Electronic Supplementary Information for

Vinylogy in Nitronates: Utilization of α-Aryl Conjugated Nitroolefins as a Nucleophile for Highly Stereoselective Aza-Henry Reaction

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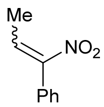
General Information: Infrared spectra were recorded on a SHIMADZU IRAffinity-1 spectrometer. ^{1}H NMR spectra were recorded on a JEOL JNM-ECS400 (400 MHz) spectrometer. Chemical shifts are reported in ppm from tetramethylsilane (0.00 ppm) resonance as the internal standard. Data are reported as follows: chemical shift, integration, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad), and coupling constants (Hz). ^{13}C NMR spectra were recorded on a JEOL JNM-ECS400 (101 MHz) spectrometer or JEOL JNM-ECA600 (151 MHz) spectrometer with complete proton decoupling. Chemical shifts are reported in ppm from the solvent resonance ($CDCl_3$: 77.16 ppm). The high resolution mass spectra were conducted on Thermo Fisher Scientific Exactive (ESI). Analytical thin layer chromatography (TLC) was performed on Merck precoated TLC plates (silica gel 60 GF_{254}, 0.25 mm). Flash column chromatography was performed on silica gel 60 (spherical, 40-50 μm; Kanto Chemical Co., Inc.). Enantiomeric excesses were determined by HPLC analysis using chiral columns [ϕ 4.6 mm x 250 mm, DAICEL CHIRALPAK IA (IA), CHIRALPAK IC (IC), CHIRALPAK ID-3 (ID-3), CHIRALPAK IF-3 (IF-3), CHIRALPAK AD-3 (AD-3), CHIRALPAK AZ-3 (AZ-3), CHIRALPAK AD-H (AD-H), and CHIRALCEL OD-3 (OD-3) with hexane (H), 2-propanol (IPA), and ethanol (EtOH) as eluent].

Diethyl ether (Et_2O) was supplied from Kanto Chemical Co., Inc. as "Dehydrated" and further purified by passing through neutral alumina under nitrogen atmosphere. Betaines[1], nitro olefins[2], and *N*-Boc imines[3] were prepared by following the literature procedure. Powdered 4Å molecular sieves (MS 4A) was supplied by NACALAI TESQUE, INC. Other simple chemicals were purchased and used as such.

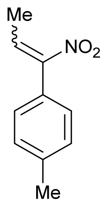
(1) (a) D. Uraguchi, K. Koshimoto, T. Ooi, *Chem. Commun.* 2010, **46**, 300. (b) D. Uraguchi, K. Oyaizu, T. Ooi, *Chem. Eur. J.* 2012, **18**, 8306.
(2) F. Asaro, G. Pitacco, E. Valentin, *Tetrahedron* 1987, **43**, 3279.
(3) A. G. Wenzel, E. N. Jacobsen, *J. Am. Chem. Soc.* 2002, **124**, 12964.

Experimental Section:

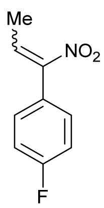
Characterization of Nitroolefins:



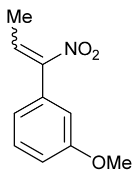
2a: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.53–7.43 (4H, m), 7.31–7.24 (2H, m), 1.83 (3H, d, *J* = 7.3 Hz); *Z* isomer δ 7.42–7.37 (3H, m), 7.36–7.31 (2H, m), 6.15 (1H, q, *J* = 7.3 Hz), 2.00 (3H, d, *J* = 7.3 Hz); ^{13}C NMR (151 MHz, $CDCl_3$) *E* isomer δ 152.3, 134.0, 130.5, 129.7, 128.7, 126.5, 14.5; *Z* isomer δ 129.6_4, 129.5_5, 129.0, 123.7, 14.1, two carbon atoms were not found probably due to overlapping; IR (film) 3057, 1667, 1514, 1443, 1327, 1184, 1074, 930 cm^{-1}; HRMS (ESI) Calcd for $C_9H_9N_1O_2Na^+$ ($[M+Na]^+$) 186.0525. Found 186.0527.



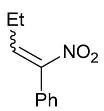
2b: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.44 (1H, q, *J* = 7.3 Hz), 7.26 (2H, d, *J* = 8.2 Hz), 7.16 (2H, d, *J* = 8.2 Hz), 2.41 (3H, s), 1.82 (3H, d, *J* = 7.3 Hz); *Z* isomer δ 7.30–7.18 (4H, m), 6.09 (1H, q, *J* = 7.3 Hz), 2.37 (3H, s), 1.98 (3H, d, *J* = 7.3 Hz); ^{13}C NMR (151 MHz, $CDCl_3$) *E* isomer δ 152.3, 139.8, 133.6, 130.4, 129.4, 126.6, 21.6, 14.5; *Z* isomer δ 129.6, 129.0, 126.4, 122.7, 21.4, 14.1, two carbon atoms were not found probably due to overlapping; IR (film) 2914, 1667, 1514, 1377, 1327, 1180, 1113, 1038, 930 cm^{-1}; HRMS (ESI) Calcd for $C_{10}H_{11}N_1O_2Na^+$ ($[M+Na]^+$) 200.0682. Found 200.0682.



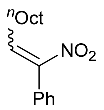
2c: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.50 (1H, q, *J* = 7.8 Hz), 7.30–7.23 (2H, m), 7.15 (2H, t, *J* = 8.7 Hz), 1.83 (3H, d, *J* = 7.8 Hz); ^{13}C NMR (151 MHz, $CDCl_3$) *E* isomer δ 163.4 (d, $J_{F–C}$ = 250.1 Hz), 151.3, 134.5, 132.6 (d, $J_{F–C}$ = 8.6 Hz), 125.5 (d, $J_{F–C}$ = 3.0 Hz), 115.9 (d, $J_{F–C}$ = 21.6 Hz), 14.6; IR (film) 2922, 1667, 1633, 1504, 1327, 1225, 1159, 1098, 932 cm^{-1}; HRMS (ESI) Calcd for $C_9H_8N_1O_2F_1Na^+$ ($[M+Na]^+$) 204.0431. Found 204.0433.



2d: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.47 (1H, q, *J* = 7.3 Hz), 7.37 (1H, t, *J* = 8.2 Hz), 7.02–6.97 (1H, m), 6.88–6.83 (1H, m), 6.82–6.79 (1H, m), 3.83 (3H, s), 1.83 (3H, d, *J* = 7.3 Hz); *Z* isomer δ 7.30 (1H, t, *J* = 8.2 Hz), 6.96–6.91 (2H, m), 6.88–6.84 (1H, m), 6.14 (1H, q, *J* = 7.3 Hz), 3.81 (3H, s), 1.99 (3H, d, *J* = 7.3 Hz); ^{13}C NMR (151 MHz, $CDCl_3$) *E* isomer δ 159.7, 152.1, 134.1, 130.7, 129.8, 122.8, 116.1, 115.3, 55.5, 14.5; *Z* isomer δ 159.9, 133.0, 130.0, 123.7, 118.9, 112.1, 14.1, three carbon atoms were not found probably due to overlapping; IR (film) 2959, 2833, 1667, 1580, 1514, 1331, 1240, 1159, 1036, 951 cm^{-1}; HRMS (ESI) Calcd for $C_{10}H_{11}N_1O_3Na^+$ ($[M+Na]^+$) 216.0631. Found 216.0633.

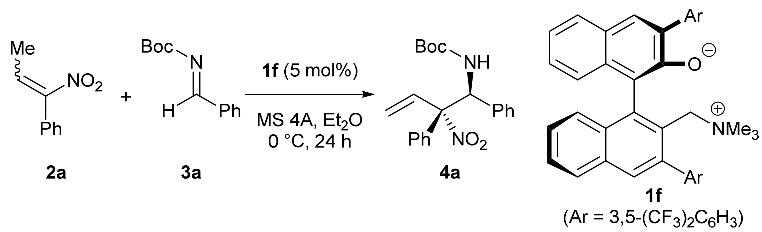


2e: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.47–7.43 (3H, m), 7.38 (1H, t, *J* = 7.8 Hz), 7.30–7.25 (2H, m), 2.15 (2H, quintet, *J* = 7.8 Hz), 1.09 (3H, t, *J* = 7.8 Hz); ^{13}C NMR (101 MHz, $CDCl_3$) *E* isomer δ 151.1, 139.9, 130.5, 129.8, 129.7, 128.7, 22.2, 13.2; IR (film) 2972, 1667, 1547, 1518, 1356, 1331, 1184, 1070, 959 cm^{-1}; HRMS (ESI) Calcd for $C_{10}H_{11}N_1O_2Na^+$ ($[M+Na]^+$) 200.0682. Found 200.0684.

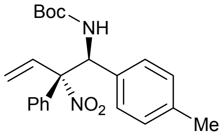


2f: The synthesis was performed by following the literature procedure.[2] Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) *E* isomer δ 7.48–7.42 (3H, m), 7.39 (1H, t, *J* = 7.8 Hz), 7.29–7.23 (2H, m), 2.12 (2H, q, *J*

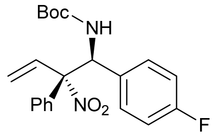
= 7.8 Hz), 1.48 (2H, quintet, J = 7.8 Hz), 1.35–1.15 (10H, m), 0.87 (3H, t, J = 7.8 Hz); ^{13}C NMR (101 MHz, $CDCl_3$) E isomer δ 151.4, 139.0, 130.5, 129.9, 129.7, 128.6, 31.9, 29.3, 29.2, 28.7, 28.6, 22.8, 14.2, one carbon atom was not found probably due to overlapping; IR (film) 2916, 2855, 1661, 1518, 1360, 1329, 1177, 1028, 964 cm^{-1}; HRMS (ESI) Calcd for $C_{16}H_{23}N_1O_2Na^+$ ([M+Na]$^+$) 284.1621. Found 284.1620.



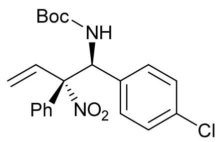
Representative Procedure for Catalytic Asymmetric Aza-Henry Reaction: A magnetic stirrer bar and MS 4A (100.0 mg) were placed in an oven-dried test tube under argon (Ar) atmosphere. The MS 4A was dried with a heat gun under reduced pressure for 5 min and the test tube was refilled with Ar. Chiral ammonium betaine **1f** (3.83 mg, 0.0050 mmol) and Et_2O (0.30 mL) were added to the test tube successively under Ar at 25 °C. After the mixture was cooled to 0 °C, nitroolefin **2a** (17.9 mg, 0.11 mmol) and benzaldehyde-derived N-Boc imine **3a** (20.5 mg, 0.10 mmol) were introduced to the tube sequentially. The reaction mixture was stirred for 24 h and then, poured into ice-cooled 1 N hydrochloric acid. The aqueous phase was extracted with ethyl acetate (EA) twice. The combined organic phases were washed with brine, dried over Na_2SO_4, and filtered. All volatiles were removed by evaporation to afford the crude residue, which was analyzed by ^{1}H NMR (400 MHz) to determine the diastereomeric ratio (*anti*/*syn* = >20:1). Purification of the residue by column chromatography on silica gel ($H/CHCl_3$ = 1:2 as eluent) gave **4a** as a mixture of diastereomers (33.2 mg, 0.090 mmol, 90%), whose enantiomeric excesses were determined by HPLC analysis (96% ee for *anti* isomer). **4a:** White solid; HPLC: IA, H/IPA = 98:2, flow rate = 0.3 mL/min, λ = 210 nm, 22.0 min (1S, 2S), 23.2 min (1R, 2R), 25.5 min (minor diastereomer), 27.6 min (minor diastereomer). Absolute and relative configurations were assigned by the derivatization to **7** (see below). ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.60–7.39 (3H, m), 7.39–7.30 (3H, m), 7.30–7.18 (4H, m), 6.44 (1H, d, J = 9.6 Hz), 6.15 (1H, dd, J = 17.4, 11.0 Hz), 5.64 (1H, d, J = 9.6 Hz), 5.37 (1H, d, J = 11.0 Hz), 4.64 (1H, d, J = 17.4 Hz), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 136.7, 136.0, 135.0, 129.0, 128.8, 128.7, 127.4, 121.4, 101.9, 80.2, 59.3, 28.4, two carbon atoms were not found probably due to overlapping; IR (film) 3447, 2976, 1713, 1547, 1479, 1366, 1312, 1294, 1159, 1057, 945 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{24}N_2O_4Na^+$ ([M+Na]$^+$) 391.1628. Found 391.1626.



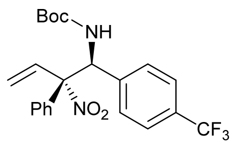
4b: Yellow oil; HPLC: AD-3, H/IPA = 98:2, flow rate = 0.3 mL/min, λ = 210 nm, 27.1 min (minor enantiomer of major diastereomer), 29.5 min (major enantiomer of major diastereomer), 32.2 min (minor diastereomer), 37.2 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.44–7.37 (3H, m), 7.24–7.19 (2H, m), 7.16 (2H, d, J = 9.4 Hz), 7.13 (2H, d, J = 9.2 Hz), 6.40 (1H, d, J = 9.6 Hz), 6.17 (1H, dd, J = 17.4, 11.0 Hz), 5.60 (1H, d, J = 9.6 Hz), 5.36 (1H, d, J = 11.0 Hz), 4.63 (1H, d, J = 17.4 Hz), 2.34 (3H, s), 1.33 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 138.5, 136.1, 135.1, 133.6, 129.5, 129.0, 128.7, 128.5, 127.4, 121.3, 102.0, 80.1, 59.0, 28.4, 21.3; IR (film) 3449, 2974, 1713, 1547, 1483, 1366, 1310, 1290, 1165, 941 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{26}N_2O_4Na^+$ ($[M+Na]^+$) 405.1785. Found 405.1786.



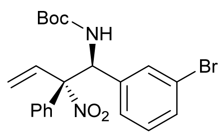
4c: Yellow oil; HPLC: ID-3, H/IPA = 97:3, flow rate = 0.2 mL/min, λ = 210 nm, 30.1 min (minor enantiomer of major diastereomer), 32.2 min (major enantiomer of major diastereomer), 39.6 min (minor diastereomer), 51.2 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.45–7.39 (3H, m), 7.26–7.16 (4H, m), 7.05 (2H, dd, $J_{H\text{–}H}$ = 7.6 Hz, $J_{F\text{–}H}$ = 7.6 Hz), 6.39 (1H, brd, J = 9.8 Hz), 6.14 (1H, dd, J = 17.4, 11.0 Hz), 5.62 (1H, d, J = 9.8 Hz), 5.40 (1H, d, J = 11.0 Hz), 4.67 (1H, d, J = 17.4 Hz), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 162.8 (d, $J_{F\text{–}C}$ = 251.6 Hz), 155.1, 135.7, 134.8, 132.5, 130.4 (d, $J_{F\text{–}C}$ = 8.7 Hz), 129.1, 128.8, 127.3, 121.7, 115.8 (d, $J_{F\text{–}C}$ = 22.3 Hz), 101.8, 80.4, 58.7, 28.4; IR (film) 3449, 2980, 1711, 1605, 1547, 1479, 1366, 1294, 1225, 1161, 849 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{23}N_2O_4F_1Na^+$ ($[M+Na]^+$) 409.1534. Found 409.1535.



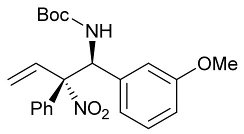
4d: Yellow oil; HPLC: AZ-3, H/EtOH = 98:2, flow rate = 0.2 mL/min, λ = 224 nm, 31.0 min (major enantiomer of major diastereomer), 36.0 min (minor enantiomer of major diastereomer), 41.4 min (minor diastereomer), 43.8 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.45–7.39 (3H, m), 7.33 (2H, d, J = 8.7 Hz), 7.24–7.15 (4H, m), 6.38 (1H, d, J = 9.4 Hz), 6.14 (1H, dd, J = 17.4, 11.0 Hz), 5.61 (1H, d, J = 9.4 Hz), 5.40 (1H, d, J = 11.0 Hz), 4.67 (1H, d, J = 17.4 Hz), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.0, 135.6, 135.3, 134.7, 130.0, 129.2, 129.0, 128.8, 127.3, 121.8, 101.7, 80.5, 58.7, 28.4, one carbon atom was not found probably due to overlapping; IR (film) 3451, 2980, 1713, 1549, 1483, 1344, 1163, 1092, 1015, 947, 849 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{23}{}^{35}Cl_1N_2O_4Na^+$ ($[M+Na]^+$) 425.1239. Found 425.1239.



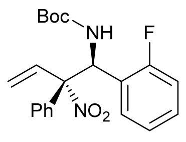
4e: White solid; HPLC: IA, H/IPA = 98:2, flow rate = 0.5 mL/min, λ = 221 nm, 12.1 min (major enantiomer of major diastereomer), 15.4 min (minor diastereomer), 16.4 min (minor diastereomer), 17.9 min (minor enantiomer of major diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.62 (2H, d, J = 8.2 Hz), 7.46–7.41 (3H, m), 7.39 (2H, d, J = 8.2 Hz), 7.24–7.17 (2H, m), 6.43 (1H, d, J = 9.6 Hz), 6.13 (1H, dd, J = 17.4, 10.8 Hz), 5.70 (1H, d, J = 9.6 Hz), 5.43 (1H, d, J = 10.8 Hz), 4.71 (1H, d, J = 17.4 Hz), 1.35 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 140.8, 135.4, 134.5, 130.9 (q, $J_{F\text{–}C}$ = 33.2 Hz), 129.3, 129.2, 128.9, 127.3, 125.8 (q, $J_{F\text{–}C}$ = 3.9 Hz), 124.0 (q, $J_{F\text{–}C}$ = 276.1 Hz), 122.1, 101.5, 80.6, 59.0, 28.4; IR (film) 3464, 2976, 1711, 1620, 1551, 1479, 1323, 1163, 1125, 1069, 947, 853 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{23}N_2O_4F_3Na^+$ ($[M+Na]^+$) 459.1502. Found 459.1501.



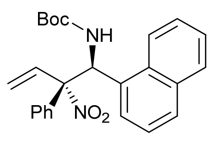
4f: White solid; HPLC: IA, H/IPA/EtOH = 96:2:2, flow rate = 0.2 mL/min, λ = 214 nm, 25.7 min (major enantiomer of major diastereomer), 28.2 min (minor enantiomer of major diastereomer), 29.3 min (minor diastereomer), 31.0 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.47 (1H, dt, J = 7.3, 1.6 Hz), 7.45–7.35 (4H, m), 7.23 (1H, t, J = 7.8 Hz), 7.22–7.15 (3H, m), 6.38 (1H, d, J = 9.6 Hz), 6.16 (1H, dd, J = 17.4, 10.8 Hz), 5.60 (1H, d, J = 9.6 Hz), 5.43 (1H, d, J = 10.8 Hz), 4.69 (1H, d, J = 17.4 Hz), 1.35 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.0, 139.0, 135.5, 134.7, 131.9$_3$, 131.8$_8$, 130.4, 129.2, 128.8, 127.3, 122.8, 122.0, 101.6, 80.5, 58.8, 28.4, one carbon atom was not found probably due to overlapping; IR (film) 3453, 2976, 1713, 1547, 1470, 1410, 1339, 1288, 1161, 1059, 947, 839 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{23}N_2O_4{}^{79}Br_1Na^+$ ([M+Na]$^+$) 469.0733. Found 469.0735.



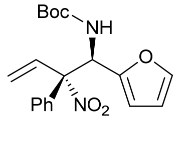
4g: Yellow oil; HPLC: IA, H/IPA = 98:2, flow rate = 0.5 mL/min, λ = 210 nm, 15.6 min (major enantiomer of major diastereomer), 17.4 min (minor enantiomer of major diastereomer), 18.9 min (minor diastereomer), 35.0 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.47–7.37 (3H, m), 7.26 (1H, t, J = 8.0 Hz), 7.24–7.17 (2H, m), 6.89–6.82 (2H, m), 6.79 (1H, s), 6.40 (1H, d, J = 10.1 Hz), 6.20 (1H, dd, J = 17.4, 11.0 Hz), 5.61 (1H, d, J = 10.1 Hz), 5.37 (1H, d, J = 11.0 Hz), 4.64 (1H, d, J = 17.4 Hz), 3.79 (3H, s), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 159.7, 155.1, 138.1, 136.0, 135.0, 129.8, 129.0, 128.7, 127.4, 121.4, 120.9, 114.7, 113.9, 101.8, 80.2, 59.2, 55.4, 28.4; IR (film) 3431, 2976, 1711, 1601, 1547, 1479, 1342, 1256, 1157, 1038, 947, 862 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{26}N_2O_5Na^+$ ([M+Na]$^+$) 421.1734. Found 421.1729.



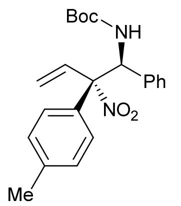
4h: Yellow oil; HPLC: ID-3, H/EtOH = 95:5, flow rate = 0.1 mL/min, λ = 210 nm, 46.6 min (minor enantiomer of major diastereomer), 50.4 min (major enantiomer of major diastereomer), 53.6 min (minor diastereomer), 56.2 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.47–7.38 (3H, m), 7.38–7.29 (1H, m), 7.29–7.19 (3H, m), 7.16 (1H, t, J = 7.1 Hz), 7.09 (1H, t, $J_{H–H}$ = 7.1 Hz, $J_{F–H}$ = 11.4 Hz), 6.43 (1H, d, J = 9.6 Hz), 6.10 (1H, d, J = 9.6 Hz), 6.06 (1H, ddd, J = 17.2, 10.7, 3.0 Hz), 5.40 (1H, d, J = 10.7 Hz), 4.64 (1H, d, J = 17.2 Hz), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 160.2 (d, $J_{F–C}$ = 251.6 Hz), 155.0, 134.7 (d, $J_{F–C}$ = 5.8 Hz), 130.5 (d, $J_{F–C}$ = 8.7 Hz), 129.1, 128.8, 128.7, 127.5, 125.1, 124.5 (d, $J_{F–C}$ = 12.6 Hz), 122.4, 115.8 (d, $J_{F–C}$ = 23.2 Hz), 102.1, 80.4, 51.9, 28.4, one carbon atom was not found probably due to overlapping; IR (film) 3449, 2932, 1713, 1549, 1481, 1344, 1298, 1229, 1157, 1057, 839 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{23}N_2O_4F_1Na^+$ ([M+Na]$^+$) 409.1534. Found 409.1535.



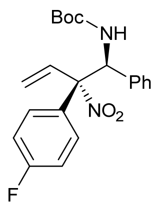
4i: Yellow oil; HPLC: OD-3, H/IPA = 98:2, flow rate = 0.3 mL/min, λ = 210 nm, 18.9 min (major enantiomer of major diastereomer), 35.2 min (minor enantiomer of major diastereomer), minor diastereomers were not assigned. Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 8.20 (1H, d, J = 8.5 Hz), 7.87 (2H, t, J = 8.5 Hz), 7.57–7.40 (7H, m), 7.38–7.35 (2H, m), 6.72 (1H, d, J = 9.6 Hz), 6.69 (1H, d, J = 9.6 Hz), 5.79 (1H, dd, J = 17.4, 10.8 Hz), 5.22 (1H, d, J = 10.8 Hz), 4.58 (1H, d, J = 17.4 Hz), 1.32 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.2, 136.2, 135.0, 133.8, 133.7, 131.7, 129.5, 129.1$_2$, 129.0$_7$, 128.8, 127.6, 126.8, 126.0, 125.9, 125.4, 123.7, 122.0, 103.1, 80.0, 52.4, 28.4; IR (film) 2926, 1713, 1549, 1487, 1368, 1325, 1165, 1067 cm^{-1}; HRMS (ESI) Calcd for $C_{25}H_{26}N_2O_4Na^+$ ([M+Na]$^+$) 441.1785. Found 441.1783.



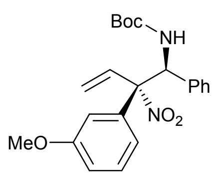
4j: Yellow oil; HPLC: AD-3, H/EtOH = 98:2, flow rate = 0.5 mL/min, λ = 210 nm, 12.7 min (major enantiomer of major diastereomer), 13.9 min (minor diastereomer), 15.7 min (minor diastereomer), 17.7 min (minor enantiomer of major diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.45–7.31 (5H, m), 7.24–7.15 (2H, m), 6.40–6.26 (3H, m), 6.06 (1H, d, J = 10.5 Hz), 5.84 (1H, d, J = 10.5 Hz), 5.46 (1H, d, J = 10.5 Hz), 4.87 (1H, d, J = 17.4 Hz), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.0, 150.3, 142.7, 134.9, 134.5, 129.0, 128.7, 127.1, 122.0, 110.7, 109.5, 101.1, 80.4, 53.6, 28.3; IR (film) 3431, 2976, 1713, 1551, 1485, 1366, 1329, 1231, 1155, 1013, 949, 870 cm^{-1}; HRMS (ESI) Calcd for $C_{19}H_{22}N_2O_5Na^+$ ($[M+Na]^+$) 381.1421. Found 381.1420.



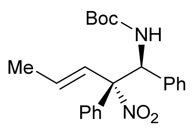
4k: White solid; HPLC: IA, H/IPA = 95:5, flow rate = 0.5 mL/min, λ = 210 nm, 10.3 min (major enantiomer of major diastereomer), 10.9 min (minor enantiomer of major diastereomer), 11.6 min (minor diastereomer), 12.7 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.38–7.29 (3H, m), 7.27–7.22 (2H, m), 7.21 (2H, d, J = 8.2 Hz), 7.10 (2H, d, J = 8.2 Hz), 6.43 (1H, d, J = 9.9 Hz), 6.14 (1H, dd, J = 17.3, 10.9 Hz), 5.60 (1H, d, J = 9.9 Hz), 5.36 (1H, d, J = 10.9 Hz), 4.66 (1H, d, J = 17.3 Hz), 2.38 (3H, s), 1.35 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 139.0, 136.8, 136.2, 132.1, 129.4, 128.8, 128.7, 127.3, 121.3, 101.7, 80.2, 59.2, 28.4, 21.2, one carbon atom was not found probably due to overlapping; IR (film) 3447, 2970, 1713, 1547, 1483, 1366, 1310, 1292, 1169, 1057, 843 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{26}N_2O_4Na^+$ ($[M+Na]^+$) 405.1785. Found 405.1787.



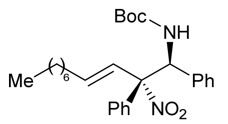
4l: White solid; HPLC: IC, H/IPA = 97:3, flow rate = 0.5 mL/min, λ = 210 nm, 10.5 min (major enantiomer of major diastereomer), 13.0 min (minor diastereomer), 14.0 min (minor diastereomer), 18.7 min (minor enantiomer of major diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.39–7.31 (3H, m), 7.26–7.18 (4H, m), 7.10 (2H, t, $J_{H–H}$ = 8.7 Hz, $J_{F–H}$ = 8.7 Hz), 6.38 (1H, d, J = 9.8 Hz), 6.16 (1H, dd, J = 17.2, 11.0 Hz), 5.60 (1H, d, J = 9.8 Hz), 5.39 (1H, d, J = 11.0 Hz), 4.65 (1H, d, J = 17.2 Hz), 1.35 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 162.8 (d, $J_{F–C}$ = 253.5 Hz), 155.1, 136.4, 136.0, 130.9 (d, $J_{F–C}$ = 2.9 Hz), 129.5 (d, $J_{F–C}$ = 8.7 Hz), 128.9, 128.8, 128.6, 128.5, 121.5, 115.7 (d, $J_{F–C}$ = 22.3 Hz), 101.4, 80.4, 59.3, 28.4; IR (film) 3453, 2978, 1709, 1605, 1549, 1514, 1485, 1312, 1236, 1169, 1055, 943, 837 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{23}N_2O_4F_1Na^+$ ($[M+Na]^+$) 409.1534. Found 409.1535.



4m: White solid; HPLC: IF-3, H/IPA/EtOH = 94:2:4, flow rate = 0.5 mL/min, λ = 210 nm, 11.0 min (minor enantiomer of major diastereomer), 12.1 min (major enantiomer of major diastereomer), 13.2 min (minor diastereomer), 13.8 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.38–7.29 (4H, m), 7.27–7.22 (2H, m), 6.94 (1H, dd, J = 8.2, 2.3 Hz), 6.83–6.74 (2H, m), 6.44 (1H, d, J = 9.6 Hz), 6.13 (1H, dd, J = 17.3, 10.9 Hz), 5.62 (1H, d, J = 9.6 Hz), 5.38 (1H, d, J = 10.9 Hz), 4.73 (1H, d, J = 17.3 Hz), 3.81 (3H, s), 1.34 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 159.8, 155.1, 136.7, 136.3, 135.8, 129.7, 128.8, 128.7, 121.4, 119.6, 114.8, 113.1, 101.8, 80.2, 59.2, 55.5, 28.4, one carbon atom was not found probably due to overlapping; IR (film) 3443, 2978, 1703, 1601, 1547, 1487, 1352, 1288, 1227, 1167, 1030, 949 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{26}N_2O_5Na^+$ ($[M+Na]^+$) 421.1734. Found 421.1733.

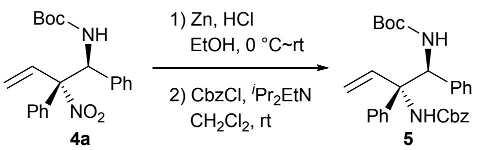


4n: White solid; HPLC: AZ-3, H/IPA = 98:2, flow rate = 0.3 mL/min, λ = 210 nm, 21.5 min (minor enantiomer of major diastereomer), 25.3 min (major enantiomer of major diastereomer), 29.4 min (minor diastereomer), 31.6 min (minor diastereomer). Absolute and relative configurations were assigned on the analogy of **4a**. ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.44–7.30 (6H, m), 7.28–7.16 (4H, m), 6.42 (1H, d, J = 9.6 Hz), 5.78 (1H, dd, J = 15.8, 3.2 Hz), 5.61 (1H, d, J = 9.6 Hz), 5.03 (1H, sextet, J = 9.0 Hz), 1.67 (3H, d, J = 6.4 Hz), 1.33 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 136.9, 135.9, 133.5, 129.4, 128.8, 128.7_4, 128.6_9, 128.6_0, 127.4, 101.9, 80.1, 59.5, 28.4, 18.3, one carbon atom was not found probably due to overlapping; IR (film) 3451, 2972, 1713, 1547, 1479, 1366, 1292, 1161, 1047, 970, 843 cm^{-1}; HRMS (ESI) Calcd for $C_{22}H_{26}N_2O_4Na^+$ ($[M+Na]^+$) 405.1785. Found 405.1785.



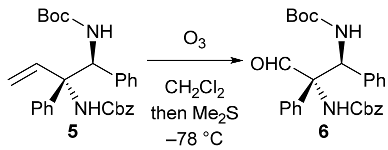
4o: HPLC analysis was performed after reduction of the nitro group to give the corresponding amine **S1**. Absolute and relative configurations were assigned on the analogy of **4a**. White solid; ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.44–7.37 (3H, m), 7.37–7.30 (3H, m), 7.28–7.16 (4H, m), 6.43 (1H, d, J = 10.1 Hz), 5.75 (1H, d, J = 16.0 Hz), 5.61 (1H, d, J = 10.1 Hz), 5.02 (1H, dt, J = 16.0, 6.8 Hz), 1.98 (2H, q, J = 6.8 Hz), 1.34 (9H, s), 1.31–1.17 (10H, m), 0.87 (3H, t, J = 6.9 Hz); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.1, 138.6, 136.9, 135.9, 128.7, 128.6, 128.3, 127.4, 102.0, 80.1, 59.6, 32.5, 31.9, 29.1, 28.6, 28.4, 22.8, 14.2, four carbon atoms were not found probably due to overlapping; IR (film) 3453, 2922, 1713, 1547, 1483, 1425, 1391, 1256, 1161, 972 cm^{-1}; HRMS (ESI) Calcd for $C_{28}H_{38}N_2O_4Na^+$ ($[M+Na]^+$) 489.2724. Found 489.2725. **S1**: The synthesis was performed by following the procedure for amine **S2** (shown below). White solid; HPLC: IA, H/IPA = 98:2, flow rate = 0.3 mL/min, λ = 210 nm, 35.6 min (minor enantiomer of major diastereomer), 42.2 min (minor diastereomer), 47.6 min (minor diastereomer), 56.7 min (major enantiomer of major diastereomer). ^{1}H NMR (400 MHz, $CDCl_3$) *anti* isomer δ 7.49 (2H, d, J = 7.8 Hz), 7.33 (2H, t, J = 7.8 Hz), 7.29–7.20 (4H, m), 7.18 (2H, br), 5.95 (1H, d, J = 15.6 Hz), 5.64 (1H, brd, J = 7.5 Hz), 5.27 (1H, dt, J = 15.6, 6.8 Hz), 5.03 (1H, d, J = 7.5 Hz), 1.95 (2H, q, J = 6.8 Hz), 1.36–1.07 (19H, m), 0.87 (3H, t, J = 6.8 Hz); ^{13}C NMR (101 MHz, $CDCl_3$) *anti* isomer δ 155.4, 144.5, 139.1, 136.4, 129.6, 128.5, 128.3, 127.7, 127.3, 126.8, 126.2, 79.2, 62.2, 32.4, 31.9, 29.3, 29.2, 28.3, 22.8, 14.3, two carbon atoms were not found probably due to overlapping; IR (film) 3362, 2965, 2924, 1703, 1514, 1366, 1248, 1163, 1011 cm^{-1}; HRMS (ESI) Calcd for $C_{28}H_{41}N_2O_2$ ($[M+H]^+$) 437.3163. Found 437.3157.

Derivatization of 4a:

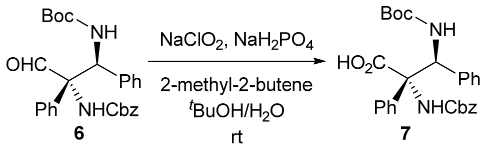


Conversion of Nitroalkene 4a to Differentially Protected Diamine 5: 4a (36.8 mg, 0.10 mmol) was taken in HCl/EtOH/H_2O (666.7 μL, 3.0 M, 2.0 mmol, EtOH/H_2O = 1:2) and Zn powder (130.8 mg, 2.0 mmol) was introduced to the solution portionwise. The mixture was stirred for 12 h at ambient temperature. The reaction mixture was diluted with water and the aqueous phase was extracted with EA twice. The combined organic extracts were washed with brine and dried over Na_2SO_4. After concentration, the resulting residue was purified by column chromatography on silica gel (H/EA = 1:1 as eluent) to afford the corresponding amine **S2** in 90% yield (30.5 mg, 0.090 mmol). **S2:** White solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (2H, d, J = 7.8 Hz), 7.34 (2H, t, J = 7.8 Hz), 7.30–7.22 (4H, m), 7.19 (2H, brd, J = 6.9 Hz), 6.42 (1H, dd, J = 17.4, 10.8 Hz), 5.66 (1H, brd, J = 6.9 Hz), 5.09 (1H, d, J = 6.9 Hz), 5.04 (1H, d, J = 10.8 Hz), 4.93 (1H, d, J = 17.4 Hz), 1.23 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) δ 155.4, 144.4, 143.7, 138.9, 128.4_4, 128.3_7, 127.8, 127.4, 127.0, 126.2, 113.4, 79.3, 62.9, 62.0, 28.3; IR (film) 3318, 2976, 1703, 1585, 1514, 1366, 1248, 1169, 995 cm^{-1}; HRMS (ESI) Calcd for $C_{21}H_{27}N_2O_4^+$ ([M+H]$^+$) 339.2067. Found 339.2065.

The amine **S2** (30.5 mg, 0.090 mmol) was dissolved into CH_2Cl_2 (0.90 mL) and ^{i}Pr$_2$EtN (39.6 µL, 0.23 mmol) and benzyl chloroformate (19.3 µL, 0.14 mmol) were added sequentially. The reaction mixture was stirred for 24 h and poured to water. The mixture was then extracted with $CHCl_3$ twice and the combined organic extracts were washed with brine. Organic extracts were dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified by silica gel column chromatography (H/EA = 5/1 as eluent) to afford **5** in 56% yield (23.6 mg, 0.050 mmol). **5:** White solid; ^{1}H NMR (400 MHz, acetone) δ 7.48 (1H, d, J = 8.2 Hz), 7.42–7.38 (3H, m), 7.38–7.28 (5H, m), 7.28–7.21 (1H, m), 7.21–7.11 (5H, m), 6.67 (1H, s), 6.08 (1H, dd, J = 17.4, 10.5 Hz), 5.38 (1H, d, J = 8.7 Hz), 5.19–5.09 (3H, m), 5.03 (1H, d, J = 12.4 Hz), 4.84 (1H, d, J = 17.4 Hz), 1.30 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.1, 155.4, 140.6, 137.8, 137.5, 136.6, 128.7, 128.5, 128.4_1, 128.3_6, 127.7, 127.6, 127.5, 126.7, 116.4, 80.1, 66.9, 66.5, 62.3, 28.5, one carbon atom was not found probably due to overlapping; IR (film) 3354, 2970, 1715, 1699, 1489, 1456, 1364, 1246, 1165 cm^{-1}; HRMS (ESI) Calcd for $C_{29}H_{32}N_2O_4Na^+$ ([M+Na]$^+$) 495.2254. Found 495.2248.

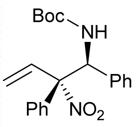


Ozonolysis of the Double Bond in 5: Ozone (O_3) gas was generated from pure oxygen by using OZM-300SW (Blowerman co. jp.) and was passed through a solution of **5** (23.6 mg, 0.050 mmol) in CH_2Cl_2 (0.50 mL) at –78 °C for 1 h. Consumption of **5** was monitored by TLC and then, the passing O_3 gas was exchanged with pure oxygen. After a while, dimethyl sulfide (36.7 µL) was added to the solution and the mixture was allowed to warm up to room temperature. All volatiles were removed by evaporation to afford the crude residue, which was purified by column chromatography on silica gel (H/EA = 5:1 as eluent) to give **6** (19.0 mg, 0.040 mmol, 80%). **6:** White solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.40 (1H, s), 7.48–7.31 (11H, m), 7.27–7.18 (3H, m), 7.09 (2H, d, J = 7.8 Hz), 6.14 (1H, s), 5.96 (1H, d, J = 9.6 Hz), 5.24 (1H, d, J = 12.6 Hz), 5.08 (1H, d, J = 12.6 Hz), 1.37 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) δ 190.8, 156.5, 156.2, 137.7, 136.2, 132.5, 129.5, 129.0, 128.9, 128.8, 128.5, 128.3, 128.2, 127.5, 127.1, 79.8, 74.4, 67.5, 56.7, 28.5; IR (film) 3372, 2978, 1711, 1697, 1506, 1456, 1365, 1248, 1165, 1067 cm^{-1}; HRMS (ESI) Calcd for $C_{28}H_{30}N_2O_5Na^+$ ([M+Na]$^+$) 497.2047. Found 497.2047.

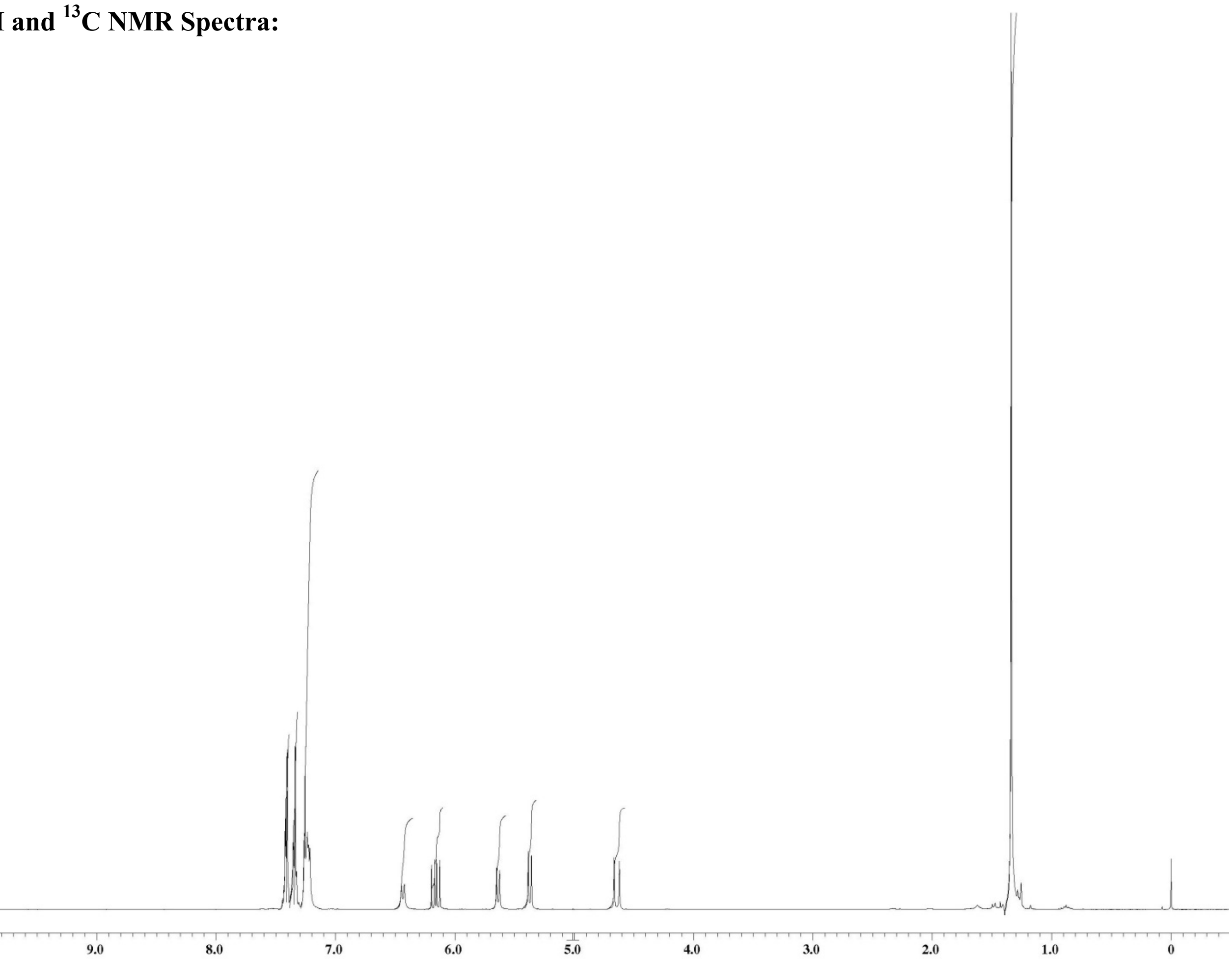


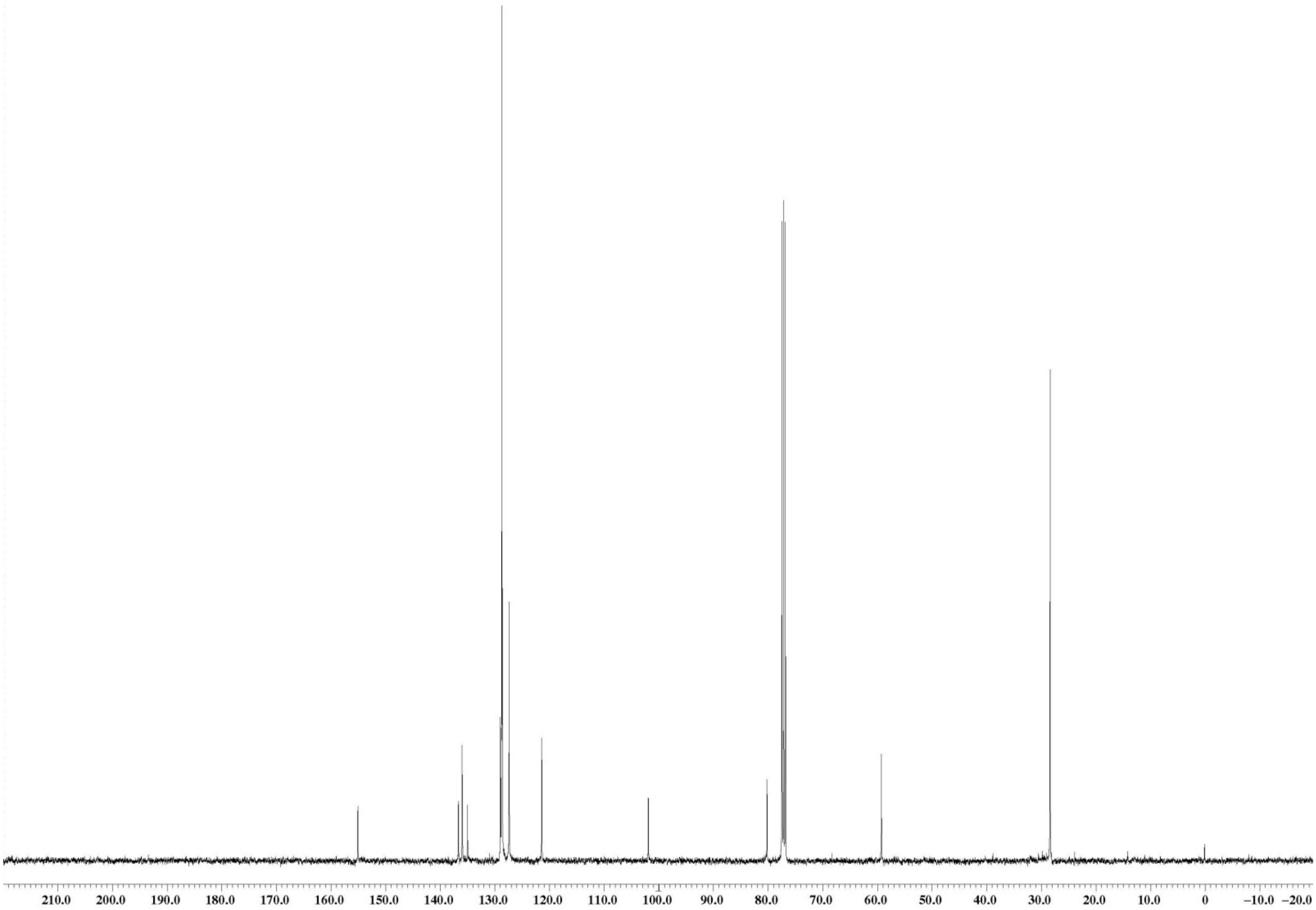
Pinnick Oxidation of 6: To a solution of **6** (19.0 mg, 0.040 mmol) in ^{t}BuOH/H_2O (0.45/0.35 mL) were added $NaClO_2$ (10.9 mg, 0.12 mmol), NaH_2PO_4 (24.0 mg, 0.20 mmol), and 2-methyl-2-butene (42.5 µL, 0.40 mmol) at room temperature with stirring. After being stirred for 1 h, the reaction mixture was diluted with brine and the aqueous phase was extracted with EA twice. Organic phases were dried over Na_2SO_4, filtered, and concentrated. The residual material was purified by column chromatography on silica gel ($CHCl_3$/MeOH = 5:1 as eluent) to give **7** (12.0 mg, 0.024 mmol, 61%), whose enantiomeric excess was determined by HPLC analysis after derivatizing to the corresponding methyl ester (97% ee).[1a] **7:** White solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (1H, br), 7.50 (2H, brd, J = 6.4 Hz), 7.42–7.20 (11H, m), 7.15 (2H, t, J = 7.3 Hz), 6.57 (1H, br), 6.31 (1H, br), 5.21 (1H, d, J = 12.4 Hz), 5.05 (1H, d, J = 12.4 Hz), 1.32 (9H, s); ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 157.1, 156.6, 138.0, 136.4, 136.2, 128.7, 128.6, 128.5, 128.4, 128.3, 128.1, 127.9, 127.3, 80.8, 67.3, 28.5, three carbon atoms were not found probably due to overlapping; IR (film) 3368, 2926, 1713, 1667, 1497, 1368, 1248, 1163, 1051, 885 cm^{-1}; HRMS (ESI) Calcd for $C_{28}H_{30}N_2O_6Na^+$ ($[M+Na]^+$) 513.1996. Found 513.2009. HPLC (methyl ester): AD-H, H/EtOH = 95:5, flow rate = 1.0 mL/min, λ = 210 nm, 7.4 min (1*S*, 2*S*), 8.6 min (1*R*, 2*R*), 27.2 min (minor diastereomer), 40.5 min (minor diastereomer). Absolute and relative configurations were assigned by comparison with the literature data.[1a]

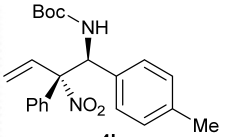
Copies of ^{1}H and ^{13}C NMR Spectra:



4a



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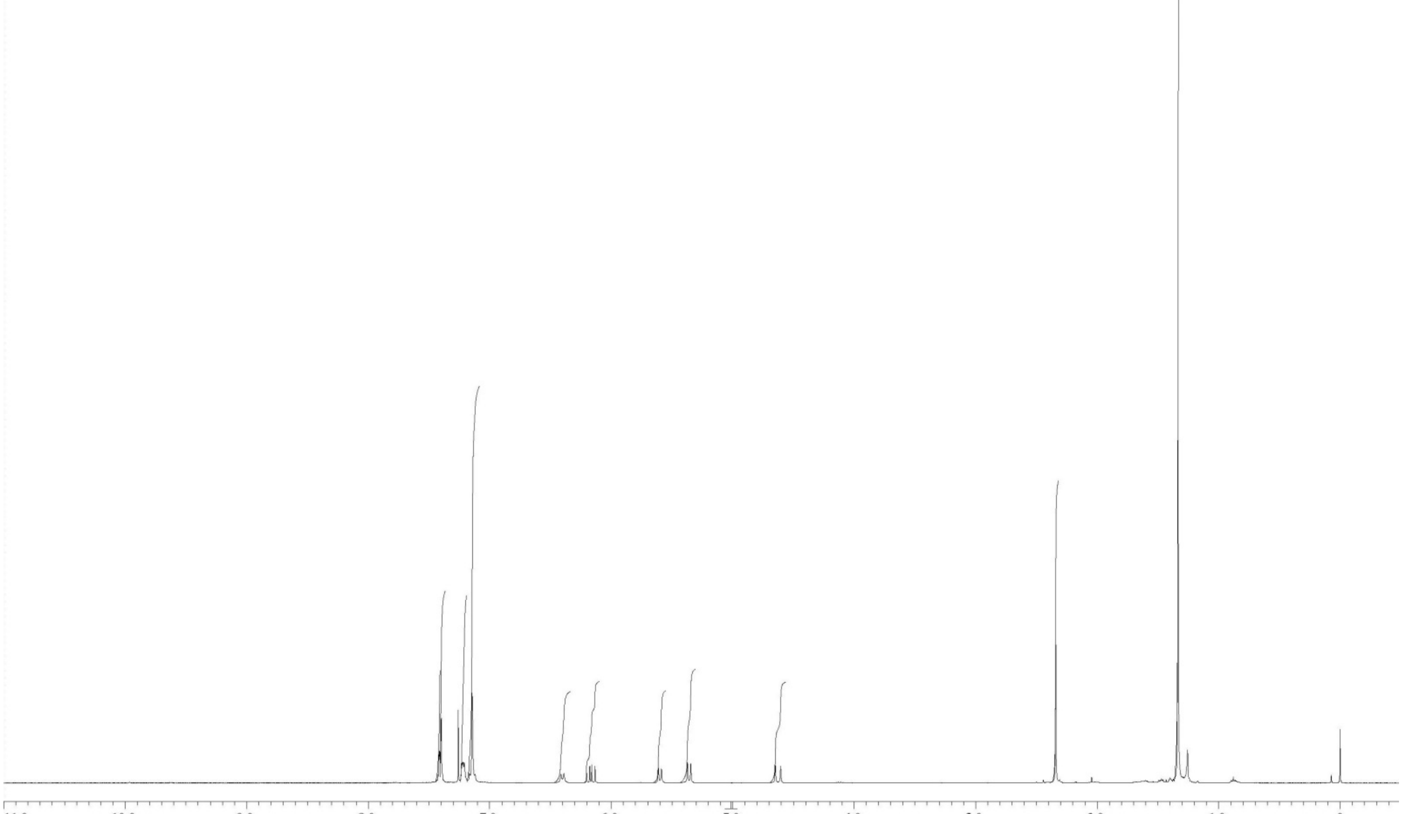
NH
Ph
NO2
Me

4b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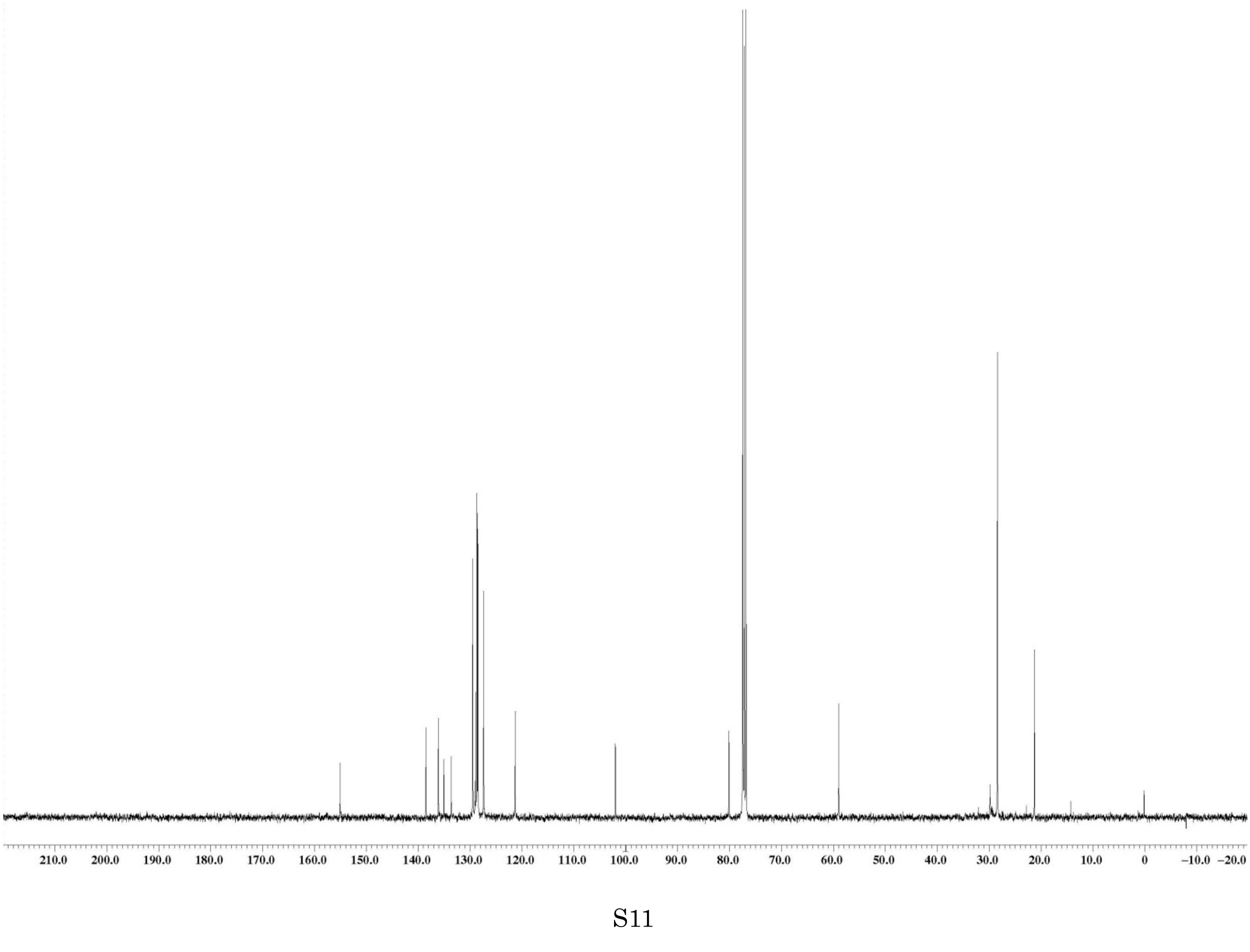
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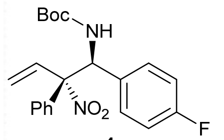
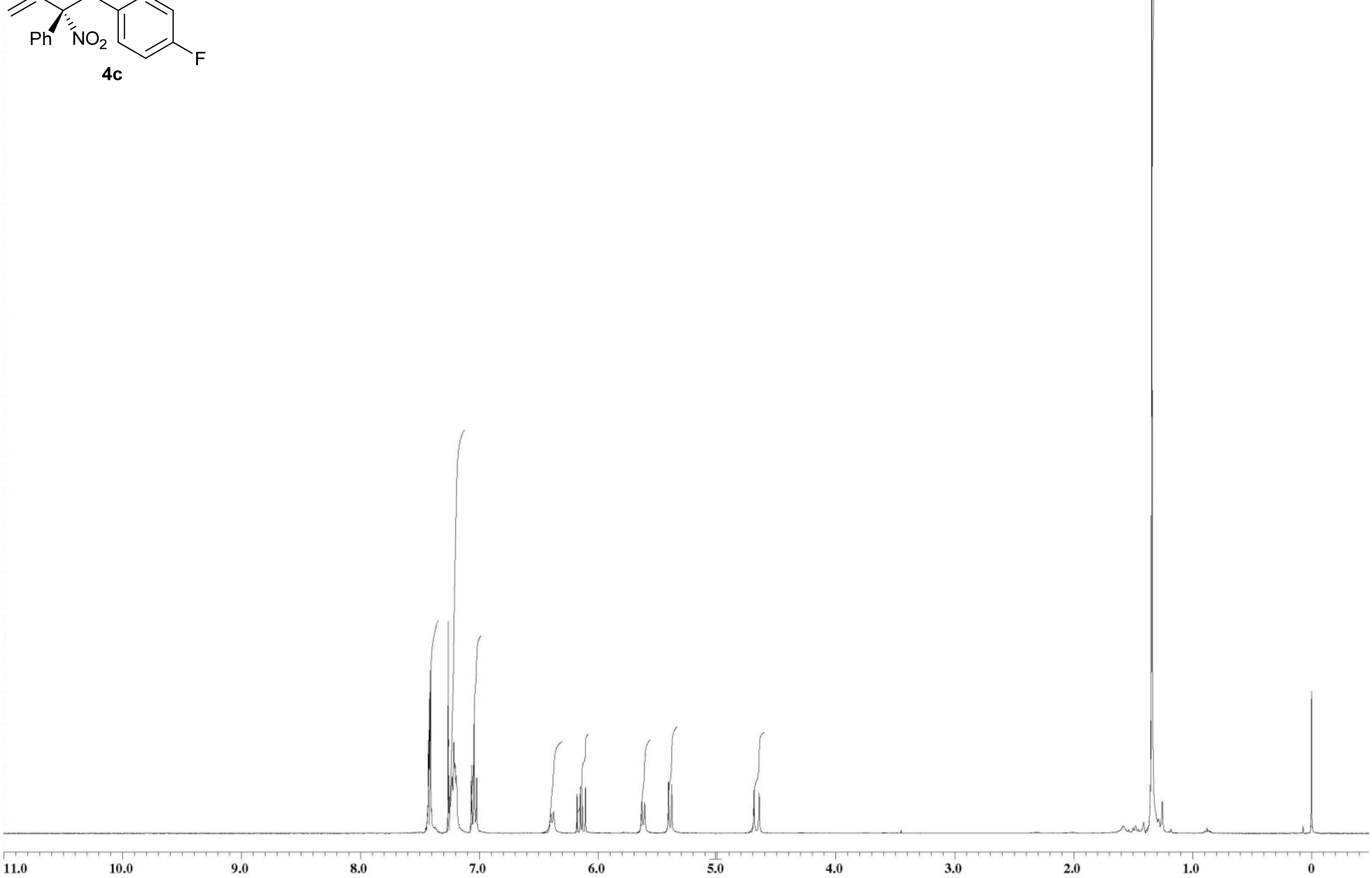

Boc
NH
Ph
NO2
F

4c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6.0
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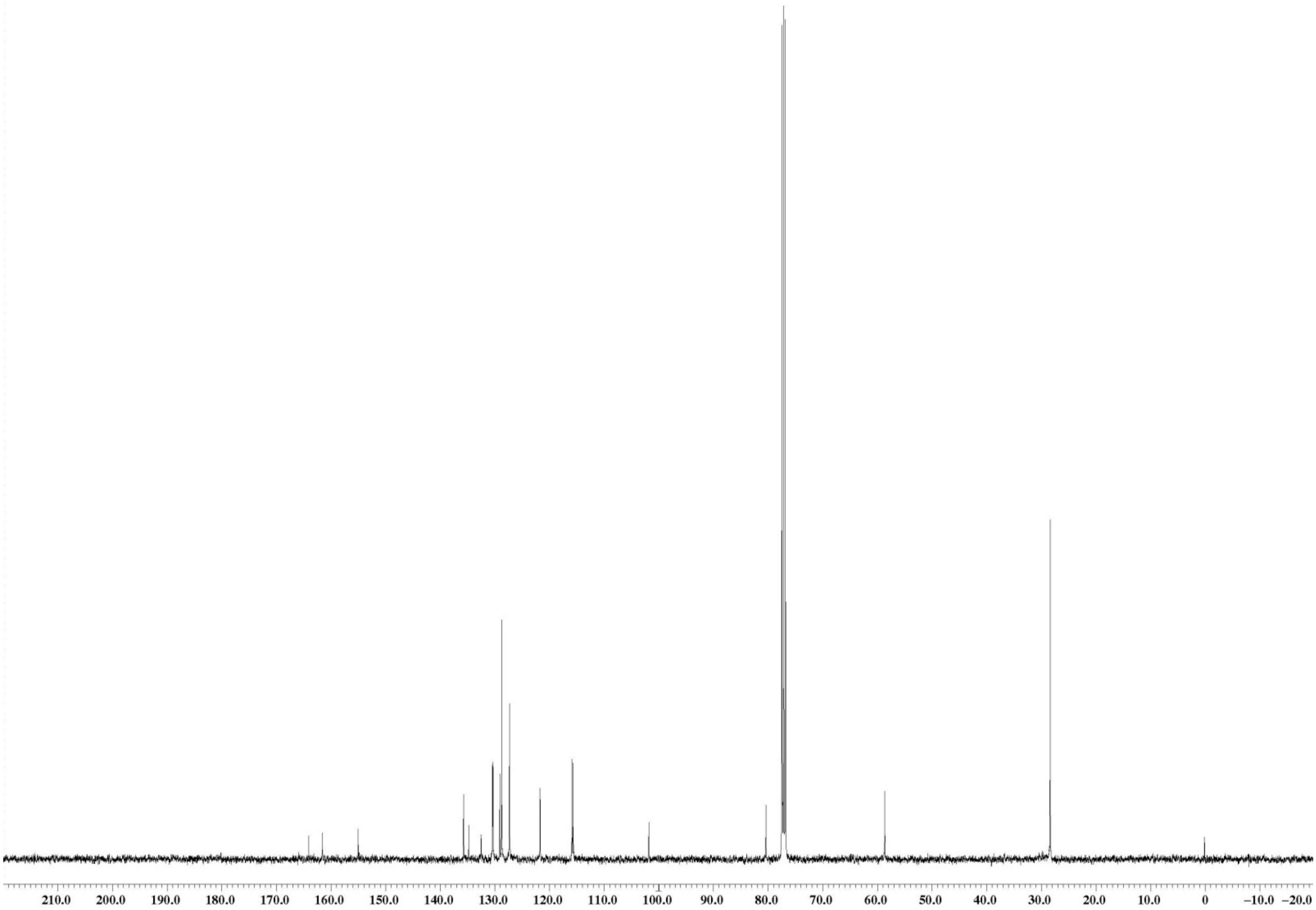
4.0
3.0
2.0
1.0
0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40.0
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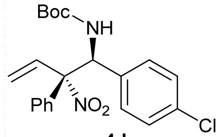
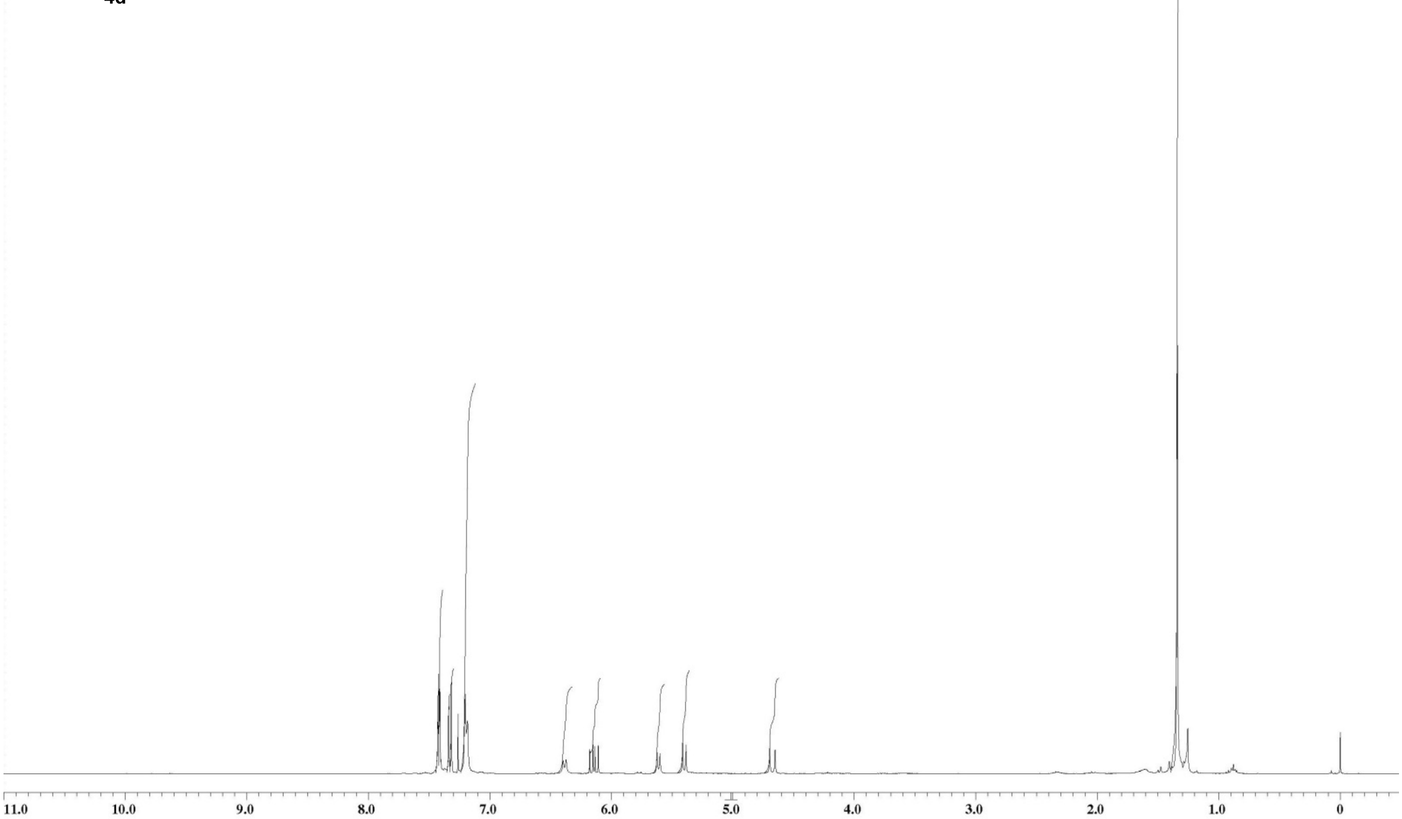
10.0
0
−10.0
−20.0


Boc
NH
Ph
NO2
Cl

4d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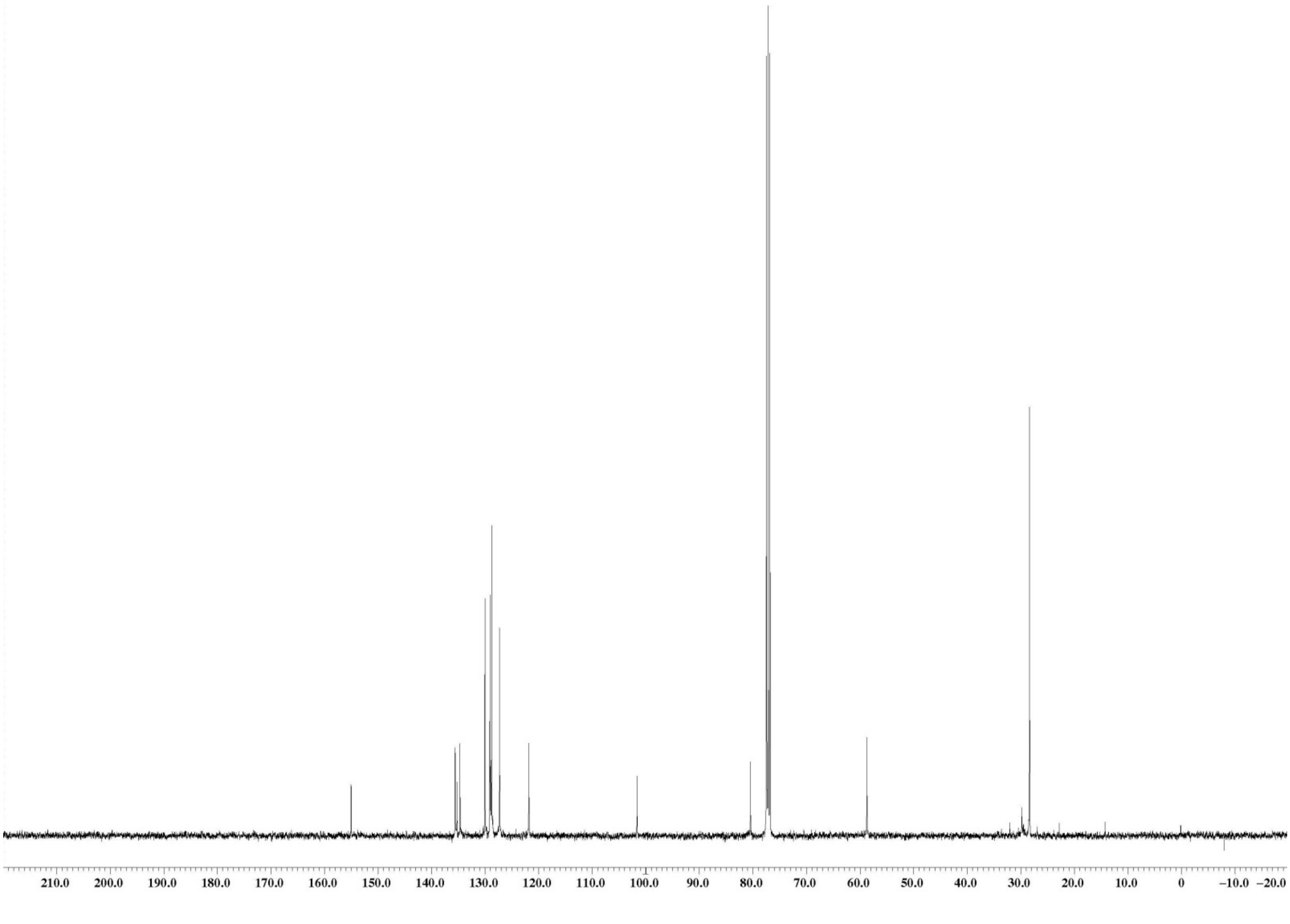
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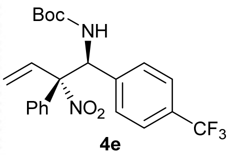
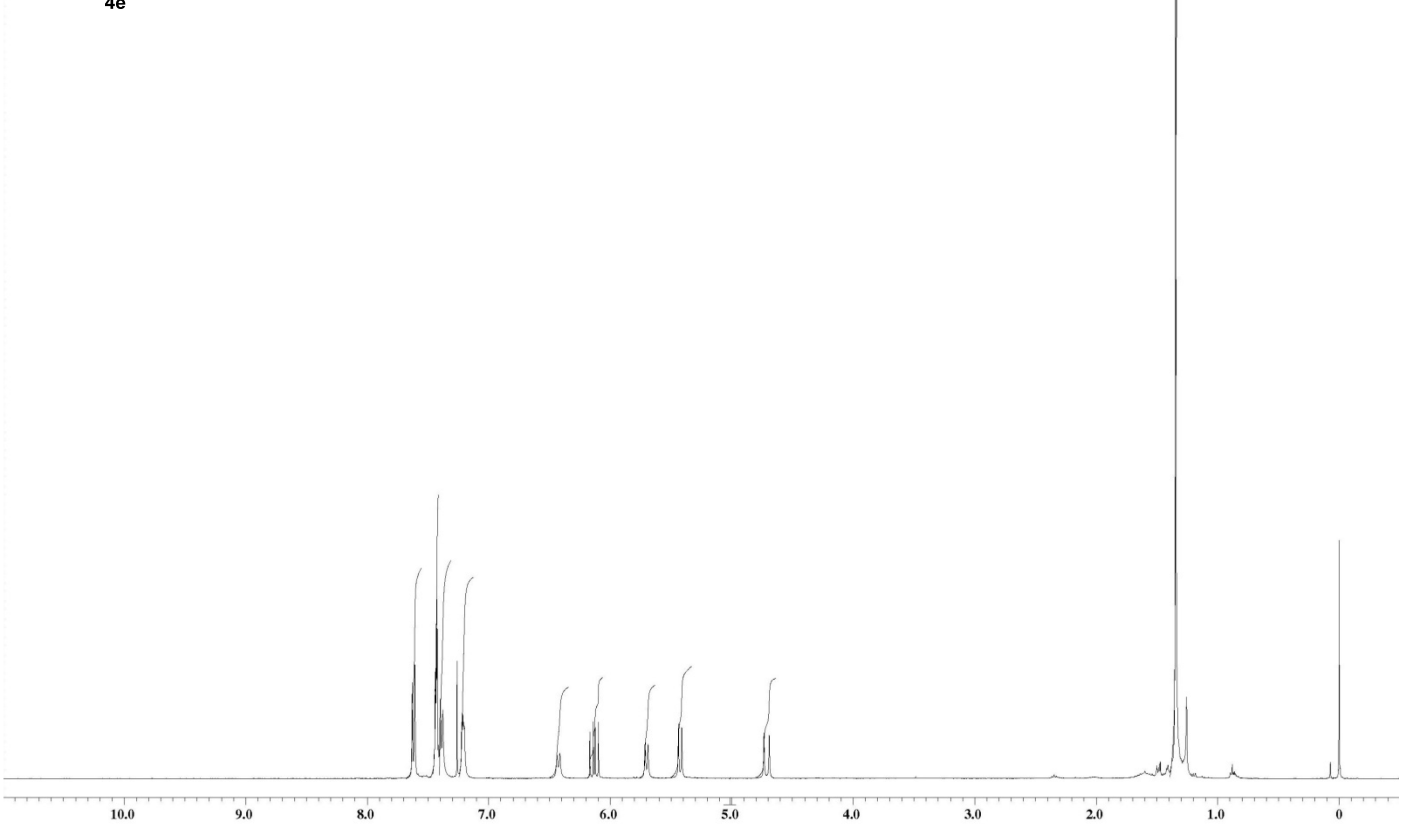

Boc
NH
Ph
NO2
CF3

4e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4.0
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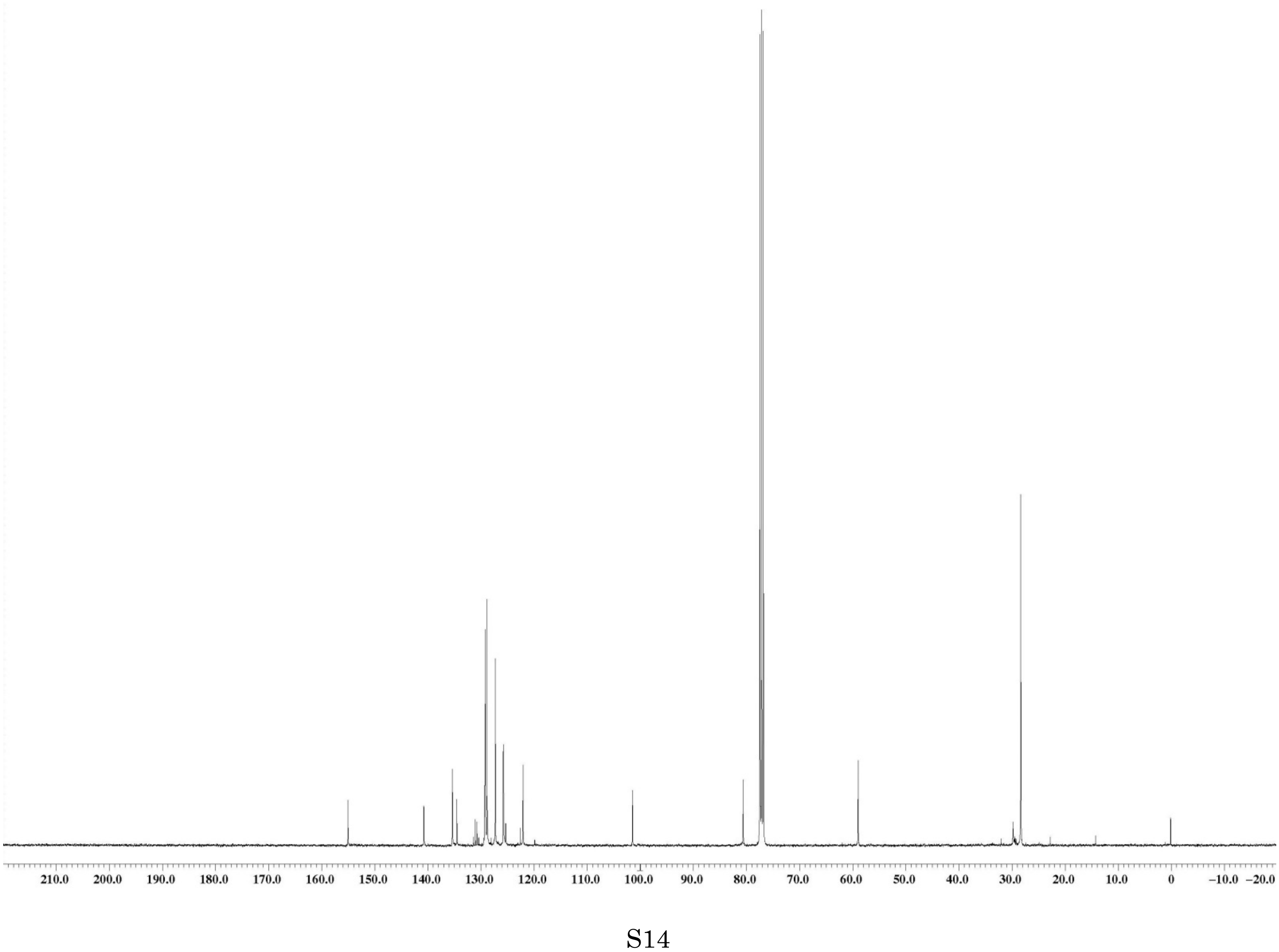
2.0
1.0
0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100.0
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0
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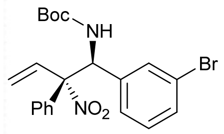
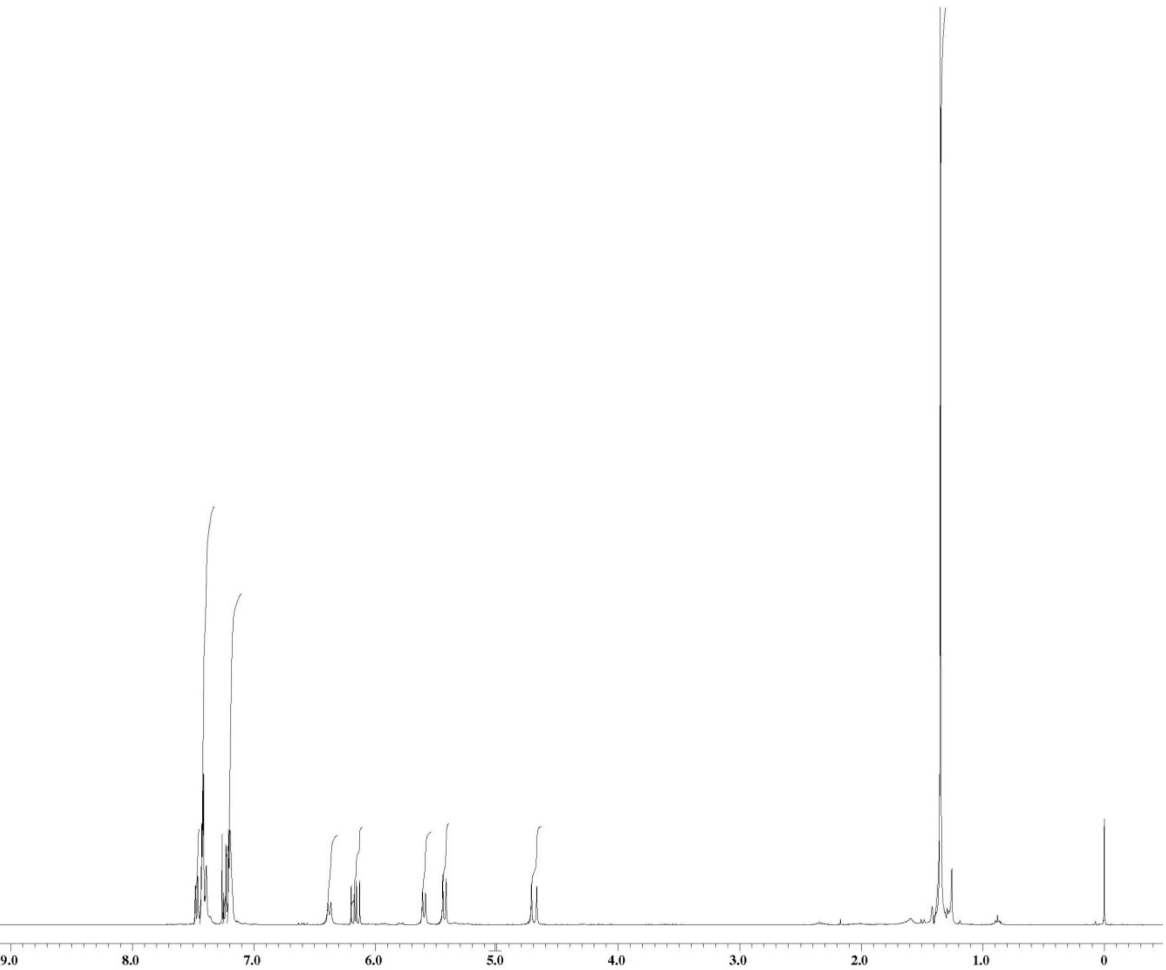
−20.0


Boc
NH
Br
Ph
NO2

4f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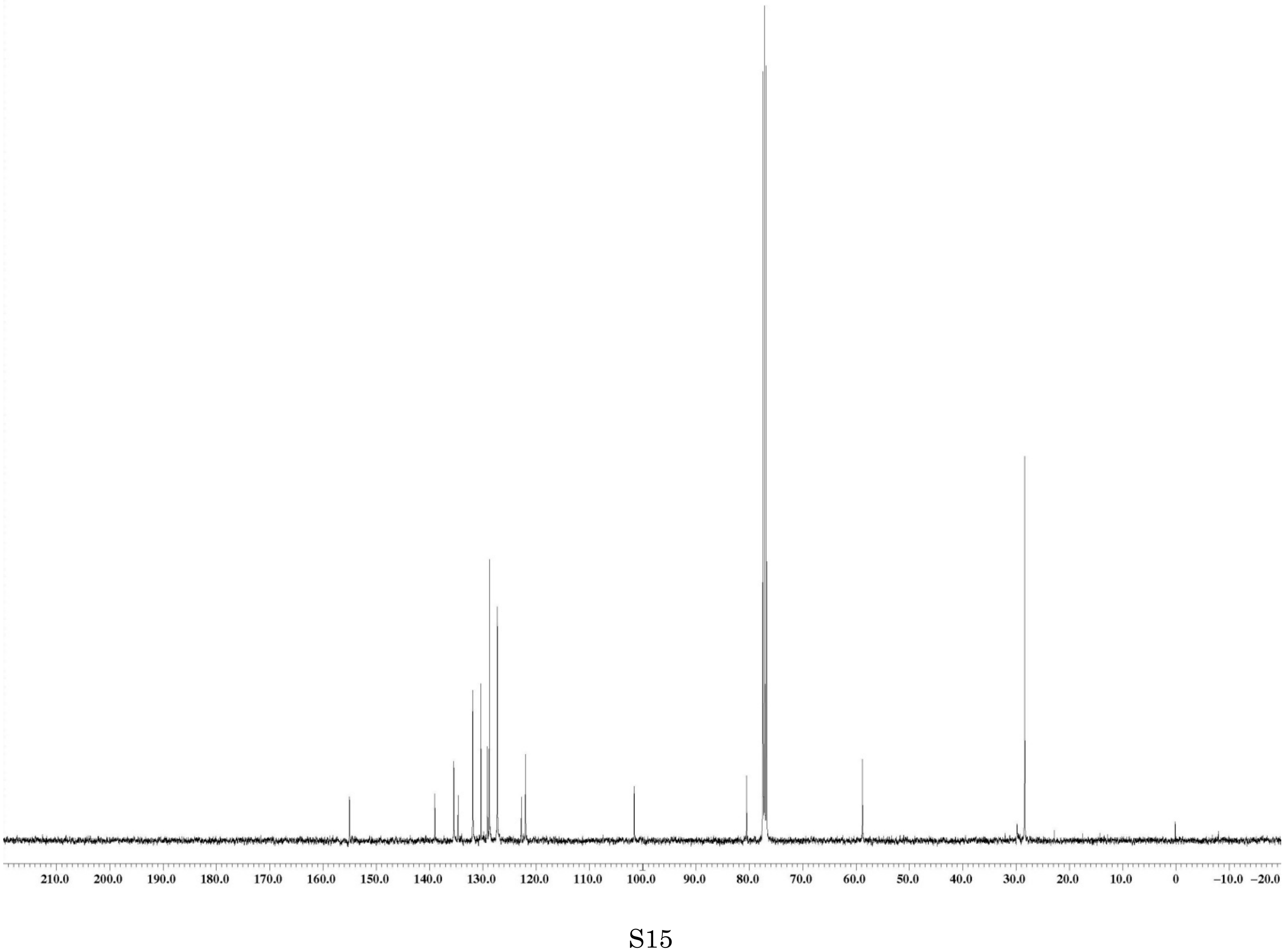
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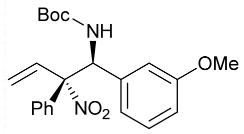
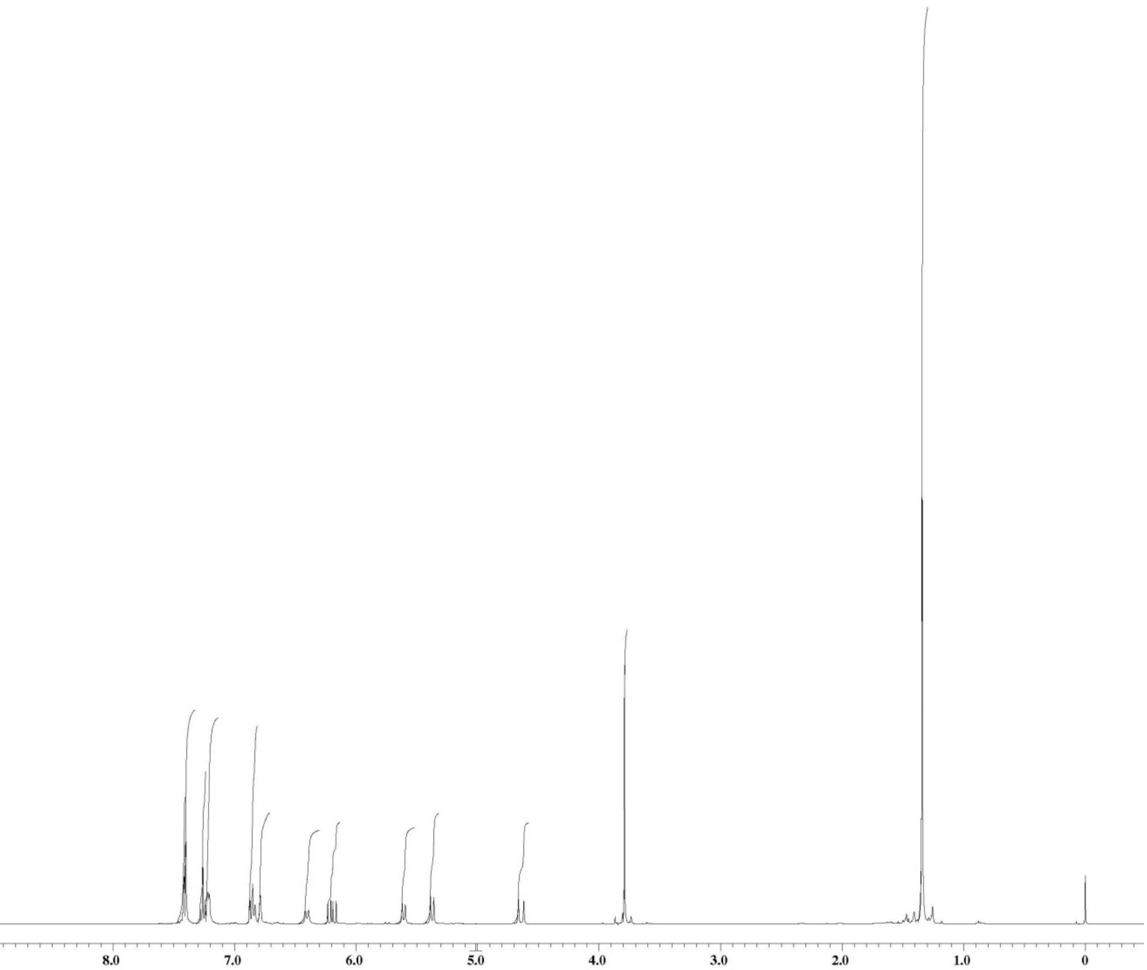


Boc
NH
OMe
Ph
NO2

4g



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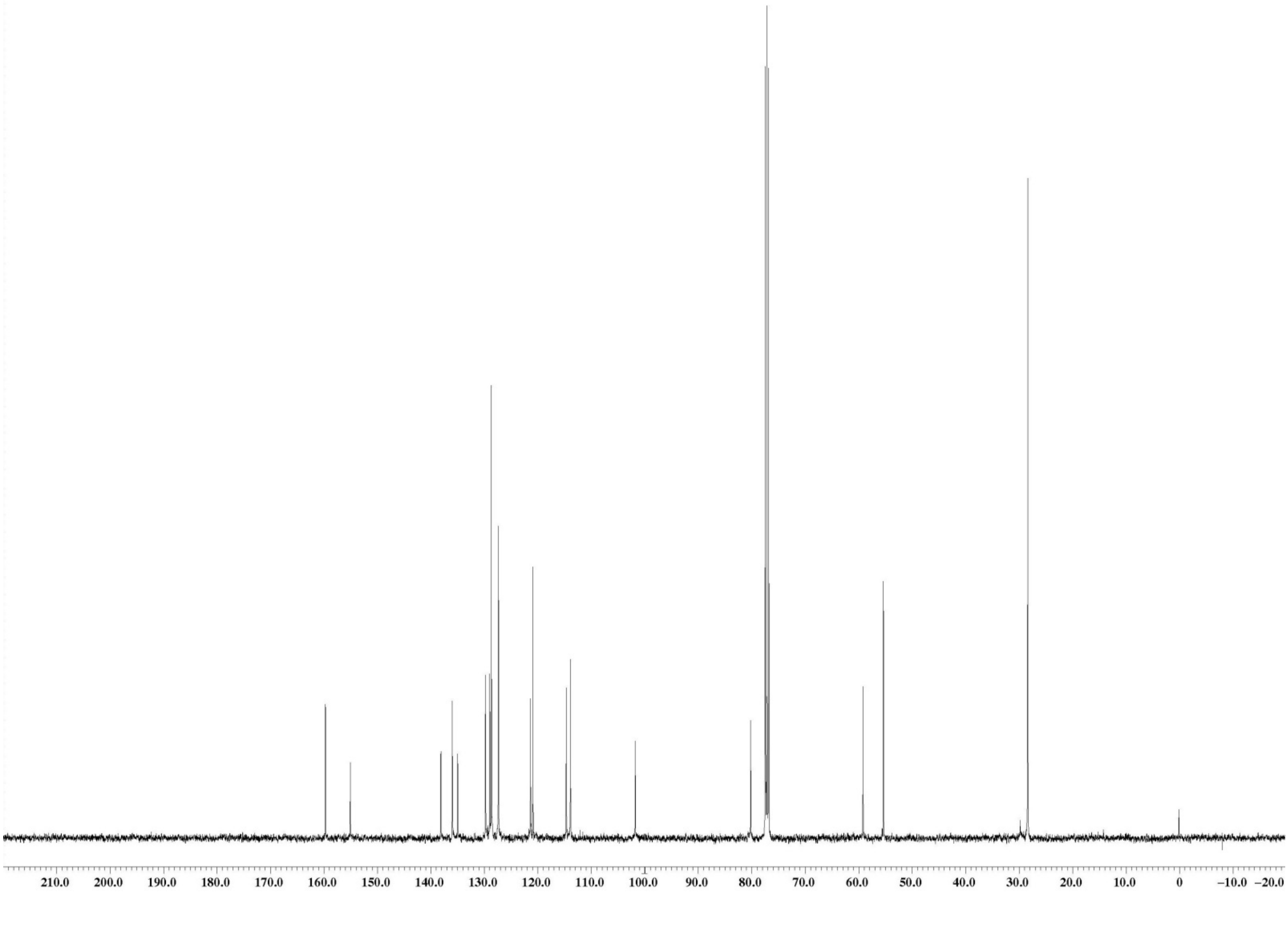

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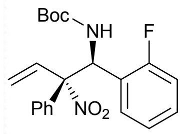
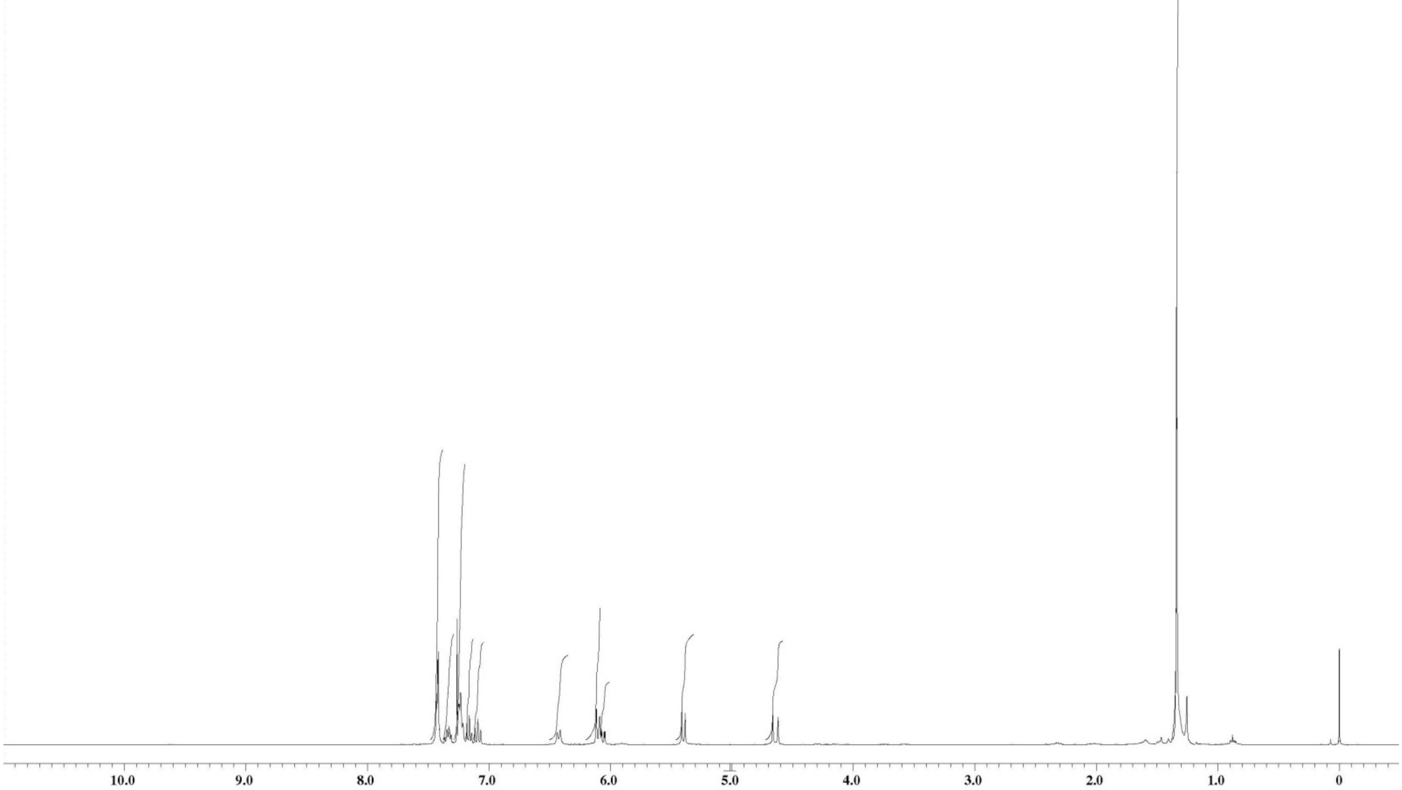
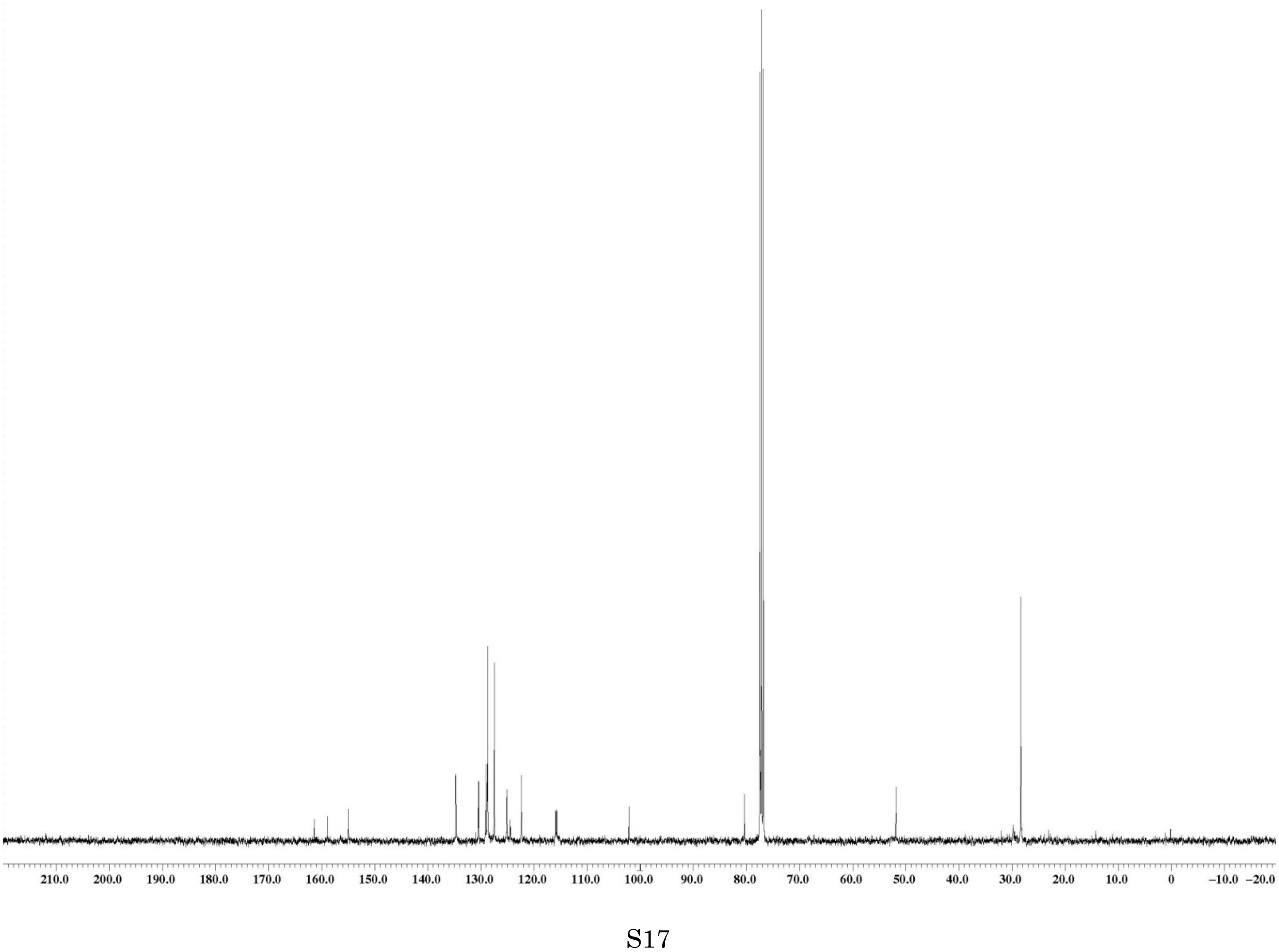
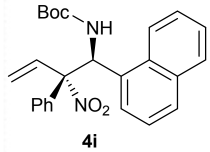


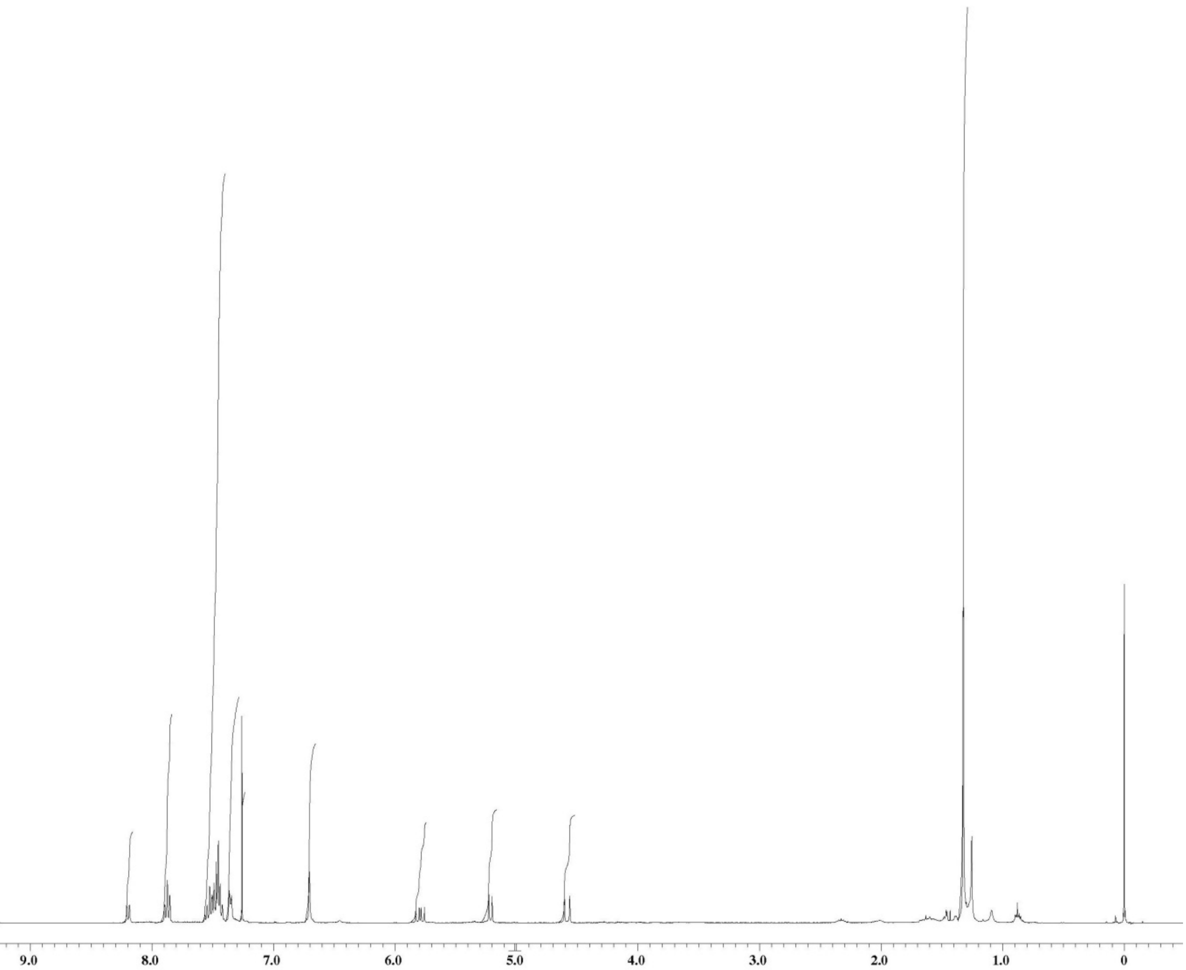
4h






Boc
NH
Ph
NO2

4i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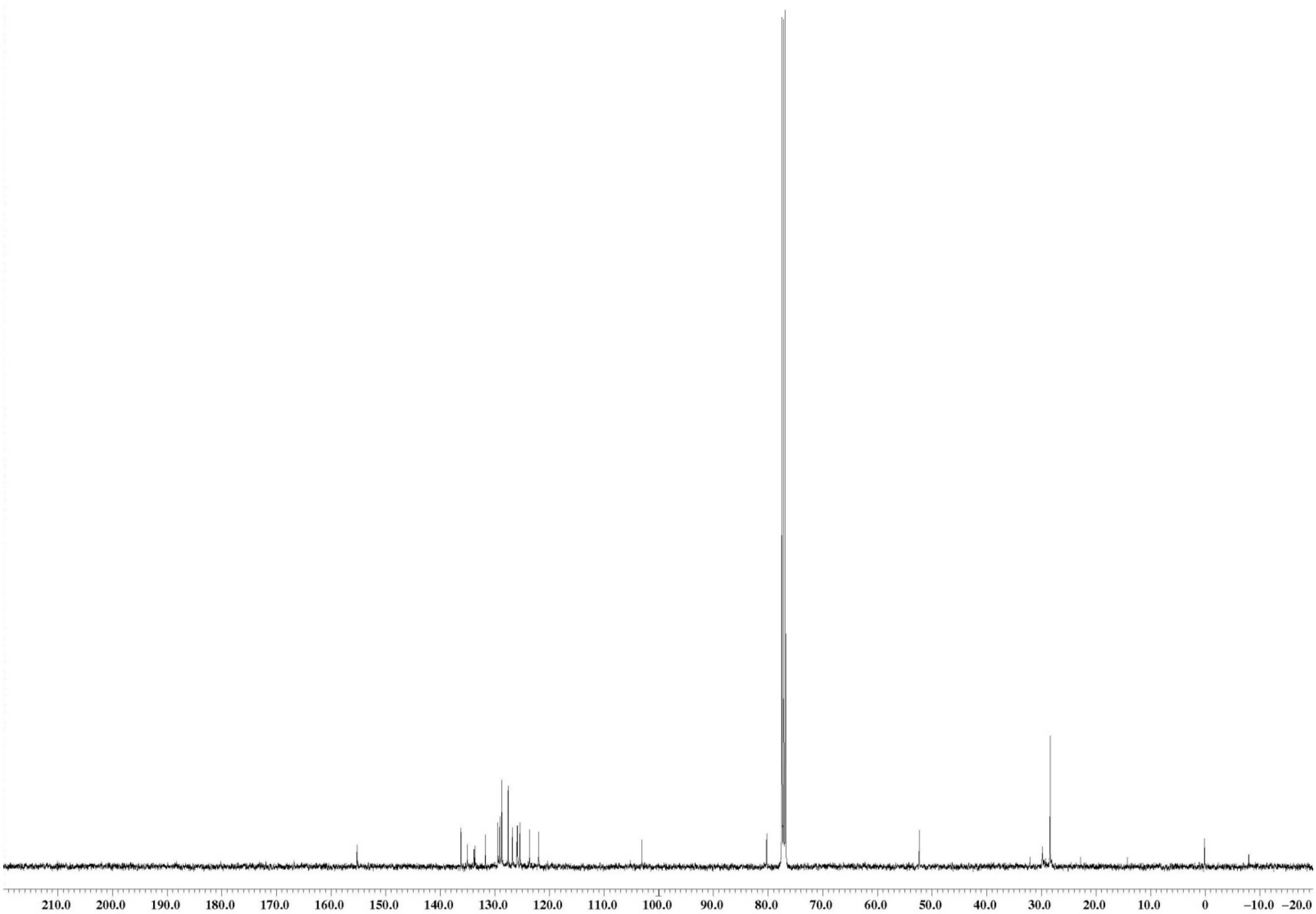
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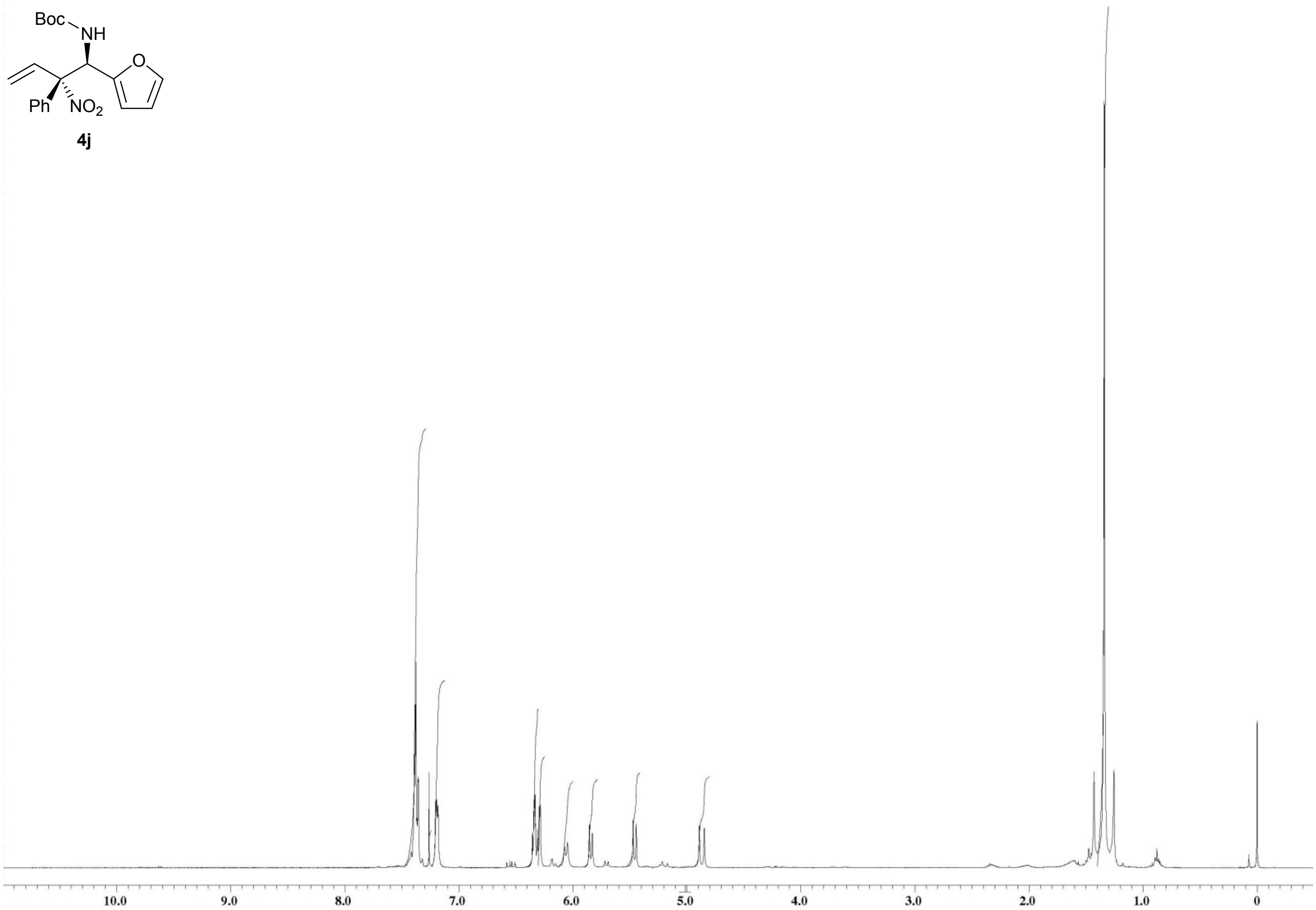
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NH
O
Ph
NO2
4j
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9.0
8.0
7.0
6.0
5.0
4.0
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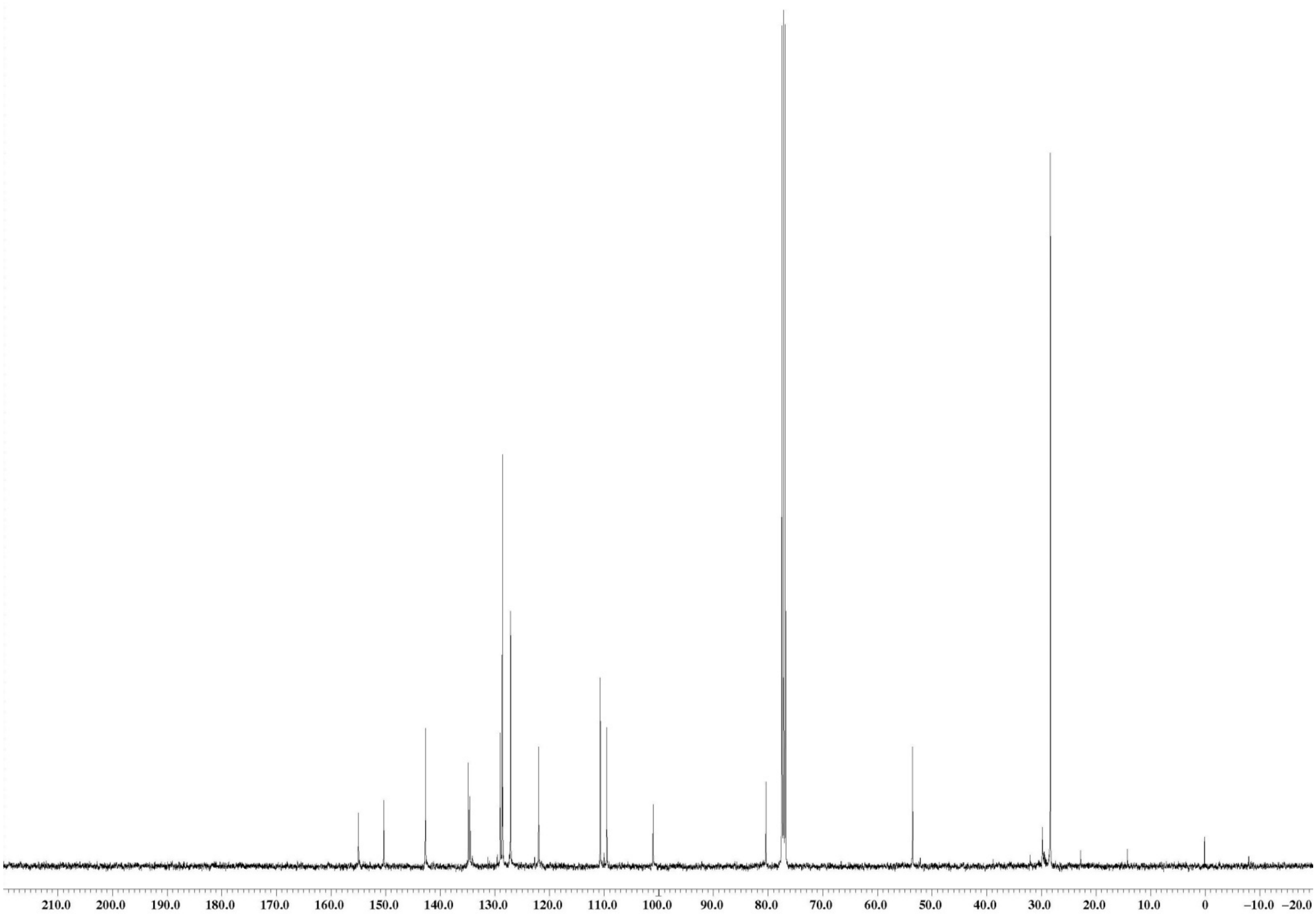
2.0
1.0
0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40.0
30.0
20.0
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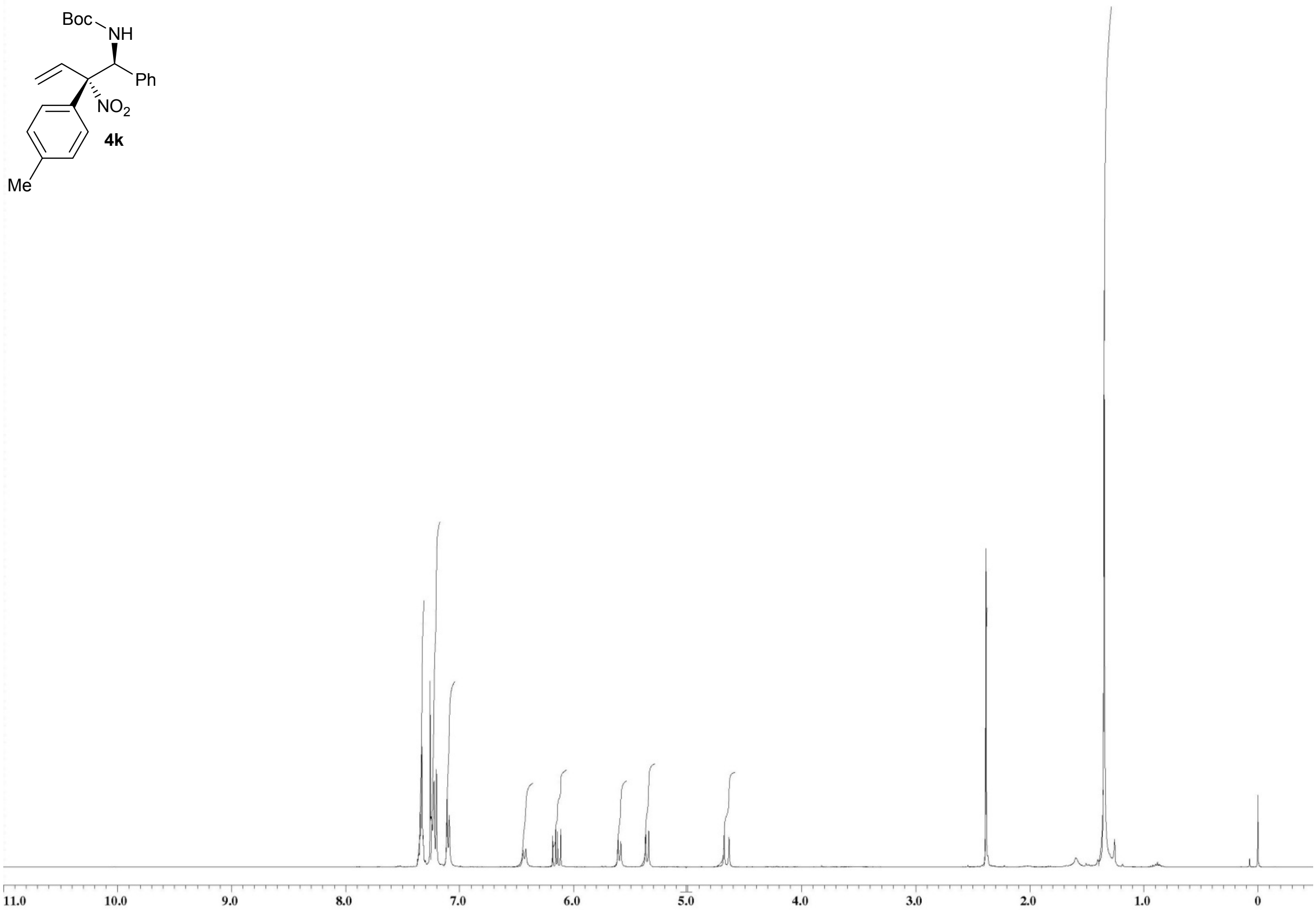
0
−10.0
−20.0


Boc
NH
Ph
NO2
Me
4k
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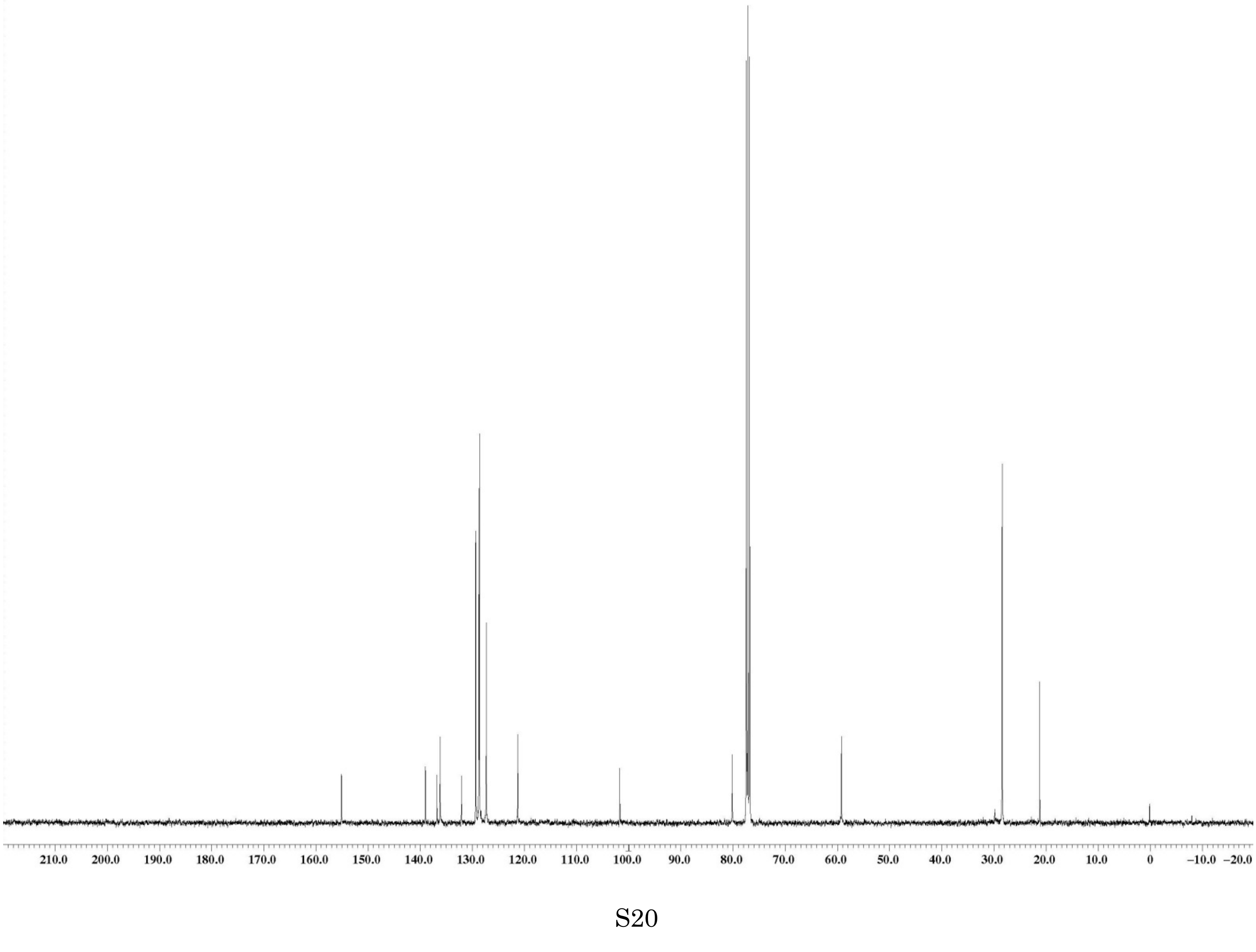
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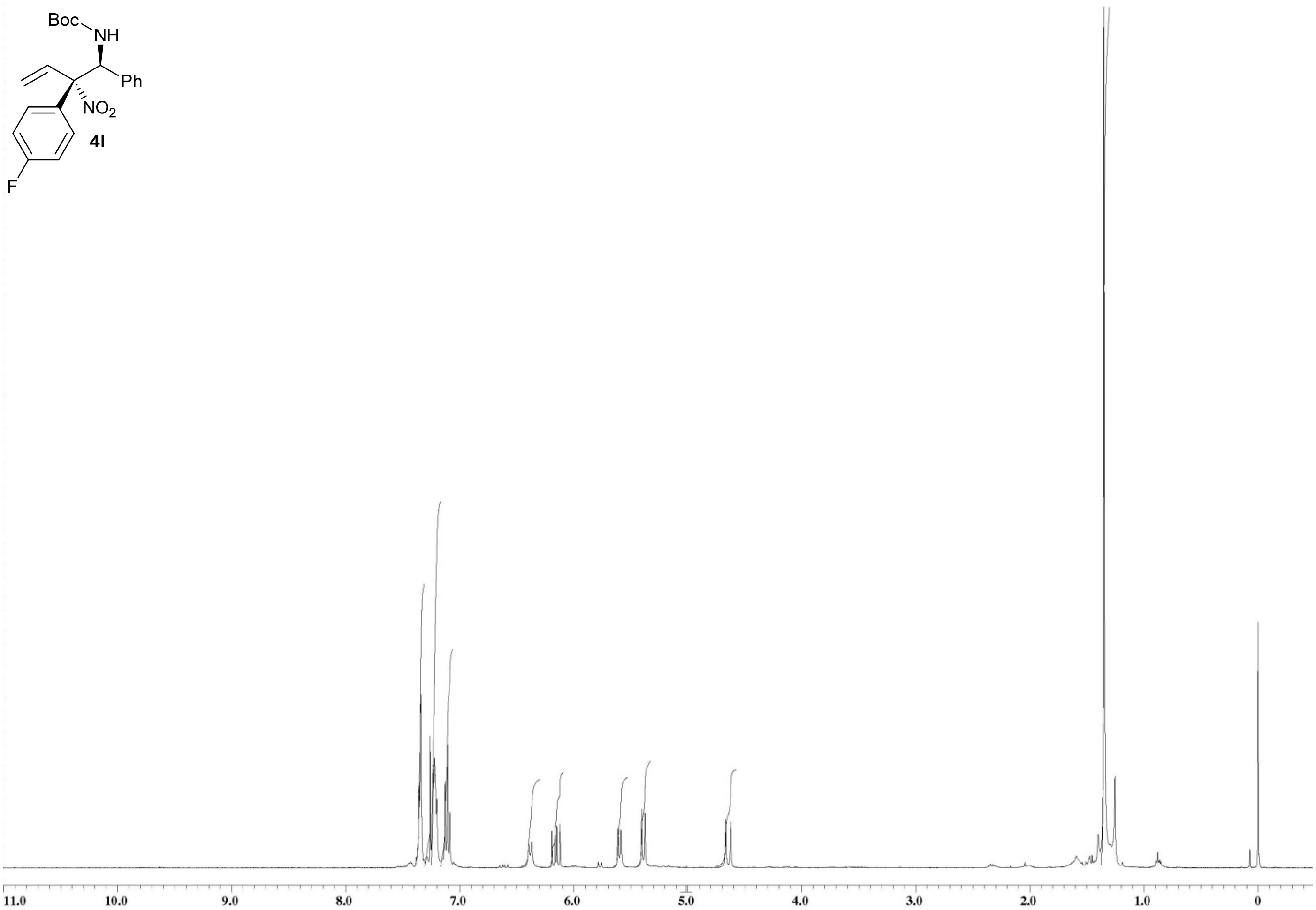
Boc
NH
Ph
NO2
4l
F
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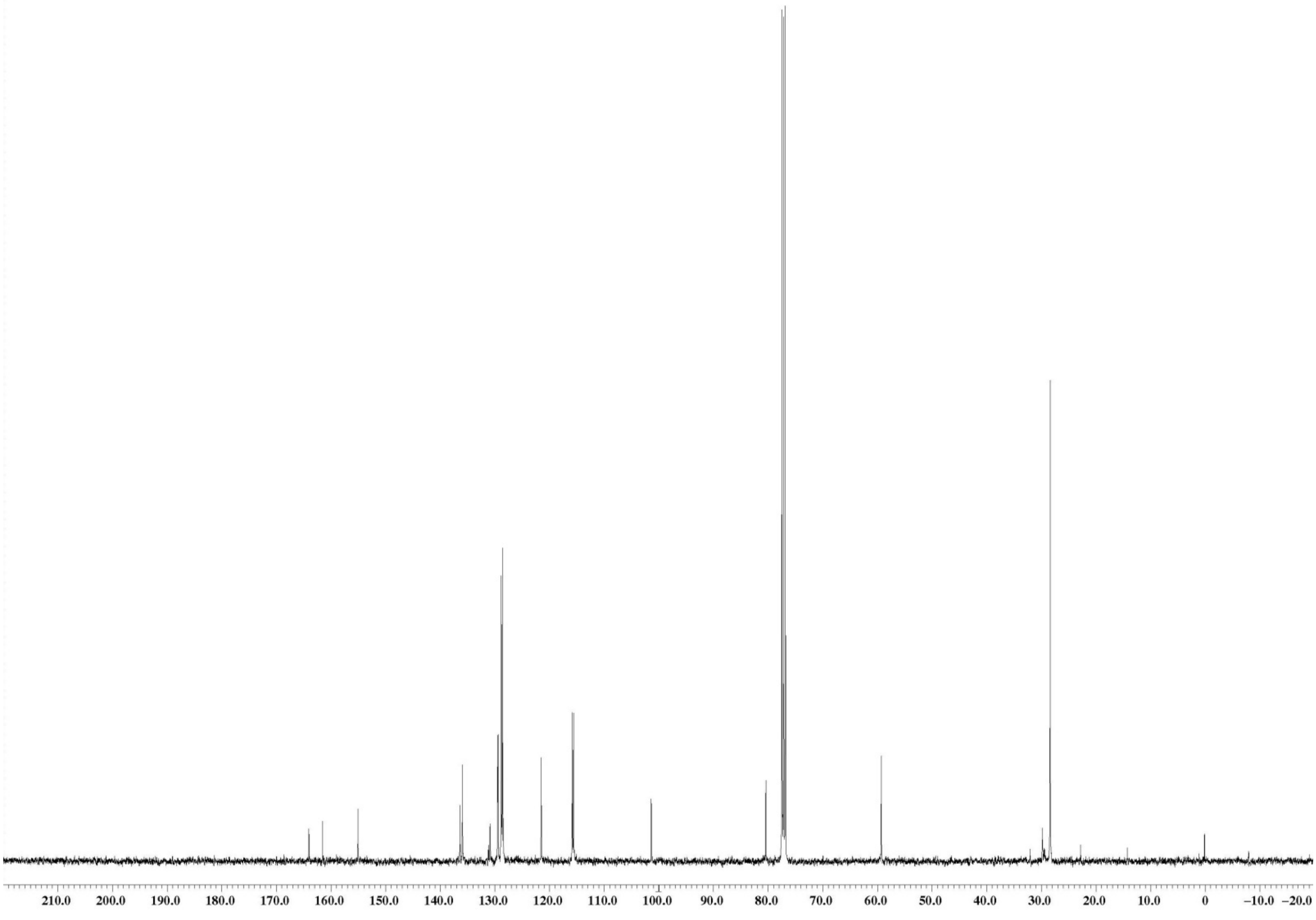
1.0
0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200.0
190.0
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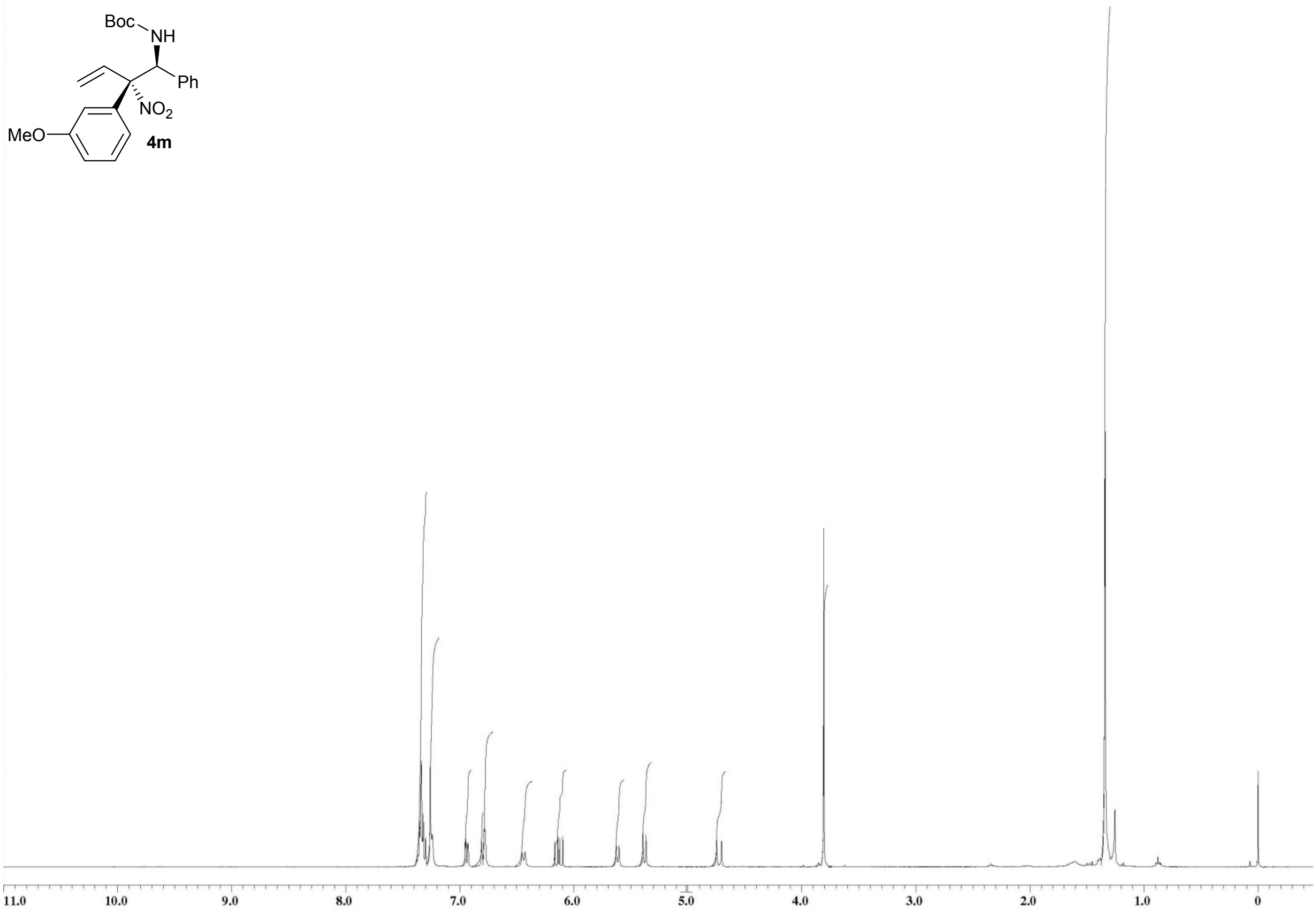
−10.0
−20.0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NH
Ph
NO2
MeO
4m
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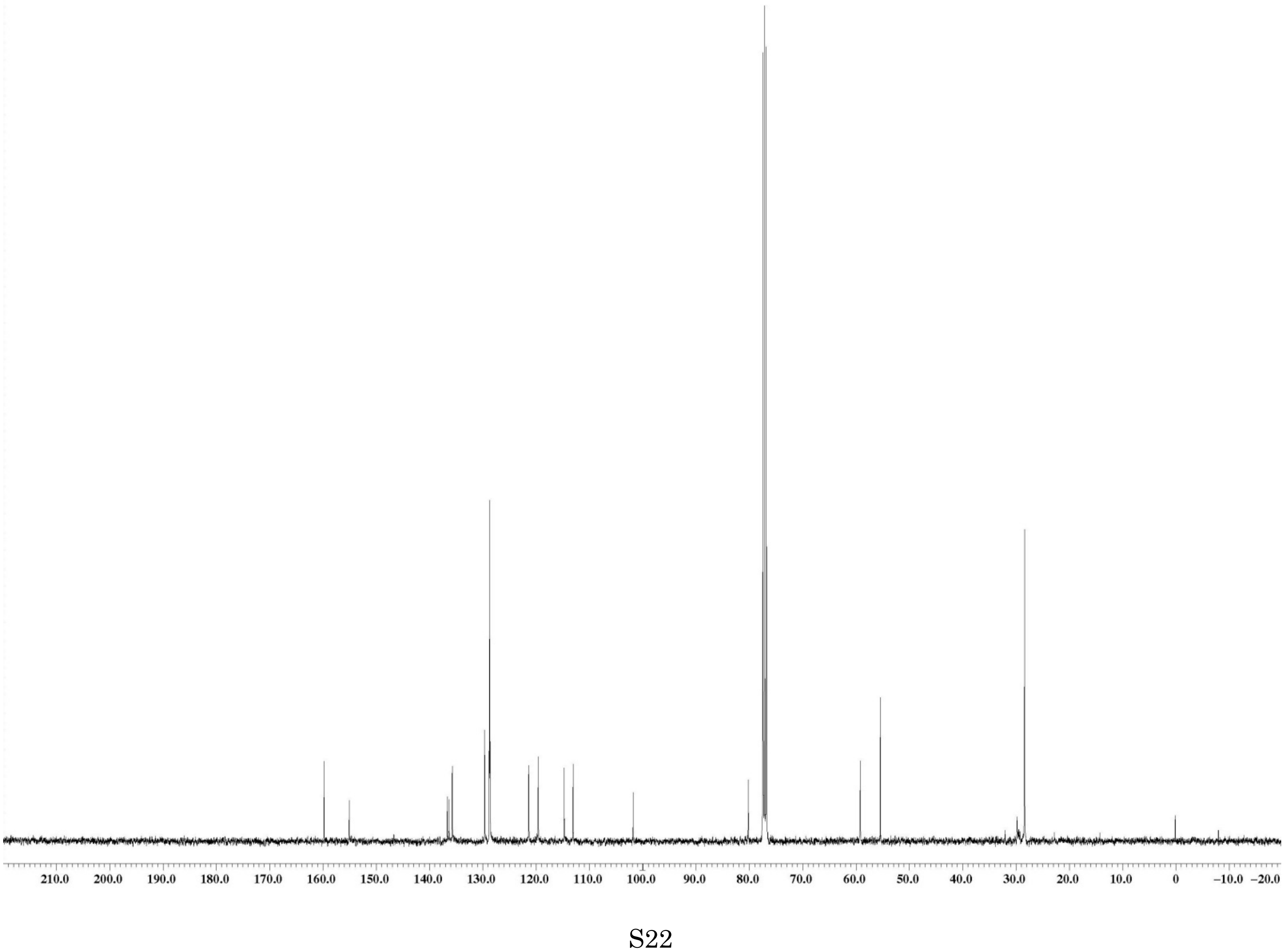
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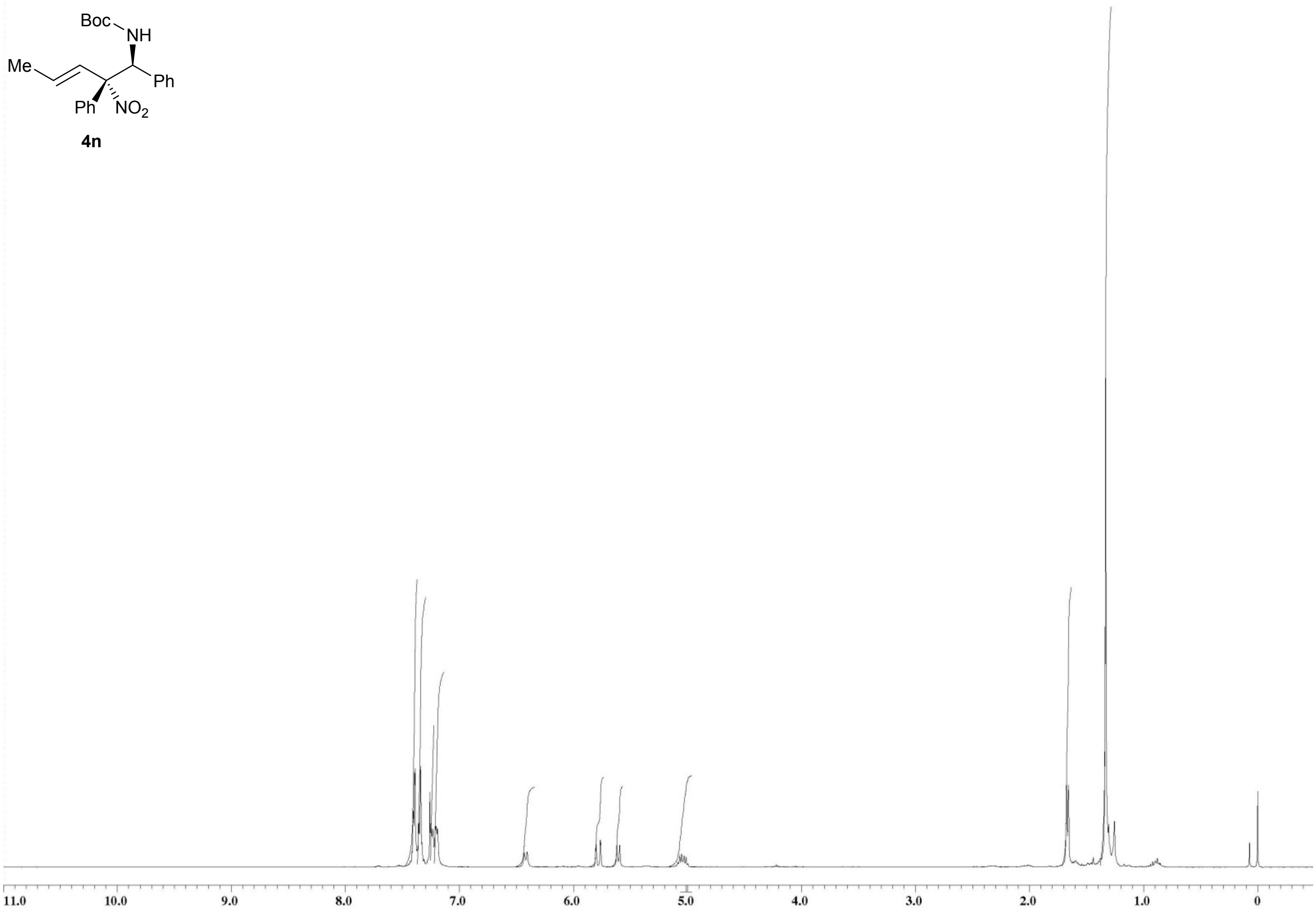
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NH
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Ph
Ph
NO2
4n
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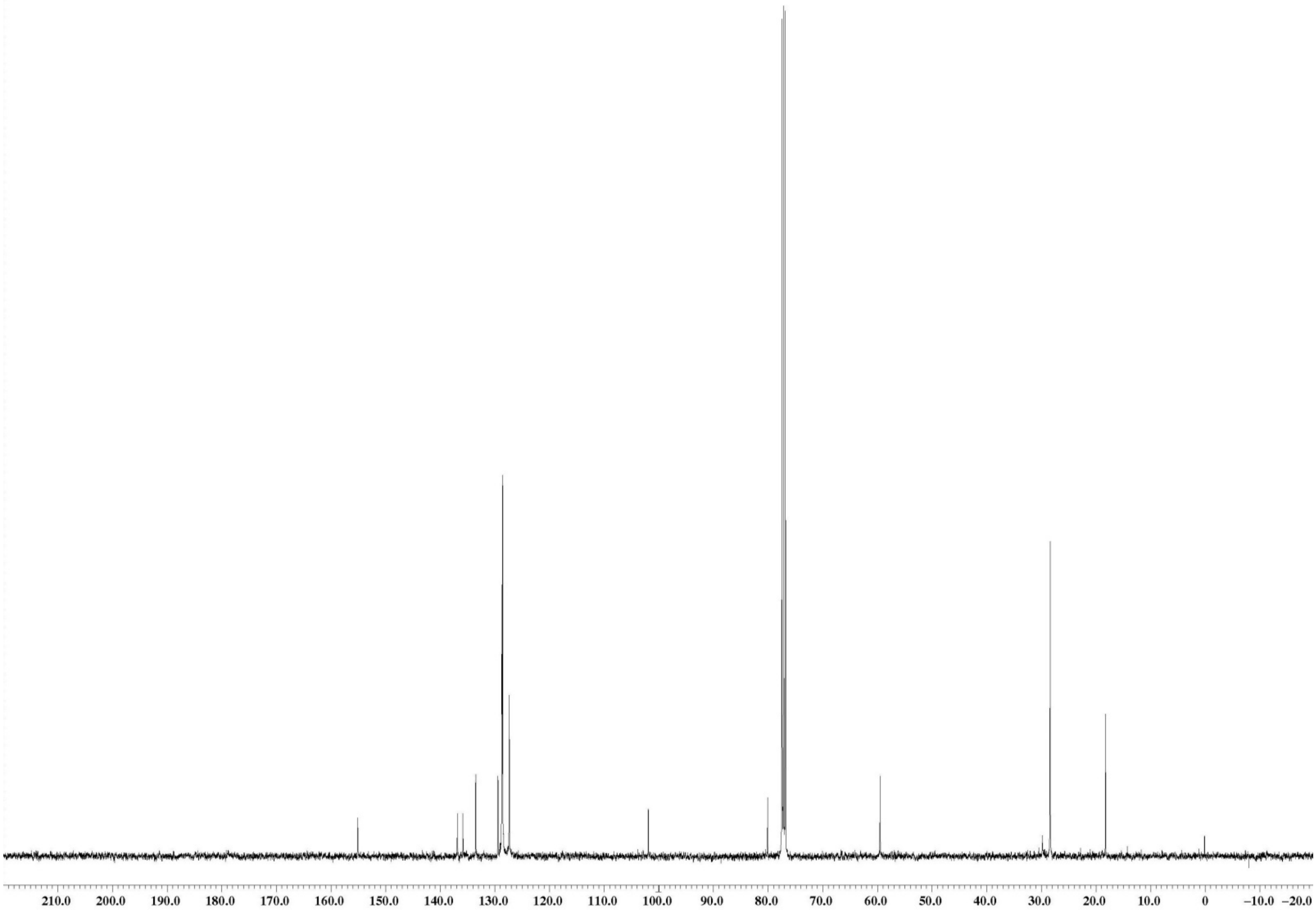
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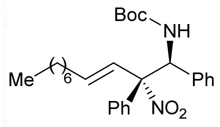
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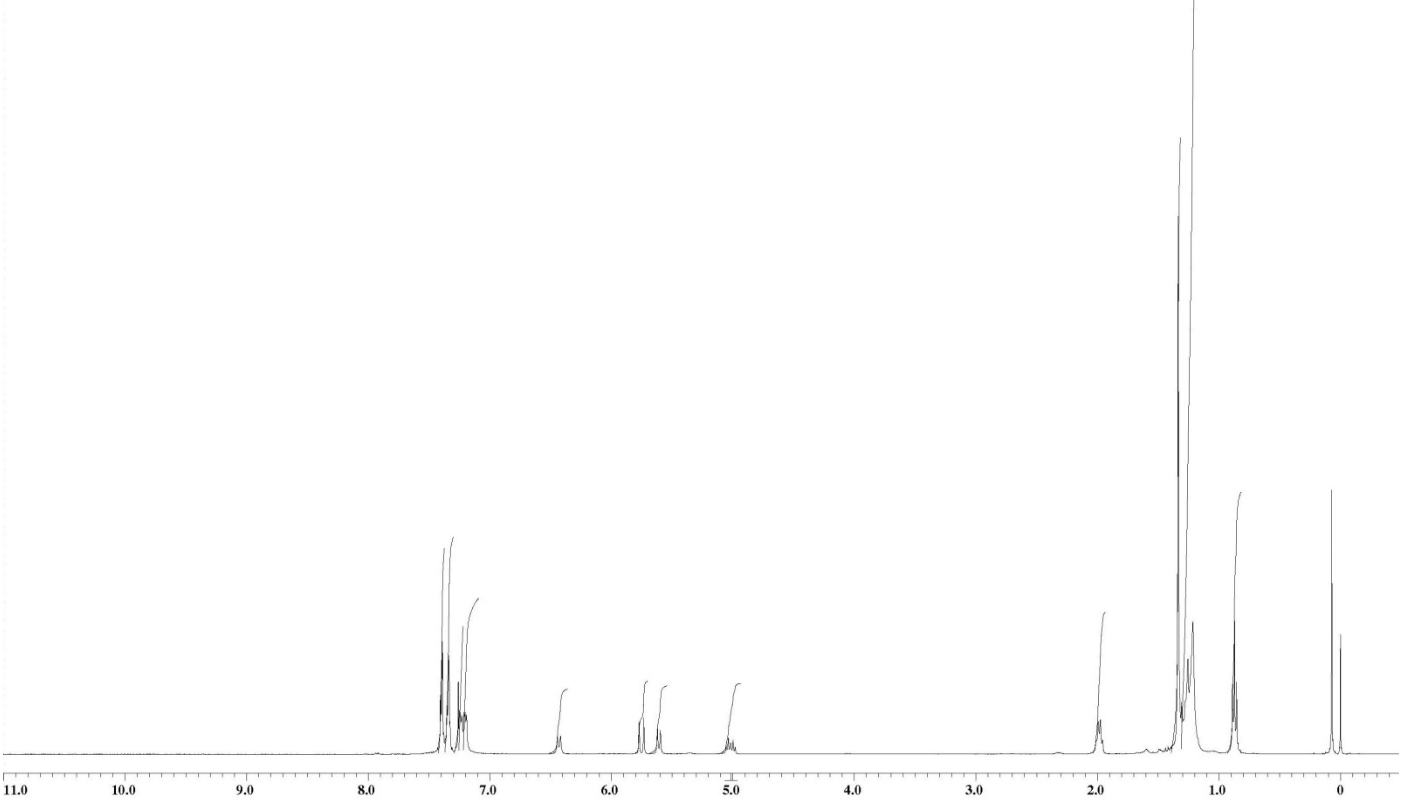
Me
6
Ph
Ph
NO2

4o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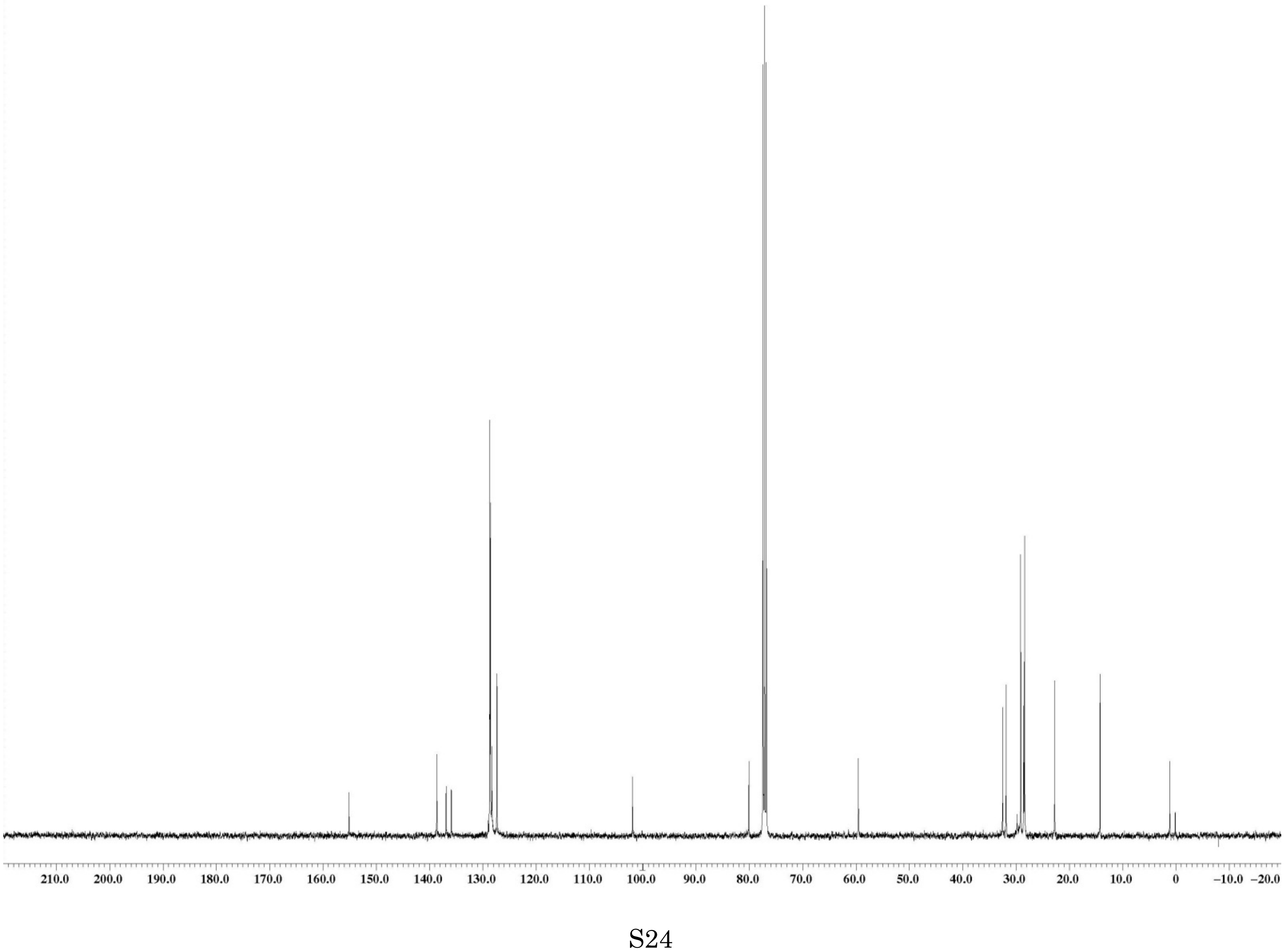
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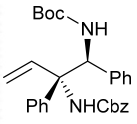
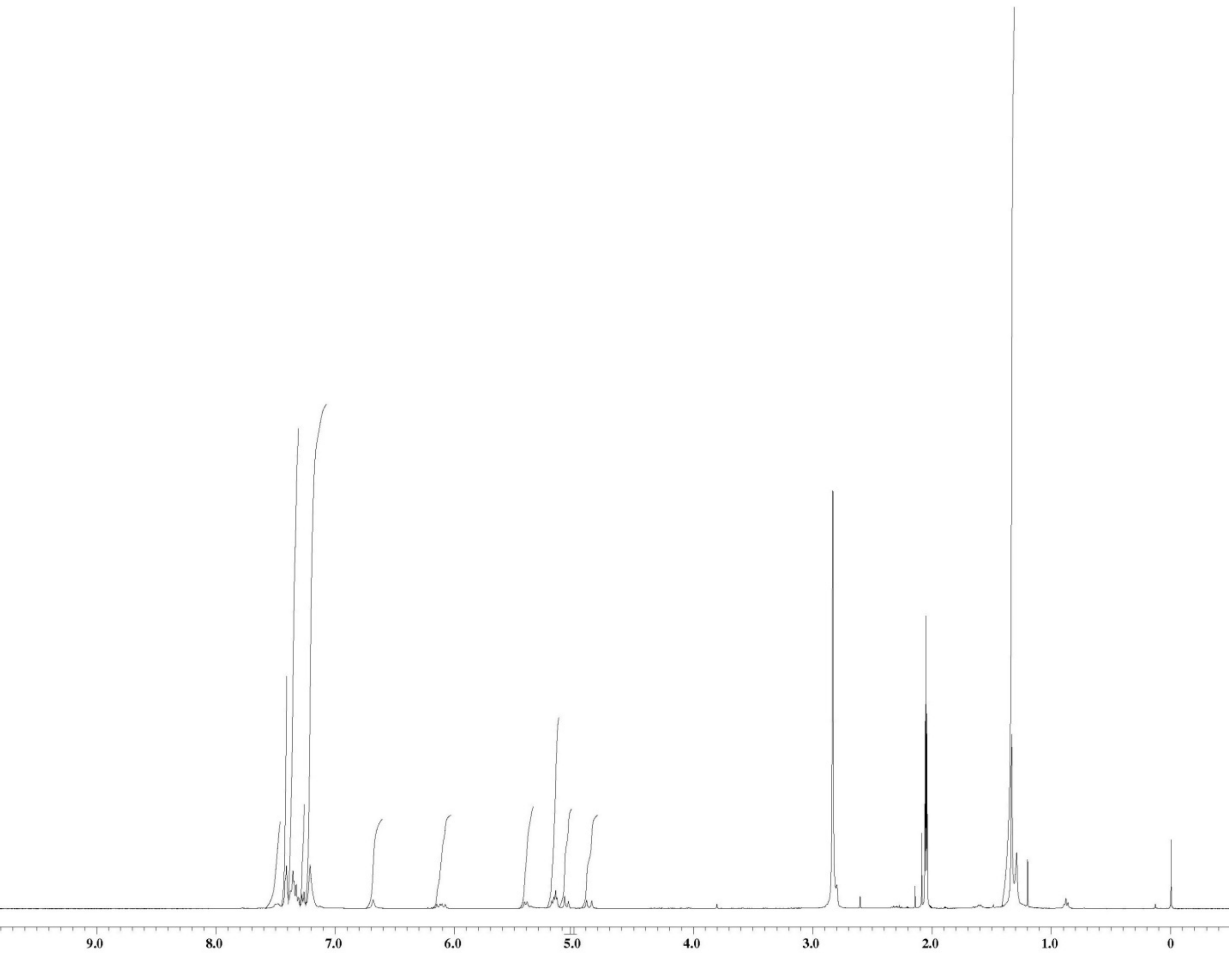

Boc
NH
Ph
Ph
NHCbz

5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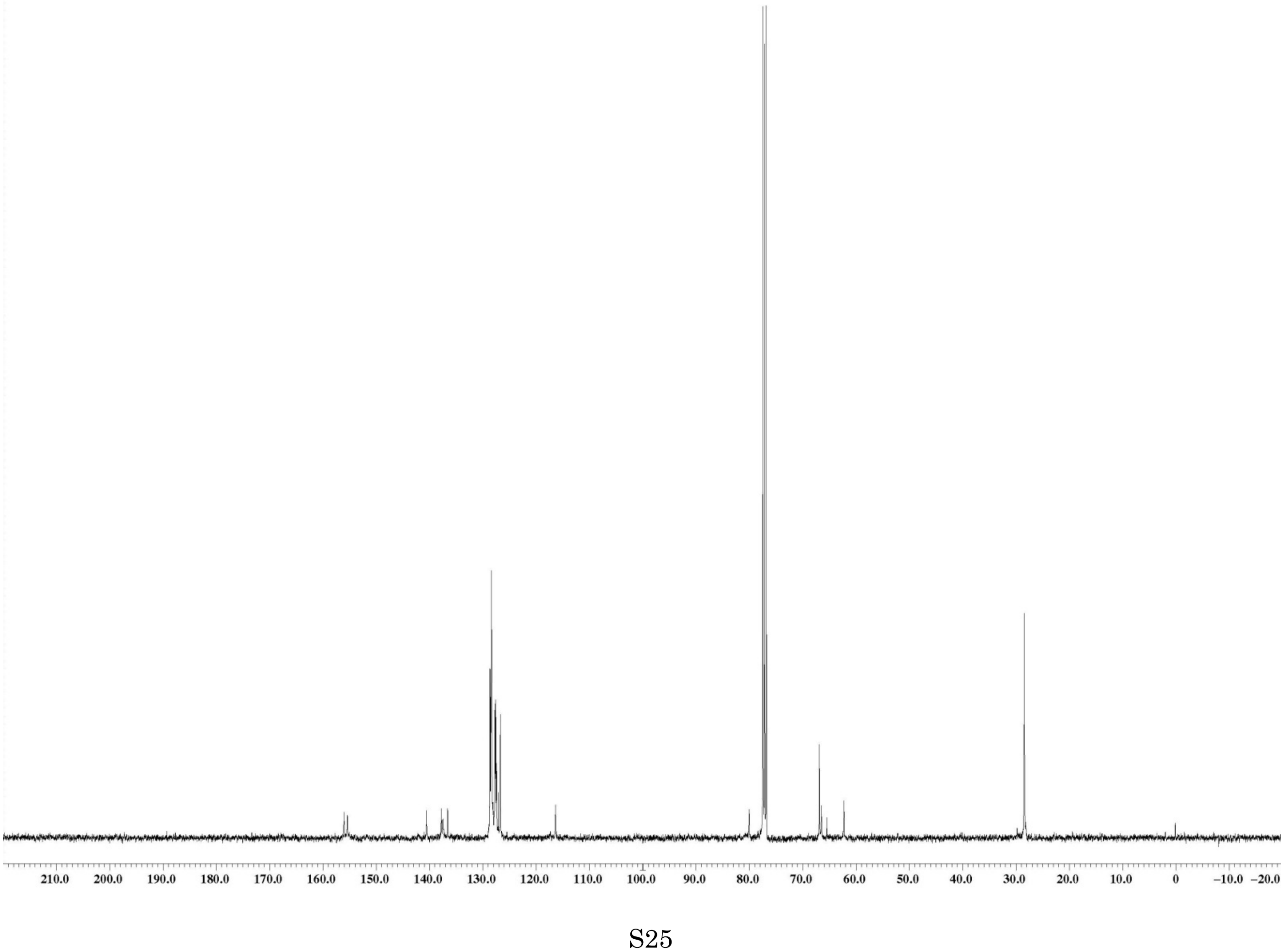
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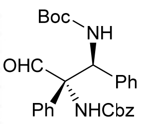
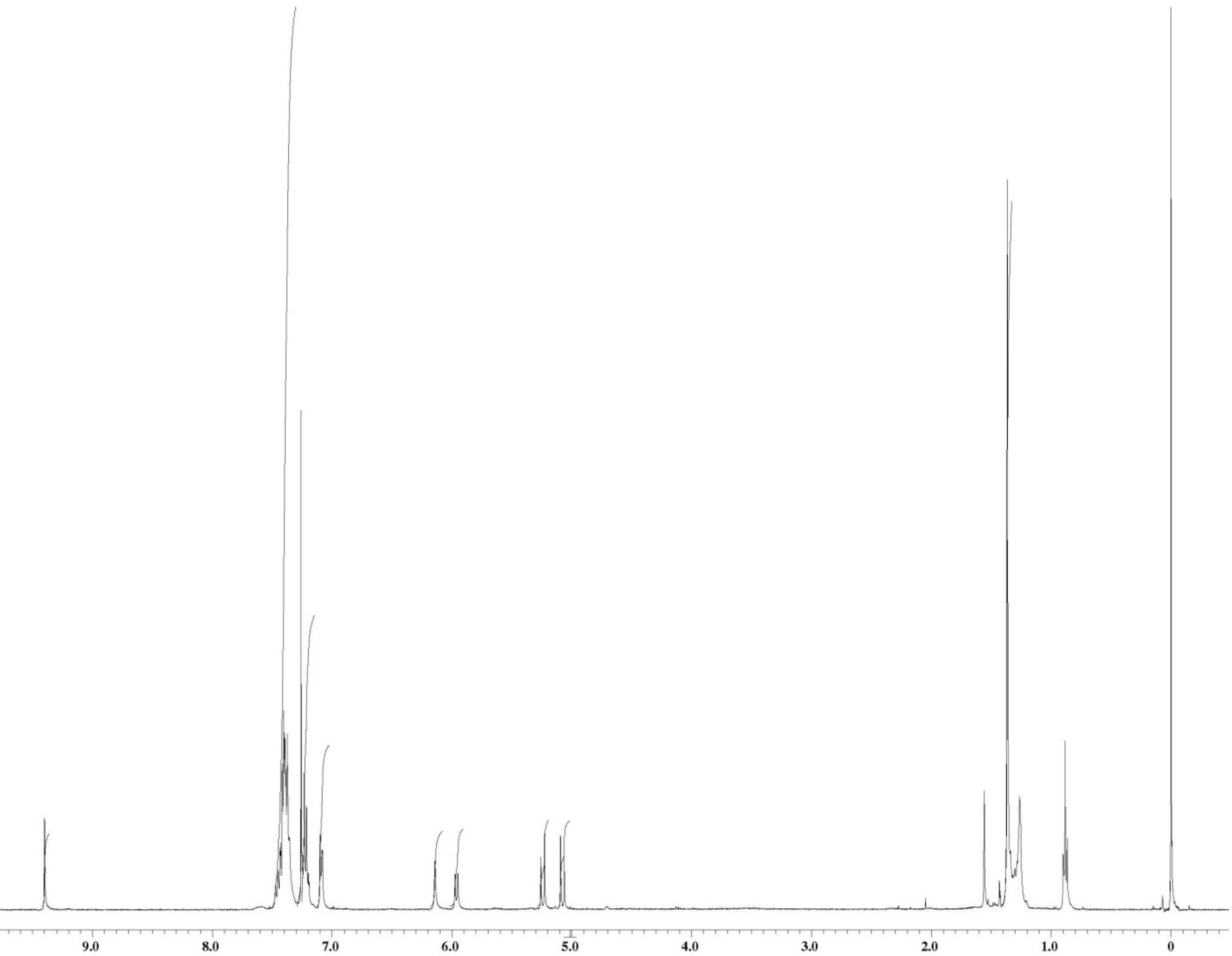

Boc
NH
OHC
Ph
Ph
NHCbz

6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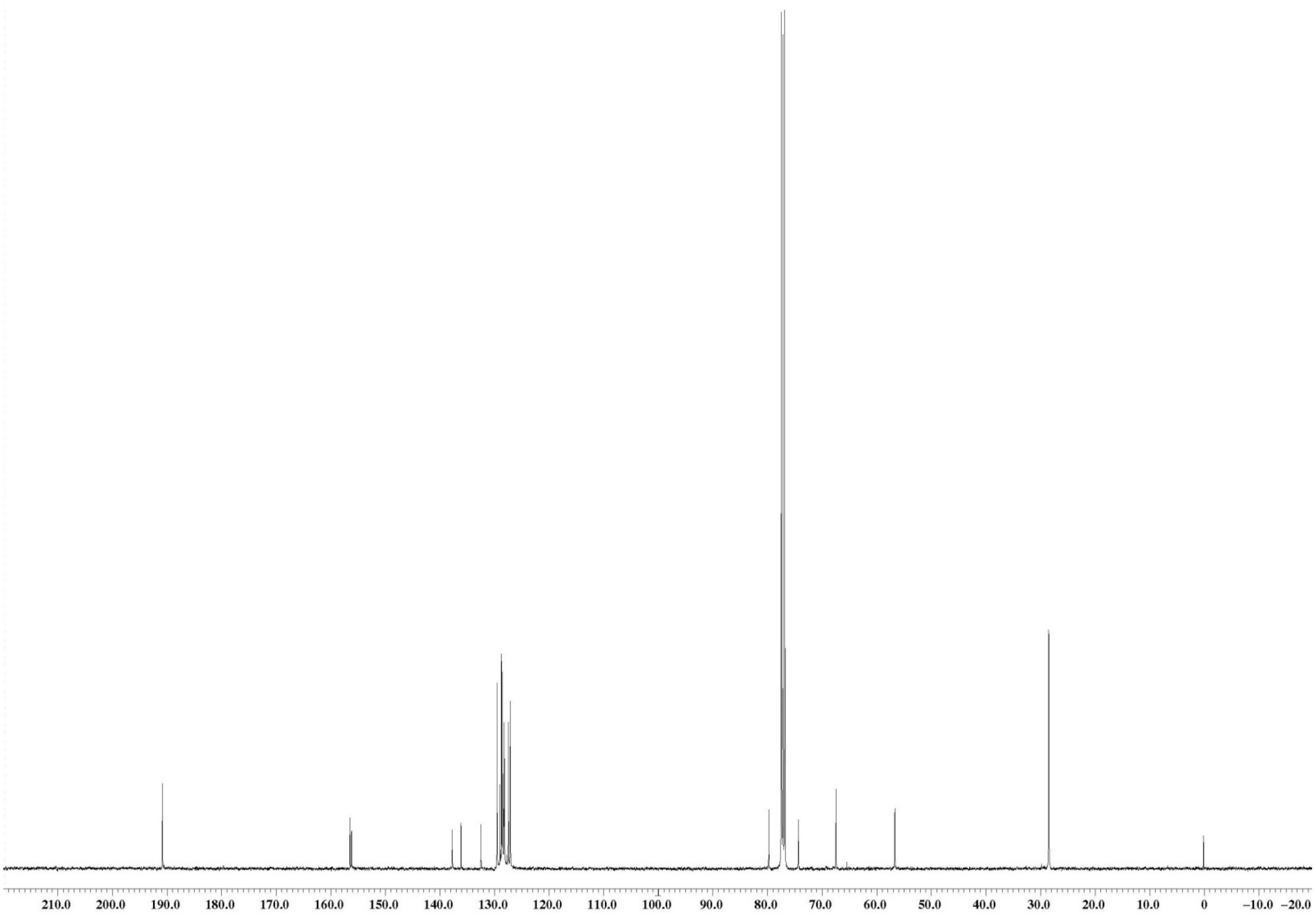
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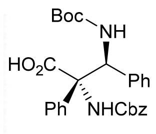

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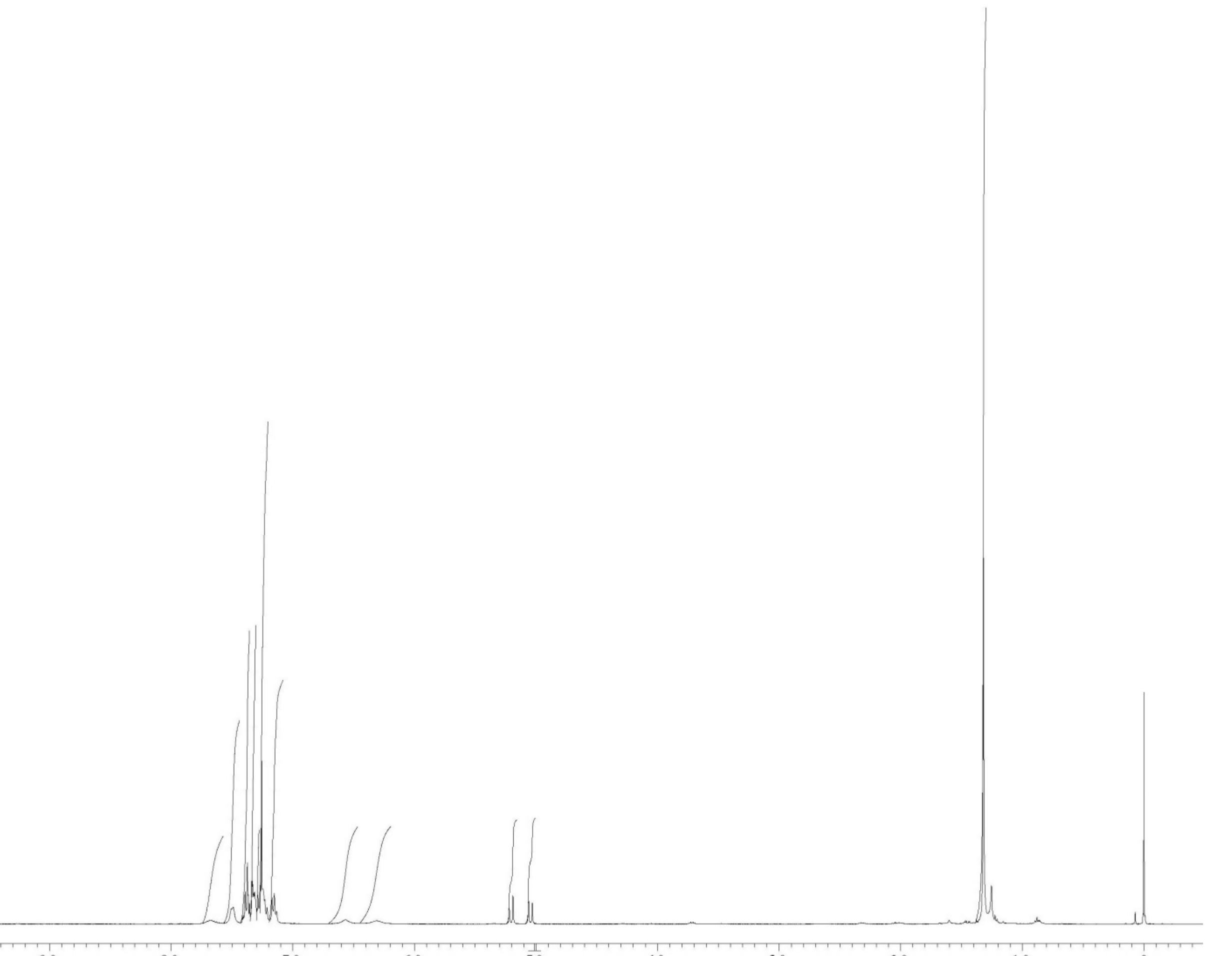
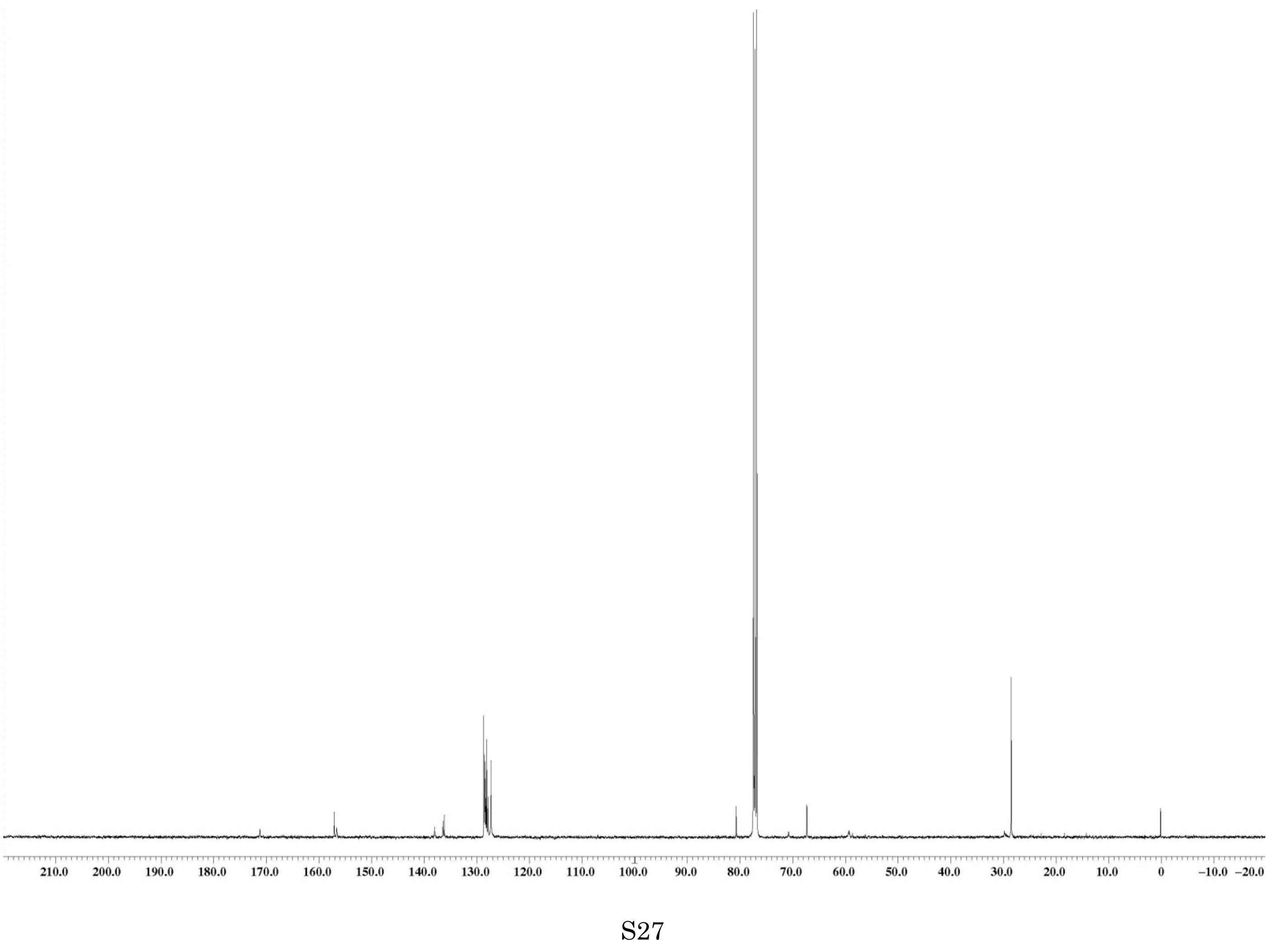
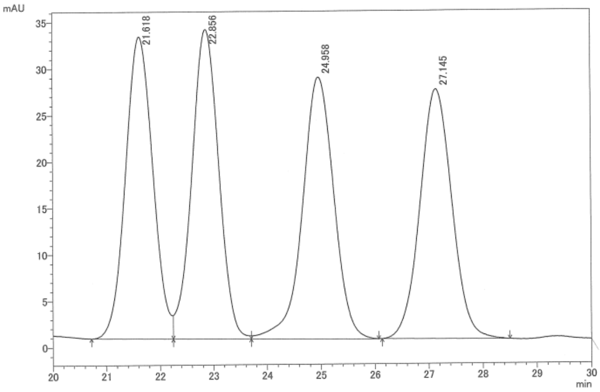
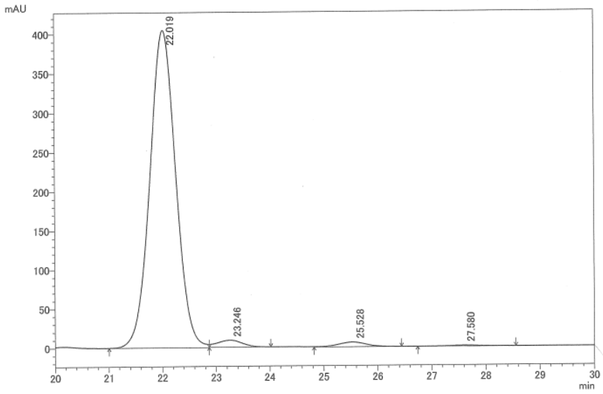




4a



1 PDA Multi 1 / 210nm 4nm



1 PDA Multi 1/210nm 4nm

PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
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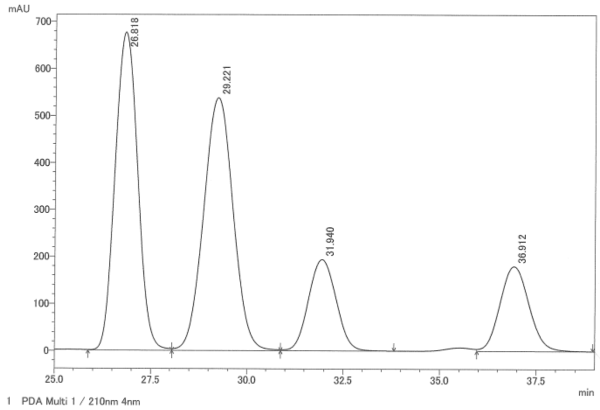
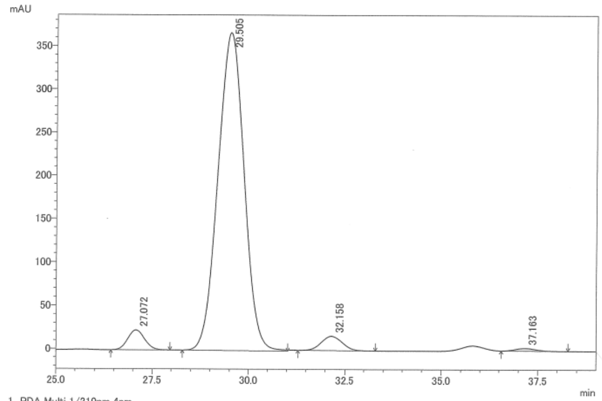
2	23.246	2.037
3	25.528	1.539
4	27.580	0.274
合計		100.000

4b



1 PDA Multi 1 / 210nm 4nm



1 PDA Multi 1/210nm 4nm

PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
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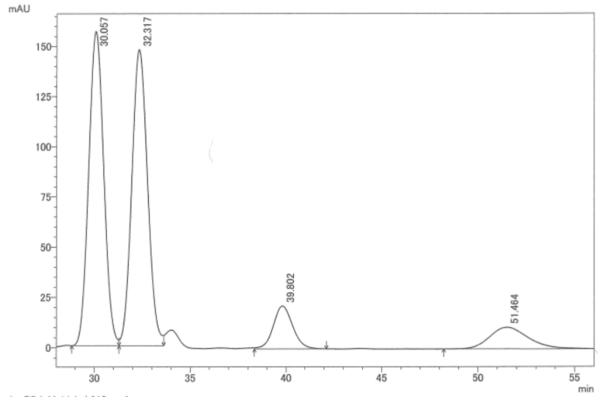
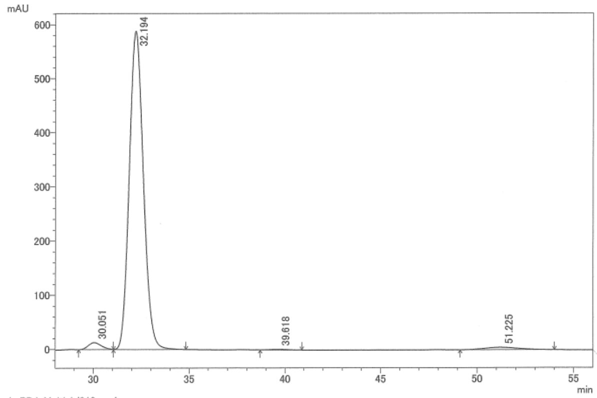
2	29.505	92.339
3	32.158	3.279
4	37.163	0.622
合計		100.000

4c



1 PDA Multi 1 / 210nm 4nm

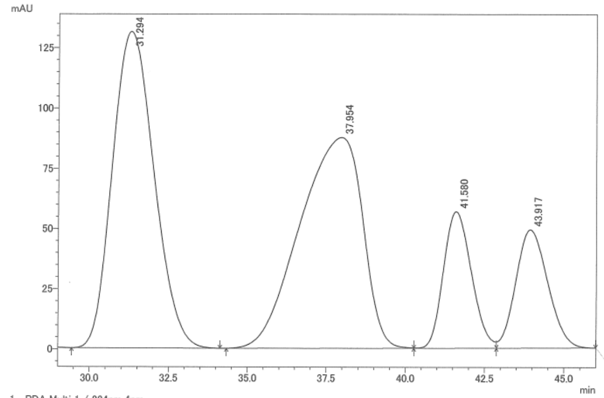


1 PDA Multi 1/210nm 4nm

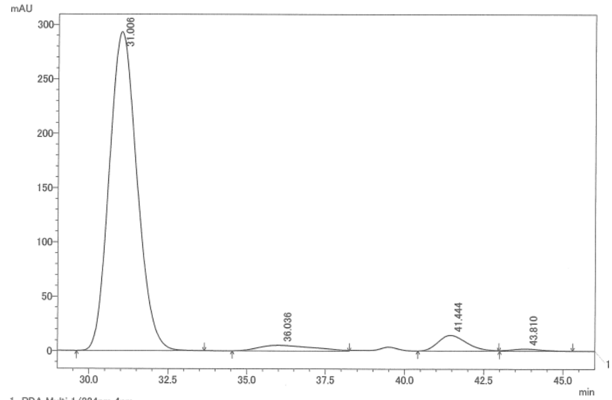
PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	30.051	1.978
2	32.194	95.947
3	39.618	0.316
4	51.225	1.759
合計		100.000

4d



1 PDA Multi 1 / 224nm 4nm

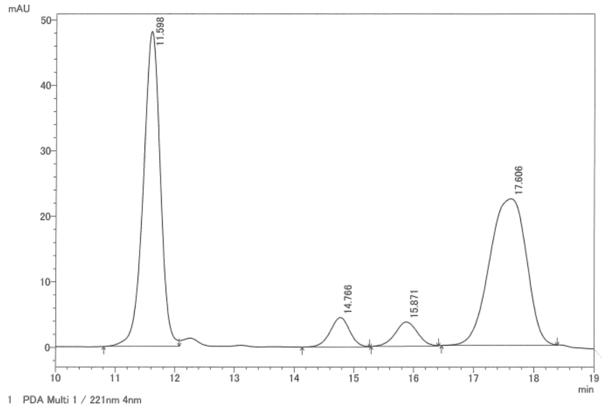


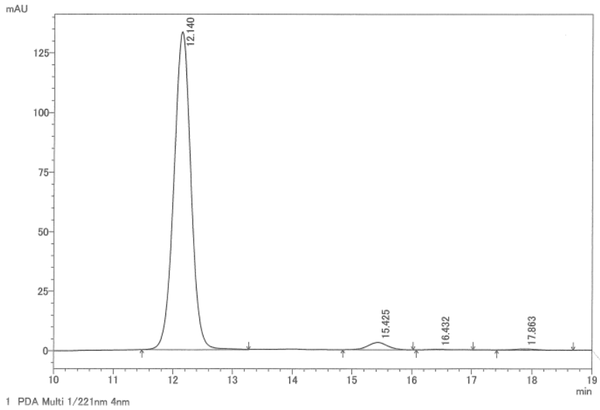
1 PDA Multi 1/224nm 4nm

PDA Ch1 224nm 4nm

ピーク#	保持時間	面積%
1	31.006	91.404
2	36.036	3.264
3	41.444	4.624
4	43.810	0.708
合計		100.000

4e

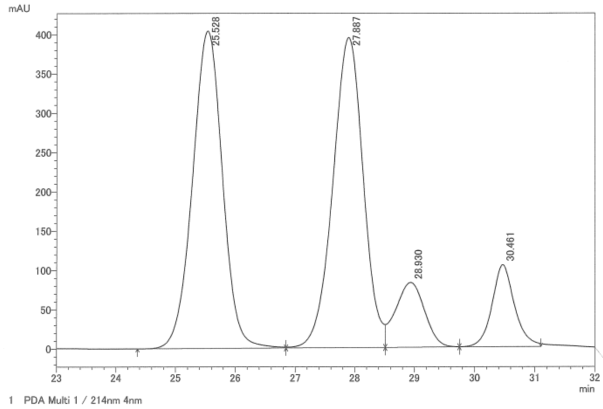


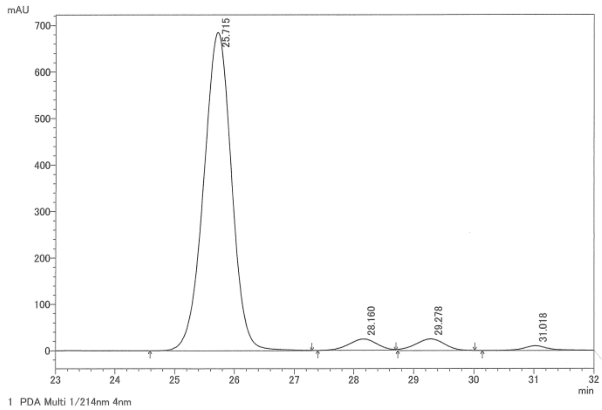


PDA Ch1 221nm 4nm

ピーク#	保持時間	面積%
1	12.140	96.596
2	15.425	2.636
3	16.432	0.214
4	17.863	0.554
合計		100.000

4f

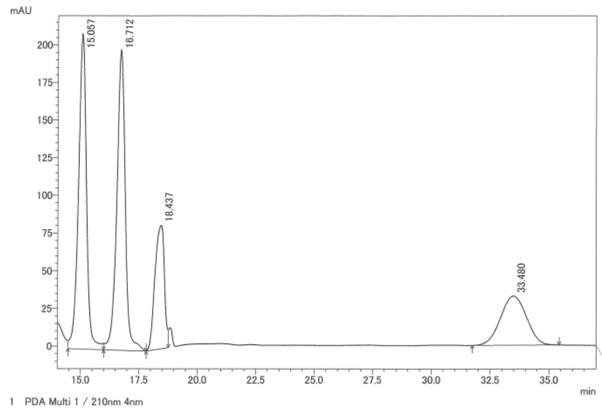


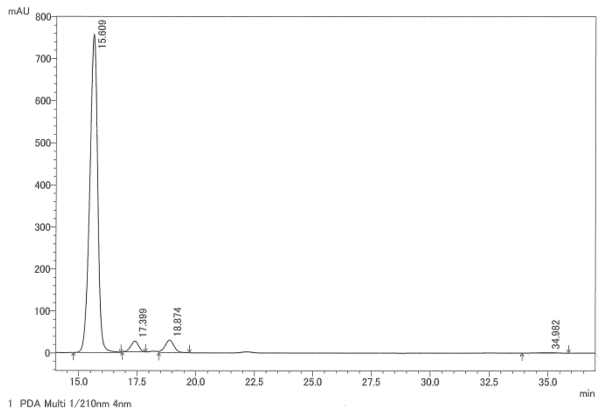


PDA Ch1 214nm 4nm

ピーク#	保持時間	面積%
1	25.715	92.028
2	28.160	3.276
3	29.278	3.425
4	31.018	1.271
合計		100.000

4g

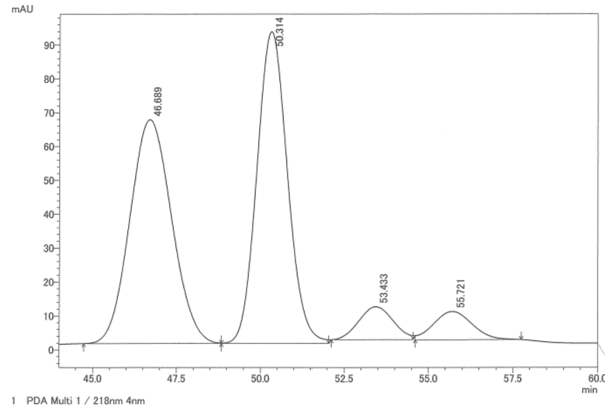


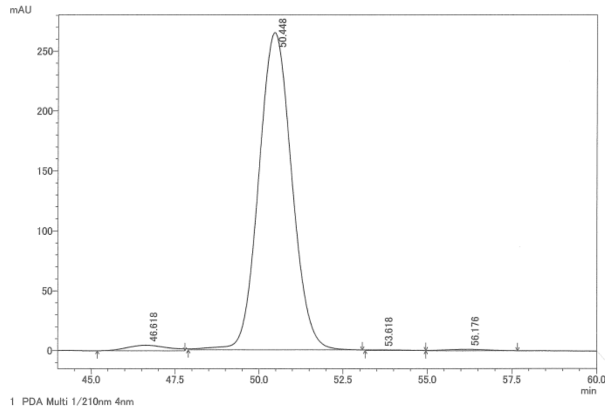


PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	15.609	92.382
2	17.399	3.078
3	18.874	4.169
4	34.982	0.371
合計		100.000

4h

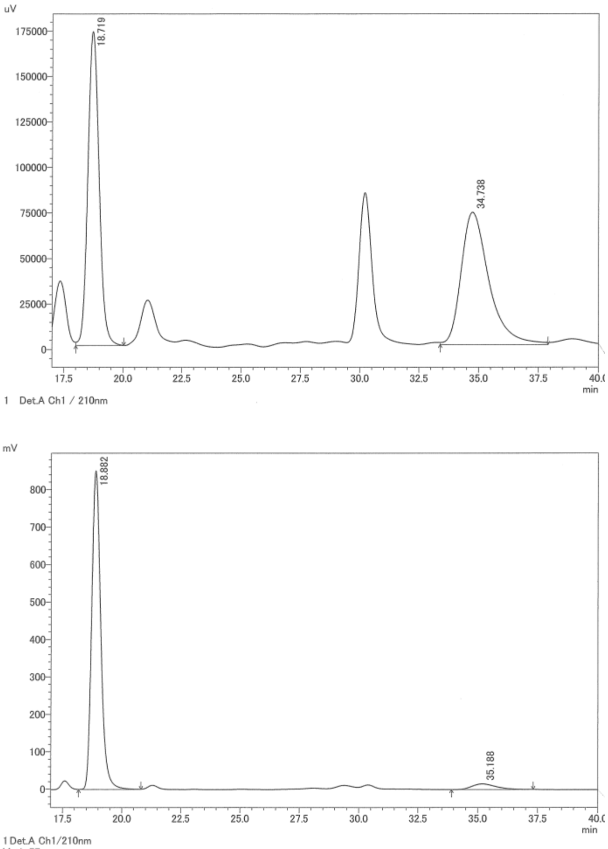




PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	46.618	2.075
2	50.448	97.180
3	53.618	0.180
4	56.176	0.565
合計		100.000

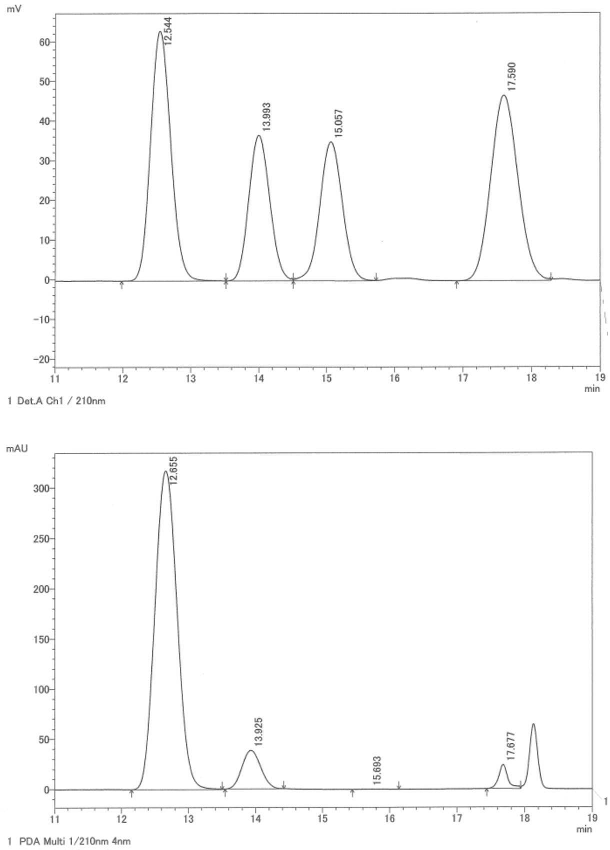
4i



検出器A Ch1 210nm

ピーク#	保持時間	面積%
1	18.882	95.384
2	35.188	4.616
合計		100.000

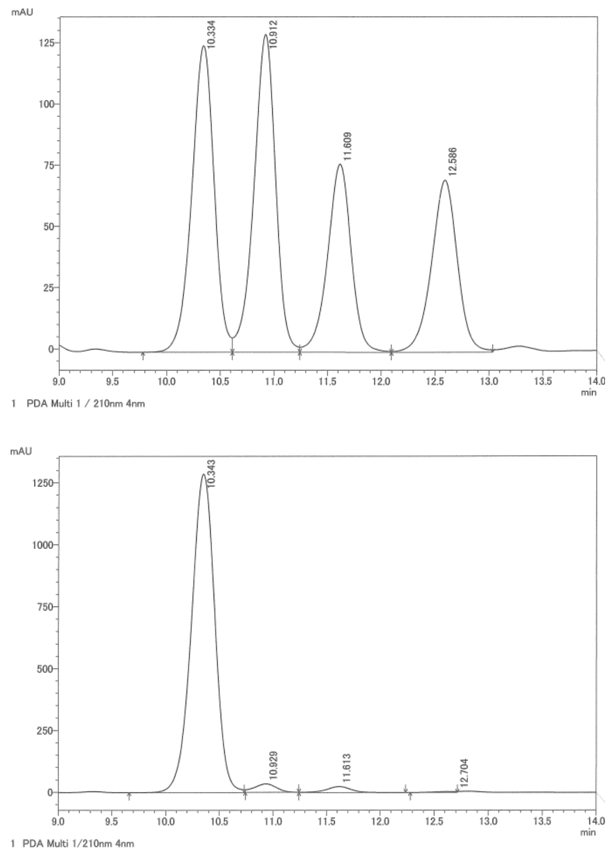
4j



PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	12.655	88.109
2	13.925	9.070
3	15.693	0.050
4	17.677	2.771
合計		100.000

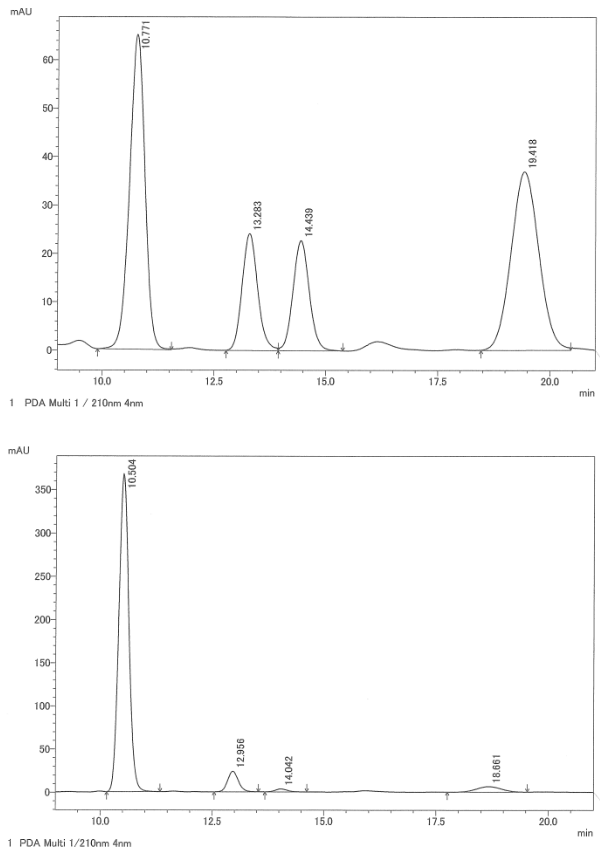
4k



PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	10.343	95.521
2	10.929	2.341
3	11.613	1.894
4	12.704	0.243
合計		100.000

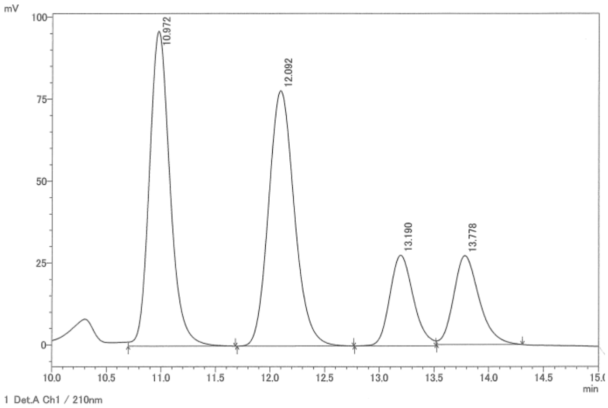
4l

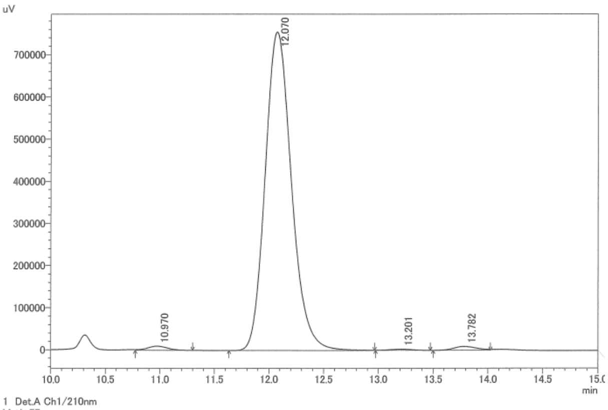


PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	10.504	88.839
2	12.956	6.233
3	14.042	1.068
4	18.661	3.859
合計		100.000

4m

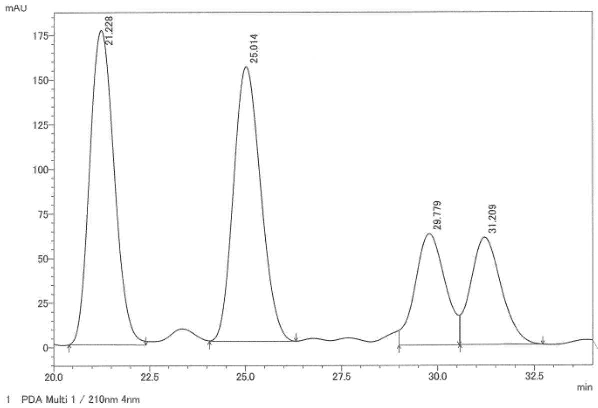


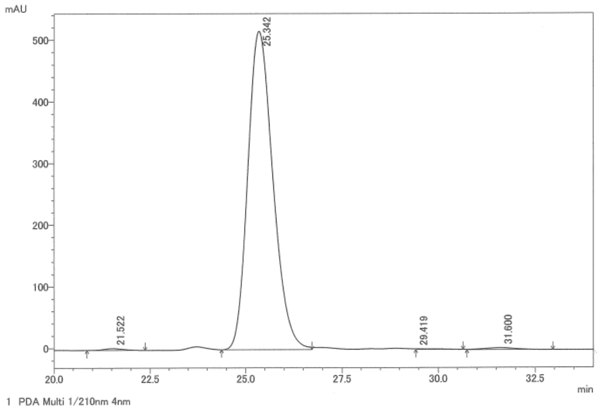


検出器A Ch1 210nm

ピーク#	保持時間	面積%
1	10.970	1.009
2	12.070	97.602
3	13.201	0.323
4	13.782	1.065
合計		100.000

4n

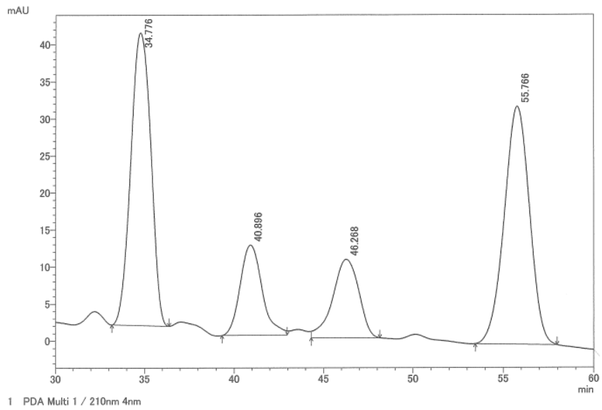


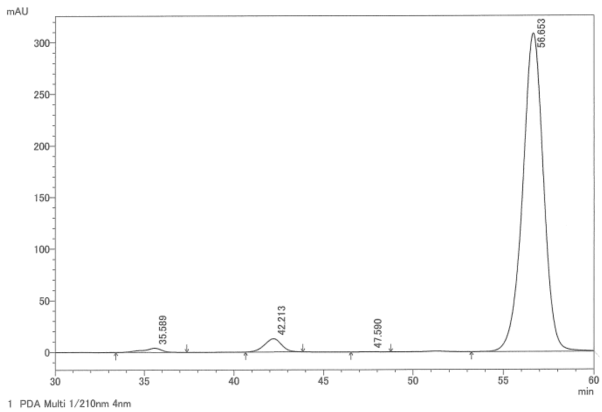


PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	21.522	0.461
2	25.342	98.576
3	29.419	0.197
4	31.600	0.766
合計		100.000

4o

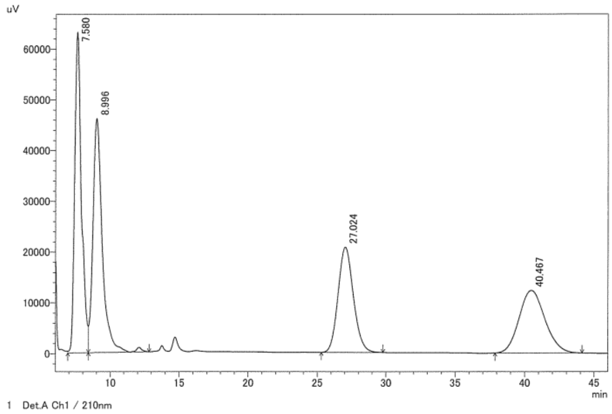


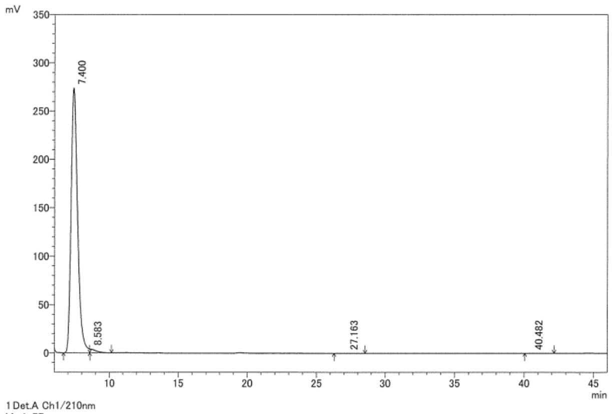


PDA Ch1 210nm 4nm

ピーク#	保持時間	面積%
1	35.589	1.158
2	42.213	3.312
3	47.590	0.053
4	56.653	95.477
合計		100.000

7 (methyl ester)





検出器A Ch1 210nm

ピーク#	保持時間	面積%
1	7.400	98.572
2	8.583	1.374
3	27.163	0.039
4	40.482	0.015
合計		100.000