*Supporting Information*

# Mn(III)-Mediated Regioselective Synthesis of (E)-Vinyl Sulfones from Sodium Sulfinates and Nitro-olefins

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## I. General Methods and materials:

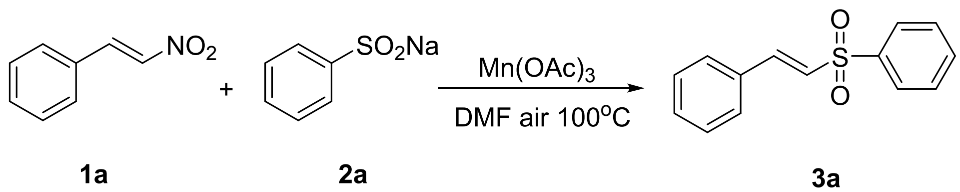
All of the reactions were carried out in 25mL round-bottom flasks with air condensers. Unless otherwise noted, all commercial reagents and solvents were obtained from the commercial provider and used without further purification. $^{1}H$ NMR and $^{13}C$ NMR spectra were recorded on Varian 600 MHz and 400 MHz spectrometers. Chemical shifts were reported relative to internal tetramethylsilane (TMS) (0.00 ppm) or $CDCl_3$ (7.26 ppm) for $^{1}H$, $CDCl_3$ (77.0 ppm) for $^{13}C$. Flash column chromatography was performed on 200-300 mesh silica gel. Analytical thin layer chromatography was performed with precoated glass baked plates (250μ) and visualized by fluorescence. MS were measured on a Bruker Apex IV FTMS spectrometer. Melting points were measured on a melting point tester RY-1G apparatus and uncorrected.

## II. Experimental

**The nitrostyrenes were synthesized according to the literatures as below:**

1. M.-Y. Wu, M.-Q. Wang, K. Li, X.-W. Feng, T. He, N. Wang, X.-Q. Yu, *Tetrahedron Lett*. **2011**, *52*, 679-683.
2. B. Quiclet-Sire, S. Z. Zard, *Synthesis*. **2005**, *19*, 3319-3326.

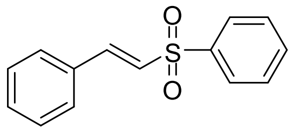
**General experimental procedure for synthesis of (E)-Vinyl Sulfones**




To a solution of nitro-olefin **1a** (1mmol) and sodium sulfinates **2a** (2 mmol, 2 equiv) in the DMF, was added $Mn(OAc)_3$ (447mg, 3 equiv), the mixture was stirring at 100 ℃ under the air atmosphere (1atm). The reaction was checked by TLC (thin layer chromatography). After the completion of the reaction, the mixture was poured into water, and extracted by ethyl acetate, washed with NaCl(aq), dried with anhydrous $Na_2SO_4$, then the solvent was removed under reduced pressure to obtain crude product, further purification by column chromatography on silica gel gave (E)-Vinyl Sulfones.

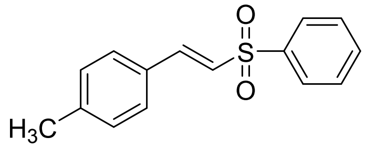
### III. Compounds Characterization

*(E)-(2-(phenylsulfonyl)vinyl)benzene* (**3a**)[1]



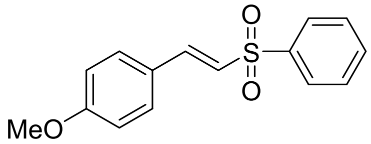

$^{1}$H NMR (600 MHz,$CDCl_3$, ppm) δ 7.95 (d, $J$ = 7.8 Hz, 2H), 7.69 (d, $J$ = 15.6 Hz, 1H), 7.61 (t, $J$ = 7.2 Hz, 1H), 7.54 (t, $J$ = 7.8Hz, 2H), 7.48 (d, $J$ = 7.2 Hz, 2H), 7.39 (t, $J$ = 8.4 Hz, 3H), 6.87 (d, $J$ = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz,$CDCl_3$, ppm) δ 142.5, 140.7, 133.4, 132.3, 131.2, 129.3, 129.0, 128.5, 127.6, 127.2.

*(E)-1-methyl-4-(2-(phenylsulfonyl)vinyl)benzene* (**3b**)[1]



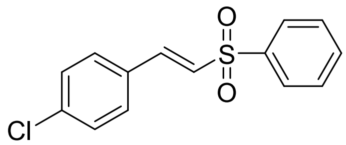

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.95 (d, $J$ = 7.8 Hz, 2H), 7.66 (d, $J$ = 15.6 Hz, 1H), 7.61 (t, $J$ = 7.2 Hz, 1H), 7.54 (t, $J$ = 7.8 Hz, 2H), 7.38 (d, $J$ = 7.8 Hz, 2H), 7.19 (d, $J$ = 7.8 Hz, 2H), 6.81 (d, $J$ = 15.6 Hz, 1H), 2.37 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 142.5, 141.8, 140.9, 133.2, 129.8, 129.6, 129.3, 128.5, 127.5, 126.0, 21.5.

*(E)-1-methoxy-4-(2-(phenylsulfonyl)vinyl)benzene* (**3c**)[1]



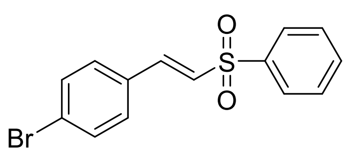

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.93 (d, $J$ = 7.5 Hz, 2H), 7.63 (d, $J$ = 15.6 Hz, 1H), 7.59 (d, $J$ = 7.5 Hz, 1H), 7.53 (t, $J$=7.8 Hz, 2H), 7.42 (d, $J$ = 8.4 Hz, 2H), 6.89 (d, $J$ = 8.4 Hz, 2H), 6.71 (d, $J$ = 15.6 Hz, 1H), 3.82 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 162.1, 142.3, 141.1, 133.1, 130.4, 129.2, 127.4, 124.9, 124.4, 114.5, 55.4.

*(E)-1-chloro-4-(2-(phenylsulfonyl)vinyl)benzene* (**3d**)[1]



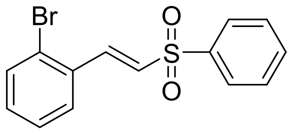

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.94 (d, $J$ = 8.4, 2H), 7.64 (d, $J$ = 9.6 Hz, 1H), 7.62 (s, 1H), 7.57-7.54 (m, 2H), 7.44-7.39 (m, 2H), 7.38-7.34 (m, 2H), 6.84 (d, $J$ = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 140.9, 140.4, 137.2, 133.5, 130.8, 129.7, 129.4,129.2, 127.9, 127.6.

*(E)-1-bromo-4-(2-(phenylsulfonyl)vinyl)benzene* (**3e**)[1]



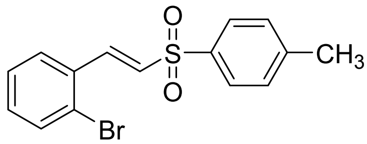

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.94 (d, $J$ = 8.4 Hz, 2H), 7.63-7.60 (m, 2H), 7.55 (t, $J$=7.8 Hz, 2H), 7.51 (d, $J$ = 8.4 Hz, 2H), 7.33 (d, $J$ = 8.4 Hz, 2H), 6.87 (d, $J$ = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 141.0, 140.4, 133.5, 132.3, 131.3, 129.9, 129.4, 128.0, 127.7, 125.6.

*(E)-1-bromo-2-(2-(phenylsulfonyl)vinyl)benzene* (**3f**)[2]



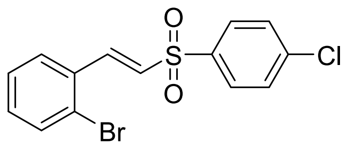

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 8.08 (d, *J* = 15.6 Hz, 1H), 7.99 (d, *J* = 7.8 Hz, 2H), 7.69-7.62 (m, 2H), 7.59 (t, *J*=7.8 Hz 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.33 (t, *J*=7.8 Hz 1H), 7.28 (s, 1H), 6.86 (d, *J* = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 141.0, 140.3, 133.6,133.5, 132.5, 132.0, 130.2, 129.4, 128.2, 127.8, 127.8, 125.5.

*(E)-1-bromo-2-(2-tosylvinyl)benzene* (**3g**)



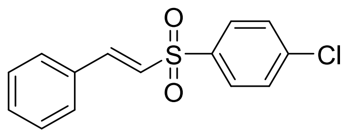

Yellow solid, mp 98-100°C. $^{1}$H NMR (400 MHz, $CDCl_3$, ppm) δ 8.03 (d, *J* = 15.6 Hz, 1H), 7.85 (d, *J* = 8.4 Hz, 2H), 7.62 (d, *J* = 8.4 Hz, 1H), 7.48 (d, *J* = 8.4 Hz, 1H), 7.37 (s, 1H), 7.34-7.21 (m, 3H), 6.83 (d, *J* = 15.6 Hz, 1H), 2.44 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 144.6, 140.4, 137.3, 133.6, 132.6, 131.9, 130.5, 130.0, 128.2, 127.9,127.8, 125.5, 21.6. HRMS Calculated for $C_{15}H_{13}BrO_2S$ $[M+Na]^+$ 358.9712, found 358.9720.

*(E)-1-bromo-2-(2-((4-chlorophenyl)sulfonyl)vinyl)benzene* (**3h**)



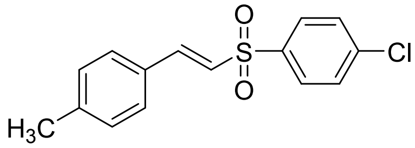

White solid, mp 125-128°C. $^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 8.05 (d, *J* = 15.6 Hz, 1H), 7.88 (d, *J* = 8.4 Hz, 2H), 7.62 (d, *J* = 7.8 Hz, 1H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.48 (d, *J* = 7.8 Hz, 1H), 7.30 (t, *J* = 7.8 Hz, 1H), 7.25 (d, *J* = 3.3 Hz, 1H), 6.80 (d, *J* = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 141.5, 140.3, 138.8, 133.7, 132.3, 132.2, 129.8,129.7, 129.3, 128.2, 127.8, 125.6. HRMS Calculated for $C_{14}H_{10}BrClO_2S$ $[M+H]^+$ 356.9346, found 356.9355.

*(E)-1-chloro-4-(styrylsulfonyl)benzene*(**3i**)[1]



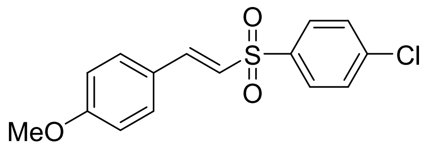

$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.88 (d, *J* = 8.4 Hz, 2H), 7.69 (d, *J* = 15.6 Hz, 1H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.49 (d, *J* = 6.9 Hz, 2H), 7.43-7.40 (m, 3H), 6.83 (d, *J* = 15.6 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ.143.0, 140.1, 139.2, 132.1, 131.4, 129.6, 129.1, 128.6, 126.8.

*(E)-1-chloro-4-((4-methylstyryl)sulfonyl)benzene* (**3j**)



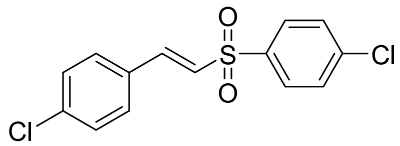
Yellow solid, mp 100-102°C. $^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.88 (d, *J* = 8.4 Hz, 2H), 7.66 (d, *J* = 15.6 Hz, 1H), 7.51 (d, *J* = 8.4 Hz, 2H), 7.38 (d, *J* = 7.8 Hz, 2H), 7.20 (d, *J* = 7.8 Hz, 2H), 6.77 (d, *J* = 15.6 Hz, 1H), 2.38 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 143.1, 142.1, 139.9, 139.4, 129.8, 129.6 , 129.4, 129.0, 128.6, 125.6, 21.5. HRMS Calculated for $C_{15}H_{13}ClO_2S$ $[M+H]^+$ 293.0396, found 293.0403.

*(E)-1-chloro-4-((4-methoxystyryl)sulfonyl)benzene*(**3k)**



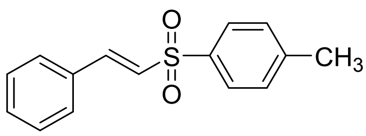
Yellow solid, mp 104-107°C. $^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.87 (d, *J* = 8.4 Hz, 2H), 7.63 (d, *J* = 15.6 Hz, 1H), 7.51 (d, *J* = 8.4 Hz, 2H), 7.44 (d, *J* = 8.7 Hz, 2H), 6.91 (d, *J* = 8.7 Hz, 2H), 6.68 (d, *J* = 15.6 Hz, 1H), 3.84 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 162.2, 142.8, 139.8, 139.7, 130.4, 129.6, 129.0, 124.8, 124.0, 114.6, 55.5. HRMS Calculated for $C_{15}H_{13}ClO_3S$ $[M+H]^+$ 309.0347, found 309.0352.

*(E)-1-chloro-4-(2-((4-chlorophenyl)sulfonyl)vinyl)benzene*(**3l)**[3]



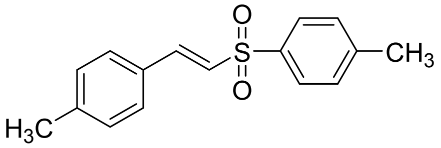
$^{1}$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.87 (d, *J* = 8.4 Hz, 2H), 7.63 (d, *J* = 15.0 Hz, 1H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.41 (d, *J* = 8.4 Hz, 2H), 7.37 (d, *J* = 8.4 Hz, 2H), 6.80 (d, *J* = 15.0 Hz, 1H); $^{13}$C NMR (100 MHz, $CDCl_3$,ppm) δ 141.5, 140.3, 139.0, 137.5, 130.7, 129.8, 129.7,129.5,129.2, 127.5.

*(E)-1-methyl-4-(styrylsulfonyl)benzene* (**3m**)[1]



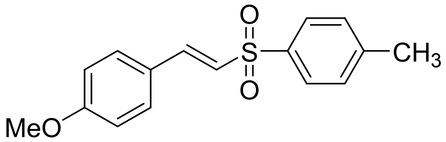
$^{1}$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.83 (d, *J* = 8.4 Hz, 2H), 7.65 (d, *J* = 15.6 Hz, 1H), 7.51-7.43 (m, 2H), 7.39 (d, *J* = 6.6 Hz, 3H), 7.34 (d, *J* = 8.4 Hz, 2H), 6.85 (d, *J* = 15.6 Hz, 1H), 2.43 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 144.4, 141.9, 137.7, 132.4, 131.1, 129.9, 129.0, 128.5, 127.7, 127.6, 21.6.

*(E)-1-methyl-4-((4-methylstyryl)sulfonyl)benzene* (**3n**)[4]



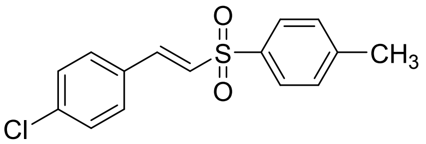

$^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.82 (d, *J* = 8.4 Hz, 2H), 7.62 (d, *J* = 15.6 Hz, 1H), 7.37-7.32 (m, 4H), 7.18 (d, *J* = 7.8 Hz, 2H), 6.80 (d, *J* = 15.6 Hz, 1H), 2.42 (s, 3H), 2.36 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 144.2, 142.0, 141.7, 138.0, 129.9, 129.7, 129.7 128.5, 127.6, 126.4, 21.5, 21.4.

*(E)-1-methoxy-4-(2-tosylvinyl)benzene* (**3o**)[4]



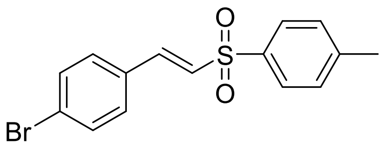

$^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.81 (d, *J* = 8.4 Hz, 2H), 7.60 (d, *J* = 15.6 Hz, 1H), 7.42 (d, *J* = 8.4 Hz, 2H), 7.32 (d, *J* = 7.8 Hz, 2H), 6.89 (d, *J* = 8.7 Hz, 2H), 6.70 (d, *J* = 15.6 Hz, 1H), 3.82 (s, 3H), 2.42 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 161.9, 144.1, 141.7, 138.2, 130.3, 129.9, 127.5, 125.0, 124.8, 114.4, 55.4, 21.5.

*(E)-1-chloro-4-(2-tosylvinyl)benzene* (**3p**)[4]



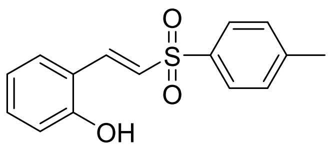

$^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.74 (d, *J* = 7.8 Hz, 2H), 7.52 (d, *J* = 15.6 Hz, 1H), 7.33 (d, *J* = 8.4 Hz, 2H), 7.29-7.26 (m, 3H), 7.18 (s, 1H), 6.74 (d, *J* = 15.6 Hz, 1H), 2.37 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 144.5, 140.4, 137.5, 137.1, 130.9, 129.9, 129.6, 129.3, 128.2, 127.7, 21.6.

*(E)-1-bromo-4-(2-tosylvinyl)benzene*(**3q**)[4]



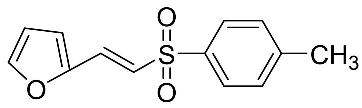

$^1$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.80 (d, *J* = 8.4 Hz, 2H), 7.56 (d, *J* = 15.6 Hz, 1H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.32 (t, *J*=8.4 Hz 4H), 6.83 (d, *J* = 15.6 Hz, 1H), 2.41 (s, 3H); $^{13}$C NMR (150 MHz, $CDCl_3$, ppm) δ 144.6, 140.5, 137.5, 132.3, 131.4, 130.0, 129.8, 128.4, 127.7, 125.5, 21.6.

*(E)-2-(2-tosylvinyl)phenol*(**3r**)[5]



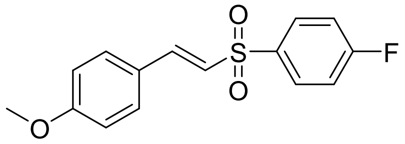

$^1$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.83 (t, J=9.9 Hz, 2H), 7.37 (d, *J* = 15.6 Hz, 1H), 7.33 (d, *J* = 7.8 Hz, 2H), 7.24 (s, 2H), 7.20 (d, *J* = 15.6 Hz, 1H), 6.92 (t, *J* = 7.2 Hz, 1H), 6.85 (d, *J* = 15.6 Hz, 1H), 6.58 (s, 1H), 2.43 (s, 3H); $^{13}$C NMR (150 MHz, $CDCl_3$, ppm) δ 155.7, 144.1, 138.3, 137.9, 132.2, 131.0, 129.9, 128.1, 127.6, 120.9, 119.7, 116.5, 21.6.

*(E)-2-(2-tosylvinyl)furan* (**3s**)[6]



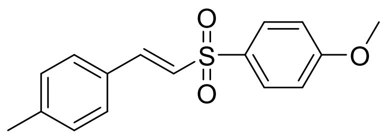

$^1$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.80 (d, *J* = 7.8 Hz, 2H), 7.47 (s, 1H), 7.41 (d, *J* = 15.0 Hz, 1H), 7.33 (d, *J* = 7.8 Hz, 2H), 6.73 (d, *J* = 15.0 Hz, 1H), 6.69 (d, *J* = 3 Hz, 1H), 6.48 (s, 1H), 2.43 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 145.5, 129.9, 128.4, 127.6, 125.1, 116.6, 112.5, 21.5.

*(E)-1-fluoro-4-((4-methoxystyryl)sulfonyl)benzene***(3t)**



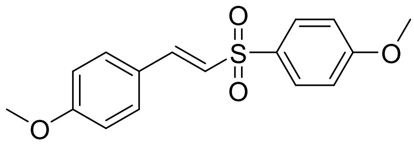

White solid, mp 114-116°C. $^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 8.00-7.88 (m, 2H), 7.62 (d, *J* = 15.6 Hz, 1H), 7.43 (d, *J* = 8.4 Hz, 2H), 7.20 (t, *J* = 8.4 Hz, 2H), 6.90 (d, *J* = 8.7 Hz, 2H), 6.68 (d, *J* = 15.6Hz, 1H), 3.83 (s, 3H); $^{13}$C NMR (150 MHz, $CDCl_3$, ppm) δ 166.3 , 164.6, 162.2, 142.4, 137.2 (d, *J* = 3.0 Hz), 130.5 – 130.2 (m), 124.8, 124.2, 116.7, 116.4, 114.5, 55.4. HRMS Calculated for $C_{15}H_{13}FO_3S$ $[M+H]^+$ 393.0631, found 393.0635.

*(E)-1-methoxy-4-((4-methylstyryl)sulfonyl)benzene***(3u)**



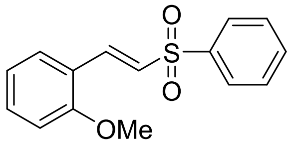

White solid, mp 109-112°C. $^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.86 (d, *J* = 8.4 Hz, 2H), 7.60 (d, *J* = 15.6 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 2H), 7.18 (d, *J* = 7.8 Hz, 2H), 7.00 (d, *J* = 8.4 Hz, 2H), 6.78 (d, *J* = 15.6 Hz, 1H), 3.87 (s, 3H), 2.37 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 163.4, 141.5, 141.4, 132.4, 129.8, 129.7, 128.4, 126.7, 114.5, 55.6, 21.4. HRMS Calculated for $C_{16}H_{16}O_3S$ $[M+Na]^+$ 311.0712, found 311.0717.

*(E)-1-methoxy-4-(2-((4-methoxyphenyl)sulfonyl)vinyl)benzene***(3v)**



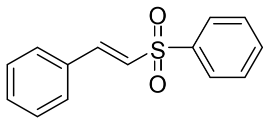

Yellow solid, mp 110-114°C. $^1$H NMR (400 MHz, $CDCl_3$, ppm) δ 7.86 (d, *J* = 8.4 Hz, 2H), 7.58 (d, *J* = 15.6 Hz, 1H), 7.42 (d, *J* = 8.4 Hz, 2H), 7.00 (d, *J* = 8.4 Hz, 2H), 6.89 (d, *J* = 8.4 Hz, 2H), 6.69 (d, *J* = 15.6 Hz, 1H), 3.87 (s, 3H), 3.83 (s, 3H); $^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 163.4, 161.9, 141.1, 132.7, 130.2, 129.7, 125.1, 125.1, 114.4, 55.6, 55.4. HRMS Calculated for $C_{16}H_{16}O_4S$ $[M+H]^+$ 305.0842, found 305.0848.

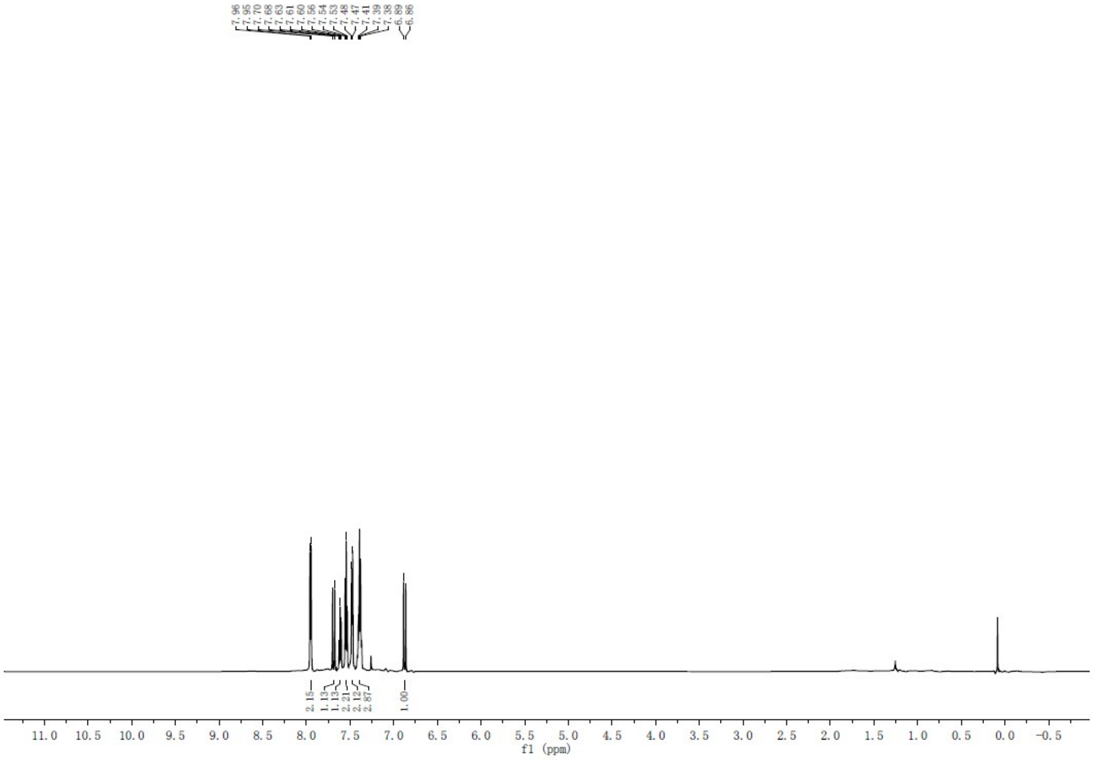
*(E)-1-methoxy-2-(2-(phenylsulfonyl)vinyl)benzene***(3w)**[7]

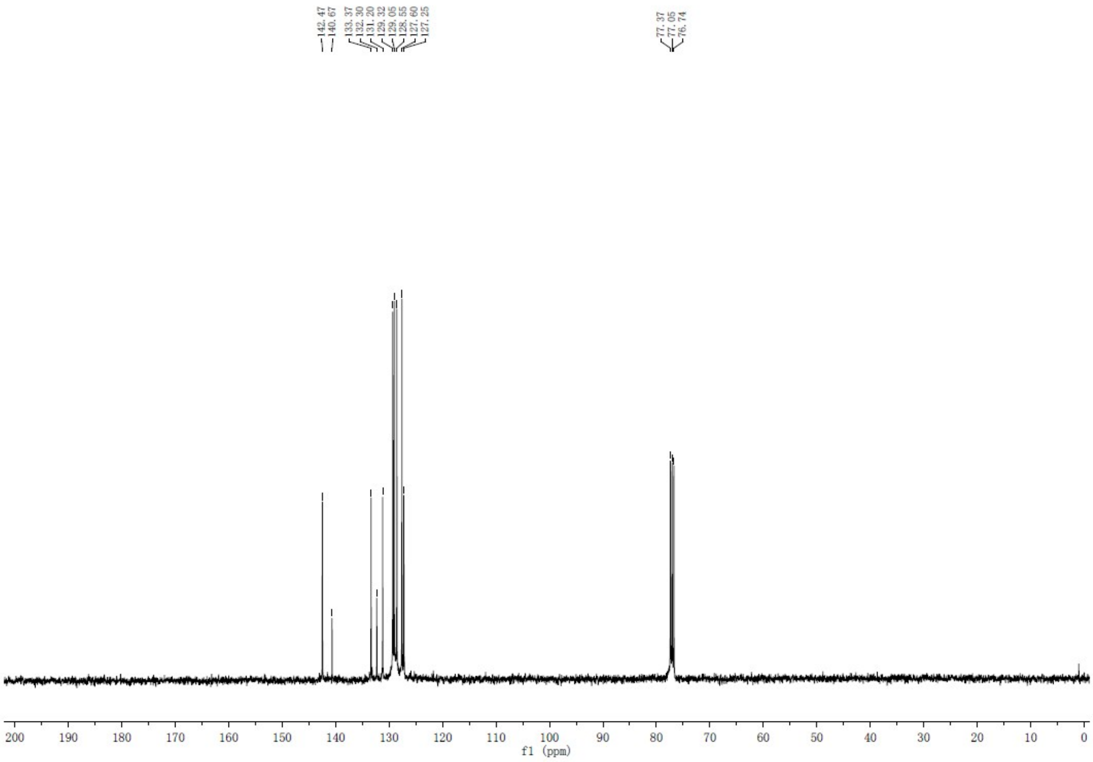


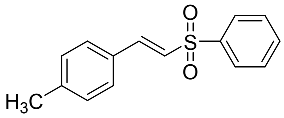

$^1$H NMR (600 MHz, $CDCl_3$, ppm) δ 7.95 (d, *J* = 7.5 Hz, 2H), 7.90 (d, *J* = 15.6 Hz, 1H), 7.60 (t, *J* = 6.9 Hz, 1H), 7.54 (t, *J* = 7.2 Hz, 2H), 7.44-7.35 (m, 2H), 7.08 (d, *J* = 15.6 Hz, 1H), 6.96 (t, *J* = 7.2 Hz, 1H), 6.92 (d, *J* = 15.6 Hz, 1H), 3.88 (s, 3H).$^{13}$C NMR (100 MHz, $CDCl_3$, ppm) δ 158.8, 141.2, 138.5, 133.1, 132.5, 130.8, 129.2, 127.8, 127.6, 121.1, 120.8, 111.2, 55.5.

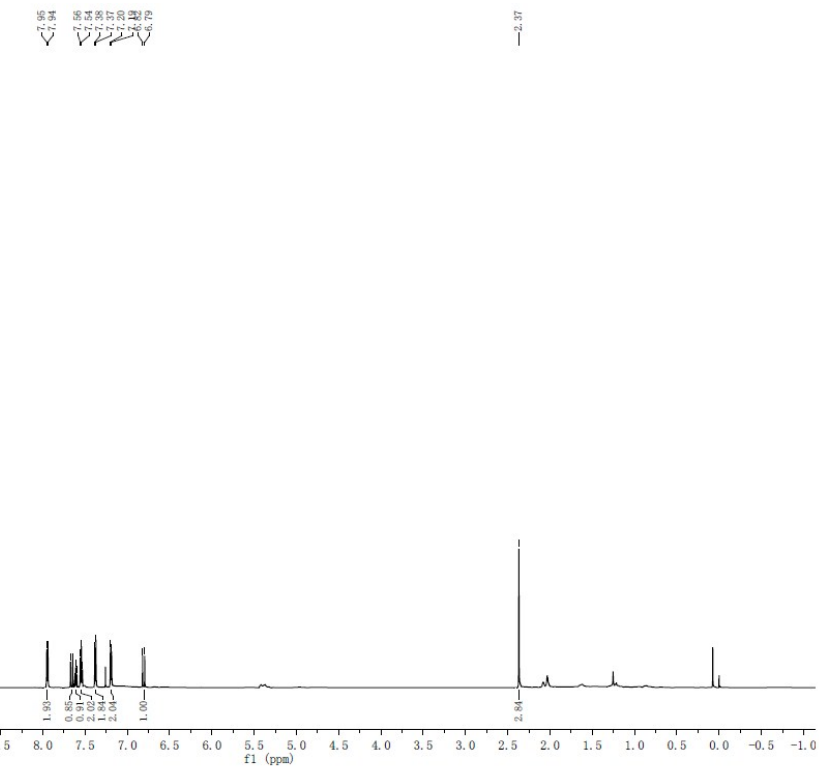
IV NMR spectra data

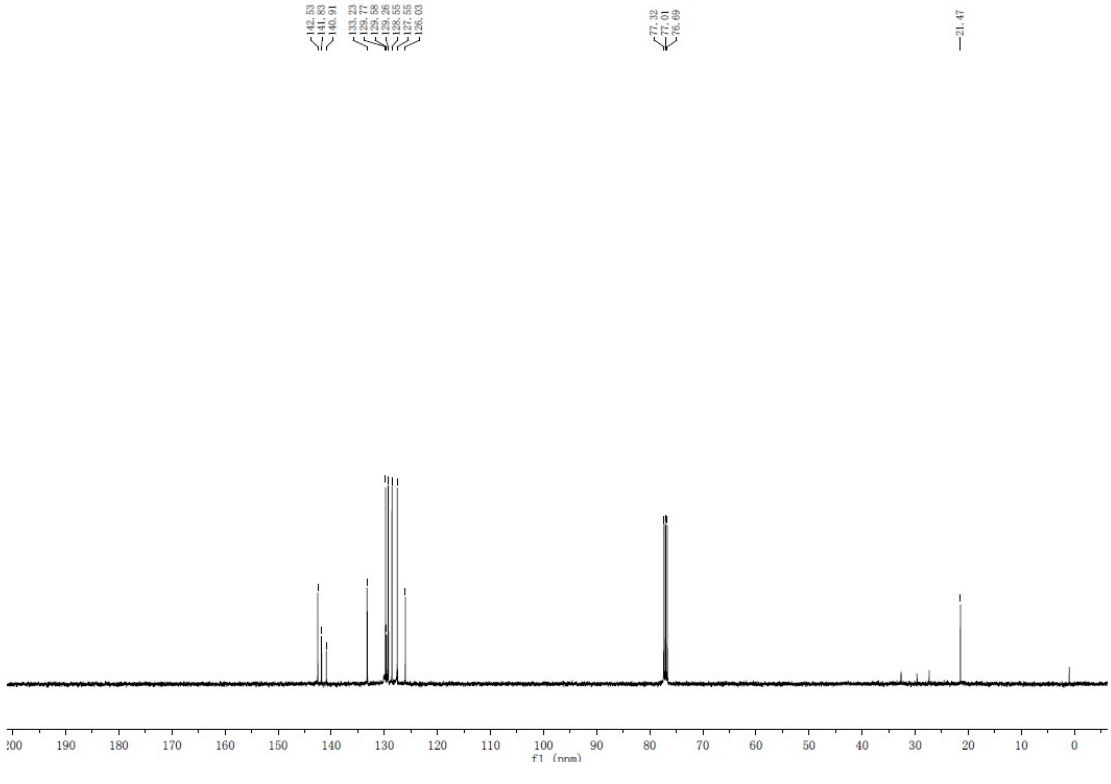


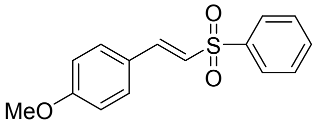



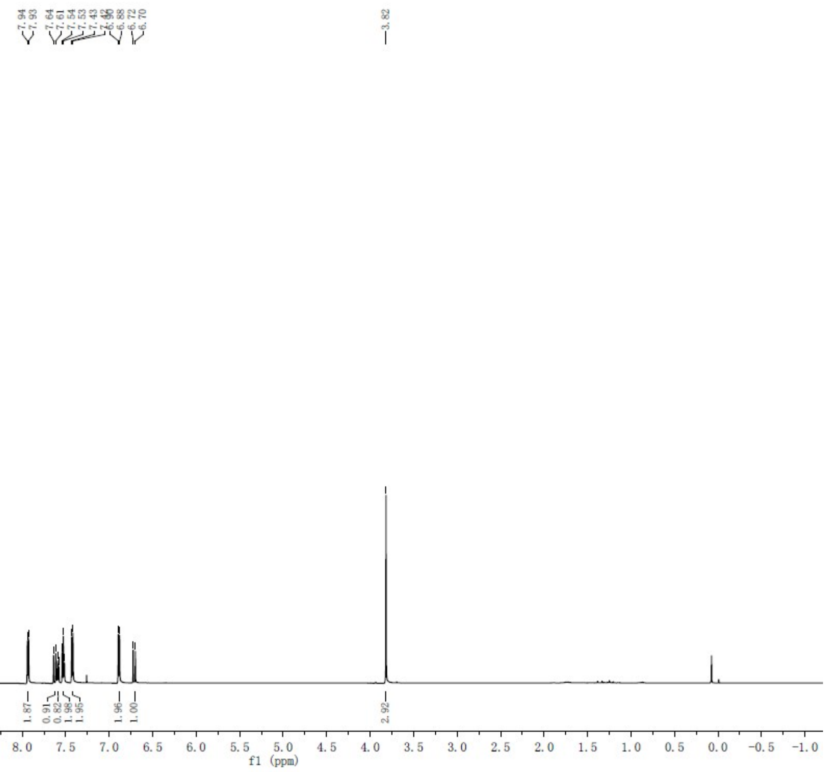



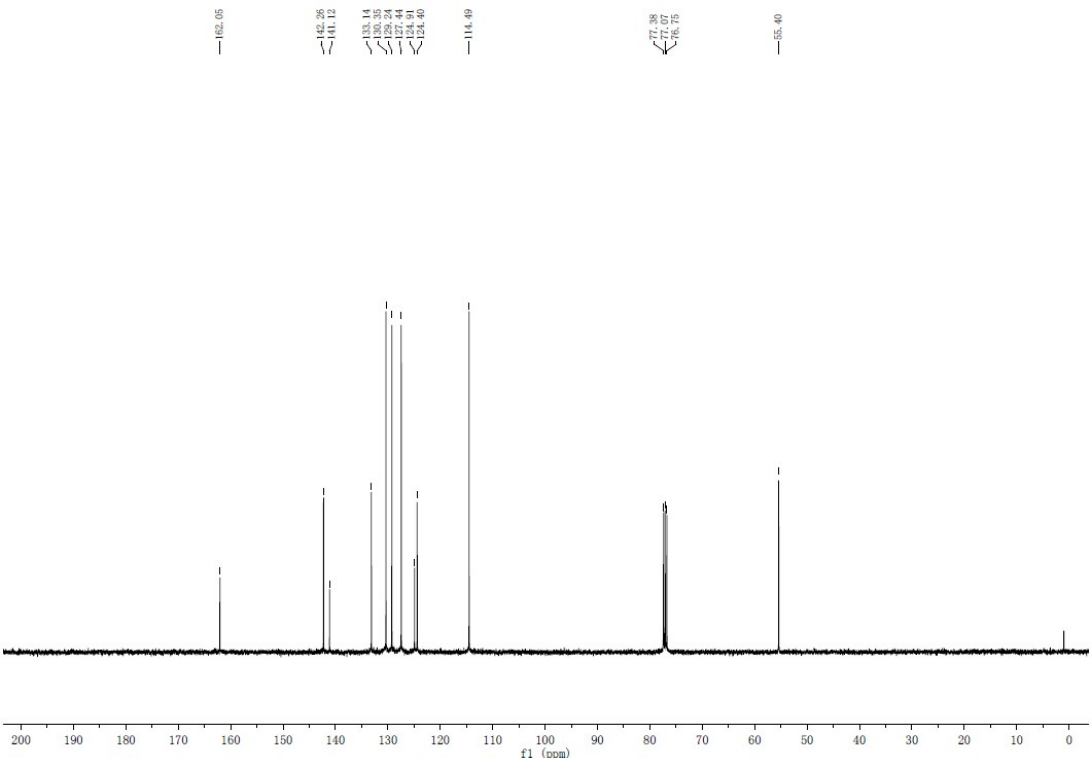


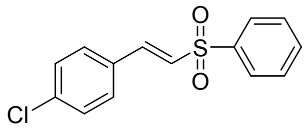


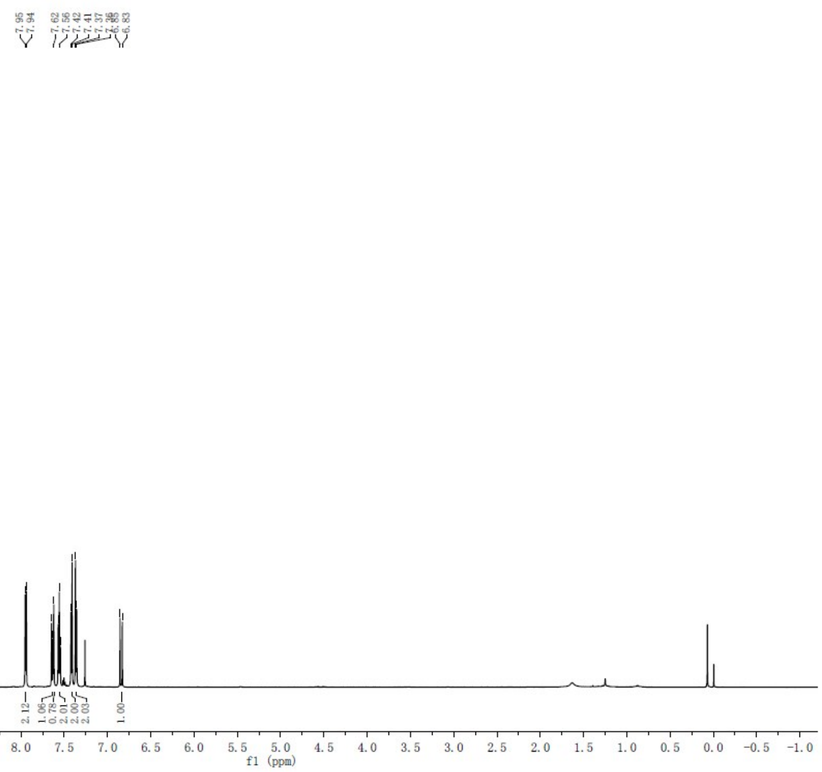


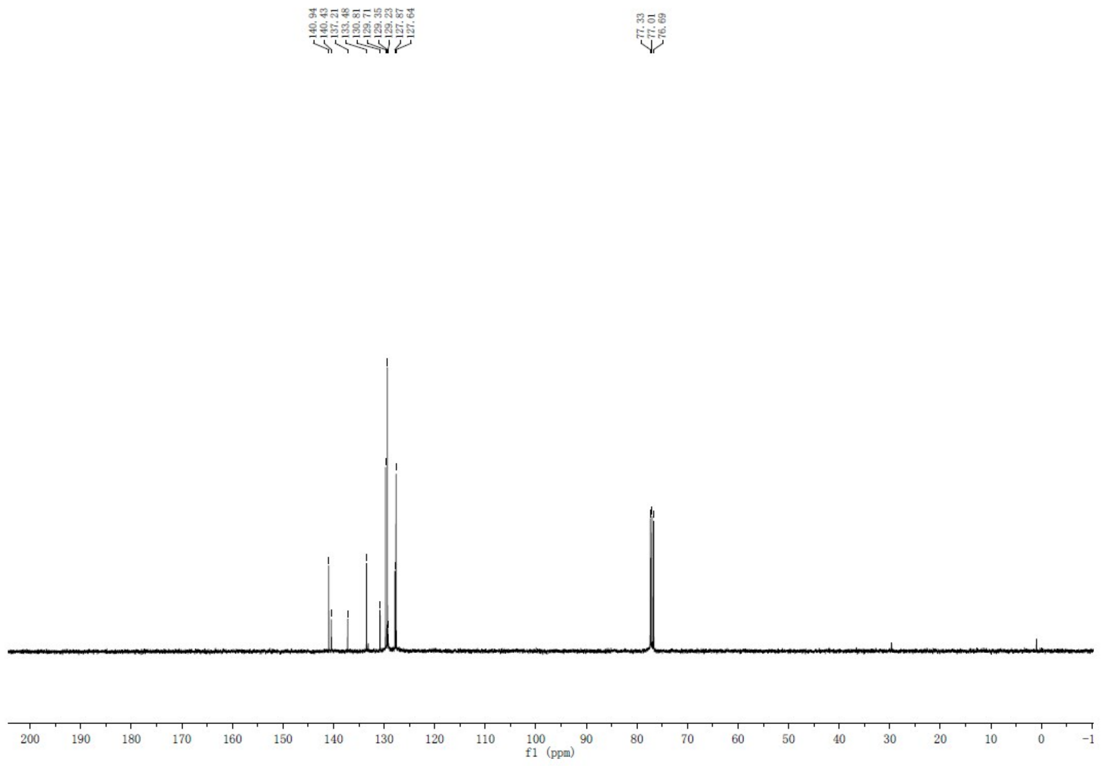

MeO
O
S
O

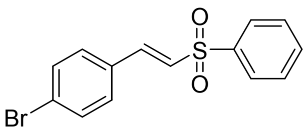

7.94
7.93
7.64
7.61
7.54
7.53
7.43
6.88
6.72
6.70
3.82
1.87
0.91
0.82
1.98
1.95
1.96
1.00
2.92
f1 (ppm)

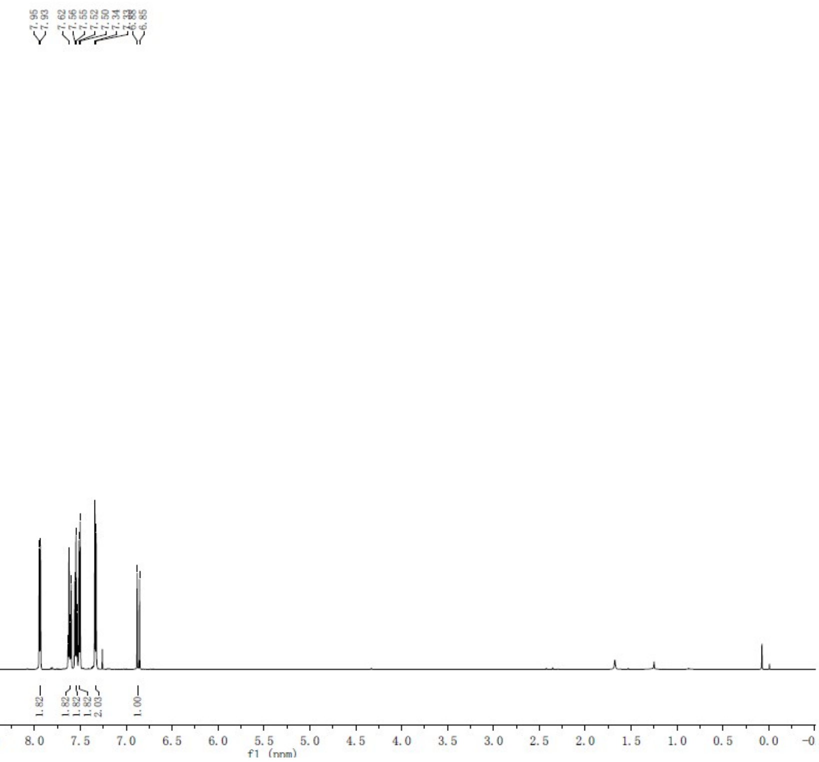

162.05
142.26
141.12
133.14
130.35
129.24
127.44
124.91
124.40
114.49
77.38
77.07
76.75
55.40
f1 (ppm)

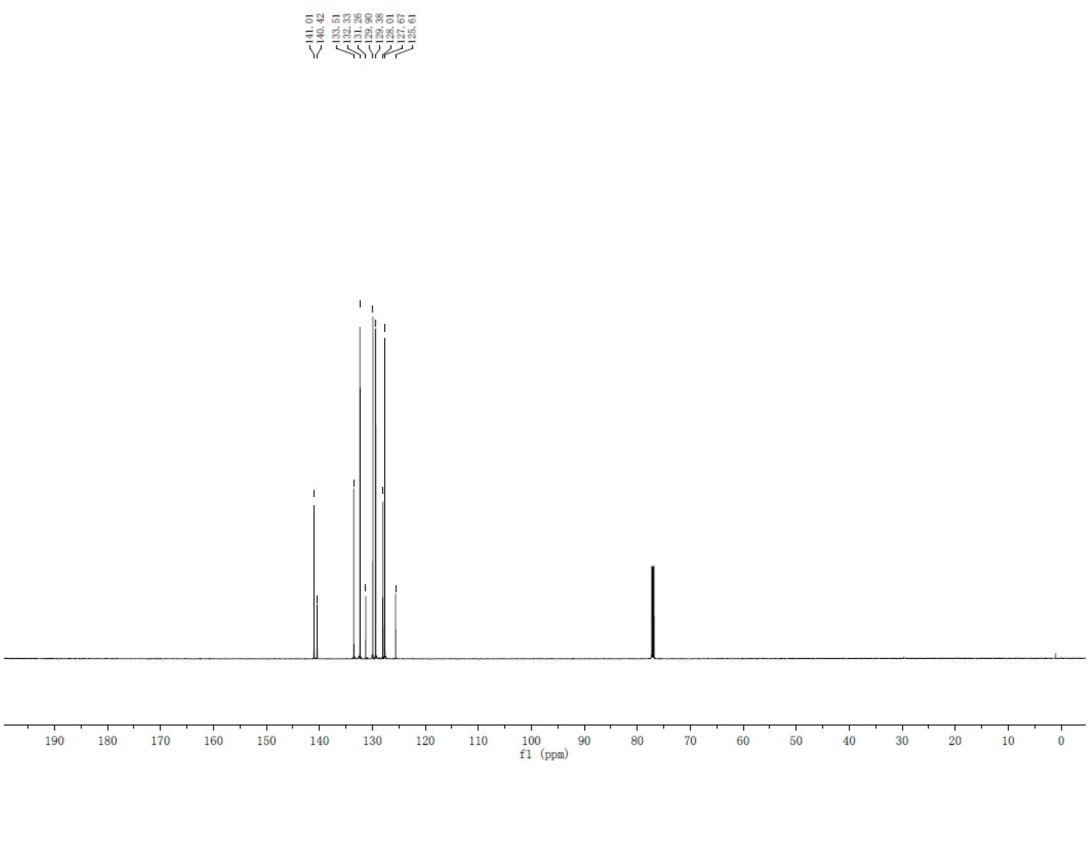

Cl
O
S
O

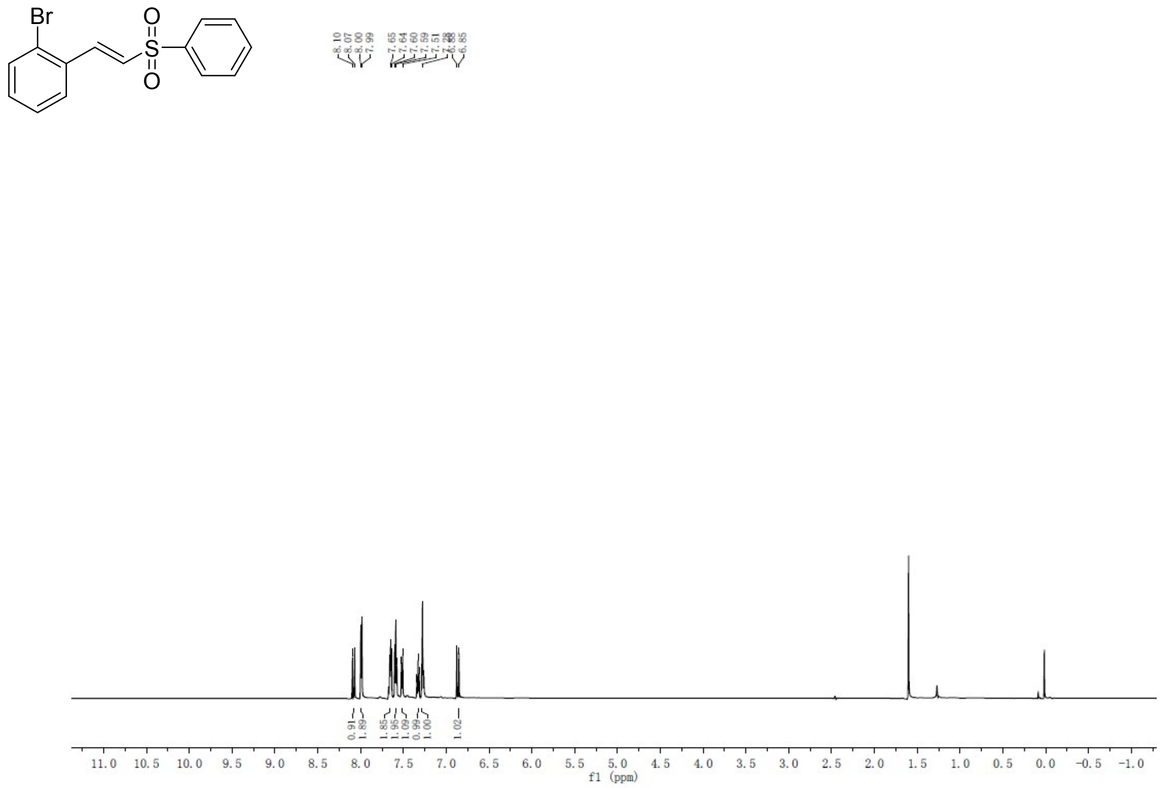


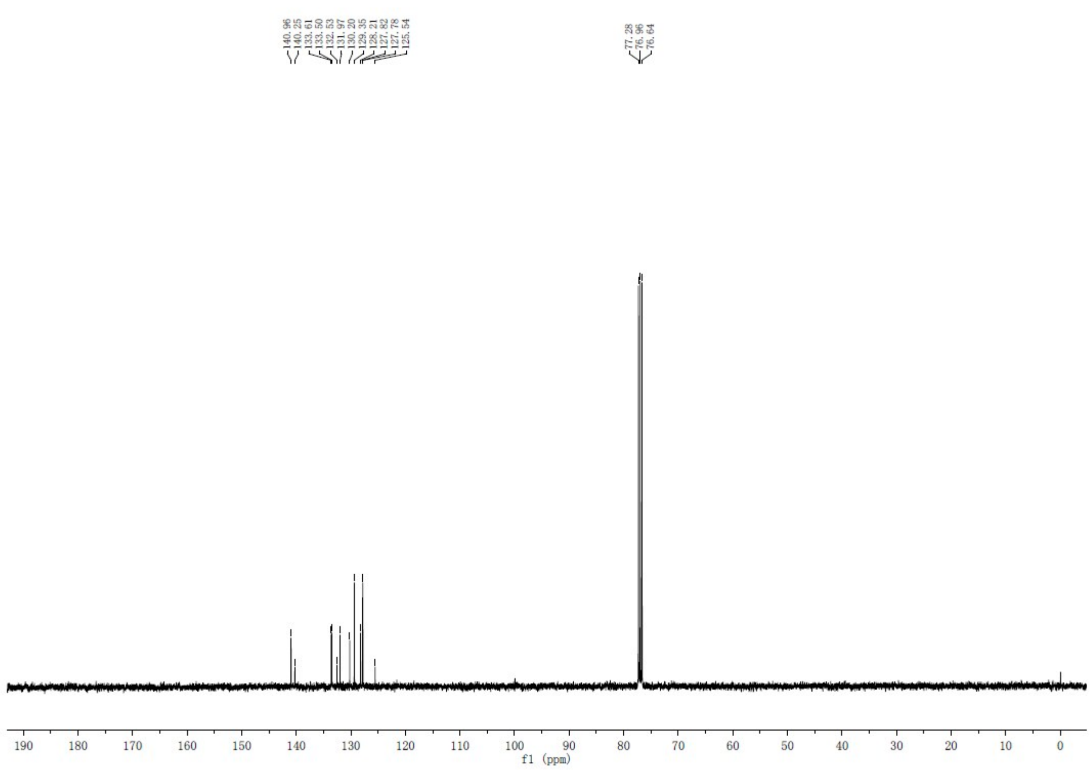


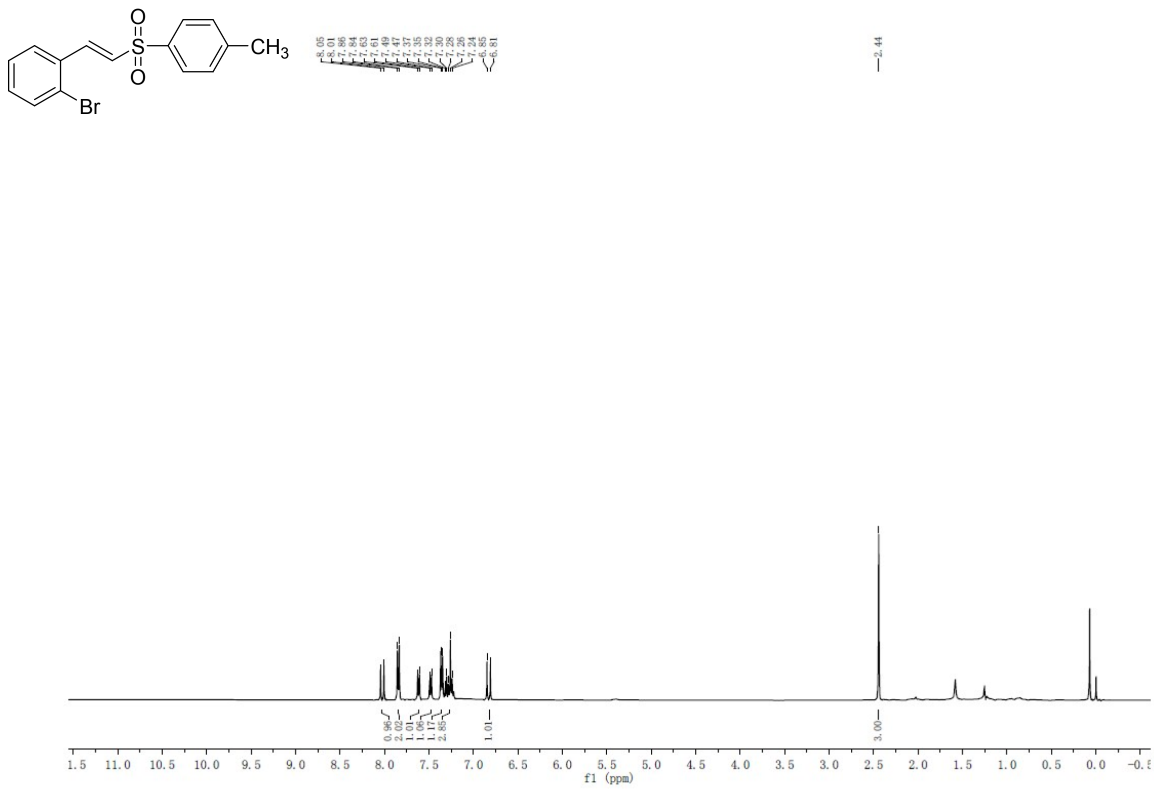

Br
O
S
O

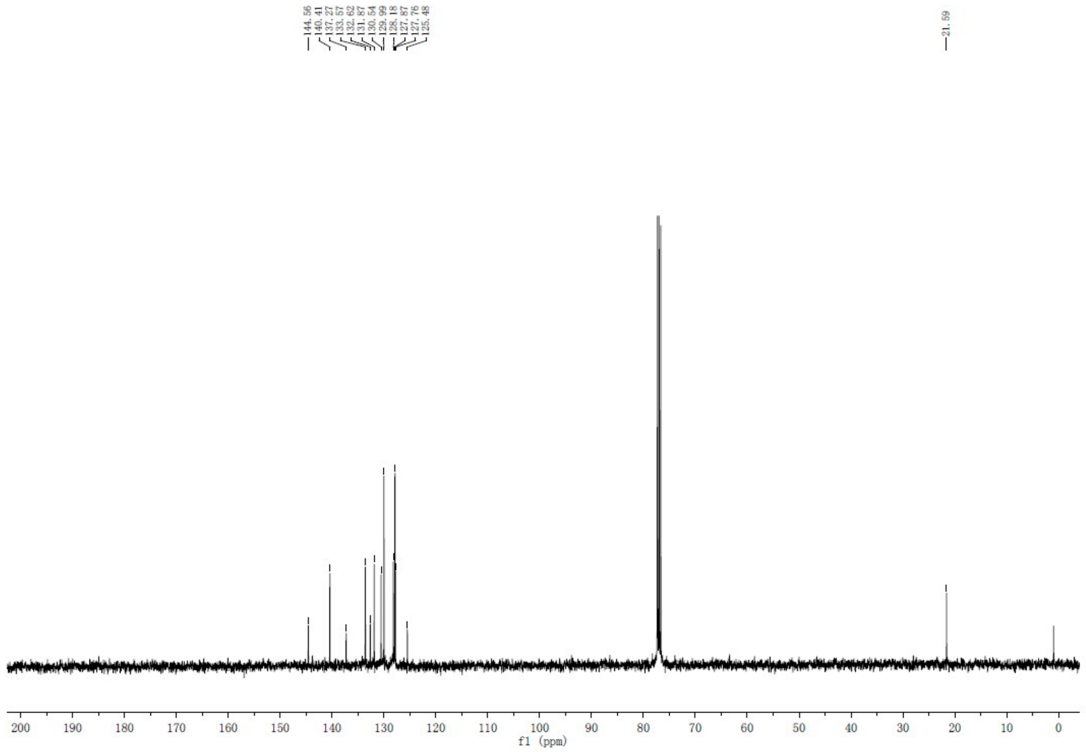


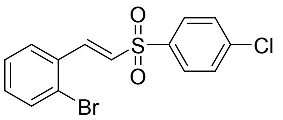


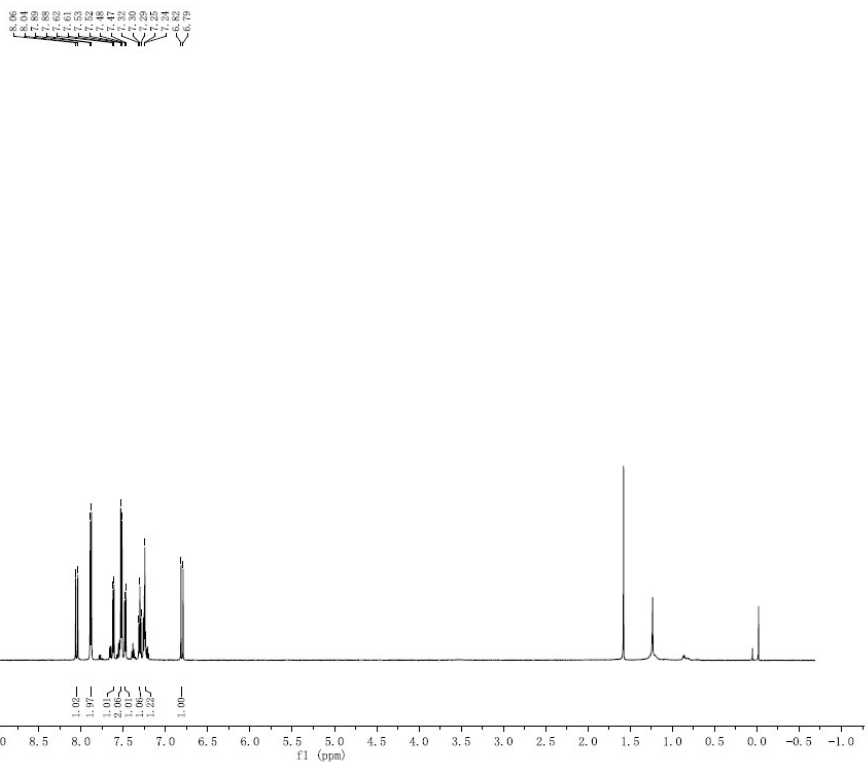

Br
f1 (ppm)

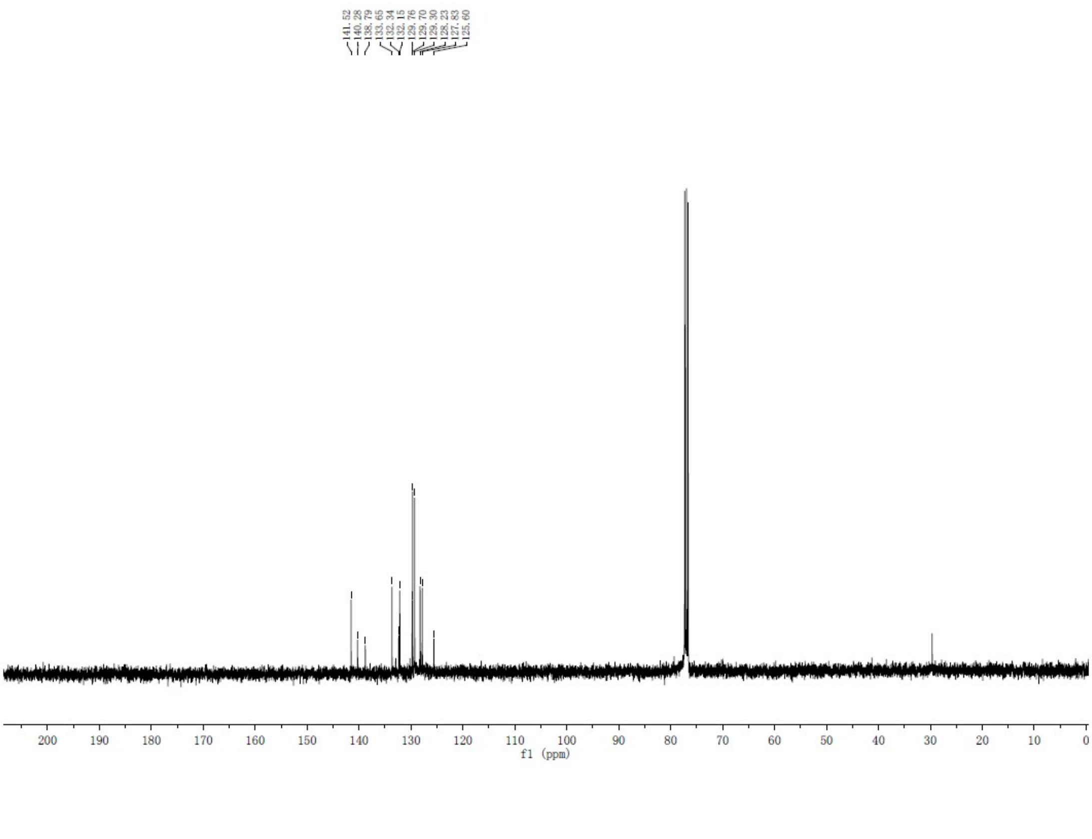

f1 (ppm)

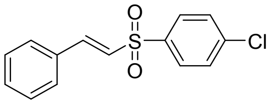

O
S
O
CH3
Br
8.05 8.01 7.86 7.84 7.63 7.61 7.49 7.47 7.37 7.35 7.32 7.30 7.28 7.26 7.24 6.85 6.81
2.44
0.96 2.02 1.01 1.06 1.17 2.85
1.01
3.00
f1 (ppm)

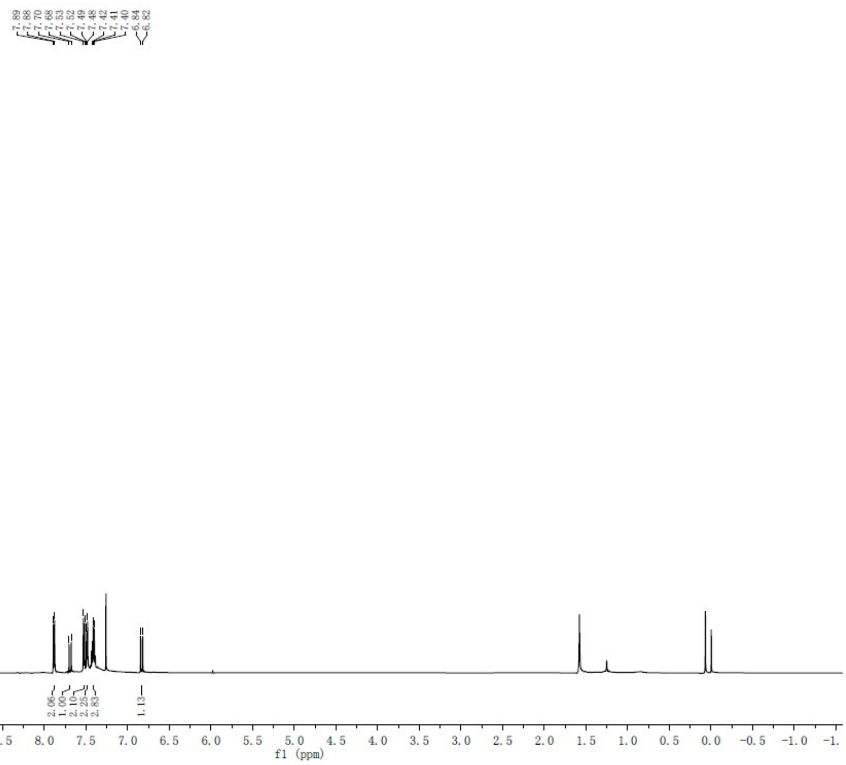

144.56 140.41 137.27 133.57 132.62 131.87 130.54 129.99 128.18 127.87 127.76 125.48
21.59
f1 (ppm)

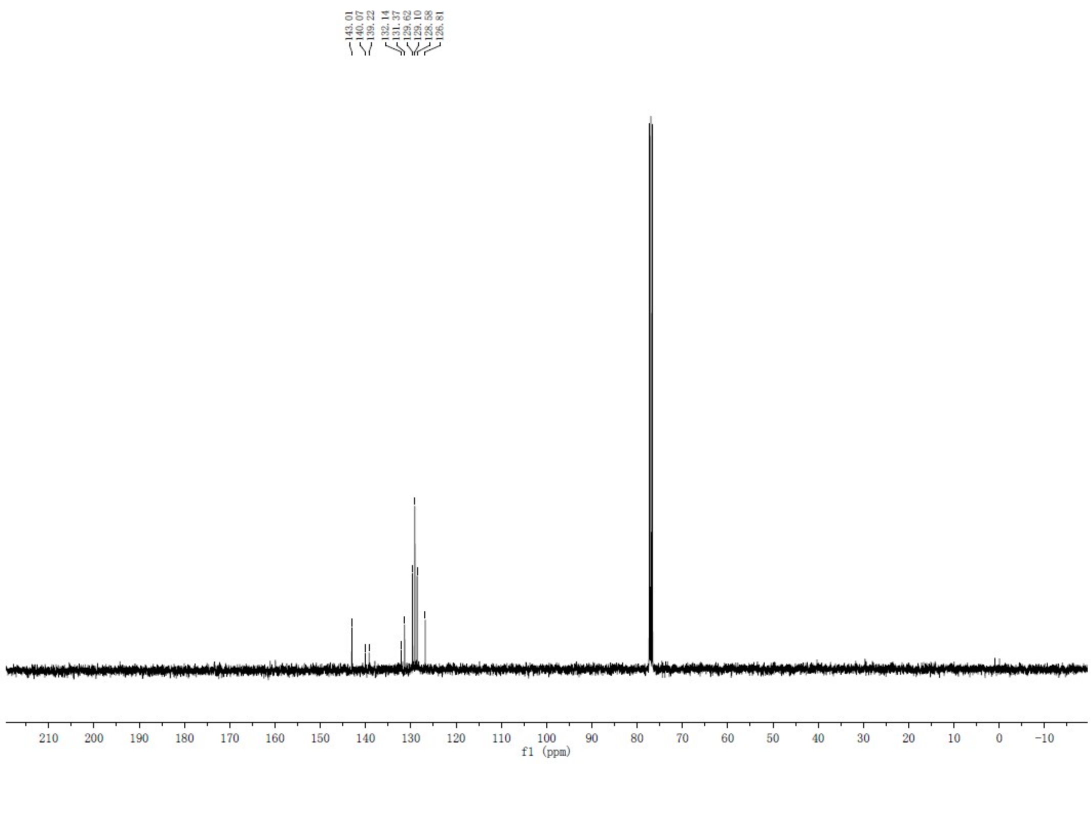

Br
Cl
O
S
O

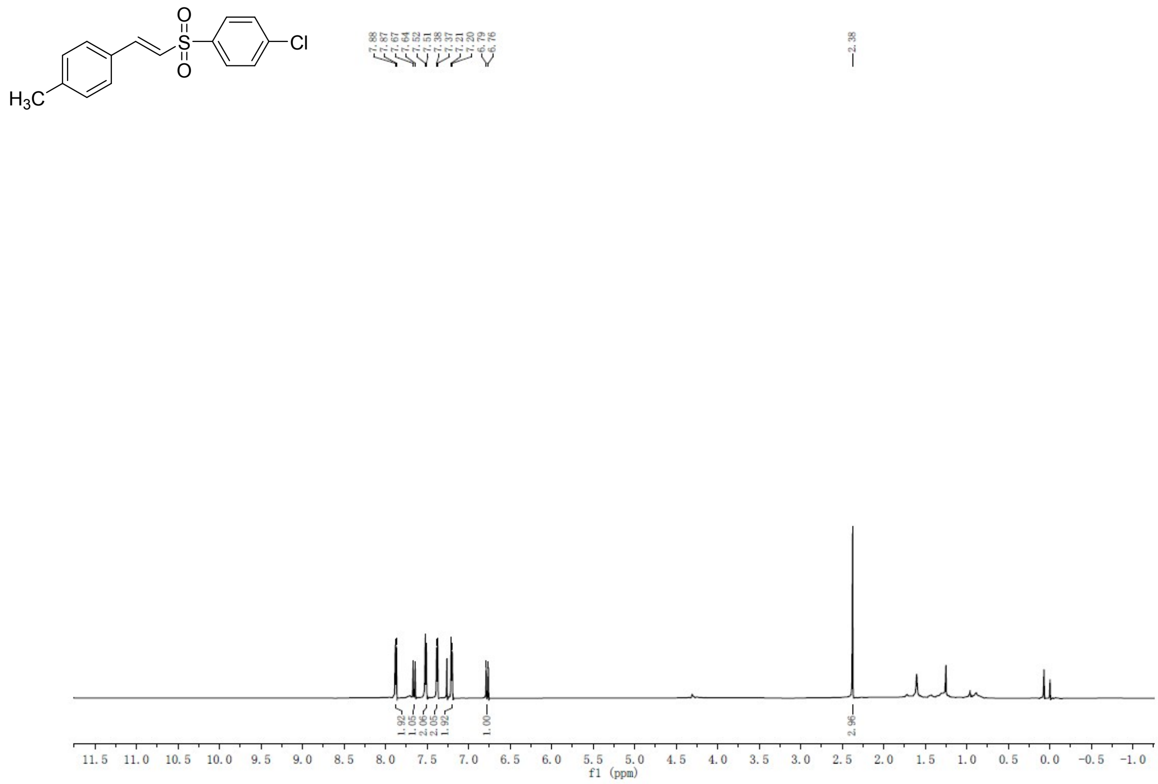

8.06
8.04
7.89
7.88
7.62
7.61
7.53
7.52
7.48
7.47
7.32
7.30
7.29
7.25
7.24
6.82
6.79
1.02
1.97
1.01
2.06
1.01
1.06
1.22
1.00
f1 (ppm)

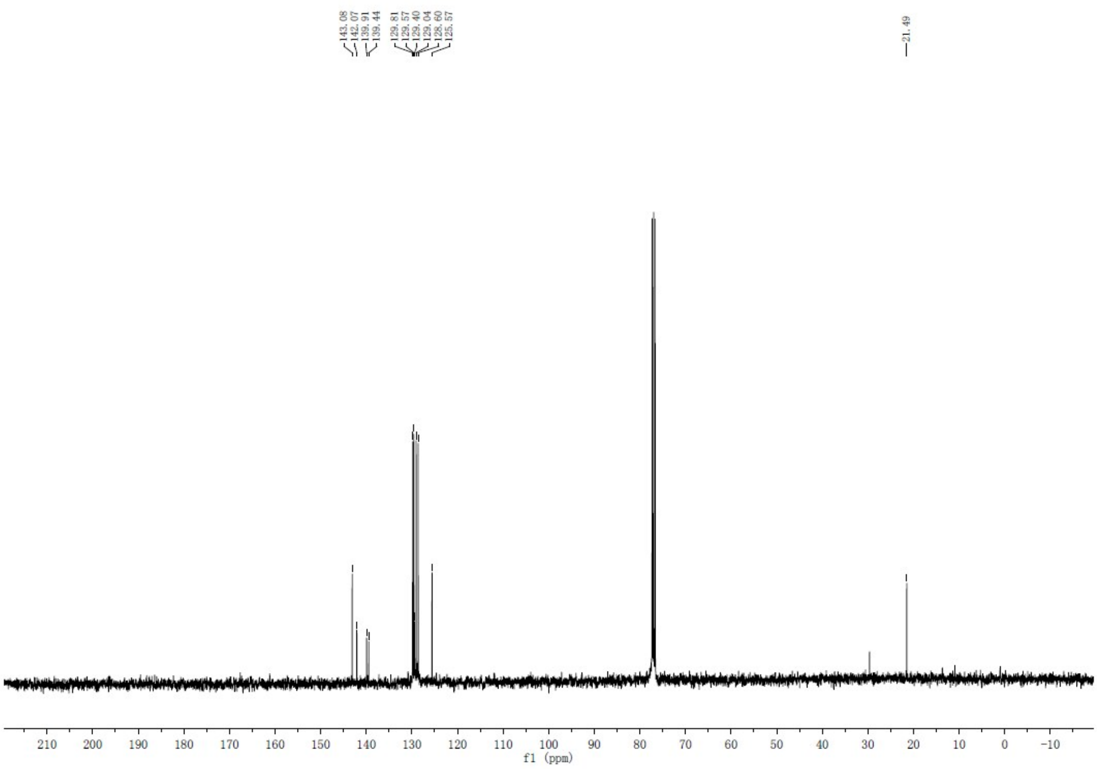

141.52
140.28
138.79
133.65
132.34
132.15
129.76
129.70
129.30
128.23
127.83
125.60
f1 (ppm)

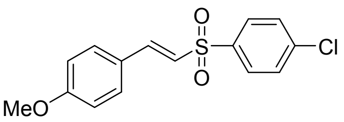


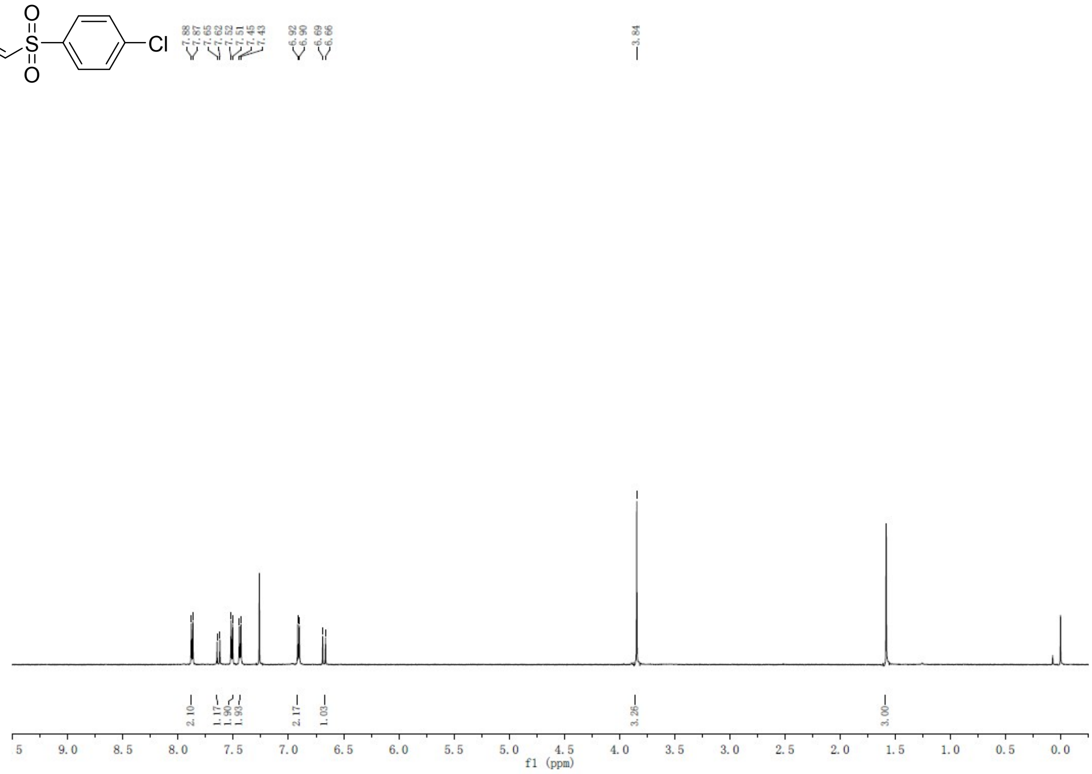


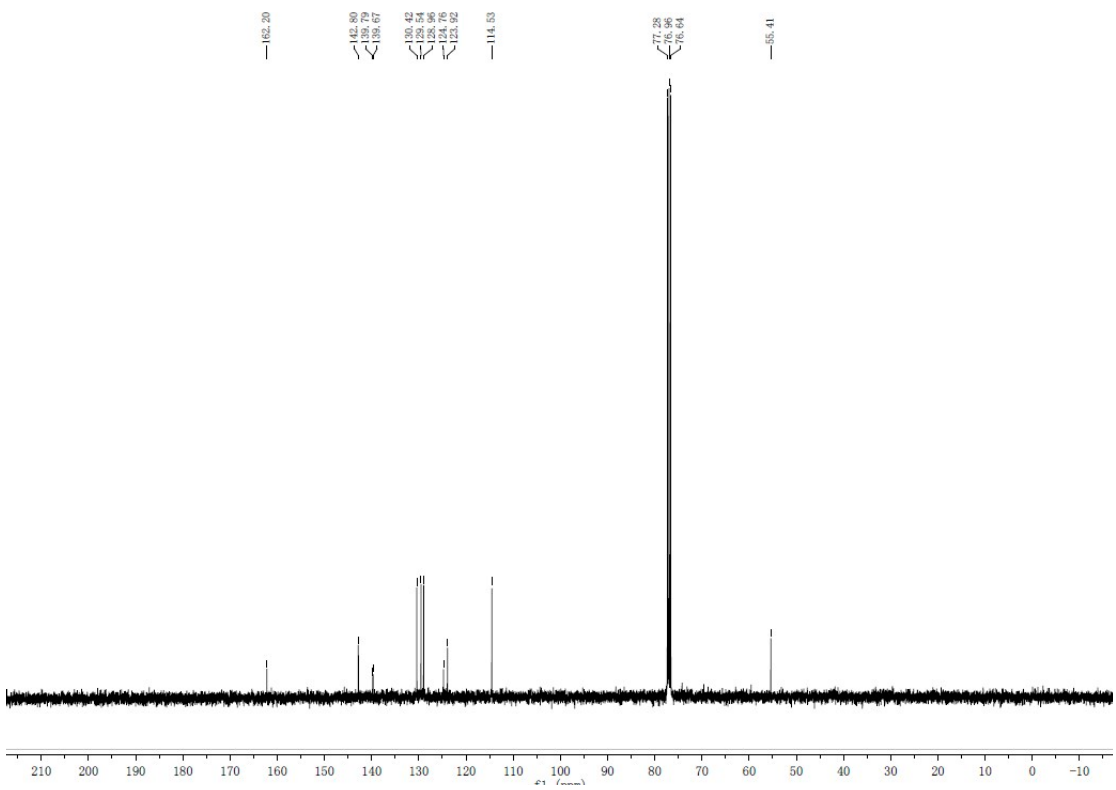


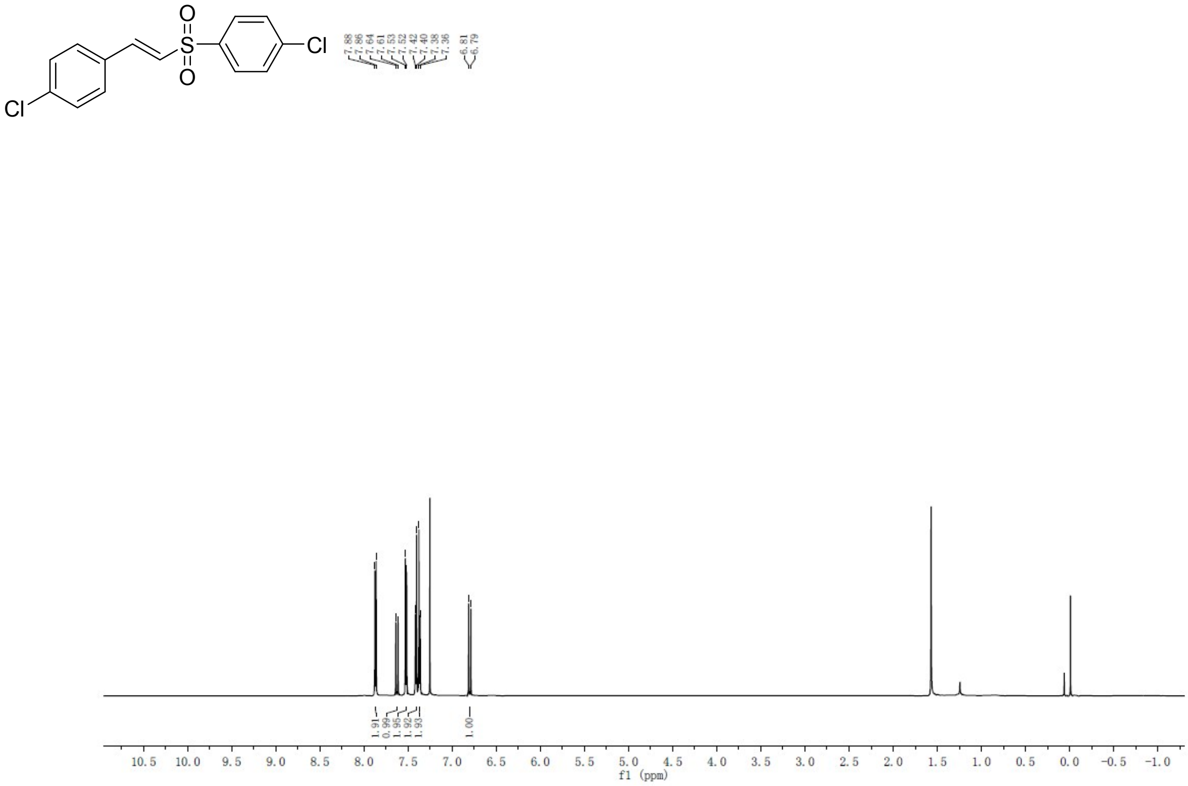

H3C
O
S
O
Cl
7.88
7.87
7.67
7.64
7.52
7.51
7.38
7.37
7.21
7.20
6.79
6.76
2.38
1.92
1.05
2.06
2.05
1.92
1.00
2.96
11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)


143.08
142.07
139.91
139.44
129.81
129.57
129.40
129.04
128.60
125.57
21.49
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

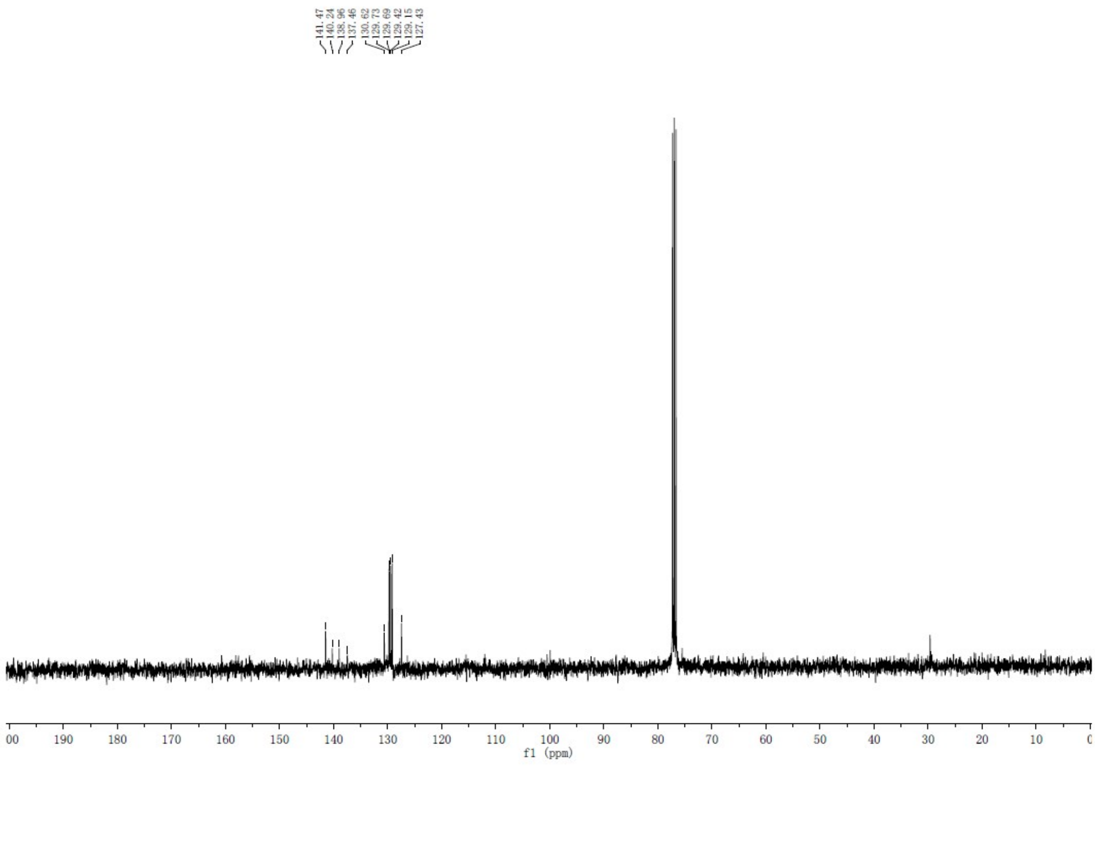




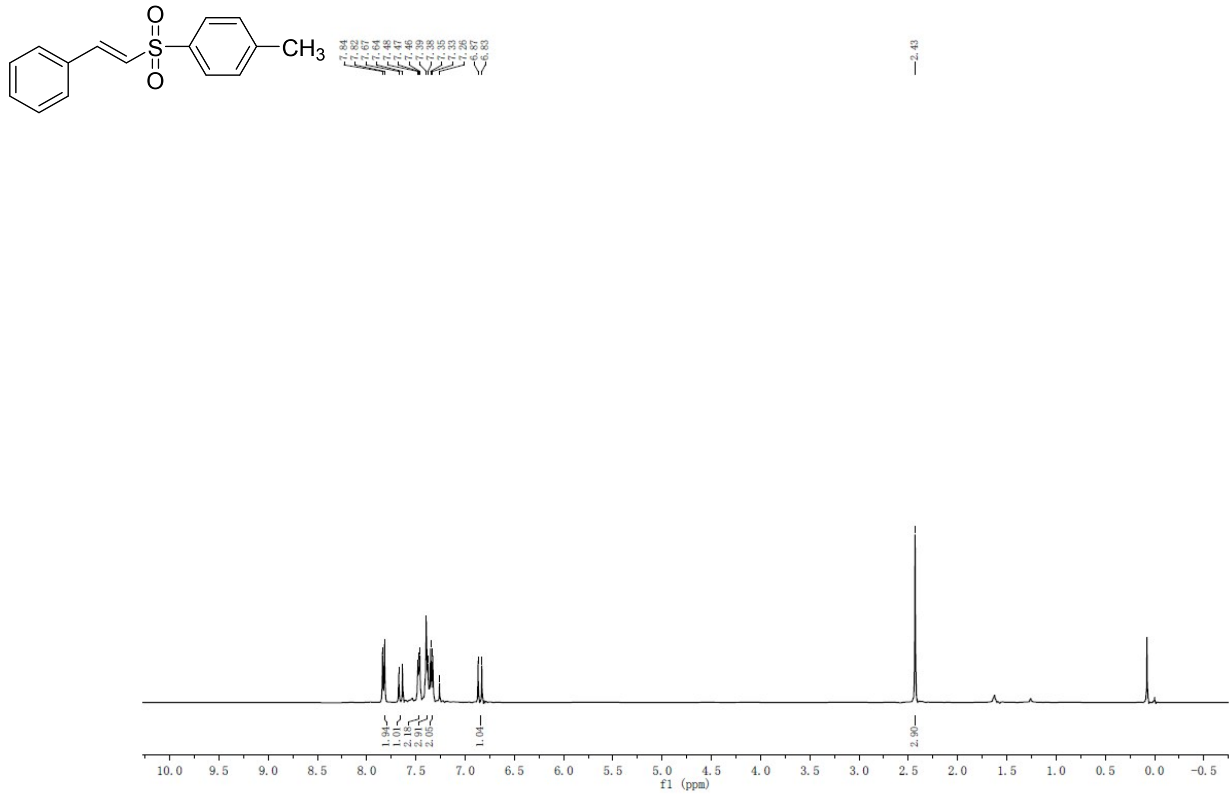


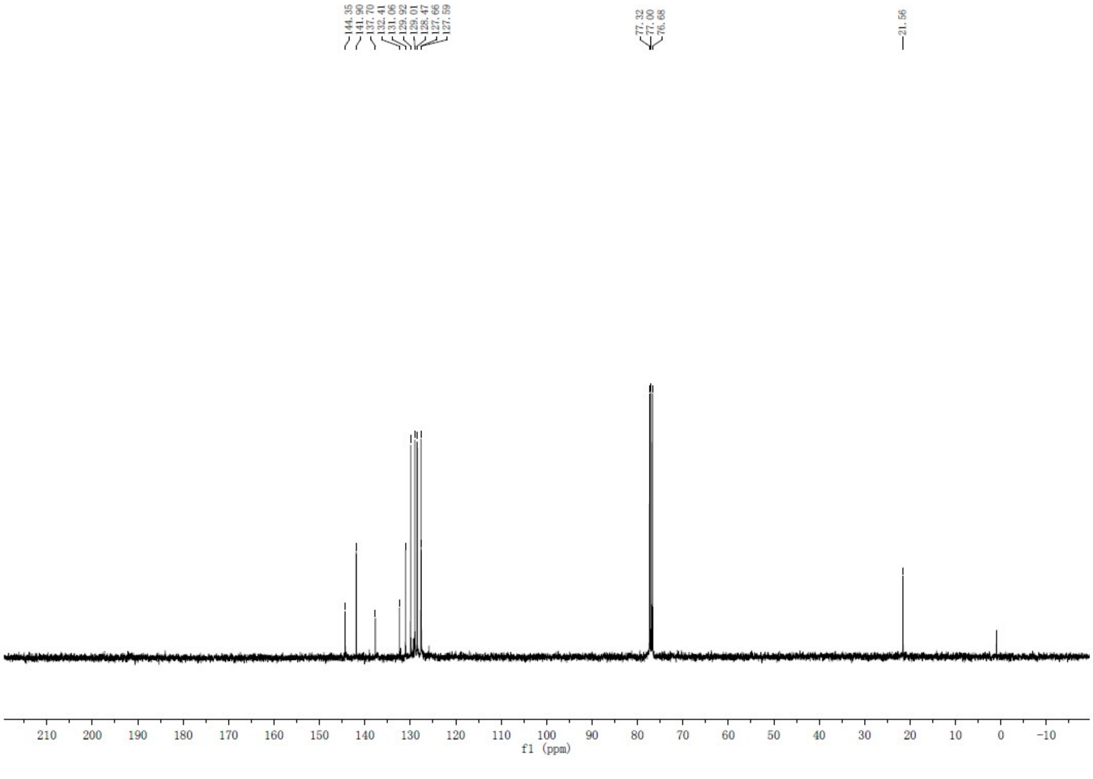


Cl
O
S
O
Cl
7.88
7.86
7.64
7.61
7.53
7.52
7.42
7.40
7.38
7.36
6.81
6.79
1.91
0.99
1.95
1.92
1.93
1.00
f1 (ppm)

141.47
140.24
138.96
137.46
130.62
129.73
129.69
129.42
129.15
127.43
f1 (ppm)


CH3
7.84
7.82
7.67
7.64
7.48
7.47
7.46
7.39
7.38
7.35
7.33
7.26
6.87
6.83
2.43
1.94
1.01
2.18
2.91
2.05
1.04
2.90
f1 (ppm)


144.35
141.90
137.70
132.41
131.06
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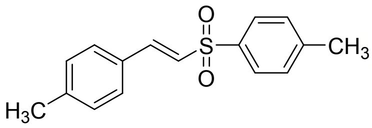
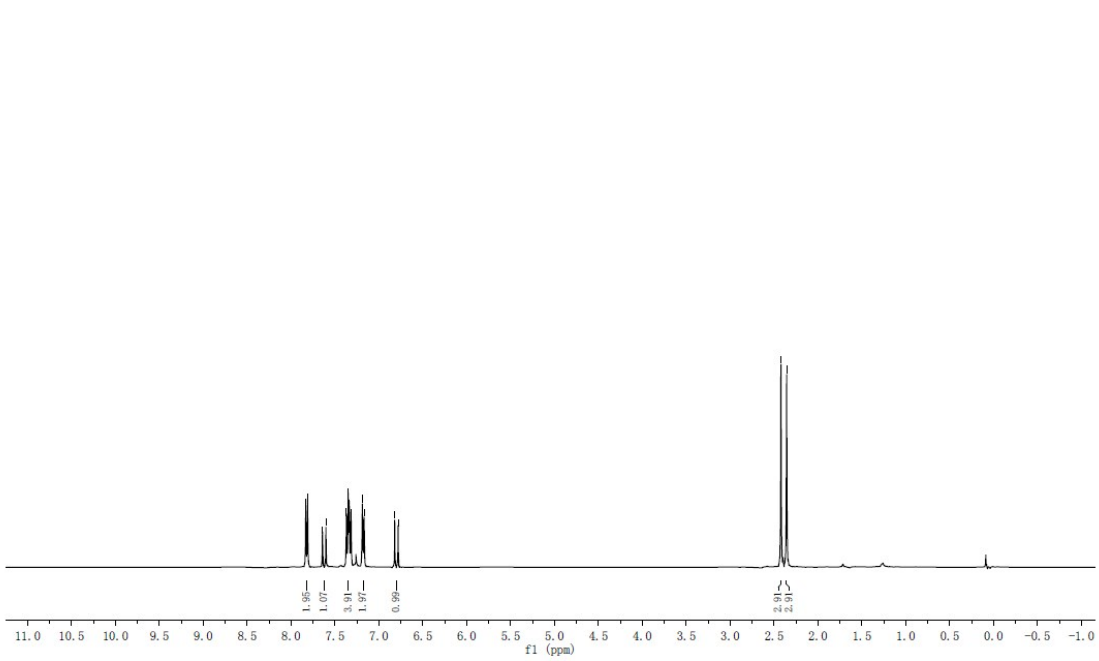
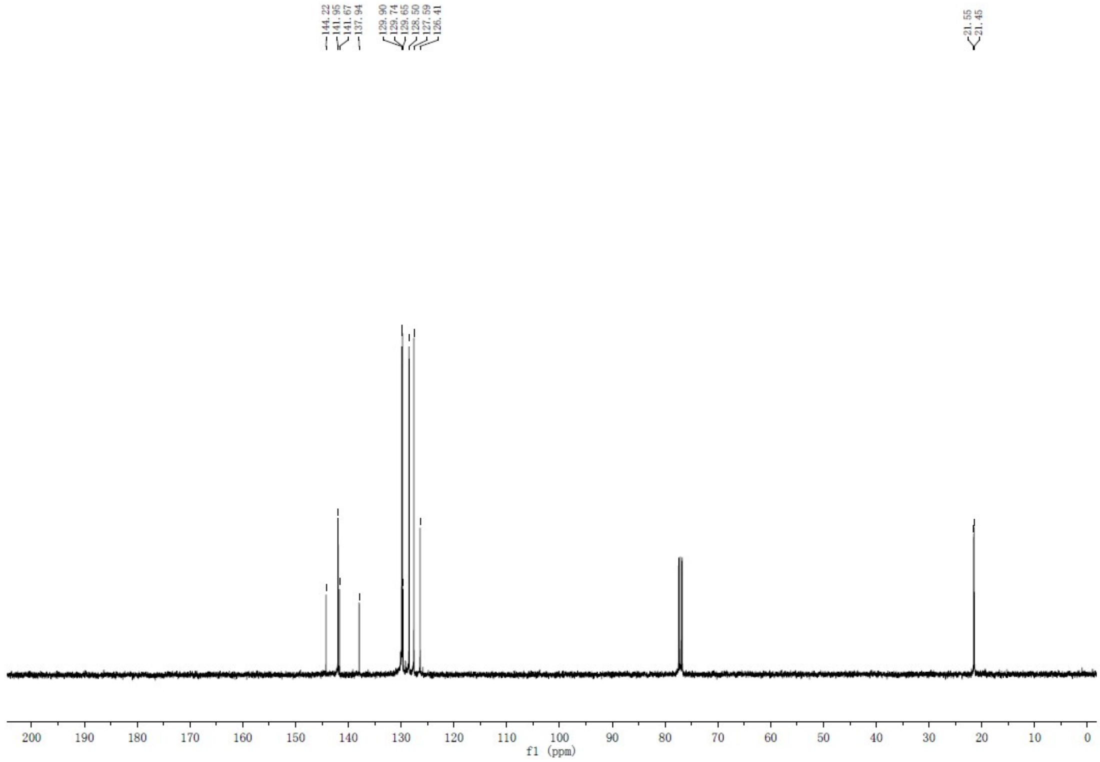
129.01
128.47
127.66
127.59
77.32
77.00
76.68
21.56
f1 (ppm)


O
S
O
CH3
H3C


7.83
7.81
7.64
7.60
7.37
7.35
7.34
7.32
7.19
7.17
6.82
6.78
2.42
2.36
1.95
1.07
3.91
1.97
0.99
2.91
2.91
f1 (ppm)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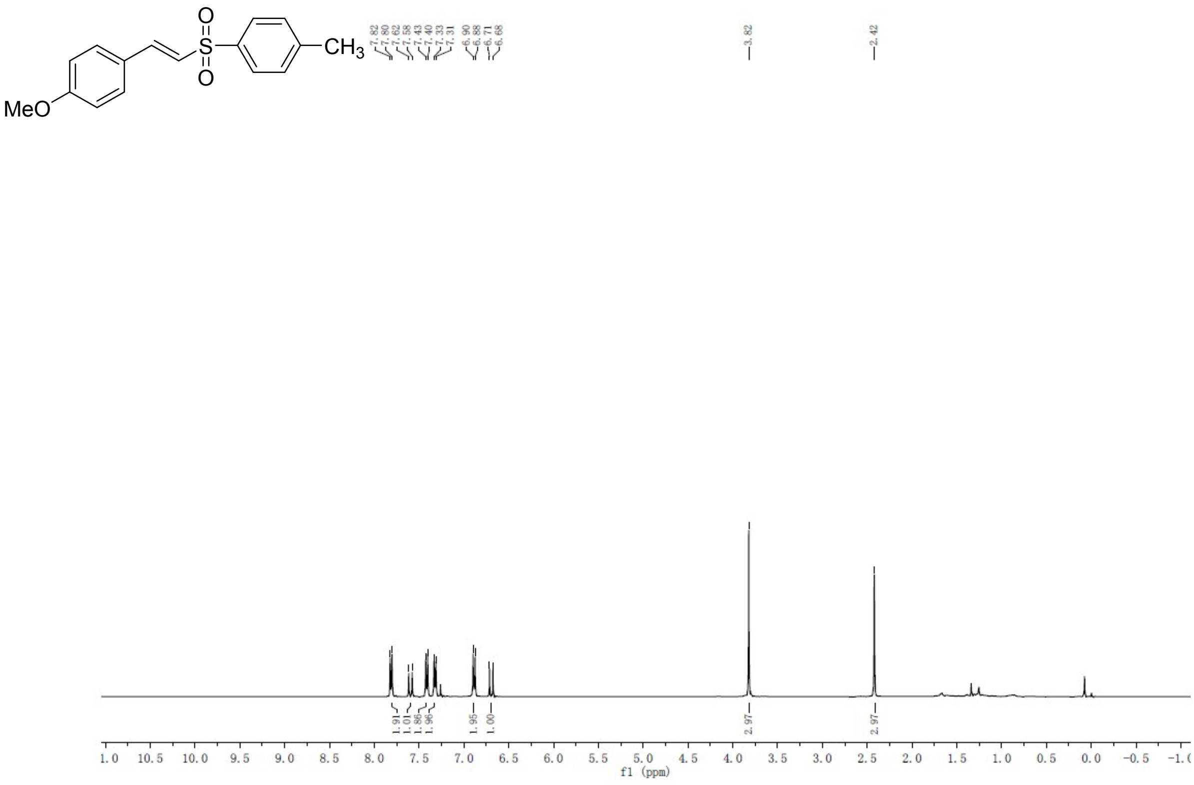
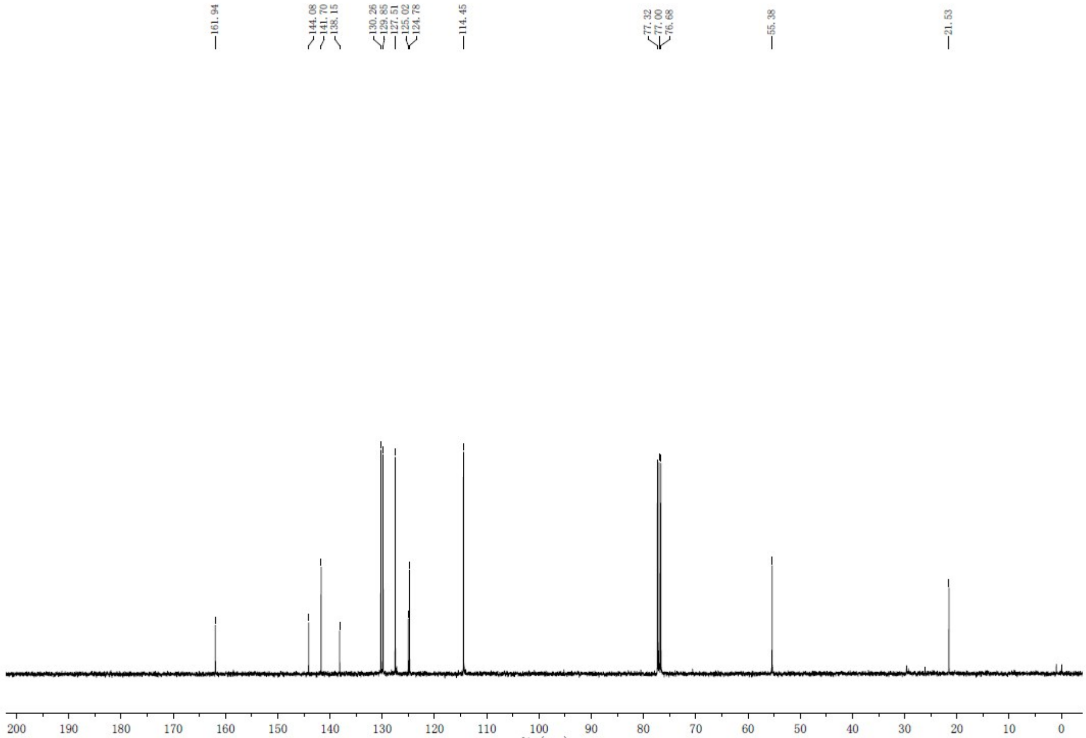
129.65
128.50
127.59
126.41
21.55
21.45
f1 (ppm)


MeO
CH3
7.82
7.80
7.62
7.58
7.43
7.40
7.33
7.31
6.90
6.88
6.71
6.68
3.82
2.42
1.91
1.01
1.86
1.96
1.95
1.00
2.97
2.97
f1 (ppm)


161.94
144.08
141.70
138.15
130.26
129.85
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125.02
124.78
114.45
77.32
77.00
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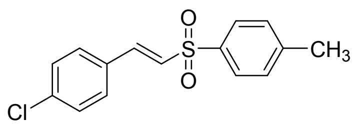
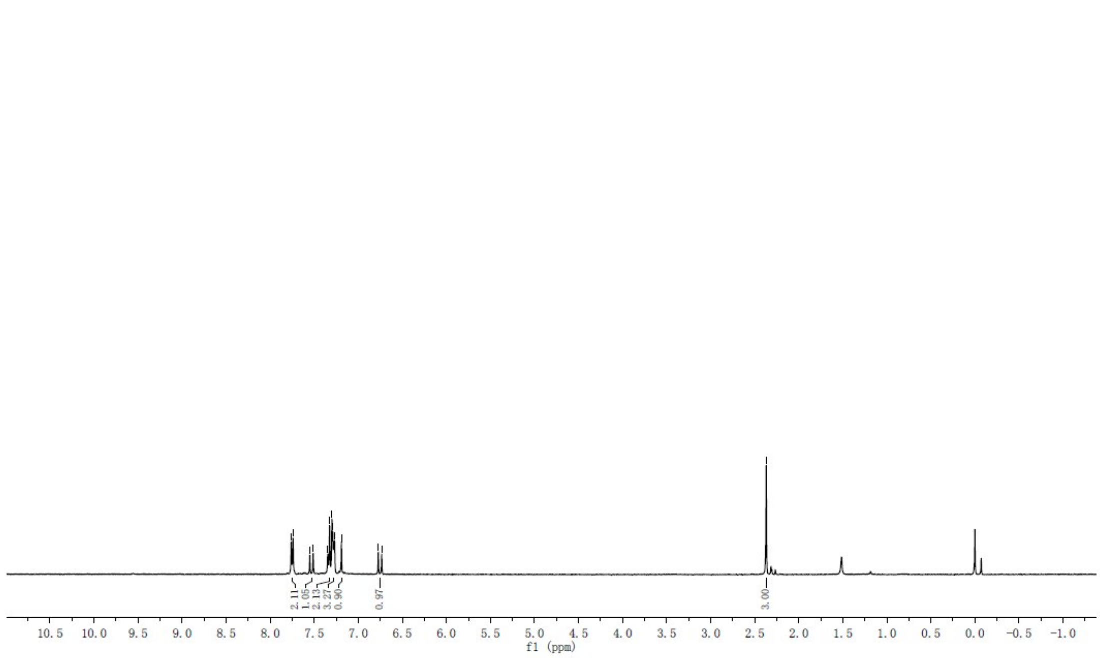
55.38
21.53
f1 (ppm)


CH3
Cl
O
S
O


7.76
7.74
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7.35
7.32
7.30
7.29
7.27
7.19
6.77
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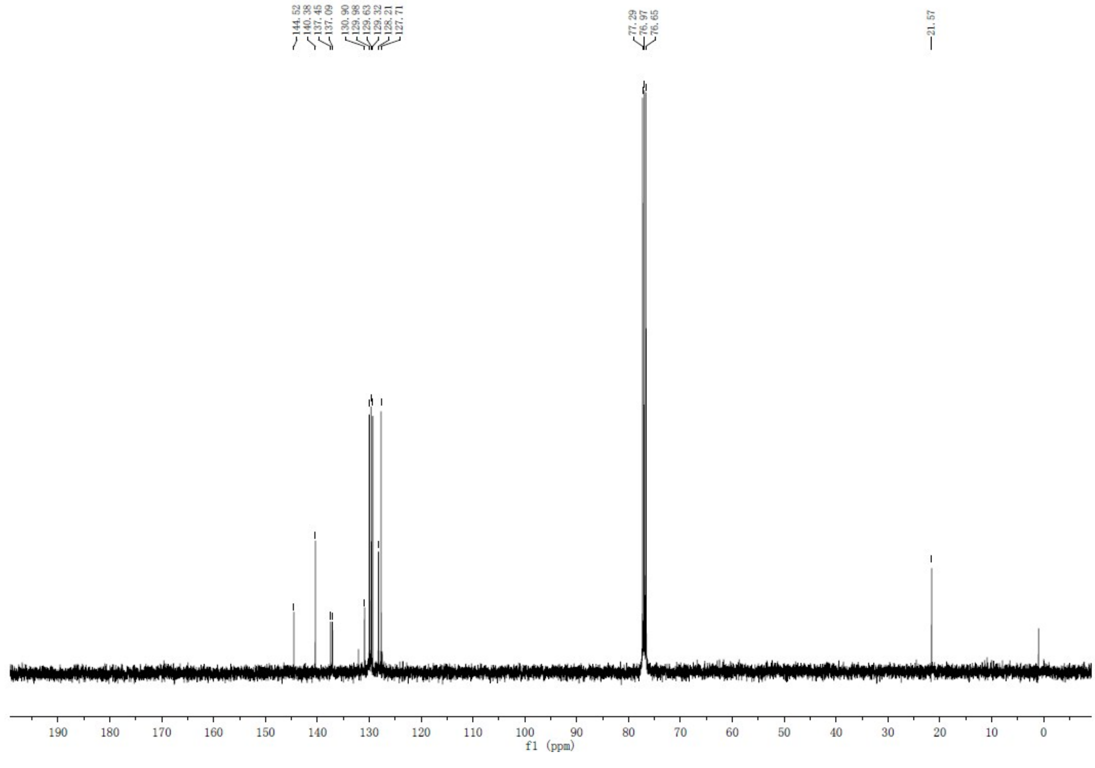
2.37
2.11
1.05
2.11
3.27
0.90
0.97
3.00
f1 (ppm)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140.38
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129.32
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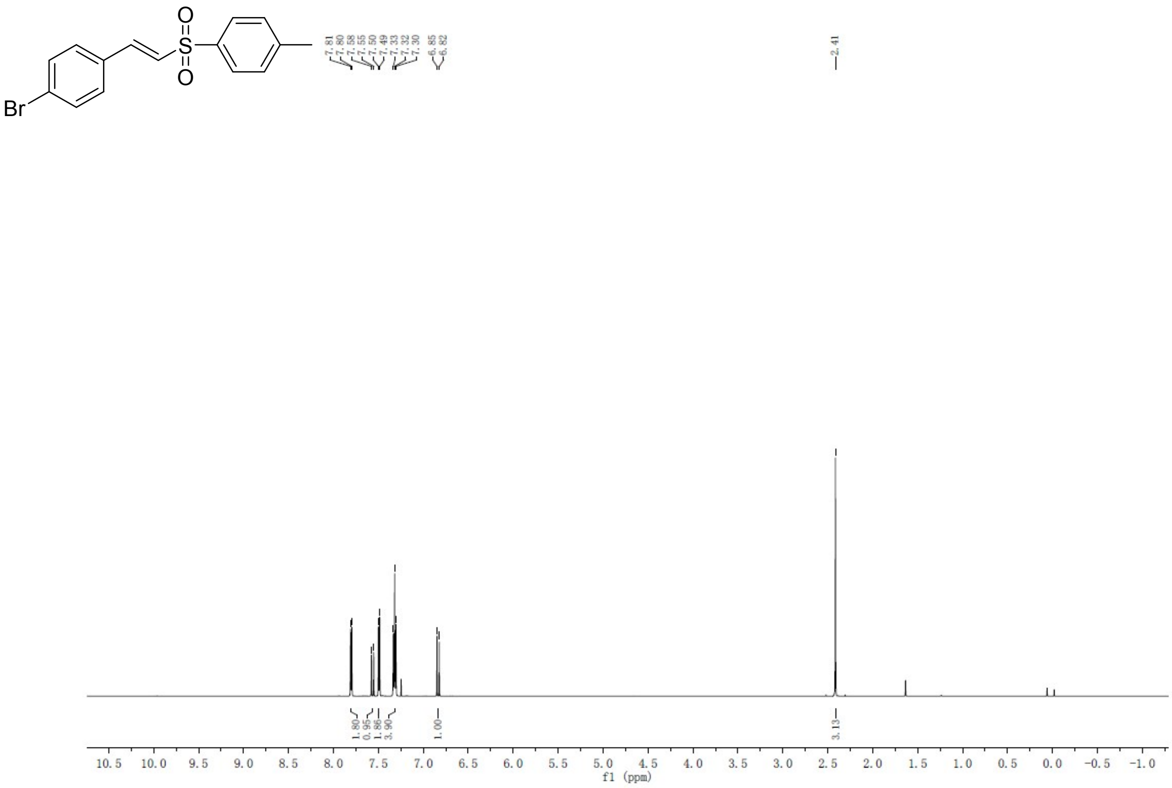
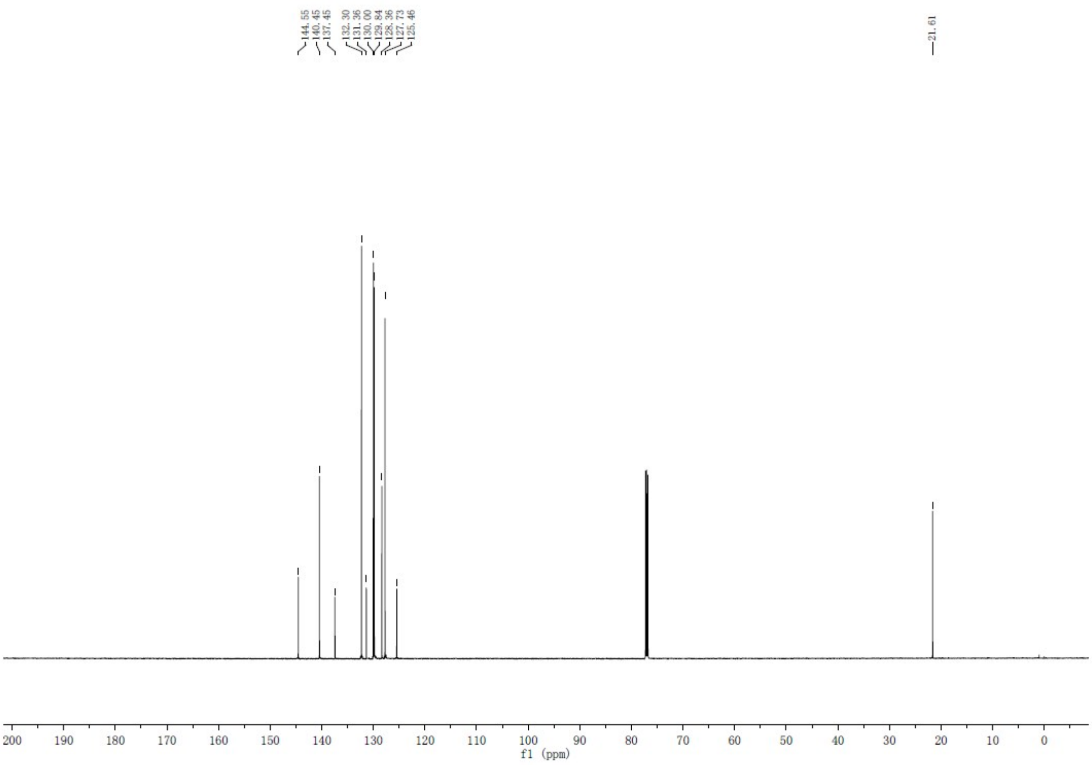
76.65
21.57
f1 (ppm)



Br
O
S
O
7.81
7.80
7.58
7.55
7.50
7.49
7.33
7.32
7.30
6.85
6.82
2.41
1.80
0.95
1.86
3.90
1.00
3.13
f1 (ppm)

144.55
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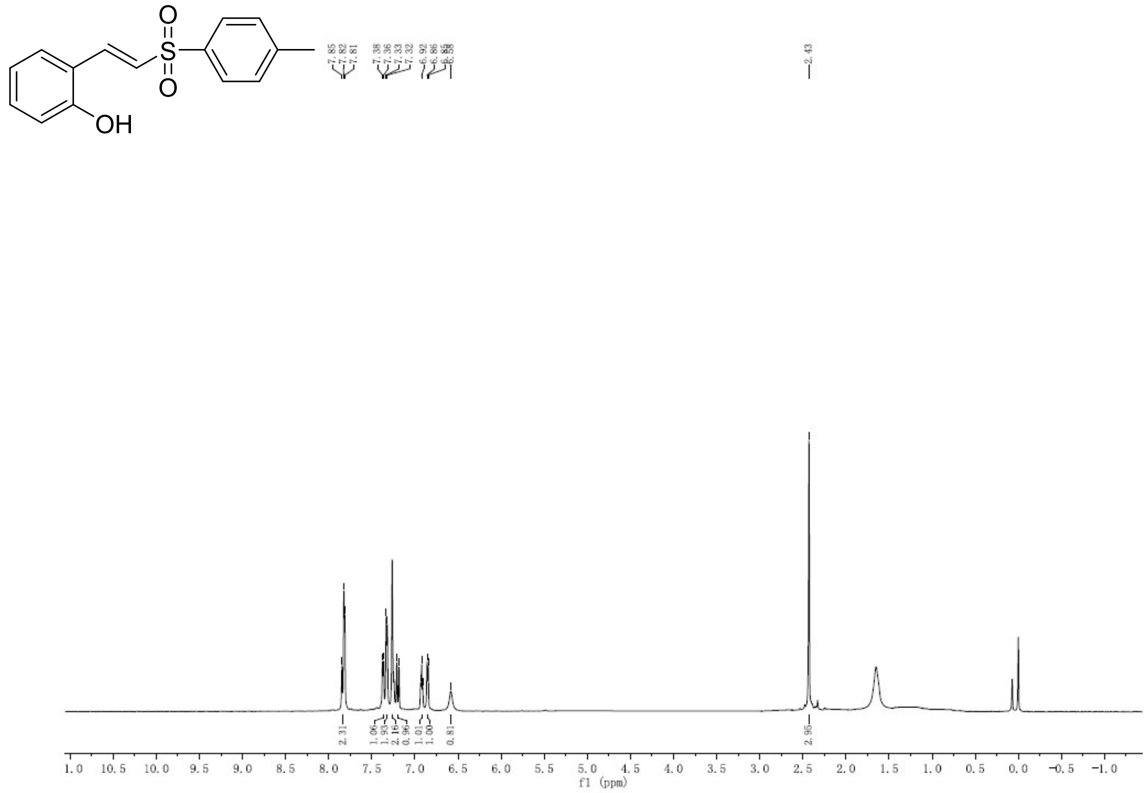
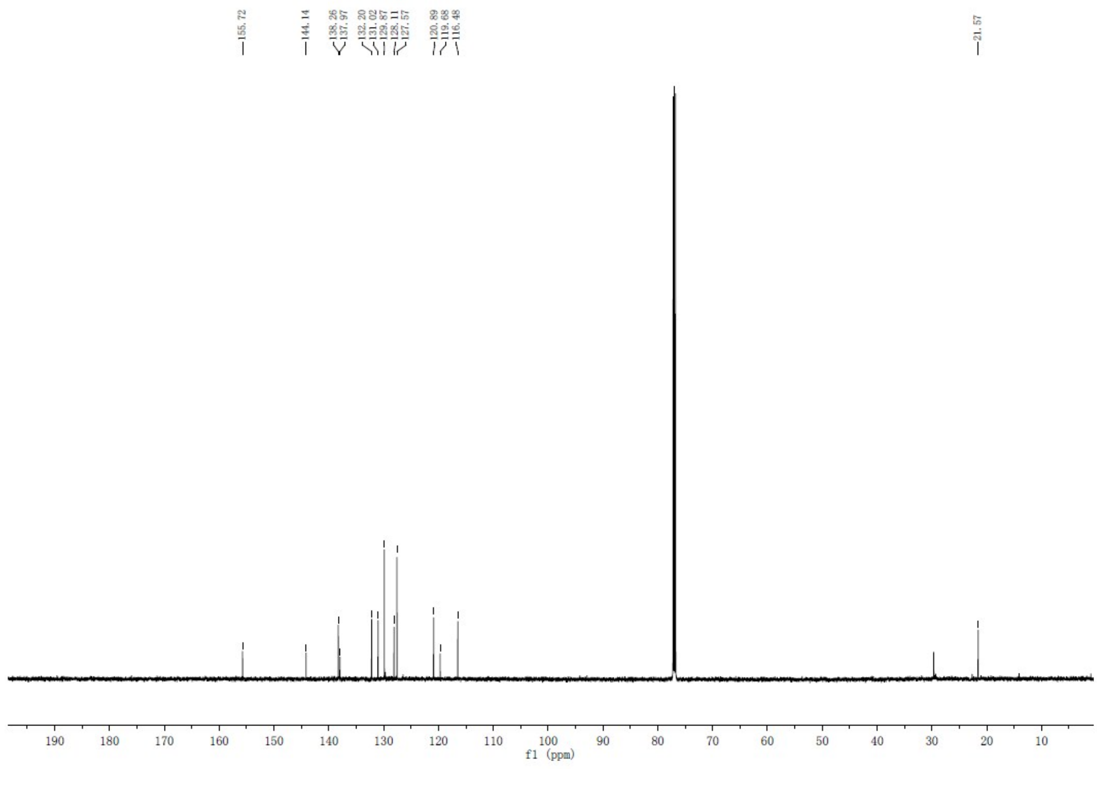
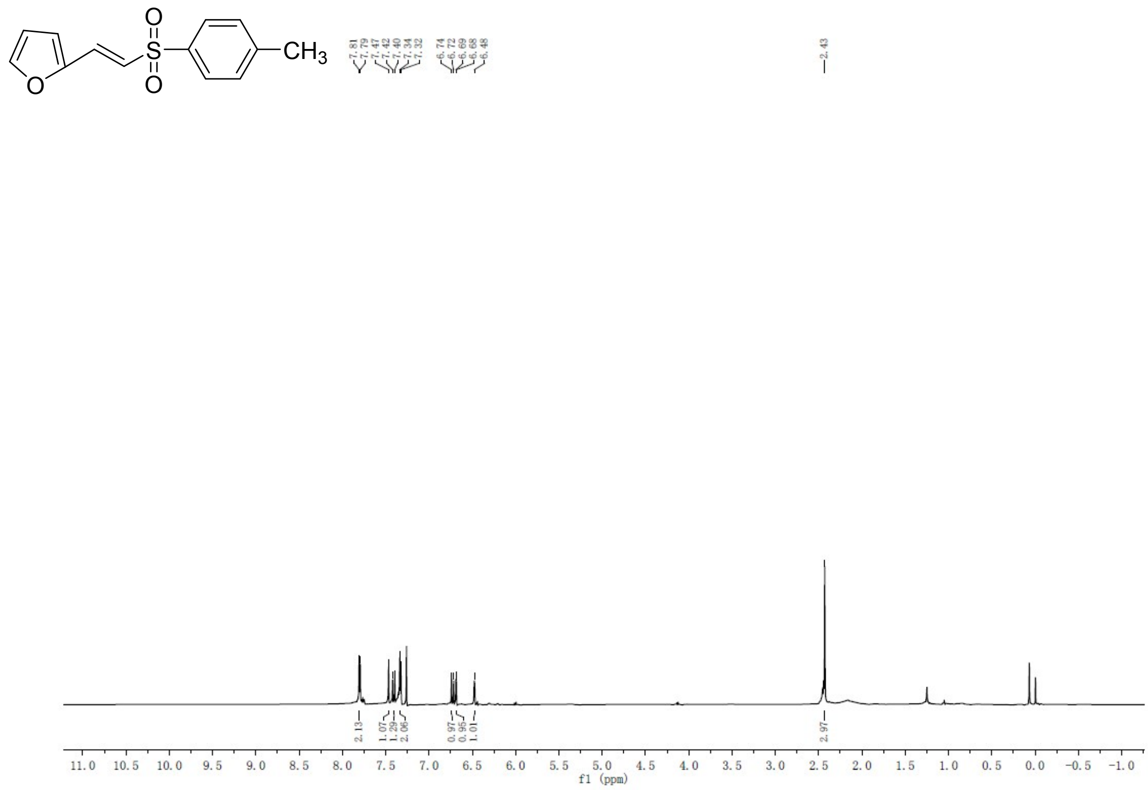
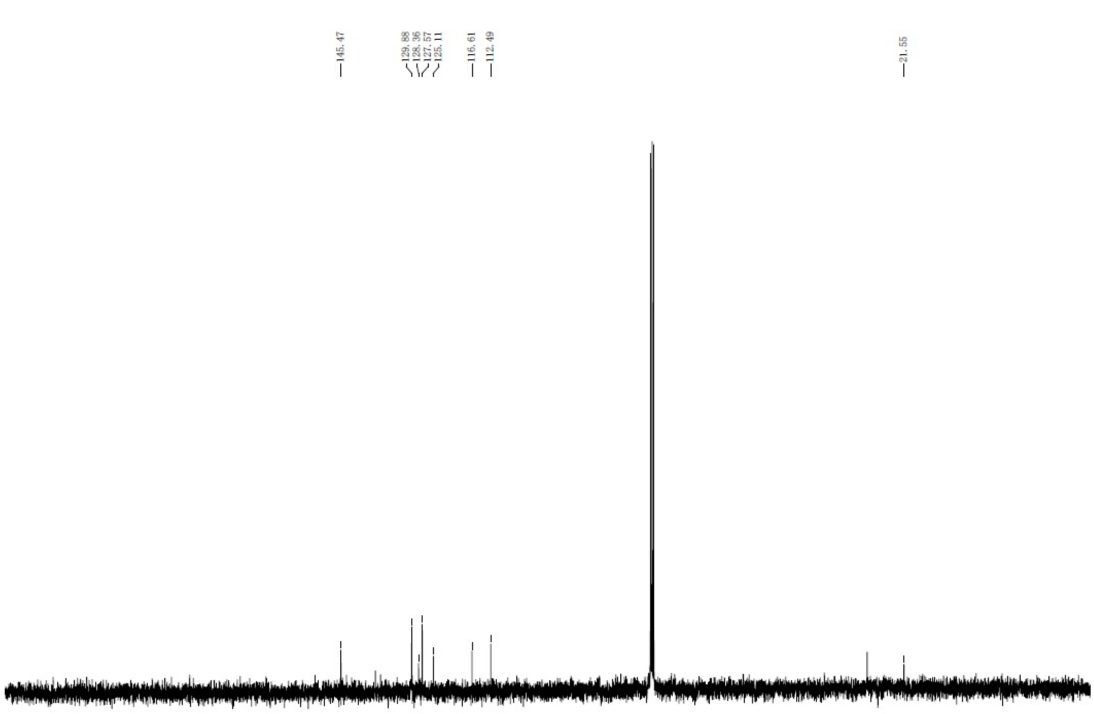
131.36
130.00
129.84
128.36
127.73
125.46
21.61
f1 (ppm)



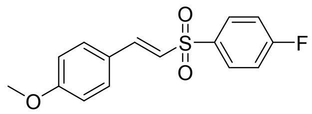




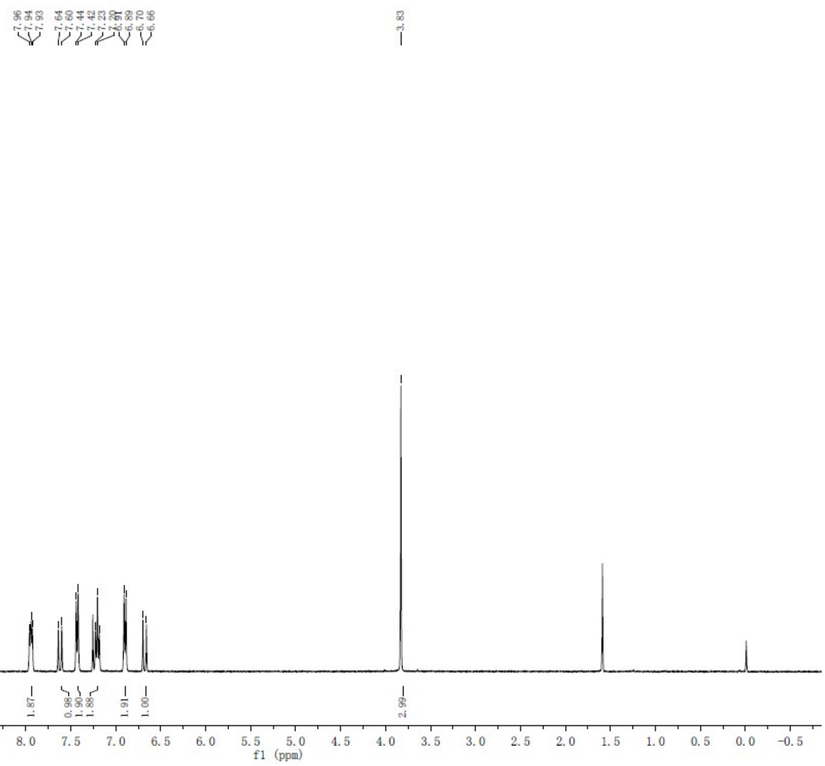
O
S
O
O
CH3
7.81
7.79
7.47
7.42
7.40
7.34
7.32
6.74
6.72
6.69
6.68
6.48
2.43
2.13
1.07
1.29
2.06
0.97
0.95
1.01
2.97
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)

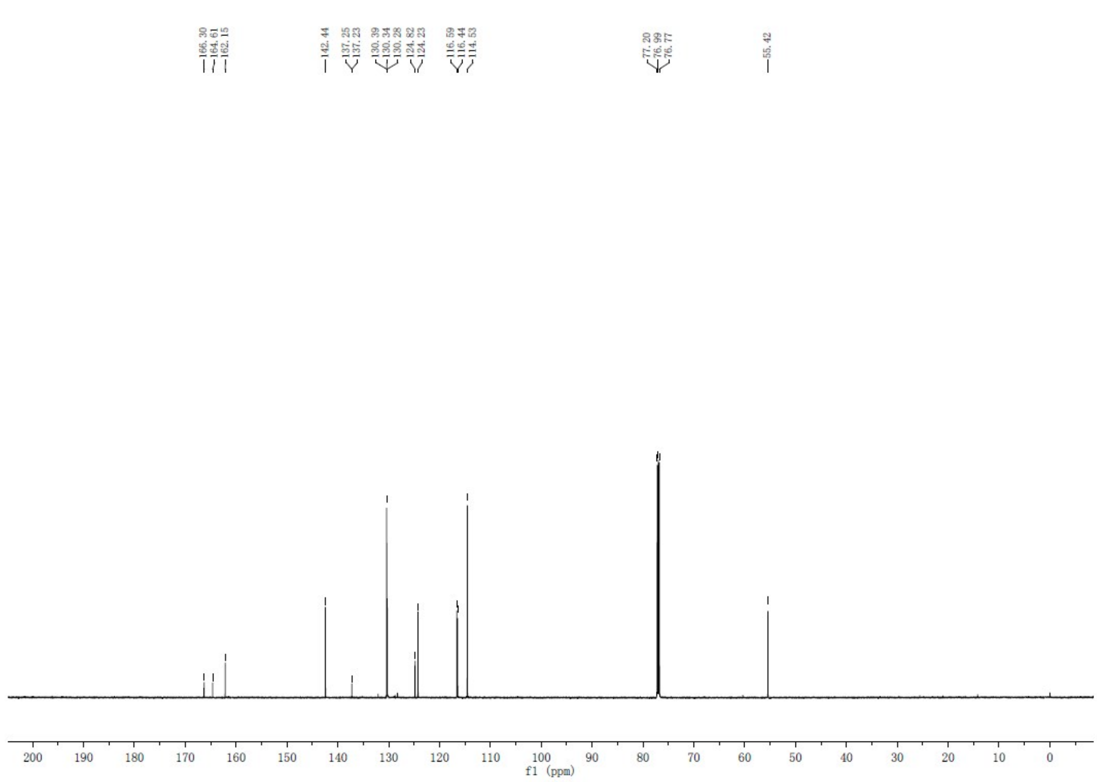
145.47
129.88
128.36
127.57
125.11
116.61
112.49
21.55
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)



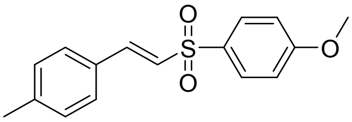
O
S
O
F
O

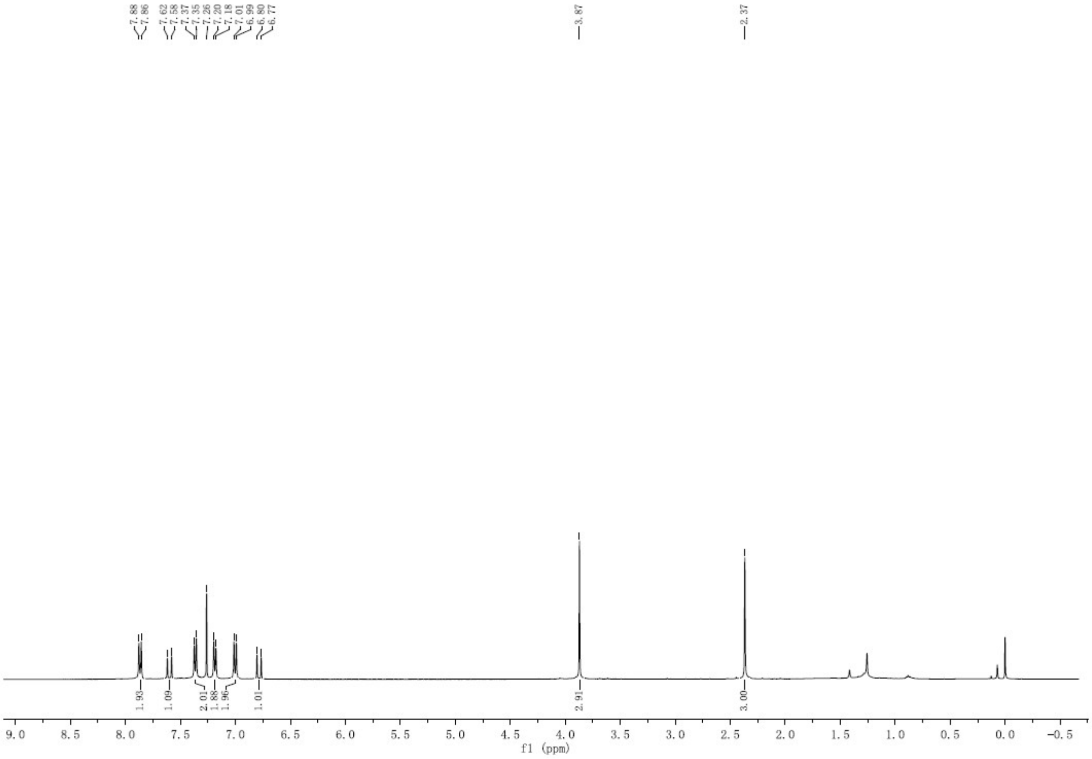



7.96
7.94
7.93
7.64
7.60
7.44
7.42
7.23
7.20
6.91
6.89
6.70
6.66
3.83
1.87
0.98
1.90
1.88
1.91
1.00
2.99
f1 (ppm)

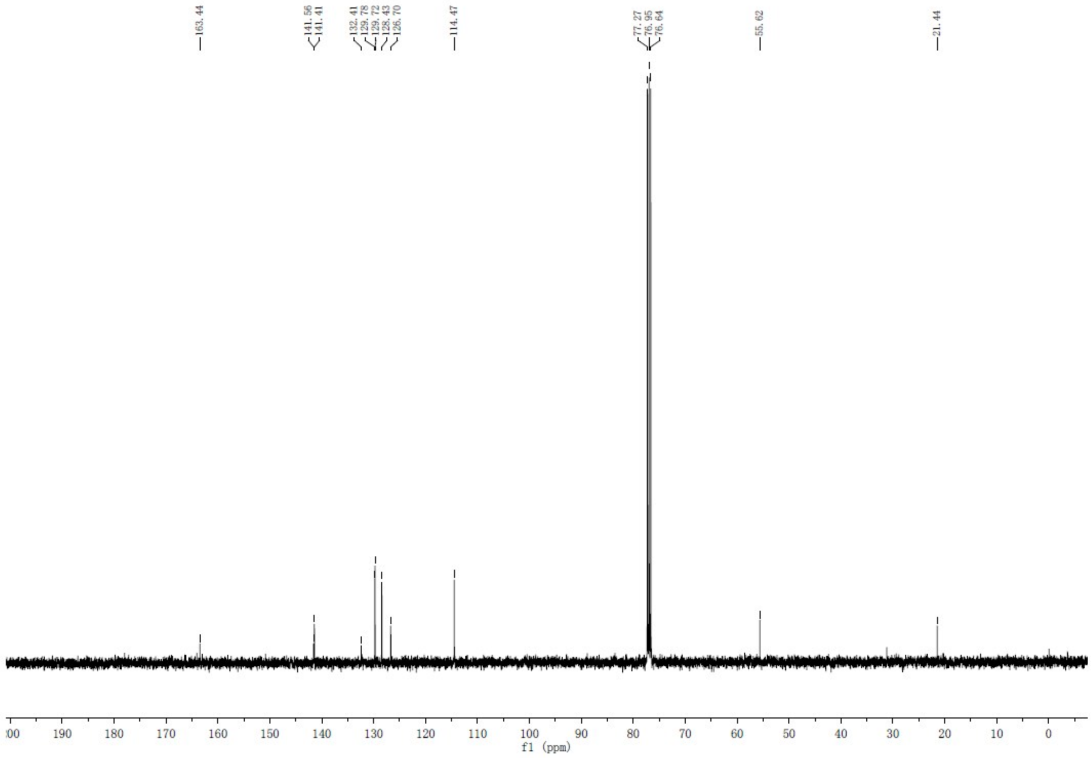



166.30
164.61
162.15
142.44
137.25
137.23
130.39
130.34
130.28
124.82
124.23
116.59
116.44
114.53
77.20
76.99
76.77
55.42
f1 (ppm)

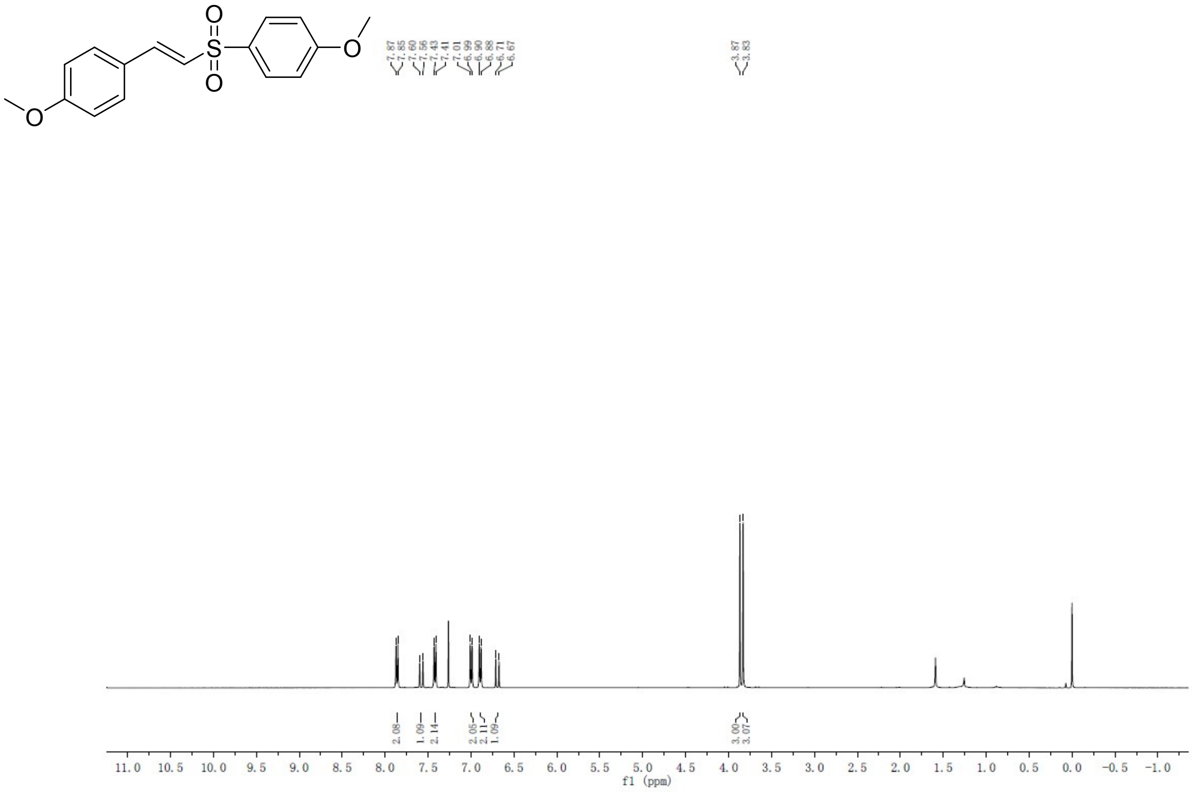


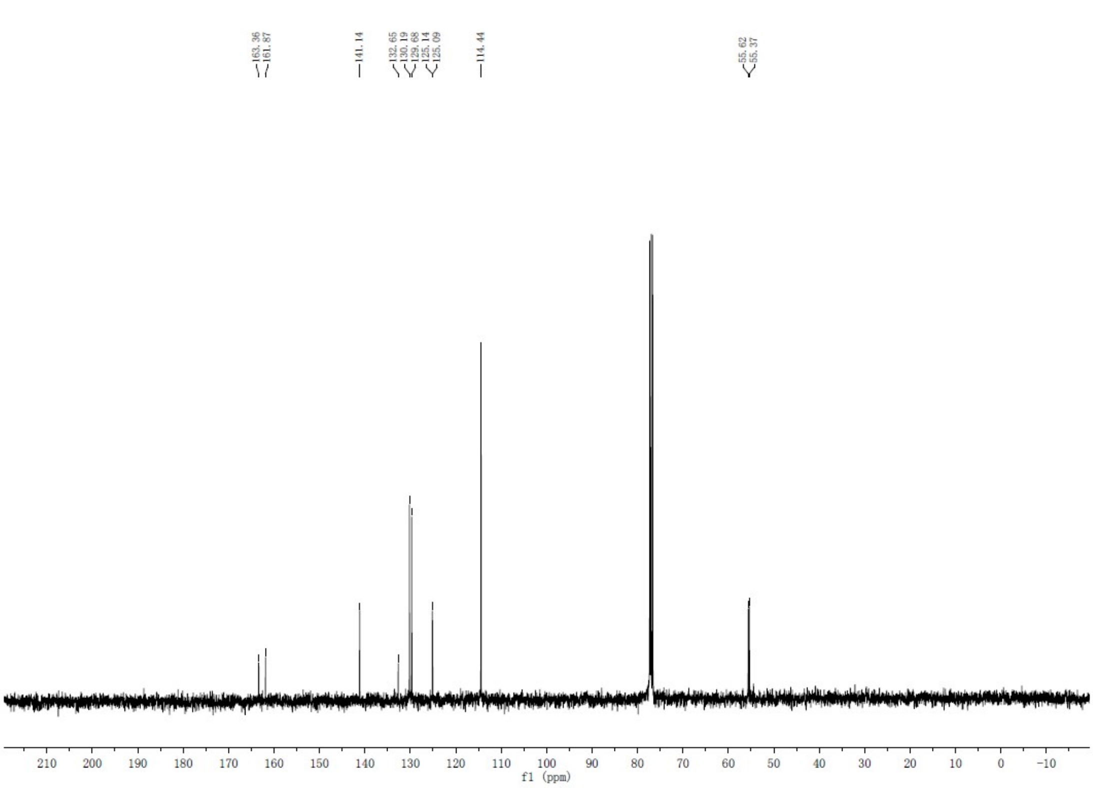


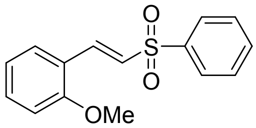
7.88
7.86
7.62
7.58
7.37
7.35
7.26
7.20
7.18
7.01
6.99
6.80
6.77
3.87
2.37
1.93
1.09
2.01
1.88
1.96
1.01
2.91
3.00
f1 (ppm)

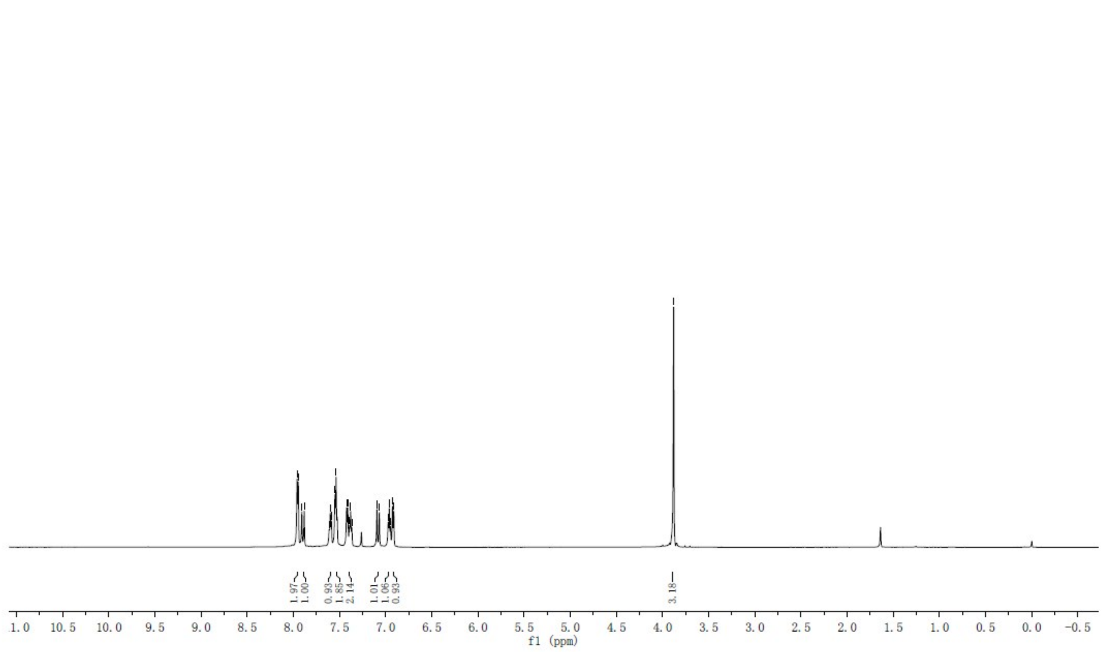



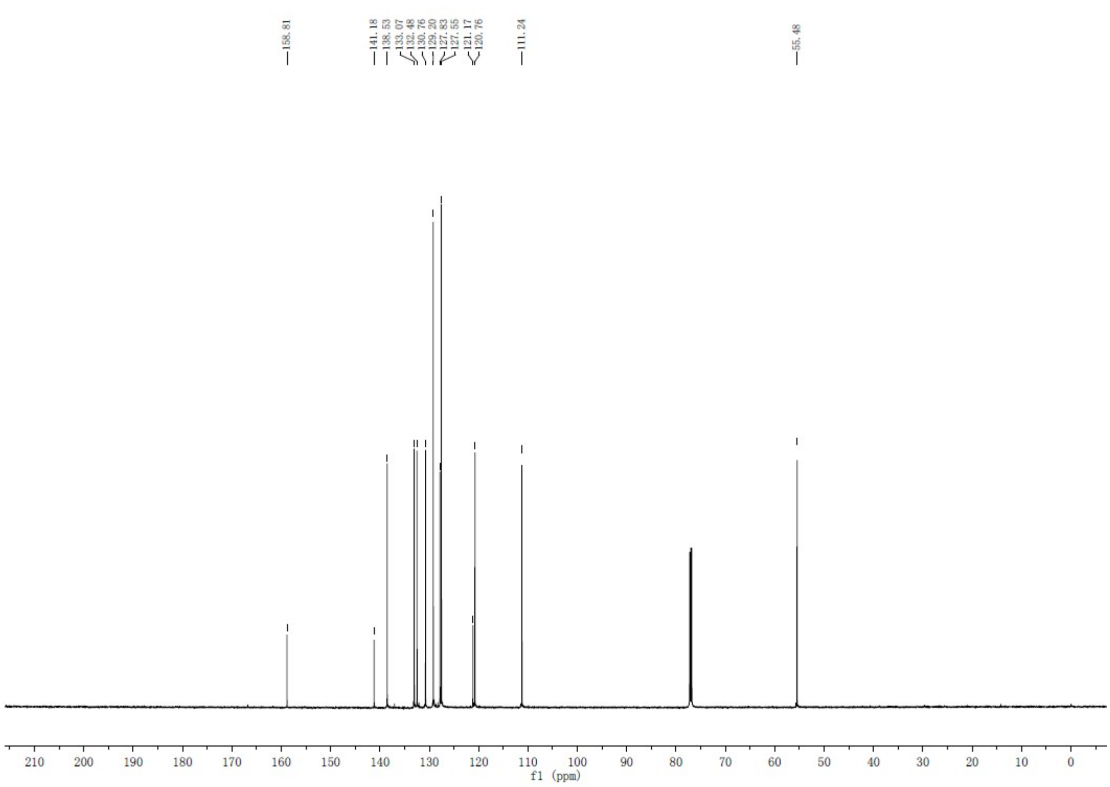
163.44
141.56
141.41
132.41
129.78
129.72
128.43
126.70
114.47
77.27
76.95
76.64
55.62
21.44
f1 (ppm)


f1 (ppm)


f1 (ppm)


OMe


7.96
7.95
7.91
7.88
7.55
7.54
7.42
3.88
1.97
1.00
0.93
1.85
2.14
1.01
1.06
0.93
3.18
f1 (ppm)


158.81
141.18
138.53
133.07
132.48
130.76
129.20
127.83
127.55
121.17
120.76
111.24
55.48
f1 (ppm)

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