Electronic Supplementary Material (ESI) for Chemical Communications.

Supplementary information for

A Copper Catalyzed Azidation and Peroxidation of β-Naphthol Derivatives via Dearomatization Strategy

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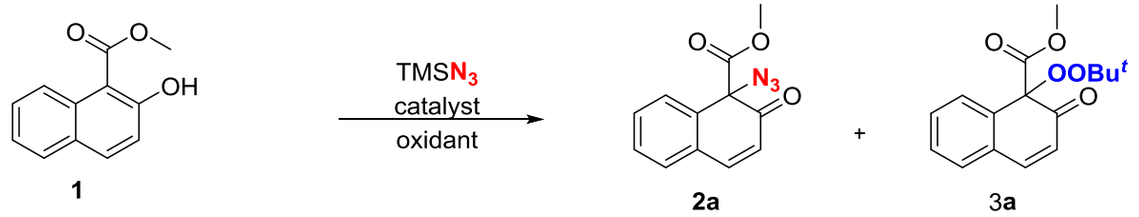
General experimental

NMR spectra were recorded on 400 MHz spectrometer in $CDCl_3$, Tetramethylsilane (TMS; $\delta = 0.00$ ppm) served as an internal standard for ^1H NMR. The corresponding residual non-deuterated solvent signal ($CDCl_3$; $\delta = 77.00$ ppm) was used as internal standard for ^{13}C NMR. IR spectra were measured using a FT/IR-410. Mass spectra were measured with Micromass Q-Tof (ESI-HRMS). Column chromatography was carried out on Silica gel 230-400 mesh (commercial suppliers) and thin-layer chromatography was carried out using SILICA GEL GF-254. For column purification, automatic flash column was also used. Melting points were measured using open glass capillary and values are uncorrected. Enantiomeric ratios were determined by HPLC analysis by using stationary phase chiral columns (25 cm × 0.46 cm) in comparison with authentic racemic materials. All the starting materials were prepared by following the literature procedure.[1, 2]

Caution!!!!

Proper safety precautions should be followed. This reaction should be carried out behind a blast shield and only on a small scale. It should be noted that while no incident occurred during this study, azides are potentially hazardous compounds and adequate safety measures should be taken.[3]

Table 1. Detailed screening studies for optimization[a]

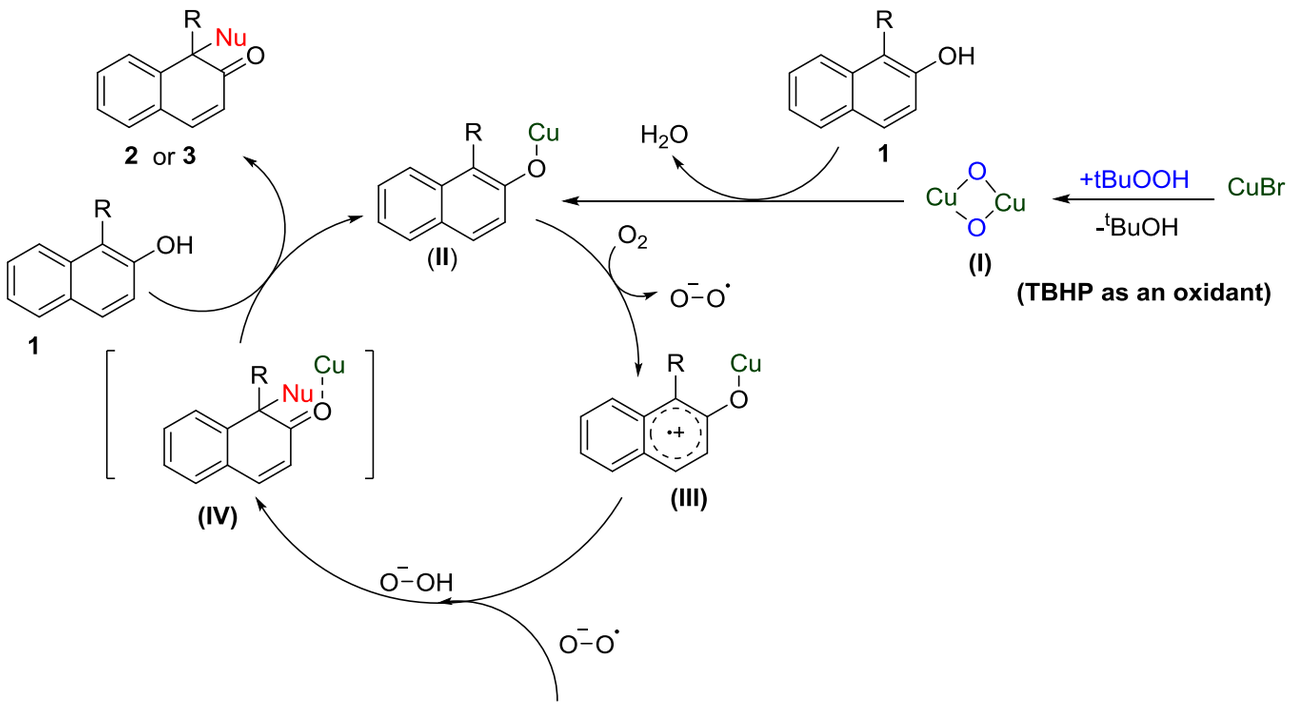


1 2a 3a

Entry	Catalyst (5 mol%)	Oxidant (1 equiv)	Solvent (1 mL)	Yield (%)[b] 2a	3a
1[c]	TBAI	aq TBHP	1,4-dioxane	ND	
2	CuBr	aq TBHP	1,4-dioxane	18	18
3	CuBr	aq TBHP	MeOH	56	ND
4	CuBr	aq TBHP	CH_3CN	84	7
5	CuBr	aq TBHP	Toluene	ND	10
6	CuBr	aq TBHP	EtOAc	25	10
7	CuBr	aq TBHP	H_2O	5	ND
8	CuBr	DBP	CH_3CN	63	ND
9	CuBr	O_2	CH_3CN	ND	
10	CuBr	DTBP	CH_3CN	ND	
11	CuBr	aq H_2O_2	CH_3CN	ND	
12	CuBr	DCP	CH_3CN	ND	
13	$CuBr_2$	aq TBHP	CH_3CN	86	14
14	CuCl	aq TBHP	CH_3CN	76	23
15	CuI	aq TBHP	CH_3CN	11	ND
16	$Cu(OAc)_2$	aq TBHP	CH_3CN	8	ND
17	$NiCl_2.6H_2O$	aq TBHP	CH_3CN	trace	67
18	$FeCl_3.6H_2O$	aq TBHP	CH_3CN	19	59
19	$CoCl_2.6H_2O$	aq TBHP	CH_3CN	16	48
20[d]	CuBr	aq TBHP	CH_3CN	trace	92
21[e]	CuBr	aq TBHP	CH_3CN	95	5
22[f]	CuBr	aq TBHP	CH_3CN	97	3
23	none	aq TBHP	CH_3CN	ND	
24	CuBr	none	CH_3CN	ND	
25[g]	CuBr	aq. TBHP	CH_3CN	ND	98

[a] Reaction conditions: **1a** (0.25 mmol),$TMSN_3$ (0.5 mmol), aq. TBHP (70% in water,1 equiv.) CuBr (5 mol%), CH_3CN (1 mL), at rt, 24 h.[b] NMR yields, calculated using terephthaldehyde as an internal standard, [c] TBAI (10 mol %), [d] NaN_3 was used instead of $TMSN_3$,[e] 0.5 equiv of aq TBHP was used, [f] 0.25 equiv. of aq. TBHP was used, [g] $TMSN_3$ was not used. ND = not detected.

Scheme 1. Tentative mechanistic proposal for azidation reaction



$$H_2O + TMSN_3 \longrightarrow HN_3 + TMSOH$$

Typical experimental procedure

(a) For the synthesis of azido compounds

$TMSN_3$ (2 equiv, 0.50mmol) was added to a well-stirred solution of β-napthol derivative (0.25 mmol), CuBr (0.05 equiv, 0.013 mol) in acetonitrile (1 mL), after that, aq TBHP (70% in water) (0.25 equiv, 0.06 mmol, 8 µL) was added dropwise to the reaction mixture and it was stirred at room temperature for 3-24 h (monitored by TLC). After completion of the reaction (monitored by TLC) reaction mixture was passed through the short pad of Celite and extracted with 50% ethyl acetate and pet ether (3x20mL). The combined organic layer was dried over anhyNa_2SO_4 and concentrated under reduced pressure. The crude product was purified on a silica gel flash column chromatography using hexane/ EtOAc to get the pure product.

(b) For the synthesis of peroxo compounds

Aq TBHP (70% in water, 1 equiv, 0.25 mmol, 35 µL) was added to a well-stirred solution of β -napthol derivative (0.25 mmol), CuBr (0.05 equiv, 0.013 mol) in acetonitrile (1 mL), after that, the reaction mixture was stirred at room temperature for 12-24 h. After completion of the reaction (monitored by TLC) reaction mixture was passed through the short pad of Celite and extracted with 50% ethyl acetate and pet ether (3x20 mL). The combined organic layer was dried over anhy Na_2SO_4 and concentrated under reduced pressure. The crude product was purified on a silica gel flash column chromatography using hexane/ EtOAc to get the pure product.

(c) Typical experimental procedure for the synthesis of compounds (4a and 4j)

Azide **2a**/**2j** (0.2mmol) was dissolved in a 2 mL of methanol. Sodium borohydride (1 equiv, 0.4 mmol) was added to the solution and was stirred at room temperature for 5 min. The reaction mixture was quenched using water 5 mL and the solvent was evaporated and water (15 mL) was added to the reaction mixture and extracted with CH_2Cl_2 (3×20 mL). The combined organic phases were dried over anhyNa_2SO_4 and the solvent was evaporated. The residue was purified by flash chromatography on silica using hexane/ EtOAc to get the pure product.

(d) Typical experimental procedure for the synthesis of compound (5a)

The compound **3a** (0.2mmol) was dissolved in methanol (2 mL). Then was added Pd/C (5 mg) to the solution and the reaction mixture was stirred at room temperature for 5 h. The reaction mixture was passed through aCelitepad and extracted using 50% ethyl acetate and pet ether. The combined organic phases were dried over anhyNa_2SO_4 and the solvent was evaporated. The residue was purified by flash chromatography on silica using hexane/ EtOAc to get the pure product.

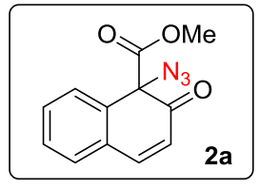
(e) Typical experimental procedure for the synthesis of compounds (5j)

The compound **2j** (0.2mmol) was dissolved in methanol (2 mL). Then was added Pd/C (5 mg) to the solution and the reaction mixture was stirred at room temperature for 5 h. The reaction mixture was passed through a Celite and extracted using 50% ethyl acetate and pet ether. The combined organic phases were dried over anhyNa_2SO_4 and the solvent was evaporated. The residue was purified by flash chromatography on silica using hexane/ EtOAc to get the pure product.

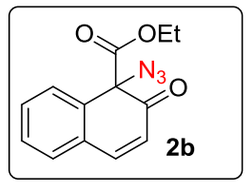
(f) Typical experimental procedure for the synthesis of compounds (6j)

The compound **2j** (0.2 mmol) was dissolved in methanol (2 mL). And was added sodium hydroxide (2 equiv, 0.4 mmol) and aq H_2O_2 (50% in water, 3 equiv) drop wise to the reaction mixture at 0°C. The reaction mixture was diluted with water and extracted with ethyl acetate (3x20 mL). The combined organic phases were dried over anhyNa_2SO_4 and the solvent was evaporated. The residue was purified by flash chromatography on silica using hexane/ EtOAc to get the pure product.

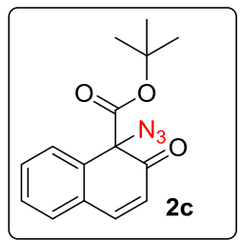
Characterization data for quaternary azidation of β-napthol derivatives



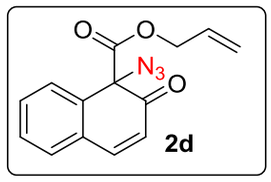
Methyl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2a): Brown solid; Yield - 95%;***mp***: 78°-80°C;Rf(20% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2110, 1752, 1670, 1129; **^{1}HNMR** (400 MHz, $CDCl_3$): δ 3.70 (s, 3 H) 6.24 (d, *J*=9.77 Hz, 1 H) 7.32 - 7.39 (m, 1 H) 7.39 - 7.55 (m, 4 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 53.73, 70.36, 76.68, 77.32, 123.37, 128.24, 129.08, 129.80, 129.99, 130.90, 135.07, 146.75, 167.29, 193.08; **HRESI-MS***(m/z)*: Calculated for $C_{12}H_9N_3O_3$ (M + Na): 266.0542, found (M + Na): 266.0541.



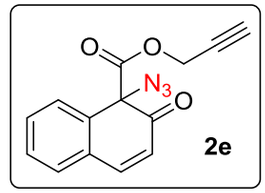
Ethyl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2b): Brown liquid; Yield - 78%; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2114, 1749, 1671, 1214; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.14 (t, *J*=7.17 Hz, 3 H) 4.01 - 4.28 (m, 2 H) 6.24 (d, *J*=10.07 Hz, 1 H) 7.32 - 7.38 (m, 1 H) 7.38 - 7.47 (m, 2 H) 7.47 - 7.53 (m, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 13.74, 63.14, 70.49, 76.69, 77.32, 123.48, 128.18, 129.17, 129.71, 129.94, 130.85, 135.34, 146.65, 166.73, 193.33; **HRESI-MS***(m/z)*: Calculated for $C_{13}H_{11}N_3O_3$ (M + Na): 280.0698, found (M + Na): 280.0697.



tert*-Butyl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2c):** Yellow oil; Yield - 91%; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2981, 2116,1745, 1672; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.33 (s, 9 H) 6.21 (d, *J*=10.07 Hz, 1 H) 7.30 - 7.37 (m, 1 H) 7.37 - 7.46 (m, 2 H) 7.46 - 7.52 (m, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 27.46, 70.94, 76.69, 77.32, 84.67, 123.43, 127.70, 129.16, 129.40, 129.76, 130.62, 135.80, 146.41, 165.24, 193.86; **HRESI-MS(m/z)*: Calculated for $C_{15}H_{15}N_3O_3$ (M + Na): 308.1011, found (M + Na): 308.1012.



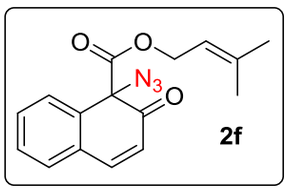
Allyl-1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2d): Black oil; Yield - 72%; Rf(10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 3555, 2112, 1750, 1670; **^{1}HNMR** (400 MHz, $CDCl_3$): δ 4.60 (d, *J*=5.49 Hz, 2 H) 5.00 - 5.23 (m, 2 H) 5.72 (ddt, *J*=16.78, 10.99, 5.34, 5.34 Hz, 1 H) 6.25 (d, *J*=10.07 Hz, 1 H) 7.32 - 7.39 (m, 1 H) 7.39 - 7.47 (m, 2 H) 7.47 - 7.56 (m, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ ppm 67.04, 70.48, 76.69, 77.32, 118.70, 123.46, 128.26, 129.16, 129.79, 129.98, 130.50, 130.88, 135.19, 146.73, 166.43, 193.18; **HRESI-MS***(m/z)*: Calculated for $C_{14}H_{11}N_3O_3$ (M + Na): 292.0698, found (M + Na): 292.0698.



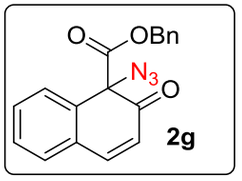
Prop-2-yn-1-yl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2e): Black solid; Yield - 79%; ***mp***: 92°-93°C;Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 3068, 2112, 1755, 1427; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.43 (t, *J*=2.44 Hz, 1 H) 4.54 - 4.80 (m, 2 H) 6.25 (d, *J*=9.77 Hz, 1

H) 7.34 - 7.40 (m, 1 H) 7.40 - 7.50 (m, 3 H) 7.52 (d, *J*=10.07 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 54.07, 70.27, 75.88, 76.05, 76.68, 77.31, 123.33, 128.33, 129.11, 129.95, 130.10, 130.93, 134.65, 146.88, 166.14, 192.47; **HRESI-MS***(m/z)*: Calculated for $C_{14}H_9N_3O_3$ (M + Na): 290.0542, found (M + Na): 290.0542.

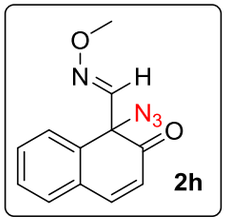
3-Methylbut-2-en-1-yl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2f): Black oil - 40%; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 3025, 2113, 1741, 1204; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.55 (s, 3 H) 1.66 (s, 3 H) 4.58 (d, *J*=7.02 Hz, 2 H) 5.07 - 5.19 (m, 1 H) 6.22 (d, *J*=10.07 Hz, 1 H) 7.32 - 7.37 (m, 1 H) 7.37 - 7.45 (m, 2 H) 7.45 - 7.52 (m, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 17.93, 25.56, 26.35, 63.81, 70.54, 76.68, 77.31, 117.00, 123.46, 128.18, 129.16, 129.62, 129.88, 130.73, 135.32, 140.76, 146.61, 166.63, 193.31; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{15}N_3O_3$ (M + Na): 320.1011, found (M + Na): 320.1011.



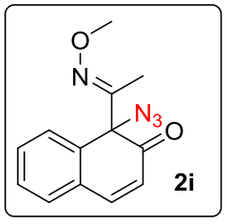
Benzyl 1-azido-2-oxo-1,2-dihydronaphthalene-1-carboxylate (2g): Dirty white solid; Yield – 81%; ***mp***: 70°-72°C;Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2113, 1752, 1672, 1208; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 5.01 - 5.22 (m, 2 H) 6.22 (d, *J*=9.77 Hz, 1 H) 6.97 - 7.09 (m, 2 H) 7.18 - 7.30 (m, 3 H) 7.30 - 7.53 (m, 5 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 68.25, 70.55, 76.69, 77.32, 123.44, 127.33, 127.46, 128.24, 128.34, 128.44, 129.16, 129.73, 129.97, 130.83, 134.48, 135.05, 146.75, 166.53, 193.09; **HRESI-MS***(m/z)*: Calculated for $C_{18}H_{13}N_3O_3$ (M + Na): 342.0855, found (M + Na): 342.0851.



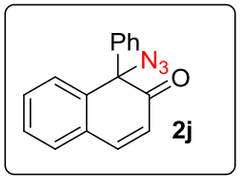
(E)-1-azido-2-oxo-1,2-dihydronaphthalene-1-carbaldehyde O-methyl oxime (2h): White solid; Yield – 58%; ***mp***: 93°-95°C;Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2108, 1689, 1033; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.85 (s, 3 H) 6.24 (d, *J*=9.77 Hz, 1 H) 7.29 (s, 1 H) 7.31 - 7.36 (m, 1 H) 7.36 - 7.49 (m, 3 H) 7.59 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 62.59, 69.03, 76.68, 77.31, 124.14, 128.19, 129.37, 129.51, 129.81, 130.68, 136.55, 144.79, 146.79, 195.23; **HRESI-MS***(m/z)*: Calculated for $C_{12}H_{10}N_4O_2$ (M + Na): 265.0701, found (M + Na): 265.0701.



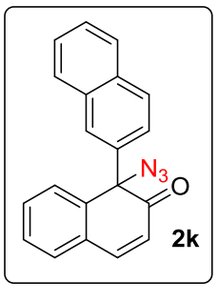
(E)-1-azido-1-(1-(methoxyimino)ethyl)naphthalen-2(1H)-one (2i): Black oil; Yield – 91%; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2923, 2107, 1668; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.63 (s, 3 H) 3.94 (s, 3 H) 6.24 (d, *J*=9.77 Hz, 1 H) 7.31 - 7.36 (m, 1 H) 7.36 - 7.47 (m, 3 H) 7.53 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 11.85, 62.45, 71.20, 76.68, 77.31, 124.56, 128.73, 129.43, 129.81, 129.88, 130.36, 136.54, 144.65, 153.12, 195.20; **HRESI-MS***(m/z)*: Calculated for $C_{13}H_{12}N_4O_2$ (M + Na): 279.0858, found (M + Na): 279.0858.



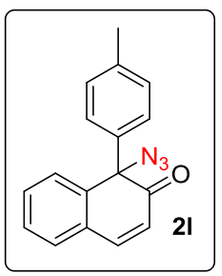
1-Azido-1-phenylnaphthalen-2(1H)-one (2j): Yellow oil; Yield – 71%; Rf (10% EtOAc/Hexane) 0.6; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2108, 1679, 1446, 1235; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.15 (d, *J*=10.07 Hz, 1 H) 7.10 - 7.23 (m, 2 H) 7.23 - 7.32 (m, 3 H) 7.34 - 7.50 (m, 4 H) 7.52 - 7.59 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 74.32, 76.68, 77.32, 124.06, 126.79, 128.70, 128.74, 129.07, 129.14, 129.65, 130.10, 130.64, 137.64, 140.35, 144.95, 196.99; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{11}N_3O$ (M + Na): 284.0800, found (M + Na): 284.0808.



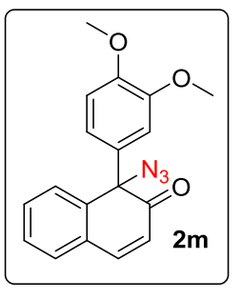
1-Azido-[1,2'-binaphthalen]-2(1H)-one (2k): Brown oil; Yield – 64%; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2107, 1677, 1238; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.19 (d, *J*=10.07 Hz, 1 H) 7.21 - 7.31 (m, 1 H) 7.37 - 7.53 (m, 6 H) 7.53 - 7.60 (m, 1 H) 7.64 - 7.70 (m, 1 H) 7.70 - 7.82 (m, 3 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 74.34, 76.68, 77.31, 124.13, 124.19, 126.24, 126.49, 126.82, 127.49, 128.43, 128.63, 129.20, 129.35, 129.73, 130.15, 130.75, 132.90, 133.08, 135.12, 140.35, 145.08, 196.81; **HRESI-MS***(m/z)*: Calculated for $C_{20}H_{13}N_3O$ (M + Na): 334.0956, found (M + Na): 334.0956.



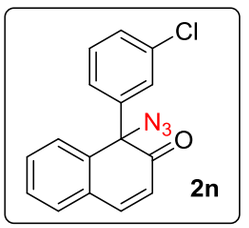
1-Azido-1-(p-tolyl)naphthalen-2(1H)-one (2l): Brown oil; Yield – 78%; Rf (10% EtOAc/Hexane) 0.6; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2108, 1680, 1197; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.28 (s, 3 H) 6.13 (d, *J*=9.77 Hz, 1 H) 6.98 - 7.13 (m, 4 H) 7.32 - 7.50 (m, 4 H) 7.52 - 7.60 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 20.98, 74.31, 76.68, 77.31, 124.06, 126.79, 128.97, 129.03, 129.40, 129.62, 130.08, 130.53, 134.49, 138.81, 140.41, 144.75, 197.25; **HRESI-MS***(m/z)*: Calculated for $C_{17}H_{13}N_3O$ (M + Na): 298.0956, found (M + Na): 298.0956.



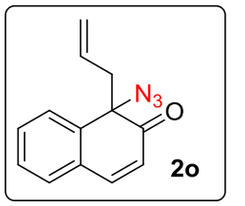
1-Azido-1-(3,4-dimethoxyphenyl)naphthalen-2(1H)-one (2m): Yellow oil; Yield – 66%; Rf (10% EtOAc/Hexane) 0.6; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2106, 1678, 1513; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.80 (s, 3 H) 3.82 (s, 3 H) 6.14 (d, *J*=9.77 Hz, 1 H) 6.51 (dd, *J*=8.54, 2.14 Hz, 1 H) 6.71 (d, *J*=8.54 Hz, 1 H) 6.82 (d, *J*=2.44 Hz, 1 H) 7.31 - 7.53 (m, 4 H) 7.57 - 7.66 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 55.79, 55.82, 74.49, 76.69, 77.32, 110.36, 110.66, 119.60, 124.02, 129.00, 129.05, 129.38, 129.62, 130.22, 130.45, 140.21, 144.47, 148.98, 149.52, 197.08; **HRESI-MS***(m/z)*: Calculated for $C_{18}H_{15}N_3O_3$ (M + Na): 344.1011, found (M + Na): 344.1010.



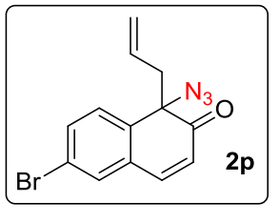
1-Azido-1-(3-chlorophenyl)naphthalen-2(1H)-one (2n): Brown oil; Yield – 65%; Rf (10% EtOAc/Hexane) 0.5; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2108, 1679; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.17 (d, *J*=10.07 Hz, 1 H) 7.03 - 7.12 (m, 1 H) 7.14 - 7.31 (m, 3 H) 7.37 - 7.53 (m, 5 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 73.52, 76.68, 77.31, 123.91, 124.94, 126.91, 128.89, 129.19, 129.42, 129.85, 129.94, 130.96, 134.70, 139.73, 139.86, 145.40, 196.10; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{10}ClN_3O$ (M + Na): 318.0410, found (M + Na): 318.0408.



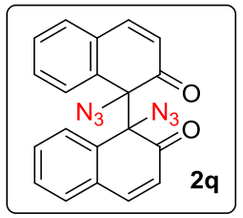
1-Allyl-1-azidonaphthalen-2(1H)-one (2o): Dirty white oil; Yield – 73%; Rf (20% EtOAc/Hexane) 0.8; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2103, 1673, 1267; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.69 (dd, *J*=13.43, 7.32 Hz, 1 H) 2.80 (dd, *J*=13.43, 7.32 Hz, 1 H) 4.86 - 5.14 (m, 2 H) 5.45 (ddt, *J*=17.05, 9.96, 7.25, 7.25 Hz, 1 H) 6.17 (d, *J*=9.77 Hz, 1 H) 7.29 - 7.50 (m, 4 H) 7.57 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 46.15, 70.28, 76.68, 77.31, 120.47, 124.07, 127.73, 128.59, 129.57, 129.78, 130.29, 139.85, 145.54, 199.19; **HRESI-MS***(m/z)*: Calculated for $C_{13}H_{11}N_3O_3$ (M + Na): 248.0800, found (M + Na): 248.0803.



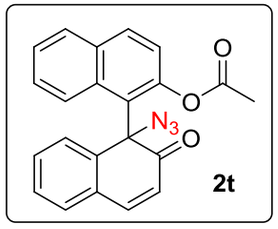
1-Allyl-1-azido-6-bromonaphthalen-2(1H)-one (2p): Brown oil; Yield – 82%; Rf (10% EtOAc/Hexane) 0.6; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2104, 1673; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.67 (dd, *J*=13.43, 7.32 Hz, 1 H) 2.78 (dd, *J*=13.43, 7.32 Hz, 1 H) 4.96 (dd, *J*=17.09, 1.22 Hz, 1 H) 5.01 - 5.12 (m, 1 H) 5.44 (ddt, *J*=17.05, 9.96, 7.25, 7.25 Hz, 1 H) 6.21 (d, *J*=10.07 Hz, 1 H) 7.33 (d, *J*=10.07 Hz, 1 H) 7.38 - 7.50 (m, 2 H) 7.57 (dd, *J*=8.24, 1.83 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 45.99, 69.91, 76.68, 77.31, 120.99, 122.51, 125.29, 129.40, 129.53, 131.42, 132.04, 132.97, 138.61, 143.91, 198.60; **HRESI-MS***(m/z)*: Calculated for $C_{13}H_{10}BrN_3O$ (M + Na): 325.9905, found (M + Na): 325.9904.



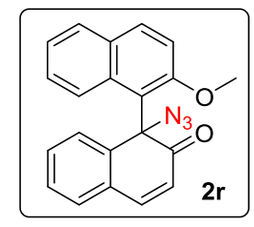
1,1'-Diazido-[1,1'-binaphthalene]-2,2'(1H,1'H)-dione (2q): Black solid; Yield – 72%; ***mp***: 111°-113°C; Rf (20% EtOAc/Hexane) 0.5; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2088, 1672, 1011; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.09 (d, *J*=10 Hz, 1 H) 6.67 (d, *J*= 10 Hz, 1 H) 7.20 (d, *J*=11.2 Hz, 2 H)7.46-7.29 (m, 4 H) 7.83-7.80 (m, 2 H) 7.95 (d, *J*=8.8 Hz, 1H) 8 (d, *J*=6.82 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 75.35, 108.06, 112.59, 117.12, 121.52, 123.63, 125.13, 127.65, 127.96, 128.73, 129.17, 129.42, 130.32, 131.07, 131.15, 132.65, 156.92; **HRESI-MS***(m/z)*: Calculated for $C_{20}H_{12}N_6O_2$(M + Na): 391.0919, found (M + Na): 391.0921.



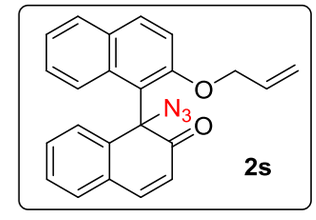
1'-Azido-2'-oxo-1',2'-dihydro-[1,1'-binaphthalen]-2-yl acetate (2r): Yellow oil; Yield – 71%; Rf (30% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2098, 1766, 1669, 1191; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.12 (s, 3 H) 6.46 (d, *J*=10.07 Hz, 1 H) 7.19-7.24 (m, 3 H) 7.33-7.35 (m, 1 H) 7.36-7.45 (m, 3 H) 7.62 (d, *J*=10.7 Hz, 1 H) 7.84-7.89 (m, 2 H) 8.14 (s, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 20.67, 71.84, 122.61, 124.04, 124.75, 125.16, 125.41, 127.33, 128.58, 129.18, 129.45, 129.66, 129.91, 130.78, 131.11, 132.41, 132.51, 139.71, 144.46, 147.66, 168.79, 190.78; **HRESI-MS***(m/z)*: Calculated for $C_{22}H_{15}N_3O_3$(M + Na): 392.1011, found (M + Na): 392.1013.



1-Azido-2'-methoxy-[1,1'-binaphthalen]-2(1H)-one (2s): Brown solid; Yield – 92%;***mp***: 136°-137°C; Rf (30% EtOAc/Hexane) 0.5; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2927, 1668, 1594, 1021; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.60 (s, 3 H) 6.40 (d, *J*=10.07 Hz, 1 H) 7.09 - 7.26 (m, 2 H) 7.31 (t, *J*=7.48 Hz, 1 H) 7.34 - 7.47 (m, 3 H) 7.51 (d, *J*=10.07 Hz, 1 H) 7.63 (t, *J*=7.78 Hz, 1 H) 7.86 (d, *J*=9.16 Hz, 2 H) 9.16 (d, *J*=8.85 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 56.01, 70.71, 76.69, 77.32, 113.98, 122.96, 123.65, 123.71, 124.08, 127.78, 128.76, 129.16, 129.20, 129.21, 129.38, 130.23, 130.29, 131.16, 133.57, 140.15, 143.58, 154.19, 192.28; **HRESI-MS***(m/z)*: Calculated for $C_{21}H_{15}N_3O_2$(M + Na): 364.1062, found (M + Na): 364.1062.**Optical rotation**: $[\alpha]_D^{25}$+164.8 (c = 1.0, $CHCl_3$) for an enantiomerically enriched sample with 79:21er.The enantiomeric ratio was determined by HPLC analysis using Phenomenex cellulose-1 column (^{i}PrOH/*n*-Hexane 10:90, 1.0 mL/min, 20 °C, 254 nm, τ_{major} = 19.4 min, τ_{minor} = 18.0 min).

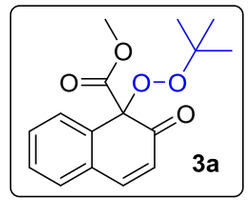


2'-(Allyloxy)-1-azido-[1,1'-binaphthalen]-2(1H)-one (2t): Brown solid; Yield – 92%;***mp***: 130°-133°C; Rf (20% EtOAc/Hexane) 0.5; Prepared as shown in general experimental procedure (a). **IR** (neat, cm^{-1}): 2096, 1668, 1021; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 4.33-4.42 (m, 2 H) 5.03-5.10 (m, 2 H) 5.64-5.74 (m, 1 H) 6.37 (d, *J*= 10.07

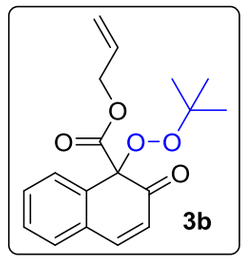


Hz, 1 H) 7.14-7.49 (m, 7 H) 7.59-7.63 (m, 1 H) 7.59-7.63(m, 2 H) 9.15 (d, *J*=8.8 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 70.24, 70.96, 114.51, 117.99, 122.44, 123.63, 123.78, 124.67, 127.70, 128.75, 129.10, 129.17, 129.34, 129.43, 130.19, 131.02, 132.57, 133.75, 140.29, 143.52, 153.29; **HRESI-MS***(m/z)*: Calculated for $C_{23}H_{17}N_3O_2$(M + Na): 390.1218, found (M + Na): 390.1217.**Optical rotation**: $[\alpha]_D^{25}$ –50.3 (c = 1.0, $CHCl_3$) for an enantiomerically enriched sample with 79:21er.The enantiomeric ratio was determined by HPLC analysis using Phenomenex cellulose-1 column (^{i}PrOH/*n*-Hexane 5:95, 1.0 mL/min, 20 °C, 254 nm, τ_{major} = 17.2 min, τ_{minor} = 13.7 min).

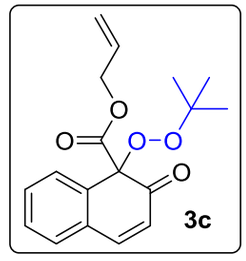
Characterization data for quaternary peroxidation of β-napthol derivatives



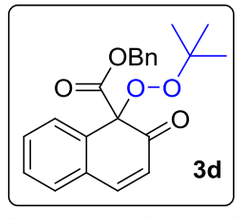
Methyl 1-(tert-butylperoxy)-2-oxo-1,2-dihydronaphthalene-1-carboxylate (3a): Brown solid; Yield – 95%; ***mp***: 112°-114°C; Rf (30% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 1759, 1680, 1020; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.13 (s, 9 H) 3.55 - 3.74 (m, 3 H) 6.23 (d, *J*=10.07 Hz, 1 H) 7.31 - 7.39 (m, 1 H) 7.39 - 7.45 (m, 3 H) 7.56 - 7.68 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.27, 52.84, 76.68, 77.31, 81.05, 83.96, 124.90, 128.09, 129.34, 129.36, 129.99, 130.58, 137.31, 145.18, 166.22, 193.21; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{18}O_5$ (M + Na): 313.1052, found (M + Na): 313.1052.



Allyl 1-(tert-butylperoxy)-2-oxo-1,2-dihydronaphthalene-1-carboxylate (3b): Orange oil; Yield – 98%; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2981, 1757, 1681; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.14 (s, 9 H) 4.39 - 4.64 (m, 2 H) 4.98 - 5.19 (m, 2 H) 5.60 - 5.81 (m, 1 H) 6.24 (d, *J*=9.77 Hz, 1 H) 7.29 - 7.51 (m, 4 H) 7.63 (d, *J*=6.71 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.31, 65.96, 76.69, 77.32, 81.06, 84.04, 118.19, 124.98, 128.08, 129.32, 129.36, 129.96, 130.64, 130.73, 137.40, 145.11, 165.33, 193.10; **HRESI-MS***(m/z)*: Calculated for $C_{18}H_{20}O_5$ (M + Na): 339.1208, found (M + Na): 339.1206.

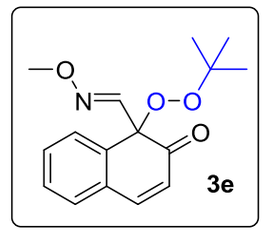


Allyl 1-(tert-butylperoxy)-2-oxo-1,2-dihydronaphthalene-1-carboxylate (3c): Brown solid; Yield – 98%; ***mp***: 68°-70°C; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2932, 1763, 1679, 1195; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.13 (s, 9 H) 2.40 (t, *J*=2.44 Hz, 1 H) 4.61 - 4.67 (m, 2 H) 6.24 (d, *J*=10.07 Hz, 1 H) 7.32 - 7.38 (m, 1 H) 7.38 - 7.48 (m, 3 H) 7.55 - 7.64 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.27, 53.13, 75.69, 76.18, 76.68, 77.32, 81.22, 83.85, 124.84, 128.30, 129.47, 129.54, 130.01, 130.63, 136.69, 145.24, 165.05, 192.65; **HRESI-MS***(m/z)*: Calculated for $C_{18}H_{18}O_5$ (M + Na): 337.1052, found (M + Na): 337.1052.

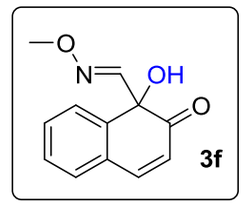


Benzyl 1-(tert-butylperoxy)-2-oxo-1,2-dihydronaphthalene-1-carboxylate (3d): Orange oil; Yield – 78%; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 1758, 1680, 1196; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.14 (s, 9 H) 5.09 (s, 2 H) 6.22 (d, *J*=9.77 Hz, 1 H) 6.96 - 7.10 (m, 2 H) 7.18 - 7.28 (m, 2 H) 7.28 - 7.45 (m, 5 H) 7.50 - 7.61 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.31, 67.11, 76.68, 77.31, 81.10, 84.14, 124.98, 127.28, 128.03, 128.11, 128.30, 129.29, 129.35, 129.92, 130.64, 134.81, 137.21, 145.13, 165.45, 193.03; **HRESI-MS***(m/z)*: Calculated for $C_{22}H_{22}O_5$ (M + Na): 389.1365, found (M + Na): 389.1365.

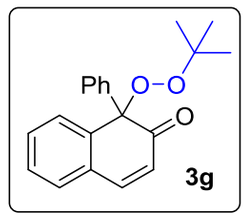
(E)-1-(tert-butylperoxy)-2-oxo-1,2-dihydronaphthalene-1-carbaldehyde O-methyl oxime (3e): Brown oil; Yield – 20%; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2933, 2314, 1682, 1573, 1018; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.18 (s, 9 H) 3.74 (s, 3 H) 6.19 (d, *J*=10.07 Hz, 1 H) 7.30-7.41 (m, 3 H) 7.43 (t, *J*=8.1 Hz, 1 H) 7.62 (d, *J*=10.07 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.49, 62.22, 80.83, 83.39, 125.12, 128.65, 129.11, 129.25, 129.63, 130.71, 139.19, 144.57, 148.02, 195.11; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{19}NO_4$(M + Na): 312.1212, found (M + Na): 312.1212.



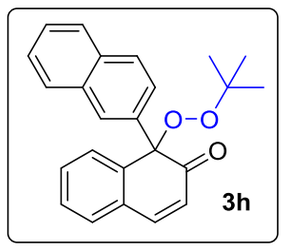
(E)-1-Hydroxy-2-oxo-1,2-dihydronaphthalene-1-carbaldehyde O-methyl oxime (3f): Black oil; Yield – 54%; Rf (10% EtOAc/Hexane) 0.2; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 3351, 1680, 1573, 1012; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.77 (s, 3 H) 4.22 (s, 1 H) 6.27 (d, *J*=9.77 Hz, 1 H) 7.29 - 7.34 (m, 1 H) 7.34 - 7.50 (m, 4 H) 7.70 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 62.15, 76.69, 77.32, 123.53, 126.84, 127.44, 128.89, 129.27, 129.60, 130.68, 139.49, 145.54, 150.49, 199.89; **HRESI-MS***(m/z)*: Calculated for $C_{12}H_{11}NO_3$(M + Na): 240.0637, found (M + Na): 240.0637.



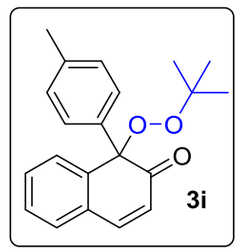
1-(*tert*-Butylperoxy)-1-phenylnaphthalen-2(1H)-one (3g): Yellow solid; Yield – 64%; ***mp***: 98°-99°C; Rf (5% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 3327, 1686, 1399, 1279; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.27 (s, 9 H) 6.05 (d, *J*=10.07 Hz, 1 H) 7.12 - 7.28 (m, 5 H) 7.32 - 7.46 (m, 4 H) 7.47 - 7.56 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.67, 76.68, 77.31, 80.54, 86.79, 124.95, 126.76, 128.22, 128.27, 128.49, 128.78, 129.16, 129.89, 131.34, 138.67, 143.03, 144.38, 197.32; **HRESI-MS***(m/z)*: Calculated for $C_{20}H_{20}O_3$ (M + Na): 331.1310, found (M + Na): 331.1314.



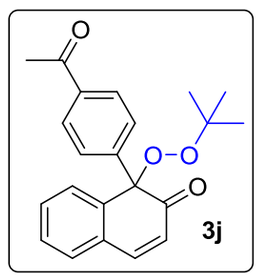
1-(tert-Butylperoxy)-[1,2'-binaphthalen]-2(1H)-one (3h): Yellow oil; Yield – 52%; Rf (10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2980, 1684, 1196; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.30 (s, 9 H) 6.09 (d, *J*=10.07 Hz, 1 H) 7.35 - 7.48 (m, 6 H) 7.49 - 7.57 (m, 3 H) 7.66 - 7.77 (m, 3 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.72, 76.69, 77.32, 80.67, 86.86, 124.26, 125.07, 126.07, 126.17, 126.52, 127.47, 128.06, 128.35, 128.45, 128.89, 129.37, 129.97, 131.42, 132.85, 133.14, 136.09, 143.02, 144.46, 197.28; **HRESI-MS***(m/z)*: Calculated for $C_{24}H_{22}O_3$ (M + Na): 381.1467, found (M + Na): 381.1467.



1-(tert-Butylperoxy)-1-(p-tolyl)naphthalen-2(1H)-one (3i): Yellow oil; Yield – 40%; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2988, 1690, 1490; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.27 (s, 9 H) 2.26 (s, 3 H) 6.04 (d, *J*=10.07 Hz, 1 H) 6.88 - 7.17 (m, 4 H) 7.27 - 7.46 (m, 4 H) 7.46 - 7.58 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 21.07, 26.68, 76.69, 77.32, 80.46, 86.91, 124.99, 126.84, 128.15, 128.76, 129.00, 129.11, 129.83, 131.36, 135.60, 138.56, 143.07, 144.22, 197.49; **HRESI-MS***(m/z)*: Calculated for $C_{21}H_{22}O_3$ (M + Na): 345.1467, found (M + Na): 345.1465.

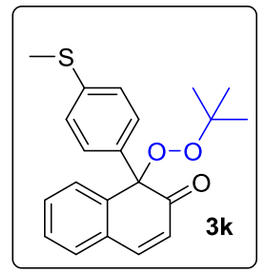


1-(4-Acetylphenyl)-1-(tert-butylperoxy)naphthalen-2(1H)-one (3j): Yellow solid; Yield – 72%; ***mp***: 83°-85°C; Rf(30% EtOAc/Hexane) 0.2; Prepared as shown in general

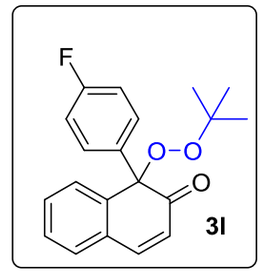


experimental procedure (b). **IR** (neat, cm^{-1}): 1685, 1603, 1266; **^{1}HNMR** (400 MHz, $CDCl_3$): δ 1.26 (s, 9 H) 2.54 (s, 3 H) 6.10 (d, *J*=10.07 Hz, 1 H) 7.21 - 7.33 (m, 2 H) 7.34 - 7.48 (m, 5 H) 7.76 - 7.86 (m, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.59, 26.61, 76.69, 77.32, 80.86, 86.16, 124.81, 126.82, 128.27, 128.59, 129.04, 129.20, 130.15, 131.18, 136.79, 142.45, 143.74, 144.86, 196.54, 197.58; **HRESI-MS***(m/z)*: Calculated for $C_{22}H_{22}O_4$(M + Na): 373.1416, found (M + Na): 373.1419.

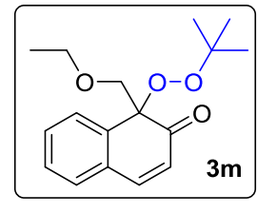
1-(*tert*-Butylperoxy)-1-(4-(methylthio)phenyl)naphthalen-2(1H)-one (3k): Yellow oil; Yield – 48%; Rf (10% EtOAc/Hexane) 0.5; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2980, 1684, 1195; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.26 (s, 9 H) 2.41 (s, 3 H) 6.05 (d, *J*=10.07 Hz, 1 H) 7.03 - 7.13 (m, 4 H) 7.31 - 7.47 (m, 4 H) 7.51 (d, *J*=7.32 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 15.44, 26.66, 76.68, 77.20, 77.31, 80.56, 86.62, 123.48, 124.97, 126.04, 127.41, 127.73, 128.30, 128.83, 129.14, 129.90, 130.20, 131.36, 135.12, 139.48, 142.72, 144.27, 197.18; **HRESI-MS***(m/z)*: Calculated for $C_{21}H_{22}O_3S$(M + Na): 377.1187, found (M + Na): 377.1186.



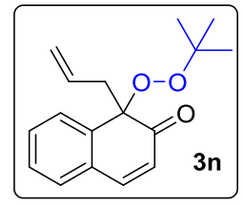
1-(*tert*-Butylperoxy)-1-(4-fluorophenyl)naphthalen-2(1H)-one (3l): Yellow solid; Yield – 79%; ***mp***: 70°-72°C; Rf(10% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 2980, 1685, 1500; **^{1}HNMR** (400 MHz, $CDCl_3$): δ 1.26 (s, 9 H) 6.05 (d, *J*=10.07 Hz, 1 H) 6.84 - 6.96 (m, 2 H) 7.09 - 7.22 (m, 2 H) 7.32 - 7.46 (m, 4 H) 7.46 - 7.55 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.64, 76.68, 77.31, 80.66, 86.23, 115.09, 115.30, 124.87, 128.43, 128.86, 128.91, 128.94, 129.17, 129.99, 131.32, 134.38, 134.40, 142.64, 144.42, 161.54, 164.01, 197.18; **HRESI-MS***(m/z)*: Calculated for $C_{20}H_{19}FO_3$(M + Na): 349.1216, found (M + Na): 349.1219.



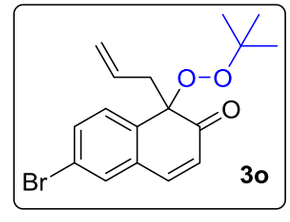
1-(*tert*-Butylperoxy)-1-(ethoxymethyl)naphthalen-2(1H)-one (3m): Black oil; Yield – 30%; Rf (20% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 3436, 2979, 1679; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.04 (t, *J*=7.02 Hz, 3 H) 1.18 (s, 9 H) 3.32 - 3.54 (m, 2 H) 3.59 - 3.75 (m, 2 H) 6.17 (d, *J*=10.07 Hz, 1 H) 7.19 - 7.46 (m, 4 H) 7.65 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 14.86, 26.56, 68.01, 75.67, 76.68, 77.31, 80.13, 86.48, 125.45, 128.02, 128.04, 129.00, 129.32, 131.09, 140.77, 144.59, 197.46; **HRESI-MS***(m/z)*: Calculated for $C_{17}H_{22}O_4$(M + Na): 313.1416, found (M + Na): 313.1415.



1-Allyl-1-(tert-butylperoxy)naphthalen-2(1H)-one (3n): Orange oil; Yield – 44%; Rf(20% EtOAc/Hexane) 0.8; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 1680, 1195; **^{1}HNMR** (400 MHz, $CDCl_3$): δ 1.16 (s, 9 H) 2.50 (dd, *J*=12.97, 6.87 Hz, 1 H) 2.69 (dd, *J*=12.97, 7.78 Hz, 1 H) 4.74 - 4.97 (m, 2 H) 5.22 - 5.45 (m, 1 H) 6.14 (d, *J*=10.07 Hz, 1 H) 7.20 - 7.38 (m, 3 H) 7.43 (t, *J*=7.48 Hz, 1 H) 7.63 (d, *J*=7.93 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.53, 45.14, 76.69, 77.32, 80.12, 84.68, 119.58, 125.80, 127.45, 127.86, 128.84, 129.52, 129.56, 130.98, 142.61, 144.70, 198.88; **HRESI-MS***(m/z)*: Calculated for $C_{17}H_{20}O_3$(M + Na): 295.1310, found (M + Na): 295.1307.

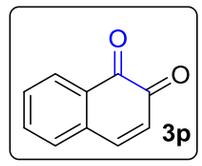


1-Allyl-6-bromo-1-(tert-butylperoxy)naphthalen-2(1H)-one (3o): Orange oil; Yield – 42%; Rf (10% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 3424, 1643, 1437; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.15 (s, 9 H) 2.46 (dd, *J*=12.97, 6.87 Hz, 1 H) 2.67 (dd, *J*=12.97, 7.78 Hz, 1 H) 4.79 - 4.90

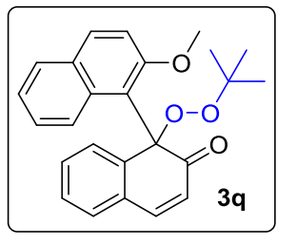


(m, 1 H) 4.92 (d, *J*=10.07 Hz, 1 H) 5.34 (ddt, *J*=17.17, 9.92, 7.36, 7.36 Hz, 1 H) 6.18 (d, *J*=10.07 Hz, 1 H) 7.25 (d, *J*=10.07 Hz, 1 H) 7.43 (d, *J*=1.83 Hz, 1 H) 7.49 (d, *J*=8.24 Hz, 1 H) 7.55 (dd, *J*=8.39, 1.98 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.49, 44.92, 76.68, 77.31, 80.37, 84.48, 120.05, 121.67, 126.93, 129.07, 129.16, 131.33, 132.31, 132.86, 141.40, 143.01, 198.16; **HRESI-MS***(m/z)*: Calculated for $C_{17}H_{19}BrO_3$(M + Na): 373.0415, found (M + Na): 373.0412.

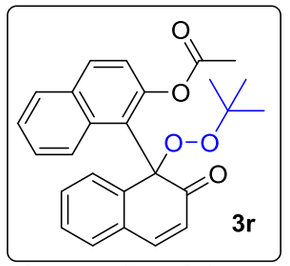
Naphthalene-1,2-dione (3p): Yellow solid; Yield – 56%; ***mp***: 145°-146°C; Rf (30% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 3382, 1661, 1287; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.44 (d, *J*=10.38 Hz, 1 H) 7.37 (d, *J*=7.32 Hz, 1 H) 7.45 (d, *J*=10.38 Hz, 1 H) 7.52 (t, *J*=7.48 Hz, 1 H) 7.66 (t, *J*=7.63 Hz, 1 H) 8.11 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 76.69, 77.32, 127.94, 129.83, 130.21, 130.85, 131.63, 134.78, 135.81, 145.32, 178.89, 180.86; **HRESI-MS***(m/z)*: Calculated for $C_{10}H_6O_2$(M + Na): 181.0265, found (M + Na): 181.0263.



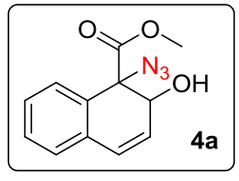
1-(*tert*-Butylperoxy)-2'-methoxy-[1,1'-binaphthalen]-2(1H)-one (3q): Brown solid; Yield – 80%; ***mp***: 138°-139°C; Rf (30% EtOAc/Hexane) 0.3; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 1682, 1595, 1019; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.09 (s, 9 H) 3.51 (s, 3 H) 6.40 (d, *J*=9.77 Hz, 1 H) 6.98 - 7.20 (m, 2 H) 7.20 - 7.33 (m, 3 H) 7.33 - 7.44 (m, 3 H) 7.53 (ddd, *J*=8.70, 7.02, 1.37 Hz, 1 H) 7.78 (dd, *J*=8.39, 5.04 Hz, 2 H) 9.12 (d, *J*=8.85 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 26.50, 55.76, 76.68, 77.32, 80.56, 86.67, 113.97, 123.48, 125.75, 126.63, 126.73, 127.91, 128.07, 128.74, 129.09, 129.74, 130.36, 130.59, 131.53, 133.68, 141.58, 142.30, 153.68, 196.89; **HRESI-MS***(m/z)*: Calculated for $C_{25}H_{24}O_4$(M + Na): 411.1572, found (M + Na): 411.1570.



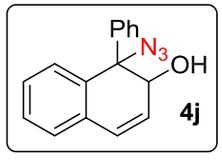
1'-(*tert*-Butylperoxy)-2'-oxo-1',2'-dihydro-[1,1'-binaphthalen]-2-yl acetate (3r): Brown liquid; Yield – 98%; Rf (30% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (b). **IR** (neat, cm^{-1}): 1768, 1682, 1186; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 1.09 (s, 9 H) 1.89 (s, 3 H) 6.43 (d, *J*=10.07 Hz, 1 H) 7.07 (d, J=8.8 Hz, 1 H) 7.15-7.32 (m, 7 H) 7.82-7.85 (m, 2 H) 9.08 (s, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 20.59, 26.42, 81.03, 86.74, 121.65, 125.20, 126.45, 126.63, 127.45, 127.83, 128.25, 128.71, 128.99, 129.92, 130.16, 130.76, 130.81, 132.48, 133.59, 140.80, 142.49, 145.92, 167.67, 195.33; **HRESI-MS***(m/z)*: Calculated for $C_{26}H_{24}O_5$(M + Na): 439.1521, found (M + Na): 439.1519.



Methyl 1-azido-2-hydroxy-1,2-dihydronaphthalene-1-carboxylate (4a): Yellow oil; Yield – 42%; Rf (30% EtOAc/Hexane) 0.7; Prepared as shown in general experimental procedure (c). **IR** (neat, cm^{-1}): 3471 (br) 2114, 1737, 1253; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.29 (s, 1 H) 3.77 (s, 3 H) 4.83 (d, *J*=7.6 Hz, 1 H) 6.01 (dd, J_1=10 Hz, J_2=2.8 Hz, 1 H) 6.44 (dd, J_1=10 Hz, J_2=2.0 Hz, 1 H) 7.12 (d, *J*=7.2 Hz, 1 H) 7.28-7.34 (m, 2 H) 7.51 (d, *J*=6.8 Hz, 1 H);**^{13}C NMR** (100 MHz, $CDCl_3$): δ 53.19, 72.24, 73.73, 127.28, 127.33, 127.71, 128.27, 129.59, 129.90, 130.59, 132.42, 169.86;**HRESI-MS***(m/z)*: Calculated for $C_{12}H_{11}N_3O_3$(M + Na): 268.0698, found (M + Na): 268.0698.

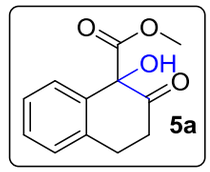


1-Azido-1-phenyl-1,2-dihydronaphthalen-2-ol (4j): Yellow oil; Yield – 95%; Rf (20% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (c). **IR** (neat, cm^{-1}): 3409, 2104, 1447; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 4.37 (br. s., 1 H) 5.98 - 6.07 (m, 1 H) 6.58 (d, *J*=9.77 Hz, 1 H) 7.21 - 7.28 (m, 3 H) 7.28 - 7.39 (m, 6 H) 7.39 - 7.49 (m, 3 H); **^{13}C**

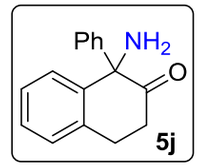


NMR (100 MHz, $CDCl_3$): δ 72.07, 72.81, 73.22, 74.55, 75.59, 76.68, 77.31, 126.40, 127.38, 127.62, 127.79, 128.00, 128.07, 128.14, 128.19, 128.27, 128.33, 128.37, 128.45, 128.73, 128.76, 128.86, 128.94, 129.04, 129.40, 129.84, 130.52, 132.97, 133.17, 134.03, 134.31, 136.64, 140.01; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{13}N_3O$(M + Na): 286.0956, found (M + Na): 286.0956.

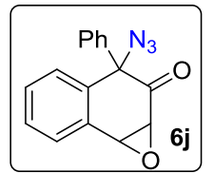
Methyl 1-hydroxy-2-oxo-1,2,3,4-tetrahydronaphthalene-1-carboxylate (5a): Yellow oil; Yield – 41%; Rf (20% EtOAc/Hexane) 0.8; Prepared as shown in general experimental procedure (d). **IR** (neat, cm^{-1}): 3446, 1722, 1453; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.57 - 2.77 (m, 1 H) 2.96 - 3.17 (m, 2 H) 3.24 - 3.44 (m, 1 H) 3.72 (s, 3 H) 4.54 (s, 1 H) 7.14 - 7.26 (m, 1 H) 7.29 - 7.40 (m, 2 H) 7.57 - 7.70 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 27.40, 34.50, 53.38, 76.68, 77.31, 79.60, 126.44, 127.46, 127.95, 128.89, 134.51, 135.91, 169.77, 206.76; **HRESI-MS***(m/z)*: Calculated for $C_{12}H_{12}O_4$(M + Na): 243.0633, found (M + Na): 243.0633.



1-Amino-1-phenyl-3,4-dihydronaphthalen-2(1H)-one (5j): Yellow oil; Yield – 72%; Rf (20% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (e). **IR** (neat, cm^{-1}): 3378, 3300, 1715, 1219; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 2.45 - 2.61 (m, 2 H) 2.61 - 2.84 (m, 6 H) 6.96 - 7.04 (m, 2 H) 7.13 - 7.22 (m, 2 H) 7.22 - 7.30 (m, 3 H) 7.33 (t, *J*=7.48 Hz, 1 H) 7.40 (t, *J*=7.63 Hz, 1 H) 7.87 (d, *J*=7.63 Hz, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 27.31, 34.98, 69.03, 76.68, 77.31, 126.55, 127.14, 127.25, 127.71, 127.81, 127.87, 128.89, 137.11, 139.14, 141.54, 211.32; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{15}NO$(M + H): 238.1232, found (M + H): 238.1231.

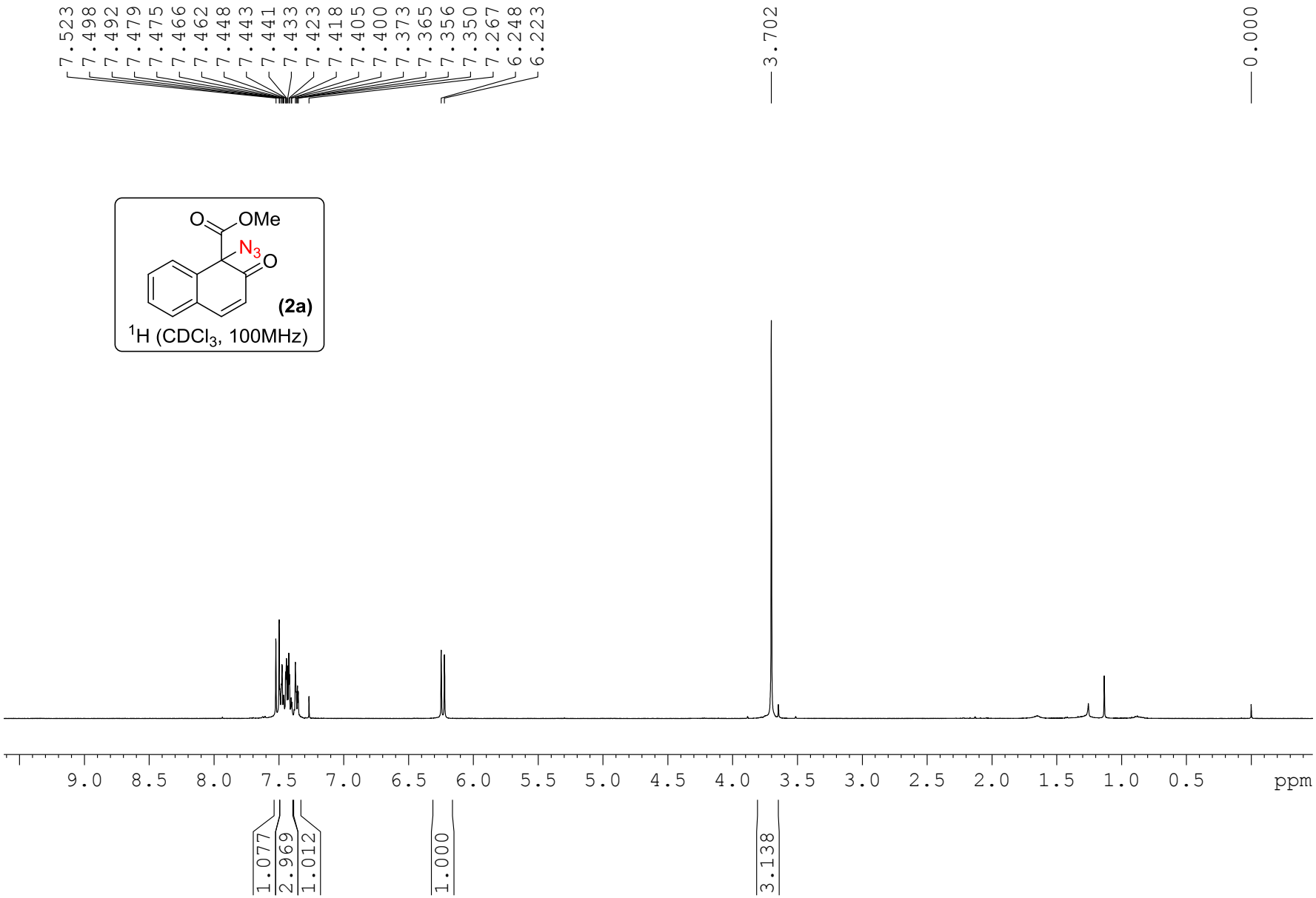


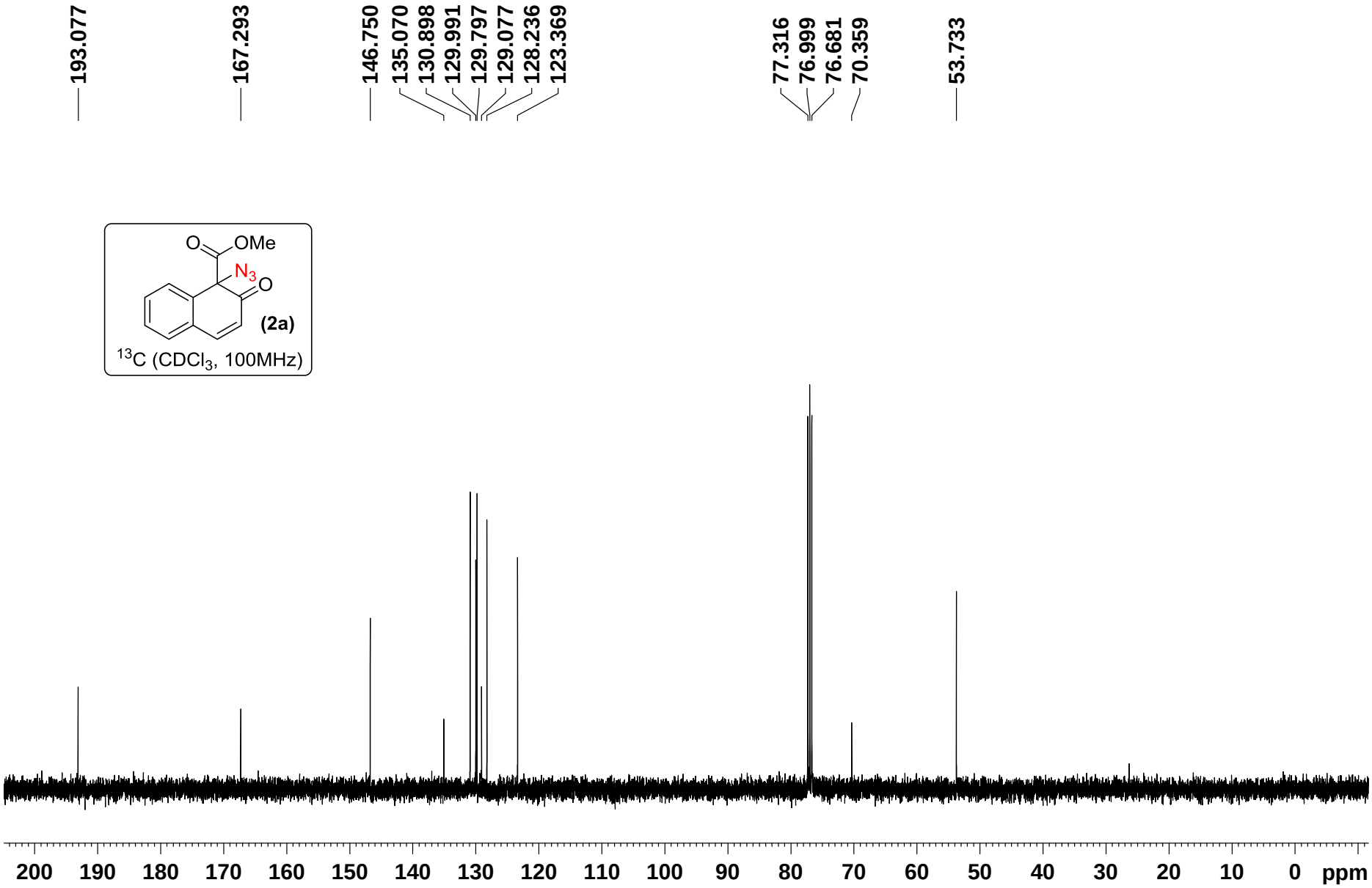
3-Azido-3-phenyl-3,7b-dihydronaphtho[1,2-b]oxiren-2(1aH)-one (6j): Yellow solid; Yield – 53%; ***mp***: 119°-121°C; Rf (10% EtOAc/Hexane) 0.4; Prepared as shown in general experimental procedure (f). **IR** (neat, cm^{-1}): 2106, 1723, 1219; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 3.85 (d, *J*=3.97 Hz, 1 H) 4.23 (d, *J*=3.97 Hz, 1 H) 7.01 (dd, *J*=6.71, 2.75 Hz, 2 H) 7.27 - 7.42 (m, 3 H) 7.42 - 7.54 (m, 1 H) 7.54 - 7.66 (m, 2 H) 7.68 - 7.79 (m, 1 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 53.40, 59.23, 75.96, 76.69, 77.32, 126.85, 128.65, 128.76, 129.09, 129.64, 129.72, 130.11, 130.92, 136.80, 137.66, 202.15; **HRESI-MS***(m/z)*: Calculated for $C_{16}H_{11}N_3O_2$(M + Na): 300.0749, found (M + Na): 300.0743.

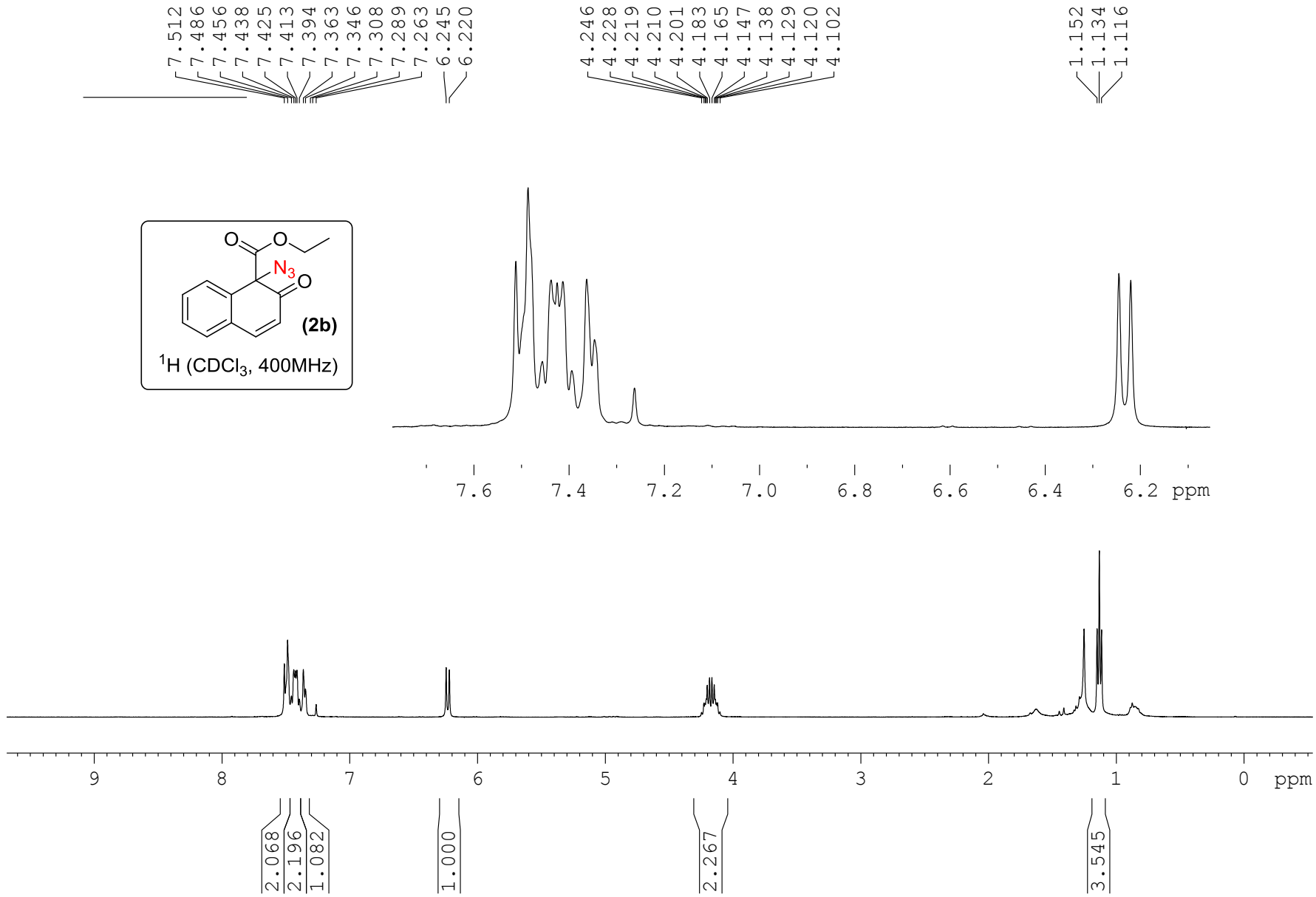


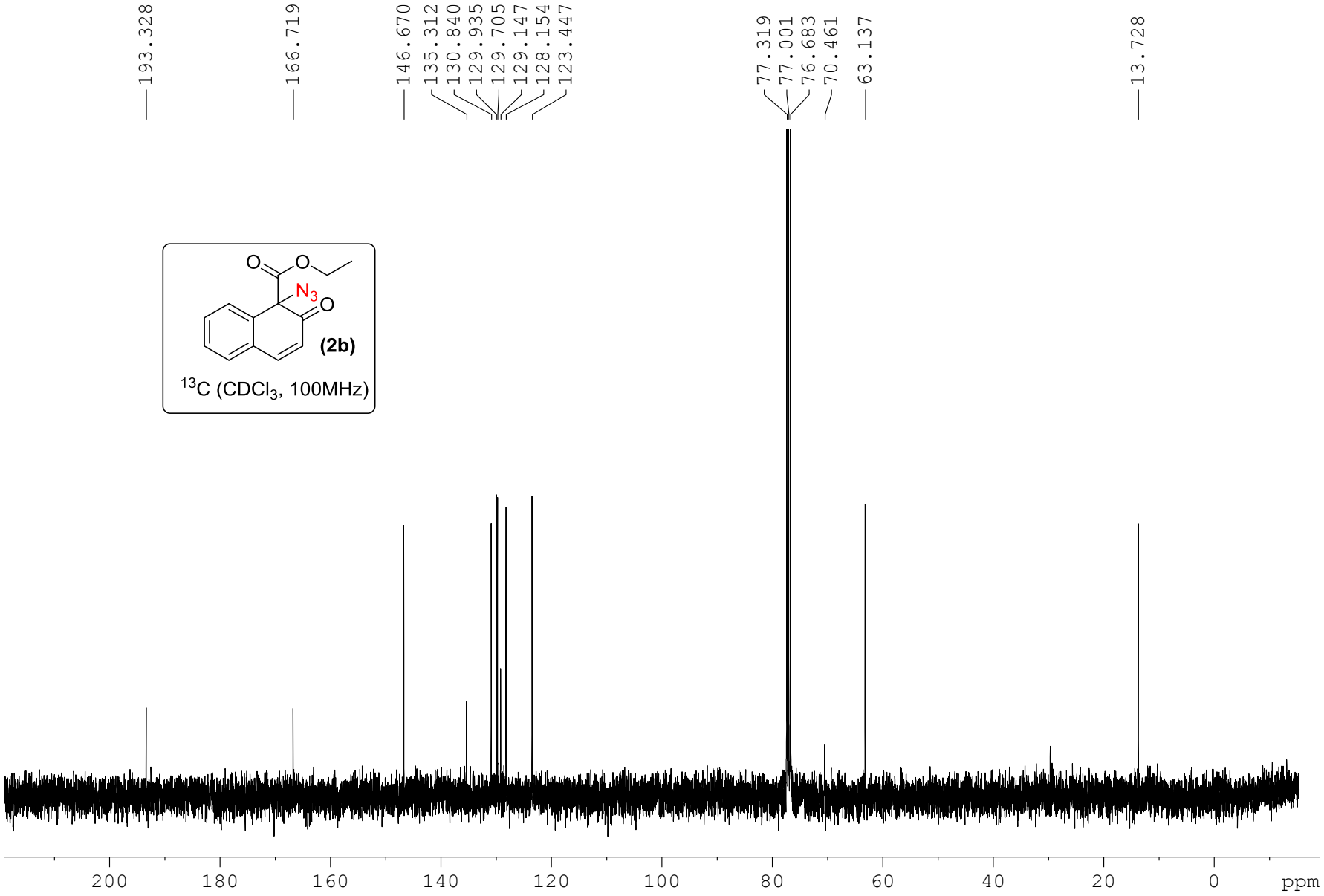
References:

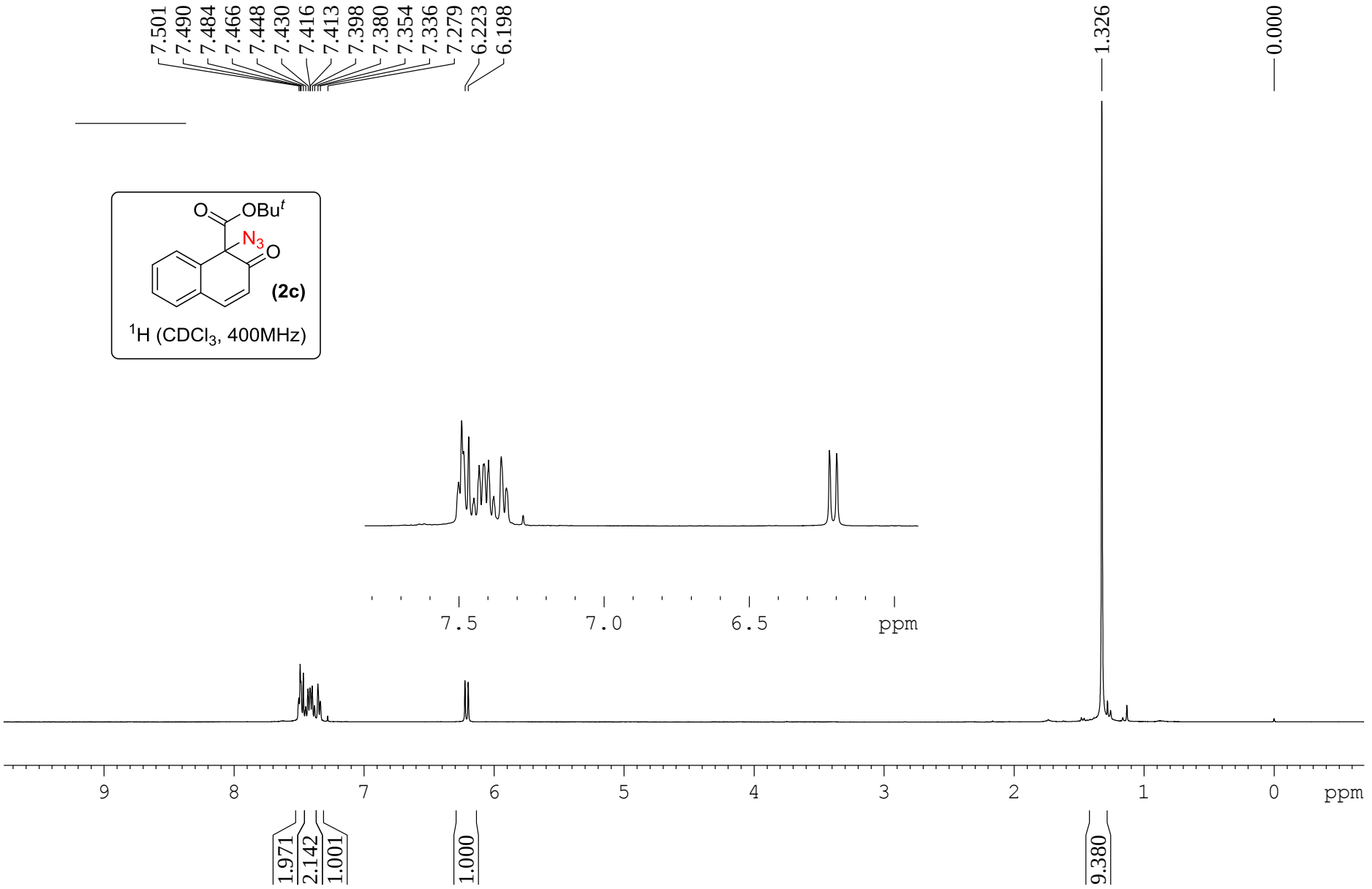
1. W. Guo, J. Li, N. Fan, W. Wu, P. Zhou, C. Xia, *Synth. Commun*. 2005, **35**, 145.
2. C. Liu, Y. Zhang, N. Liu, J. Qiu, *Green Chem. 2012*, **14**, 2999.
3. F. Gonzalez-Bobes, N. Kopp, L. Li, J. Deerberg, P. Sharma, S. Leung, M. Davies, J. Bush, J. Hamm, M. Hrytsak, *Org. Process Res. Dev*. 2012, **16**, 2051.

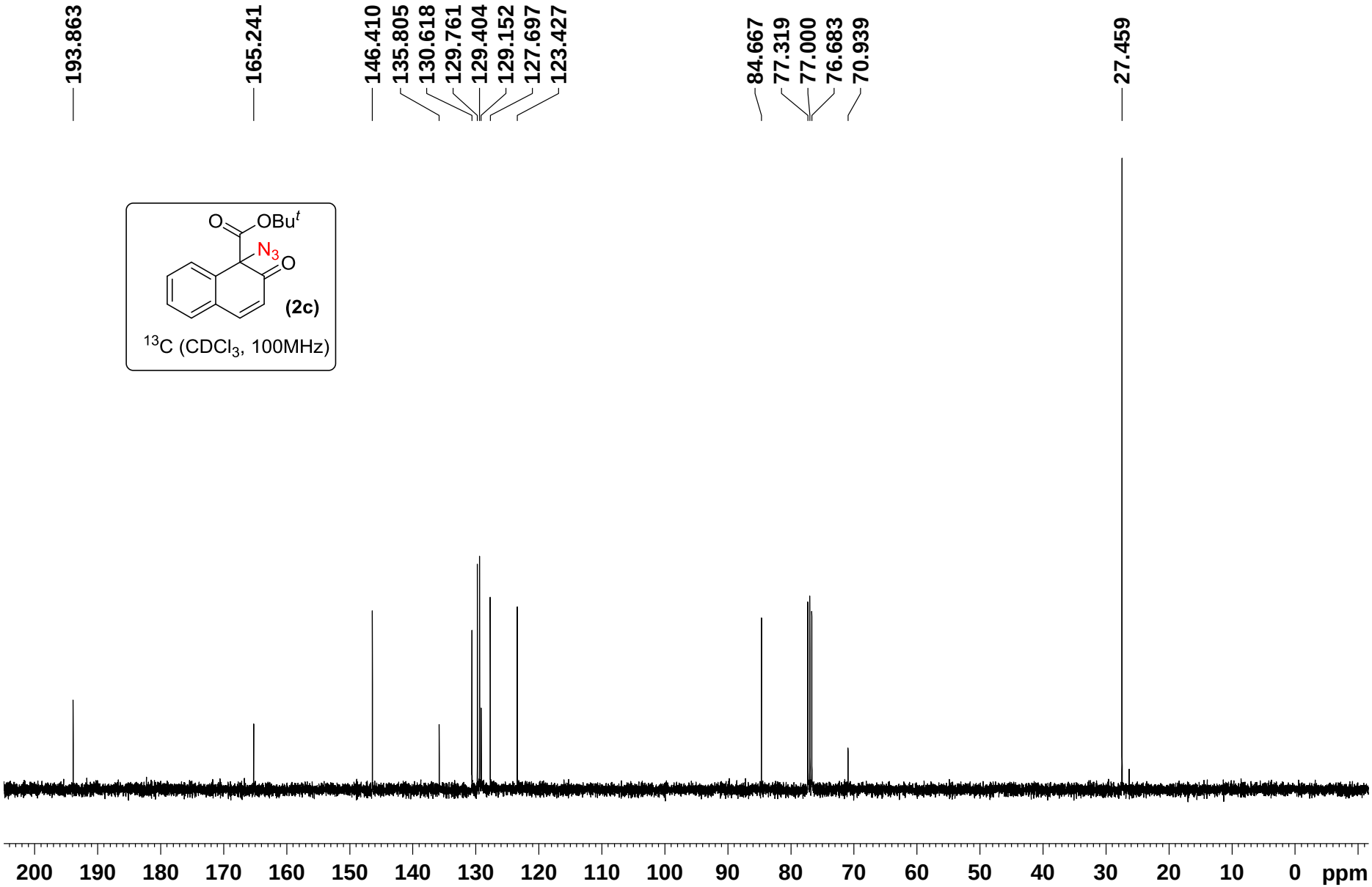

7.523
7.498
7.492
7.479
7.475
7.466
7.462
7.448
7.443
7.441
7.433
7.423
7.418
7.405
7.400
7.373
7.365
7.356
7.350
7.267
6.248
6.223
3.702
0.000
O
OMe
N3
O
(2a)
1H (CDCl3, 100MHz)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.077
2.969
1.012
1.000
3.138

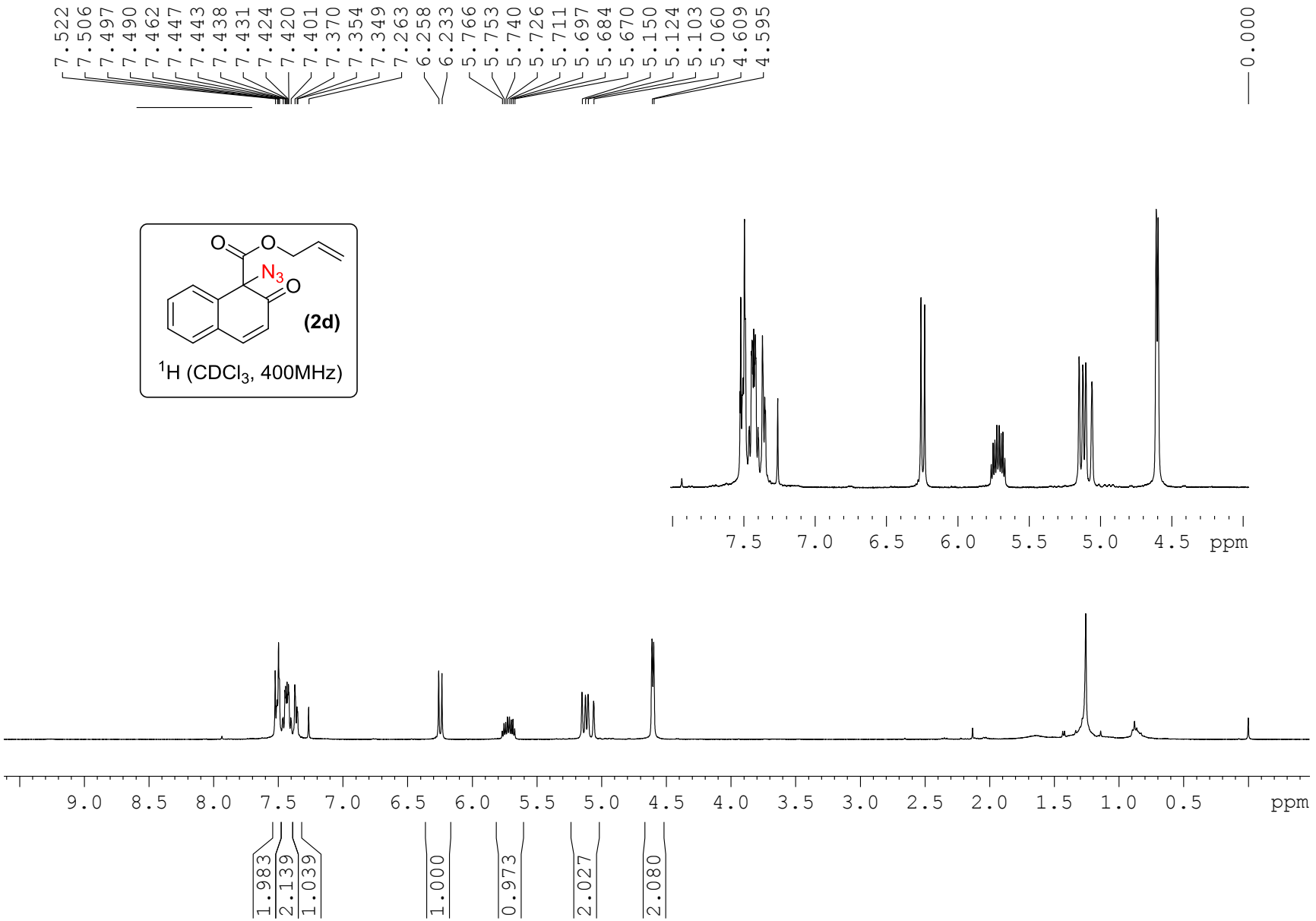

193.077
167.293
146.750
135.070
130.898
129.991
129.797
129.077
128.236
123.369
77.316
76.999
76.681
70.359
53.733
OMe
N3
O
(2a)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

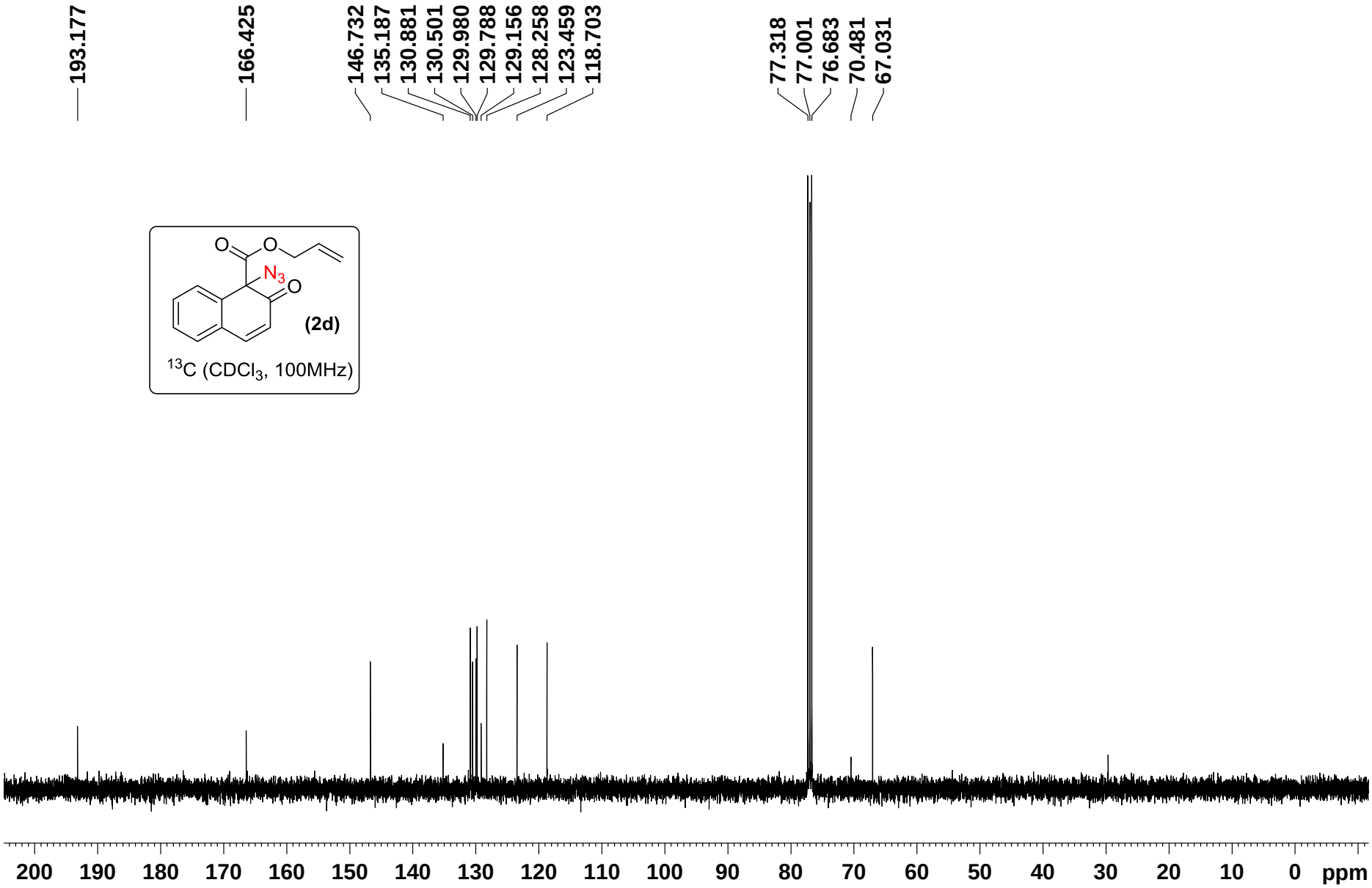

7.512
7.486
7.456
7.438
7.425
7.413
7.394
7.363
7.346
7.308
7.289
7.263
6.245
6.220
4.246
4.228
4.219
4.210
4.201
4.183
4.165
4.147
4.138
4.129
4.120
4.102
1.152
1.134
1.116
(2b)
1H (CDCl3, 400MHz)
7.6
7.4
7.2
7.0
6.8
6.6
6.4
6.2 ppm
9
8
7
6
5
4
3
2
1
0 ppm
2.068
2.196
1.082
1.000
2.267
3.545

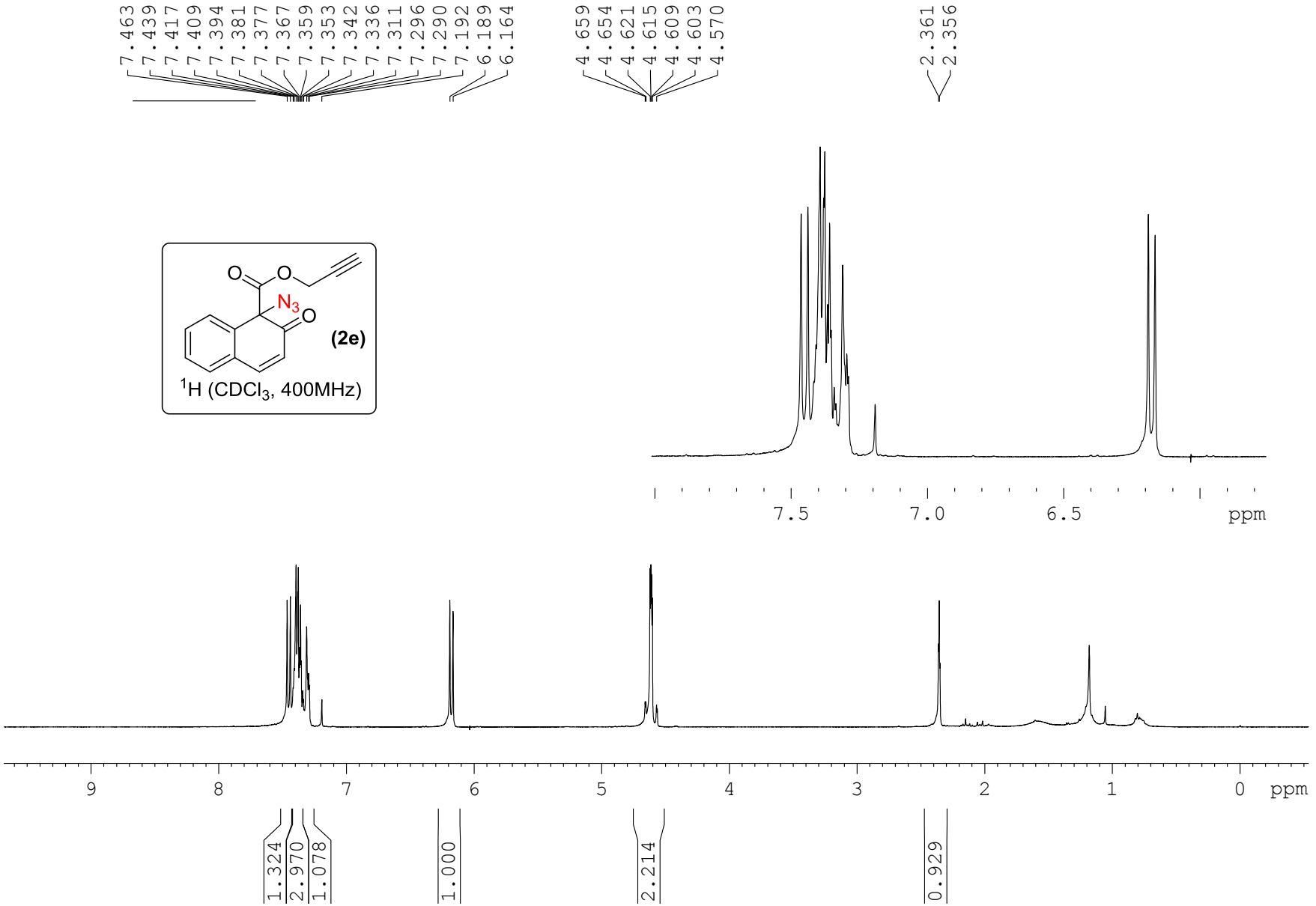

193.328
166.719
146.670
135.312
130.840
129.935
129.705
129.147
128.154
123.447
77.319
77.001
76.683
70.461
63.137
13.728
(2b)
^{13}C (CDCl$_3$, 100MHz)
200
180
160
140
120
100
80
60
40
20
0
ppm

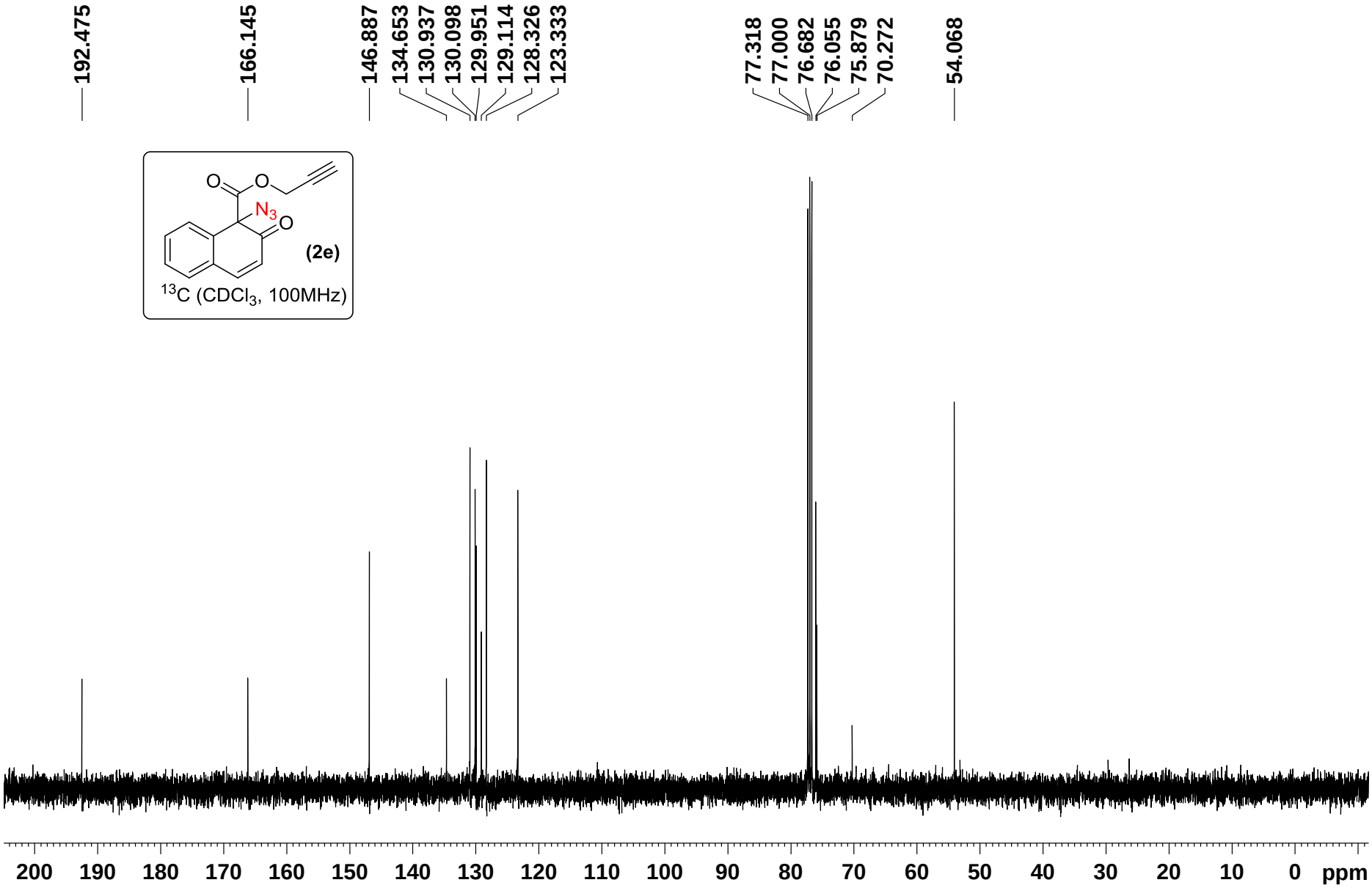

7.501
7.490
7.484
7.466
7.448
7.430
7.416
7.413
7.398
7.380
7.354
7.336
7.279
6.223
6.198
1.326
0.000
O
OBu^t
N$_3$
O
(2c)
^{1}H (CDCl$_3$, 400MHz)
7.5
7.0
6.5
ppm
9
8
7
6
5
4
3
2
1
0
ppm
1.971
2.142
1.001
1.000
9.380

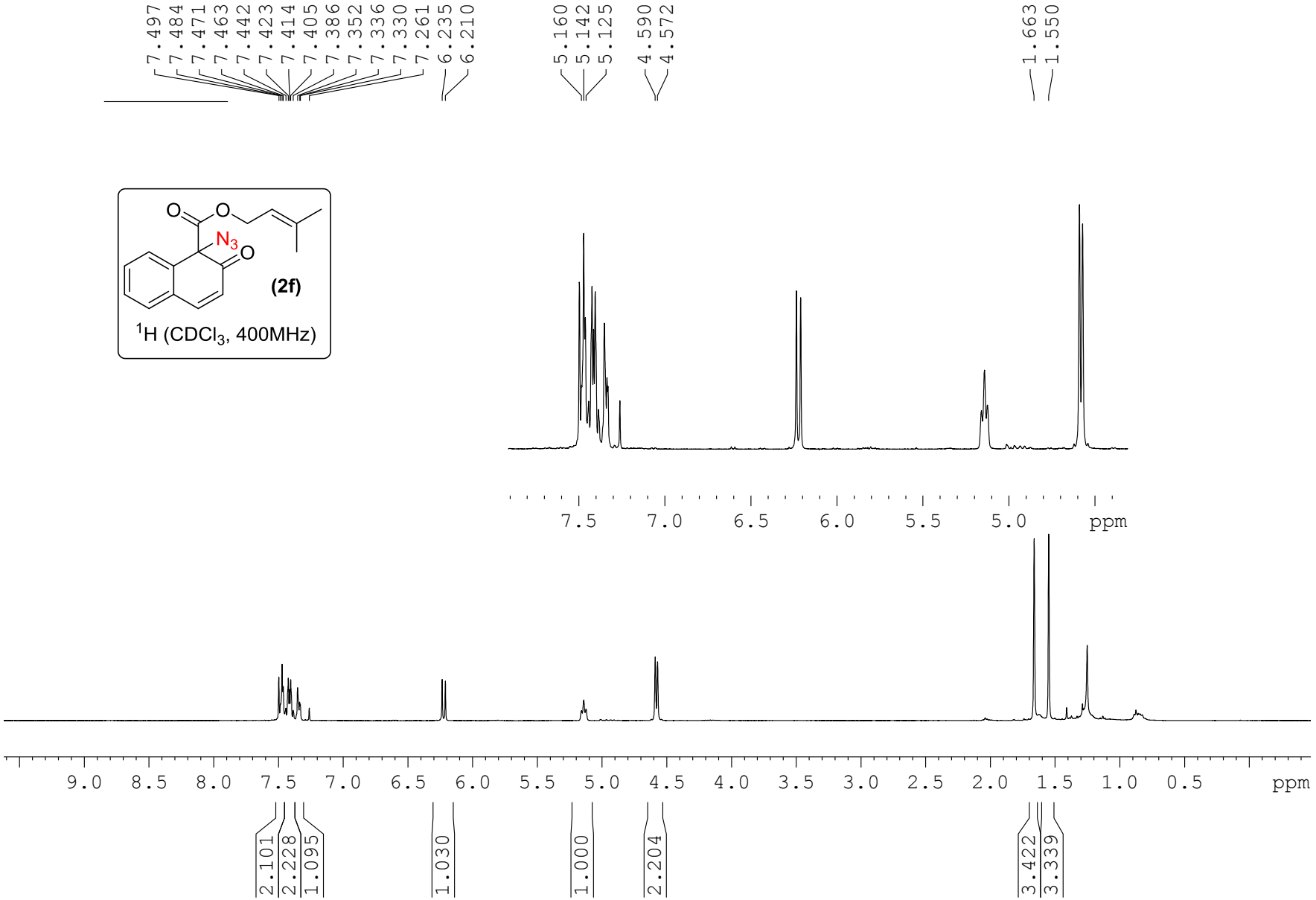

193.863
165.241
146.410
135.805
130.618
129.761
129.404
129.152
127.697
123.427
84.667
77.319
77.000
76.683
70.939
27.459
O
OBu^t
N$_3$
O
(2c)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

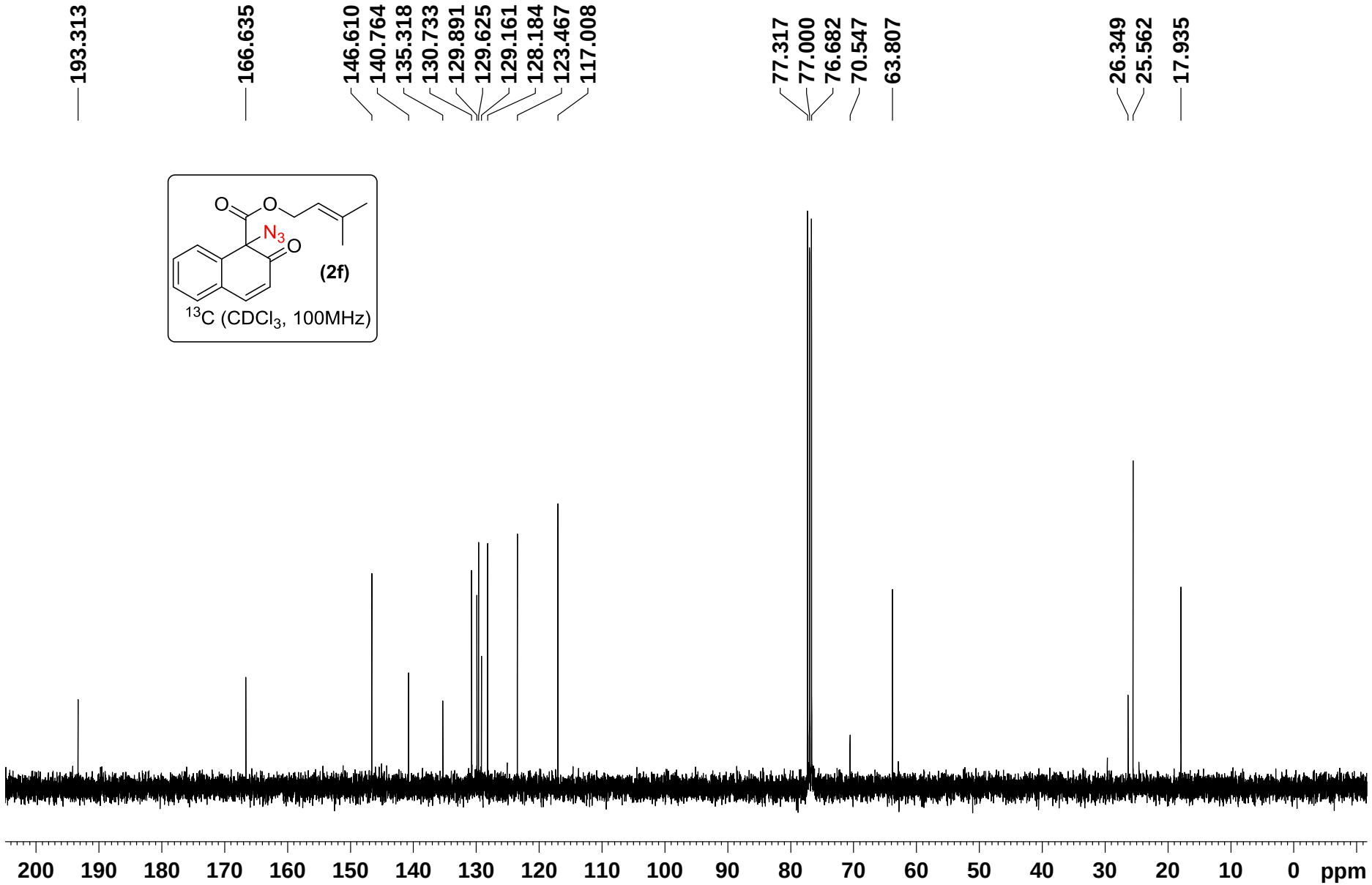

7.522
7.506
7.497
7.490
7.462
7.447
7.443
7.438
7.431
7.424
7.420
7.401
7.370
7.354
7.349
7.263
6.258
6.233
5.766
5.753
5.740
5.726
5.711
5.697
5.684
5.670
5.150
5.124
5.103
5.060
4.609
4.595
0.000
(2d)
1H (CDCl3, 400MHz)
7.5 7.0 6.5 6.0 5.5 5.0 4.5 ppm
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.983
2.139
1.039
1.000
0.973
2.027
2.080


193.177
166.425
146.732
135.187
130.881
130.501
129.980
129.788
129.156
128.258
123.459
118.703
77.318
77.001
76.683
70.481
67.031
O
O
N3
O
(2d)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm


7.463
7.439
7.417
7.409
7.394
7.381
7.377
7.367
7.359
7.353
7.342
7.336
7.311
7.296
7.290
7.192
6.189
6.164
4.659
4.654
4.621
4.615
4.609
4.603
4.570
2.361
2.356
(2e)
1H (CDCl3, 400MHz)
7.5
7.0
6.5
ppm
9
8
7
6
5
4
3
2
1
0
ppm
1.324
2.970
1.078
1.000
2.214
0.929


192.475
166.145
146.887
134.653
130.937
130.098
129.951
129.114
128.326
123.333
77.318
77.000
76.682
76.055
75.879
70.272
54.068
O
O
N3
O
(2e)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm


7.497
7.484
7.471
7.463
7.442
7.423
7.414
7.405
7.386
7.352
7.336
7.330
7.261
6.235
6.210
5.160
5.142
5.125
4.590
4.572
1.663
1.550
(2f)
^{1}H (CDCl$_3$, 400MHz)
7.5
7.0
6.5
6.0
5.5
5.0
ppm
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.101
2.228
1.095
1.030
1.000
2.204
3.422
3.339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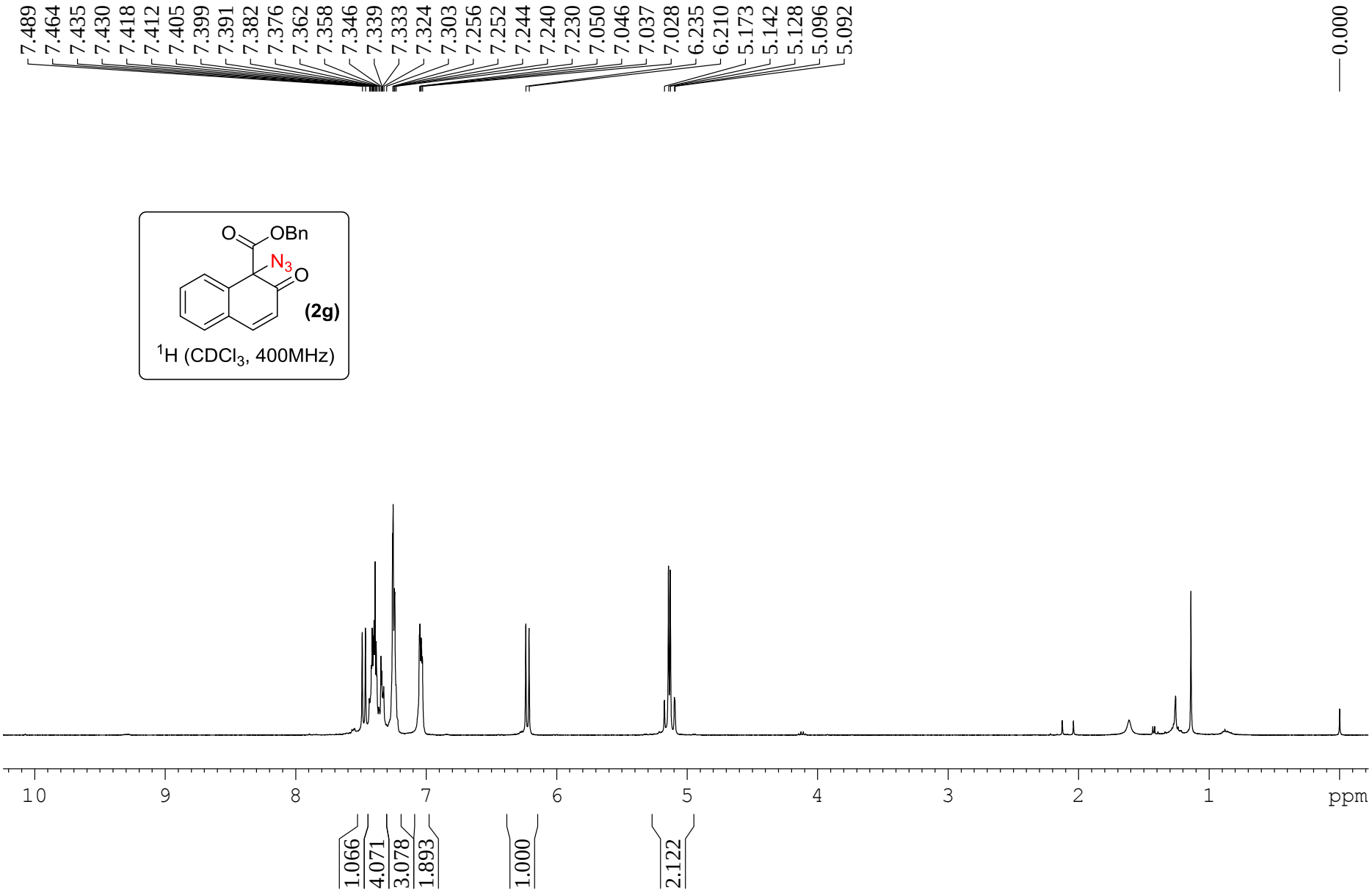
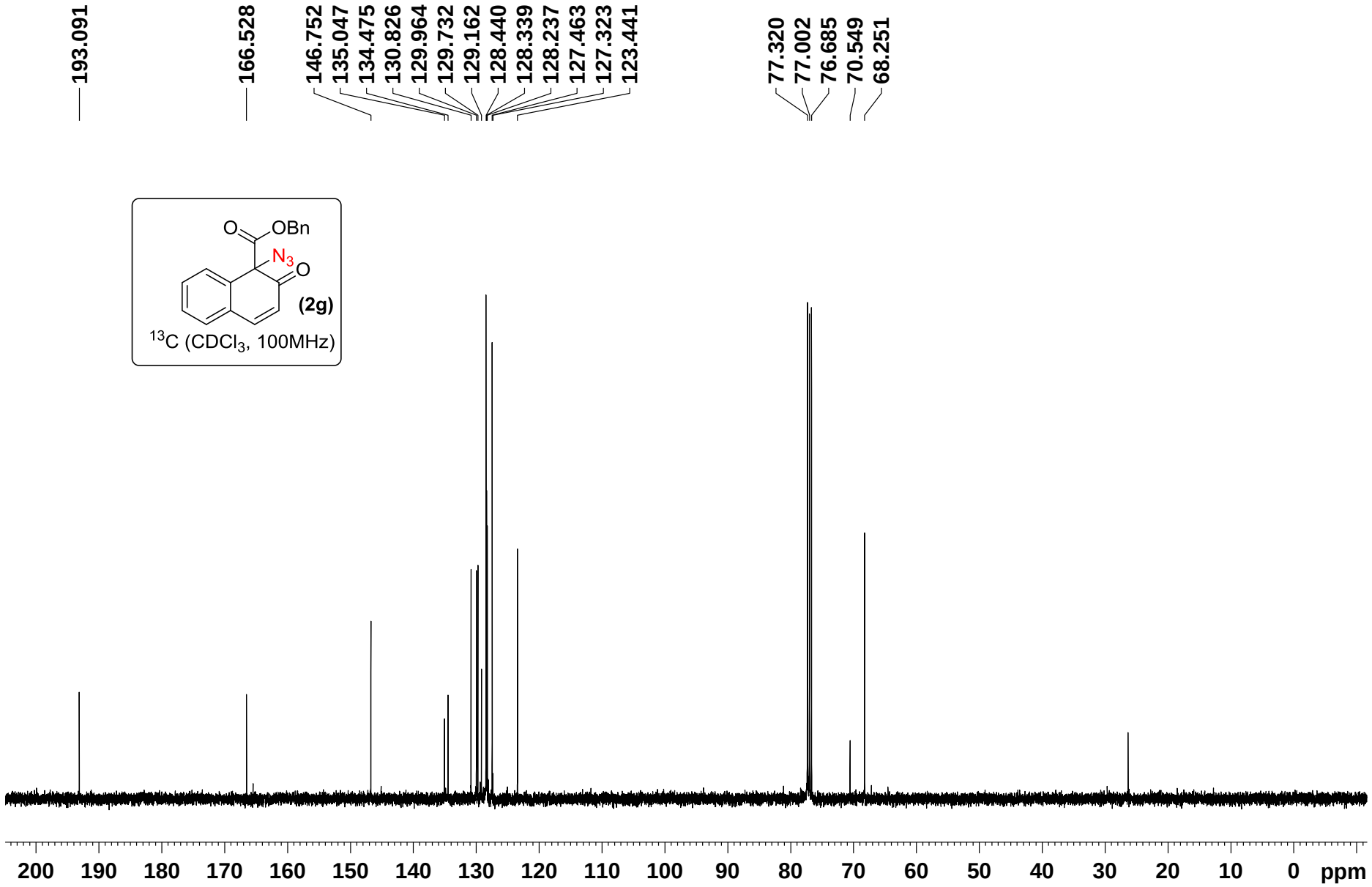
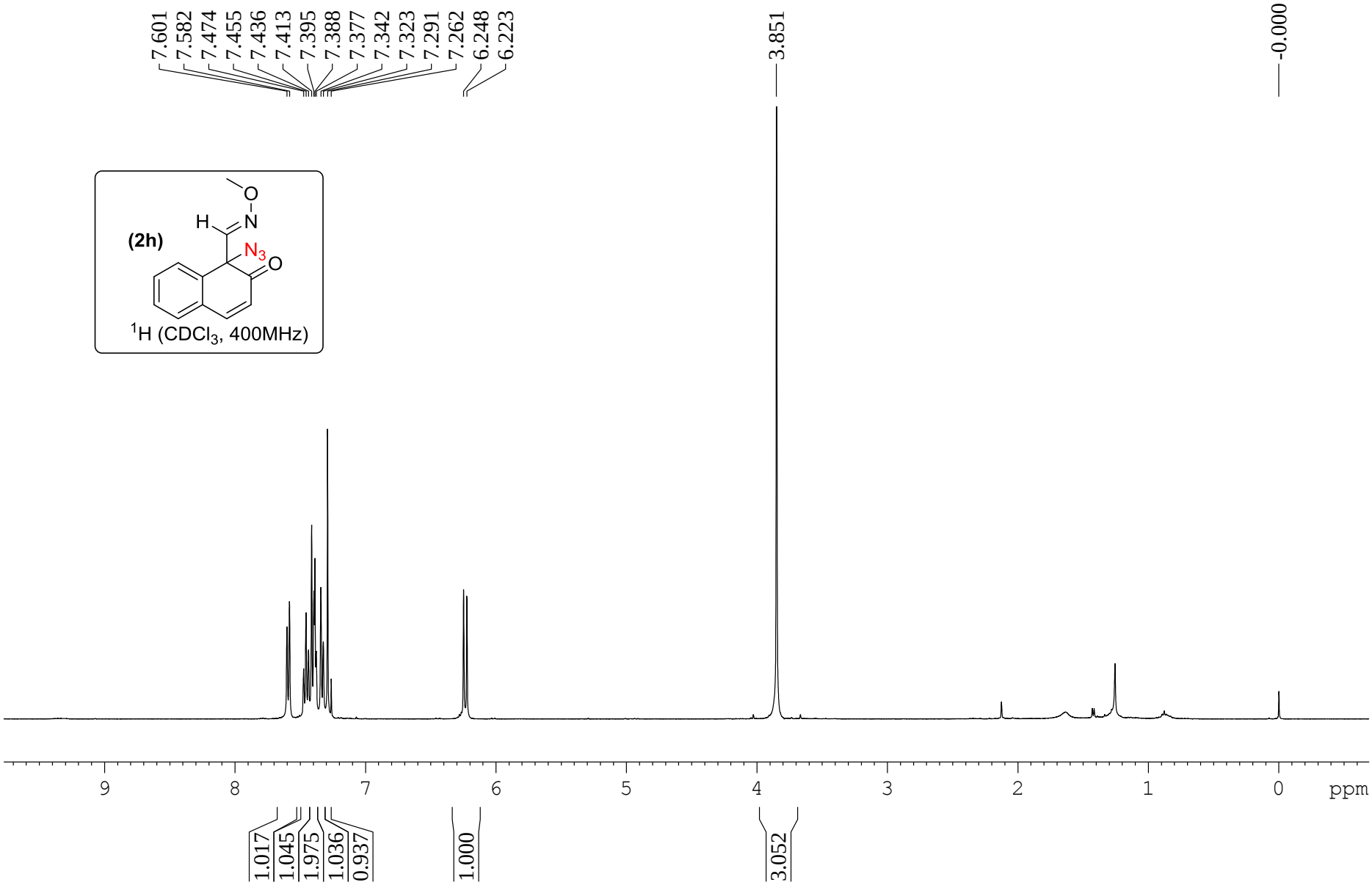
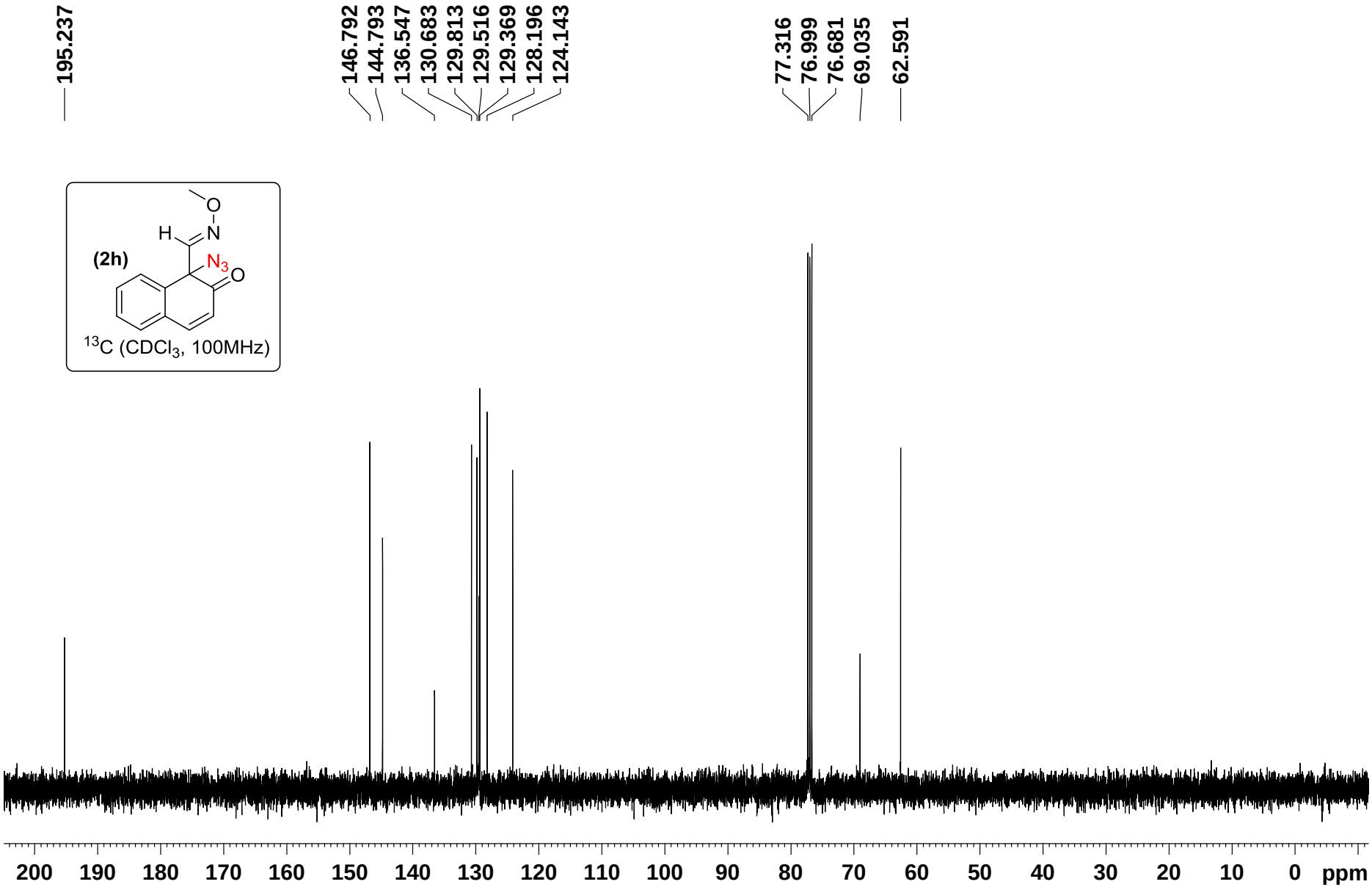
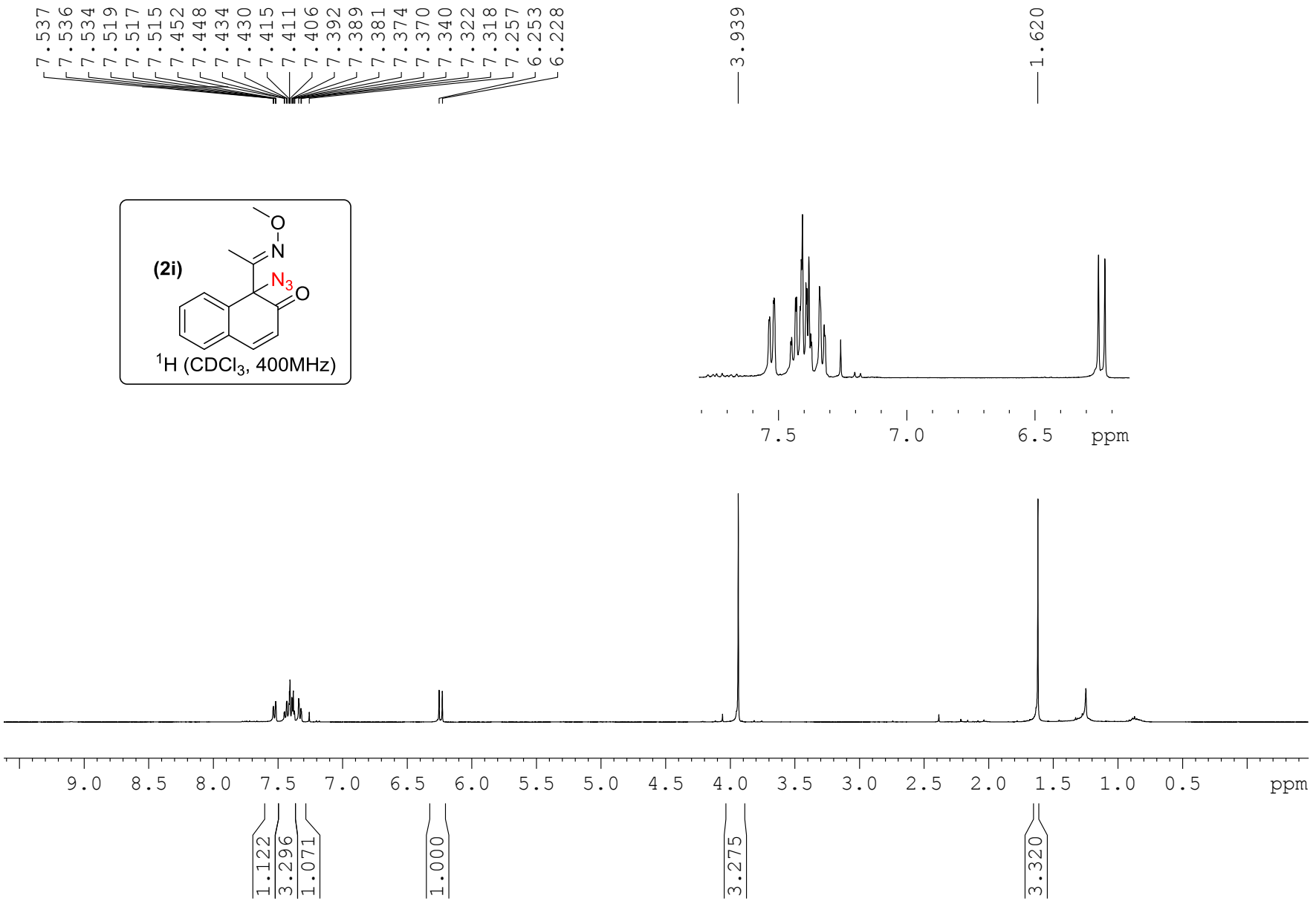
166.635
146.610
140.764
135.318
130.733
129.891
129.625
129.161
128.184
123.467
117.008
77.317
77.000
76.682
70.547
63.807
26.349
25.562
17.935
O
O
N3
O
(2f)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

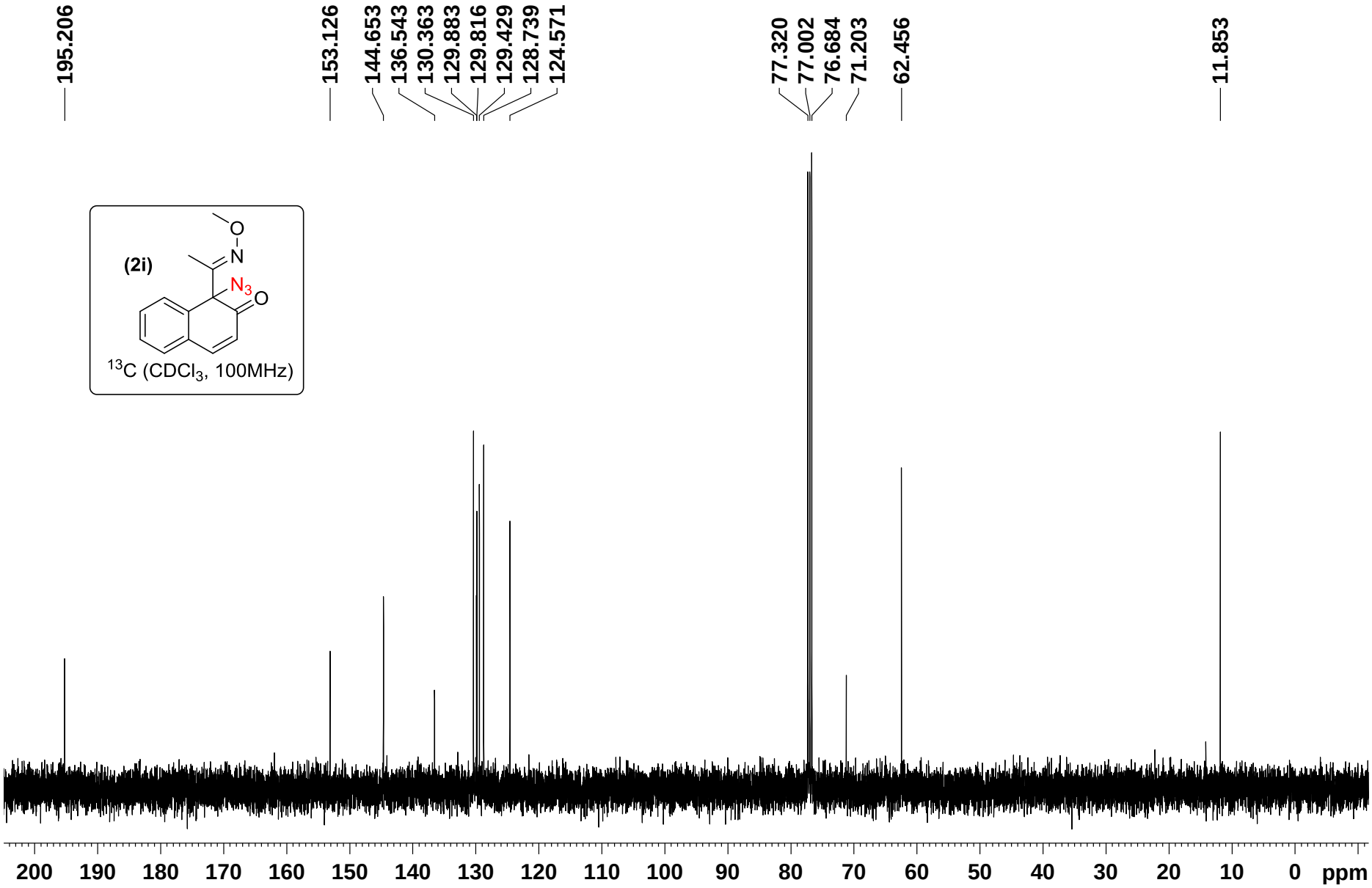

7.489
7.464
7.435
7.430
7.418
7.412
7.405
7.399
7.391
7.382
7.376
7.362
7.358
7.346
7.339
7.333
7.324
7.303
7.256
7.252
7.244
7.240
7.230
7.050
7.046
7.037
7.028
6.235
6.210
5.173
5.142
5.128
5.096
5.092
0.000
O
OBn
N3
O
(2g)
1H (CDCl3, 400MHz)
10
9
8
7
6
5
4
3
2
1
ppm
1.066
4.071
3.078
1.893
1.000
2.122

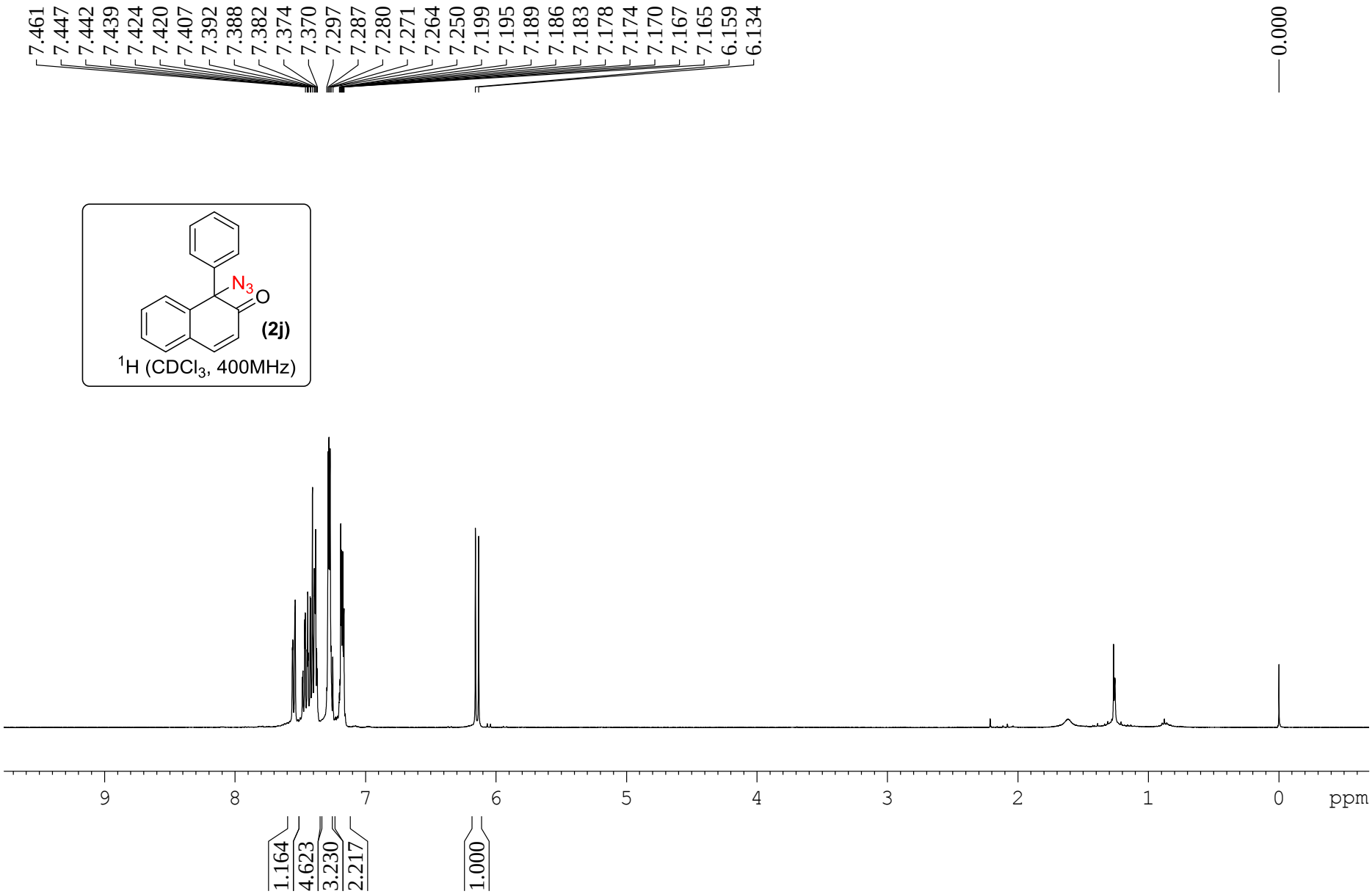

193.091
166.528
146.752
135.047
134.475
130.826
129.964
129.732
129.162
128.440
128.339
128.237
127.463
127.323
123.441
77.320
77.002
76.685
70.549
68.251
OBn
N3
O
(2g)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

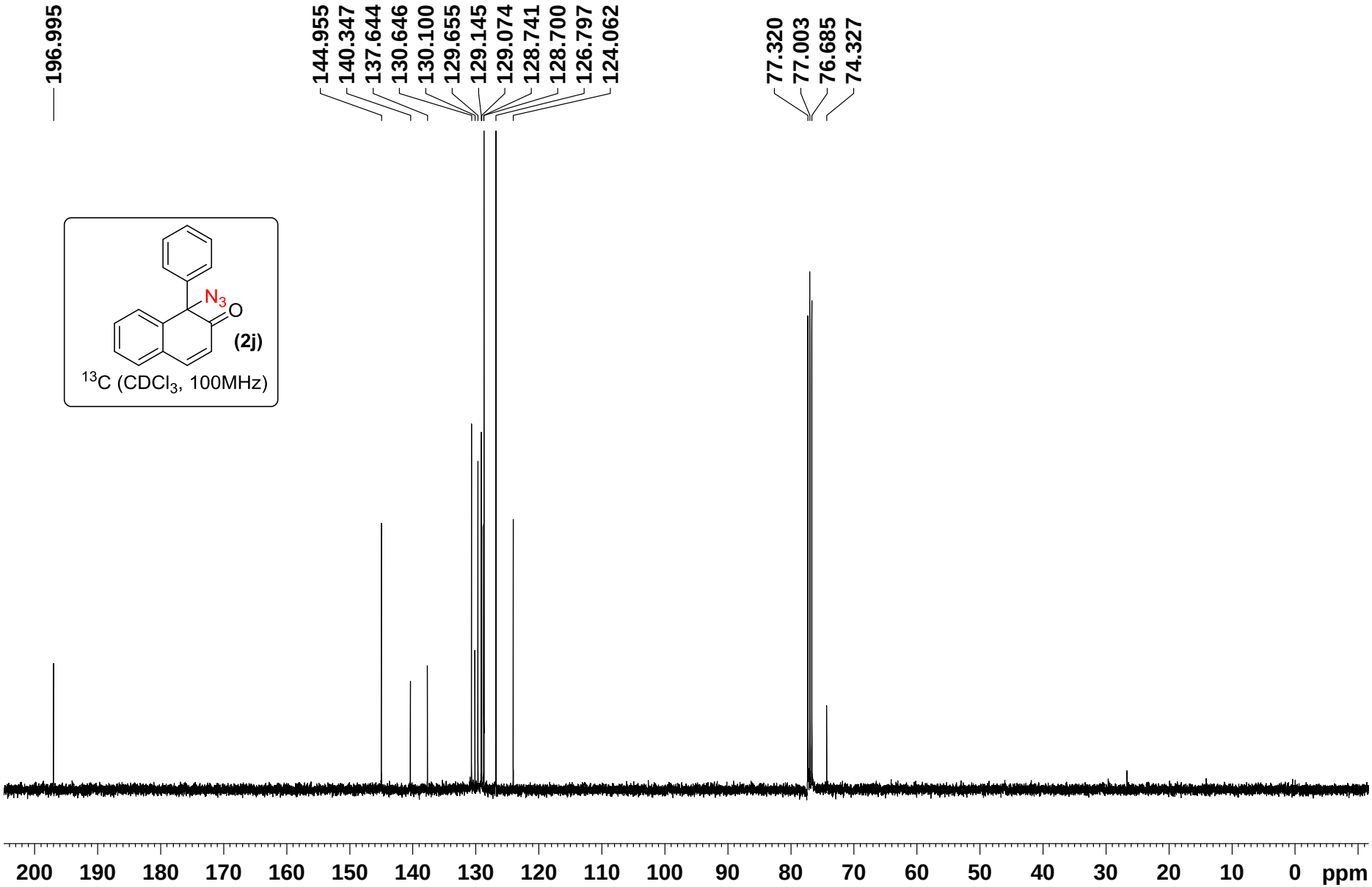

7.601
7.582
7.474
7.455
7.436
7.413
7.395
7.388
7.377
7.342
7.323
7.291
7.262
6.248
6.223
3.851
-0.000
(2h)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.017
1.045
1.975
1.036
0.937
1.000
3.052

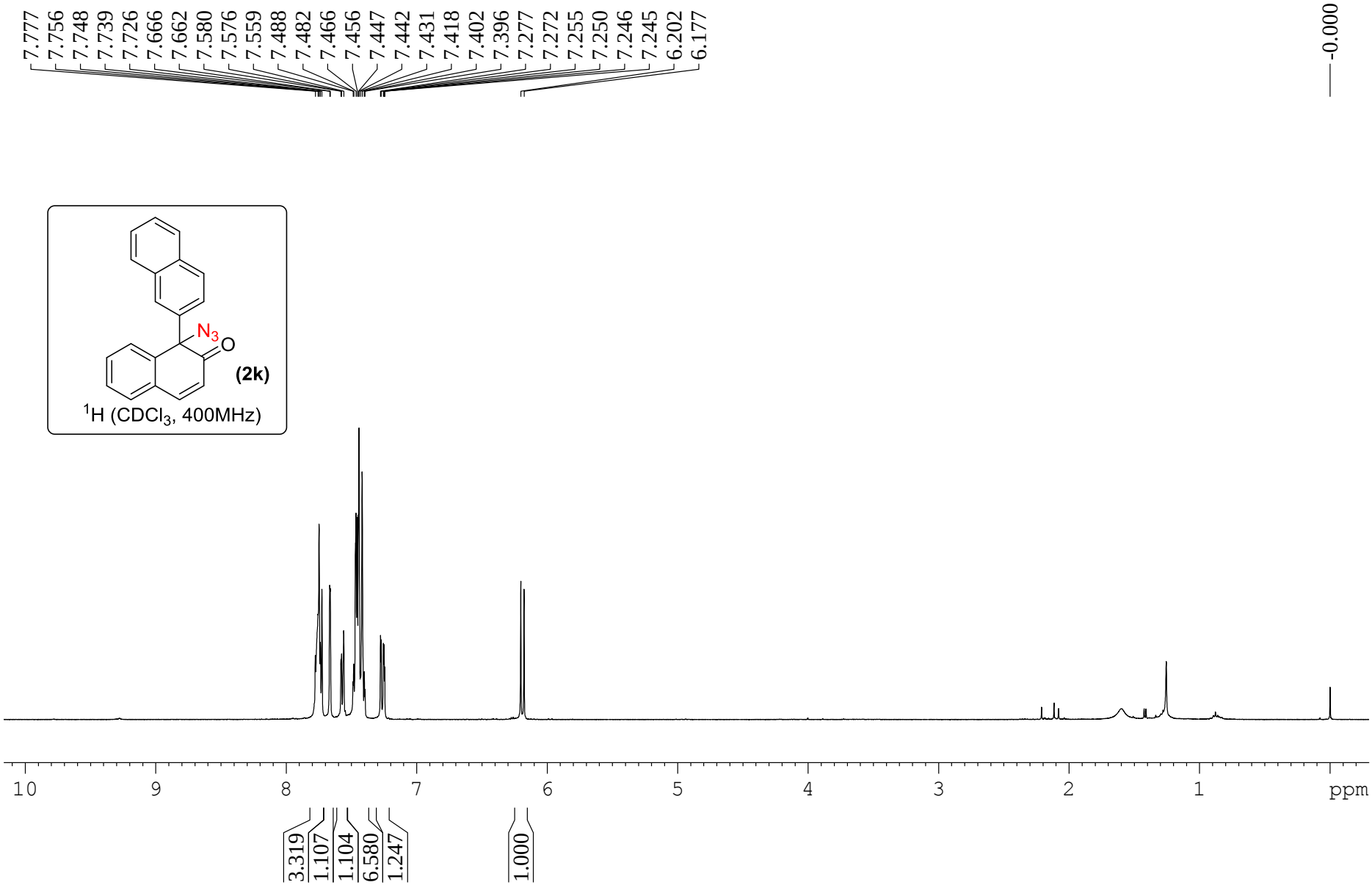

195.237
146.792
144.793
136.547
130.683
129.813
129.516
129.369
128.196
124.143
77.316
76.999
76.681
69.035
62.591
(2h)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

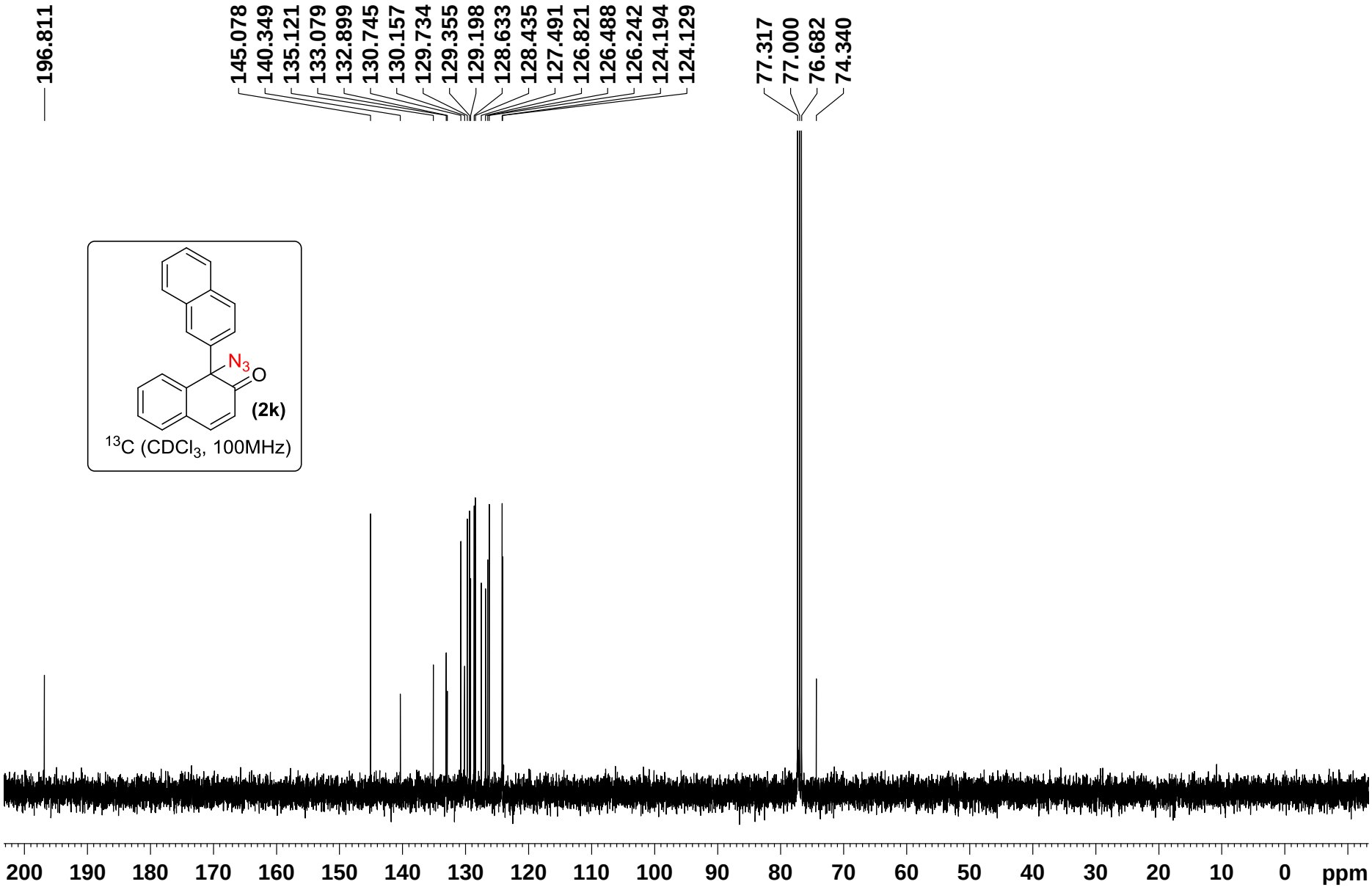

7.537
7.536
7.534
7.519
7.517
7.515
7.452
7.448
7.434
7.430
7.415
7.411
7.406
7.392
7.389
7.381
7.374
7.370
7.340
7.322
7.318
7.257
6.253
6.228
3.939
1.620
(2i)
^{1}H (CDCl$_3$, 400MHz)
7.5
7.0
6.5
ppm
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.122
3.296
1.071
1.000
3.275
3.320

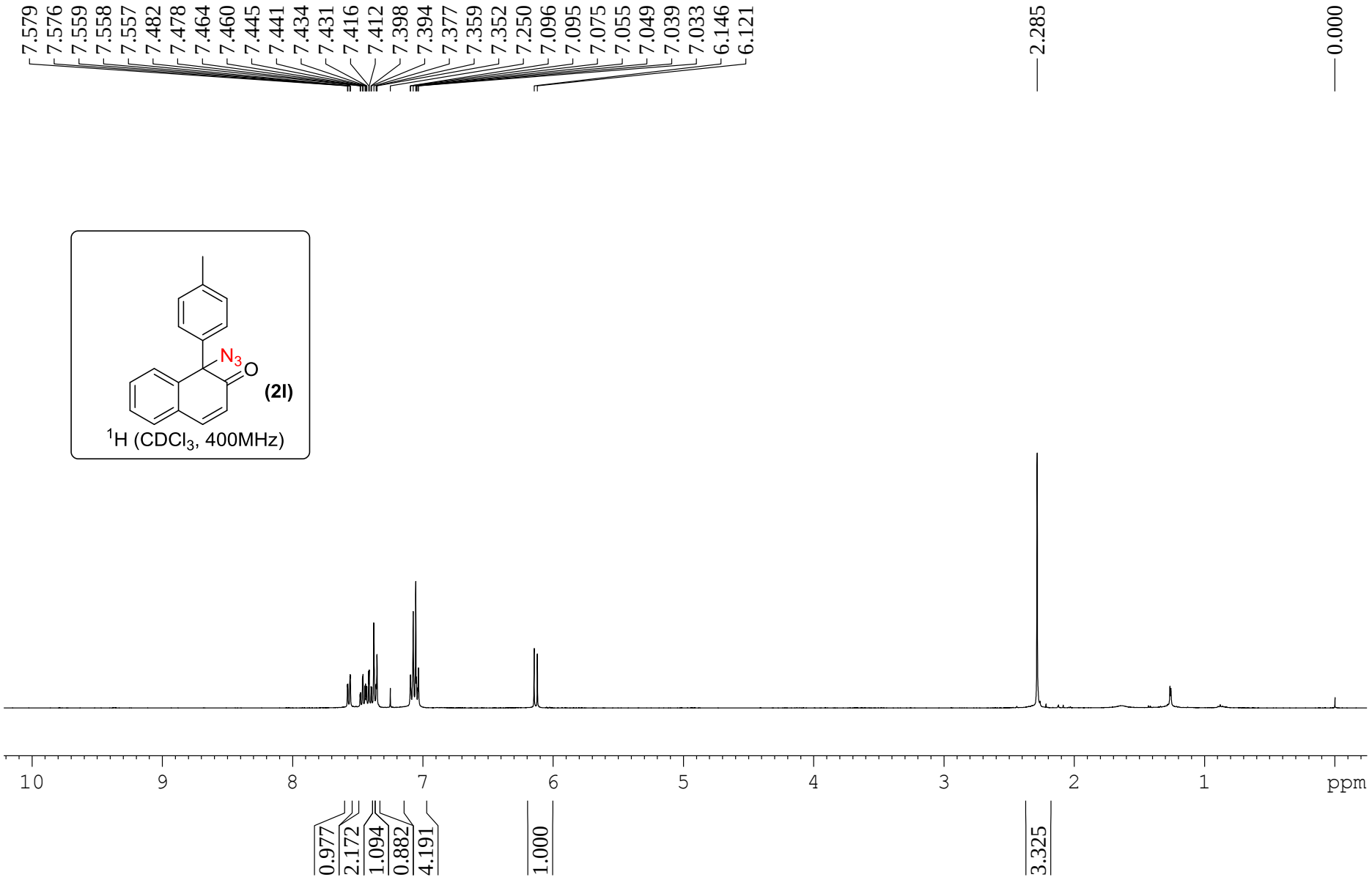

195.206
153.126
144.653
136.543
130.363
129.883
129.816
129.429
128.739
124.571
77.320
77.002
76.684
71.203
62.456
11.853
(2i)
N3
O
O
N
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

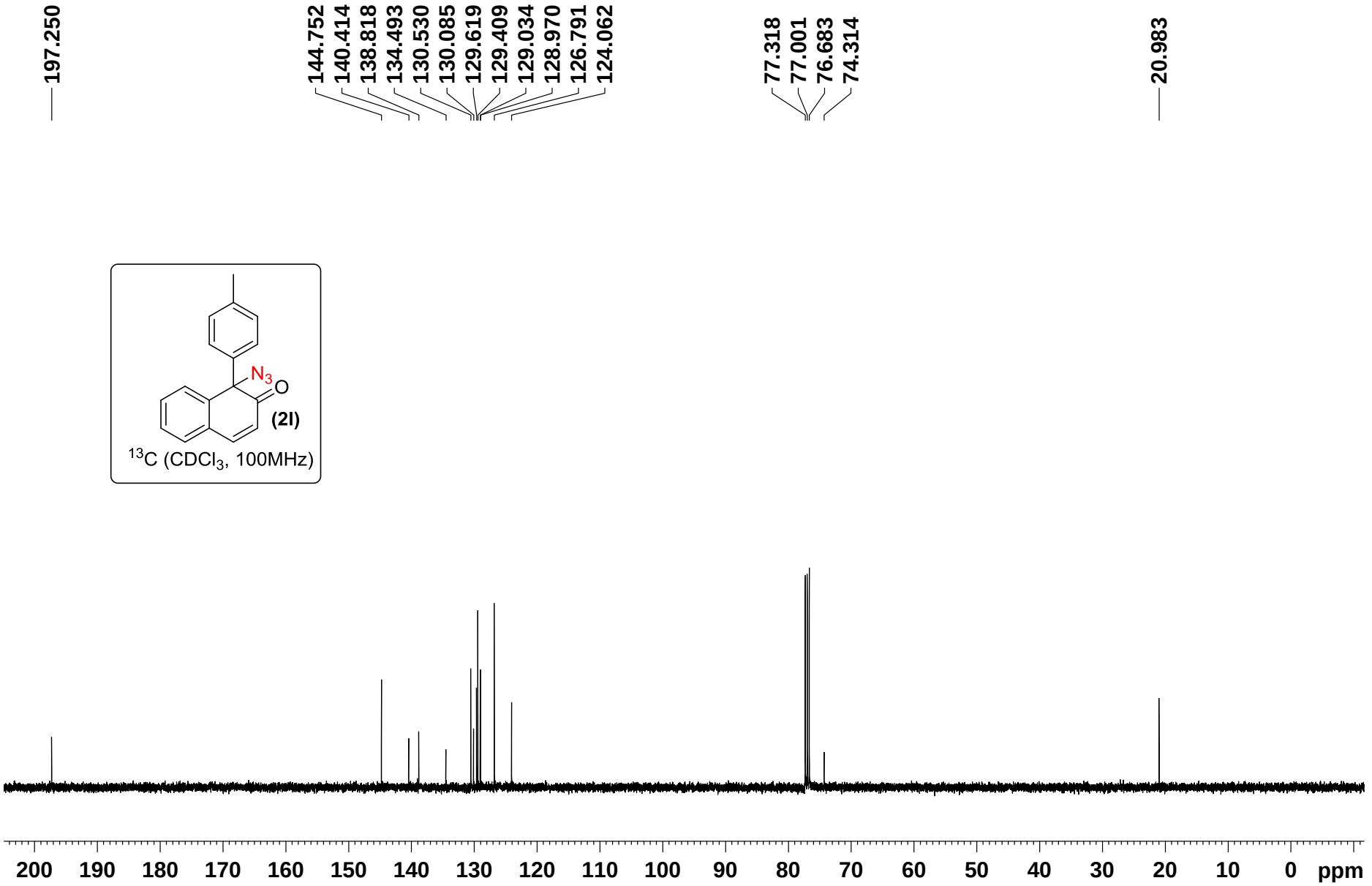

7.461
7.447
7.442
7.439
7.424
7.420
7.407
7.392
7.388
7.382
7.374
7.370
7.297
7.287
7.280
7.271
7.264
7.250
7.199
7.195
7.189
7.186
7.183
7.178
7.174
7.170
7.167
7.165
6.159
6.134
0.000
N3
O
(2j)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.164
4.623
3.230
2.217
1.000

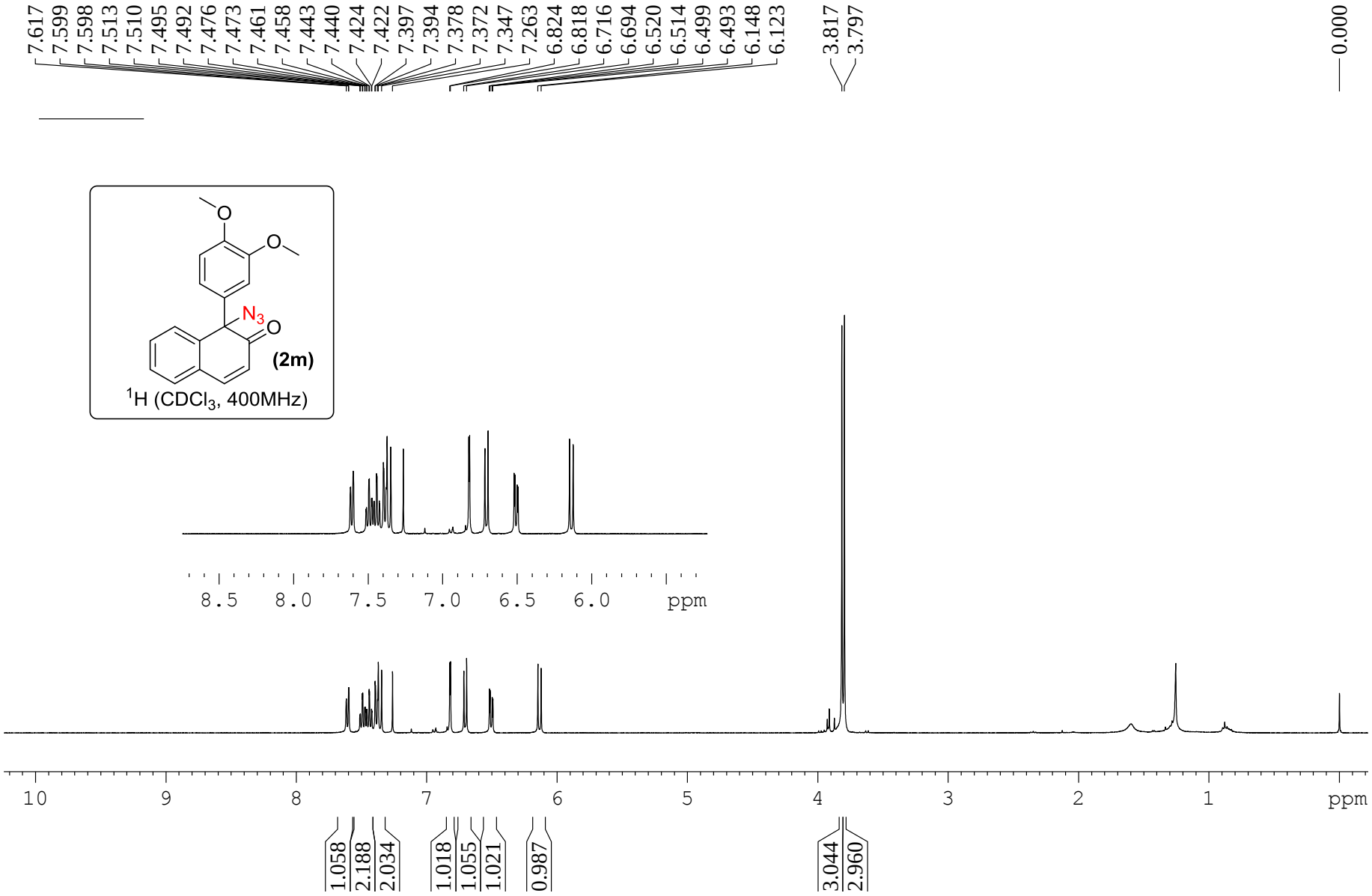

196.995
144.955
140.347
137.644
130.646
130.100
129.655
129.145
129.074
128.741
128.700
126.797
124.062
77.320
77.003
76.685
74.327
N3
O
(2j)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

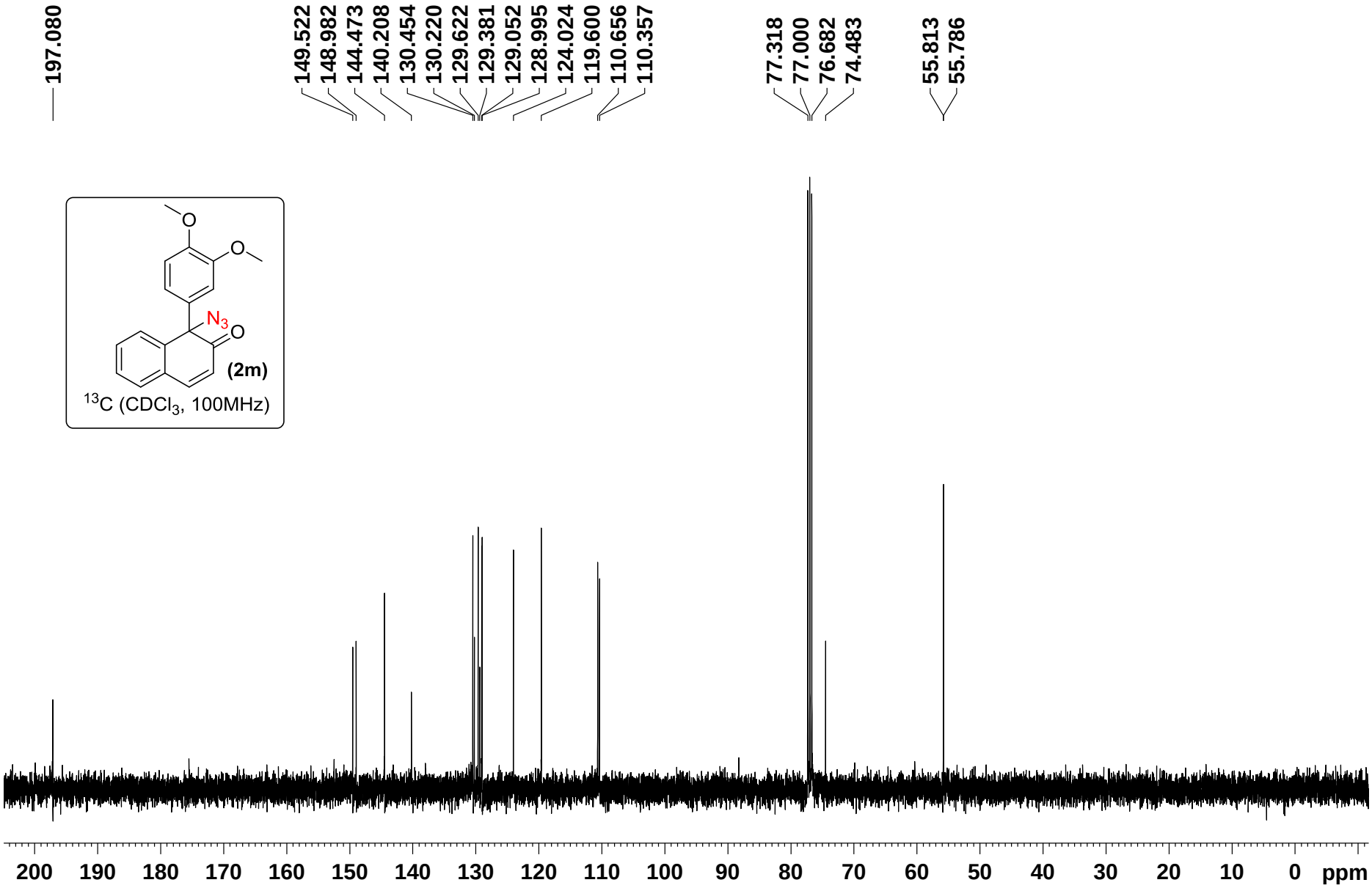

7.777
7.756
7.748
7.739
7.726
7.666
7.662
7.580
7.576
7.559
7.488
7.482
7.466
7.456
7.447
7.442
7.431
7.418
7.402
7.396
7.277
7.272
7.255
7.250
7.246
7.245
6.202
6.177
-0.000
N3
O
(2k)
1H (CDCl3, 400MHz)
10
9
8
7
6
5
4
3
2
1
ppm
3.319
1.107
1.104
6.580
1.247
1.000

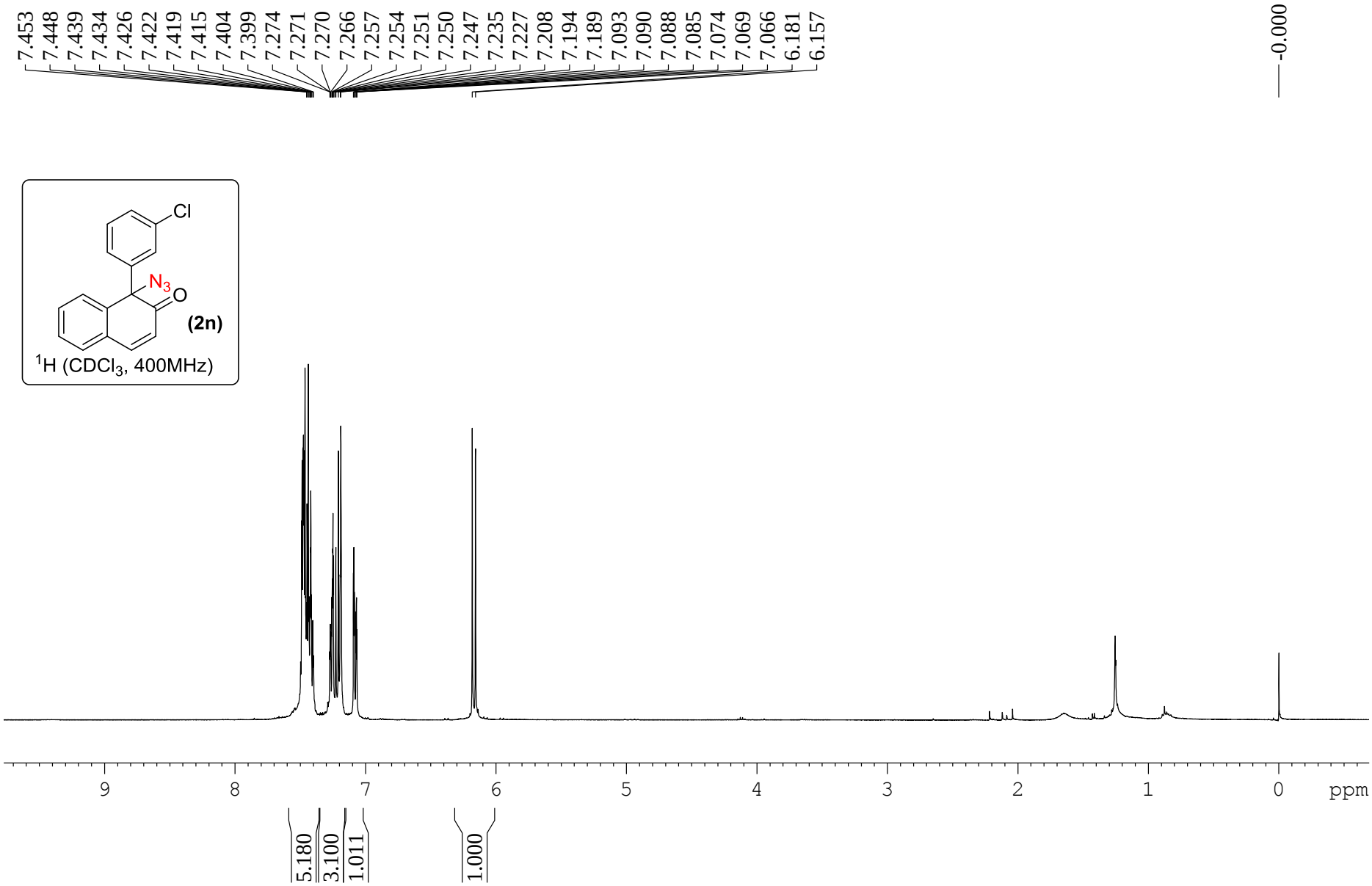

196.811
145.078
140.349
135.121
133.079
132.899
130.745
130.157
129.734
129.355
129.198
128.633
128.435
127.491
126.821
126.488
126.242
124.194
124.129
77.317
77.000
76.682
74.340
N3
O
(2k)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

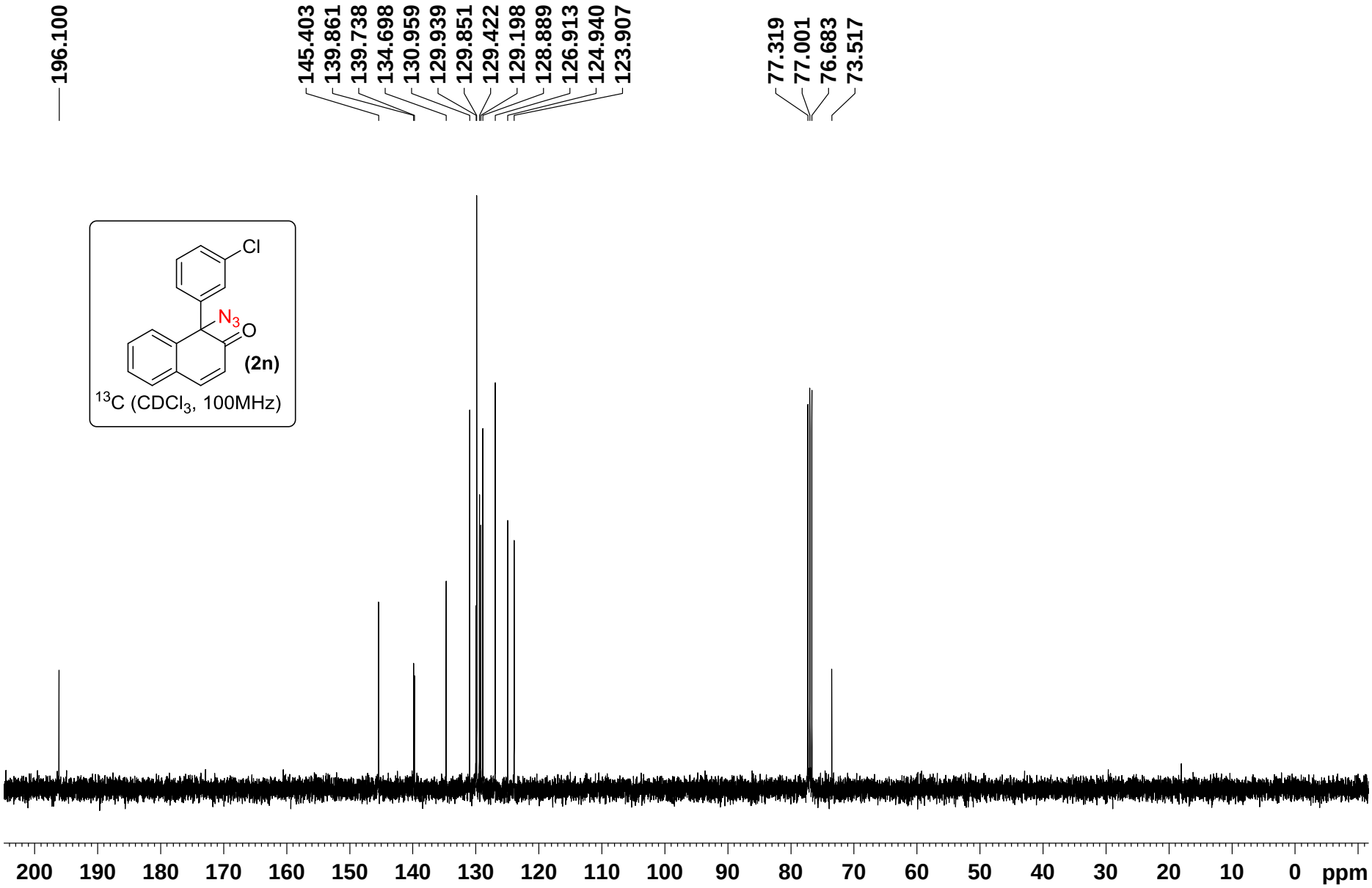

7.579
7.576
7.559
7.558
7.557
7.482
7.478
7.464
7.460
7.445
7.441
7.434
7.431
7.416
7.412
7.398
7.394
7.377
7.359
7.352
7.250
7.096
7.095
7.075
7.055
7.049
7.039
7.033
6.146
6.121
2.285
0.000
N3
O
(2l)
1H (CDCl3, 400MHz)
10
9
8
7
6
5
4
3
2
1
ppm
0.977
2.172
1.094
0.882
4.191
1.000
3.325

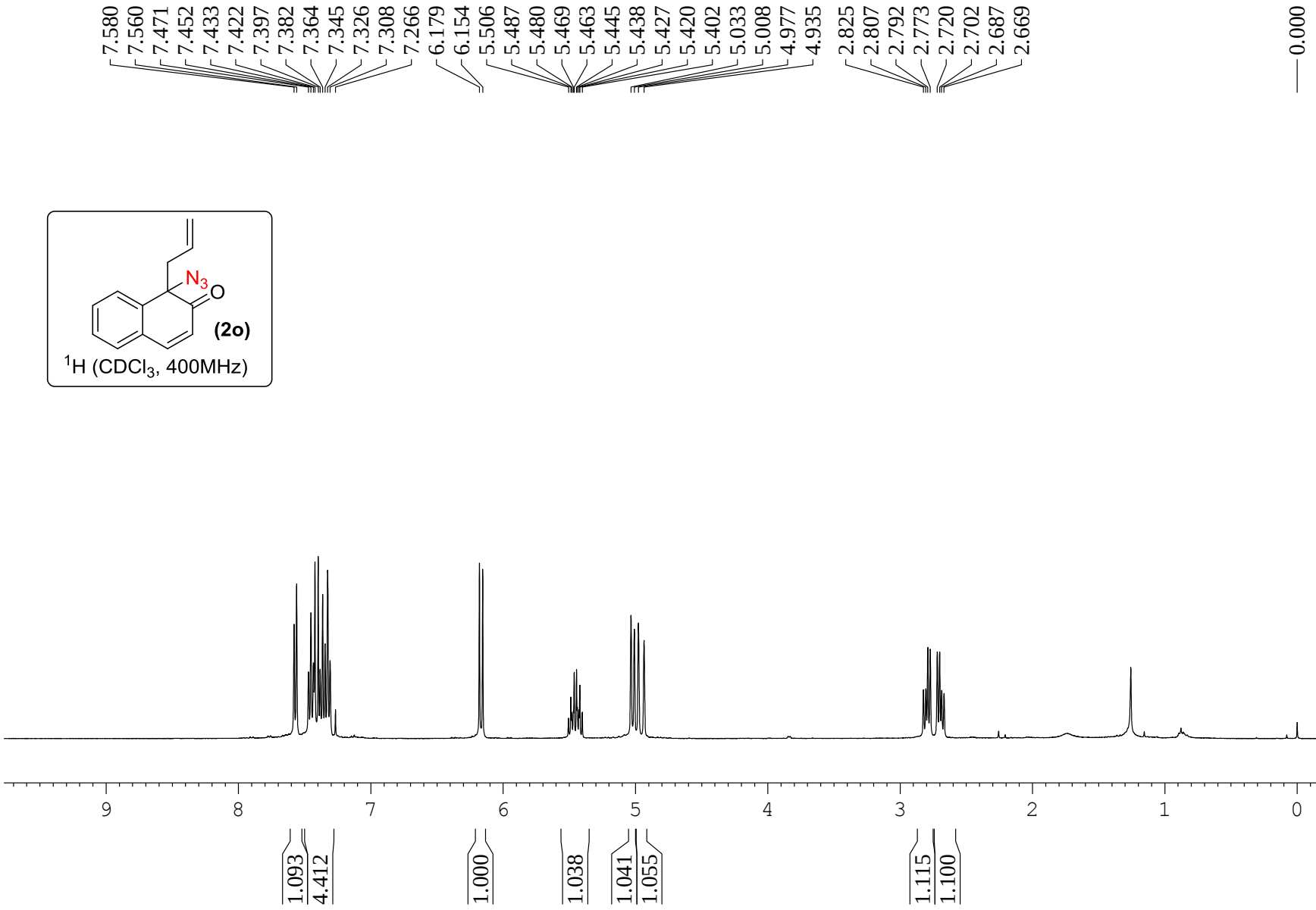

197.250
144.752
140.414
138.818
134.493
130.530
130.085
129.619
129.409
129.034
128.970
126.791
124.062
77.318
77.001
76.683
74.314
20.983
N3
O
(2l)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

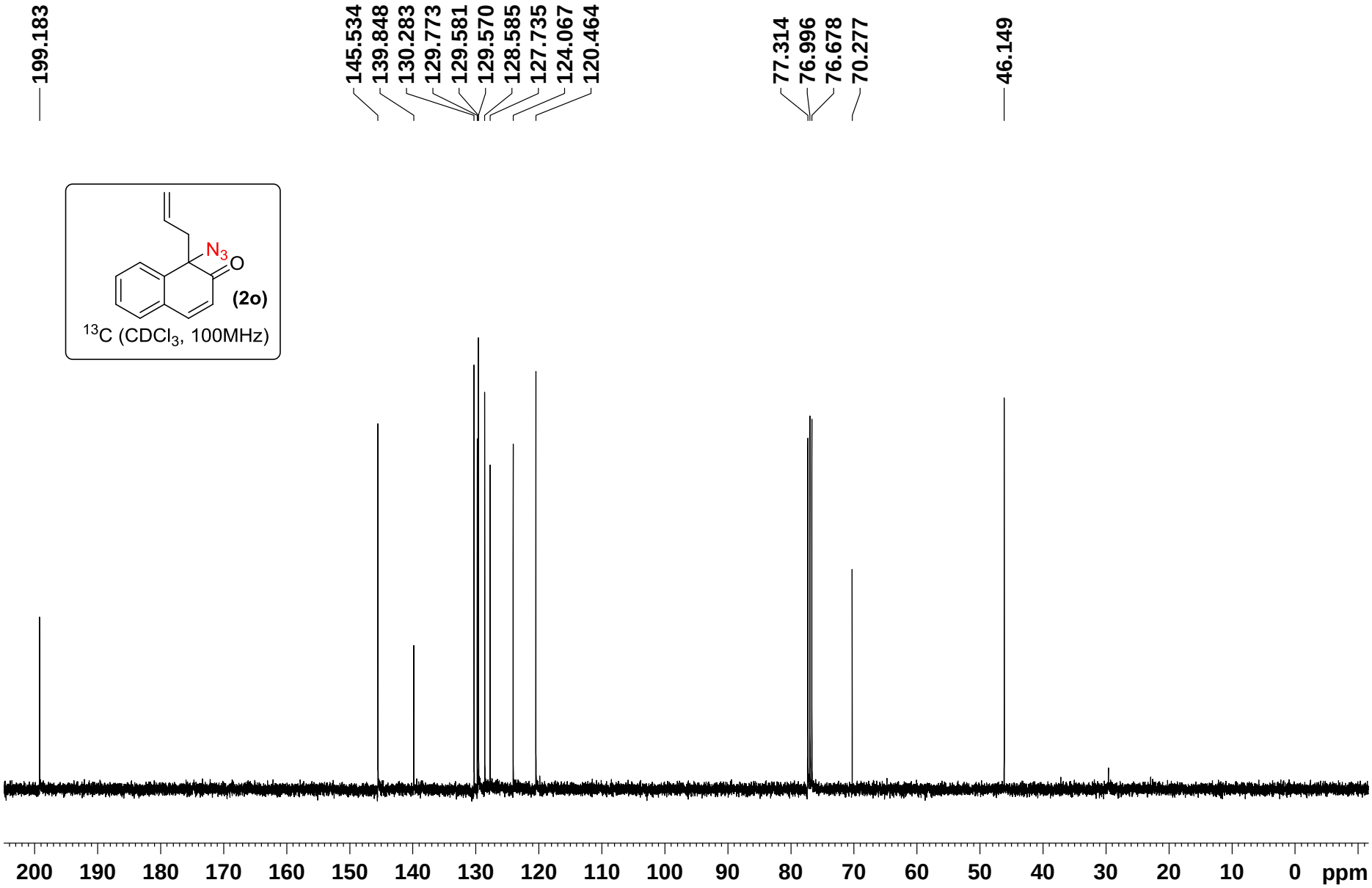

7.617
7.599
7.598
7.513
7.510
7.495
7.492
7.476
7.473
7.461
7.458
7.443
7.440
7.424
7.422
7.397
7.394
7.378
7.372
7.347
7.263
6.824
6.818
6.716
6.694
6.520
6.514
6.499
6.493
6.148
6.123
3.817
3.797
0.000
O
O
N3
O
(2m)
1H (CDCl3, 400MHz)
8.5
8.0
7.5
7.0
6.5
6.0
ppm
10
9
8
7
6
5
4
3
2
1
ppm
1.058
2.188
2.034
1.018
1.055
1.021
0.987
3.044
2.960

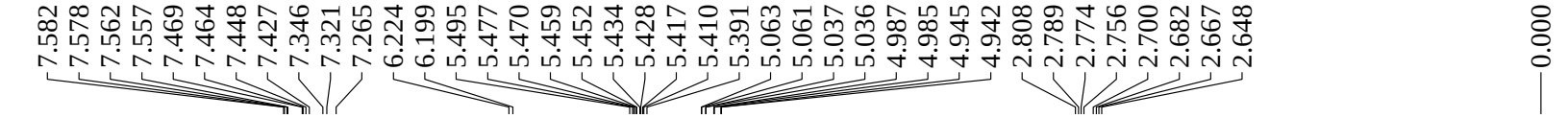

197.080
149.522
148.982
144.473
140.208
130.454
130.220
129.622
129.381
129.052
128.995
124.024
119.600
110.656
110.357
77.318
77.000
76.682
74.483
55.813
55.786
O
O
N3
O
(2m)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

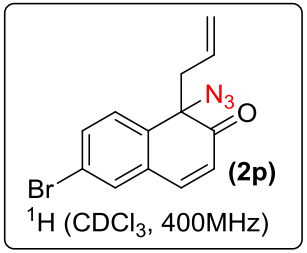

7.453
7.448
7.439
7.434
7.426
7.422
7.419
7.415
7.404
7.399
7.274
7.271
7.270
7.266
7.257
7.254
7.251
7.250
7.247
7.235
7.227
7.208
7.194
7.189
7.093
7.090
7.088
7.085
7.074
7.069
7.066
6.181
6.157
-0.000
Cl
N3
O
(2n)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
5.180
3.100
1.011
1.000

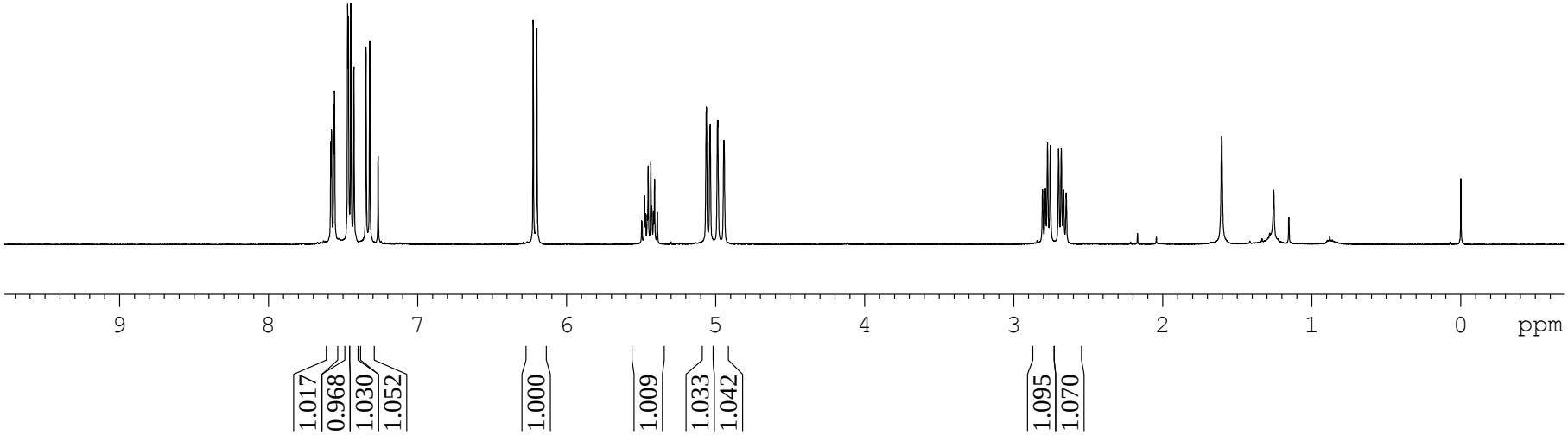

196.100
145.403
139.861
139.738
134.698
130.959
129.939
129.851
129.422
129.198
128.889
126.913
124.940
123.907
77.319
77.001
76.683
73.517
Cl
N3
O
(2n)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

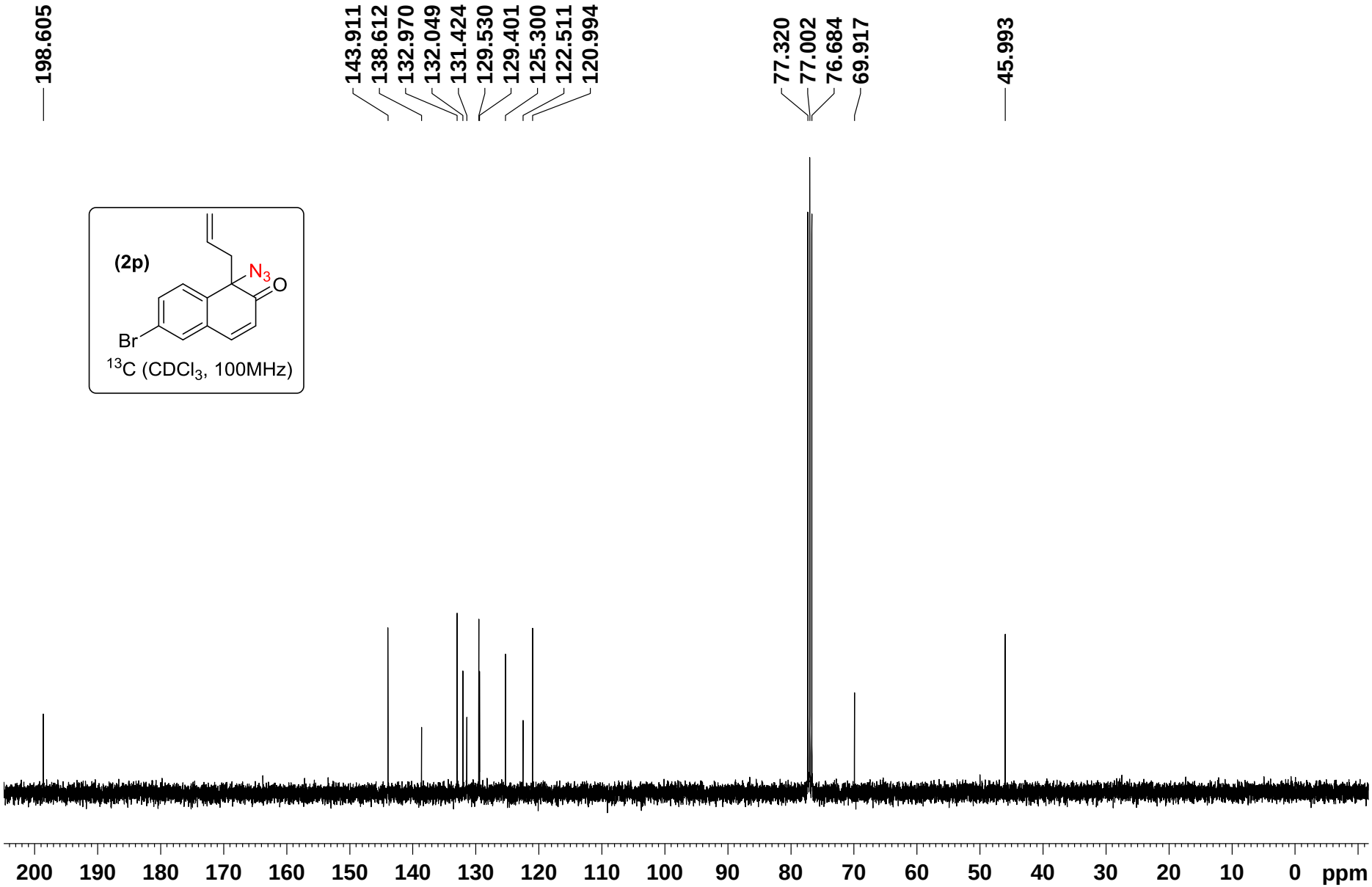

7.580
7.560
7.471
7.452
7.433
7.422
7.397
7.382
7.364
7.345
7.326
7.308
7.266
6.179
6.154
5.506
5.487
5.480
5.469
5.463
5.445
5.438
5.427
5.420
5.402
5.033
5.008
4.977
4.935
2.825
2.807
2.792
2.773
2.720
2.702
2.687
2.669
0.000
N3
O
(2o)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.093
4.412
1.000
1.038
1.041
1.055
1.115
1.100

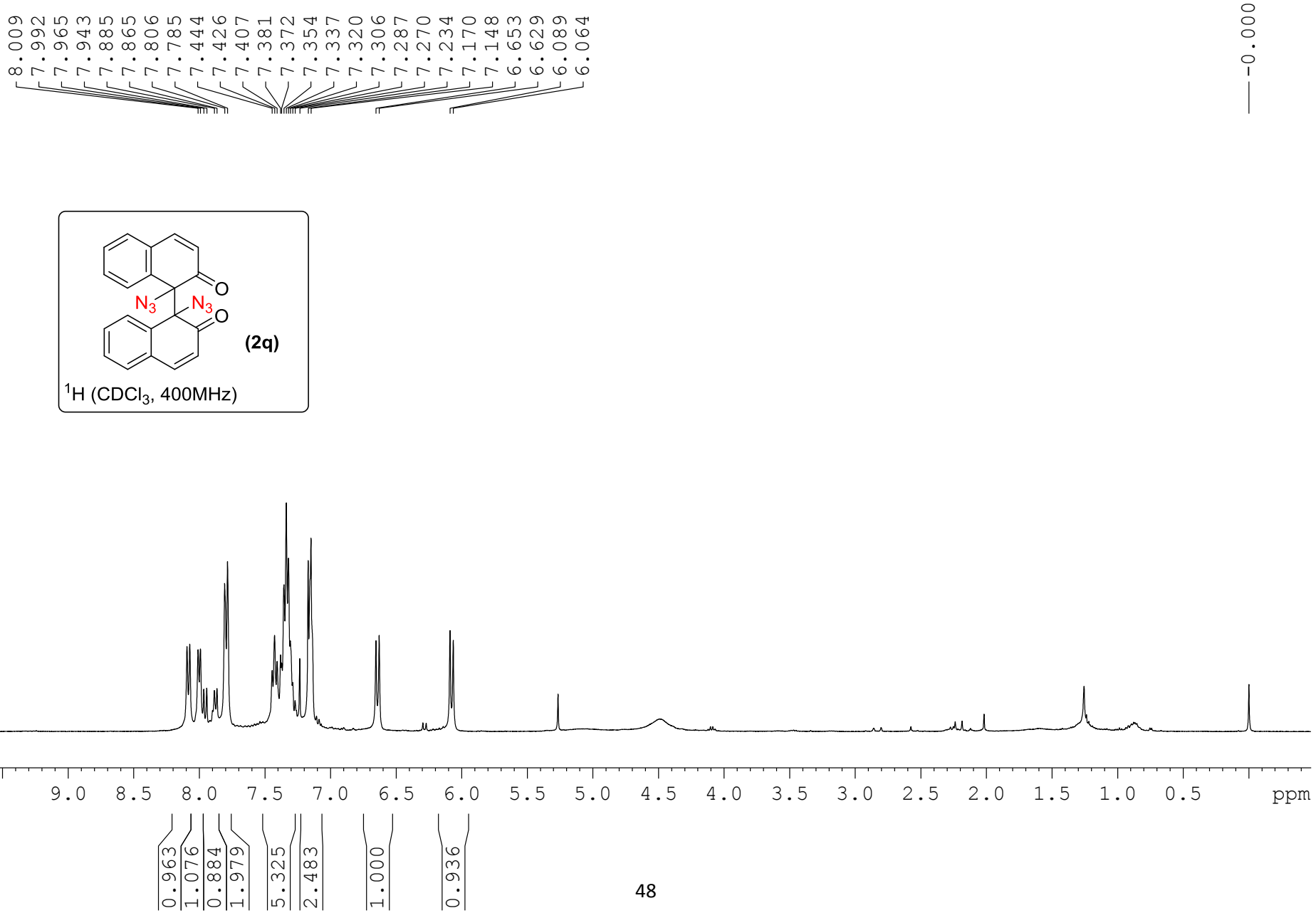

199.183
145.534
139.848
130.283
129.773
129.581
129.570
128.585
127.735
124.067
120.464
77.314
76.996
76.678
70.277
46.149
N3
O
(2o)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

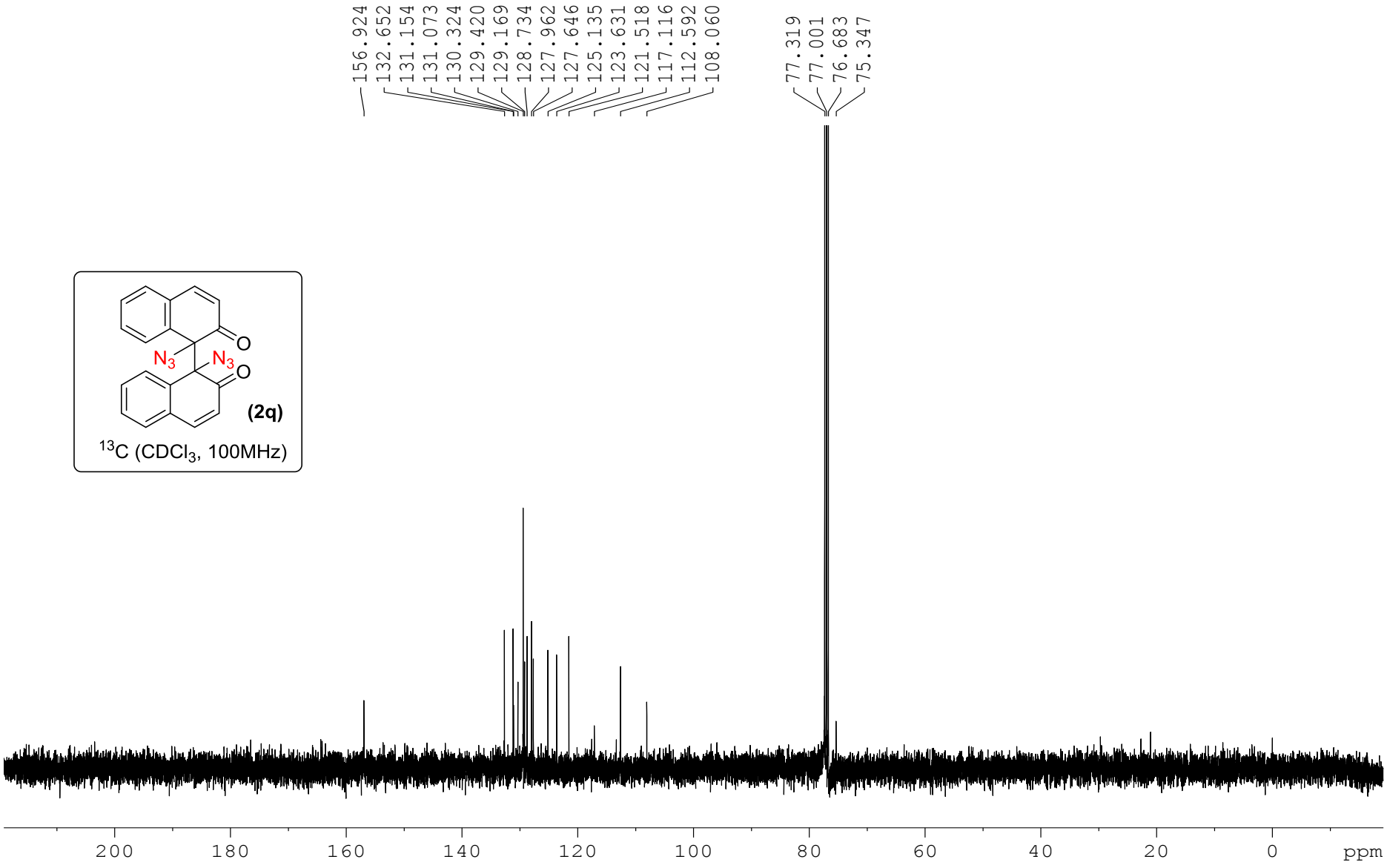

7.582
7.578
7.562
7.557
7.469
7.464
7.448
7.427
7.346
7.321
7.265
6.224
6.199
5.495
5.477
5.470
5.459
5.452
5.434
5.428
5.417
5.410
5.391
5.063
5.061
5.037
5.036
4.987
4.985
4.945
4.942
2.808
2.789
2.774
2.756
2.700
2.682
2.667
2.648
0.000

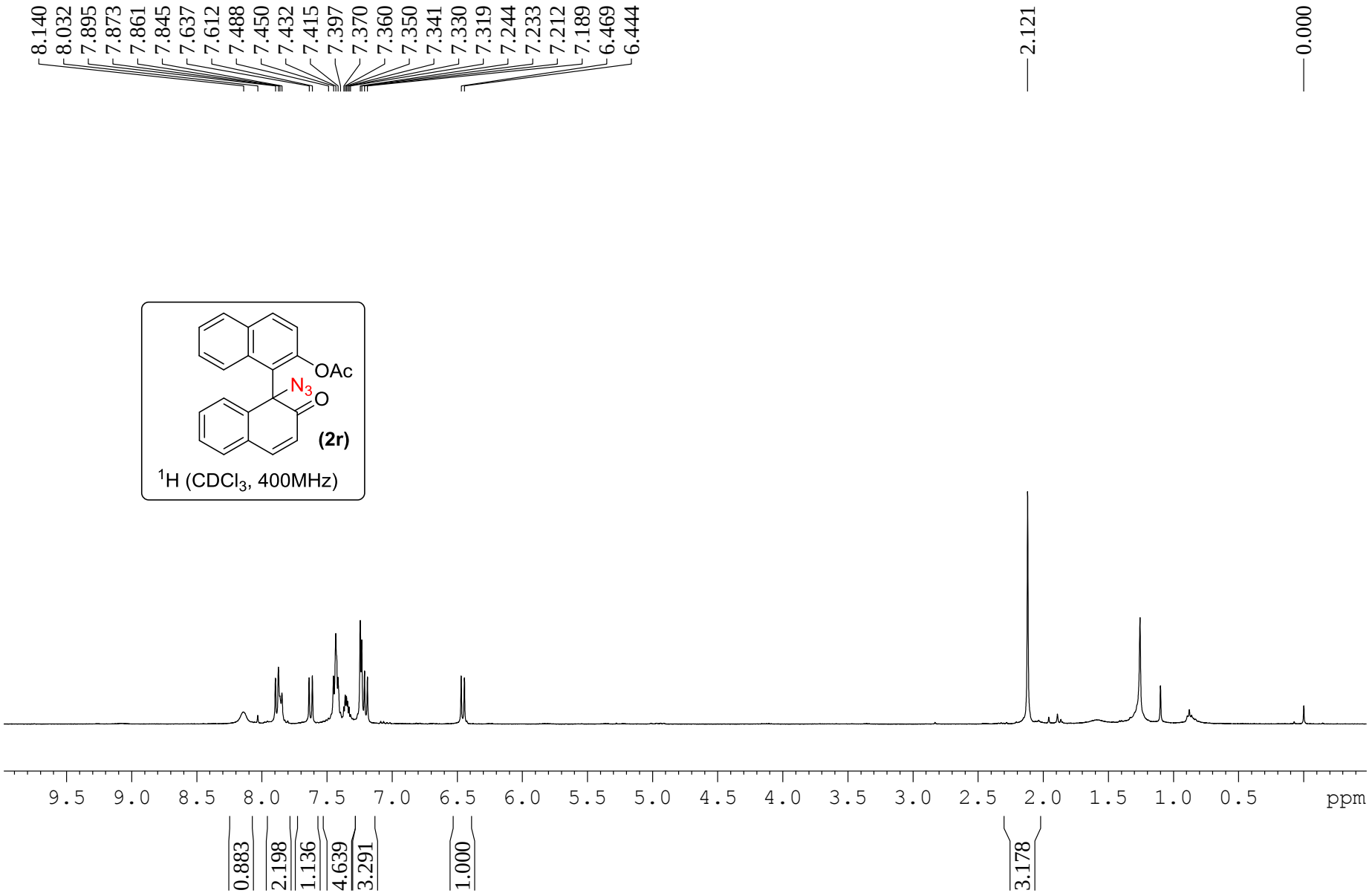

N3
O
(2p)
Br
1H (CDCl3, 400MHz)

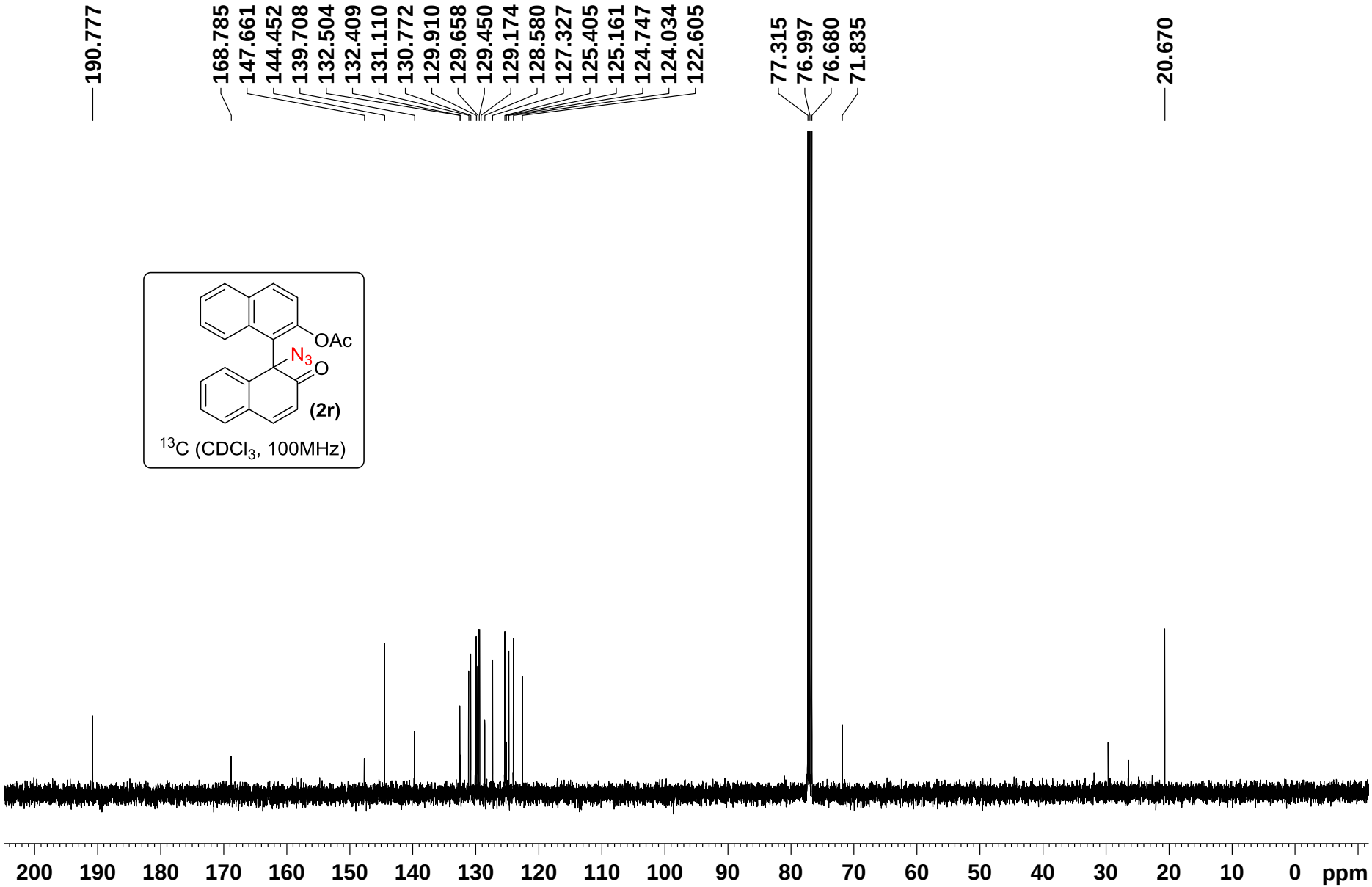

9
8
7
6
5
4
3
2
1
0
ppm
1.017
0.968
1.030
1.052
1.000
1.009
1.033
1.042
1.095
1.070

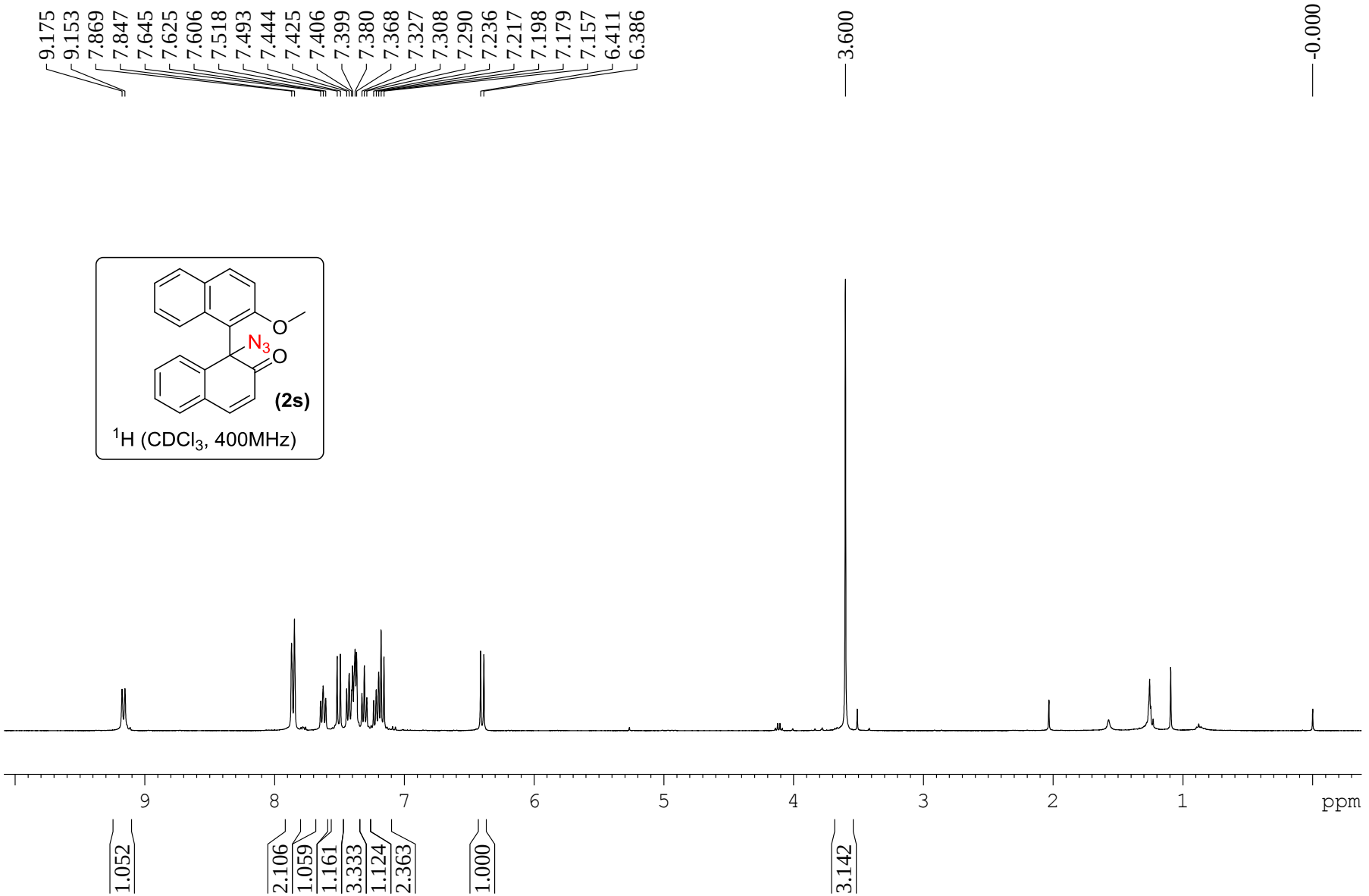

198.605
143.911
138.612
132.970
132.049
131.424
129.530
129.401
125.300
122.511
120.994
77.320
77.002
76.684
69.917
45.993
(2p)
N3
O
Br
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

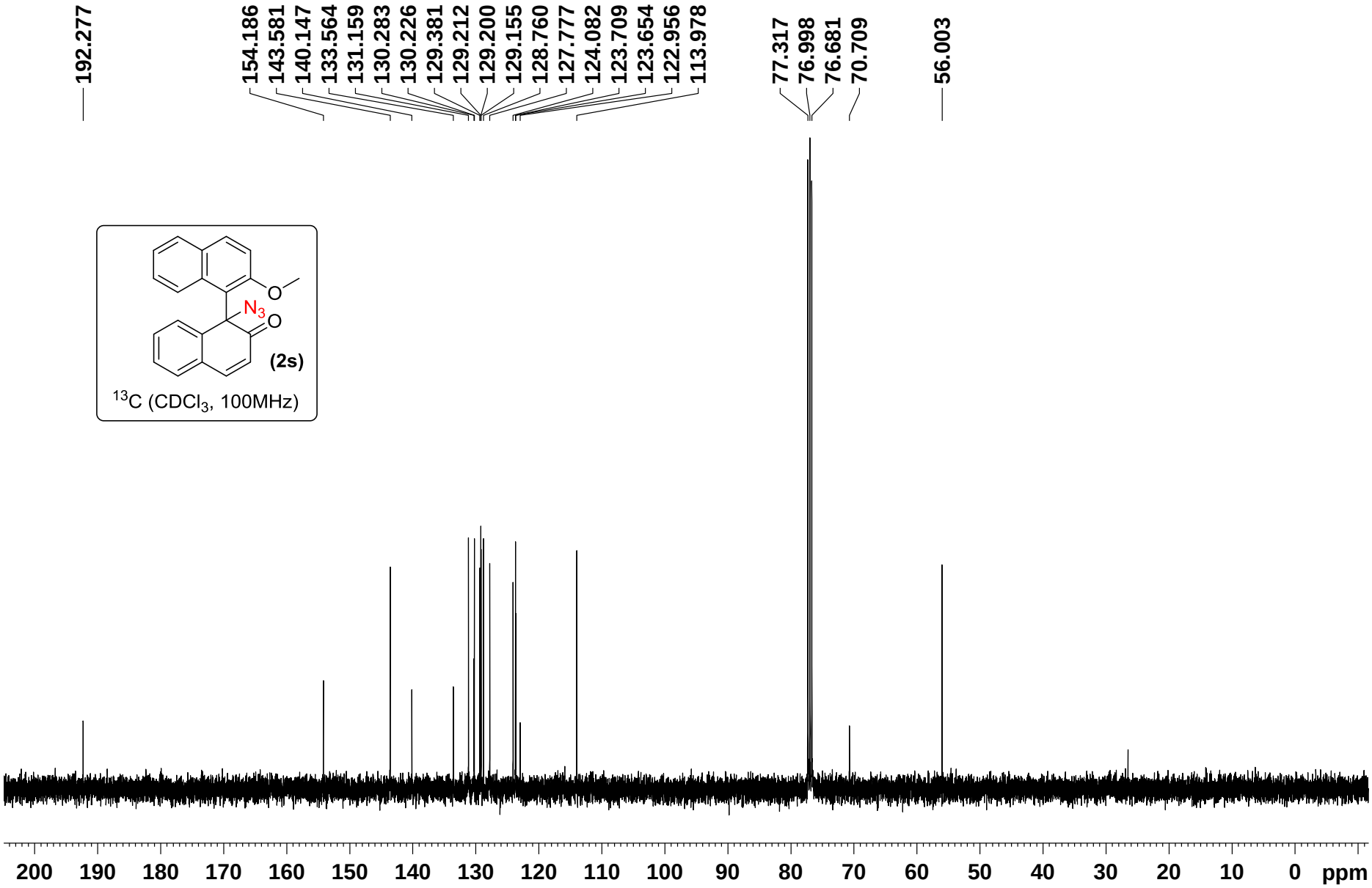

8.009
7.992
7.965
7.943
7.885
7.865
7.806
7.785
7.444
7.426
7.407
7.381
7.372
7.354
7.337
7.320
7.306
7.287
7.270
7.234
7.170
7.148
6.653
6.629
6.089
6.064
-0.000
N3
N3
O
O
(2q)
1H (CDCl3, 400MHz)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
0.963
1.076
0.884
1.979
5.325
2.483
1.000
0.936

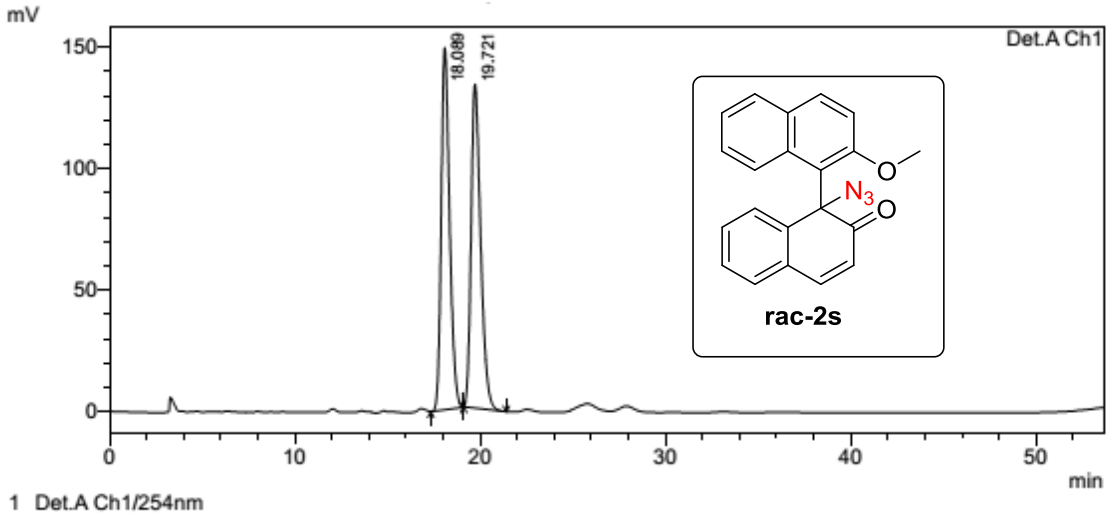

156.924
132.652
131.154
131.073
130.324
129.420
129.169
128.734
127.962
127.646
125.135
123.631
121.518
117.116
112.592
108.060
77.319
77.001
76.683
75.347
N3
N3
O
O
(2q)
13C (CDCl3, 100MHz)
200
180
160
140
120
100
80
60
40
20
0
ppm


8.140
8.032
7.895
7.873
7.861
7.845
7.637
7.612
7.488
7.450
7.432
7.415
7.397
7.370
7.360
7.350
7.341
7.330
7.319
7.244
7.233
7.212
7.189
6.469
6.444
2.121
0.000
OAc
N3
O
(2r)
1H (CDCl3, 400MHz)
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
ppm
0.883
2.198
1.136
4.639
3.291
1.000
3.178


190.777
168.785
147.661
144.452
139.708
132.504
132.409
131.110
130.772
129.910
129.658
129.450
129.174
128.580
127.327
125.405
125.161
124.747
124.034
122.605
77.315
76.997
76.680
71.835
20.670
OAc
N3
O
(2r)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm


9.175
9.153
7.869
7.847
7.645
7.625
7.606
7.518
7.493
7.444
7.425
7.406
7.399
7.380
7.368
7.327
7.308
7.290
7.236
7.217
7.198
7.179
7.157
6.411
6.386
3.600
-0.000
N3
O
O
(2s)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
ppm
1.052
2.106
1.059
1.161
3.333
1.124
2.363
1.000
3.142

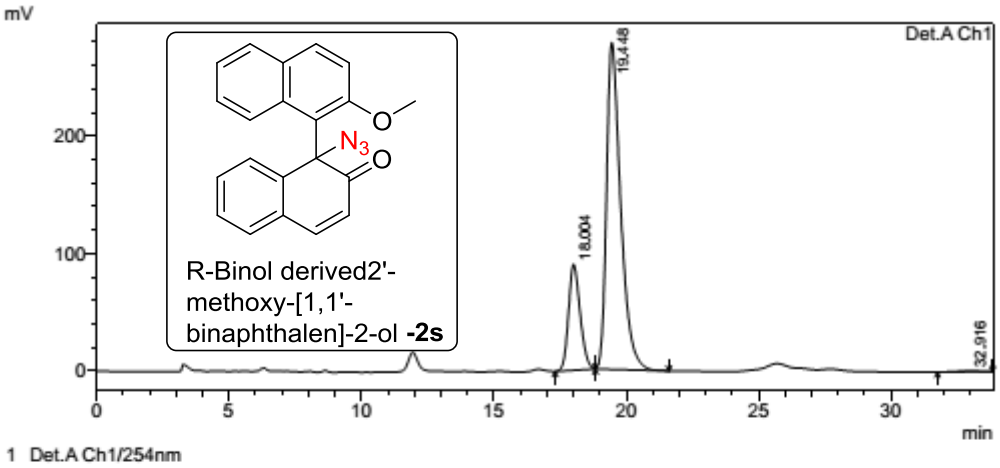

192.277
154.186
143.581
140.147
133.564
131.159
130.283
130.226
129.381
129.212
129.200
129.155
128.760
127.777
124.082
123.709
123.654
122.956
113.978
77.317
76.998
76.681
70.709
56.003
O
N3
O
(2s)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



PeakTable

Detector A Ch1 254nm

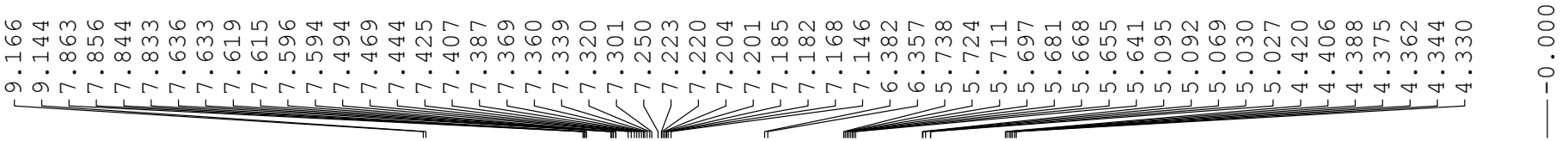
Peak#	Ret. Time	Area	Area %
1	18.089	4673609	49.548
2	19.721	4758820	50.452
Total		9432429	100.000

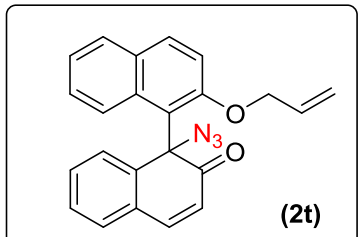


PeakTable

Detector A Ch1 254nm

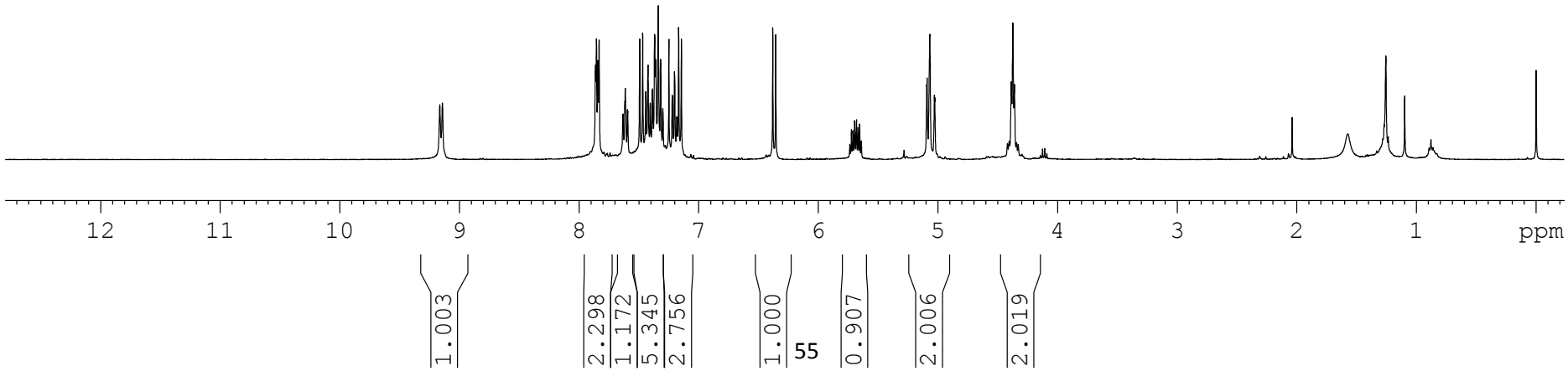
Peak#	Ret. Time	Area	Area %
1	18.004	2737364	20.962
2	19.448	10274842	78.680
3	32.916	46758	0.358
Total		13058964	100.000

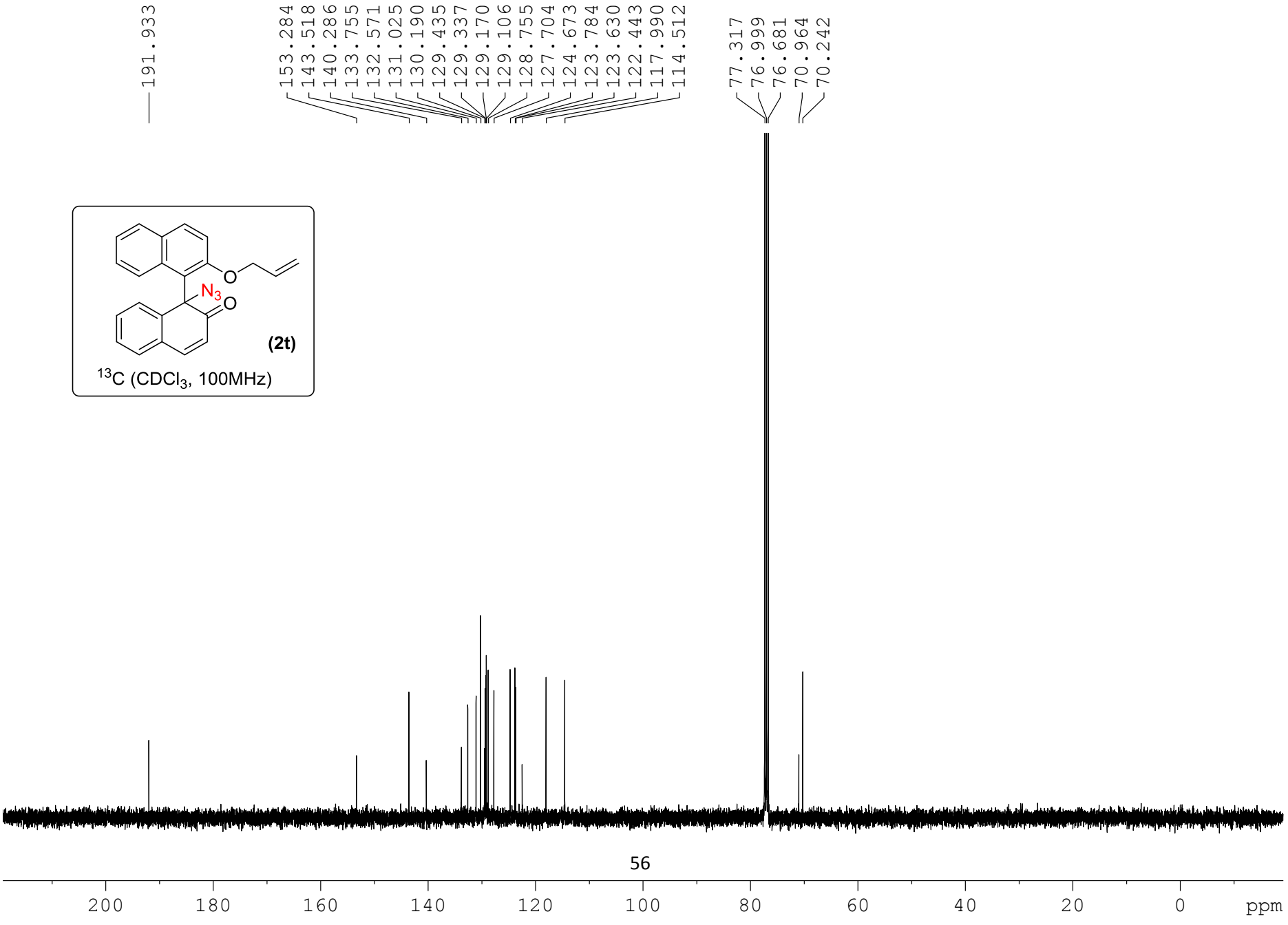


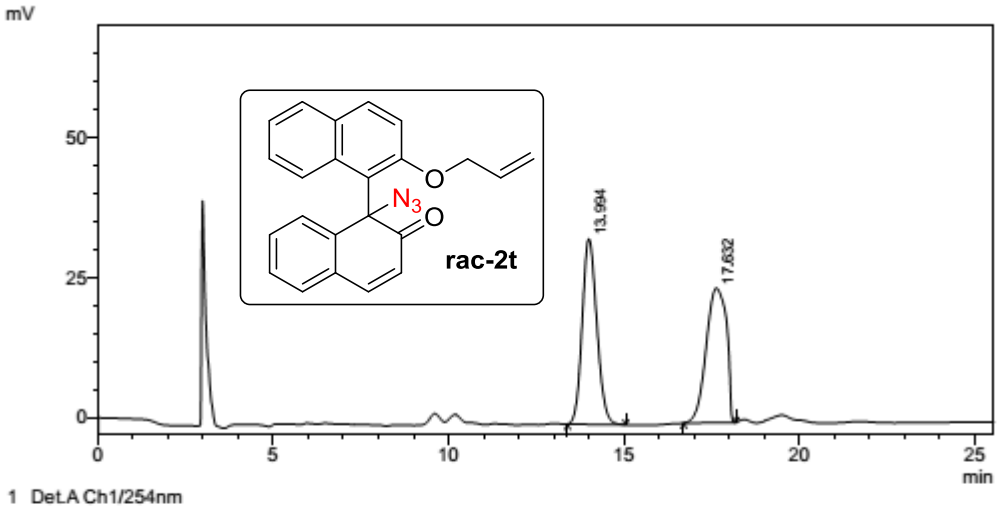


(2t)

^{1}H ($CDCl_3$, 400MHz)



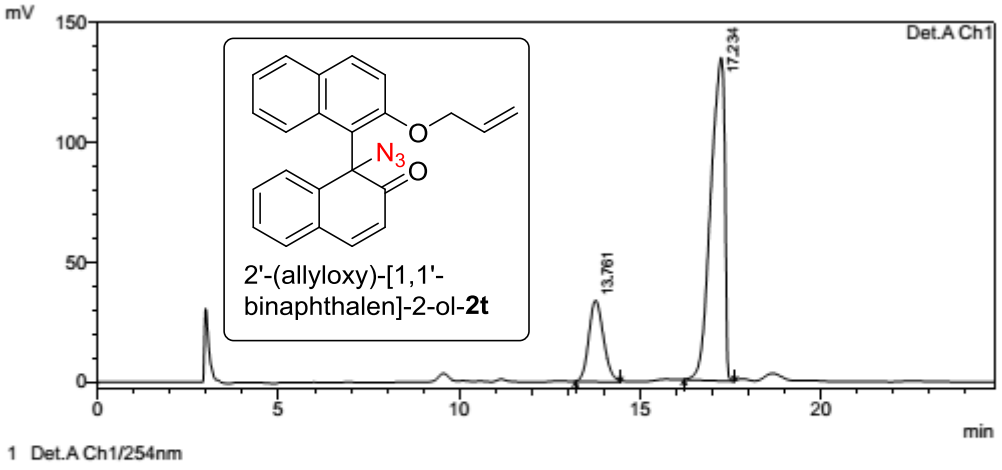

191.933
153.284
143.518
140.286
133.755
132.571
131.025
130.190
129.435
129.337
129.170
129.106
128.755
127.704
124.673
123.784
123.630
122.443
117.990
114.512
77.317
76.999
76.681
70.964
70.242
N3
O
O
(2t)
13C (CDCl3, 100MHz)
200
180
160
140
120
100
80
60
40
20
0
ppm



PeakTable

Detector A Ch1 254nm

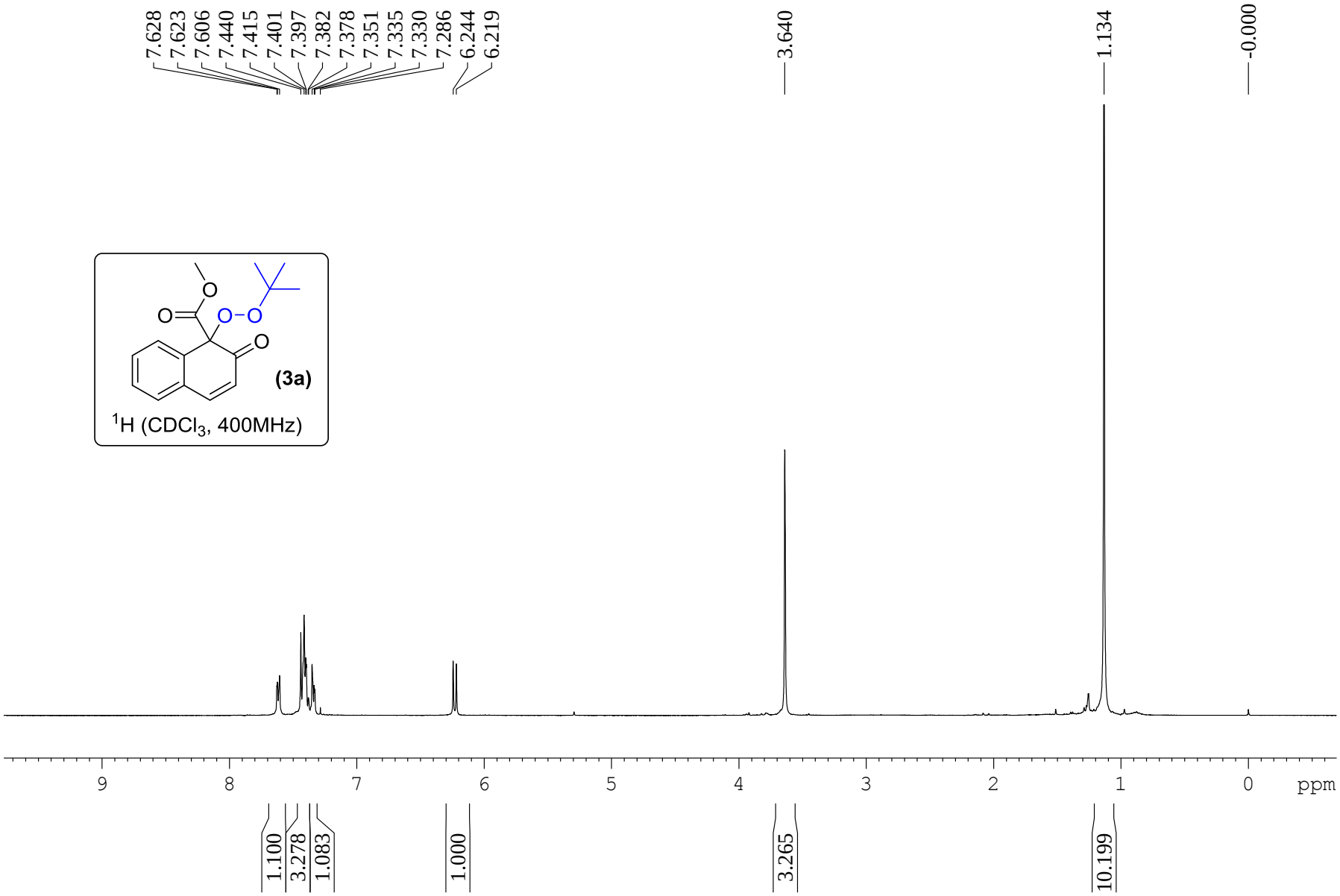
Peak#	Ret. Time	Area	Area %
1	13.994	963917	49.997
2	17.632	964015	50.003
Total		1927932	100.000

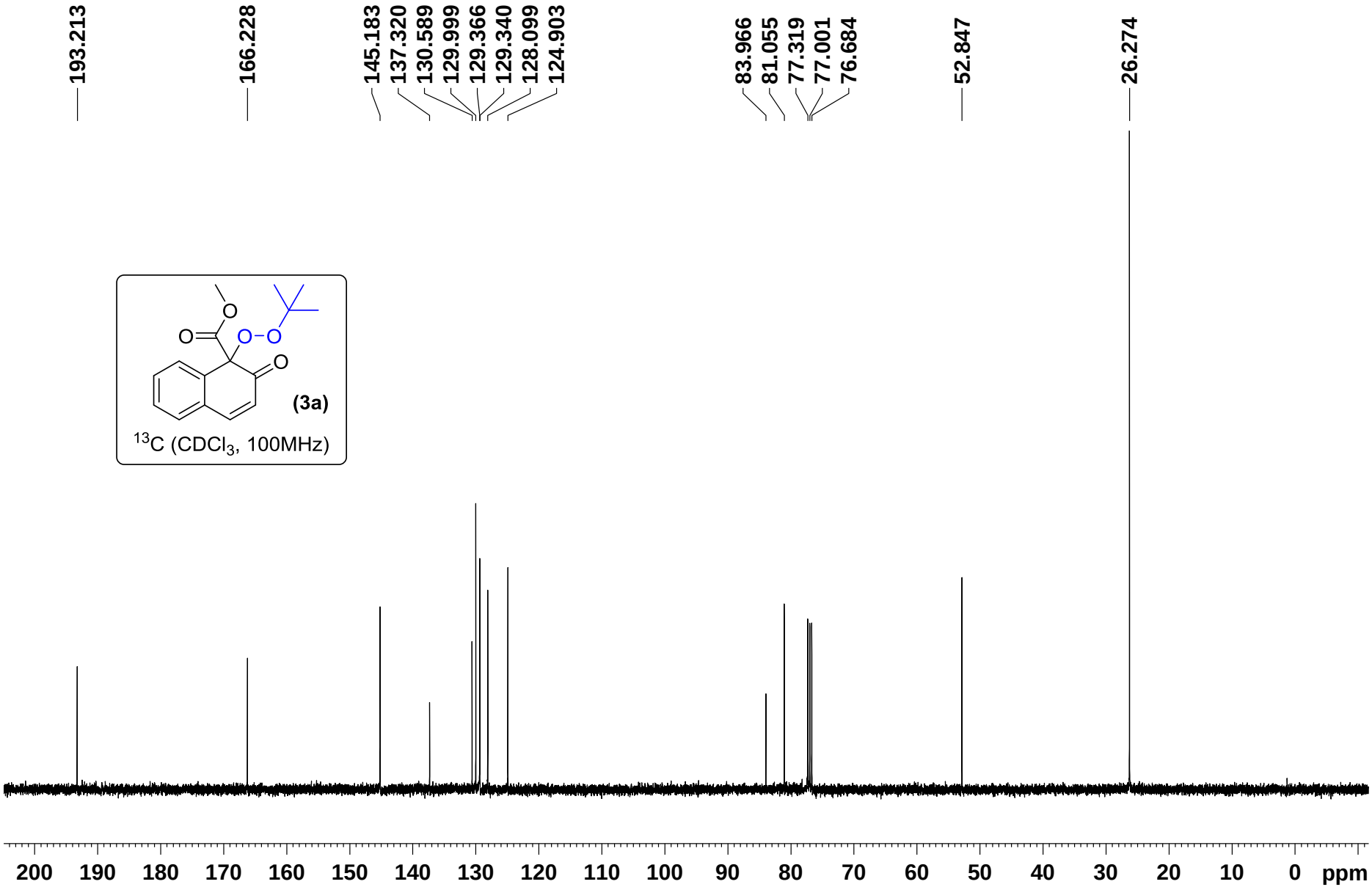


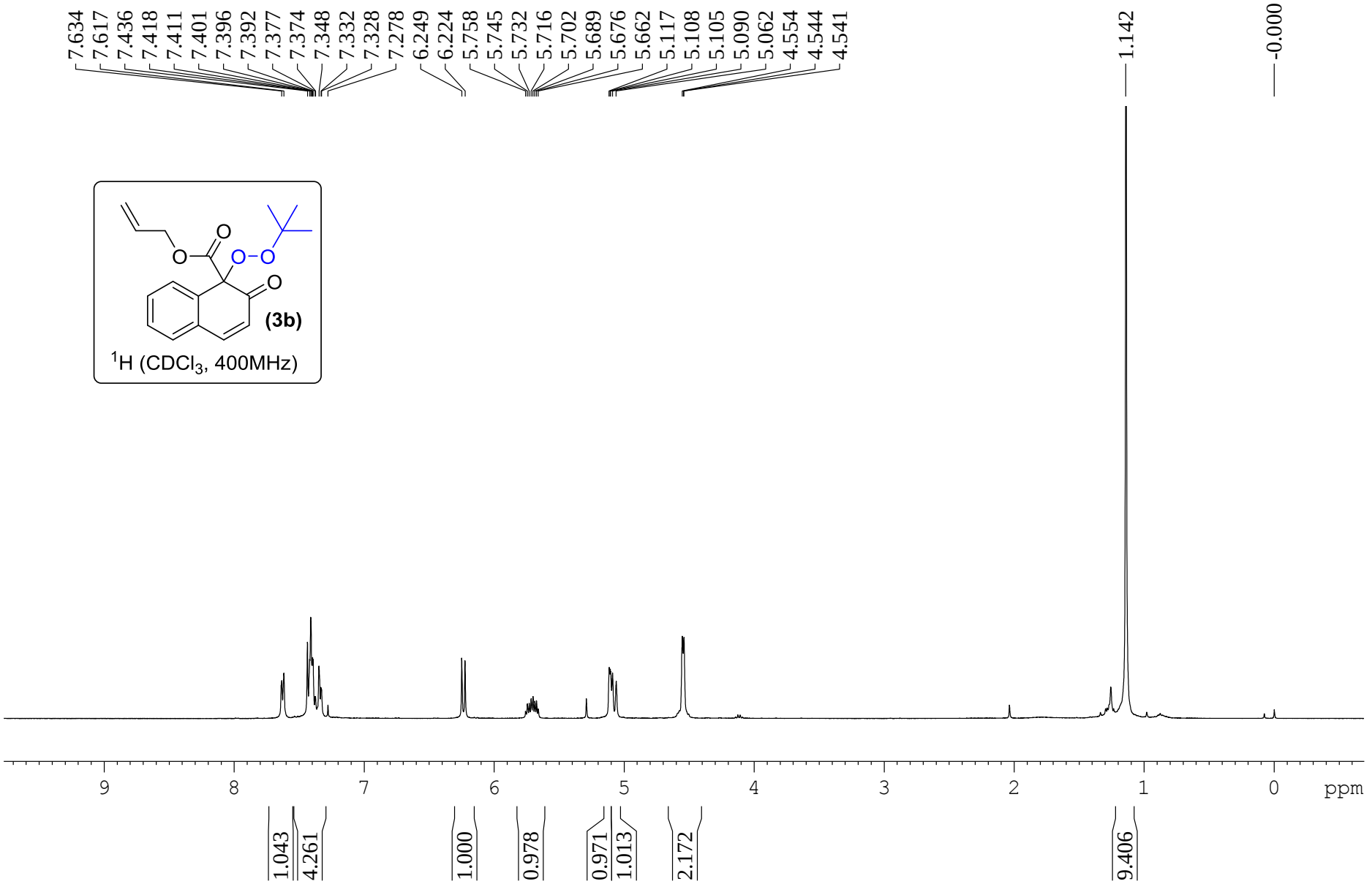
PeakTable

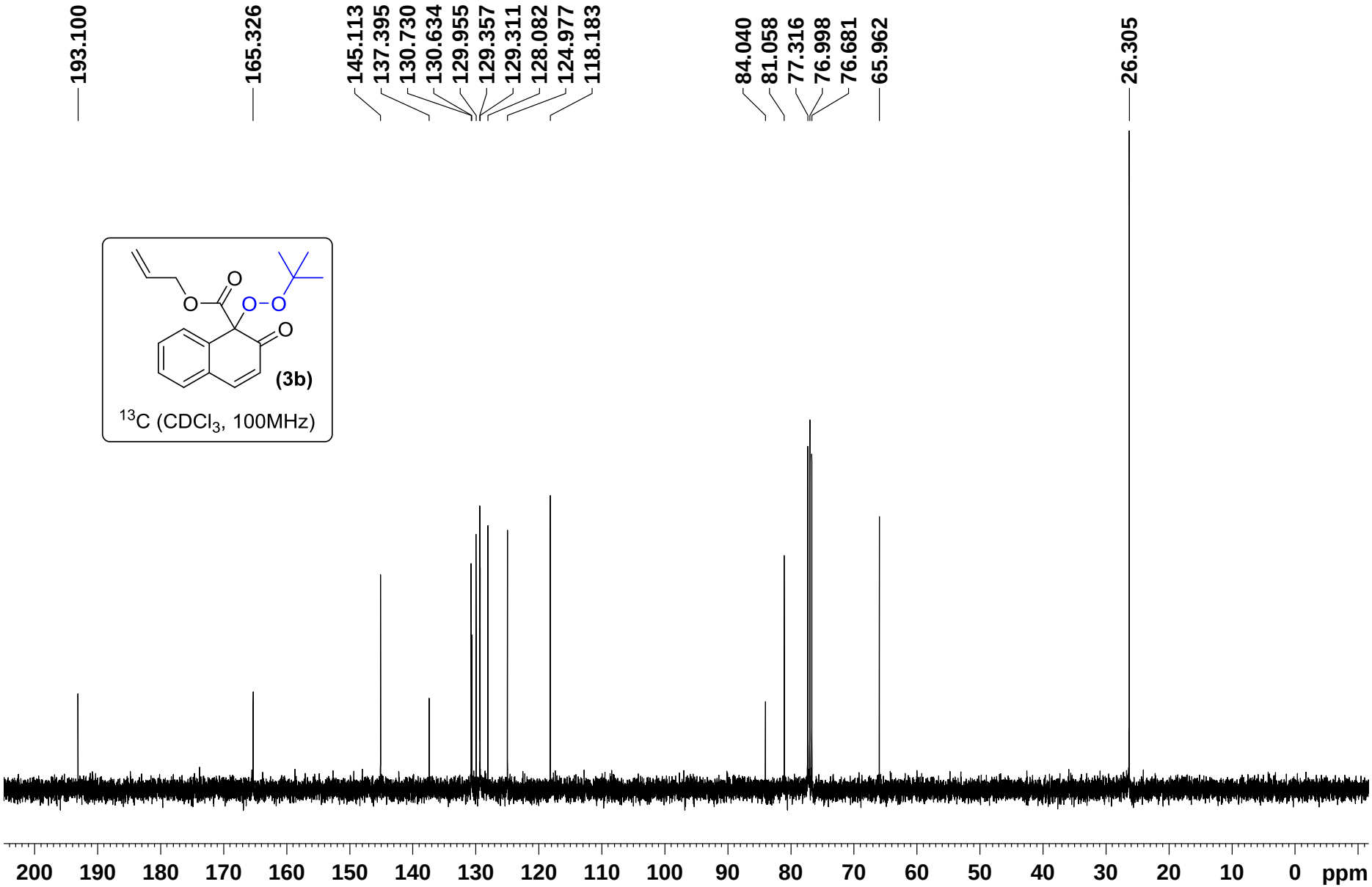
Detector A Ch1 254nm

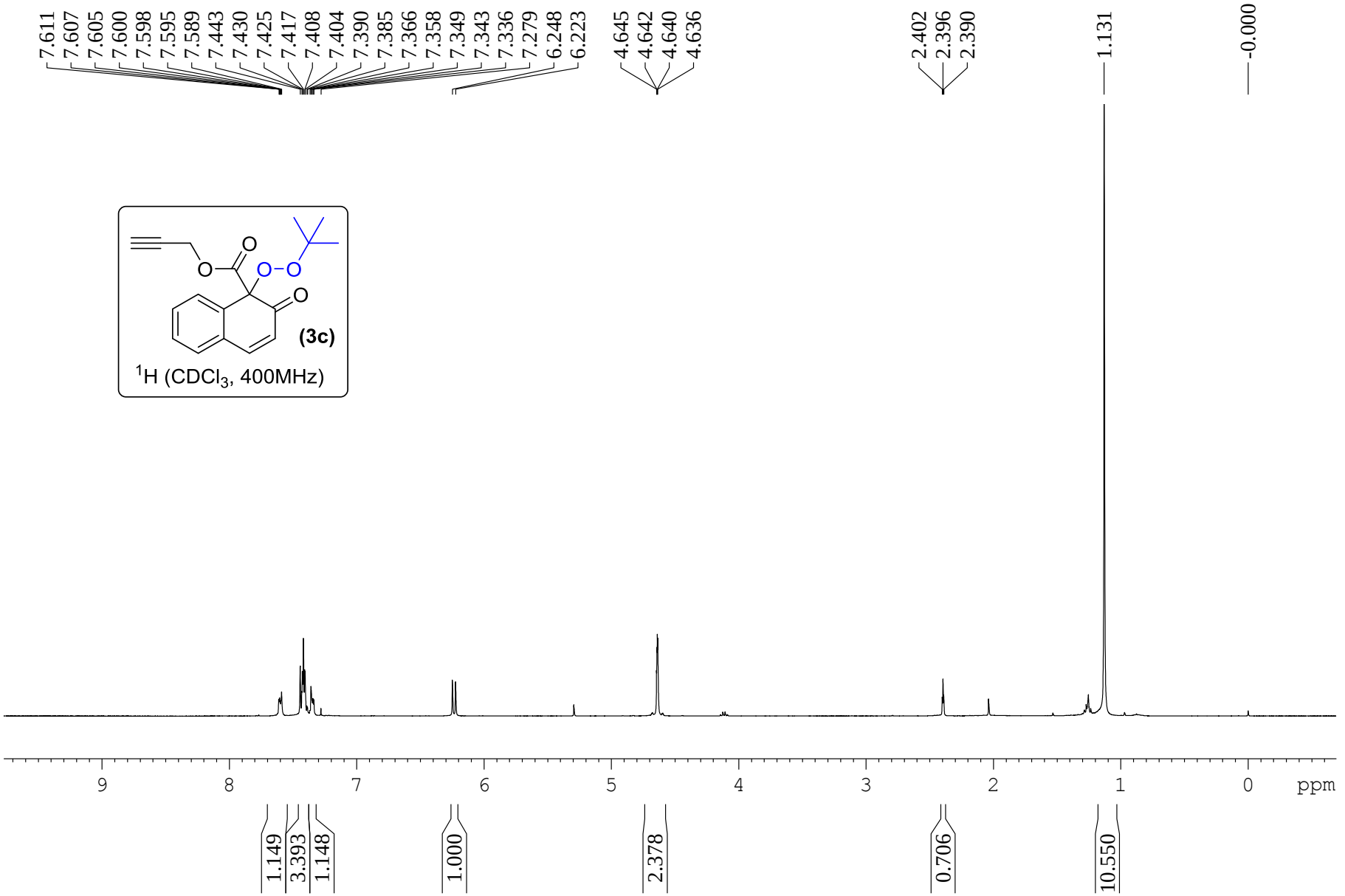
Peak#	Ret. Time	Area	Area %
1	13.761	968056	20.988
2	17.234	3644476	79.012
Total		4612532	100.000

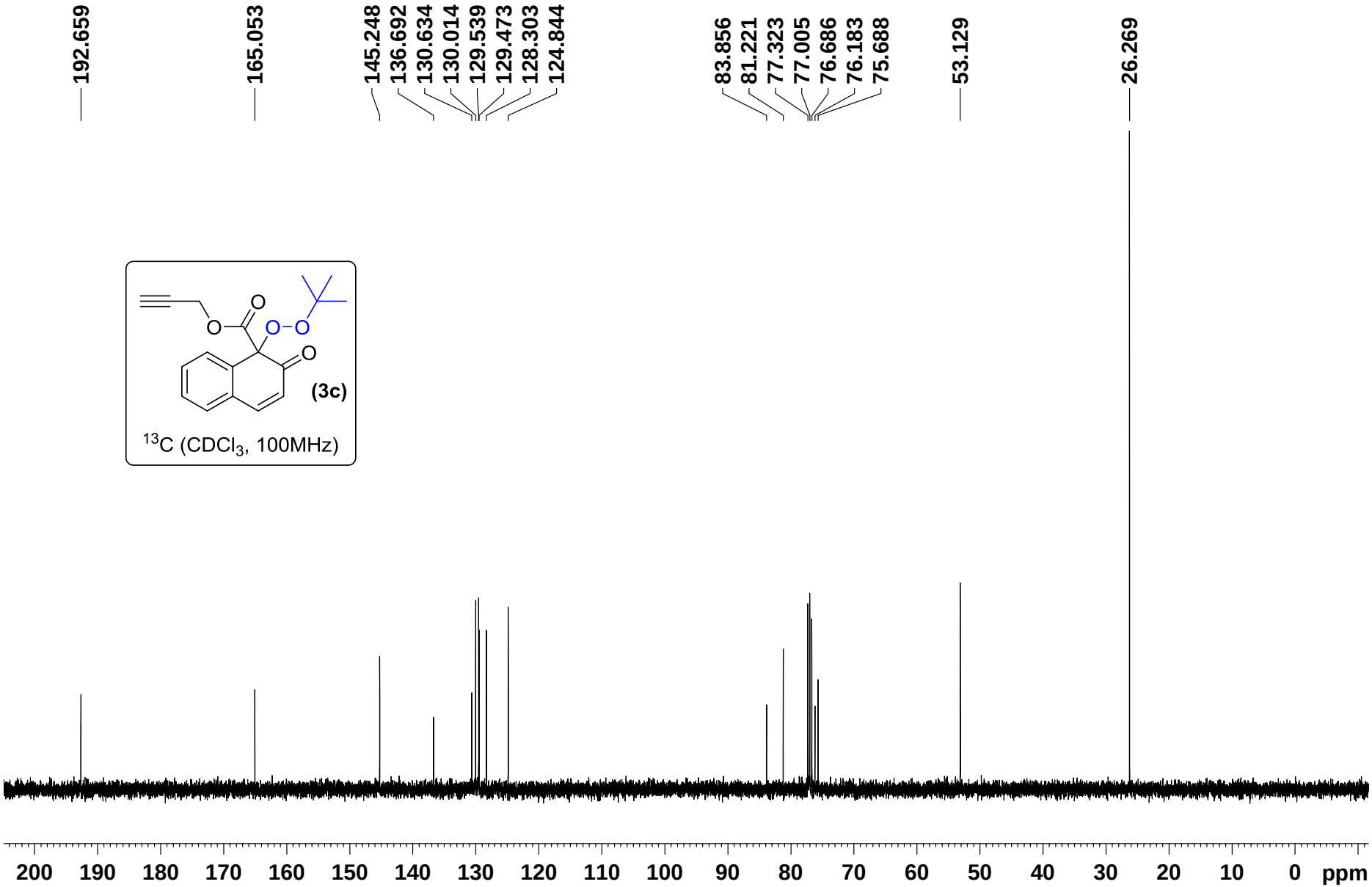

7.628
7.623
7.606
7.440
7.415
7.401
7.397
7.382
7.378
7.351
7.335
7.330
7.286
6.244
6.219
3.640
1.134
-0.000
(3a)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.100
3.278
1.083
1.000
3.265
10.199

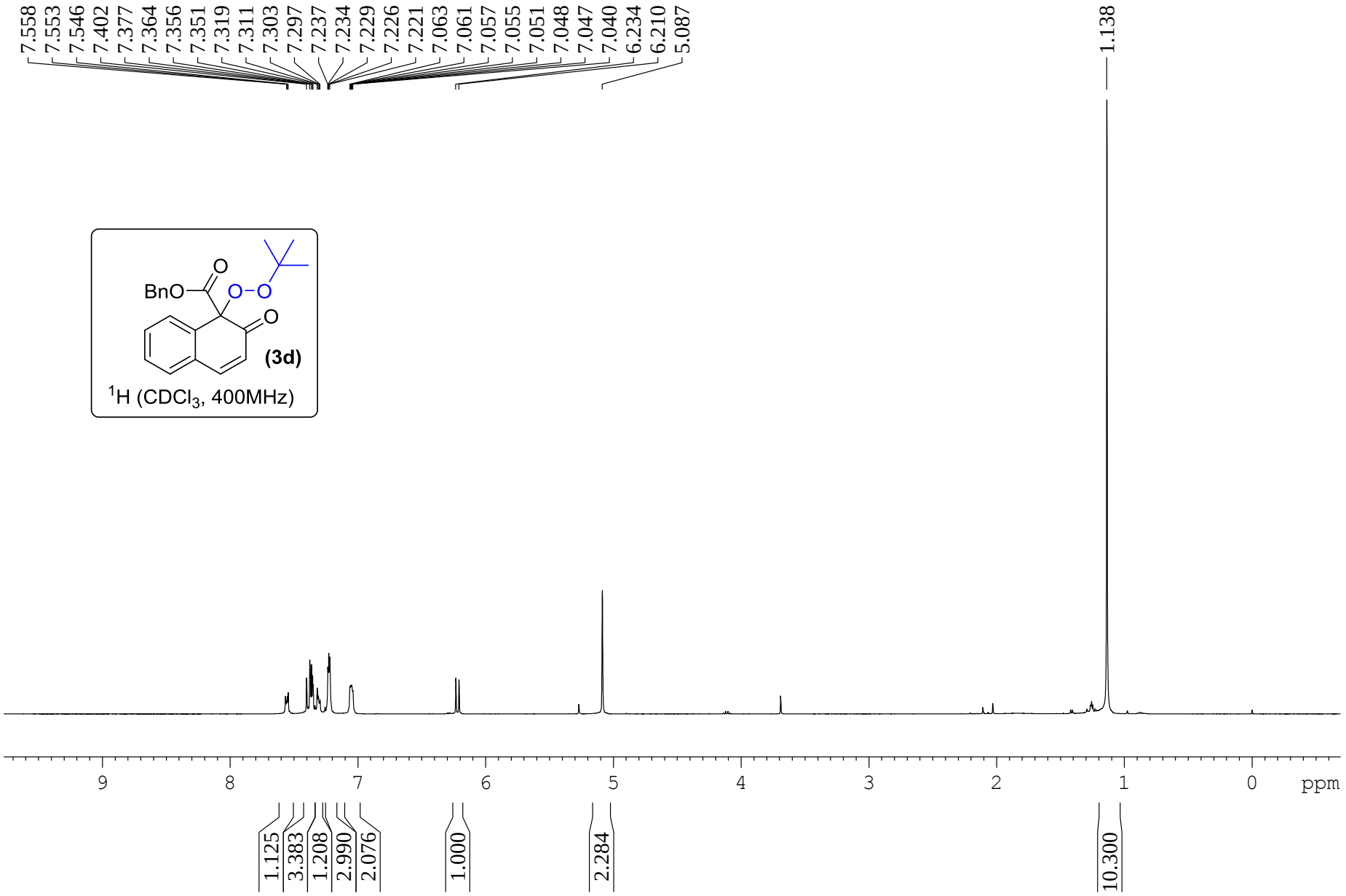

193.213
166.228
145.183
137.320
130.589
129.999
129.366
129.340
128.099
124.903
83.966
81.055
77.319
77.001
76.684
52.847
26.274
(3a)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

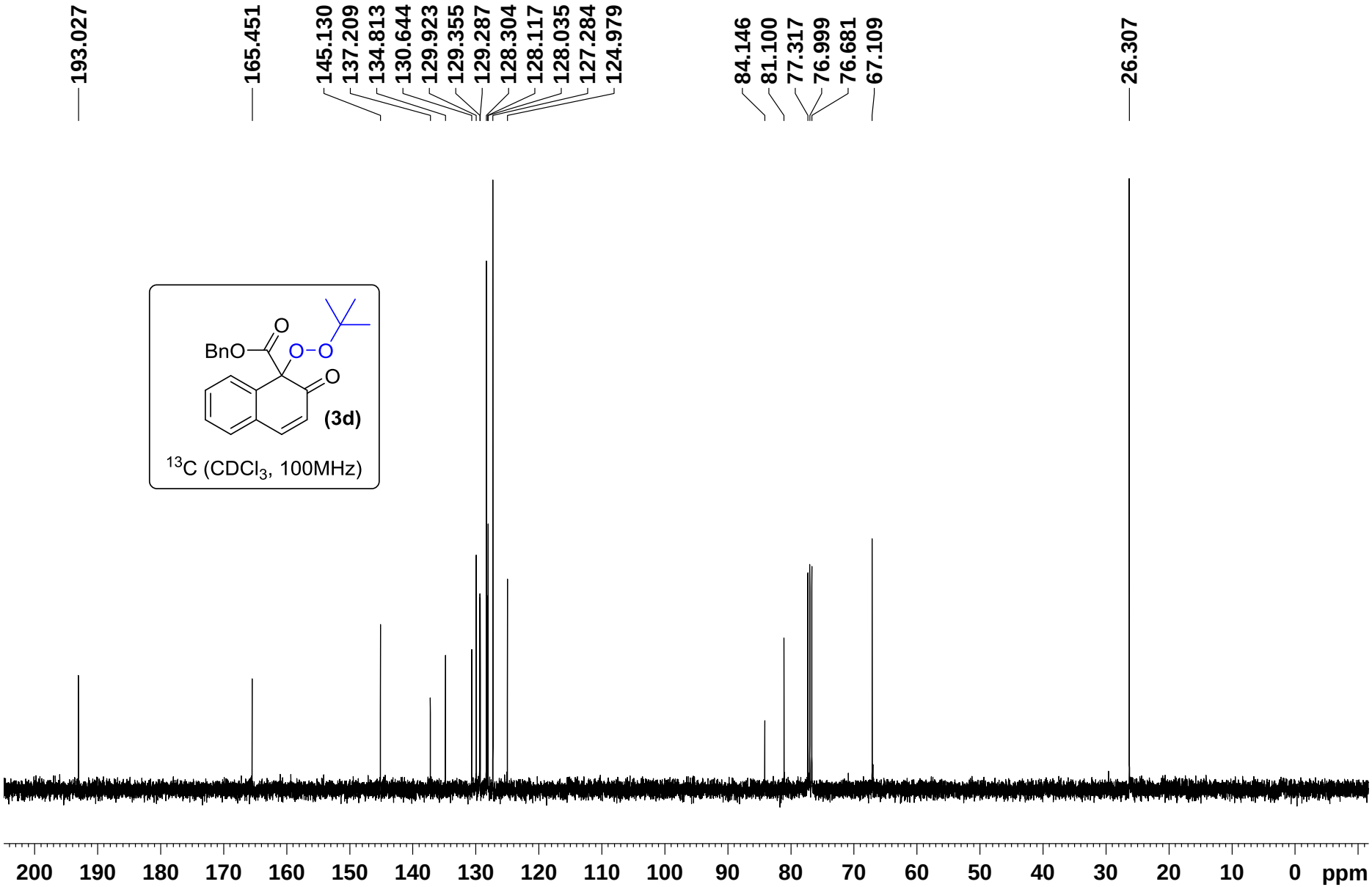

7.634
7.617
7.436
7.418
7.411
7.401
7.396
7.392
7.377
7.374
7.348
7.332
7.328
7.278
6.249
6.224
5.758
5.745
5.732
5.716
5.702
5.689
5.676
5.662
5.117
5.108
5.105
5.090
5.062
4.554
4.544
4.541
1.142
-0.000
(3b)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.043
4.261
1.000
0.978
0.971
1.013
2.172
9.406

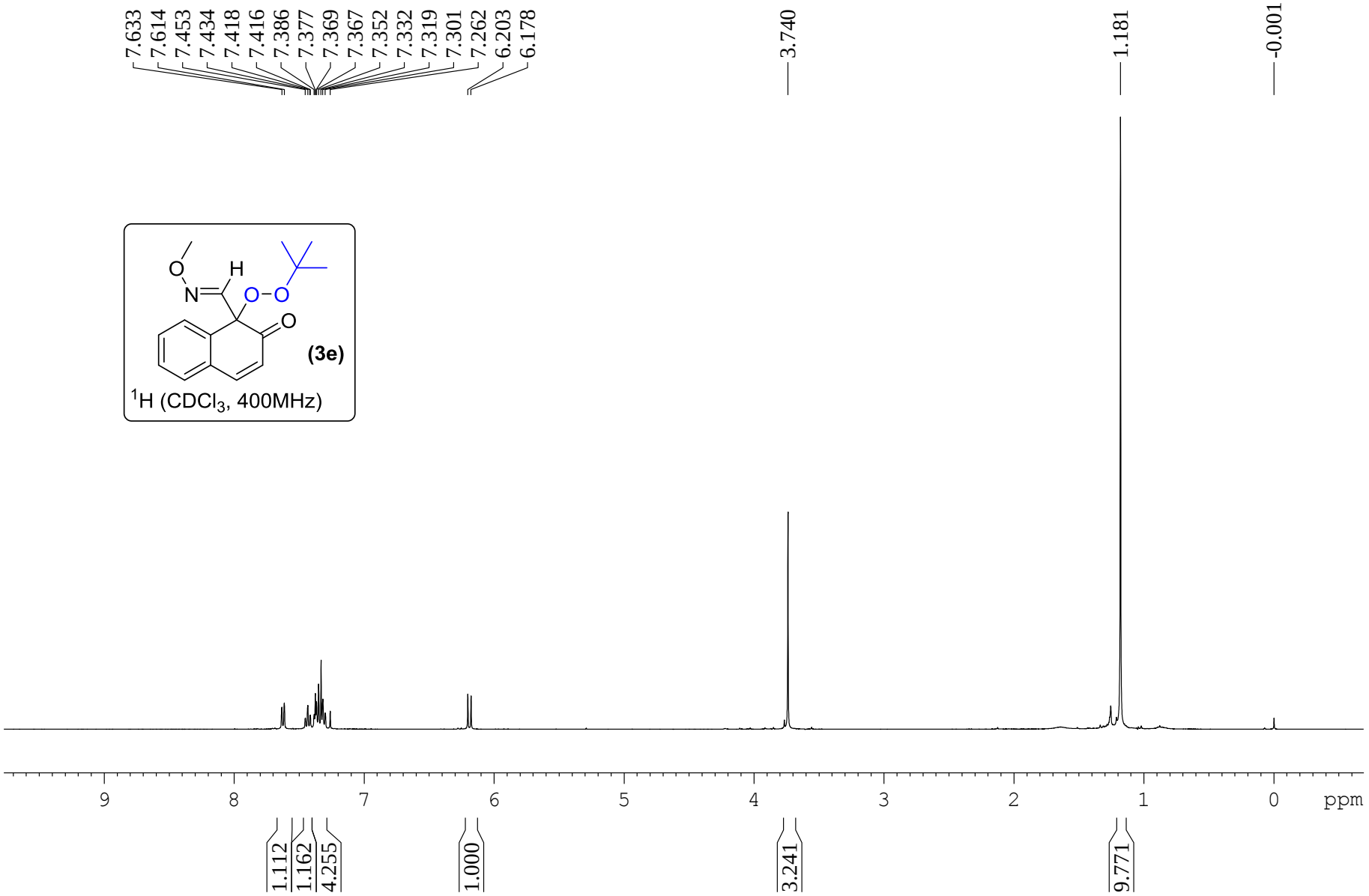

193.100
165.326
145.113
137.395
130.730
130.634
129.955
129.357
129.311
128.082
124.977
118.183
84.040
81.058
77.316
76.998
76.681
65.962
26.305
(3b)
^{13}C ($CDCl_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

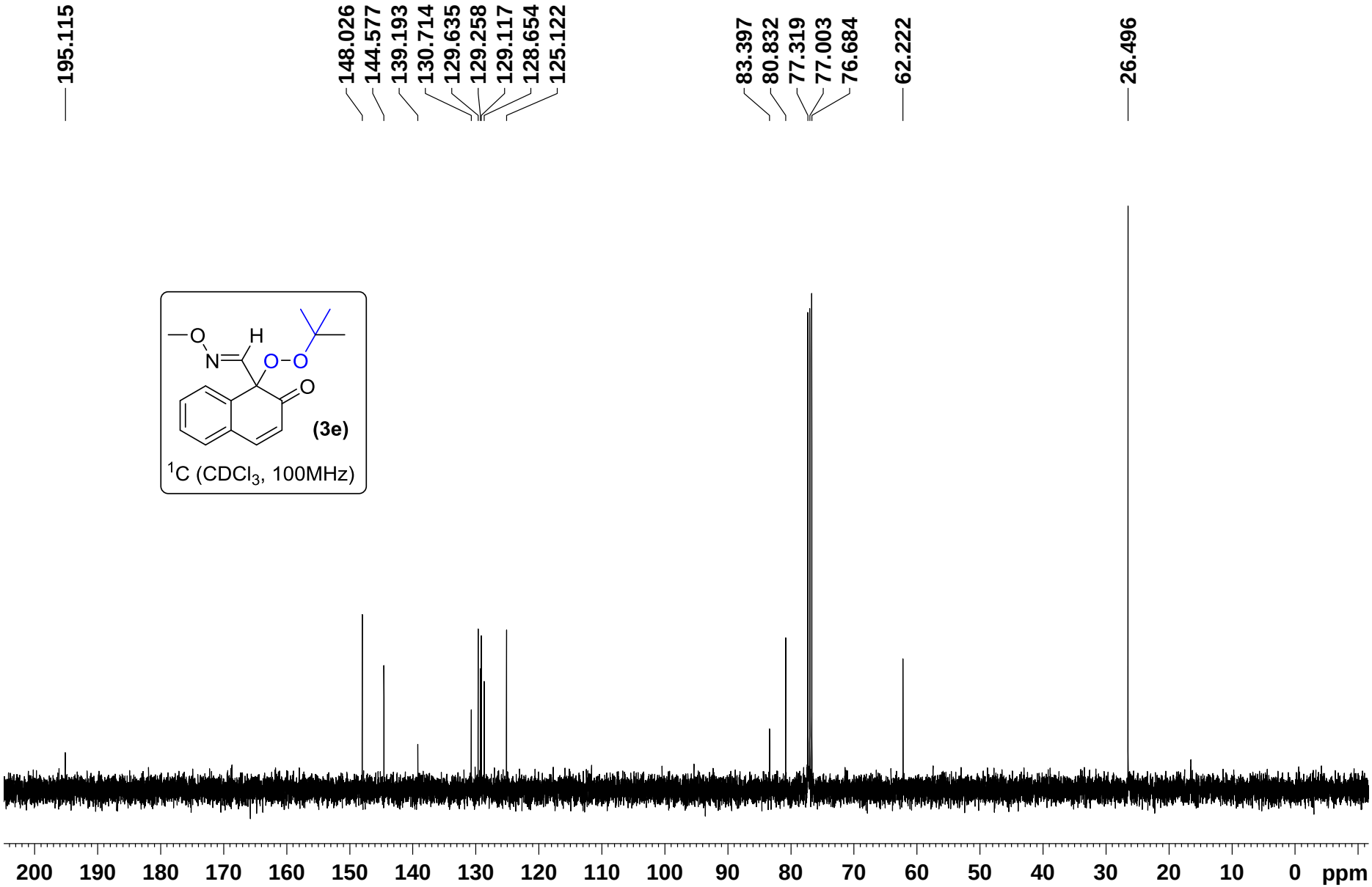

7.611
7.607
7.605
7.600
7.598
7.595
7.589
7.443
7.430
7.425
7.417
7.408
7.404
7.390
7.385
7.366
7.358
7.349
7.343
7.336
7.279
6.248
6.223
4.645
4.642
4.640
4.636
2.402
2.396
2.390
1.131
-0.000
(3c)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.149
3.393
1.148
1.000
2.378
0.706
10.550

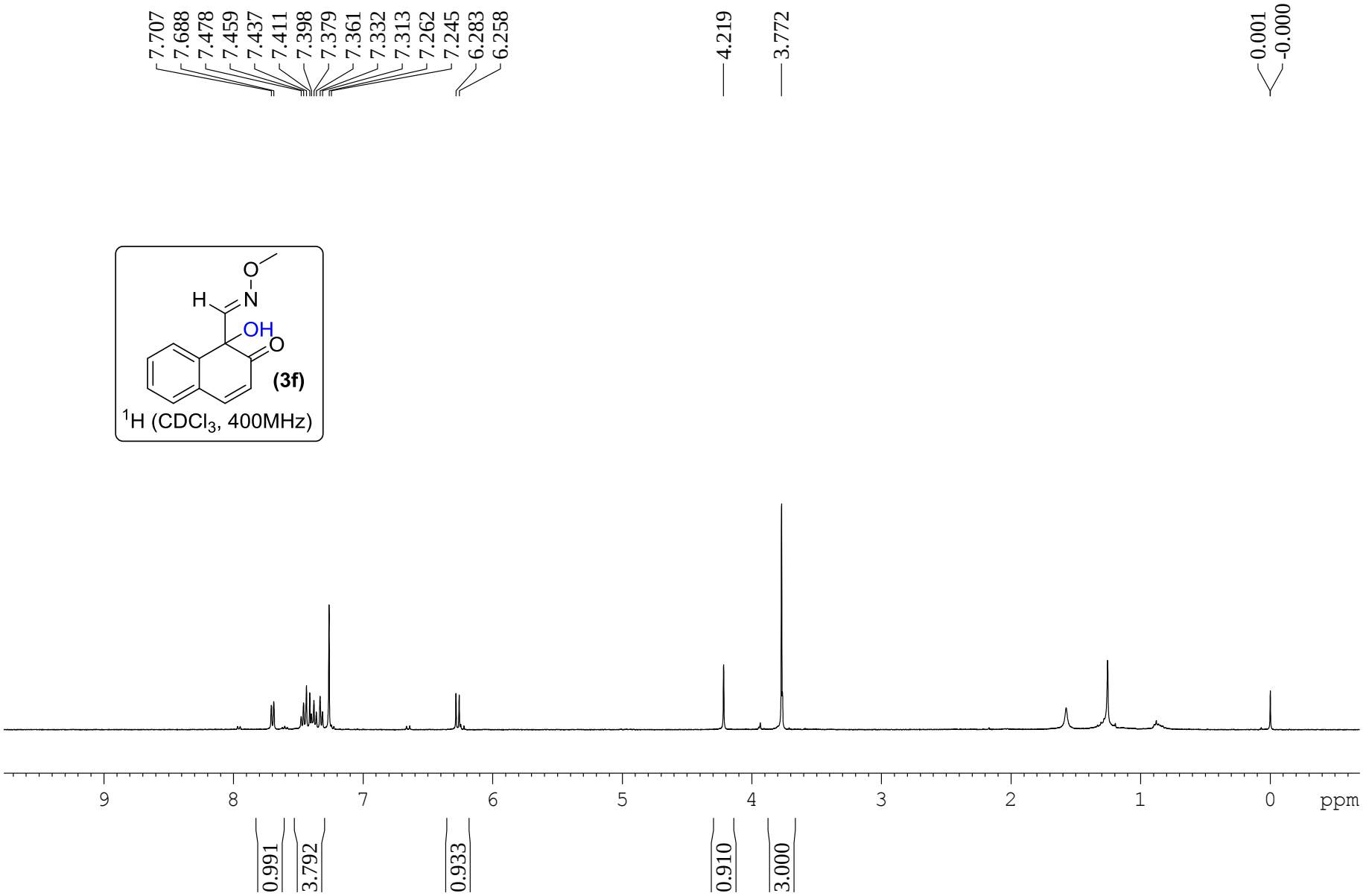

192.659
165.053
145.248
136.692
130.634
130.014
129.539
129.473
128.303
124.844
83.856
81.221
77.323
77.005
76.686
76.183
75.688
53.129
26.269
(3c)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

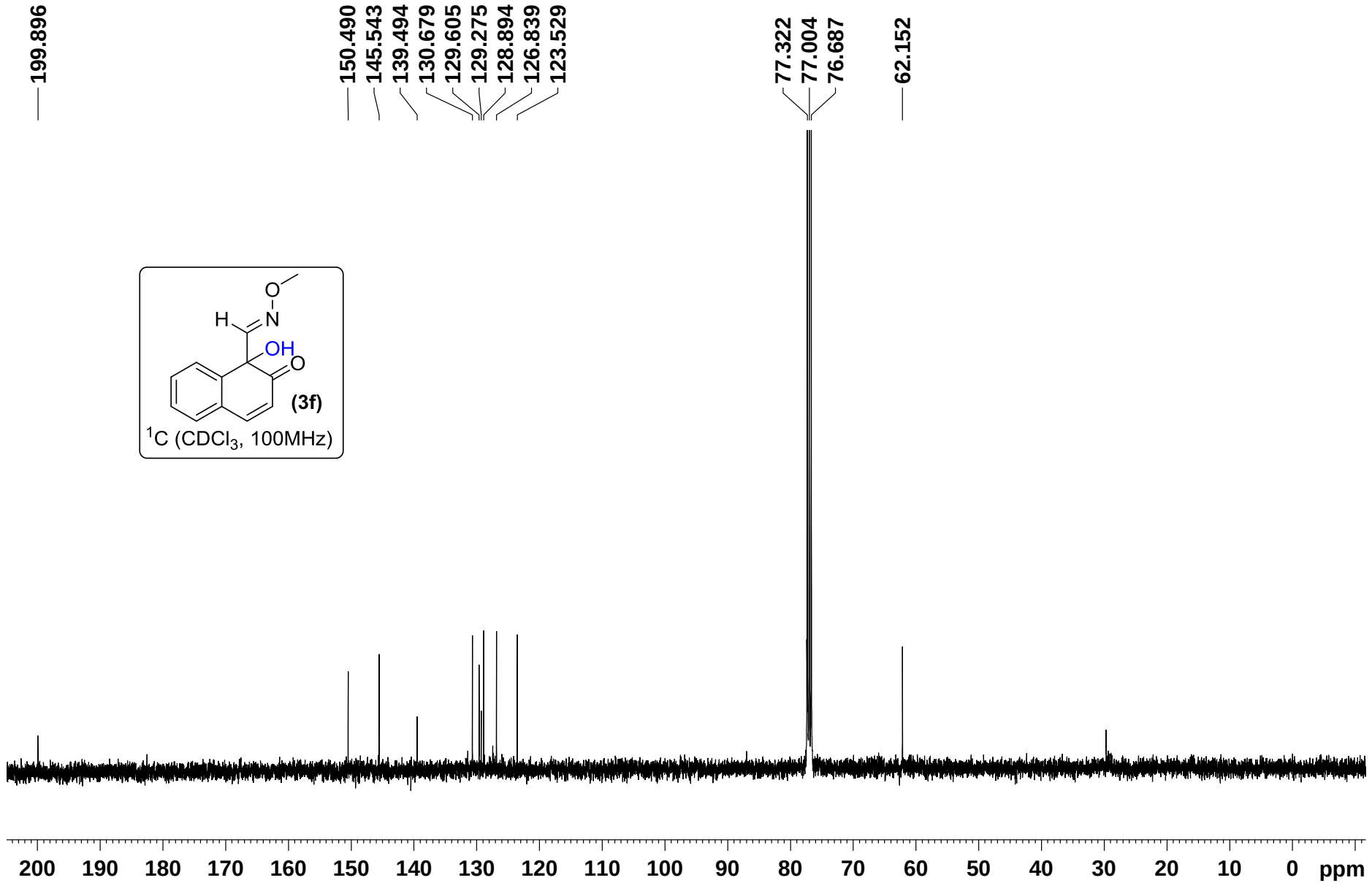

7.558
7.553
7.546
7.402
7.377
7.364
7.356
7.351
7.319
7.311
7.303
7.297
7.237
7.234
7.229
7.226
7.221
7.063
7.061
7.057
7.055
7.051
7.048
7.047
7.040
6.234
6.210
5.087
1.138
BnO
O
O-O
O
(3d)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.125
3.383
1.208
2.990
2.076
1.000
2.284
10.300

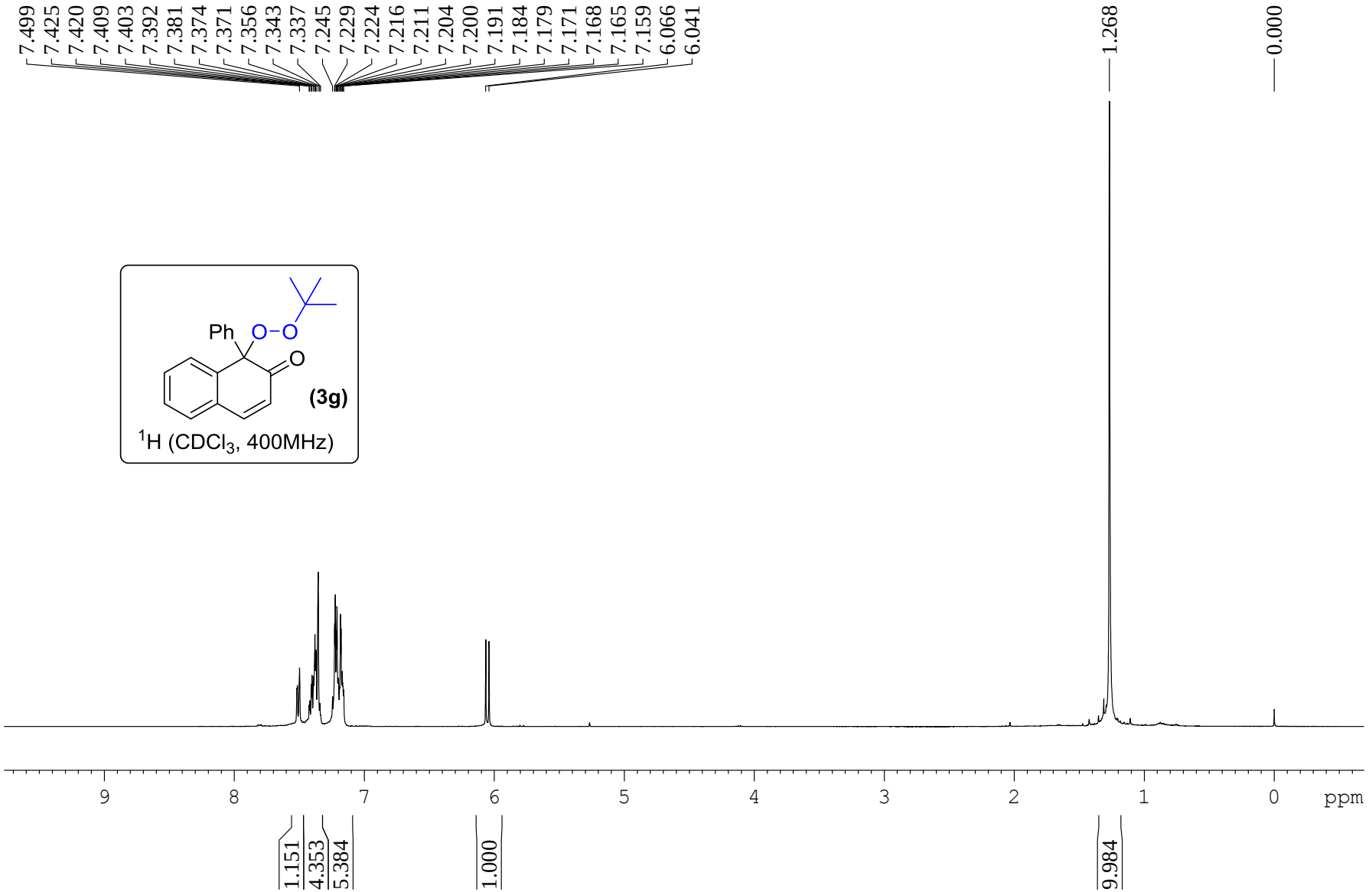

193.027
165.451
145.130
137.209
134.813
130.644
129.923
129.355
129.287
128.304
128.117
128.035
127.284
124.979
84.146
81.100
77.317
76.999
76.681
67.109
26.307
BnO
O
O
O
O
(3d)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

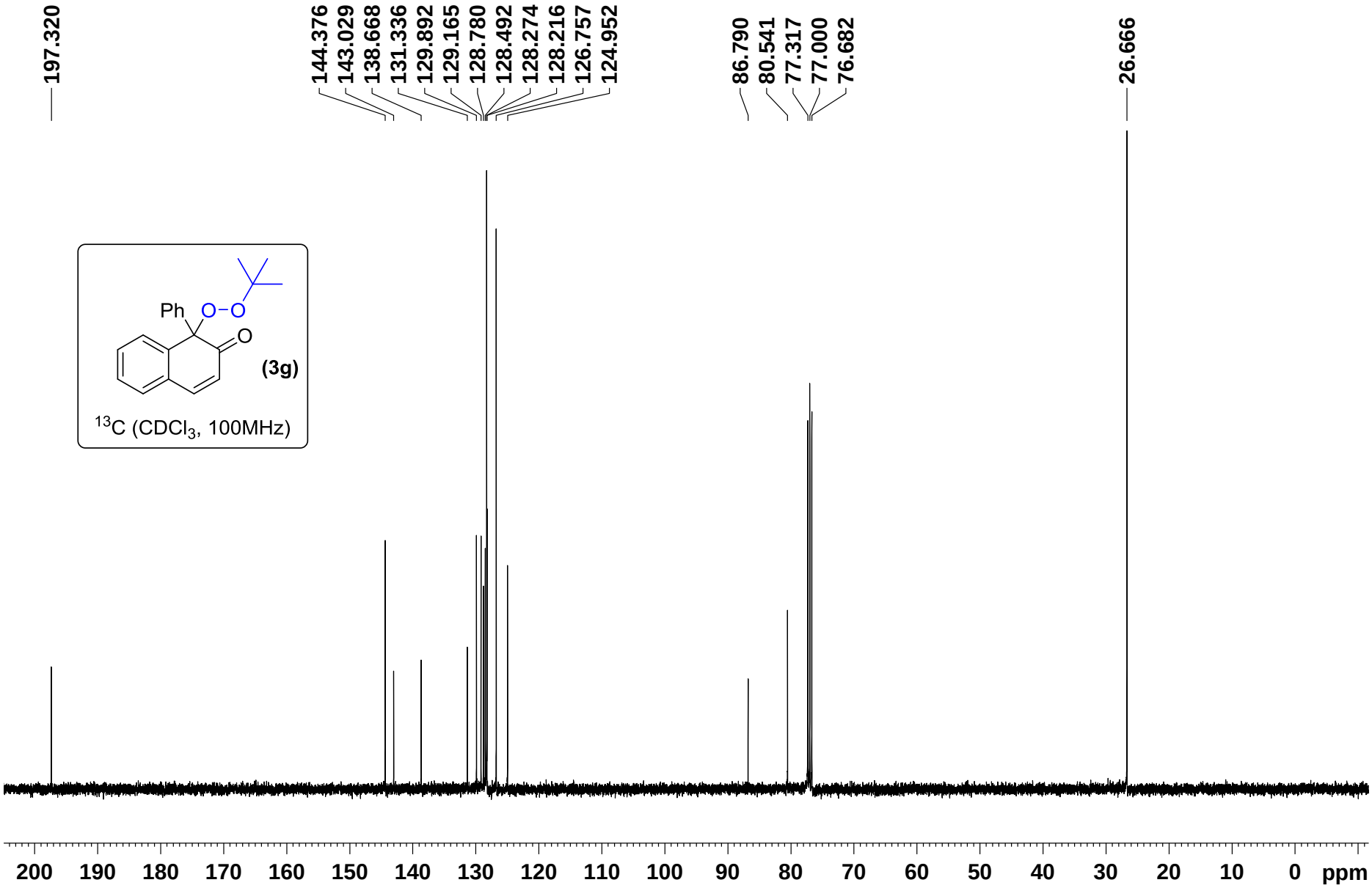

7.633
7.614
7.453
7.434
7.418
7.416
7.386
7.377
7.369
7.367
7.352
7.332
7.319
7.301
7.262
6.203
6.178
3.740
1.181
-0.001
(3e)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.112
1.162
4.255
1.000
3.241
9.771

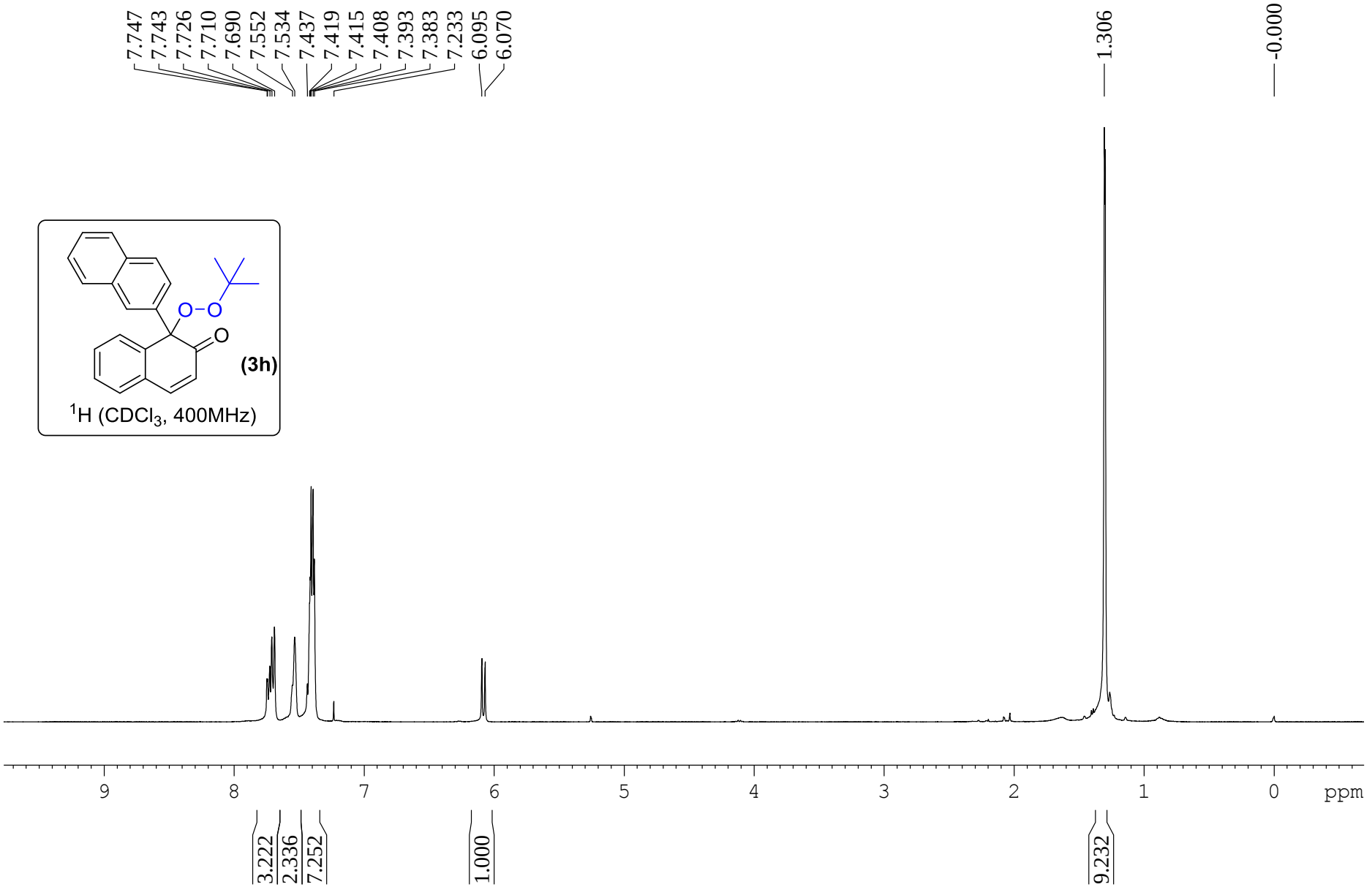

195.115
148.026
144.577
139.193
130.714
129.635
129.258
129.117
128.654
125.122
83.397
80.832
77.319
77.003
76.684
62.222
26.496
(3e)
^{1}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

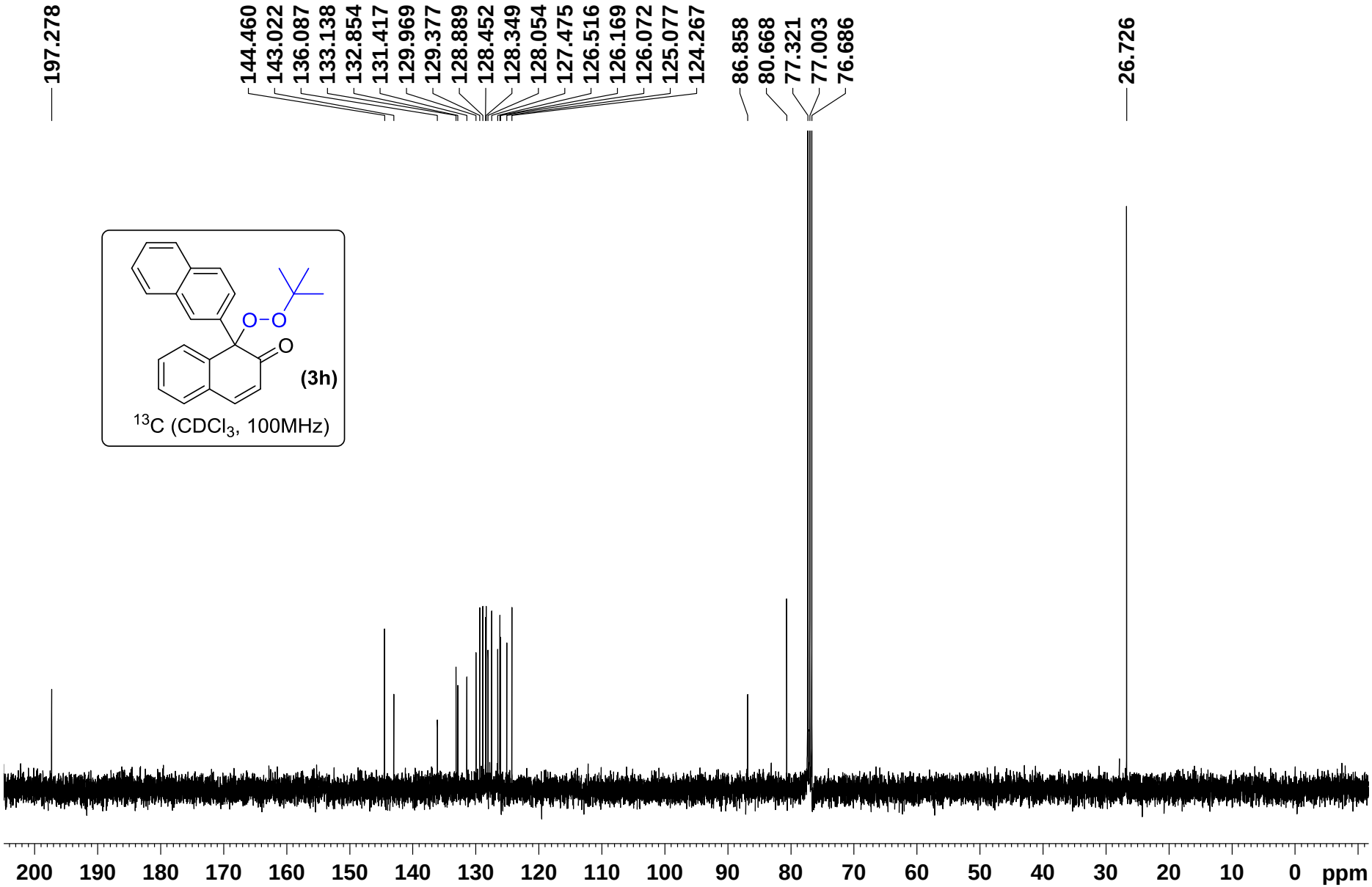

7.707
7.688
7.478
7.459
7.437
7.411
7.398
7.379
7.361
7.332
7.313
7.262
7.245
6.283
6.258
4.219
3.772
0.001
-0.000
O
H
N
OH
O
(3f)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
0.991
3.792
0.933
0.910
3.000

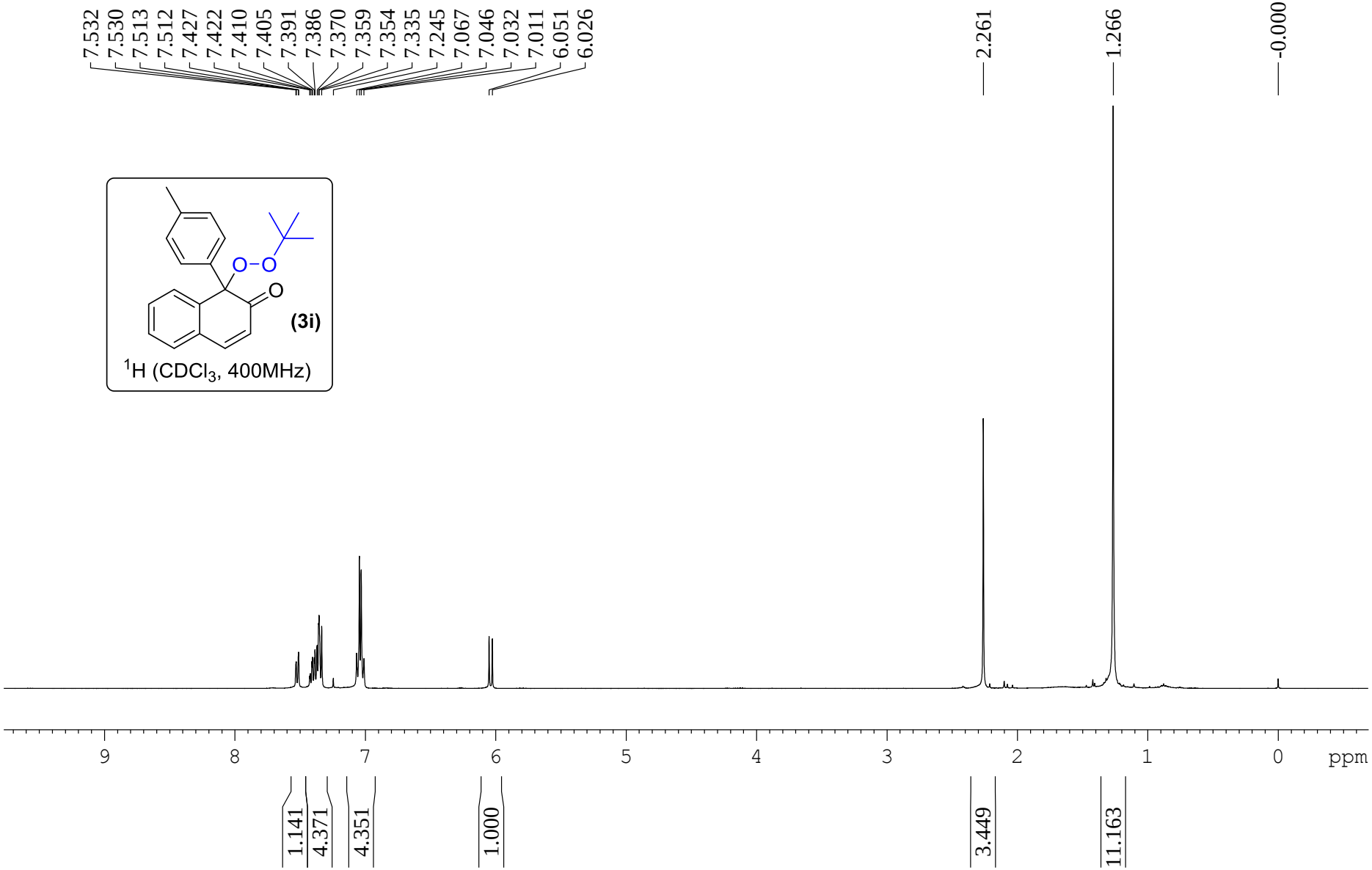

199.896
150.490
145.543
139.494
130.679
129.605
129.275
128.894
126.839
123.529
77.322
77.004
76.687
62.152
O
H
N
OH
O
(3f)
^{1}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

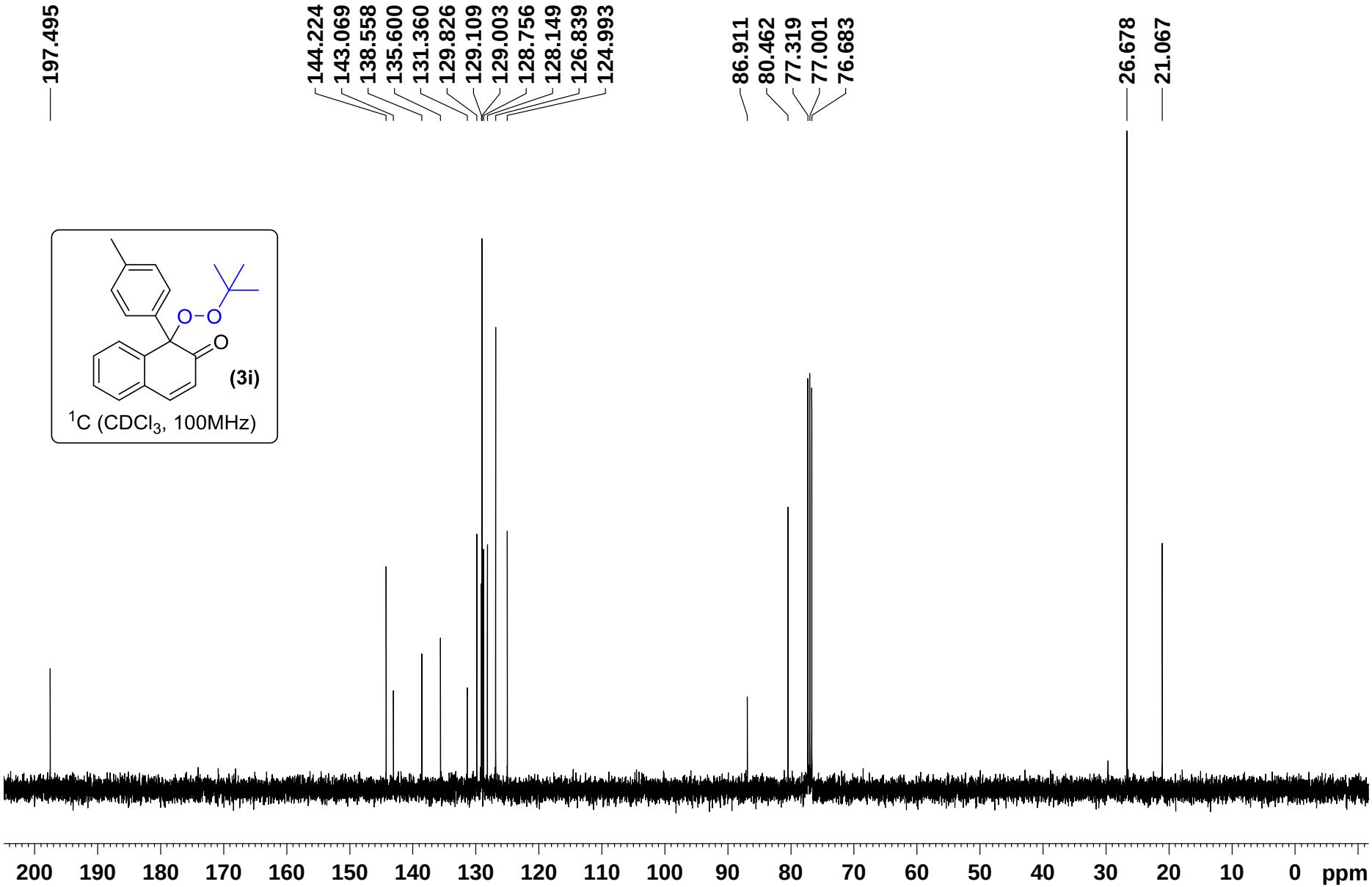

7.499
7.425
7.420
7.409
7.403
7.392
7.381
7.374
7.371
7.356
7.343
7.337
7.245
7.229
7.224
7.216
7.211
7.204
7.200
7.191
7.184
7.179
7.171
7.168
7.165
7.159
6.066
6.041
1.268
0.000
Ph
O–O
O
(3g)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.151
4.353
5.384
1.000
9.984

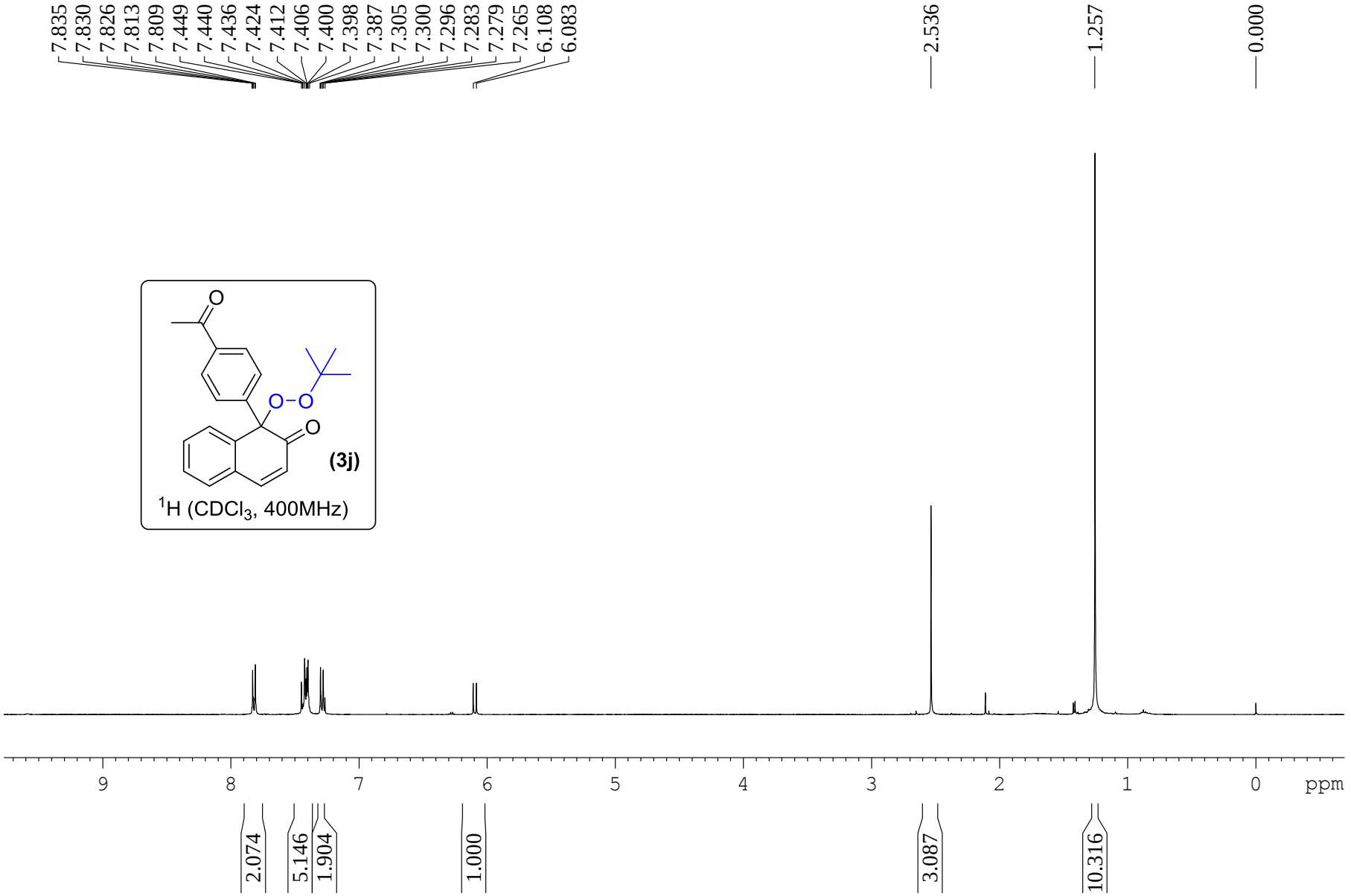

197.320
144.376
143.029
138.668
131.336
129.892
129.165
128.780
128.492
128.274
128.216
126.757
124.952
86.790
80.541
77.317
77.000
76.682
26.666
Ph
O–O
O
(3g)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

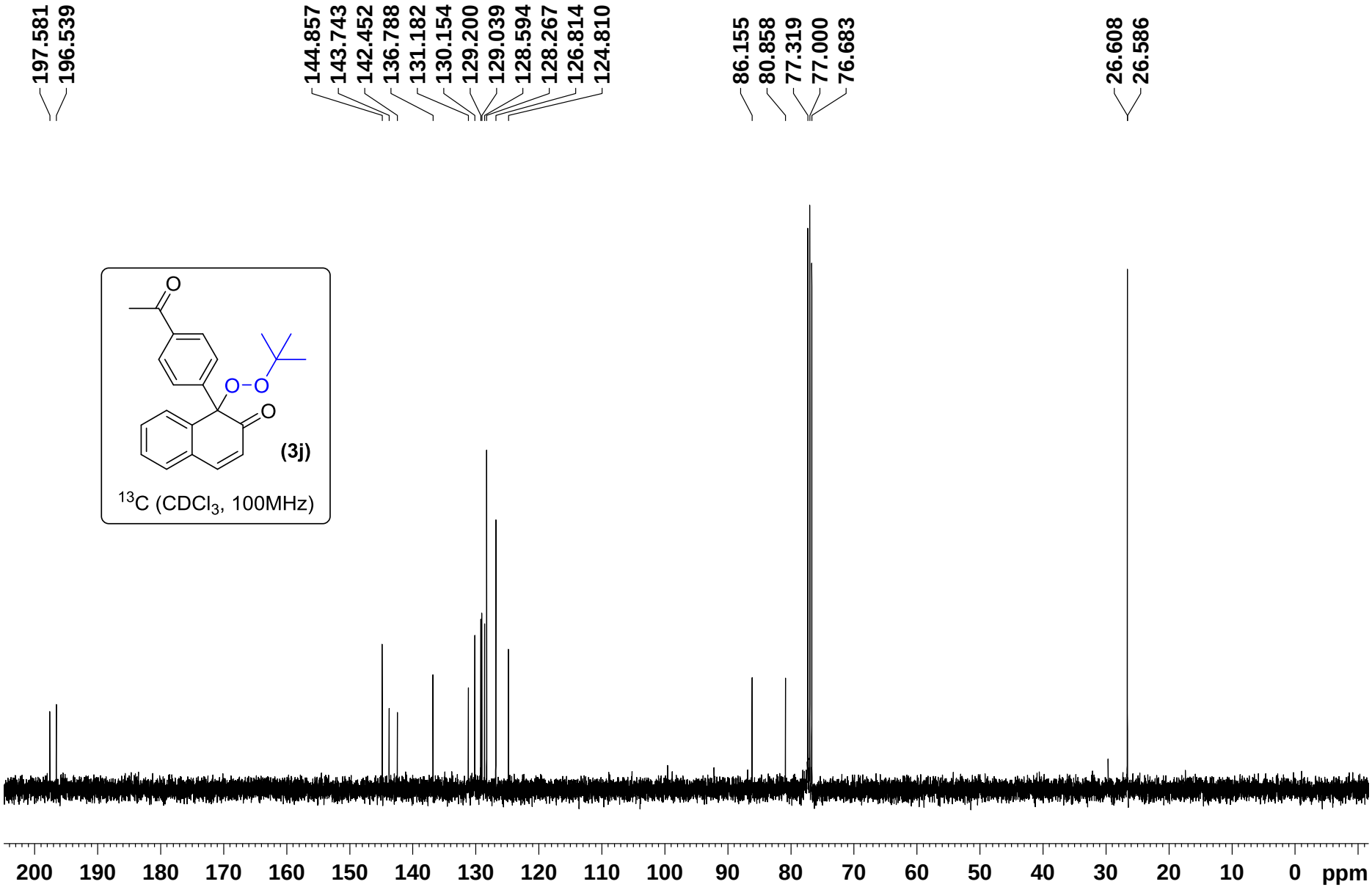

7.747
7.743
7.726
7.710
7.690
7.552
7.534
7.437
7.419
7.415
7.408
7.393
7.383
7.233
6.095
6.070
1.306
-0.000
O-O
O
(3h)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
3.222
2.336
7.252
1.000
9.232

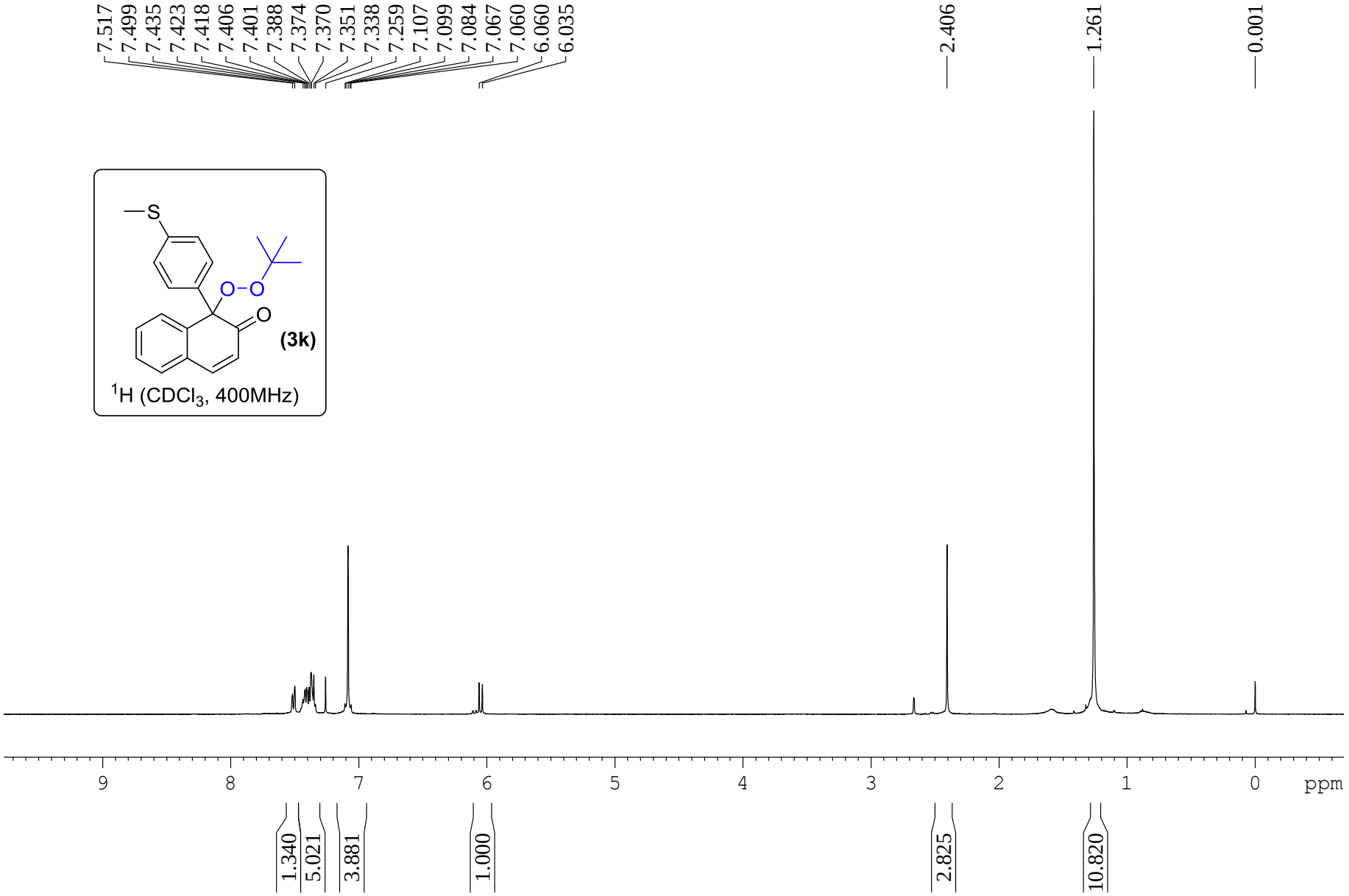

197.278
144.460
143.022
136.087
133.138
132.854
131.417
129.969
129.377
128.889
128.452
128.349
128.054
127.475
126.516
126.169
126.072
125.077
124.267
86.858
80.668
77.321
77.003
76.686
26.726
O-O
O
(3h)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

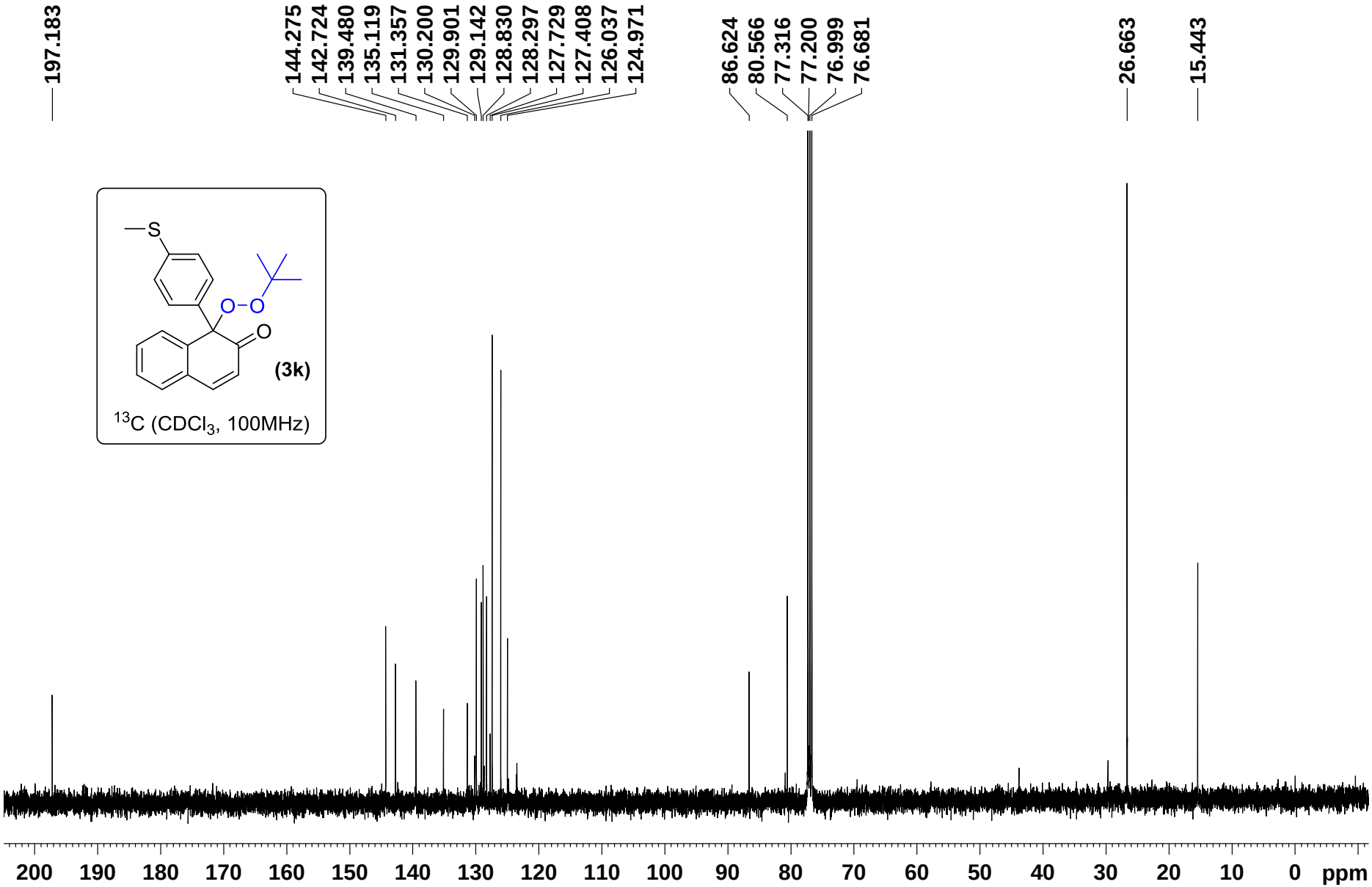

7.532
7.530
7.513
7.512
7.427
7.422
7.410
7.405
7.391
7.386
7.370
7.359
7.354
7.335
7.245
7.067
7.046
7.032
7.011
6.051
6.026
2.261
1.266
-0.000
O-O
O
(3i)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.141
4.371
4.351
1.000
3.449
11.163

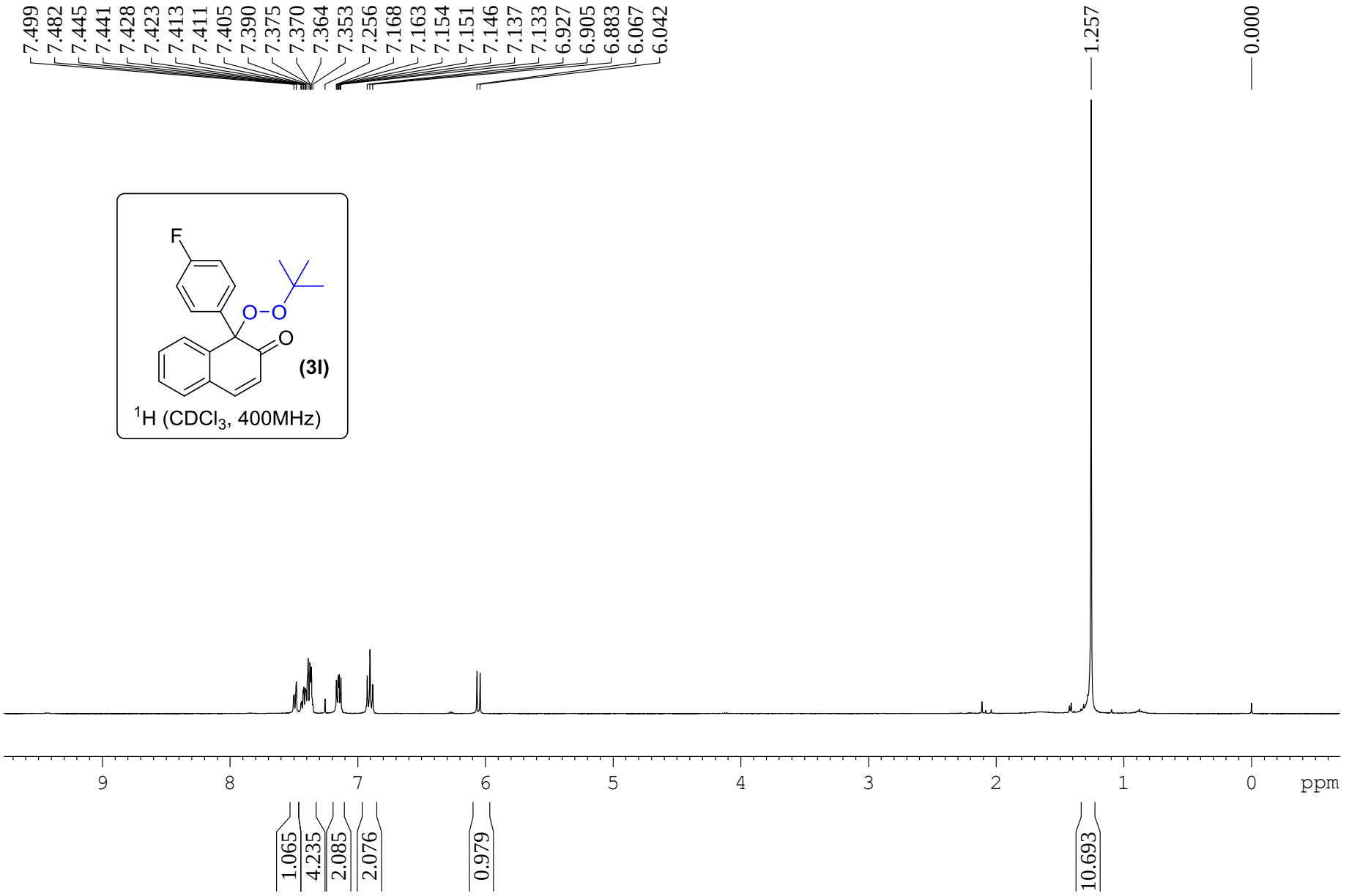

197.495
144.224
143.069
138.558
135.600
131.360
129.826
129.109
129.003
128.756
128.149
126.839
124.993
86.911
80.462
77.319
77.001
76.683
26.678
21.067
O–O
O
(3i)
^{1}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

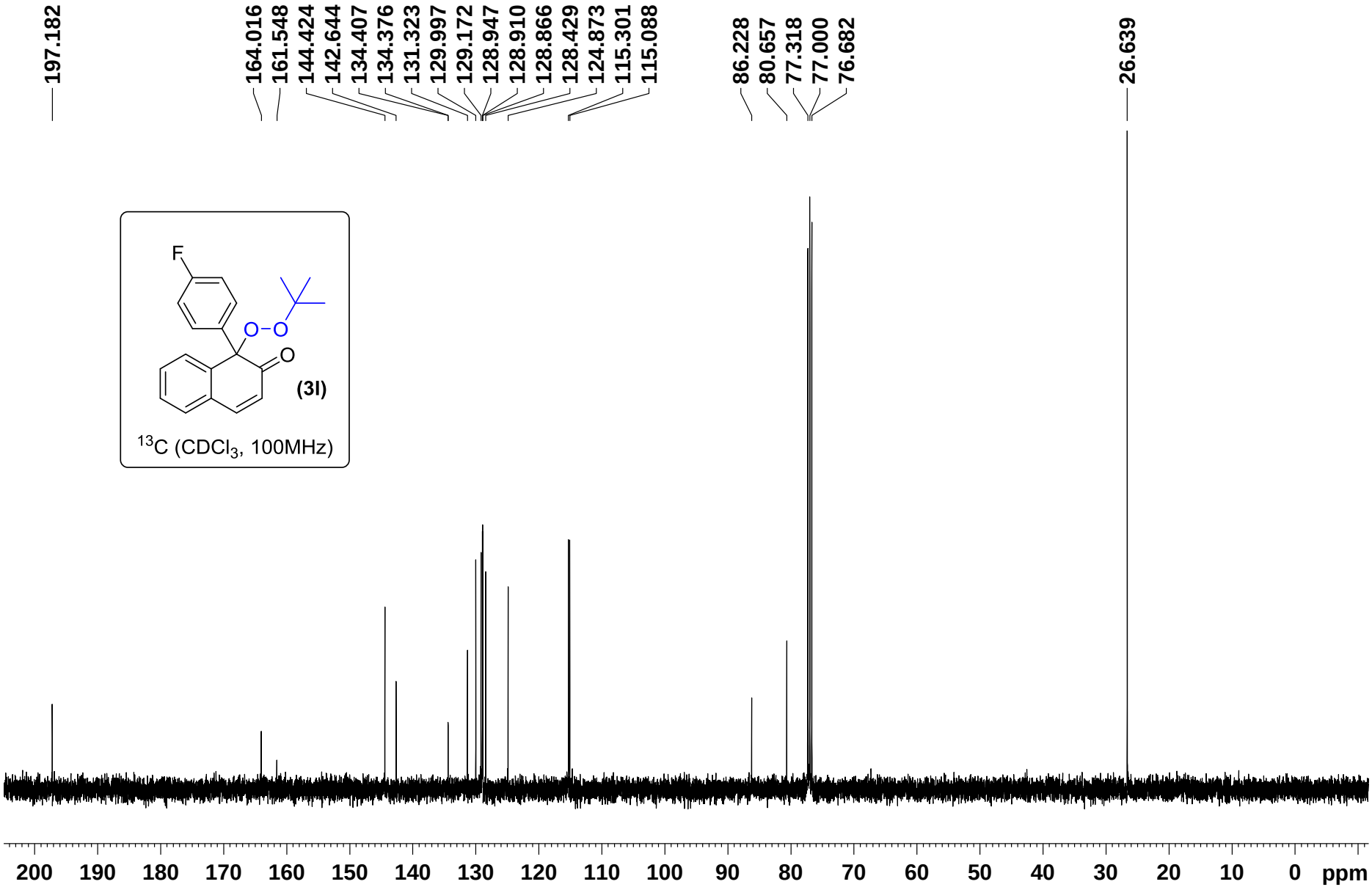

7.835
7.830
7.826
7.813
7.809
7.449
7.440
7.436
7.424
7.412
7.406
7.400
7.398
7.387
7.305
7.300
7.296
7.283
7.279
7.265
6.108
6.083
2.536
1.257
0.000
O
O–O
O
(3j)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
2.074
5.146
1.904
1.000
3.087
10.316

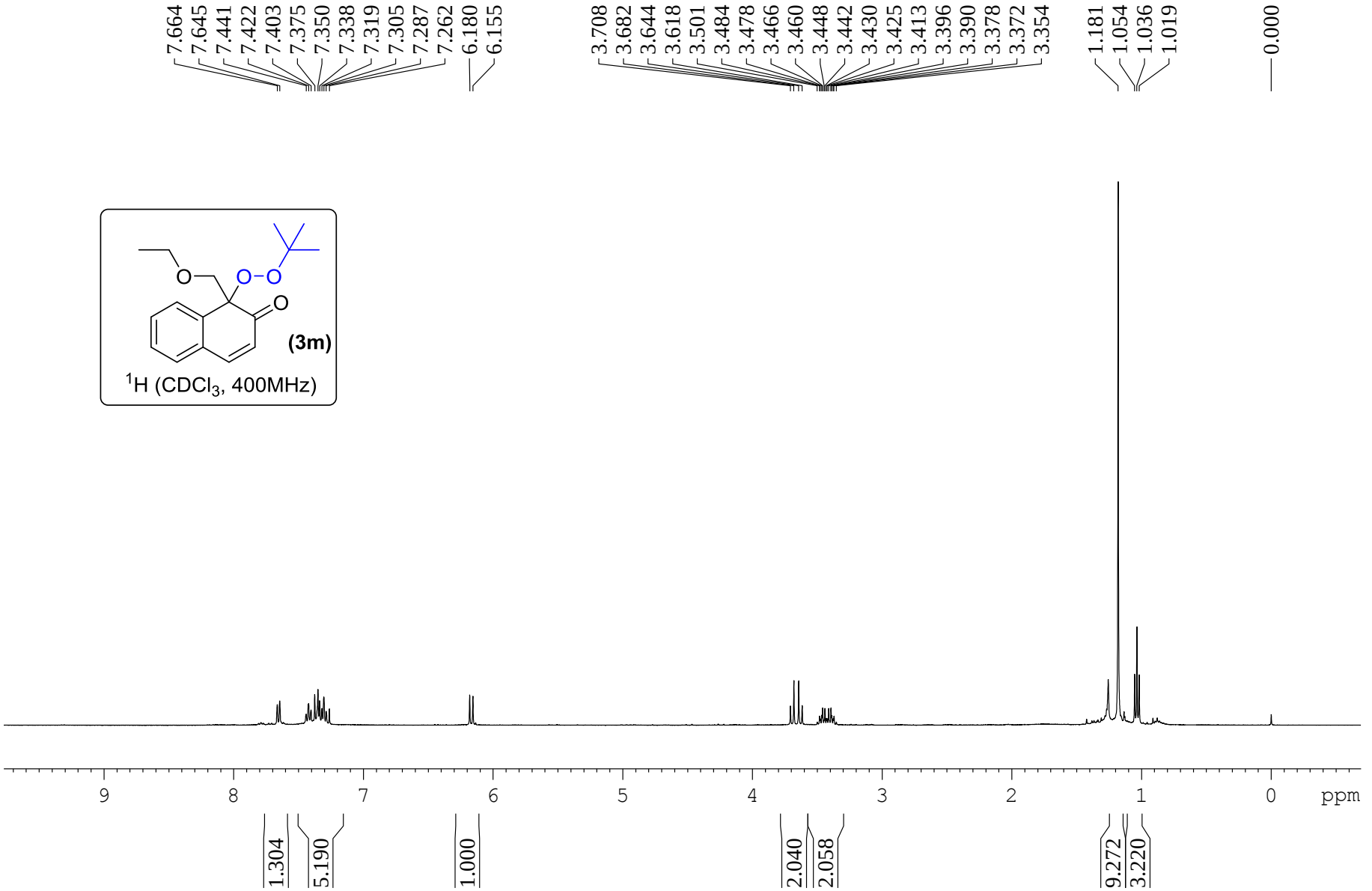

197.581
196.539
144.857
143.743
142.452
136.788
131.182
130.154
129.200
129.039
128.594
128.267
126.814
124.810
86.155
80.858
77.319
77.000
76.683
26.608
26.586
O
O–O
O
(3j)
^{13}C (CDCl$_3$, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

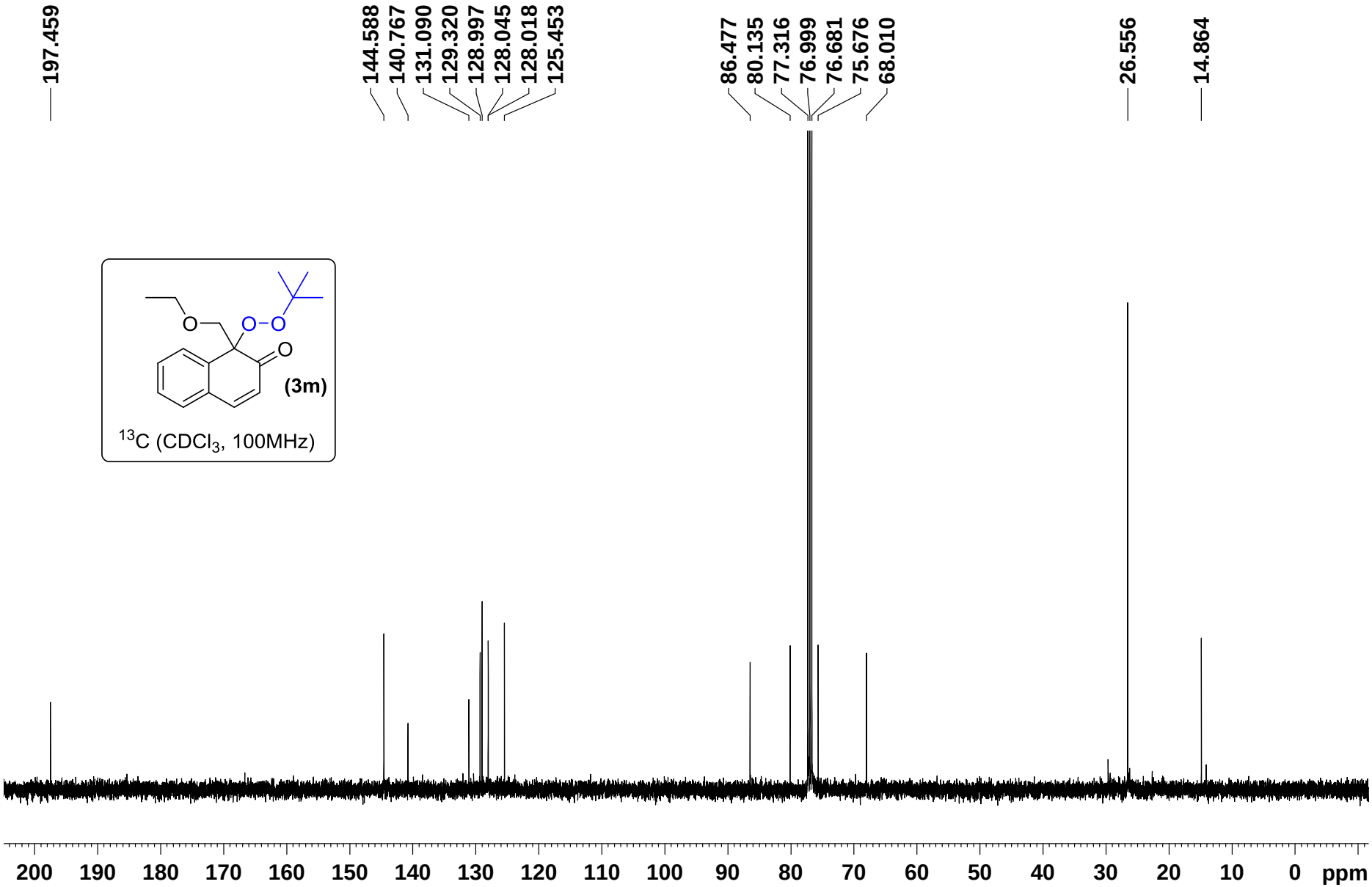

7.517
7.499
7.435
7.423
7.418
7.406
7.401
7.388
7.374
7.370
7.351
7.338
7.259
7.107
7.099
7.084
7.067
7.060
6.060
6.035
2.406
1.261
0.001
S
O-O
O
(3k)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.340
5.021
3.881
1.000
2.825
10.820

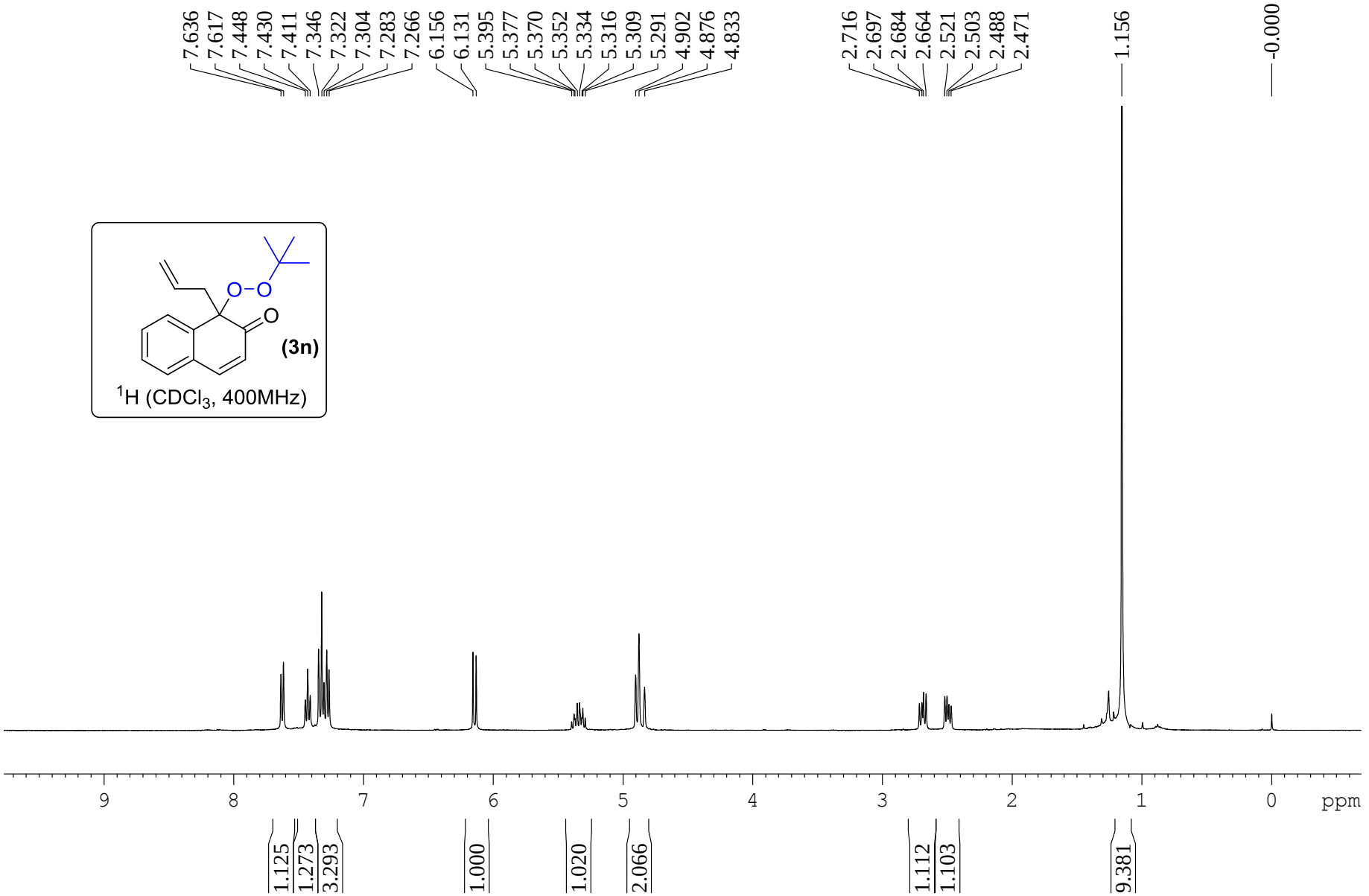

197.183
144.275
142.724
139.480
135.119
131.357
130.200
129.901
129.142
128.830
128.297
127.729
127.408
126.037
124.971
86.624
80.566
77.316
77.200
76.999
76.681
26.663
15.443
S
O-O
O
(3k)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

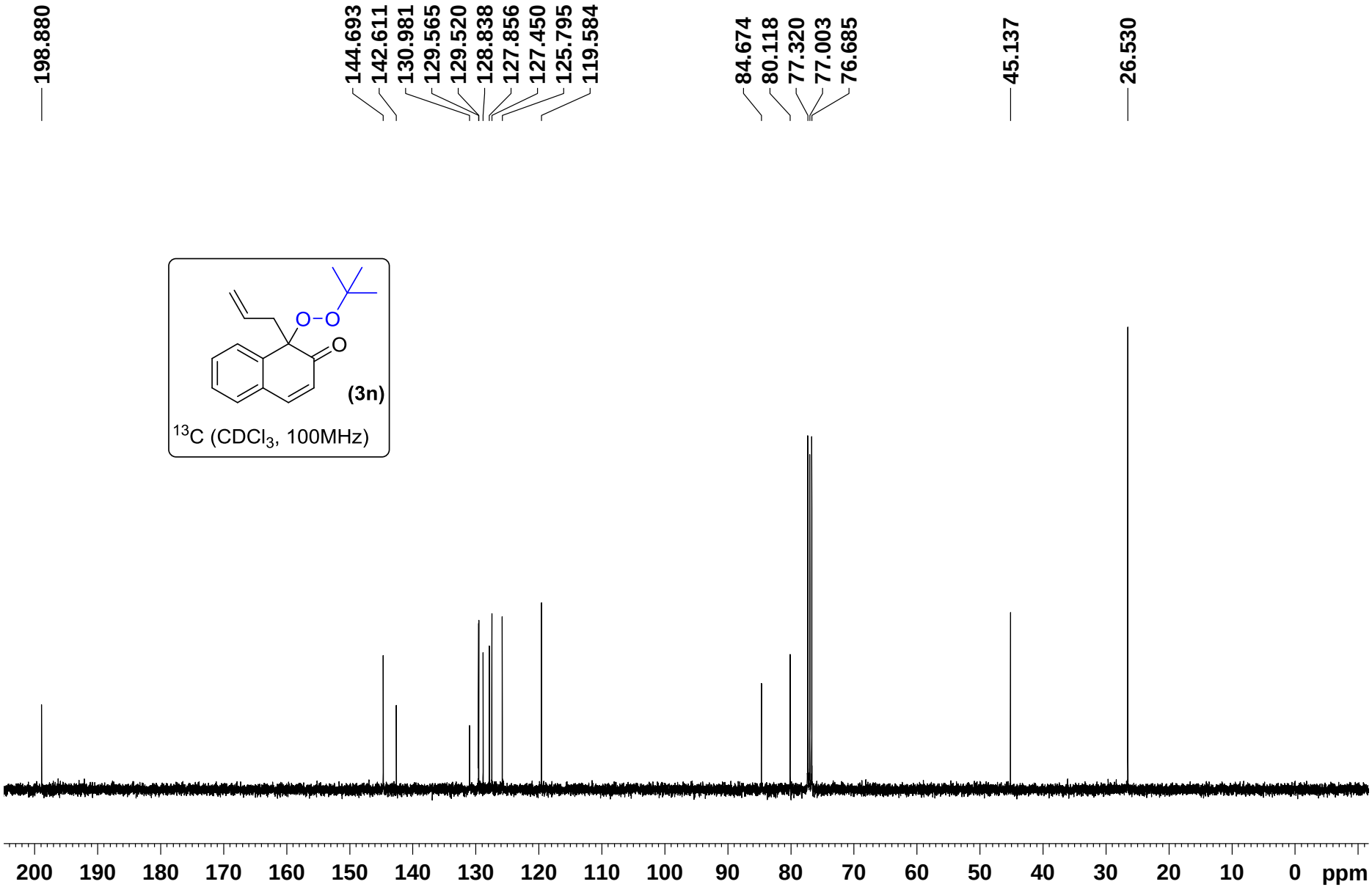

7.499
7.482
7.445
7.441
7.428
7.423
7.413
7.411
7.405
7.390
7.375
7.370
7.364
7.353
7.256
7.168
7.163
7.154
7.151
7.146
7.137
7.133
6.927
6.905
6.883
6.067
6.042
1.257
0.000
F
O–O
O
(3l)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.065
4.235
2.085
2.076
0.979
10.693

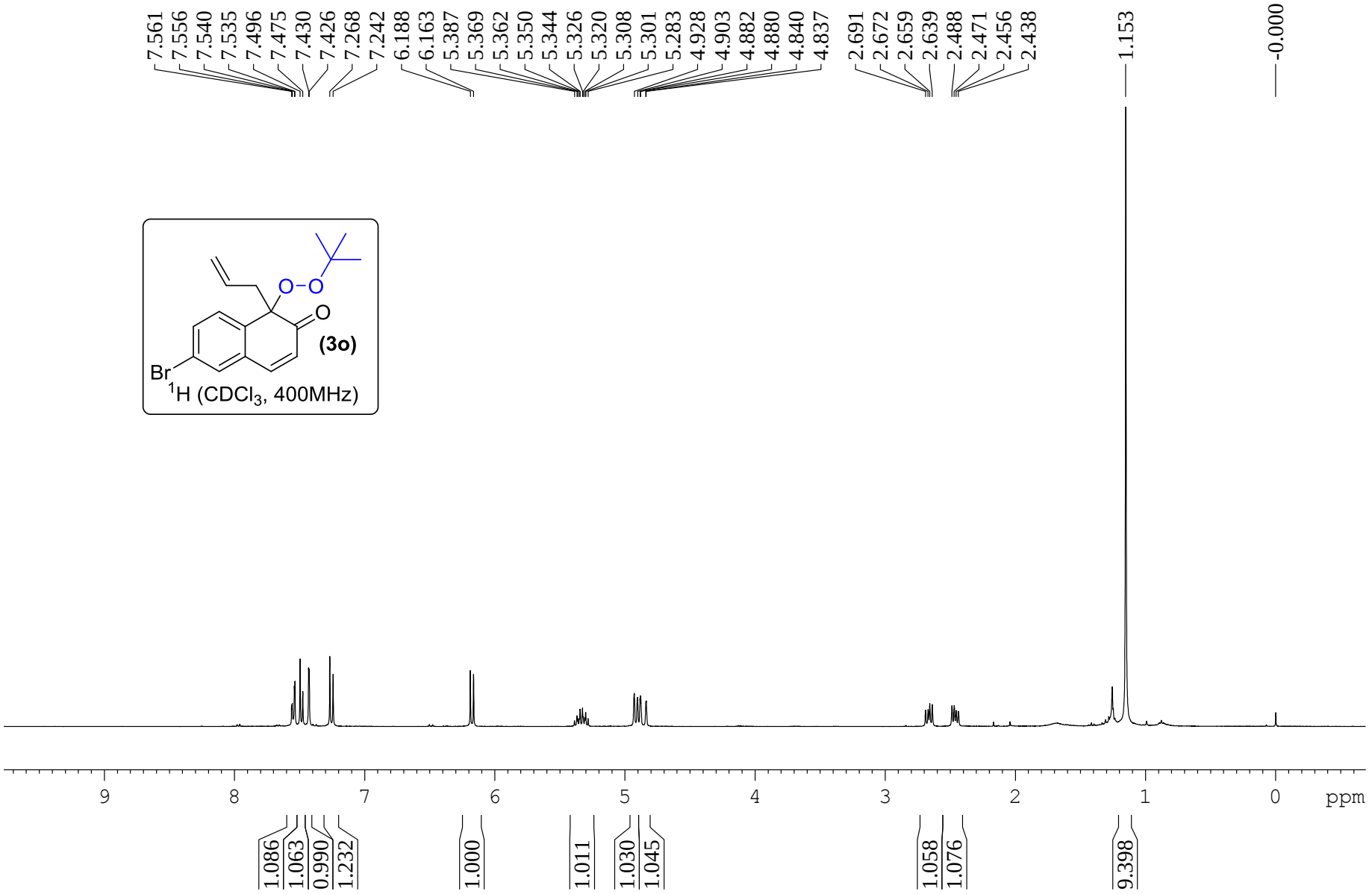

197.182
164.016
161.548
144.424
142.644
134.407
134.376
131.323
129.997
129.172
128.947
128.910
128.866
128.429
124.873
115.301
115.088
86.228
80.657
77.318
77.000
76.682
26.639
F
O–O
O
(3l)
^{13}C (CDCl$_3$, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

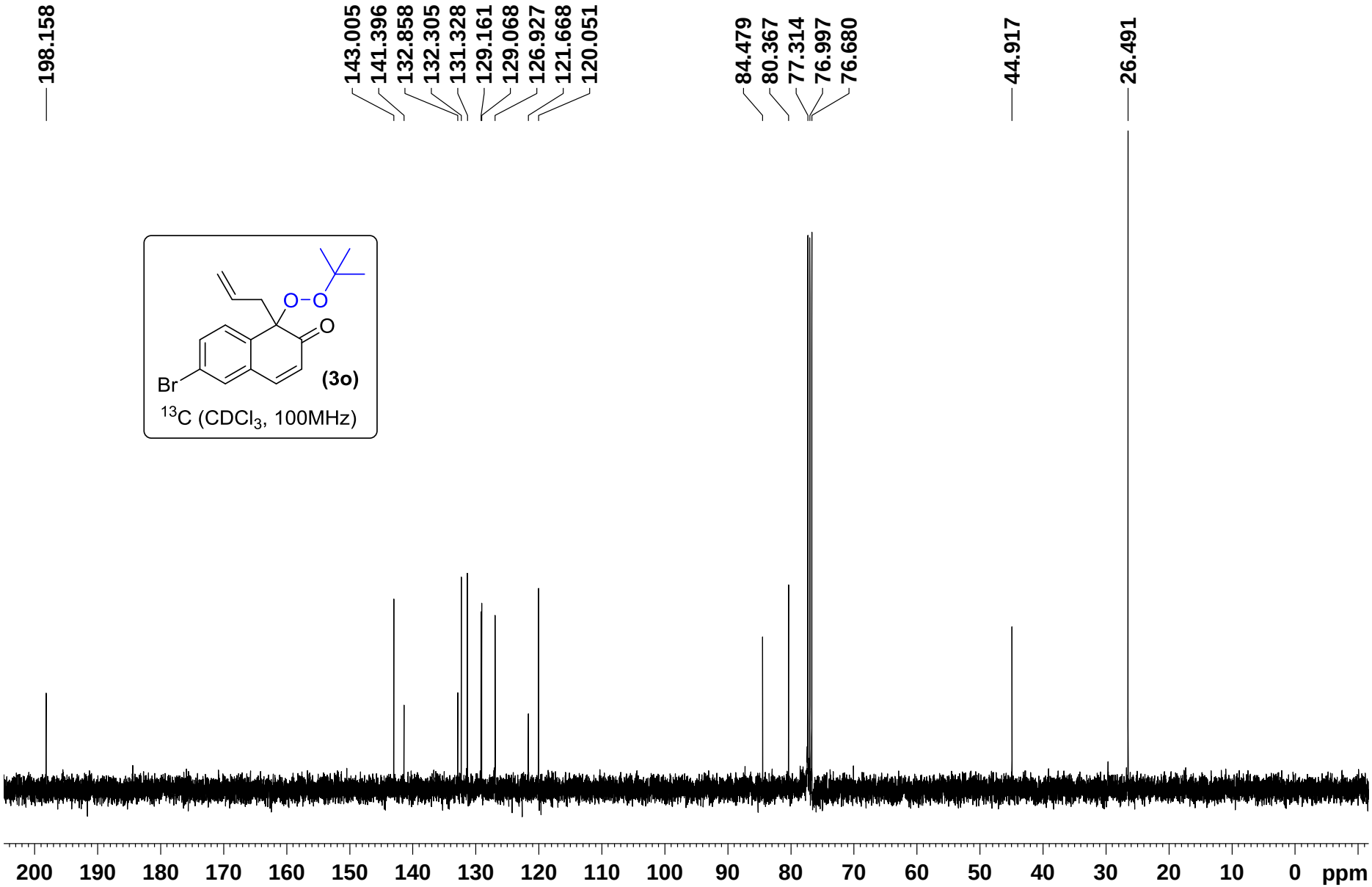

7.664
7.645
7.441
7.422
7.403
7.375
7.350
7.338
7.319
7.305
7.287
7.262
6.180
6.155
3.708
3.682
3.644
3.618
3.501
3.484
3.478
3.466
3.460
3.448
3.442
3.430
3.425
3.413
3.396
3.390
3.378
3.372
3.354
1.181
1.054
1.036
1.019
0.000
O
O-O
O
(3m)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.304
5.190
1.000
2.040
2.058
9.272
3.220

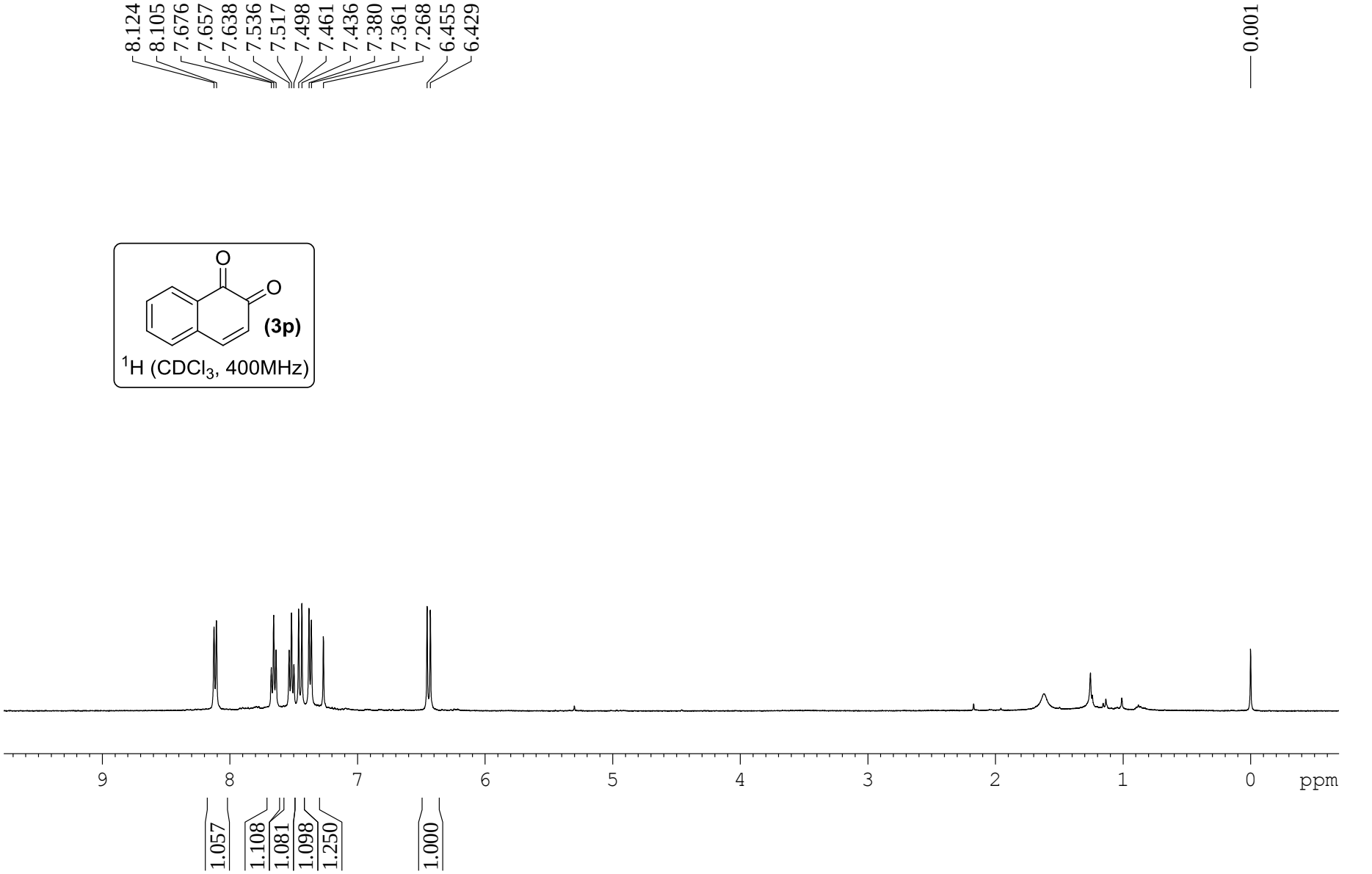

197.459
144.588
140.767
131.090
129.320
128.997
128.045
128.018
125.453
86.477
80.135
77.316
76.999
76.681
75.676
68.010
26.556
14.864
O
O–O
O
(3m)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

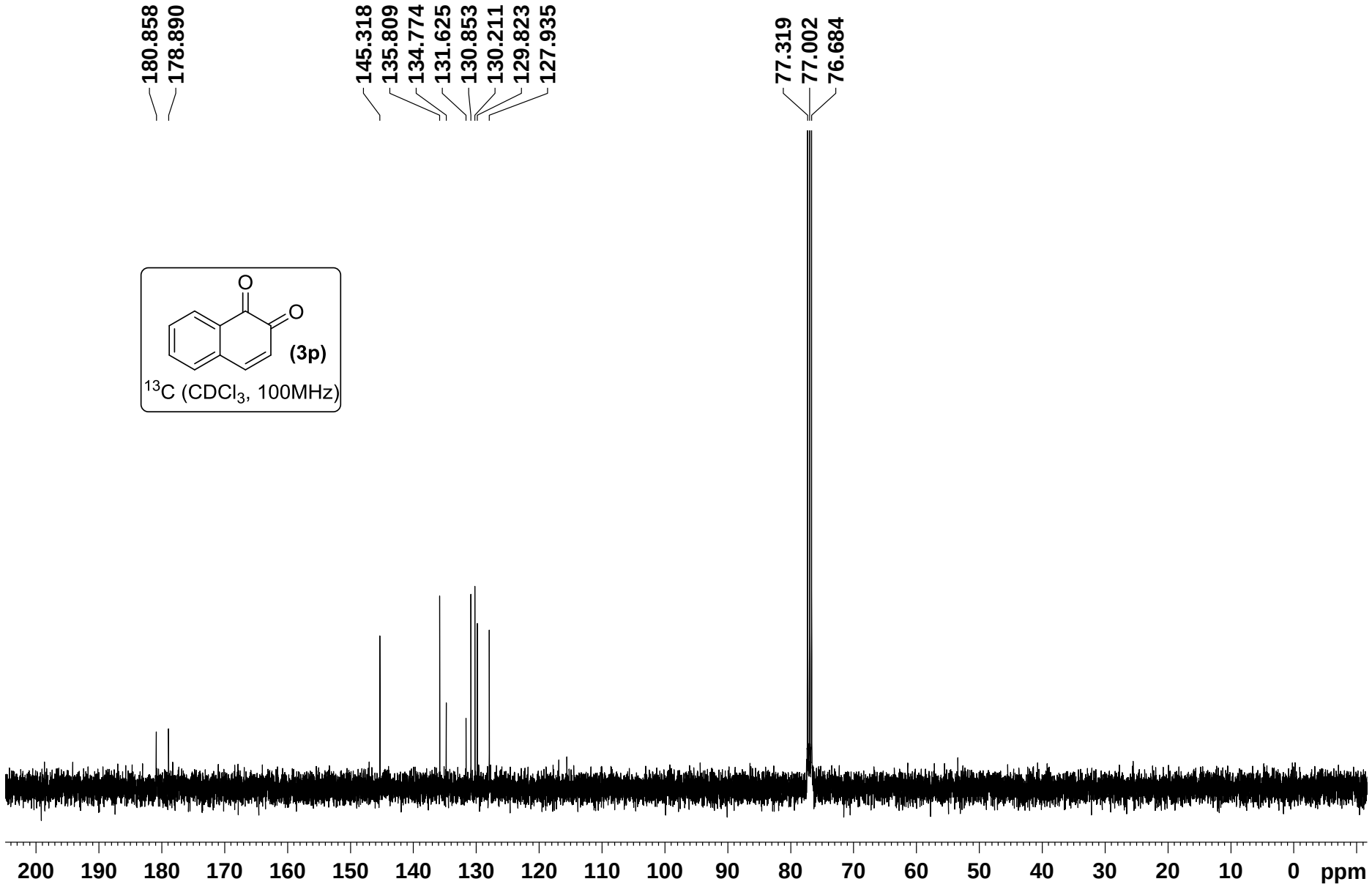

7.636
7.617
7.448
7.430
7.411
7.346
7.322
7.304
7.283
7.266
6.156
6.131
5.395
5.377
5.370
5.352
5.334
5.316
5.309
5.291
4.902
4.876
4.833
2.716
2.697
2.684
2.664
2.521
2.503
2.488
2.471
1.156
-0.000
O-O
O
(3n)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.125
1.273
3.293
1.000
1.020
2.066
1.112
1.103
9.381

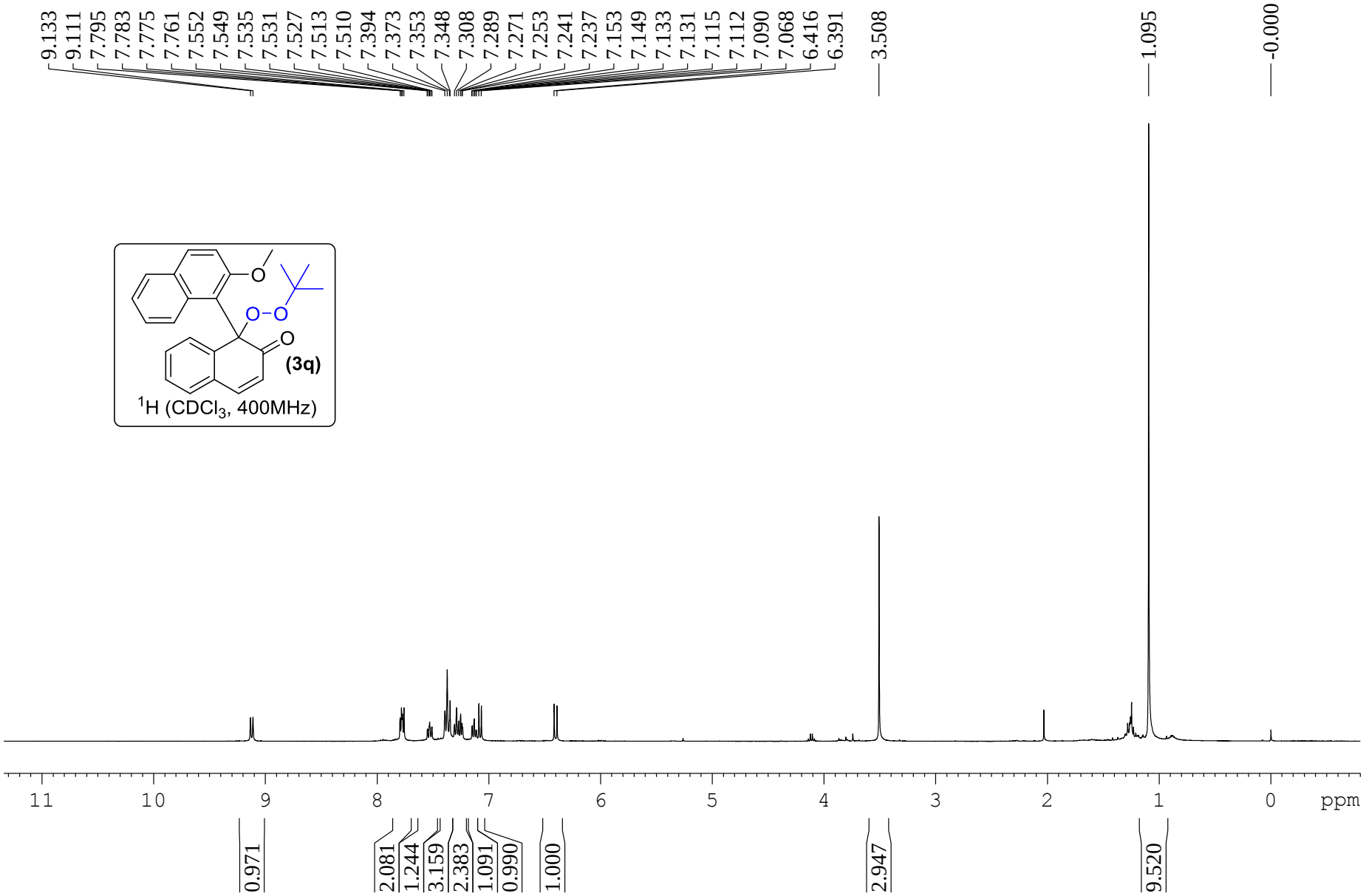

198.880
144.693
142.611
130.981
129.565
129.520
128.838
127.856
127.450
125.795
119.584
84.674
80.118
77.320
77.003
76.685
45.137
26.530
O–O
O
(3n)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

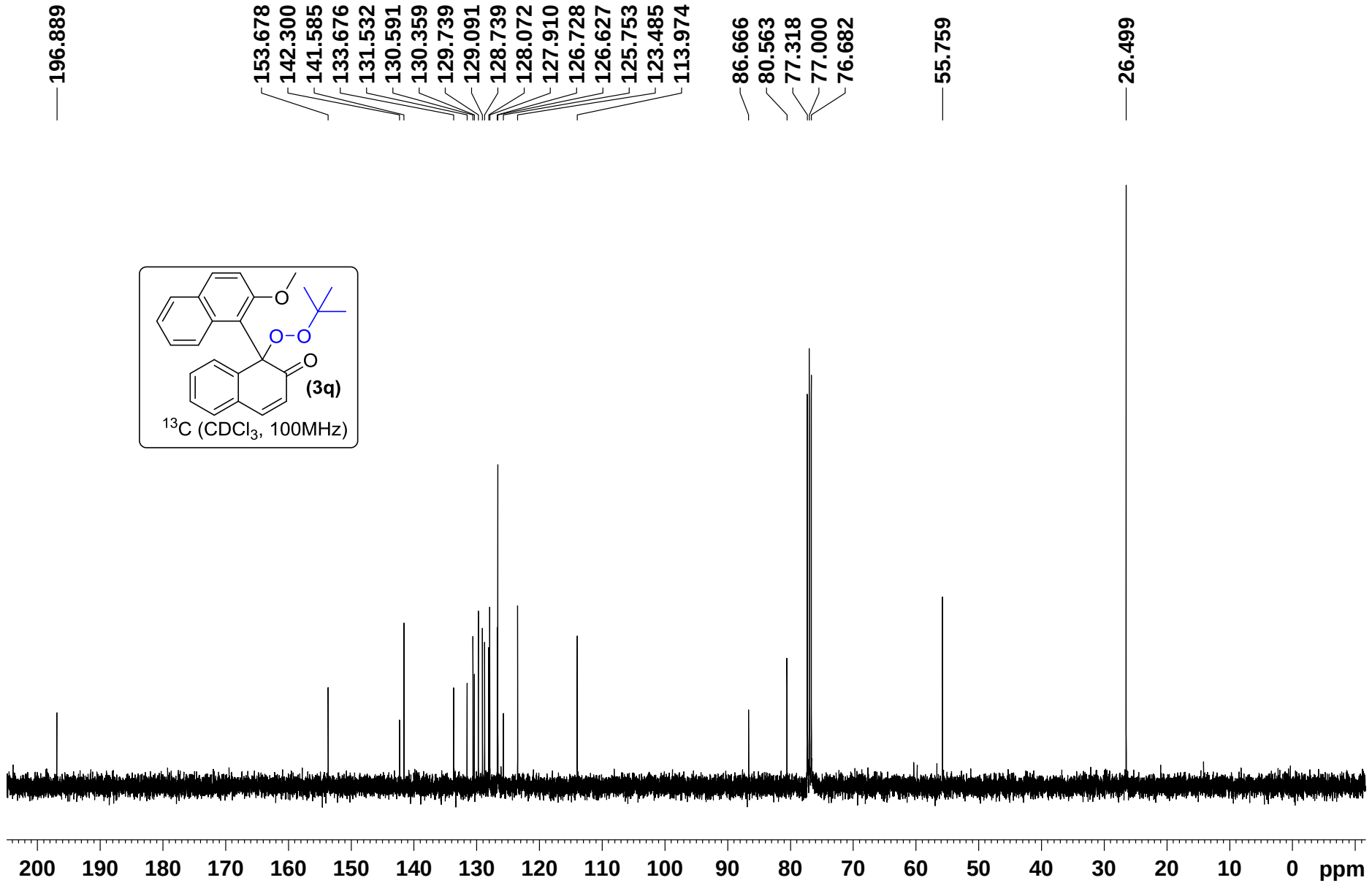

7.561
7.556
7.540
7.535
7.496
7.475
7.430
7.426
7.268
7.242
6.188
6.163
5.387
5.369
5.362
5.350
5.344
5.326
5.320
5.308
5.301
5.283
4.928
4.903
4.882
4.880
4.840
4.837
2.691
2.672
2.659
2.639
2.488
2.471
2.456
2.438
1.153
-0.000
O
O
(3o)
Br
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.086
1.063
0.990
1.232
1.000
1.011
1.030
1.045
1.058
1.076
9.398

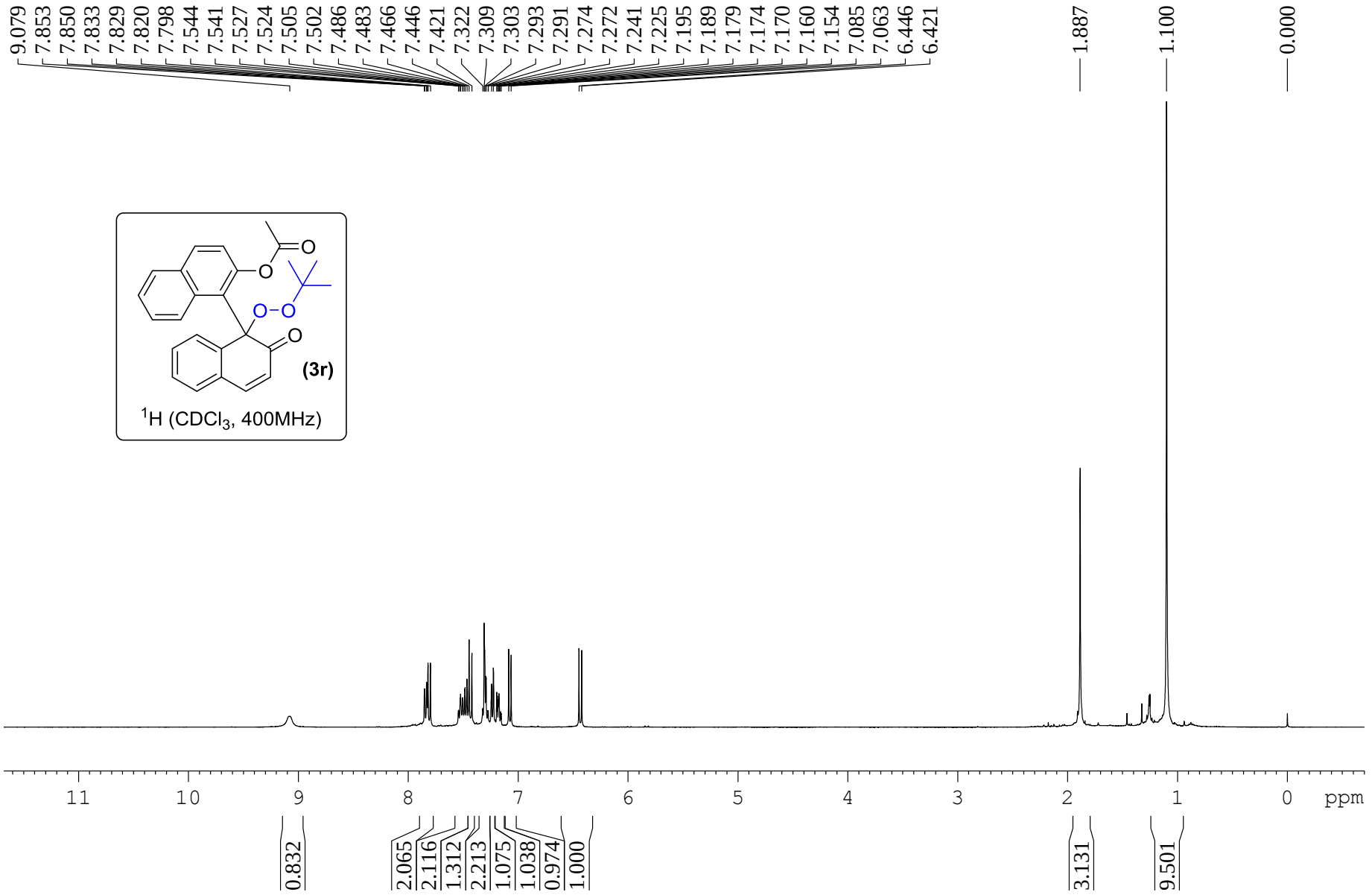

198.158
143.005
141.396
132.858
132.305
131.328
129.161
129.068
126.927
121.668
120.051
84.479
80.367
77.314
76.997
76.680
44.917
26.491
O–O
O
Br
(3o)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

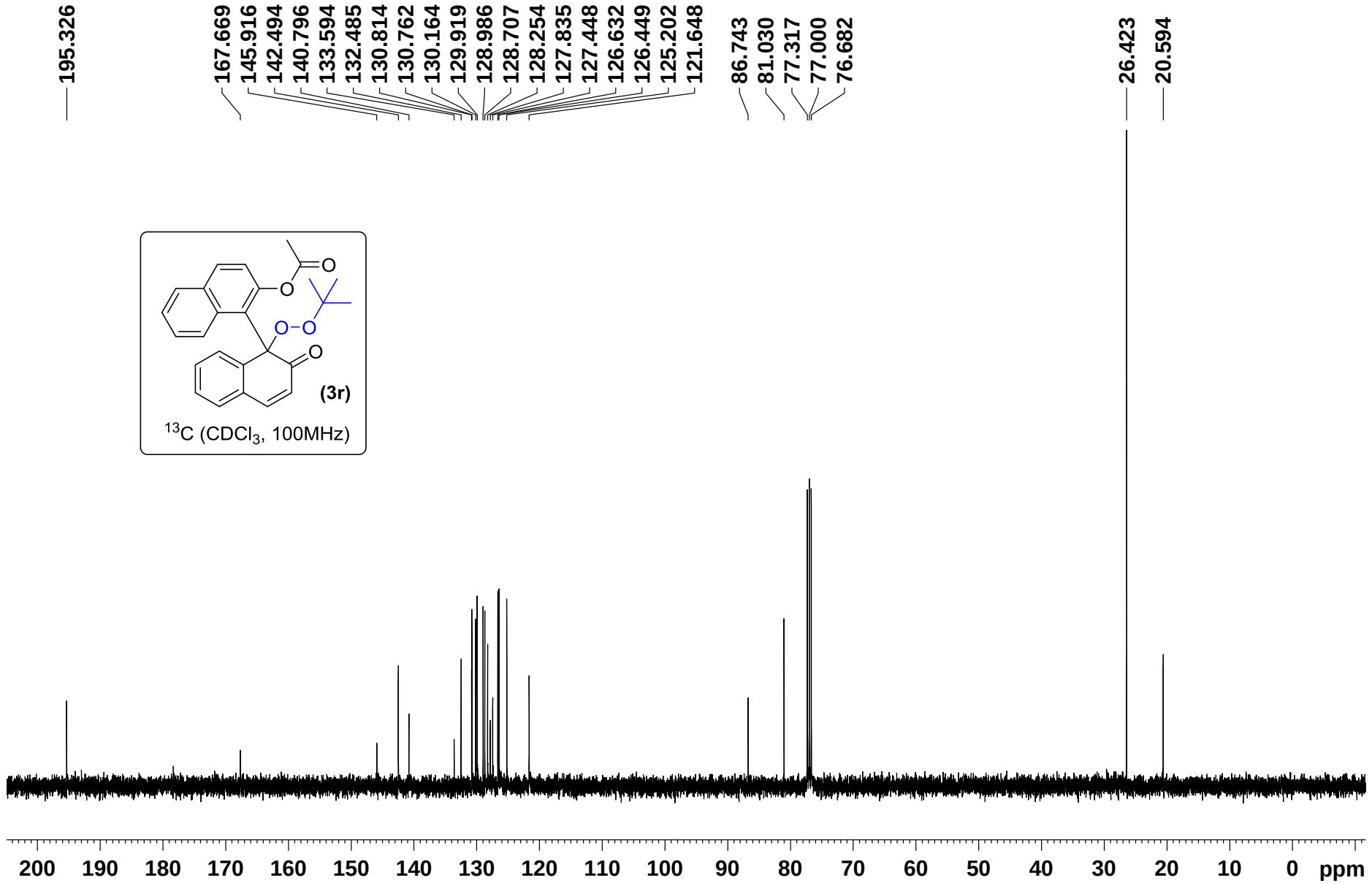

8.124
8.105
7.676
7.657
7.638
7.536
7.517
7.498
7.461
7.436
7.380
7.361
7.268
6.455
6.429
0.001
O
O
(3p)
^{1}H (CDCl$_3$, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.057
1.108
1.081
1.098
1.250
1.000

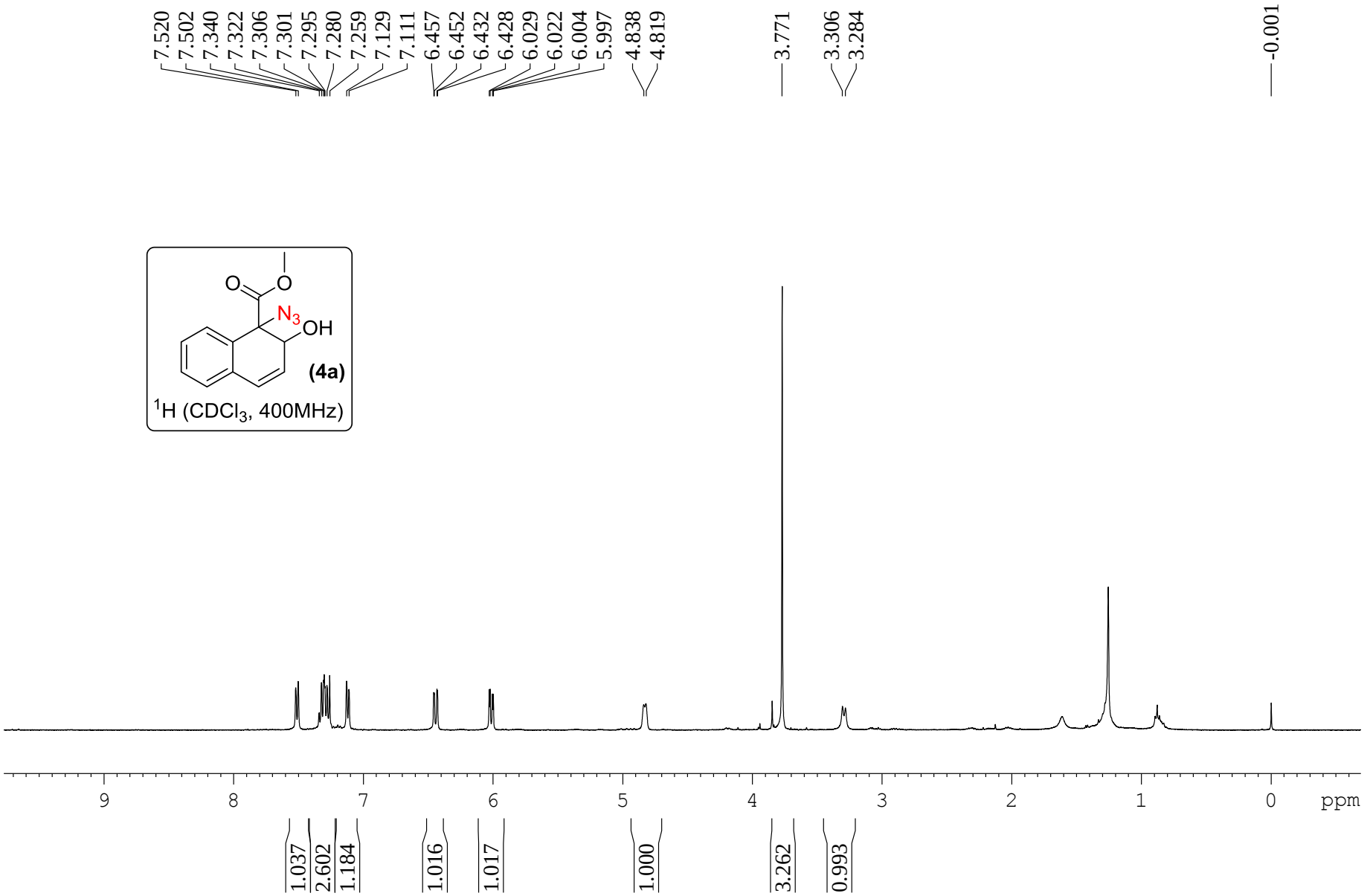

180.858
178.890
145.318
135.809
134.774
131.625
130.853
130.211
129.823
127.935
77.319
77.002
76.684
O
O
(3p)
^{13}C (CDCl$_3$, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

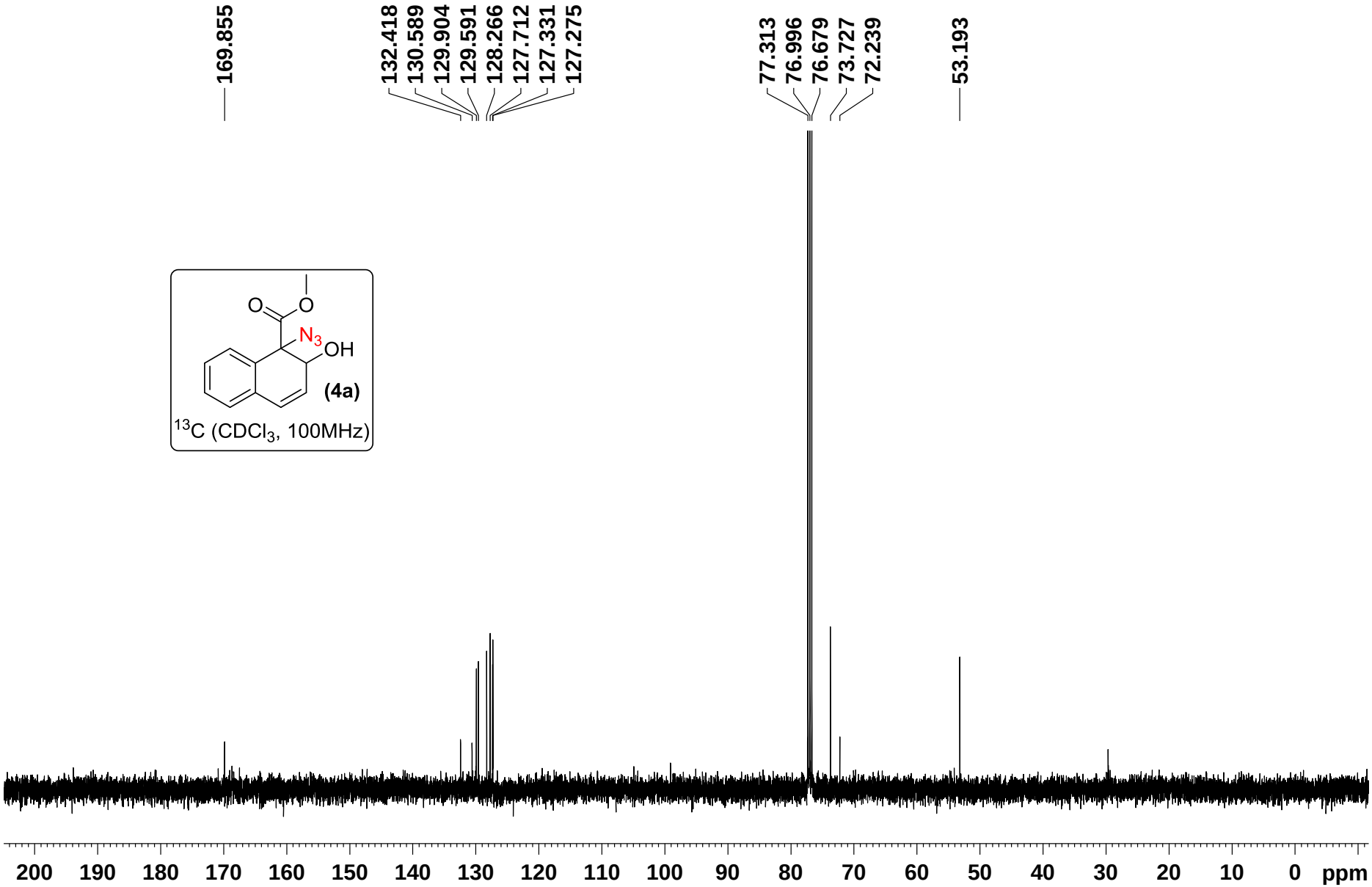

9.133
9.111
7.795
7.783
7.775
7.761
7.552
7.549
7.535
7.531
7.527
7.513
7.510
7.394
7.373
7.353
7.348
7.308
7.289
7.271
7.253
7.241
7.237
7.153
7.149
7.133
7.131
7.115
7.112
7.090
7.068
6.416
6.391
3.508
1.095
-0.000
O
O–O
O
(3q)
^{1}H (CDCl$_3$, 400MHz)
11
10
9
8
7
6
5
4
3
2
1
0
ppm
0.971
2.081
1.244
3.159
2.383
1.091
0.990
1.000
2.947
9.520

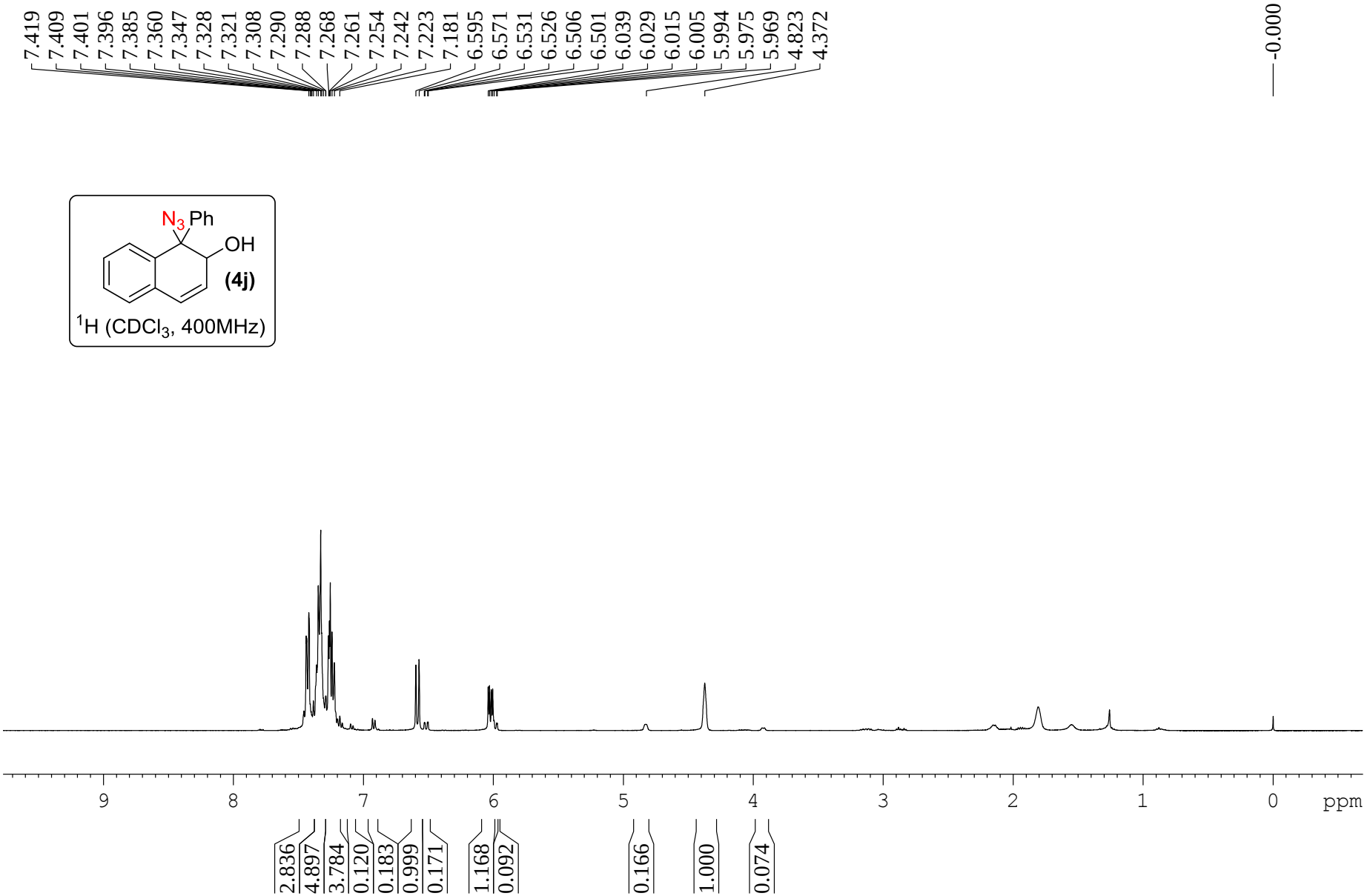

196.889
153.678
142.300
141.585
133.676
131.532
130.591
130.359
129.739
129.091
128.739
128.072
127.910
126.728
126.627
125.753
123.485
113.974
86.666
80.563
77.318
77.000
76.682
55.759
26.499
O
O–O
O
(3q)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

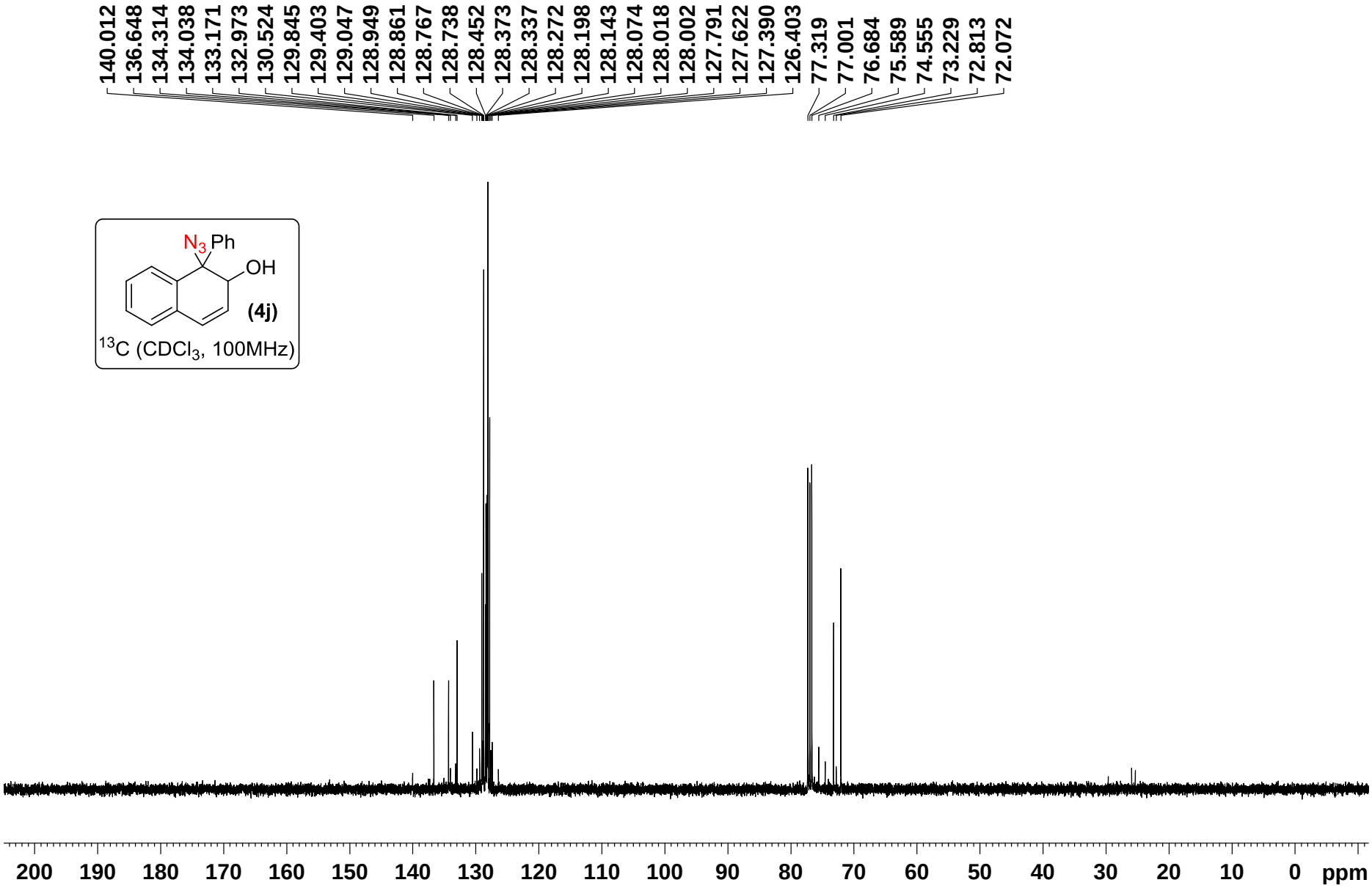

9.079
7.853
7.850
7.833
7.829
7.820
7.798
7.544
7.541
7.527
7.524
7.505
7.502
7.486
7.483
7.466
7.446
7.421
7.322
7.309
7.303
7.293
7.291
7.274
7.272
7.241
7.225
7.195
7.189
7.179
7.174
7.170
7.160
7.154
7.085
7.063
6.446
6.421
1.887
1.100
0.000
(3r)
^{1}H ($CDCl_3$, 400MHz)
11
10
9
8
7
6
5
4
3
2
1
0
ppm
0.832
2.065
2.116
1.312
2.213
1.075
1.038
0.974
1.000
3.131
9.501

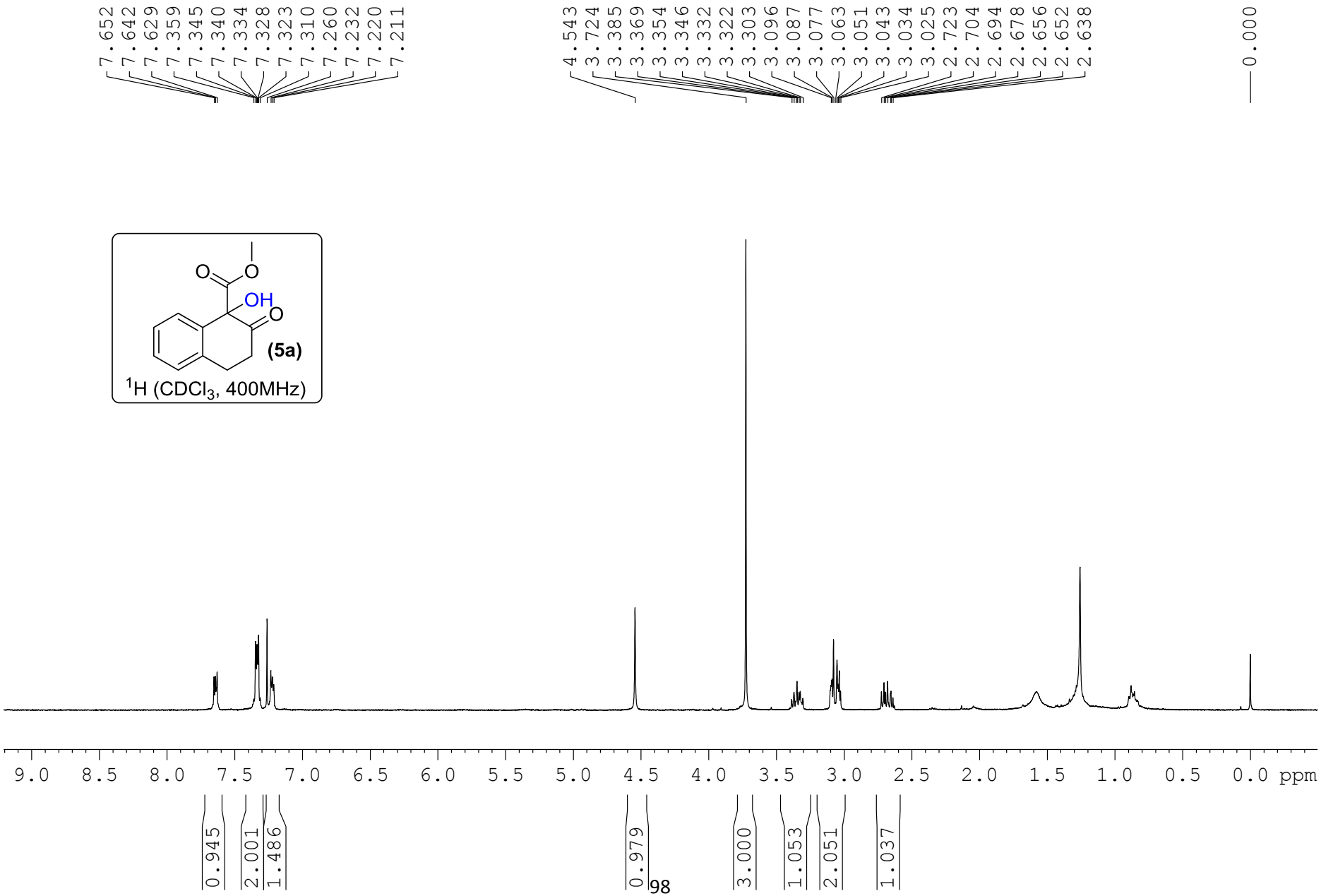

195.326
167.669
145.916
142.494
140.796
133.594
132.485
130.814
130.762
130.164
129.919
128.986
128.707
128.254
127.835
127.448
126.632
126.449
125.202
121.648
86.743
81.030
77.317
77.000
76.682
26.423
20.594
O
O
O-O
O
(3r)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

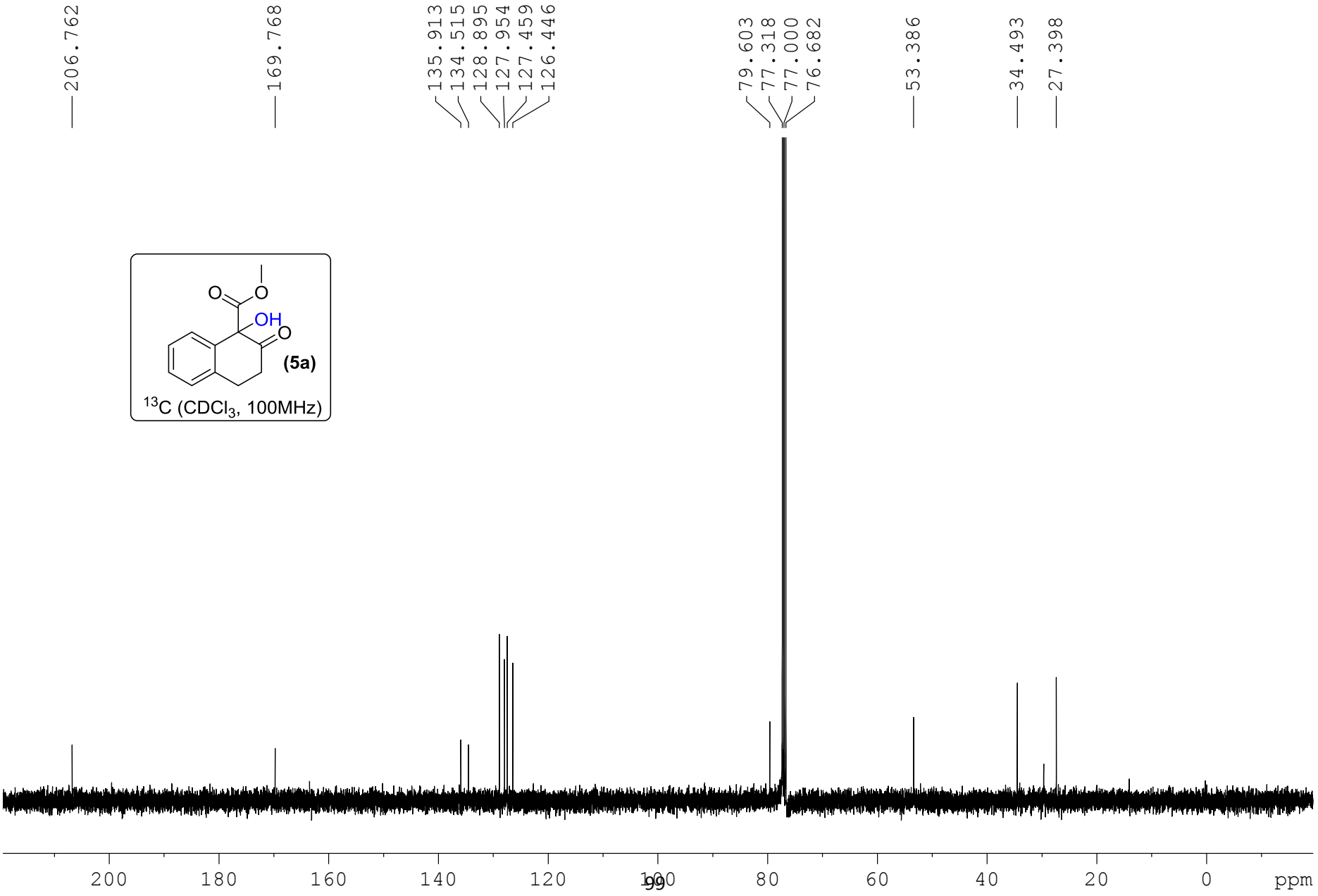

7.520
7.502
7.340
7.322
7.306
7.301
7.295
7.280
7.259
7.129
7.111
6.457
6.452
6.432
6.428
6.029
6.022
6.004
5.997
4.838
4.819
3.771
3.306
3.284
-0.001
O
O
N3
OH
(4a)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.037
2.602
1.184
1.016
1.017
1.000
3.262
0.993

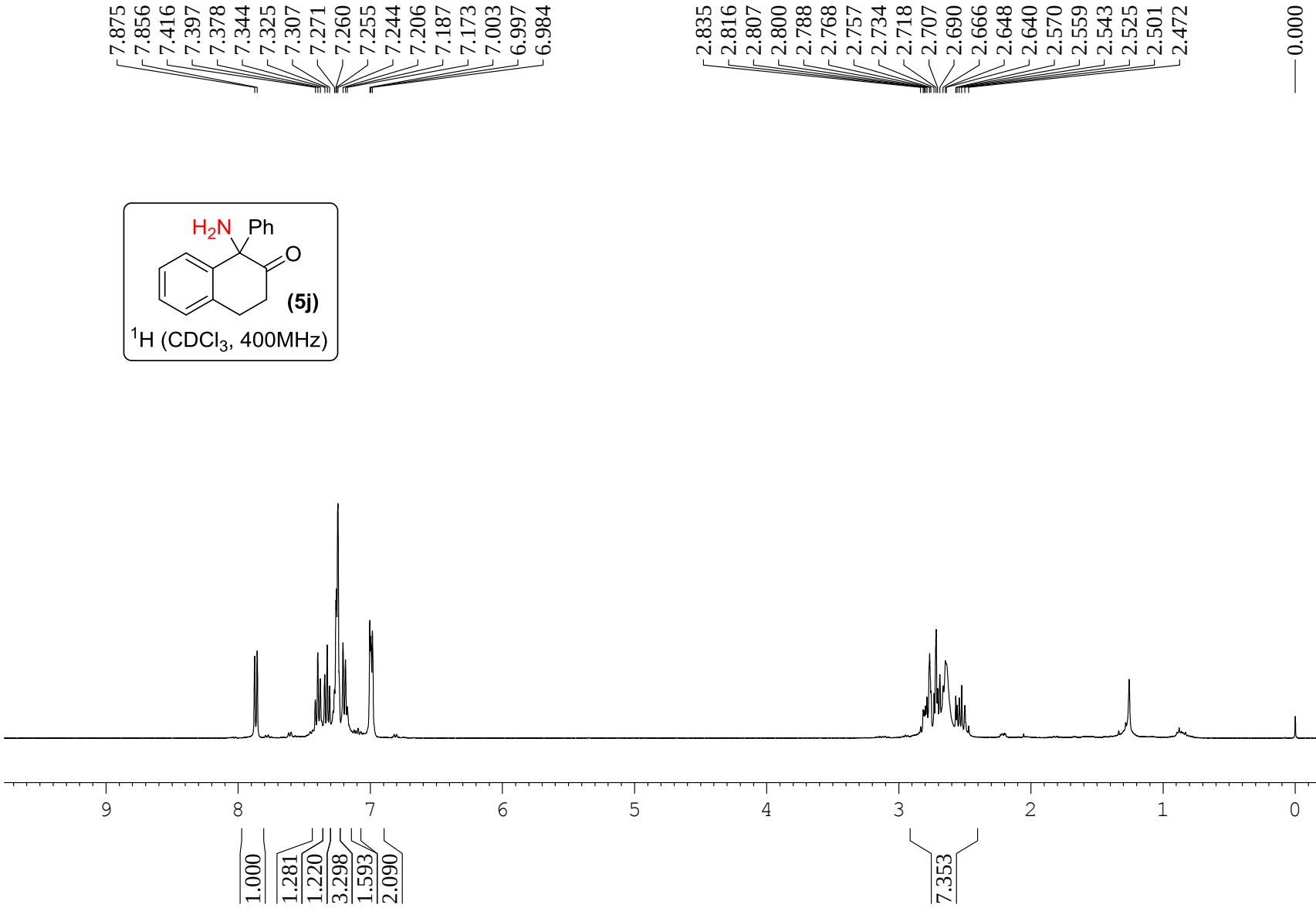

169.855
132.418
130.589
129.904
129.591
128.266
127.712
127.331
127.275
77.313
76.996
76.679
73.727
72.239
53.193
O
O
N3
OH
(4a)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

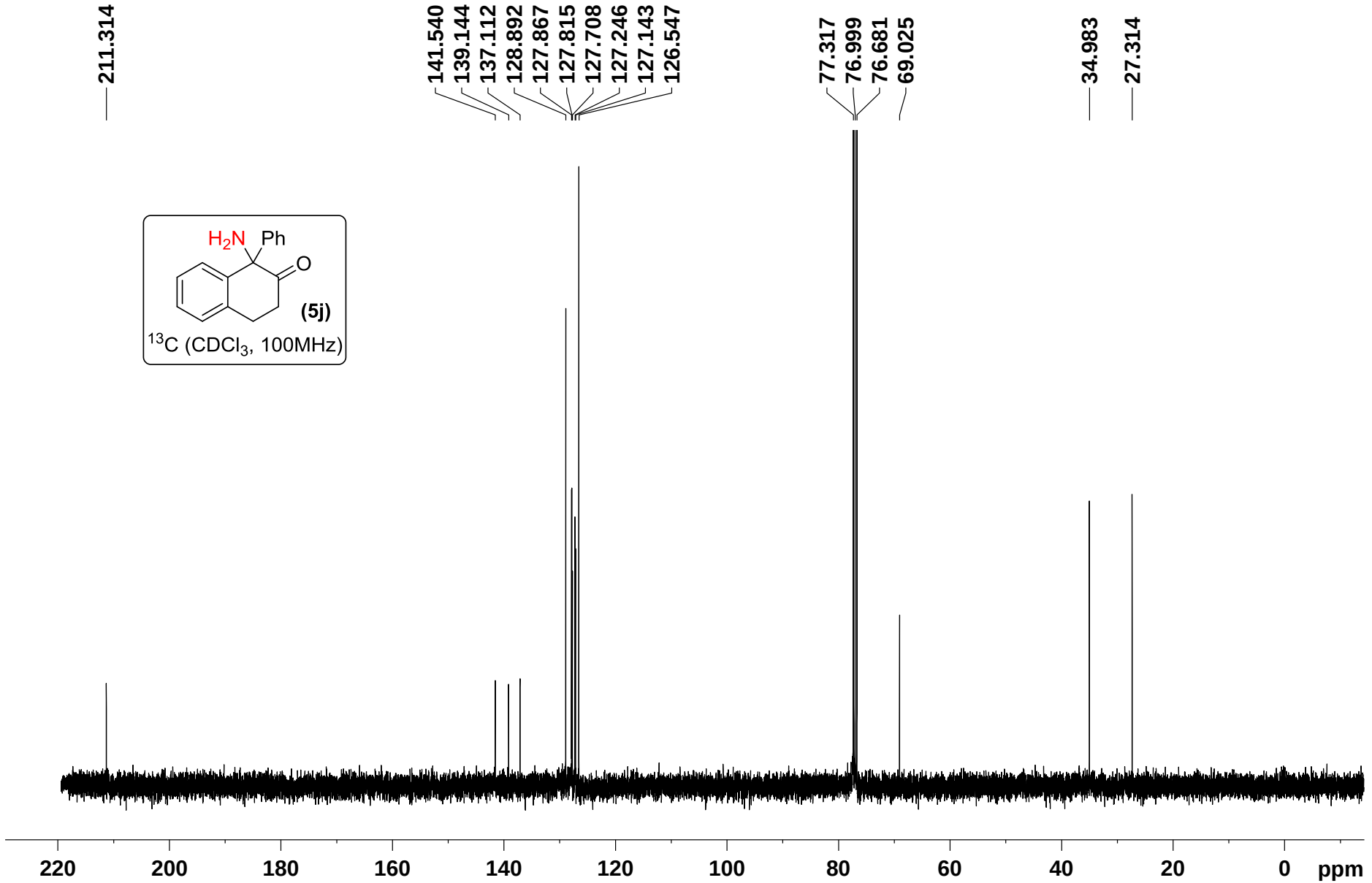

7.419
7.409
7.401
7.396
7.385
7.360
7.347
7.328
7.321
7.308
7.290
7.288
7.268
7.261
7.254
7.242
7.223
7.181
6.595
6.571
6.531
6.526
6.506
6.501
6.039
6.029
6.015
6.005
5.994
5.975
5.969
4.823
4.372
-0.000
N3 Ph
OH
(4j)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
2.836
4.897
3.784
0.120
0.183
0.999
0.171
1.168
0.092
0.166
1.000
0.074

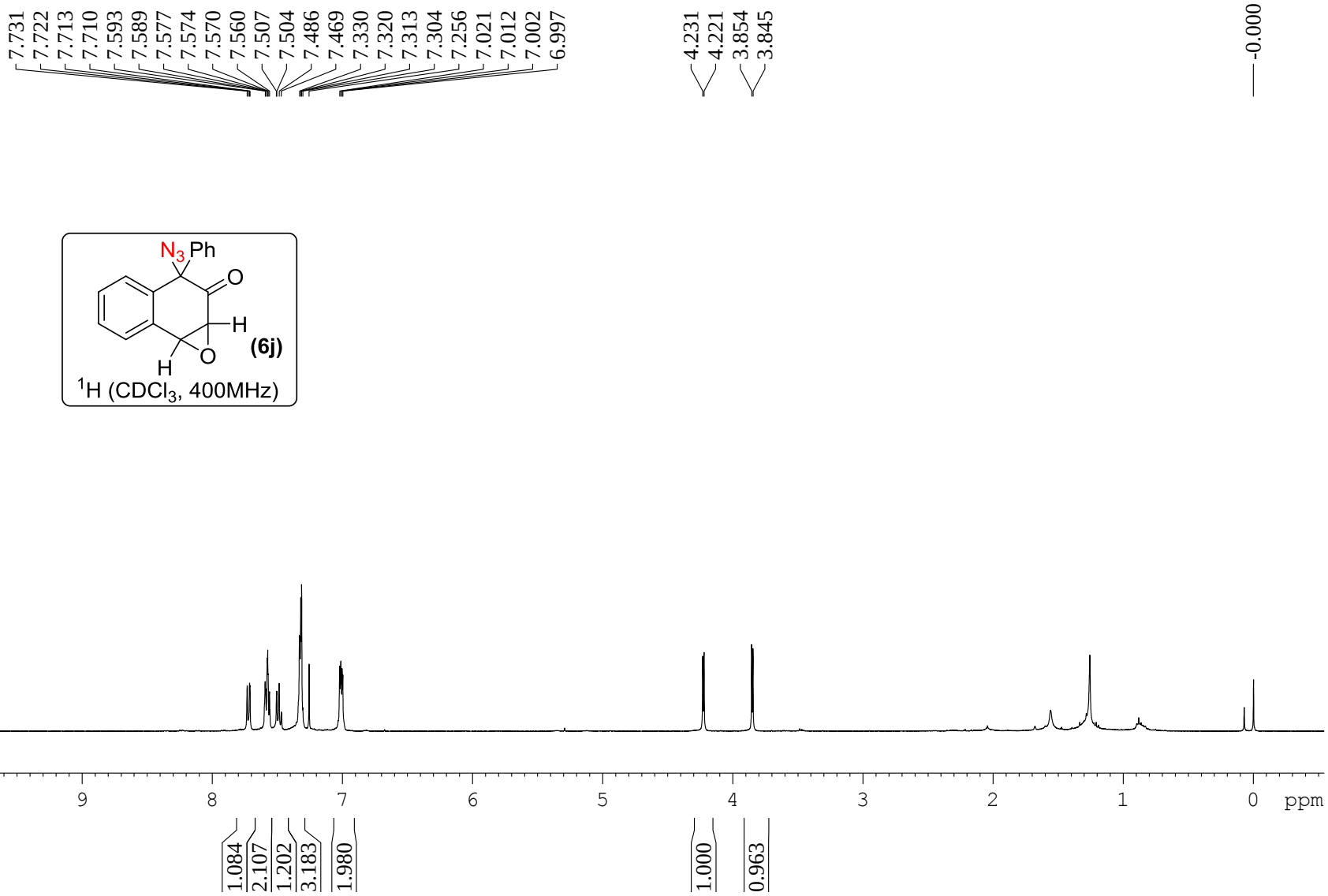

140.012
136.648
134.314
134.038
133.171
132.973
130.524
129.845
129.403
129.047
128.949
128.861
128.767
128.738
128.452
128.373
128.337
128.272
128.198
128.143
128.074
128.018
128.002
127.791
127.622
127.390
126.403
77.319
77.001
76.684
75.589
74.555
73.229
72.813
72.072
N3 Ph
OH
(4j)
13C (CDCl3, 100MHz)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

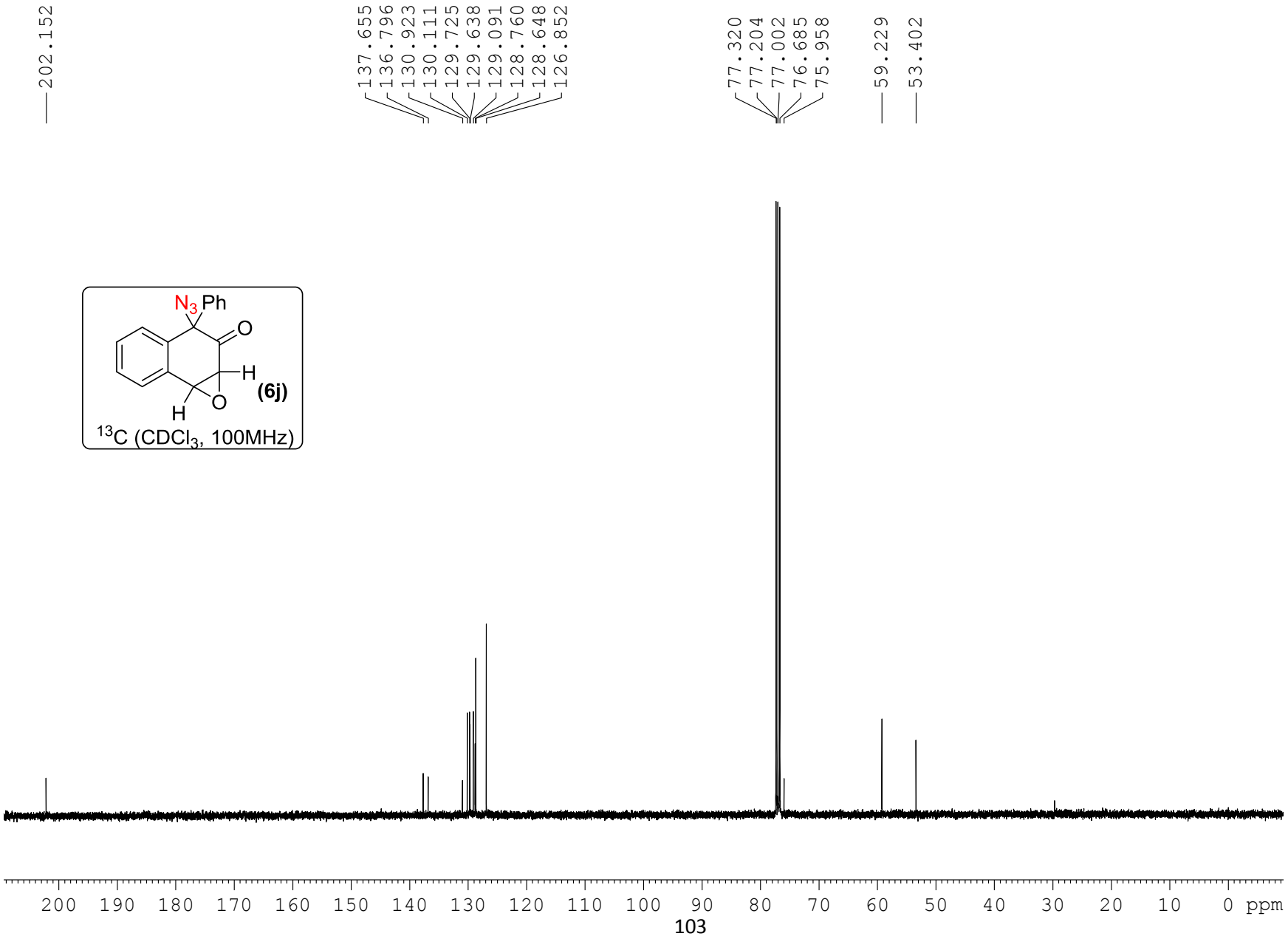

7.652
7.642
7.629
7.359
7.345
7.340
7.334
7.328
7.323
7.310
7.260
7.232
7.220
7.211
4.543
3.724
3.385
3.369
3.354
3.346
3.332
3.322
3.303
3.096
3.087
3.077
3.063
3.051
3.043
3.034
3.025
2.723
2.704
2.694
2.678
2.656
2.652
2.638
0.000
OH
O
O
O
(5a)
1H (CDCl3, 400MHz)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0 ppm
0.945
2.001
1.486
0.979
3.000
1.053
2.051
1.037


206.762
169.768
135.913
134.515
128.895
127.954
127.459
126.446
79.603
77.318
77.000
76.682
53.386
34.493
27.398
O
O
OH
O
(5a)
13C (CDCl3, 100MHz)
200
180
160
140
120
100
80
60
40
20
0
ppm


7.875
7.856
7.416
7.397
7.378
7.344
7.325
7.307
7.271
7.260
7.255
7.244
7.206
7.187
7.173
7.003
6.997
6.984
2.835
2.816
2.807
2.800
2.788
2.768
2.757
2.734
2.718
2.707
2.690
2.666
2.648
2.640
2.570
2.559
2.543
2.525
2.501
2.472
0.000
H2N Ph
O
(5j)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.281
1.220
3.298
1.593
2.090
7.353


211.314
141.540
139.144
137.112
128.892
127.867
127.815
127.708
127.246
127.143
126.547
77.317
76.999
76.681
69.025
34.983
27.314
H2N
Ph
O
(5j)
13C (CDCl3, 100MHz)
220
200
180
160
140
120
100
80
60
40
20
0
ppm


7.731
7.722
7.713
7.710
7.593
7.589
7.577
7.574
7.570
7.560
7.507
7.504
7.486
7.469
7.330
7.320
7.313
7.304
7.256
7.021
7.012
7.002
6.997
4.231
4.221
3.854
3.845
-0.000
N3 Ph
O
H
O
H
(6j)
1H (CDCl3, 400MHz)
9
8
7
6
5
4
3
2
1
0
ppm
1.084
2.107
1.202
3.183
1.980
1.000
0.963


202.152
137.655
136.796
130.923
130.111
129.725
129.638
129.091
128.760
128.648
126.852
77.320
77.204
77.002
76.685
75.958
59.229
53.402
N3 Ph
O
H
O
H
(6j)
13C (CDCl3, 100MHz)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm