

Electronic Supporting Information

Copper oxide nanoparticle mediated ‘click chemistry’ for the synthesis of mono-, bis- and tris-triazole derivatives using 10,10-dipropargyl-9-anthrone as a key building block

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I. General Information and Methods.

IR spectra were recorded on IR spectrophotometer. ^1H and ^{13}C NMR spectra were recorded on 400 MHz spectrometer TMS as internal reference; chemical shifts (δ scale) are reported in parts per million (ppm). ^1H NMR Spectra are reported in the order: multiplicity, coupling constant (J value) in hertz (Hz) and no of protons; signals were characterized as s (singlet), d (doublet), t (triplet), q (quatret), m (multiplet) and bs (broad). Elemental analyses were carried out using CHNS/O analyzer. The X-ray crystal structures were determined with a diffractometer. Complete crystallographic data of **8b** (CCDC no. 942856) and **9b** (CCDC no. 921613) for the structural analysis have been deposited with the Cambridge Crystallographic Data Centre, Copies of this information may be obtained free of charge from the Director, Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ, UK, (fax: +44-1223-336033, e-mail: deposit@ccdc.cam.ac.uk or via: www.ccdc.cam.ac.uk). The copper oxide nanoparticle were purchased from Sigma-Aldrich.

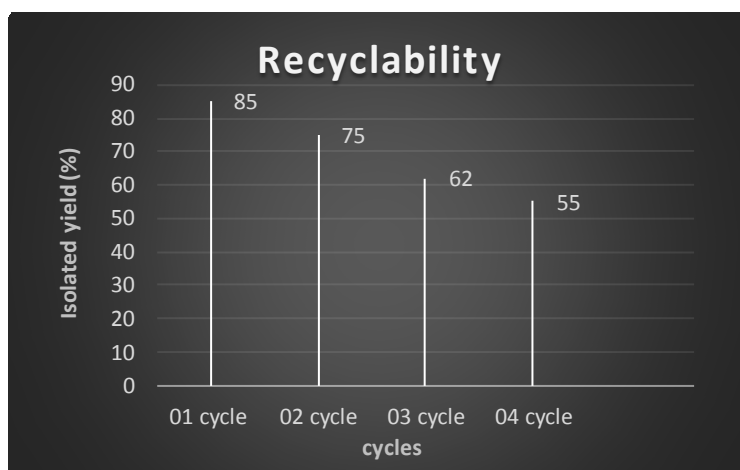


Fig. 1 Recyclability of copper oxide nanoparticle of **9b**

Recyclability of the catalyst^a in **9b**

Entry	mmol scale	Amount of catalyst	Recovered catalyst	Time (h)	Yield (%)
01	04	32	28	1.5	85
02	3.5	28	24	2	75
03	3	24	20	2.5	62
04	2.5	20	15	3	55

^aThe copper oxide nanoparticle was reused as follows: it was filtered off, washed with dichloromethane and finally dried before use for next cycle.

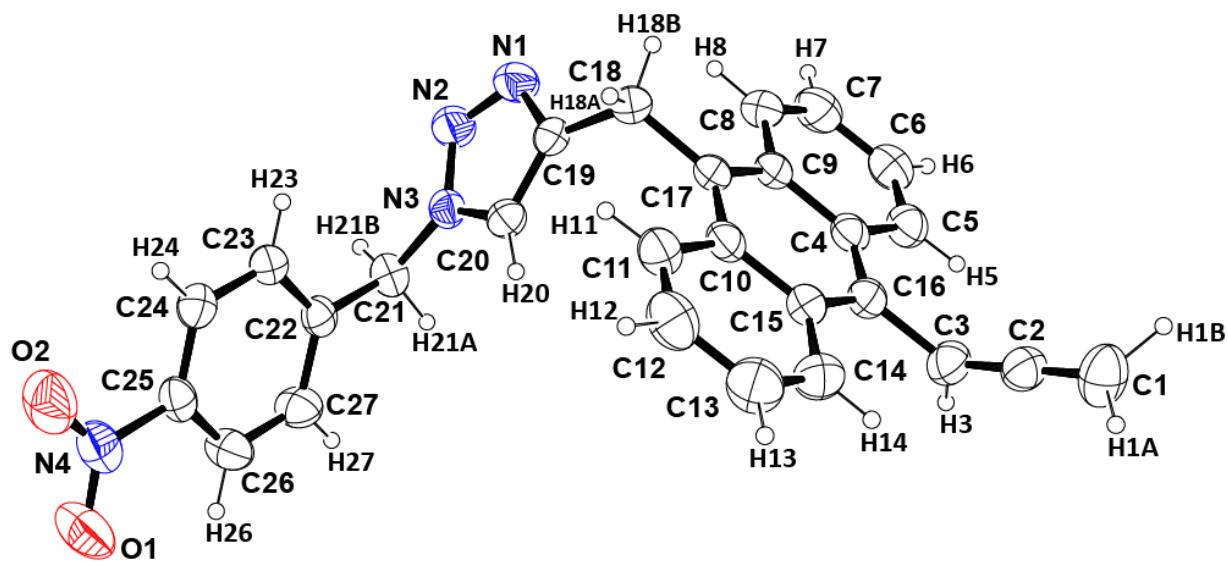


Fig. 2 30% probability of ORTEP ellipsoids of **8b**

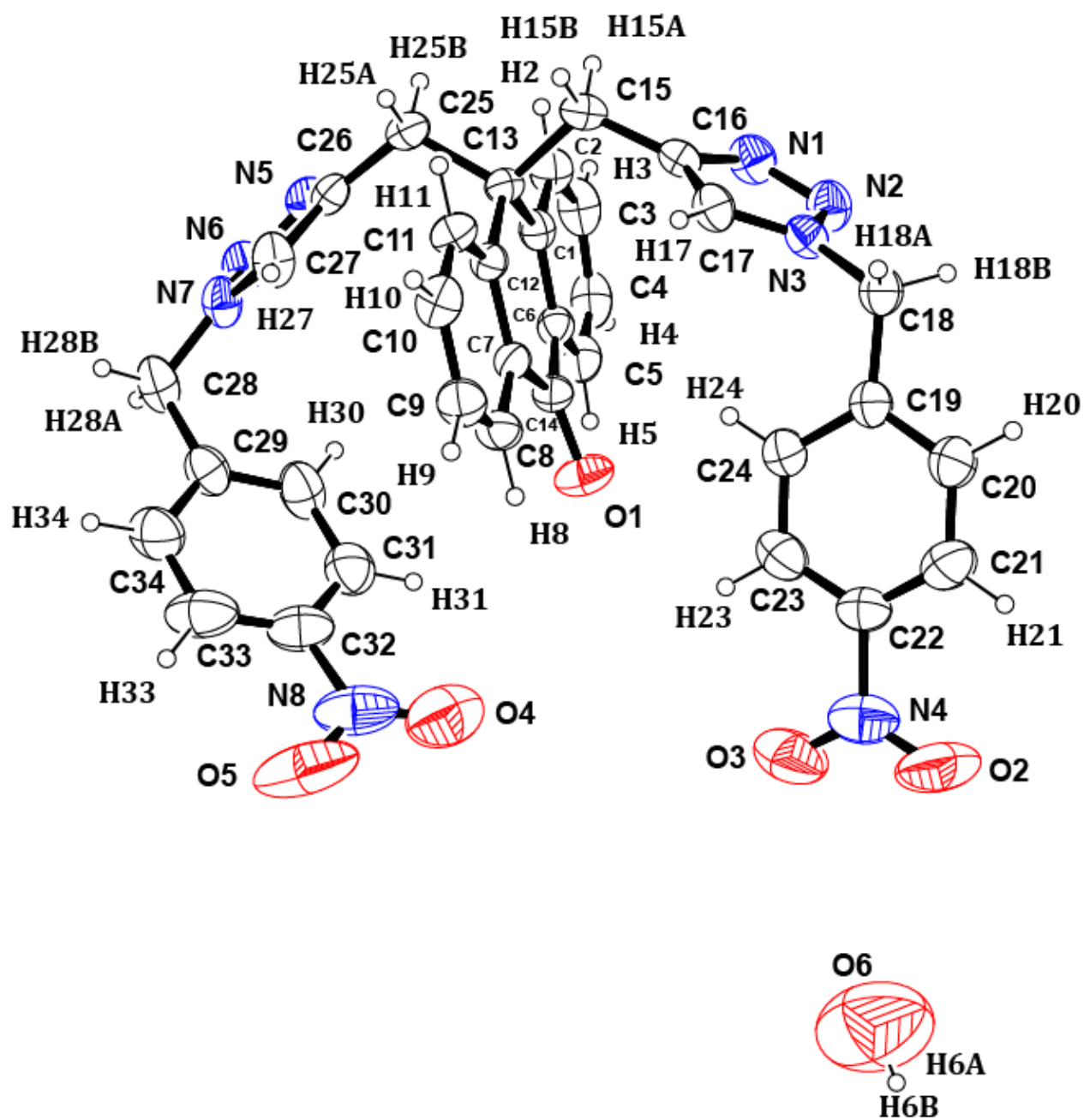


Fig. 3 30% probability of ORTEP ellipsoids of 9b

Table 6 Crystal Data and Structure Refinement for Compound **8b** and **9b**

Entry	Identification code	Compound 8b	Compound 9b
01	Empirical formula	C27 H20 N4 O2	C34 H27.05 N8 O5.53
02	Formula weight	432.47	636.09
03	Temperature	296(2) K	296(2) K
04	Wavelength	0.71073	0.71073
05	Radiation type	Mo K α	Mo K α
06	Radiation source	'fine-focus sealed tube'	fine-focus sealed tube
07	Crystal system	monoclinic	monoclinic
08	Space group	P 21/n	P 21/c
09	Cell length	a 12.4688(7) b 10.2492(6) c 16.9379(9)	a 17.5453(9) b 9.9306(6) c 18.5780(10)
10	Cell Angle	α 90.0 β 97.094(5) δ 90.0	α 90.0 β 108.562(2) δ 90.0
11	Cell Volume	2148.0 (2)	3068.6(3)
12	Density	1.337	1.395
13	Completeness to theta	25.00° / 99.8%	25.25° / 96.9%
14	Absorption correction	multi-scan	multi-scan
15	Refinement method	Full-matrix least-squares on F2	Full-matrix least-squares on F2
16	Index ranges	-14 \leq h \leq 14, -12 \leq k \leq 6, - 12 \leq l \leq 20	-20 \leq h \leq 19, -11 \leq k \leq 11, - 22 \leq l \leq 22
17	Reflection number	3780	5375
18	Theta range	2.94-25.00	1.22-25.25
19	Cell formula units Z	4	4
20	CCDC no	942856	921613

10,10-dipropargyl-9-anthrone (2): Yield = 0.256 g, 95%, white solid, mp 210-211 °C, ¹H NMR (400 MHz, CDCl₃): δ 8.42-8.39 (m, 2H), 7.73-7.67 (m, 4H), 7.54-7.48 (m, 2H), 3.09 (d, *J* = 2.4 Hz, 4H), 1.66 (t, *J* = 2.4 Hz, 2H); ¹³C NMR (100 MHz, CDCl₃): δ 183.8, 144.6, 133.7, 132.6, 127.8, 127.7, 126.0, 79.5, 71.7, 45.2, 33.5; IR (KBr)_{v_{max}} 3286, 3255, 3073, 2914, 2116, 1649, 1600, 1585, 1459, 1440, 1324, 1178 cm⁻¹; Anal. calcd for C₂₀H₁₄O: C, 88.86; H, 5.22. found C, 88.75; H, 5.15.

9-allenyl-10-prop-2-ynyl-anthracene (4): Yield = 0.227 g, 90%, yellow solid, mp 168-169 °C, ¹H NMR (400 MHz, CDCl₃): δ 8.45 (d, *J* = 8.8 Hz, 2H), 8.33 (d, *J* = 8.8 Hz, 2H), 7.59-7.50 (m, 4H), 6.95 (t, *J* = 7.2 Hz, 1H), 5.05 (d, *J* = 7.2 Hz, 2H), 4.44 (d, *J* = 2.4 Hz, 2H), 2.07 (t, *J* = 2.8 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 211.2, 129.7, 129.6, 128.2, 127.8, 126.8, 126.2, 125.4, 124.6, 88.1, 82.4, 75.6, 69.8, 17.9; IR (KBr)_{v_{max}} 3284, 3043, 2972, 2109, 1945, 1622, 1442, 1374, 1314, 1180 cm⁻¹; Anal. calcd for C₂₀H₁₄: C, 94.45; H, 5.55. found C, 94.34; H, 5.49.

10,10-diprop-2-ynyl-9-(prop-2-yn-1-oxy)-9,10-dihydroanthracene (5): Yield = 0.263 g, 85%, pale yellow solid, mp 96-97 °C, ¹H NMR (400 MHz, CDCl₃): δ 7.62 (d, *J* = 8.0 Hz, 2H), 7.53 (d, *J* = 7.2 Hz, 2H), 7.39 (t, *J* = 7.2 Hz, 2H), 7.33 (t, *J* = 7.2 Hz, 2H), 5.61 (s, 1H), 4.03 (d, *J* = 2.4 Hz, 2H), 3.34 (t, *J* = 2.8 Hz, 2H), 2.85 (d, *J* = 2.4 Hz, 2H), 2.49 (t, *J* = 2.4 Hz, 1H), 1.92 (t, *J* = 2.4 Hz, 1H), 1.59 (t, *J* = 2.4 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 141.3, 134.8, 130.0, 128.6, 127.2, 126.7, 126.0, 81.3, 81.0, 80.0, 75.7, 75.1, 71.9, 70.7, 54.3, 46.1, 35.9, 26.6; IR (KBr)_{v_{max}} 3286, 3066, 3028, 2923, 2853, 2116, 1649, 1599, 1484, 1446, 1323 cm⁻¹; Anal. calcd for C₂₃H₁₈O: C, 89.00; H, 5.85. found C, 88.88; H, 5.78.

1-benzyl-4-((9-(propa-1,2-dienyl)anthracen-10-yl)methyl)-1H-1,2,3-triazole (8a): Yield = 0.348 g, 90%, yellow solid, mp 177-178 °C, ¹H NMR (400 MHz, CDCl₃): δ 8.38 (d, *J* = 9.6 Hz, 2H), 8.21 (d, *J* = 9.2 Hz, 2H), 7.44-7.41 (m, 4H), 7.18-7.16 (m, 3H), 7.01 (brs, 2H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.66 (s, 1H), 5.22 (s, 2H), 4.99 (s, 2H), 4.98 (s, 2H); ¹³C NMR (100 MHz, CDCl₃): δ 211.2, 134.9, 130.6, 129.9, 129.7, 129.1, 128.6, 127.9, 127.5, 126.7, 126.1, 125.9, 125.0, 121.9, 88.1, 75.7, 54.1, 25.3; IR (KBr)_{v_{max}} 3120, 3064, 2953, 1946, 1662, 1550, 1444, 1318, 1215 cm⁻¹; Anal. calcd for C₂₇H₂₁N₃: C, 83.69; H, 5.46; N, 10.84. found C, 83.56; H, 5.39; N, 10.78.

1-(4-nitrobenzyl)-4-((9-(propa-1,2-dienyl)anthracen-10-yl)methyl)-1H-1,2,3-triazole (8b): Yield = 0.376 g, 87%, yellow solid, mp 153-154 °C, ¹H NMR (400 MHz, CDCl₃): δ 8.44 (d, *J* = 8.8 Hz, 2H), 8.25 (d, *J* = 8.8 Hz, 2H), 8.06 (d, *J* = 8.4 Hz, 2H), 7.50-7.48 (m, 4H), 7.18 (d, *J* = 8.4 Hz, 2H), 6.93 (t, *J* = 7.6 Hz, 1H), 6.74 (s, 1H), 5.35 (s, 2H), 5.06 (s, 2H), 5.03 (s, 2H); ¹³C NMR (100 MHz, CDCl₃): δ 211.1,

148.5, 147.8, 141.7, 130.2, 129.7, 129.5, 128.3, 127.4, 126.6, 126.1, 125.4, 124.7, 124.0, 122.1, 87.9, 75.6, 52.8, 25.0; IR (KBr) ν_{\max} 3135, 3075, 3051, 2963, 1946, 1605, 1520, 1443, 1344, 1261, 1209 cm^{-1} ; Anal. calcd for $\text{C}_{27}\text{H}_{20}\text{N}_4\text{O}_2$: C, 74.98; H, 4.66; N, 12.95. found C, 74.89; H, 4.59; N, 12.85.

1-(4-methoxybenzyl)-4-((9-(propa-1,2-dienyl)anthracen-10-yl)methyl)-1H-1,2,3-triazole (8c): Yield = 0.354 g, 85%, yellow solid, mp 161-162 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.45-8.42 (m, 2H), 8.28-8.26 (m, 2H), 7.51-7.45 (m, 4H), 7.02 (d, $J = 8.4$ Hz, 2H), 6.94 (t, $J = 7.6$ Hz, 1H), 6.74 (d, $J = 7.6$ Hz, 2H), 6.68 (s, 1H), 5.21 (s, 2H), 5.05 (s, 2H), 5.04 (d, $J = 7.6$ Hz, 2H), 3.72 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.1, 159.7, 147.9, 130.6, 129.8, 129.5, 129.3, 126.7, 126.5, 125.9, 125.3, 124.9, 121.5, 114.3, 87.9, 75.6, 55.2, 53.5, 25.2; IR (KBr) ν_{\max} 3127, 3068, 2962, 2932, 2836, 1946, 1611, 1513, 1441, 1302, 1249, 1209 cm^{-1} ; Anal. calcd for $\text{C}_{28}\text{H}_{23}\text{N}_3\text{O}$: C, 80.55; H, 5.55; N, 10.06. found C, 80.46; H, 5.46; N, 9.98.

4-((9-(propa-1,2-dienyl)anthracen-10-yl)methyl)-1-propyl-1H-1,2,3-triazole (8d): Yield = 0.258 g, 76%, yellow solid, mp: 117-118 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.46-8.44 (m, 2H), 8.29-8.27 (m, 2H), 7.52-7.47 (m, 4H), 6.95 (t, $J = 7.2$ Hz, 1H), 6.68 (s, 1H), 5.06-5.04 (m, 4H), 4.04 (t, $J = 7.6$ Hz, 2H), 1.74-1.68 (m, 2H), 0.78 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 147.7, 130.8, 129.9, 129.7, 127.4, 126.7, 126.1, 125.4, 125.0, 121.8, 88.1, 75.7, 51.9, 25.3, 23.7, 11.1; IR (KBr) ν_{\max} 3119, 3068, 2966, 2931, 2875, 1950, 1620, 1550, 1443, 1383, 1262, 1218 cm^{-1} ; Anal. calcd for $\text{C}_{23}\text{H}_{21}\text{N}_3$: C, 81.38; H, 6.24; N, 12.38. found C, 81.29; H, 6.15; N, 12.29.

1-butyl-4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazole (8e): Yield = 0.268 g, 76%, yellow solid, mp 120-121 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.47-8.44 (m, 2H), 8.31-8.28 (m, 2H), 7.52-7.48 (m, 4H), 6.66 (t, $J = 7.2$ Hz, 1H), 6.68 (s, 1H), 5.06-5.05 (m, 4H), 4.08 (t, $J = 7.2$ Hz, 2H), 1.69-1.64 (m, 2H), 1.23-1.14 (m, 2H), 0.81 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 147.6, 130.7, 129.9, 129.6, 127.4, 126.6, 126.1, 125.4, 124.9, 121.7, 88.1, 75.6, 50.1, 32.2, 25.3, 19.8, 13.5; IR (KBr) ν_{\max} 3120, 3070, 2962, 2929, 2871, 1951, 1599, 1460, 1385, 1261, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{24}\text{H}_{23}\text{N}_3$: C, 81.55; H, 6.56; N, 11.89. found C, 81.44; H, 6.45; N, 11.79.

1-(sec-butyl)-4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazole (8f): Yield = 0.282 g, 80%, yellow solid, mp 129-130 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.46-8.44 (m, 2H), 8.30-8.28 (m, 2H), 7.51-7.48 (m, 4H), 6.96 (t, $J = 6.8$ Hz, 1H), 6.68 (s, 1H), 5.08-5.05 (m, 4H), 4.33 (q, $J = 7.2$ Hz, 1H), 1.73-1.62 (m, 2H), 1.32 (d, $J = 6.8$ Hz, 3H), 0.68 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ

211.2, 147.4, 130.9, 130.1, 129.7, 127.3, 126.6, 126.1, 125.4, 125.1, 119.7, 88.2, 75.7, 58.9, 30.3, 25.5, 20.8, 10.5; IR (KBr) ν_{\max} 3123, 3066, 2964, 2933, 2876, 1949, 1619, 1547, 1443, 1384, 1368, 1260, 1225 cm^{-1} ; Anal. calcd for $\text{C}_{24}\text{H}_{23}\text{N}_3$: C, 81.55; H, 6.56; N, 11.89. found C, 81.45; H, 6.46; N, 11.80.

1-hexyl-4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazole (8g): Yield = 0.289 g, 76%, yellow solid, mp 141-142 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.47-8.44 (m, 2H), 8.29-8.27 (m, 2H), 7.52-7.47 (m, 4H), 6.96 (t, $J = 7.2$ Hz, 1H), 6.67 (s, 1H), 5.06-5.04 (m, 4H), 4.07 (t, $J = 7.2$ Hz, 2H), 1.68-1.65 (m, 2H), 1.15-1.12 (m, 6H), 0.77 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 147.7, 130.8, 129.9, 129.7, 127.4, 126.7, 126.1, 125.4, 125.0, 121.8, 88.1, 75.6, 50.3, 31.1, 30.2, 26.2, 25.3, 22.4, 13.9; IR (KBr) ν_{\max} 3121, 3073, 2953, 2929, 2856, 1945, 1619, 1554, 1443, 1314, 1219 cm^{-1} ; Anal. calcd for $\text{C}_{26}\text{H}_{27}\text{N}_3$: C, 81.85; H, 7.13; N, 11.01. found C, 81.74; H, 7.05; N, 10.94.

1-allyl-4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazole (8h): Yield = 0.276 g, 82%, yellow solid, mp 164-165 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.46-8.44 (m, 2H), 8.30-8.27 (m, 2H), 7.51-7.44 (m, 4H), 6.95 (t, $J = 7.2$ Hz, 1H), 6.71 (s, 1H), 5.83-5.74 (m, 1H), 5.14 (d, $J = 10.4$ Hz, 2H), 5.06-5.02 (m, 4H), 4.72 (d, $J = 6.0$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 148.0, 131.3, 130.7, 129.9, 129.6, 127.4, 126.7, 126.1, 125.4, 124.9, 121.7, 120.1, 88.1, 75.6, 52.8, 25.3; IR (KBr) ν_{\max} 3122, 3069, 2926, 2853, 1952, 1618, 1443, 1383, 1220, 1137 cm^{-1} ; Anal. calcd for $\text{C}_{23}\text{H}_{19}\text{N}_3$: C, 81.87; H, 5.68; N, 12.45. found C, 81.76; H, 5.60; N, 12.36. Chemical Formula: $\text{C}_{23}\text{H}_{19}\text{N}_3$

Ethyl 2-(4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazol-1-yl)acetate (8i): Yield = 0.299 g, 78%, yellow solid, mp 159-160 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.45-8.43 (m, 2H), 8.31-8.28 (m, 2H), 7.52-7.47 (m, 4H), 6.95 (t, $J = 7.2$ Hz, 1H), 6.85 (s, 1H), 5.09 (s, 2H), 5.05 (d, $J = 6.8$ Hz, 2H), 4.88 (s, 2H), 4.11 (q, $J = 8.0$ Hz, 2H), 1.14 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 166.2, 148.1, 130.5, 129.9, 129.6, 127.4, 126.7, 126.1, 125.4, 124.9, 123.3, 88.1, 75.6, 62.3, 50.8, 25.1, 14.0; IR (KBr) ν_{\max} 3132, 3080, 2990, 2961, 1938, 1756, 1620, 1546, 1445, 1375, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{24}\text{H}_{21}\text{N}_3\text{O}_2$: C, 75.18; H, 5.52; N, 10.96. found C, 75.05; H, 5.44; N, 10.87.

1-phenyl-2-(4-((10-(propa-1,2-dien-1-yl)anthracen-9-yl)methyl)-1H-1,2,3-triazol-1-yl)ethanone (8j): Yield = 0.324 g, 78%, yellow solid, mp 181-182 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.38 (d, $J = 8.8$ Hz, 2H), 8.28 (d, $J = 8.4$ Hz, 2H), 7.76 (d, $J = 8.0$ Hz, 2H), 7.52 (t, $J = 7.6$ Hz, 2H), 7.48-7.40 (m, 3H), 7.37 (t, $J = 7.2$ Hz, 2H), 6.89-6.85 (m, 2H), 5.49 (s, 2H), 5.04 (s, 2H), 4.98 (d, $J = 6.8$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3): δ 211.2, 190.4, 134.5, 133.9, 130.6, 129.9, 129.6, 129.2, 128.1, 127.4, 126.6, 126.2, 125.4,

124.9, 123.8, 88.1, 75.6, 55.4, 25.2; IR (KBr) ν_{\max} 3134, 3067, 2963, 2923, 2853, 1948, 1705, 1597, 1448, 1412, 1349, 1261, 1226 cm^{-1} ; Anal. calcd for $\text{C}_{28}\text{H}_{21}\text{N}_3\text{O}$: C, 80.94; H, 5.09; N, 10.11. found C, 80.82; H, 4.98; N, 10.04.

10,10-bis((1-benzyl-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9a): Yield = 0.472 g, 88%, white solid, mp 195-196 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.05 (d, J = 7.6 Hz, 2H), 7.88 (d, J = 8.0 Hz, 2H), 7.65 (d, J = 8.0 Hz, 2H), 7.34-7.25 (m, 8H), 6.76 (d, J = 6.0 Hz, 4H), 5.79 (s, 2H), 5.12 (s, 4H), 3.84 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.6, 144.9, 143.2, 134.5, 133.9, 132.3, 129.0, 128.5, 127.4, 127.3, 127.2, 121.5, 53.6, 47.1, 40.8; IR (KBr) ν_{\max} 3164, 3133, 3062, 3032, 2961, 1664, 1602, 1545, 1496, 1455, 1323, 1216 cm^{-1} ; Anal. calcd for $\text{C}_{34}\text{H}_{28}\text{N}_6\text{O}$: C, 76.10; H, 5.26; N, 15.66. found C, 75.98; H, 5.18; N, 15.56.

10,10-bis((1-(4-nitrobenzyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9b): Yield = 0.533 g, 85%, white solid, mp 181-182 °C, ^1H NMR (400 MHz, CDCl_3): δ 7.98 (d, J = 8.8 Hz, 4H), 7.90 (d, J = 8.0 Hz, 2H), 7.84 (d, J = 8.0 Hz, 2H), 7.62-7.58 (m, 2H), 7.26-7.22 (m, 2H), 6.71 (d, J = 8.8 Hz, 4H), 5.84 (s, 2H), 5.13 (s, 4H), 3.77 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 181.3, 146.3, 144.1, 142.2, 141.7, 132.9, 130.9, 126.7, 126.2, 125.5, 122.7, 121.3, 50.9, 46.1, 39.4; IR (KBr) ν_{\max} 3136, 3070, 2956, 2931, 2857, 1661, 1601, 1523, 1493, 1455, 1419, 1357, 1324, 1216 cm^{-1} .

10,10-bis((1-(4-methoxybenzyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9c): Yield = 0.489 g, 82%, white solid, mp 167-168 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.01 (d, J = 7.6 Hz, 2H), 7.84 (d, J = 8.0 Hz, 2H), 7.61 (t, J = 8.0 Hz, 2H), 7.29 (t, J = 7.6 Hz, 2H), 6.77-6.69 (m, 8H), 5.70 (s, 2H), 5.01 (s, 4H), 3.80 (s, 6H), 3.78 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.6, 159.8, 145.0, 143.1, 133.9, 132.4, 129.0, 127.4, 127.3, 126.6, 121.3, 114.4, 55.5, 53.3, 47.1, 40.9; IR (KBr) ν_{\max} 3129, 3066, 2960, 2933, 2833, 1663, 1602, 1515, 1324, 1255, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{36}\text{H}_{32}\text{N}_6\text{O}_3$: C, 72.47; H, 5.41; N, 14.08. found C, 72.35; H, 5.30; N, 13.98.

10,10-bis((1-(4-methylbenzyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9d): Yield = 0.485 g, 88%, white solid, mp 215-216 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.06 (d, J = 8.0 Hz, 2H), 7.87 (d, J = 8.0 Hz, 2H), 7.64 (t, J = 7.6 Hz, 2H), 7.32 (t, J = 7.6 Hz, 2H), 7.07 (d, J = 7.6 Hz, 4H), 6.68 (d, J = 7.6 Hz, 4H), 5.78 (s, 2H), 5.07 (s, 4H), 3.83 (s, 4H), 2.35 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.6, 144.9, 143.1, 138.3, 133.9, 132.2, 131.5, 129.6, 127.4, 127.2, 121.4, 53.4, 47.0, 40.8, 21.2; IR (KBr) ν_{\max} 3132,

3062, 3025, 2959, 2922, 1666, 1602, 1516, 1458, 1323, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{36}\text{H}_{32}\text{N}_6\text{O}$: C, 76.57; H, 5.71; N, 14.88. found C, 76.45; H, 5.60; N, 14.77.

10,10-bis((1-(4-bromobenzyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9e): Yield = 0.588 g, 85%, white solid, mp 205-206 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.05 (d, J = 8.0 Hz, 2H), 7.92 (d, J = 8.0 Hz, 2H), 7.67 (t, J = 7.2 Hz, 2H), 7.41 (d, J = 8.4 Hz, 4H), 7.34 (t, J = 7.6 Hz, 2H), 6.63 (d, J = 8.4 Hz, 4H), 5.78 (s, 2H), 5.07 (s, 4H), 3.87 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.6, 144.8, 134.1, 133.5, 132.2, 129.7, 128.9, 127.5, 127.3, 127.2, 122.6, 121.6, 52.9, 47.1, 40.7; IR (KBr) ν_{max} 3123, 3065, 2954, 2929, 1651, 1598, 1489, 1458, 1408, 1325, 1176 cm^{-1} ; Anal. calcd for $\text{C}_{34}\text{H}_{26}\text{Br}_2\text{N}_6\text{O}$: C, 58.81; H, 3.77; N, 12.10. found C, 58.70; H, 3.69; N, 11.98.

10,10-bis((1-(4-fluorobenzyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9f): Yield = 0.492 g, 86%, white solid, mp 194-195 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.05 (d, J = 7.6 Hz, 2H), 7.89 (d, J = 8.0 Hz, 2H), 7.67 (t, J = 8.0 Hz, 2H), 7.34 (t, J = 7.2 Hz, 2H), 6.98-6.94 (m, 4H), 6.76-6.73 (m, 4H), 5.77 (s, 2H), 5.09 (s, 4H), 3.84 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.5, 163.9, 144.9, 134.0, 132.2, 130.4, 129.2, 129.1, 127.5, 127.2, 127.1, 121.3, 116.1, 115.8, 52.8, 47.1, 40.8; IR (KBr) ν_{max} 3133, 3067, 2965, 1665, 1603, 1514, 1457, 1323, 1237, 1161 cm^{-1} ; Anal. calcd for $\text{C}_{34}\text{H}_{26}\text{F}_2\text{N}_6\text{O}$: C, 71.32; H, 4.58; N, 14.68. found C, 71.22; H, 4.50; N, 14.59.

10,10-bis((1-propyl-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9g): Yield = 0.330 g, 75%, white solid, mp 188-189 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.14 (d, J = 8.0 Hz, 2H), 7.93 (d, J = 8.0 Hz, 2H), 7.72 (t, J = 7.6 Hz, 2H), 7.41 (t, J = 7.6 Hz, 2H), 5.86 (s, 2H), 3.91-3.82 (m, 8H), 1.53-1.46 (m, 4H), 0.57 (t, J = 7.2 Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.9, 145.2, 142.8, 134.1, 132.5, 127.6, 127.3, 127.2, 121.1, 51.6, 46.9, 40.9, 23.5, 10.7; IR (KBr) ν_{max} 3133, 3063, 2965, 2934, 2876, 1666, 1602, 1457, 1385, 1352, 1323, 1215 cm^{-1} ; Anal. calcd for $\text{C}_{26}\text{H}_{28}\text{N}_6\text{O}$: C, 70.89; H, 4.41; N, 19.08. found C, 70.77; H, 4.35; N, 18.97.

10,10-bis((1-butyl-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9h): Yield = 0.351 g, 75%, white solid, mp 176-177 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.18 (d, J = 8.0 Hz, 2H), 7.96 (d, J = 8.4 Hz, 2H), 7.76 (t, J = 8.4 Hz, 2H), 7.44 (t, J = 7.2 Hz, 2H), 5.89 (s, 2H), 3.94 (t, J = 7.2 Hz, 4H), 3.88 (s, 4H), 1.52-1.45 (m, 4H), 0.98-0.88 (m, 4H), 0.77 (t, J = 7.6 Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.9, 145.2, 142.8, 134.1, 132.5, 127.6, 127.3, 127.2, 121.1, 49.7, 46.9, 40.9, 32.0, 19.4, 13.4; IR (KBr) ν_{max}

3129, 3071, 2957, 2928, 2856, 1666, 1603, 1461, 1324, 1215 cm^{-1} ; Anal. calcd for $\text{C}_{28}\text{H}_{32}\text{N}_6\text{O}$: C, 71.77; H, 6.88; N, 17.93. found C, 71.65; H, 6.79; N, 17.83.

10,10-bis((1-(sec-butyl)-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9i): Yield = 0.365 g, 78%, white solid, mp 149-150 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.11 (d, $J = 7.6$ Hz, 2H), 7.92 (d, $J = 8.4$ Hz, 2H), 7.70 (t, $J = 7.2$ Hz, 2H), 7.38 (t, $J = 7.6$ Hz, 2H), 5.83 (s, 2H), 4.11 (q, $J = 7.6$ Hz, 2H), 3.84 (s, 4H), 1.49-1.36 (m, 4H), 1.14 (d, $J = 6.8$ Hz, 6H), 0.40 (t, $J = 7.2$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.8, 145.3, 142.6, 134.0, 132.5, 127.5, 127.4, 127.1, 119.1, 58.4, 47.1, 40.8, 30.1, 20.6, 10.0; IR (KBr) ν_{max} 3137, 3067, 3036, 2963, 2935, 2875, 1666, 1603, 1479, 1459, 1351, 1326, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{28}\text{H}_{32}\text{N}_6\text{O}$: C, 71.77; H, 6.88; N, 17.93. found C, 71.64; H, 6.78; N, 17.82.

10,10-bis((1-hexyl-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9j): Yield = 0.330 g, 75%, white solid, mp 162-163 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.15 (d, $J = 8.0$ Hz, 2H), 7.92 (d, $J = 7.6$ Hz, 2H), 7.71 (t, $J = 8.0$ Hz, 2H), 7.41 (t, $J = 8.0$ Hz, 2H), 5.86 (s, 2H), 3.90 (t, $J = 7.2$ Hz, 4H), 3.85 (s, 4H), 1.50-1.43 (m, 4H), 1.19-1.06 (m, 8H), 0.94-0.86 (m, 4H), 0.81 (t, $J = 7.2$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.9, 145.3, 142.8, 134.1, 132.6, 127.6, 127.3, 121.1, 50.0, 46.9, 41.1, 31.1, 30.1, 25.9, 22.5, 14.1; IR (KBr) ν_{max} 3132, 3061, 2953, 2931, 2860, 1668, 1603, 1459, 1383, 1323, 1213 cm^{-1} ; Anal. calcd for $\text{C}_{32}\text{H}_{40}\text{N}_6\text{O}$: C, 70.25; H, 7.68; N, 16.02. found C, 70.11; H, 7.59; N, 15.91.

10,10-bis((1-allyl-1H-1,2,3-triazol-4-yl)methyl)anthracen-9(10H)-one (9k): Yield = 0.348 g, 80%, white solid, mp 179-180 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.17 (d, $J = 8.0$ Hz, 2H), 7.95 (d, $J = 8.0$ Hz, 2H), 7.75 (t, $J = 8.0$ Hz, 2H), 7.44 (t, $J = 8.0$ Hz, 2H), 5.92 (s, 2H), 5.69-5.62 (m, 2H), 5.11 (d, $J = 10.4$ Hz, 2H), 4.77 (d, $J = 17.2$ Hz, 2H), 4.57 (d, $J = 6.0$ Hz, 4H), 3.88 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.9, 144.9, 142.9, 134.0, 132.4, 131.1, 127.5, 127.2, 121.3, 119.1, 52.1, 46.9, 40.8; IR (KBr) ν_{max} 3135, 3066, 2959, 2916, 2823, 1665, 1601, 1458, 1323, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{26}\text{H}_{24}\text{N}_6\text{O}$: C, 71.54; H, 5.54; N, 19.25. found C, 71.43; H, 5.45; N, 19.13.

diethyl2,2'-(4,4'-((10-oxo-9,10-dihydroanthracene-9,9-diyl)bis(methylene))bis(1H-1,2,3-triazole-4,1-diyl))diacetate (9l): Yield = 0.423 g, 80%, white solid, mp 153-154 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.14 (d, $J = 8.0$ Hz, 2H), 7.94 (t, $J = 8.0$ Hz, 2H), 7.73 (t, $J = 8.0$ Hz, 2H), 7.40 (t, $J = 7.6$ Hz, 2H), 6.06 (s, 2H), 4.72 (s, 4H), 4.07 (q, $J = 6.8$ Hz, 4H), 3.88 (s, 4H), 1.13 (t, $J = 7.2$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 182.8, 165.9, 144.9, 143.1, 133.9, 132.3, 127.5, 127.3, 122.7, 62.2, 50.6, 46.7, 40.7, 13.9; IR

(KBr) ν_{\max} 3170, 3138, 2987, 2939, 2845, 2861, 1755, 1666, 1603, 1459, 1354, 1324, 1263, 1231 cm^{-1} ;
Anal. calcd for $\text{C}_{28}\text{H}_{28}\text{N}_6\text{O}_5$: C, 63.63; H, 5.34; N, 15.90. found C, 63.50; H, 5.25; N, 15.78.

10-((1-(4-nitrobenzyl)-1H-1,2,3-triazol-4-yl)methyl)-10-(prop-2-yn-1-yl)anthracen-9(10H)-one (10):

Yield = 0.340 g, 76%, white solid, mp 183-184 °C, ^1H NMR (400 MHz, CDCl_3): δ 8.23 (d, J = 8.4 Hz, 2H), 8.12 (d, J = 8.8 Hz, 2H), 7.79 (d, J = 8.0 Hz, 2H), 7.68 (t, J = 8.0 Hz, 2H), 7.43 (t, J = 8.0 Hz, 2H), 6.85 (d, J = 8.8 Hz, 2H), 5.87 (s, 1H), 5.23 (s, 2H), 3.73 (s, 2H), 3.21 (d, J = 2.4 Hz, 2H), 1.63 (t, J = 2.4 Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3): δ 183.2, 148.0, 144.8, 143.9, 141.8, 134.0, 132.5, 127.9, 127.8, 127.5, 126.7, 124.3, 121.8, 79.4, 71.8, 52.7, 46.1, 39.9, 34.6; IR (KBr) ν_{\max} 3287, 3139, 3073, 2926, 2852, 2301, 1657, 1602, 1517, 1460, 1348, 1324, 1224 cm^{-1} ; Anal. calcd for $\text{C}_{27}\text{H}_{20}\text{N}_4\text{O}_3$: C, 72.31; H, 4.49; N, 12.49. found C, 72.18; H, 4.39; N, 12.37.

10-((1-(3-bromopropyl)-1H-1,2,3-triazol-4-yl)methyl)-10-(prop-2-yn-1-yl)anthracen-9(10H)-one (11):

Yield = 0.282 g, 65%, semi-solid, ^1H NMR (400 MHz, CDCl_3): δ 8.31 (d, J = 7.6 Hz, 2H), 7.82 (d, J = 8.0 Hz, 2H), 7.73 (t, J = 8.0 Hz, 2H), 7.49 (t, J = 7.6 Hz, 2H), 5.94 (s, 1H), 4.04 (t, J = 6.8 Hz, 2H), 3.73 (s, 2H), 3.23 (d, J = 2.8 Hz, 2H), 2.96 (t, J = 6.4 Hz, 2H), 1.84-1.77 (m, 2H), 1.65 (t, J = 2.4 Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3): δ 183.3, 144.8, 142.9, 133.9, 132.5, 127.7, 127.5, 127.4, 126.5, 122.1, 121.7, 79.5, 71.6, 47.6, 46.7, 46.1, 39.7, 34.5, 32.3; IR (KBr) ν_{\max} 3294, 3068, 2925, 2853, 2101, 1654, 1599, 1458, 1324, 1218, 1176 cm^{-1} ; Anal. calcd for $\text{C}_{23}\text{H}_{20}\text{BrN}_3\text{O}$: C, 63.60; H, 4.64; N, 9.67. found C, 63.48; H, 4.55; N, 9.56.

10,10-bis((1-benzyl-1H-1,2,3-triazol-4-yl)methyl)-9,10-dihydroanthracen-9-ol (12a):

Yield = 0.452 g, 84%, white solid, mp 159-160 °C, ^1H NMR (400 MHz, CDCl_3): δ 7.56 (d, J = 7.6 Hz, 2H), 7.34 (d, J = 7.6 Hz, 2H), 7.31-7.23 (m, 8H), 7.22-7.18 (m, 2H), 6.89 (d, J = 8.4 Hz, 2H), 6.79 (d, J = 6.8 Hz, 2H), 6.31 (s, 1H), 5.67 (s, 1H), 5.18 (s, 2H), 5.13 (s, 2H), 5.00 (s, 1H), 4.98 (s, 1H), 3.69 (s, 2H), 3.67 (s, 2H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.6, 144.3, 138.4, 137.9, 135.0, 134.8, 129.0, 128.9, 128.8, 128.4, 127.7, 127.5, 127.1, 126.6, 122.6, 121.7, 67.8, 53.7, 53.6, 46.5, 40.4, 40.3; IR (KBr) ν_{\max} 3532, 3146, 3061, 3035, 2924, 2825, 1601, 1543, 1490, 1415, 1352, 1325, 1220 cm^{-1} ; Anal. calcd for $\text{C}_{34}\text{H}_{30}\text{N}_6\text{O}$: C, 75.81; H, 5.61; N, 15.60. found C, 75.65; H, 5.53; N, 15.48.

10,10-bis((1-(4-nitrobenzyl)-1H-1,2,3-triazol-4-yl)methyl)-9,10-dihydroanthracen-9-ol (12b):

Yield = 0.502 g, 80%, white solid, mp 226-227 °C, ^1H NMR (400 MHz, CD_2Cl_2): δ 8.10 (d, J = 8.4 Hz, 4H), 7.62 (d, J = 8.0 Hz, 2H), 7.42 (d, J = 7.6 Hz, 2H), 7.34 (t, J = 7.2 Hz, 2H), 7.27 (t, J = 7.2 Hz, 2H), 7.01 (d, J =

8.4 Hz, 2H), 6.89 (d, $J = 8.4$ Hz, 2H), 6.56 (s, 1H), 5.89 (s, 1H), 5.33 (s, 2H), 5.25 (s, 2H), 5.13 (s, 1H), 5.12 (s, 1H), 3.73 (s, 4H); ^{13}C NMR (100 MHz, CDCl_3): δ 145.8, 145.6, 141.8, 137.7, 136.6, 126.7, 126.6, 126.1, 125.6, 124.9, 124.8, 122.2, 122.1, 121.5, 64.3, 50.3, 44.9, 36.5; IR (KBr) ν_{max} 3543, 3132, 2962, 2927, 2855, 1603, 1517, 1487, 1421, 1754, 1261, 1218 cm^{-1} ; Anal. calcd for $\text{C}_{34}\text{H}_{28}\text{N}_8\text{O}_5$: C, 63.96; H, 4.49; N, 17.82. found C, 63.83; H, 4.38; N, 18.70.

10,10-bis((1-propyl-1H-1,2,3-triazol-4-yl)methyl)-9,10-dihydroanthracen-9-ol (12c): Yield = 0.318 g, 72%, white solid, mp 141-142 °C, ^1H NMR (400 MHz, CDCl_3): δ 7.57 (d, $J = 7.6$ Hz, 2H), 7.51 (d, $J = 7.6$ Hz, 2H), 7.35-7.31 (m, 2H), 7.28-7.26 (m, 2H), 6.40 (s, 1H), 5.79 (s, 1H), 5.32 (s, 1H), 3.96 (t, $J = 7.2$ Hz, 2H), 3.90-3.85 (m, 3H), 3.69-3.68 (m, 4H), 1.61 (q, $J = 7.2$ Hz, 2H), 1.53 (q, $J = 7.2$ Hz, 2H), 0.69 (t, $J = 7.2$ Hz, 3H), 0.59 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.1, 143.9, 138.9, 138.0, 129.0, 128.6, 127.3, 126.8, 122.5, 121.5, 111.9, 68.4, 51.7, 51.5, 46.6, 40.6, 39.8, 23.7; IR (KBr) ν_{max} 3537, 3132, 2964, 2927, 2875, 1602, 1542, 1490, 1457, 1328, 1261 cm^{-1} ; Anal. calcd for $\text{C}_{26}\text{H}_{30}\text{N}_6\text{O}$: C, 70.56; H, 6.83; N, 18.99. found C, 70.45; H, 6.72; N, 18.88.

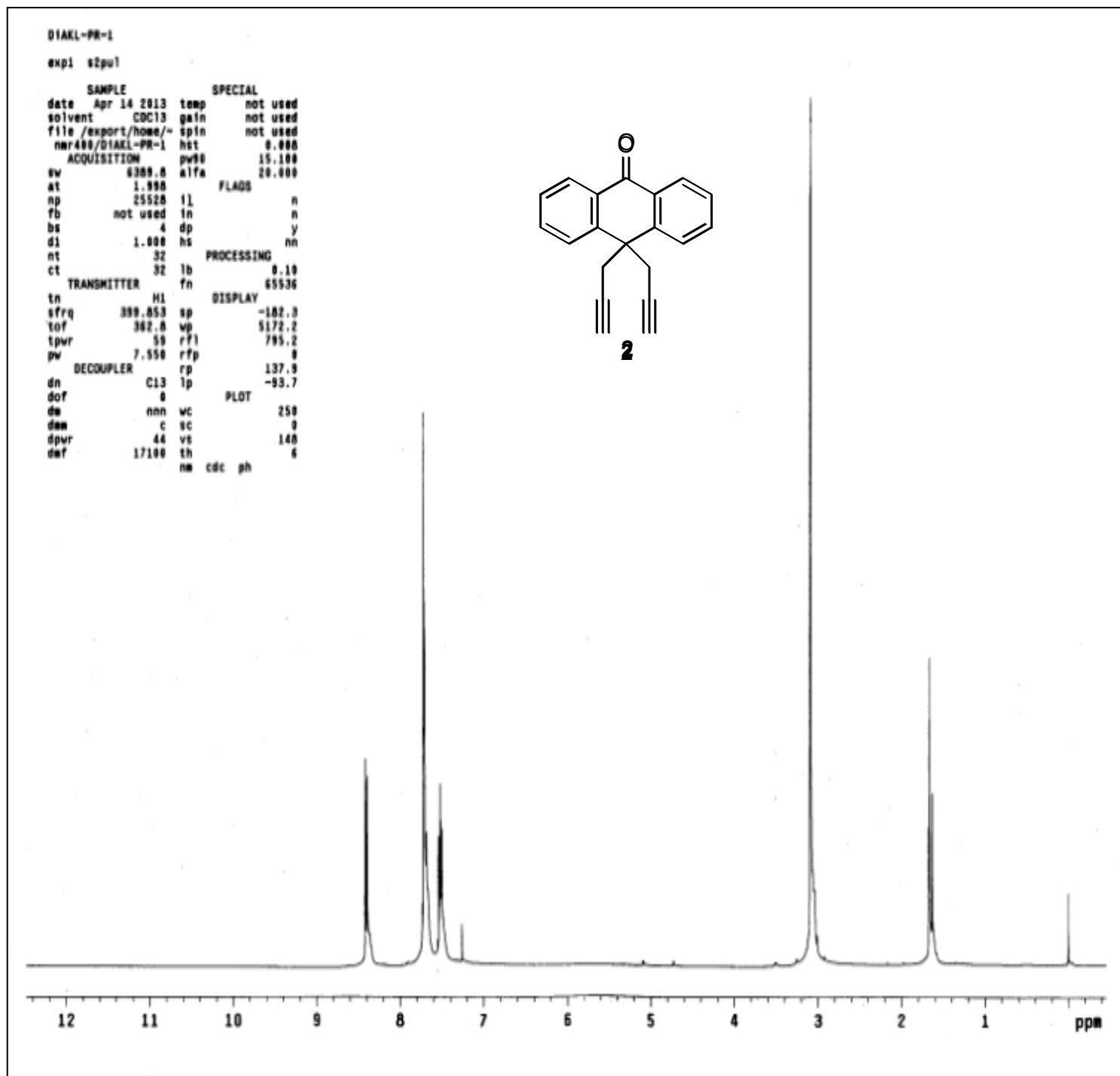
diethyl 2,2'-(4,4'-((10-hydroxy-9,10-dihydroanthracene-9,9-diyl)bis(methylene))bis(1H-1,2,3-triazole-4,1-diyl))diacetate (12d): Yield = 0.413 g, 78%, white solid, mp: 145-146 °C, ^1H NMR (400 MHz, CDCl_3): δ 7.65 (d, $J = 8.0$ Hz, 2H), 7.50 (d, $J = 8.0$ Hz, 2H), 7.33 (t, $J = 7.6$ Hz, 2H), 7.21 (t, $J = 7.2$ Hz, 2H), 6.17 (s, 1H), 5.95 (s, 1H), 5.20 (s, 1H), 4.72 (s, 2H), 4.70 (s, 2H), 4.68 (s, 1H), 4.08-4.02 (m, 4H), 3.74 (s, 2H), 3.66 (s, 2H), 1.15-1.11 (m, 6H); ^{13}C NMR (100 MHz, CDCl_3): δ 166.7, 166.1, 144.1, 138.3, 137.7, 128.7, 128.3, 127.6, 127.1, 126.5, 123.4, 122.9, 66.8, 62.4, 62.2, 50.6, 50.4, 46.6, 40.6, 40.3, 14.0, 13.9; IR (KBr) ν_{max} 3537, 3143, 2986, 2943, 1746, 1603, 1547, 1489, 1463, 1383, 1221 cm^{-1} ; Anal. calcd for $\text{C}_{28}\text{H}_{30}\text{N}_6\text{O}_5$: C, 63.38; H, 5.70; N, 15.84. found C, 63.25; H, 5.59; N, 15.72.

4,4'-((10-((1-benzyl-1H-1,2,3-triazol-4-yl)methoxy)-9,10-dihydroanthracene-9,9

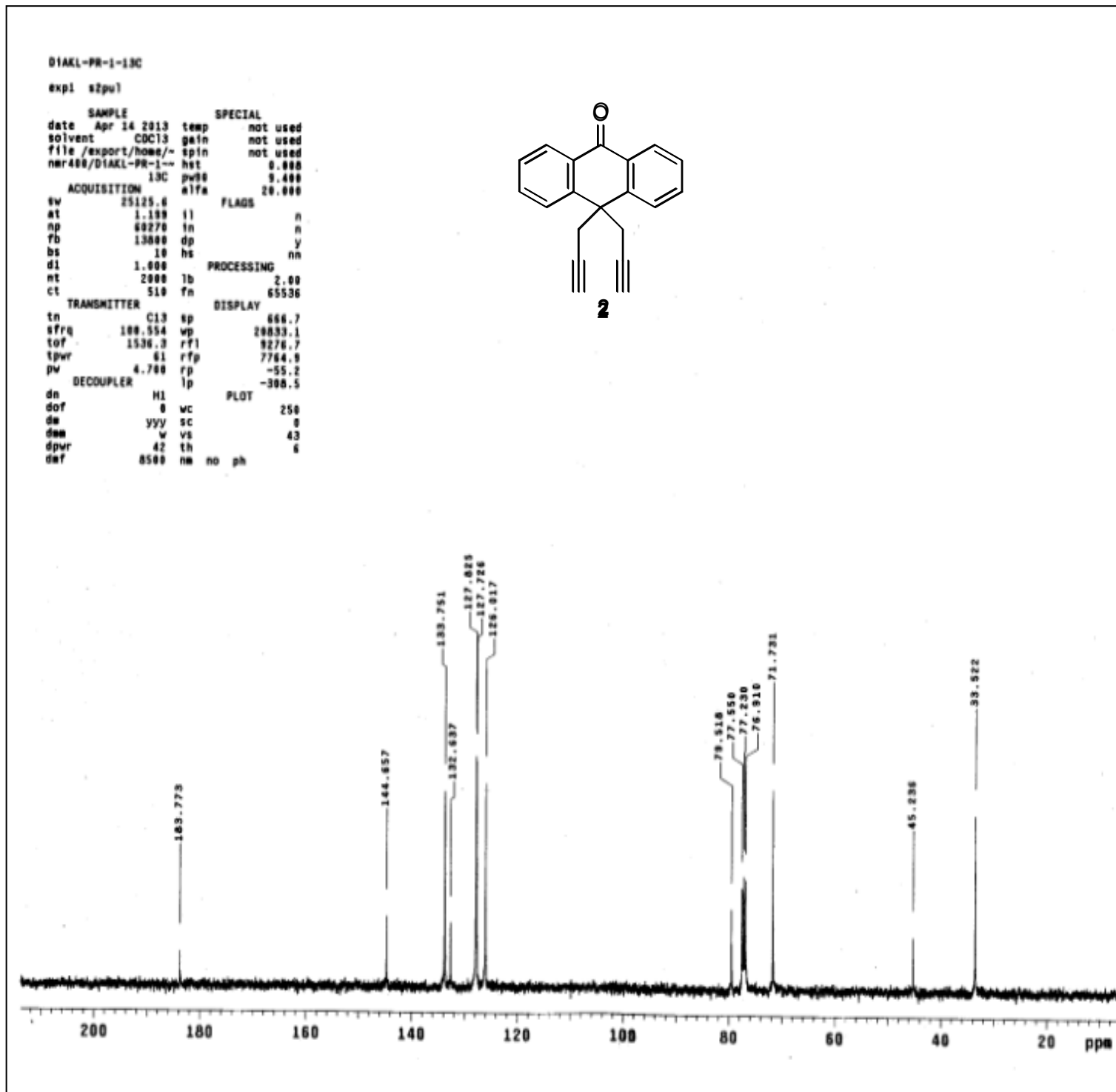
diyl)bis(methylene))bis(1-benzyl-1H-1,2,3-triazole) (13): Yield = 0.510 g, 72%, Semi-solid, ^1H NMR (400 MHz, CDCl_3): δ 7.50 (d, $J = 8.0$ Hz, 2H), 7.34-7.32 (m, 5H), 7.27-7.15 (m, 12H), 6.97-6.95 (m, 2H), 6.75 (d, $J = 7.2$ Hz, 2H), 6.28 (s, 1H), 5.71 (s, 1H), 5.42 (s, 2H), 5.11-5.09 (m, 4H), 5.07 (s, 2H), 3.81 (s, 2H), 3.71 (s, 2H), 3.64 (s, 2H); ^{13}C NMR (100 MHz, CDCl_3): δ 145.7, 144.4, 144.2, 140.2, 134.9, 134.7, 134.6, 129.0, 128.8, 128.7, 128.4, 128.3, 128.2, 128.1, 127.8, 127.2, 127.1, 126.8, 122.7, 122.5, 121.8, 74.5, 58.3, 53.9, 53.5, 53.3, 47.1, 40.7, 38.4; IR (KBr) ν_{max} 3135, 3061, 3031, 2925, 2847, 1603, 1544,

1496, 1453, 1325, 1217 cm^{-1} ; Anal. calcd for $\text{C}_{44}\text{H}_{39}\text{N}_9\text{O}$: C, 74.45; H, 5.54; N, 17.76. found C, 74.32; H, 5.46; N, 17.64.

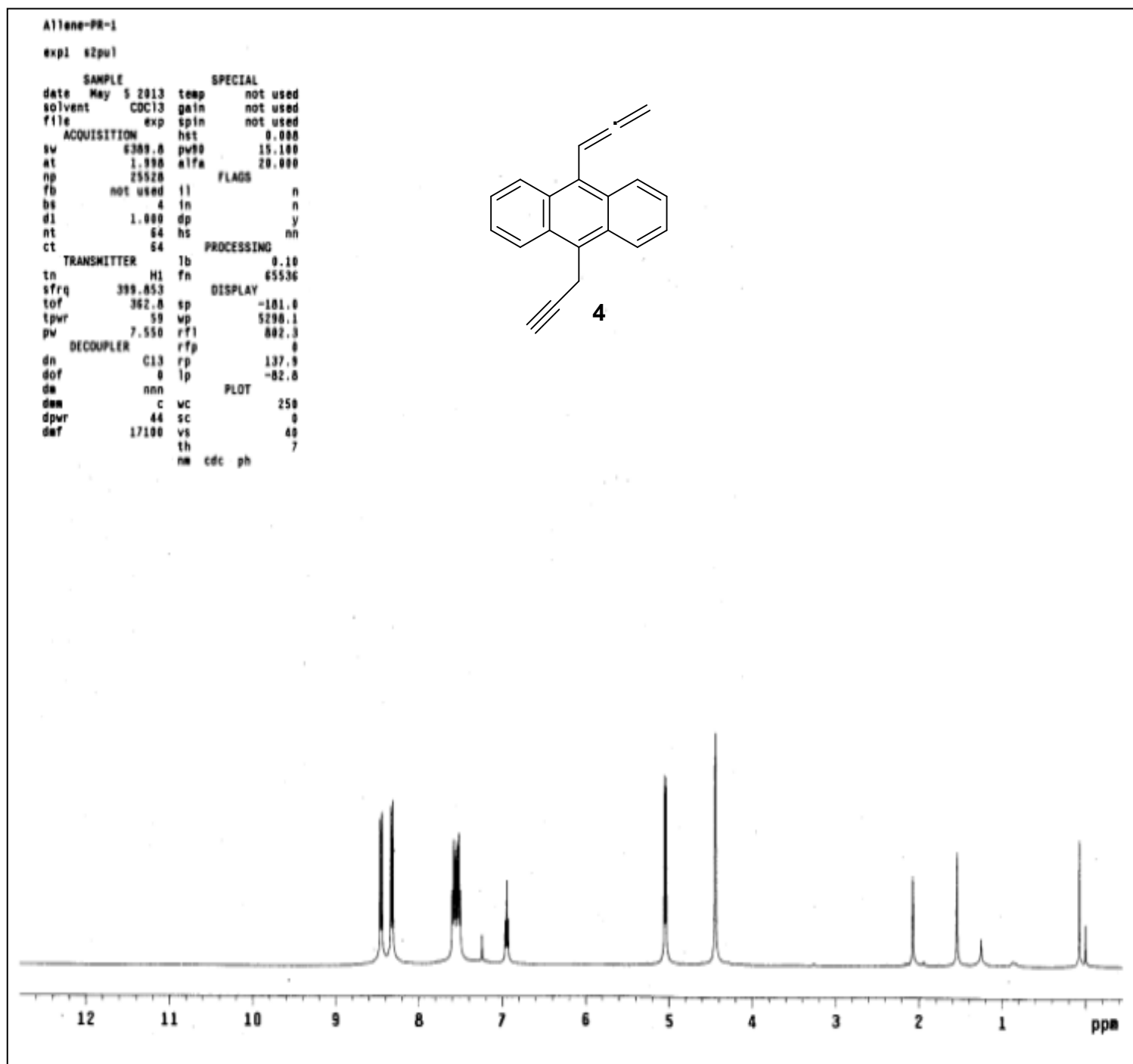
¹H NMR spectra of **2**



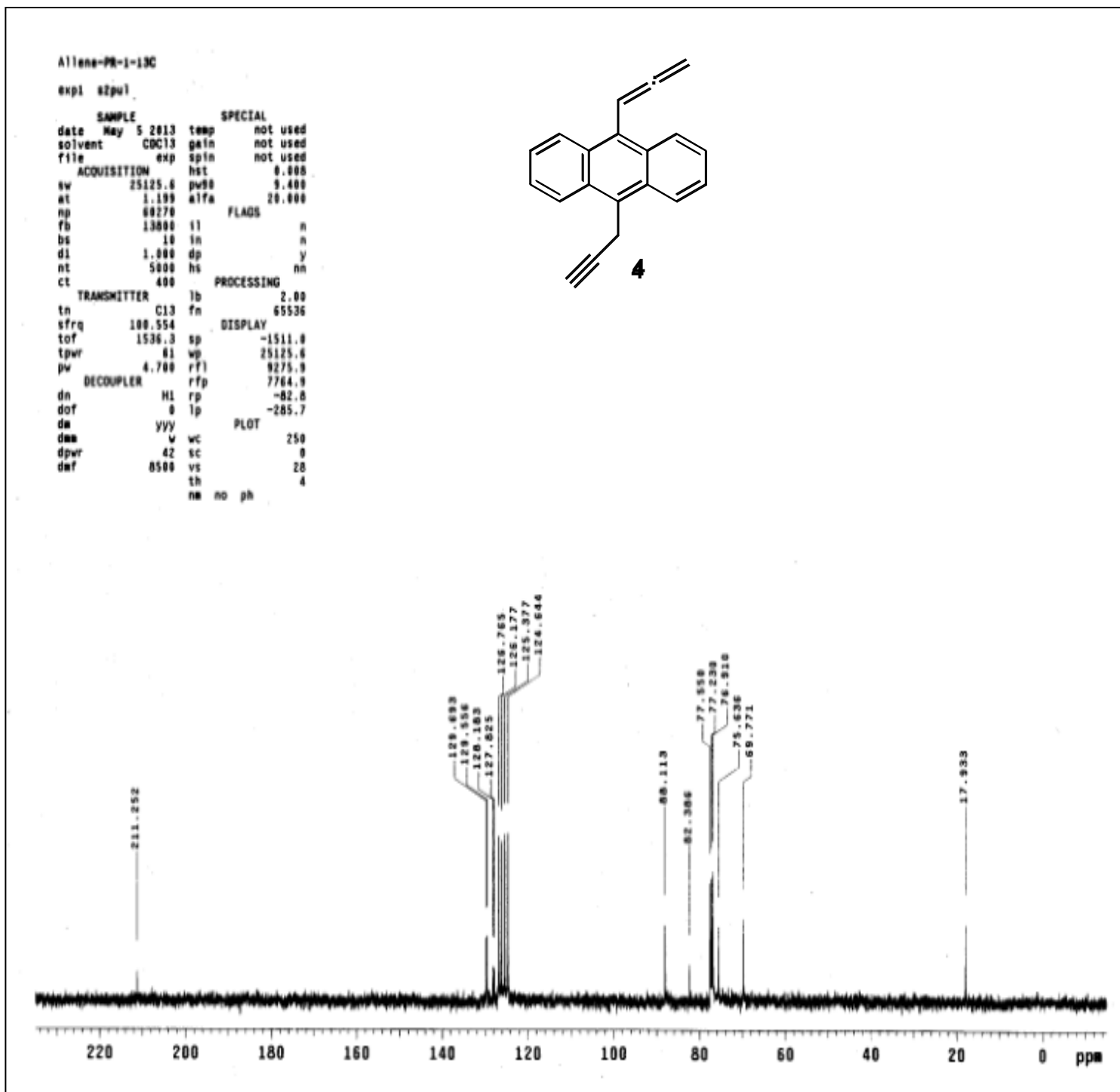
^{13}C NMR spectra of **2**



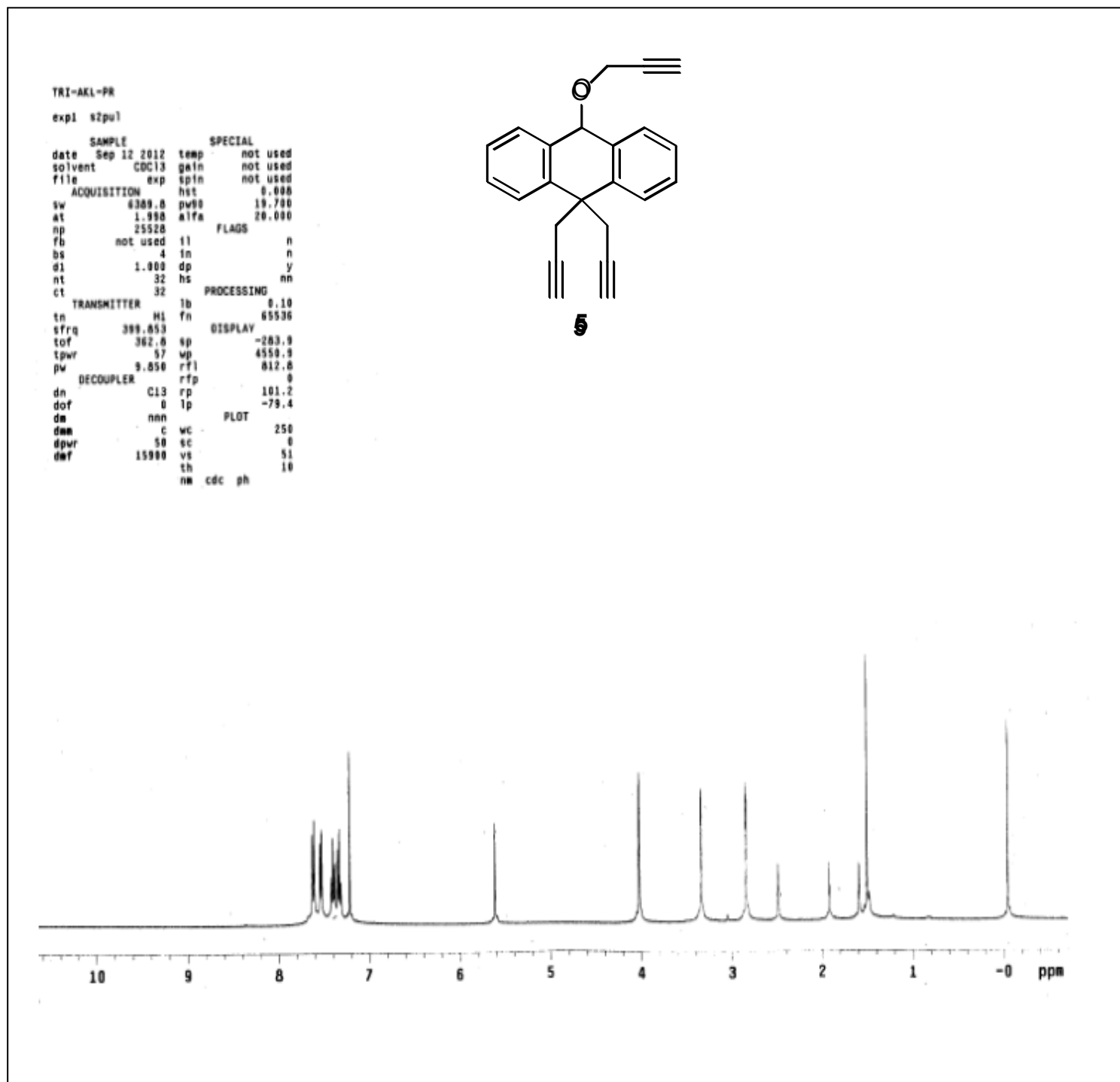
^1H NMR spectra of **4**



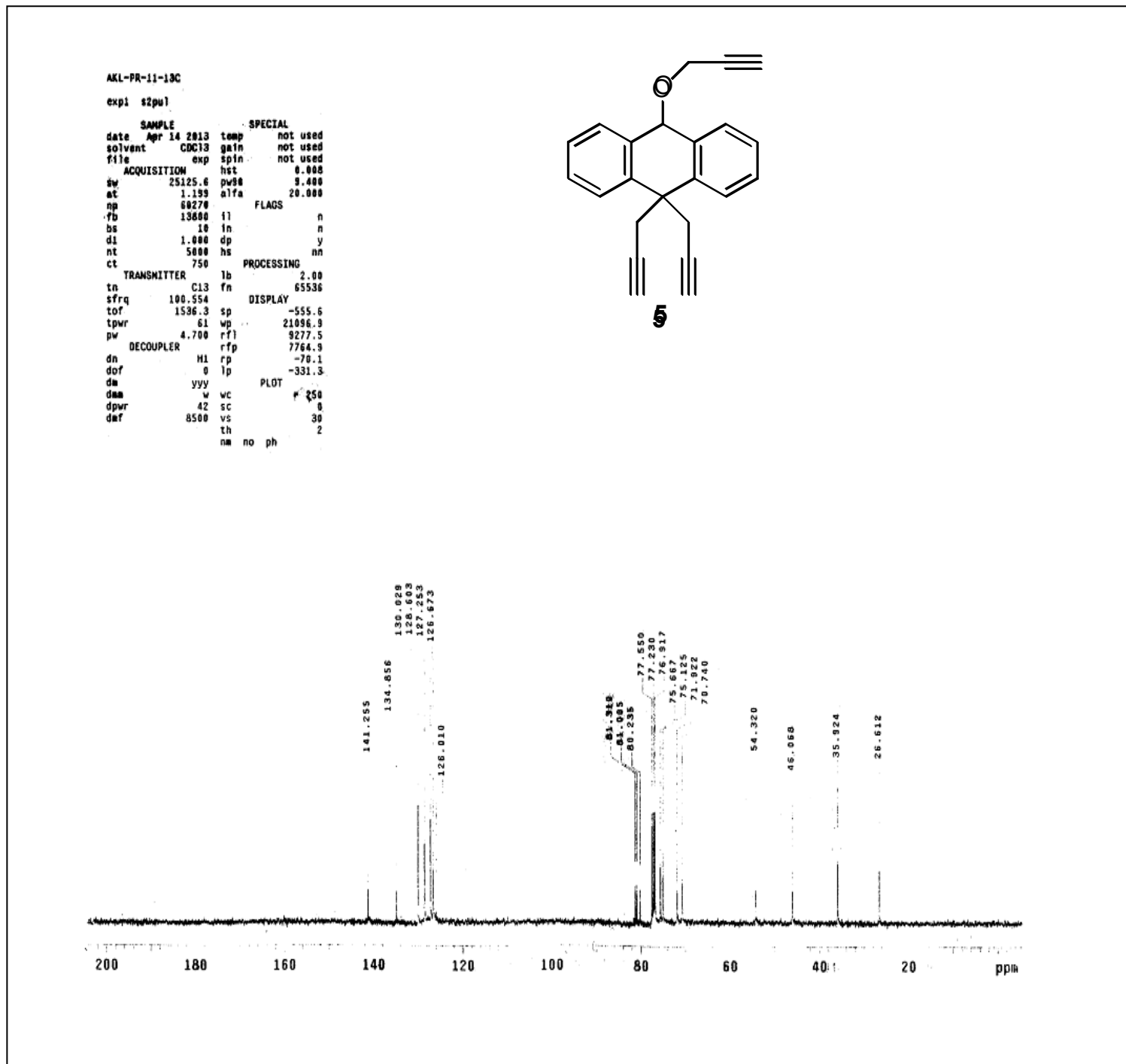
^{13}C NMR spectra of **4**



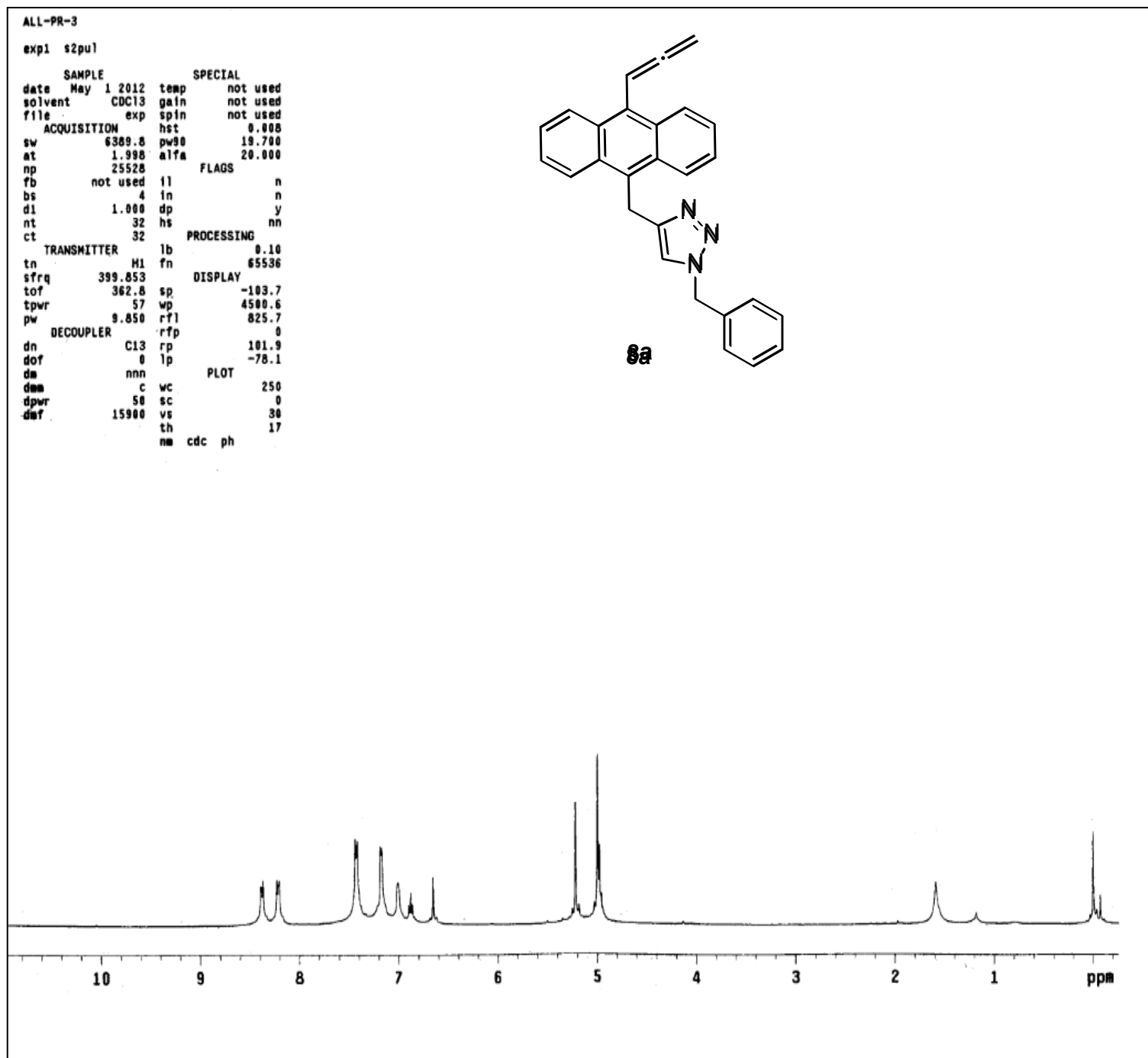
^1H NMR spectra of **5**



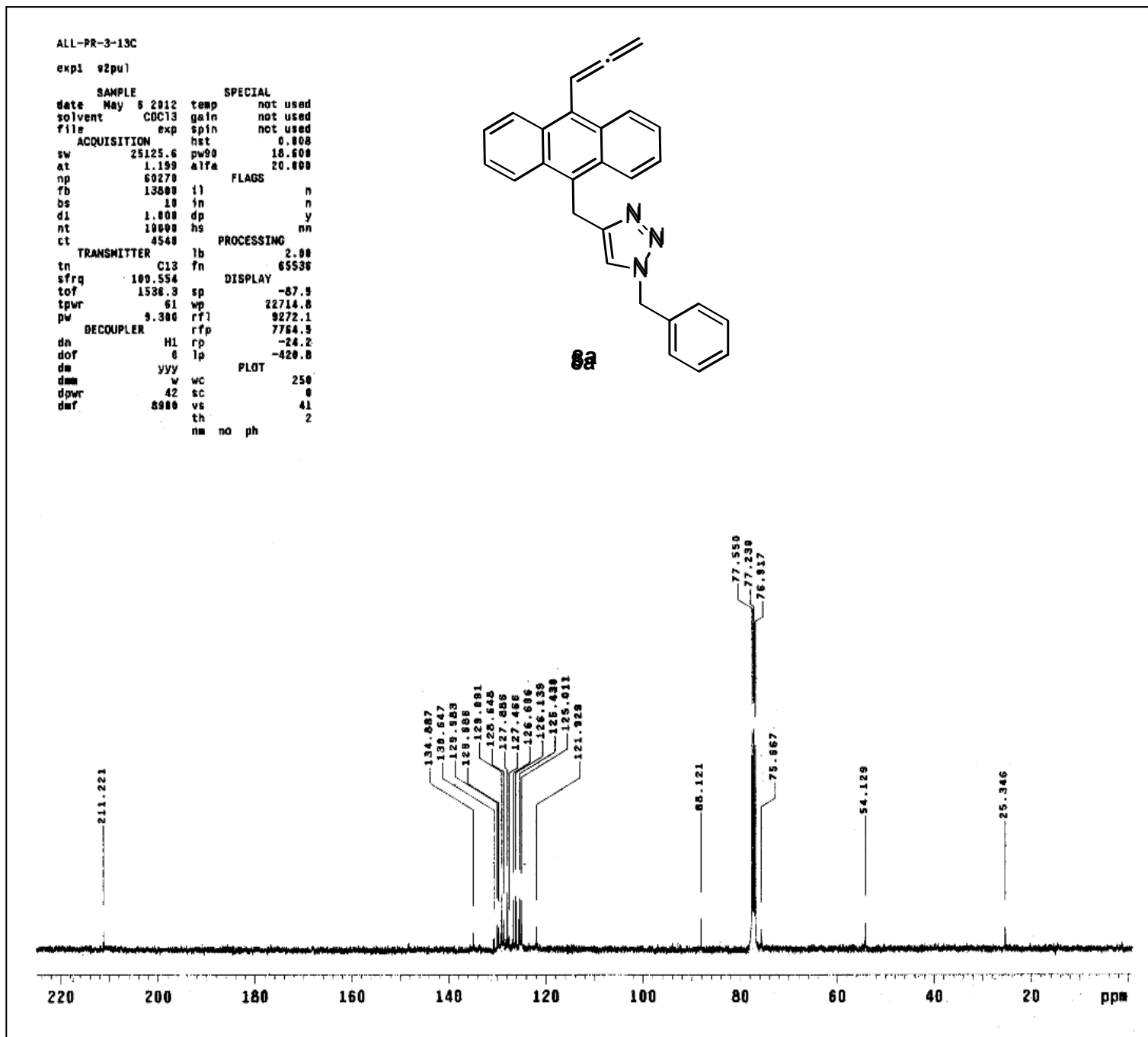
^{13}C NMR spectra of 5



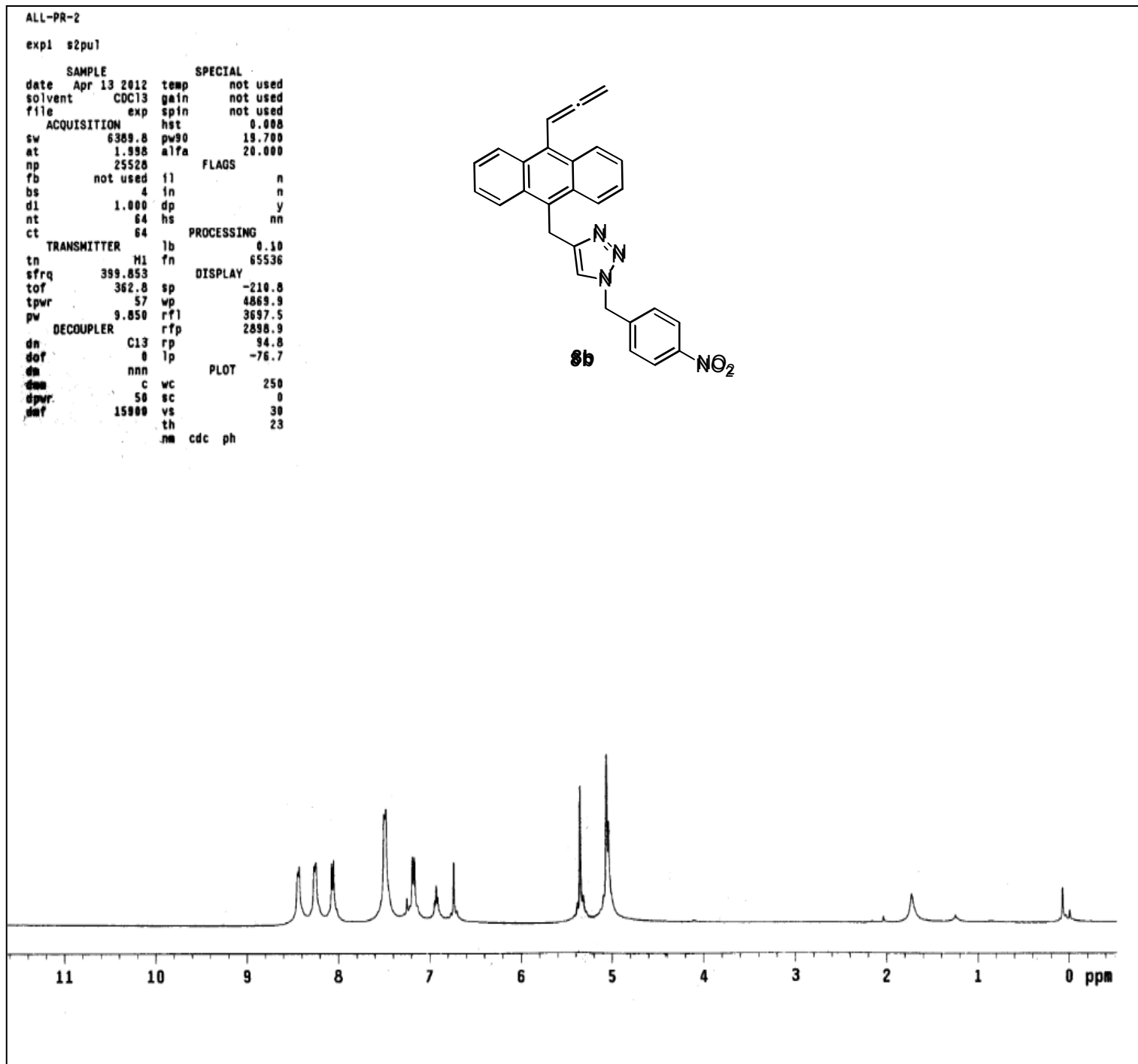
¹H NMR spectra of **8a**



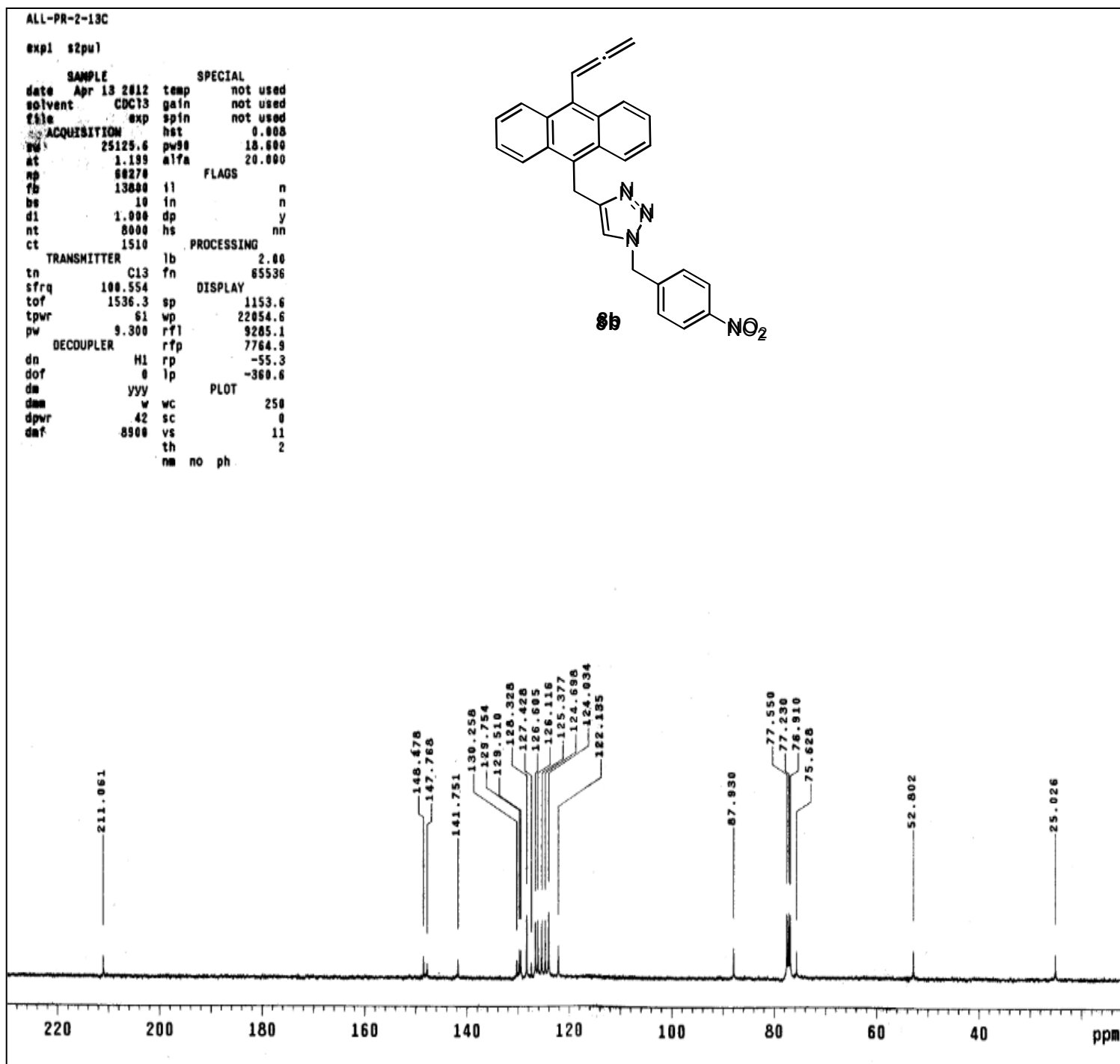
^{13}C NMR spectra of **8a**



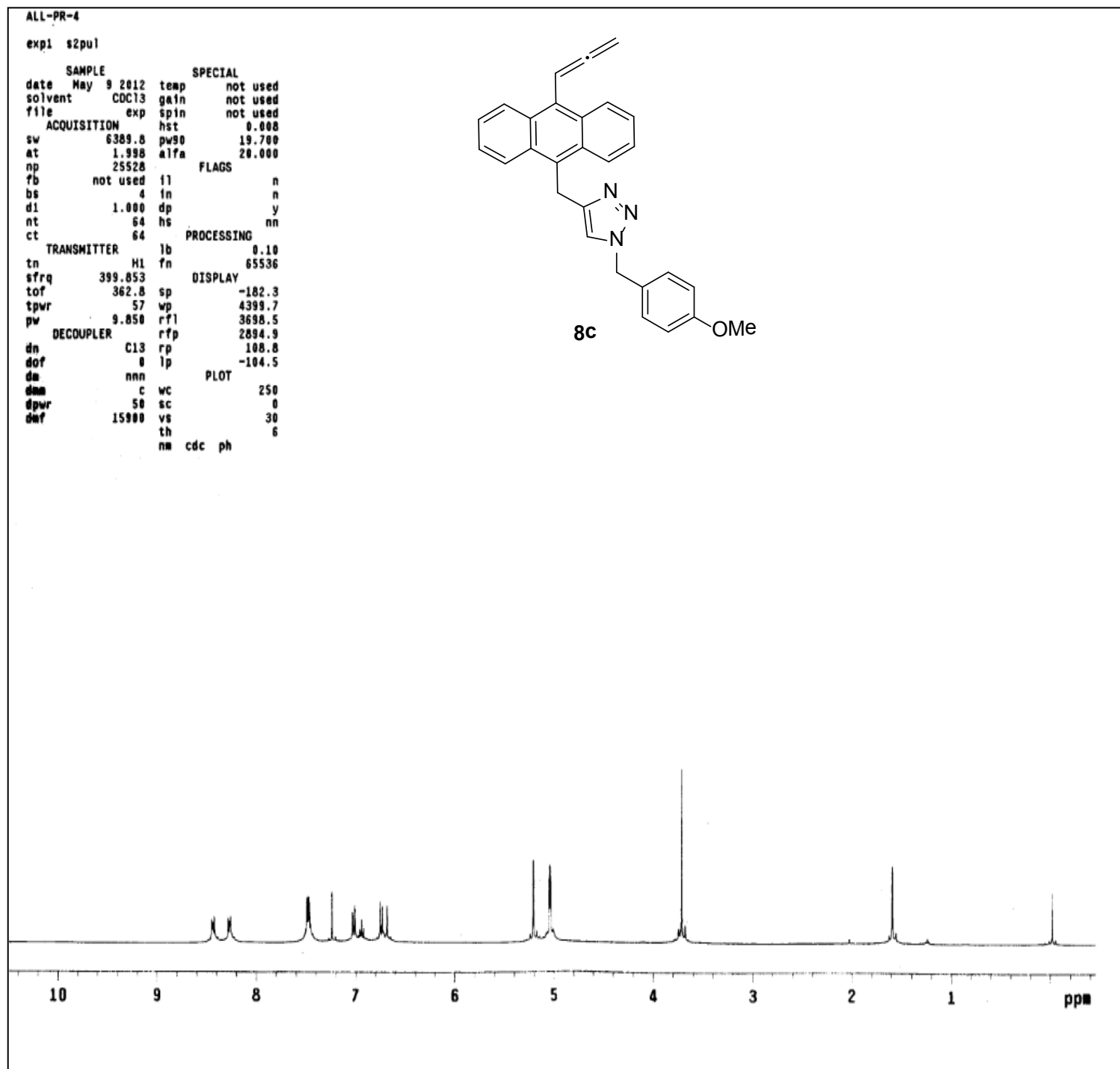
¹H NMR spectra of **8b**



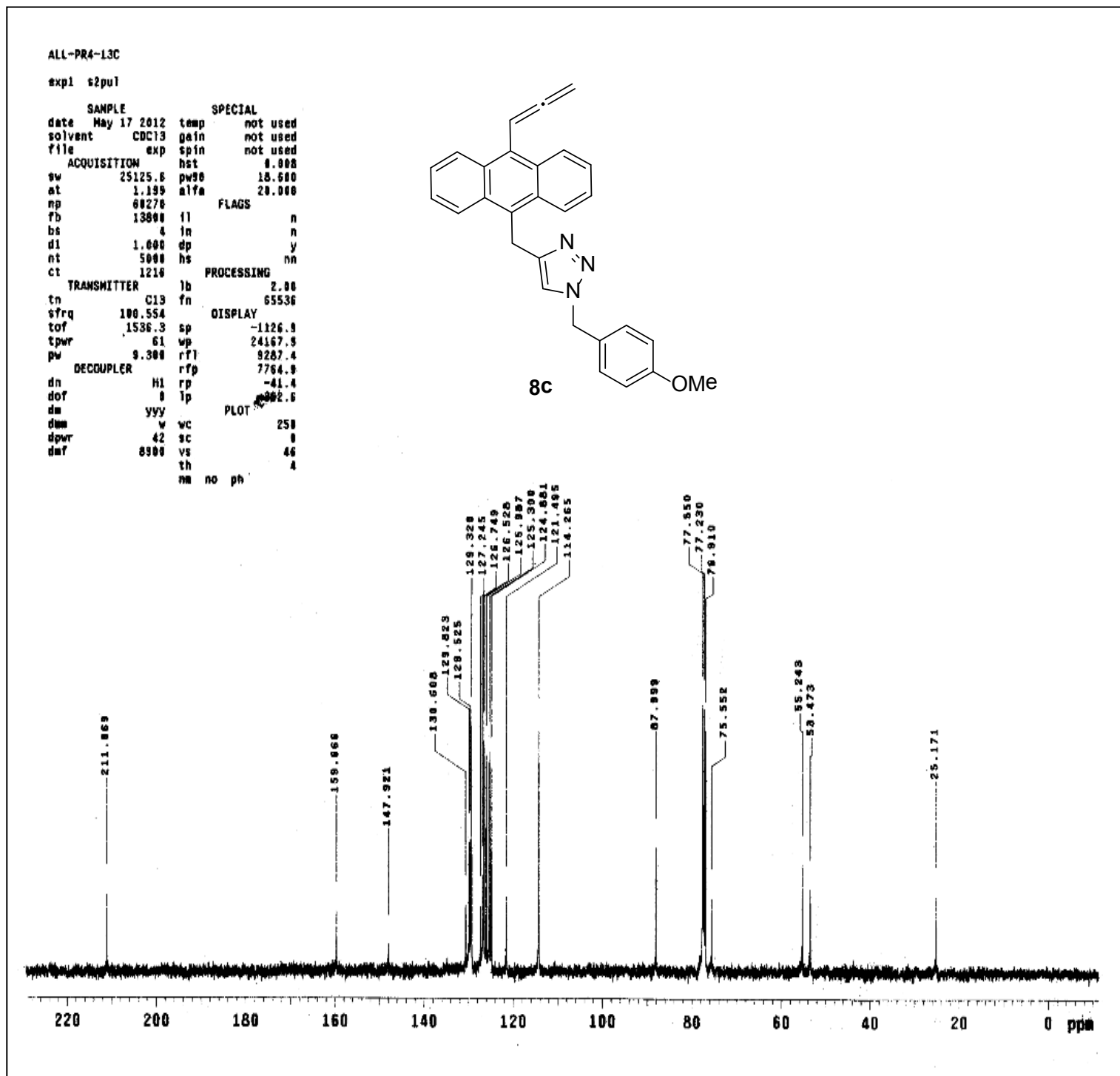
¹³C NMR spectra of **8b**



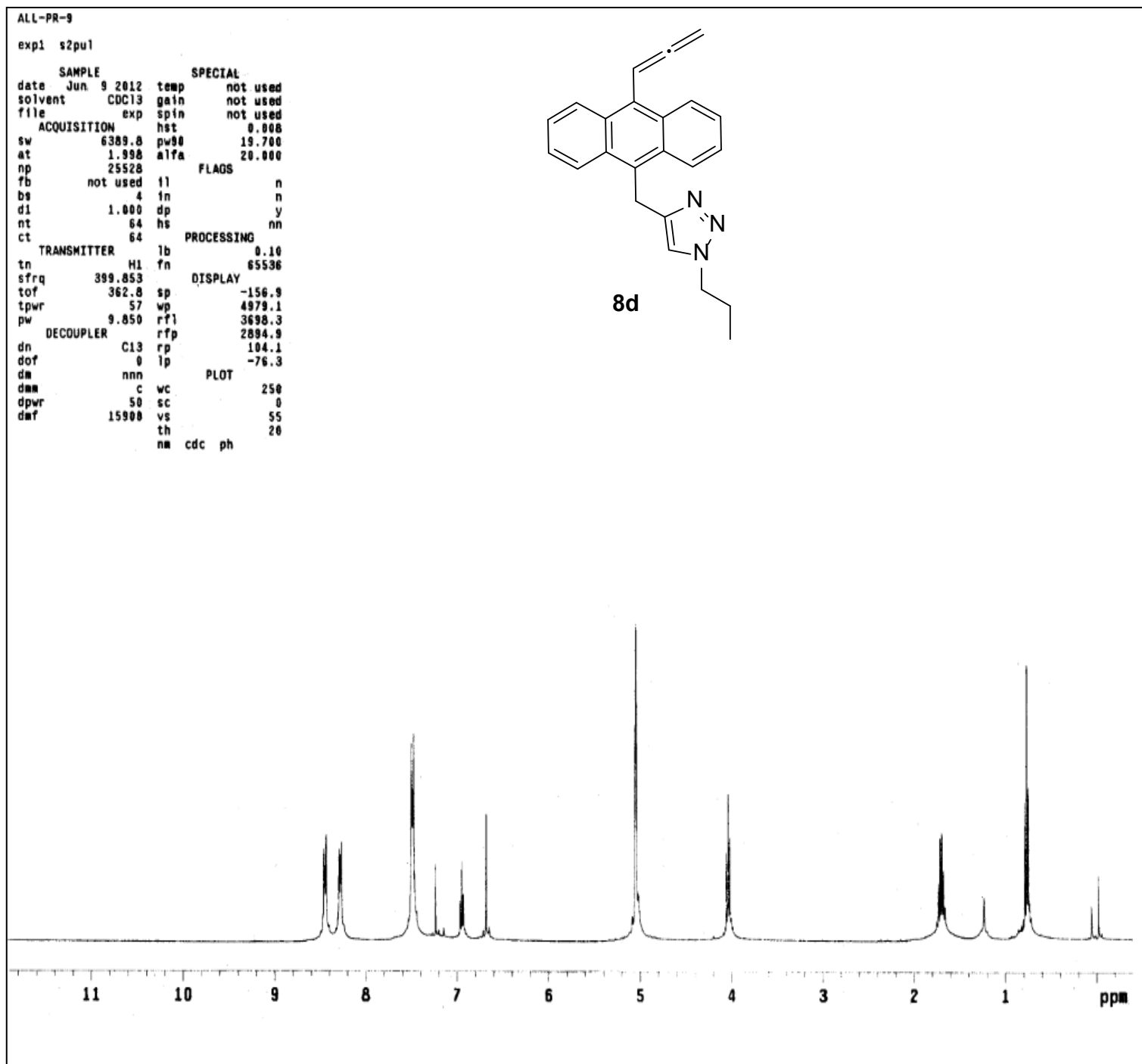
¹H NMR spectra of **8c**



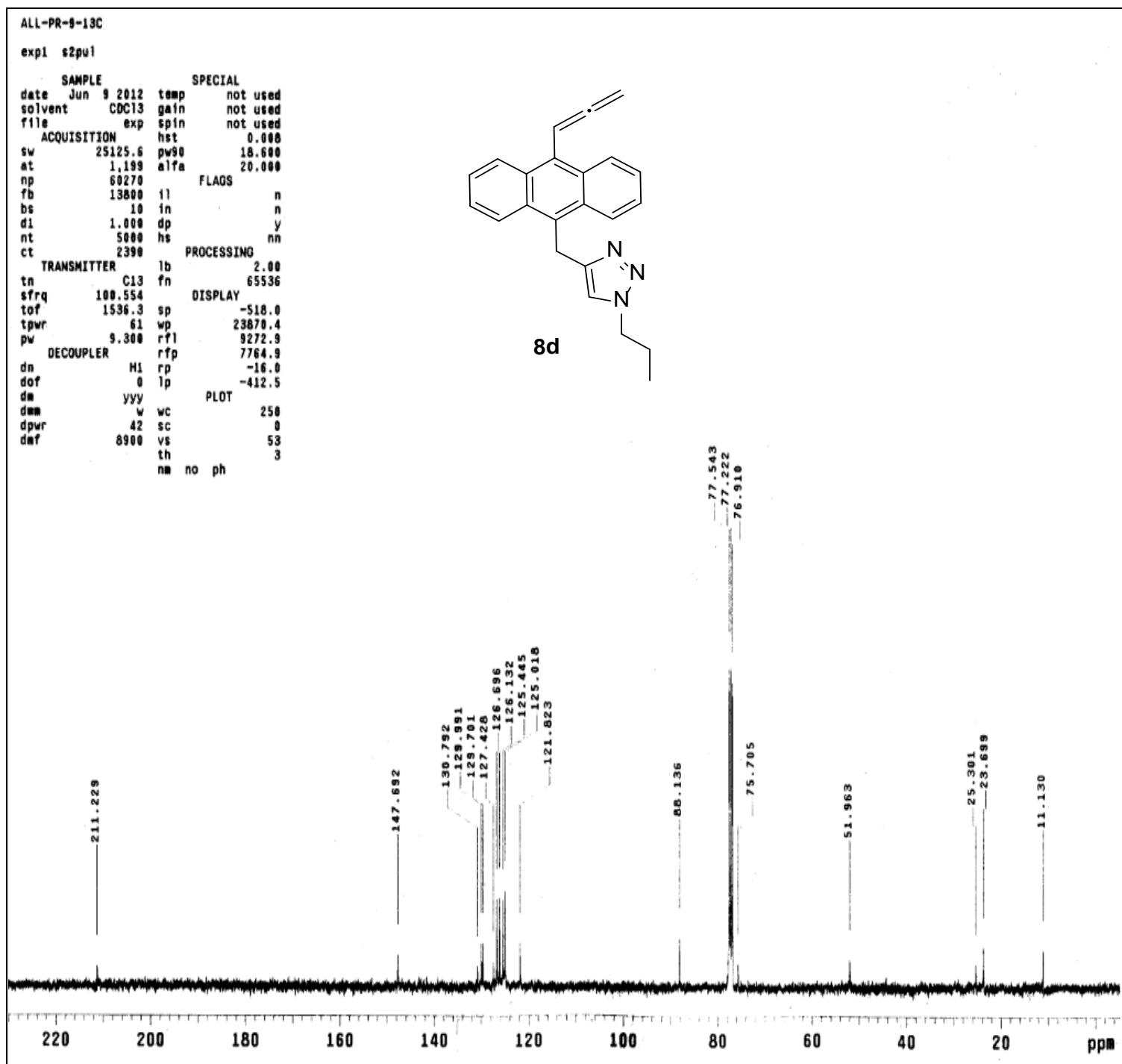
¹³C NMR spectra of 8c



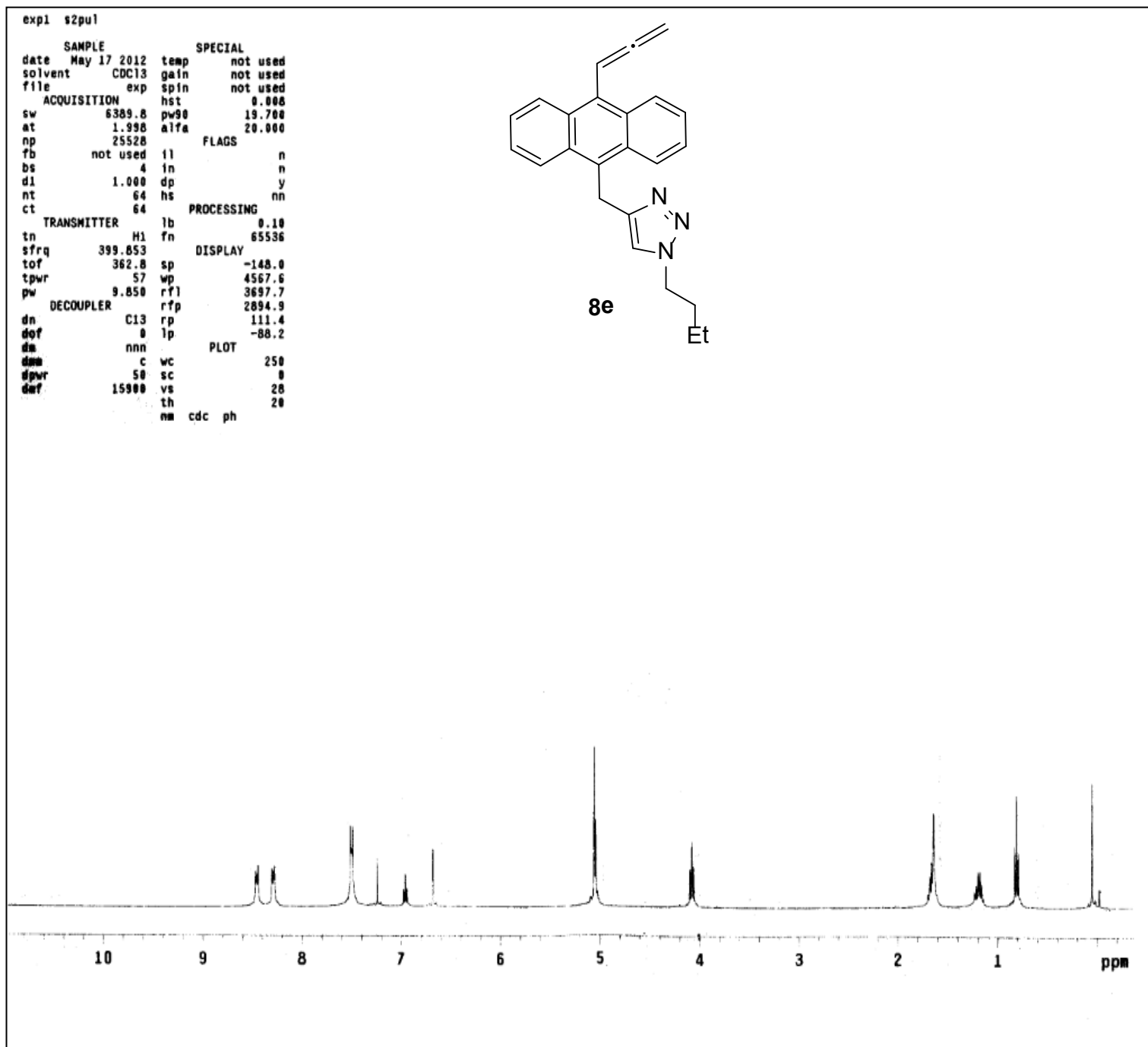
¹H NMR spectra of **8d**



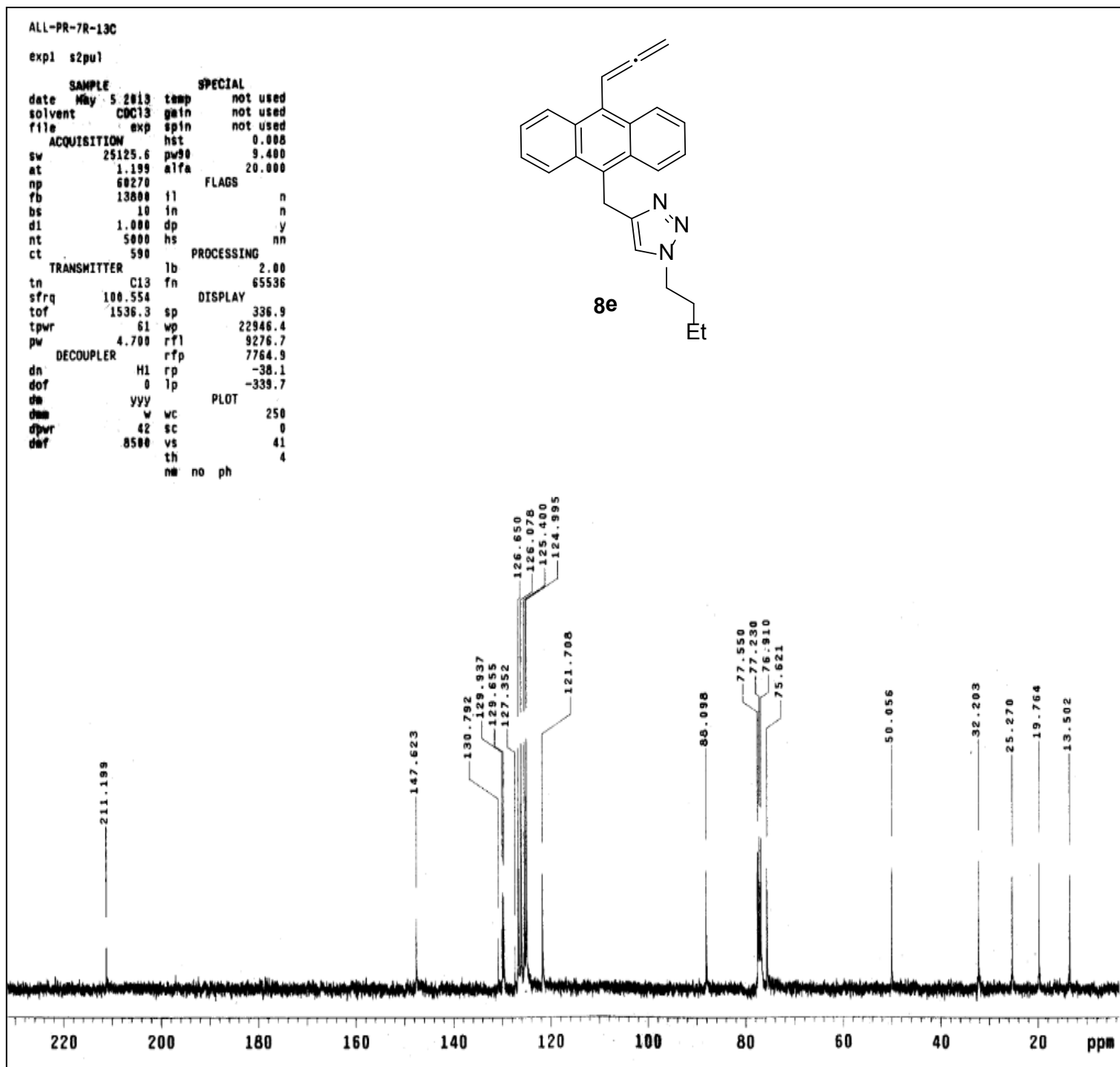
^{13}C NMR spectra of **8d**



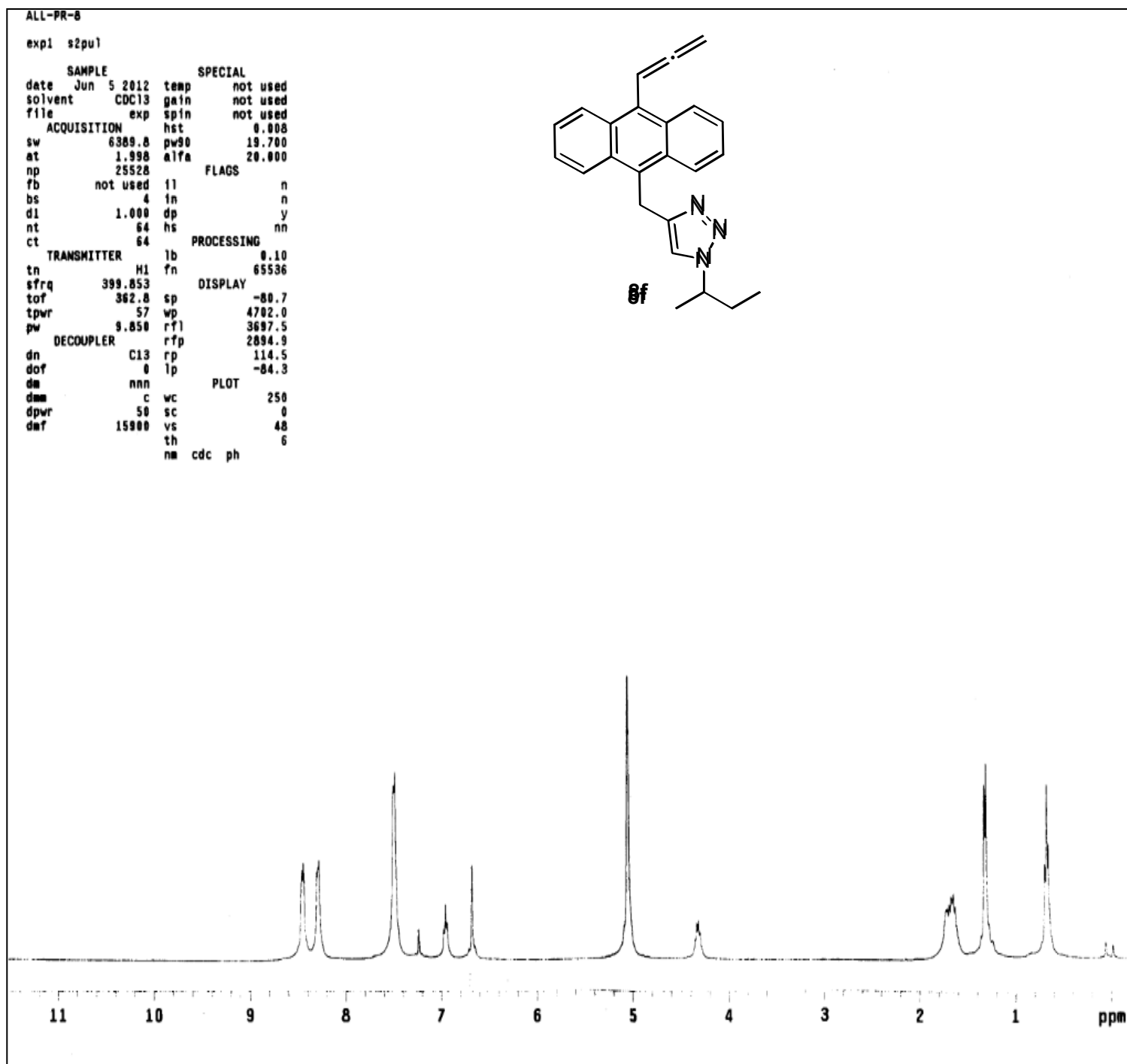
¹H NMR spectra of **8e**



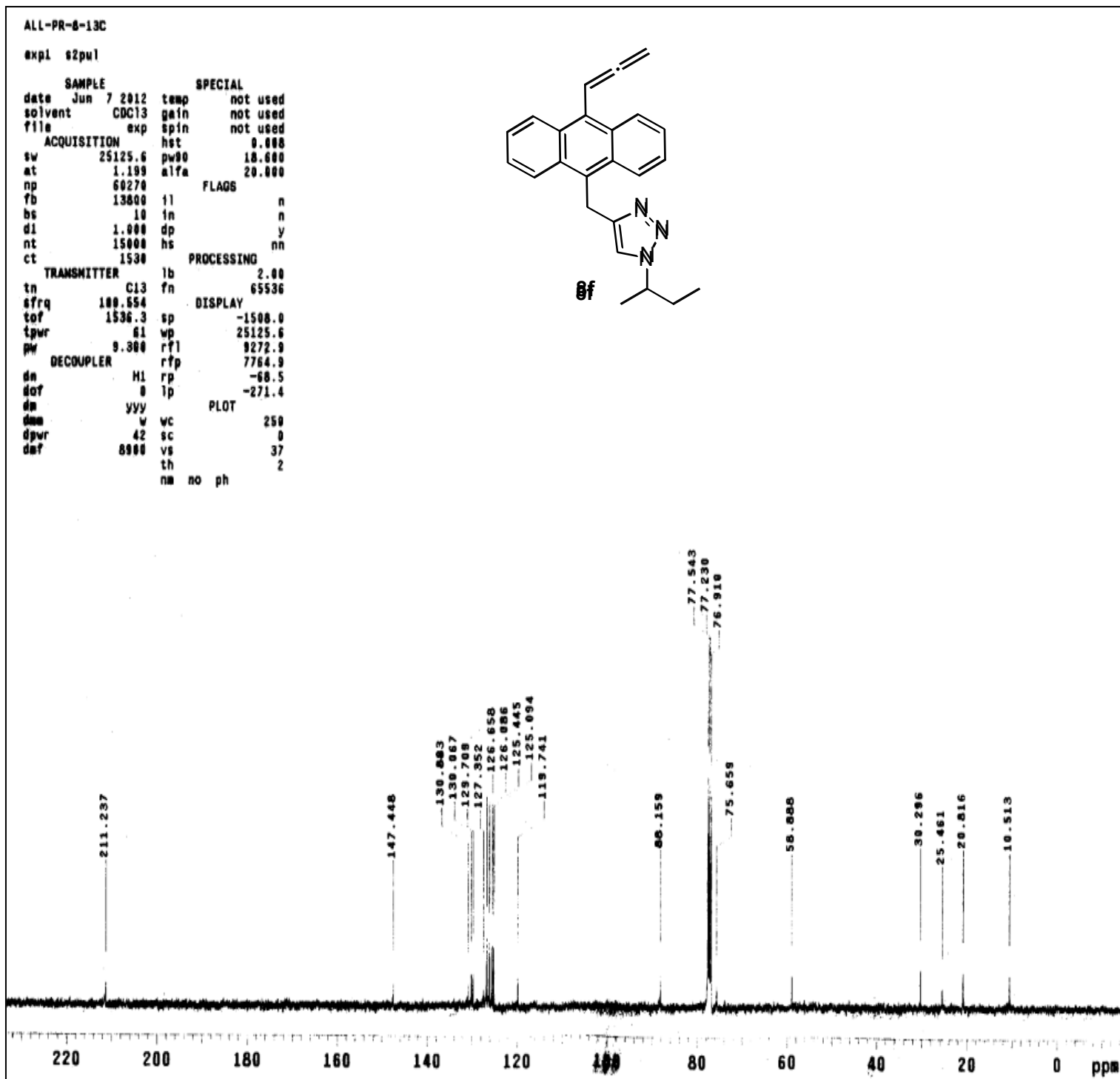
¹³C NMR spectra of **8e**



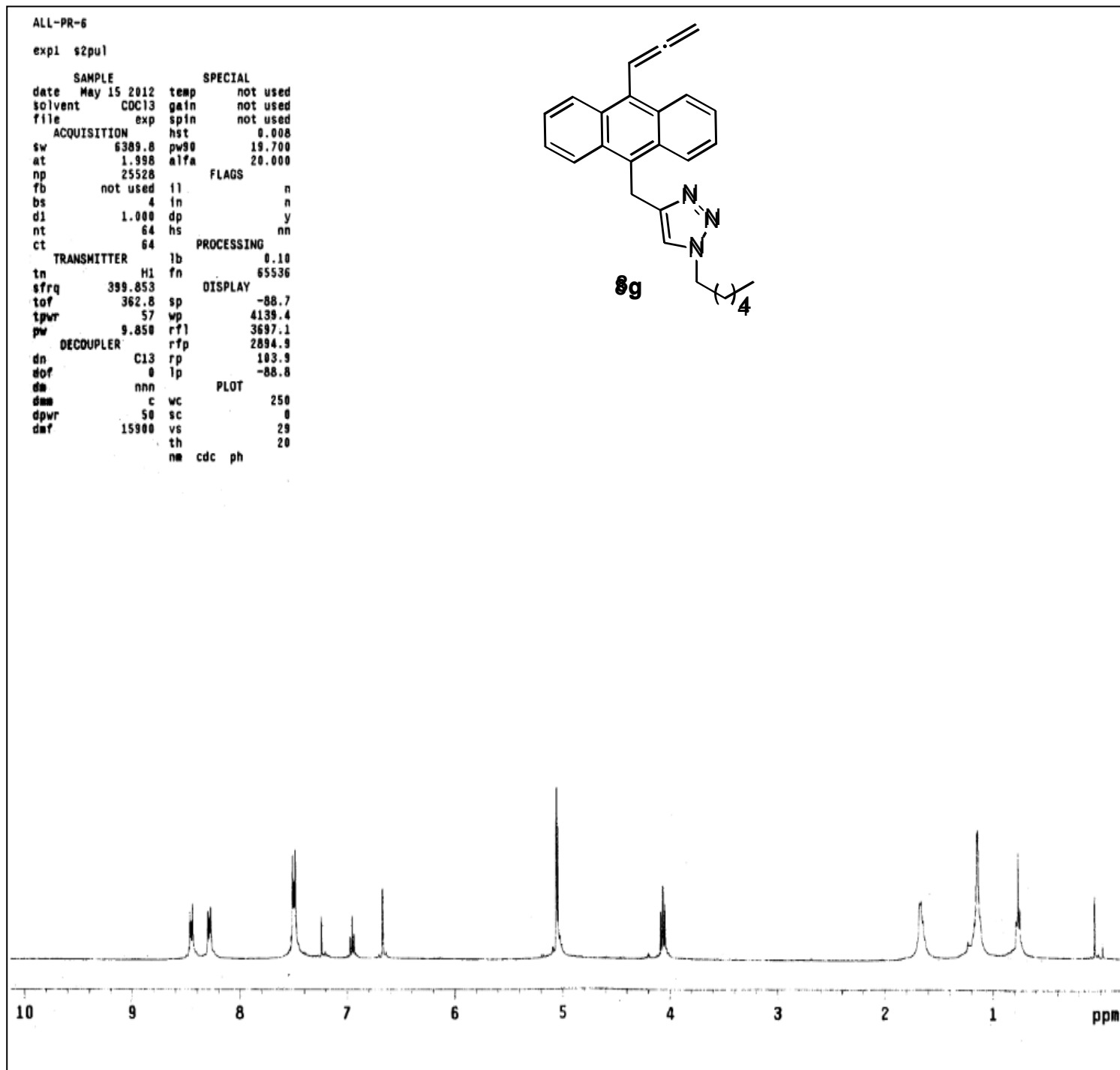
¹H NMR spectra of **8f**



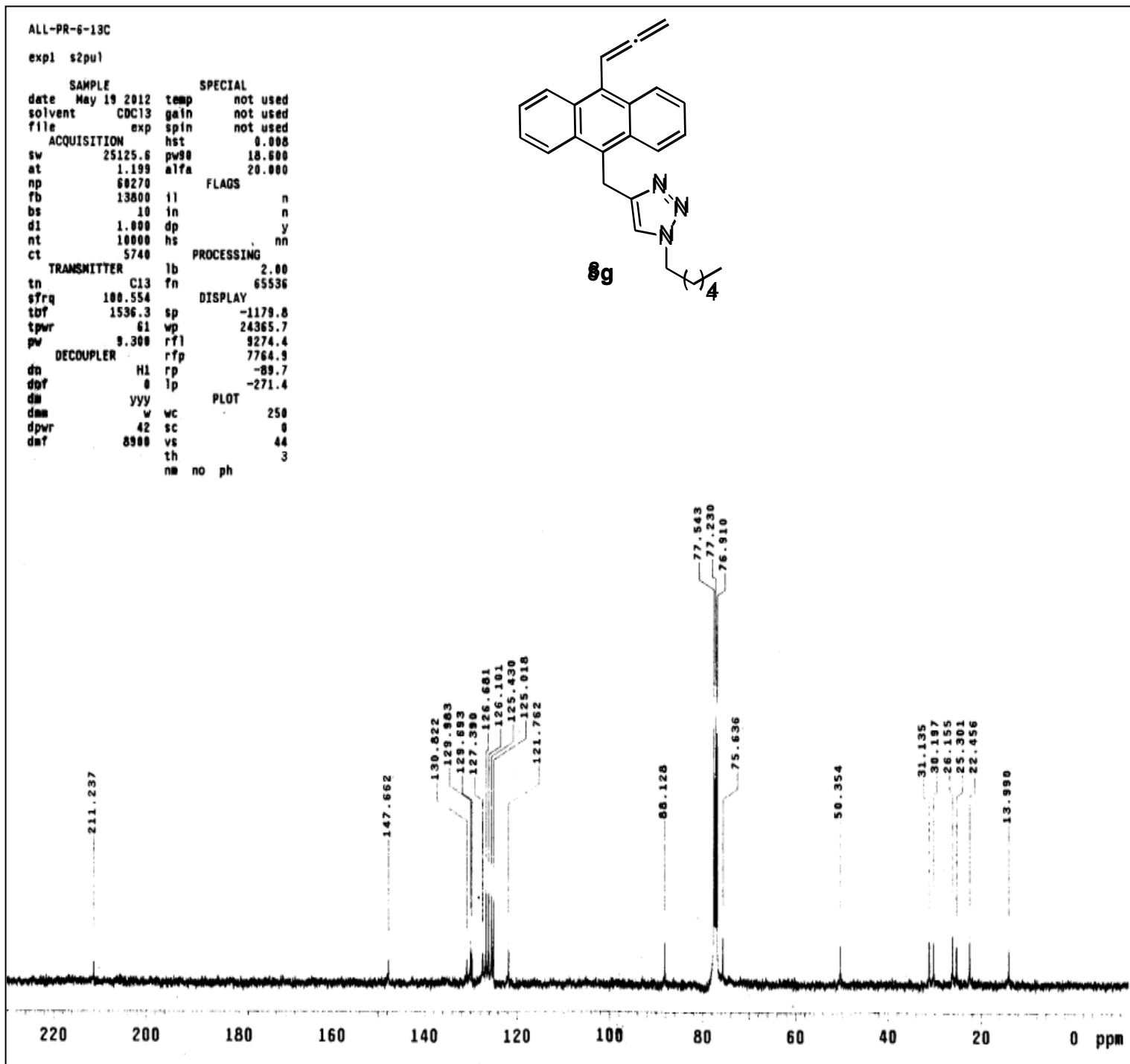
^{13}C NMR spectra of **8f**



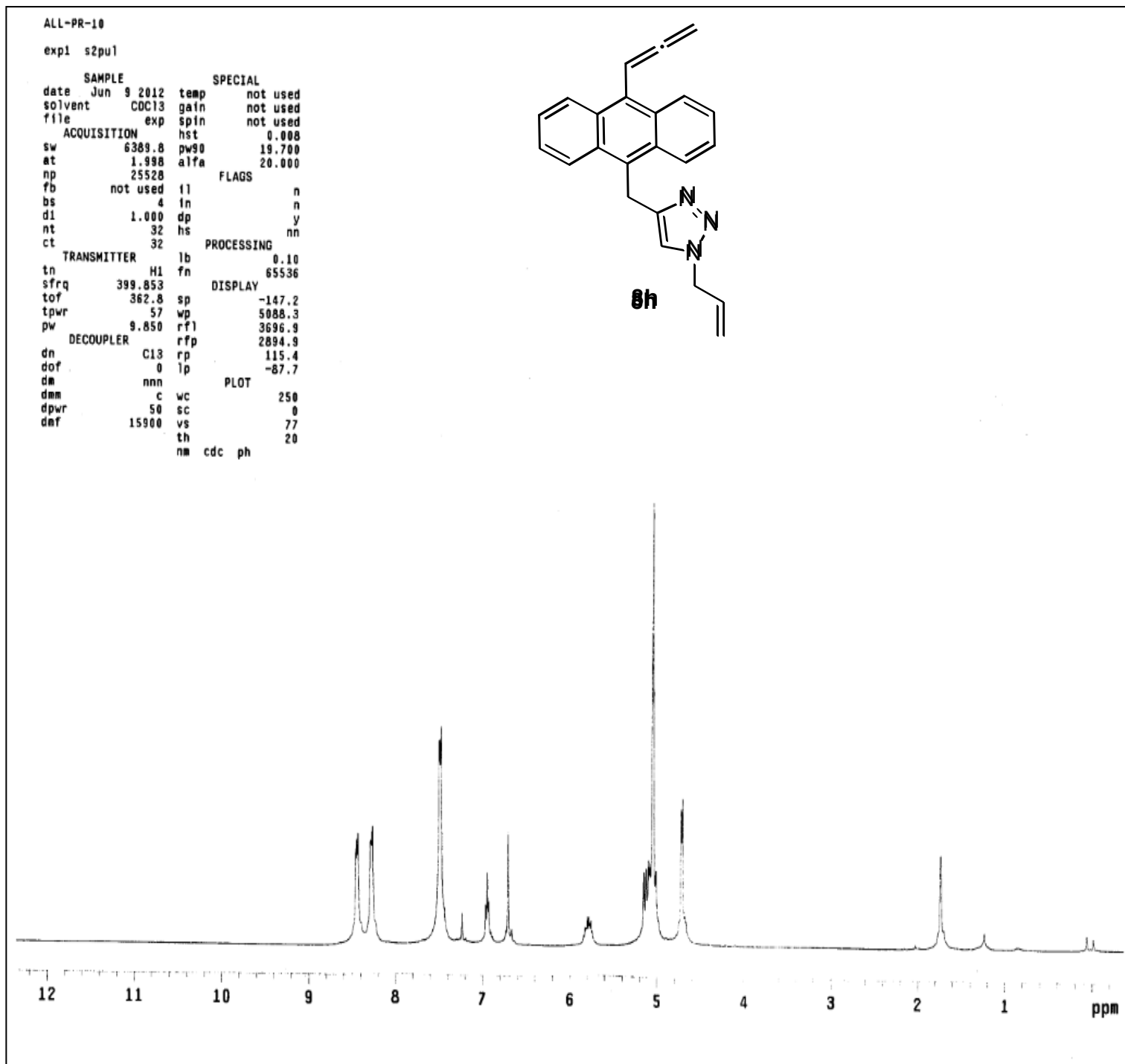
¹H NMR spectra of **8g**



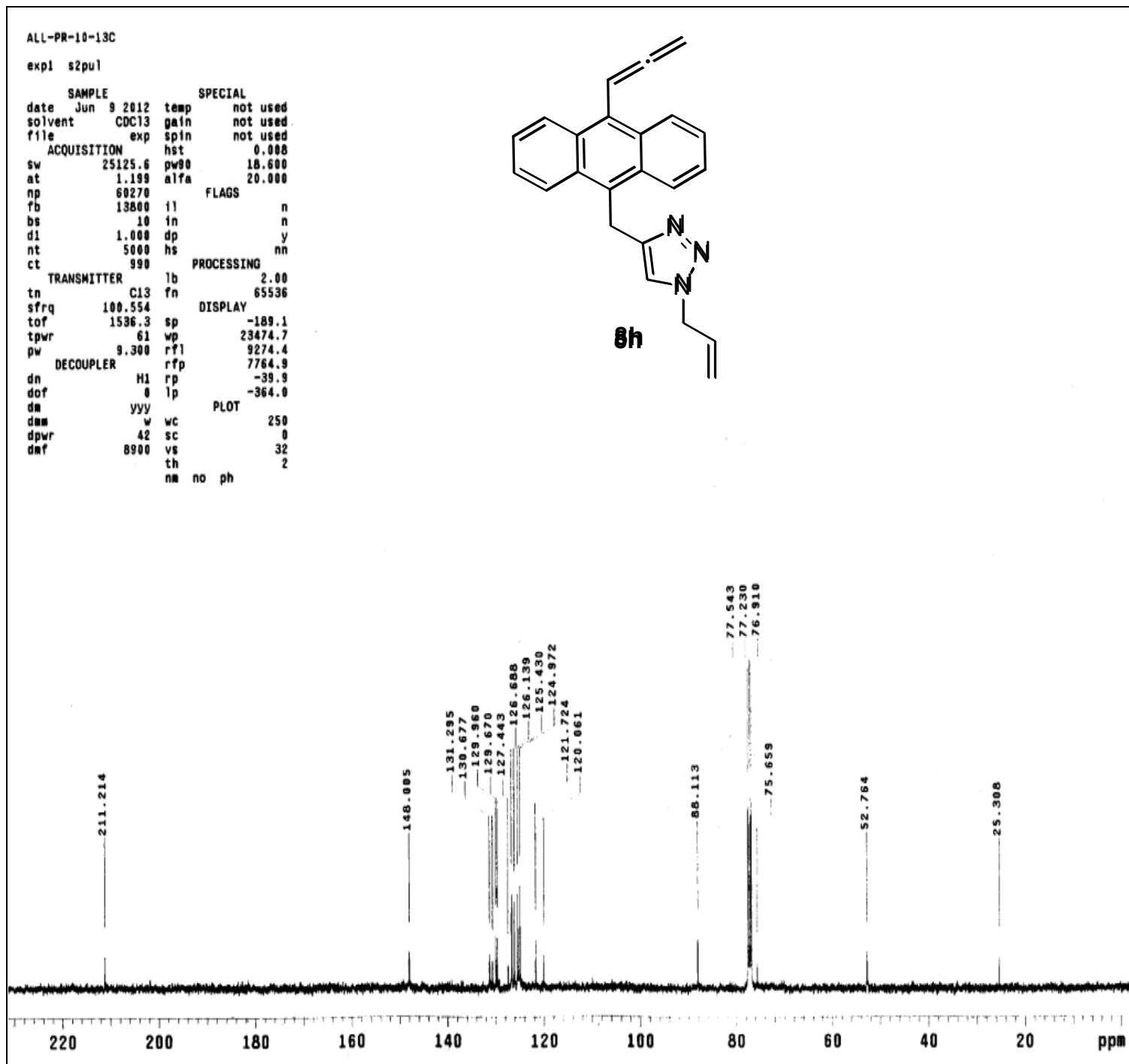
¹³C NMR spectra of **8g**



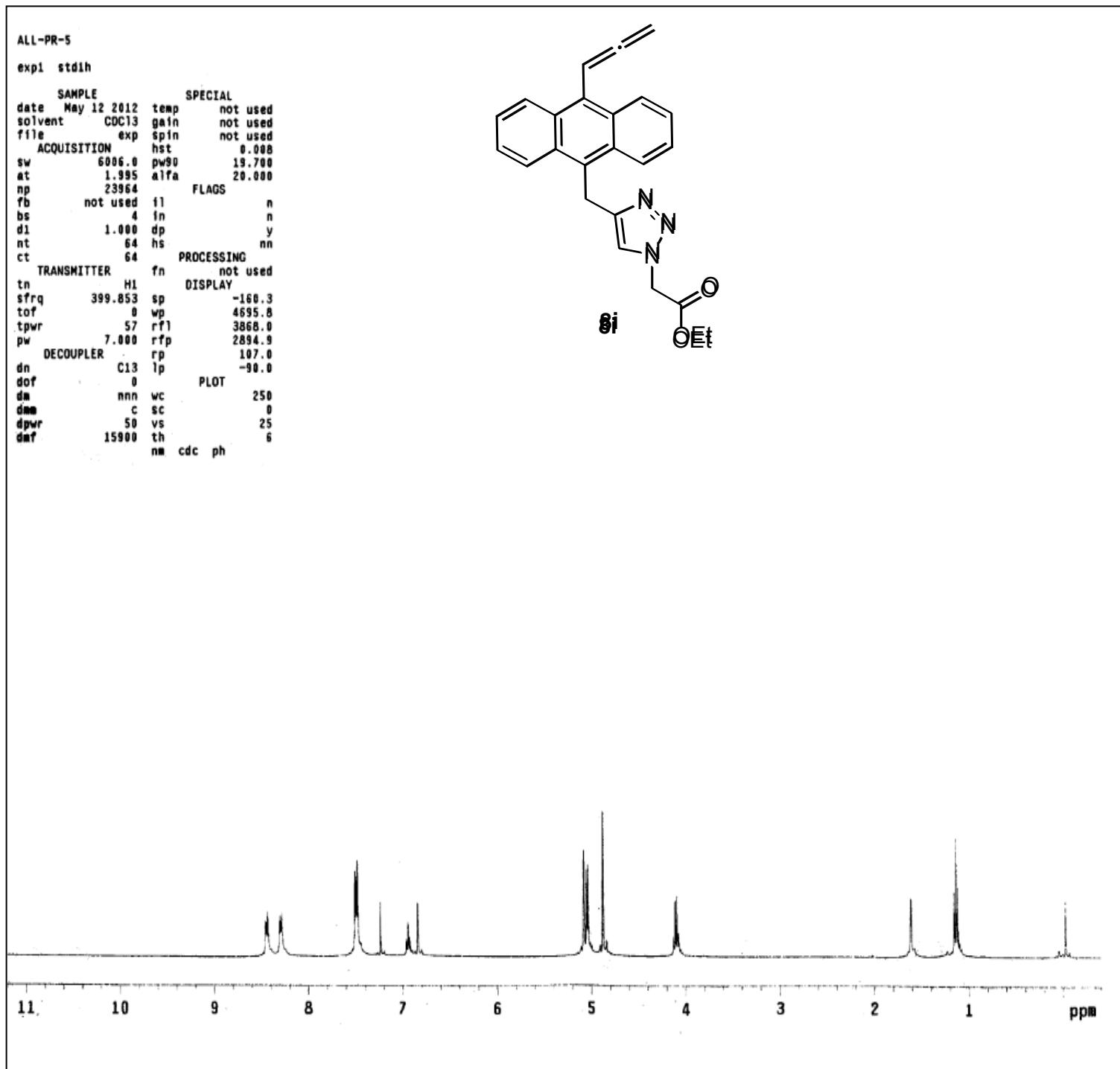
¹H NMR spectra of **8h**



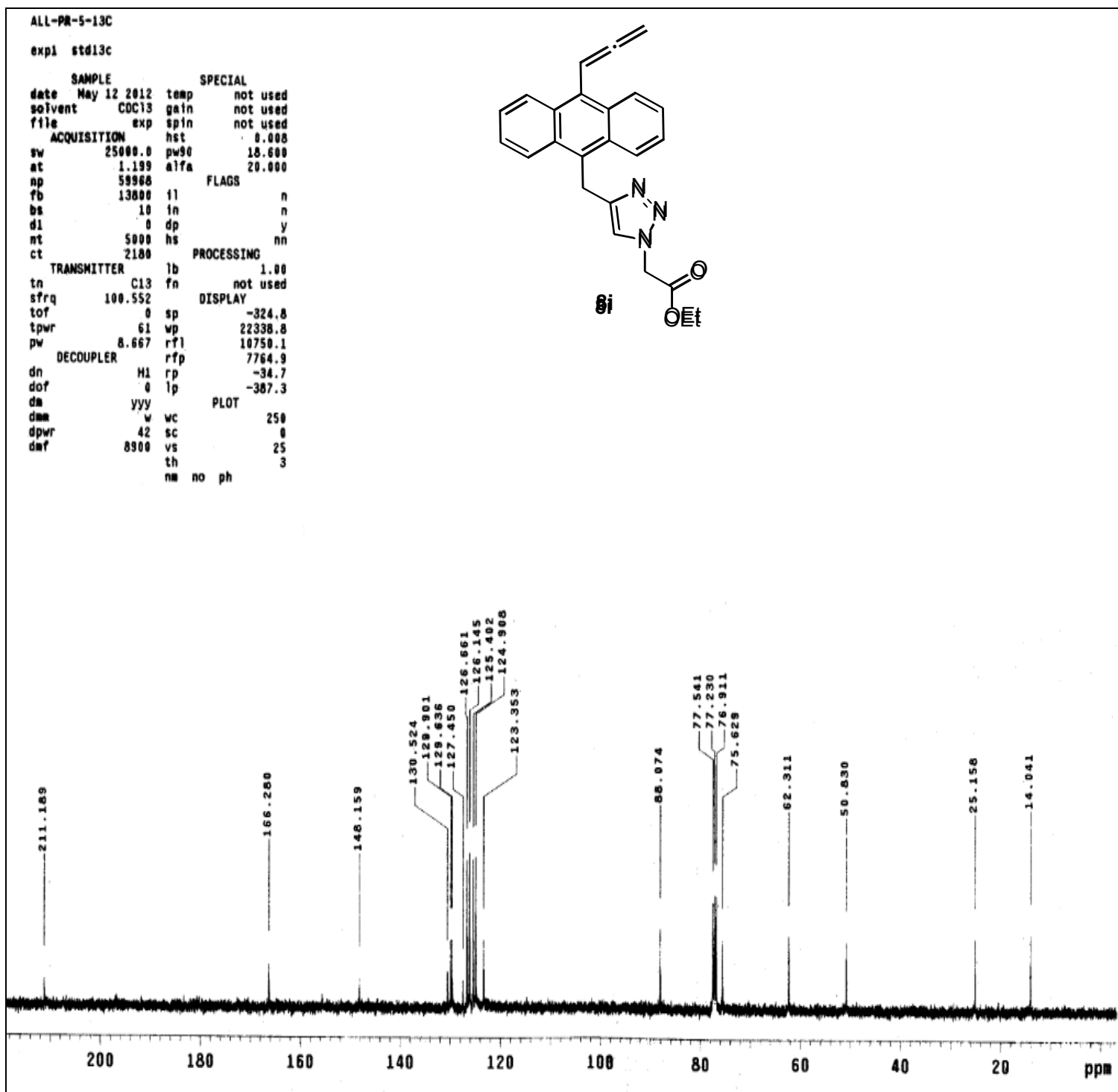
¹³C NMR spectra of **8h**



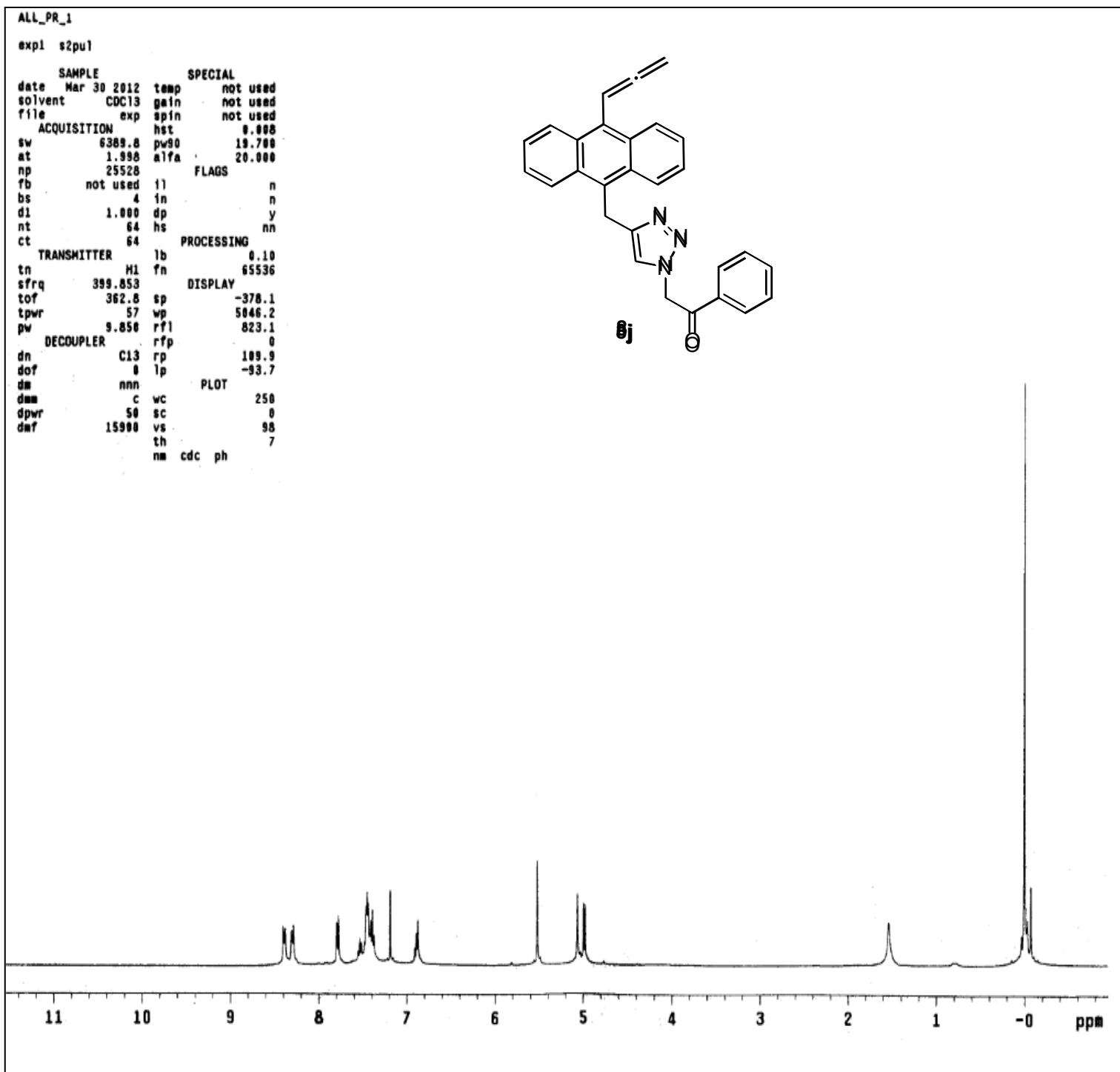
¹H NMR spectra of **8i**



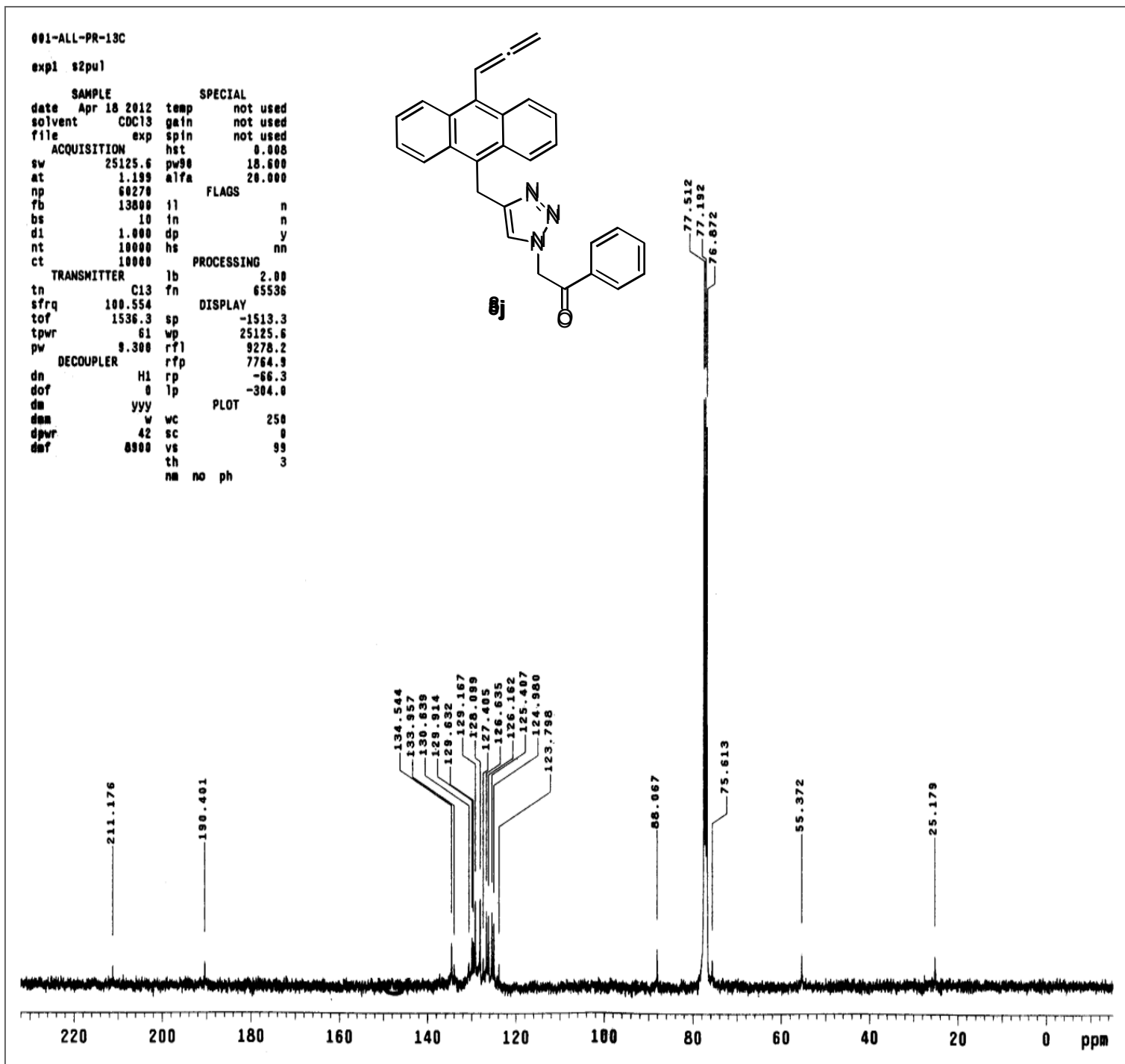
^{13}C NMR spectra of **8i**



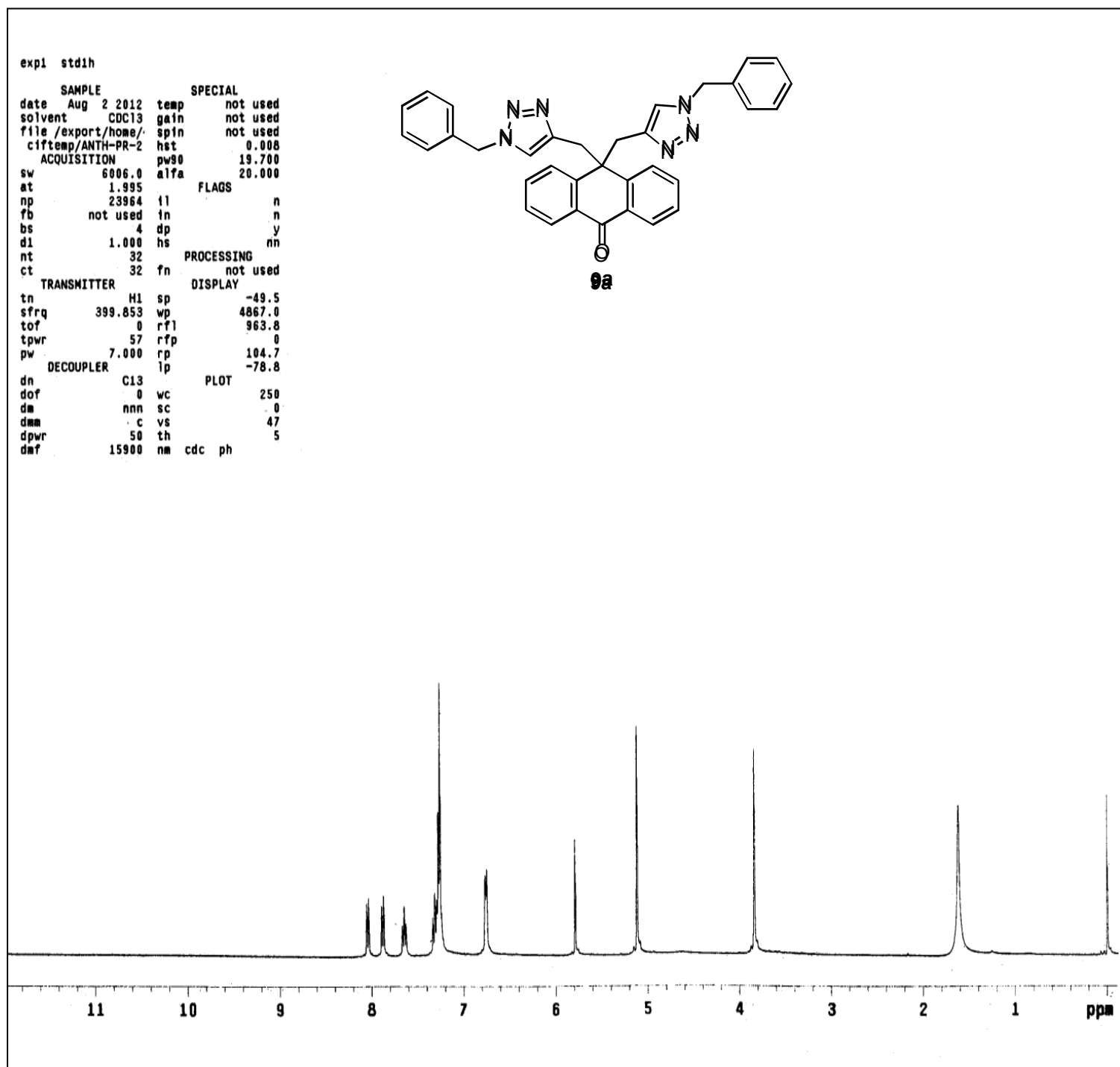
¹H NMR spectra of **8j**



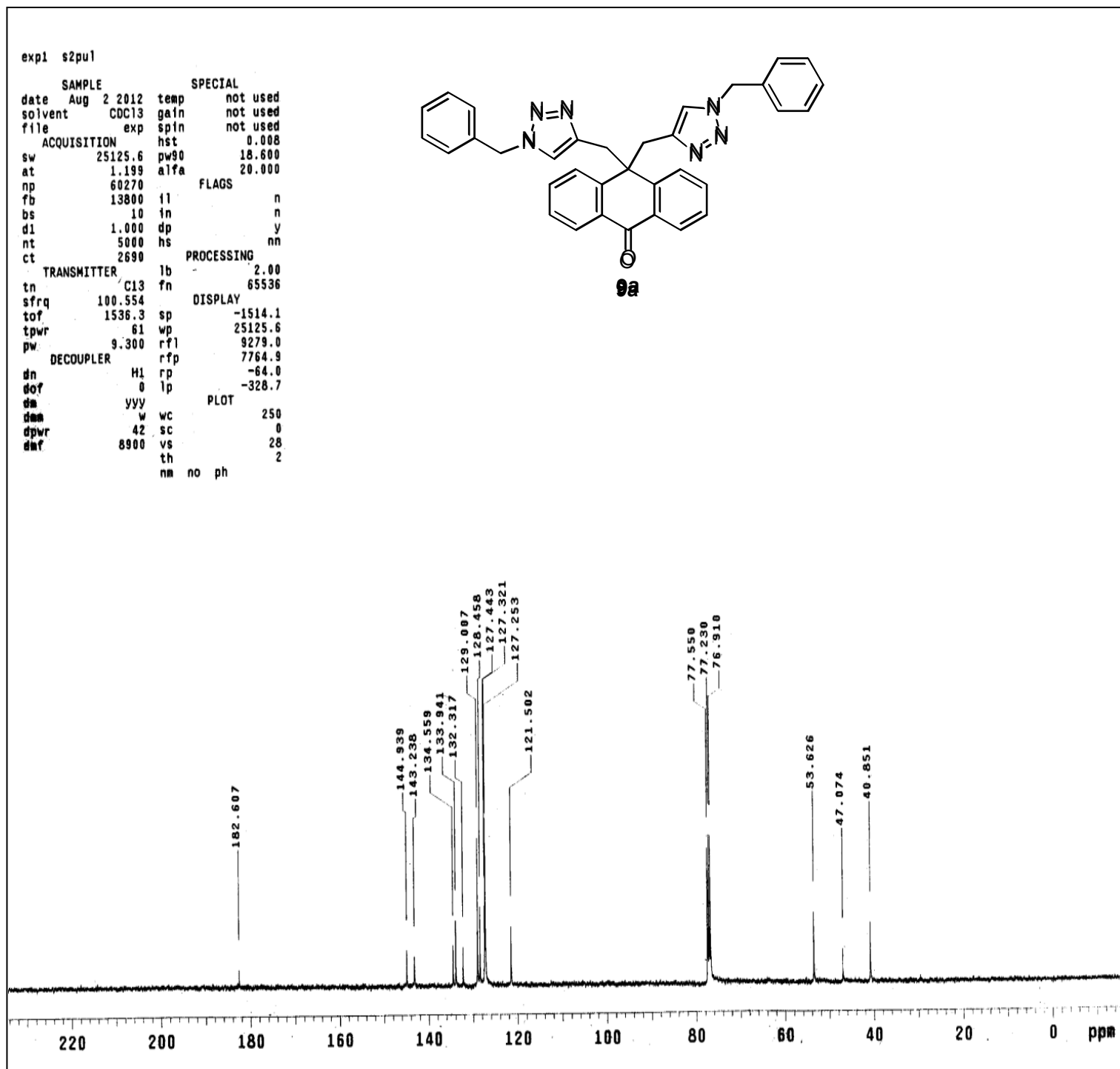
^{13}C NMR spectra of **8j**



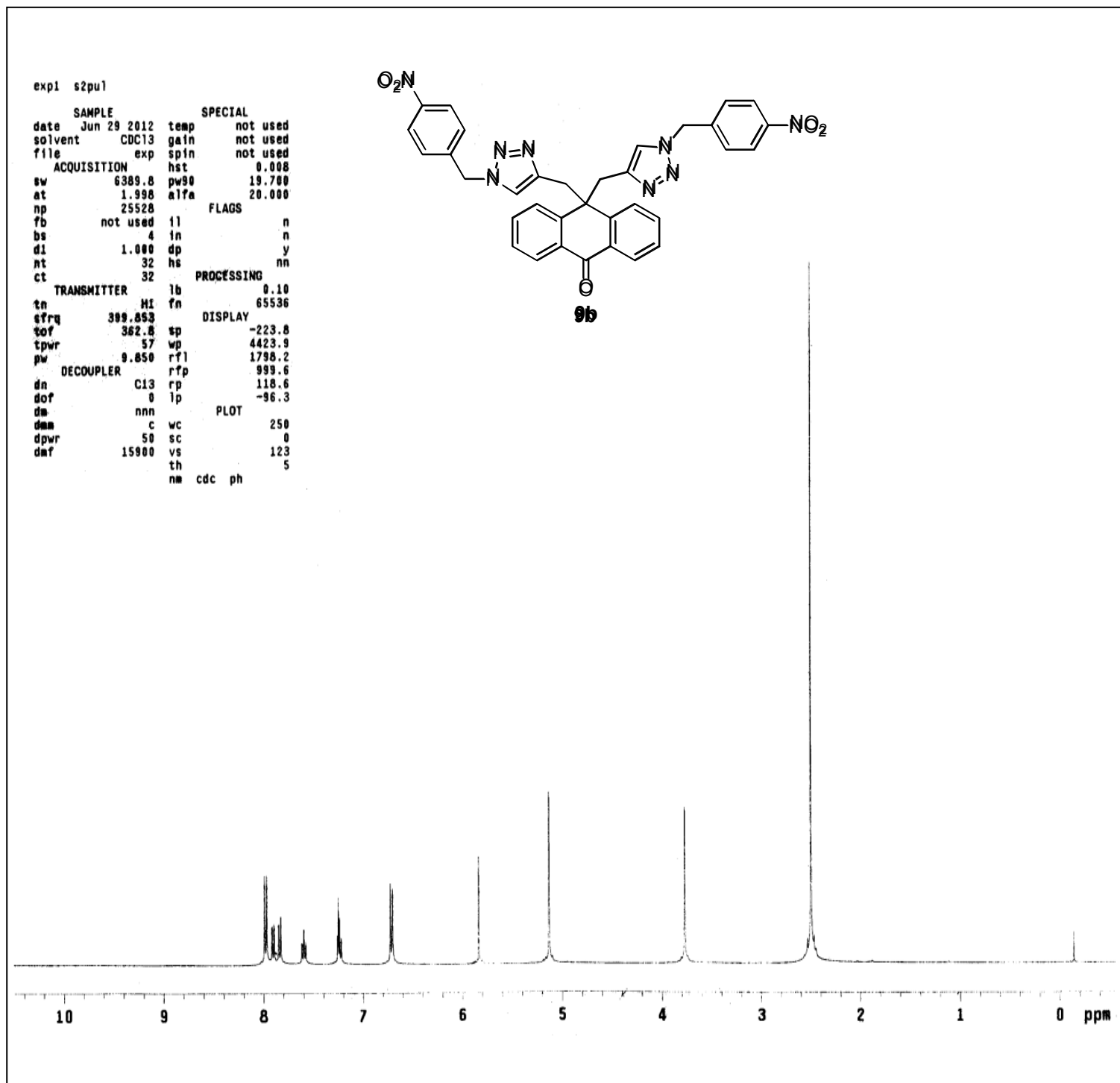
¹H NMR spectra of 9a



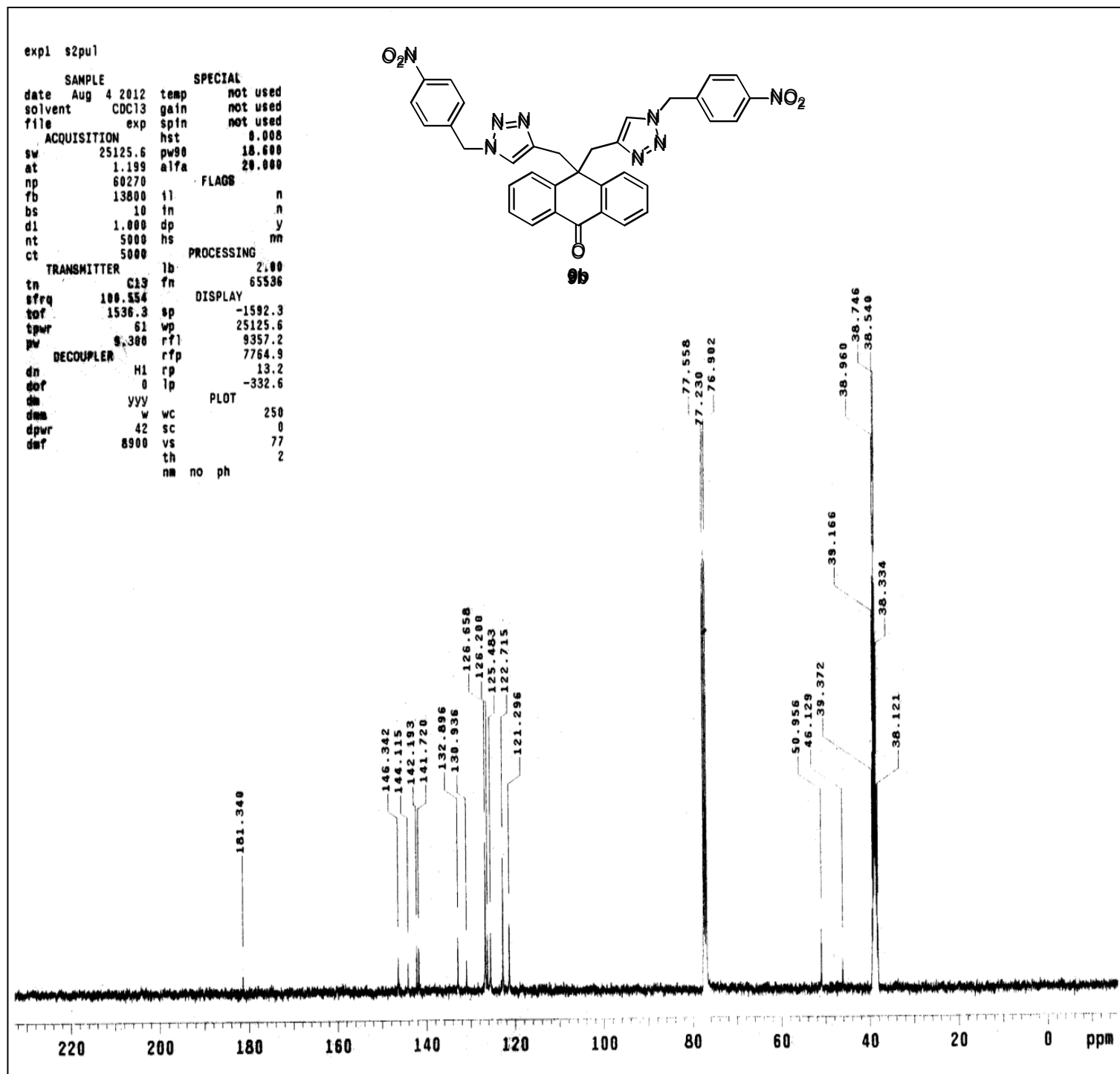
¹³C NMR spectra of 9a



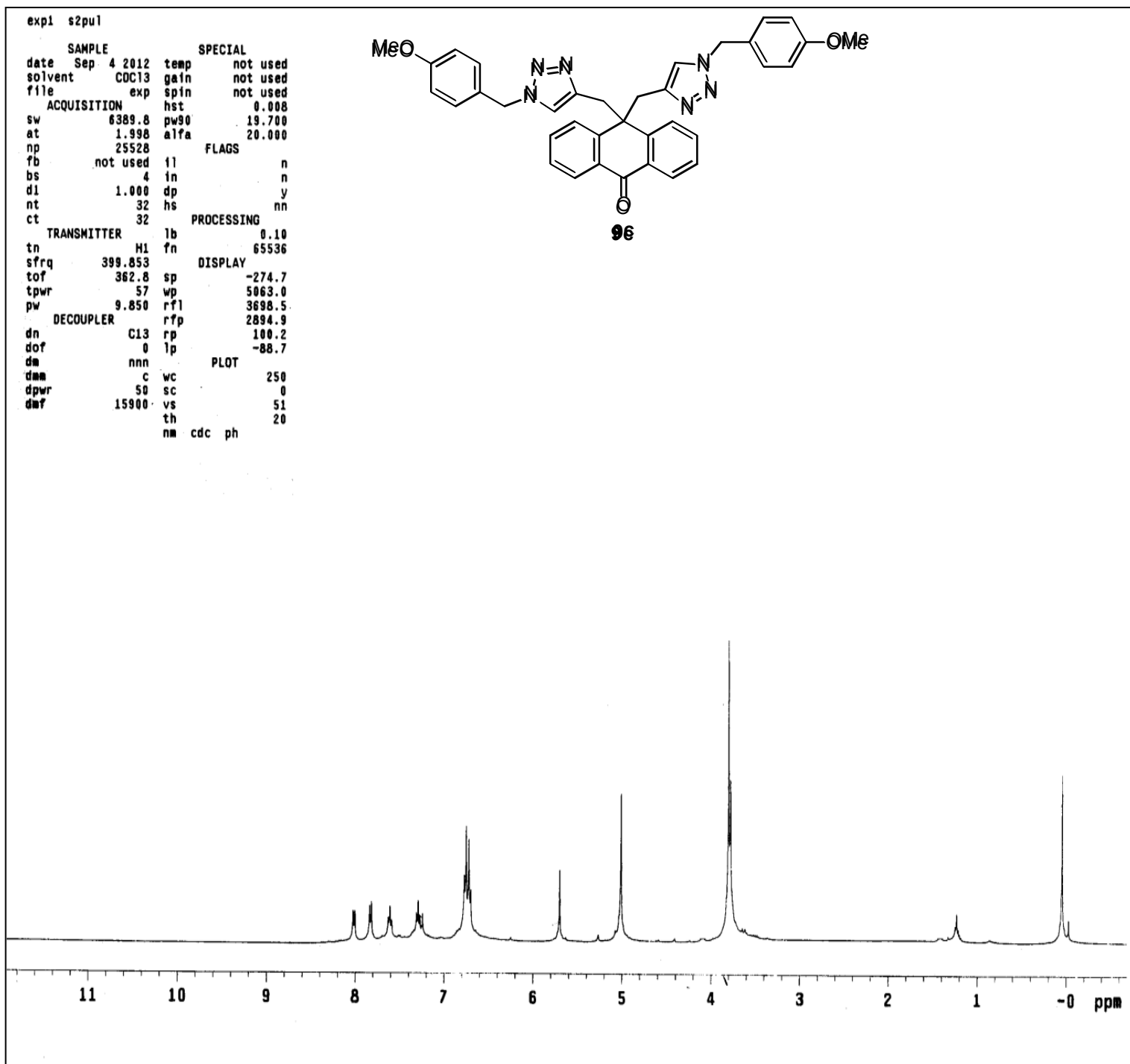
¹H NMR spectra of **9b**



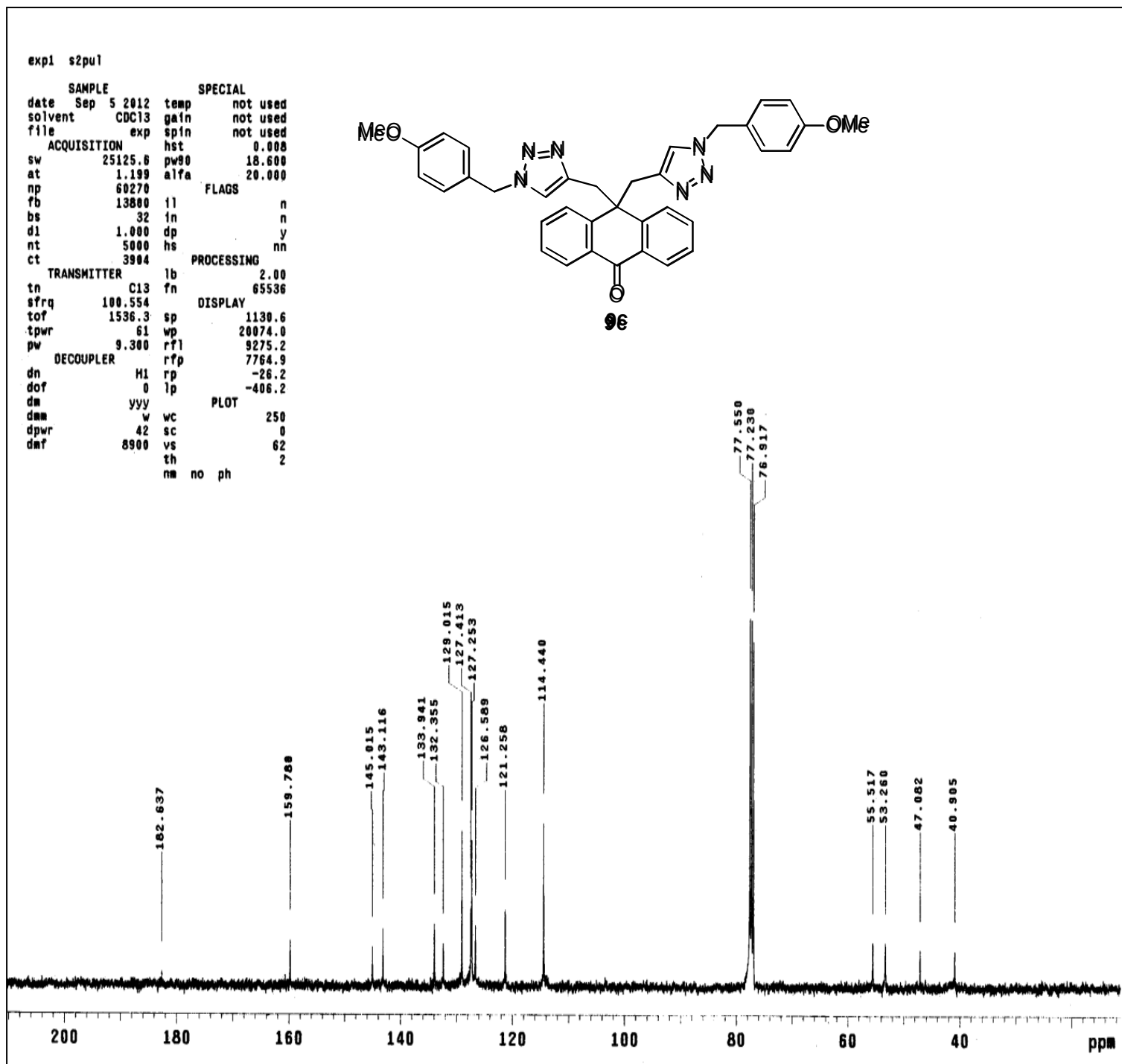
¹³C NMR spectra of 9b



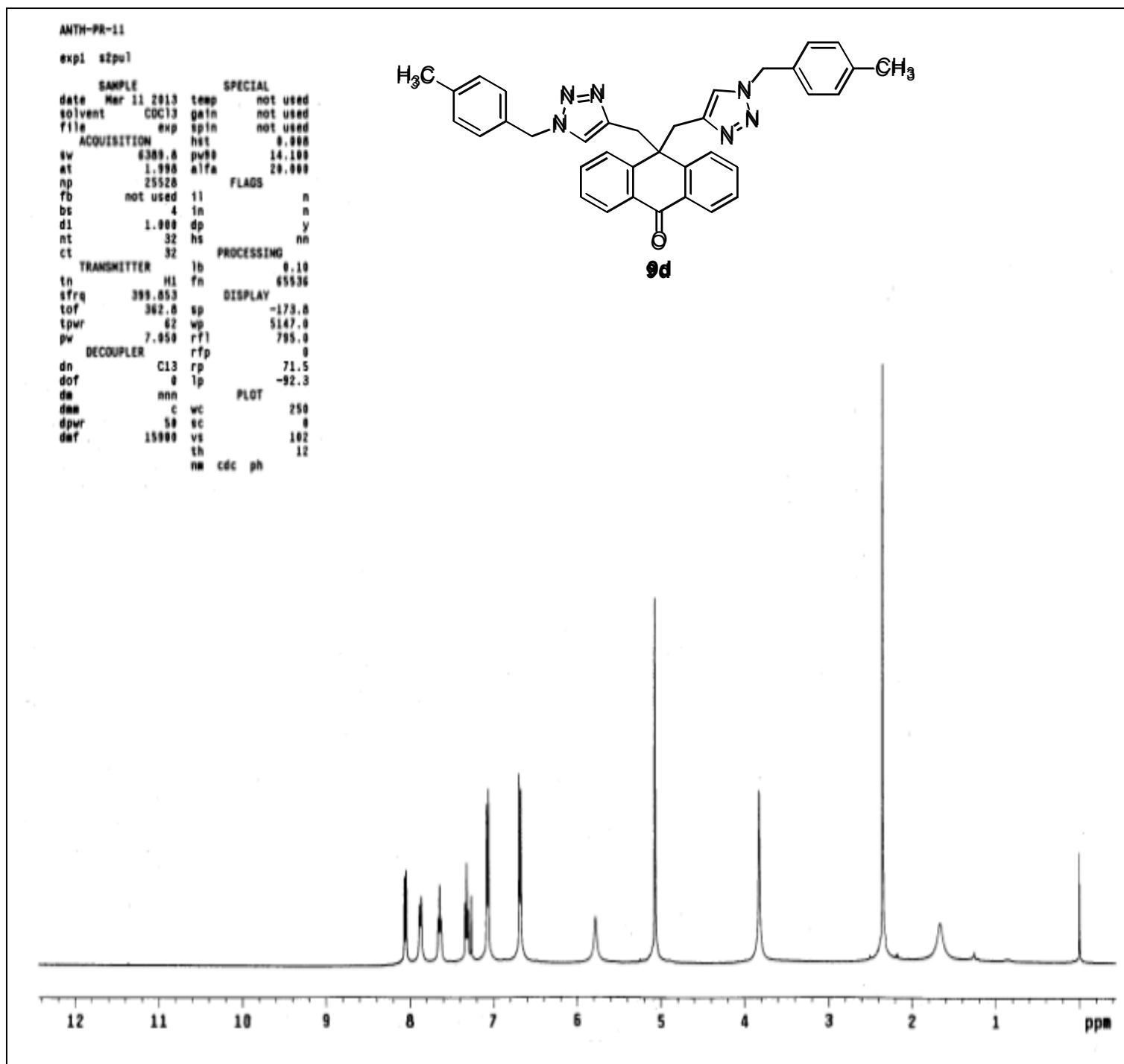
¹H NMR spectra of 9c



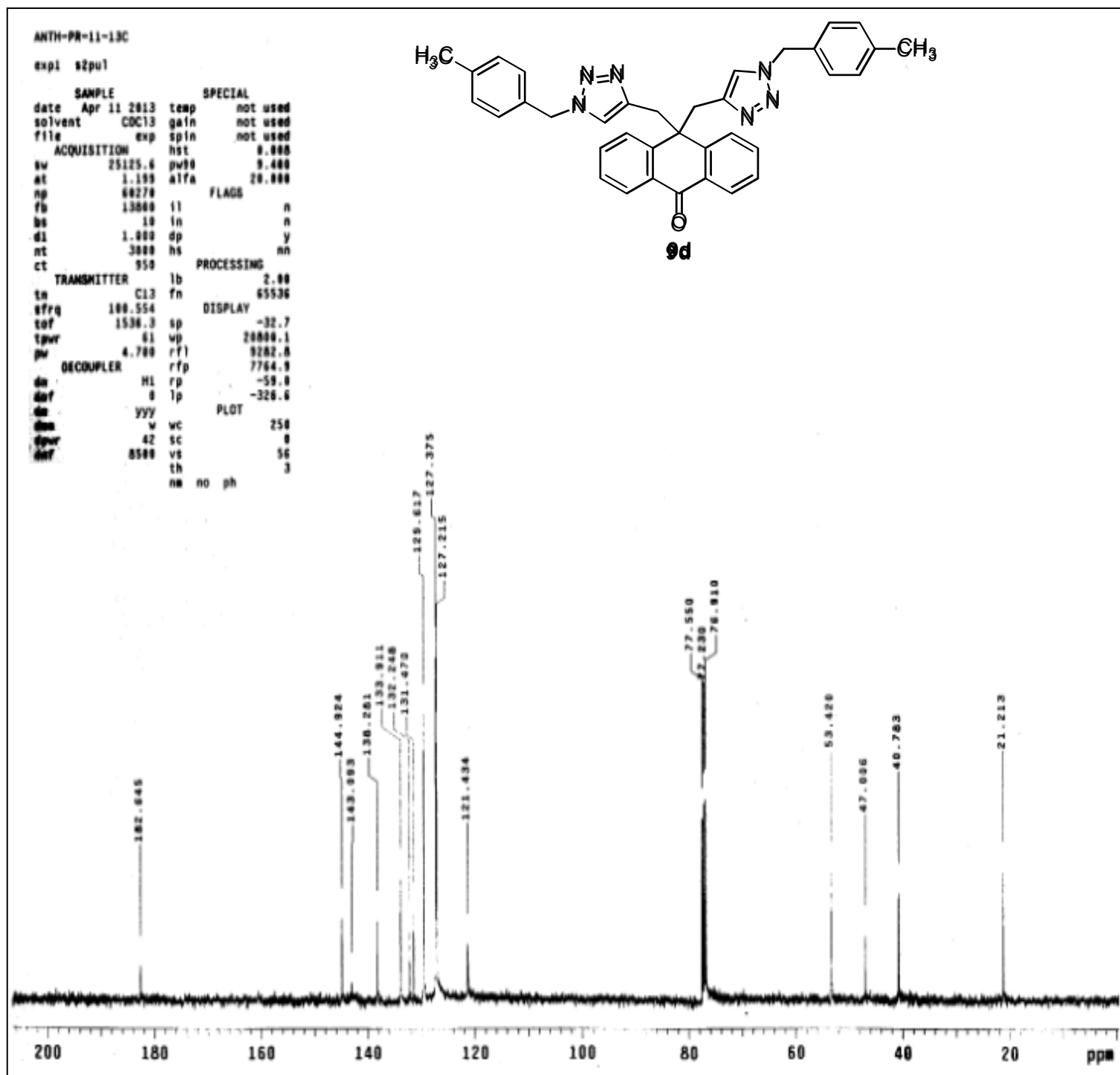
^{13}C NMR spectra of **9c**



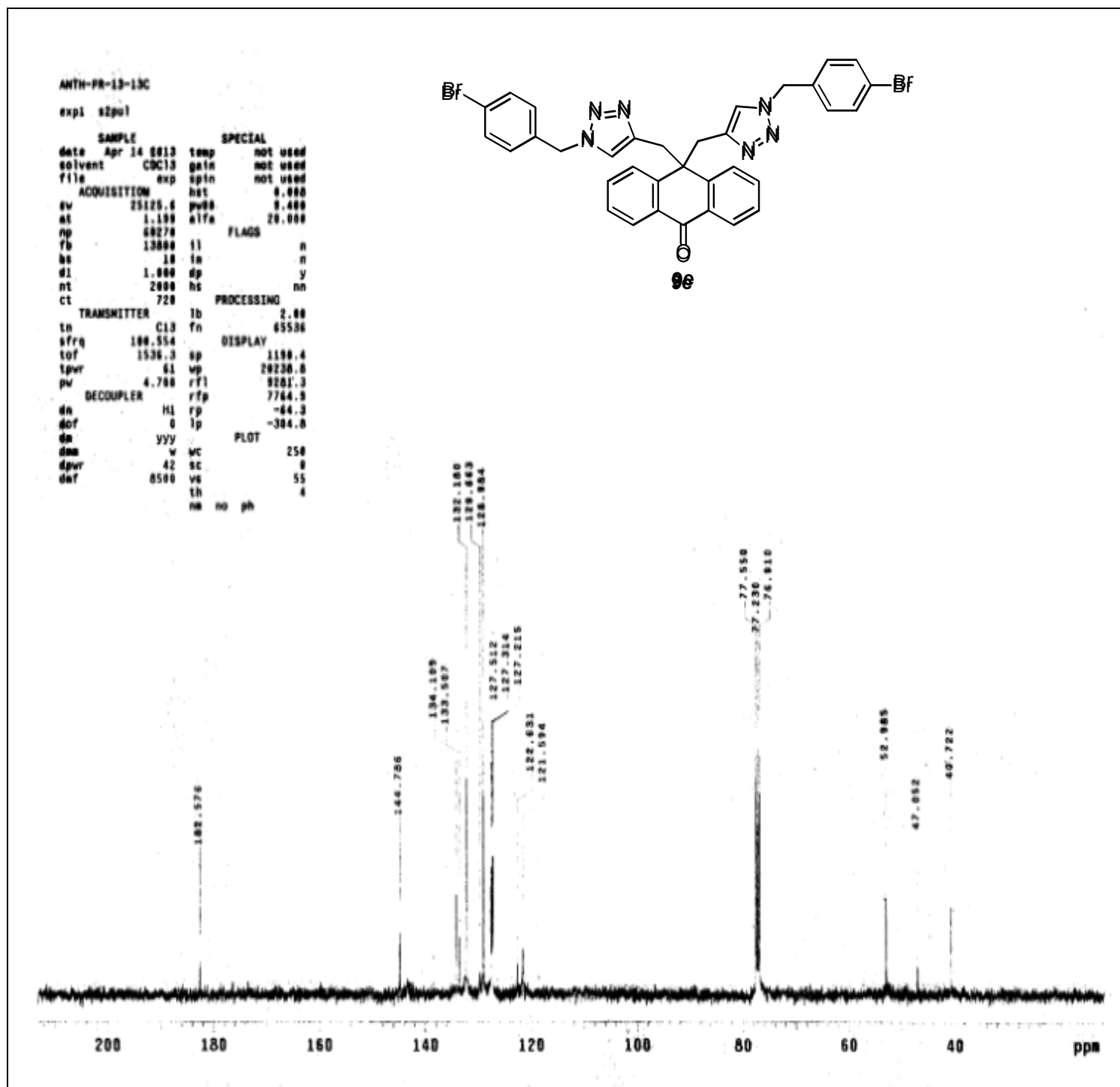
¹H NMR spectra of **9d**



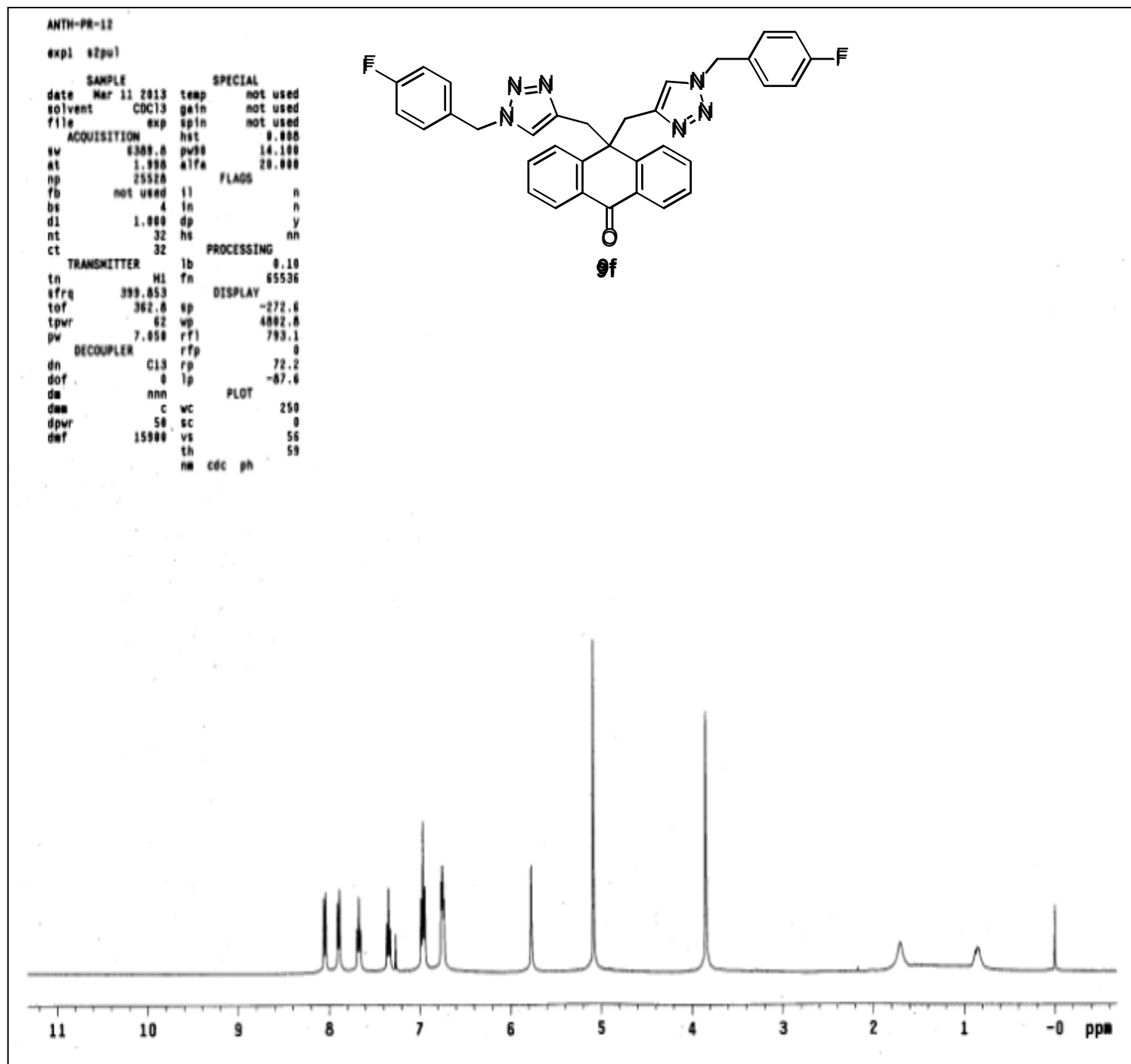
¹³C NMR spectra of 9d



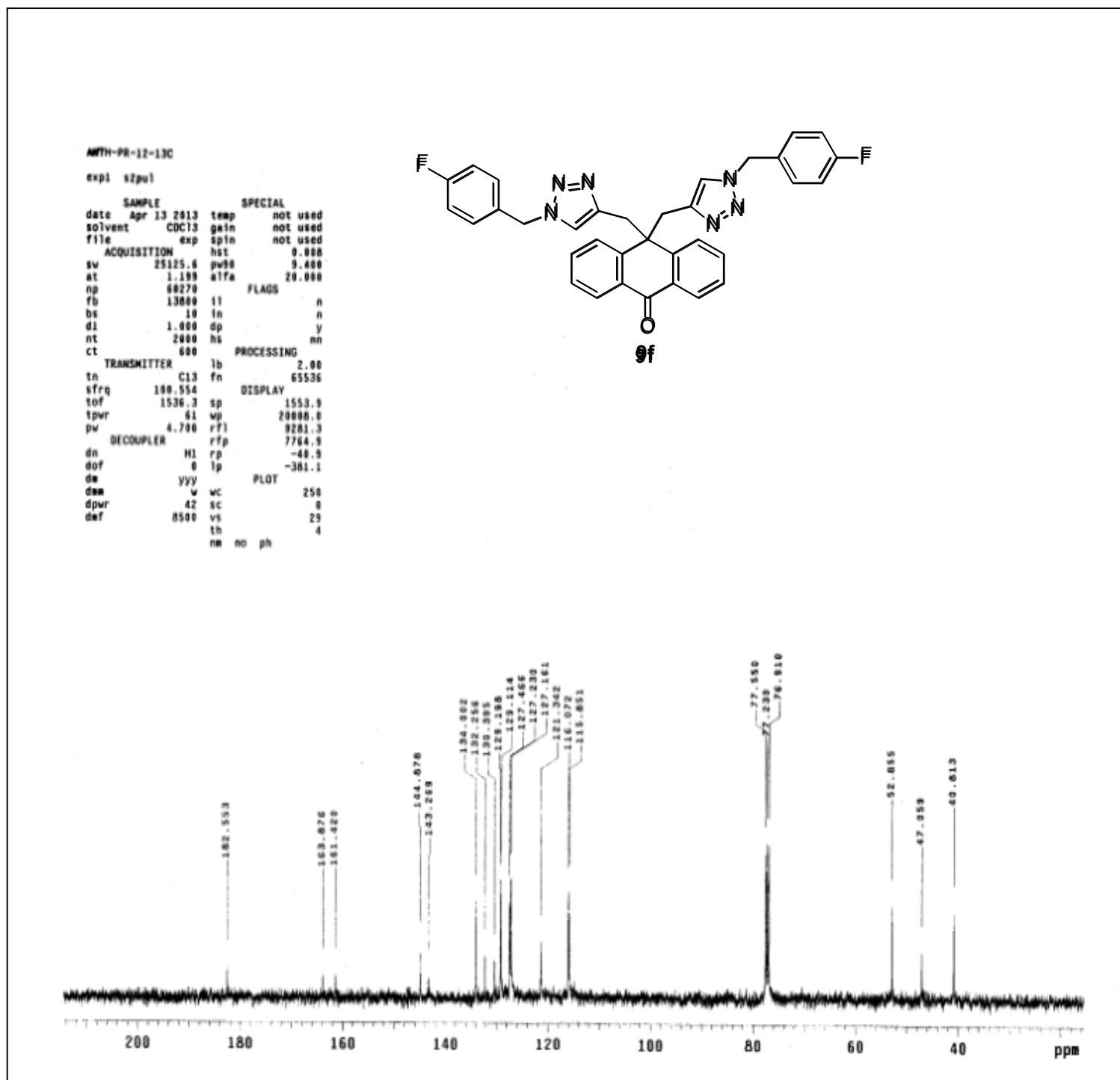
^{13}C NMR spectra of **9e**



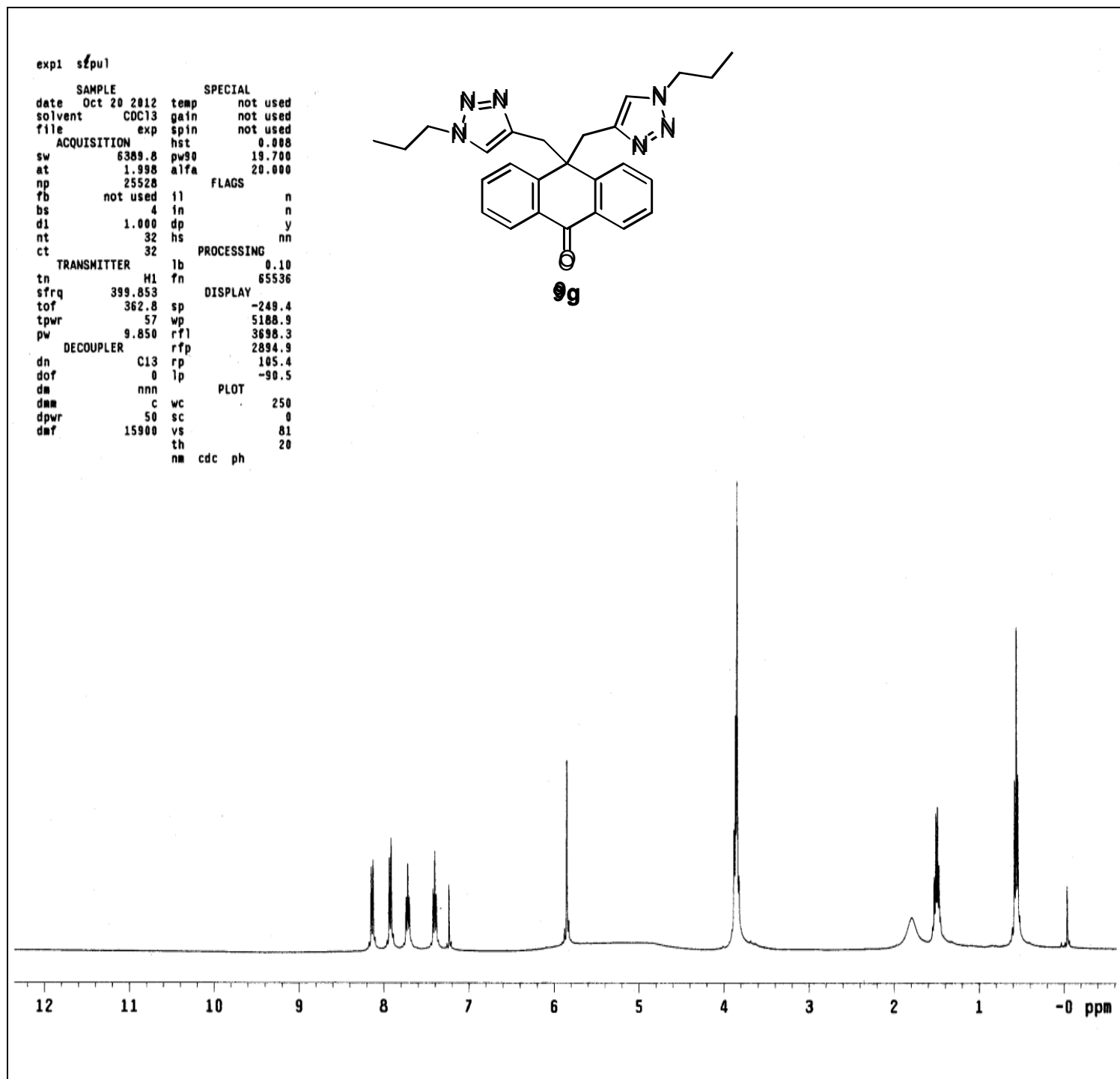
¹H NMR spectra of 9f



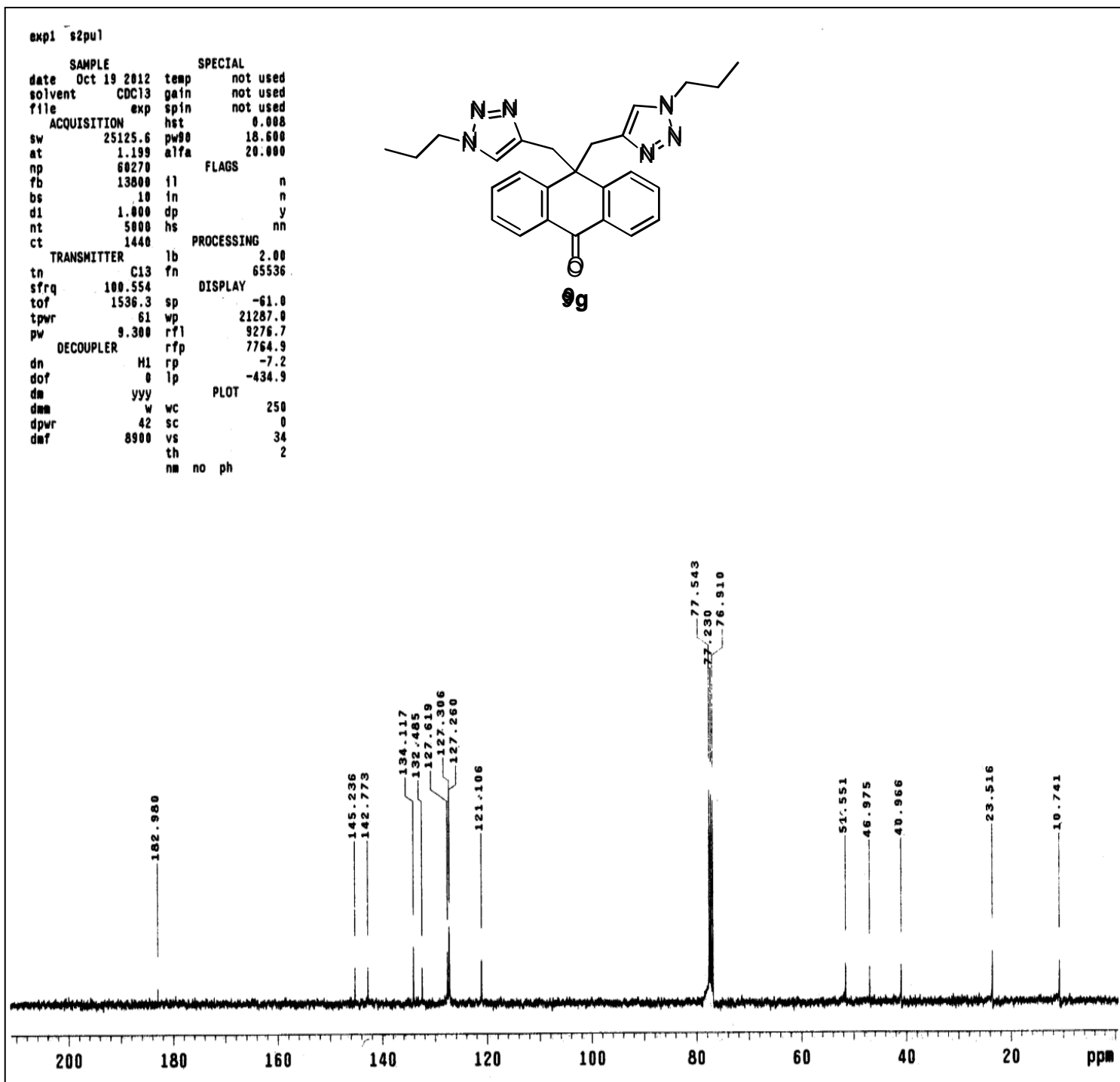
^{13}C NMR spectra of **9f**



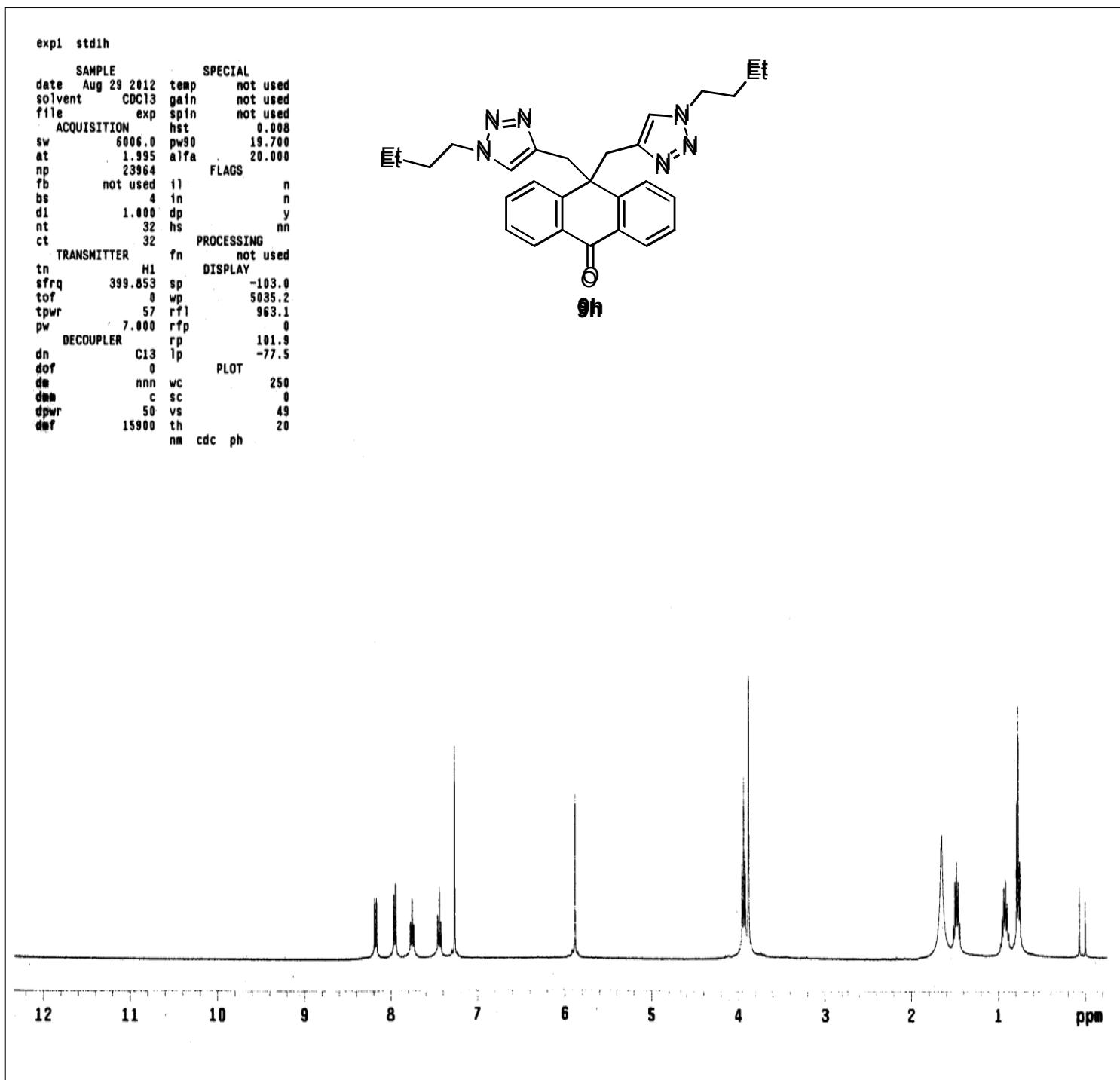
¹H NMR spectra of **9g**



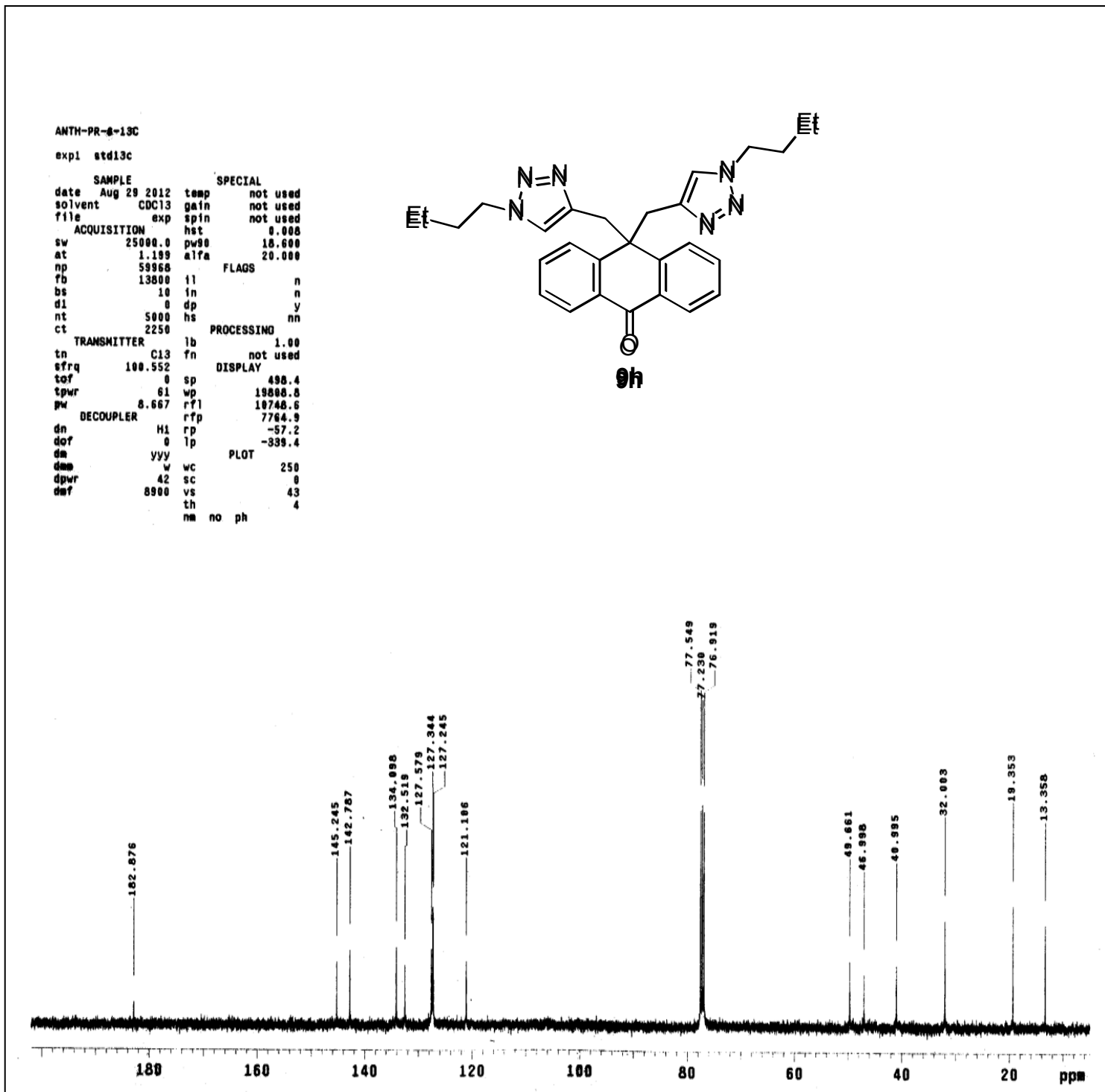
¹³C NMR spectra of 9g



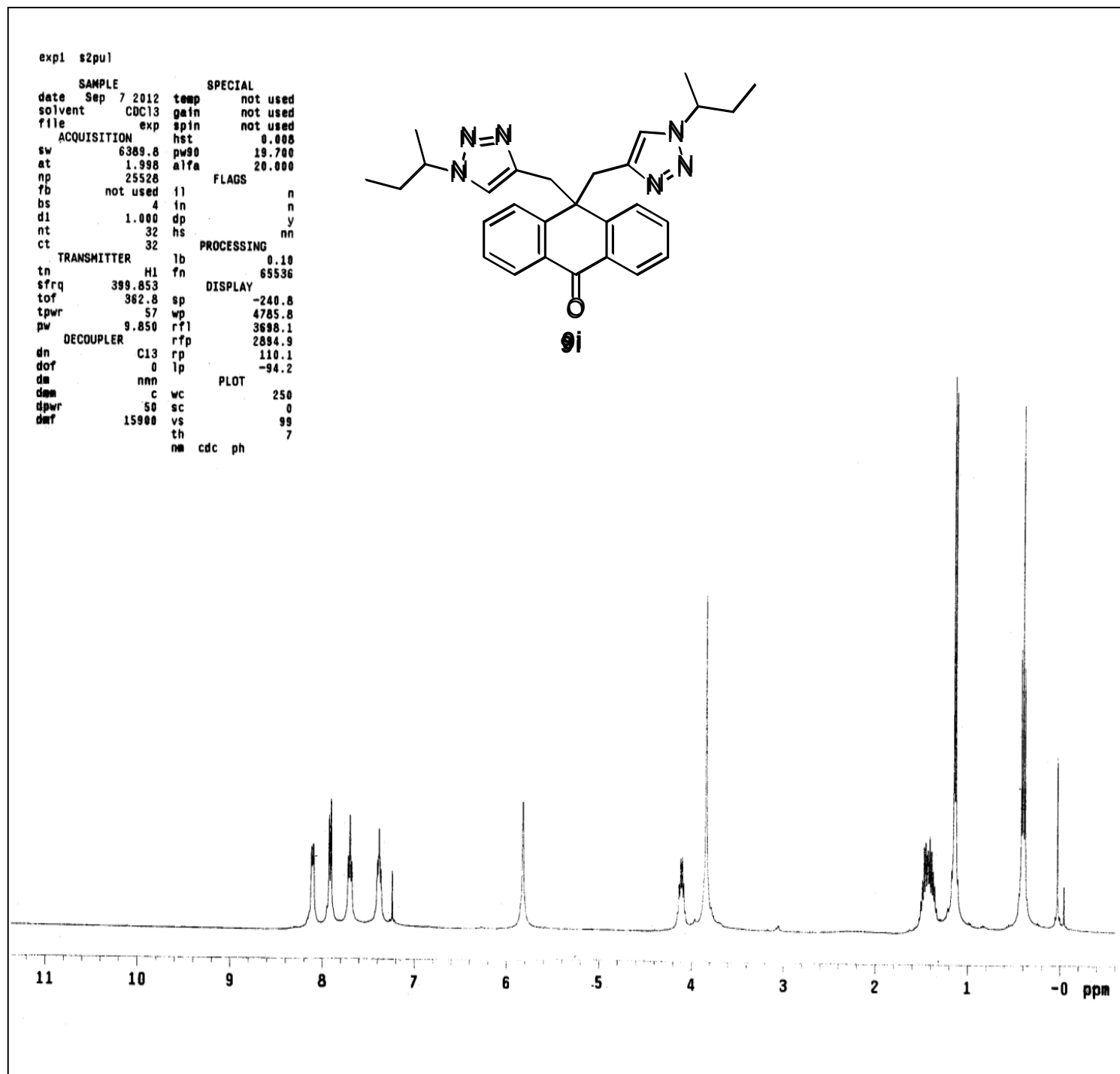
¹H NMR spectra of **9h**



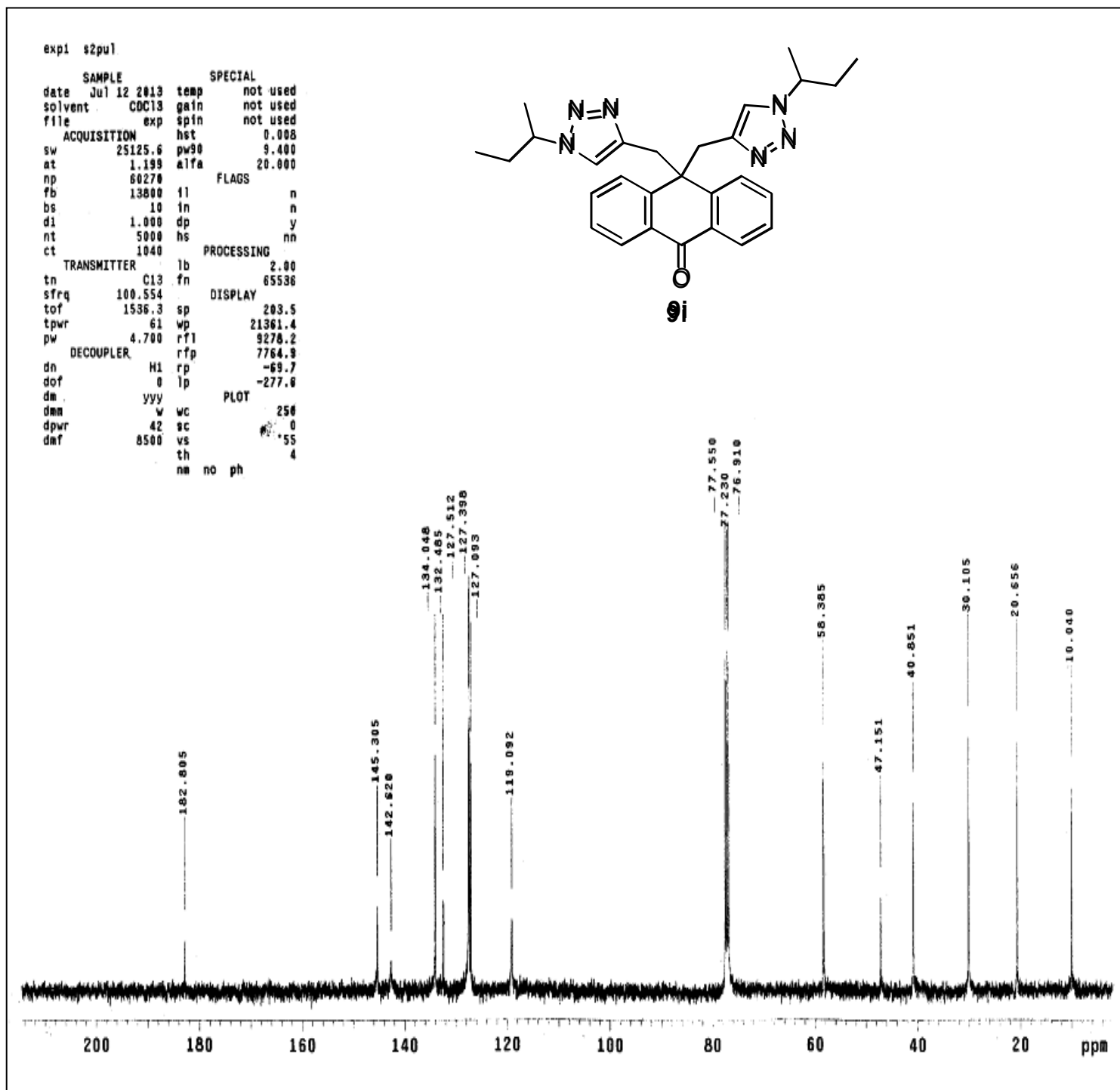
¹³C NMR spectra of 9h



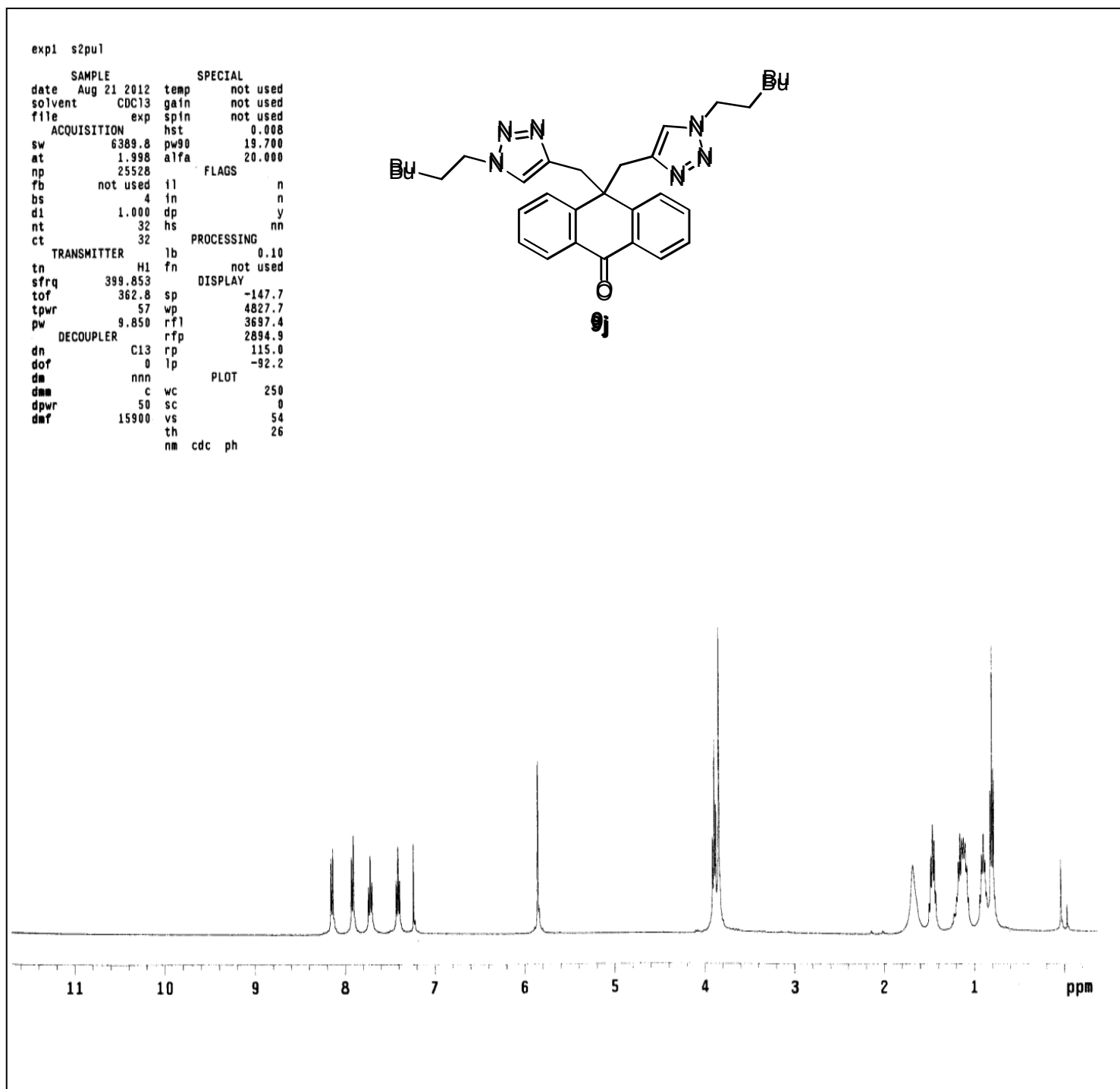
¹H NMR spectra of 9i



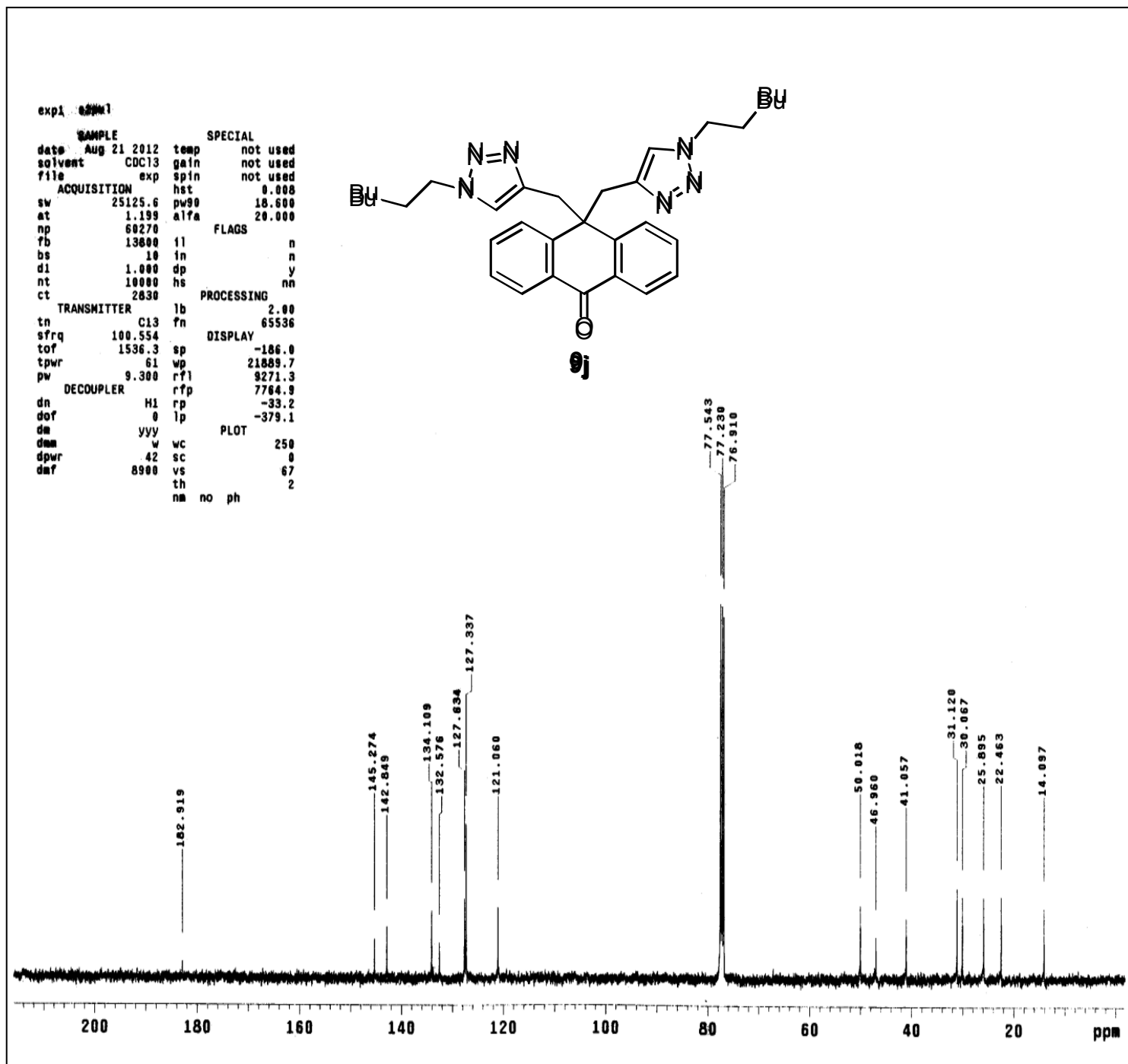
^{13}C NMR spectra of **9i**



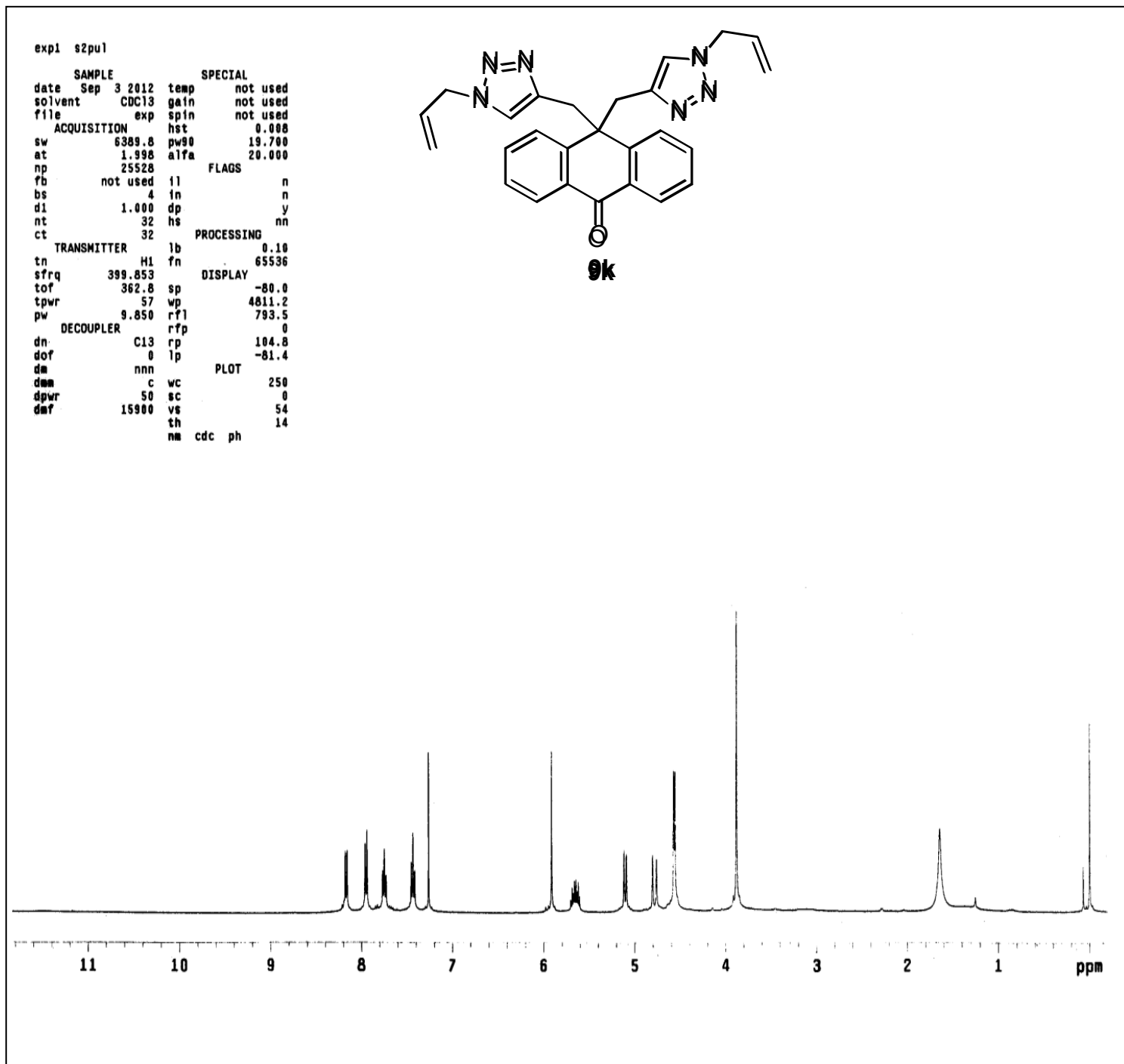
¹H NMR spectra of 9j



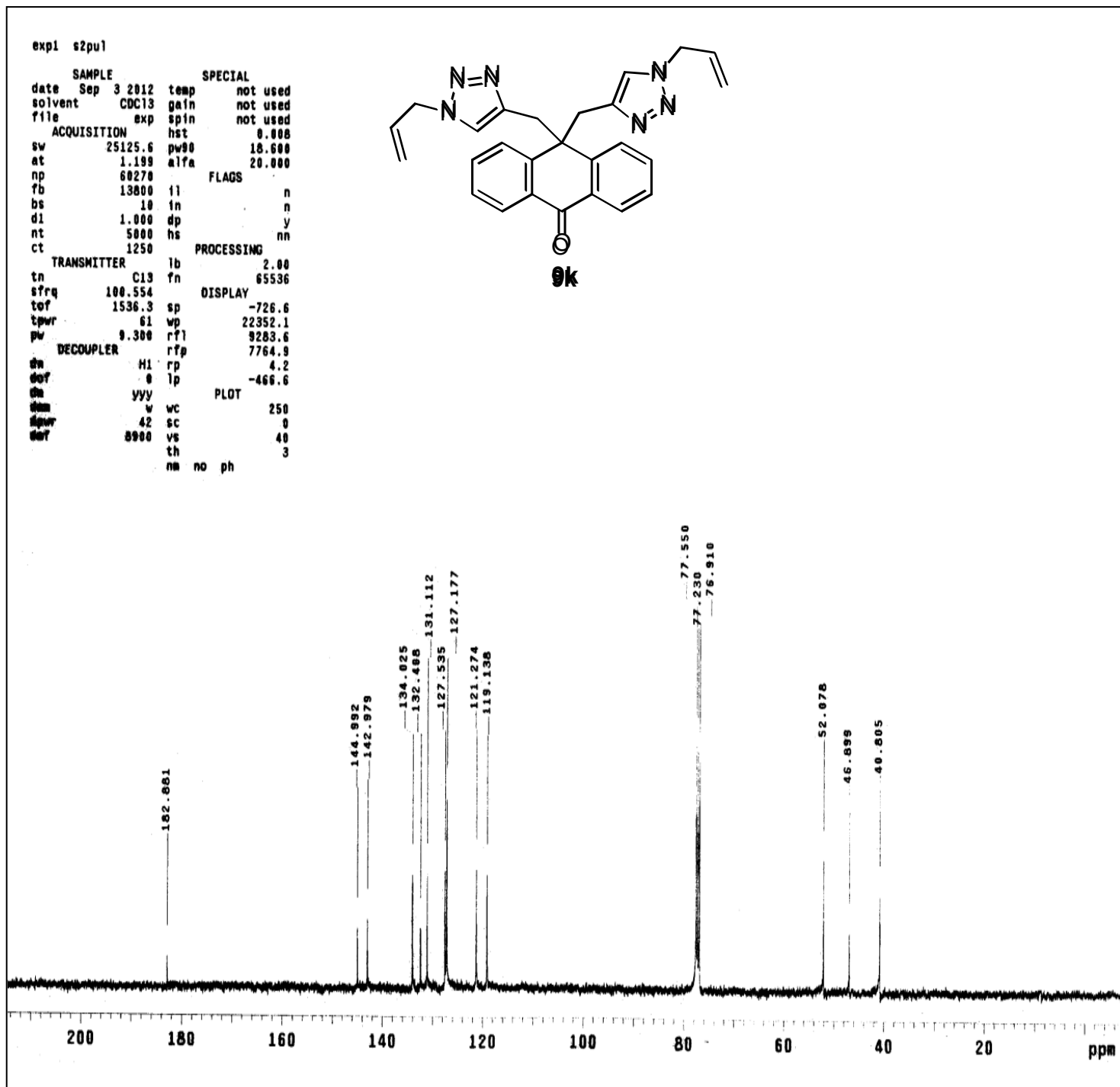
^{13}C NMR spectra of **9j**



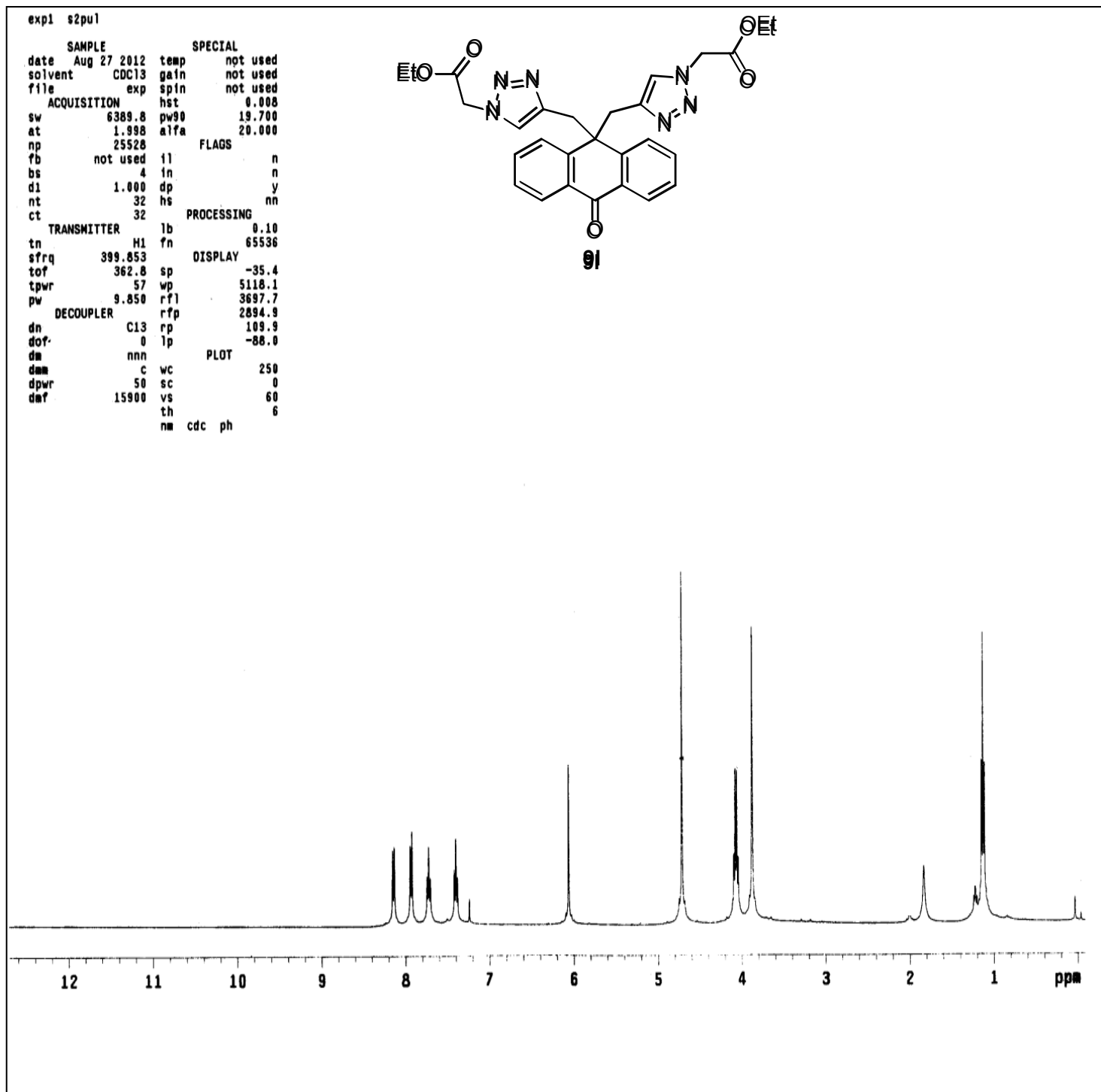
¹H NMR spectra of **9k**



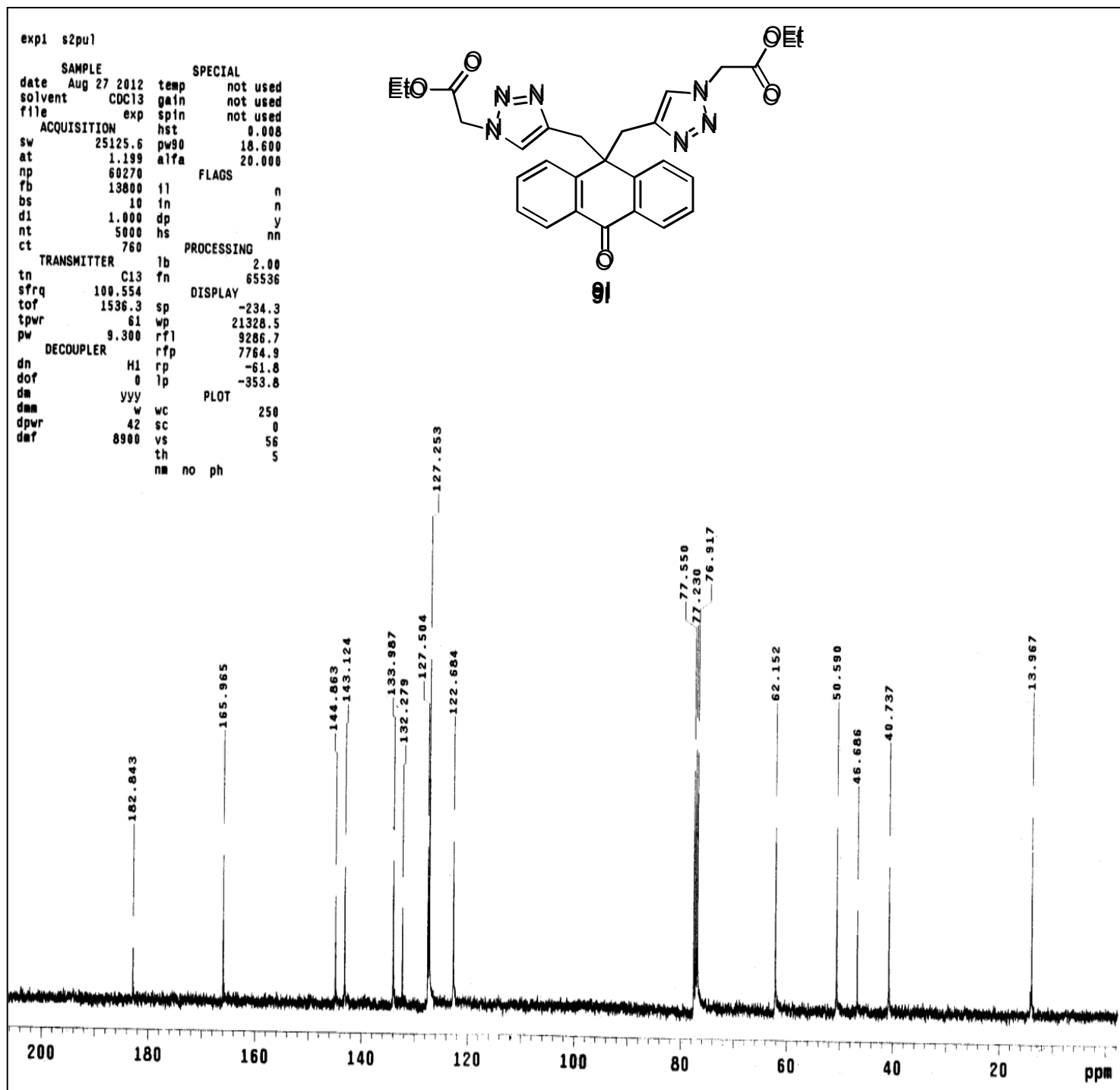
¹³C NMR spectra of 9k



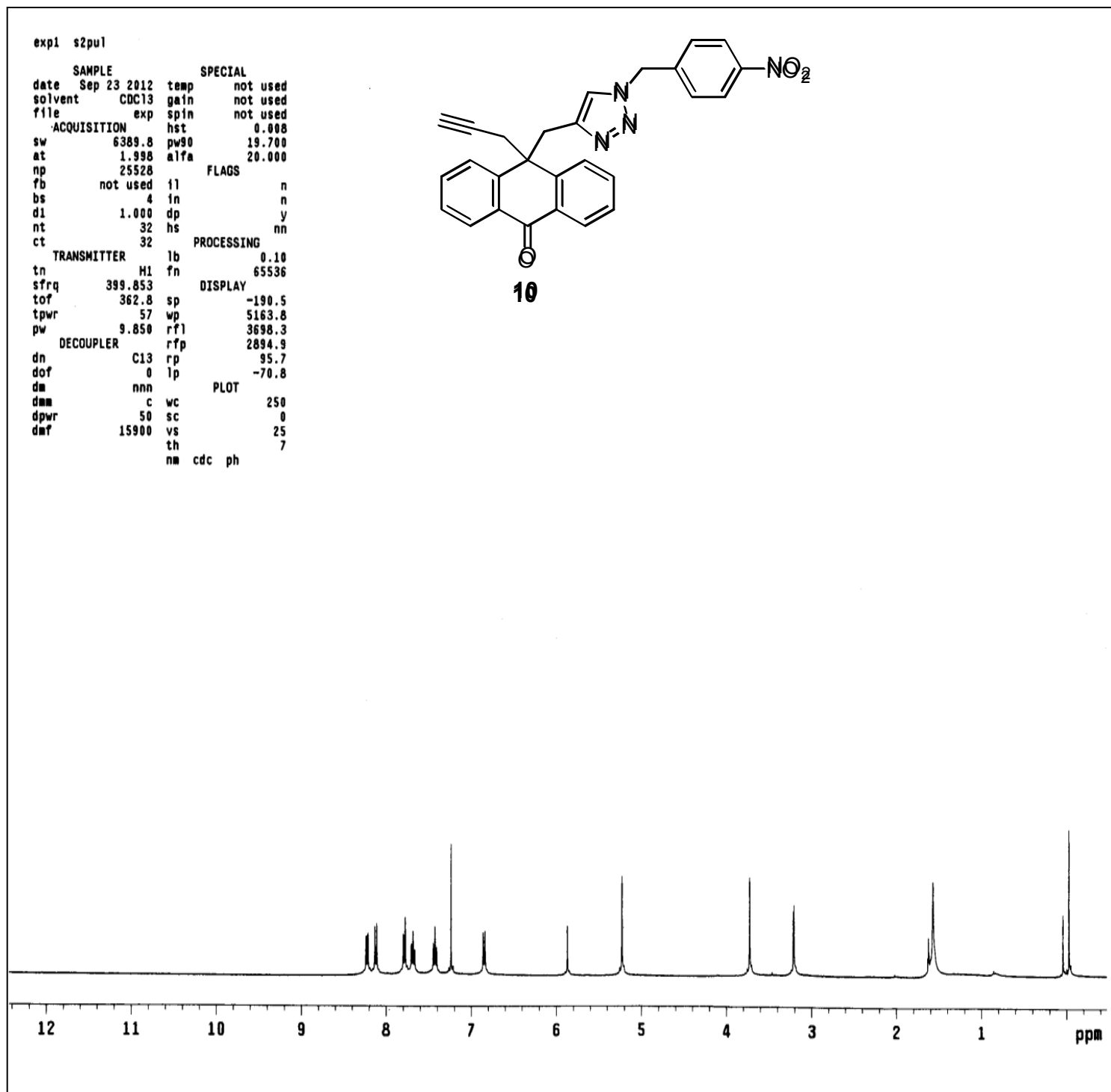
¹H NMR spectra of 91



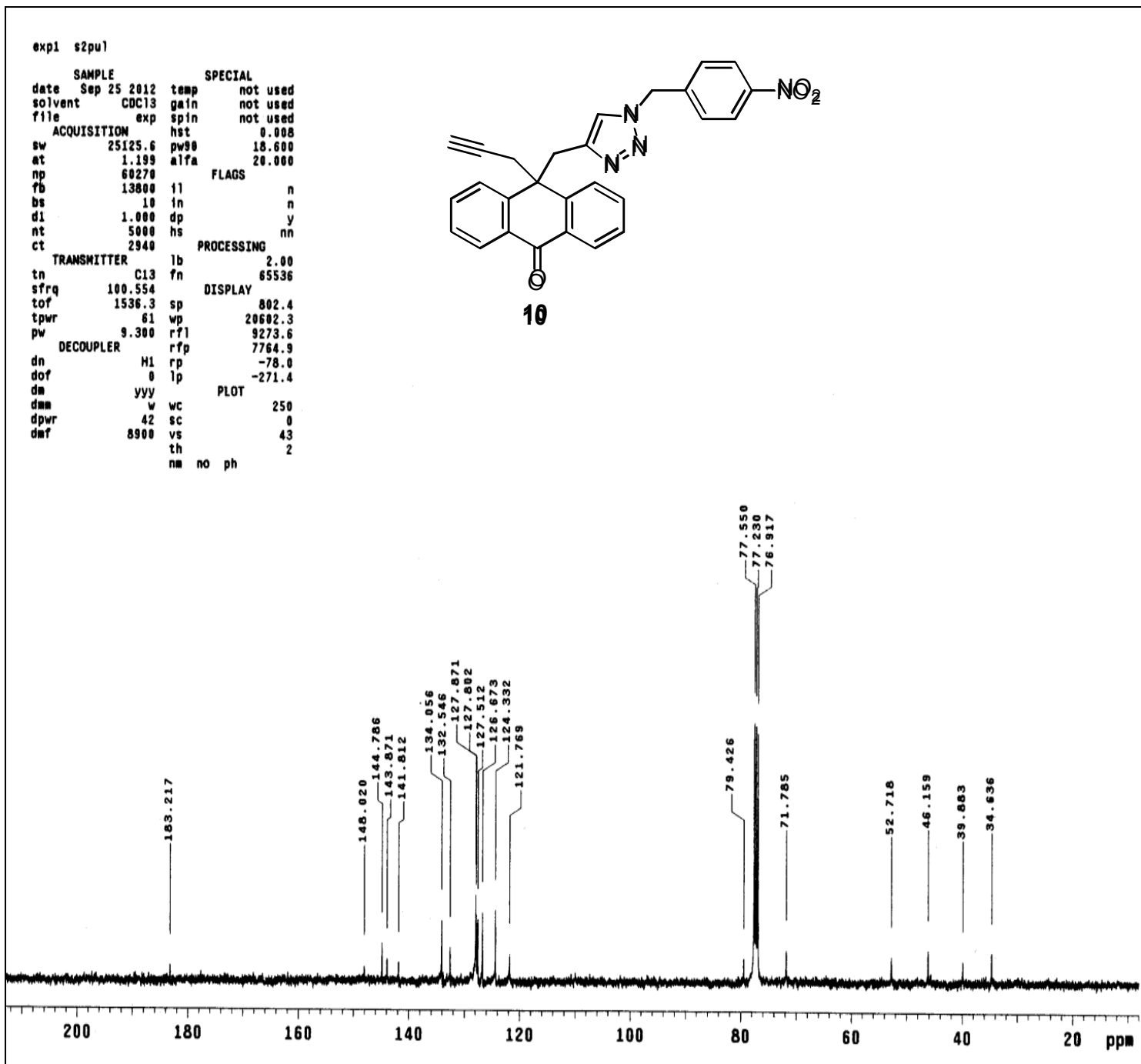
¹³C NMR spectra of 91



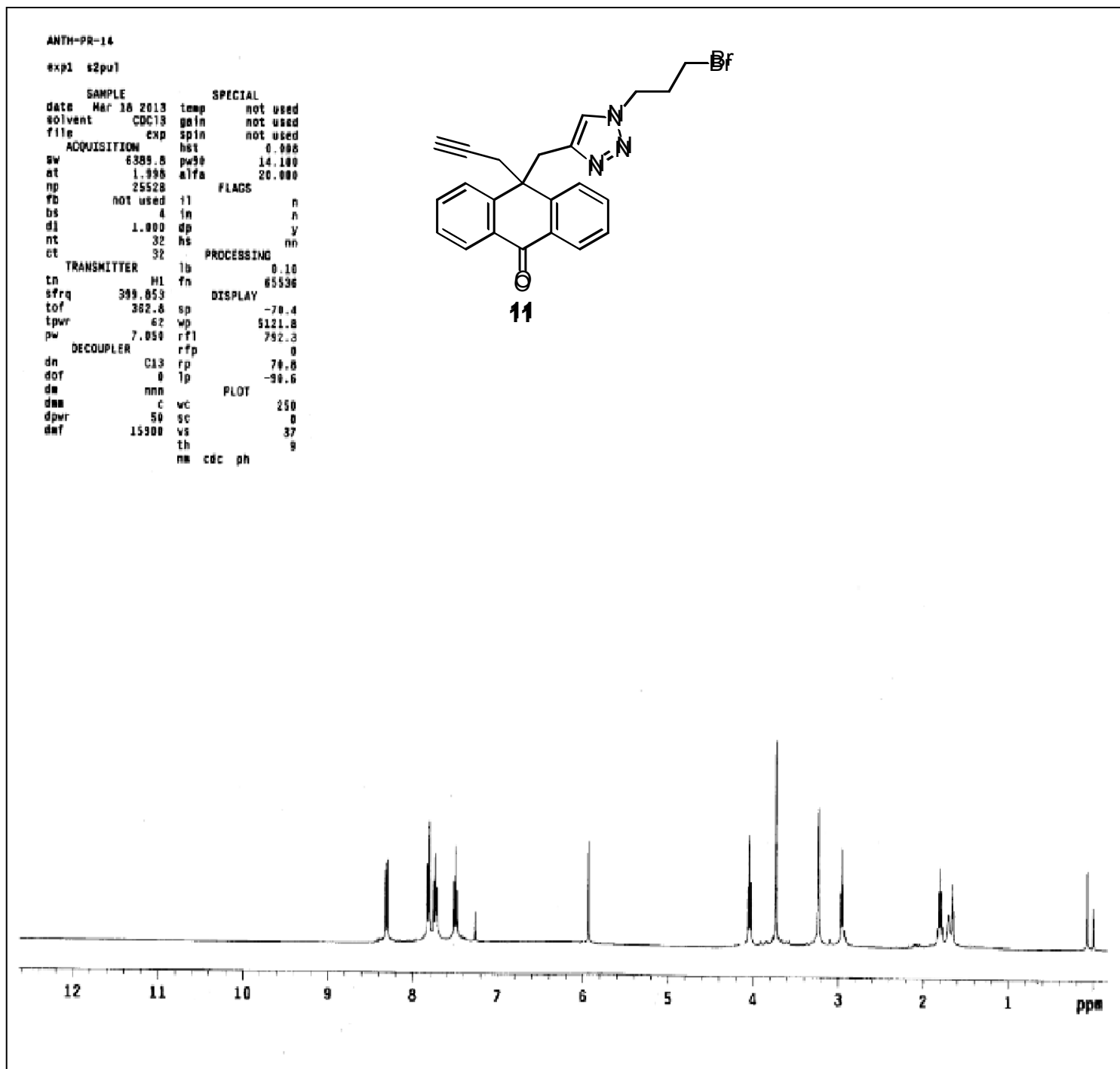
¹H NMR spectra of **10**



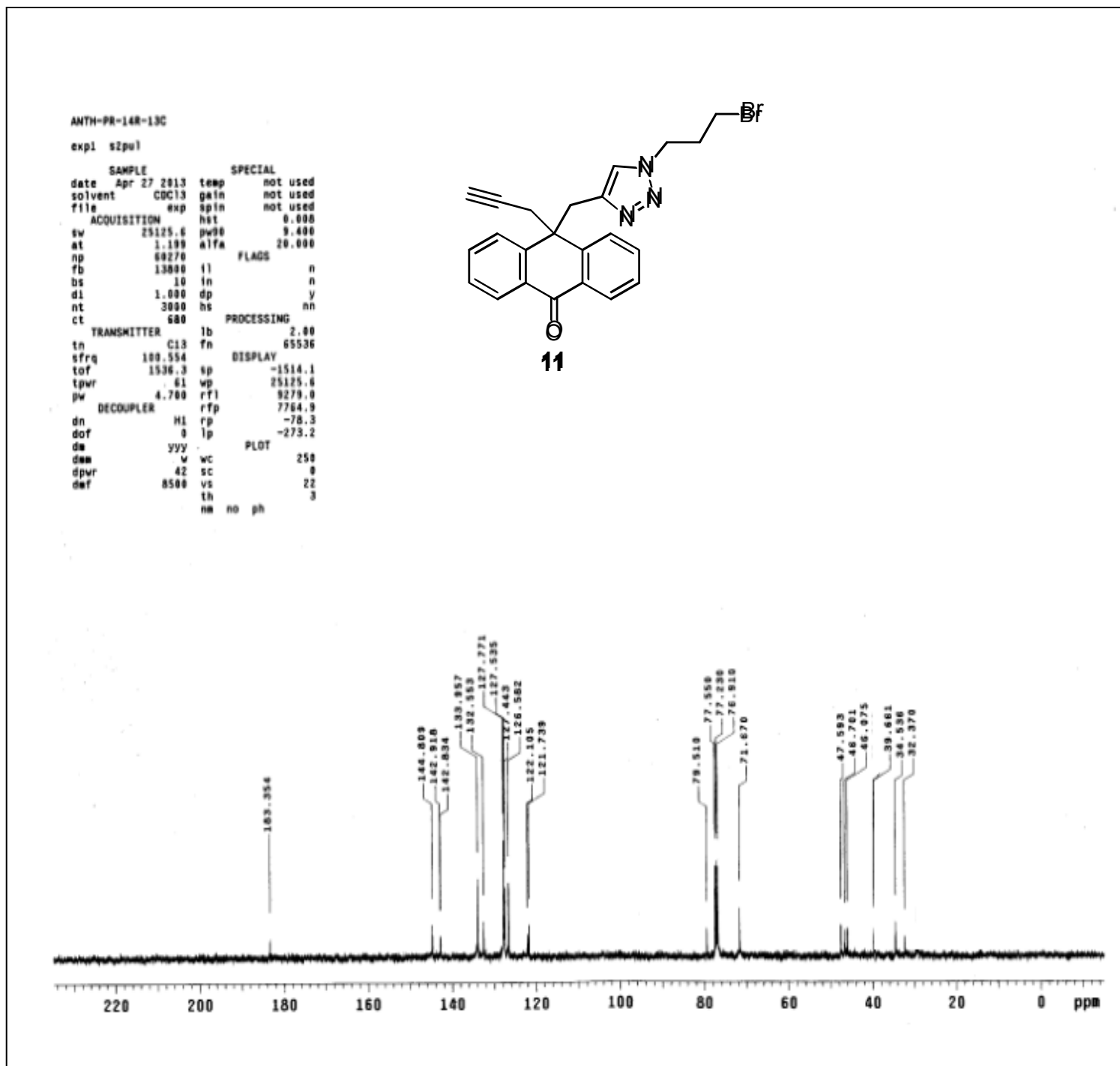
¹³C NMR spectra of **10**



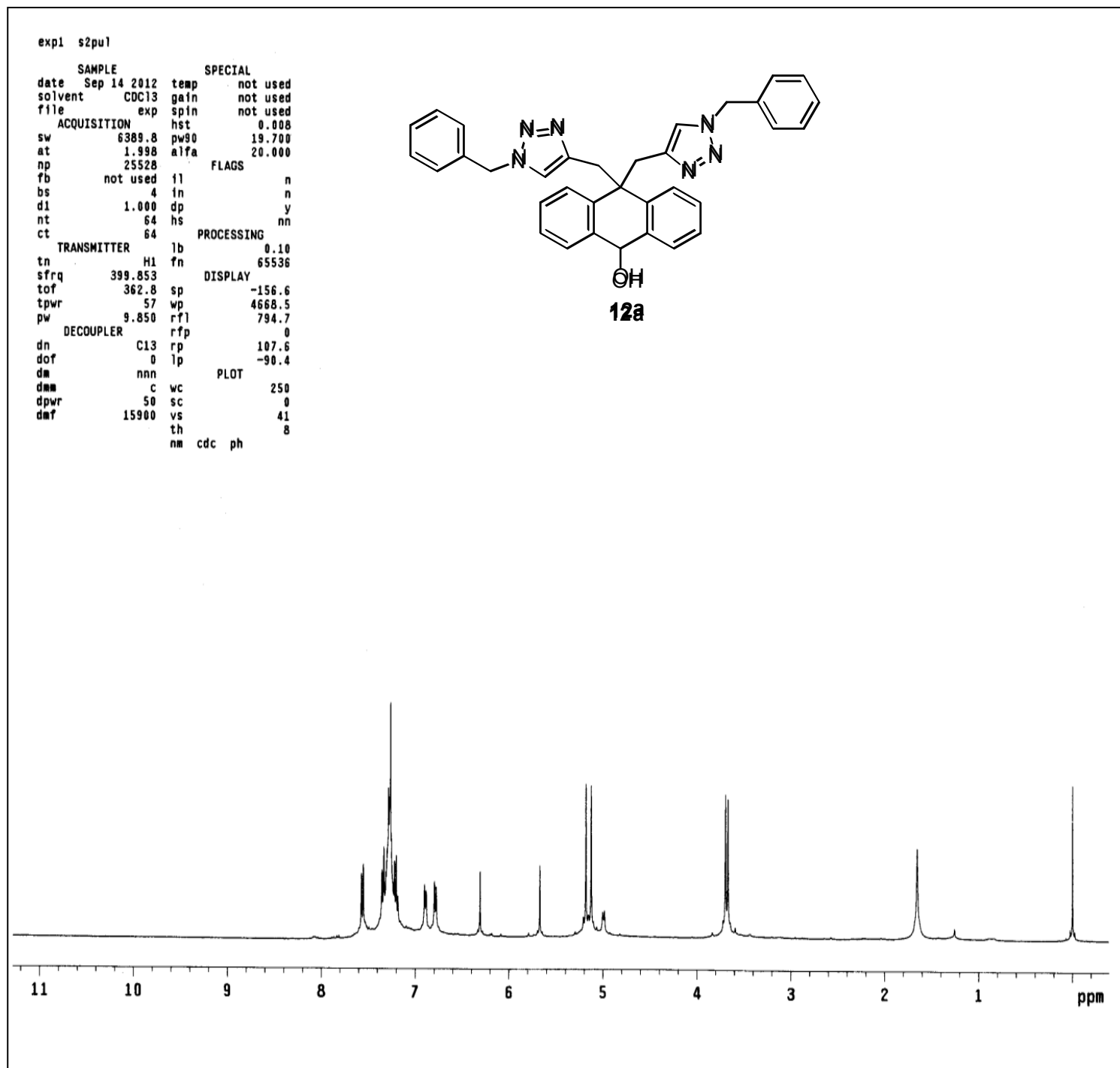
¹H NMR spectra of 11



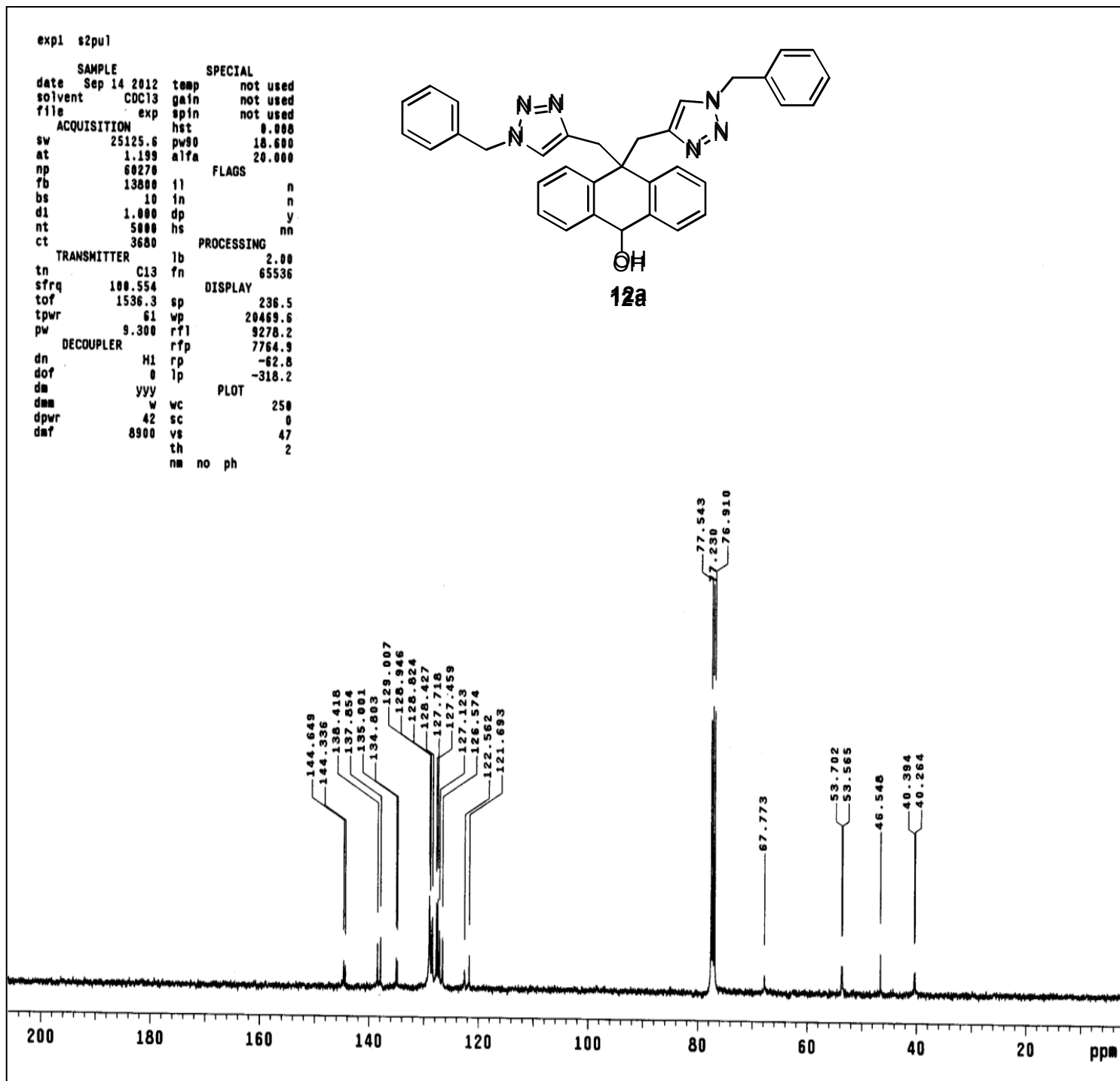
^{13}C NMR spectra of **11**



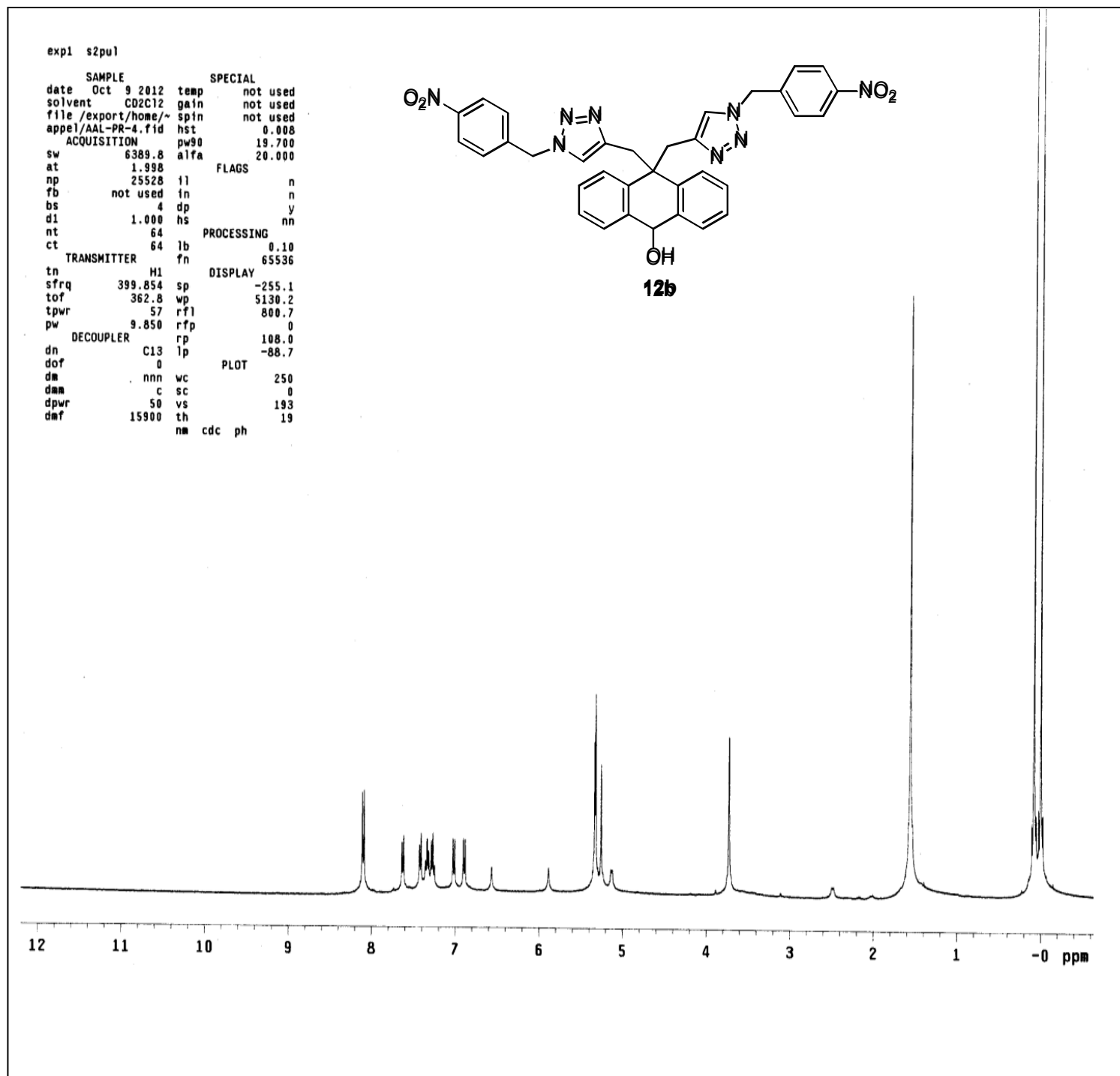
¹H NMR spectra of **12a**



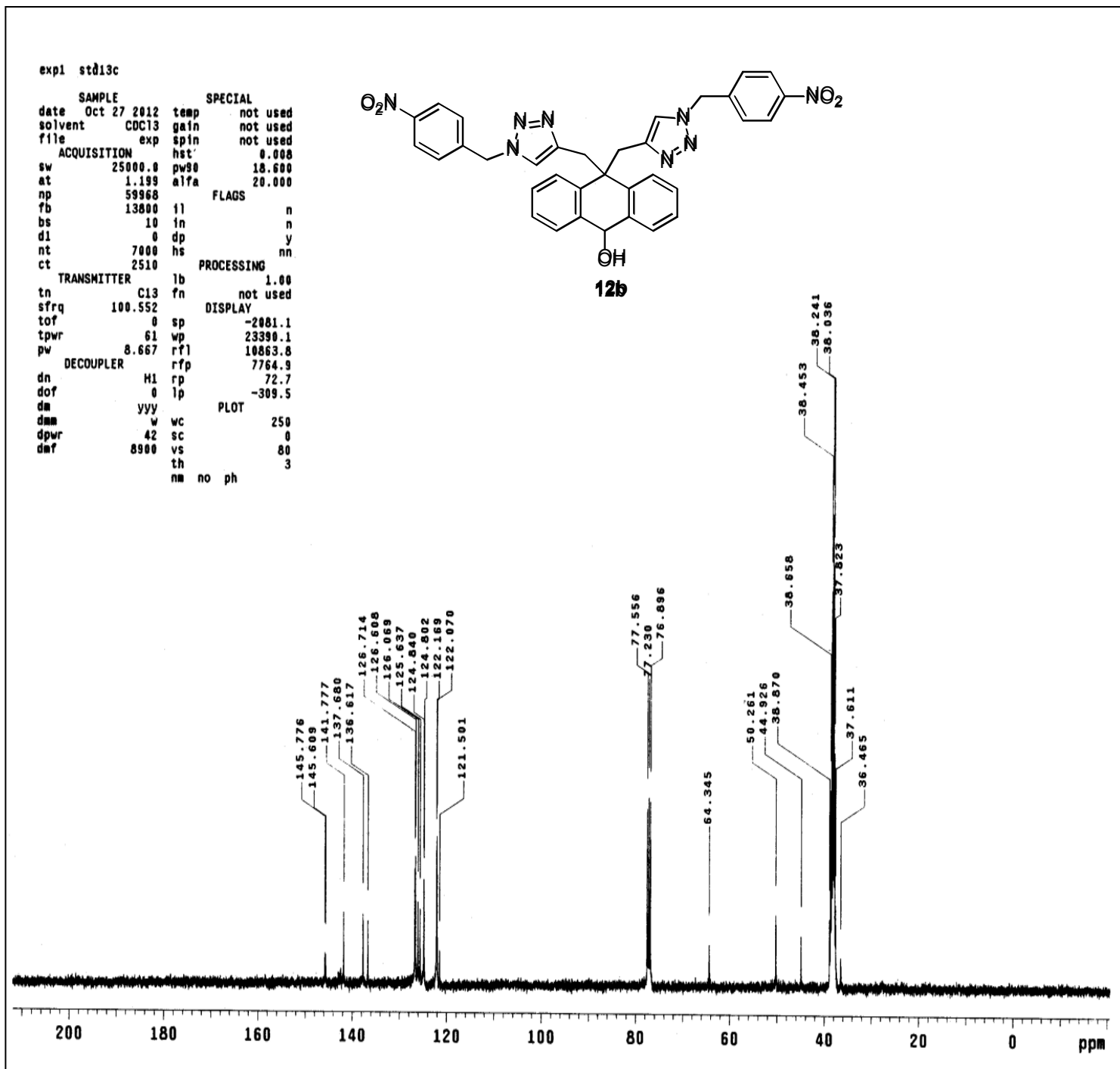
¹³C NMR spectra of 12a



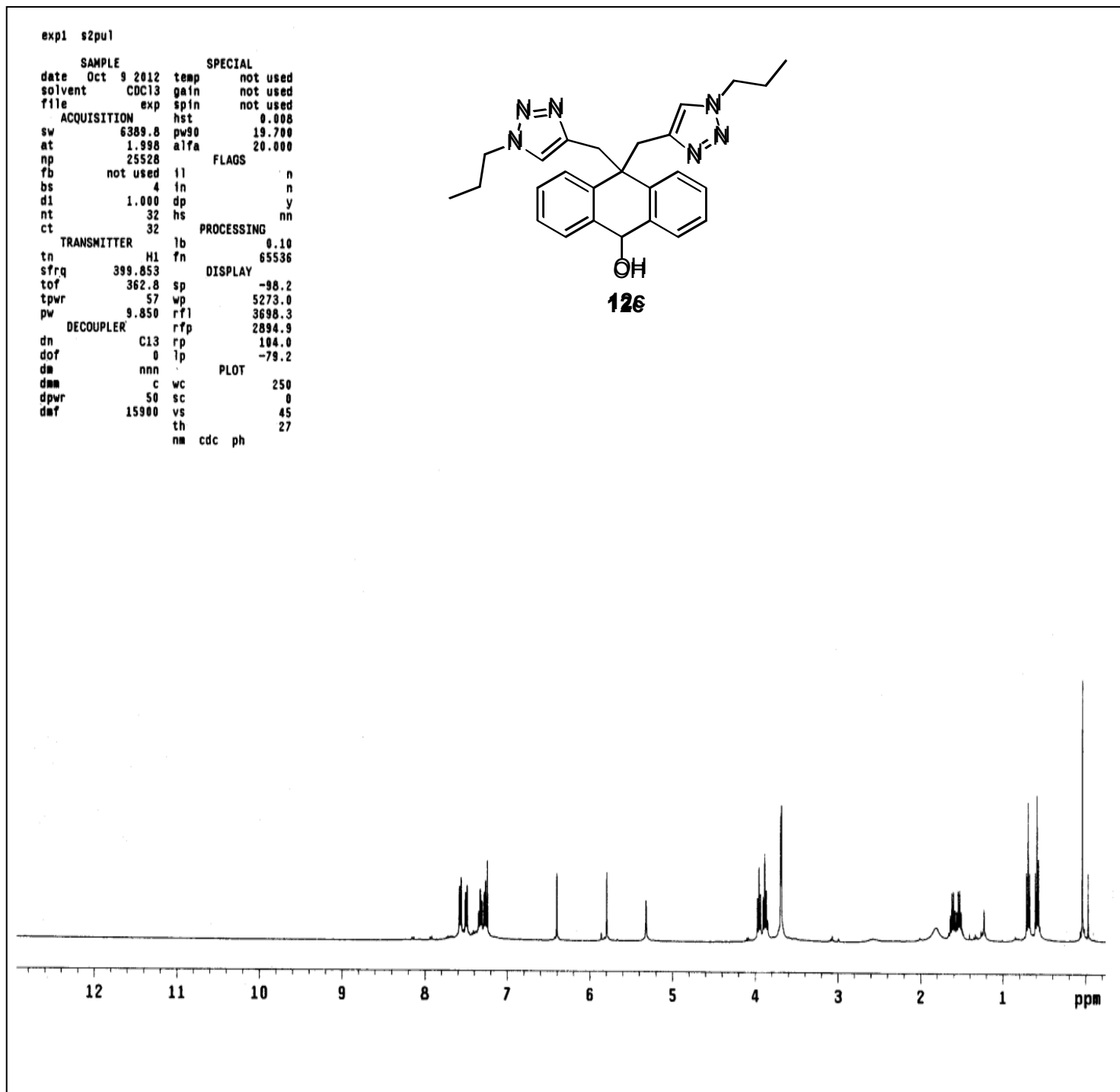
¹H NMR spectra of **12b**



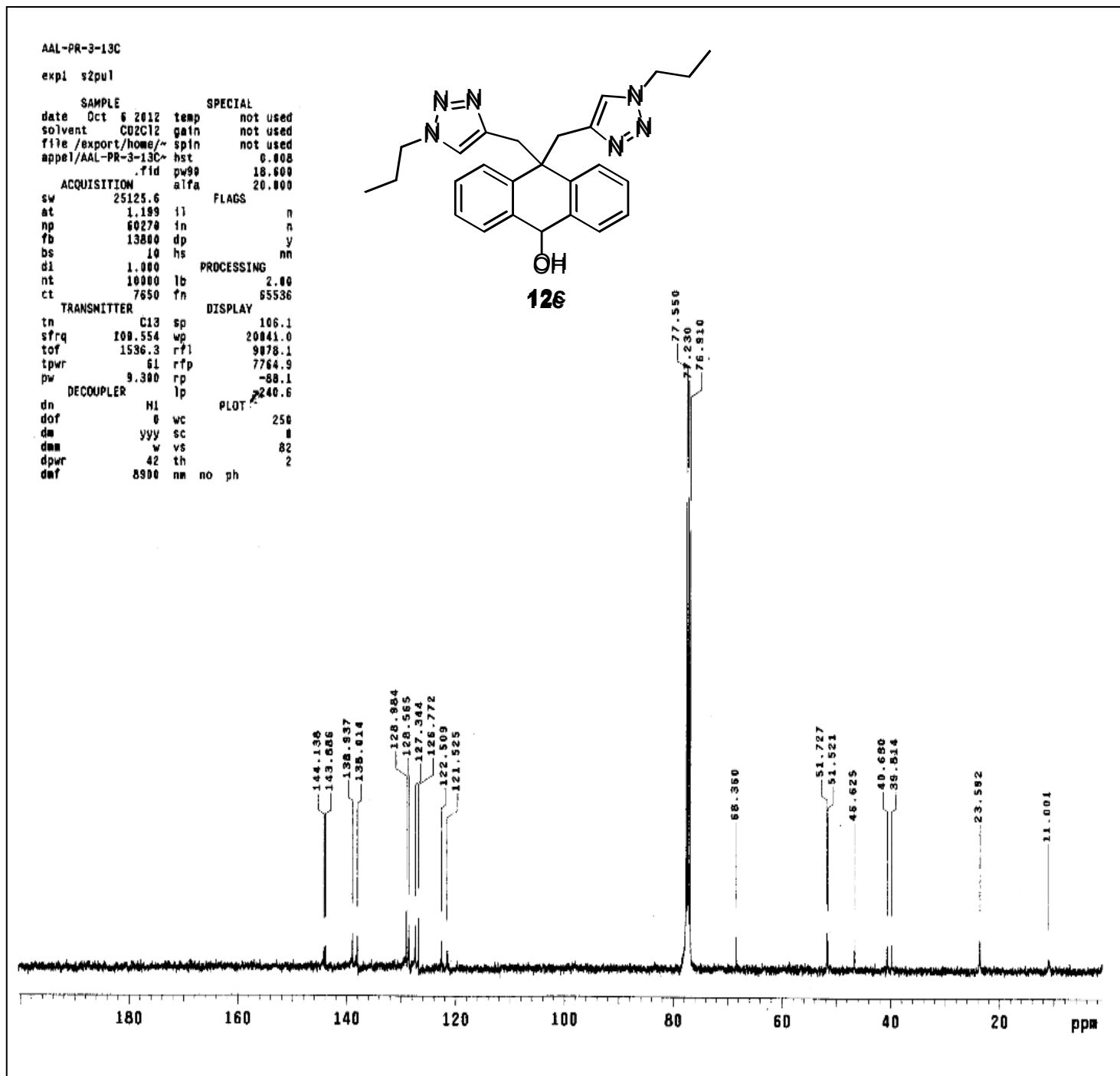
¹³C NMR spectra of 12b



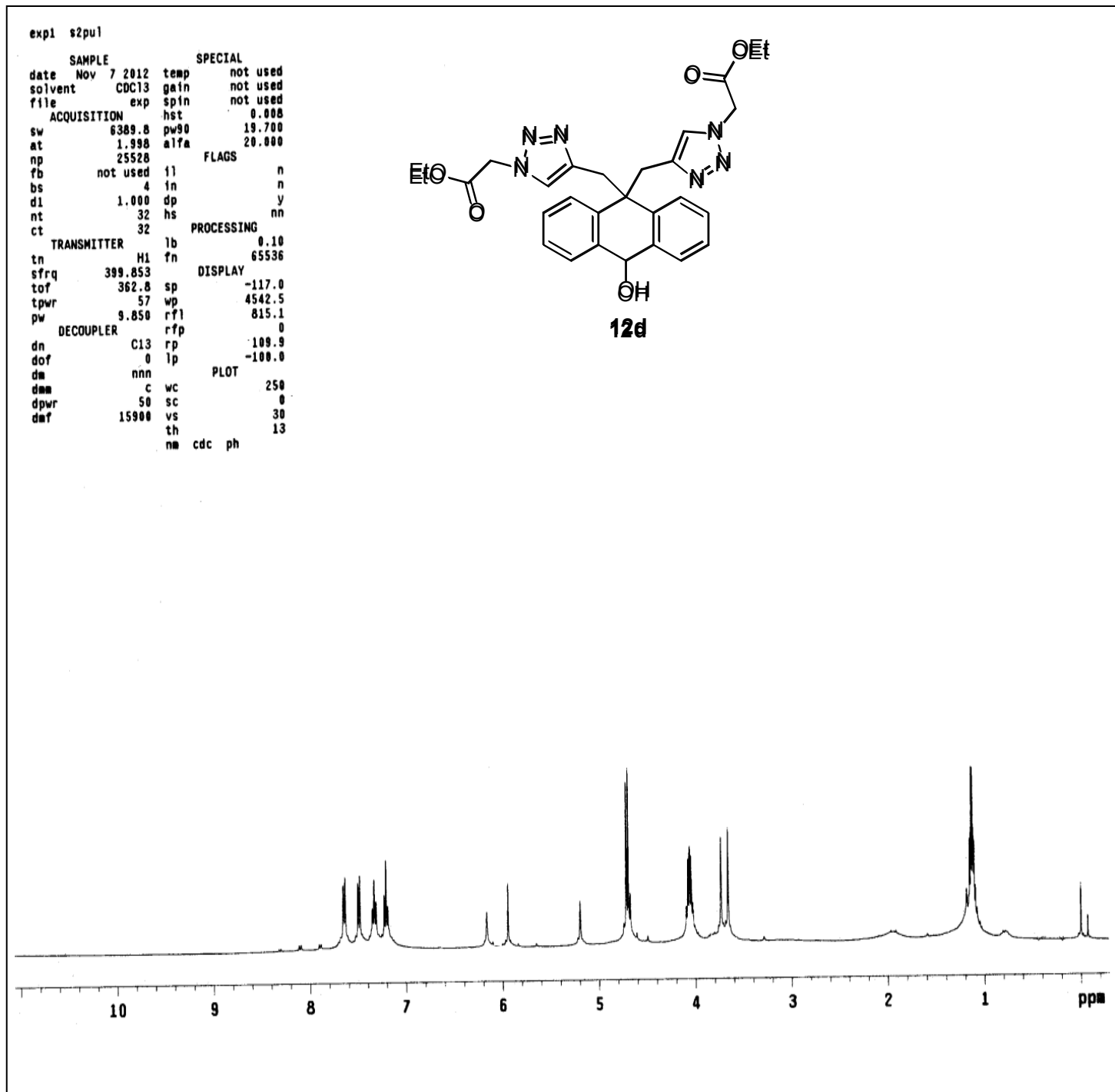
¹H NMR spectra of **12c**



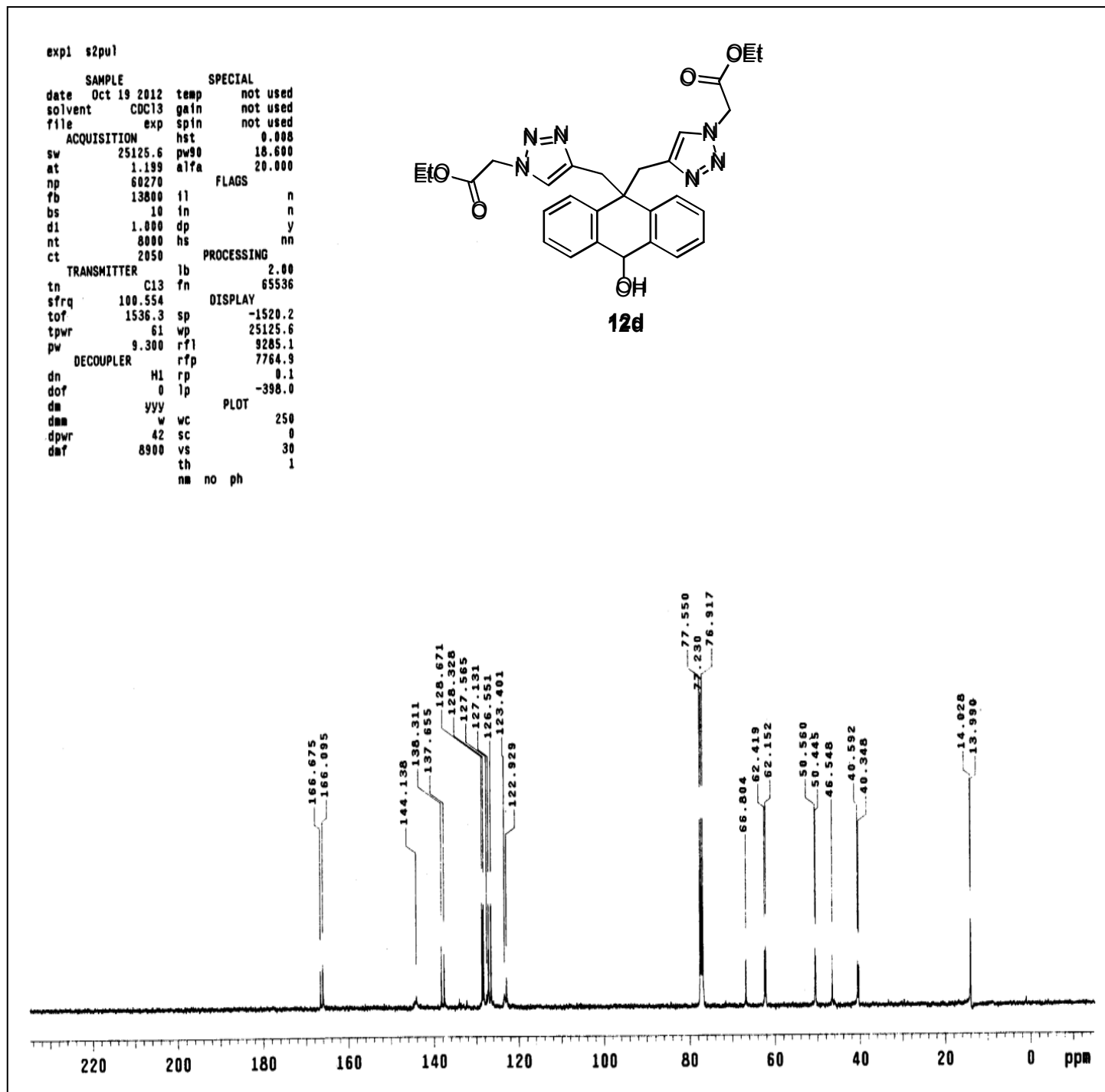
¹³C NMR spectra of 12c



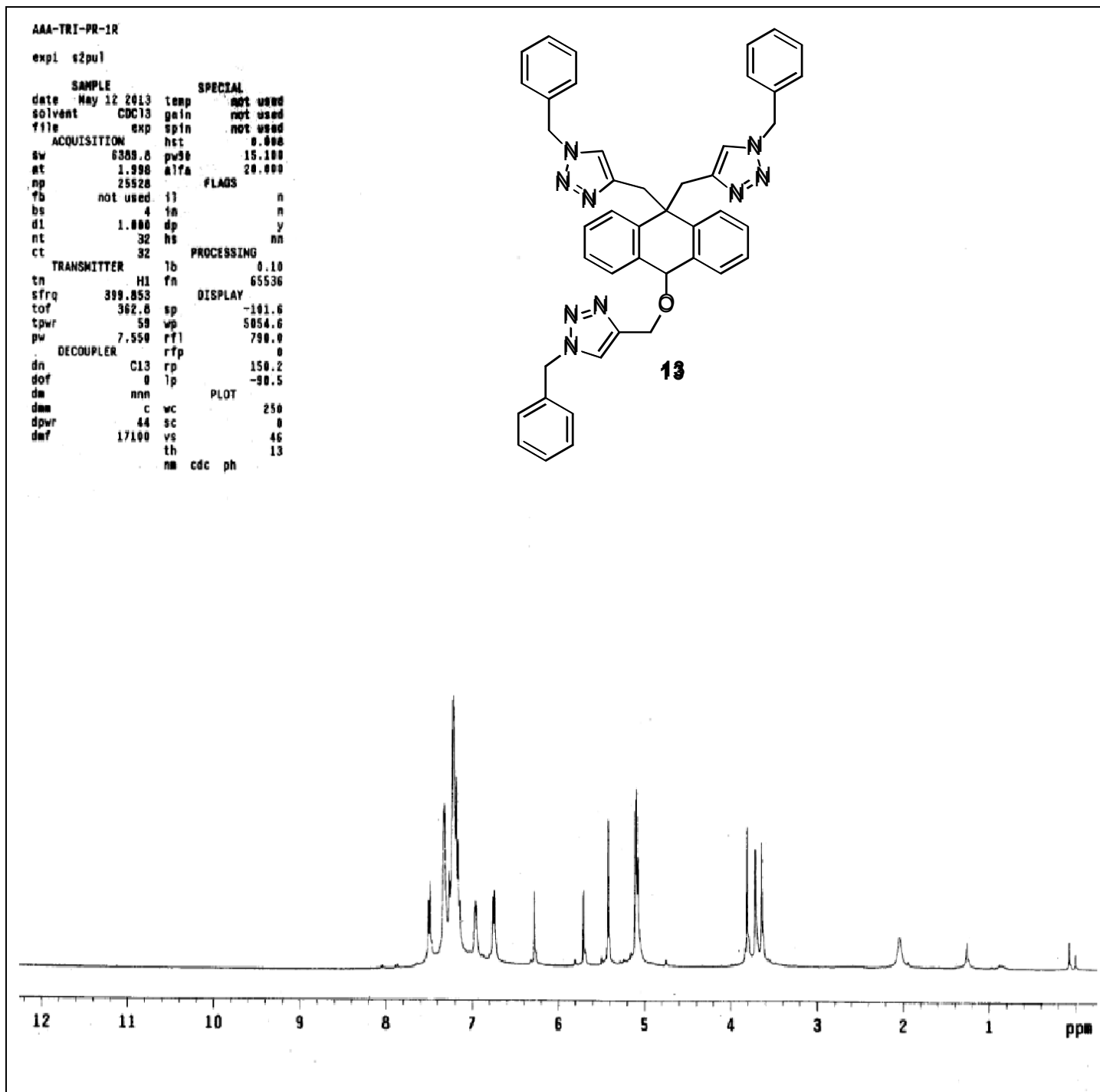
¹H NMR spectra of **12d**



¹³C NMR spectra of 12d



¹H NMR spectra of 13



¹³C NMR spectra of **13**

