Supporting Information

Hypervalent Iodine Catalyzed Generation of Nitrile Oxides from Oximes and their Cycloaddition with Alkenes or Alkynes

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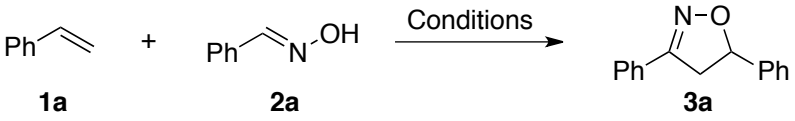
1. General experimental remarks

All reactions were performed under dry argon atmosphere with flame-dried glassware. Dichloromethane was distilled from CaH_2 immediately prior to use. Diethyl ether was distilled from Na/benzophenone. All commercial reagents were ACS reagent grade and used without further purification. Melting points were determined in an open capillary tube with a Mel-temp II melting point apparatus. Infrared spectra were recorded as a KBr pellet on a Perkin-Elmer 1600 series FT-IR spectrophotometer. NMR spectra were recorded on a Varian Inova 500 MHz NMR spectrometer at 500 MHz (^{1}H NMR) and 125 MHz (^{13}C NMR). Chemical shifts are reported in parts per million (ppm). ^{1}H and ^{13}C chemical shifts are referenced relative to the tetramethylsilane.

2. Table S1: Optimization study of the iodine-mediated catalytic cyclization of styrene 1a and benzaldoxime 2a.[a]



1a **2a** **3a**

Entry	Conditions	Solvent (ratio)	Oxidant (eq.)	ArI (eq.)	**3a** (%)[b]
1	12 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	none	-
2	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.5)	75 (75)
3	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	73 (74)
4	12 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(70)
5	24 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	70 (72)
6	48 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(73)
7	4 h, 40 ^{o}C	MeOH-H_2O (20:1)	Oxone (3)	PhI (0.2)	(35)
8	4 h, 40 ^{o}C	MeOH-TFE-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(40)
9	4 h, 40 ^{o}C	MeOH-CH_2Cl_2-H_2O	Oxone (3)	PhI (0.2)	(12)

		(10:10:1)			
10	4 h, 40 ^{o}C	MeOH-MeCN-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(11)
11	4 h, 40 ^{o}C	MeOH-AcOEt-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(6)
12	4 h, 40 ^{o}C	MeOH-Hexane-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(49)
13	4 h, 40 ^{o}C	MeOH-THF-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(4)
14	4 h, 40 ^{o}C	MeOH-toluene-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(13)
15	4 h, 40 ^{o}C	MeOH-HFIP (1:1)	Oxone (3)	PhI (0.2)	(1)
16	4 h, 40 ^{o}C	EtOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(62)
17	4 h, 40 ^{o}C	*i*-PrOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(27)
18	4 h, 40 ^{o}C	*t*-BuOH-HFIP-H_2O (10:10:1)	Oxone (3)	PhI (0.2)	(16)
19	4 h, 40 ^{o}C	HFIP-H_2O (20:1)	Oxone (3)	PhI (0.2)	(57)
20	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:3)	Oxone (3)	PhI (0.2)	(74)
21	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:5)	Oxone (3)	PhI (0.2)	(66)
22	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (2)	PhI (0.2)	(63)
23	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	*m*-CPBA (3)	PhI (0.2)	(53)
24	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	H_2O_2 (3)	PhI (0.2)	-
25	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	AcOOH (3)	PhI (0.2)	(10)
26	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	TBHP (3)	PhI (0.2)	-
27	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	*p*-$MeOC_6H_4I$ (0.2)	(53)
28	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	*p*-MeC_6H_4I (0.2)	(71)
29	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	3,5-$Me_2C_6H_3I$ (0.2)	(85)
30	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	2,4,6-$Me_3C_6H_2I$ (0.2)	(67)
31	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (2)	*p*-ClC_6H_4I (0.2)	(44)
32	4 h, 40 ^{o}C	MeOH-HFIP-H_2O (10:10:1)	Oxone (1.5)	*p*-$CF_3C_6H_4I$ (0.2)	(17)
33	24 h, rt	MeOH-HFIP-H_2O	Oxone (1.5)	3,5-$Me_2C_6H_3I$	88 (87)

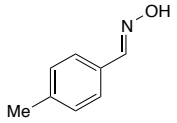
		(10:10:1)		(0.2)	
34	24 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (1.5)	3,5-$Me_2C_6H_3I$ (0.1)	(66)
35	48 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (1.5)	3,5-$Me_2C_6H_3I$ (0.1)	(72)
36	24 h, rt	MeOH-HFIP-H_2O (10:10:1)	none	3,5-$Me_2C_6H_3I$ (0.2)	-
37	24 h, rt	MeOH-HFIP-H_2O (10:10:1)	Oxone (3)	3,5-$Me_2C_6H_3I$ (0.2)	(65)

[a] Reaction of benzaldoxime (1 equiv.) was carried out with styrene (1.2 equiv.), oxidant and ArI. [b] Isolated yields; in parentheses are ^{1}H NMR yields.

3. Typical procedure for preparation of aldoximes from aldehydes

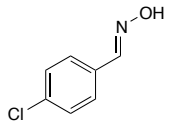
To a mixture solution of aldehyde (5.0 mmol) and hydroxylamine hydrochloride (10 mmol) in CH_2Cl_2 (25 mL) pyridine (20.0 mmol) was added under stirring. The reaction was stirred at room temperature for 20 h. After reaction, aqueous HCl (2.0 M, 15 mL) was added to the reaction mixture and the solution was extracted with CH_2Cl_2. Then the organic layer was dried over Na_2SO_4 and the solvent was evaporated in vacuum. The residue was separated by column chromatography using the mixture EtOAc-hexanes (1:2) to afford the pure aldoxime **2**.

4-Methylbenzaldehyde Oxime (2b).[1]



Reaction of hydroxylamine hydrochloride with 4-methylbenzaldehyde (601 mg, 5.0 mmol) according to the general procedure afforded 541 mg (80%) of product **2b**, isolated as a white solid: colorless needles (recrystallized from dichloromethane-hexane); mp 76.8-77.7 °C (lit.[2], mp 74-76 °C); IR (KBr) cm^{-1}: 3286, 2995, 2915, 1607, 1446, 1287, 712; ^{1}H NMR (500 MHz, $CDCl_3$): δ 8.12 (s, 1H), 7.47 (d, J = 8.0 Hz, 2H), 7.19 (d, J = 8.0 Hz, 2H), 2.37 (s, 3H).

4-Chlorobenzaldehyde Oxime (2c).[1]

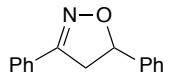


Reaction of hydroxylamine hydrochloride with 4-chlorobenzaldehyde (703 mg, 5.0 mmol) according to the general procedure afforded 643 mg (83%) of product **2c**, isolated as a white solid: colorless needles (recrystallized from dichloromethane-hexane); mp 110.3-110.7 °C (lit.[2], mp 106-108 °C); IR (KBr) cm^{-1}: 3294, 1596, 1493, 1318, 1088, 691; ^1H NMR (500 MHz, $CDCl_3$): δ 8.10 (s, 1H), 7.52 (d, J = 8.5 Hz, 2H), 7.36 (d, J = 8.5 Hz, 2H).

4. Typical procedure for the synthesis of isoxazolines and isoxazoles

To a solution of alkene **1** or alkyne **4** (0.3 mmol) in a solvent mixture of MeOH (0.75 mL), HFIP (0.75 mL), and H_2O (0.075 mL) were added benzaldoxime **2** (0.25 mmol), Oxone (0.75 mmol) and 3,5-C_6H_3I (0.05 mmol). The reaction was stirred at room temperature for 24 hours. After reaction completion, the mixture was filtered, the inorganic solids on filter were washed with CH_2Cl_2, then 5% aqueous $Na_2S_2O_3$ (5 mL) was added to the filtrate, and the resulting solution was extracted with dichloromethane. The organic phase was dried over anhydrous Na_2SO_4 and concentrated. Purification by preparative TLC (hexane-ethyl acetate = 9 : 1 or 95 : 5) afforded analytically pure isoxazolines **3** or isoxazoles **5**.

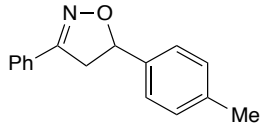
3,5-Diphenyl-2-isoxazoline (3a)[1]



Reaction of styrene **1a** (31 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 49 mg (88%) of product **3a**, isolated as a yellow solid: light yellow needles (recrystallized from dichloromethane-hexane); mp 71.2-72.3 °C

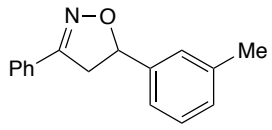
(lit.[1], mp 73-74 ºC); IR (KBr) cm^{-1} 3029, 2971, 2877, 1448, 1364, 1064, 894, 860, 752, 687; ^1H NMR (500 MHz, $CDCl_3$): δ 7.72-7.65 (m, 2H), 7.43-7.28 (m, 8H), 5.73 (dd, *J* = 11.0, 8.3 Hz, 1H), 3.77 (dd, *J* = 16.8, 11.0 Hz, 1H), 3.33 (dd, *J* = 16.8, 8.3 Hz, 1H).

5-(*p*-Methylphenyl)-3-phenyl-2-isoxazoline (3b)[2]



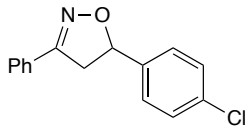
Reaction of *p*-methylstyrene **1b** (35 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 46 mg (78%) of product **3b**, isolated as a yellow solid: colorless needles (recrystallized from dichloromethane-hexane); mp 84.2-84.8 ºC (lit.[2], mp 94-95 ºC); IR (KBr) cm^{-1} 3043, 2929, 2917, 1364, 906, 869, 760, 691; ^1H NMR (500 MHz, $CDCl_3$): δ 7.72-7.66 (m, 2H), 7.44-7.36 (m, 3H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 5.69 (dd, *J* = 10.9, 8.5 Hz, 1H), 3.74 (dd, *J* = 16.6, 10.9 Hz, 1H), 3.32 (dd, *J* = 16.6, 8.5 Hz, 1H), 2.34 (s, 3H).

5-(*m*-Methylphenyl)-3-phenyl-2-isoxazoline (3c)[3]



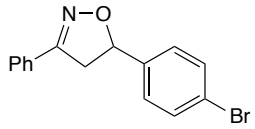
Reaction of *m*-methylstyrene **1c** (35 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 48 mg (81%) of product **3c**, isolated as a yellow oil; IR (neat) cm^{-1} 3030, 2920, 1446, 1359, 1077, 902, 848, 761, 693; ^1H NMR (500 MHz, $CDCl_3$) δ 7.72-7.66 (m, 2H), 7.43-7.37 (m, 3H), 7.25 (t, *J* = 7.5 Hz, 1H), 7.21 (s, 1H), 7.18 (d, *J* = 7.5 Hz, 1H), 7.12 (d, *J* = 7.5 Hz, 1H), 5.69 (dd, *J* = 11.1, 8.4 Hz, 1H), 3.74 (dd, *J* = 16.8, 8.4 Hz, 1H), 3.33 (dd, *J* = 16.8, 11.1 Hz, 1H), 2.35 (s, 3H).

5-(*p*-Chlorophenyl)-3-phenyl-2-isoxazoline (3d)[3]



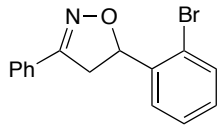
Reaction of *p*-chlorostyrene **1e** (42 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 59 mg (92%) of product **3d**, isolated as a yellow solid: colorless blocks (recrystallized from dichloromethane-hexane); mp 109.7-111.1 °C (lit.[3], mp 110.0-111.5 °C); IR (KBr) cm^{-1} 3048. 2988, 2856, 1448, 1367, 1094, 1069, 896, 860, 760, 688; ^1H NMR (500 MHz, $CDCl_3$): δ 7.71-7.66 (m, 2H), 7.45-7.39 (m, 3H), 7.37-7.31 (m, 4H), 5.72 (dd, *J* = 11.0, 8.0 Hz, 1H), 3.79 (dd, *J* = 16.8, 11.0 Hz, 1H), 3.30 (dd, *J* = 16.8, 8.0 Hz, 1H).

5-(*p*-Bromophenyl)-3-phenyl-2-isoxazoline (3e)[4]



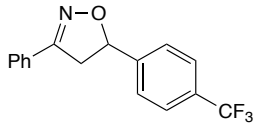
Reaction of *p*-bromostyrene **1f** (55 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 65 mg (87%) of product **3e**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 129.8-130.3 °C (lit.[4], mp 130-131 °C); IR (KBr) cm^{-1} 3048, 2976, 2895, 1369, 1327, 1055, 887, 862, 762, 690; ^1H NMR (500 MHz, $CDCl_3$): δ 7.71-7.64 (m, 2H), 7.49 (d, *J* = 8.5 Hz, 2H), 7.45-7.37 (m, 3H), 7.27 (d, *J* = 8.5 Hz, 2H), 5.69 (dd, *J* = 11.0, 8.1 Hz, 1H), 3.78 (dd, *J* = 16.6, 11.0 Hz, 1H), 3.28 (dd, *J* = 16.6, 8.1 Hz, 1H).

5-(*o*-Bromophenyl)-3-phenyl-2-isoxazoline (3f)[5]



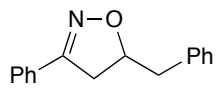
Reaction of *o*-bromostyrene **1g** (55 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 67 mg (89%) of product **3g**, isolated as a yellow oil; IR (neat) cm^{-1} 3062, 2926, 2857, 1446, 1357, 1076, 901, 863, 756, 692; ^1H NMR (500 MHz, $CDCl_3$): δ 7.70-7.64 (m, 2H), 7.59-7.53 (m, 2H), 7.43-7.35 (m, 3H), 7.32 (td, *J* = 7.6, 1.0 Hz, 1H), 7.15 (td, *J* = 7.6, 1.5 Hz, 1H), 5.97 (dd, *J* = 11.1, 6.9 Hz, 1H), 3.94 (dd, *J* = 16.5, 11.1 Hz, 1H), 3.20 (dd, *J* = 16.5, 6.9 Hz, 1H).

3-Phenyl-5-(*p*-trifluoromethyl-phenyl)-2-isoxazoline (3g)[5]



Reaction of *p*-trifluoromethylstyrene **1h** (52 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 72 mg (99%) of product **3g**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 143.2-144.1 ºC; IR (KBr) cm^{-1} 3062, 2914, 1423, 1332, 1121, 1072, 903, 840, 766, 694; ^1H NMR (500 MHz, $CDCl_3$): δ 7.71-7.66 (m, 2H), 7.63 (d, *J* = 8.5 Hz, 2H), 7.51 (d, *J* = 8.3 Hz, 2H), 7.45-7.37 (m, 3H), 5.78 (dd, *J* = 11.0, 7.6 Hz, 1H), 3.84 (dd, *J* = 16.6, 11.0 Hz, 1H), 3.31 (dd, *J* = 16.6, 7.6 Hz, 1H).

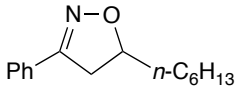
5-Benzyl-3-phenyl-2-isoxazoline (3h)[6]



Reaction of allylbenzene **1i** (35 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 46 mg (78%) of product **3h**, isolated as a

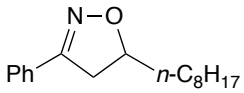
yellow solid: colorless needles (recrystallized from dichloromethane-hexane); mp 67.5-68.2 ºC (lit.[6], mp 67.5-68.2 °C); IR (KBr) cm^{-1} 3024, 2940, 2914, 1446, 1360, 1083, 916, 881, 754, 700; ^1H NMR (500 MHz, $CDCl_3$): δ 7.66-7.60 (m, 2H), 7.40-7.35 (m, 3H), 7.34-7.29 (m, 2H), 7.28-7.21 (m, 3H), 5.03-4.94 (m, 1H), 3.30 (dd, *J* = 16.5, 10.0 Hz, 1H), 3.16 (dd, *J* = 13.9, 6.0 Hz, 1H), 3.04 (dd, *J* = 16.5, 8.0 Hz, 1H), 2.88 (dd, *J* = 13.9, 7.3 Hz, 1H).

5-Hexyl-3-phenyl-2-isoxazoline (3i)[1]



Reaction of 1-octene **1j** (34 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 40 mg (69%) of product **3i**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 49.4-50.7 ºC (lit.[1], mp 47-48 ºC); IR (KBr) cm^{-1} 2952, 2922, 2857, 1450, 1363, 755, 696; ^1H NMR (500 MHz, $CDCl_3$): δ 7.70-7.64 (m, 2H), 7.43-7.37 (m, 3H), 4.78-4.69 (m, 1H), 3.38 (dd, *J* = 16.3, 10.3 Hz, 1H), 2.83 (dd, *J* = 16.3, 8.3 Hz, 1H), 1.84-1.75 (m, 1H), 1.67-1.57 (m, 1H), 1.54-1.24 (m, 8H), 0.89 (t, *J* = 8.0 Hz, 3H).

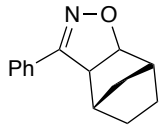
5-Octyl-3-phenyl-2-isoxazoline (3j)[7]



Reaction of 1-decene **1k** (42 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 46 mg (71%) of product **3j**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 60.4-61.0 ºC (lit.[7], mp 60 ºC); IR (KBr) cm^{-1} 2954, 2921, 2849, 1447, 1361, 755, 690; ^1H NMR (500 MHz, $CDCl_3$): δ 7.69-7.63 (m, 2H), 7.42-7.37 (m, 3H), 4.77-4.68 (m, 1H), 3.38 (dd, *J* = 16.3, 10.5

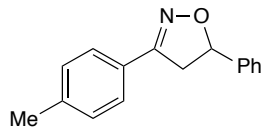
Hz, 1H), 2.96 (dd, *J* = 16.3, 8.3 Hz, 1H), 1.83-1.75 (m, 1H), 1.67-1.57 (m, 1H), 1.53-1.21 (m, 12H), 0.88 (t, *J* = 8.0 Hz, 3H).

(4*S*,7*S*)-3-phenyl-3a,4,5,6,7,7a-hexahydro-4,7-methanobenzo[*d*]isoxazole (3k)[8]



Reaction of norbornene **1k** (28 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 7 mg (30%) of product **3k**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 98.4-99.0 ºC (lit.[8], mp 98-99 °C); IR (KBr) cm^{-1} 2968, 2872, 1448, 1357, 774, 695; ^1H NMR (500 MHz, $CDCl_3$): δ 7.75-7.68 (m, 2H), 7.43-7.36 (m, 3H), 4.64 (d, *J* = 8.5 Hz, 1H), 3.50 (d, *J* = 8.5, 1H), 2.57 (d, *J* = 48.5 Hz, 2H), 1.62-1.51 (m, 3H), 1.40-1.33 (m, 1H), 1.23-1.14 (m, 12H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 156.9, 129.7, 128.7, 126.8, 87.9, 57.1, 43.0, 39.3, 32.3, 27.4, 22.7.

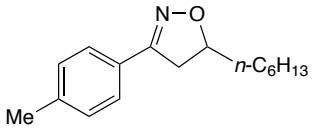
5-Phenyl-3-(*p*-methylphenyl)-2-isoxazoline (3l)[1]



Reaction of styrene **1a** (31 mg, 0.30 mmol) and *p*-methylbenzaldehyde oxime **2b** (31 mg, 0.25 mmol) according to the general procedure afforded 42 mg (71%) of product **3l**, isolated as a yellow solid: colorless blocks (recrystallized from dichloromethane-hexane); mp 94.9-96.0 ºC (lit.[1], mp 97 ºC); IR (KBr) cm^{-1} 3048, 2905, 2869, 1450, 1352, 901, 824, 758, 698; ^1H NMR (500 MHz, $CDCl_3$): δ 7.58 (d, *J* = 8.0 Hz, 2H), 7.43-7.27 (m, 5H), 7.21 (d, *J* = 8.0 Hz, 2H), 5.71 (dd, *J* = 10.9, 8.4 Hz, 1H), 3.75 (dd, *J* = 16.5, 10.9 Hz, 1H), 3.32 (dd, *J* =

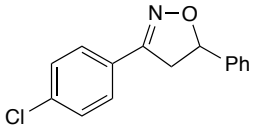
16.5, 8.4 Hz, 1H), 2.38 (s, 3H).

5-Hexyl-3-(*p*-methylphenyl)-2-isoxazoline (3m)[5]



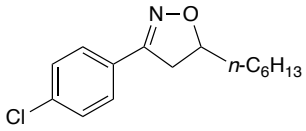
Reaction of 1-octene **1j** (34 mg, 0.30 mmol) and *p*-methylbenzaldehyde oxime **2b** (34 mg, 0.25 mmol) according to the general procedure afforded 33 mg (54%) of product **3m**, isolated as a yellow solid: white solid (recrystallized from dichloromethane-hexane); mp 49.5-50.0 ºC; IR (KBr) cm^{-1} 2953, 2927, 2849, 1450, 1363, 1058, 898, 816; ^1H NMR (500 MHz, $CDCl_3$): δ 7.55 (d, *J* = 8.0 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 4.75-4.66 (m, 1H), 3.36 (dd, *J* = 16.3, 10.3 Hz, 1H), 2.94 (dd, *J* = 16.3, 8.3 Hz, 1H), 2.37 (s, 3H), 1.84-1.73 (m, 1H), 1.66-1.56 (m, 1H), 1.53-1.24 (m, 8H), 0.89 (t, *J* = 6.8 Hz, 3H).

5-Phenyl-3-(*p*-chlorophenyl)-2-isoxazoline (3n)[1]



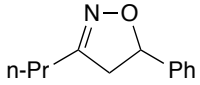
Reaction of styrene **1a** (31 mg, 0.30 mmol) and *p*-chlorobenzaldehyde oxime **2c** (39 mg, 0.25 mmol) according to the general procedure afforded 49 mg (77%) of product **3n**, isolated as a yellow solid: colorless plates (recrystallized from dichloromethane-hexane); mp 124.2-125.2 ºC (lit.[1], mp 127-129 ºC); IR (KBr) cm^{-1} 3043, 2905, 1417, 1348, 1093, 907, 837, 758, 699; ^1H NMR (500 MHz, $CDCl_3$): δ 7.62 (d, *J* = 9.0 Hz, 2H), 7.44-7.29 (m, 7H), 5.75 (dd, *J* = 11.0, 8.3 Hz, 1H), 3.74 (dd, *J* = 16.8, 11.0 Hz, 1H), 3.31 (dd, *J* = 16.8, 8.3 Hz, 1H).

5-Hexyl-3-(*p*-chlorophenyl)-2-isoxazoline (3o)[5]



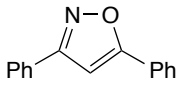
Reaction of 1-octene **1j** (34 mg, 0.30 mmol) and *p*-chlorobenzaldehyde oxime **2c** (39 mg, 0.25 mmol) according to the general procedure afforded 52 mg (79%) of product **3o**, isolated as a yellow solid: white solid (recrystallized from dichloromethane-hexane); mp 75.3-75.9 ºC; IR (KBr) cm^{-1} 2952, 2926, 2848, 1470, 1357, 1097, 903, 829; ^1H NMR (500 MHz, $CDCl_3$): δ 7.59 (d, *J* = 8.5 Hz, 2H), 7.36 (d, *J* = 8.5 Hz, 2H), 4.79-4.68 (m, 1H), 3.35 (dd, *J* = 16.4, 10.5 Hz, 1H), 2.93 (dd, *J* = 16.4, 8.3 Hz, 1H), 1.84-1.73 (m, 1H), 1.68-1.57 (m, 1H), 1.53-1.23 (m, 8H), 0.89 (t, *J* = 6.7 Hz, 3H).

5-Phenyl-3-propyl-2-isoxazoline (3p)[1]



Reaction of styrene **1a** (31 mg, 0.30 mmol) and butylaldehyde oxime **2d** (22 mg, 0.25 mmol) according to the general procedure afforded 8 mg (17%) of product **3p**, isolated as a colorless oil; IR (neat) cm^{-1} 3031, 2962, 2933, 2874, 1455, 1327, 874, 758, 700; ^1H NMR (500 MHz, $CDCl_3$): δ 7.39-7.27 (m, 5H), 5.55 (dd, *J* = 11.0, 8.0 Hz, 1H), 3.35 (dd, *J* = 17.0, 11.0 Hz, 1H), 2.89 (dd, *J* = 17.0, 8.0 Hz, 1H), 2.37 (t, *J* = 7.8 Hz, 2H), 1.67-1.57 (m, 2H), 0.97 (t, *J* = 7.5 Hz, 3H).

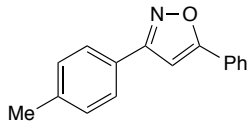
3,5-Diphenylisoxazole (5a)[1]



Reaction of phenylacetylene **4** (31 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 41 mg (75%) of product **5a**, isolated as a yellow solid: light colorless needles (recrystallized from dichloromethane-hexane); mp

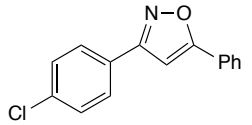
138.8-139.4 ºC (lit.[1], mp 139-140 ºC); IR (KBr) cm^{-1} 3381, 3119, 765, 692; ^1H NMR (500 MHz, $CDCl_3$): δ 7.90-7.82 (m, 4H), 7.54-7.41 (m, 6H), 6.83 (s, 1H).

5-Phenyl-3-(*p*-methylphenyl)-2-isoxazole (5b)[10]



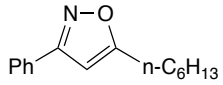
Reaction of phenylacetylene **4a** (31 mg, 0.30 mmol) and *p*-methylbenzaldehyde oxime **2b** (34 mg, 0.25 mmol) according to the general procedure afforded 41 mg (70%) of product **5b**, isolated as a yellow solid: light colorless needles (recrystallized from dichloromethane-hexane); mp 135.1-135.4 ºC (lit.[10], mp 136-138 ºC); IR (KBr) cm^{-1} 3119, 3012, 2917, 2857, 1605, 1577, 1448, 1425, 1387, 762, 685; ^1H NMR (500 MHz, $CDCl_3$): δ 7.84 (d, J = 7.0 Hz, 2H), 7.76 (d, J = 8.3 Hz, 1H), 7.52-7.40 (m, 3H), 7.29 (d, J = 8.3 Hz, 2H), 6.81 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 170.2, 162.9, 140.1, 130.2, 129.6, 129.0, 127.6, 126.7, 126.3, 125.8, 97.4, 21.4.

5-Phenyl-3-(*p*-chlorophenyl)-2-isoxazoline (5c)[10]



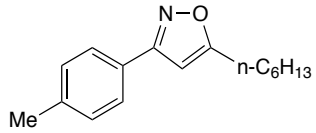
Reaction of phenylacetylene **4a** (31 mg, 0.30 mmol) and *p*-chlorobenzaldehyde oxime **2c** (39 mg, 0.25 mmol) according to the general procedure afforded 45 mg (70%) of product **5c**, isolated as a yellow solid: light colorless blocks (recrystallized from dichloromethane-hexane); mp 172.0-173.8 ºC (lit.[10], mp 178-180 ºC); IR (KBr) cm^{-1} 3381, 3119, 765, 692; ^1H NMR (500 MHz, $CDCl_3$): δ 7.87-7.78 (m, 4H), 7.53-7.43 (m, 5H), 6.80 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 170.7, 162.0, 136.1, 130.4, 129.2, 129.1, 128.1, 127.6, 127.3, 125.9, 97.3.

5-Hexyl-3-phenyl-2-isoxazole (5d)[11]



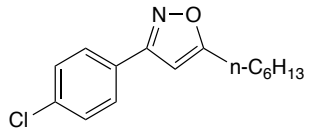
Reaction of 1-octyne **4b** (33 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 28 mg (49%) of product **5d**, isolated as a colorless oil; IR (neat) cm^{-1} 3128, 3053, 2956, 2931, 2859, 1602, 1580, 1471, 1443, 1408, 768, 693; ^1H NMR (500 MHz, $CDCl_3$): δ 7.83-7.76 (m, 2H), 7.48-7.39 (m, 3H), 6.28 (s, 1H), 2.79 (t, *J* = 7.5 Hz, 2H), 1.74 (quint, *J* = 7.5 Hz, 2H), 1.46-1.28 (m, 6H), 0.90 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 174.3, 162.3, 129.8, 129.5, 128.8, 126.8, 98.8, 31.4, 28.8, 27.5, 26.8, 22.5, 14.0

5-Hexyl-3-(*p*-methylphenyl)-2-isoxazole (5e)



Reaction of 1-octyne **4b** (33 mg, 0.30 mmol) and *p*-methylbenzaldehyde oxime **2b** (34 mg, 0.25 mmol) according to the general procedure afforded 24 mg (39%) of product **5e**, isolated as a colorless oil; IR (neat) cm^{-1} 3107, 3012, 2926, 2856, 1602, 1573, 1469, 1428, 1391, 787; ^1H NMR (500 MHz, $CDCl_3$): δ 7.68 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 8.0 Hz, 2H), 6.25 (s, 1H), 2.78 (t, *J* = 7.8 Hz, 2H), 2.39 (s, 3H), 1.74 (quint, *J* = 7.8 Hz, 2H), 1.46-1.28 (m, 6H), 0.90 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 3107, 3012, 2926, 2856, 1602, 1573, 1469, 1428, 1391, 787; HRMS (ESI): calcd for $C_{16}H_{22}NO$ ($[M+H]^+$): 244.1701, found: 244.1695.

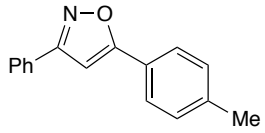
5-Hexyl-3-(*p*-chlorophenyl)-2-isoxazole (5f)



Reaction of 1-octyne **4b** (33 mg, 0.30 mmol) and *p*-chlorobenzaldehyde oxime **2c** (39 mg, 0.25 mmol) according to the general procedure afforded 29 mg (42%) of product **5**, isolated as a white solid: colorless needles (recrystallized from dichloromethane-hexane); mp 35.2-35.6 °C; IR (KBr) cm^{-1} 3119, 3048, 2932, 2857, 1607, 1574, 1466, 1430, 792, 686; ^1H NMR (500 MHz, $CDCl_3$): δ 7.73 (d, *J* = 8.5 Hz, 2H), 7.42 (d, *J* = 8.5 Hz, 2H), 6.25 (s, 1H),

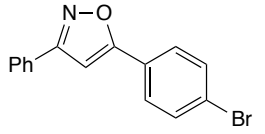
2.79 (t, *J* = 7.5 Hz, 2H), 1.74 (quint, *J* = 7.5 Hz, 2H), 1.46-1.29 (m, 6H), 0.90 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 174.7, 161.4, 135.8, 129.1, 128.0, 128.0, 98.6, 31.4, 28.8, 27.5, 26.8, 22.5, 14.0; HRMS (ESI): calcd for $C_{15}H_{19}ClNO$ ($[M+H]^+$): 264.1155, found: 264.1141.

5-(*p*-Methylphenyl)-3-phenyl-2-isoxazole (5g)[10]



Reaction of *p*-methylphenylacetylene **4c** (35 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 16 mg (27%) of product **5g**, isolated as a yellow solid: light colorless needles (recrystallized from dichloromethane-hexane); mp 137.2-137.8 ºC (lit.[10], mp 128-130 ºC); IR (KBr) cm^{-1} 3119, 3024, 2917, 2833, 1619, 1595, 1462, 1446, 1397, 766, 688; ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.87 (d, *J* = 8.0 Hz, 2H), 7.73 (d, *J* = 8.3 Hz, 2H), 7.51-7.43 (m, 3H), 7.29 (d, *J* = 8.3 Hz, 2H), 6.77 (s, 1H), 2.41 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 170.6. 163.0, 140.5, 130.0, 129.7, 129.3, 128.9, 126.8, 125.8, 124.8, 96.9, 21.5.

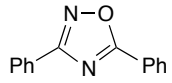
5-(*p*-Bromophenyl)-3-phenyl-2-isoxazole (5h)[10]



Reaction of *p*-bromophenylacetylene **4d** (54 mg, 0.30 mmol) and benzaldehyde oxime **2a** (30 mg, 0.25 mmol) according to the general procedure afforded 16 mg (44%) of product **5h**, isolated as a yellow solid: light yellow needles (recrystallized from dichloromethane-hexane); mp 178-179 ºC (lit.[10], mp 182-184 °C); IR (KBr) cm^{-1} 3107, 3024, 2929, 2857, 1607, 1488, 1417, 770, 696; ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.89-7.83 (m, 2H), 7.71 (d, *J* = 9.0 Hz, 2H), 7.63 (d, *J* = 9.0 Hz, 2H), 6.84 (s, 1H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 170.4, 163.0, 130.2, 130.0, 129.2, 129.0, 128.9, 127.5, 126.8, 125.8, 97.5.

4. Mechanistic Study of Cycloaddition

3,5-diphenyl-1,2,4-oxadiazole (7)[12]



To a solution of benzaldoxime **2a** (0.25 mmol) in a solvent mixture of MeOH (0.75 mL), HFIP (0.75 mL), and H_2O (0.075 mL) were added Oxone (0.75 mmol) and 3,5-$Me_2C_6H_3I$ (0.05 mmol). The reaction was stirred at room temperature for 24 hours. After reaction, the mixture was filtered, the inorganic solids on filter were washed with CH_2Cl_2, then 5% aqueous $Na_2S_2O_3$ (5 mL) was added to the filtrate, and the resulting solution was extracted with dichloromethane. The organic phase was dried over anhydrous Na_2SO_4 and concentrated. Purification by preparative TLC (hexane-ethyl acetate = 9 : 1) afforded 11 mg (38%) of analytically pure 3,5-diphenyl-1,2,4-oxadiazole **7**, isolated as a white solid: light colorless needles (recrystallized from dichloromethane-hexane); mp 106.2-107.3 ºC (lit.[12], mp 106-108 ºC); IR (KBr) cm^{-1} 3017, 2929, 2833, 1610, 1563, 1482, 1446, 1365, 727, 688; ^1H NMR (500 MHz, $CDCl_3$): δ 8.23 (d, J = 8.0 Hz, 2H), 8.21-8.14 (m, 2H), 7.65-7.59 (m, 1H), 7.59-7.48 (m, 5H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 175.7, 169.0, 132.7, 131.2, 129.1, 128.9, 128.2, 127.6, 127.0, 124.4.

References:

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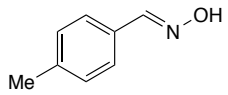
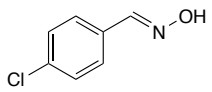
^{1}H NMR (500 MHz, $CDCl_3$):

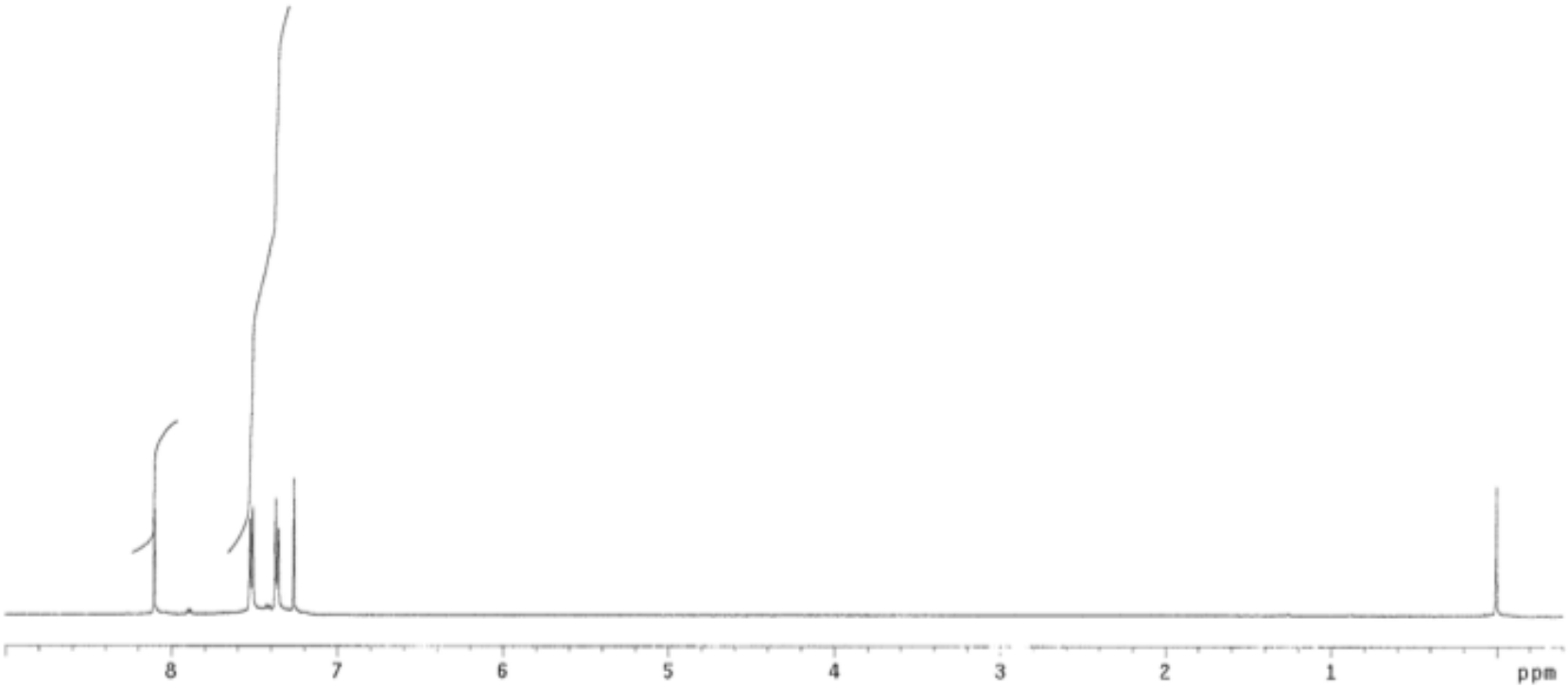


2b

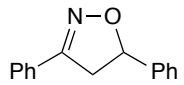
^{1}H NMR (500 MHz, $CDCl_3$):



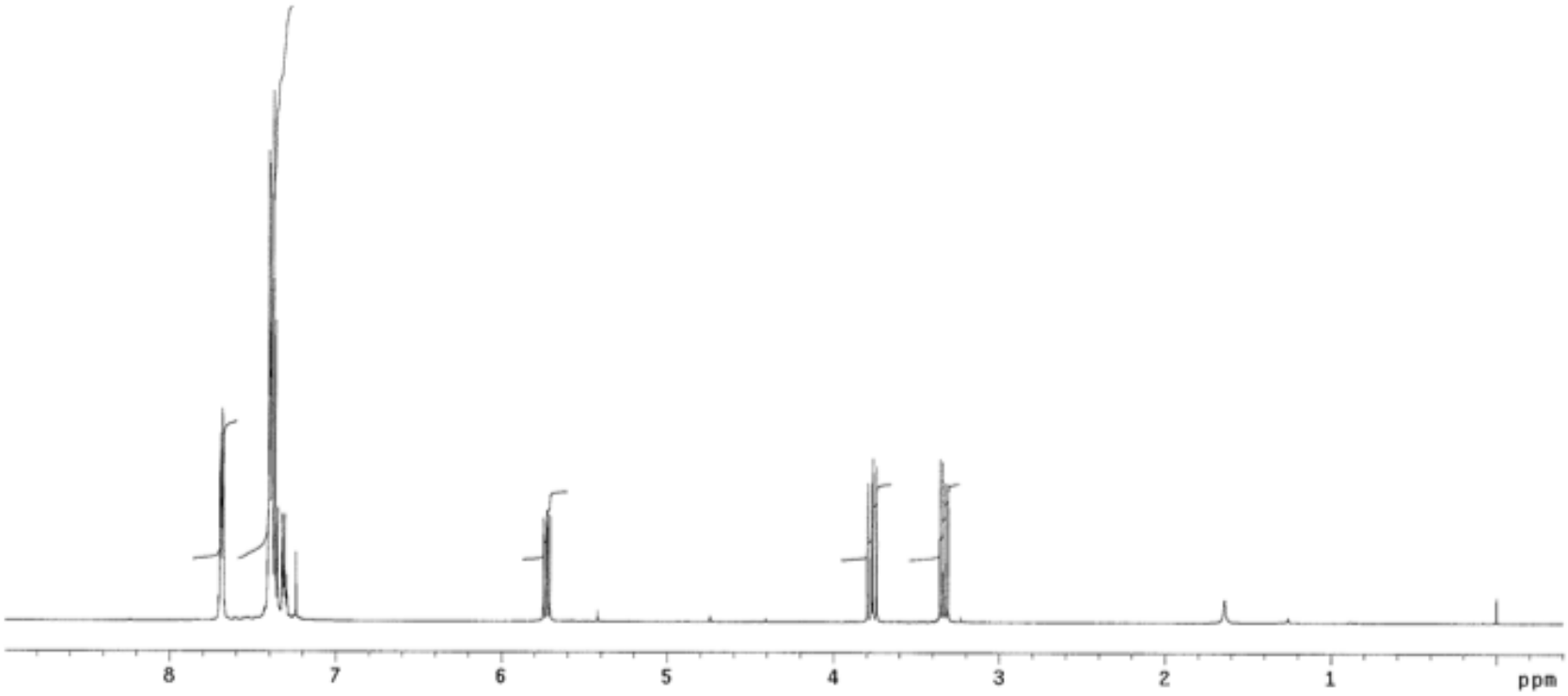
2c



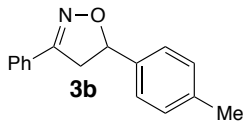
^{1}H NMR (500 MHz, $CDCl_3$):



3a



^{1}H NMR (500 MHz, $CDCl_3$):



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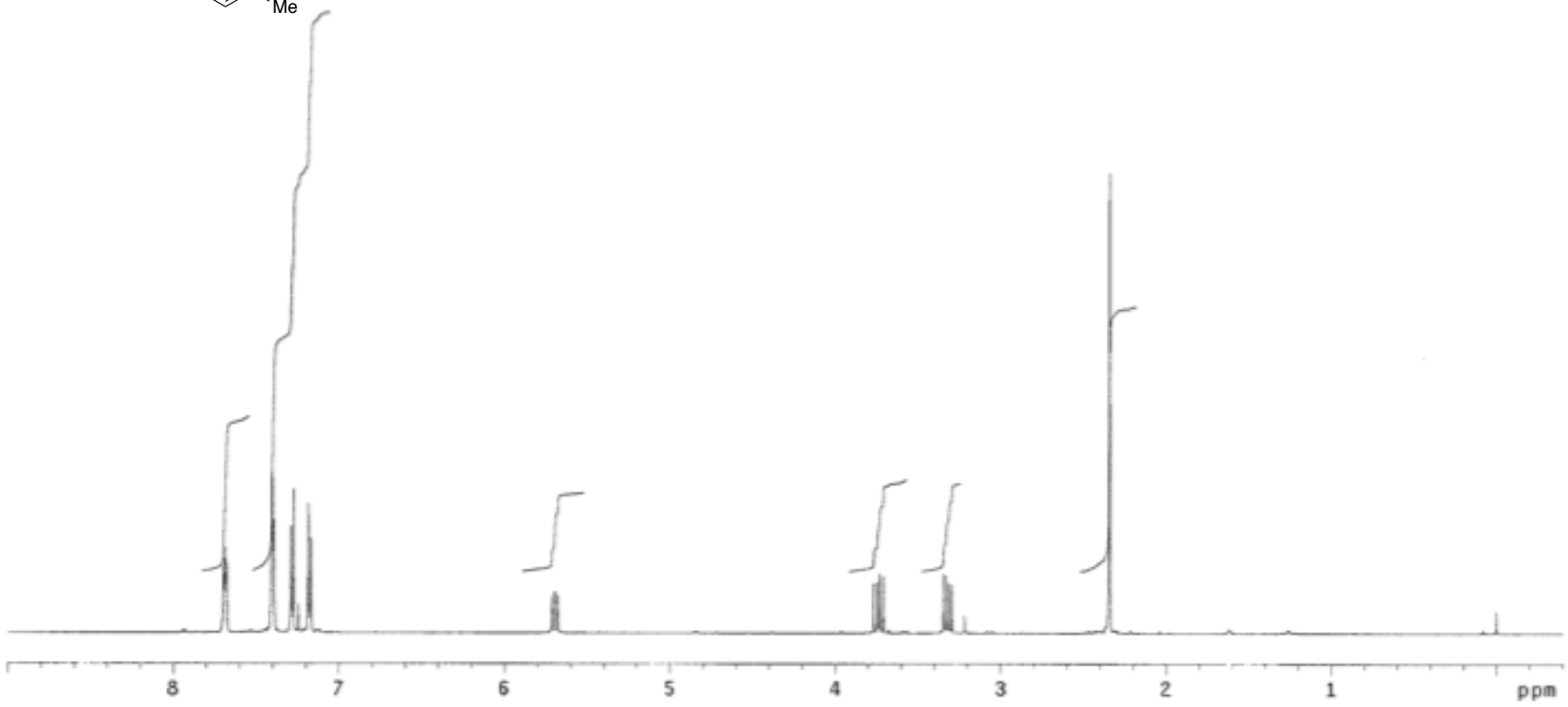

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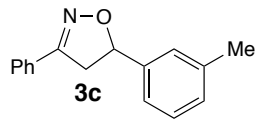

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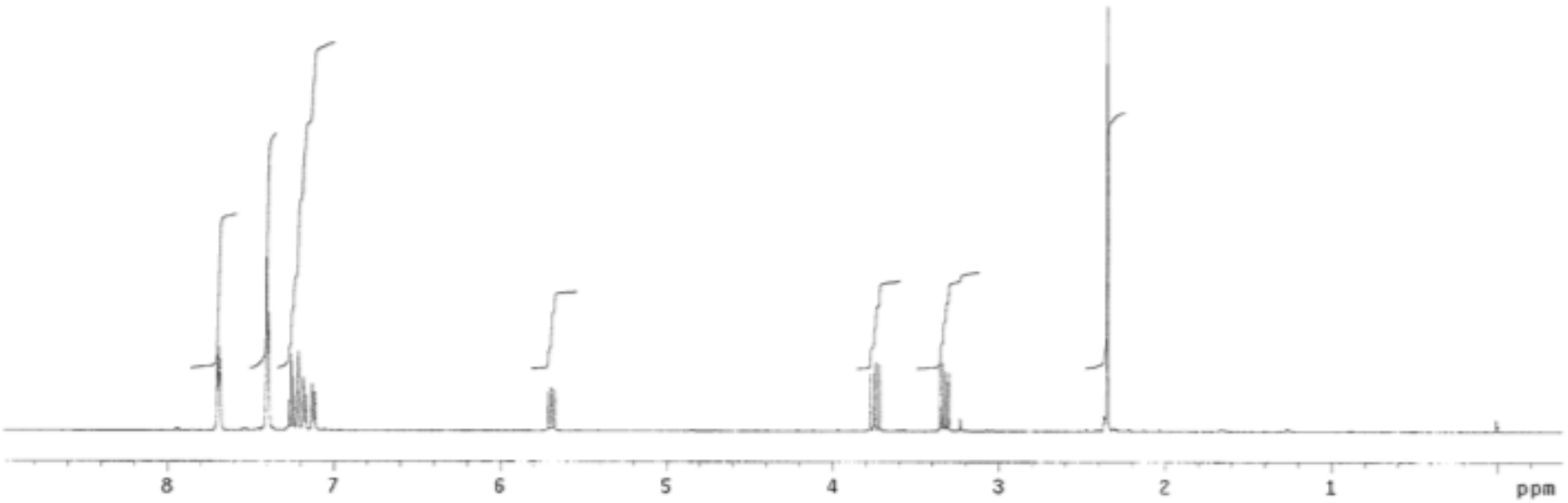

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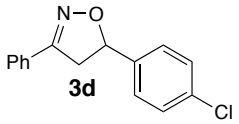

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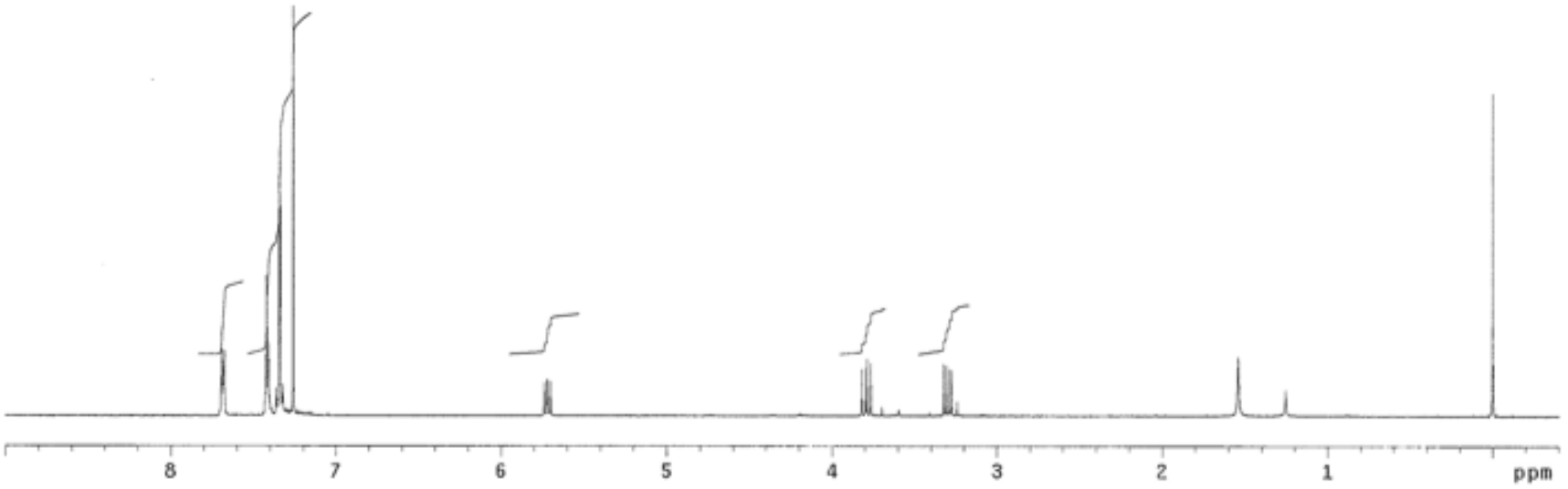

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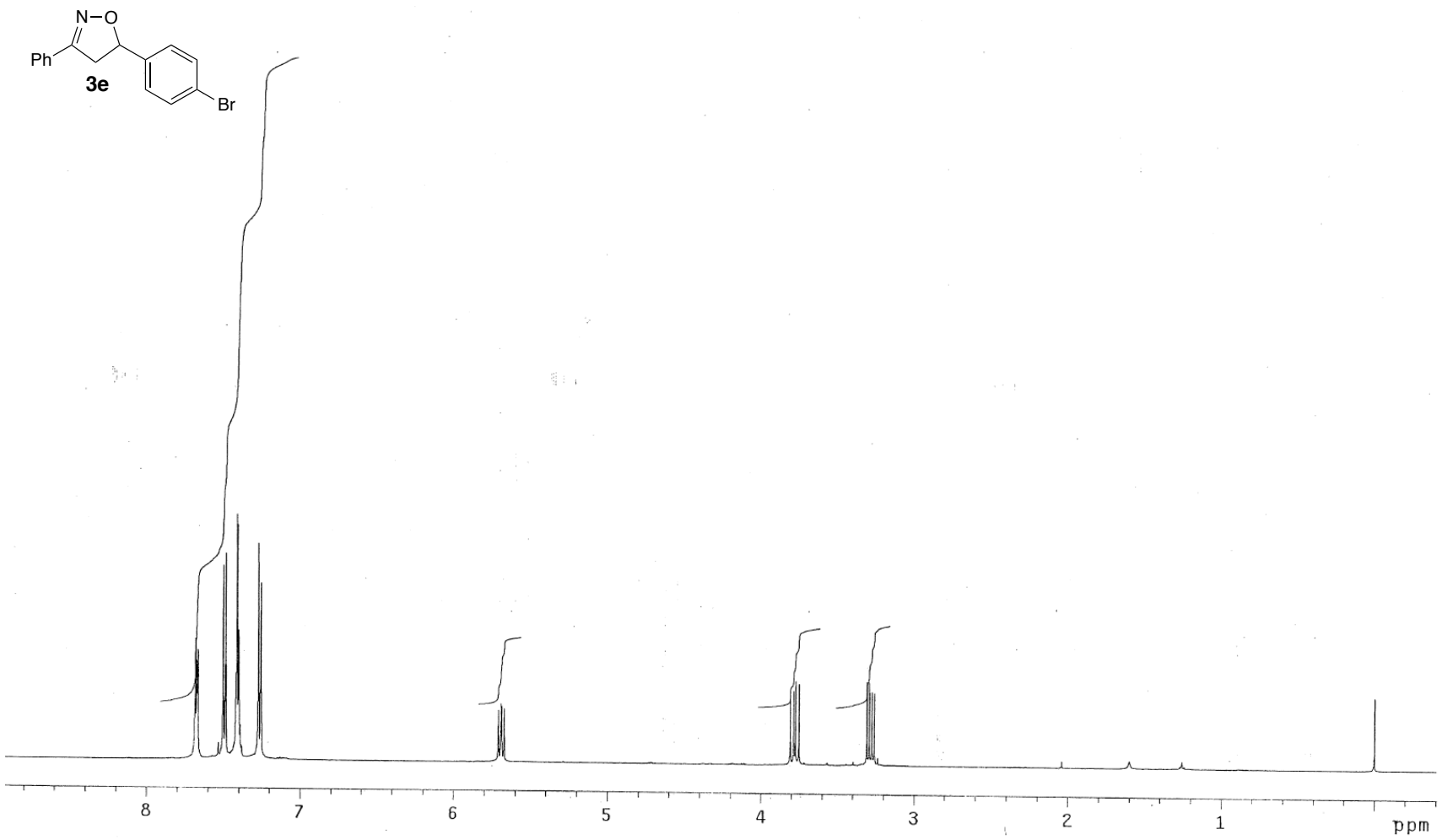

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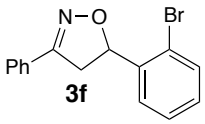

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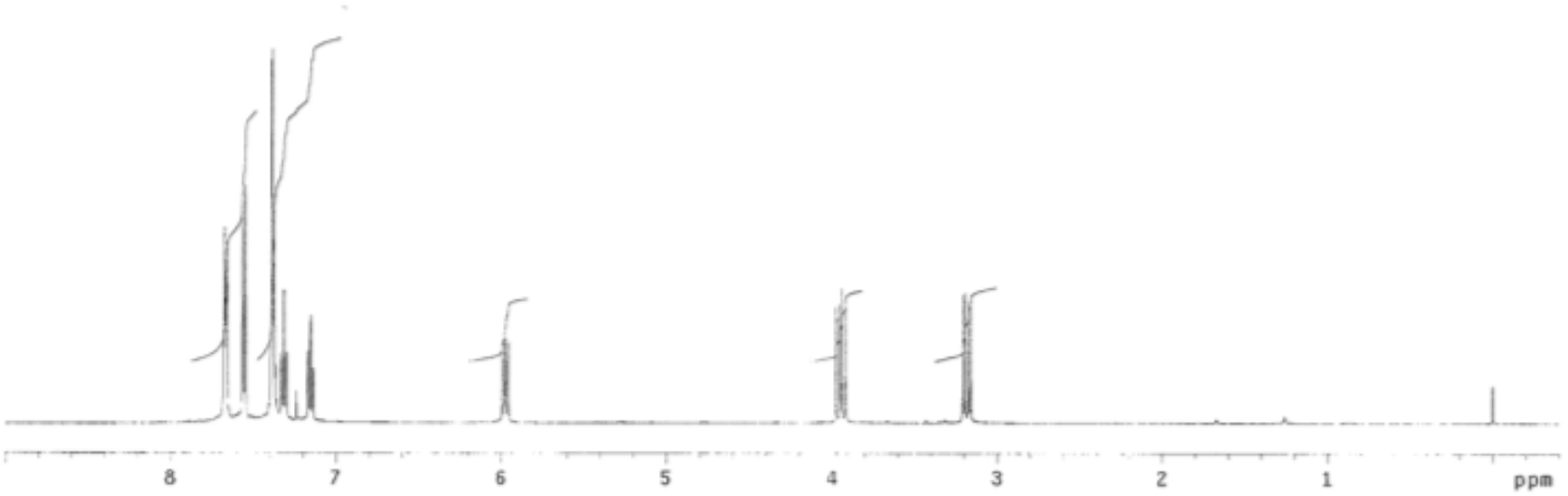

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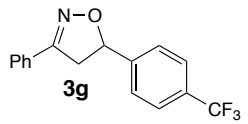

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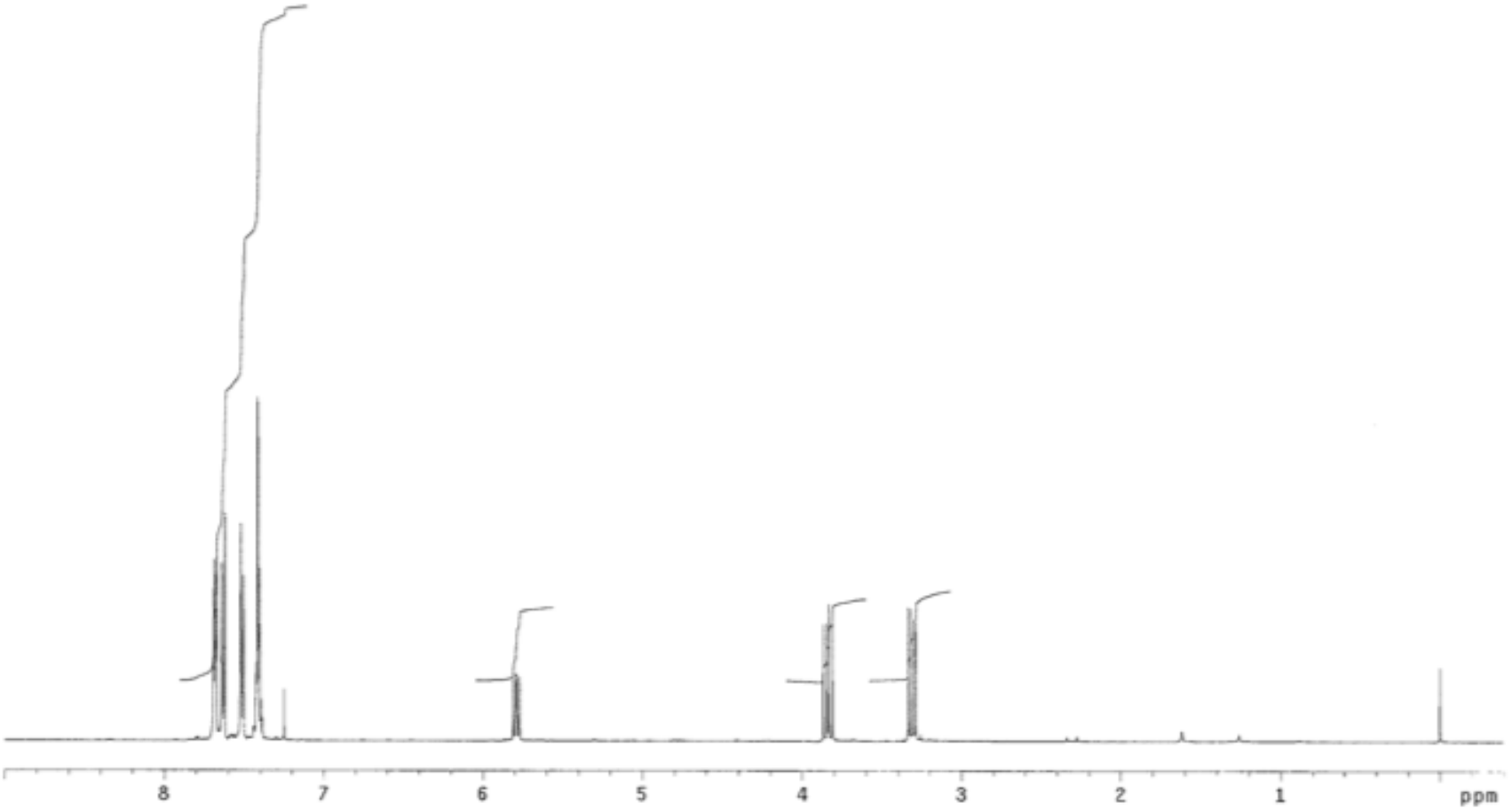

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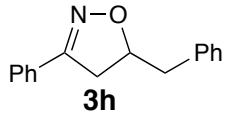

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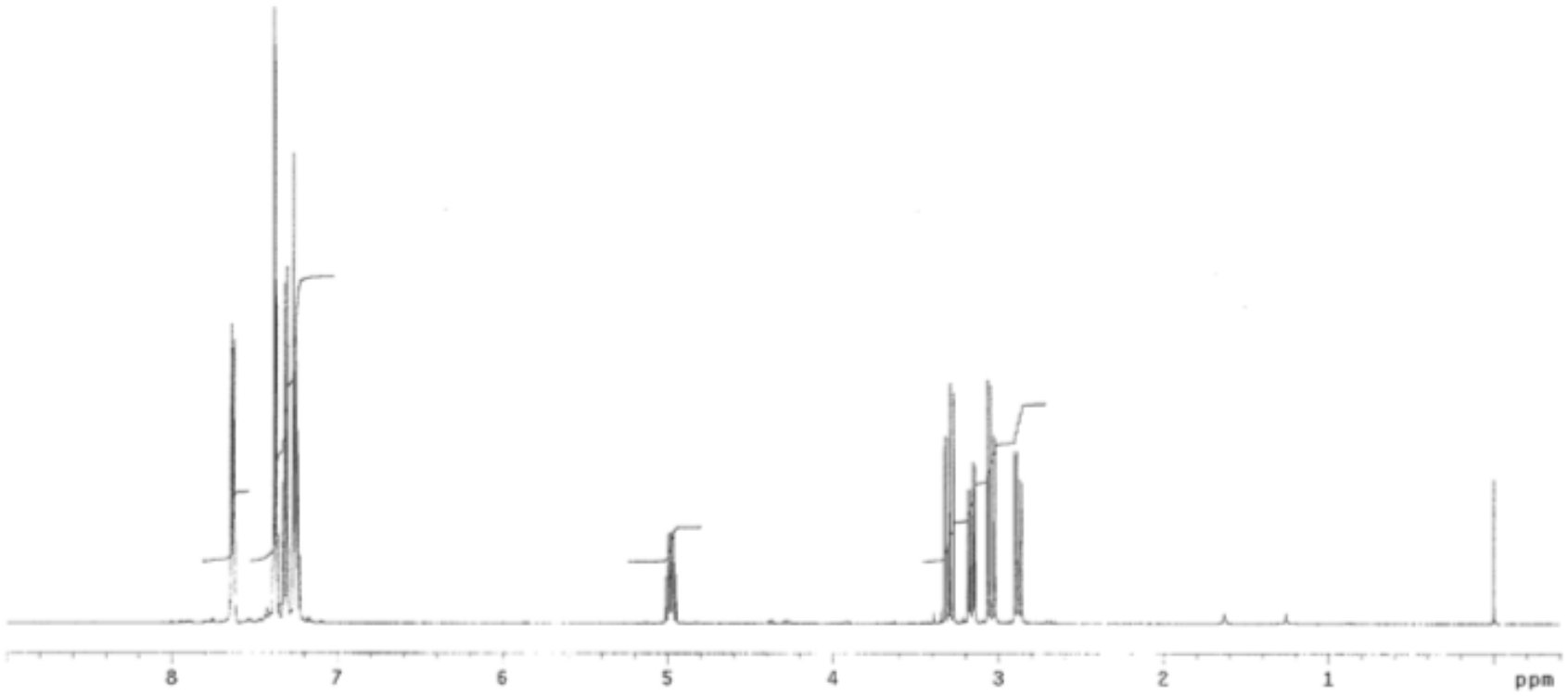

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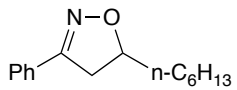

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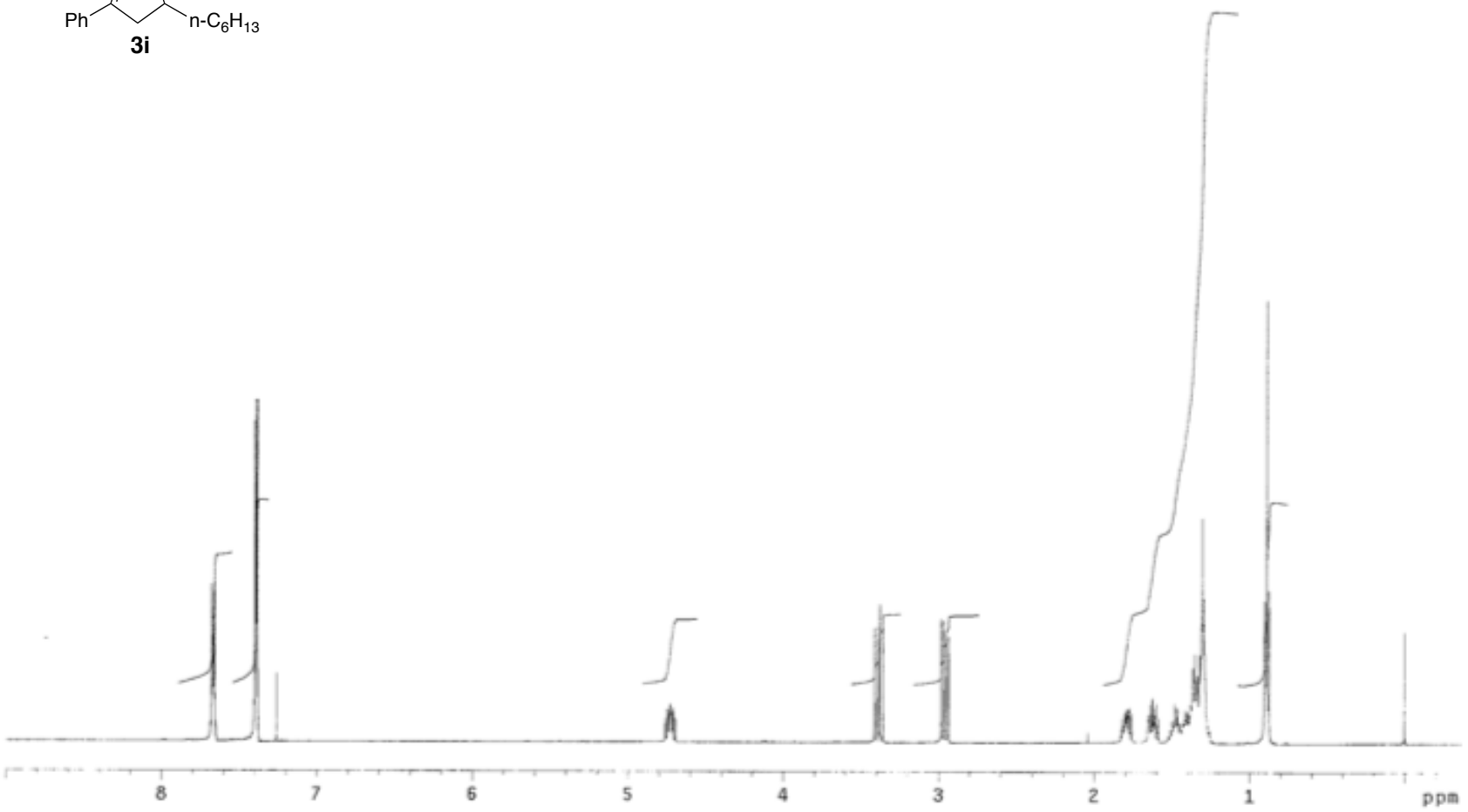

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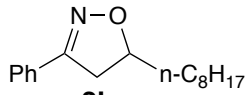

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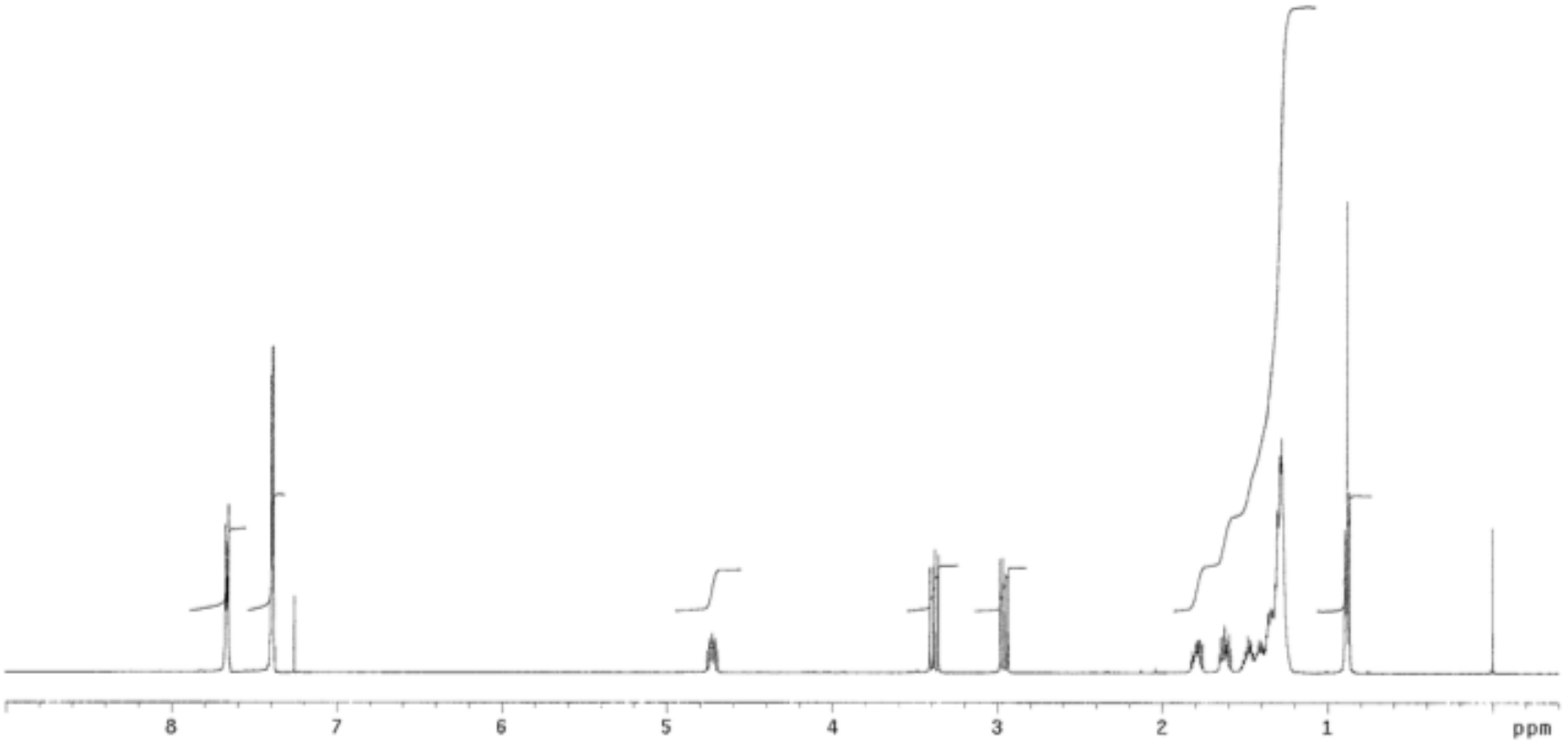

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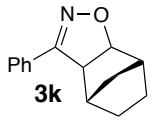

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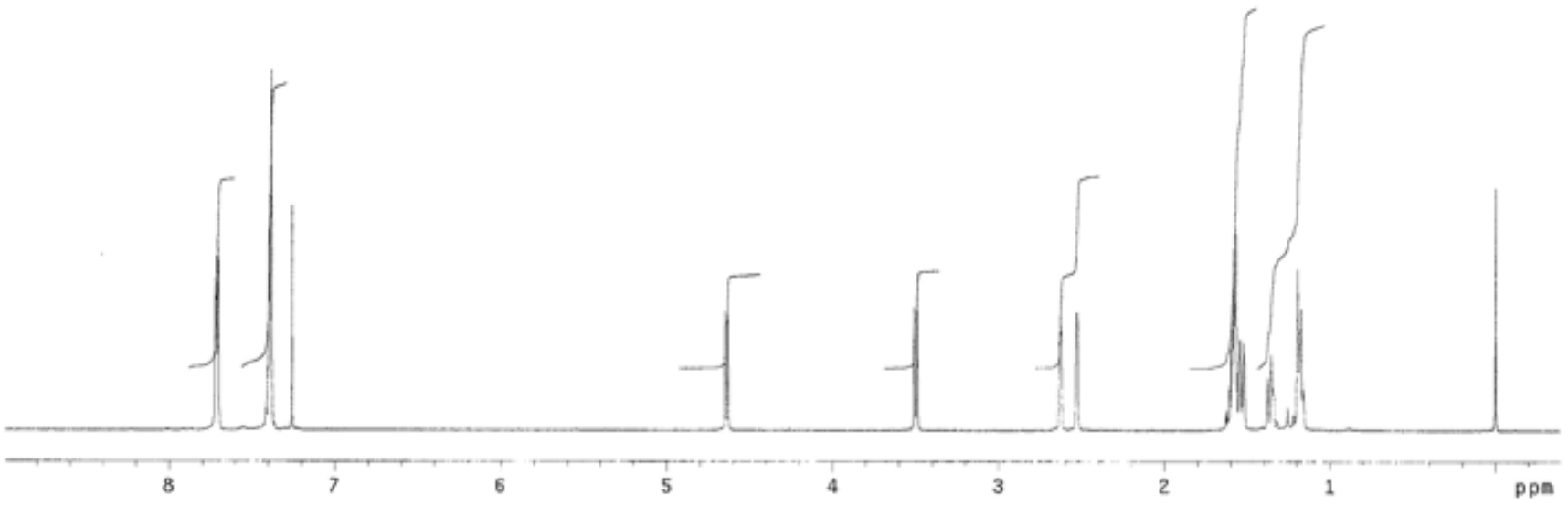
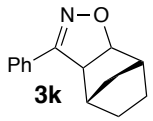


^{13}C NMR (125 MHz, $CDCl_3$):



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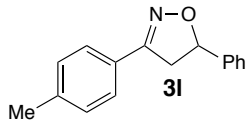

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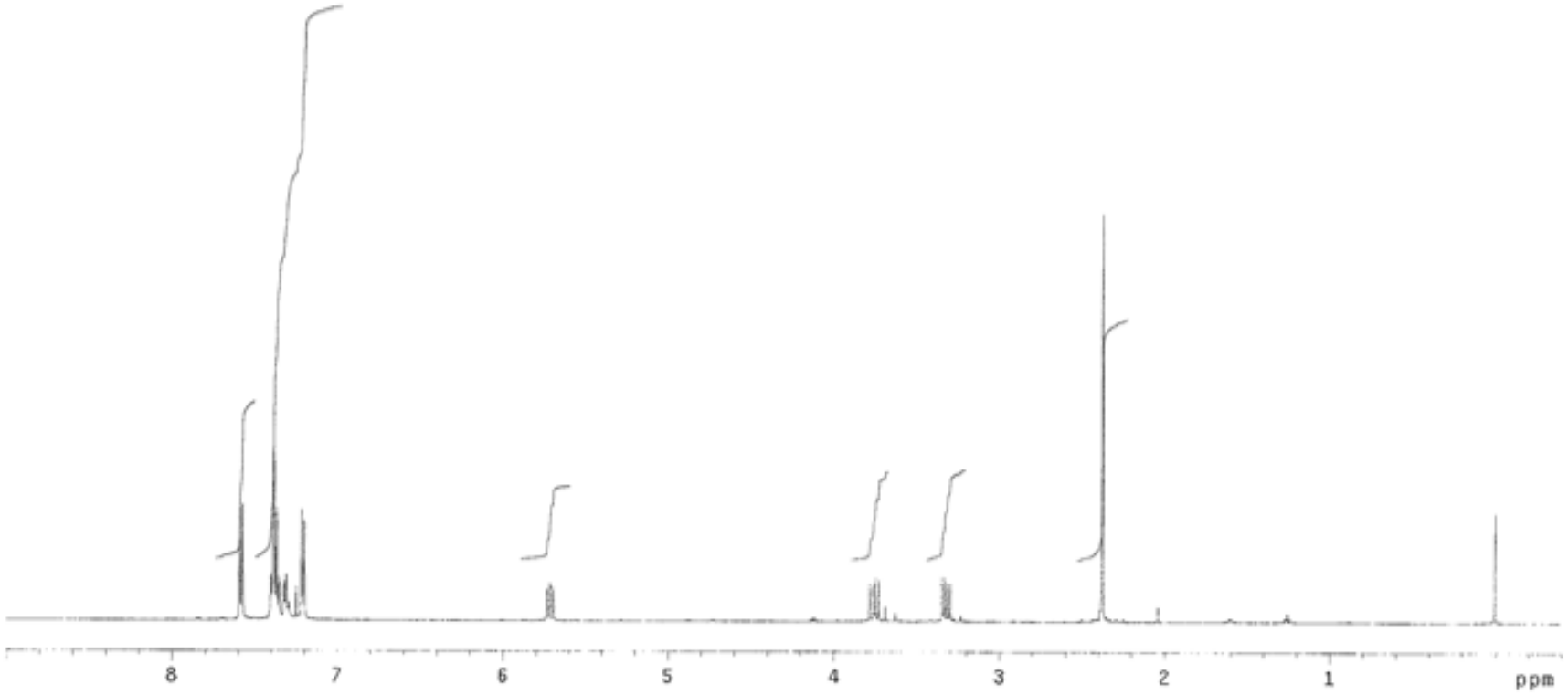

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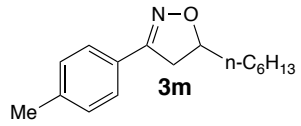

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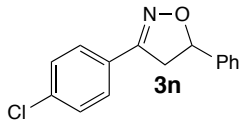
^{1}H NMR (500 MHz, $CDCl_3$):



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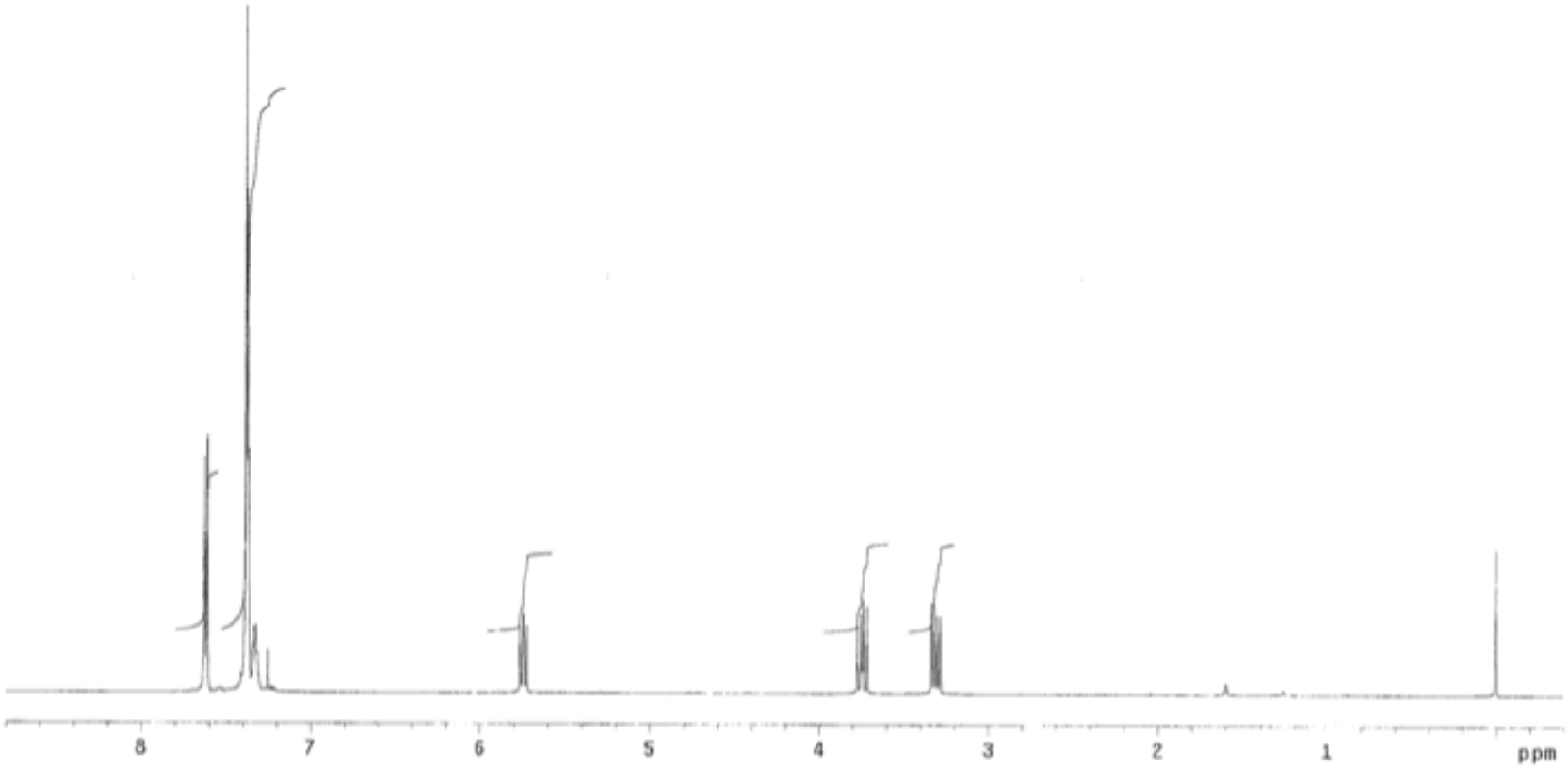
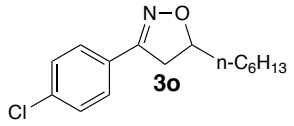


^{13}C NMR (125 MHz, $CDCl_3$):



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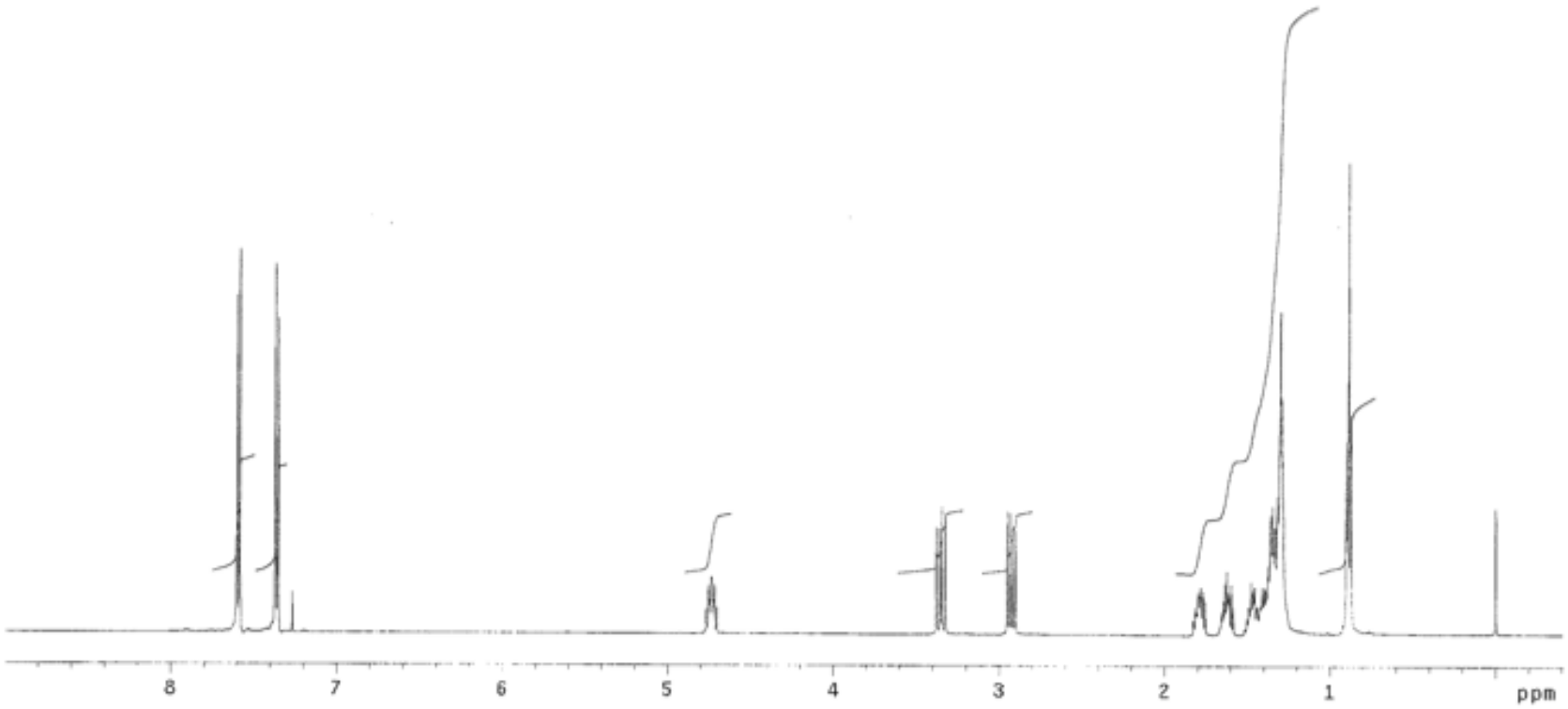

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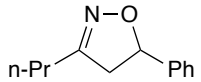

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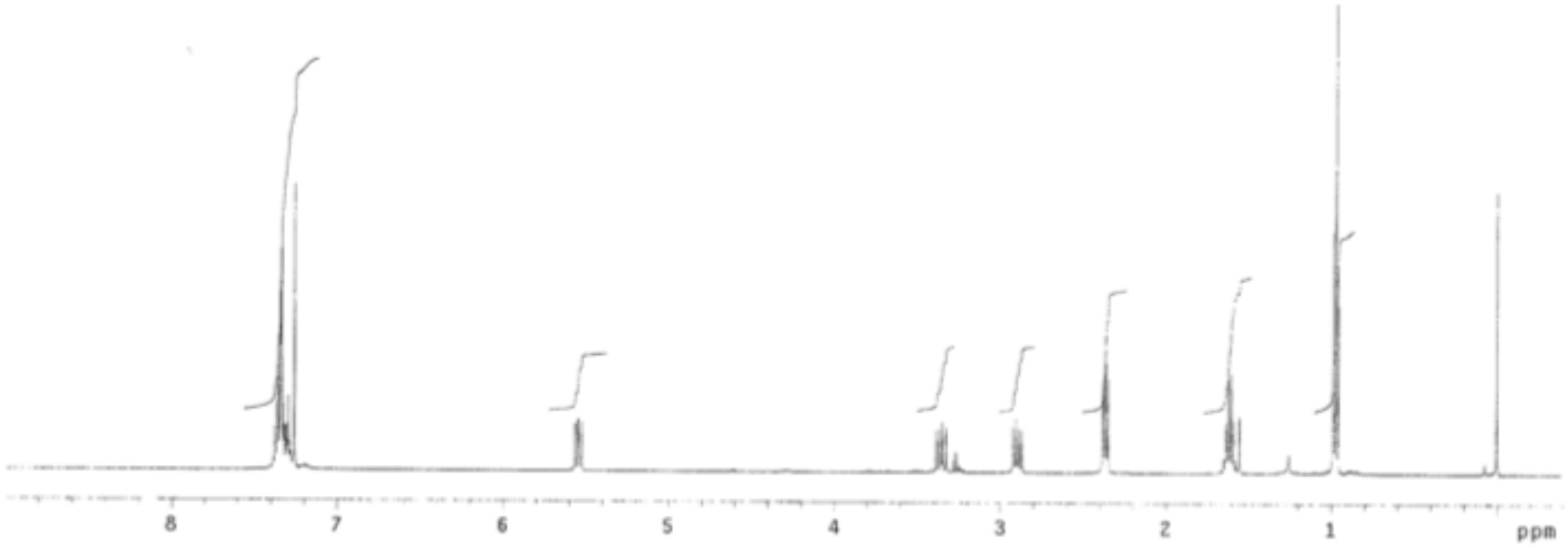

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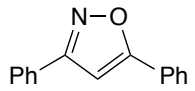

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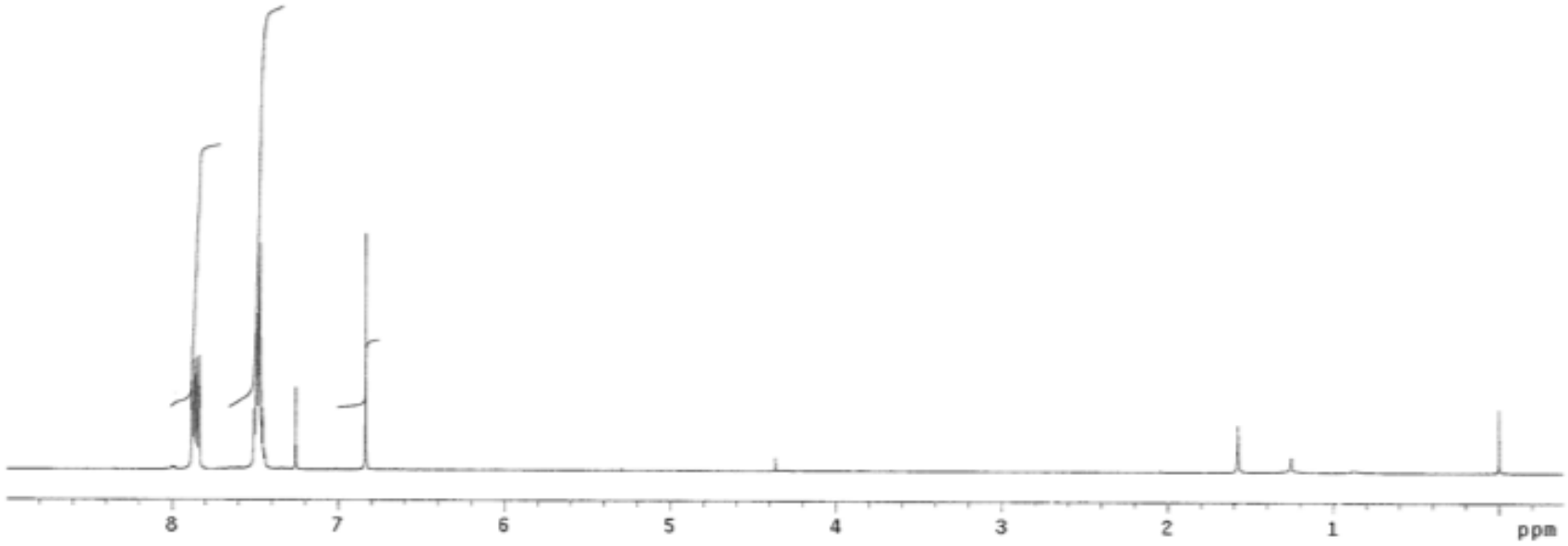

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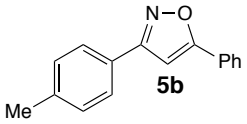

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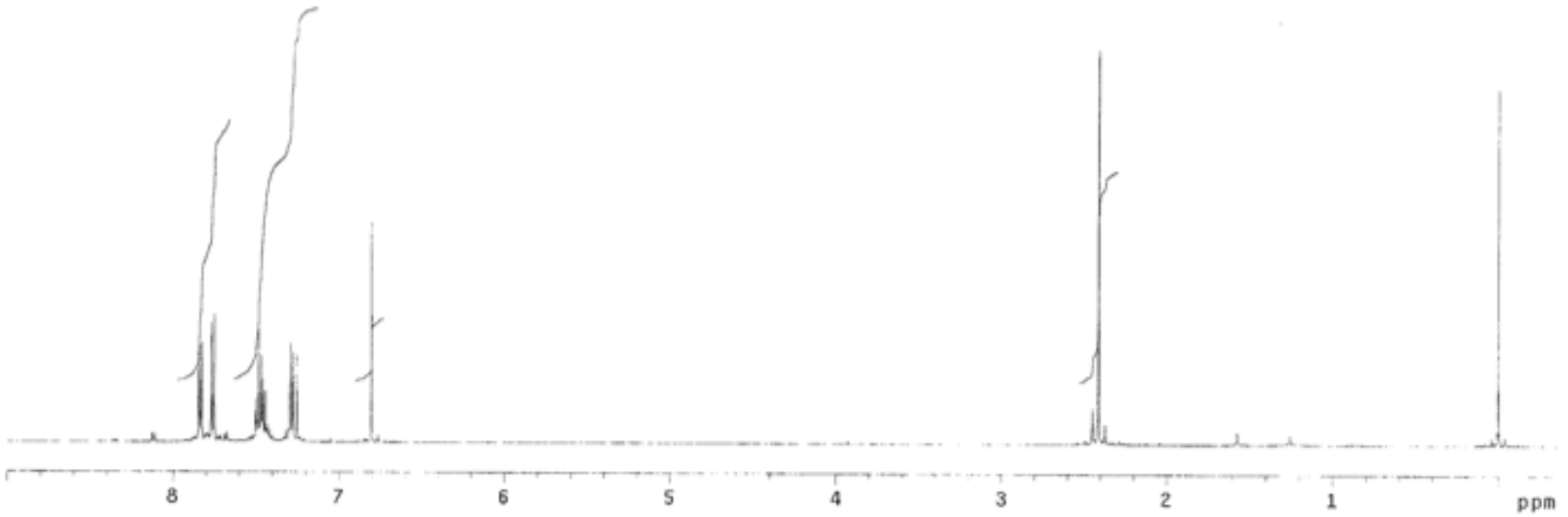

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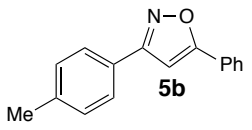

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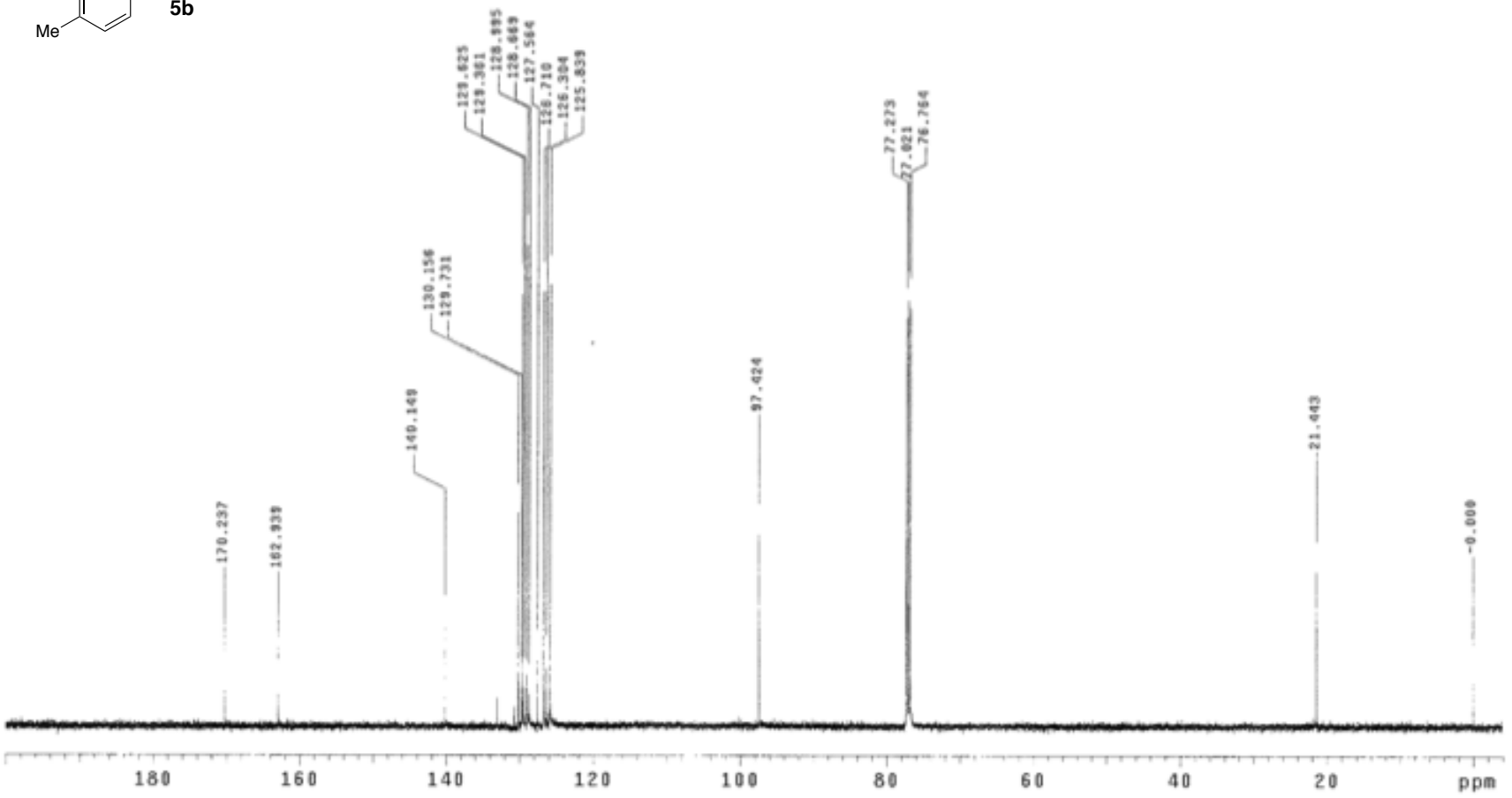

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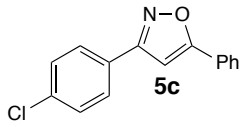

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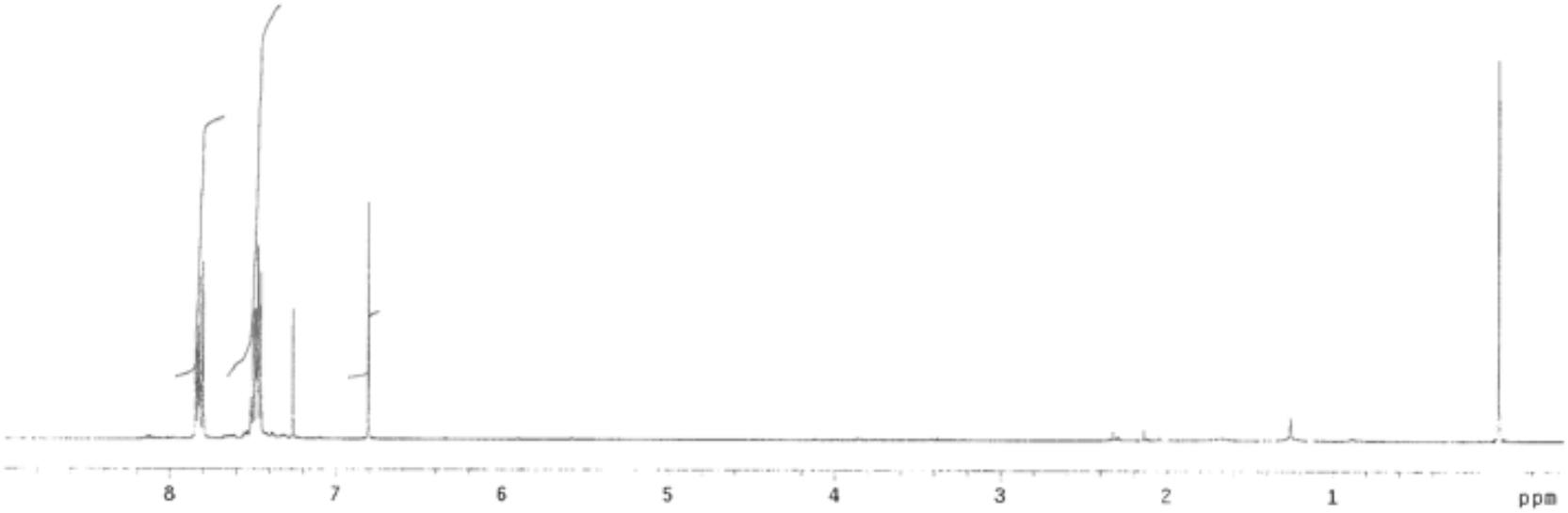

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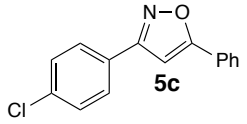

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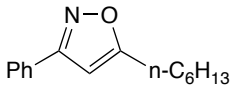

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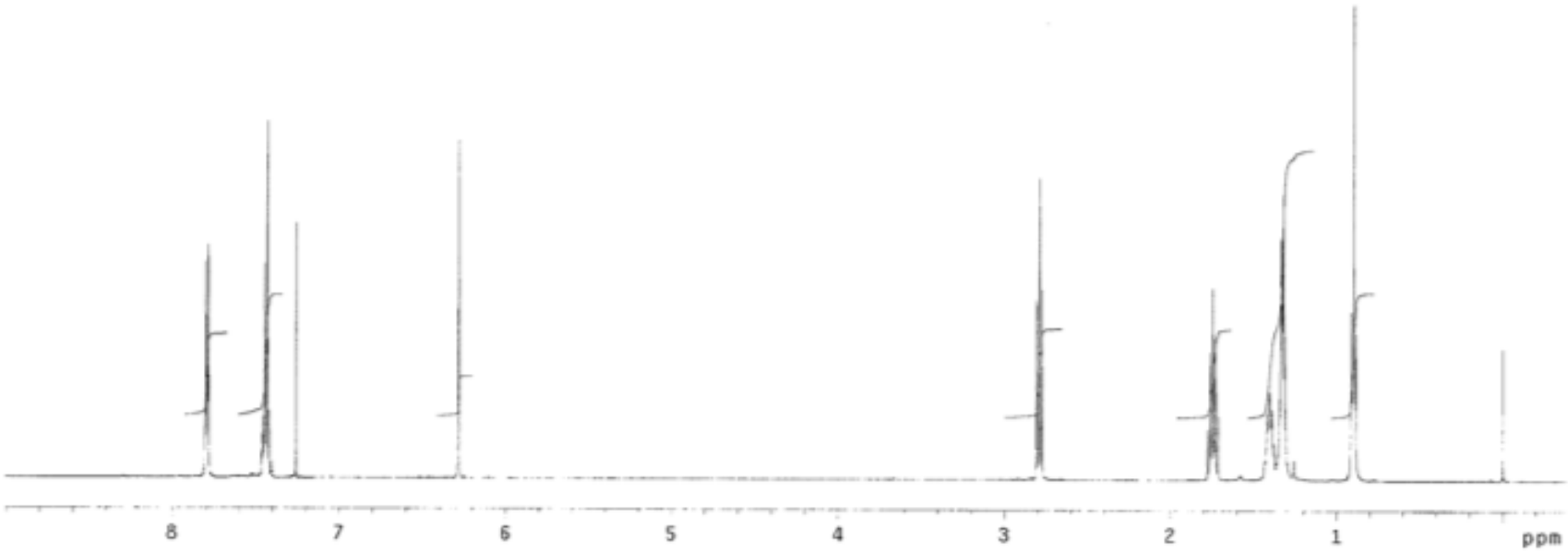

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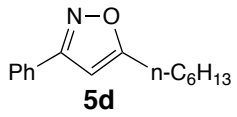

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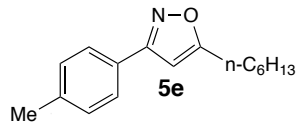

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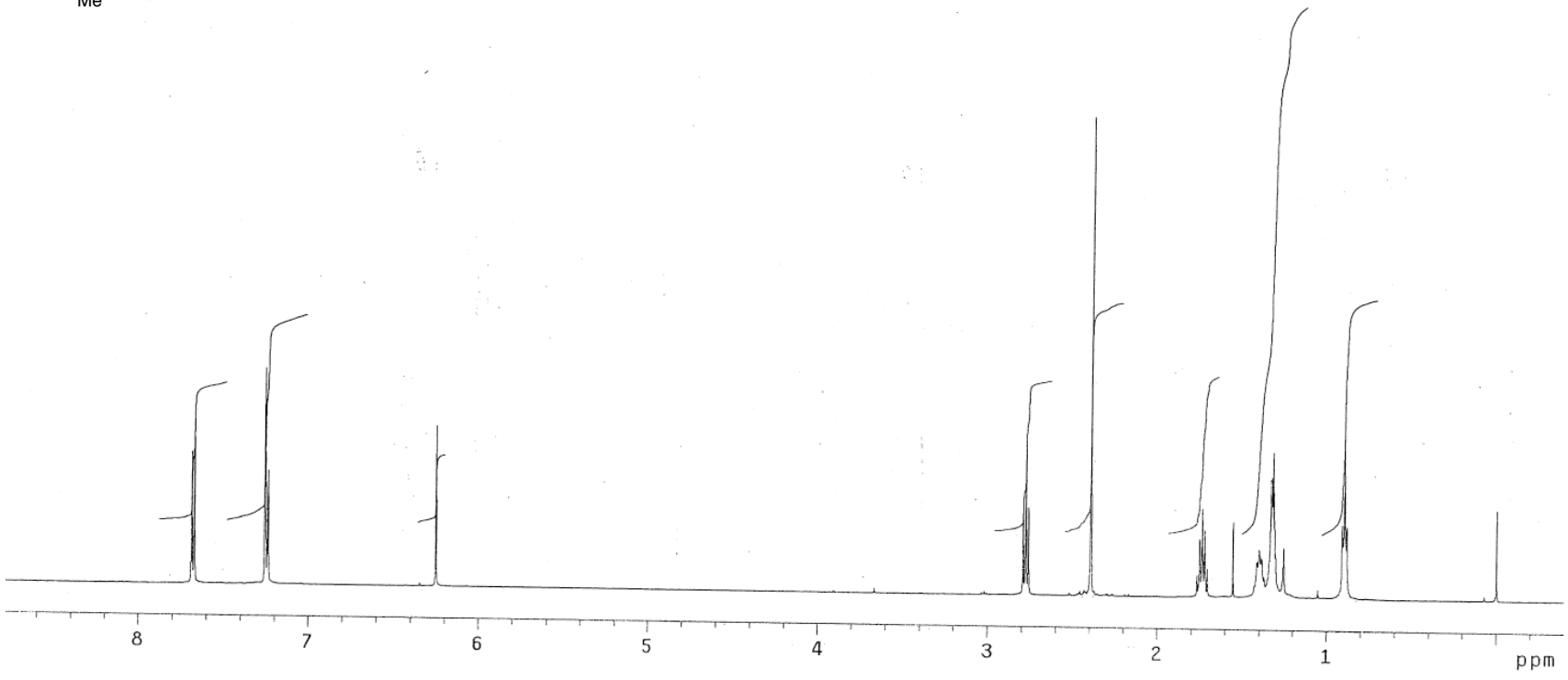

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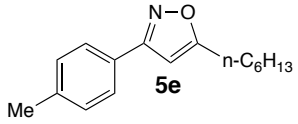

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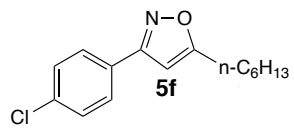

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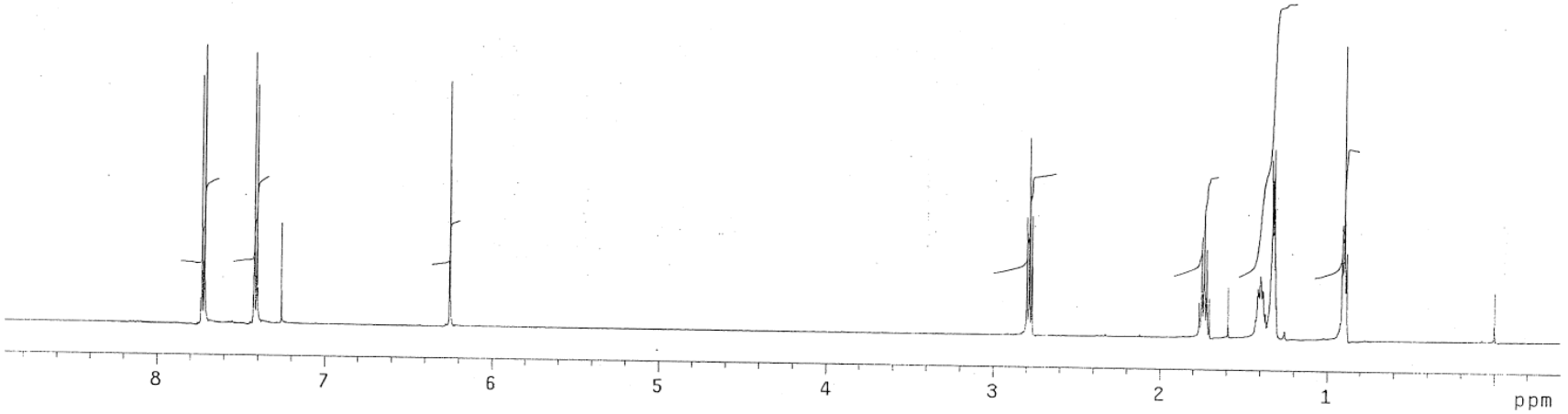

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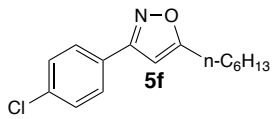

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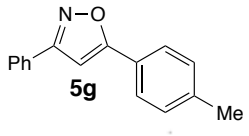

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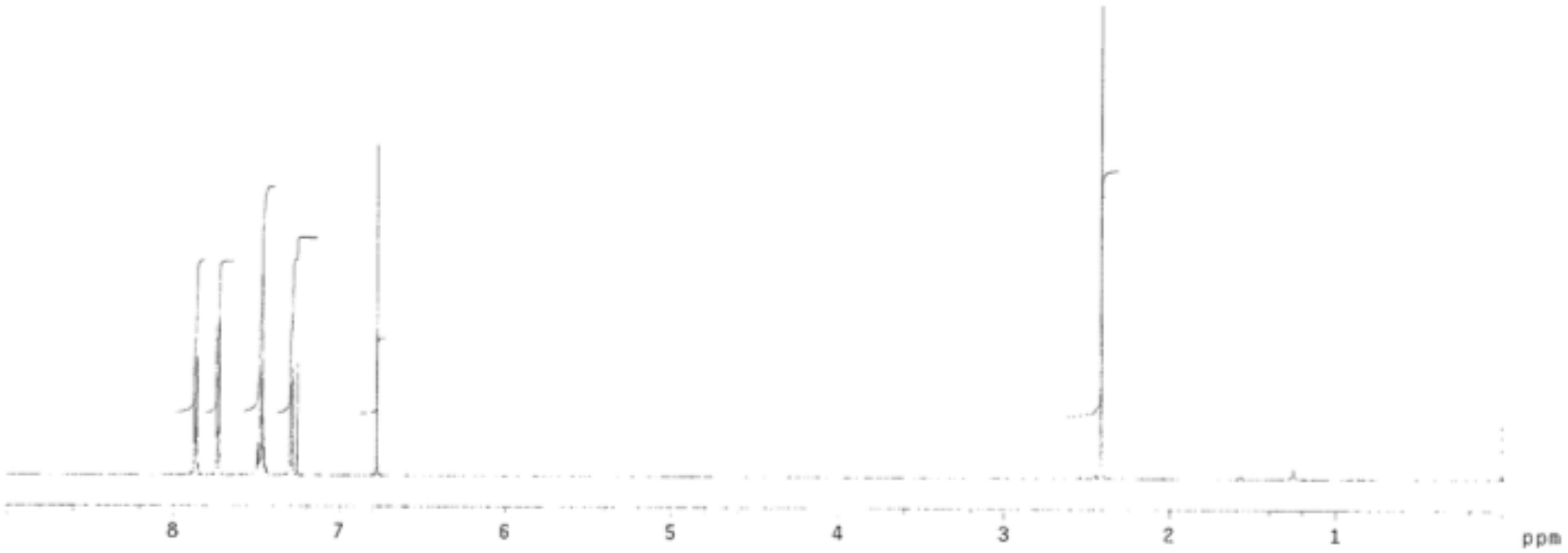

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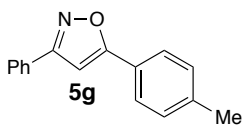

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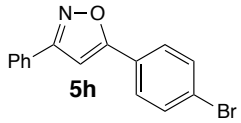

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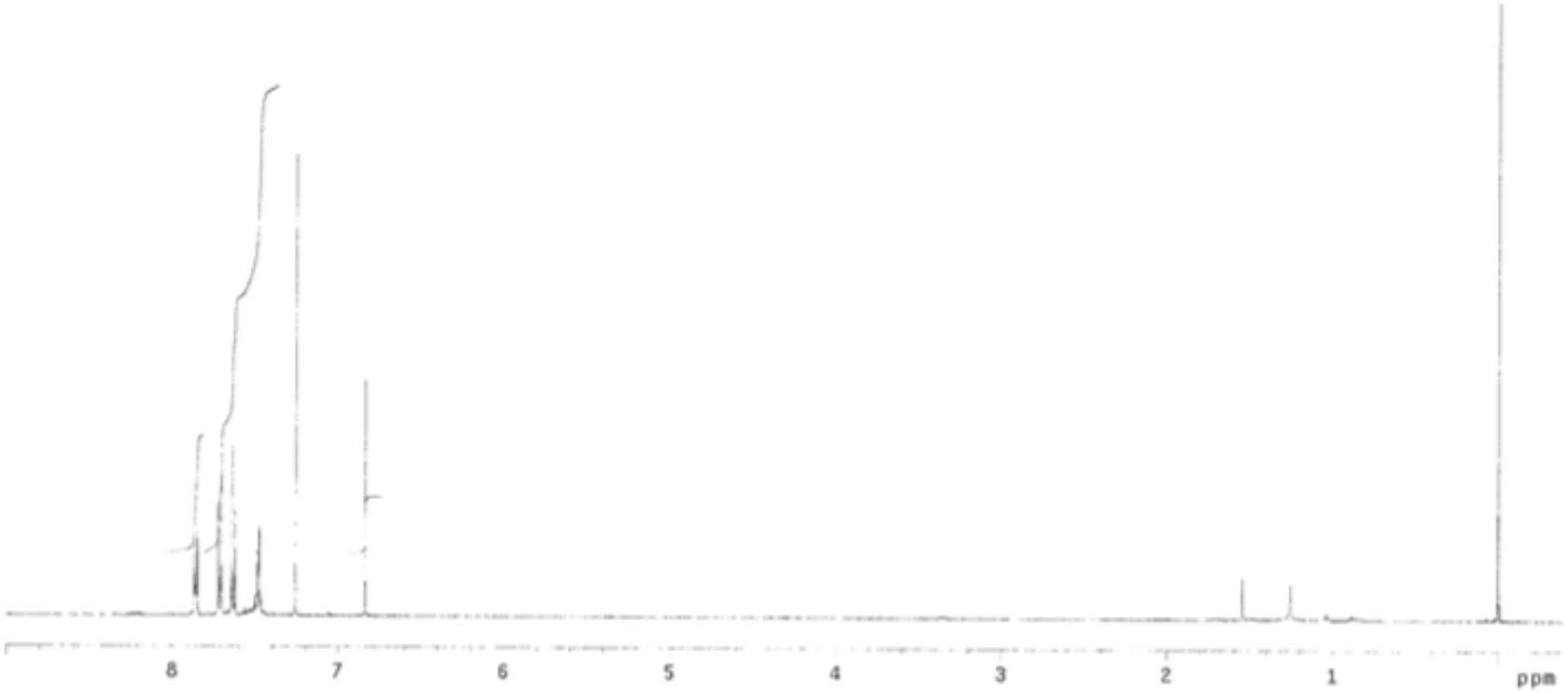

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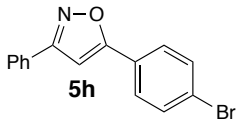

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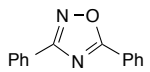

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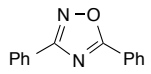

7