Supporting Information

Rapid Sequentially Palladium Catalyzed Four-Component Synthesis of Novel Fluorescent Biaryl-Substituted Isoxazoles

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Supporting Information 1

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1. General Considerations

All reactions, unless otherwise indicated, were performed using Schlenk, septum and cannula techniques. 1,4-Dioxane was taken from a solvent purification system MB-SPS-800 (MBraun). Commercial grade reagents were purchased from ABCR, Acros Organics, Sigma Aldrich, Fluka and Alfa Aesar and used as supplied without further purification. Other starting materials were prepared according to standard literature procedures.
Column chromatography was performed using the flash technique at 2 bar with silica gel 60 M (0.04–0.063 mm) from Macherey–Nagel after adsorbing the crude mixtures on Celite® 545, (0.02-0.1 mm). For reaction control by TLC silica gel 60 coated aluminium plates (F_{254}, Merck) were used and analyzed with UV light at wavelengths 254 and 365 nm.
^{1}H-, ^{13}C-, ^{19}F- and DEPT-135-NMR-spectra were recorded on the instruments Avance III - 600, Avance III - 300 and Avance DRX - 500 from Bruker. $CDCl_3$, CD_2Cl_2, acetone-d^6, THF-d^8 were used as solvents. As an internal standard, the residual non-deuterated proton signal of the corresponding solvent was locked ($CDCl_3$: ^{1}H ≯ 7.26, ^{13}C ≯ 77.16; THF-d_8: ^{1}H ≯ 3.58, ^{13}C ≯ 67.57; acetone-d_6: ^{1}H ≯ 2.05, ^{13}C ≯ 29.84; CD_2Cl_2: ^{1}H ≯ 5.32, ^{13}C ≯ 53.8). The signal multiplicities are abbreviated as follows: s: singlet; d: doublet; td: triplet of a doublet, q: quatet and m: multiplet. The allocation of the quaternary carbon nuclei was done using DEPT-135 spectra.
Mass spectra were measured on the following instruments: EI: TSQ 7000 (Finnigan MAT), GC/MS: Finnigan Trace DSQ with Finnigan Trace GC Ultra (Thermo Electron Corp.), ESI-HR mass spectra: UHR-QTOF maXis 4G (Bruker Daltonics). IR spectra were recorded on a Shimadzu IR Affinity-1 with ATR technique. The intensities of IR signals are abbreviated as vs (very strong), s (strong), m (medium) and w (weak). Absorption spectra were recorded on a Perkin Elmer UV/vis/NIR Lambda 19 spectrometer. For the determination of the extinction coefficients ε absorption measurements at five different concentrations were carried out. Emission spectra were recorded in dichloromethane HPLC grade at 293 K on a on a Hitachi F7000 spectrometer. Solid-state emission spectra were recorded on the same spectrometer using the powdered substance. The solid-state fluorescence quantum yield was determined with an integrated sphere (Ulbricht sphere). The melting points (uncorrected) were determined with a Melting Point B-540 (Büchi). Elemental analyses were performed with a PerkinElmer Series II Analyser 2400 at the Institute for Pharmaceutical and Medicinal Chemistry of the Heinrich-Heine-University Düsseldorf.
The X-ray structure analysis of compound **4k** was performed in the working group of Prof. Dr. Walter Frank by Dr. Guido J. Reiss at the Heinrich-Heine-University Düsseldorf.

2. Syntheses

2.1 General procedure 1 for the one-pot synthesis of 3-biarylsubstituted isoxazoles 4 (GP1)

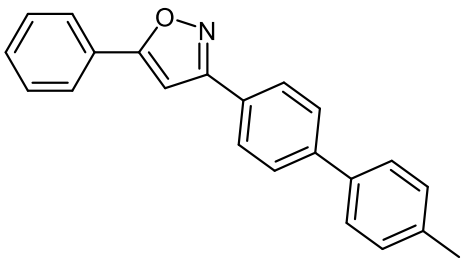
$Pd(PPh_3)_2Cl_2$ (14 mg, 0.02 mmol) and CuI (8 mg, 0.04 mmol) were placed into a 10 mL microwave vessel under a nitrogen atmosphere. 1,4-Dioxane (2 mL) and acid chloride **1** (1.00 mmol) were successively added and the solution was briefly degassed with nitrogen through a cannula (for experimental details, see Table S1). After addition of *p*-bromophenyl acetylene (**2a**) (200 mg, 1.10 mmol) and triethylamine (106 mg, 1.05 mmol) the reaction mixture turned dark and solids precipitated. Stirring at room temperature was continued for 1 h. Then, hydroxylammonium chloride (76 mg, 1.1 mmol) and triethylamine (101 mg, 1.00 mmol) were added to the reaction mixture and the microwave vessel was irradiated at 140 °C for 5 minutes in a microwave reactor. The resulting solid mixture was suspended with 1,4-dioxane (1 mL) and water (0.3 mL), briefly degassed and arylboronic acid **3** (1.50 mmol) and potassium carbonate (553 mg, 4.00 mmol) were added. The mixture was irradiated at 140 °C for 30 minutes in a microwave reactor. After cooling to room temp the reaction mixture was transferred with dichloromethane (20 mL) into a separating funnel and washed with saturated aqueous NH_4Cl solution (30 mL). The aqueous layer was extracted with dichloromethane (3 x 20 mL), the combined organic layers were dried (anhydrous $MgSO_4$) and the solvent was removed at reduced pressure. The residue

was purified by column chromatography on silica gel. The experimental details are summarized in Table S1.

Table S1: Experimental details for the synthesis of 3-biarylsubstituted isoxazoles **4**

Entry	Acid chloride **1**	Boronic acid **3**	Product **4**
1	142 mg (1.01 mmol) of benzoyl chloride (**1a**)	206 mg (1.51 mmol) of *p*-tolylboronic acid (**3a**)	251 mg (80%) of **4a**
2	170 mg (1.00 mmol) of 4-methoxybenzoyl chloride (**1b**)	203 mg (1.50 mmol) of **3a**	227 mg (66%) of **4b**
3	157 mg (0.99 mmol) of 2-fluorobenzoyl chloride (**1c**)	205 mg (1.51 mmol) of **3a**	120 mg (36%) of **4c**
4	212 mg (1.02 mmol) of 4-(trifluoro-methyl)benzoyl chloride (**1d**)	201 mg (1.49 mmol) of **3a**	97 mg (25%) of **4d**
5	175 mg (1.00 mmol) of 3-chlorobenzoyl chloride (**1e**)	203 mg (1.50 mmol) of **3a**	90 mg (26%) of **4e**
6	141 mg (1.00 mmol) of **1a**	228 mg (1.50 mmol) of 4-methoxyphenyl boronic acid (**3b**)	245 mg (74%) of **4f**
7	143 mg (1.02 mmol) of **1a**	222 mg (1.51 mmol) of 4-cyanophenyl boronic acid (**3c**)	230 mg (71%) of **4g**
8	142 mg (1.01 mmol) of **1a**	250 mg (1.51 mmol) of 4-(dimethyl-amino)phenyl boronic acid (**3d**)	90 mg (27%) of **4h**
9	141 mg (1.00 mmol) of **1a**	225 mg (1.50 mmol) of 4-formylphenyl boronic acid (**3e**)	173 mg (53%) of **4i**
10	141 mg (1.00 mmol) of **1a**	248 mg (1.49 mmol) of 4-nitrophenyl boronic acid (**3f**)	61 mg (18%) of **4j**
11	171 mg (1.00 mmol) of **1b**	220 mg (1.50 mmol) of **3c**	181 mg (51%) of **4k**

2.1.1 3-(4'-Methyl-[1,1'-biphenyl]-4-yl)-5-phenylisoxazole (4a)

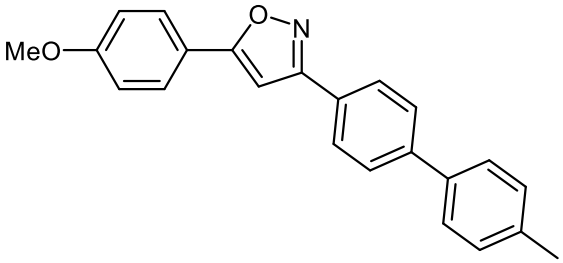


According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4a** (251 mg, 80%) was isolated as a colorless solid.

Mp 195 °C. ^{1}H NMR (600 MHz, $CDCl_3$) δ 2.42 (s, 3 H), 6.87 (s, 1 H), 7.27-7.32 (m, 2 H), 7.45-7.60 (m, 5 H), 7.67-7.74 (m, 2 H), 7.83-7.98 (m, 4 H).^{13}C NMR (75 MHz, $CDCl_3$) δ 21.3 (CH_3), 97.6, 126.0, 127.0, 127.3, 127.5, 127.6 (C_{quat}), 127.8 (C_{quat}), 129.1, 129.7, 130.4, 137.5 (C_{quat}), 137.8 (C_{quat}), 142.9 (C_{quat}), 162.8 (C_{quat}), 170.5 (C_{quat}). GC/MS-EI (*m*/*z* (%)): 311 ([M]$^+$, 43), 165 (10), 105 ([C_7H_5O]$^+$, 100), 77 ([C_6H_5]$^+$, 54). IR: $\tilde{\nu}$ [cm^{-1}] = 3125 (w), 3059 (w), 2361 (s), 1614 (m), 1593 (w), 1574 (m), 1558 (m), 1493 (s), 1447 (s), 1429 (s), 1402 (w), 1391 (w), 1325 (w), 1314 (w), 1259 (w), 1204 (w), 1140 (w), 1098 (w), 1002 (w), 947 (s), 914 (s), 908 (s),

851 (m), 821 (s), 802 (s), 760 (s), 733 (m), 683 (s), 662 (m). Anal. calcd. for $C_{22}H_{17}NO$ (311.4): C 84.86, H 5.50, N 4.50; Found: C 84.68, H 5.53, N 4.37.

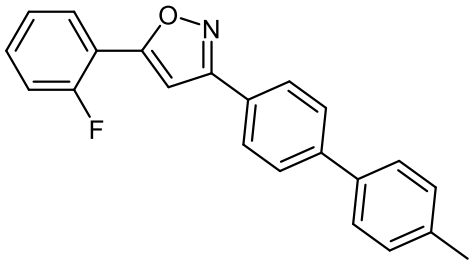
2.1.2 5-(4-Methoxyphenyl)-3-(4'-methyl-[1,1'-biphenyl]-4-yl)isoxazole (4b)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4b** (227 mg, 66%) was isolated as a colorless solid.

Mp 194 °C. ^{1}H NMR (600 MHz, $CDCl_3$) δ 2.42 (s, 3 H), 3.88 (s, 3 H), 6.74 (s, 1 H), 6.99-7.03 (m, 2 H), 7.27-7.30 (m, 2 H), 7.53-7.58 (m, 2 H), 7.67-7.72 (m, 2 H), 7.77-7.82 (m, 2 H), 7.90-7.94 (m, 2 H). ^{13}C NMR (151 MHz, $CDCl_3$) δ 21.3 (CH_3), 55.6 (CH_3), 96.3, 114.6, 120.5 (C_{quat}), 127.1, 127.3, 127.5, 127.6, 128.0 (C_{quat}), 129.8, 137.6 (C_{quat}), 137.8 (C_{quat}), 142.8 (C_{quat}), 161.3 (C_{quat}), 162.8 (C_{quat}), 170.5 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 341 ([M]$^+$, 41), 209 (11), 135 ([$C_8H_7O_2$]$^+$, 100), 107 ([C_7H_7O]$^+$, 10), 77 ([C_6H_5]$^+$, 11). IR: $\tilde{\nu}$ [cm^{-1}] = 3121 (w), 2968 (w), 2938 (w), 2913 (w), 2860 (w), 2841 (w), 1612 (s), 1597 (s), 1541 (w), 1499 (s), 1522 (m), 1435 (s), 1418 (m), 1406 (m), 1391 (m), 1325 (w), 1306 (m), 1260 (s), 1246 (s), 1202 (m), 1177 (s), 1140 (w), 1115 (w), 1088 (m), 1047 (w), 1026 (s), 1005 (m), 951 (s), 924 (s), 835 (s), 824 (s), 804 (s), 736 (m), 731 (m), 692 (s), 625 (s). Anal. calcd. for $C_{23}H_{19}NO_2$ (341.4): C 80.92, H 5.61, N 4.10; found: C 80.82, H 5.63, N 3.99.

2.1.3 5-(2-Fluorphenyl)-3-(4'-methyl-[1,1'-biphenyl]-4-yl)Isoxazole (4c)

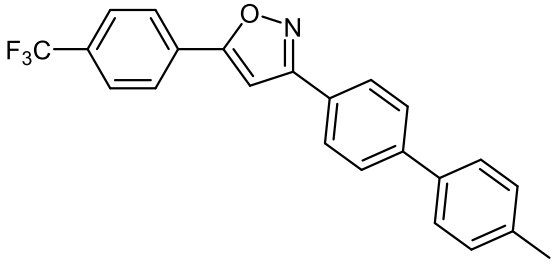


According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4c** (120 mg, 36%) was isolated as a colorless solid.

Mp 186 °C. ^{1}H NMR (300 MHz, $CDCl_3$) δ 2.42 (s, 3 H), 7.07 (d, *J* = 3.7 Hz, 1 H), 7.19-7.35 (m, 4 H), 7.41-7.50 (m, 1 H), 7.52-7.60 (m, 2 H), 7.68-7.75 (m, 2 H), 7.93-7.99 (m, 2 H), 8.04 (td, *J* = 7.6, 1.8 Hz, 1 H). ^{13}C

NMR (75 MHz, $CDCl_3$) δ 21.3 (CH_3), 101.8 (d, J = 11.0 Hz), 116.0 (d, J = 12.1 Hz, C_{quat}), 116.4 (d, J = 21.5 Hz), 124.9 (d, J = 3.5 Hz), 127.1, 127.4, 127.5, 127.7 (C_{quat}), 127.8 (d, J = 2.2 Hz), 129.8, 131.8 (d, J = 8.7 Hz), 137.5 (C_{quat}), 137.8 (C_{quat}), 143.0 (C_{quat}), 159.3 (d, $^1J_{C\text{-}F}$ = 253.2 Hz, C_{quat}), 163.1 (C_{quat}), 164.3 (d, J = 2.8 Hz, C_{quat}). ^{19}F NMR (282 MHz, $CDCl_3$) δ -111.6. EI MS (70 eV, m/z (%)): 330 (18), 329 ([M]$^+$, 78), 301 (24), 234 ([$C_{16}H_{12}NO$]$^+$, 13), 209 (25), 206 ([$C_{15}H_{12}N$]$^+$, 11), 165 (22), 152 (15), 123 ([C_7H_4FO]$^+$, 100), 95 ([C_6H_4F]$^+$, 23). IR: $\tilde{\nu}$ [cm^{-1}] = 3024 (w), 2986 (w), 2970 (w), 2941 (w), 2913 (w), 1622 (m), 1613 (m), 1597 (m), 1572 (w), 1555 (w), 1508 (w), 1493 (s), 1460 (w), 1439 (m), 1427 (m), 1404 (m), 1387 (m), 1325 (w), 1304 (w), 1277 (w), 1256 (w), 1231 (s), 1211 (w), 1204 (w), 1140 (w), 1117 (w), 1086 (w), 1045 (m), 1030 (w), 1003 (w), 951 (s), 943 (m), 916 (m), 851 (w), 808 (vs), 754 (cs), 740 (m), 733 (m), 688 (m). Anal. calcd. for $C_{22}H_{16}FNO$ (329.4): C 80.23, H 4.90, N 4.25; found: C 80.03, H 4.79, N 4.17.

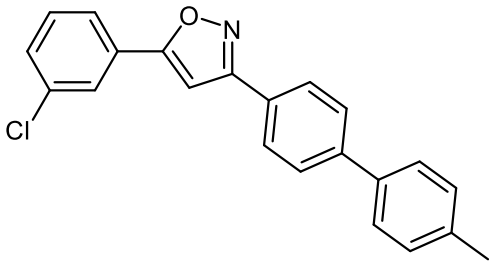
2.1.4 3-(4'-Methyl-[1,1'-biphenyl]-4-yl)-5-(4-(trifluormethyl)phenyl)Isoxazole (4d)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4d** (97 mg, 25%) was isolated as a colorless solid.

Mp 243 °C. ^{1}H NMR (300 MHz, THF-d_8) δ 2.38 (s, 3 H), 7.23-7.31 (m, 2 H), 7.45 (s, 1 H), 7.57-7.63 (m, 2 H), 7.73-7.80 (m, 2 H), 7.83-7.90 (m, 2 H), 7.97-8.04 (m, 2 H), 8.07-8.17 (m, 2 H). ^{13}C NMR (126 MHz, THF-d_8) δ 21.3 (CH_3), 100.4, 125.3 (q, $^1J_{C\text{-}F}$ = 272 Hz, C_{quat}) δ 127.1 (q, $^3J_{C\text{-}F}$ = 3.8 Hz), 127.2, 127.7, 128.1, 128.1, 128.9 (C_{quat}), 130.5, 132.3 132.4 (q, $^2J_{C\text{-}F}$ = 32.5 Hz, C_{quat}), 138.4 (C_{quat}), 138.5 (C_{quat}), 143.9 (C_{quat}), 163.8 (C_{quat}), 169.7 (C_{quat}). ^{19}F NMR (282 MHz, THF-d_8) δ -63.6. EI MS (70 eV, m/z (%)): 380 (23), 379 ([M]$^+$, 100), 378 (16), 351 (16), 234 ([$C_{16}H_{12}NO$]$^+$, 37), 209 (17), 206 ([$C_{15}H_{12}N$]$^+$, 23), 190 (19), 173 ([$C_8H_4F_3O$]$^+$, 74), 165 (20), 152 ([$C_{12}H_8$]$^+$, 19), 145 ([$C_7H_4F_3$]$^+$, 56). IR: $\tilde{\nu}$ [cm^{-1}] = 3113 (w), 3034 (w), 2924 (w), 2359 (w), 1603 (w), 1558 (m), 1504 (m), 1435 (m), 1413 (w), 1387 (w), 1321 (s, br), 1279 (m), 1263 (m), 1224 (w), 1233 (w), 1192 (m), 1167 (s), 1134 (s), 1121 (s), 1113 (s), 1092 (s), 1069 (s), 1039 (m), 1016 (s), 1005 (m), 947 (s), 921 (s), 849 (s), 806 (s), 777 (w), 735 (w), 696 (m), 687 (m). Anal. calcd for $C_{23}H_{16}F_3NO$ (379.4): C 72.82, H 4.25, N 3.69; found: C 72.62, H 4.52, N 3.71.

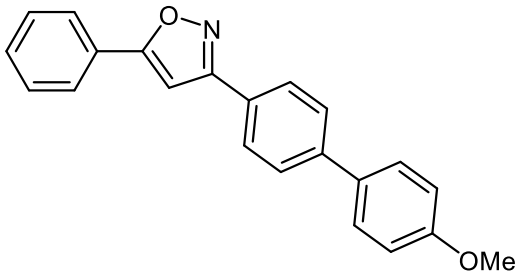
2.1.5 5-(3-Chlorphenyl)-3-(4'-methyl-[1,1'-biphenyl]-4-yl)Isoxazole (4e)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4e** (90 mg, 26%) was isolated as a colorless solid.

Mp 208 °C. ^{1}H NMR (300 MHz, THF-d_8) δ 2.37 (s, 3 H), 7.23-7.30 (m, 2 H), 7.35 (s, 1 H), 7.46-7.55 (m, 2 H), 7.56-7.63 (m, 2 H), 7.72-7.78 (m, 2 H), 7.81-7.87 (m, 1 H), 7.92-8.01 (m, 3 H). ^{13}C NMR (75 MHz, THF-d_8) δ 21.3 (CH_3), 99.6, 124.9, 126.6, 127.7, 128.1, 128.1, 128.9 (C_{quat}), 130.5, 130.7 (C_{quat}), 131.0, 131.7, 136.0 (C_{quat}), 138.4 (C_{quat}), 138.5 (C_{quat}), 143.7 (C_{quat}), 163.7 (C_{quat}), 169.7 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 347 ([^{37}Cl-M]$^+$, 35), 346 (30), 345 ([^{35}Cl-M]$^+$, 100), 344 (14), 317 (22), 234 ([$C_{16}H_{12}NO$]$^+$, 40), 209 (27), 206 ([$C_{15}H_{12}N$]$^+$, 24), 173 (12), 165 (26), 152 ([$C_{12}H_8$]$^+$, 27), 141 ([$C_7H_4{}^{37}ClO$]$^+$, 32), 139 ([$C_7H_4{}^{35}ClO$]$^+$, 99), 113 ([$C_6H_4{}^{37}Cl$]$^+$, 17), 111 ([$C_6H_4{}^{35}Cl$]$^+$, 43). IR: $\tilde{\nu}$ [cm^{-1}] = 3102 (w), 3030 (w), 2916 (w), 1587 (m), 1568 (m), 1557 (m), 1510 (w), 1479 (s), 1408 (m), 1378 (w), 1373 (w), 1289 (w), 1246 (w), 1138 (w), 1105 (m), 1076 (m), 1055 (m), 1019 (m), 951 (s), 939 (m), 899 (m), 831 (m), 808 (vs), 793 (s), 770 (s), 737 (m), 700 (s), 687 (s), 667 (s). Anal. calcd. for $C_{22}H_{16}ClNO$ (345.8): C 76.41, H 4.66, N 4.05; found: C 76.14, H 4.76, N 3.77.

2.1.6 3-(4'-Methoxy-[1,1'-biphenyl]-4-yl)-5-phenylisoxazole (4f)

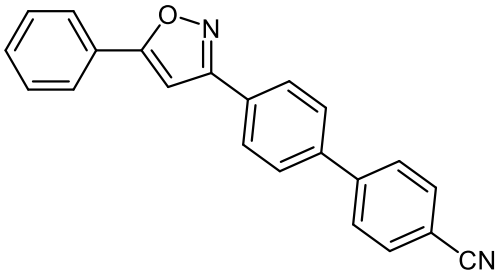


According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4f** (245 mg, 74%) was isolated as a colorless solid.

Mp 200 °C. ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.87 (s, 3 H), 6.86 (s, 1 H), 6.97-7.05 (m, 2 H), 7.44-7.54 (m, 3 H), 7.56-7.63 (m, 2 H), 7.64-7.71 (m, 2 H), 7.83-7.95 (m, 4 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 55.5 (CH_3), 97.6, 114.5, 126.0, 127.2, 127.3, 127.5 (C_{quat}), 127.6 (C_{quat}), 128.3, 129.2, 130.4, 132.9 (C_{quat}), 142.5 (C_{quat}), 159.7 (C_{quat}), 162.8 (C_{quat}), 170.5 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 328 ([M+H]$^+$, 24), 327 ([M]$^+$, 100), 284

([$C_{20}H_{14}NO]^+$, 16), 275 (10), 225 (21), 222 ([$C_{15}H_{12}NO]^+$, 12), 152 ([$C_{12}H_8]^+$, 11), 146 (23), 139 (13), 130 (18), 105 ([$C_7H_5O]^+$, 98), 77 ([$C_6H_5]^+$, 36). IR: $\tilde{\nu}$ [cm^{-1}] = 3119 (w), 3051 (w), 3042 (w), 3015 (w), 2957 (w), 2914 (w), 2839 (w), 1602 (s, br), 1585 (m), 1574 (m), 1561 (w), 1537 (m), 1508 (s), 1491 (s), 1470 (m), 1447 (s), 1431 (s), 1406 (s), 1389 (m), 1325 (w), 1312 (m), 1288 (s), 1269 (s), 1256 (s), 1223 (m), 1206 (s), 1182 (s), 1142 (w), 1115 (w), 1072 (w), 1050 (w), 1038 (s), 1025 (m), 1012 (m), 999 (m), 947 (s), 912 (s), 825 (s), 810 (s), 765 (s), 760 (s), 731 (s), 685 (s). Anal. calcd. for $C_{22}H_{17}NO_2$ (327.4): C 80.71, H 5.23, N 4.28; found: C 80.91, H 5.23, N 4.18.

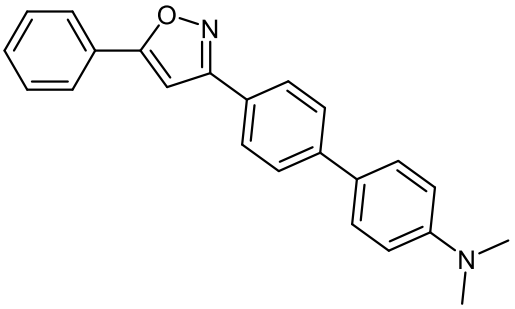
2.1.7 4'-(5-Phenylisoxazol-3-yl)-[1,1'-biphenyl]-4-carbonitrile (4g)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4g** (230 mg, 71%) was isolated as a colorless solid.

Mp 185 °C. ^{1}H NMR (600 MHz, acetone-d_6) δ 7.47 (s, 1 H), 7.52-7.61 (m, 3 H), 7.90-8.01 (m, 8 H), 8.09-8.14 (m, 2 H). ^{13}C NMR (151 MHz, acetone-d_6) δ 99.1, 112.4 (C_{quat}), 119.4 (C_{quat}), 126.7, 128.5, 128.5 (C_{quat}), 128.9, 128.9, 130.3, 130.6 (C_{quat}), 131.5, 133.8, 141.6 (C_{quat}), 145.4 (C_{quat}), 163.4 (C_{quat}), 171.5 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 322 ([M]$^+$, 32), 105 ([$C_7H_5O]^+$, 100), 77 ([$C_6H_5]^+$, 36). IR: $\tilde{\nu}$ [cm^{-1}] = 3109 (w), 3053 (w), 2228 (m), 1607 (m), 1489 (s), 1447 (s), 1431 (s), 1398 (m), 1385 (w), 1362 (w), 1323 (w), 1258 (m), 1180 (m), 1109 (m), 1070 (m), 1049 (m), 1028 (m), 1006 (m), 970 (w), 947 (s), 920 (s), 838 (s), 819 (s), 812 (s), 765 (s), 744 (m), 721 (m), 691 (s), 644 (m), 625 (m). Anal. calcd. for $C_{22}H_{14}N_2O$ (322.4): C 81.97, H 4.38, N 8.69; found: C 81.72, H 4.55, N 8.74.

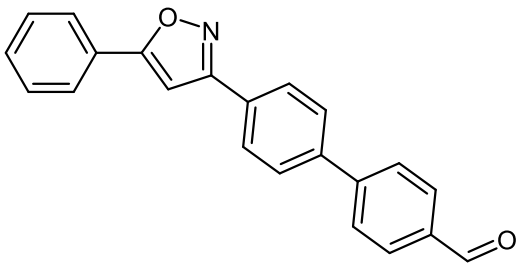
2.1.8 N,N-Dimethyl-4'-(5-phenylisoxazol-3-yl)-[1,1'-biphenyl]-4-amine (4h)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1, addition of 1 vol% of triethylamine) compound **4h** (90 mg, 27%) was isolated as a colorless solid.

Mp 242 °C. ^{1}H NMR (600 MHz, $CDCl_3$) δ 3.03 (s, 6 H), 6.86 (s, 1 H), 6.77-7.00 (m, 2 H), 7.43-7.53 (m, 3 H), 7.56-7.60 (m, 2 H), 7.65-7.69 (m, 2 H), 7.83-7.93 (m, 4 H). ^{13}C NMR (151 MHz, THF-d_8) δ 40.6 (CH_3), 98.5, 113.7, 126.7, 127.1, 128.0, 128.1 (C_{quat}), 128.3, 129.1 (C_{quat}), 129.2 (C_{quat}), 129.9, 130.9, 143.9 (C_{quat}), 151.7 (C_{quat}), 163.7 (C_{quat}), 171.1 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 341 (26), 340 ([M]$^+$, 100), 339 ([M-H]$^+$, 24), 238 (14), 235 ([$C_{16}H_{15}N_2$]$^+$, 12), 152 ([$C_{12}H_8$]$^+$, 11), 105 ([C_7H_5O]$^+$, 24), 77 ([C_6H_5]$^+$, 18). IR: $\tilde{\nu}$ [cm^{-1}] = 3111 (w), 3024 (w), 2916 (w), 2847 (w), 2799 (w), 1601 (s, br), 1575 (m), 1564 (m), 1552 (m), 1541 (m), 1516 (s), 1491 (s), 1472 (w), 1447 (s), 1433 (s), 1418 (s), 1391 (m), 1352 (s, br), 1333 (m), 1285 (m), 1260 (m), 1227 (s), 1213 (s), 1193 (w), 1167 (s, br), 1123 (m), 1092 (w), 1074 (w), 1064 (w), 1026 (w), 947 (s), 926 (m), 917 (m), 908 (s), 847 (s), 816 (vs), 804 (vs), 758 (vs), 743 (m), 718 (s), 681 (vs), 627 (w). Anal. calcd. for $C_{23}H_{20}N_2O$ (340.4): C 81.15, H 5.92, N 8.23; found: C 80.89, H 5.81, N 8.04.

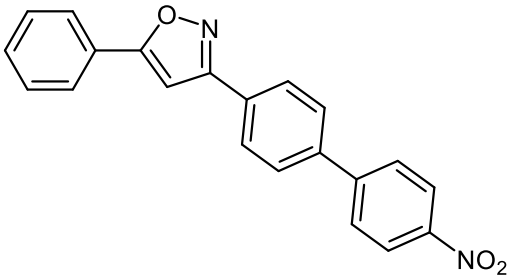
2.1.9 4'-(5-Phenylisoxazol-3-yl)-[1,1'-biphenyl]-4-carbaldehyde (4i)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4i** (173 mg, 53%) was isolated as a colorless solid.

Mp 174 °C. ^{1}H NMR (300 MHz, THF-d_8) δ 7.28 (s, 1 H), 7.43-7.56 (m, 3 H), 7.85-8.10 (m, 10 H), 10.04 (s, 1 H). ^{13}C NMR (75 MHz, THF-d_8) δ 98.6, 126.6, 128.3, 128.5, 128.7 (C_{quat}), 128.8, 130.1, 130.6 (C_{quat}), 131.0, 131.1, 137.3 (C_{quat}), 142.2 (C_{quat}), 146.7 (C_{quat}), 163.3 (C_{quat}), 171.4 (C_{quat}), 191.8. EI MS (70 eV, *m*/*z* (%)): 326 (13), 325 ([M]$^+$, 54), 297 ([$C_{21}H_{15}NO$]$^+$, 11), 152 (12), 105 ([C_7H_5O]$^+$, 100), 77 ([C_6H_5]$^+$, 33). IR: $\tilde{\nu}$ [cm^{-1}] = 3115 (w), 2826 (w), 2733 (w), 1699 (s, br), 1605 (s), 1574 (m), 1558 (s), 1489 (m), 1458 (m), 1447 (m), 1435 (m), 1408 (m), 1387 (m), 1362 (w), 1310 (w), 1287 (w), 1258 (w), 1215 (m), 1190 (m), 1171 (m), 1121 (w), 1107 (w), 1074 (w), 1050 (w), 1009 (m), 999 (m), 947 (m), 922 (m), 860 (m), 837 (m), 819 (s), 800 (vs), 764 (vs), 749 (m), 739 (m), 687 (vs), 660 (s). Anal. calcd. for $C_{22}H_{15}NO_2$ (325.4): C 81.21, H 4.65, N 4.30; found: C 81.30, H 4.65, N 4.00.

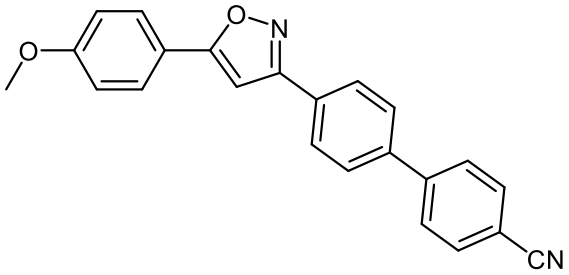
2.1.10 3-(4'-Nitro-[1,1'-biphenyl]-4-yl)-5-phenylisoxazole (4j)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **4j** (61 mg, 18%) was isolated as a colorless solid.

Mp 230 °C. ^{1}H NMR (500 MHz, THF-d_8) δ 7.28 (s, 1 H), 7.44-7.55 (m, 3 H), 7.88-8.00 (m, 6 H), 8.06-8.11 (m, 2 H), 8.31-8.36 (m, 2 H). ^{13}C NMR (126 MHz, THF-d_8) δ 98.6, 125.0, 126.7, 128.4, 128.8, 128.9 (C_{quat}), 128.9 (C_{quat}), 128.9, 130.1, 131.2, 141.2 (C_{quat}), 147.5 (C_{quat}), 148.8 (C_{quat}), 163.2 (C_{quat}), 171.6 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 342 ([M]$^+$, 38), 105 ([C_7H_5O]$^+$, 100), 77 ([C_6H_5]$^+$, 31). IR: $\tilde{\nu}$ [cm^{-1}] = 3113 (w), 2438 (w), 1591 (s), 1576 (m), 1560 (m), 1518 (s), 1487 (m), 1445 (m), 1431 (m), 1400 (m), 1383 (m), 1344 (s), 1333 (s), 1290 (w), 1256 (m), 1221 (w), 1202 (w), 1179 (w), 1126 (w), 1111 (s), 1090 (w), 1072 (w), 1028 (w), 1006 (w), 1001 (w), 949 (s), 922 (w), 868 (m), 852 (s), 837 (s), 814 (s), 772 (vs), 758 (s), 731 (s), 691 (vs), 665 (m). Anal. calcd. for $C_{21}H_{13}N_2O_3$ (342.4): C 73.68, H 4.12, N 8.18; found: C 73.39, H 3.92, N 8.04.

2.1.11 4'-(5-(4-Methoxyphenyl)isoxazol-3-yl)-[1,1'-biphenyl]-4-carbonitrile (4k)



According to **GP1** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) and recrystallization from ethyl acetate compound **4k** (181 mg, 51%) was isolated as a colorless solid.

Mp 211 °C. ^{1}H NMR (600 MHz, THF-d_8) δ 3.85 (s, 3 H), 7.05-7.08 (m, 2 H) 7.11 (s, 1 H), 7.81-7.85 (m, 6 H), 7.88-7.91 (m, 2 H), 8.03-8.06 (m, 2 H). ^{13}C NMR (151 MHz, THF-d_8) δ 55.8 (CH_3), 97.0, 112.8 (C_{quat}), 115.4, 119.2 (C_{quat}), 121.4 (C_{quat}), 128.2, 128.3, 128.6, 128.6, 131.0 (C_{quat}), 133.7, 141.4 (C_{quat}), 145.5 (C_{quat}), 162.6 (C_{quat}), 163.1 (C_{quat}), 171.6 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 352 ([M]$^+$, 31), 135 ([$C_8H_7O_2$]$^+$, 100), 107 ([C_7H_7O]$^+$, 10), 77 ([C_6H_5]$^+$, 13). IR: $\tilde{\nu}$ [cm^{-1}] = 2988 (w), 2972 (w), 2885 (w), 2232 (w), 1654 (s), 1609 (s), 1599 (s), 1576 (w), 1559 (vs), 1509 (s), 1497 (s), 1460 (m), 1439 (m), 1431 (m), 1420 (m), 1394 (m), 1387 (m), 1339

(w), 1325 (w), 1306 (w), 1292 (w), 1252 (s), 1242 (s), 1225 (m), 1207 (w), 1175 (s), 1152 (w), 1113 (m), 1076 (m), 1028 (s), 1003 (w), 978 (w), 952 (m), 947 (w), 924 (m), 880 (w), 837 (s), 825 (vs), 818 (s), 797 (s), 745 (m), 731 (w), 714 (m), 702 (m), 689 (m). Anal. calcd. for $C_{23}H_{16}N_2O_2$ (352.4): C 78.39, H 4.58, N 7.95; found: C 78.57, H 4.86, N 7.99.

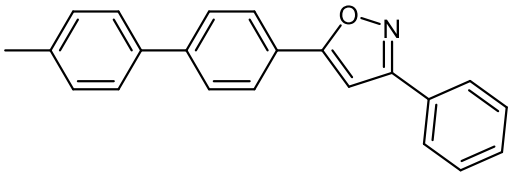
2.2 General procedure 2 for the one-pot synthesis of 5-biarylsubstituted isoxazoles 5 (GP2)

$Pd(PPh_3)_2Cl_2$ (14 mg, 0.02 mmol) and CuI (8 mg, 0.04 mmol) were placed into a 10 mL microwave vessel under a nitrogen atmosphere. 1,4-Dioxane (2 mL) and 4-bromobenzoyl chloride (**1f**) (220 mg, 1.00 mmol) were added and the solution was briefly degassed with nitrogen through a cannula. After addition of terminal alkyne **2** (1.10 mmol) and triethylamine (106 mg, 1.05 mmol) the reaction mixture turned dark and solids precipitated (for experimental details, see Table S2). The mixture was stirred at room temperature for one hour. Then, hydroxylammonium chloride (76 mg, 1.1 mmol) and triethylamine (101 mg, 1.00 mmol) were added and the mixture was irradiated at 140 °C for 5 min in a microwave reactor. The resulting solid mixture was suspended with 1,4-dioxane (1 mL) and water (0.3 mL), briefly degassed and arylboronic acid **3** (1.50 mmol) and potassium carbonate (553 mg, 4.00 mmol) were added. The mixture was irradiated at 140 °C for 30 min in a microwave reactor. After cooling to room temp the reaction mixture was transferred with dichloromethane (20 mL) into a separating funnel and washed with saturated aqueous NH_4Cl solution (30 mL). The aqueous layer was extracted with dichloromethane (3 x 20 mL), the combined organic layers were dried (anhydrous $MgSO_4$) and the solvent was removed under reduced pressure. The residue was purified by column chromatography on silica gel. The experimental details are summarized in Table S2.

Table S2. Experimental details for the synthesis of 5-biarylsubstituted isoxazoles **5**.

Entry	Alkyne **2**	Boronic acid **3**	Product **5**
1	102 mg (1.00 mmol) of phenylacetylene (**2b**)	204 mg (1.50 mmol) of *p*-tolylboronic acid (**3a**)	152 mg (49%) of **5a**
2	(103 mg, 1.01 mmol) of **2b**	230 mg (1.51 mmol) of 4-methoxyphenyl boronic acid (**3b**)	95 mg (29%) of **5b**
3	172 mg (1.01 mmol) of 1-ethynyl-4-(trifluoromethyl)-benzene (**2c**)	228 mg (1.50 mmol) of **3b**	52 mg (13%) of **5c**
4	128 mg (1.01 mmol) of 4-ethynylbenzonitrile (**2d**)	228 mg (1.50 mmol) of **3b**	21 mg (6%) of **5d**
5	127 mg (1.00 mmol) of **2d**	248 mg (1.50 mmol) of 4-(dimethylamino)phenyl) boronic acid (**3d**)	124 mg (34%) of **5e**

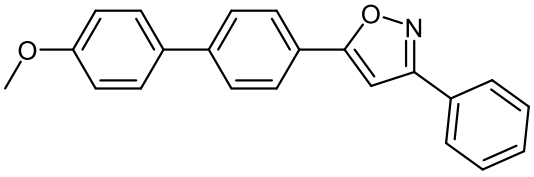
2.2.1 5-(4'-Methyl-[1,1'-biphenyl]-4-yl)-3-phenylisoxazole (5a)



According to **GP2** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **5a** (152 mg, 49%) was isolated as a colorless solid.

Mp 192 °C. ^{1}H NMR (300 MHz, THF-d_8) δ 2.38 (s, 3 H), 7.23 (s, 1 H), 7.25-7.30 (m, 2 H), 7.42-7.52 (m, 3 H), 7.57-7.63 (m, 2 H), 7.75-7.82 (m, 2 H), 7.90-8.00 (m, 4 H). ^{13}C NMR (75 MHz, THF-d_8) δ 21.3 (CH_3), 98.4, 127.1, 127.4 (C_{quat}), 127.6, 127.7, 128.2, 129.8, 130.5, 130.7 (C_{quat}), 130.8, 138.2 (C_{quat}), 138.7 (C_{quat}), 143.7 (C_{quat}), 163.8 (C_{quat}), 171.1 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 312 ([M+1]$^+$, 17), 311 ([M]$^+$, 72), 195 ([$C_{14}H_{11}O$]$^+$, 100), 167 ([$C_{13}H_{11}$]$^+$, 12), 165 (25), 152 ([$C_{12}H_8$]$^+$, 36). IR: $\tilde{\nu}$ [cm^{-1}] = 3105 (w), 3961 (w), 3028 (w), 2913 (w), 2859 (w), 1716 (m), 1609 (m), 1595 (m), 1578 (m), 1493 (s), 1462 (s), 1443 (m), 1418 (w), 1400 (s), 1379 (w), 1285 (w), 1260 (w), 1204 (w), 1140 (w), 1090 (w), 1052 (w), 1026 (w), 1003 (m), 949 (s), 920 (m), 908 (m), 855 (w), 845 (m), 831 (w), 808 (vs), 764 (vs), 740 (w), 733 (m), 685 (vs), 664 (m). ESI-HRMS: mass calcd. for [$C_{22}H_{17}$NO-H]$^+$: 312.1383; found: 312.1382. HPLC (*Area%*): 99.78.

2.2.2 5-(4'-Methoxy-[1,1'-biphenyl]-4-yl)-3-phenylisoxazole (5b)

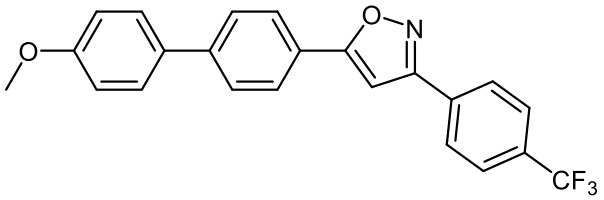


According to **GP2** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) compound **5b** (95 mg, 29%) was isolated as a colorless solid.

Mp 199 °C. ^{1}H NMR (500 MHz, THF-d_8) δ 3.83 (s, 3 H), 6.98-7.03 (m, 2 H), 7.19 (s, 1 H), 7.41-7.50 (m, 3 H), 7.62-7.66 (m, 2 H), 7.73-7.77 (m, 2 H), 7.90-7.95 (m, 4 H). ^{13}C NMR (126 MHz, THF-d_8) δ 55.7 (CH_3), 98.3, 115.3, 127.1 (C_{quat}), 127.1, 127.7, 127.9, 128.9, 129.8, 130.7, 130.8 (C_{quat}), 133.4 (C_{quat}), 143.6 (C_{quat}), 161.2 (C_{quat}), 163.8 (C_{quat}), 171.2 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 328 ([M+1]$^+$, 24), 327 ([M]$^+$, 100), 284 (11), 211 ([$C_{14}H_{11}O_2$]$^+$, 84), 183 ([$C_{13}H_{11}O$]$^+$, 13), 168 ([$C_{12}H_8O$]$^+$, 20), 152 ([$C_{12}H_8$]$^+$, 21), 140 (19), 139 (26), 77 ([C_6H_5]$^+$, 14). IR: $\tilde{\nu}$ [cm^{-1}] = 3105 (w), 3038 (w), 2918 (w), 2903 (w), 1597 (s, br), 1578 (m), 1557 (m), 1531 (m), 1512 (m), 1493 (s), 1462 (s), 1441 (s), 1423 (w), 1396 (s), 1290 (s), 1281 (s), 1254 (s, br), 1227 (w), 1204 (s), 1182 (s), 1142 (w), 1117 (w), 1090 (w), 1072 (w), 1051 (w), 1038 (s), 1013 (m), 999 (m), 951 (s), 934 (m), 916 (m),

826 (vs), 808 (vs), 764 (vs), 731 (s), 718 (w), 685 (vs), 664 (w), 644 (w). Anal. calcd. for $C_{22}H_{17}NO_2$ (327.4): C 80.71, H 5.23, N 4.28; found: C 80.61, H 5.30, N 4.07.

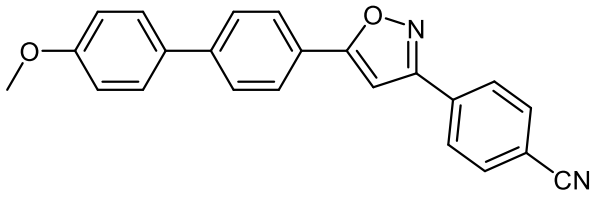
2.2.3 5-(4'-Methoxy-[1,1'-biphenyl]-4-yl)-3-(4-(trifluoromethyl)phenyl)Isoxazole (5c)



According to **GP2** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:1) and recrystallization from ethyl acetate compound **5c** (52 mg, 13%) was isolated as a colorless solid.

Mp 213 °C. ^{1}H NMR (300 MHz, THF-d_8) δ 3.83 (s, 3 H), 6.98-7.06 (m, 2 H), 7.34 (s, 1 H), 7.62-7.69 (m, 2 H), 7.74-7.87 (m, 4 H), 7.92-8.00 (m, 2 H), 8.11-8.18 (m, 2 H). ^{13}C NMR (75 MHz, THF-d_8) δ 55.7 (CH_3), 98.5, 115.3, 125.4 (q, $^{1}J_{C\text{-}F}$ = 271 Hz, C_{quat}) 126.7 (C_{quat}), 126.9 (q, $^{3}J_{C\text{-}F}$ = 3.9 Hz), 127.1, 127.9, 128.3, 128.9, 132.4 (q, $^{2}J_{C\text{-}F}$ = 32.2 Hz, C_{quat}), 133.1 (C_{quat}), 134.4 (C_{quat}), 143.8 (C_{quat}), 161.2 (C_{quat}), 162.8 (C_{quat}), 171.8 (C_{quat}). ^{19}F NMR (282 MHz, THF-d_8) δ -65.4. EI MS (70 eV, *m*/*z* (%)): 396 ([M+1]$^+$, 21), 395 ([M]$^+$, 100), 380 ([$C_{22}H_{13}F_3NO_2$]$^+$, 11), 352 (13), 211 ([$C_{14}H_{11}O_2$]$^+$, 47), 183 ([$C_{13}H_{11}O$]$^+$, 16), 173 (13), 168 ([$C_{12}H_8O$]$^+$, 21), 152 ([$C_{12}H_8$]$^+$, 21), 145 ([$C_7H_4F_3$]$^+$, 20), 140 (22), 139 (28). IR: $\tilde{\nu}$ [cm^{-1}] = 3119 (w), 3038 (w), 2959 (w), 2926 (w), 2872 (w), 2854 (w), 1601 (s), 1580 (w), 1557 (w), 1526 (m), 1497 (s), 1464 (s), 1454 (s), 1439 (s), 1408 (w), 1387 (m), 1364 (w), 1325 (s), 1275 (s, br), 1257 (s, br), 1223 (w), 1202 (m), 1170 (s, br), 1121 (vs), 1111 (vs), 1090 (s), 1067 (s), 1051 (w), 1034 (s), 1011 (m), 999 (w), 980 (w), 951 (s), 924 (m), 881 (w), 847 (s), 826 (vs), 806 (vs), 779 (w), 760 (w), 741 (w), 731 (w), 718 (w), 692 (s), 687 (s), 664 (w), 646 (w), 629 (w). Anal. calcd. for $C_{23}H_{16}F_3NO_2$ (395.4): C 69.87, H 4.08, N 3.54; found: C 69.64, H 4.04, N 3.34.

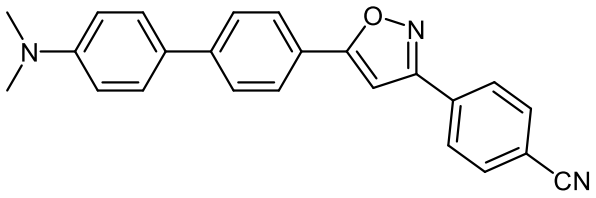
2.2.4 4-(5-(4'-Methoxy-[1,1'-biphenyl]-4-yl)isoxazol-3-yl)benzonitril (5d)



According to **GP2** and chromatography on silica gel (hexane/dichloromethane 10:1 to 1:2) and recrystallization from ethyl acetate compound **5d** (21 mg, 6%) was isolated as a colorless solid.

Mp 229 °C. ^{1}H NMR (600 MHz, CD_2Cl_2) δ 3.86 (s, 3 H), 6.94 (s, 1 H), 7.00-7.04 (m, 2 H), 7.60-7.64 (m, 2 H), 7.71-7.75 (m, 2 H), 7.79-7.83 (m, 2 H), 7.89-7.93 (m, 2 H), 7.99-8.03 (m, 2 H). ^{13}C NMR (151 MHz, CD_2Cl_2) δ 55.9 (CH_3), 97.8, 114.2 (C_{quat}), 114.9, 118.9 (C_{quat}), 125.8 (C_{quat}), 126.8, 127.7, 127.9, 128.6, 132.7 (C_{quat}), 133.4, 134.0 (C_{quat}), 143.4 (C_{quat}), 160.5 (C_{quat}), 162.2 (C_{quat}), 171.6 (C_{quat}). EI MS (70 eV, *m*/*z* (%)): 353 ([M+1]$^+$, 26), 352 ([M]$^+$, 100), 337 ([$C_{22}H_{13}N_2O_2$]$^+$, 14), 309 (18), 211 ([$C_{14}H_{11}O_2$]$^+$, 50), 183 ([$C_{13}H_{11}O$]$^+$, 13), 168 ([$C_{12}H_8O$]$^+$, 22), 152 ([$C_{12}H_8$]$^+$, 26), 140 (26), 139 (35), 102 ([C_7H_4N]$^+$, 14). IR: $\tilde{\nu}$ [cm^{-1}] = 2959 (m), 2918 (s), 2849 (m), 2226 (m), 1603 (s), 1578 (w), 1555 (w), 1495 (s), 1456 (s), 1433 (s), 1422 (w), 1402 (w), 1383 (w), 1366 (w), 1314 (w), 1292 (w), 1275 (m), 1256 (s), 1204 (s), 1180 (s), 1084 (m), 1046 (w), 1032 (s), 1011 (m), 999 (w), 949 (s), 924 (s), 849 (s), 822 (s), 812 (s), 797 (vs), 777 (w), 729 (m), 712 (w), 698 (w), 687 (m), 660 (w). Anal. calcd. for $C_{23}H_{16}N_2O_2$ (352.4): C 78.39, H 4.58, N 7.95; found: C 78.30, H 4.54, N 7.88.

2.2.5 4-(5-(4'-(Dimethylamino)-[1,1'-biphenyl]-4-yl)isoxazol-3-yl)benzonitrile (5e)

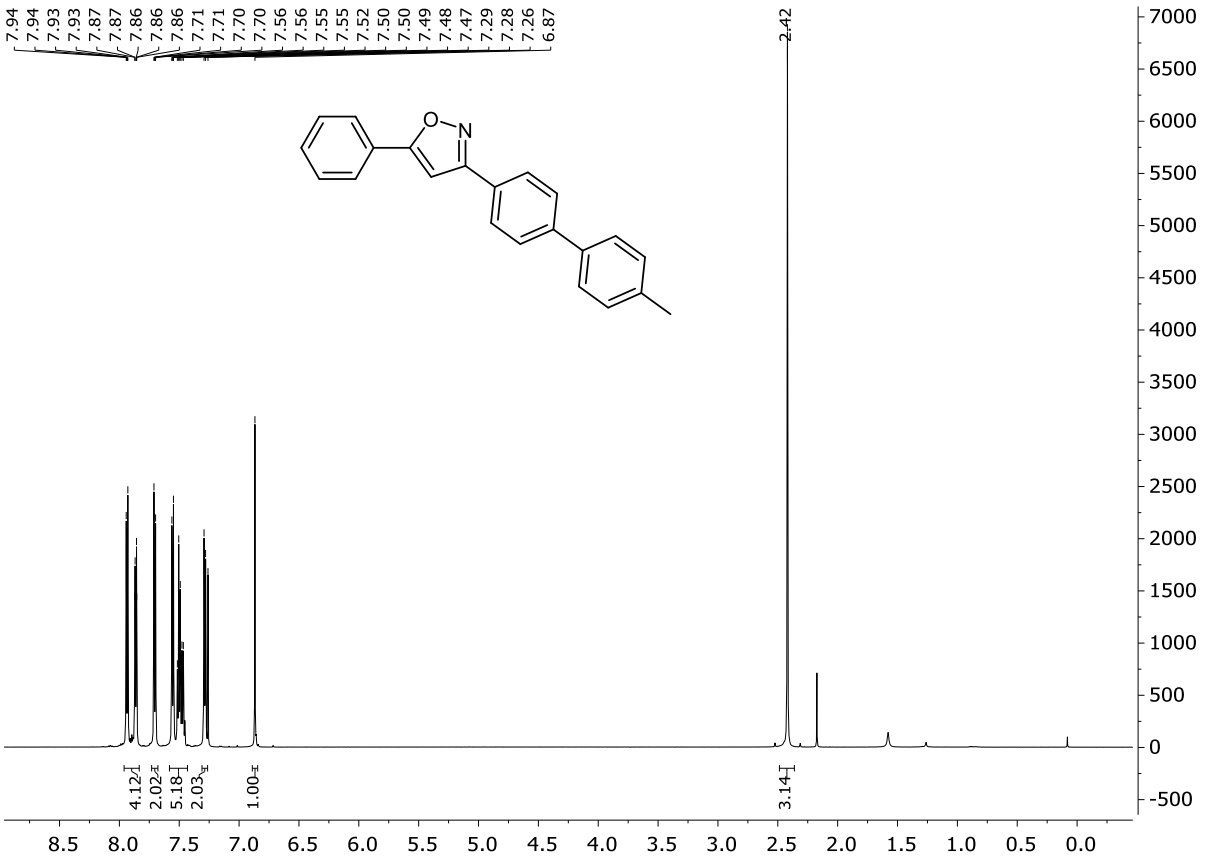


According to **GP2** and chromatography on silica gel (hexane/dichloromethane 5:1 to 1:5, addition of 1 vol% of triethylamine) and recrystallization from acetonitrile compound **5e** (124 mg, 34%) was isolated as a yellow solid.

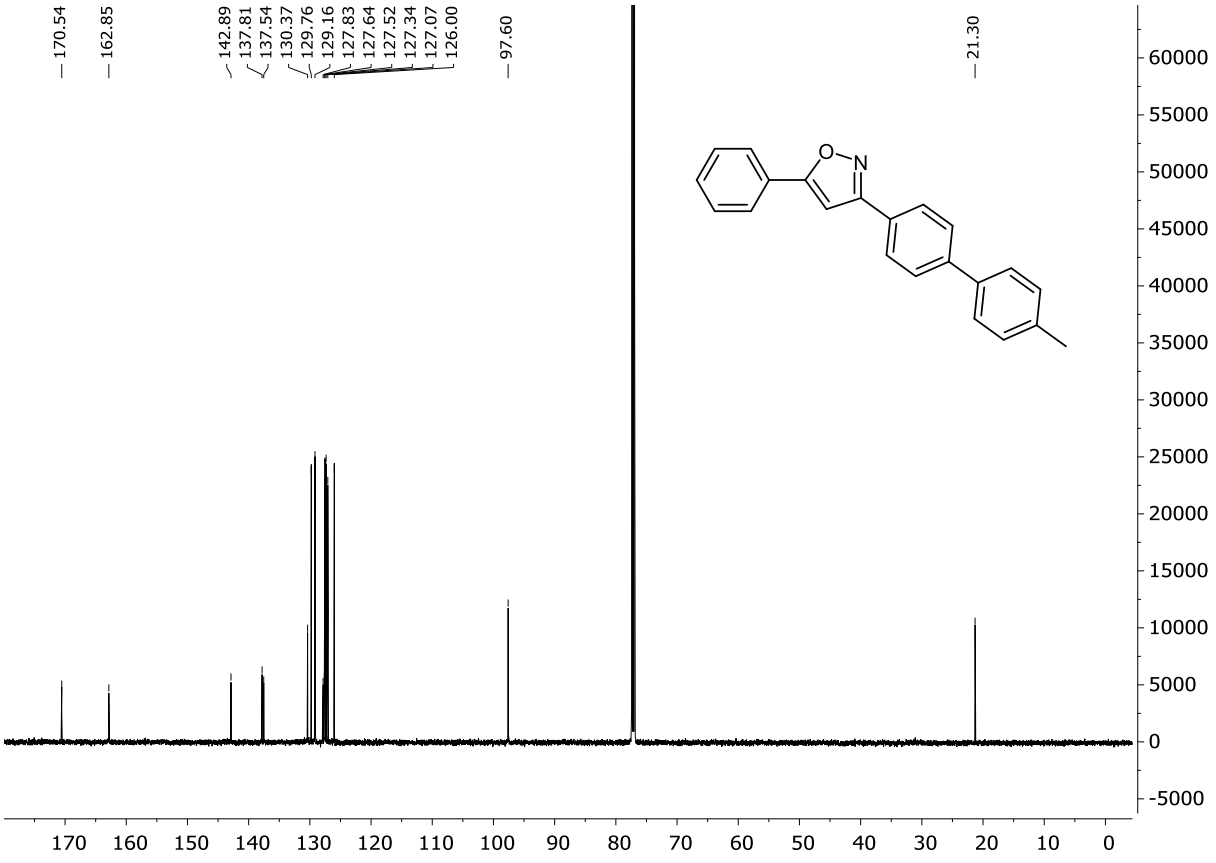
Mp 253 °C. ^{1}H NMR (500 MHz, CD_2Cl_2) δ 3.01 (s, 6 H), 6.83 (d, *J* = 8.4 Hz, 2 H), 6.91 (s, 1 H), 7.55-7.62 (m, 2 H), 7.69-7.75 (m, 2 H), 7.78-7.84 (m, 2 H), 7.85-7.91 (m, 2 H), 7.98-8.04 (m, 2 H). ^{13}C NMR (126 MHz, CD_2Cl_2) δ 41.0 (CH_3), 97.6, 113.5, 114.2 (C_{quat}), 119.0 (C_{quat}), 125.2 (C_{quat}), 125.5 (C_{quat}), 126.9, 127.0, 128.0, 128.2, 133.4, 134.2 (C_{quat}), 143.9 (C_{quat}), 155.5 (C_{quat}), 162.2 (C_{quat}), 171.9 (C_{quat}). ESI MS (*m*/*z*): 366 ([M+H]$^+$). IR: $\tilde{\nu}$ [cm^{-1}] = 3121 (w), 3032 (w), 2986 (w), 2957 (w), 2893 (w), 2810 (w), 2228 (m), 1597 (s, br), 1562 (w), 1537 (m), 1497 (s), 1435 (s), 1383 (w), 1360 (s), 1319 (w), 1283 (s), 1261 (w), 1225 (s), 1211 (s), 1193 (w), 1171 (m), 1126 (m), 1115 (m), 1086 (w), 1061 (m), 1049 (w), 1015 (w), 951 (s), 922 (m), 847 (vs), 814 (vs), 795 (vs), 781 (w), 714 (m), 687 (m). Anal. calcd. for $C_{24}H_{19}N_3O$ (365.4): C 78.88, H 5.24, N 11.50; found: C 78.98, H 5.22, N 11.40.

3. ^{1}H and ^{13}C NMR spectra of compounds 4 and 5

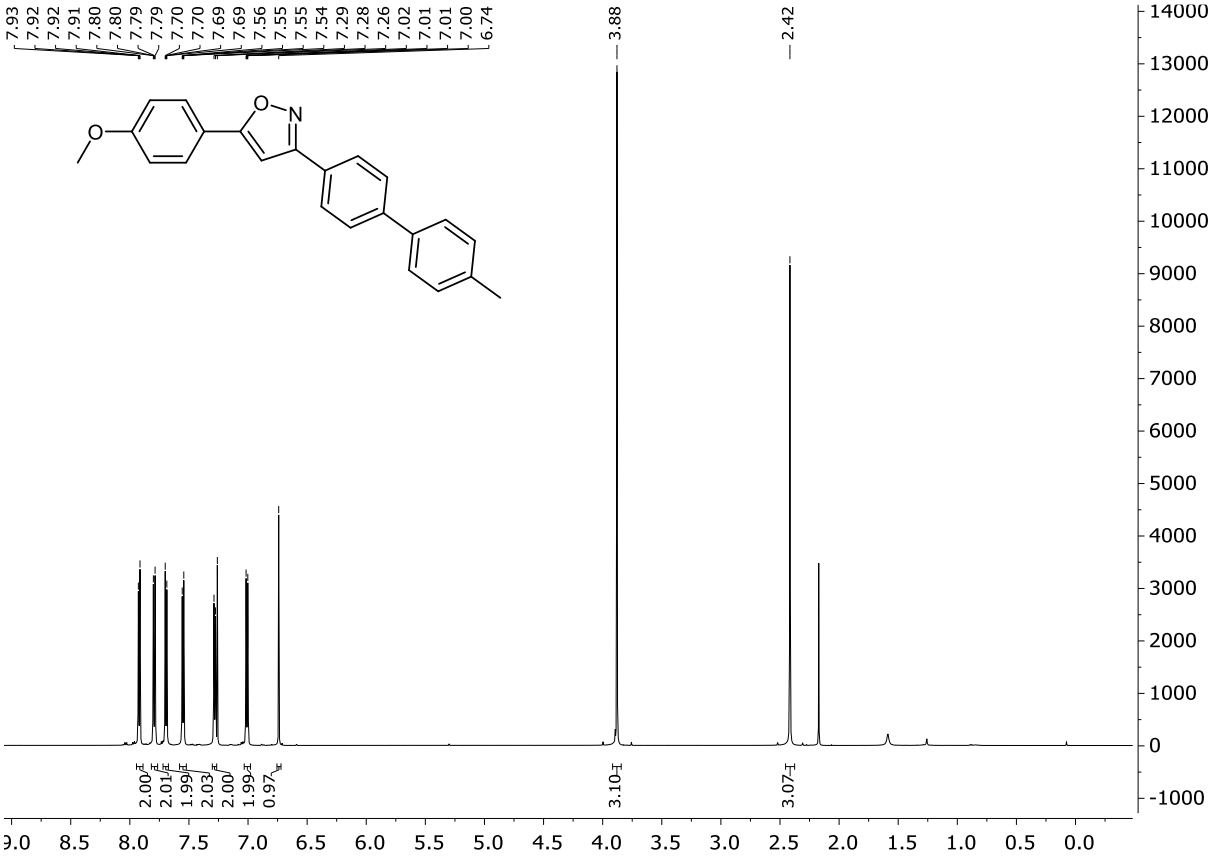
^{1}H NMR spectrum of **4a** (600 MHz, $CDCl_3$, 298 K):



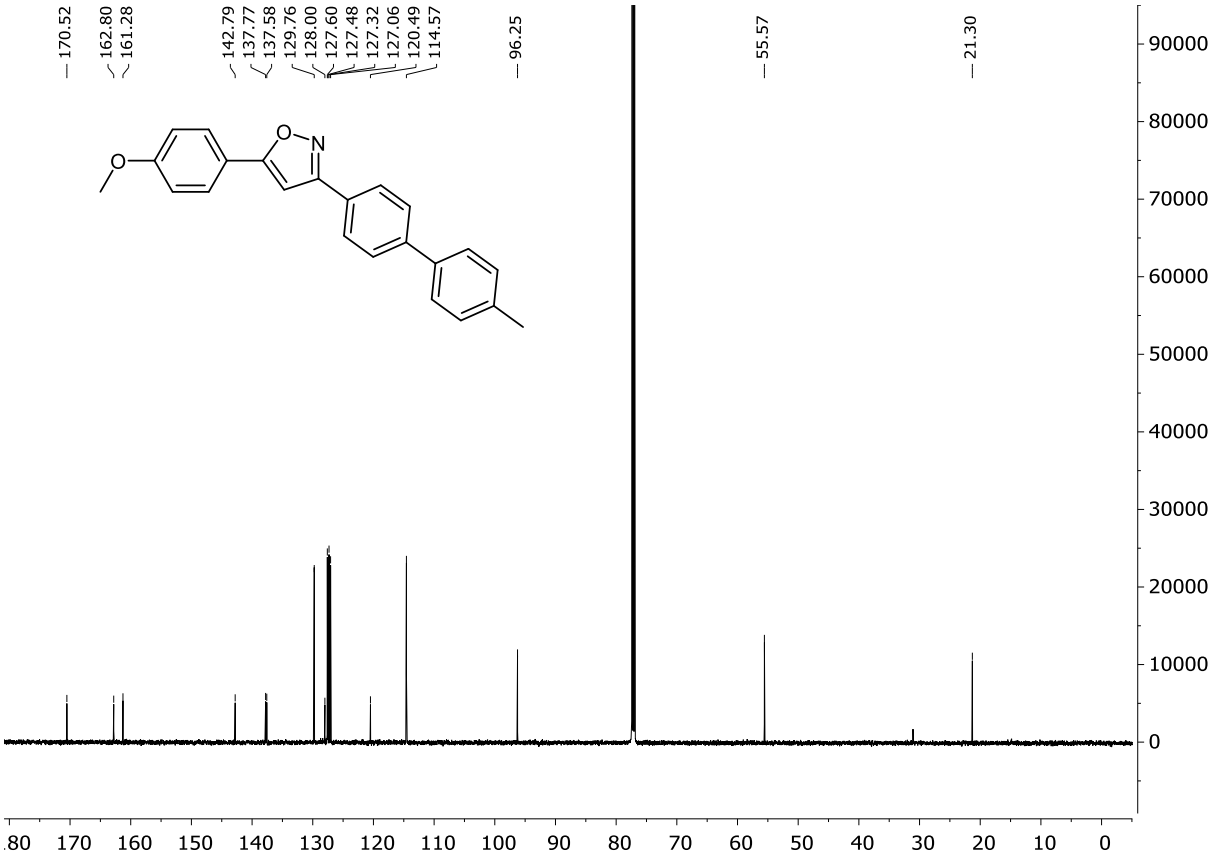
^{13}C NMR spectrum of **4a** (151 MHz, $CDCl_3$, 298 K):



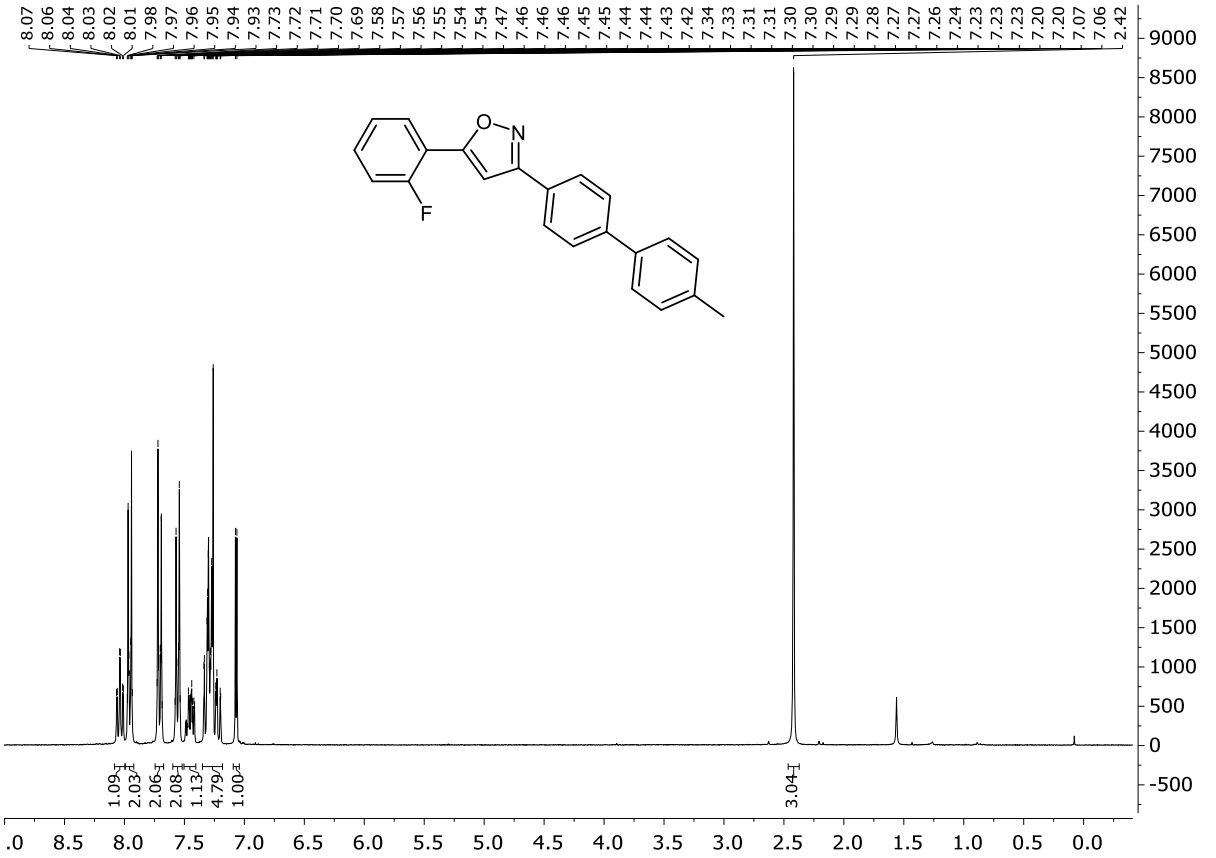
^{1}H NMR spectrum of **4b** (600 MHz, $CDCl_3$, 298 K):



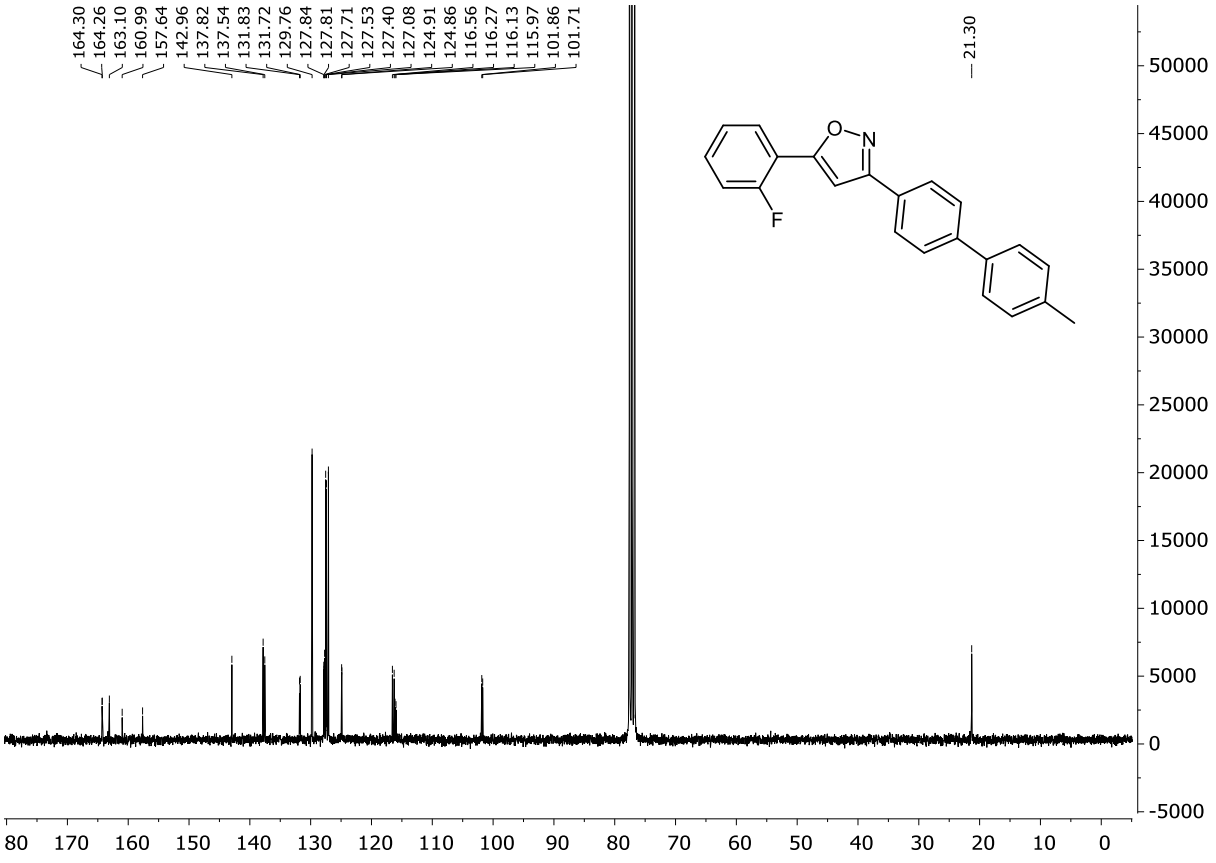
^{13}C NMR spectrum of **4b** (151 MHz, $CDCl_3$, 298 K):



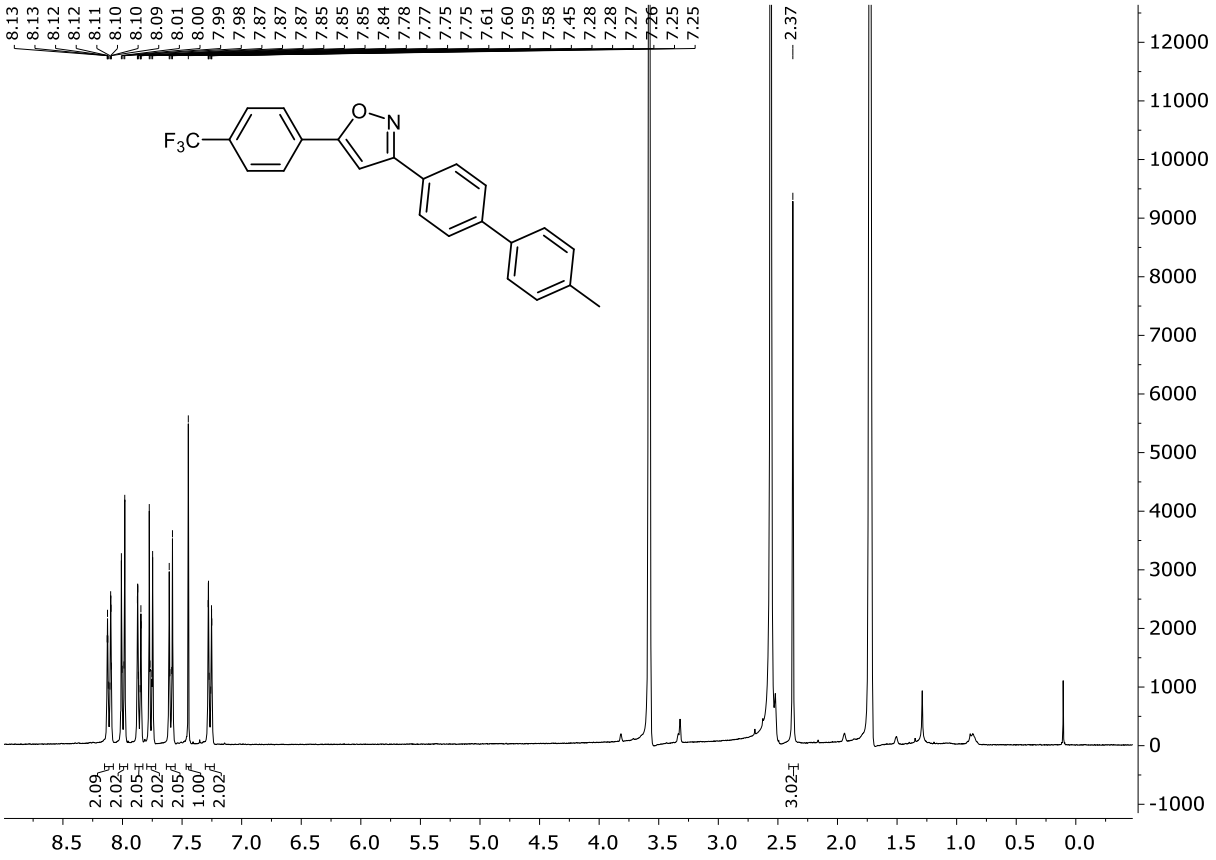
^{1}H NMR spectrum of **4c** (300 MHz, $CDCl_3$, 298 K):



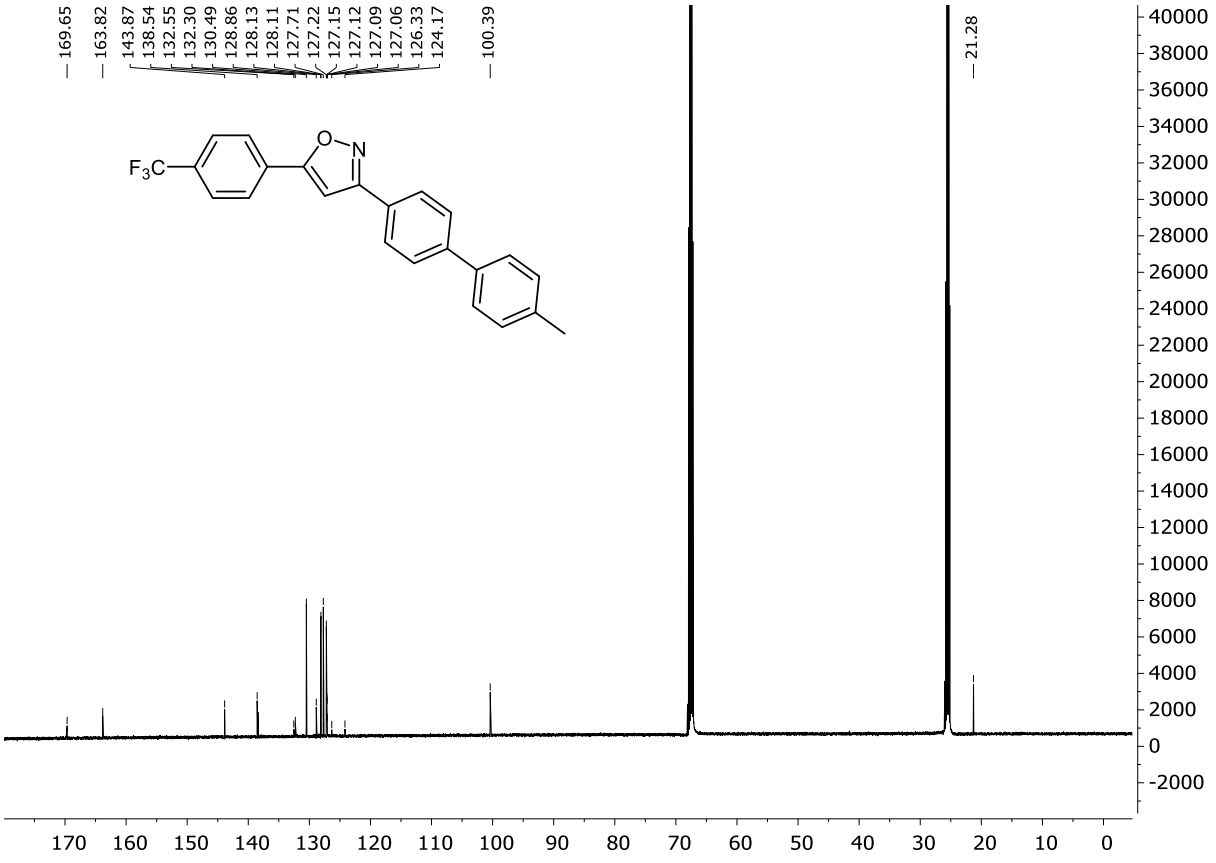
^{13}C NMR spectrum of **4c** (75 MHz, $CDCl_3$, 298 K):



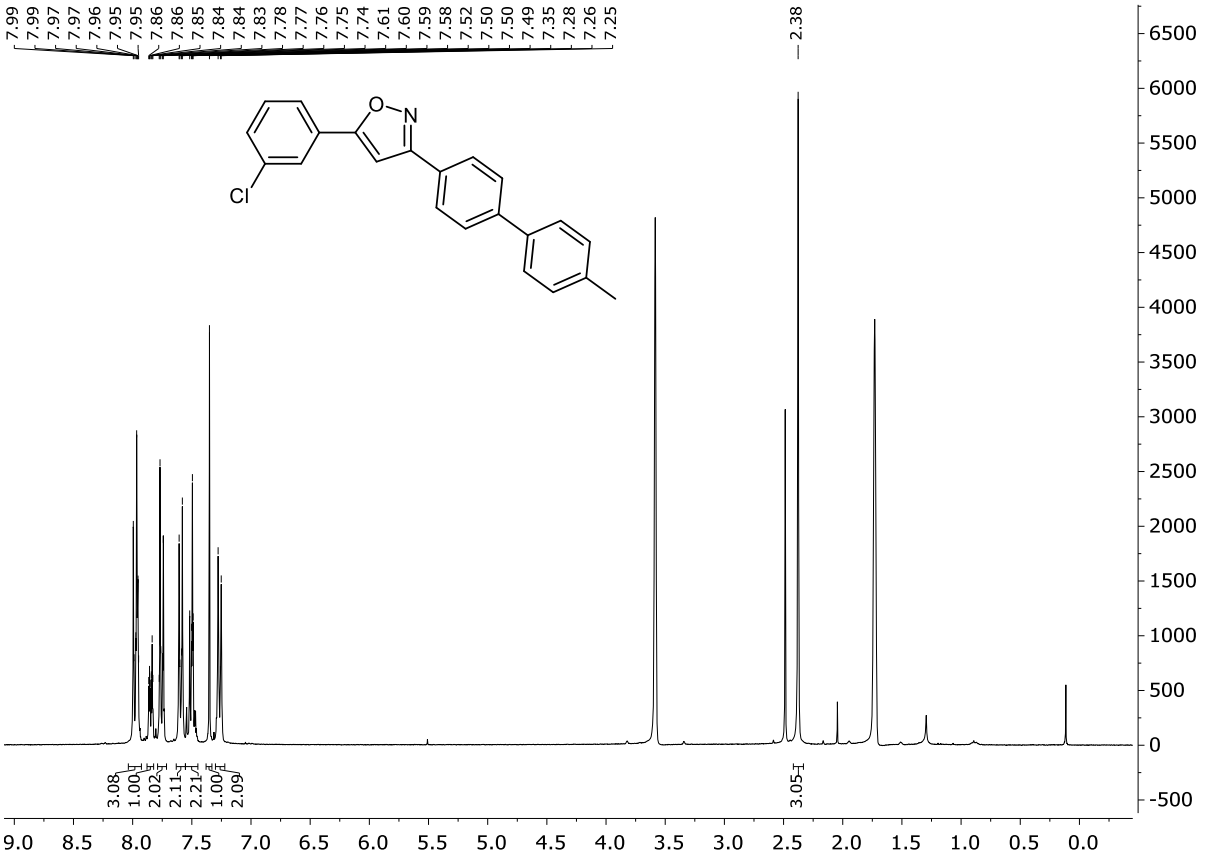
^{1}H NMR spectrum of **4d** (300 MHz, THF-d_8, 298 K):



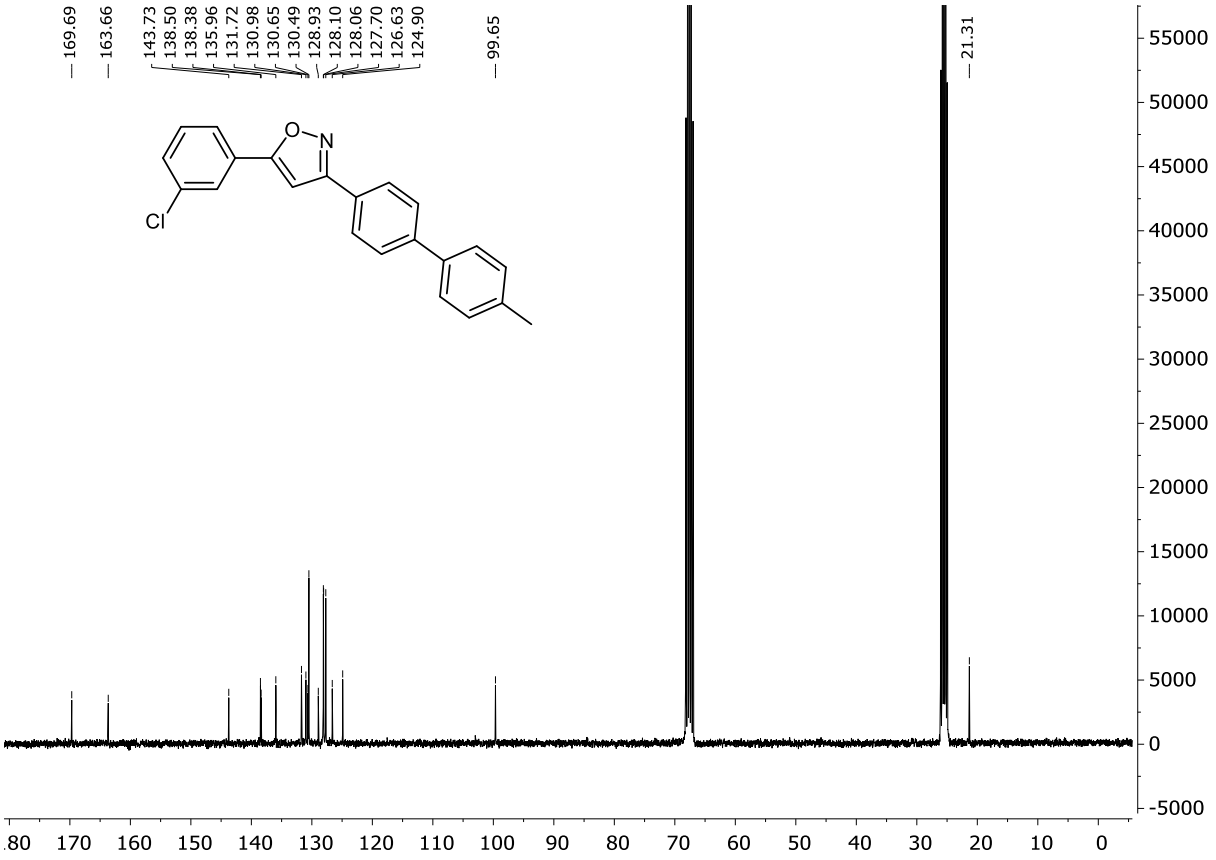
^{13}C NMR spectrum of **4d** (126 MHz, THF-d_8, 298 K):



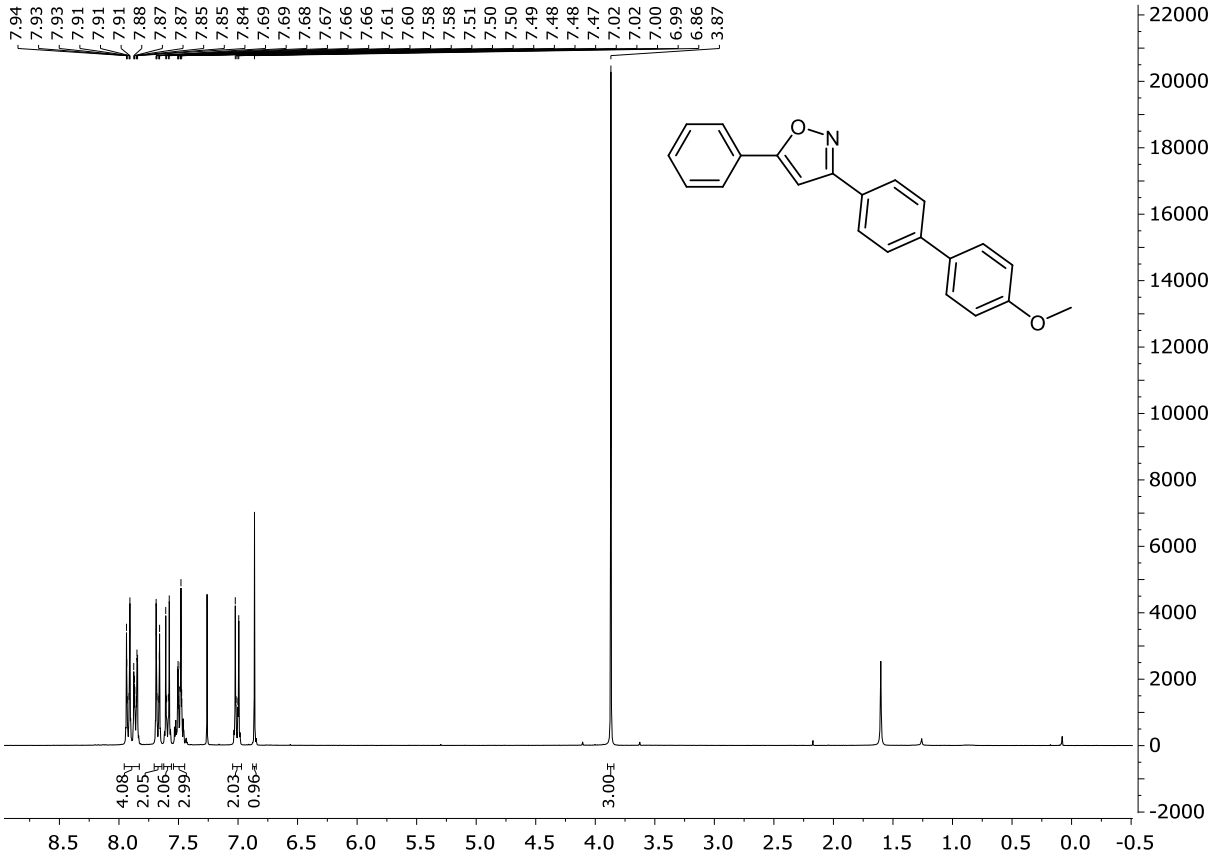
^{1}H NMR spectrum of **4e** (300 MHz, THF-*d*$_8$, 298 K):



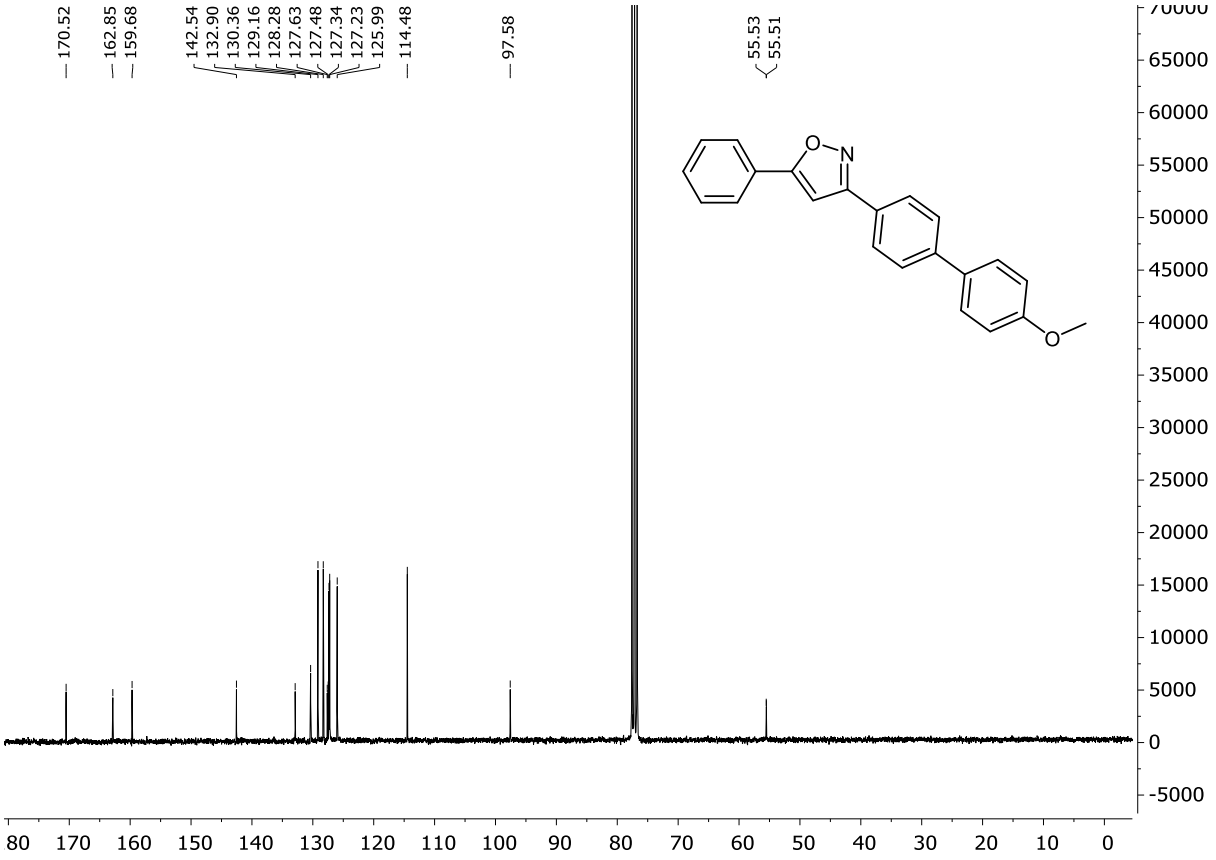
^{13}C NMR spectrum of **4e** (75 MHz, THF-*d*$_8$, 298 K):



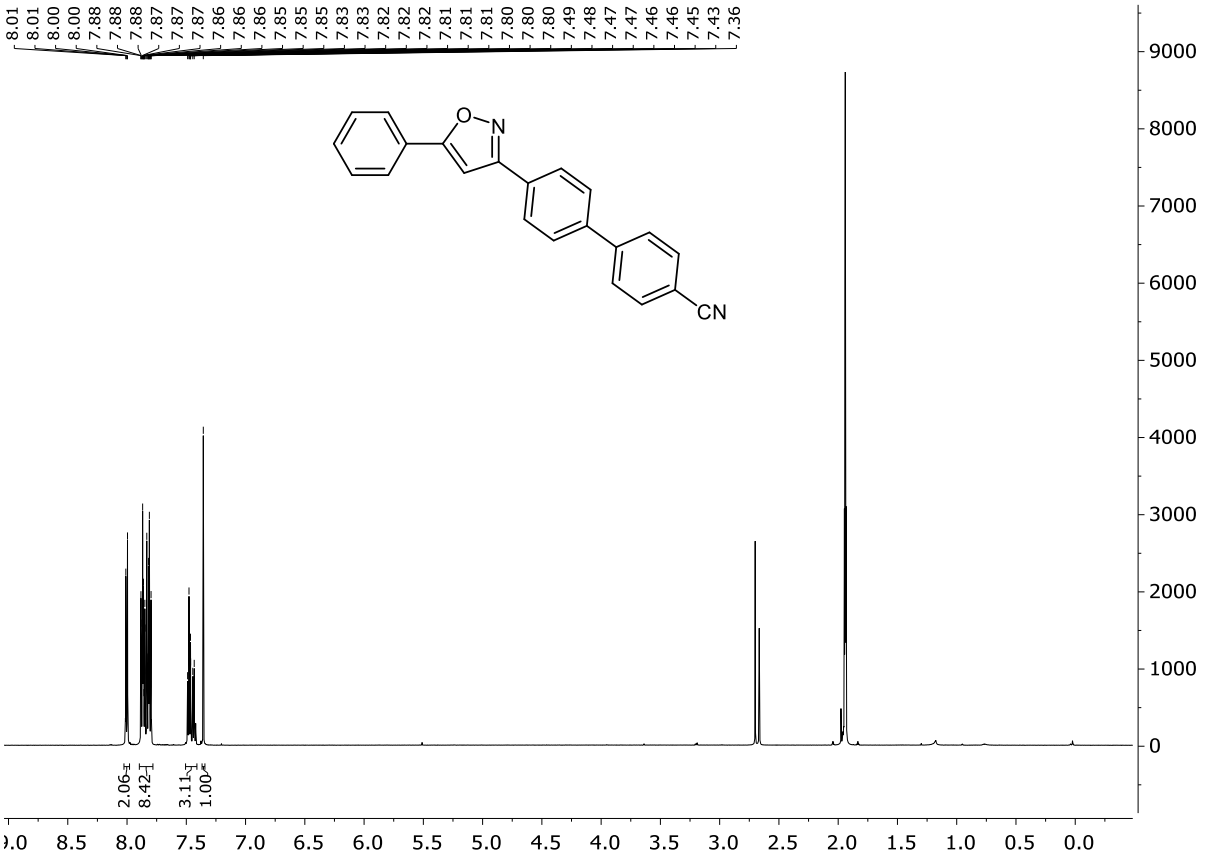
^{1}H NMR spectrum of **4f** (300 MHz, $CDCl_3$, 298 K):



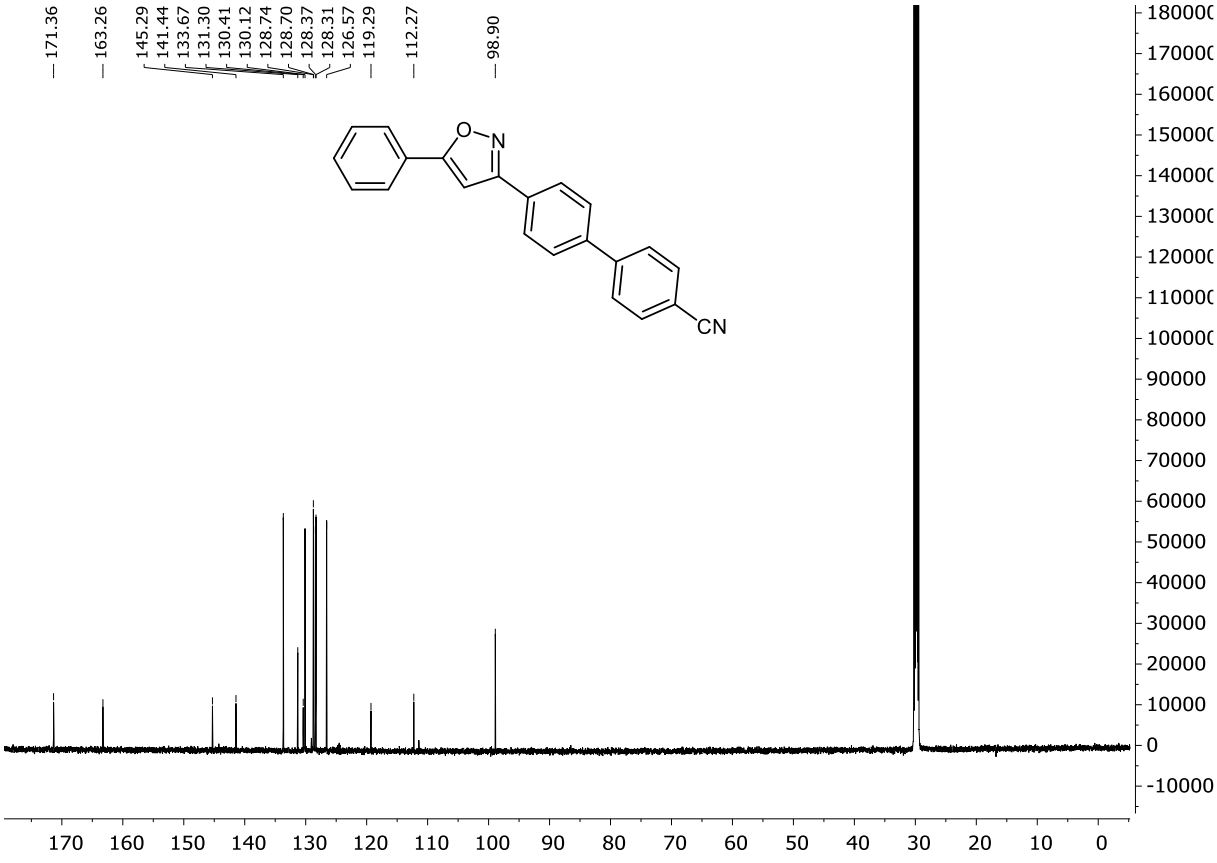
^{13}C NMR spectrum of **4f** (75 MHz, $CDCl_3$, 298 K):



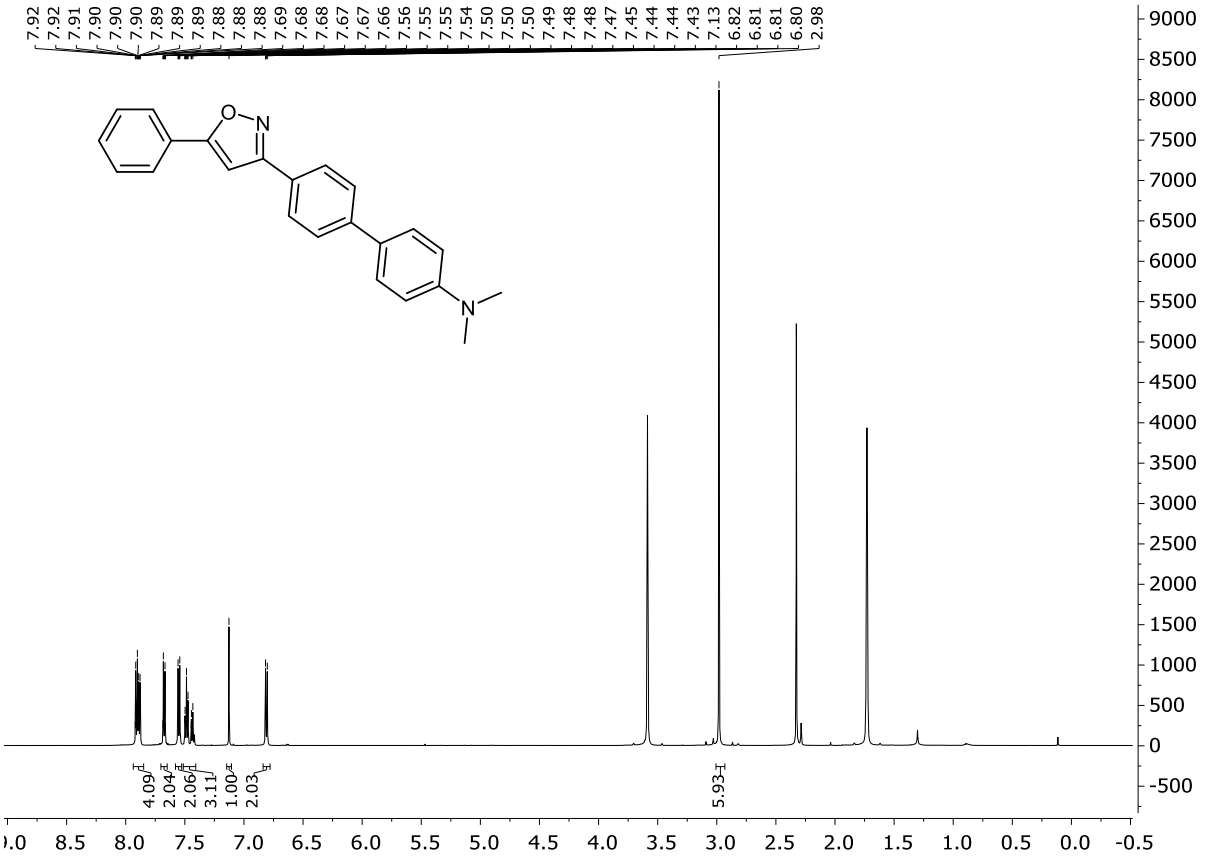
^{1}H NMR spectrum of **4g** (600 MHz, acetone-d_6, 298 K):



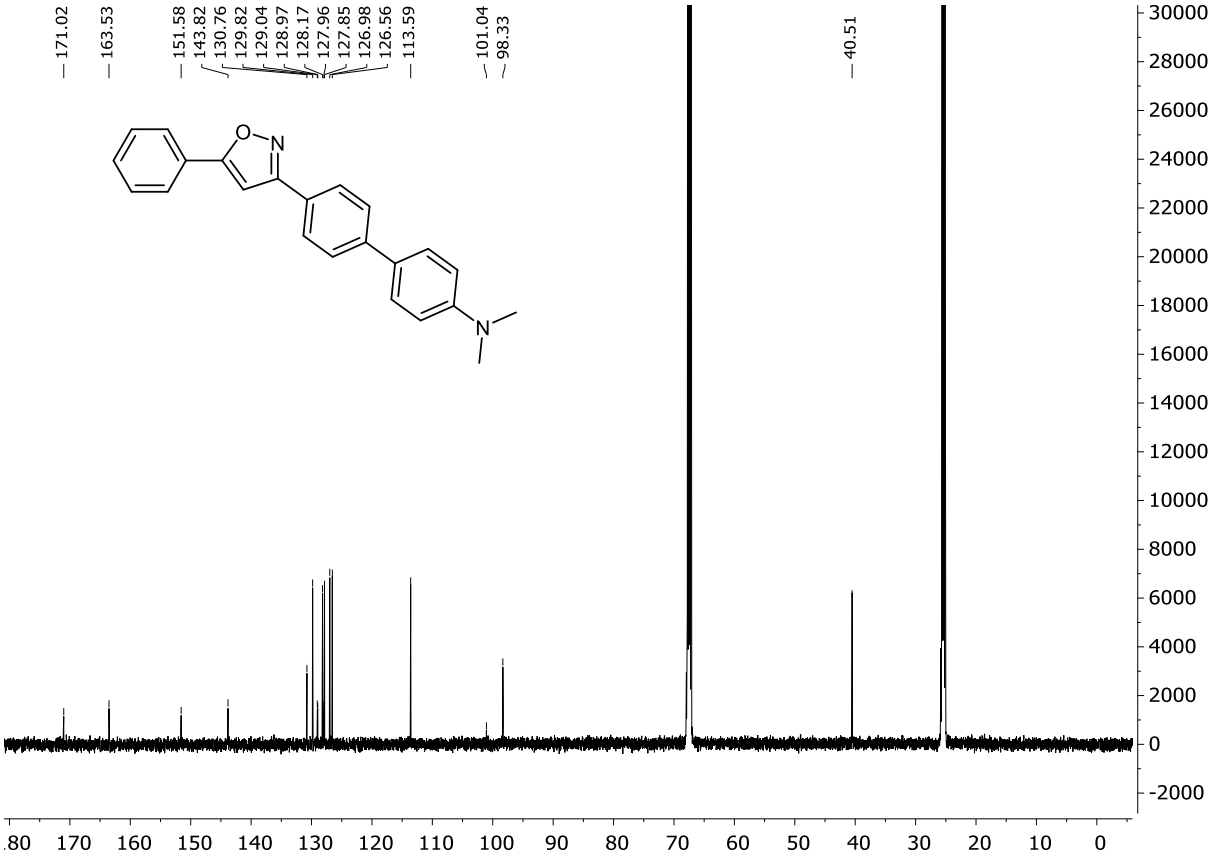
^{13}C NMR spectrum of **4g** (151 MHz, acetone-d_6, 298 K):



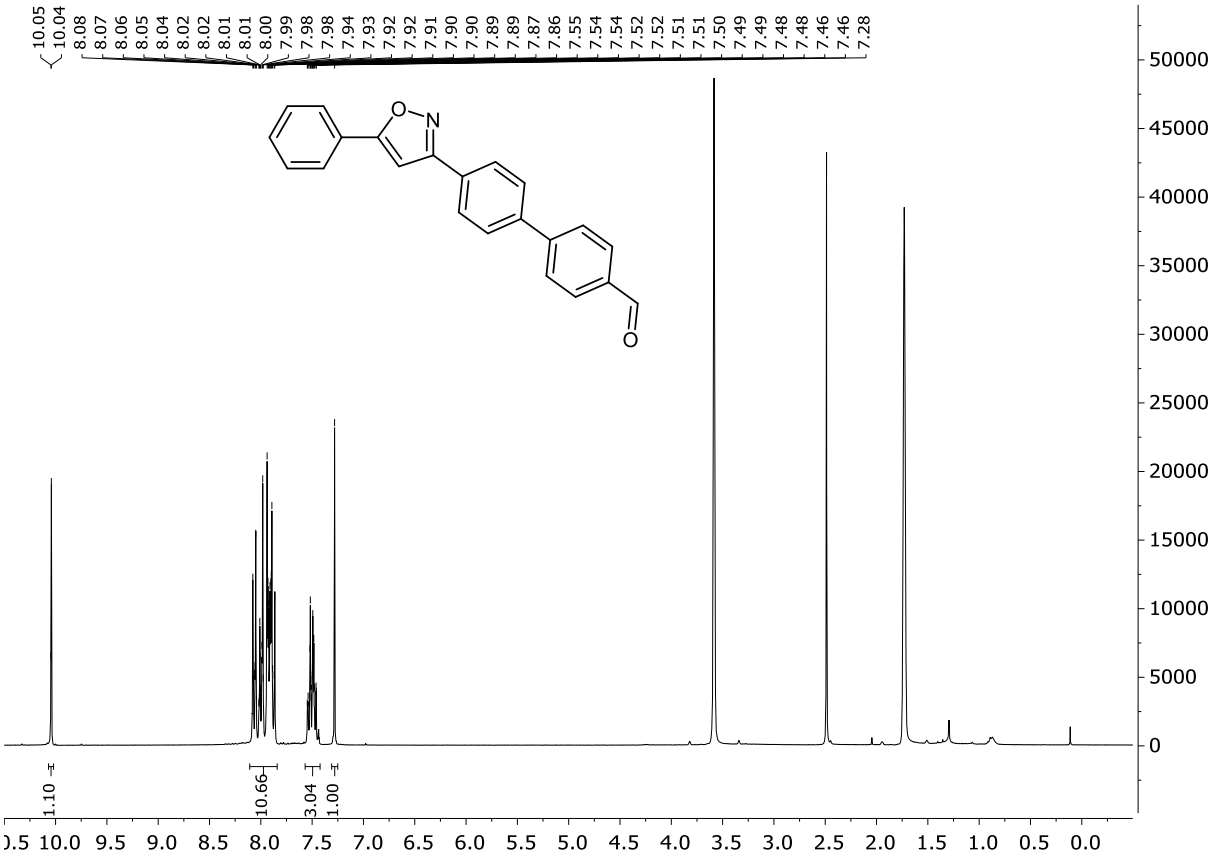
^{1}H NMR spectrum of **4h** (600 MHz, $CDCl_3$, 328 K):



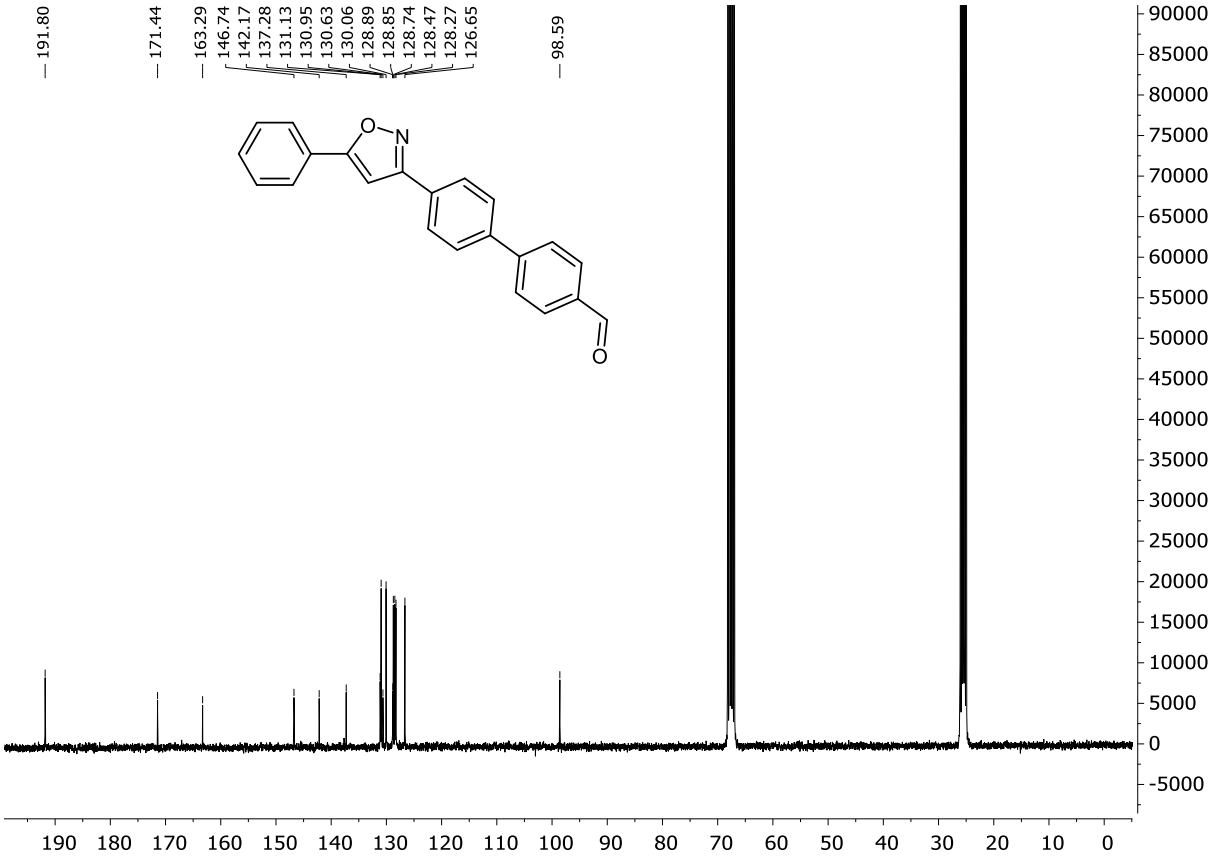
^{13}C NMR spectrum of **4h** (151 MHz, $CDCl_3$, 328 K):



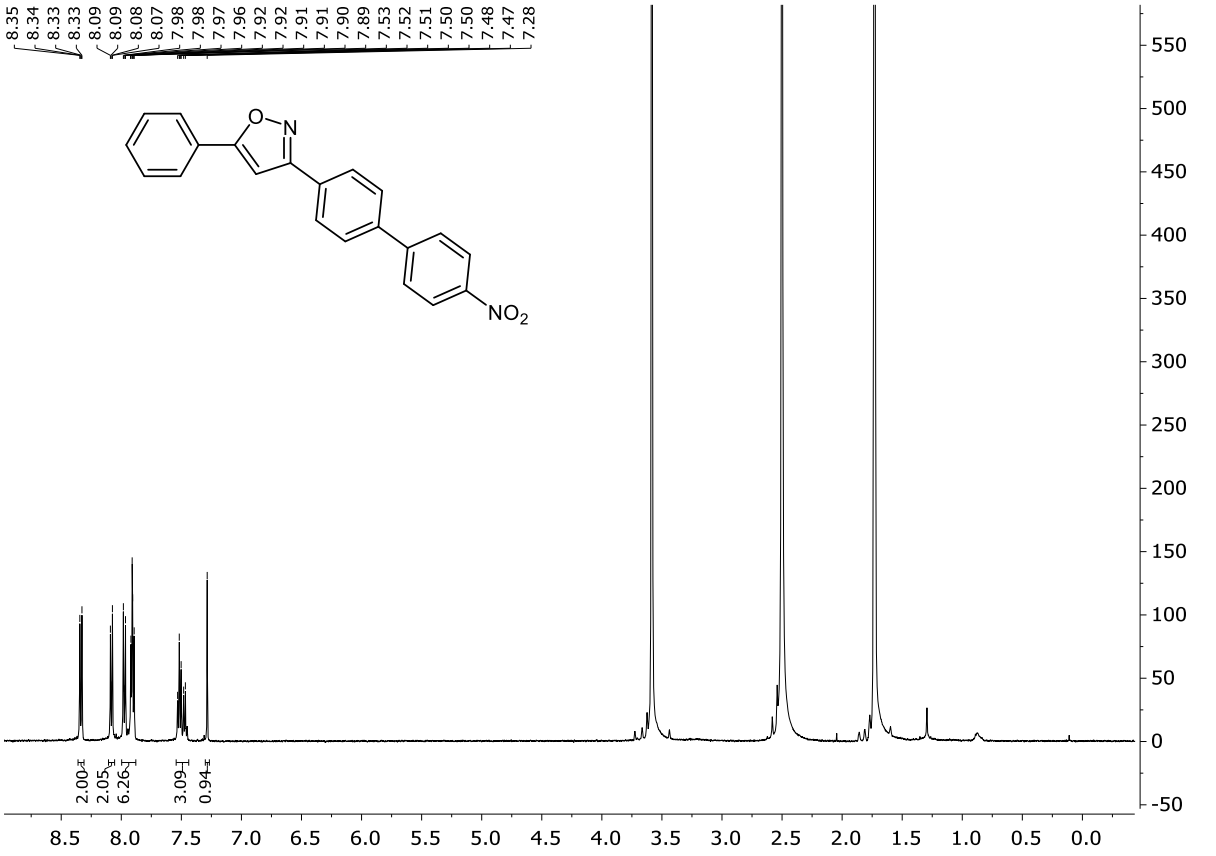
^{1}H NMR spectrum of **4i** (300 MHz, THF-d_8, 298 K):



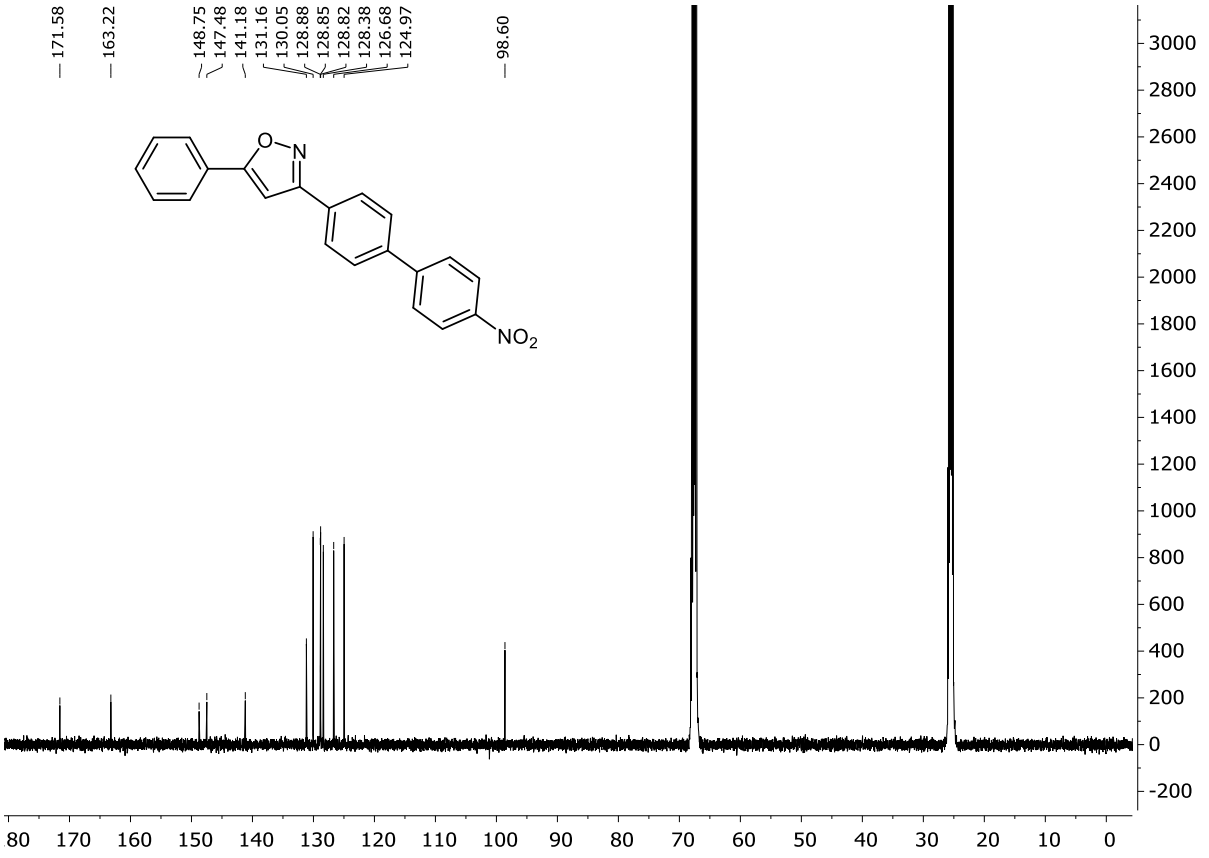
^{13}C NMR spectrum of **4i** (75 MHz, THF-d_8, 298 K):



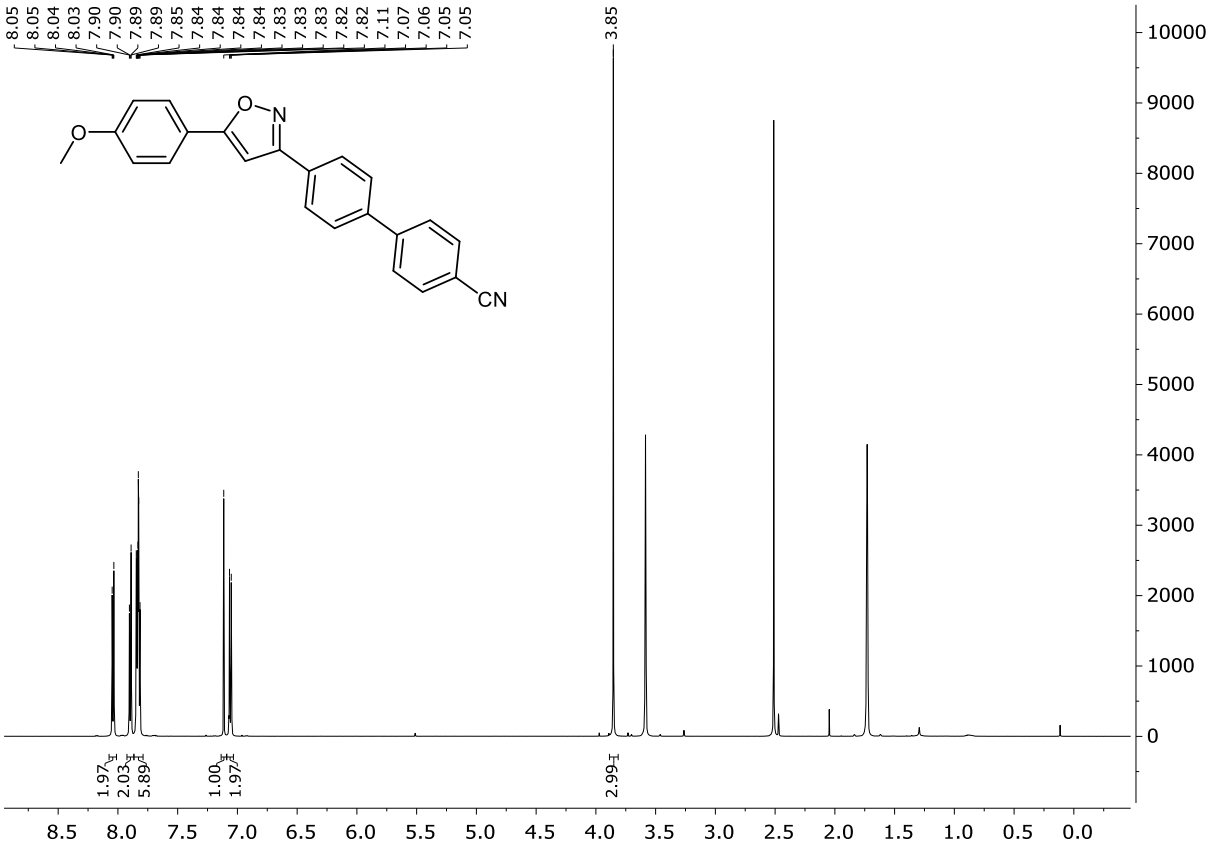
^{1}H NMR spectrum of **4j** (500 MHz, THF-d_8, 298 K):



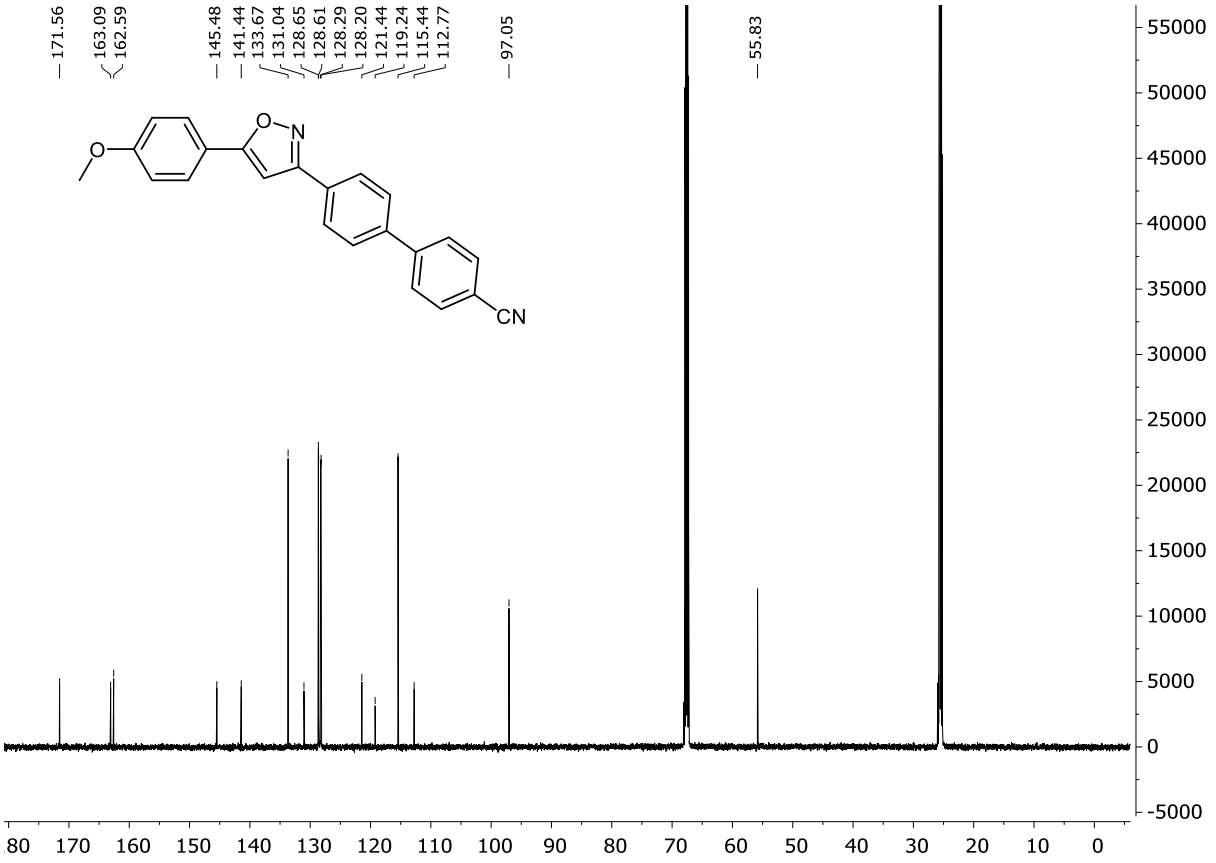
^{13}C NMR spectrum of **4j** (126 MHz, THF-d_8, 298 K):



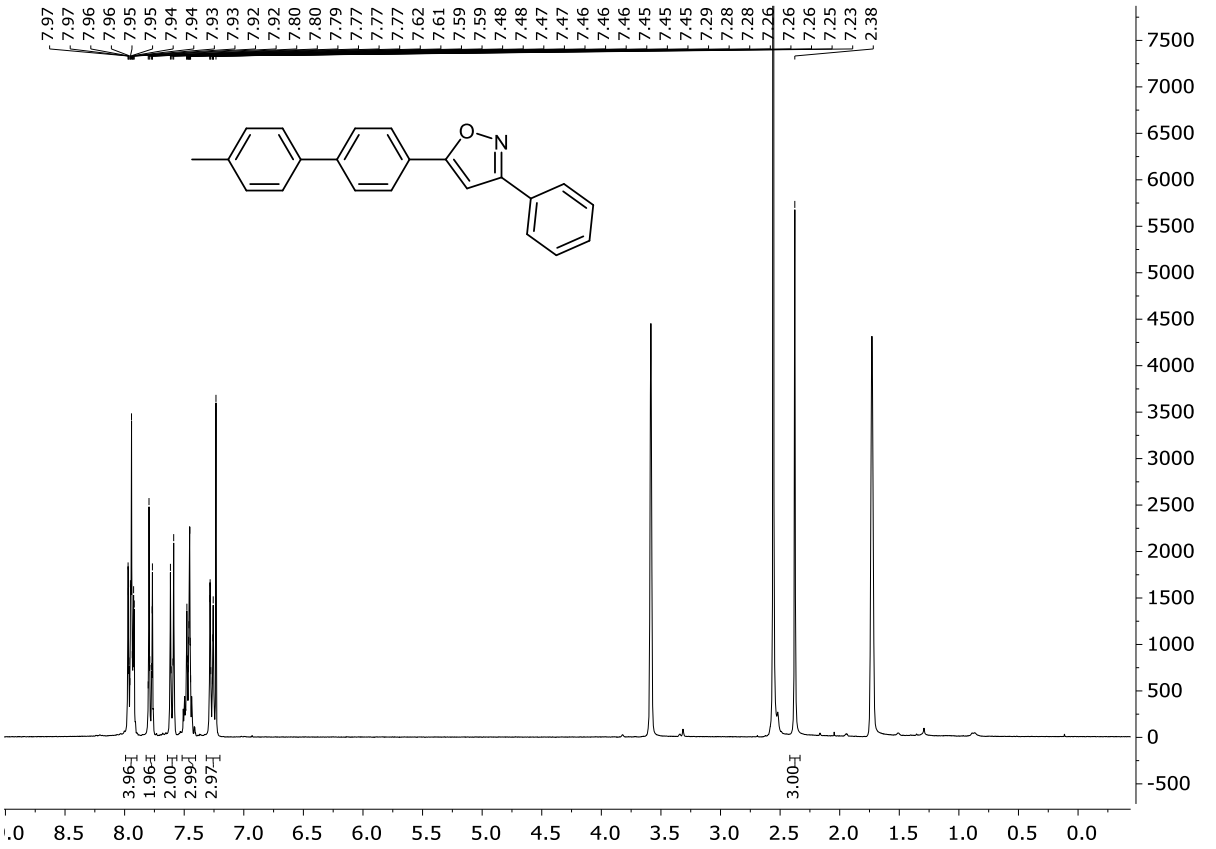
^{1}H NMR spectrum of **4k** (600 MHz, THF-d_8, 298 K):



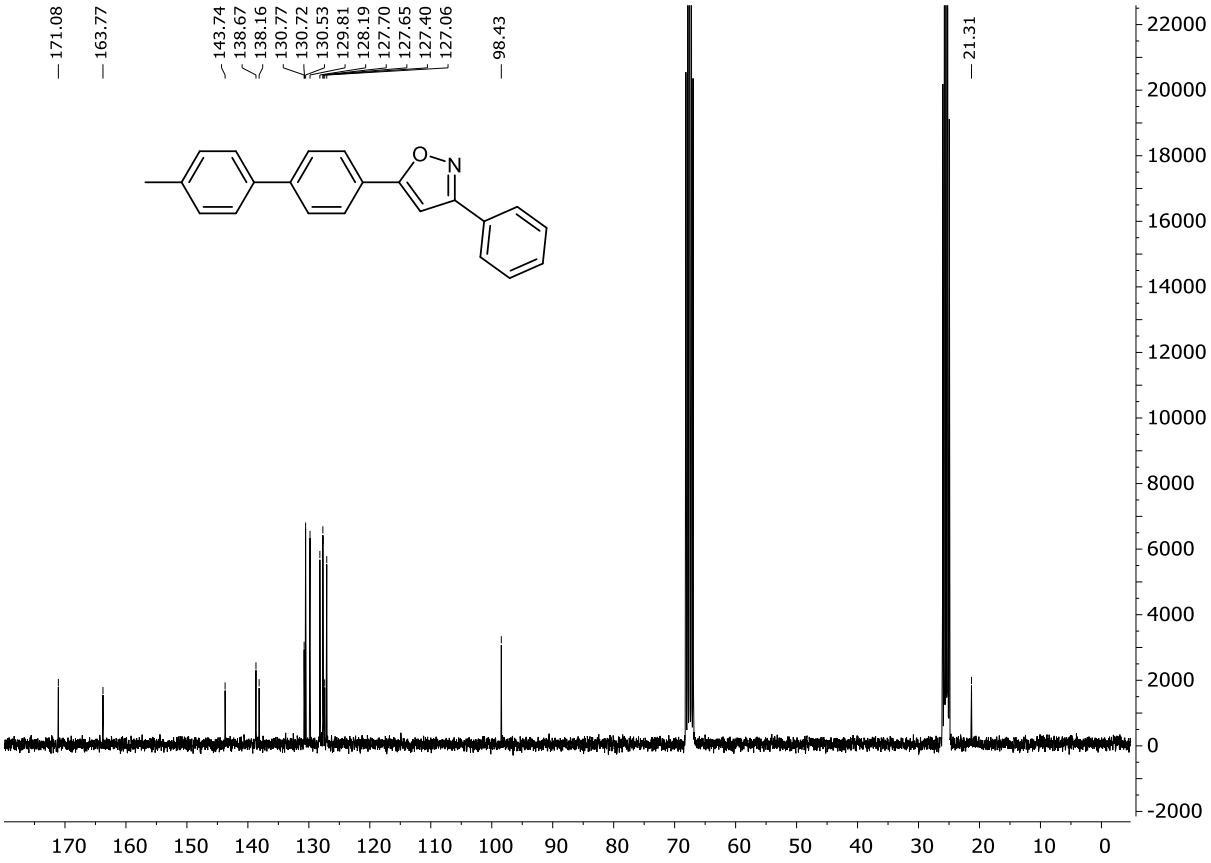
^{13}C NMR spectrum of **4k** (151 MHz, THF-d_8, 298 K):



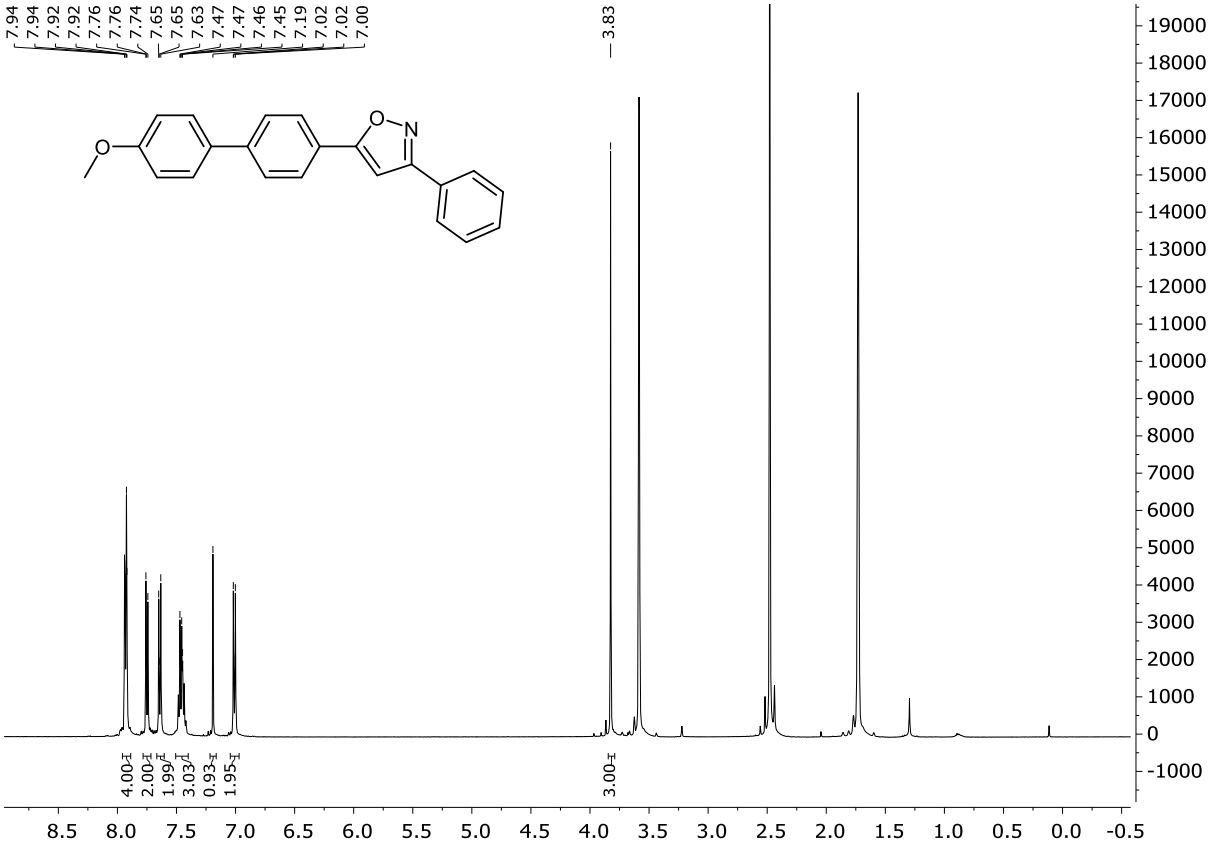
^{1}H NMR spectrum of **5a** (300 MHz, THF-d_8, 298 K):



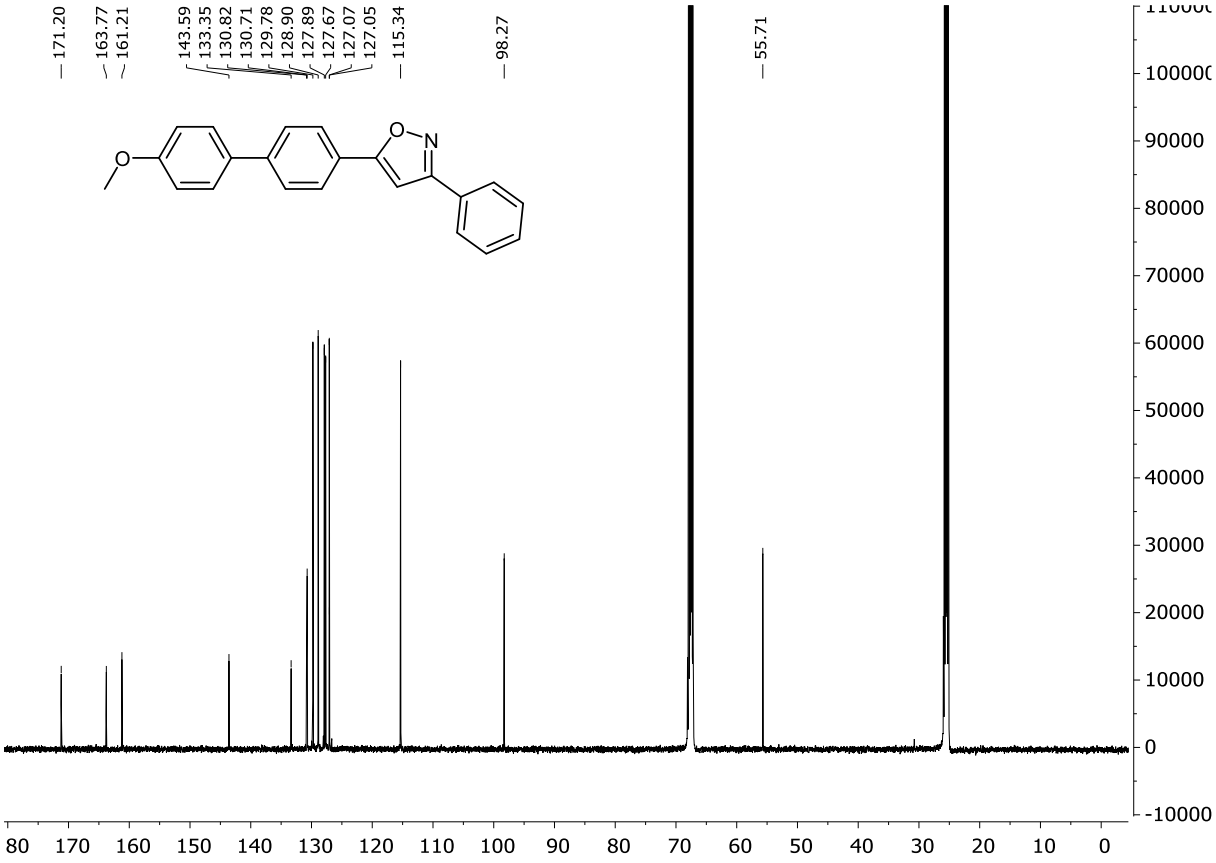
^{13}C NMR spectrum of **5a** (75 MHz, THF-d_8, 298 K):



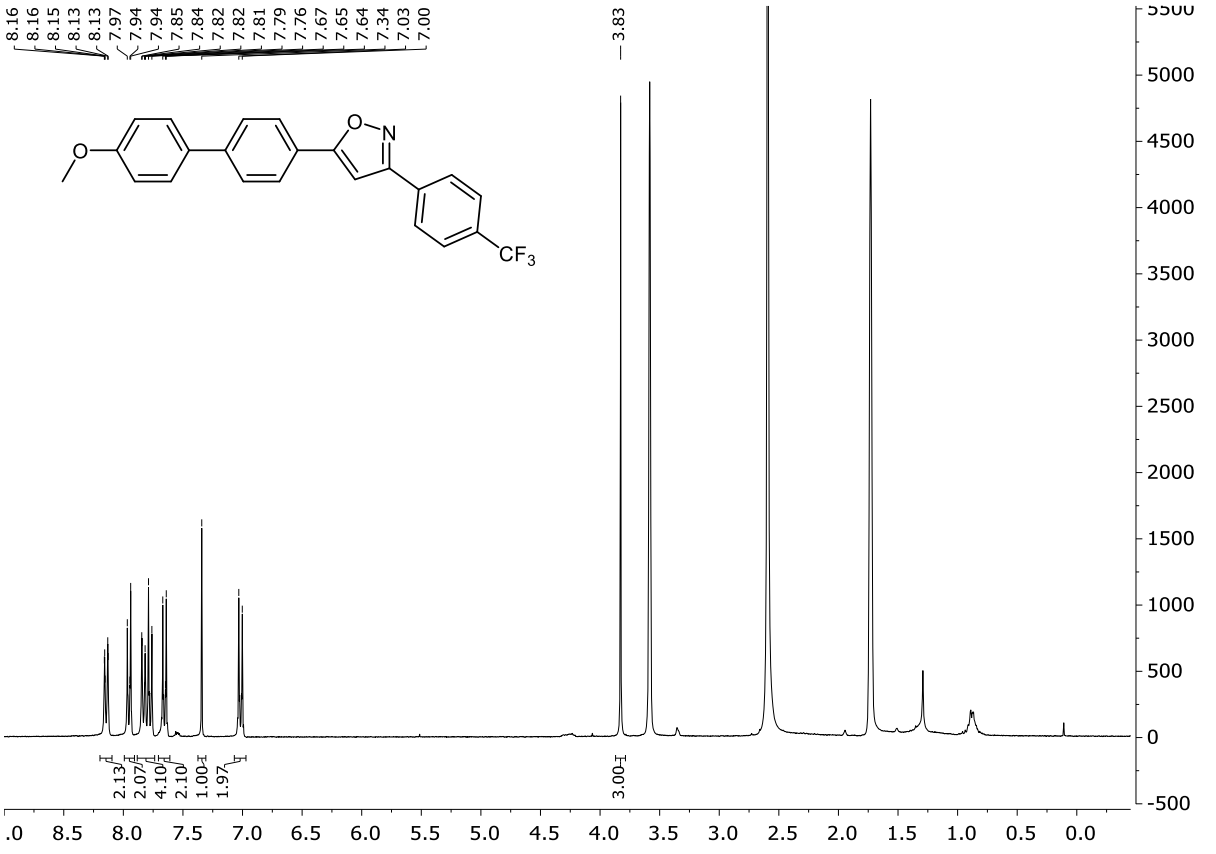
^{1}H NMR spectrum of **5b** (500 MHz, THF-d_8, 298 K):



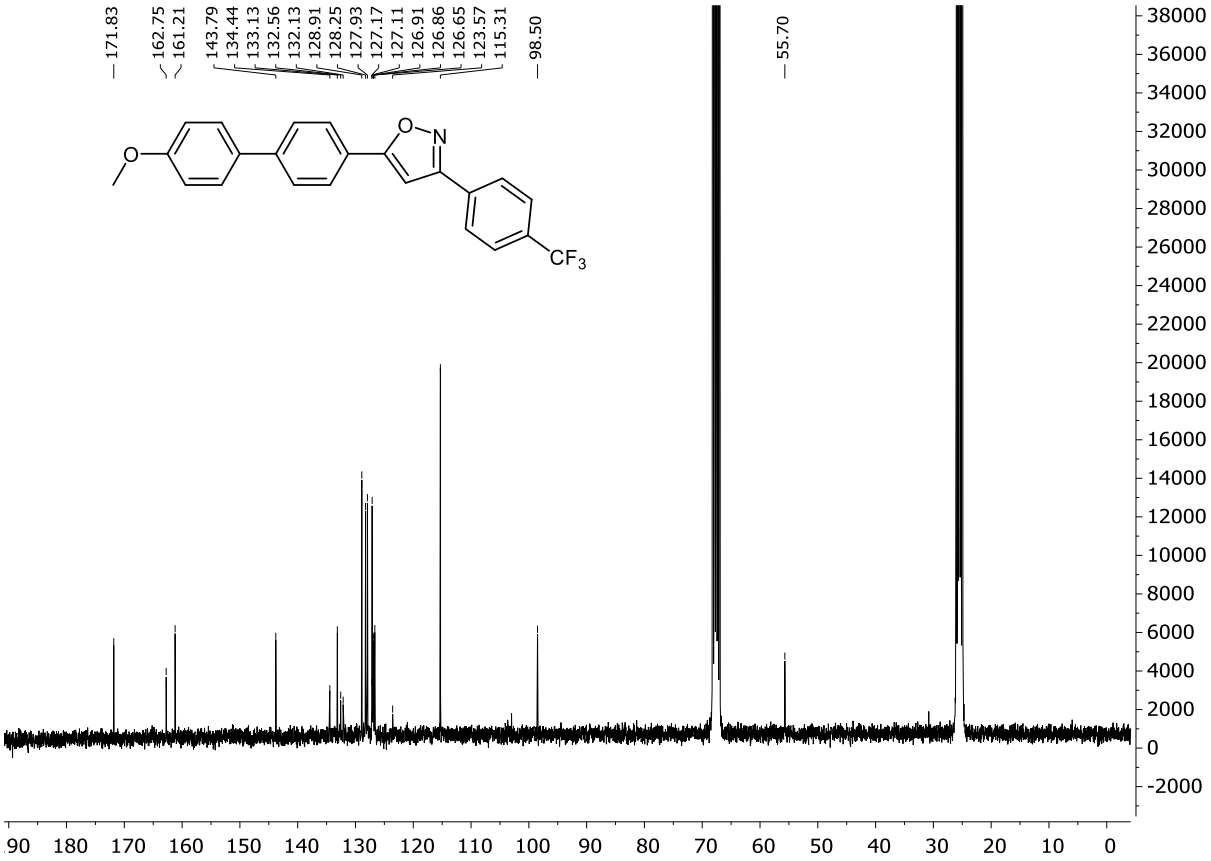
^{13}C NMR spectrum of **5b** (126 MHz, THF-d_8, 298 K):



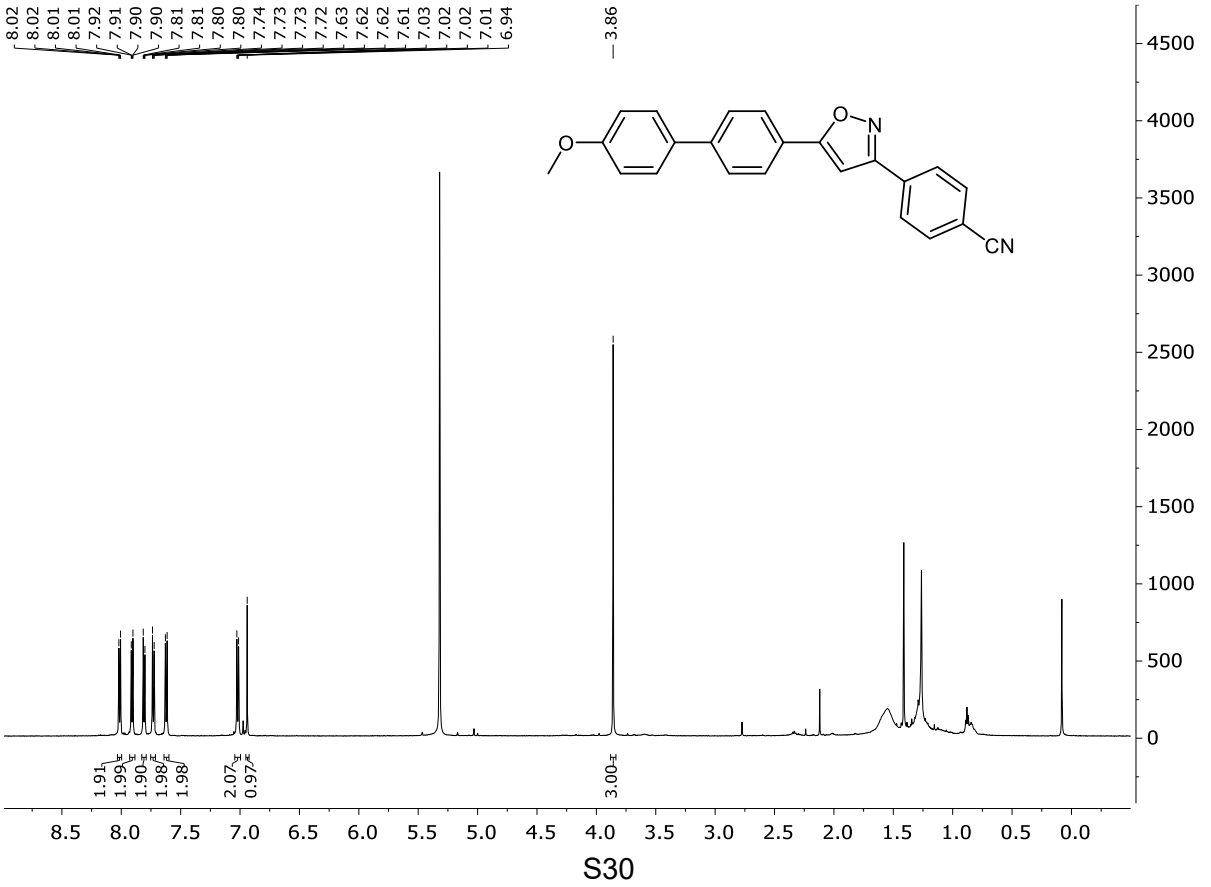
^{1}H NMR spectrum of **5c** (300 MHz, THF-d_8, 298 K):



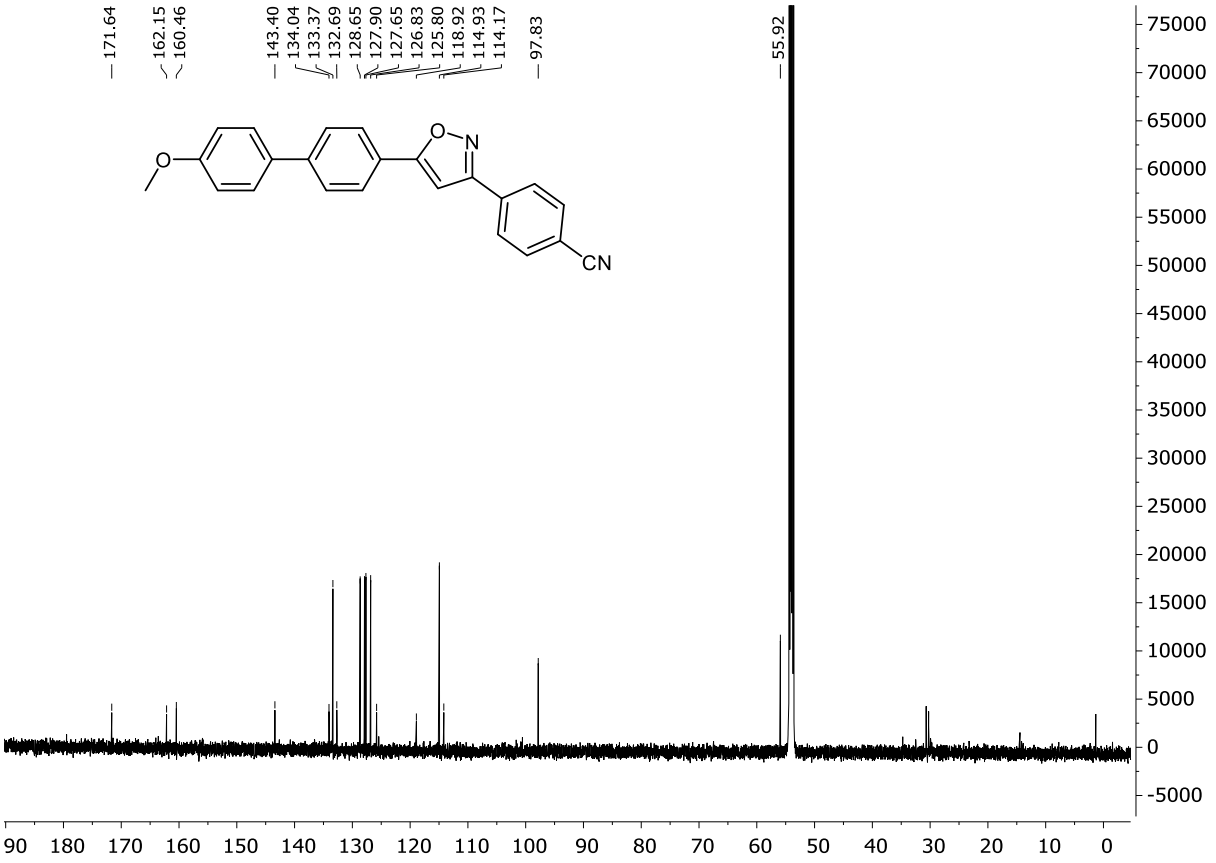
^{13}C NMR spectrum of **5c** (75 MHz, THF-d_8, 298 K):



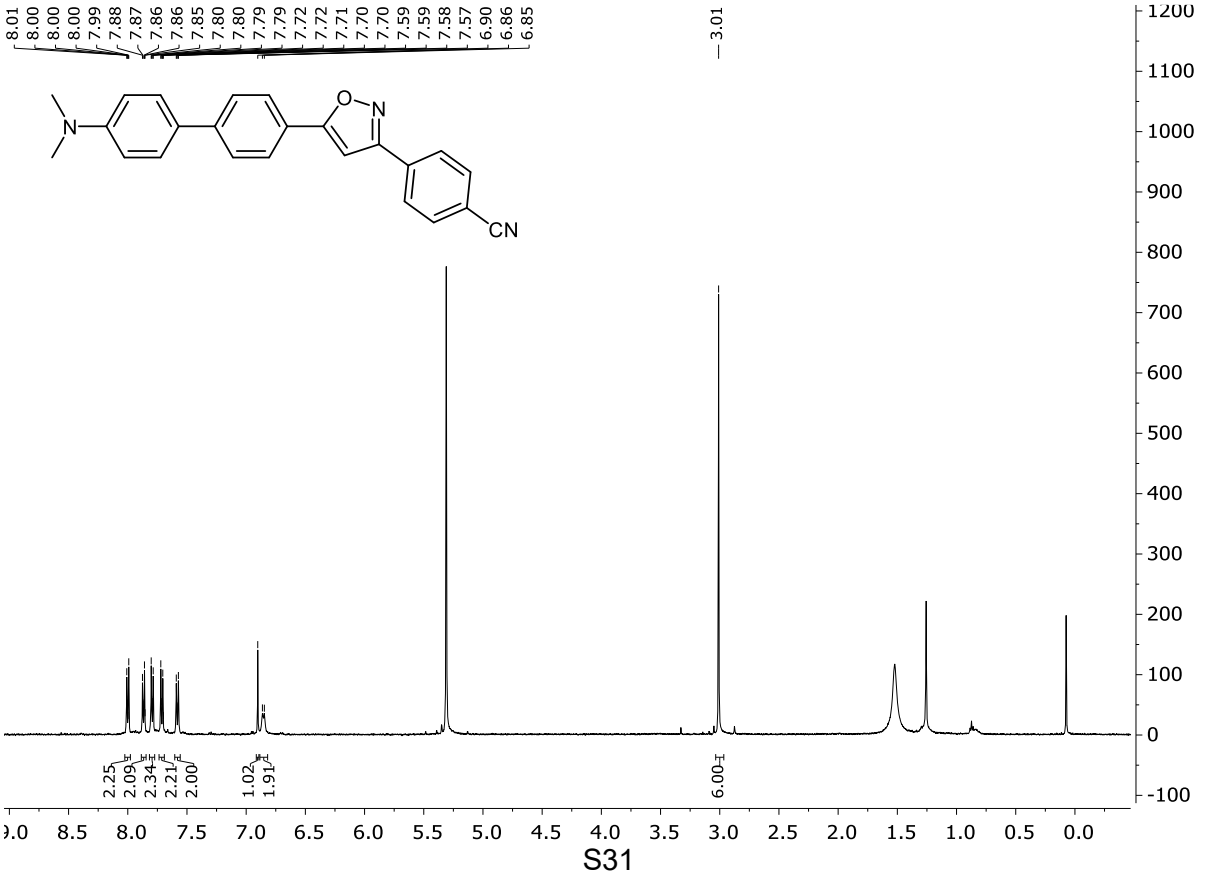
^{1}H NMR spectrum of **5d** (600 MHz, CD_2Cl_2, 298 K):



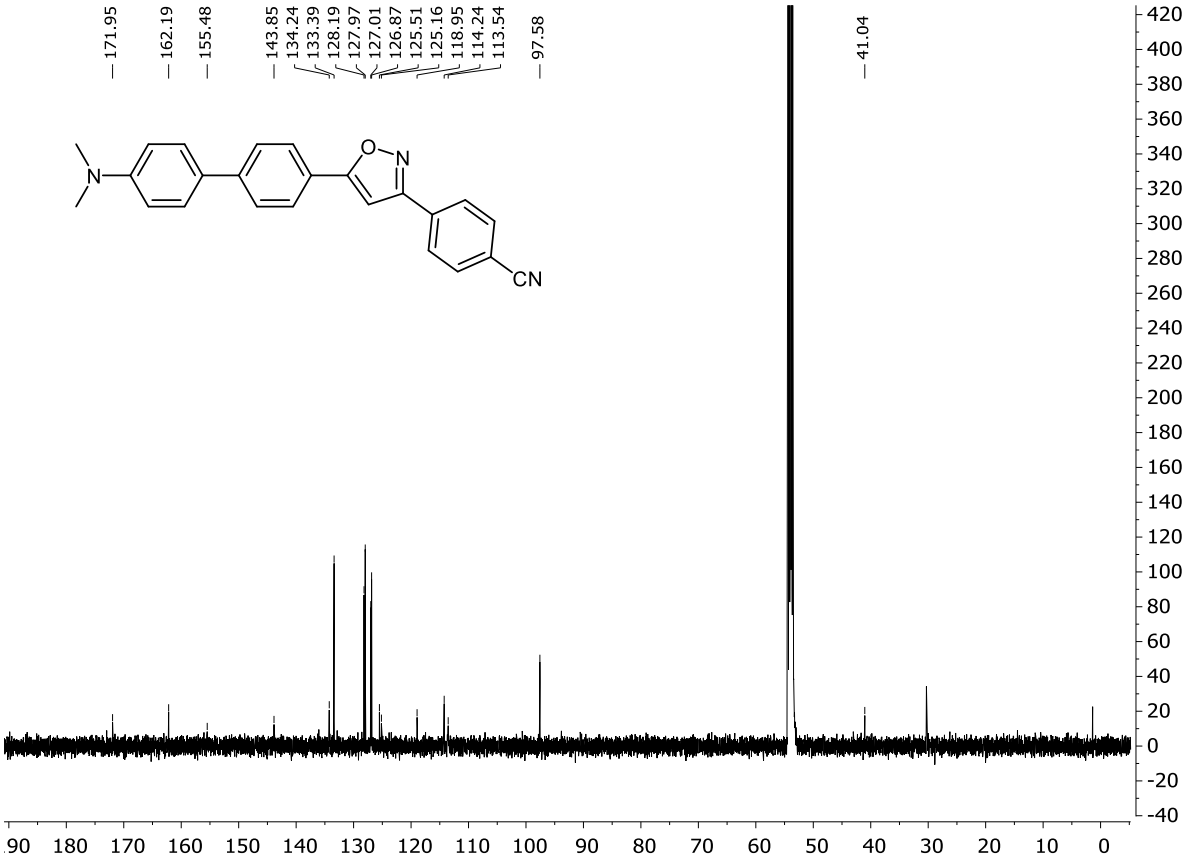
^{13}C NMR spectrum of **5d** (151 MHz, CD_2Cl_2, 298 K):



^{1}H NMR spectrum of **5e** (300 MHz, CD_2Cl_2, 298 K):



^{13}C NMR spectrum of **5e** (126 MHz, CD_2Cl_2, 298 K):



4. Solvent-dependent Emission of Chromophores 5c and 5d

For comparison, the emission spectra of biaryl-substituted isoxazoles **5c** and **5d** were recorded in toluene, dichloromethane and acetonitrile (Table S3, Figures S1 and S2). The relative fluorescence intensities are normalized to the intensity in toluene.

Table S3: Solvent-dependent emission of compounds **5c** and **5d** (recorded at 293 K, c_0(**5**) = 10^{-6} M, λ_{exc} = $\lambda_{max,abs}$).

Compound	Solvent	Emission maxima $\lambda_{max,em}$ [nm]	Relative Intensitiy
5c	toluene	373	1.00
	CH_2Cl_2	376	0.92
	MeCN	407	0.59
5d	toluene	372	1.00
	CH_2Cl_2	411	0.25
	MeCN	498	0.16

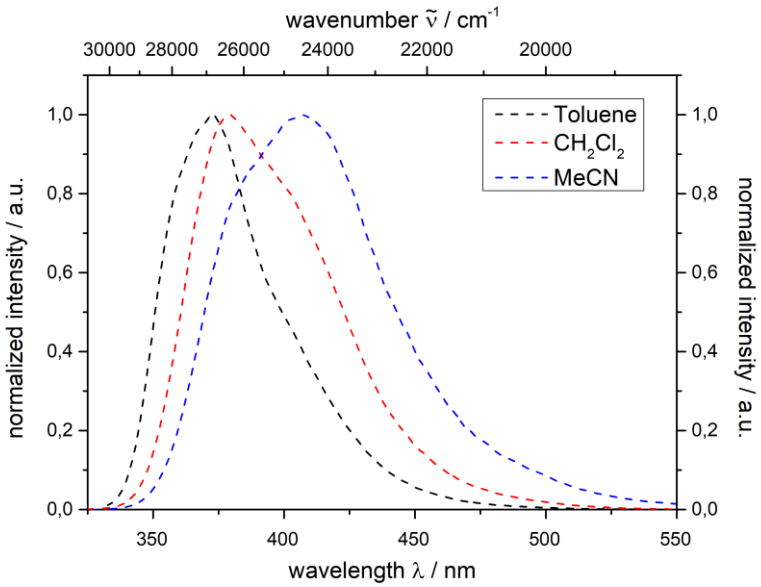


Figure S1: Normalized emission spectra of **5c** in toluene, CH_2Cl_2 and MeCN (recorded at 293 K, $\lambda_{exc} = \lambda_{max,abs}$).

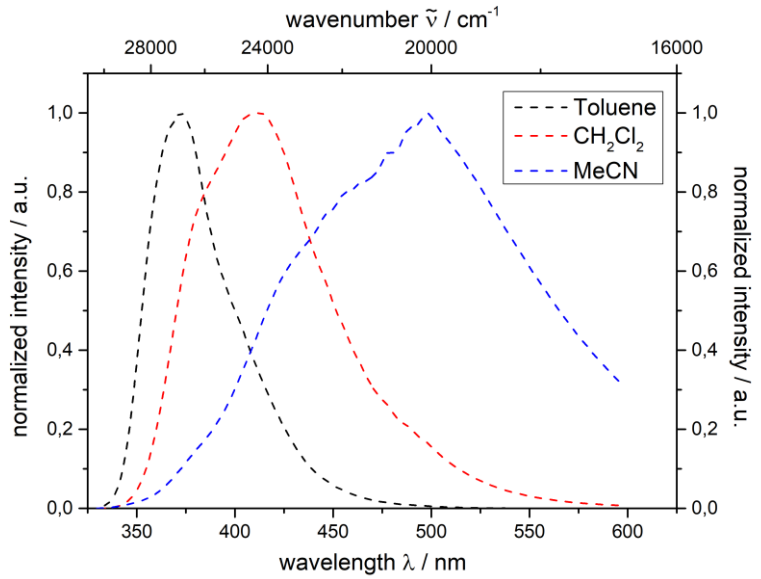


Figure S2: Normalized emission spectra of **5d** in toluene, CH_2Cl_2 and MeCN (recorded at 293 K, $\lambda_{exc} = \lambda_{max,abs}$).

5. Crystal Data and Structure Refinement for Compound 4k

Empirical formula	C23H16N2O2
Formula weight	352.38 g/mol
Crystal description and colour	Block, colourless
Crystal size	0.2×0.15×0.1 mm^3
Temperature	293 K
Measurement device type	Stoe IPDS
Radiation and wavelength	Mo-Kα, λ = 0.71073 Å
Crystal system	monoclinic
Space group	$P2_1/c$
Unit cell dimensions	a = 16.6071(8) Å b = 5.7802(2) Å ⊚⊚= 95.937(4)° c = 18.1504(9) Å
Volume	1732.95(13) $Å^3$
Formula units Z	4
Density (calculated)	1.351 Mg/m^3
Absorption coefficient	0.018(3) mm^{-1}
F (000)	736
Theta range for data collection	2.3 to 27.5°
Index ranges	-21 ≤ h ≤ 21 -6 ≤ k ≤ 7 -23 ≤ l ≤ 23
Reflections collected	26831
Independent reflections	3976
Observed reflections (I>2⊚(I))	3528
Refinement method	Full matrix least square on F^2
Final R indices (I>2⊚(I))[a]	R_1 = 0.058 wR_2 = 0.119
Data / restraints / parameters	3976/0/246
Goodness-of-fit on F^2[b]	1.03
Largest diff. Peak and hole (max.,min.)	0.149 and -0.154 e.$Å^{-3}$

[a] $R1 = ⊚||F_o|-|F_c||/⊚|F_o|$; $wR_2 = [⊚[w(F_o^2-F_c^2)^2/⊚⊚[(wF_o^2)^2]]^{1/2}$; $w = 1/[⊚^2(F_o^2)+(aP)^2+bP]$ mit $P = (F_o^2+2F_c^2)/3$

[b] GooF = $S = [[⊚w(F_o^2-F_c^2)^2]/(m-n)]^{1/2}$, m = number of reflections, n = number of parameters

The asymmetric unit of **1a** which coincides with the molecular entity is depicted in Figure . Packing in the crystal lattice is depicted in Figure S4.

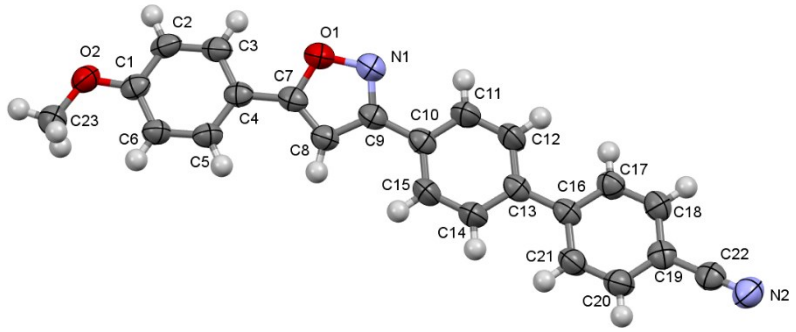


Figure S3: Asymmetric unit of isoxazole **4k** (thermal ellipsoids shown at 50% probability).

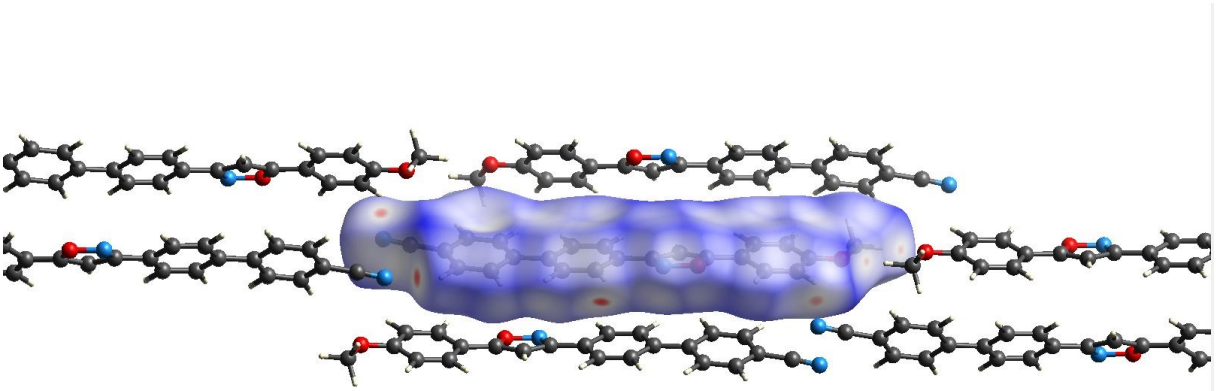


Figure S4: Hirshfeld surface of isoxazole **4k** in the crystal lattice mapped with the d_{norm} property.[Error! Bookmark not defined.c] Red represents the closest, blue the most distant contacts.

6. Data of Quantum Chemical Calculations

The ground state geometries of compounds **4k**, **5c**, **5d** and **5e**, were optimized using the Gaussian09 program package [1]. The B3LYP functional [2,3,4,5,6] with the Pople 6-311G(d,p) basis set [7] was used, applying the Polarizable Continuum Model (PCM) [8] with dichloromethane as a solvent. The DFT optimized structures as local minima were verified by frequency analyses. Excitiation and emission energies were calculated with TD-DFT [9,10,11] methods (CAM-B3LYP functional [12], 6-311++G(d,p) basis set, PCM: dichloromethane).

6.1 Computed xyz coordinates of compound 4k (B3LYP/6-311G(d,p), PCM CH_2Cl_2)

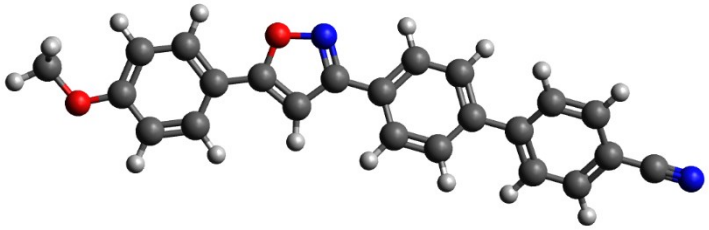


Figure S5: Optimized ground state geometry of **4k** (B3LYP/6-311G(d,p), PCM CH_2Cl_2).

C	0.87265	0.68602	0.01469
N	1.38936	1.89804	0.06974
O	2.77246	1.72137	0.06528
C	3.06311	0.39909	0.00517
C	1.89341	-0.30685	-0.03061
C	4.46934	0.01818	-0.00489
C	-0.58812	0.49681	0.01254
C	-1.44896	1.55928	0.32450
C	-2.82446	1.38224	0.31620
C	-3.39392	0.13723	0.00205
C	-2.52890	-0.92210	-0.30746
C	-1.15066	-0.74565	-0.30437
C	4.84337	-1.33753	-0.05107
C	6.17545	-1.70487	-0.05940
C	7.18188	-0.72655	-0.02218
C	6.82512	0.62595	0.02353
C	5.48104	0.98543	0.03211

C	-4.86441	-0.05046	-0.00160
C	-5.71997	0.97336	-0.44090
C	-7.09654	0.80574	-0.44692
C	-7.65447	-0.40431	-0.00870
C	-6.81415	-1.43688	0.43305
C	-5.43928	-1.25576	0.43428
O	8.45635	-1.18929	-0.03416
C	9.53002	-0.24587	0.00061
C	-9.07199	-0.58435	-0.01160
N	-10.21873	-0.73050	-0.01390
H	1.77408	-1.37529	-0.06801
H	-1.02994	2.52293	0.58461
H	-3.46415	2.21455	0.58481
H	-2.93525	-1.88847	-0.58105
H	-0.51345	-1.58088	-0.56839
H	4.08514	-2.11097	-0.07989
H	6.46744	-2.74728	-0.09455
H	7.57860	1.40084	0.05256
H	5.21657	2.03454	0.06818
H	-5.30250	1.90434	-0.80378
H	-7.74142	1.60216	-0.79636
H	-7.24177	-2.36894	0.78045
H	-4.80513	-2.05320	0.80117
H	10.44224	-0.83819	-0.01763
H	9.50556	0.41326	-0.87201
H	9.50168	0.35224	0.91606

SCF Done: E(RB3LYP) = -1146.18625607 A.U. after 14 cycles

Zero-point correction = 0.330732 (Hartree/Particle)

Thermal correction to Energy = 0.352700

Thermal correction to Enthalpy = 0.353644

Thermal correction to Gibbs Free Energy = 0.276345

Sum of electronic and zero-point Energies = -1145.941564

Sum of electronic and thermal Energies = -1145.919596

Sum of electronic and thermal Enthalpies = -1145.918651

Sum of electronic and thermal Free Energies = -1145.995951

6.1.1 Computed excitations of compound 4k (CAM-B3LYP, 6-311++G(d,p) PCM CH_2Cl_2)

Excited State 1: Singlet-A 4.3438 eV 285.43 nm f=2.1867 <S**2>=0.000

91 -> 93 0.56545

92 -> 94 0.36934

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -1145.52392700

Copying the excited state density for this state as the 1-particle RhoCI density.

Excited State 2: Singlet-A 4.4893 eV 276.17 nm f=0.0397 <S**2>=0.000

91 -> 93 -0.34800

92 -> 93 -0.39438

92 -> 94 0.42920

Excited State 3: Singlet-A 4.8673 eV 254.73 nm f=0.0346 <S**2>=0.000

89 -> 94 0.16991

90 -> 93 0.35904

90 -> 96 -0.10253

91 -> 94 0.11634

91 -> 95 0.13530

91 -> 98 0.12175

91 ->100 -0.19477

92 -> 93 0.13390

92 -> 94 0.14062

92 -> 96 -0.24034

92 -> 99 -0.28244

Excited State 4: Singlet-A 4.8928 eV 253.40 nm f=0.0034 <S**2>=0.000

89 -> 93 0.17636

89 -> 94 -0.21857

90 -> 93 0.27983

90 -> 96 -0.14291

91 -> 95 0.14370

91 -> 98 0.11080

91 -> 99 -0.10497

91 ->100 -0.13569

92 -> 96 0.17730

92 -> 99 0.36804

92 ->100 -0.18350

Excited State 5: Singlet-A 4.9721 eV 249.36 nm f=0.0180 <S**2>=0.000

87 -> 95 -0.20407

88 -> 93 0.50138

88 -> 94 0.16455

88 -> 96 0.13201

91 -> 95 -0.31277

91 ->100 -0.13124

Excited State 6: Singlet-A 5.1413 eV 241.15 nm f=0.0474 <S**2>=0.000

86 -> 93 0.14361

90 -> 93 -0.10523

91 -> 93 -0.13368

92 -> 93 0.45188

92 -> 94 0.28601

92 -> 96 -0.21958

92 -> 99 0.22346

6.2 Computed xyz coordinates of compound 5c (B3LYP/6-311G(d,p), PCM CH_2Cl_2)

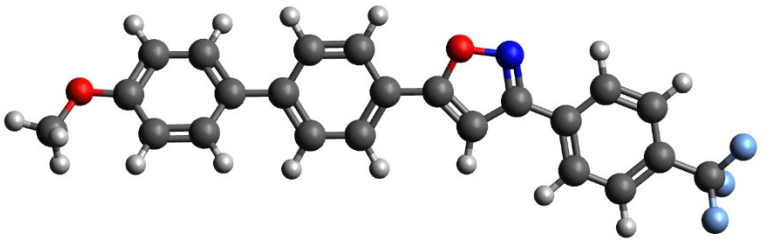


Figure S6: Optimized ground state geometry of **5c** (B3LYP/6-311G(d,p), PCM CH_2Cl_2).

C	-2.53411	0.72553	-0.13316
N	-2.18752	1.98335	-0.32396
O	-0.79777	2.00019	-0.31639
C	-0.32688	0.74432	-0.12129
C	-1.38751	-0.10854	0.00068
C	1.11971	0.56749	-0.07903
C	-3.95799	0.34705	-0.07870
C	-4.95449	1.33356	-0.05197
C	-6.29581	0.98140	-0.00754
C	-6.66186	-0.36581	0.01011
C	-5.68132	-1.35672	-0.01545
C	-4.33855	-1.00041	-0.06055
C	1.67830	-0.70401	0.12103
C	3.05383	-0.87256	0.16735
C	3.92961	0.21603	0.01212
C	3.36075	1.48422	-0.19066
C	1.98520	1.66077	-0.23422
C	5.39847	0.03215	0.06164
C	6.23798	1.01202	0.62328
C	7.61122	0.84205	0.67508
C	8.20125	-0.32063	0.16000
C	7.38678	-1.30623	-0.40611
C	6.00610	-1.12210	-0.44731
O	9.55586	-0.39446	0.25664
C	10.21311	-1.56253	-0.23606
C	-8.11005	-0.74925	0.11247
F	-8.92893	0.18883	-0.41249
F	-8.49799	-0.91953	1.40220
F	-8.37931	-1.91241	-0.52248
H	-1.35783	-1.17029	0.17121
H	-4.66985	2.37736	-0.06602
H	-7.05675	1.75092	0.00827
H	-5.96289	-2.40200	-0.00924
H	-3.58907	-1.78103	-0.09055
H	1.03553	-1.56627	0.25265

H	3.45553	-1.86189	0.35073
H	4.00420	2.34323	-0.33853
H	1.57607	2.64937	-0.39865
H	5.80670	1.91030	1.04957
H	8.25066	1.59480	1.12050
H	7.81110	-2.20920	-0.82321
H	5.39745	-1.88974	-0.91114
H	11.27318	-1.40682	-0.04658
H	9.87702	-2.45996	0.29229
H	10.05064	-1.68685	-1.31104

SCF Done: E(RB3LYP) = -1391.05329372 A.U. after 13 cycles

Zero-point correction = 0.336339 (Hartree/Particle)

Thermal correction to Energy = 0.360213

Thermal correction to Enthalpy = 0.361157

Thermal correction to Gibbs Free Energy = 0.277936

Sum of electronic and zero-point Energies = -1390.805240

Sum of electronic and thermal Energies = -1390.781365

Sum of electronic and thermal Enthalpies = -1390.780421

Sum of electronic and thermal Free Energies = -1390.863642

6.2.1 Computed excitations of compound 5c (CAM-B3LYP, 6-311++G(d,p) PCM CH_2Cl_2)

Excited State 1: Singlet-A 4.1071 eV 301.88 nm f=1.4357 <S**2>=0.000

101 ->103 0.14767

102 ->103 0.58247

102 ->104 -0.31791

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -1390.37807633

Copying the excited state density for this state as the 1-particle RhoCI density.

Excited State 2: Singlet-A 4.7798 eV 259.39 nm f=0.0123 <S**2>=0.000

98 ->103 0.28679

98 ->104 -0.20889

100 ->103 0.14498

101 ->109 0.12582

102 ->104 -0.16518

102 ->106 -0.12676

102 ->107 0.47767

Excited State 3: Singlet-A 4.9005 eV 253.00 nm f=0.0151 <S**2>=0.000

98 ->103 0.14508

98 ->104 -0.11065

99 ->103 -0.17741

99 ->104 0.13434

99 ->113 0.13178

101 ->107 0.14998

101 ->109 -0.10290

102 ->104 -0.16172

102 ->107 -0.22424

102 ->109 0.45916

102 ->110 -0.10887

Excited State 4: Singlet-A 5.0045 eV 247.75 nm f=0.0401 <S**2>=0.000

96 ->103 -0.10044

97 ->103 -0.16442

97 ->104 -0.15279

98 ->103 0.18392

98 ->104 -0.12999

100 ->105 -0.10774

101 ->103 0.31300

101 ->104 0.11939

102 ->103 0.14412

102 ->104 0.39182

102 ->109 0.14774

102 ->113 0.12508

Excited State 5: Singlet-A 5.0922 eV 243.48 nm f=0.0870 <S**2>=0.000

97 ->103 0.33589

97 ->104 0.34191

100 ->103 0.20154

100 ->105 0.28130

101 ->103 0.21247

101 ->105 0.13628

102 ->104 0.14706

Excited State 6: Singlet-A 5.1823 eV 239.25 nm f=0.4384 <S**2>=0.000

97 ->103 -0.16613

97 ->104 -0.10795

98 ->103 -0.14182

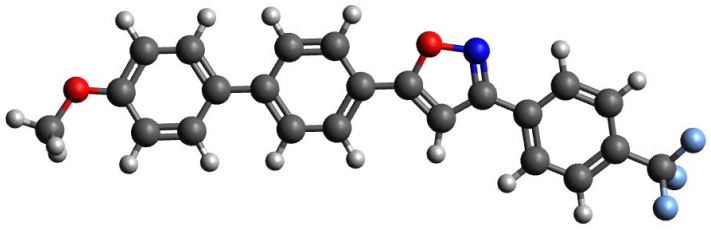
99 ->103 -0.14915

100 ->103 0.48227

100 ->104 0.29036

101 ->104 0.17666

6.2.2 Computed xyz coordinates of the S_1 State of compound 5c (B3LYP/6-311G(d,p), PCM CH_2Cl_2)



C 3.47309 0.61265 0.04782

Figure S7: Optimized S_1 geometry of **5c** (B3LYP/6-311G(d,p), PCM CH_2Cl_2).

N 3.1441 1.9067 -0.10409

O 1.72383 1.96616 -0.01805

C 1.24968 0.70867 0.18165

C 2.28872 -0.17481 0.23223

C 4.83371 0.15203 0.01722

C -0.1805 0.54215 0.29339

C 5.91167 1.07128 -0.18484

C 7.21694 0.64977 -0.21774

C 7.54941 -0.72682 -0.05044

C 6.47871 -1.65142 0.15295

C 5.17471 -1.22146 0.18416

C -0.75566 -0.73495 0.49266

C	-2.11734	-0.88441	0.59877
C	-2.99713	0.23	0.49662
C	-2.40632	1.5059	0.29365
C	-1.04199	1.66046	0.20248
O	-8.55929	-0.3085	0.81689
C	-4.43264	0.06965	0.5924
C	-5.32873	1.08171	0.13441
C	-6.68527	0.92647	0.21822
C	-7.23567	-0.25415	0.77986
C	-6.37375	-1.27143	1.25071
C	-5.01338	-1.10694	1.14883
C	-9.2308	-1.46588	1.35873
C	8.88627	-1.16017	-0.08555
F	9.11047	-1.83547	-1.23046
F	9.12968	-1.98178	0.98594
F	9.68316	-0.11032	0.03995
H	2.22718	-1.23966	0.37854
H	5.6844	2.12197	-0.31437
H	8.01298	1.3692	-0.3732
H	6.70463	-2.70324	0.28312
H	4.39299	-1.95597	0.34085
H	-0.12016	-1.60859	0.55586
H	-2.51647	-1.88078	0.72717
H	-3.02819	2.38868	0.23966
H	-0.61657	2.6447	0.06365
H	-4.94007	1.98178	-0.31996
H	-7.36532	1.68559	-0.14504
H	-6.77241	-2.17186	1.69503
H	-4.37639	-1.88947	1.53559
H	-8.97521	-1.59356	2.41151
H	-10.29027	-1.25211	1.25536
H	-8.97012	-2.35734	0.78668

SCF Done: E(RB3LYP) = -1391.11949278 A.U. after 13 cycles

6.2.3 Computed emission of compound 5c (CAM-B3LYP, 6-311++G(d,p) PCM CH_2Cl_2

Excited State 1: Singlet-A 3.4298 eV 361.49 nm f=1.5501 <S**2>=0.000

102 ->103 0.65843

102 ->104 0.19269

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -1390.39029828

Copying the excited state density for this state as the 1-particle RhoCI density.

6.3 Computed xyz coordinates of compound 5d (B3LYP/6-311G(d,p), PCM CH_2Cl_2)

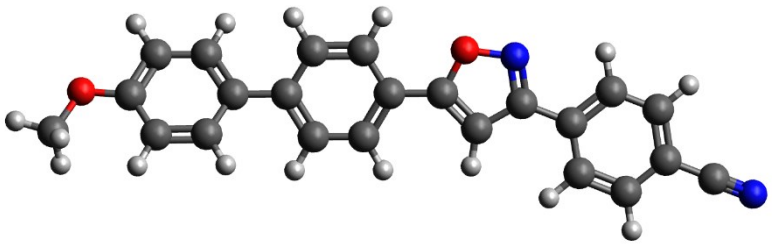


Figure S8: Optimized ground state geometry of **5c** (B3LYP/6-311G(d,p), PCM CH_2Cl_2).

C	-3.46548	0.53965	-0.09678
N	-3.15349	1.80265	-0.31317
O	-1.76603	1.85625	-0.31219
C	-1.26013	0.61730	-0.09501
C	-2.29710	-0.26113	0.04838
C	0.19065	0.47995	-0.05770
C	-4.87828	0.12618	-0.03159
C	-5.89924	1.08938	-0.01795
C	-7.22982	0.70861	0.03651
C	-7.56550	-0.65389	0.08032
C	-6.55343	-1.62323	0.06831
C	-5.22336	-1.23094	0.01270
C	0.78356	-0.77172	0.16717
C	2.16325	-0.90348	0.20647
C	3.00927	0.20348	0.01896
C	2.40598	1.45169	-0.20746
C	1.02606	1.59163	-0.24394
C	4.48278	0.05907	0.05883

C	5.30156	1.07651	0.58299
C	6.67935	0.94510	0.62324
C	7.29505	-0.21542	0.13393
C	6.50138	-1.23866	-0.39374
C	5.11587	-1.09281	-0.42399
O	8.65213	-0.24950	0.21529
C	9.33534	-1.41281	-0.25288
C	-8.93732	-1.05194	0.13816
N	-10.04635	-1.37382	0.18495
H	-2.23837	-1.31808	0.23975
H	-5.63957	2.13920	-0.04842
H	-8.01149	1.45739	0.04787
H	-6.81098	-2.67412	0.10052
H	-4.45350	-1.99166	-0.00315
H	0.16471	-1.64721	0.32348
H	2.59164	-1.87767	0.40926
H	3.02565	2.32357	-0.37961
H	0.59020	2.56535	-0.42741
H	4.85072	1.97469	0.98867
H	7.30299	1.72721	1.03947
H	6.94547	-2.14170	-0.78963
H	4.52345	-1.88945	-0.85897
H	10.39312	-1.22188	-0.08398
H	9.03246	-2.30313	0.30660
H	9.16114	-1.57346	-1.32116

SCF Done: E(RB3LYP) = -1146.17795030 A.U. after 14 cycles

Zero-point correction = 0.330679 (Hartree/Particle)

Thermal correction to Energy = 0.352672

Thermal correction to Enthalpy = 0.353617

Thermal correction to Gibbs Free Energy = 0.275966

Sum of electronic and zero-point Energies = -1145.939633

Sum of electronic and thermal Energies = -1145.917639

Sum of electronic and thermal Enthalpies = -1145.916695

Sum of electronic and thermal Free Energies = -1145.994345

6.3.1 Computed excitations of compound 5d (CAM-B3LYP, 6-311++G(d,p) PCM CH_2Cl_2)

Excited State 1: Singlet-A 4.0862 eV 303.42 nm f=1.4955 <S**2>=0.000

90 -> 93 -0.13420

91 -> 93 0.10326

92 -> 93 0.42887

92 -> 94 0.50050

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -1145.53118448

Copying the excited state density for this state as the 1-particle RhoCI density.

Excited State 2: Singlet-A 4.7329 eV 261.96 nm f=0.1414 <S**2>=0.000

88 -> 93 -0.13785

88 -> 94 -0.20249

90 -> 94 -0.10672

91 -> 93 0.25952

92 -> 93 0.31195

92 -> 94 -0.30551

92 -> 97 -0.30724

Excited State 3: Singlet-A 4.8198 eV 257.24 nm f=0.1638 <S**2>=0.000

88 -> 93 0.10730

88 -> 94 0.22437

89 -> 94 0.11556

90 -> 93 0.18240

91 -> 93 0.25648

91 -> 99 0.10974

92 -> 93 0.21429

92 -> 94 -0.16784

92 -> 97 0.39671

92 -> 99 -0.10230

Excited State 4: Singlet-A 4.8852 eV 253.79 nm f=0.4183 <S**2>=0.000

87 -> 93 0.16703

89 -> 93 -0.12200

90 -> 93 0.50624

90 -> 95 -0.11100

91 -> 93 0.16515

92 -> 94 0.11400

92 -> 97 -0.13313

92 -> 99 0.21558

Excited State 5: Singlet-A 4.9204 eV 251.98 nm f=0.0103 <S**2>=0.000

87 -> 93 -0.28817

87 -> 94 0.12225

88 -> 93 0.15796

88 -> 94 0.22519

89 -> 94 -0.13400

90 -> 93 -0.12540

90 -> 95 0.15865

91 -> 97 0.13132

92 -> 99 0.38584

Excited State 6: Singlet-A 4.9706 eV 249.44 nm f=0.0543 <S**2>=0.000

87 -> 93 0.41171

87 -> 94 -0.15942

88 -> 93 0.12230

88 -> 94 0.11652

90 -> 93 -0.23905

90 -> 94 0.11002

90 -> 95 -0.22036

91 -> 95 -0.10680

92 -> 93 0.14865

92 -> 94 -0.19884

92 -> 99 0.13256

6.4 Computed xyz coordinates of compound 5e (B3LYP/6-311G(d,p), PCM CH_2Cl_2)

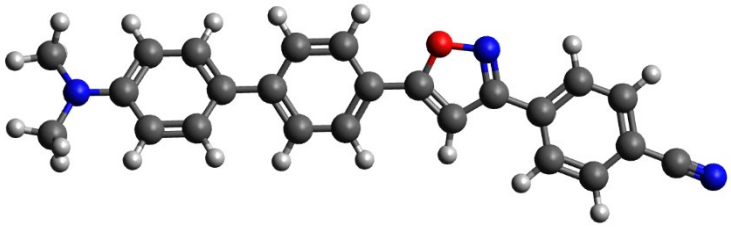


Figure S9: Optimized ground state geometry of **5e** (B3LYP/6-311G(d,p), PCM CH_2Cl_2).

C	-3.87214	0.54274	-0.09657
N	-3.55490	1.80233	-0.32540
O	-2.16646	1.84699	-0.33704
C	-1.66591	0.60628	-0.11513
C	-2.70804	-0.26431	0.04419
C	-5.28682	0.13838	-0.01647
C	-0.21697	0.45919	-0.09078
C	-6.30177	1.10779	0.00466
C	-7.63413	0.73537	0.07237
C	-7.97780	-0.62493	0.12232
C	-6.97178	-1.60049	0.10304
C	-5.63994	-1.21649	0.03411
C	0.37085	-0.79360	0.14408
C	1.74928	-0.93543	0.17024
C	2.60566	0.16140	-0.04214
C	2.00488	1.41098	-0.27929
C	0.62637	1.56122	-0.30087
N	8.29761	-0.41936	0.00819
C	4.07459	0.00693	-0.01816
C	4.91863	1.04052	0.42024
C	6.29789	0.90614	0.44762
C	6.92686	-0.28645	0.01580
C	6.07753	-1.33398	-0.41482
C	4.69996	-1.18181	-0.42854
C	8.90043	-1.71465	-0.27399
C	9.13249	0.61920	0.59495

C	-9.35139	-1.01439	0.19381
N	-10.46194	-1.32921	0.25170
H	-2.65447	-1.32019	0.24275
H	-6.03578	2.15589	-0.03062
H	-8.41106	1.48898	0.08935
H	-7.23548	-2.64971	0.13997
H	-4.87483	-1.98186	0.01240
H	-0.25247	-1.66247	0.31960
H	2.17000	-1.91082	0.38278
H	2.62745	2.27617	-0.47318
H	0.19634	2.53596	-0.49333
H	4.48782	1.96774	0.78138
H	6.88916	1.73179	0.81805
H	6.49590	-2.27202	-0.75173
H	4.09853	-2.00684	-0.79352
H	8.60906	-2.08057	-1.26299
H	9.98355	-1.60948	-0.26745
H	8.62400	-2.47696	0.46693
H	8.96301	0.73621	1.67409
H	10.17873	0.36211	0.44020
H	8.95446	1.58637	0.11607

SCF Done: E(RB3LYP) = -1165.54226561 A.U. after 14 cycles

Zero-point correction = 0.370801 (Hartree/Particle)

Thermal correction to Energy = 0.394686

Thermal correction to Enthalpy = 0.395630

Thermal correction to Gibbs Free Energy = 0.313750

Sum of electronic and zero-point Energies = -1165.348686

Sum of electronic and thermal Energies = -1165.324801

Sum of electronic and thermal Enthalpies = -1165.323857

Sum of electronic and thermal Free Energies = -1165.405737

6.4.1 Computed excitations of compound 5e (CAM-B3LYP, 6-311++G(d,p) PCM CH_2Cl_2)

Excited State 1: Singlet-A 3.7187 eV 333.41 nm f=1.4730 <S**2>=0.000

95 -> 97 -0.12972

95 -> 98 0.13461

96 -> 97 -0.39269

96 -> 98 0.52190

This state for optimization and/or second-order correction.

Total Energy, E(TD-HF/TD-KS) = -1164.96444890

Copying the excited state density for this state as the 1-particle RhoCI density.

Excited State 2: Singlet-A 4.3969 eV 281.98 nm f=0.0435 <S**2>=0.000

94 -> 98 0.10930

95 -> 97 -0.10558

96 -> 97 -0.20279

96 -> 98 -0.16124

96 ->102 0.45970

96 ->105 0.36412

Excited State 3: Singlet-A 4.4708 eV 277.32 nm f=0.0543 <S**2>=0.000

95 -> 97 0.24345

96 -> 97 0.42579

96 -> 98 0.33384

96 ->102 0.12211

96 ->105 0.28029

Excited State 4: Singlet-A 4.7237 eV 262.47 nm f=0.0262 <S**2>=0.000

92 -> 97 -0.15689

92 -> 98 0.29089

95 ->102 -0.20955

96 -> 97 -0.11173

96 ->100 0.24349

96 ->101 -0.11370

96 ->102 -0.28444

96 ->105 0.33352

Excited State 5: Singlet-A 4.8185 eV 257.31 nm f=0.0775 <S**2>=0.000

92 -> 98 -0.11472

95 -> 98 -0.13545

96 ->100 0.49226

96 ->101 -0.27257

96 ->102 0.15201

96 ->105 -0.12226

Excited State 6: Singlet-A 4.8615 eV 255.03 nm f=0.7416 <S**2>=0.000

93 -> 97 0.57427

94 -> 97 -0.11292

95 -> 98 0.21506

96 ->100 0.14516

References

1 Frisch, M.J.; Trucks, G.W.; Schlegel, H.B.; Scuseria, G.E.; Robb, M.A.; Cheeseman, J.R.; Scalmani, G.; Barone, V.; Mennucci, B.; Petersson, G.A. *Gaussian 09*, Gaussian, Inc., Wallingford CT, 2009.

2 Lee, C.; Yang, W.; Parr, R.G. Development of the Colle-Salvetti correlation-energy formula into a functional of the electron density. *Phys. Rev. B* **1988**, *37*, 785-789. DOI: 10.1103/PhysRevB.37.785

3 Becke, A.D. A new mixing of Hartree–Fock and local density-functional theories. *J. Chem. Phys.* **1993**, *98*, 1372-1377. DOI: 10.1063/1.464304

4 Becke, A.D. Density-functional thermochemistry. III. The role of exact exchange. *J. Chem. Phys.* **1993**, *98*, 5648-5652. DOI: 10.1063/1.464913

5 Kim, K.; Jordan, K.D. Comparison of Density Functional and MP2 Calculations on the Water Monomer and Dimer. *J. Phys. Chem.* **1994**, *98*, 10089-10094. DOI: 10.1021/j100091a024

6 Stephens, P.J.; Devlin, F.J.; Chabalowski, C.F.; Frisch, M.J. Ab Initio Calculation of Vibrational Absorption and Circular Dichroism Spectra Using Density Functional Force Fields. *J. Phys. Chem.* **1994**, *98*, 11623-11627. DOI: 10.1021/j100096a001

7 Krishnan, R.; Binkley, J.S.; Seeger, R.; Pople, J.A. Self-consistent molecular orbital methods. XX. A basis set for correlated wave functions. *J. Chem. Phys.* **1980**, *72*, 650-654. DOI: 10.1063/1.438955

8 Scalmani, G.; Frisch, M.J. Continuous surface charge polarizable continuum models of solvation. I. General formalism. *J. Chem. Phys.* **2010**, *132*, 114110. DOI: 10.1063/1.3359469

9 Bauernschmitt, R.; Ahlrichs R. Treatment of electronic excitations within the adiabatic approximation of time dependent density functional theory. *Chem. Phys. Lett.* **1996**, *256*, 454-464. DOI: 10.1016/0009-2614(96)00440-X

10 Casida, M.E.; Jamorski, C.; Casida, K.C.; Salahub, D.R. Molecular excitation energies to high-lying bound states from time-dependent density-functional response theory: Characterization and correction of the time-dependent local density approximation ionization threshold. *J. Chem. Phys.* **1998**, *108*, 4439-4449. DOI: 10.1063/1.475855

11 Stratmann, R.E.; Scuseria, G.E.; Frisch, M.J. An efficient implementation of time-dependent density-functional theory for the calculation of excitation energies of large molecules. *J. Chem. Phys.* **1998**, *109*, 8218-8224. DOI: 10.1063/1.477483

12 Yanai, T.; Tew, D.P.; Handy, N.C. A new hybrid exchange–correlation functional using the Coulomb-attenuating method (CAM-B3LYP). *Chem. Phys. Lett.* **2004**, *393*, 51-57. DOI: 10.1016/j.cplett.2004.06.011