = 11.3 Hz), 15.1 (d, J = 3.2 Hz) ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 17.9 ppm; IR (ATR) 3066, 2939, 1588, 1486, 1439, 1110, 1047, 996 cm⁻¹.

N-[1-(4-Methoxyphenyl)ethyl]phthalimide (9aa) and N-[1-(2-methoxyphenyl)ethyl]phthalimide (9ab). A mixture of two isomers (25.6 mg, 91% yield). Isomers were separated by fractional crystallization from toluene. **N-[1-(4-Methoxyphenyl)ethyl]phthalimide (9aa).** Colorless crystals, mp 66.5-68.5°C. ¹H NMR (400 MHz, CDCl₃) δ 7.81-7.77 (m, 2H), 7.70-7.65 (m, 2H), 7.48-7.42 (m, 2H), 6.88-6.83 (m, 2H), 5.53 (q, J = 7.4 Hz, 1H), 3.77 (s, 3H), 1.90 (d, J = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.2, 159.0, 133.8, 132.5, 132.0, 128.8, 123.1, 113.7, 55.2, 49.2, 17.7 ppm; IR (ATR) 2983, 1773, 1701, 1606, 1510, 1387, 1352, 1330, 1246, 1046 cm⁻¹; HRMS (ESI-TOF) calcd for C₁₇H₁₅NO₃Na [M + Na]⁺ 304.0950 found 304.0951.

N-[1-(2-Methoxyphenyl)ethyl]phthalimide (9ab). Colorless crystals, mp 120-121°C. ¹H NMR (400 MHz, CDCl₃) δ 7.87-7.74 (m, 2H), 7.71-7.58 (m, 3H), 7.33-7.20 (m, 1H), 7.04-6.93 (m, 1H), 6.87-6.79 (m, 1H), 5.86 (q, J = 7.2 Hz, 1H), 3.75 (s, 3H), 1.83 (d, J = 7.2 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.0, 156.8, 133.6, 132.1, 128.8, 128.4, 127.8, 123.0, 120.2, 110.3, 55.4, 43.9, 17.3 ppm; IR (ATR) 2976, 1758, 1701, 1604, 1492, 1464, 1393, 1354, 1334, 1247 cm⁻¹; HRMS (ESI-TOF) calcd for C₁₇H₁₅NO₃Na [M + Na]⁺ 304.0950 found 304.0956.

N-[1-(4-Methoxyphenyl)-1-phenylmethyl]phthalimide (9ba) and N-[1-(2-methoxyphenyl)-1-phenylmethyl]phthalimide (9bb). A mixture of two isomers (28.5 mg, 83% yield). Isomers were separated by column chromatography (toluene:ethyl acetate; 20:1, v/v). **N-[1-(4-Methoxyphenyl)-1-phenylmethyl]phthalimide (9ba).** Oil. ¹H NMR (400 MHz, CDCl₃) δ 7.90-7.81 (m, 2H), 7.75-7.67 (m, 2H), 7.40-7.30 (m, 7H), 6.90-6.83 (m, 2H), 6.67 (s, 1H), 3.79 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 167.9, 159.1, 138.5, 134.0, 131.9, 130.3, 130.2, 128.3, 128.3, 127.5, 123.3, 113.7, 57.3, 55.2 ppm; IR (ATR) 3030, 2836, 1768, 1709, 1610, 1511, 1382, 1353, 1326, 1247 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₂H₁₇NO₃Na [M + Na]⁺ 366.1106 found 366.1111. **N-[1-(2-Methoxyphenyl)-1-phenylmethyl]phthalimide (9bb).** Colorless crystals, mp 104-106°C. ¹H NMR (400 MHz, CDCl₃) δ 7.87-7.74 (m, 2H), 7.72-7.66 (m, 2H), 7.40-7.30 (m, 6H), 7.30-7.18 (m, 1H), 6.97 (s, 1H), 6.94-6.81 (m, 2H), 3.74 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.1, 157.1, 138.4, 133.9, 132.0, 130.9, 129.1, 128.3, 128.3, 127.4, 126.5, 123.3, 120.1, 110.2, 55.6, 52.6 ppm; IR (ATR) 2934, 2836, 1764, 1704, 1601, 1492, 1464, 1438, 1386, 1353, 1329, 1249 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₂H₁₇NO₃Na [M + Na]⁺ 366.1106 found 366.1108.

***N*-[1-(4-Methoxyphenyl)-3-methylbutyl]phthalimide (9ca)** and ***N*-[1-(2-methoxyphenyl)-3-methylbutyl]phthalimide (9cb)**. A mixture of two isomers (28.5 mg, 88% yield). Attempts to separate isomers by fractional crystallization or column chromatography failed. Major *p*-isomer (**9ca**): ^1H NMR (400 MHz, CDCl_3) δ 7.85-7.73^a (m, 2H), 7.71-7.62^a (m, 2H), 7.54-7.44 (m, 2H), 6.88-6.80^a (m, 2H), 5.40 (dd, $J_1 = 10.0$ Hz, $J_2 = 6.5$ Hz, 1H), 3.77 (s, 3H), 2.60-2.46^a (m, 1H), 2.08-1.97 (m, 1H), 1.58-1.45^a (m, 1H), 0.97^a (d, $J = 6.4$ Hz, 3H), 0.96^a (d, $J = 6.8$ Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 168.4, 159.0, 133.8, 132.1, 131.9, 129.5, 123.1, 113.7, 55.2, 52.5, 39.9, 25.5, 22.9, 22.0 ppm. Minor *o*-isomer (**9cb**): ^1H NMR (400 MHz, CDCl_3) δ 7.85-7.73^a (m, 2H), 7.71-7.62^a (m, 3H), 7.26-7.19 (m, 1H), 6.99-6.92 (m, 1H), 6.88-6.80^a (m, 1H), 5.87 (dd, $J_1 = 10.5$ Hz, $J_2 = 5.4$ Hz, 1H), 3.79 (s, 3H), 2.60-2.46^a (m, 1H), 1.96-1.86 (m, 1H), 1.58-1.45^a (m, 1H), 1.01 (d, $J = 6.5$ Hz, 3H), 0.95^a (d, $J = 6.8$ Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 168.3, 156.9, 133.6, 132.0, 128.9, 128.7, 127.8, 123.0, 120.2, 110.4, 55.5, 46.4, 39.7, 25.4, 23.2, 21.9 ppm. ^aOverlapping signals of two isomers.

***N*-[1-(4-Methoxyphenyl)ethyl]succinimide (9da)** and ***N*-[1-(2-methoxyphenyl)ethyl]succinimide (9db)**. A mixture of two isomers (13.1 mg, 56% yield). Isomers were separated by column chromatography (toluene:ethyl acetate; 5:1, v/v). ***N*-[1-(4-Methoxyphenyl)ethyl]succinimide (9da)**. Oil. ^1H NMR (400 MHz, CDCl_3) δ 7.46-7.35 (m, 2H), 6.92-6.80 (m, 2H), 5.38 (q, $J = 7.4$ Hz, 1H), 3.78 (s, 3H), 2.62 (s, 4H), 1.90 (d, $J = 7.3$ Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 177.0, 159.1, 131.8, 129.0, 113.7, 55.2, 49.9, 28.1, 16.7 ppm; IR (ATR) 2919, 1698, 1612, 1514, 1390, 1361, 1249, 1189 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{13}\text{H}_{15}\text{NO}_3\text{Na}$ [$\text{M} + \text{Na}$]⁺ 256.0950 found 250.0949. ***N*-[1-(2-Methoxyphenyl)ethyl]succinimide (9db)**. Colorless crystals, mp 95-97°C. ^1H NMR (400 MHz, CDCl_3) δ 7.60-7.53 (m, 1H), 7.30-7.21 (m, 1H), 7.01-6.93 (m, 1H), 6.87-6.80 (m, 1H), 5.68 (q, $J = 7.3$ Hz, 1H), 3.78 (s, 3H), 2.61 (s, 4H), 1.72 (d, $J = 7.3$ Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 176.7, 156.8, 128.8, 128.6, 127.0, 120.1, 110.2, 55.4, 44.5, 28.0, 16.2 ppm; IR (ATR) 2943, 1687, 1600, 1495, 1392, 1355, 1295, 1248, 1208, 1191, 1178 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{13}\text{H}_{15}\text{NO}_3\text{Na}$ [$\text{M} + \text{Na}$]⁺ 256.0950 found 256.0955.

***N*-[1-(2,4-Dimethoxyphenyl)ethyl]phthalimide (9e)**. Colorless crystals (25.5 mg, 82% yield), mp 129.5-131.5°C. ^1H NMR (400 MHz, CDCl_3) δ 7.77 (dd, $J_1 = 5.4$ Hz, $J_2 = 3.1$ Hz, 2H), 7.66 (dd, $J_1 = 5.4$ Hz, $J_2 = 3.0$ Hz, 2H), 7.57 (d, $J = 8.5$ Hz, 1H), 6.51 (dd, $J_1 = 8.5$ Hz, $J_2 = 2.4$ Hz, 1H), 6.39 (d, $J = 2.4$ Hz, 1H), 5.79 (q, $J = 7.3$ Hz, 1H), 3.79 (s, 3H), 3.72 (s, 3H), 1.81 (d, $J = 7.3$ Hz, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 168.0, 160.4, 157.9, 133.6, 132.1, 129.1, 122.9, 120.2, 103.6, 98.3, 55.4, 55.3, 43.4, 17.3 ppm; IR (ATR) 2976, 1771, 1699, 1608, 1463, 1387, 1272, 1116, 1031 cm^{-1} ; HRMS (ESI-TOF) calcd for $\text{C}_{18}\text{H}_{17}\text{NO}_4\text{Na}$ [$\text{M} + \text{Na}$]⁺ 334.1055 found 334.1058.

***N*-[1-(2,4-Dimethoxyphenyl)-1-phenylmethyl]phthalimide (9f)**. Colorless crystals (22.4 mg, 60% yield), mp 134.5-136.5°C. ^1H NMR (400 MHz, CDCl_3) δ 7.84-7.78 (m, 2H), 7.73-7.66 (m, 2H), 7.39-7.27 (m, 5H), 7.15-7.10 (m, 1H), 6.92 (s, 1H), 6.46-6.39 (m, 2H), 3.78 (s, 3H), 3.72 (s, 3H) ppm; ^{13}C NMR (100 MHz, CDCl_3) δ 168.2, 160.5, 158.1, 138.7, 133.8,

132.0, 131.8, 128.3, 128.1, 127.3, 123.2, 119.0, 103.7, 98.1, 55.6, 55.3, 52.2 ppm; IR (ATR) 2933, 1764, 1708, 1614, 1589, 1387, 1356, 1207, 1109, 1062 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₃H₁₉NO₄Na [M⁺] 396.1212 found 396.1218.

***N*-[1-(2,4-Dimethoxyphenyl)-3-methylbutyl]phthalimide (9g).** Colorless crystals (26.9 mg, 76% yield), mp 85.5-87.5°C. ¹H NMR (400 MHz, CDCl₃) δ 7.82-7.73 (m, 2H), 7.70-7.64 (m, 2H), 7.61 (d, *J* = 8.6 Hz, 1H), 6.49 (dd, *J*₁ = 8.6 Hz, *J*₂ = 2.5 Hz, 1H), 6.39 (d, *J* = 2.5 Hz, 1H), 5.79 (dd, *J*₁ = 10.3 Hz, *J*₂ = 5.8 Hz, 1H), 3.78 (s, 3H), 3.75 (s, 3H), 2.46 (ddd, *J*₁ = 13.7 Hz, *J*₂ = 10.3 Hz, *J*₃ = 5.2 Hz, 1H), 1.91 (ddd, *J*₁ = 14.2 Hz, *J*₂ = 8.5 Hz, *J*₃ = 5.6 Hz, 1H), 1.60-1.41 (m, 1H), 1.01 (d, *J* = 6.6 Hz, 3H), 0.95 (d, *J* = 6.6 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.4, 160.2, 158.1, 133.6, 132.1, 129.7, 123.0, 120.1, 103.7, 98.3, 55.5, 55.3, 45.9, 39.9, 25.4, 23.1, 22.0 ppm; IR (ATR) 2962, 1767, 1708, 1614, 1586, 1385, 1126, 1031 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₁H₂₃NO₄Na [M + Na]⁺ 376.1525 found 376.1525.

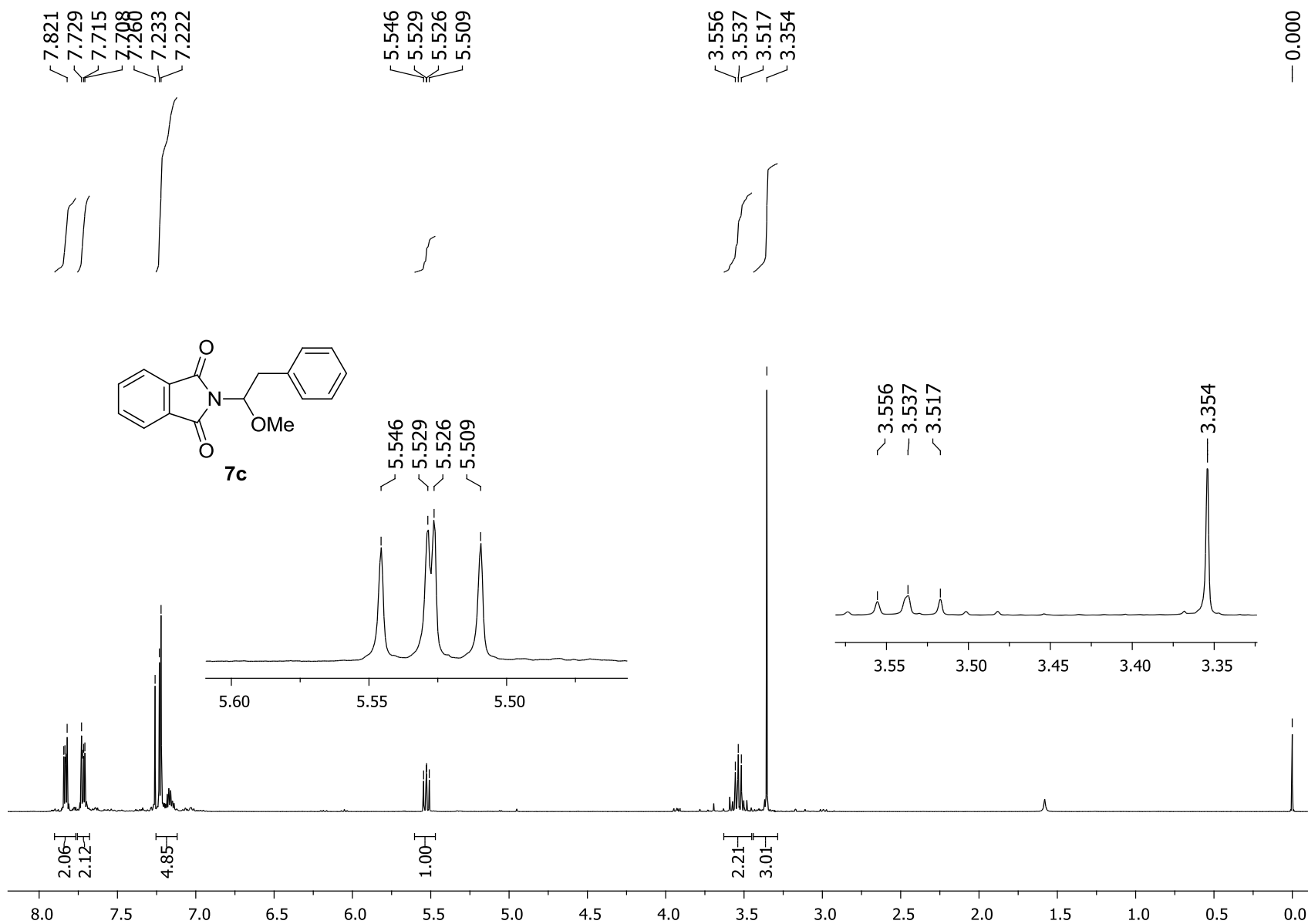
***N*-[1-(4-Methylphenyl)ethyl]phthalimide (9ha)** and ***N*-[1-(2-methylphenyl)ethyl]phthalimide**^{6,7} (**9hb**). A mixture of two isomers (13.3 mg, 50% yield). Attempts to separate isomers by fractional crystallization or column chromatography failed. Major *p*-isomer (**9ha**): ¹H NMR (400 MHz, CDCl₃) δ 7.83-7.70^a (m, 2H), 7.72-7.64^a (m, 2H), 7.43-7.36 (m, 2H), 7.17-7.10 (m, 2H), 5.54 (q, *J* = 7.3 Hz, 1H), 2.31 (s, 3H), 1.91 (d, *J* = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.2, 137.4, 137.3, 133.8, 132.0, 129.1, 127.3, 123.1, 49.4, 21.0, 17.5 ppm. Minor *o*-isomer (**9hb**): ¹H NMR (400 MHz, CDCl₃) δ 7.83-7.70^a (m, 2H), 7.72-7.64^a (m, 2H), 7.32-7.04^a (m, 4H), 5.72 (q, *J* = 7.9 Hz, 1H), 2.37 (s, 3H), 1.88 (d, *J* = 7.3 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.1, 138.1, 135.9, 133.8, 131.9, 130.4, 128.0, 127.7, 125.9, 124.4, 46.8, 19.5, 18.2 ppm.
^aOverlapping signals of two isomers.

***N*-[1-(4-Methylphenyl)-1-phenylmethyl]phthalimide (9ia)** and ***N*-[1-(2-methylphenyl)-1-phenylmethyl]phthalimide (9ib)**. A mixture of two isomers (19.6 mg, 60% yield). The major isomer was isolated by column chromatography (toluene:ethyl acetate; 20:1, v/v) and crystallization from toluene. ***N*-[1-(4-Methylphenyl)-1-phenylmethyl]phthalimide (9ia)**. Colorless crystals, mp 150.5-151.5°C. ¹H NMR (400 MHz, CDCl₃) δ 7.87-7.73 (m, 2H), 7.72-7.63 (m, 2H), 7.37-7.24 (m, 7H), 7.17-7.05 (m, 2H), 6.65 (s, 1H), 2.30 (s, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 168.0, 138.4, 137.4, 135.3, 134.0, 131.9, 129.1, 128.7, 128.6, 128.3, 127.6, 123.4, 57.6, 21.1 ppm; IR (ATR) 3033, 2921, 1769, 1713, 1514, 1382, 1354, 1328 cm⁻¹; HRMS (ESI-TOF) calcd for C₂₂H₁₇NO₂Na [M + Na]⁺ 350.1157 found 350.1156.

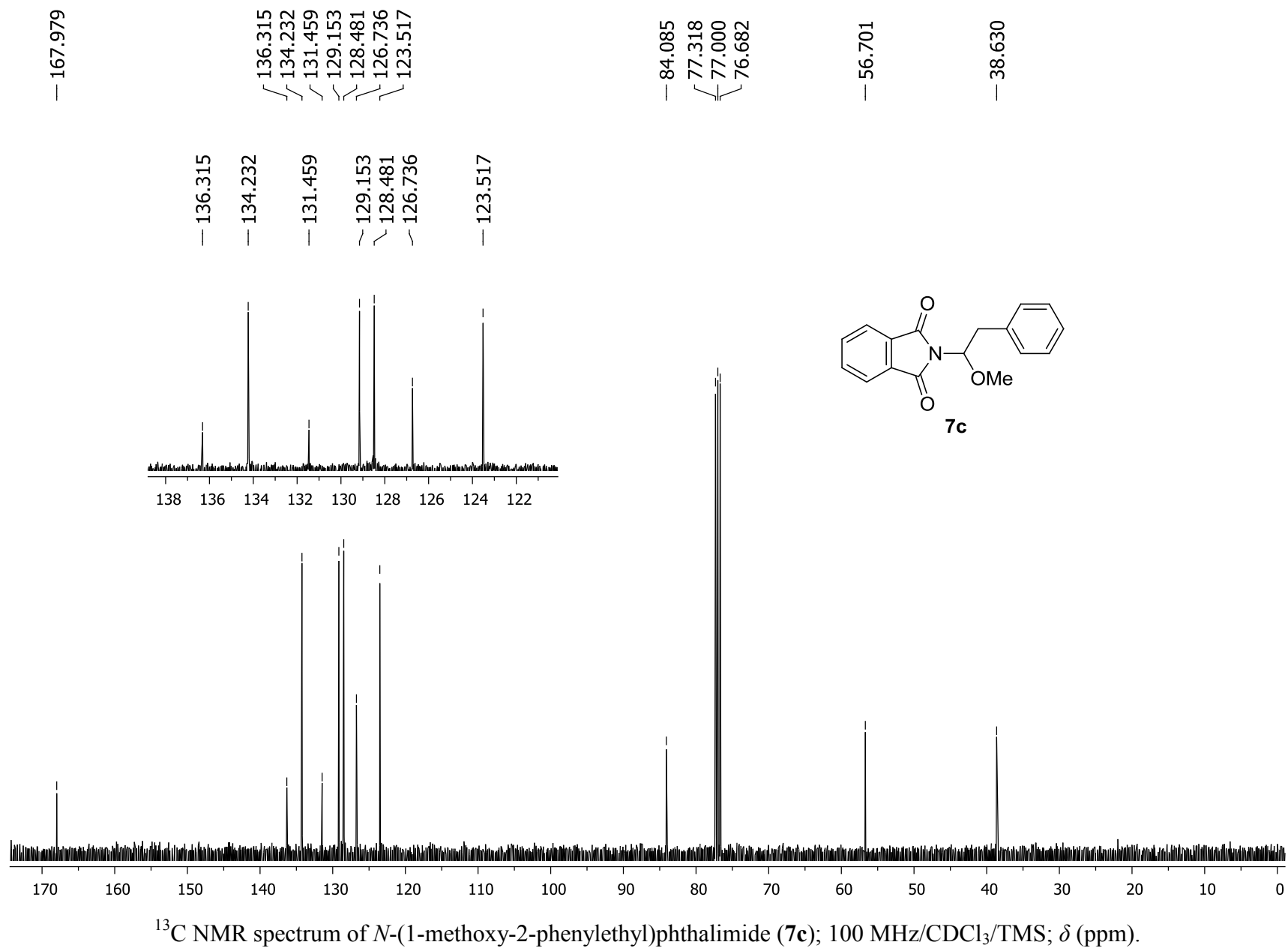
1-(2,4,6-Trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (10). Colorless crystals (273.1 mg, 73% yield), mp 146.0-148.0°C. ¹H NMR (400 MHz, CDCl₃) δ 7.96-7.92 (m, 6H), 7.76-7.70 (m, 6H), 6.00 (s, 2H), 5.60-5.40 (m, 1H), 3.82 (s, 3H), 3.35 (br s, 6H), 1.94 (dd, *J*₁ = 14.4 Hz, *J*₂ = 8.1 Hz, 3H) ppm; ¹³C NMR (100 MHz, CDCl₃) δ 162.9 (d, *J* = 3.1 Hz), 159.3, 136.8 (qd, *J*₁ = 33.6 Hz, *J*₂ = 3.0 Hz), 135.0 (d, *J* = 10.0 Hz), 127.0 (dq, *J*₁ = 12.3 Hz, *J*₂ = 3.8 Hz), 122.8 (q, *J* = 274.8 Hz), 122.1 (d, *J* = 81.6 Hz), 99.8 (d, *J* = 5.3 Hz), 91.0 (d, *J* = 2.3 Hz), 55.6, 55.2, 29.4 (d, *J* = 43.6 Hz), 14.4 ppm; ³¹P NMR (161.9 MHz, CDCl₃) δ 23.3 ppm; ¹⁹F NMR (376 MHz, CDCl₃) δ -63.7 (s, CF₃) ppm; IR (ATR) 2944, 1608, 1591, 1321, 1127, 1062 cm⁻¹; HRMS (ESI-TOF) calcd for C₃₂H₂₇F₉O₃P [M⁺] 661.1554 found 661.1555.

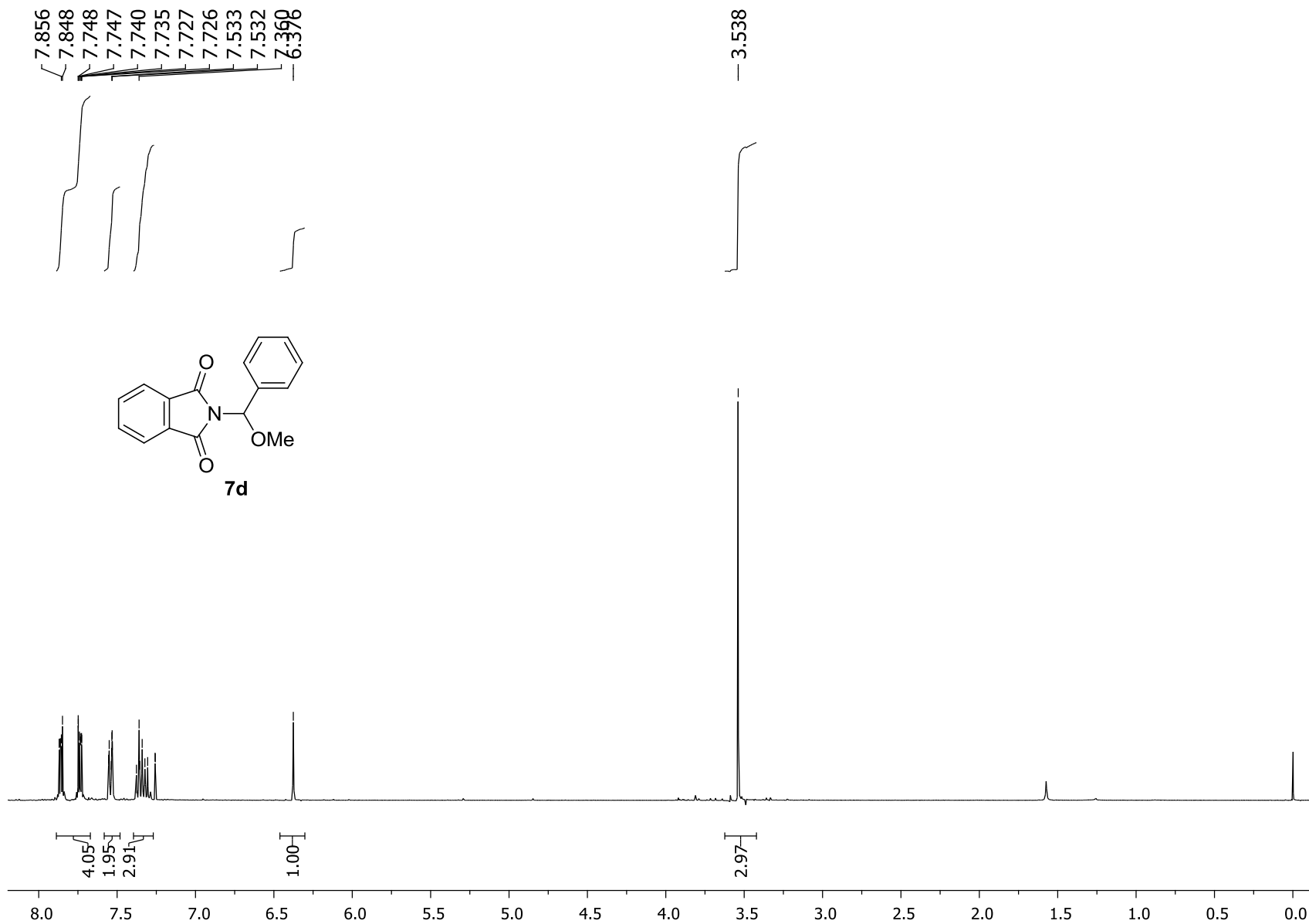
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- [2] Reger, D.L.; Horger, J.J.; Debreczeni, A.; Smith, M.D. *Inorg. Chem.*, **2011**, 50, 10225–10240.
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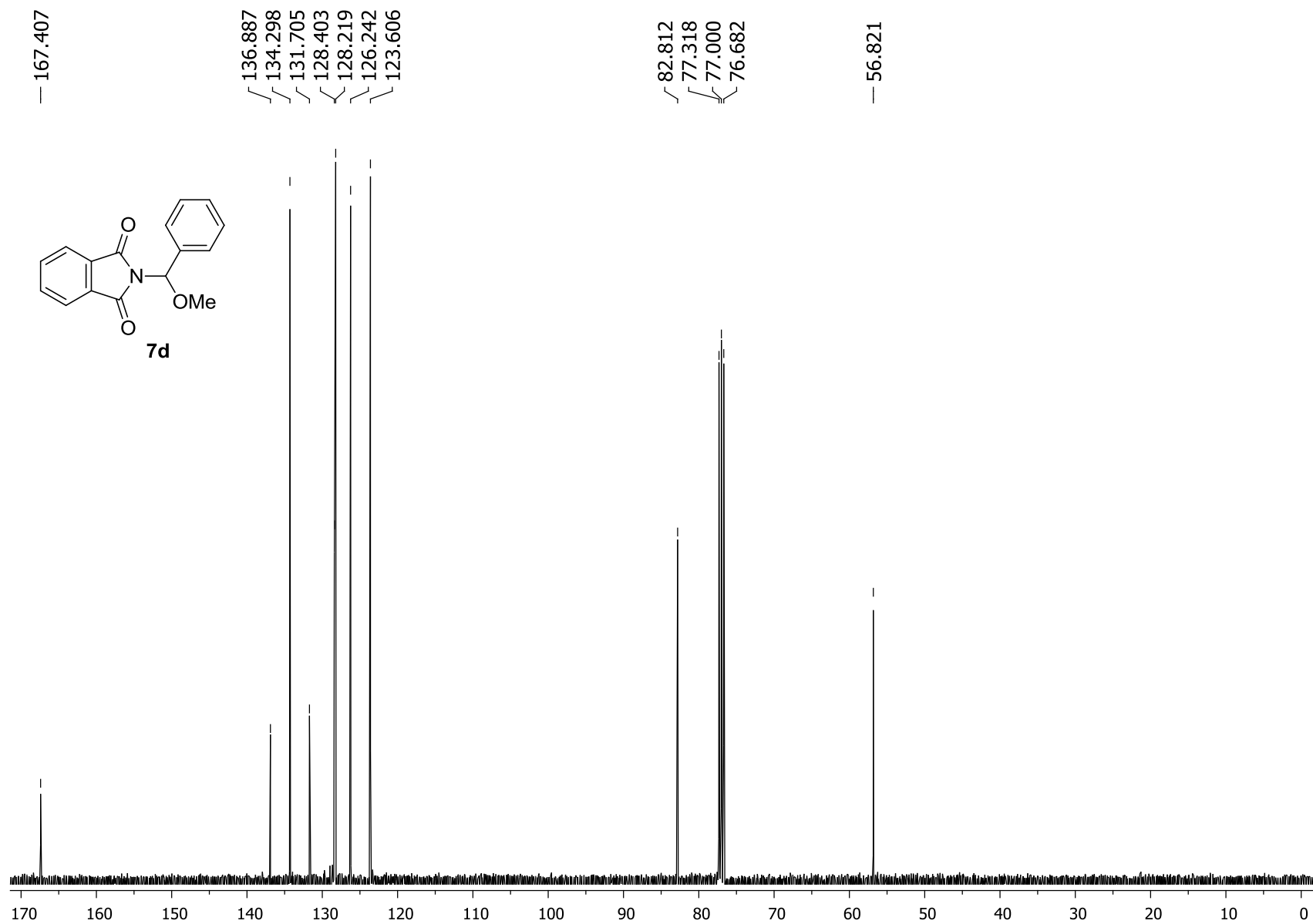


¹H NMR spectrum of *N*-(1-methoxy-2-phenylethyl)phthalimide (**7c**); 400 MHz/CDCl₃/TMS; δ (ppm).

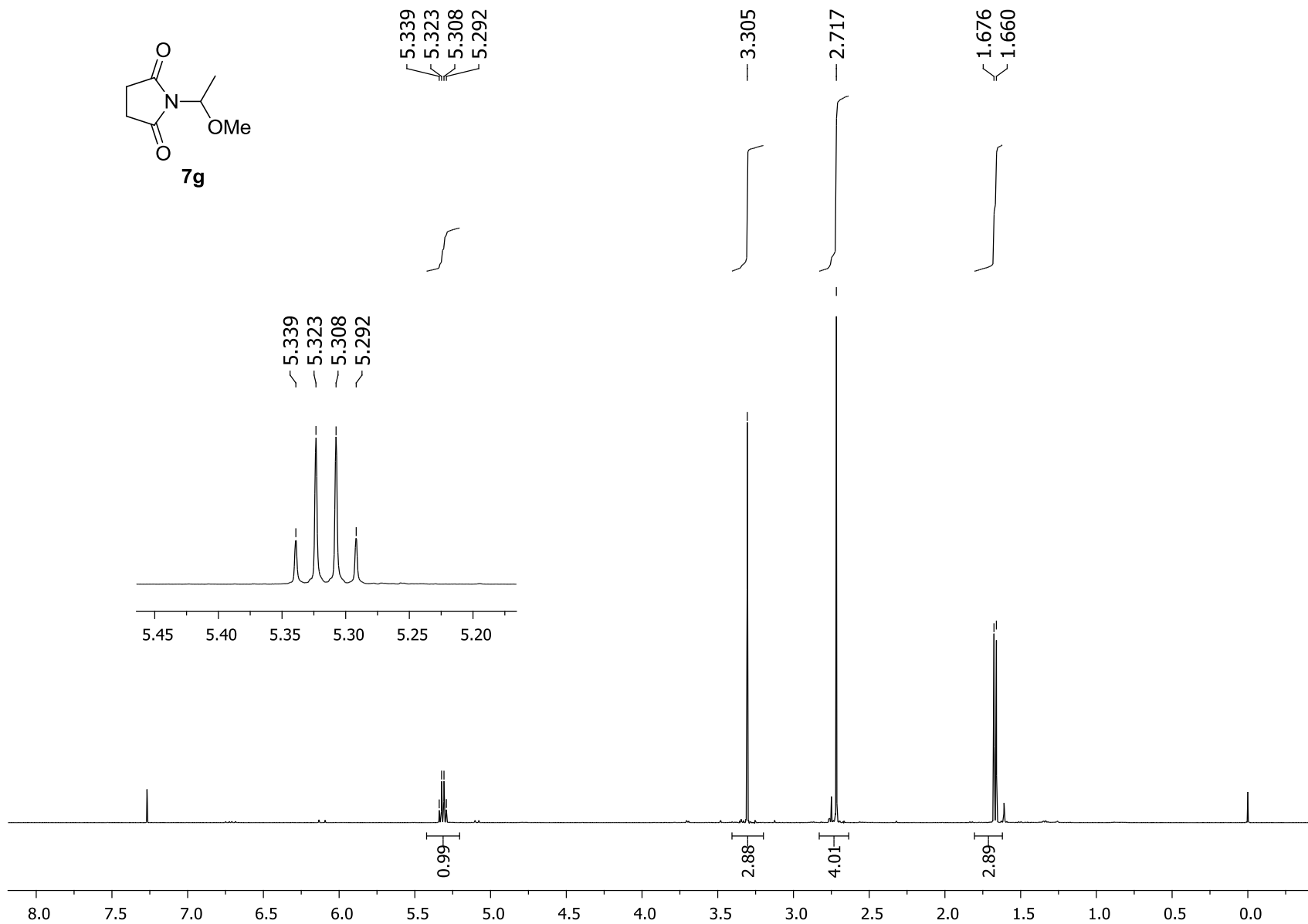


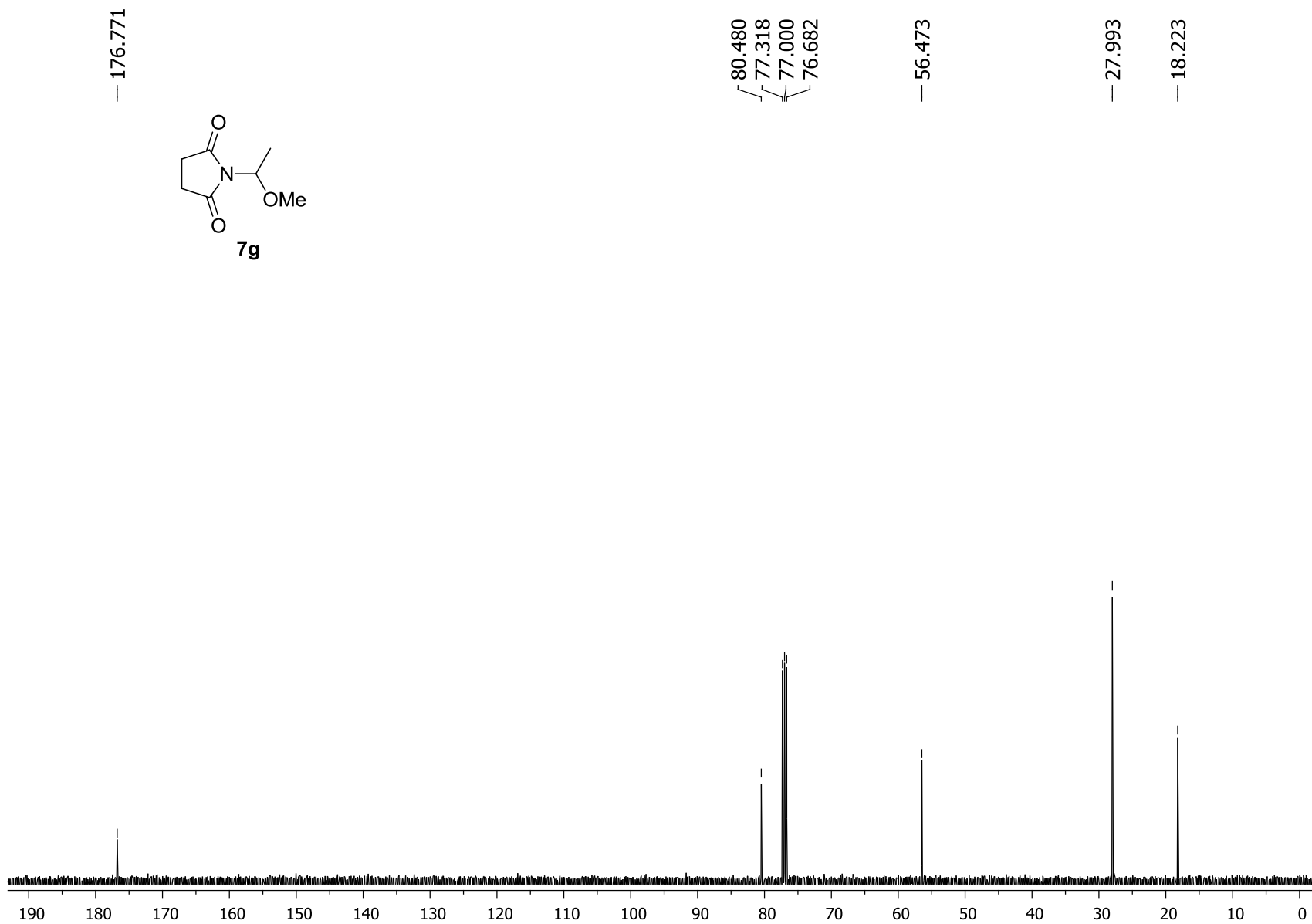


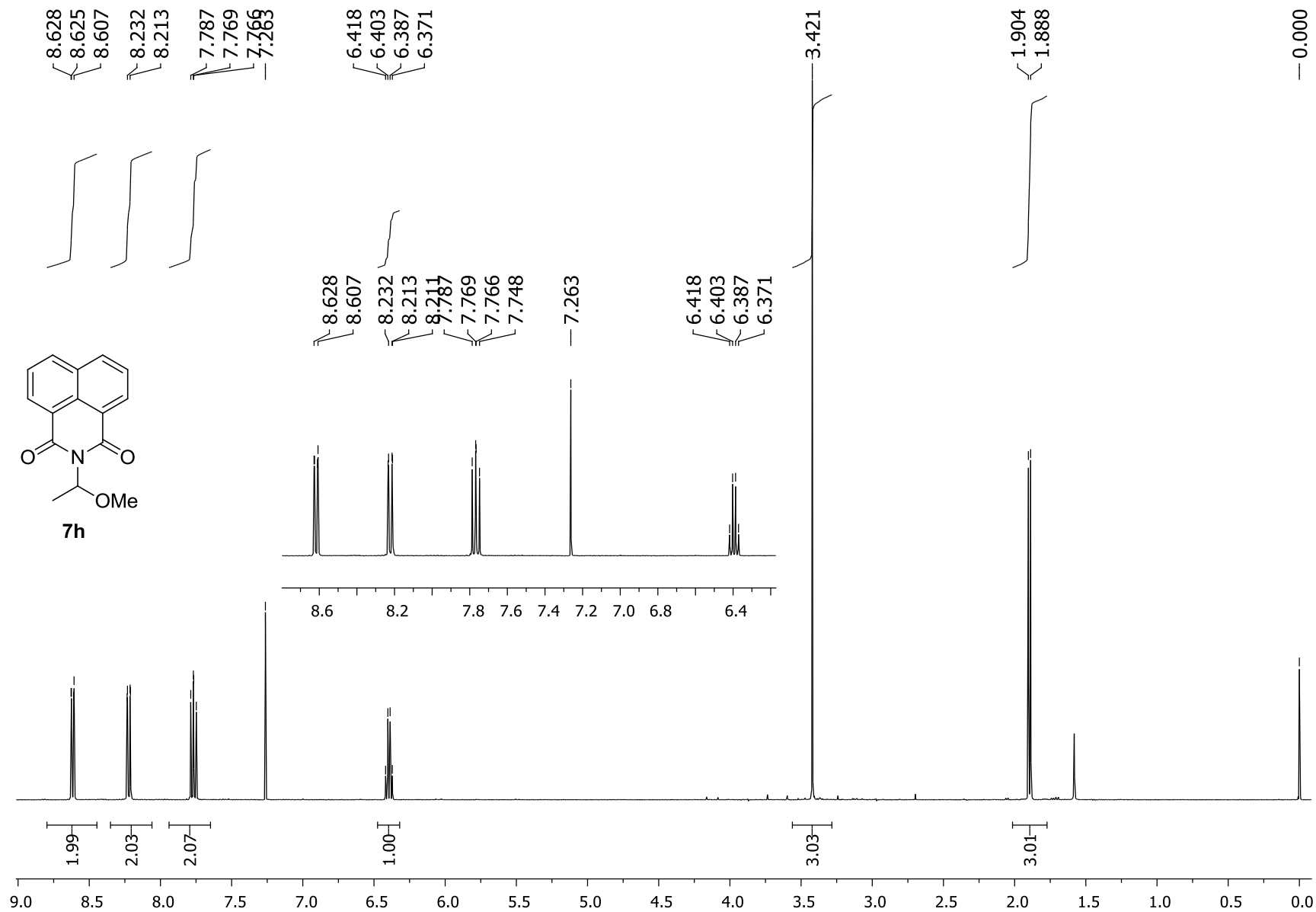
¹H NMR spectrum of *N*-(1-methoxy-1-phenylmethyl)phthalimide (**7d**); 400 MHz/CDCl₃/TMS; δ (ppm).



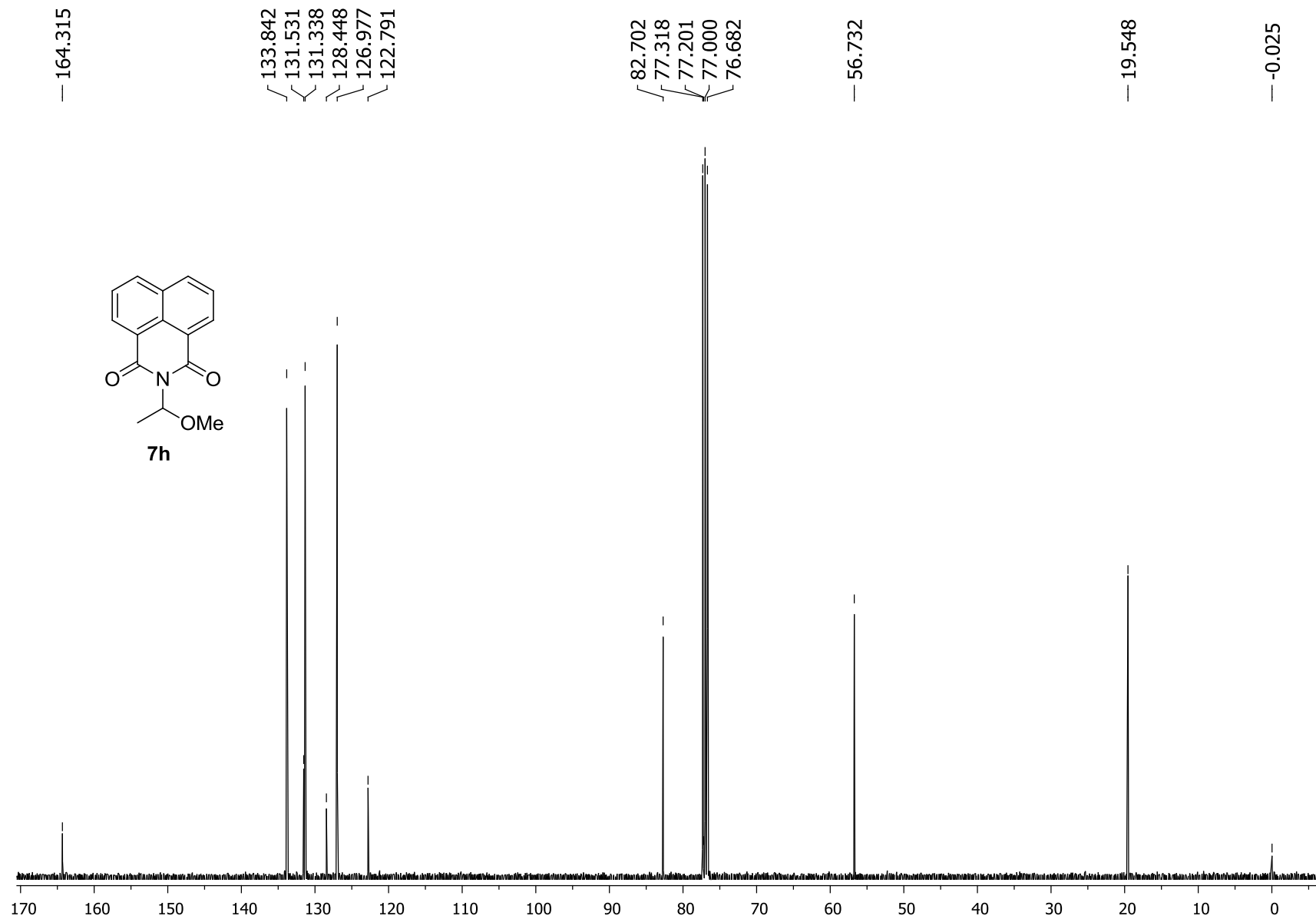
¹³C NMR spectrum of *N*-(1-methoxy-1-phenylmethyl)phthalimide (**7d**); 100 MHz/CDCl₃/TMS; δ (ppm).



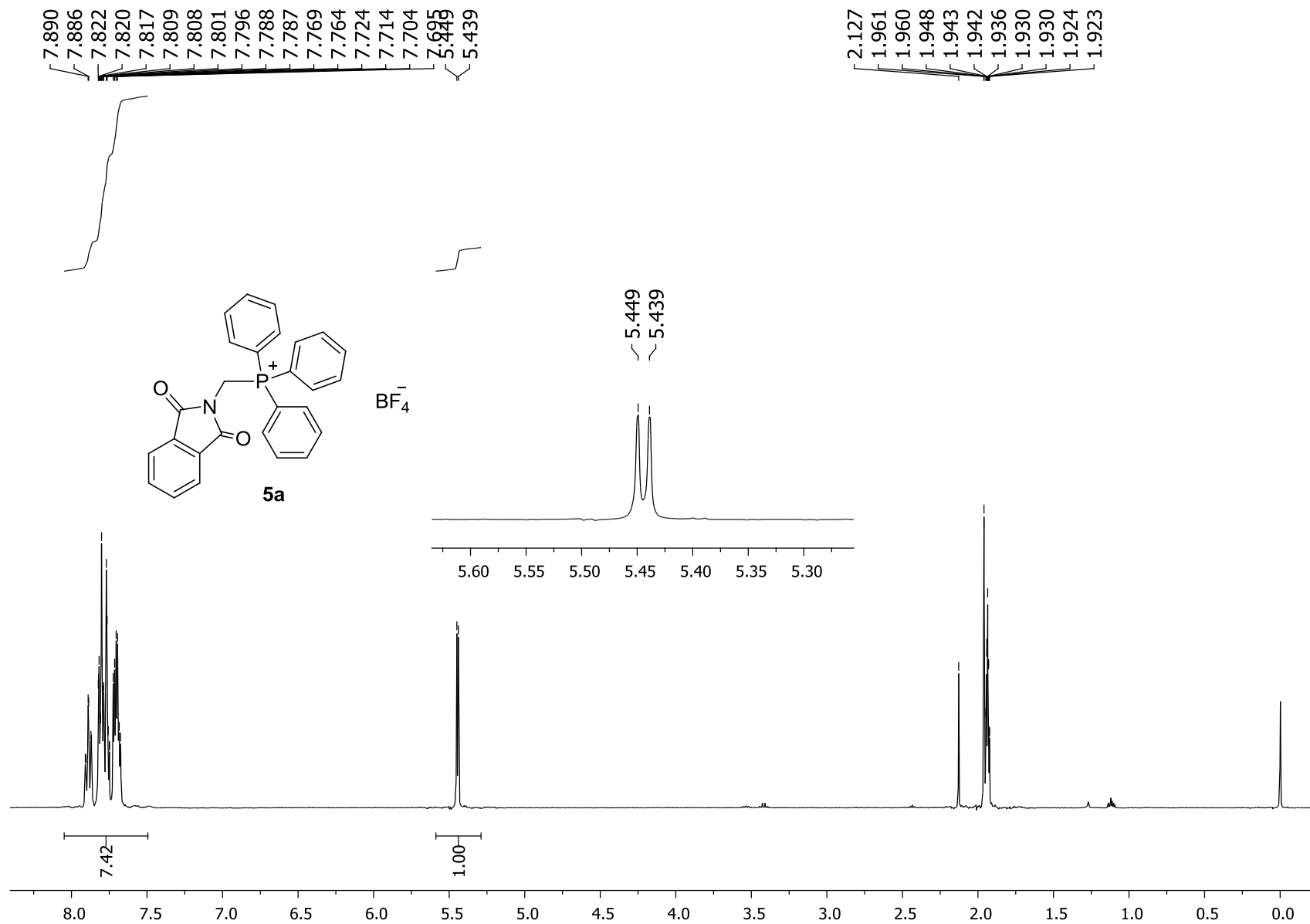




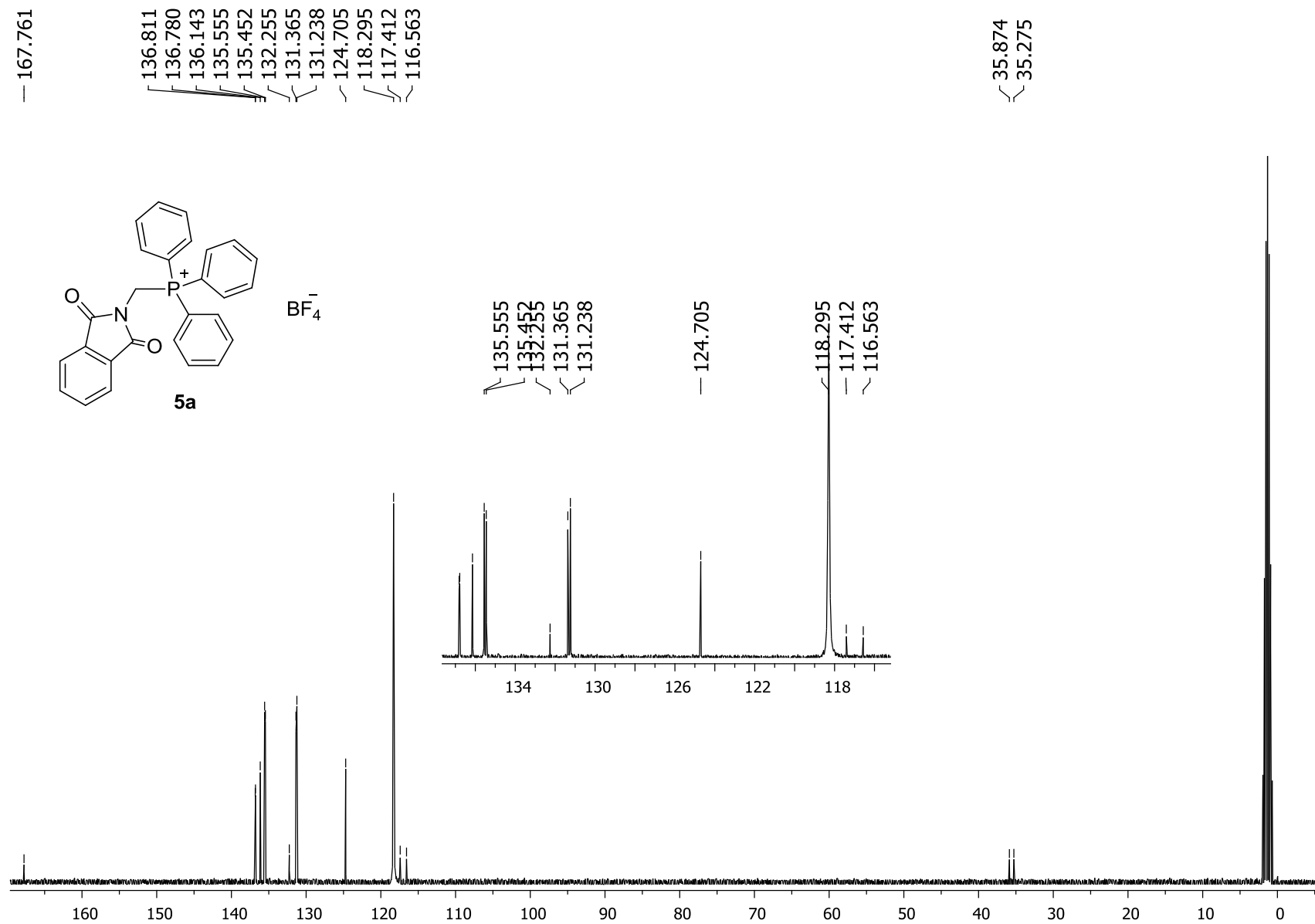
¹H NMR spectrum of *N*-(1-methoxyethyl)-1,8-naphthalimide (**7h**); 400 MHz/CDCl₃/TMS; δ (ppm).



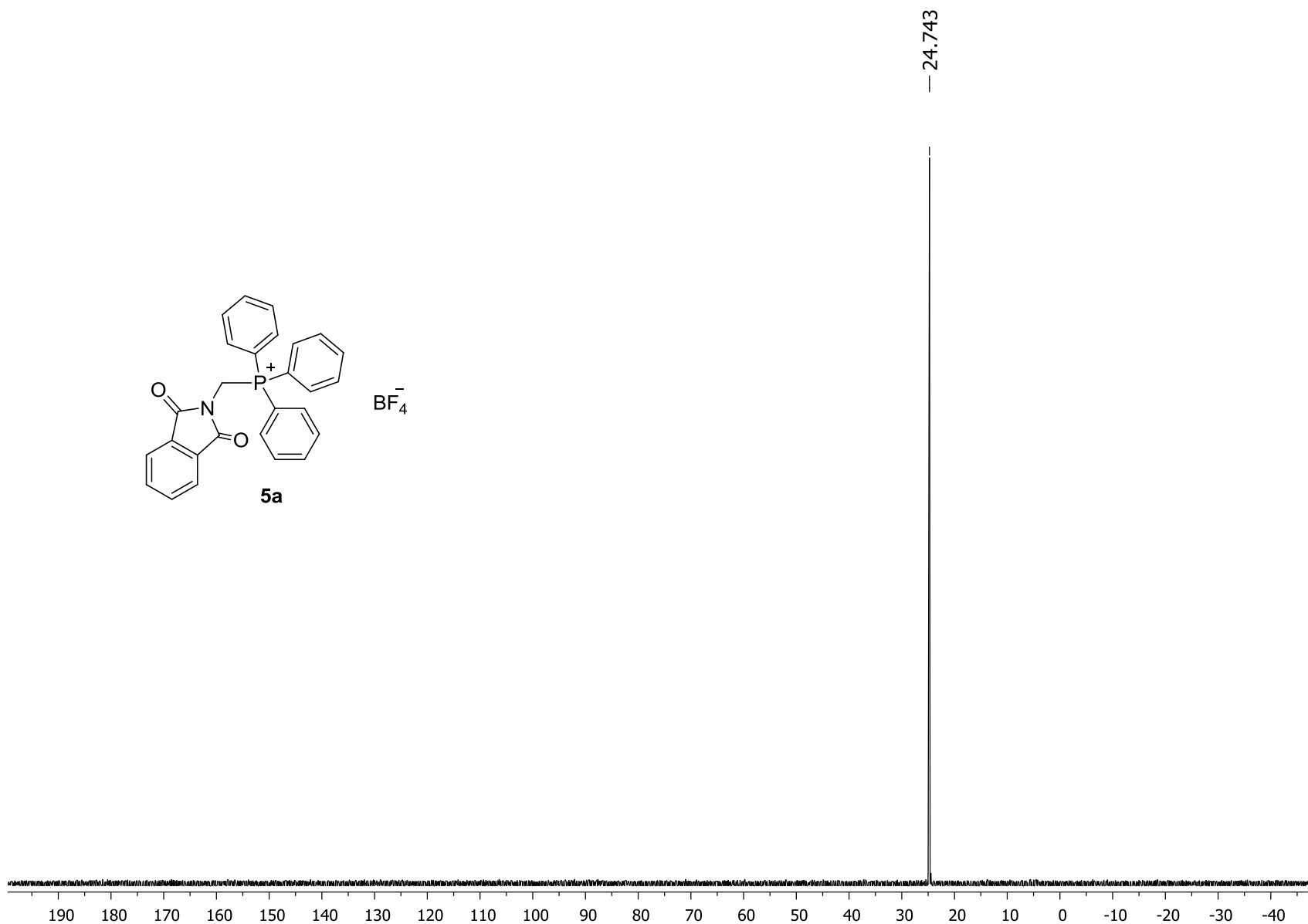
^{13}C NMR spectrum of *N*-(1-methoxyethyl)-1,8-naphthalimide (**7h**); 100 MHz/ CDCl_3 /TMS; δ (ppm).



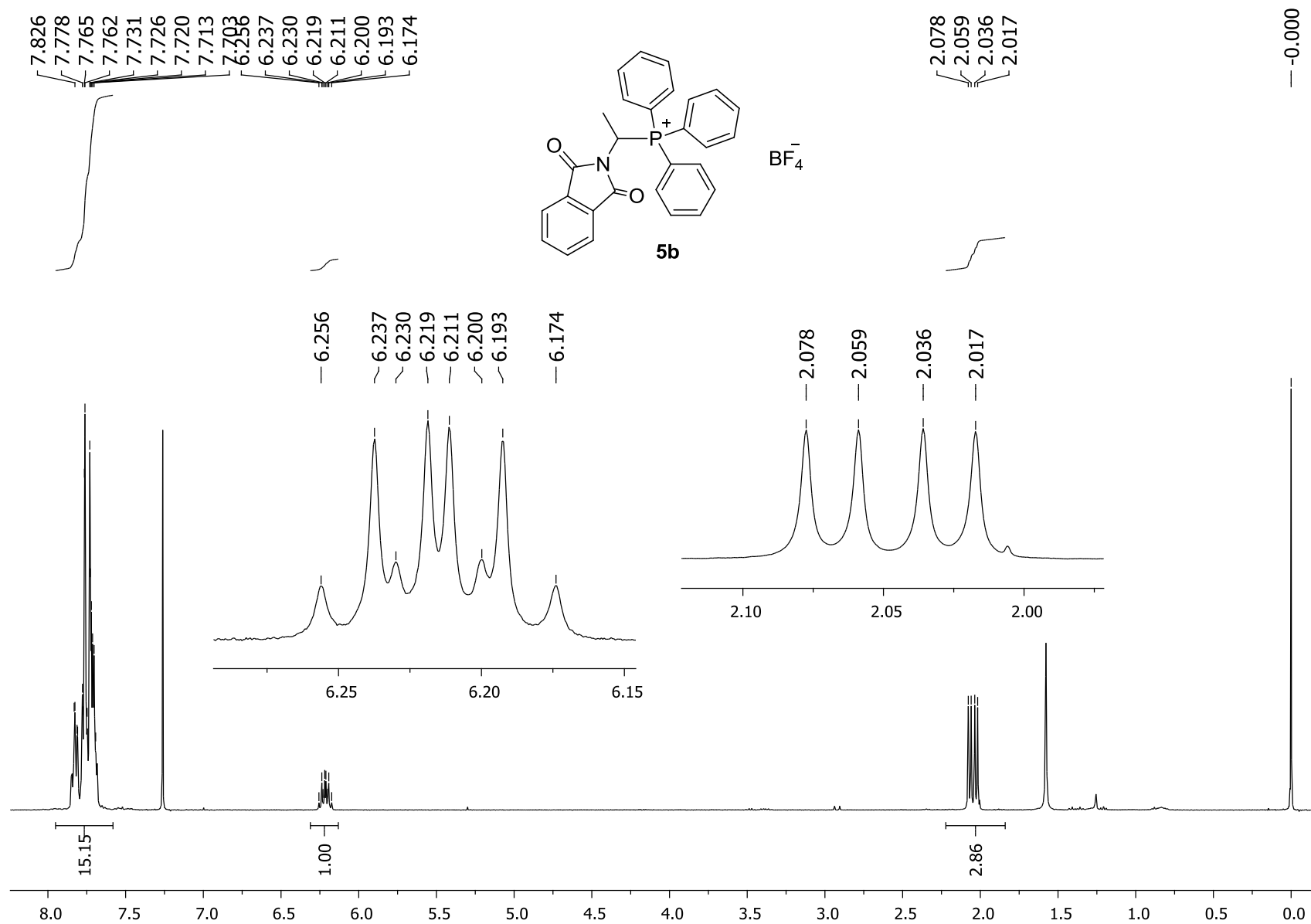
¹H NMR spectrum of 1-(*N*-phthalimido)methyltriphenylphosphonium tetrafluoroborate (**5a**); 400 MHz/CD₃CN/TMS; δ (ppm).



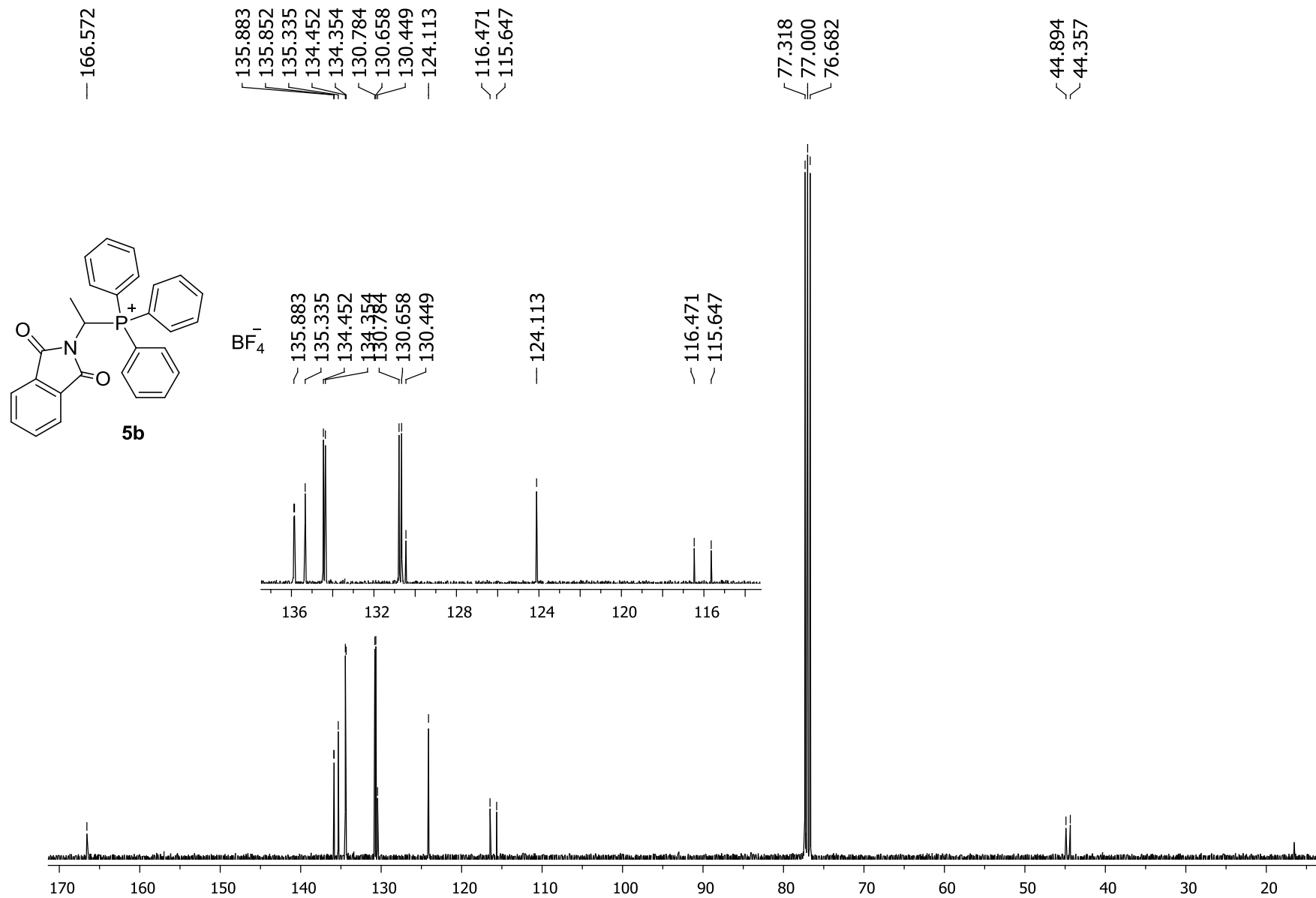
¹³C NMR spectrum of 1-(*N*-phthalimido)methyltriphenylphosphonium tetrafluoroborate (**5a**); 100 MHz/CD₃CN/TMS; δ (ppm).



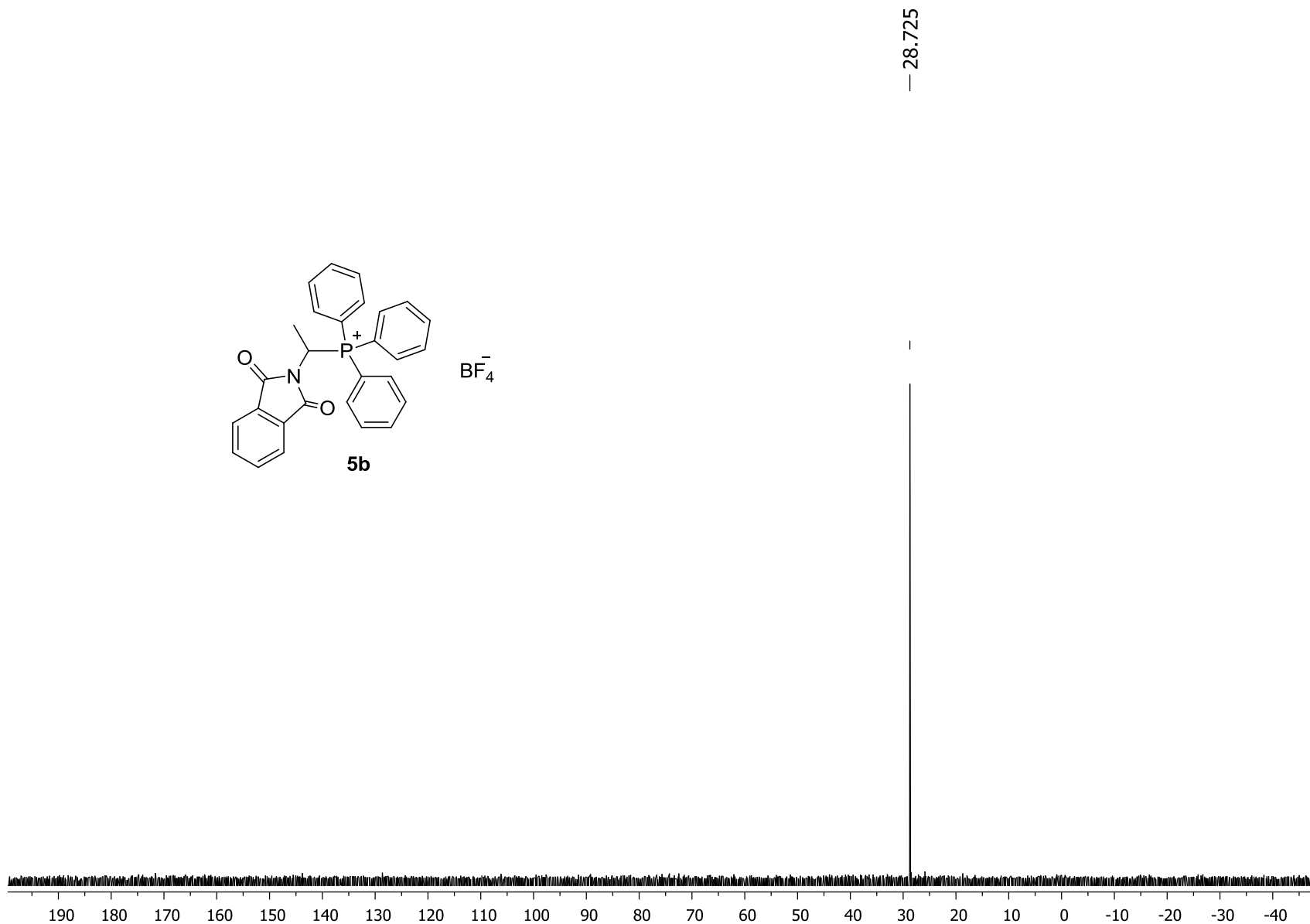
^{31}P NMR spectrum of 1-(*N*-phthalimido)methyltriphenylphosphonium tetrafluoroborate (**5a**); 161.9 MHz/ CD_3CN ; δ (ppm).



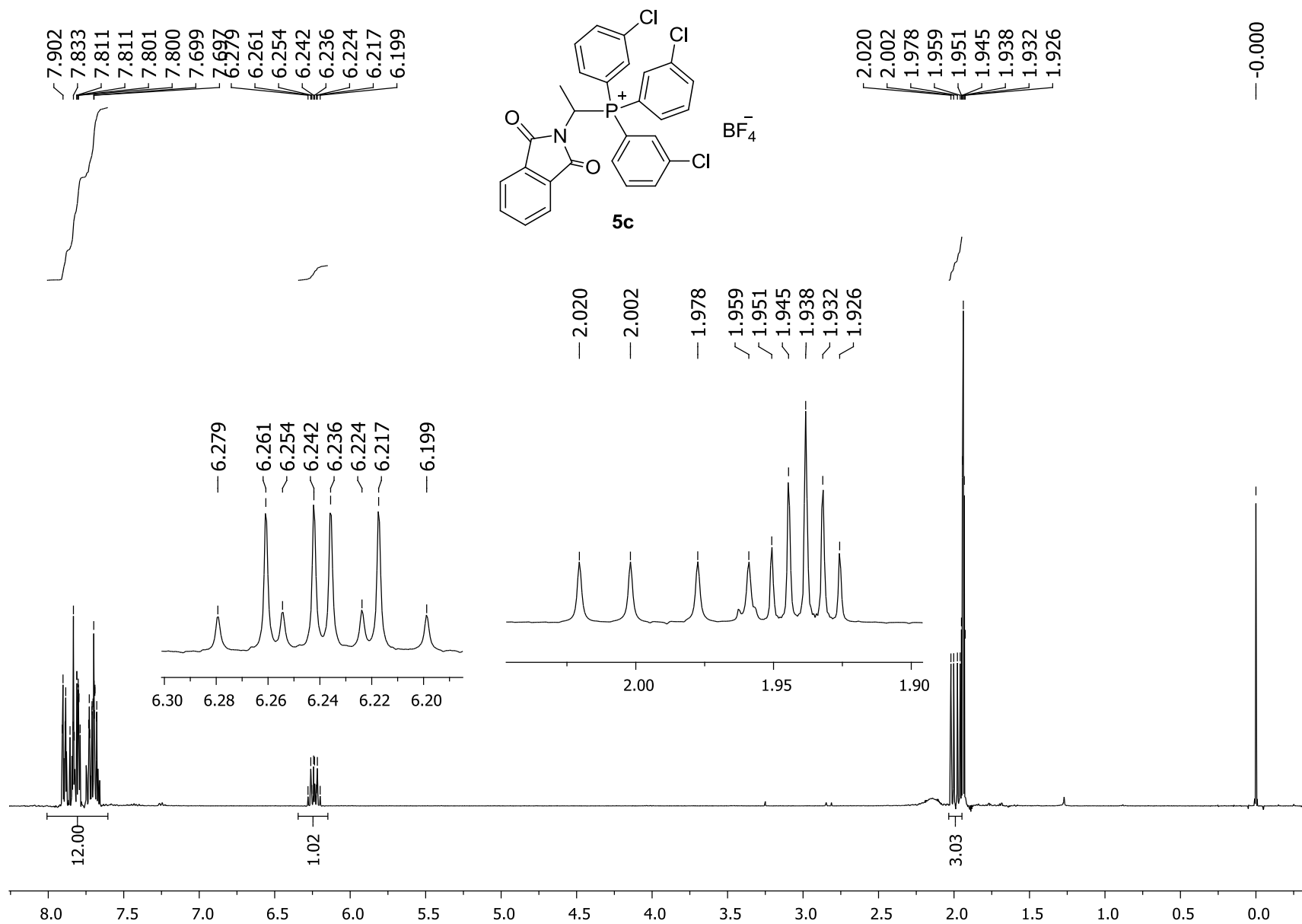
^1H NMR spectrum of 1-(*N*-phthalimido)ethyltriphenylphosphonium tetrafluoroborate (**5b**); 400 MHz/ CDCl_3 /TMS; δ (ppm).



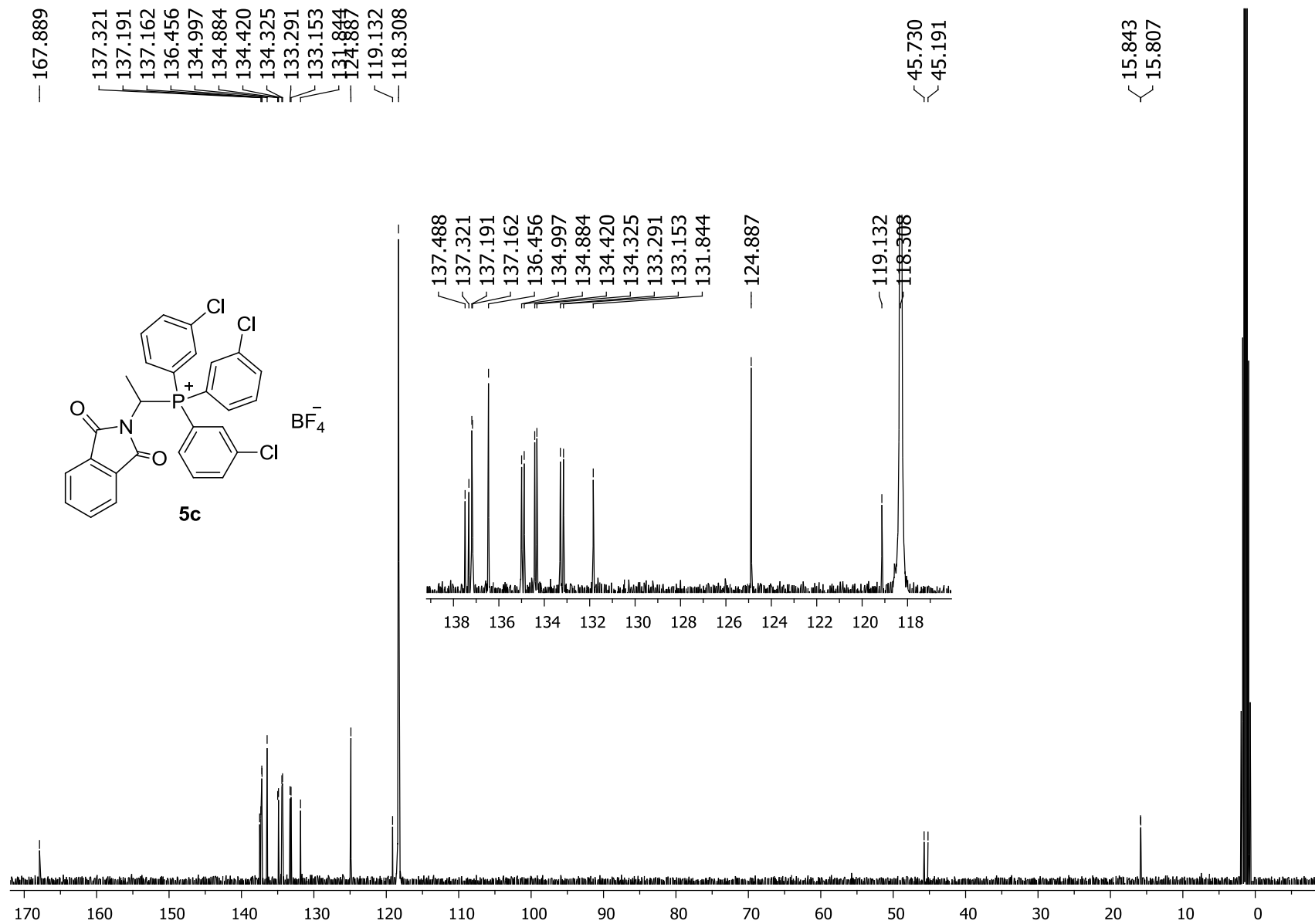
^{13}C NMR spectrum of 1-(*N*-phthalimido)ethyltriphenylphosphonium tetrafluoroborate (**5b**); 100 MHz/ CDCl_3 /TMS; δ (ppm).



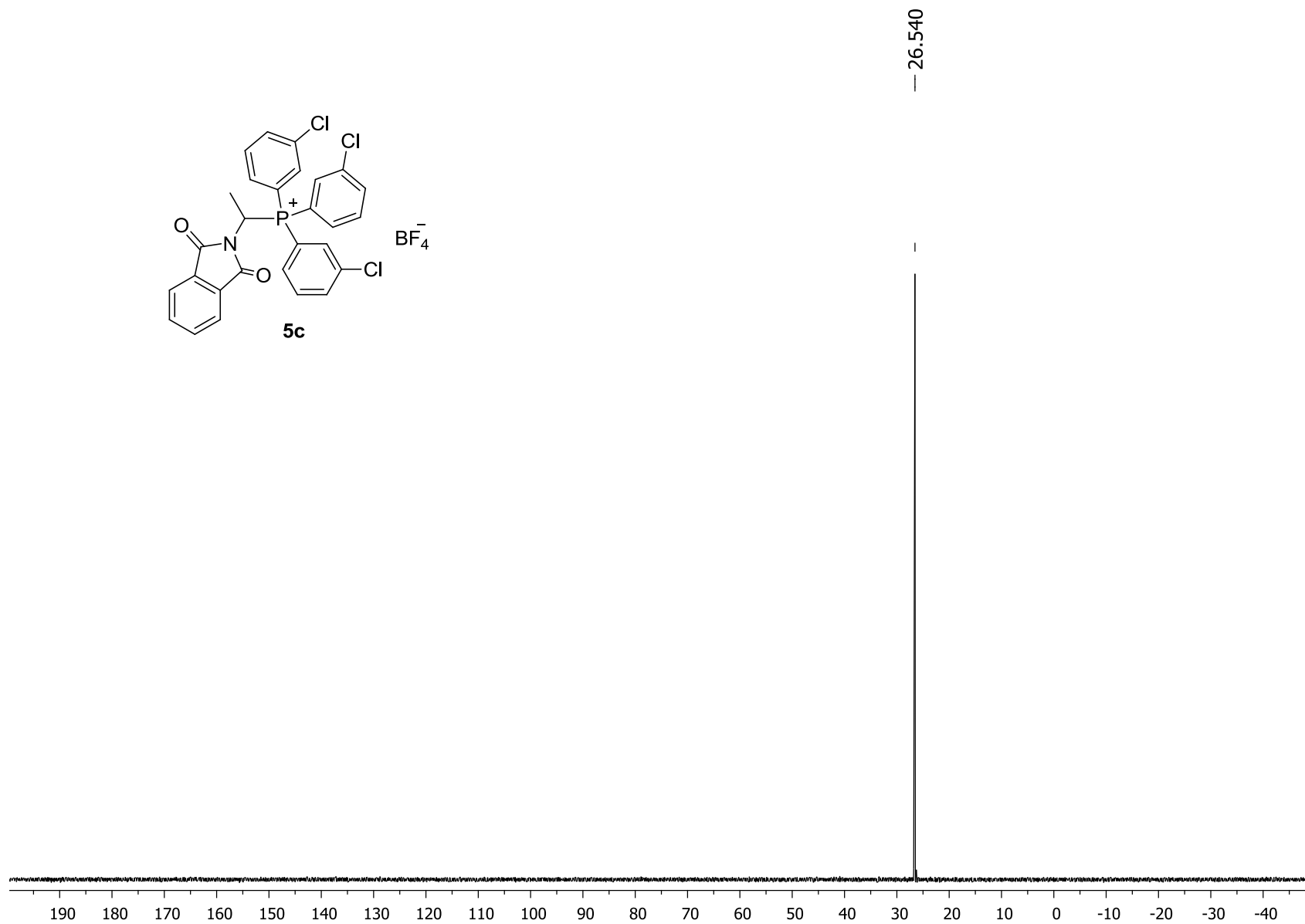
^{31}P NMR spectrum of 1-(*N*-phthalimido)ethyltriphenylphosphonium tetrafluoroborate (**5b**); 161.9 MHz/ CDCl_3 ; δ (ppm).



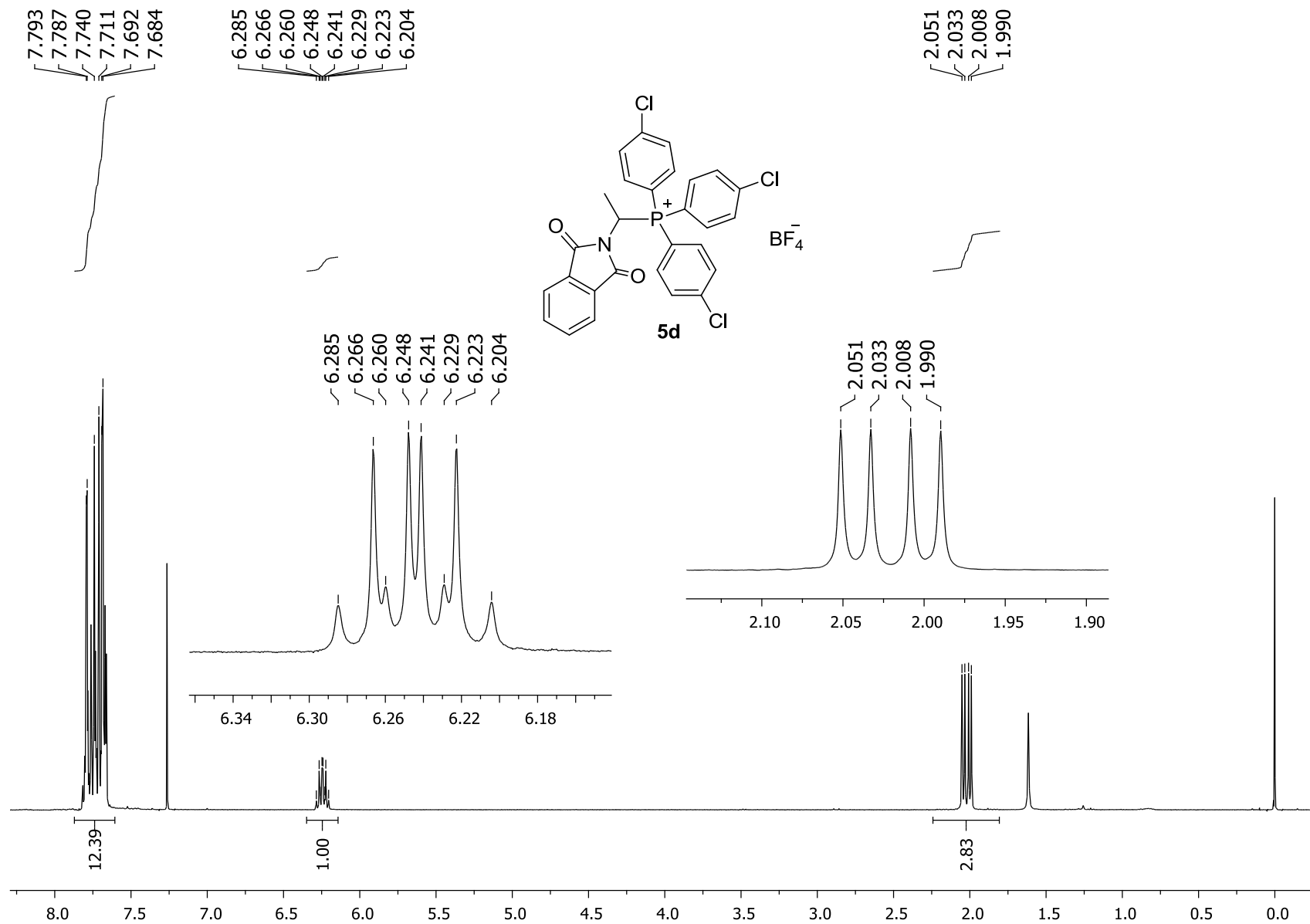
¹H NMR spectrum of 1-(*N*-phthalimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5c**); 400 MHz/CD₃CN/TMS; δ (ppm).



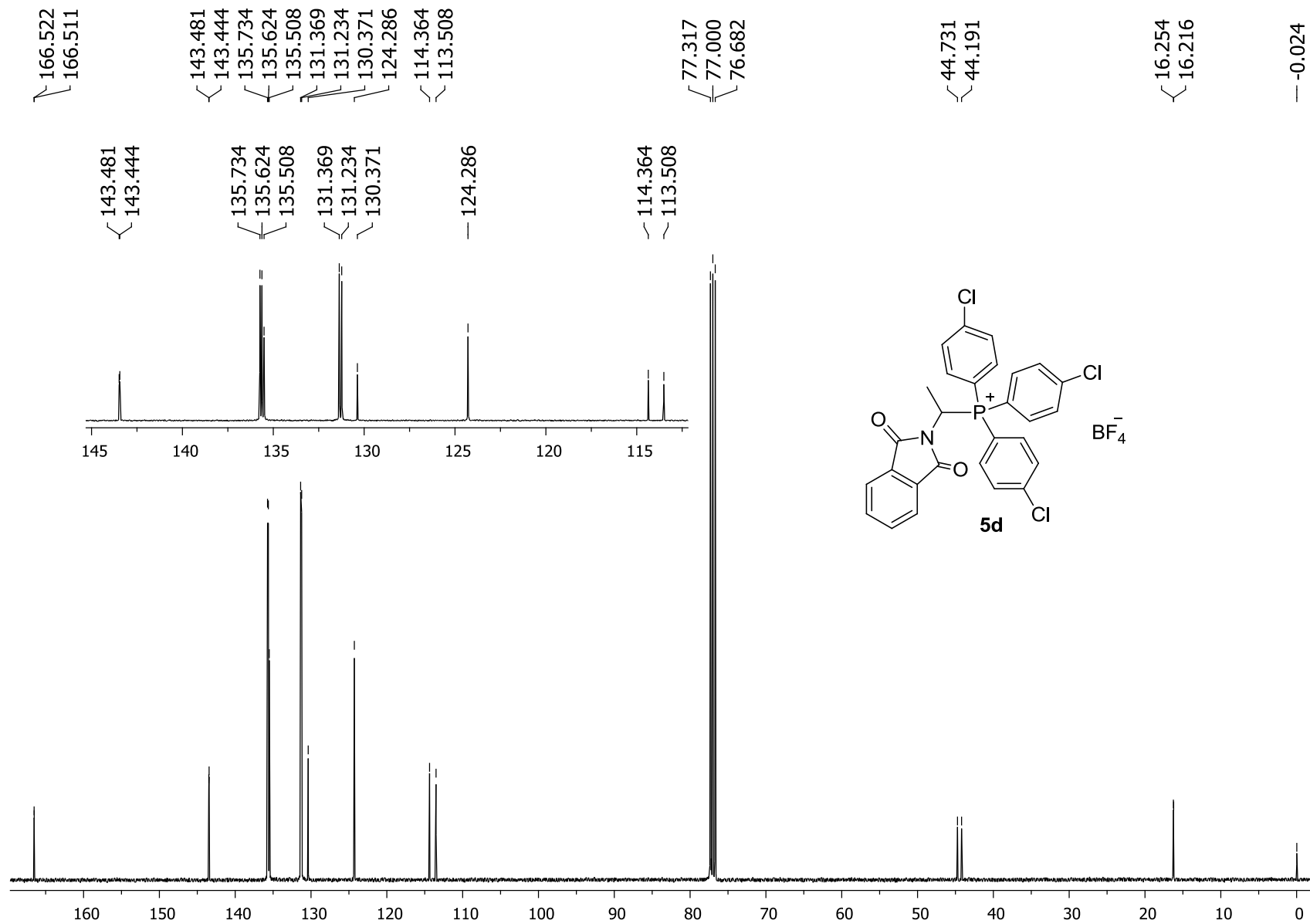
¹³C NMR spectrum of 1-(*N*-phthalimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5c**); 100 MHz/CD₃CN/TMS; δ (ppm).



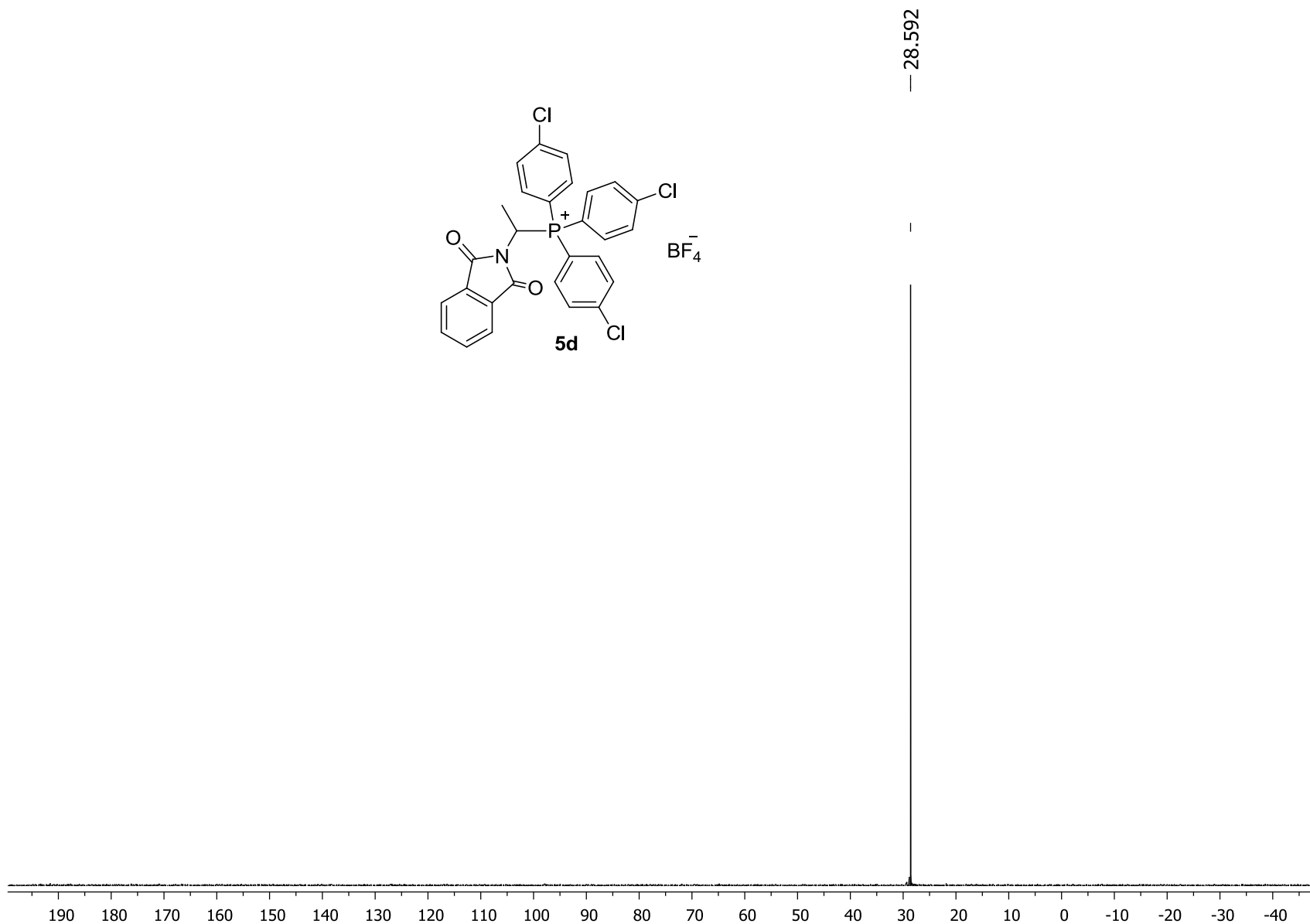
^{31}P NMR spectrum of 1-(*N*-phthalimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5c**); 161.9 MHz/ CD_3CN ; δ (ppm).



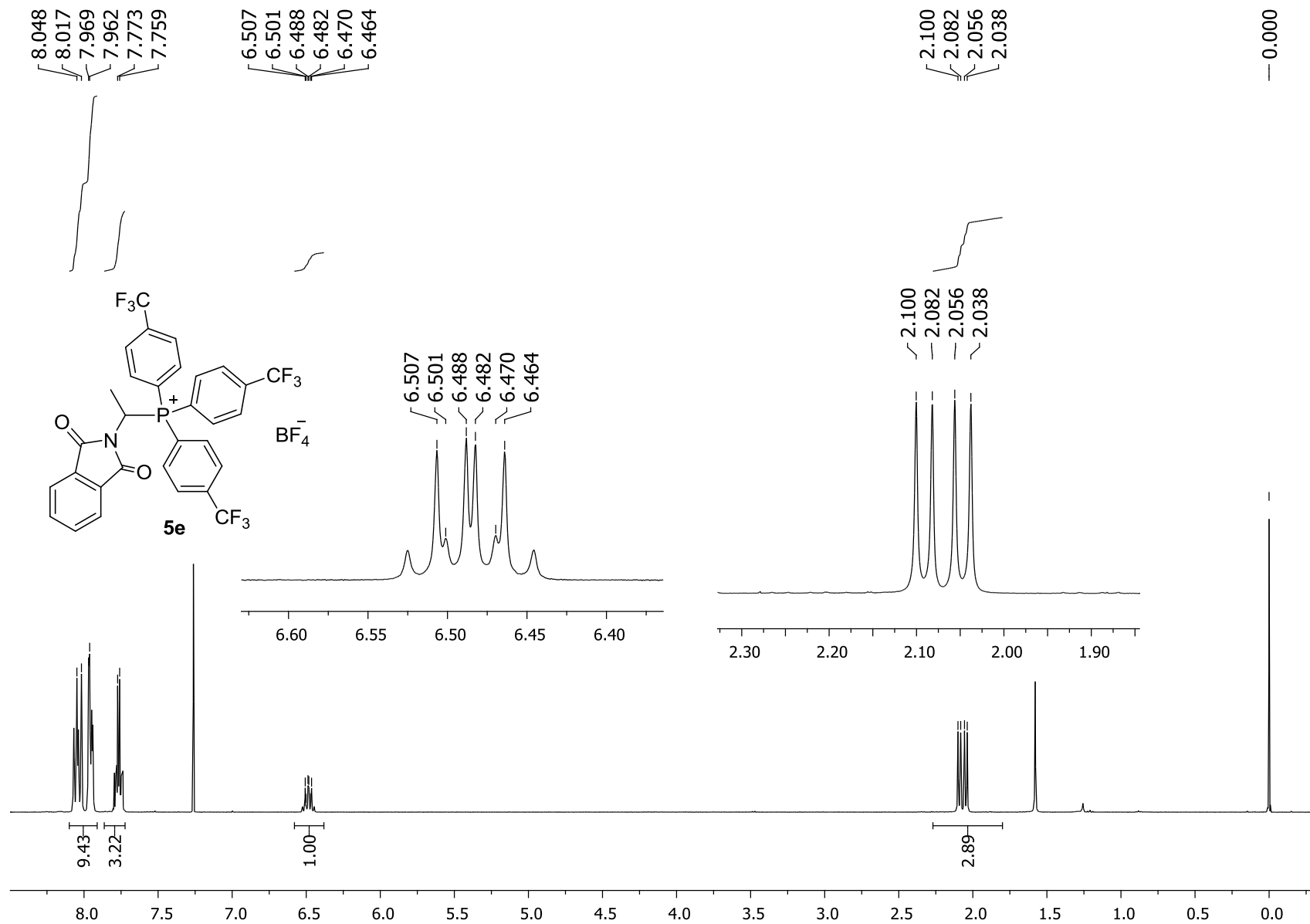
^1H NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-chlorophenyl)phosphonium tetrafluoroborate (**5d**); 400 MHz/ CDCl_3 /TMS; δ (ppm).



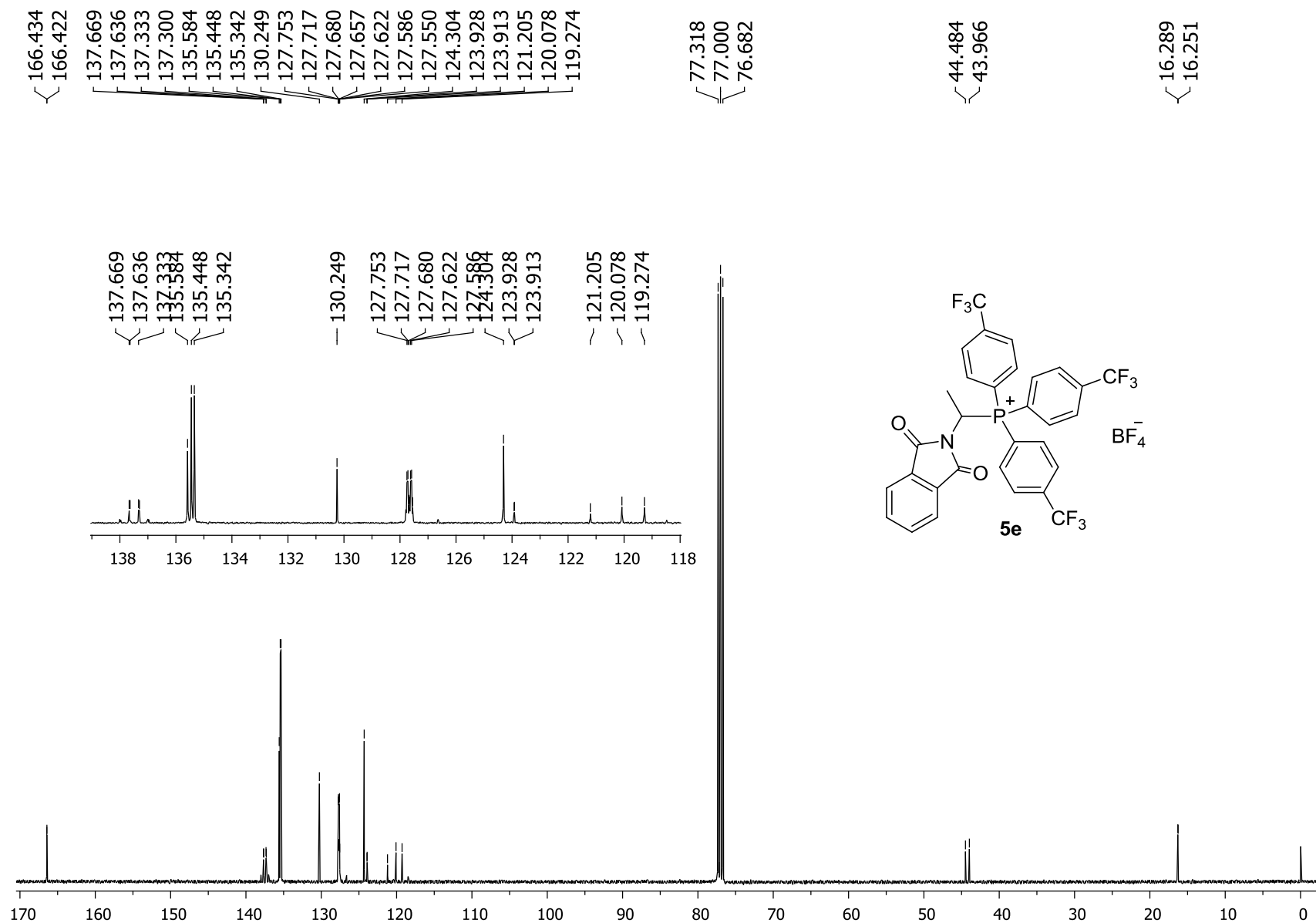
¹³C NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-chlorophenyl)phosphonium tetrafluoroborate (**5d**); 100 MHz/CDCl₃/TMS; δ (ppm).



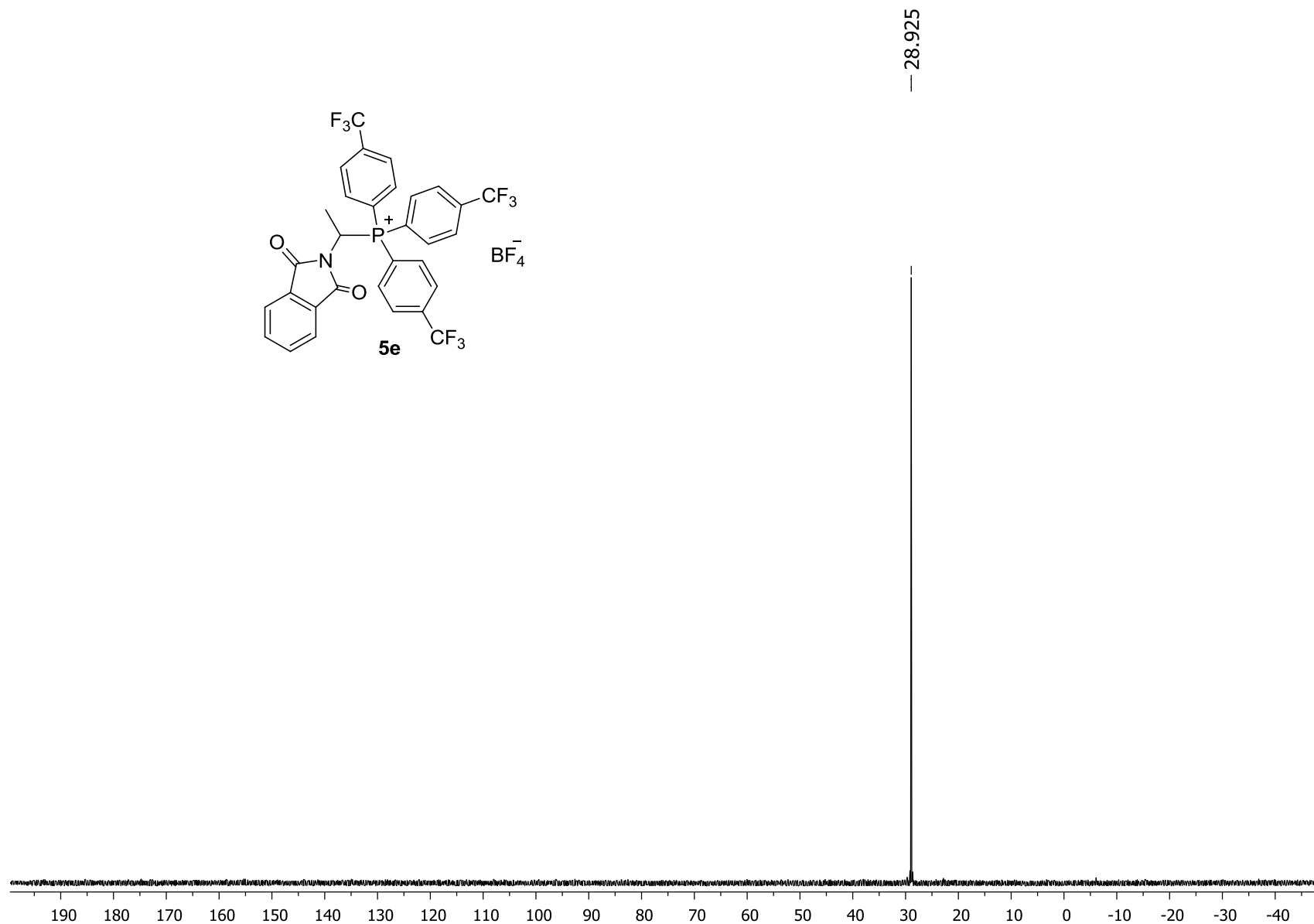
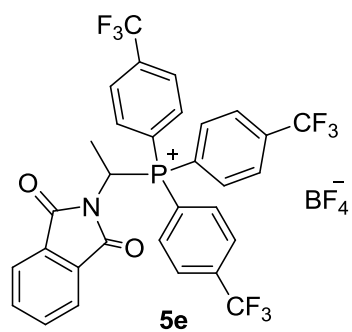
^{31}P NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-chlorophenyl)phosphonium tetrafluoroborate (**5d**); 161.9 MHz/ CDCl_3 ; δ (ppm).



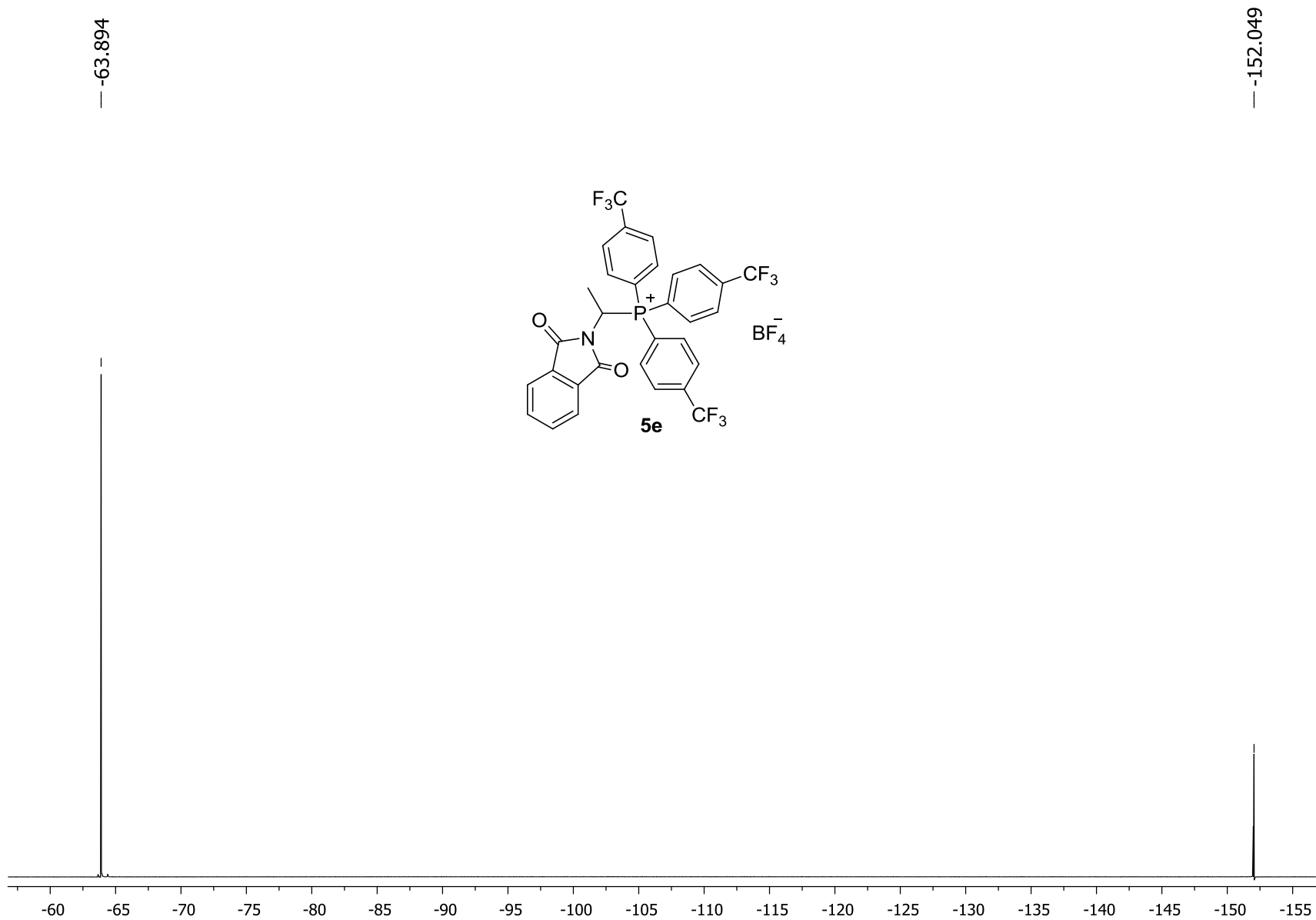
¹H NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5e**); 400 MHz/CDCl₃/TMS; δ (ppm).



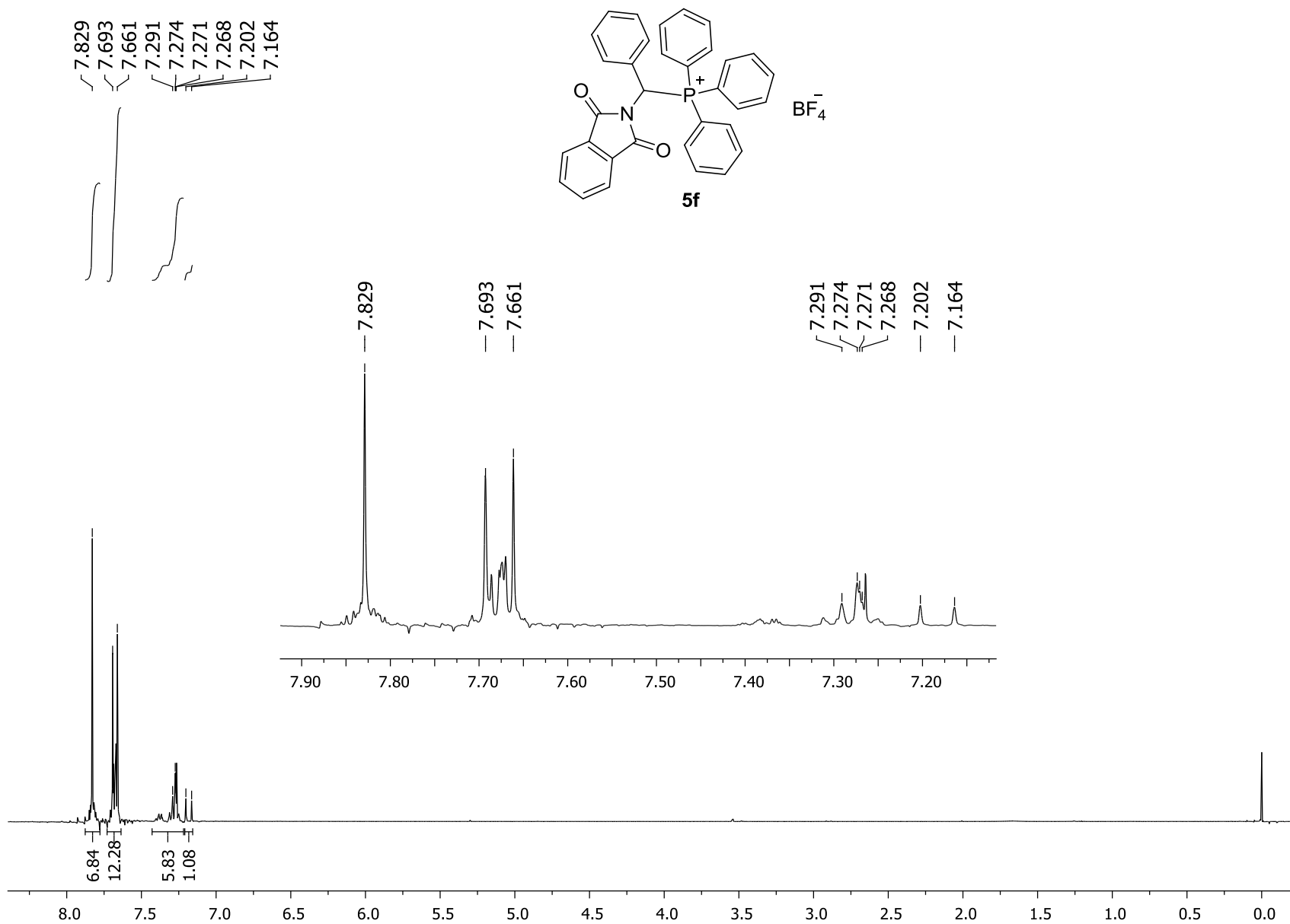
¹³C NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5e**); 100 MHz/CDCl₃/TMS; δ (ppm).



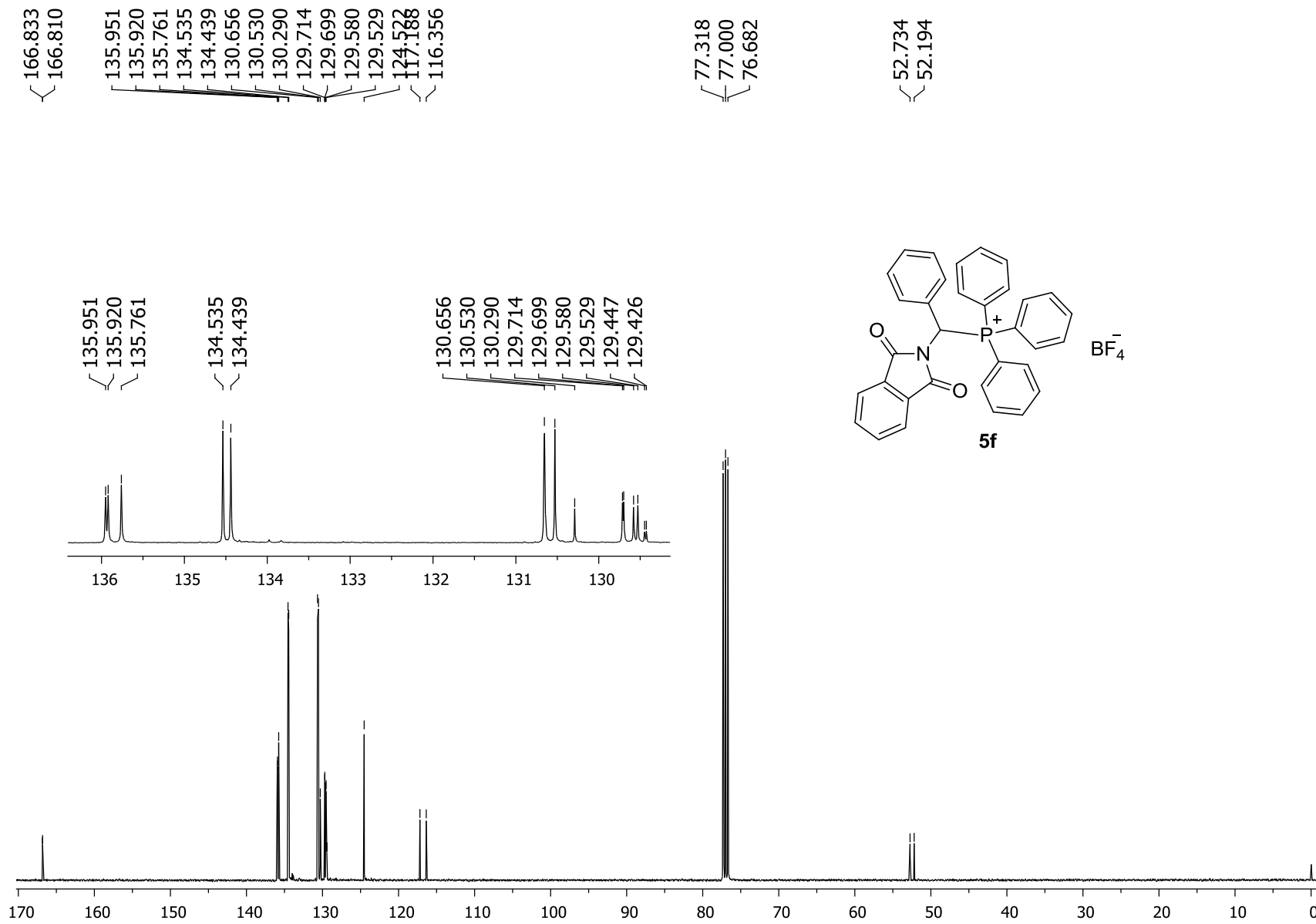
^{31}P NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5e**); 161.9 MHz/ CDCl_3 ; δ (ppm).



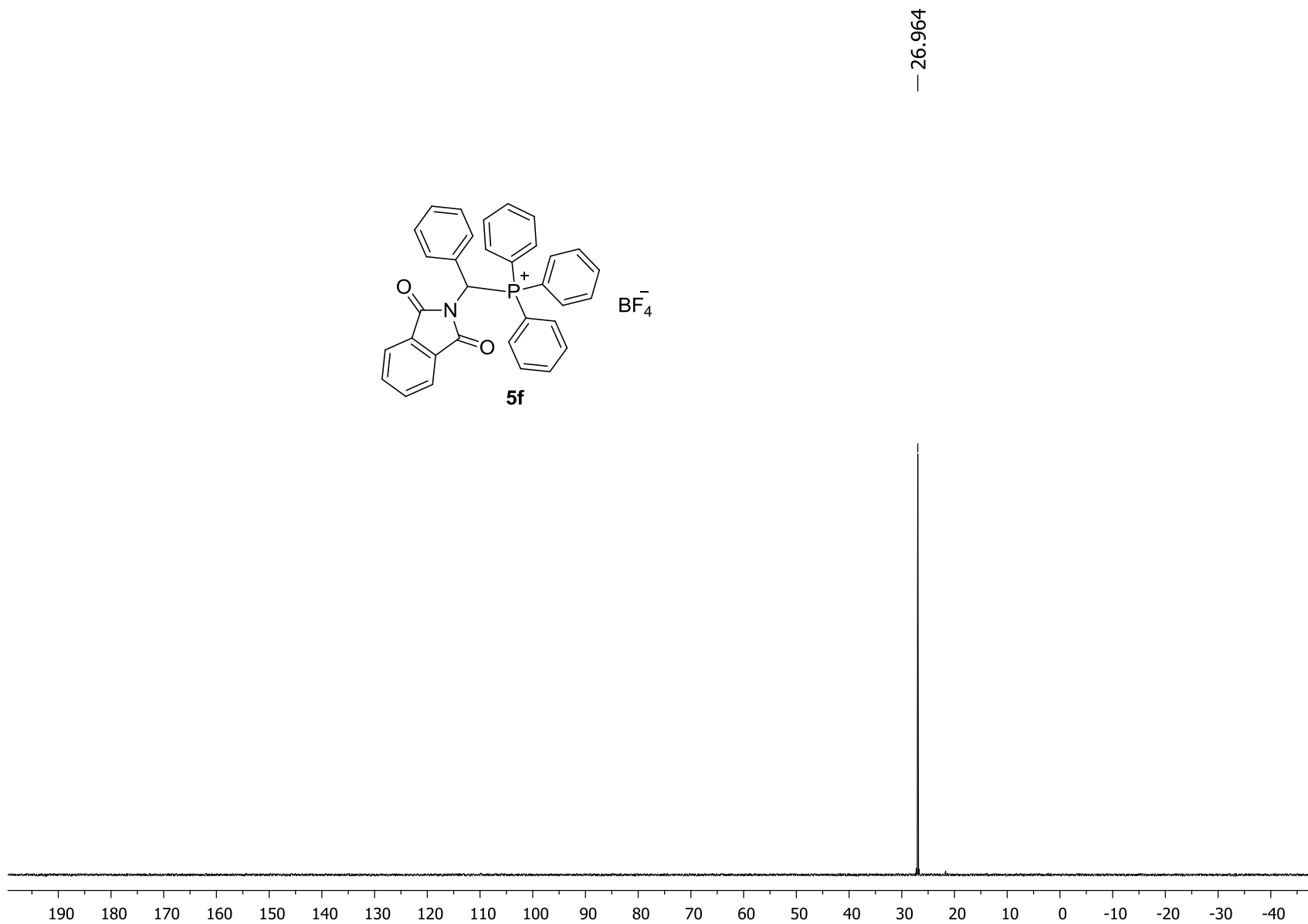
¹⁹F NMR spectrum of 1-(*N*-phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5e**); 376 MHz/CDCl₃; δ (ppm).



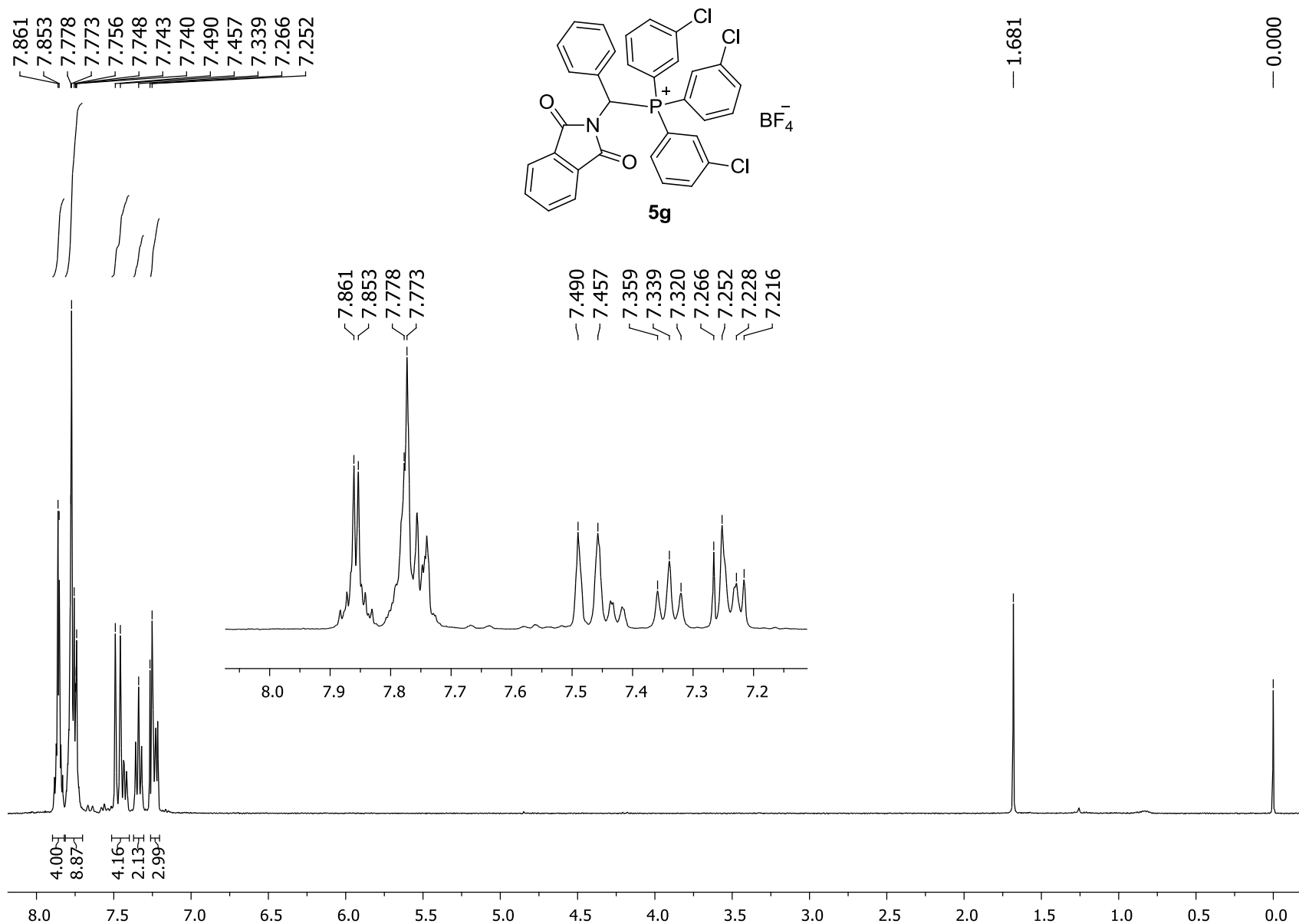
^1H NMR spectrum of 1-(*N*-phthalimido)phenylmethytriphenylphosphonium tetrafluoroborate (**5f**); 400 MHz/ CDCl_3/TMS ; δ (ppm).



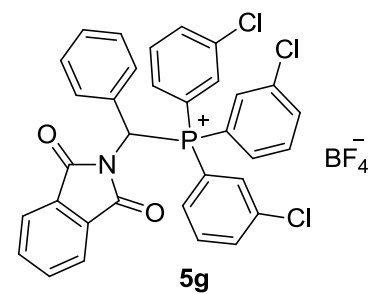
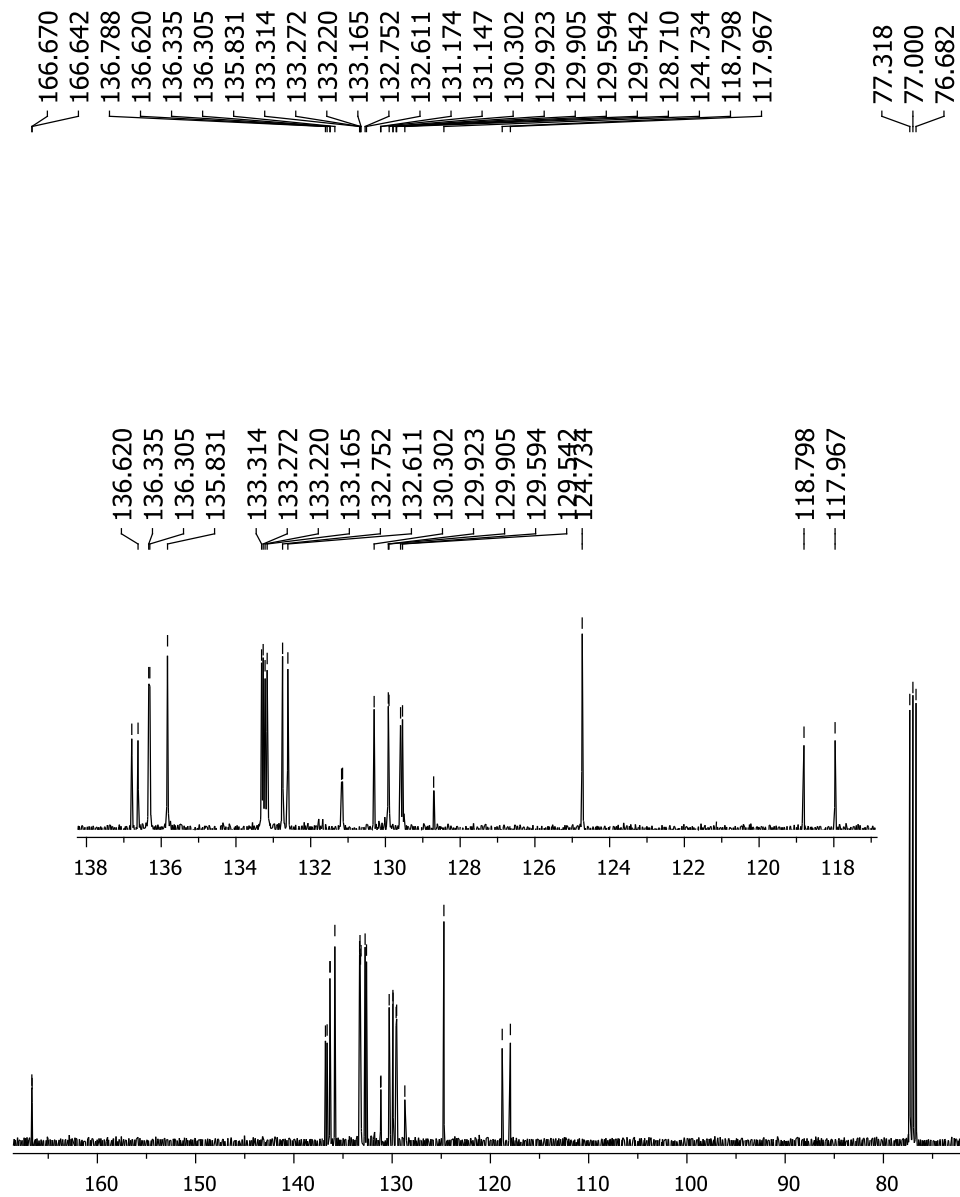
^{13}C NMR spectrum of 1-(*N*-phthalimido)phenylmethyltriphenylphosphonium tetrafluoroborate (**5f**); 100 MHz/ CDCl_3/TMS ; δ (ppm).



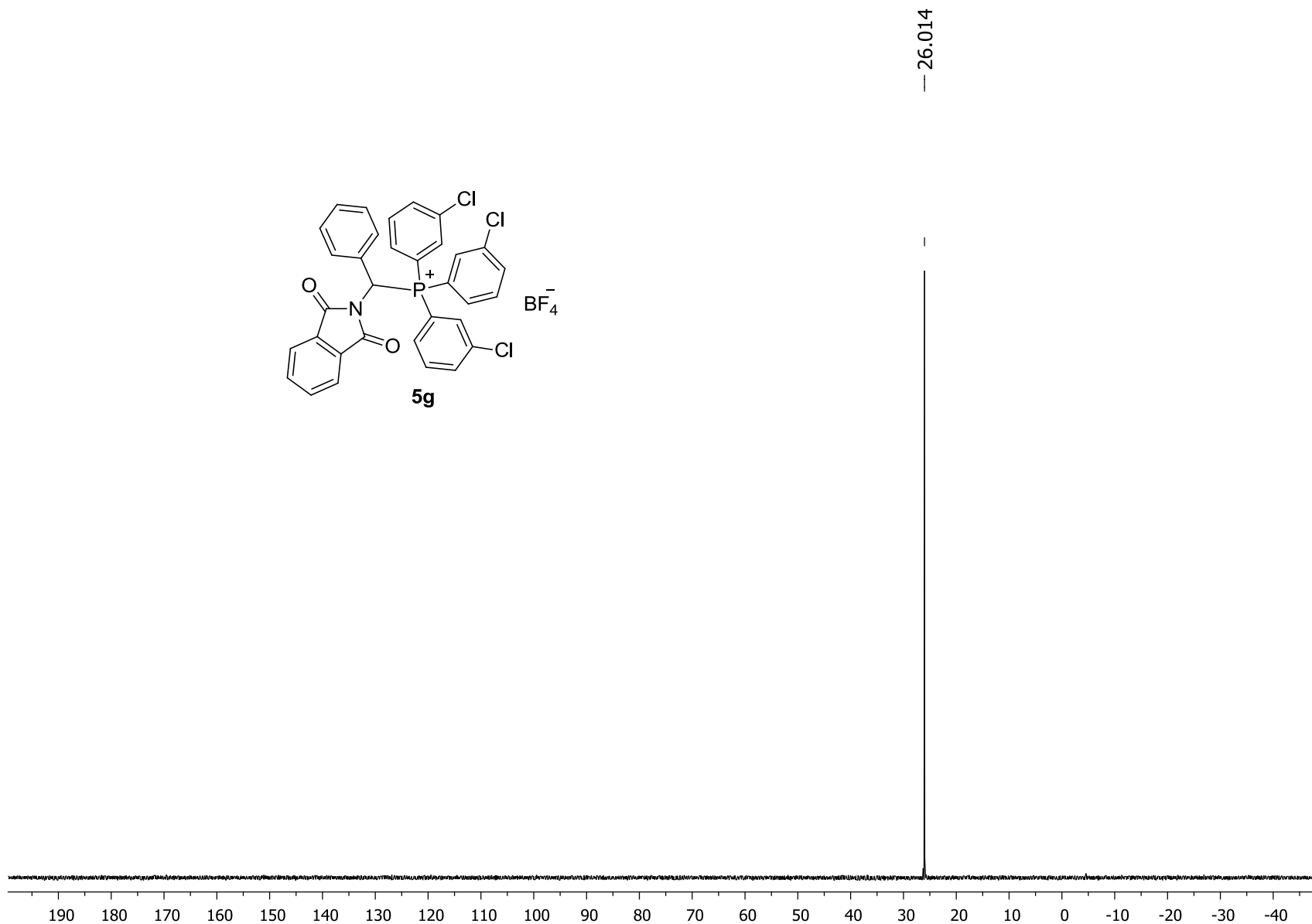
^{31}P NMR spectrum of 1-(*N*-phthalimido)phenylmethyltriphenylphosphonium tetrafluoroborate (**5f**); 161.9 MHz/ CDCl_3 ; δ (ppm).



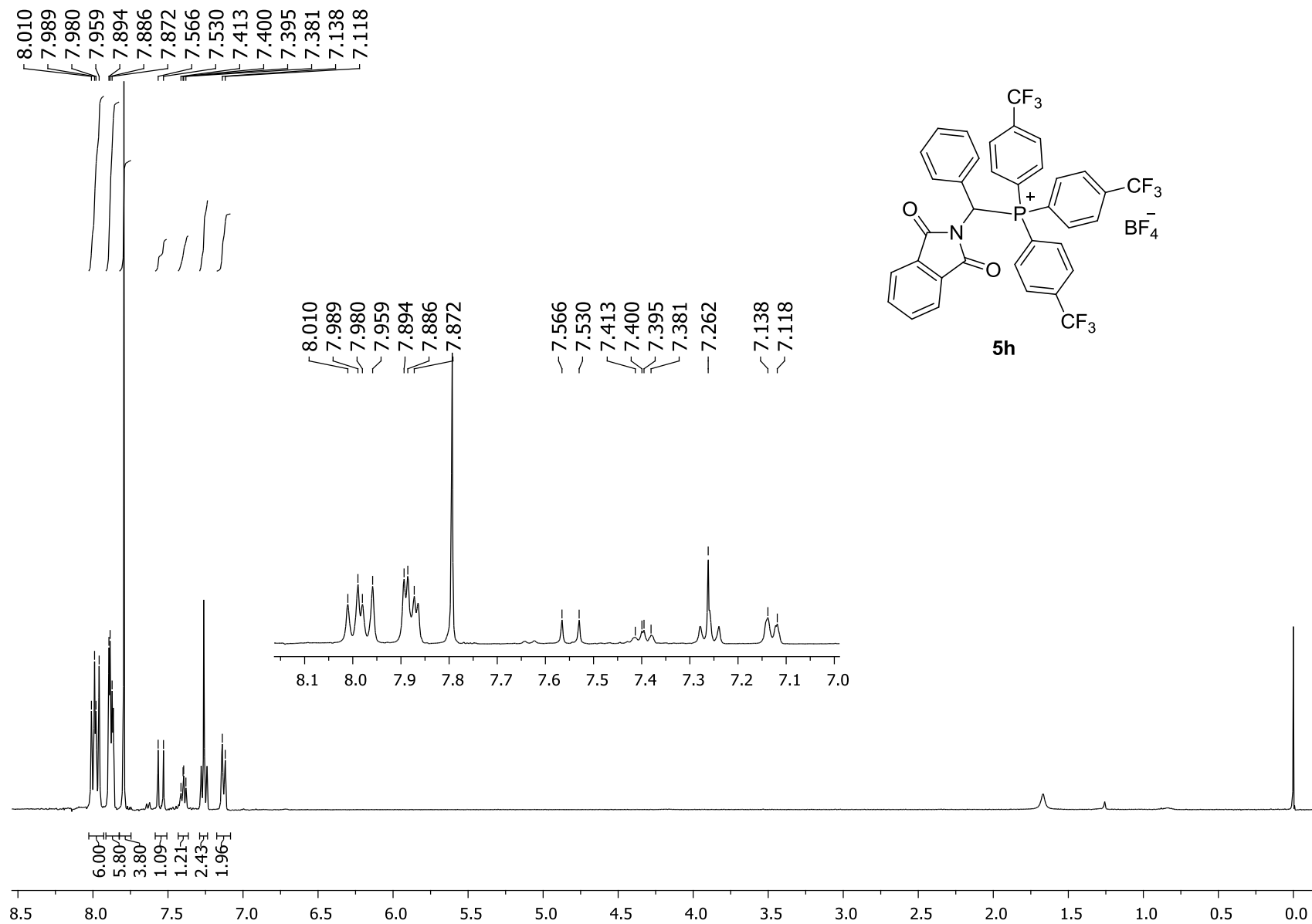
^1H NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5g**); 400 MHz/ CDCl_3 /TMS; δ (ppm).



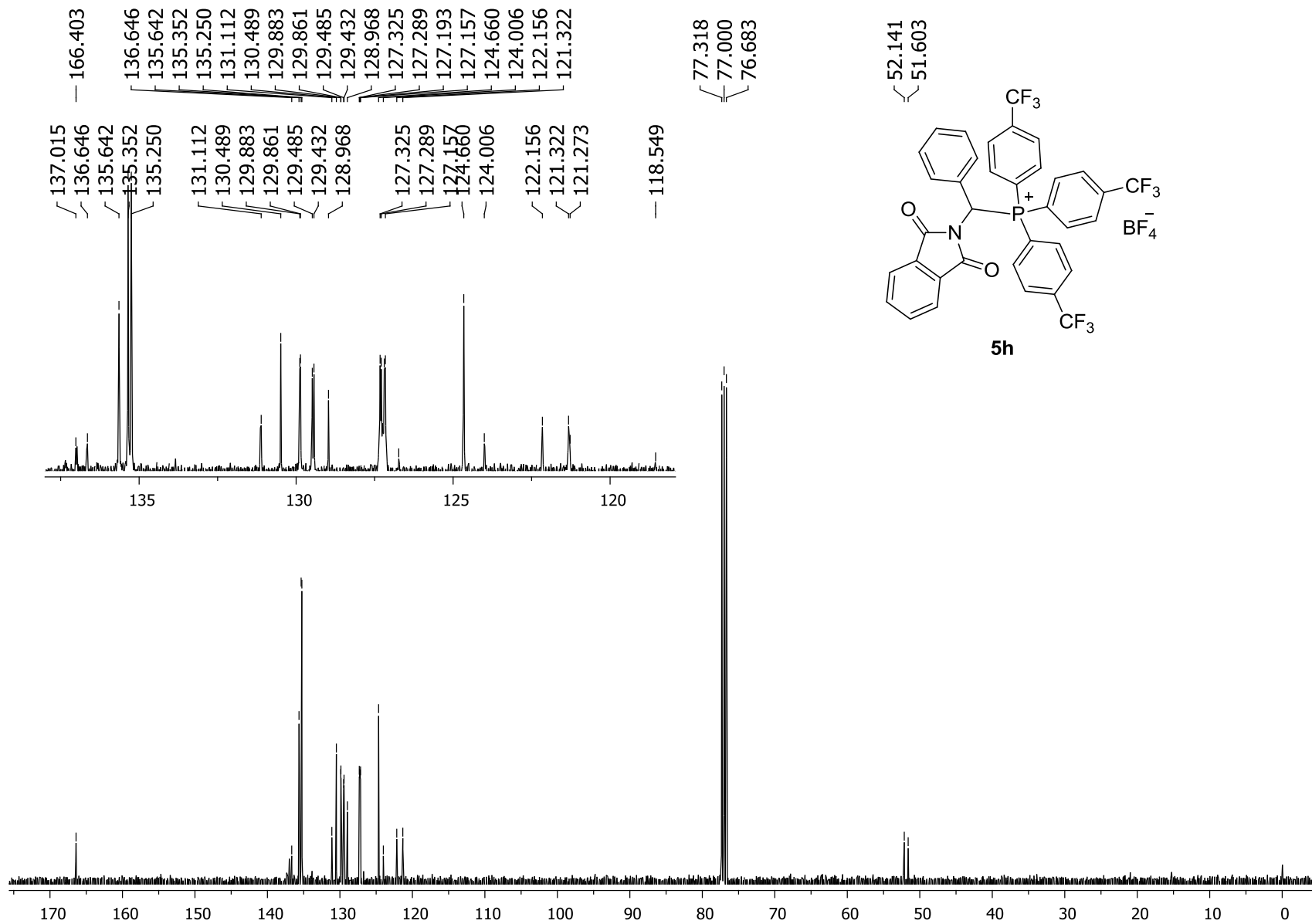
^{13}C NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5g**); 100 MHz/ CDCl_3 /TMS; δ (ppm).



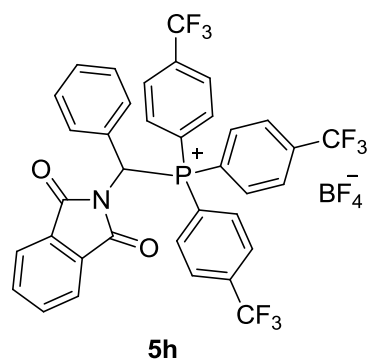
³¹P NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5g**); 161.9 MHz/CDCl₃; δ (ppm).



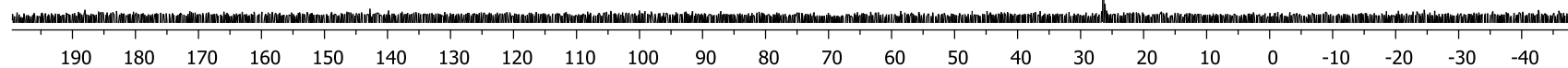
¹H NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5h**); 400 MHz/CDCl₃/TMS; δ (ppm).



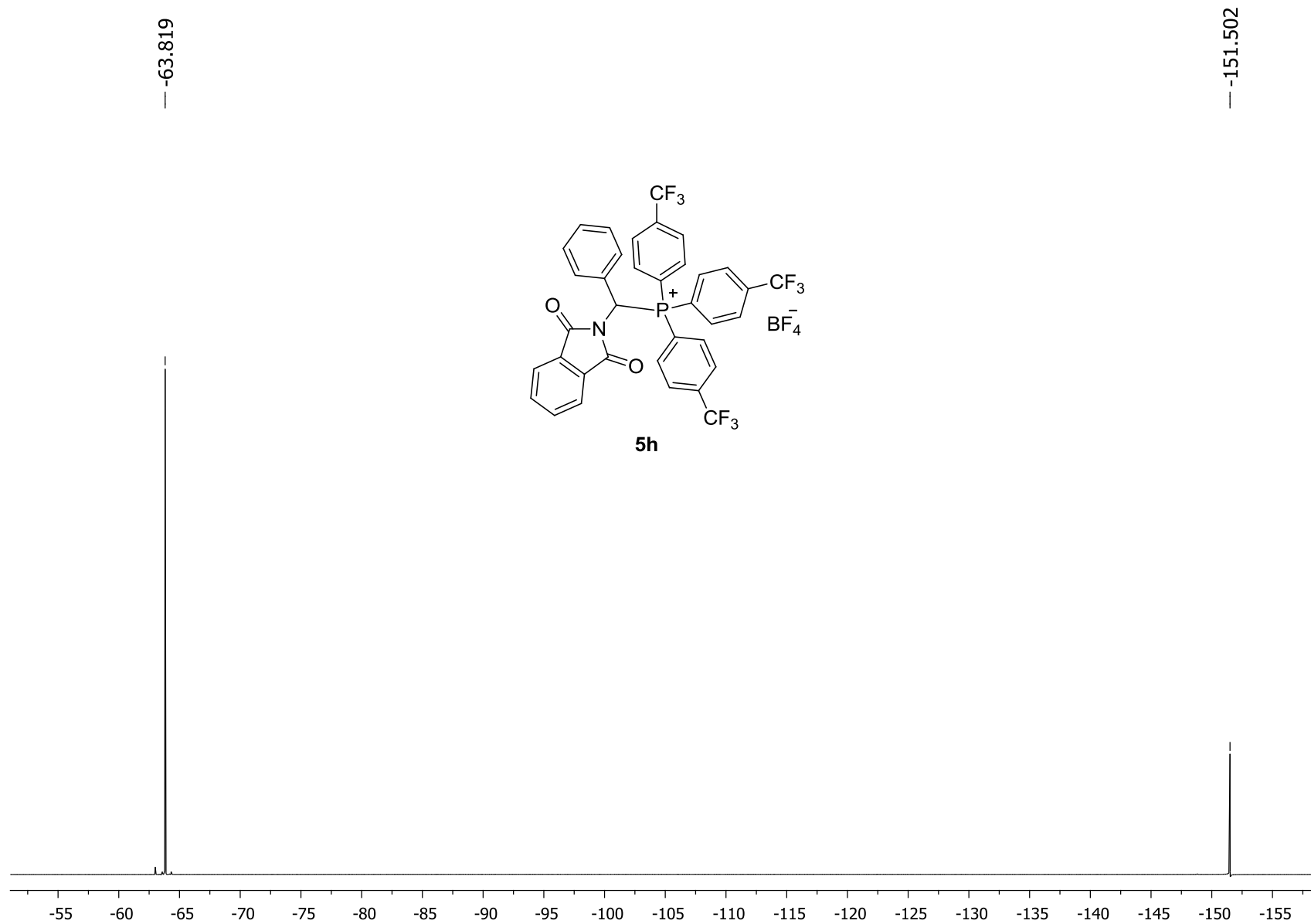
^{13}C NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5h**); 100 MHz/ CDCl_3/TMS ; δ (ppm).



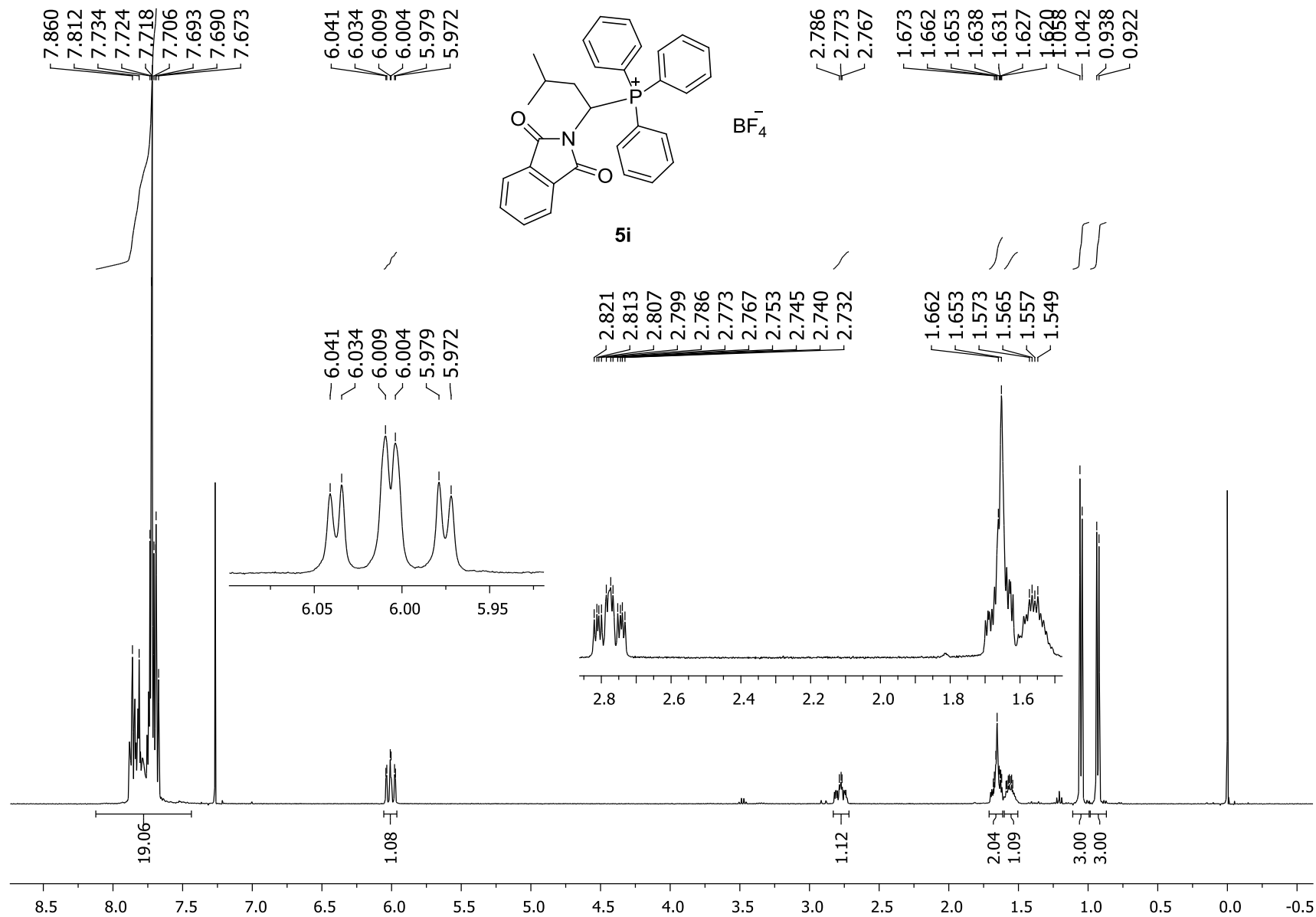
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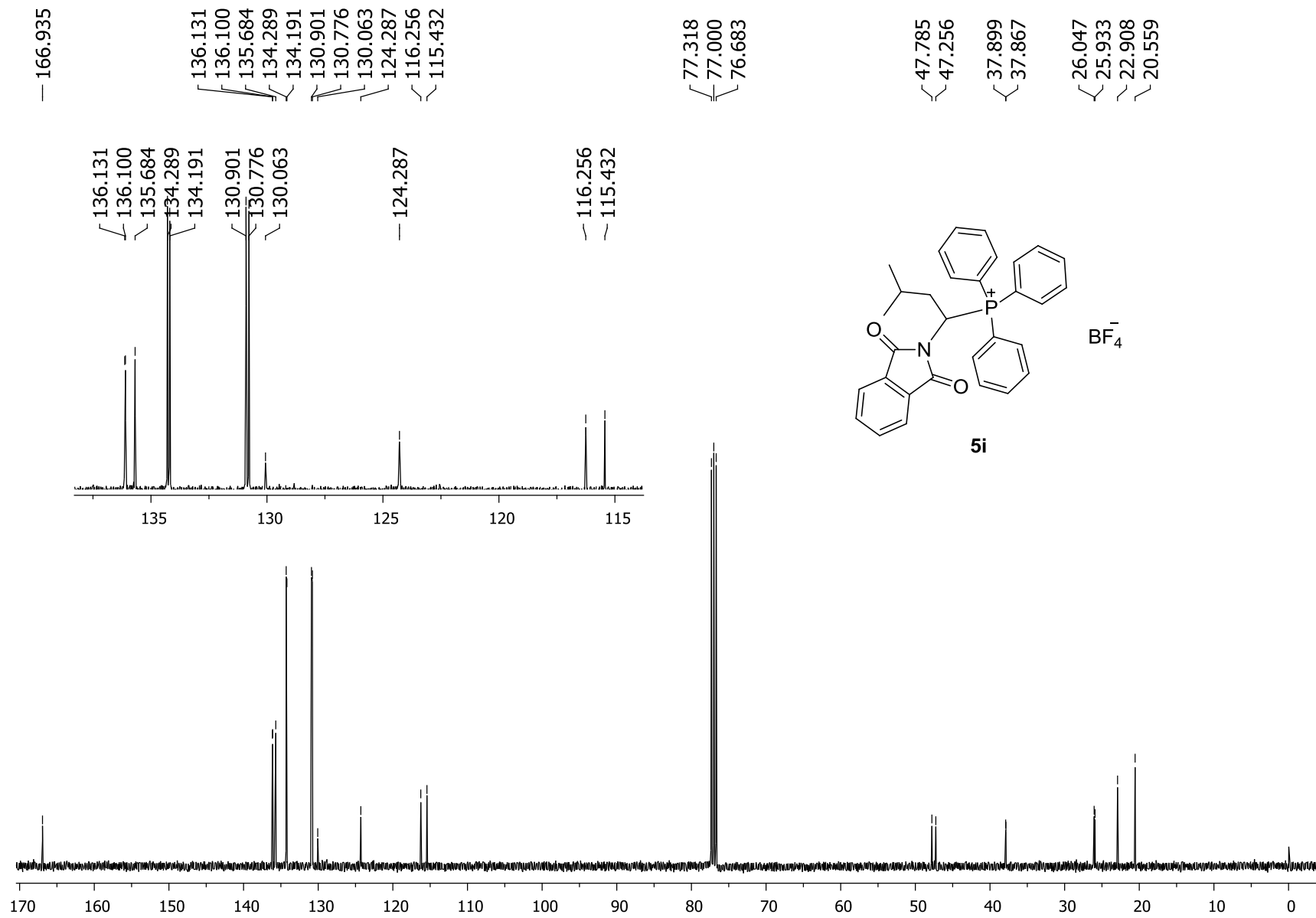
^{31}P NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5h**); 161.9 MHz/ CDCl_3 ; δ (ppm).



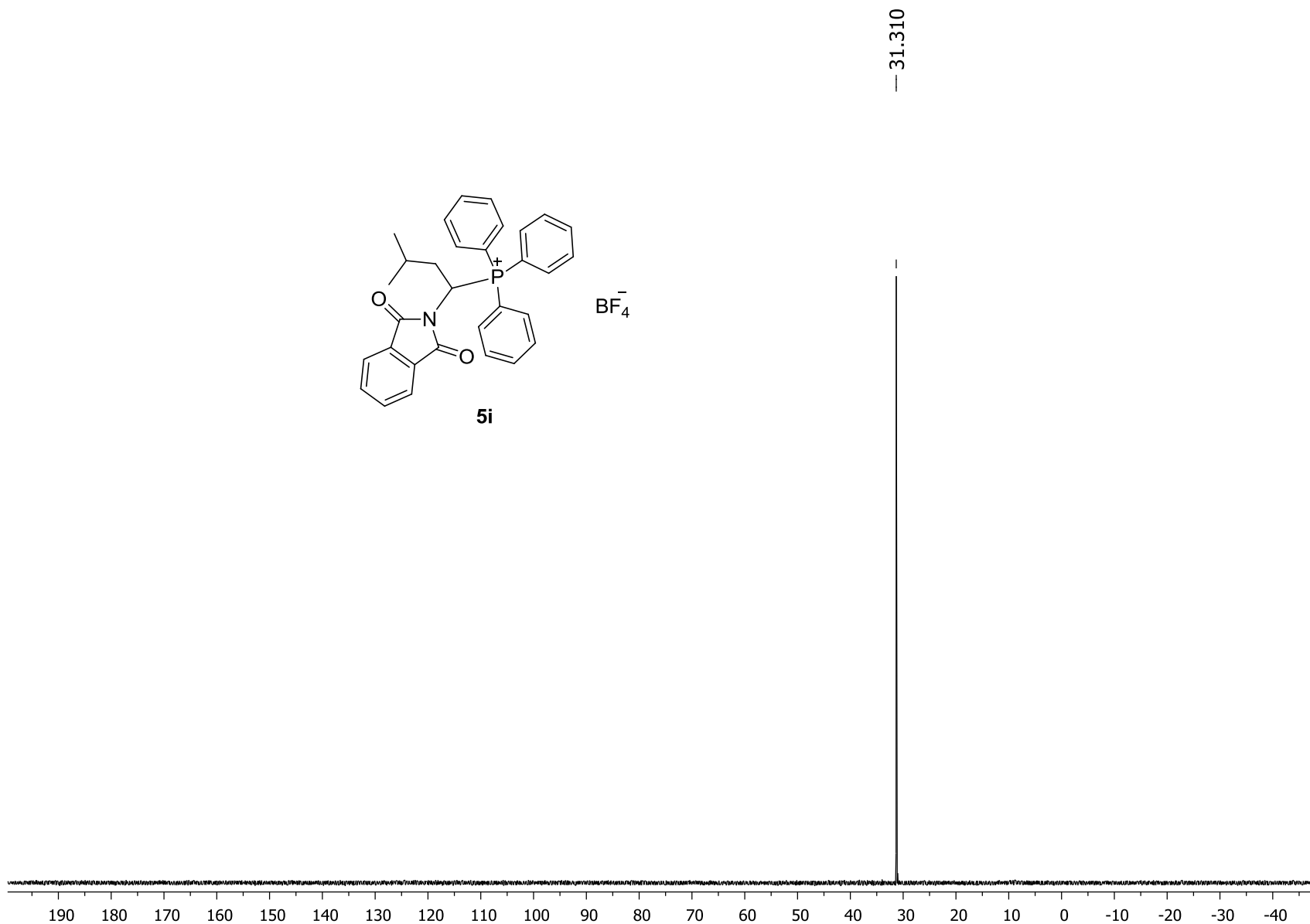
¹⁹F NMR spectrum of 1-(*N*-phthalimido)phenylmethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5h**); 376 MHz/CDCl₃; δ (ppm).



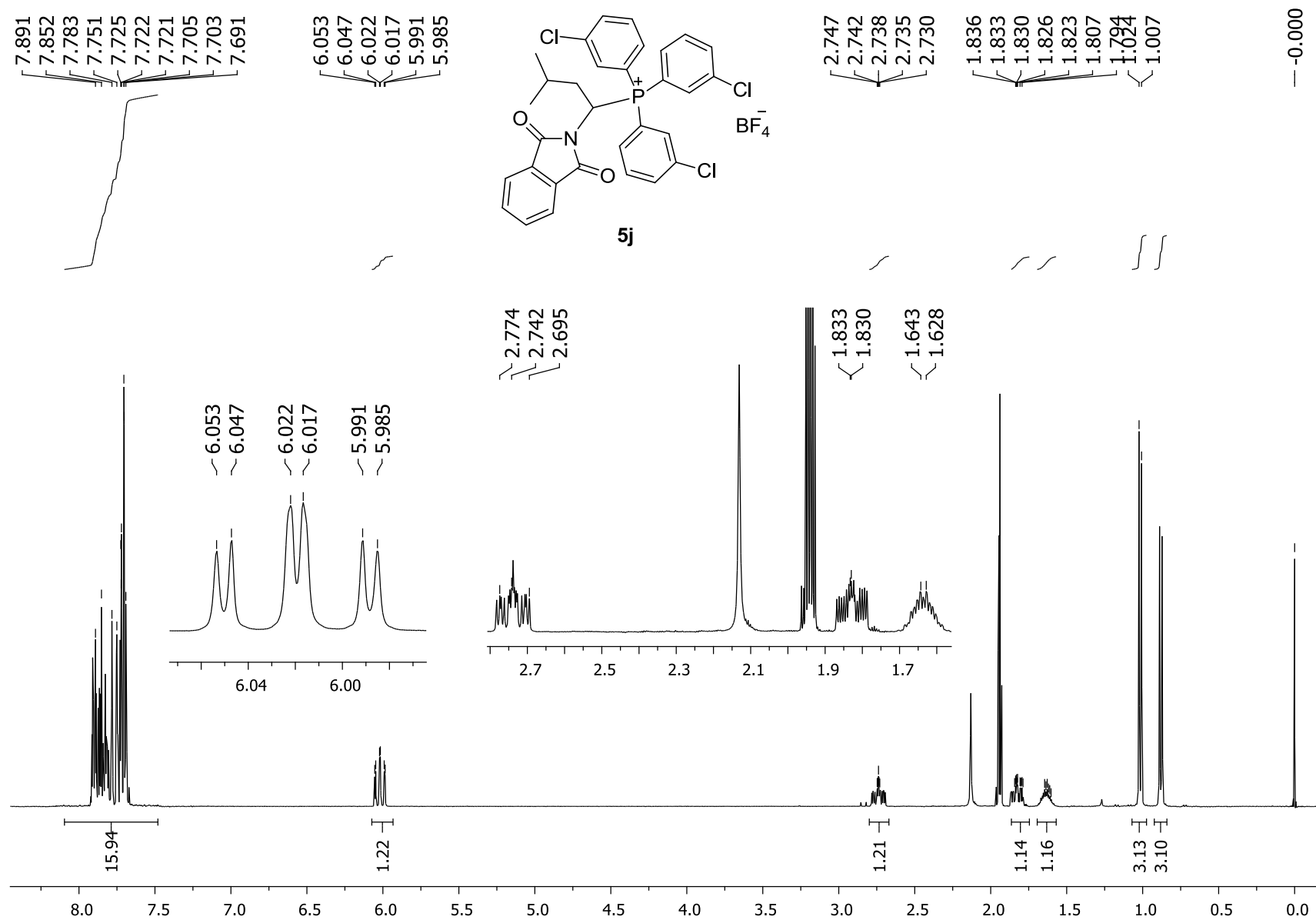
^1H NMR spectrum of 3-methyl-1-(*N*-phthalimido)butyltriphenylphosphonium tetrafluoroborate (**5i**); 400 MHz/ CDCl_3 /TMS; δ (ppm).



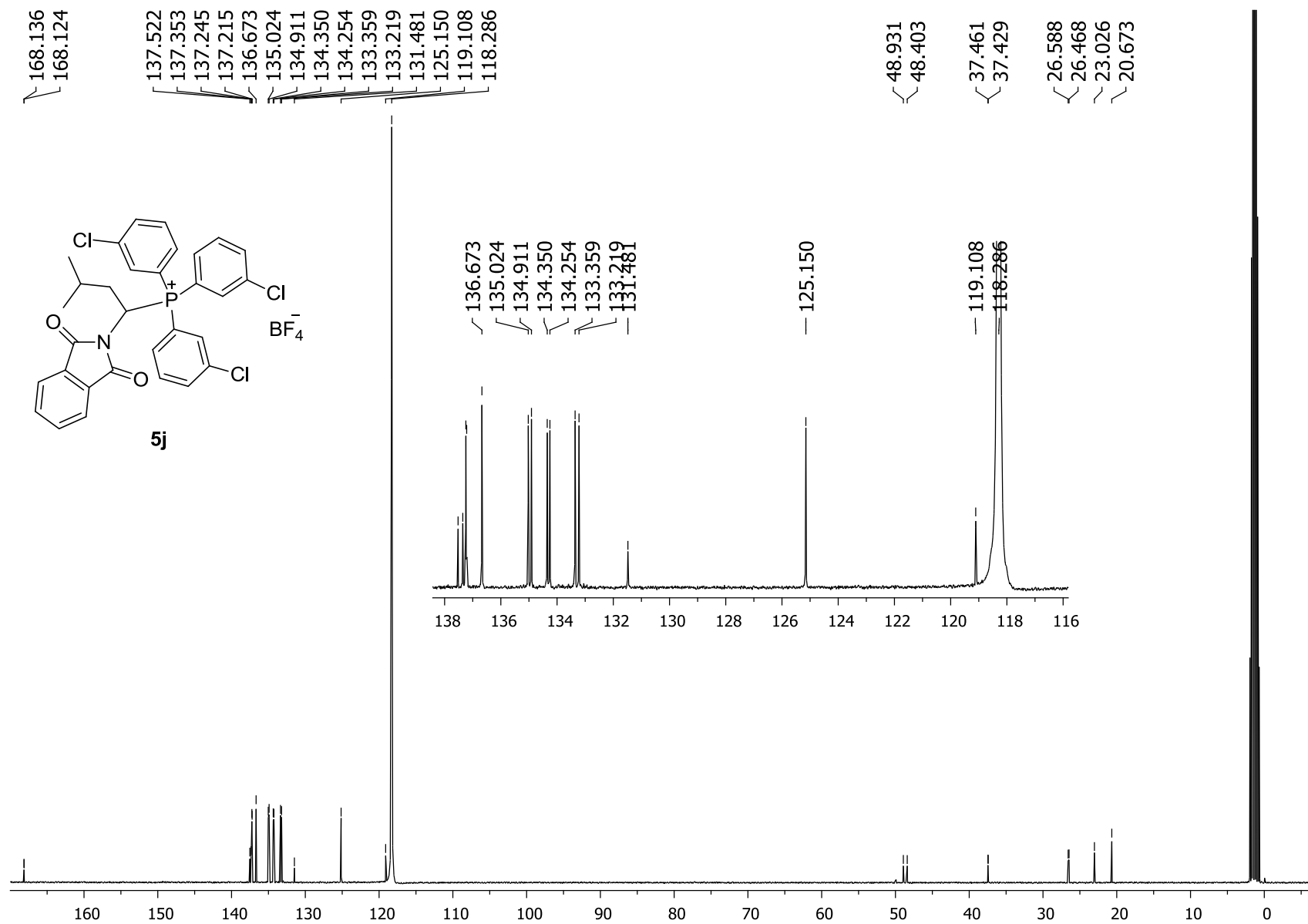
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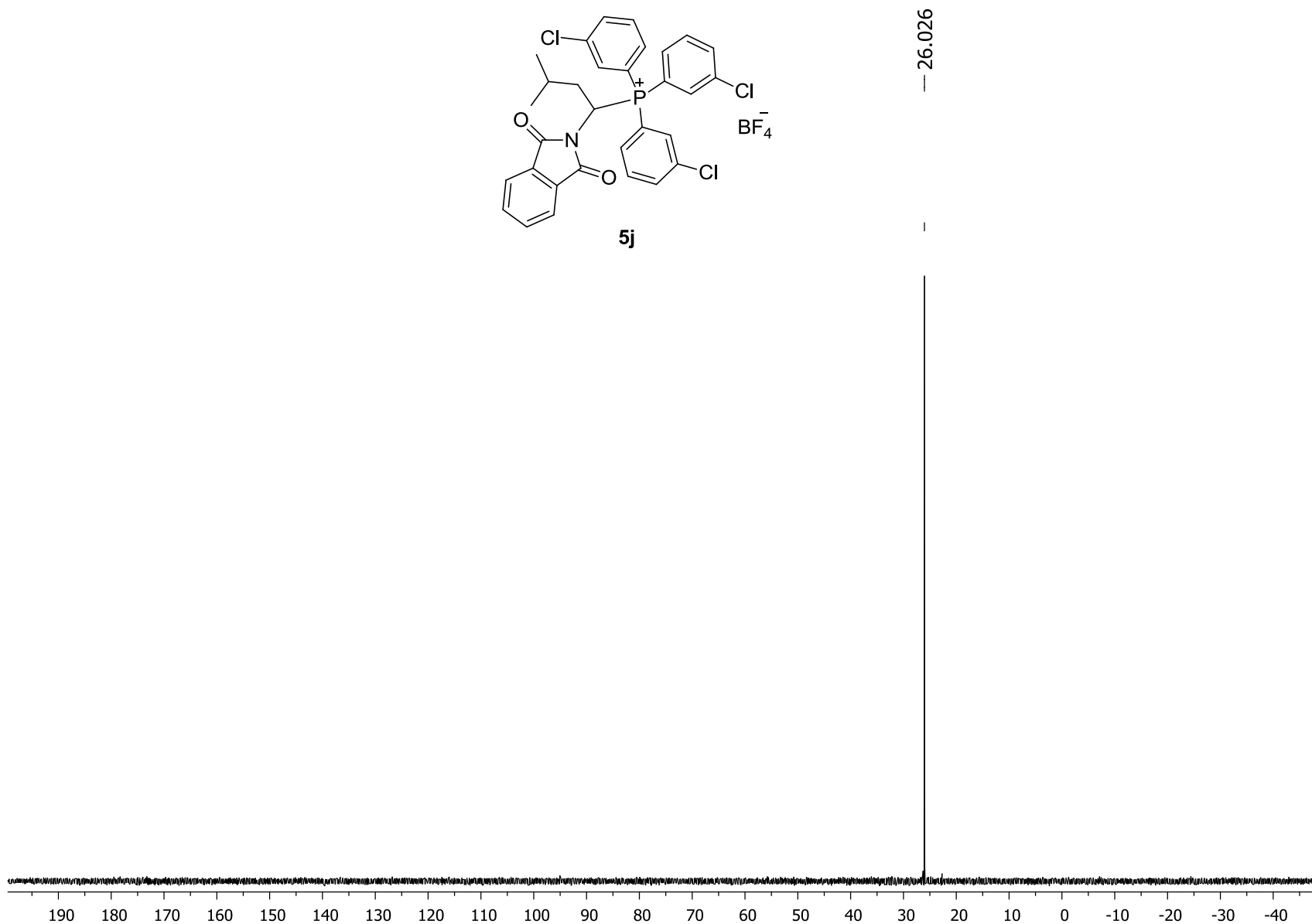
^{31}P NMR spectrum of 3-methyl-1-(*N*-phthalimido)butyltriphenylphosphonium tetrafluoroborate (**5i**); 161.9 MHz/ CDCl_3 ; δ (ppm).



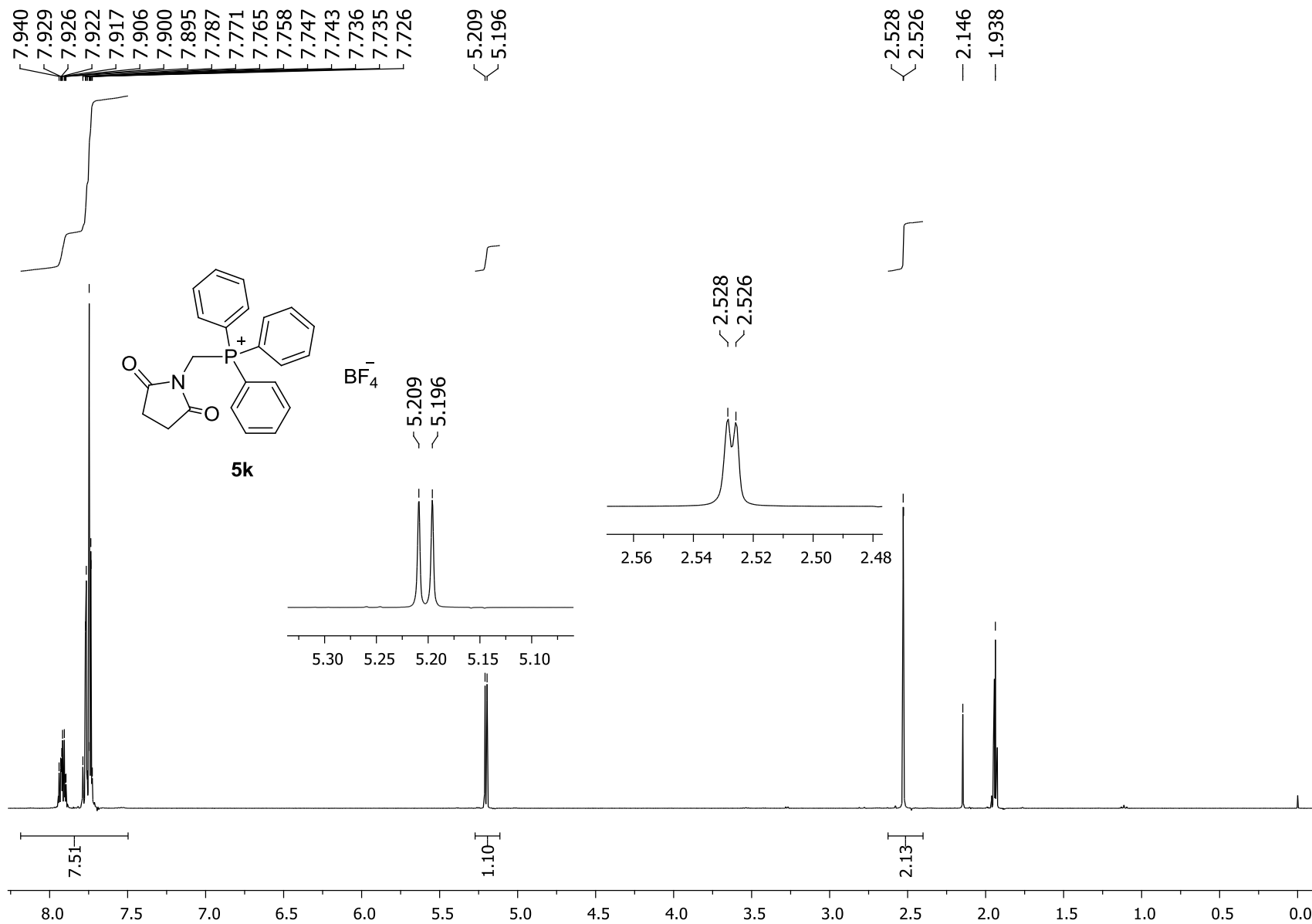
¹H NMR spectrum of 3-methyl-1-(*N*-phthalimido)butyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5j**); 400 MHz/CD₃CN/TMS; δ (ppm).



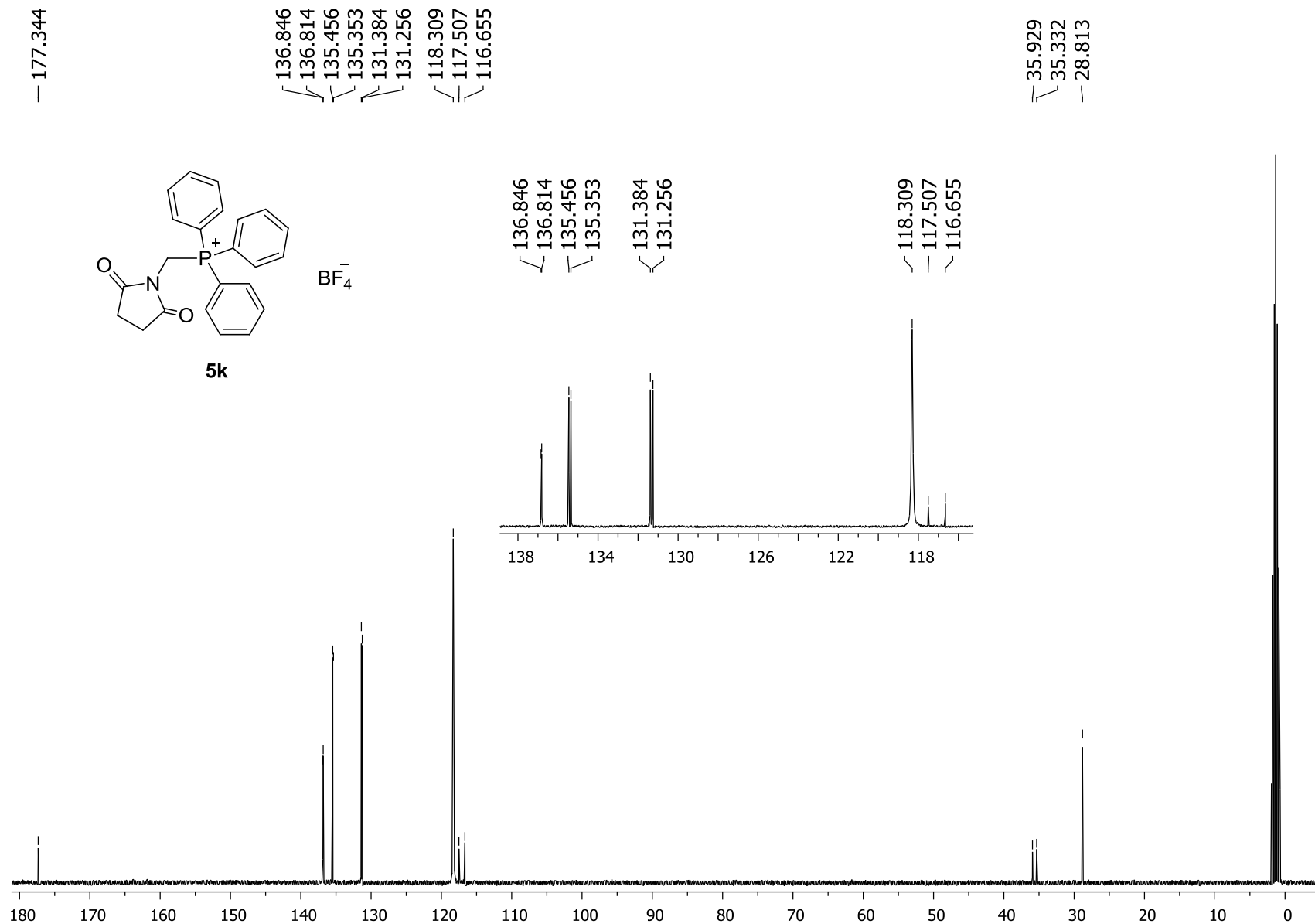
¹³C NMR spectrum of 3-methyl-1-(*N*-phthalimido)butyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5j**); 100 MHz/CD₃CN/TMS; δ (ppm).



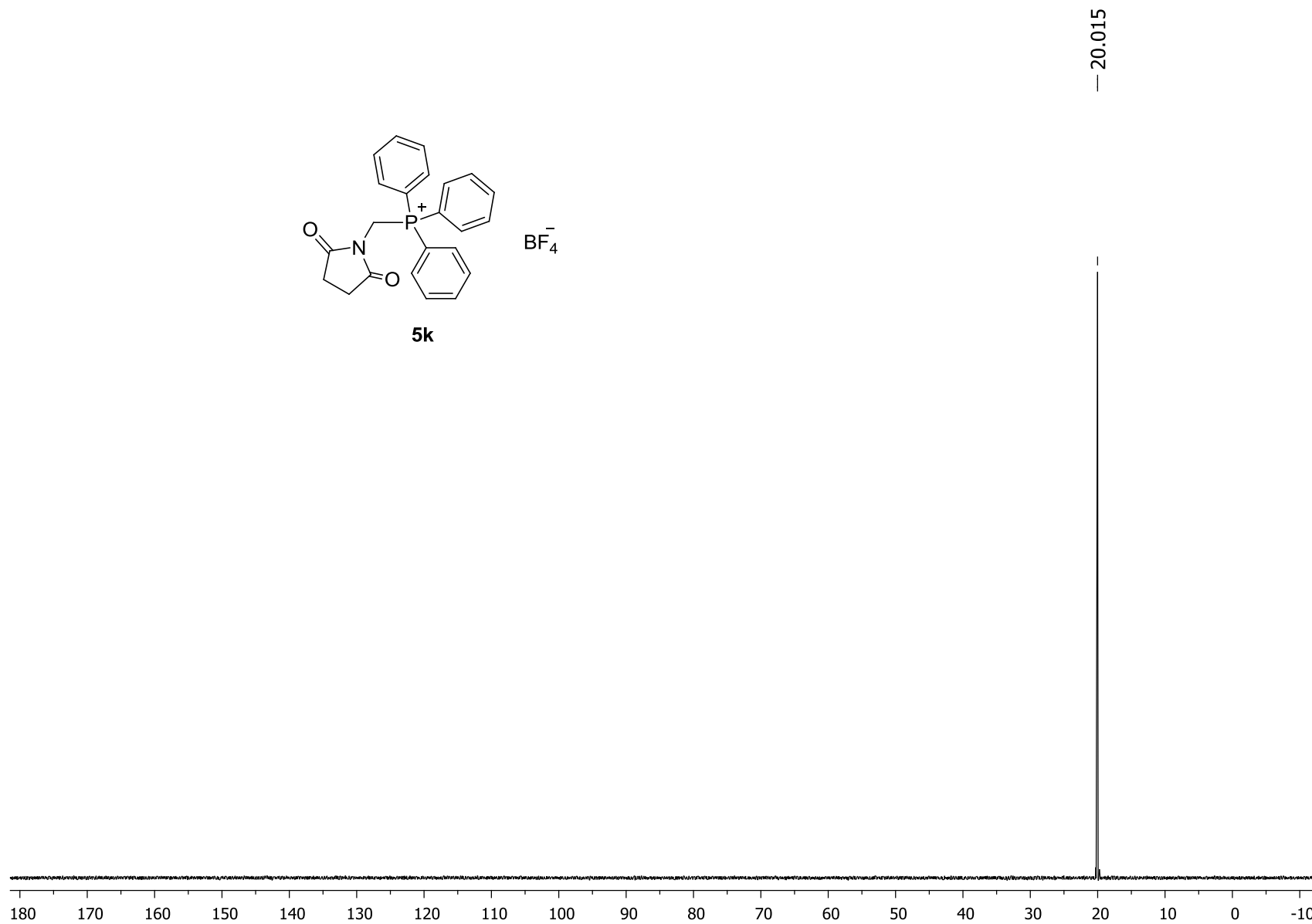
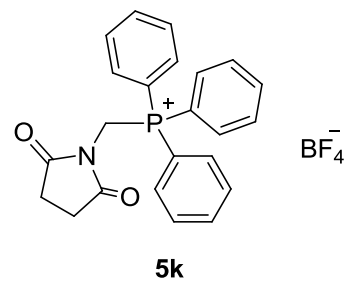
³¹P NMR spectrum of 3-methyl-1-(*N*-phthalimido)butyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5j**); 161.9 MHz/CD₃CN; δ (ppm).



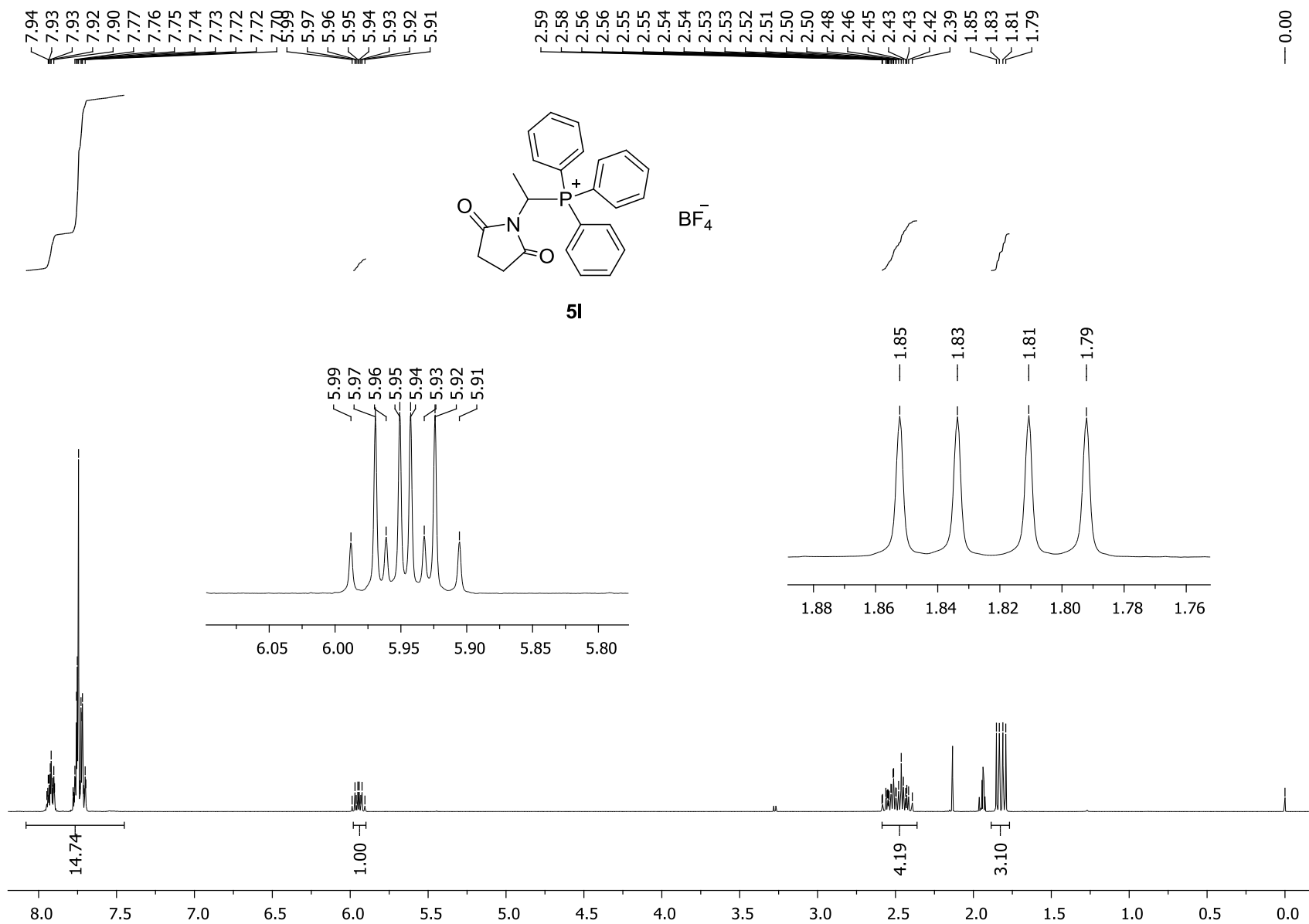
^1H NMR spectrum of 1-(*N*-succinimido)methyltriphenylphosphonium tetrafluoroborate (**5k**); 400 MHz/ $\text{CD}_3\text{CN}/\text{TMS}$; δ (ppm).



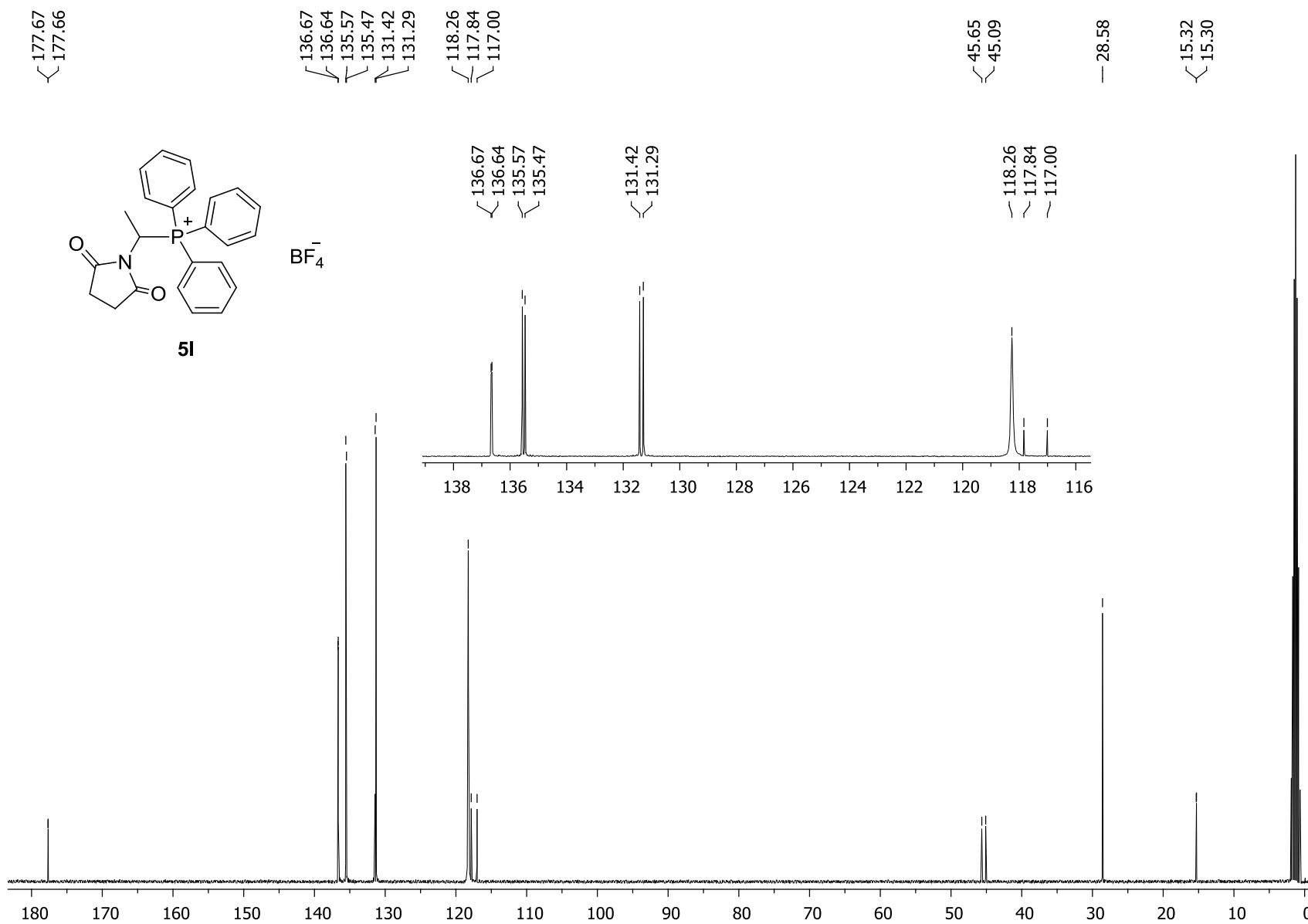
^{13}C NMR spectrum of 1-(*N*-succinimido)methyltriphenylphosphonium tetrafluoroborate (**5k**); 100 MHz/ $\text{CD}_3\text{CN}/\text{TMS}$; δ (ppm).



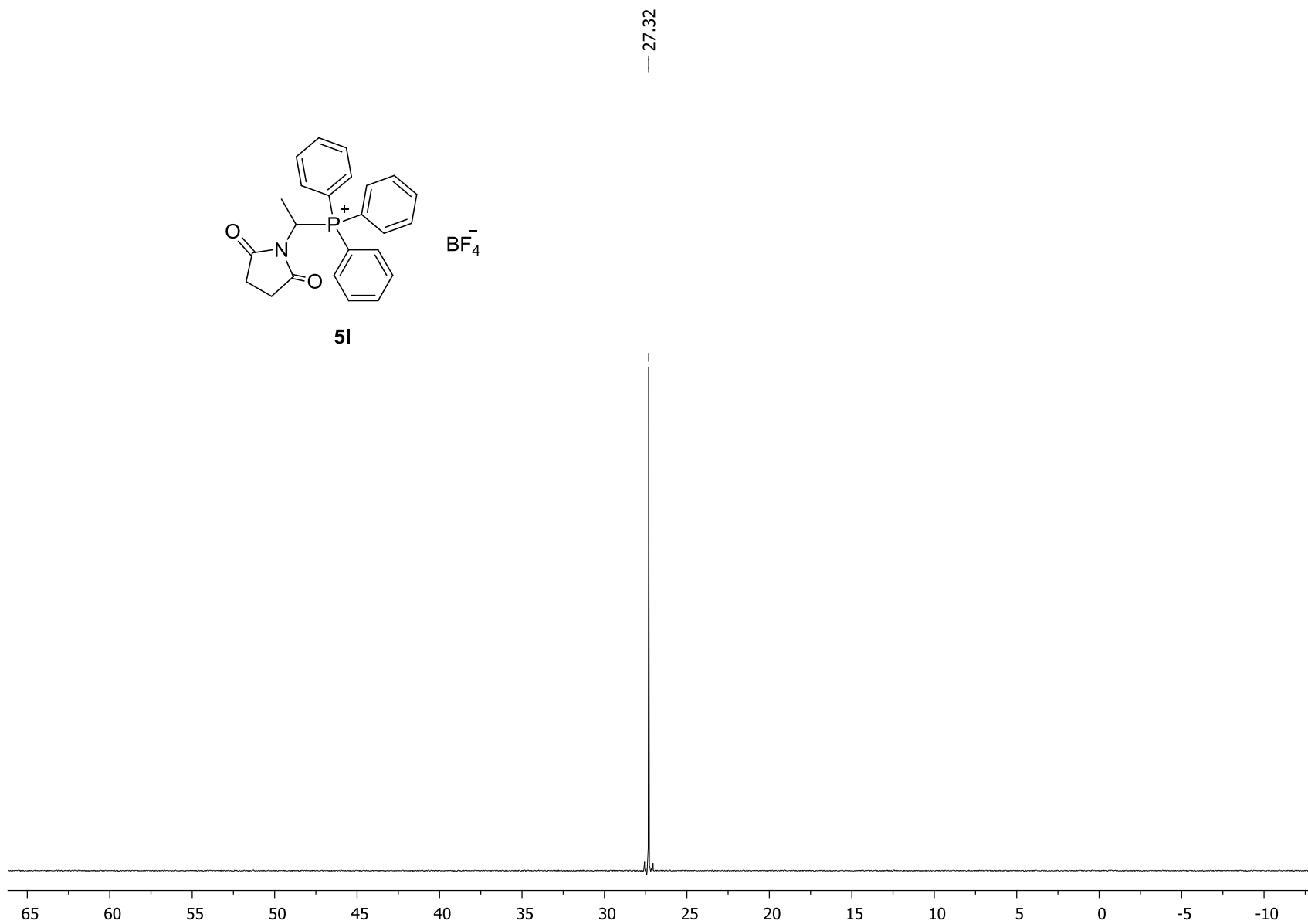
^{31}P NMR spectrum of 1-(*N*-succinimido)methyltriphenylphosphonium tetrafluoroborate (**5k**); 161.9 MHz/ CD_3CN ; δ (ppm).



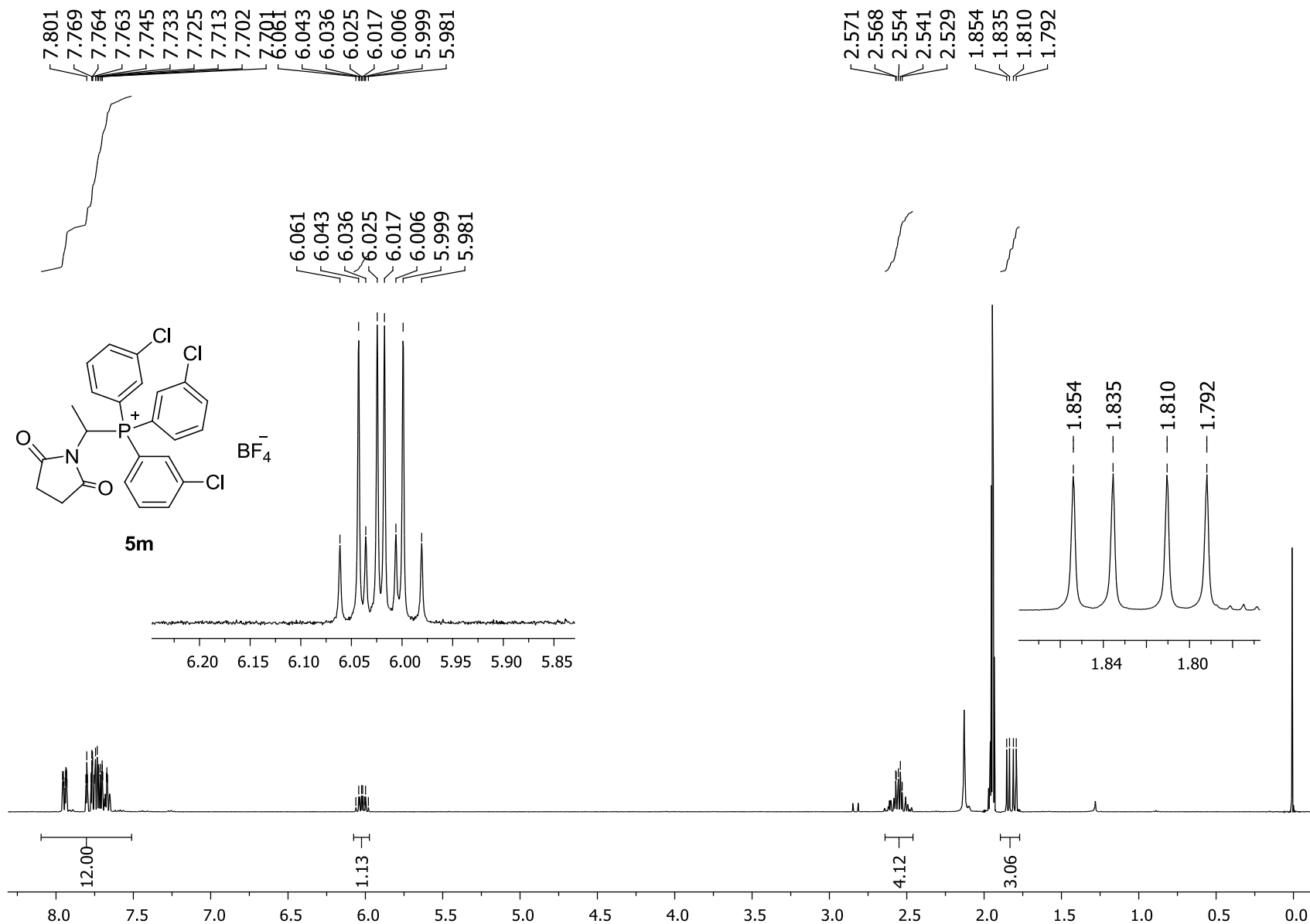
¹H NMR spectrum of 1-(*N*-succinimido)ethyltriphenylphosphonium tetrafluoroborate (**5I**); 400 MHz/ CD₃CN/TMS; δ (ppm).



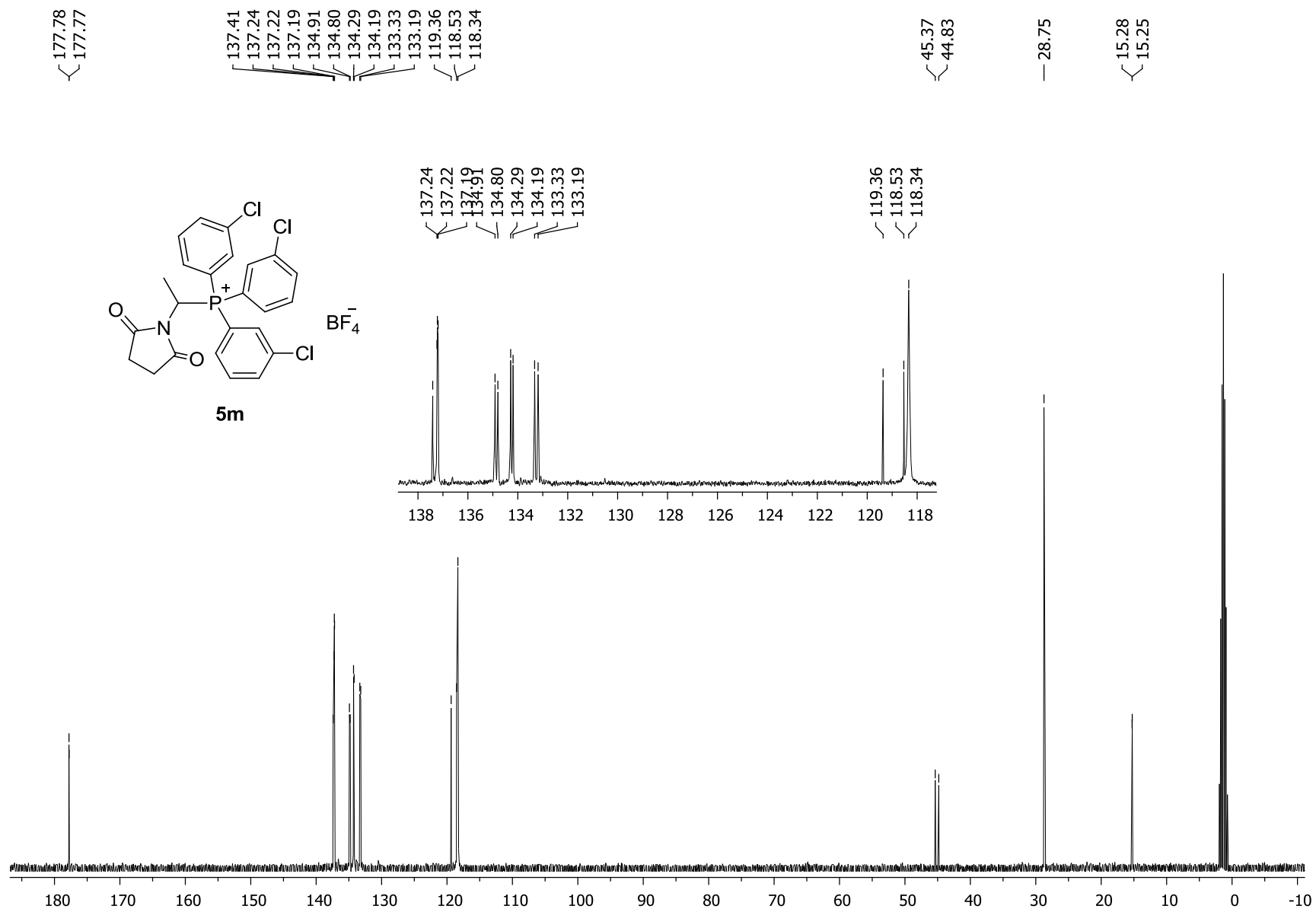
^{13}C NMR spectrum of 1-(*N*-succinimido)ethyltriphenylphosphonium tetrafluoroborate (**5I**); 100 MHz/ $\text{CD}_3\text{CN}/\text{TMS}$; δ (ppm).



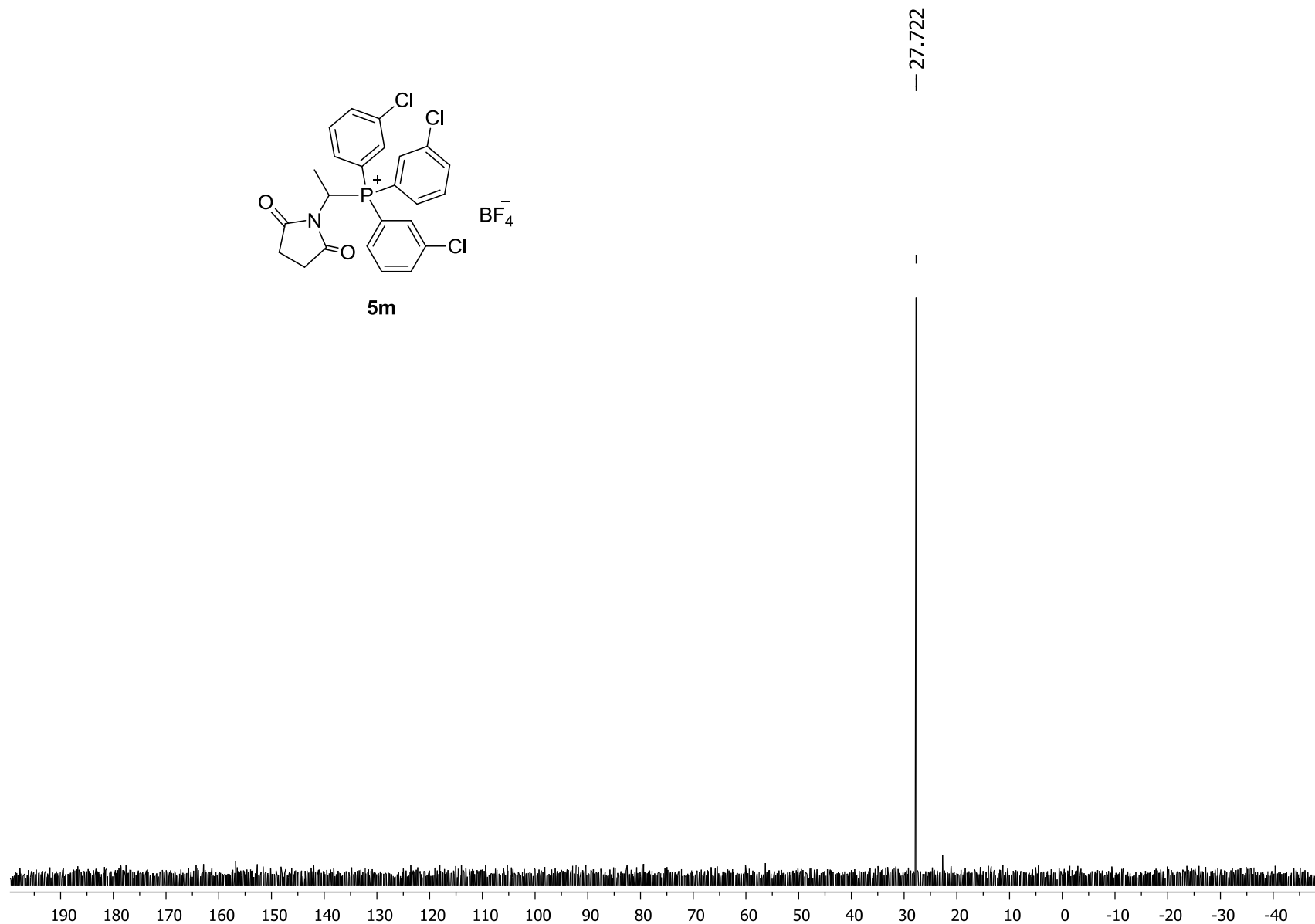
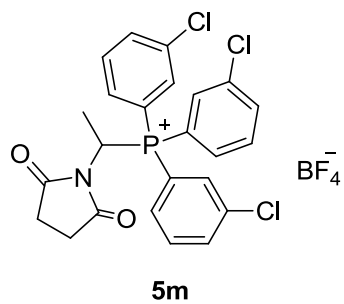
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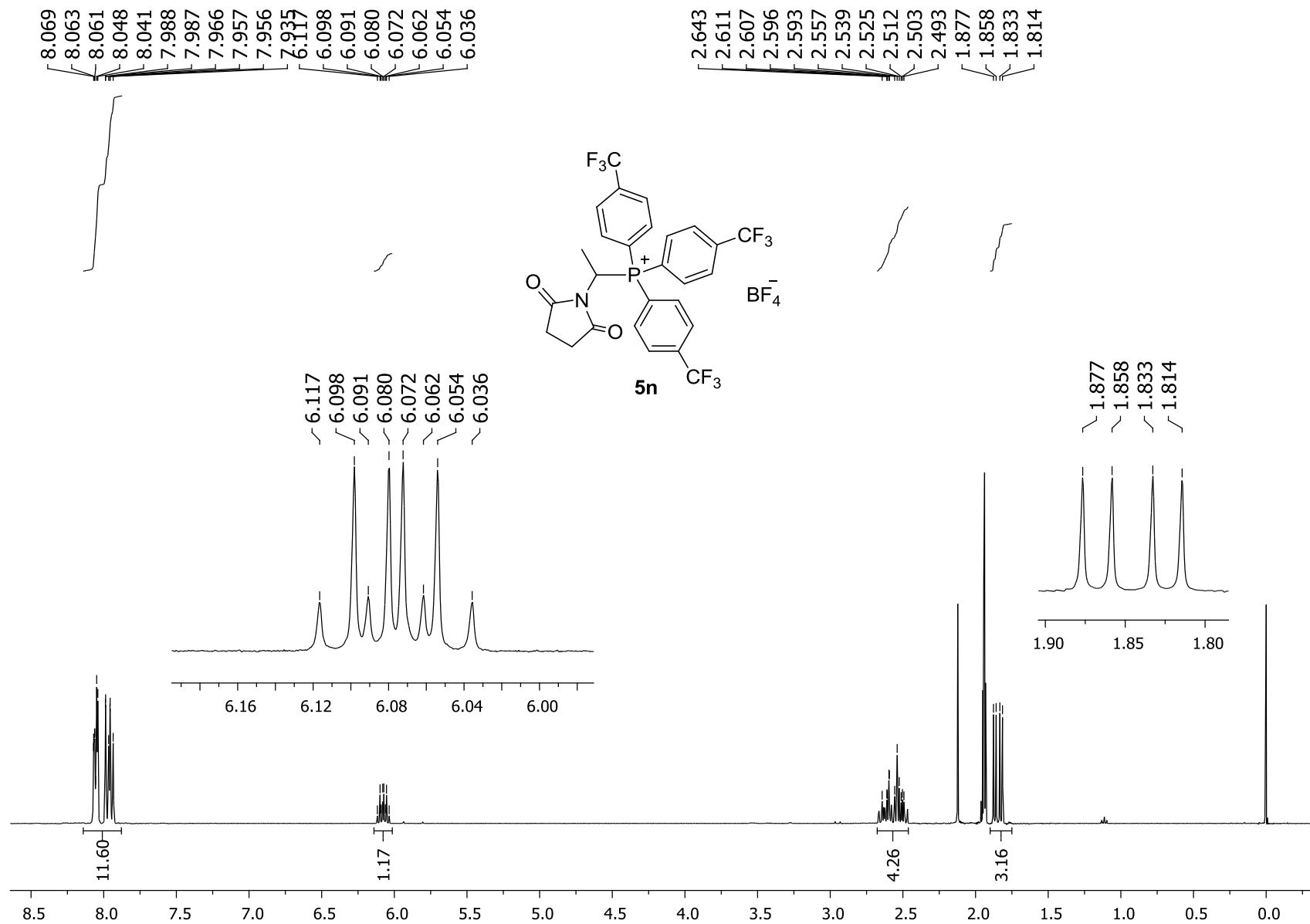
^1H NMR spectrum of 1-(*N*-succinimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5m**); 400 MHz/ CD_3CN /TMS; δ (ppm).



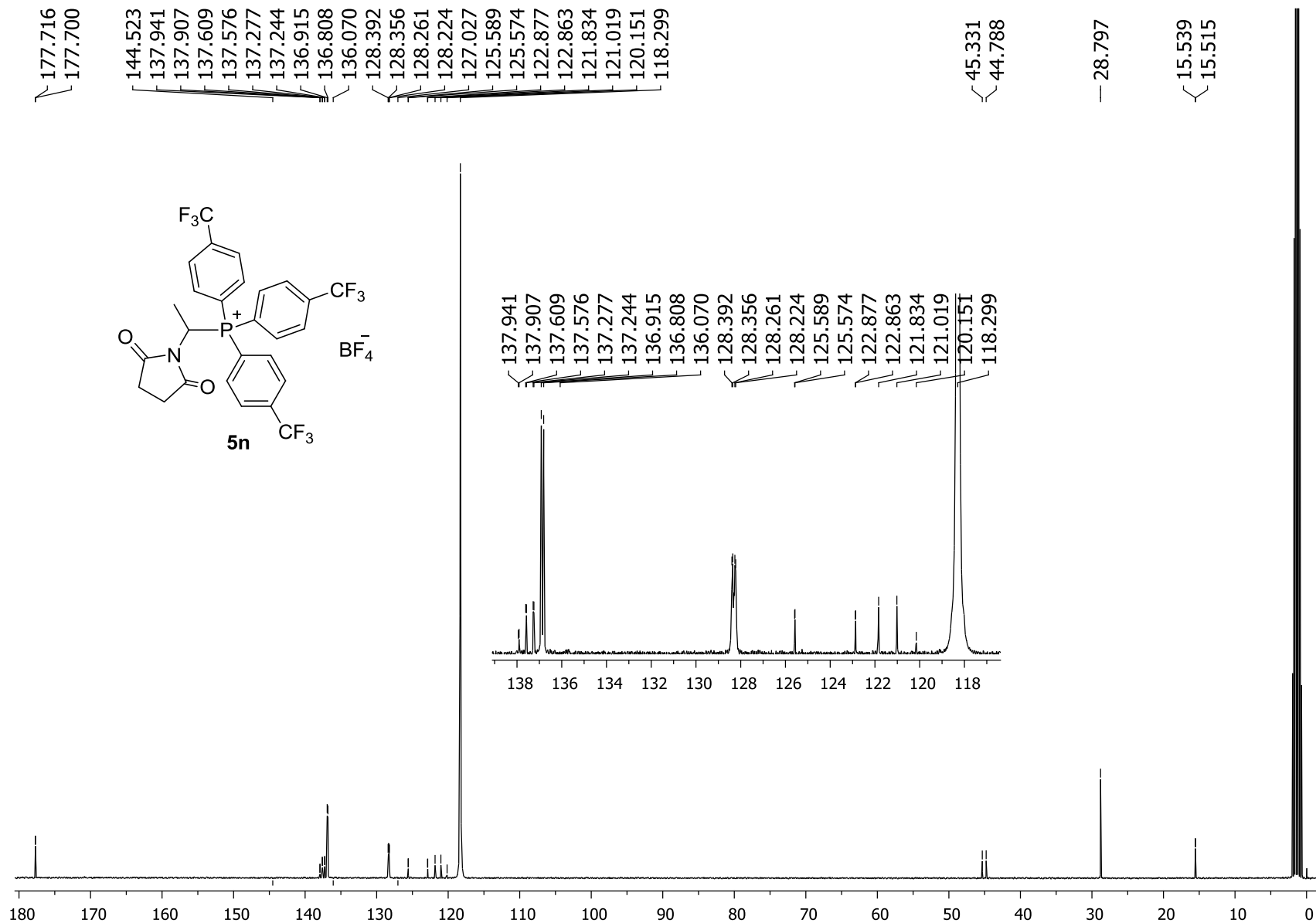
¹³C NMR spectrum of 1-(*N*-succinimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5m**); 100 MHz/CD₃CN/TMS; δ (ppm).



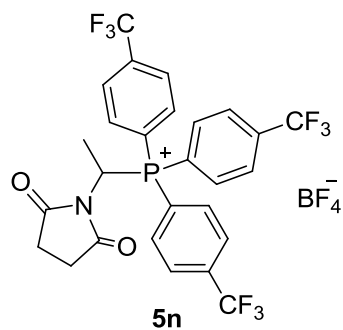
^{31}P NMR spectrum of 1-(*N*-succinimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5m**); 161.9 MHz/ CD_3CN ; δ (ppm).



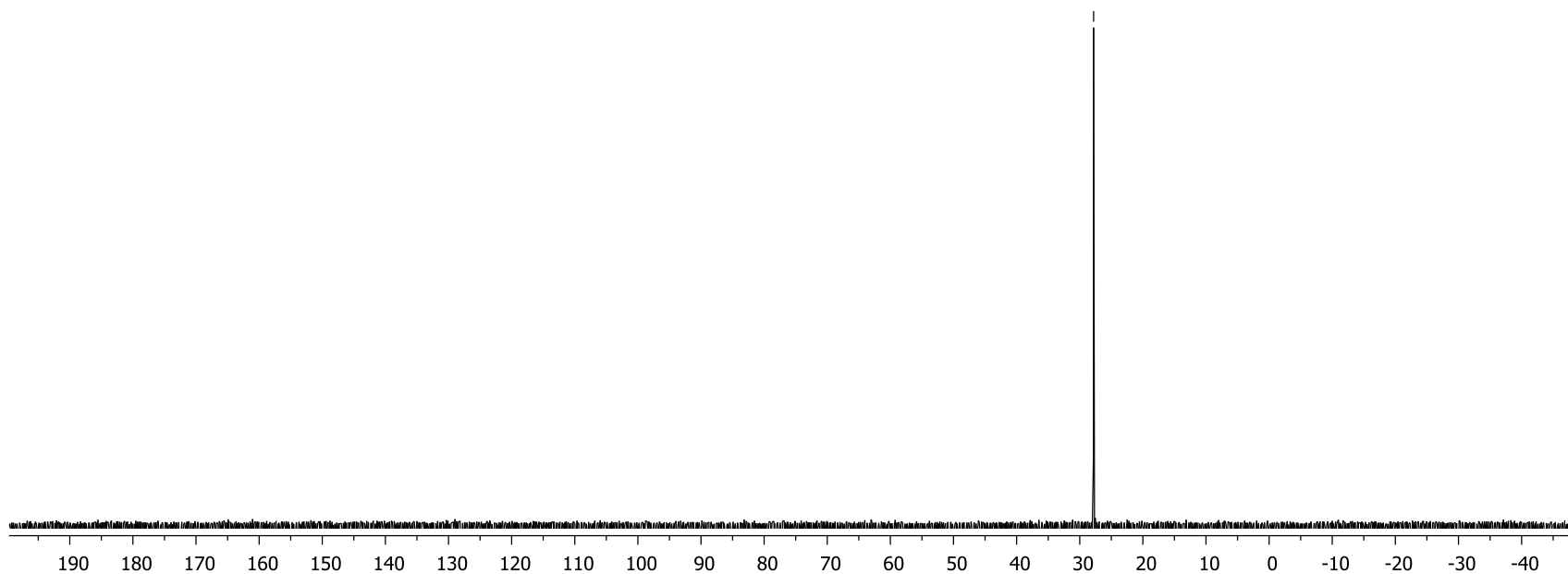
¹H NMR spectrum of 1-(*N*-succinimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5n**); 400 MHz/CD₃CN/TMS; δ (ppm).



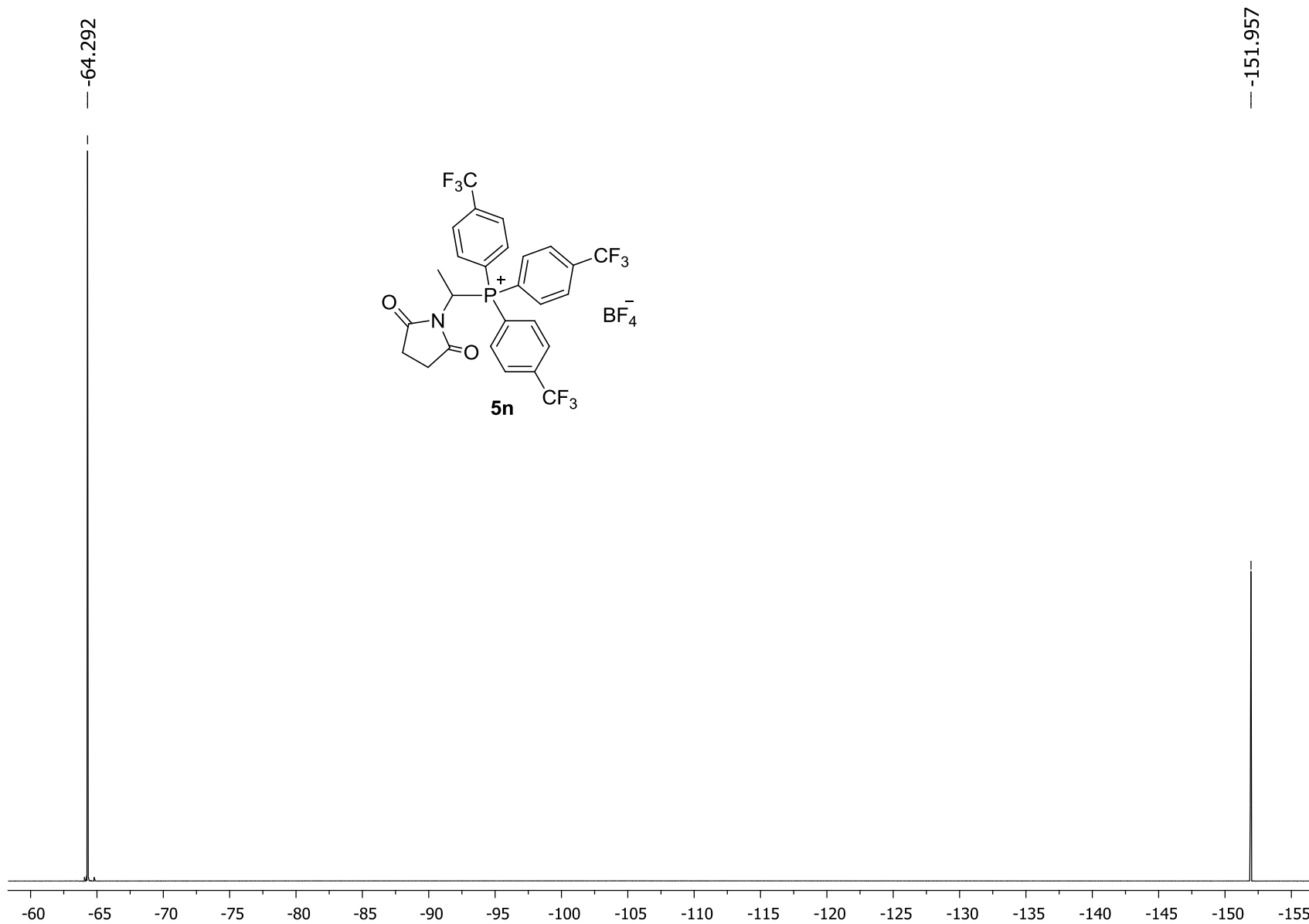
¹³C NMR spectrum of 1-(*N*-succinimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5n**); 100 MHz/CD₃CN/TMS; δ (ppm).



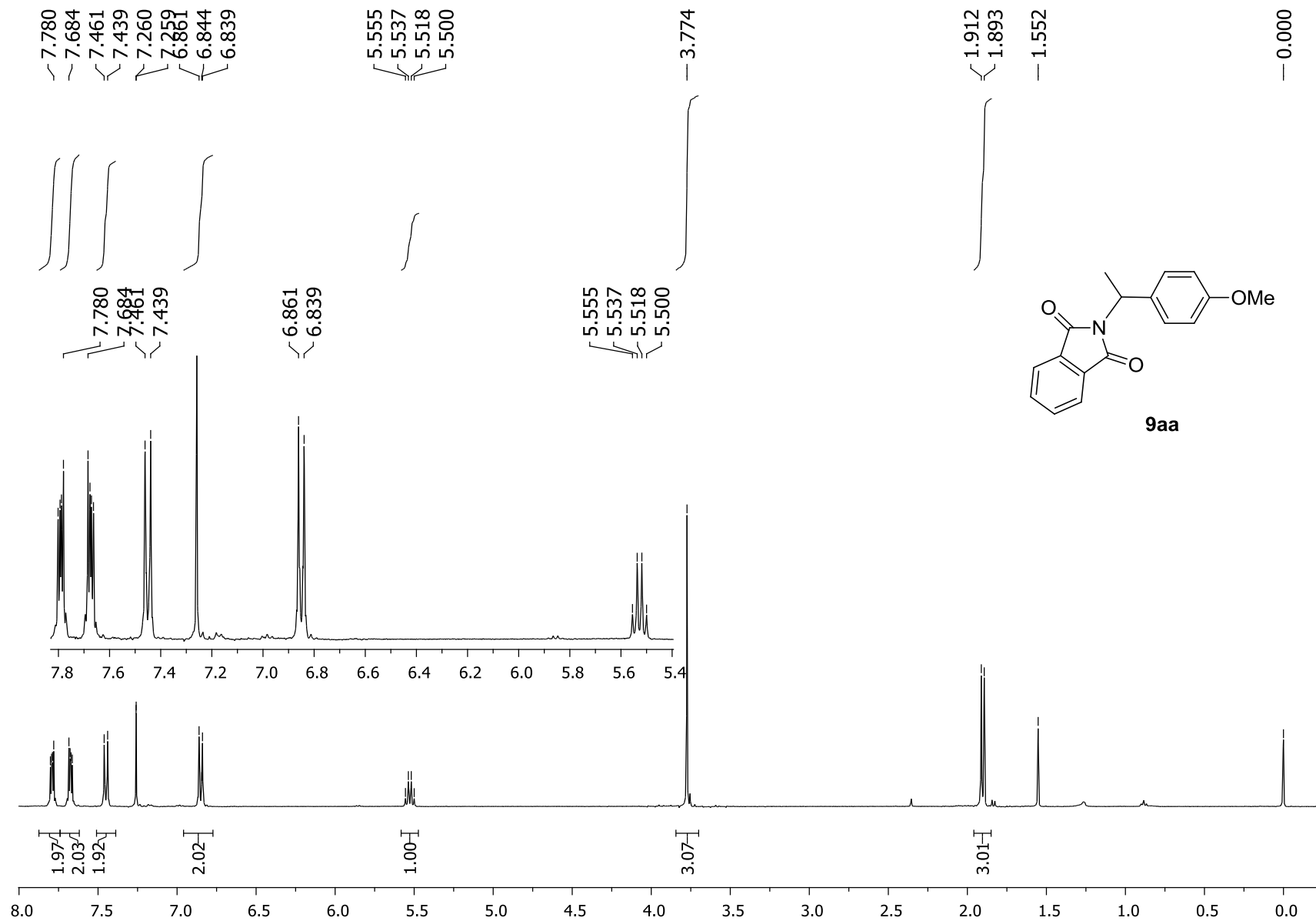
— 27.804



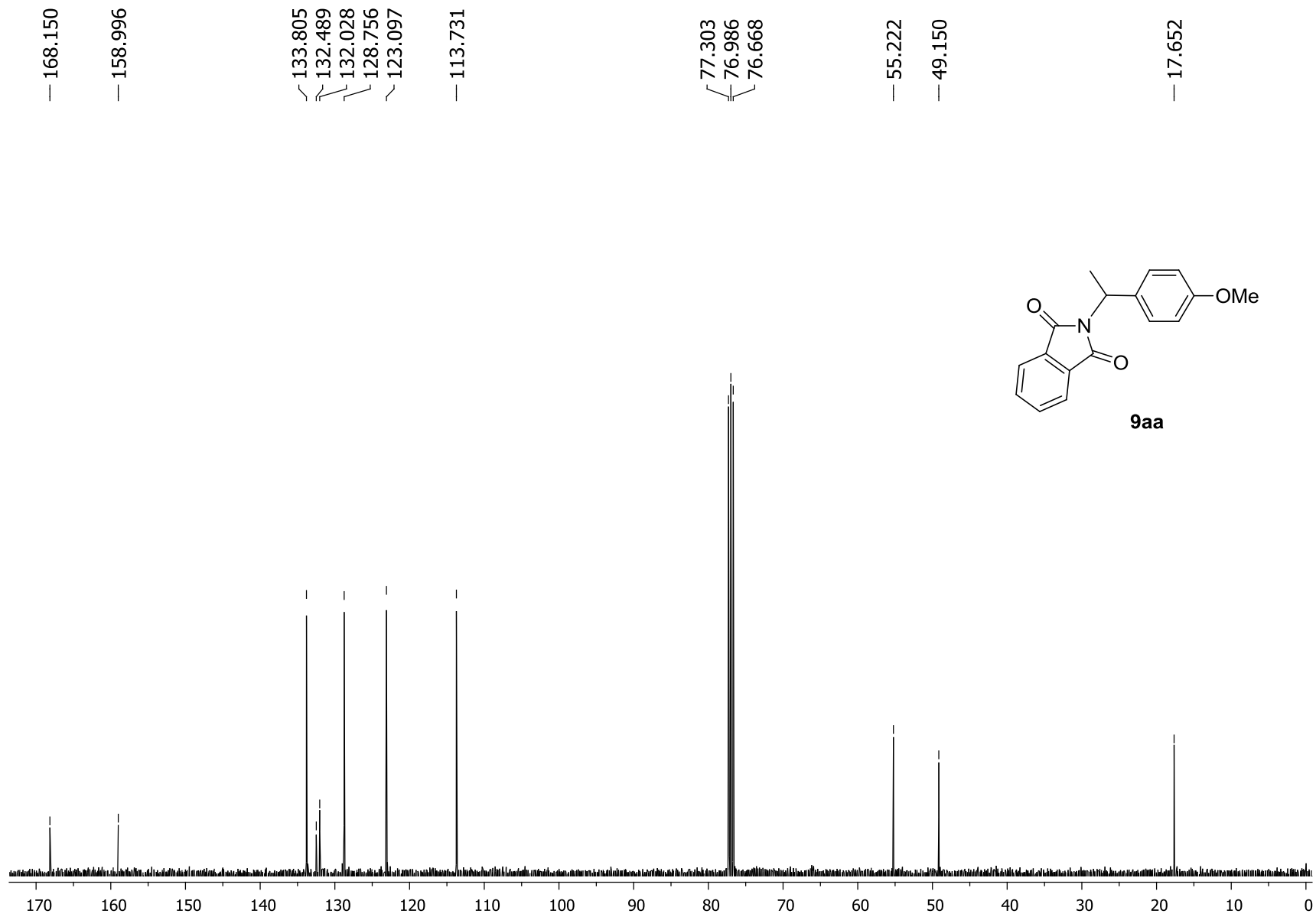
^{31}P NMR spectrum of 1-(*N*-succinimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5n**); 161.9 MHz/ CD_3CN ; δ (ppm).



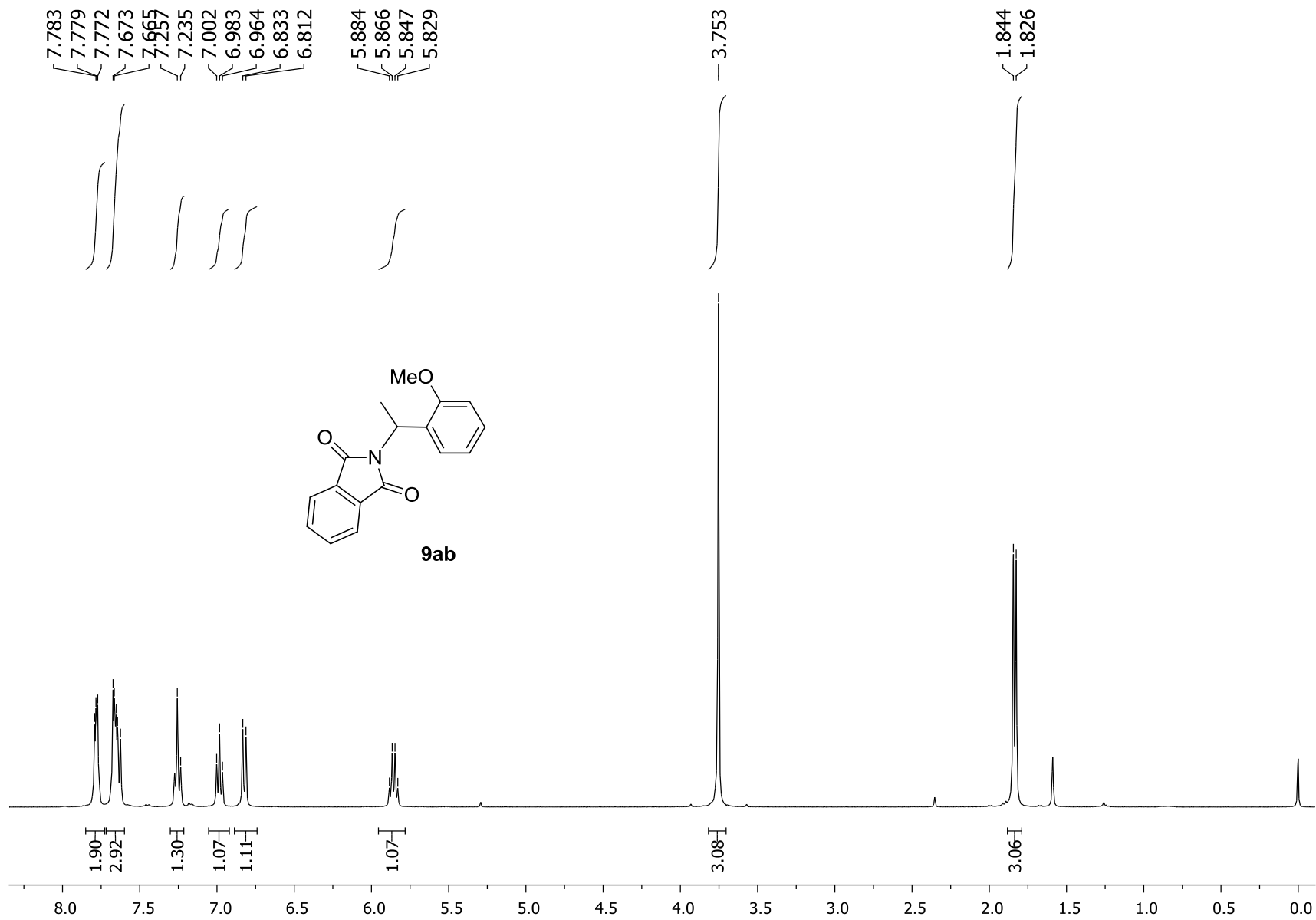
^{19}F NMR spectrum of 1-(*N*-succinimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5n**); 376 MHz/ CD_3CN ; δ (ppm).



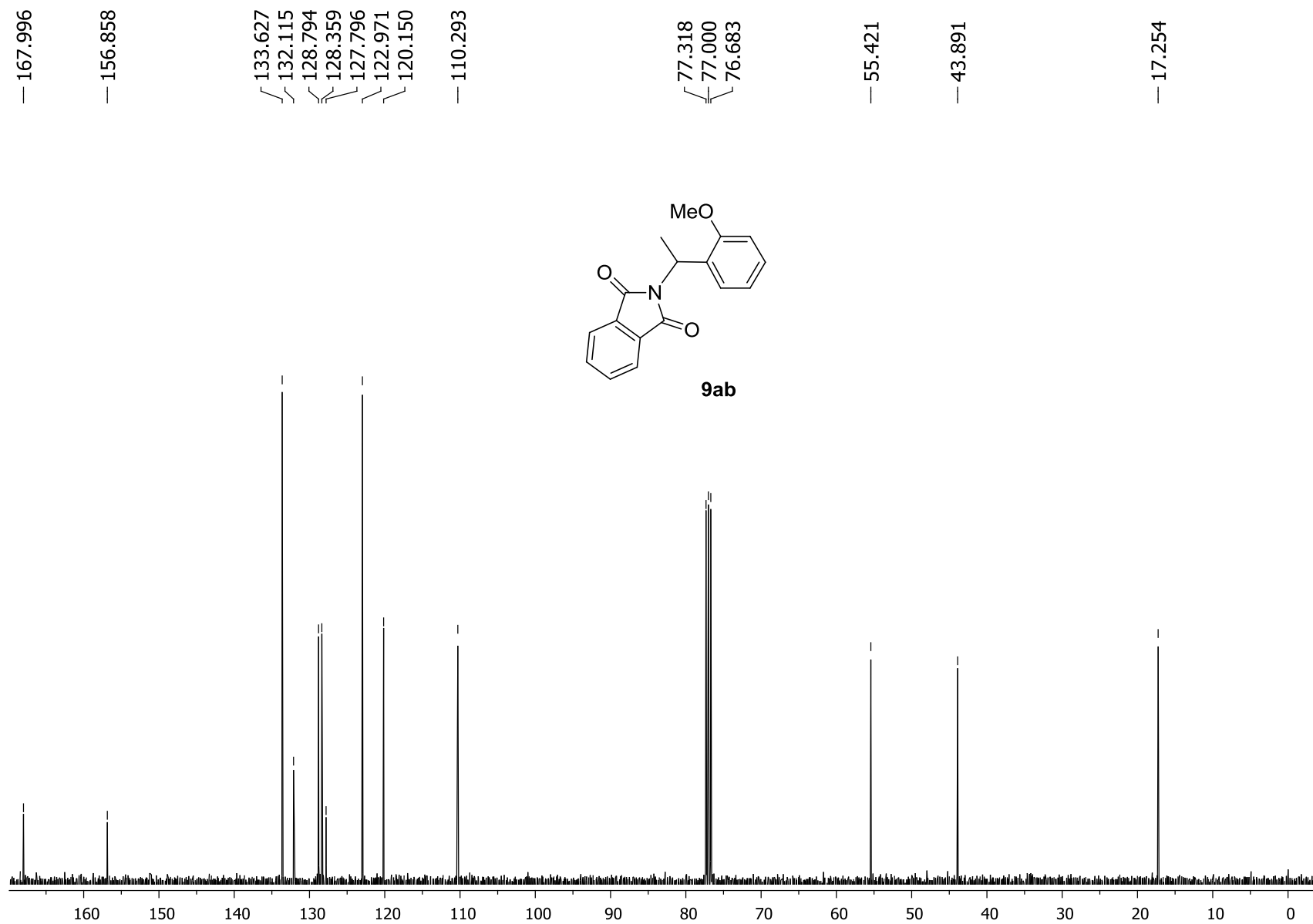
^1H NMR spectrum of *N*-[1-(4-methoxyphenyl)ethyl]phthalimide (**9aa**); 400 MHz/ CDCl_3 /TMS; δ (ppm).

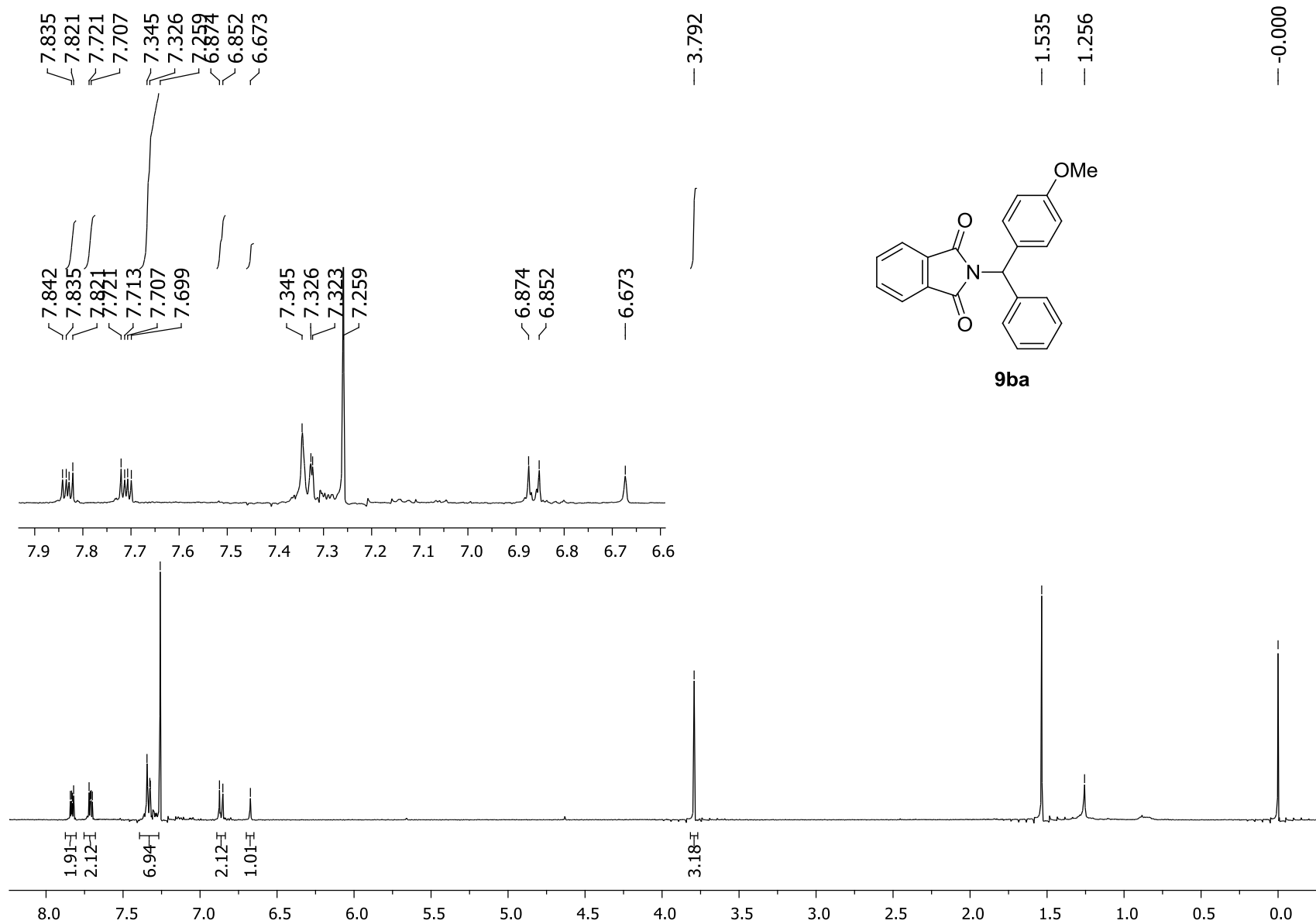


^{13}C NMR spectrum of *N*-[1-(4-methoxyphenyl)ethyl]phthalimide (**9aa**); 100 MHz/ CDCl_3 /TMS; δ (ppm).

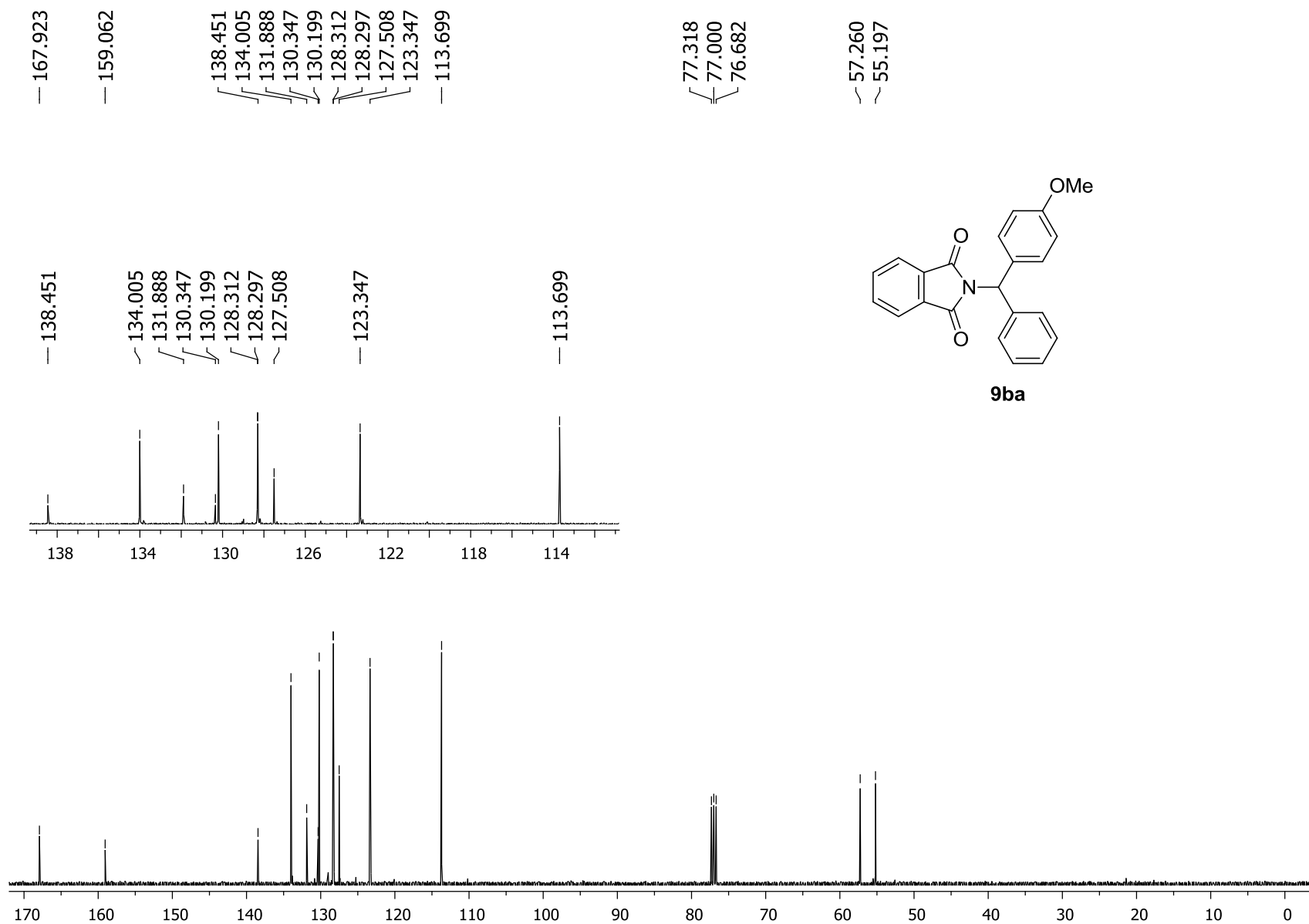


¹H NMR spectrum of *N*-[1-(2-methoxyphenyl)ethyl]phthalimide (**9ab**); 400 MHz/CDCl₃/TMS; δ (ppm).

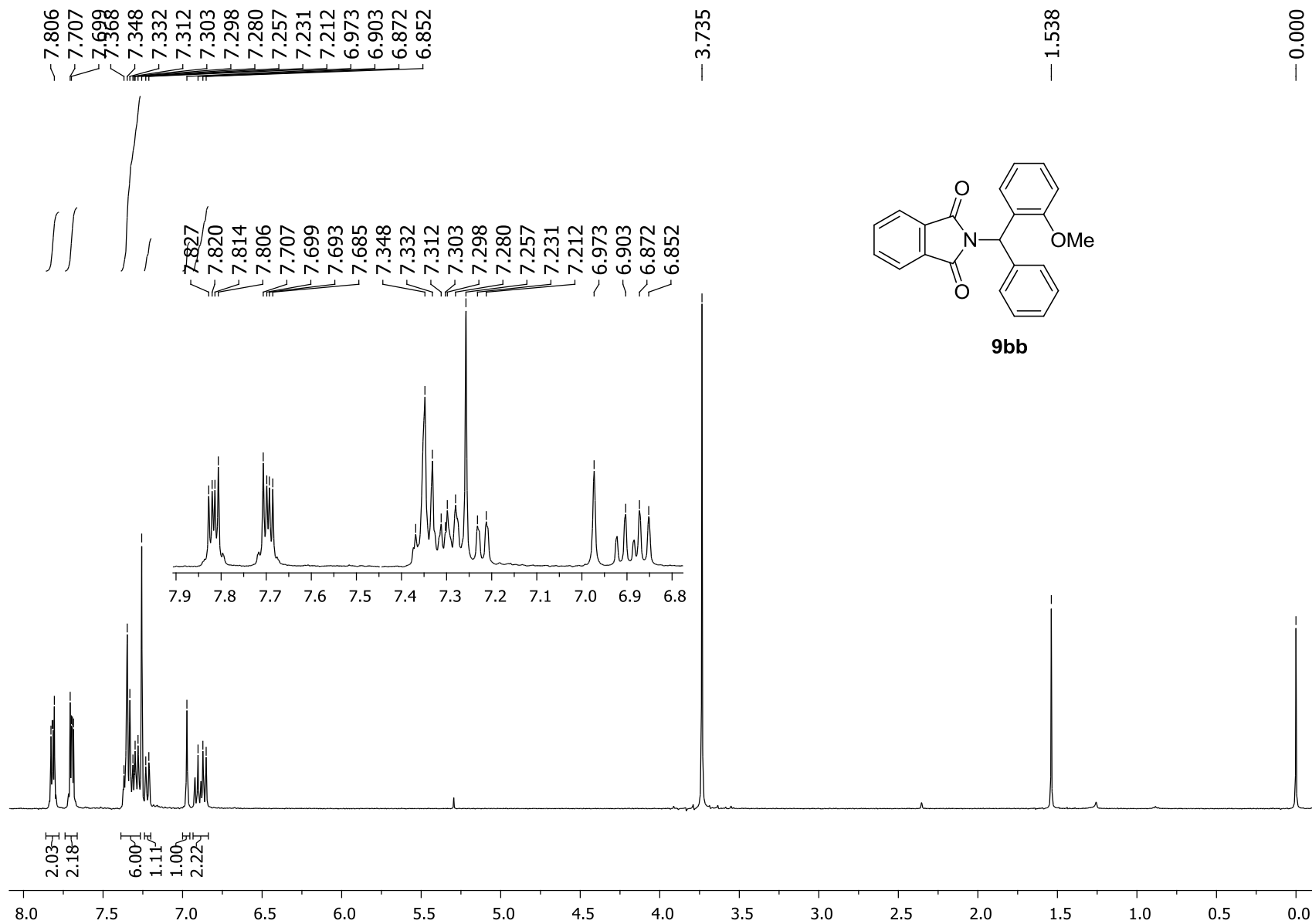




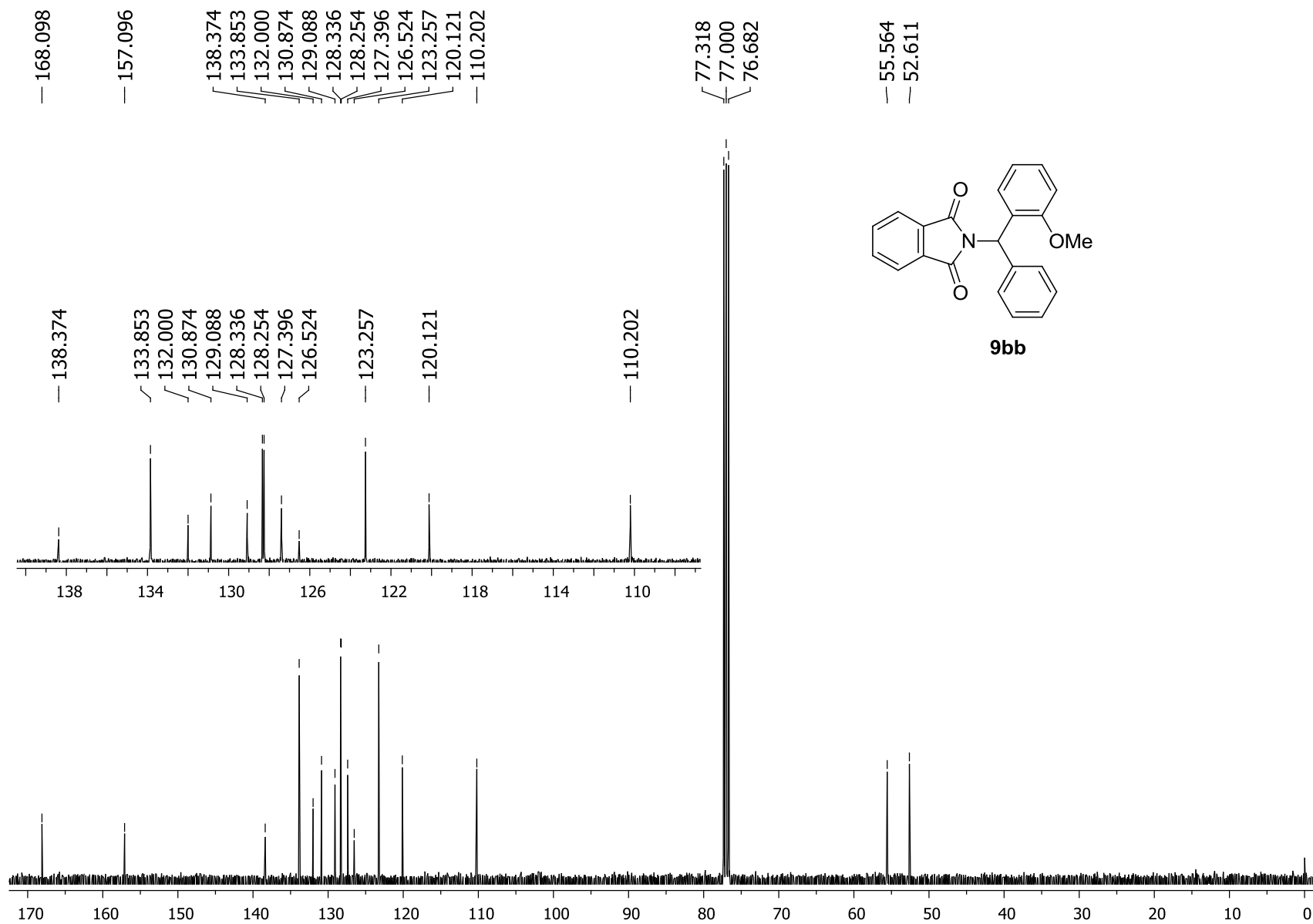
¹H NMR spectrum of *N*-[1-(4-methoxyphenyl)-1-phenylmethyl]phthalimide (**9ba**); 400 MHz/CDCl₃/TMS; δ (ppm).



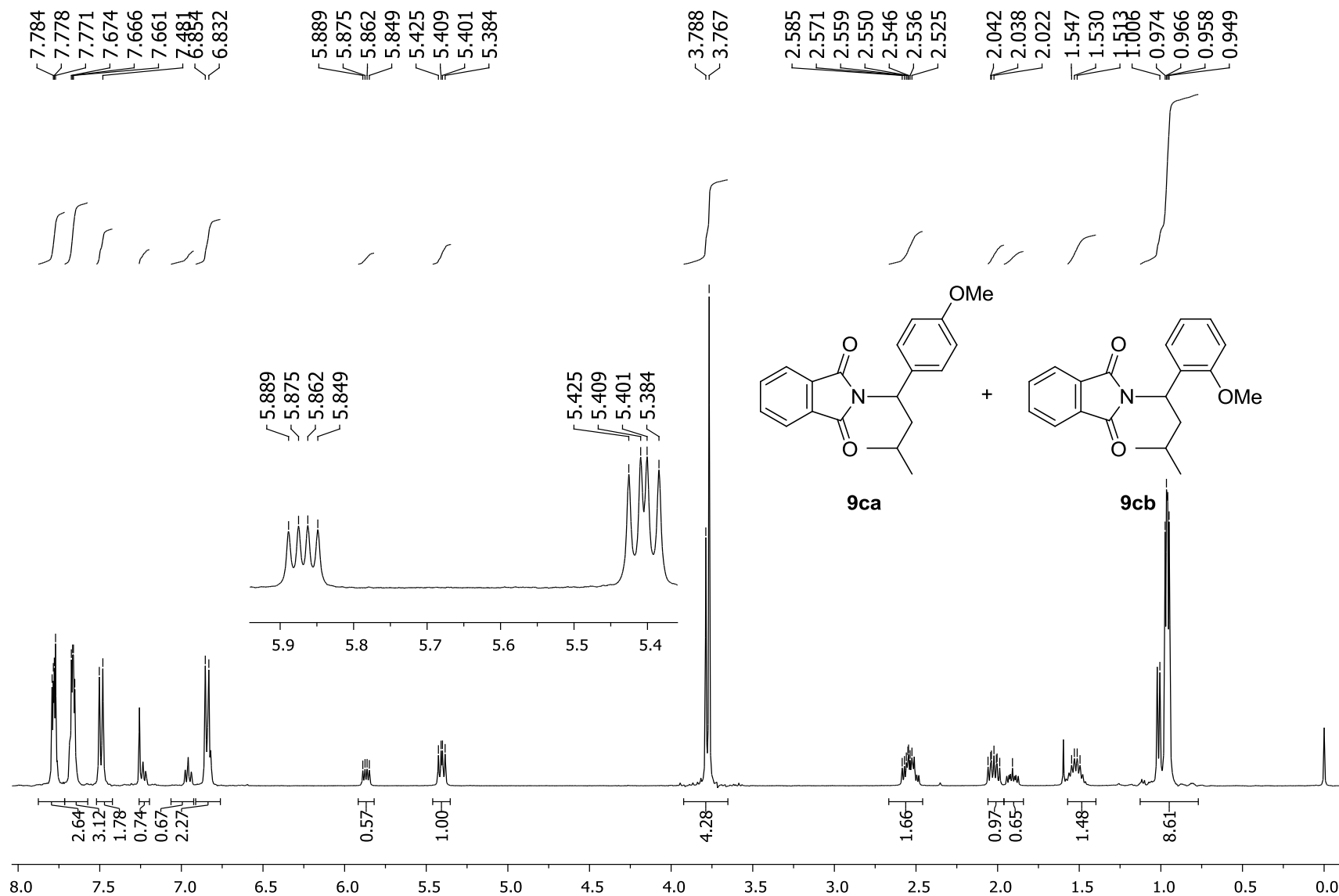
¹³C NMR spectrum of *N*-[1-(4-methoxyphenyl)-1-phenylmethyl]phthalimide (**9ba**); 100 MHz/CDCl₃/TMS; δ (ppm).



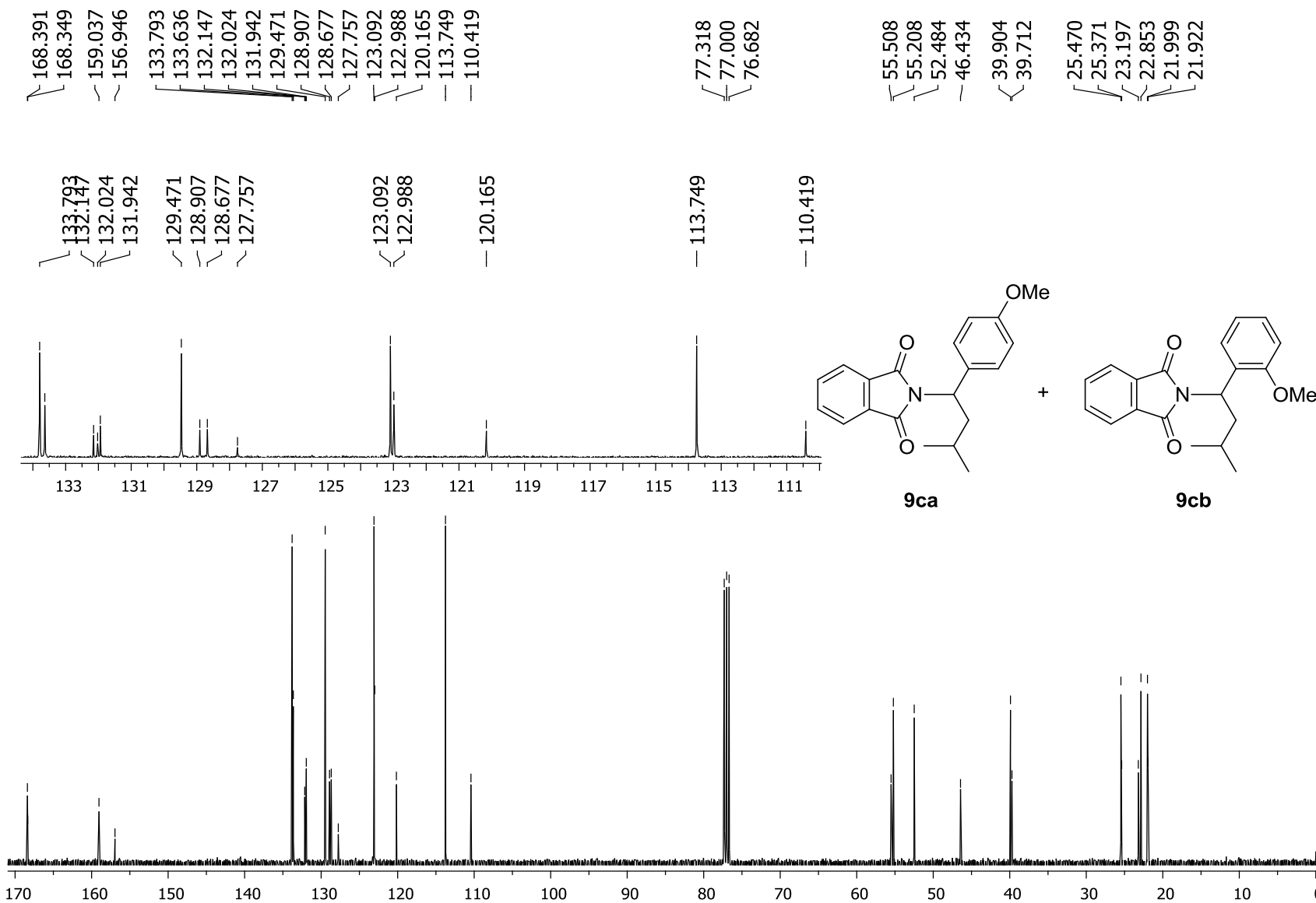
¹H NMR spectrum of *N*-[1-(2-methoxyphenyl)-1-phenylmethyl]phthalimide (**9bb**); 400 MHz/¹³CDCl₃/TMS; δ (ppm).



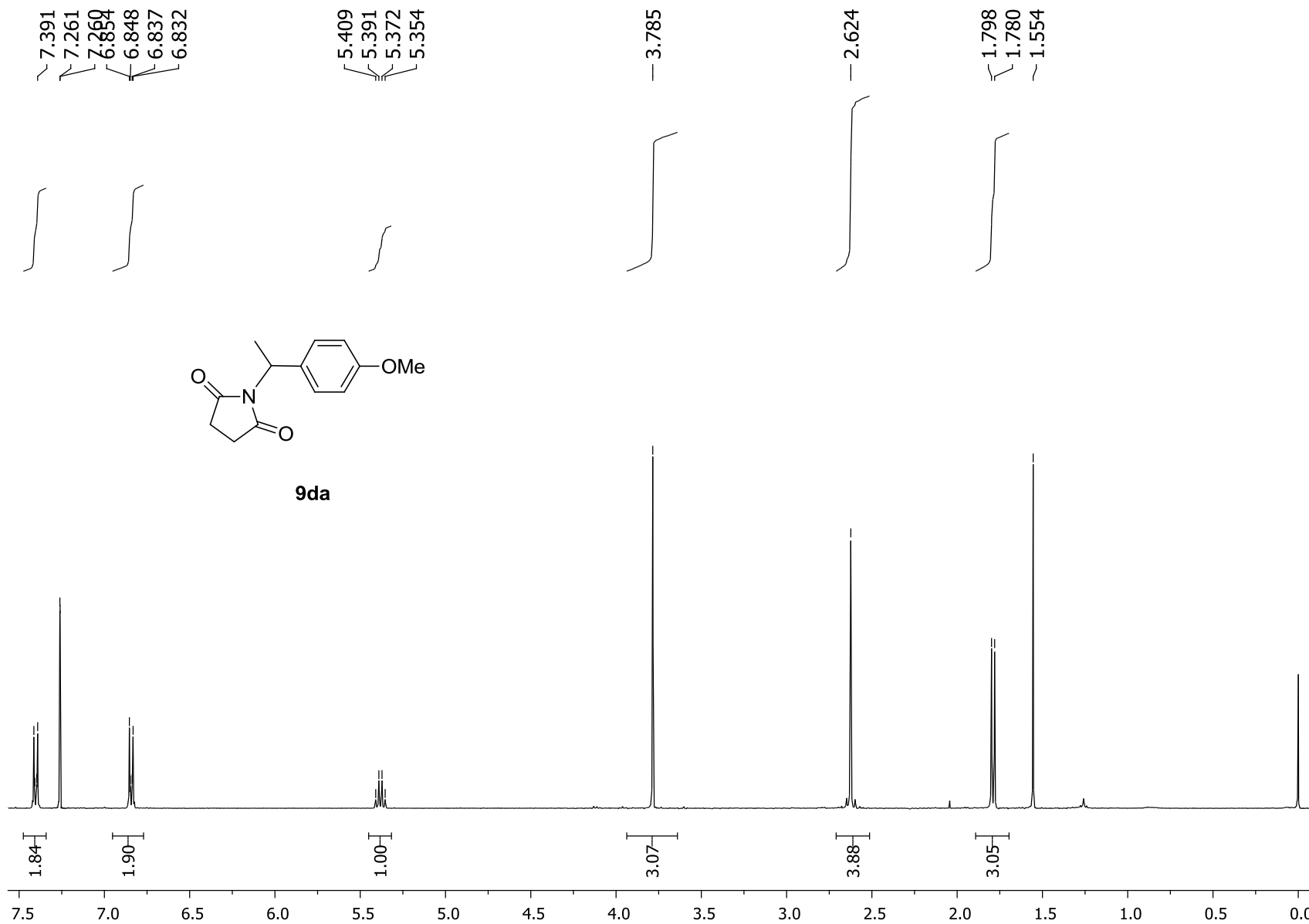
¹³C NMR spectrum of *N*-[1-(2-methoxyphenyl)-1-phenylmethyl]phthalimide (**9bb**); 100 MHz/CDCl₃/TMS; δ (ppm).

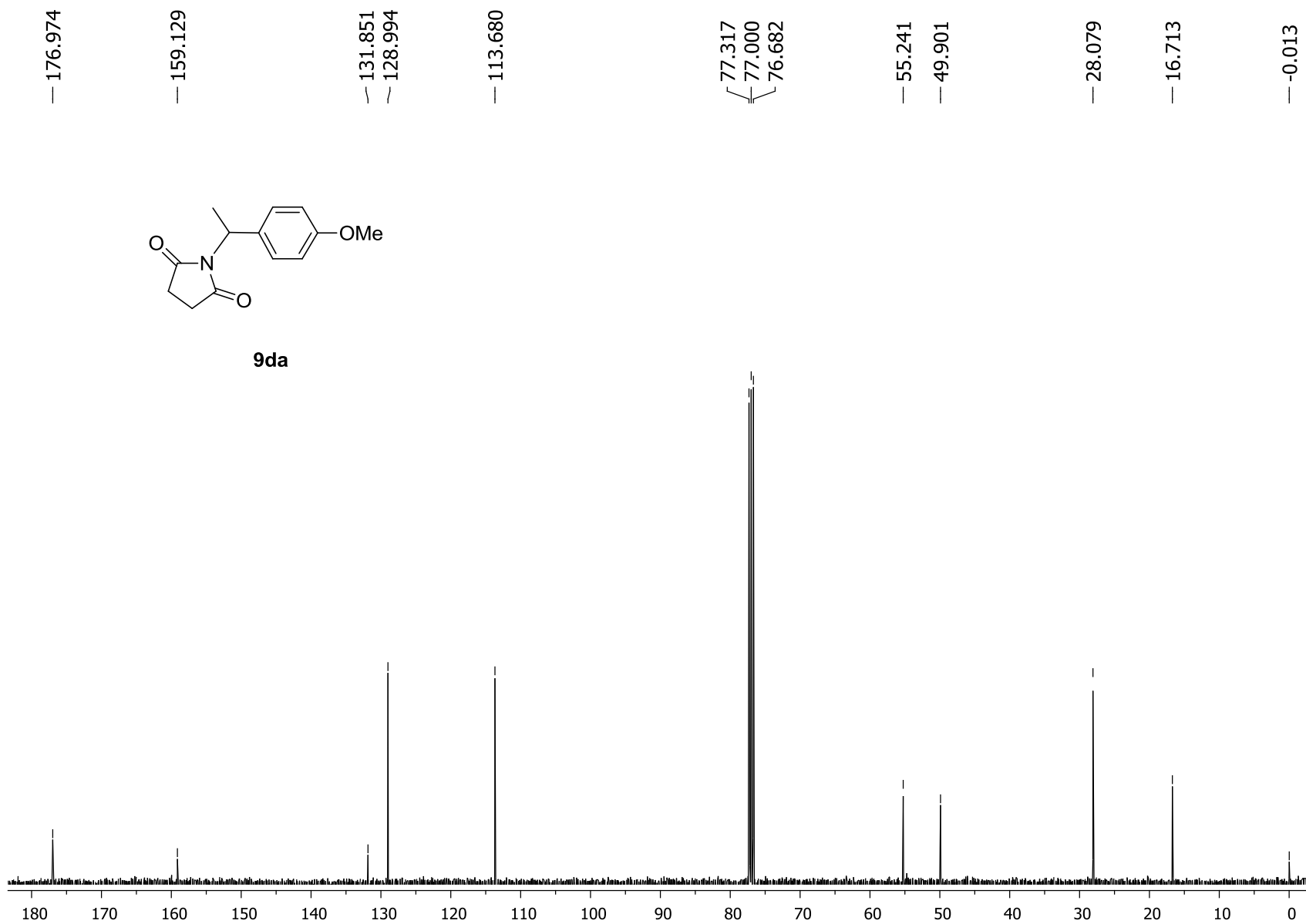


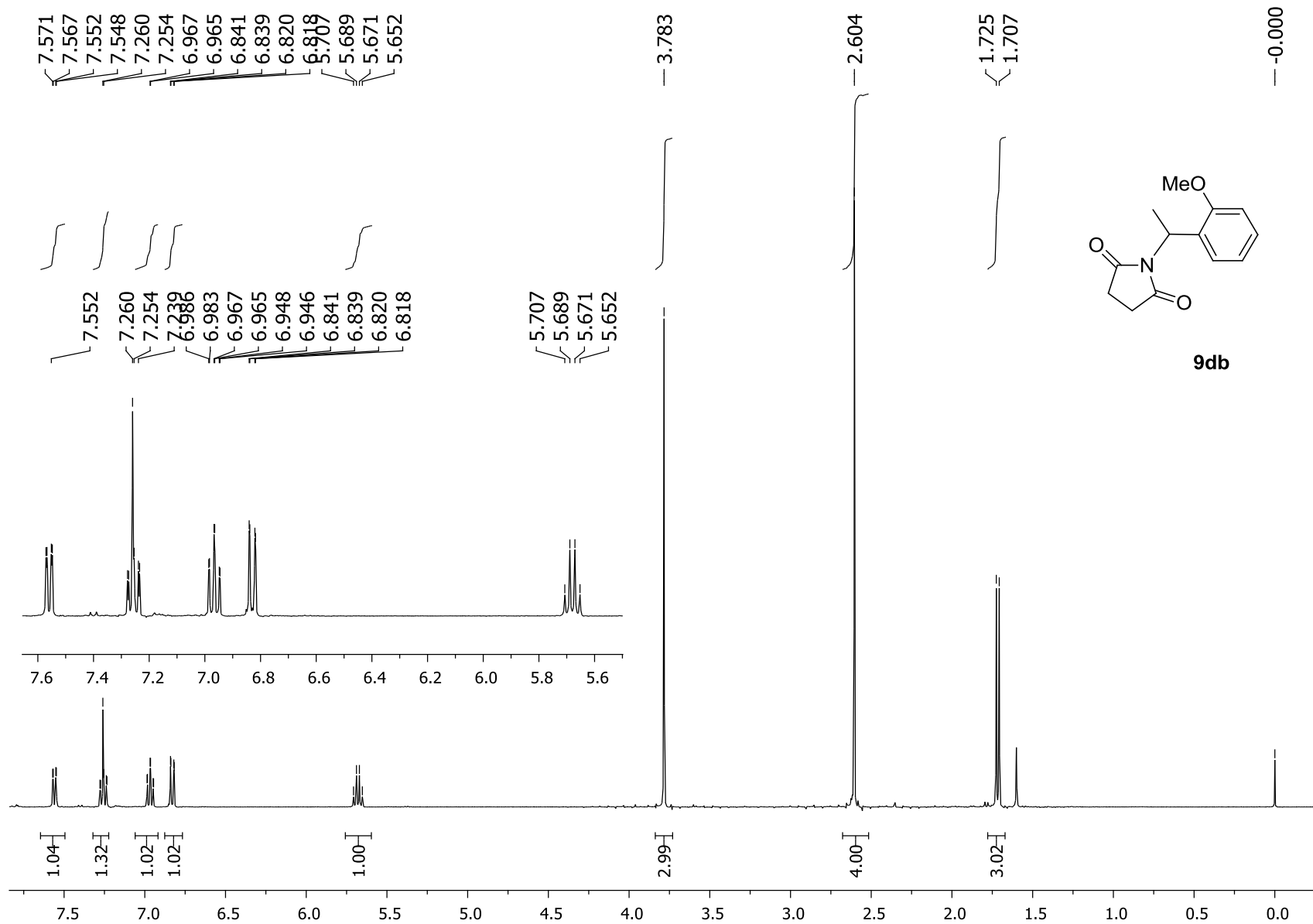
¹H NMR spectrum of mixture *N*-[1-(4-methoxyphenyl)-3-methylbutyl]phthalimide (**9ca**) and *N*-[1-(2-methoxyphenyl)-3-methylbutyl]phthalimide (**9cb**); 400 MHz/CDCl₃/TMS; δ (ppm).



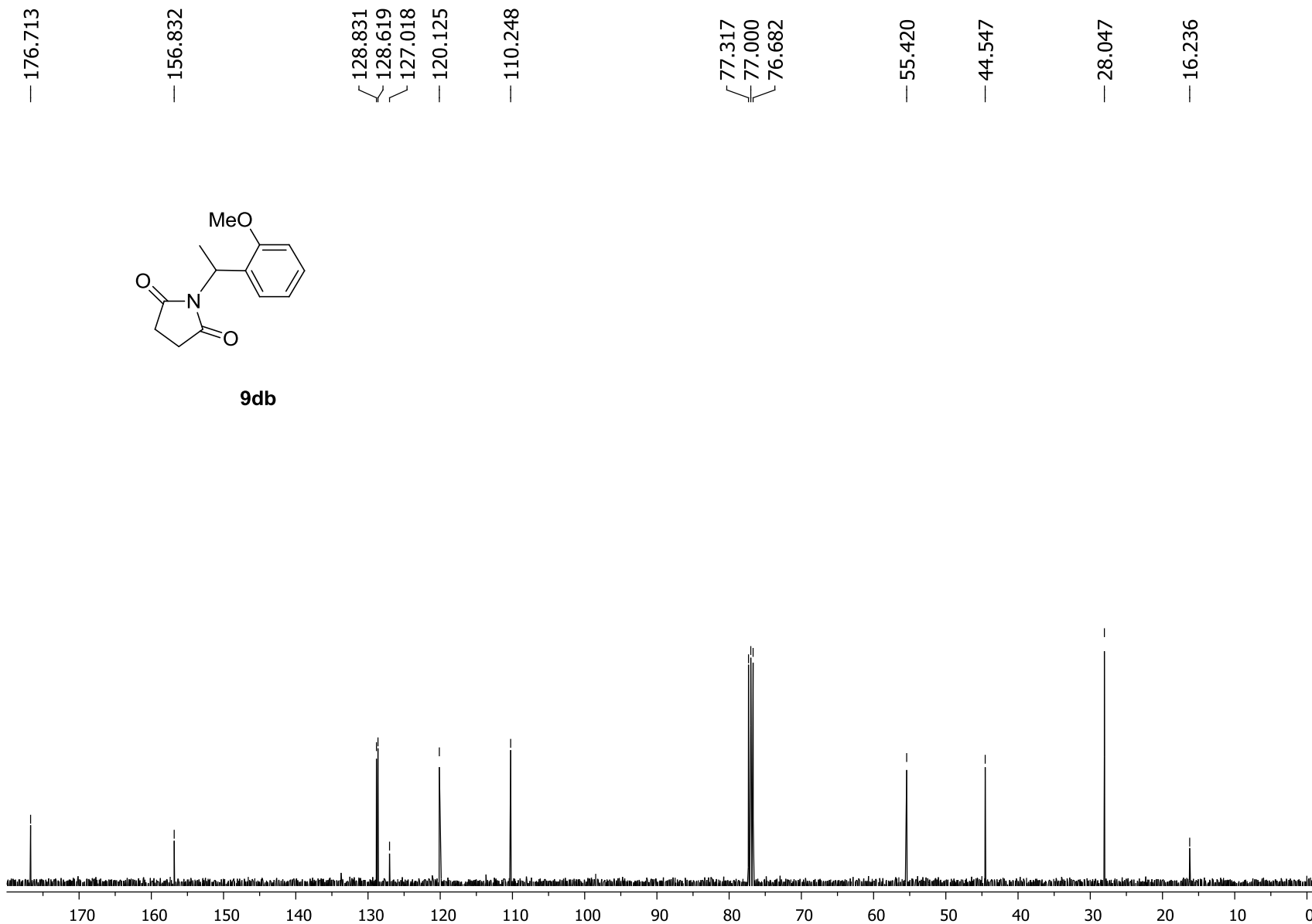
¹³C NMR spectrum of mixture *N*-[1-(4-methoxyphenyl)-3-methylbutyl]phthalimide (**9ca**) and *N*-[1-(2-methoxyphenyl)-3-methylbutyl]phthalimide (**9cb**); 100 MHz/CDCl₃/TMS; δ (ppm).

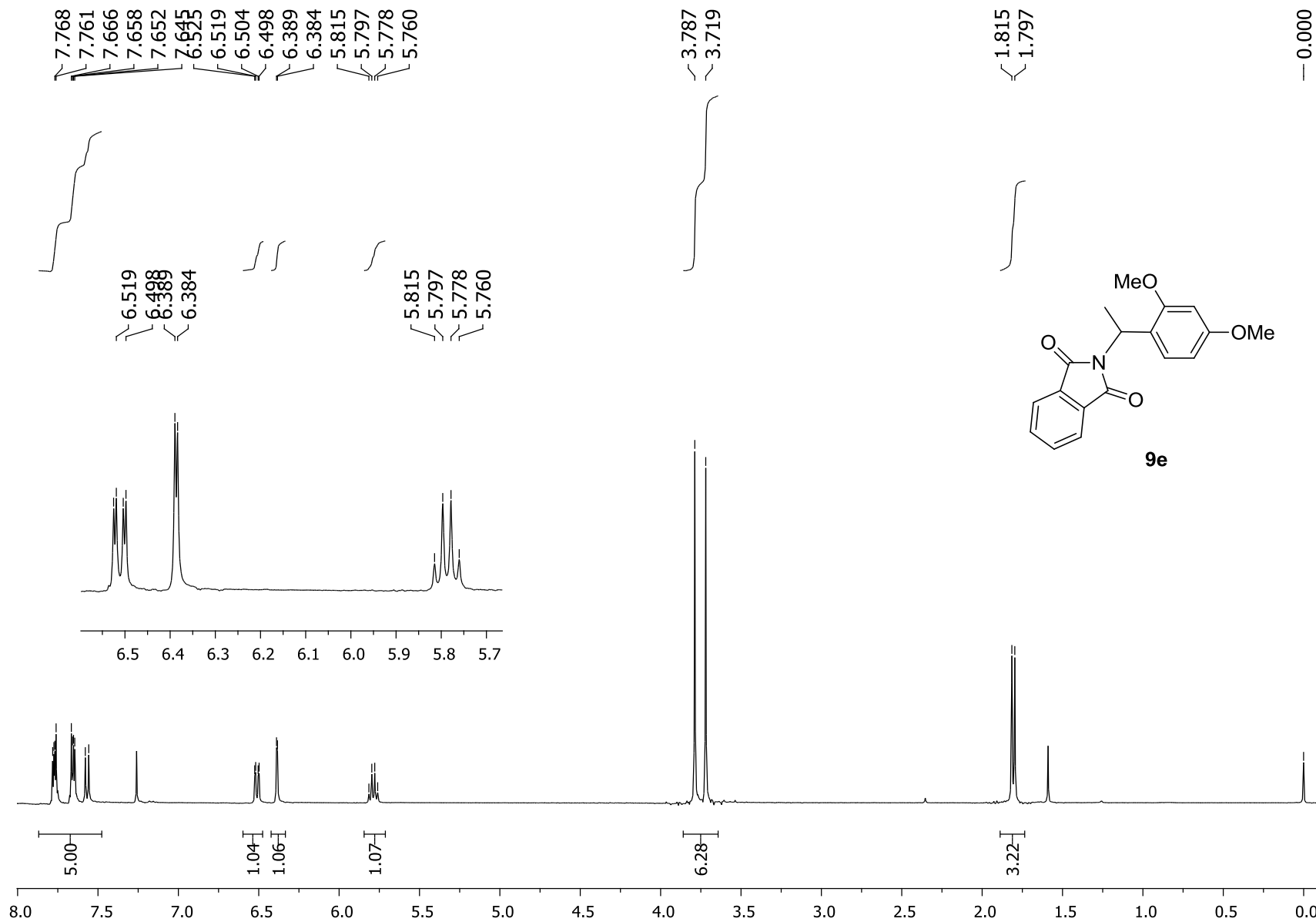




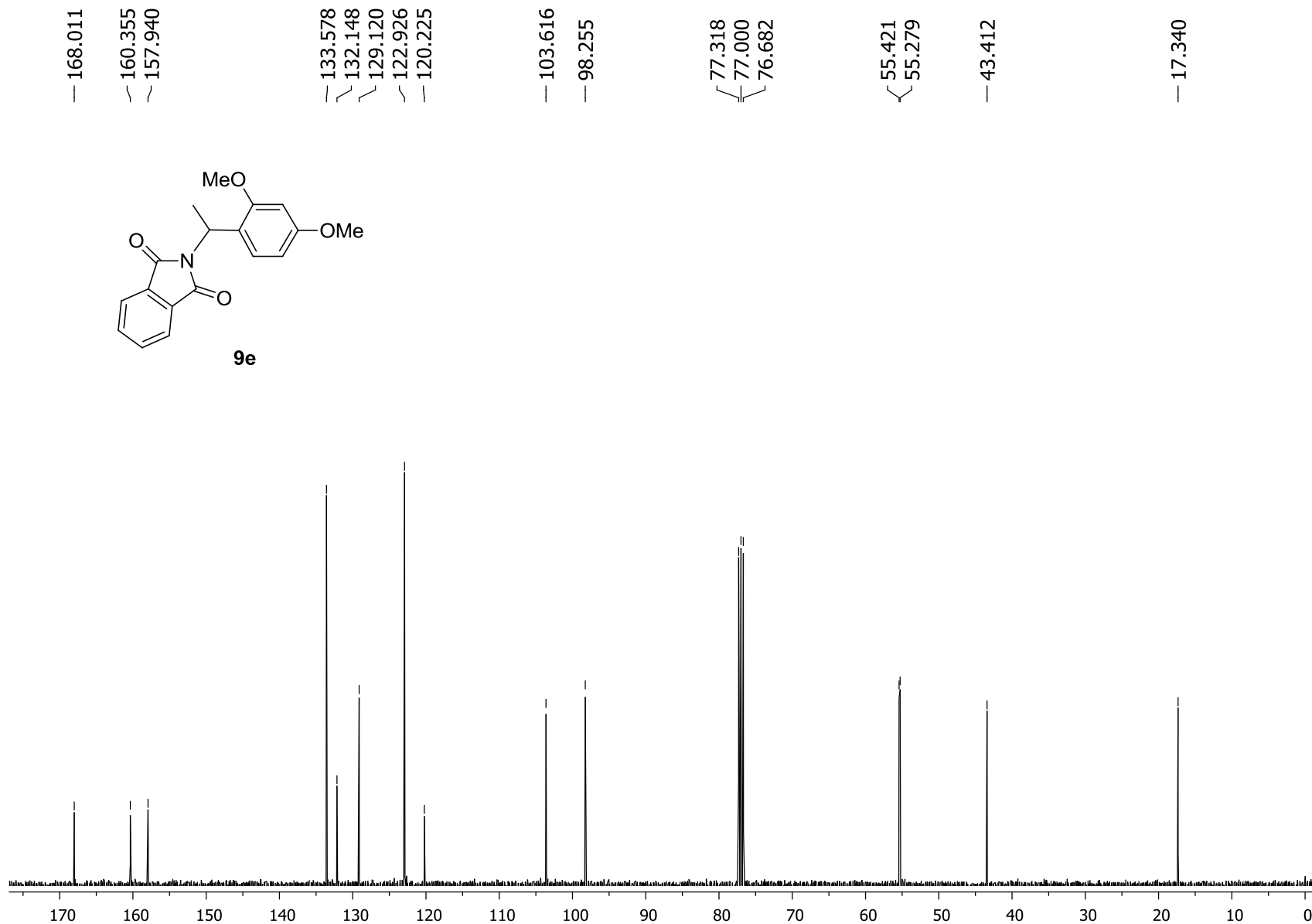
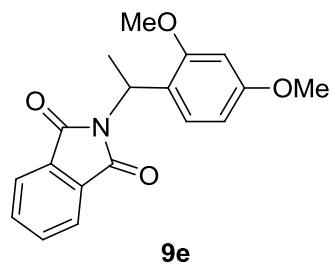


¹H NMR spectrum of *N*-[1-(2-methoxyphenyl)ethyl]succinimide (**9db**); 400 MHz/CDCl₃/TMS; δ (ppm).

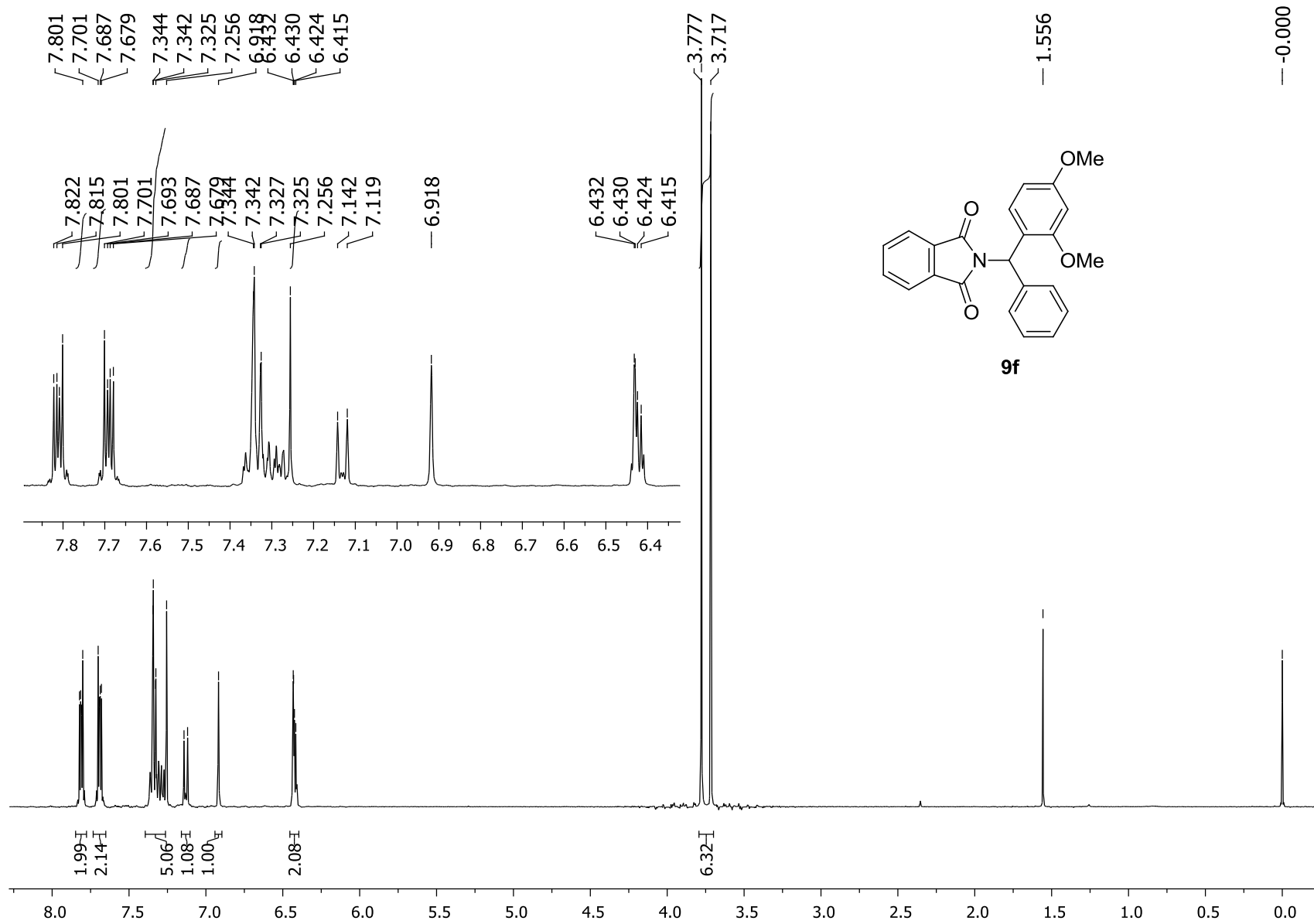




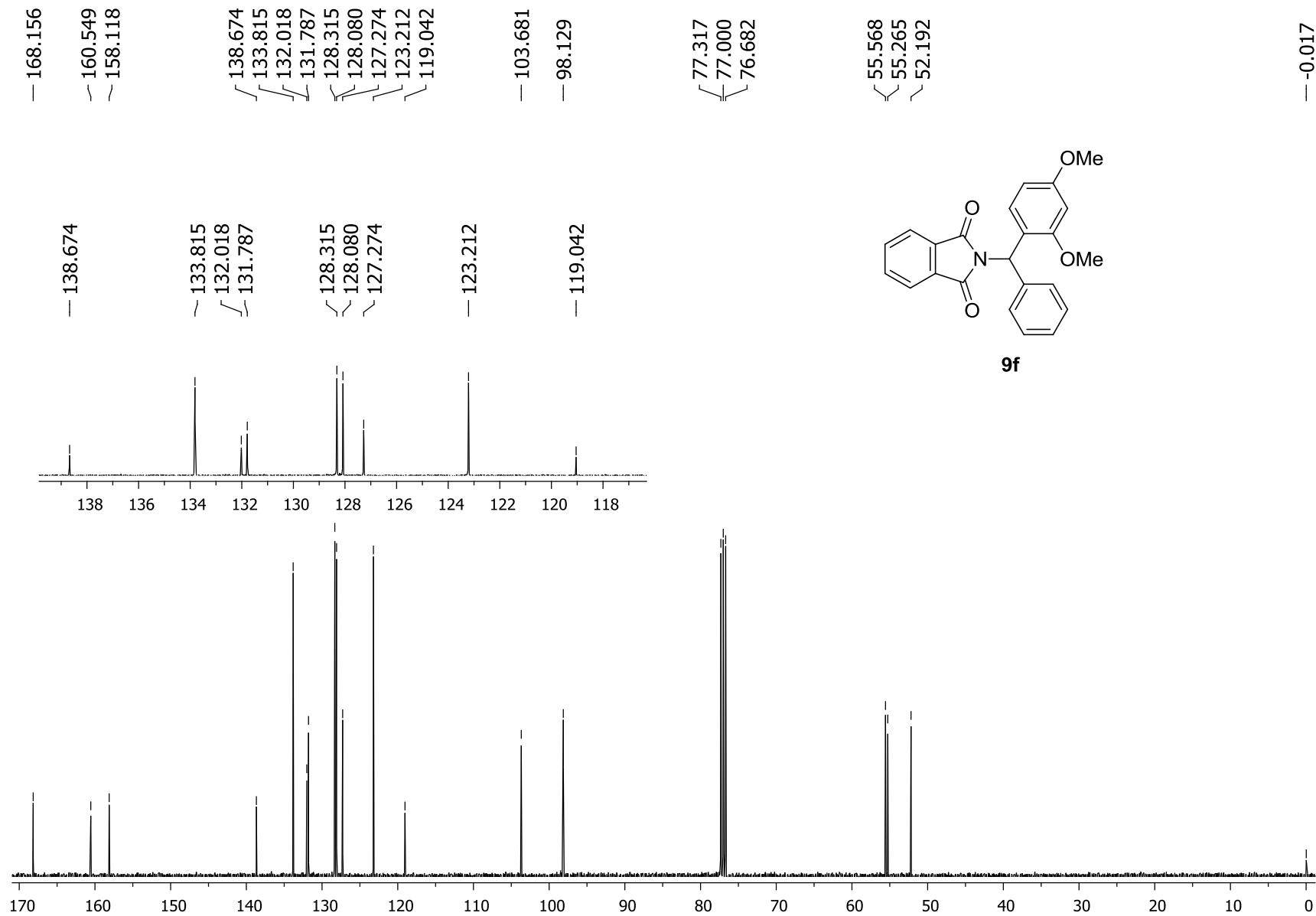
¹H NMR spectrum of *N*-[1-(2,4-dimethoxyphenyl)ethyl]phthalimide (**9e**); 400 MHz/CDCl₃/TMS; δ (ppm).



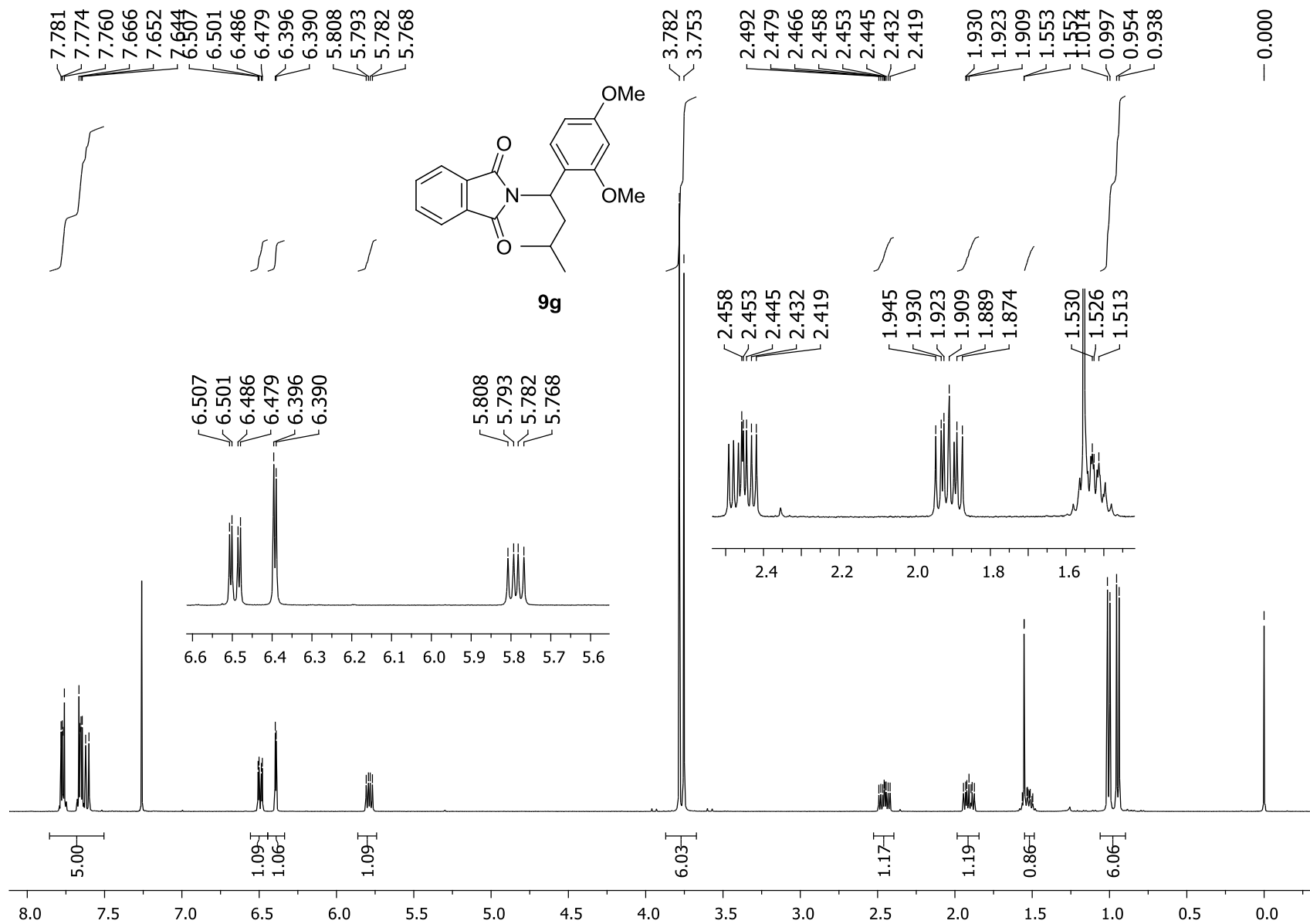
^{13}C NMR spectrum of *N*-[1-(2,4-dimethoxyphenyl)ethyl]phthalimide (**9e**); 100 MHz/ CDCl_3 /TMS; δ (ppm).



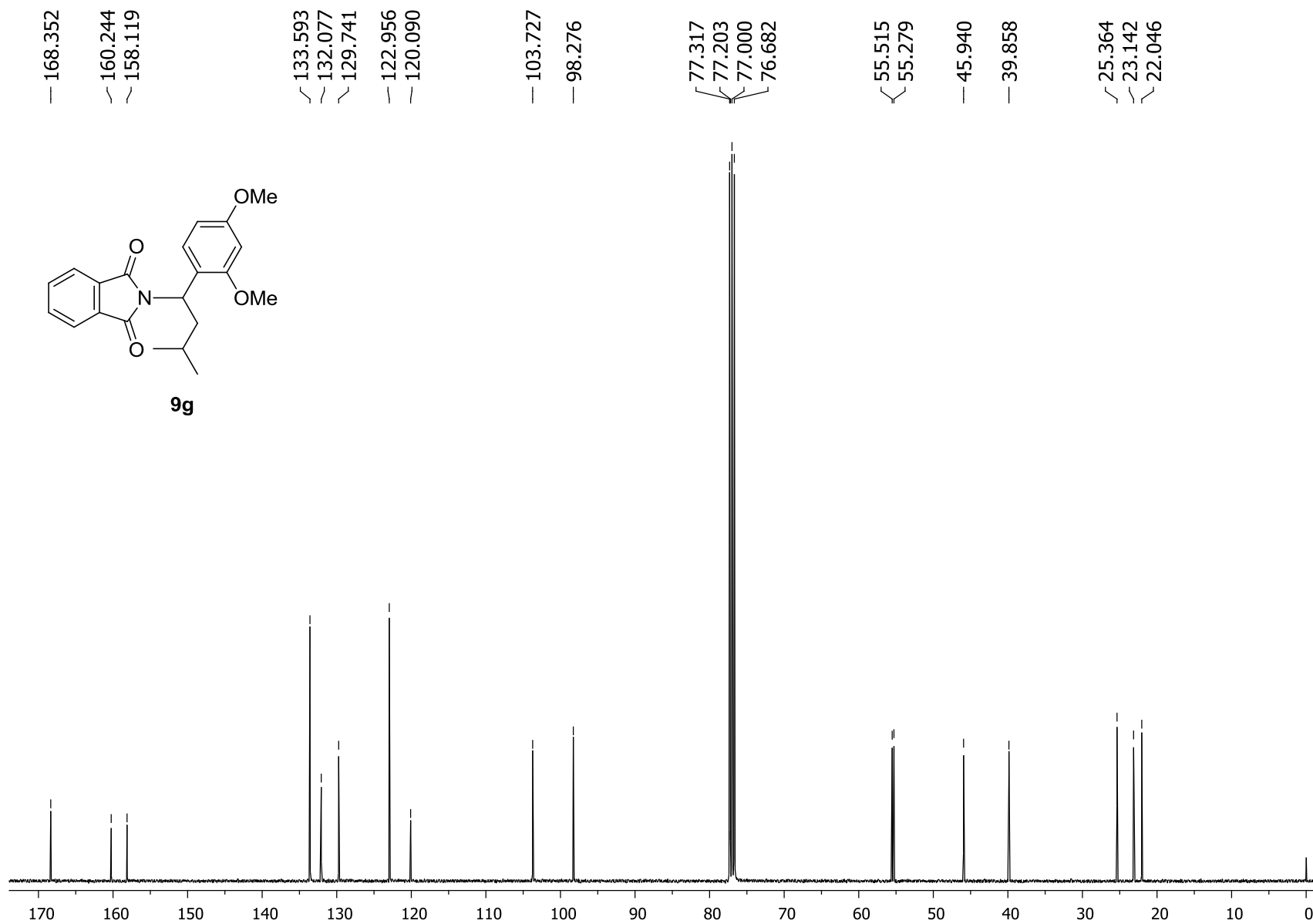
¹H NMR spectrum of *N*-[1-(2,4-dimethoxyphenyl)-1-phenylmethyl]phthalimide (**9f**); 400 MHz/CDCl₃/TMS; δ (ppm).

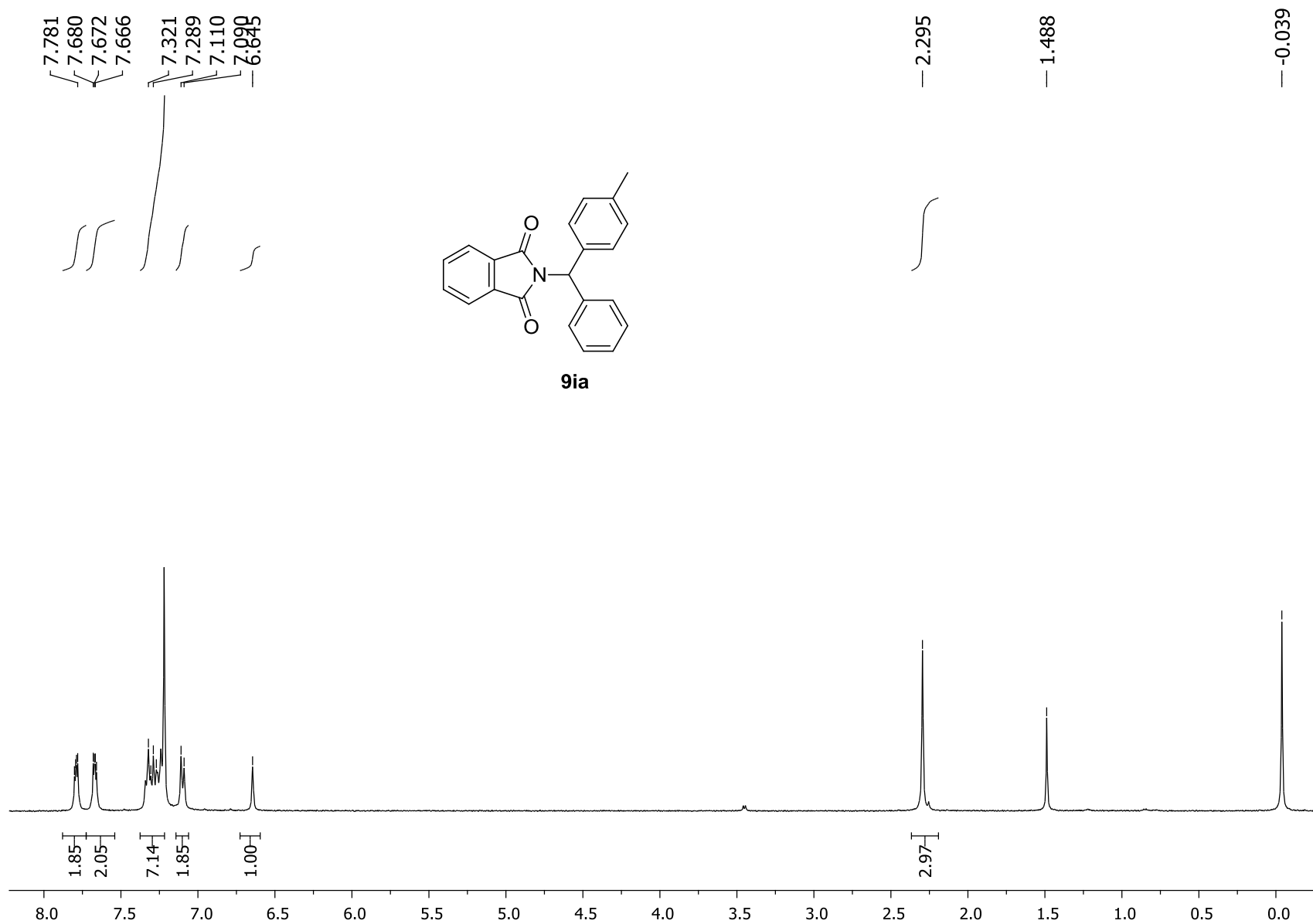


¹³C NMR spectrum of *N*-[1-(2,4-dimethoxyphenyl)-1-phenylmethyl]phthalimide (**9f**); 100 MHz/CDCl₃/TMS; δ (ppm).

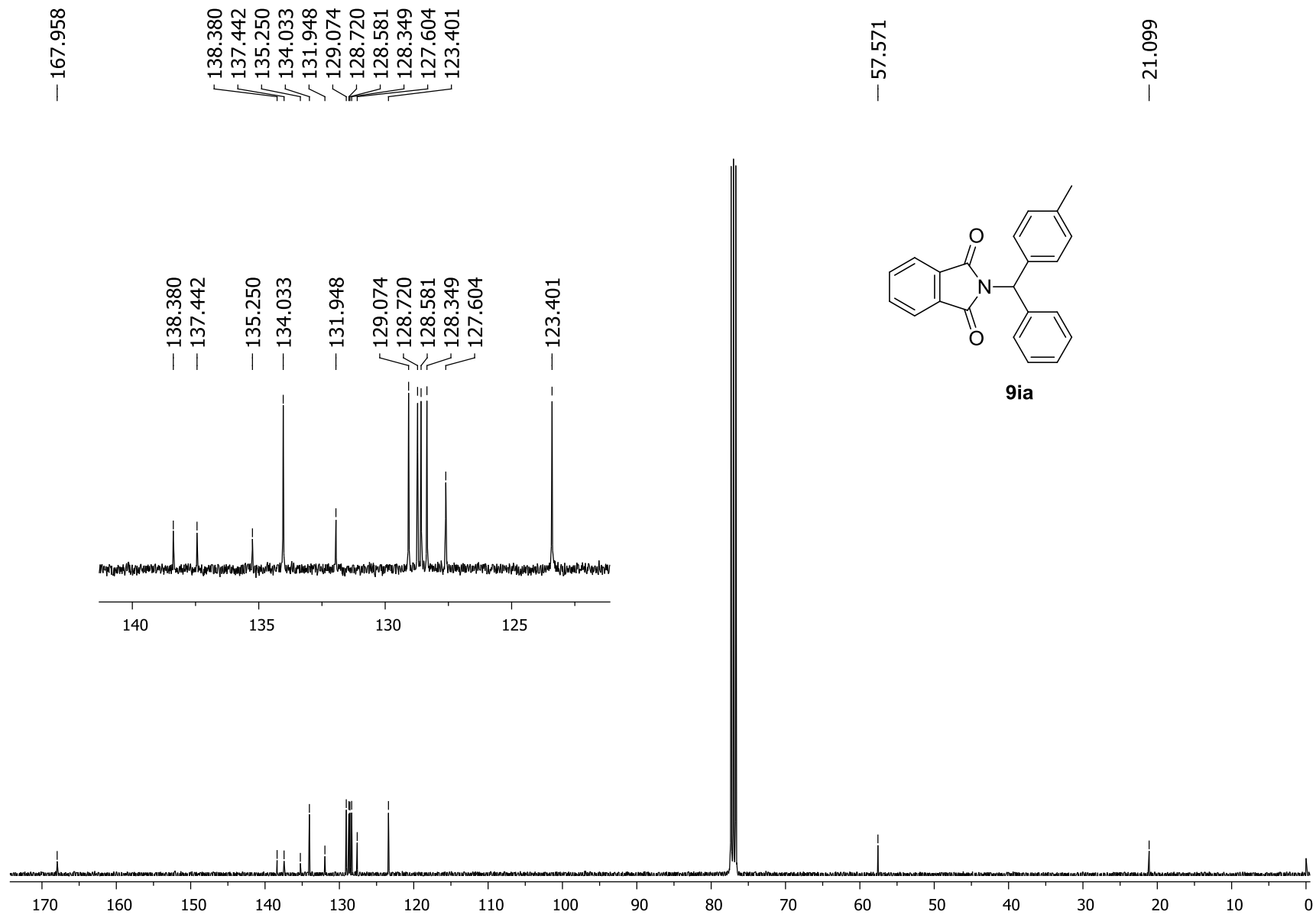


¹H NMR spectrum of *N*-[1-(2,4-dimethoxyphenyl)-3-methylbutyl]phthalimide (**9g**); 400 MHz/CDCl₃/TMS; δ (ppm).

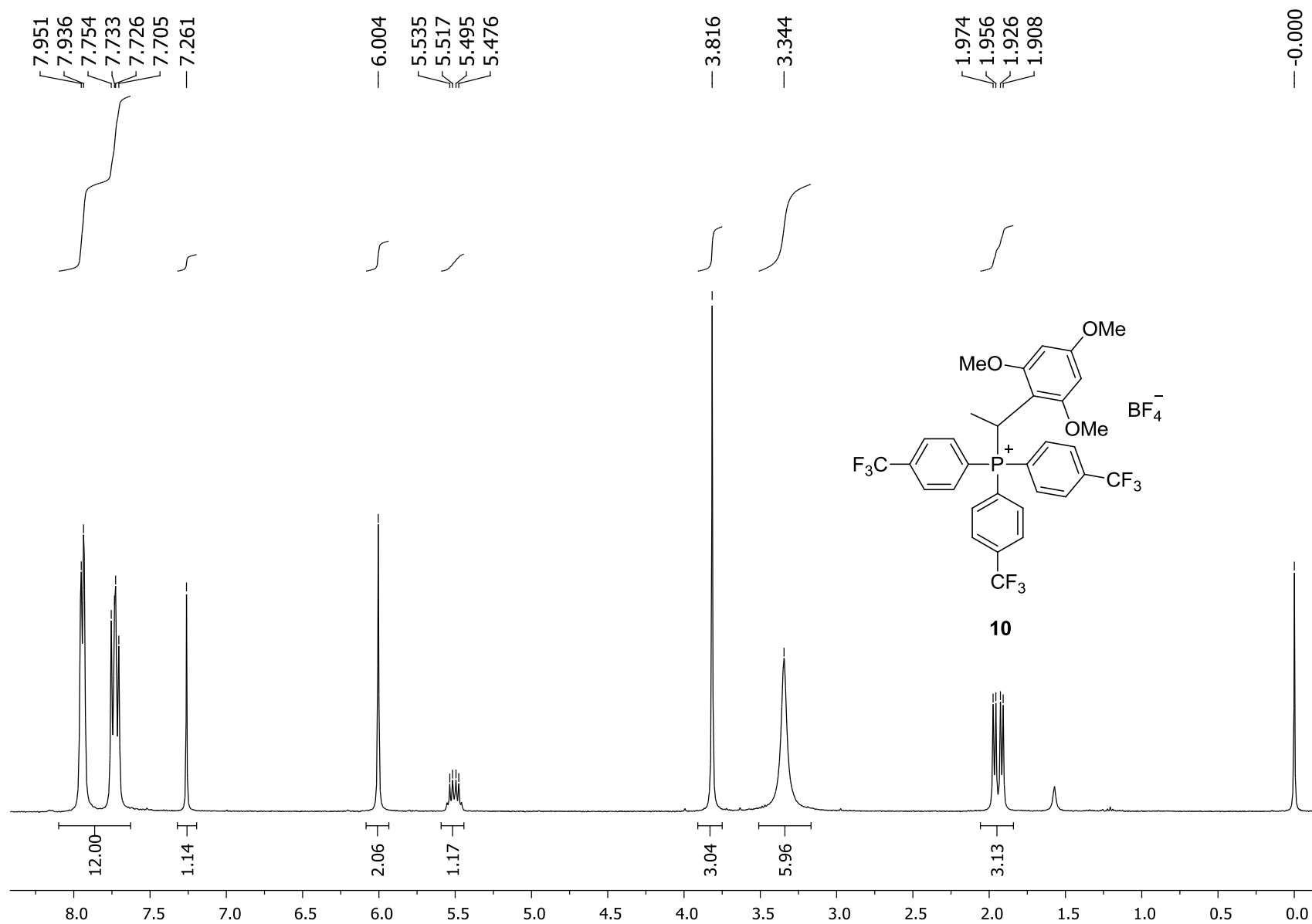




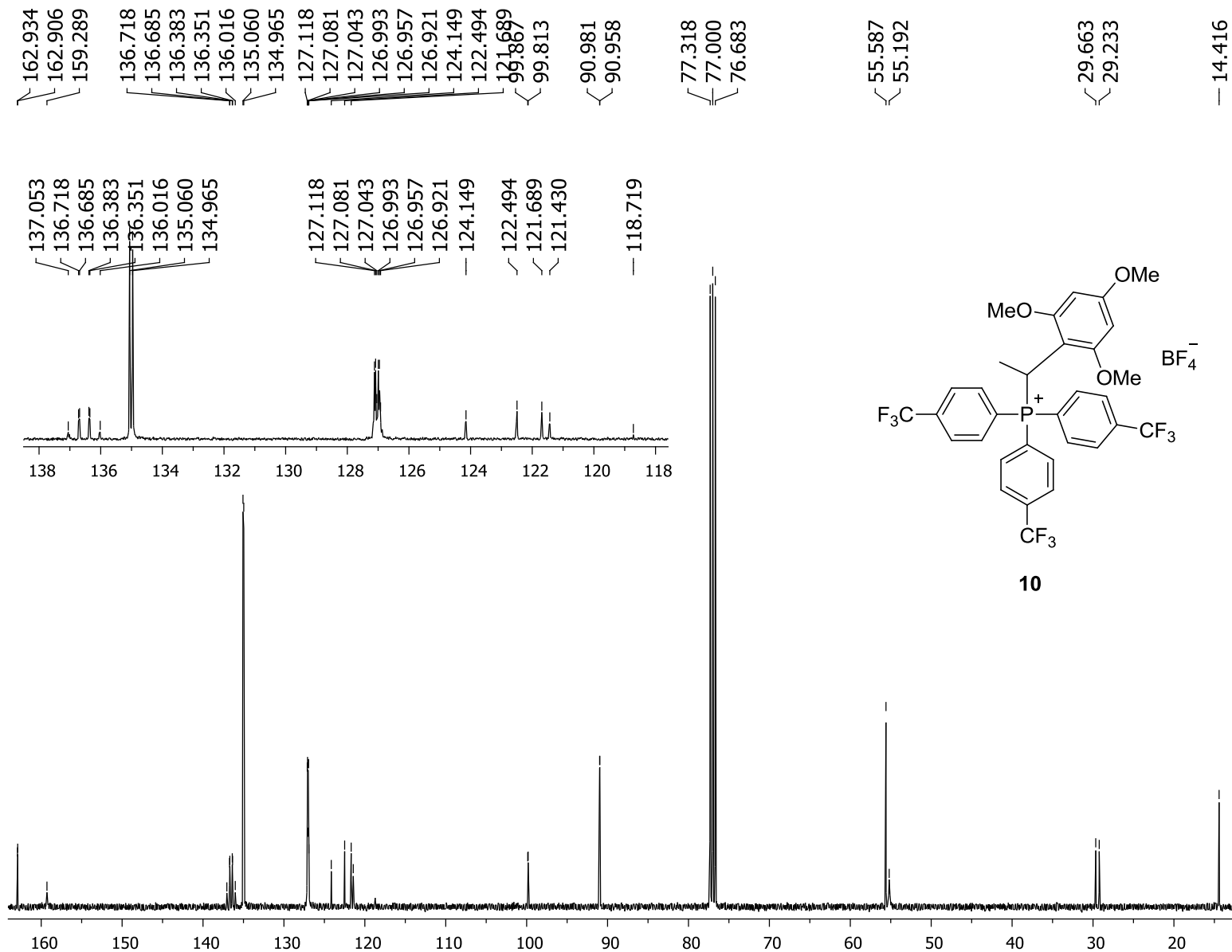
¹H NMR spectrum of *N*-[1-(4-methylphenyl)-1-phenylmethyl]phthalimide (**9ia**); 400 MHz/CDCl₃/TMS; δ (ppm).



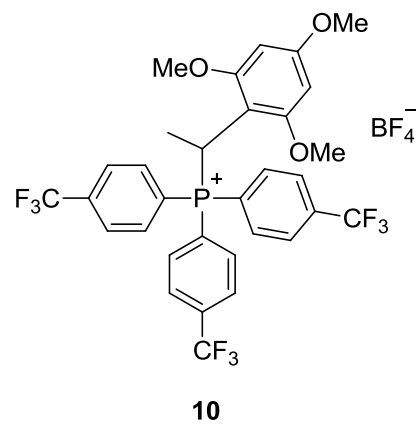
¹³C NMR spectrum of *N*-[1-(4-methylphenyl)-1-phenylmethyl]phthalimide (**9ia**); 100 MHz/CDCl₃/TMS; δ (ppm).



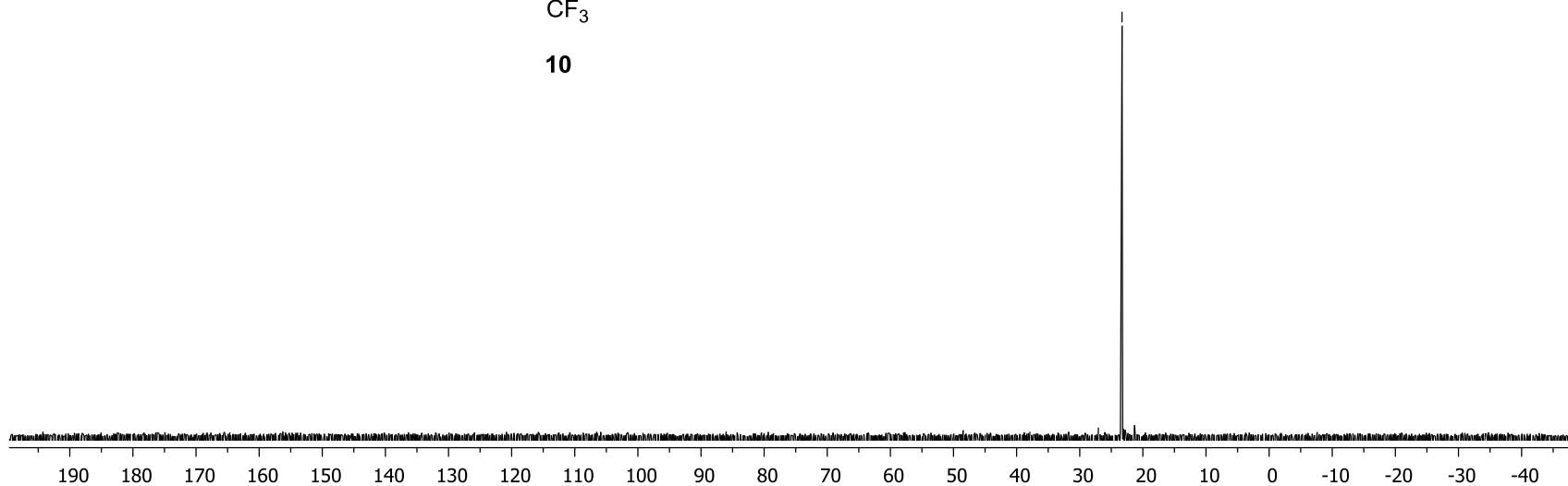
¹H NMR spectrum of 1-(2,4,6-trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**10**); 400 MHz/CDCl₃/TMS; δ (ppm).



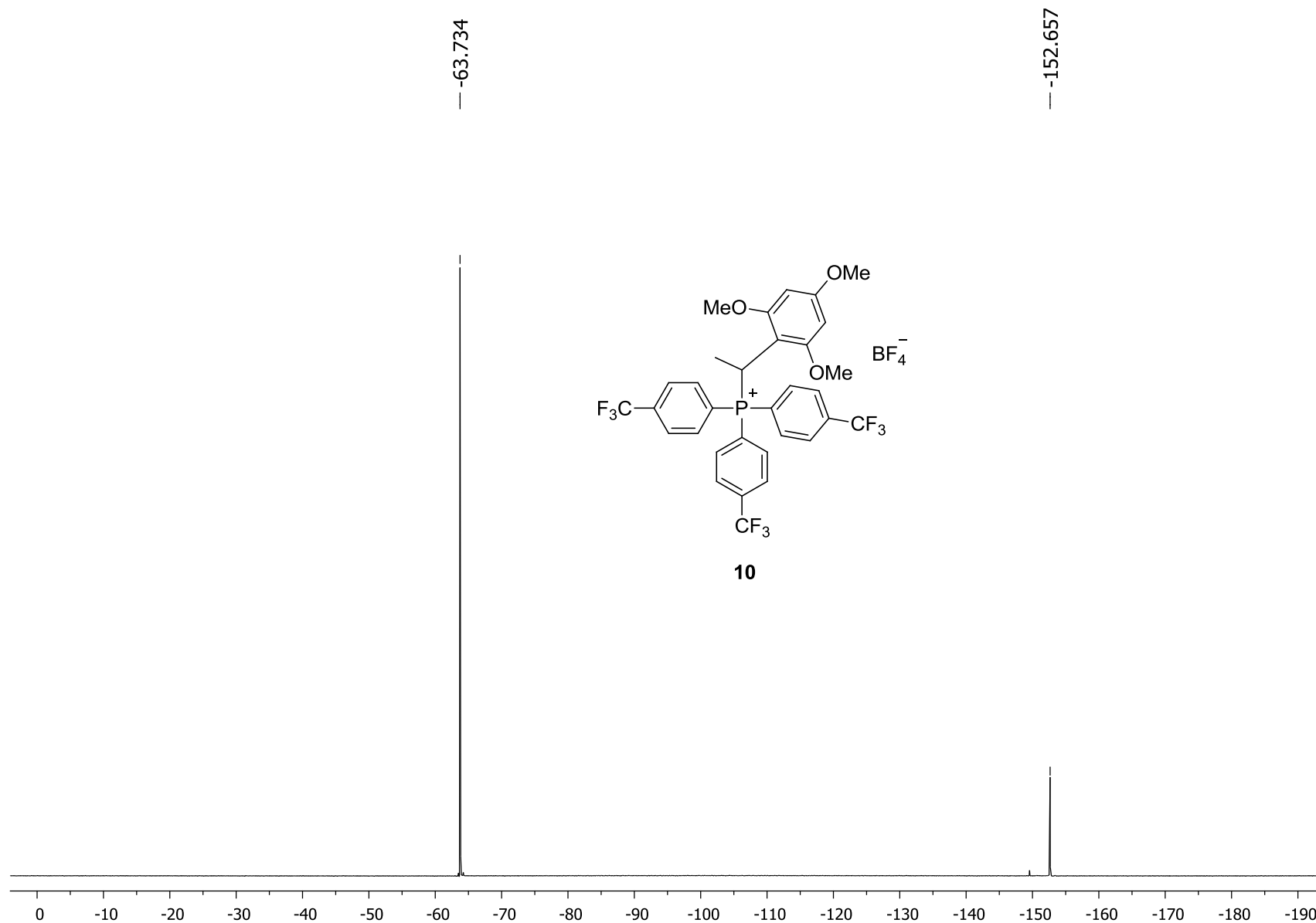
^{13}C NMR spectrum of 1-(2,4,6-trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**10**); 100 MHz/ $CDCl_3$ /TMS; δ (ppm).



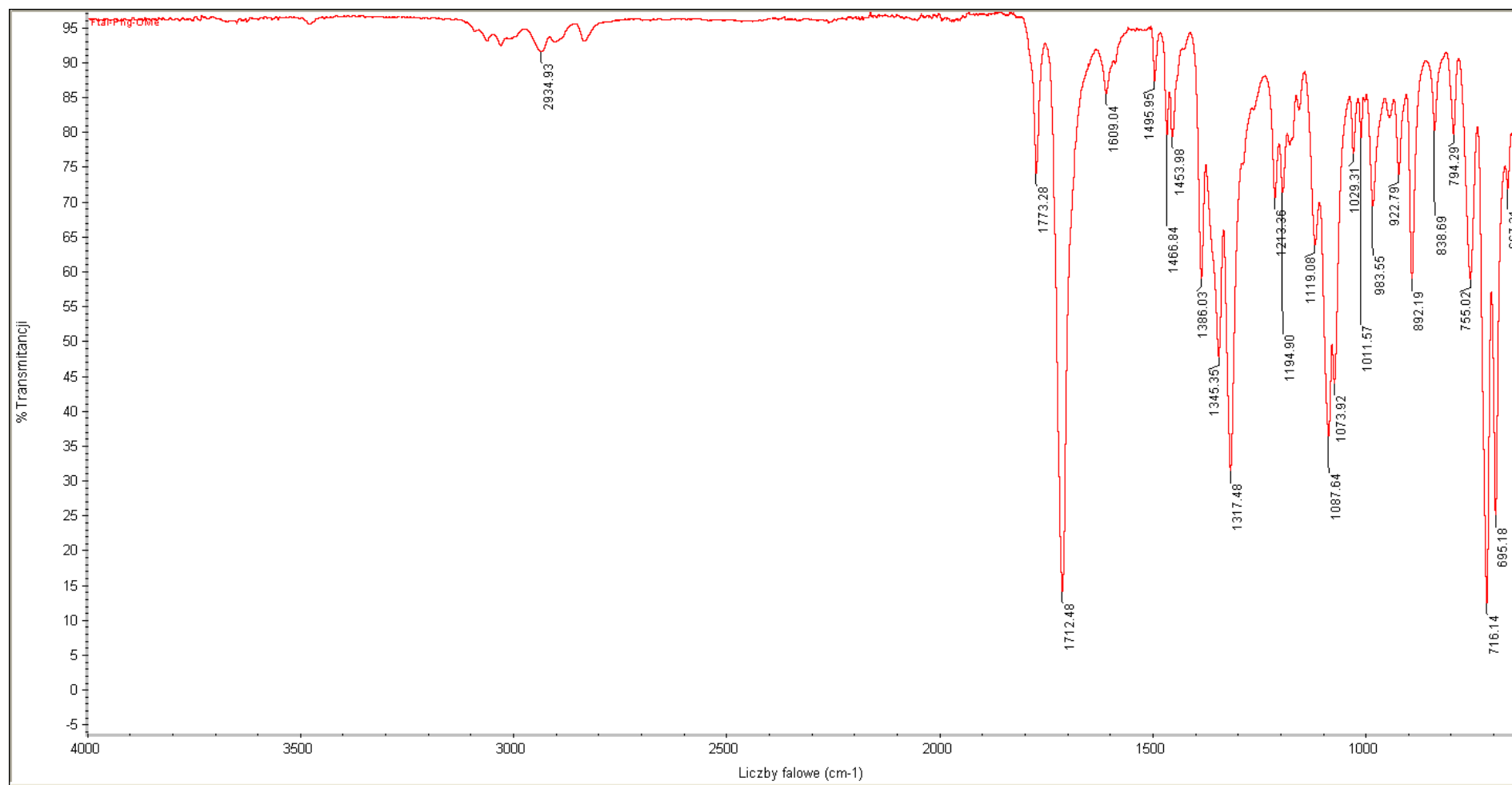
— 23.304



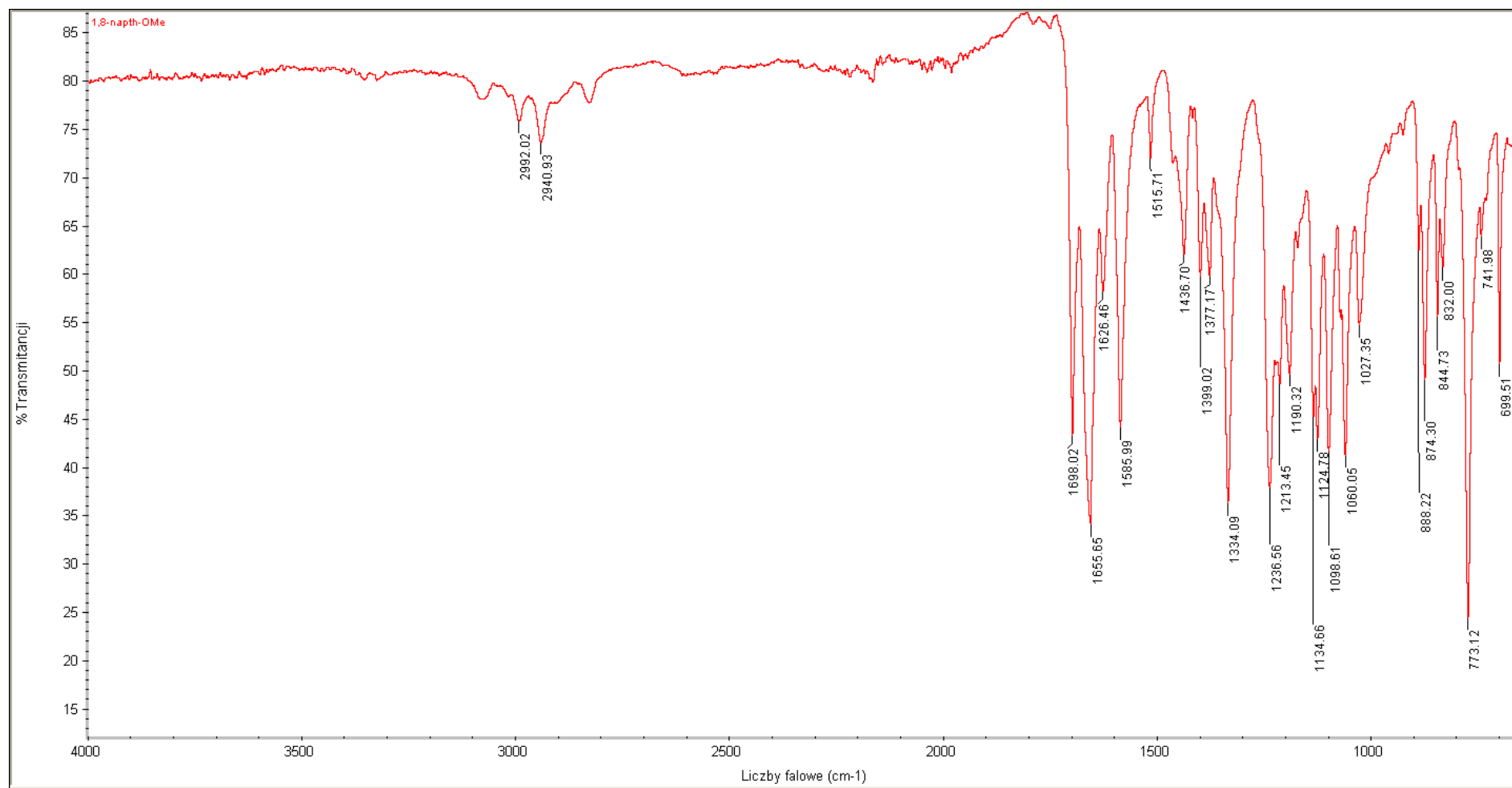
^{31}P NMR spectrum of 1-(2,4,6-trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**10**); 161.9 MHz/ CDCl_3 ; δ (ppm).



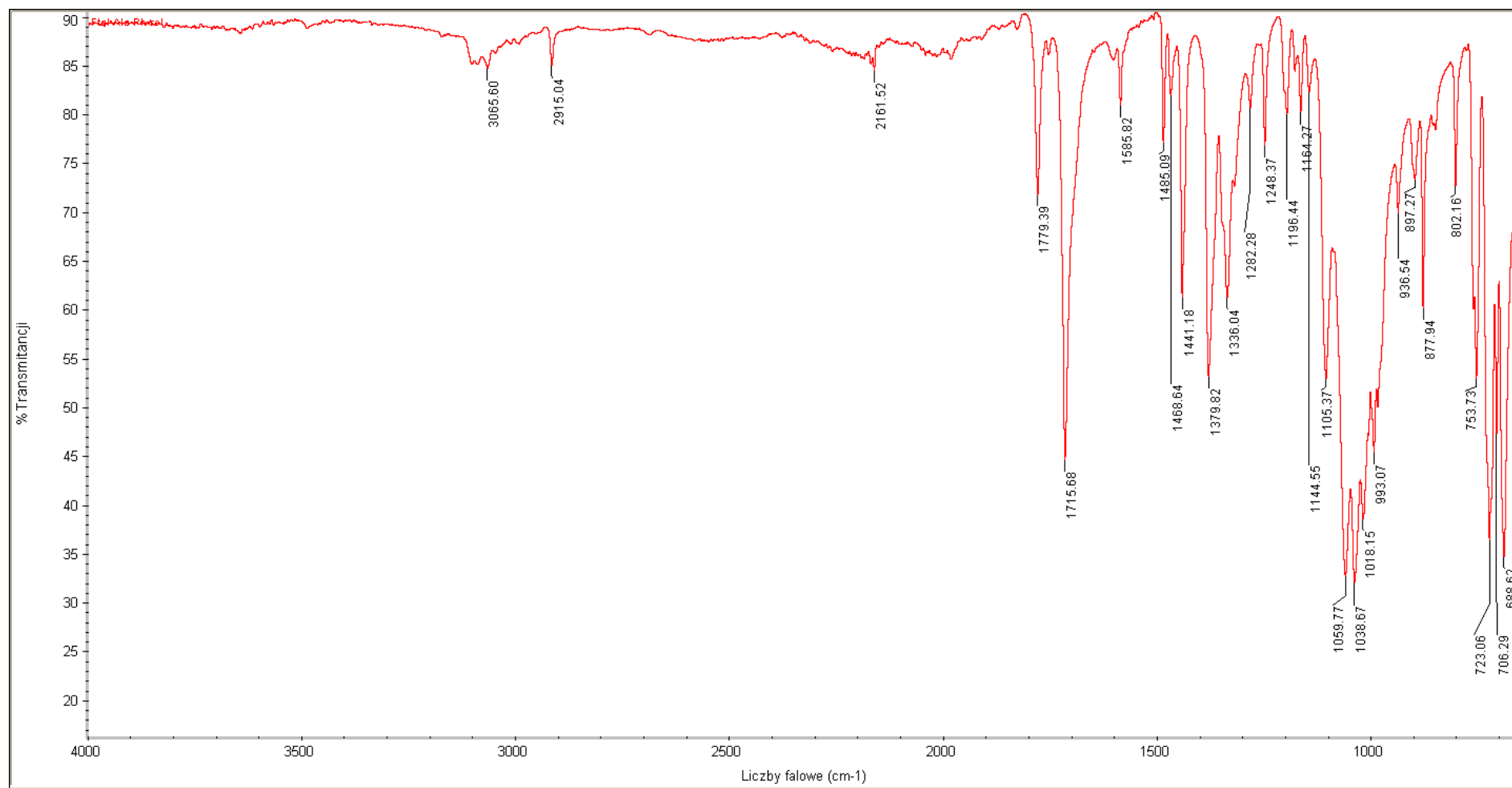
^{19}F NMR spectrum of 1-(2,4,6-trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**10**); 376 MHz/ $CDCl_3$; δ (ppm).



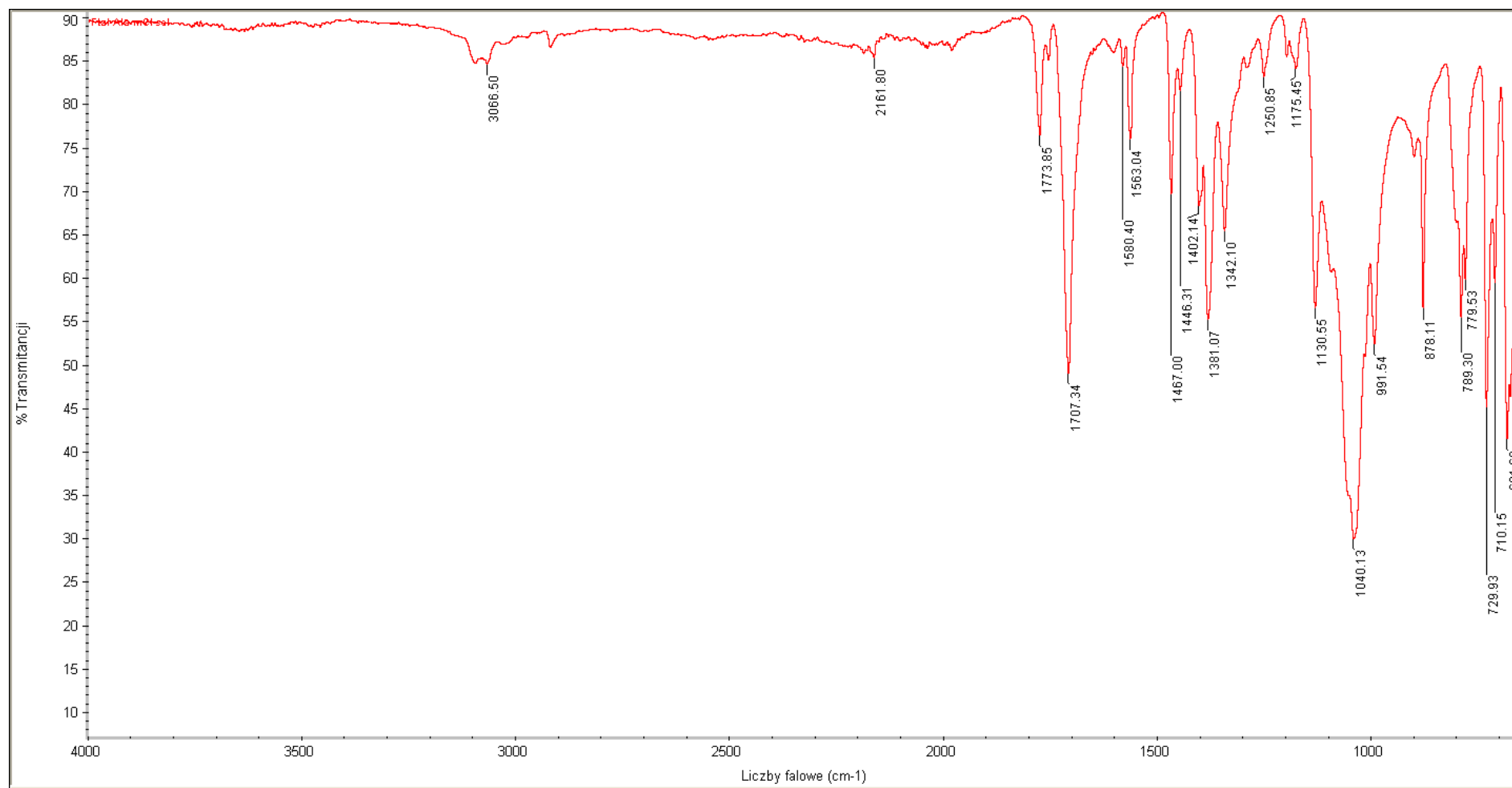
IR spectrum of *N*-(1-methoxy-1-phenylmethyl)phthalimide (**7c**); ATR, (cm⁻¹).



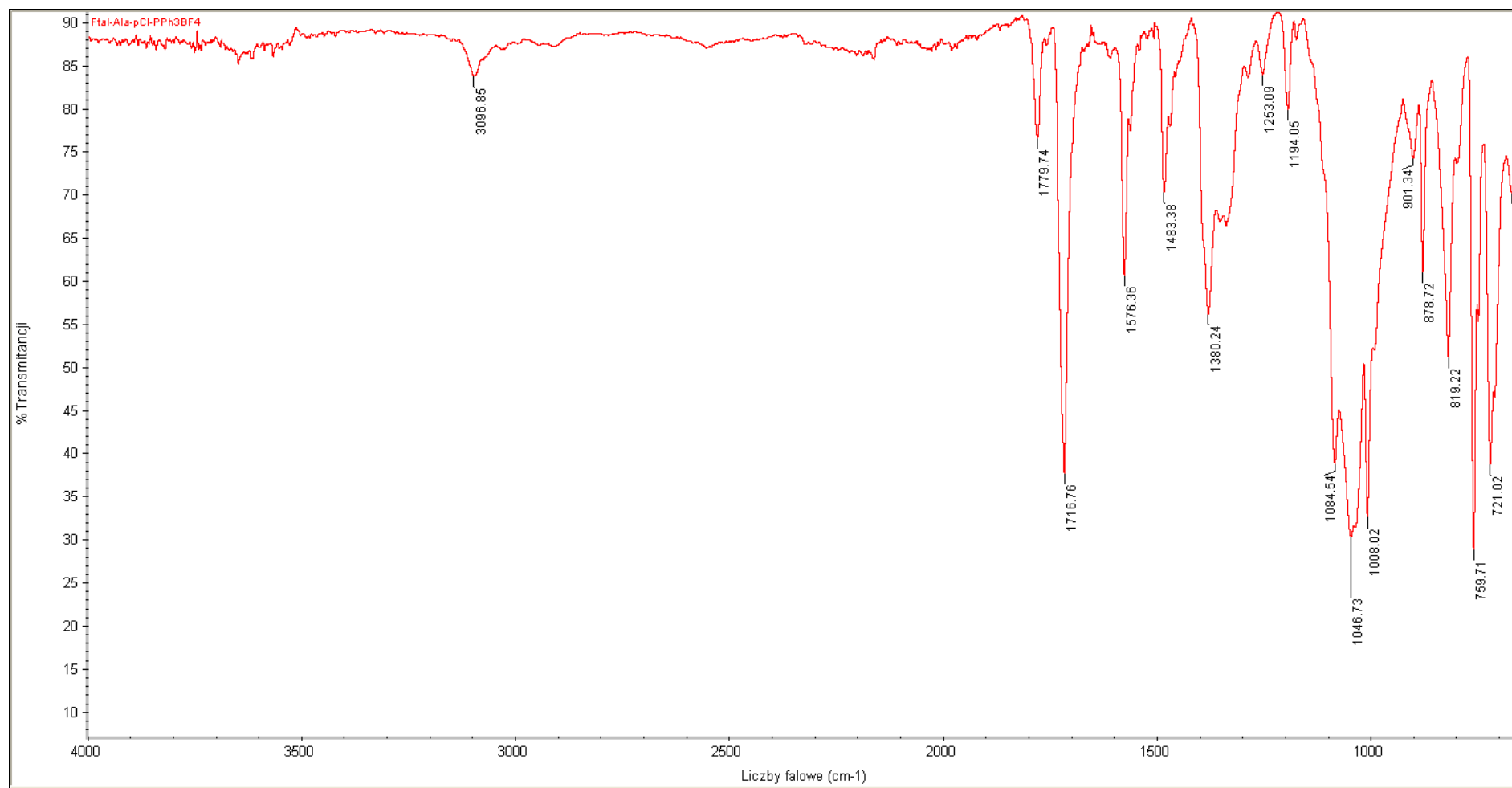
IR spectrum of *N*-(1-methoxyethyl)-1,8-naphthalimide (**7h**); ATR (cm⁻¹).



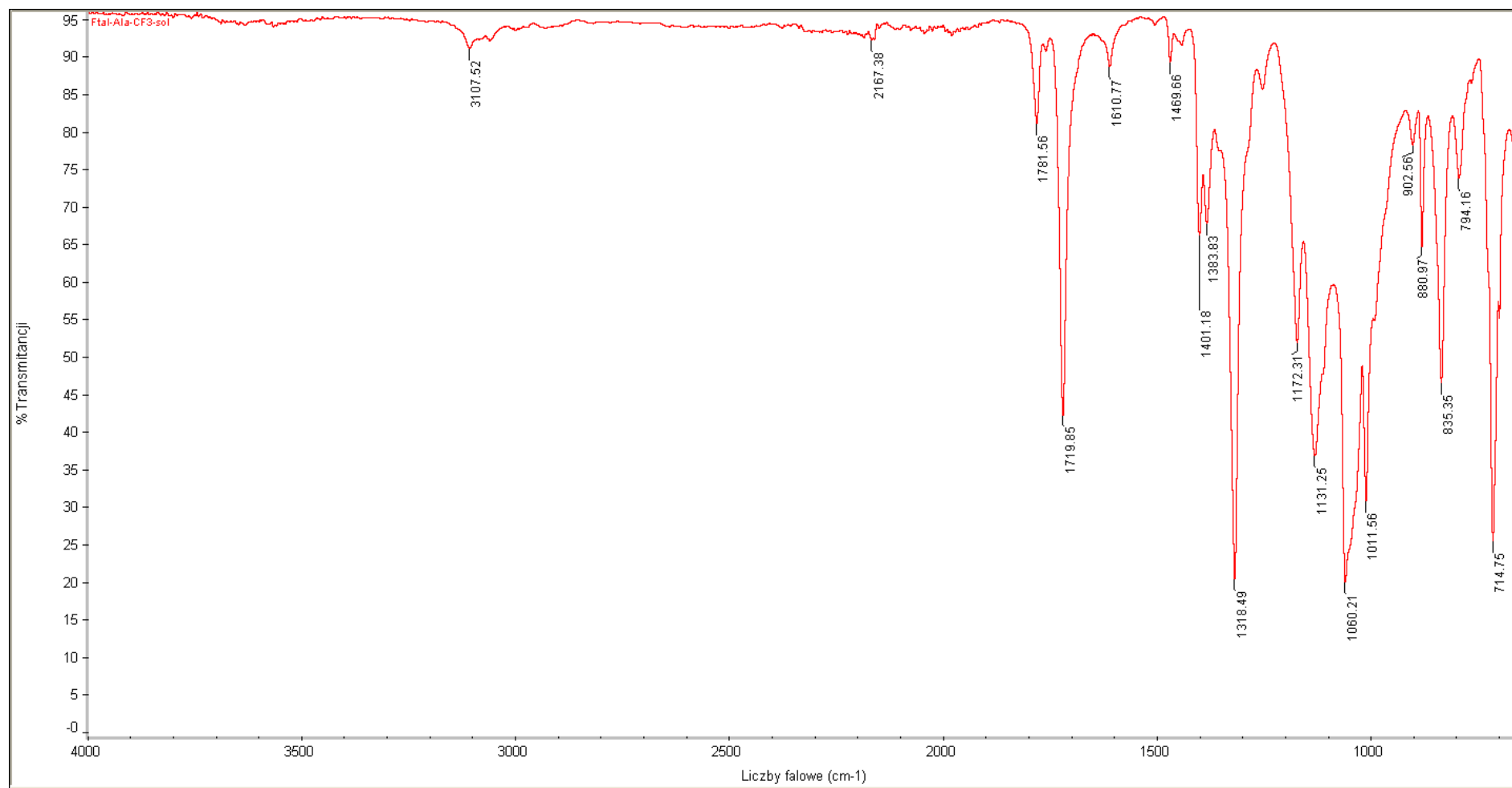
IR spectrum of 1-(*N*-phthalimido)ethyltriphenylphosphonium tetrafluoroborate (**5b**); ATR (cm⁻¹).



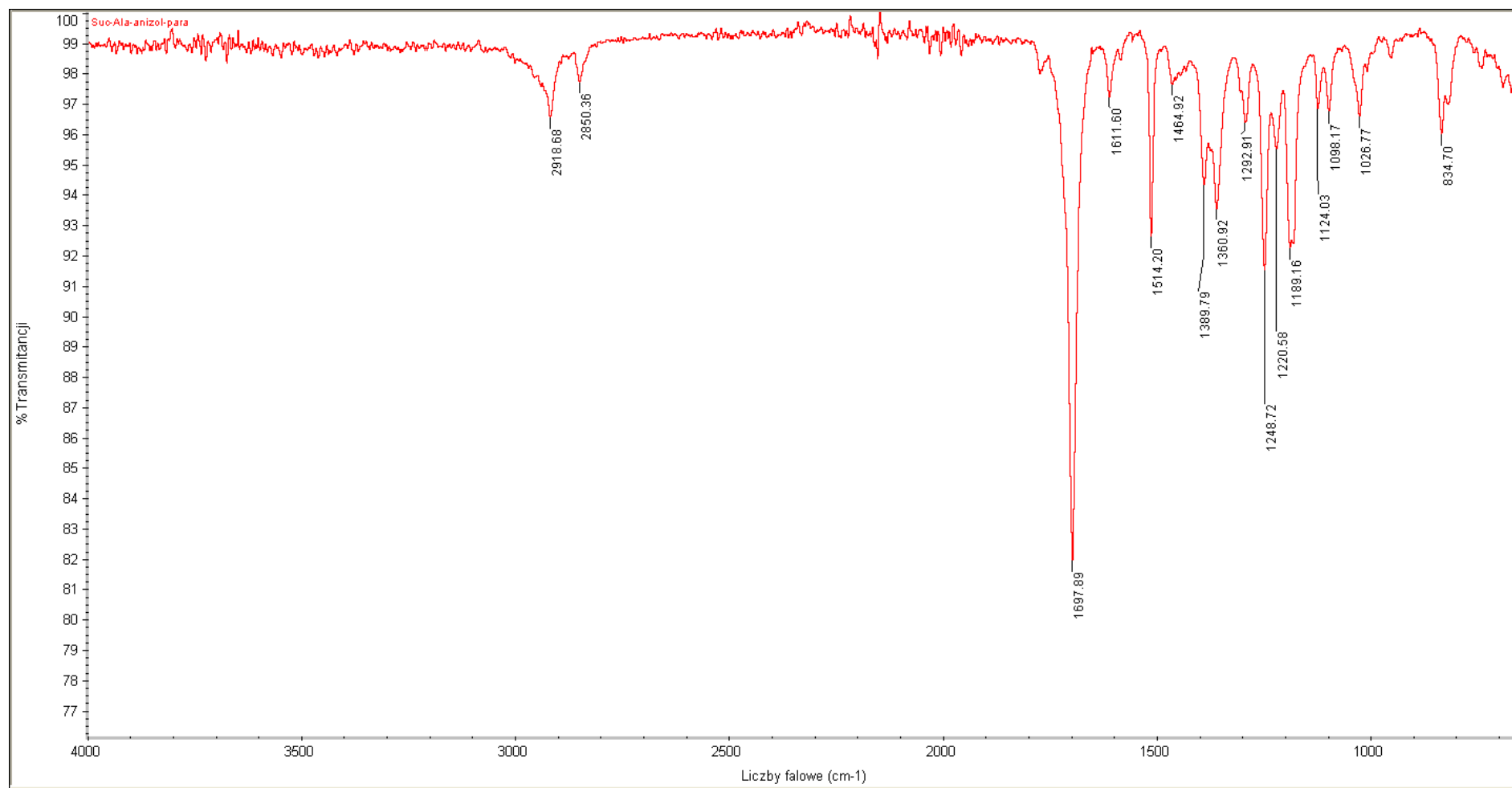
IR spectrum of 1-(*N*-phthalimido)ethyltris(3-chlorophenyl)phosphonium tetrafluoroborate (**5c**); ATR (cm⁻¹).



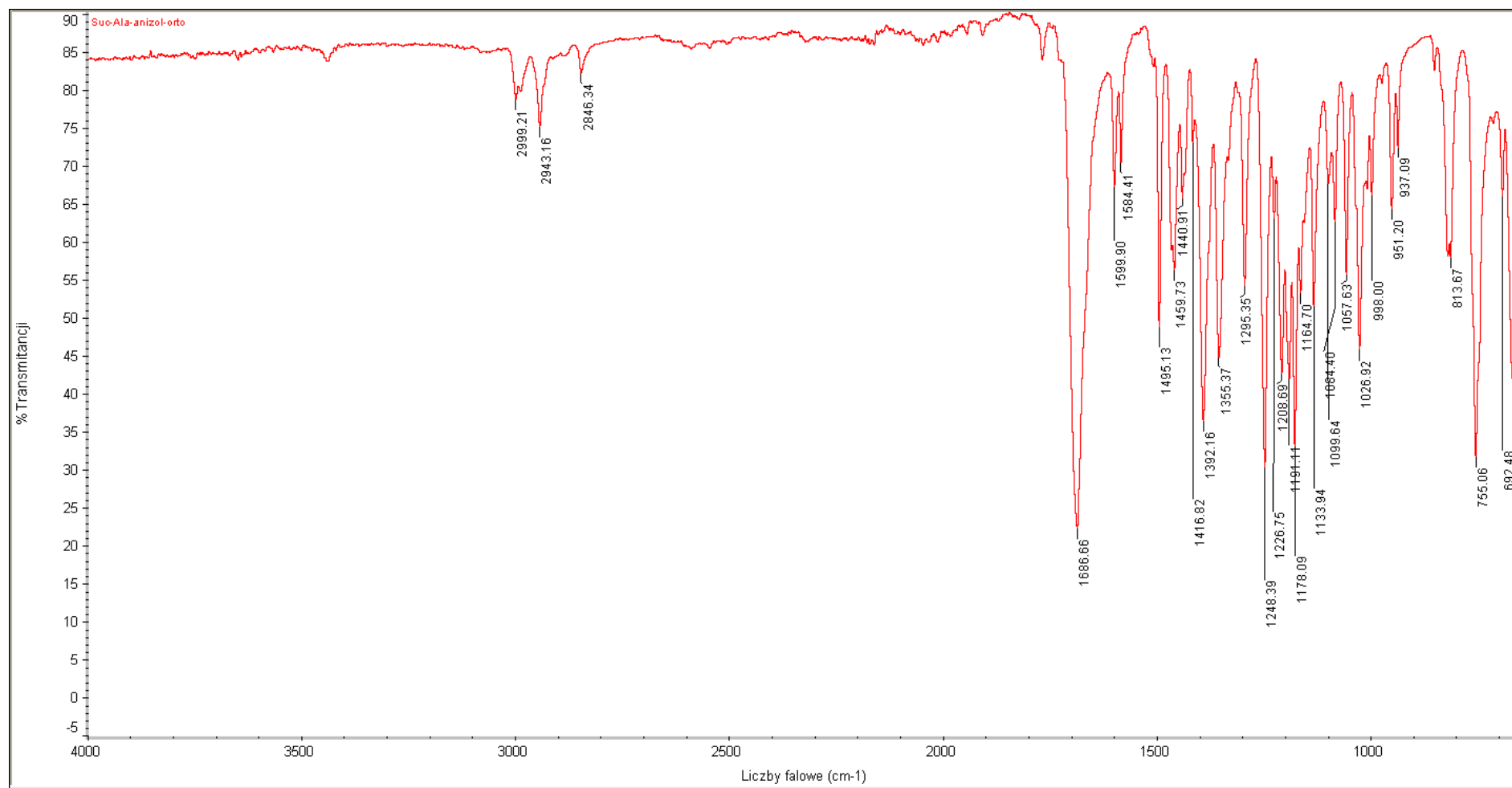
IR spectrum of 1-(*N*-phthalimido)ethyltris(4-chlorophenyl)phosphonium tetrafluoroborate (**5d**); ATR (cm⁻¹).



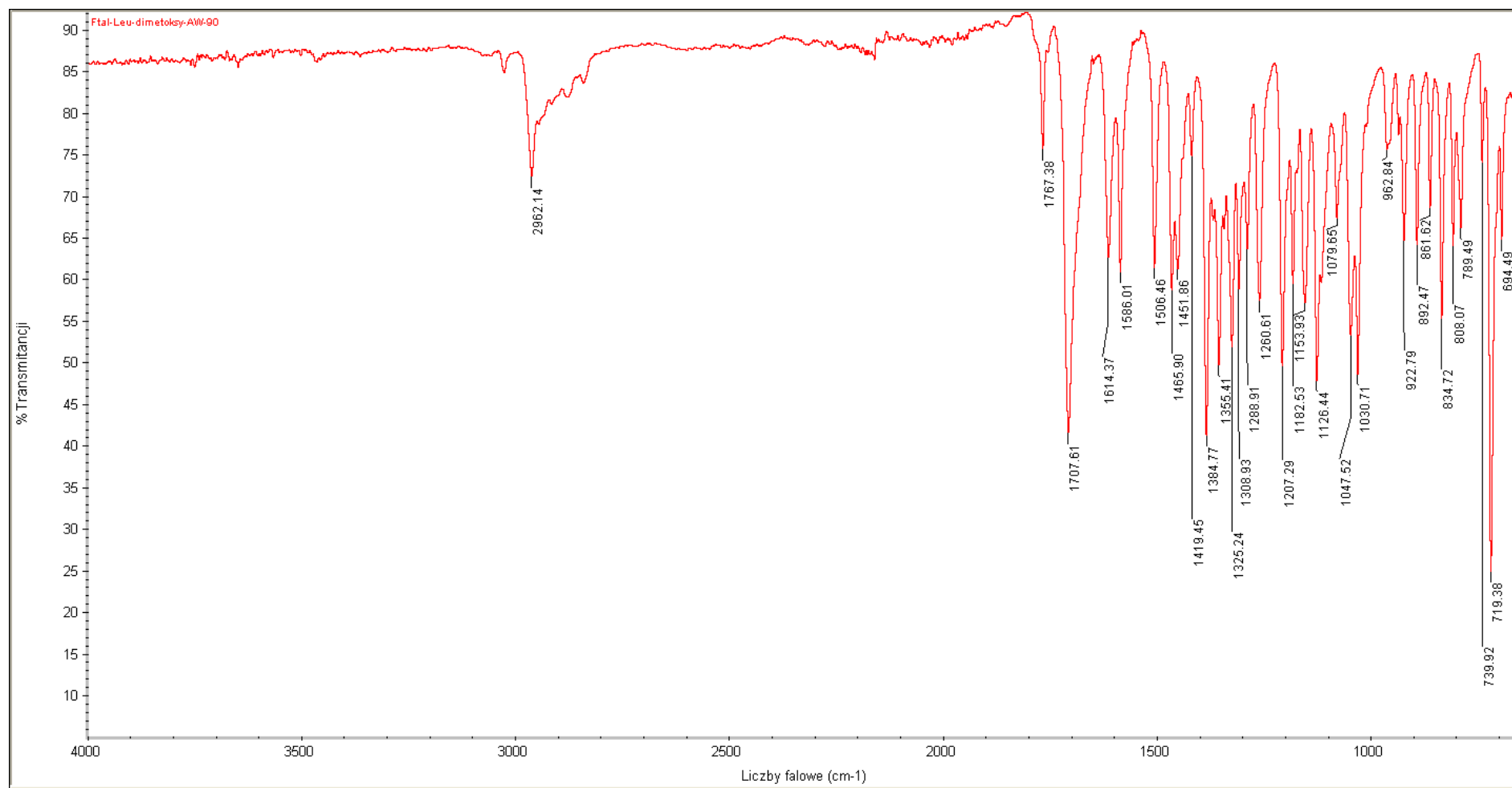
IR spectrum of 1-(*N*-phthalimido)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**5e**); ATR (cm⁻¹).



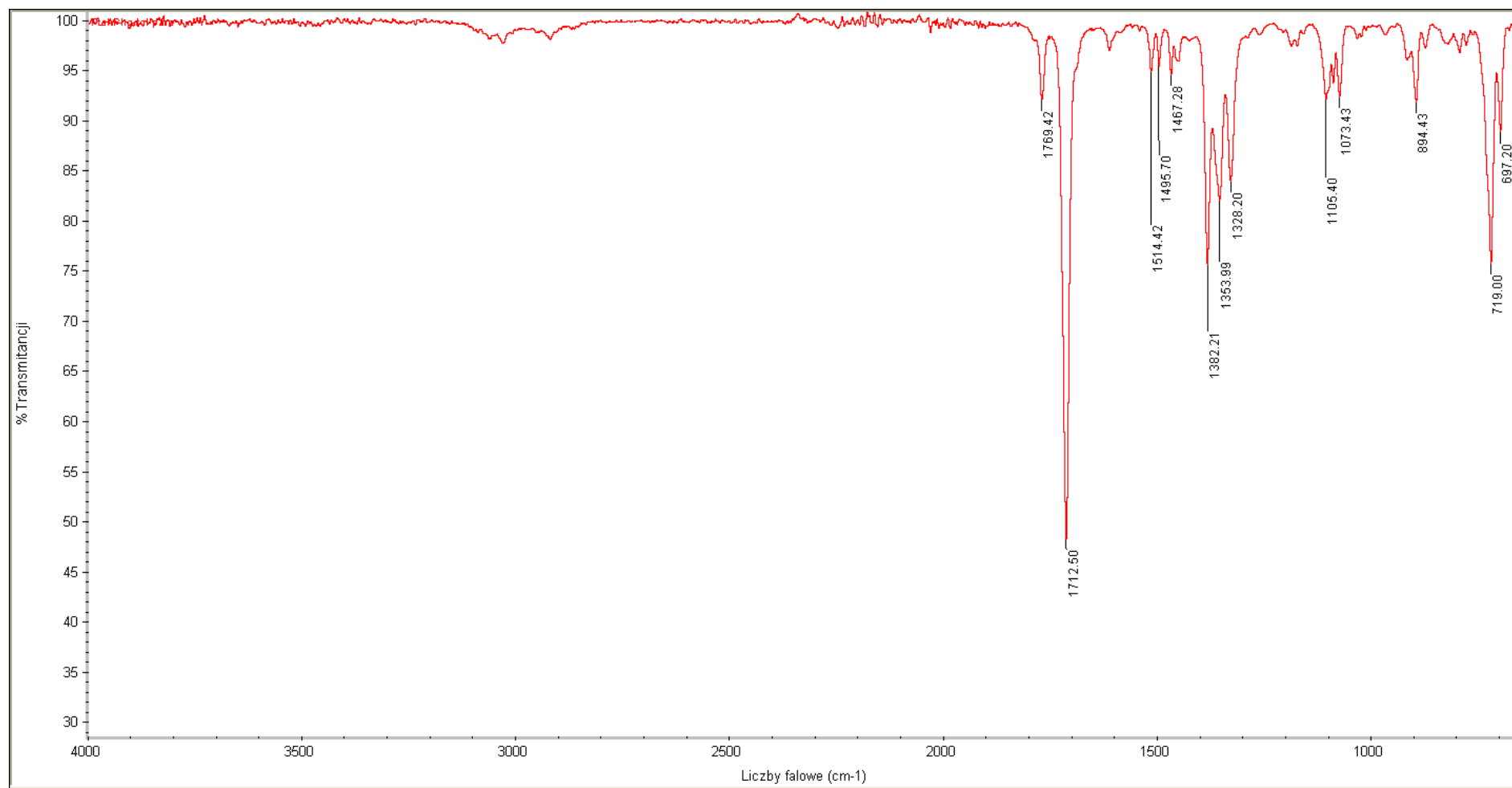
IR spectrum of *N*-[1-(4-methoxyphenyl)ethyl]succinimide (**9da**); ATR (cm⁻¹).



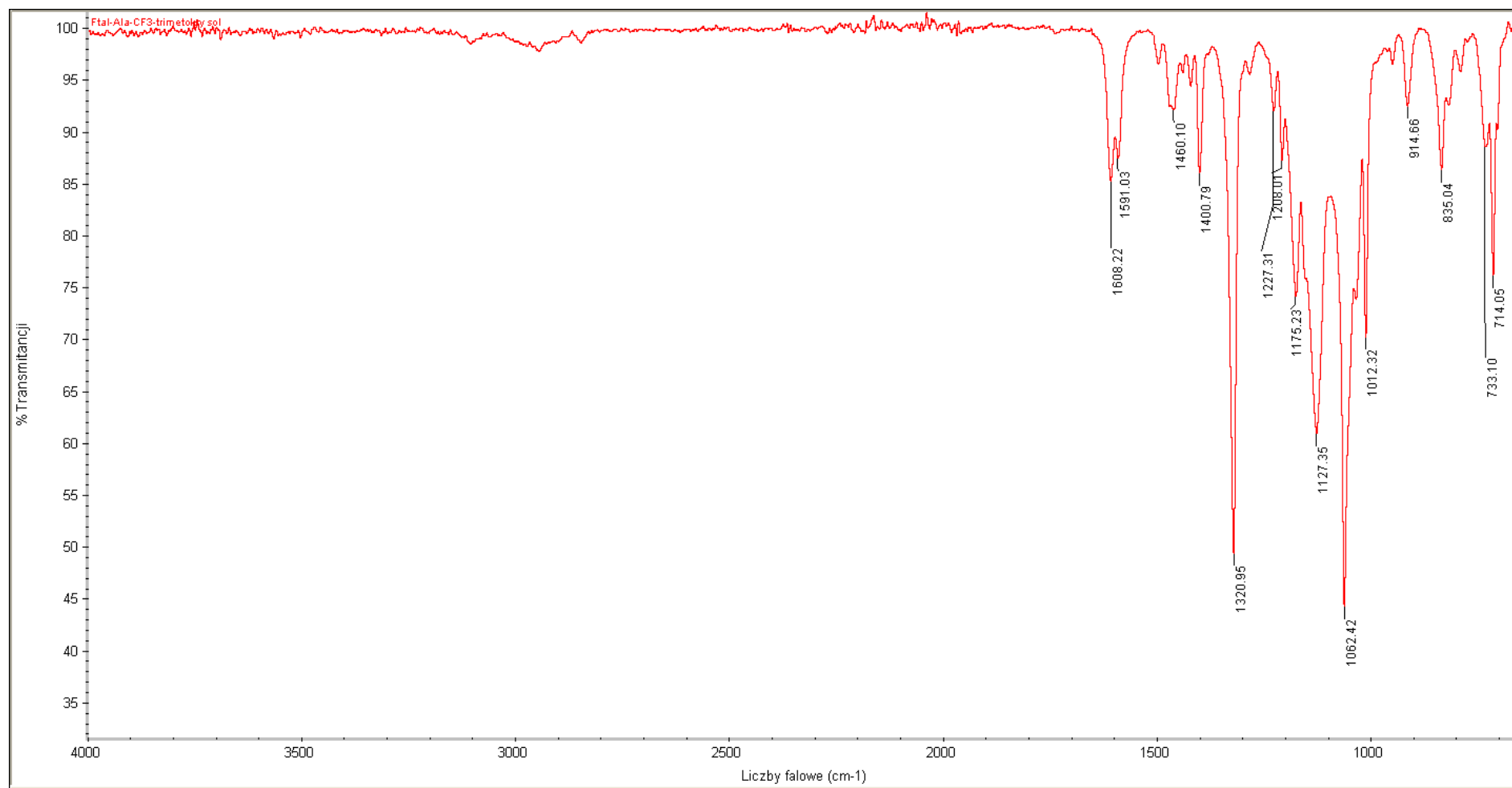
IR spectrum of *N*-[1-(2-methoxyphenyl)ethyl]succinimide (**9db**); ATR (cm⁻¹).



IR spectrum of *N*-[1-(2,4-dimethoxyphenyl)-3-methylbutyl]phthalimide (**9g**); ATR (cm⁻¹).



IR spectrum of *N*-[1-(4-methylphenyl)-1-phenylmethyl]phthalimide (**9ia**); ATR (cm⁻¹).



IR spectrum of 1-(2,4,6-trimethoxyphenyl)ethyltris(4-trifluoromethylphenyl)phosphonium tetrafluoroborate (**10**); ATR (cm⁻¹).