Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information:

Carboxylation of Styrenes with CBr_4 and DMSO *via* Cooperative Photoredox and cobalt catalysis

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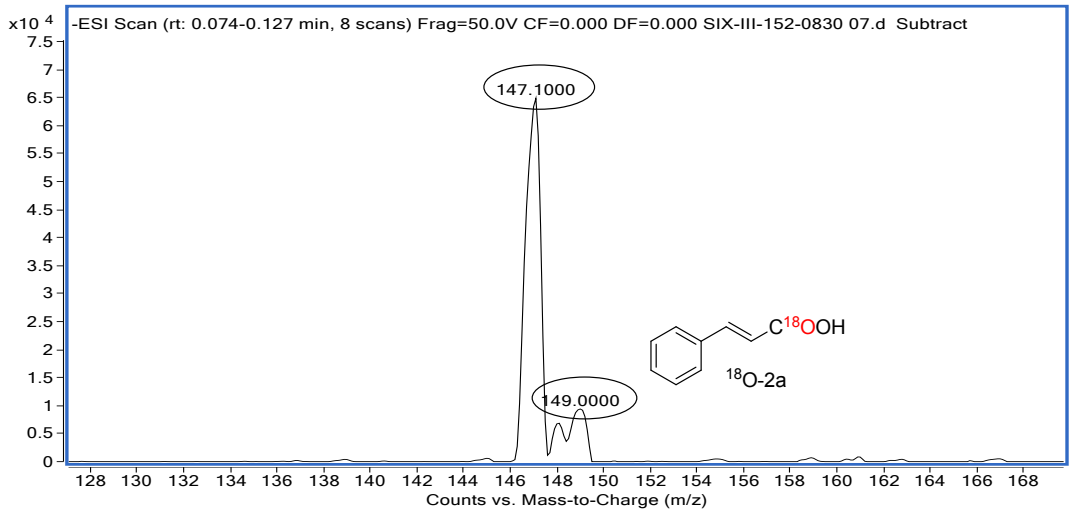
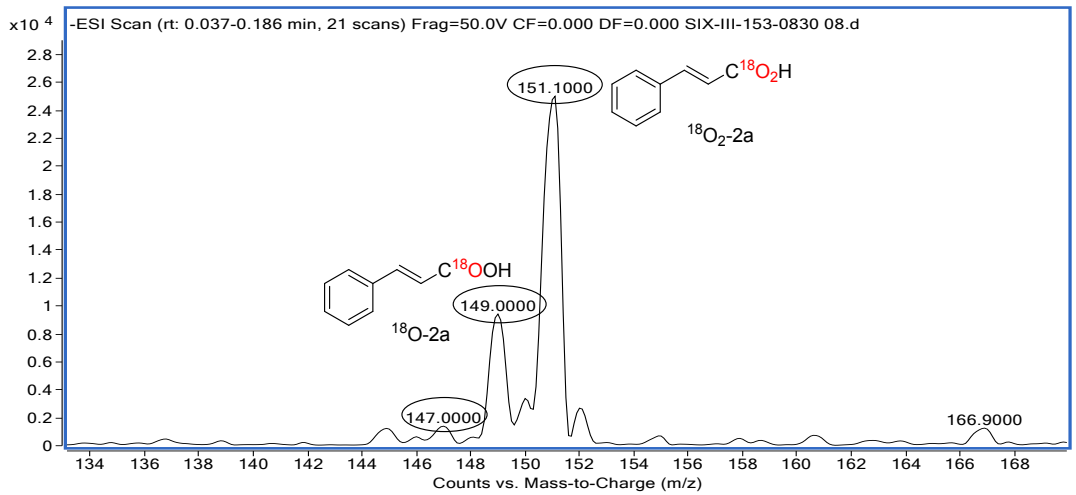
1. **^{18}O Labeling experiment**

ESI-MS analysis of Reaction with ^{18}O labeled H_2O:



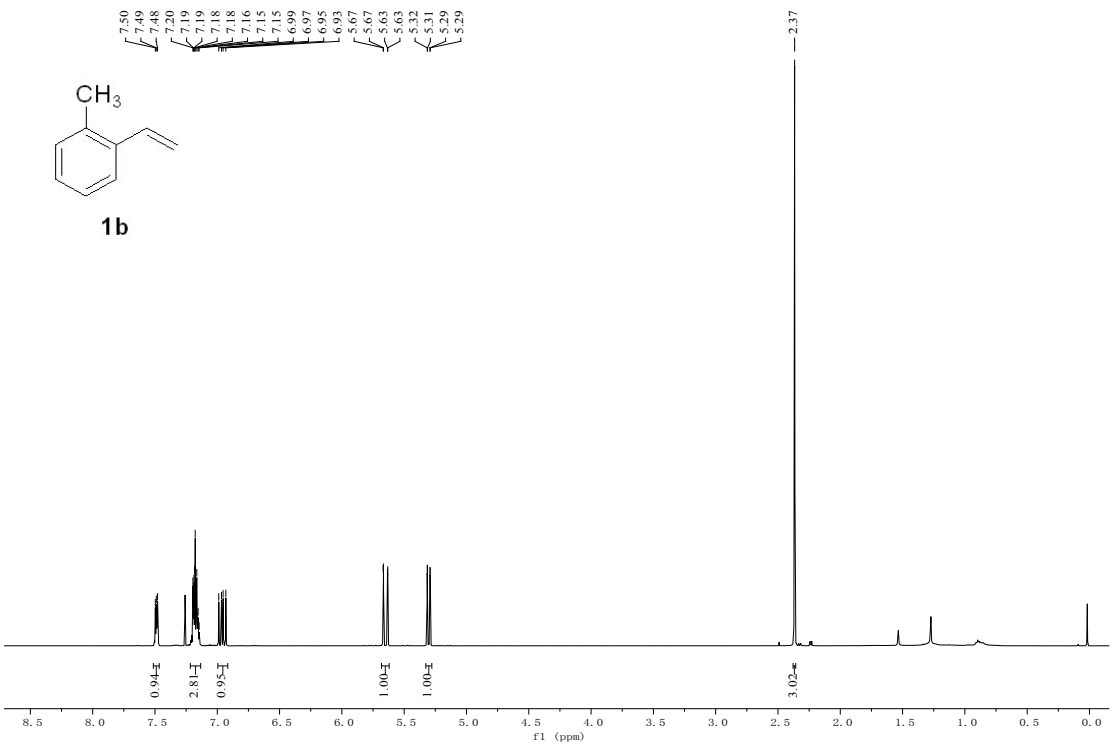
ESI-MS analysis of Reaction with ^{18}O labeled DMSO:



2. ^{1}H and ^{13}C NMR Spectral Charts for Compounds Synthesized

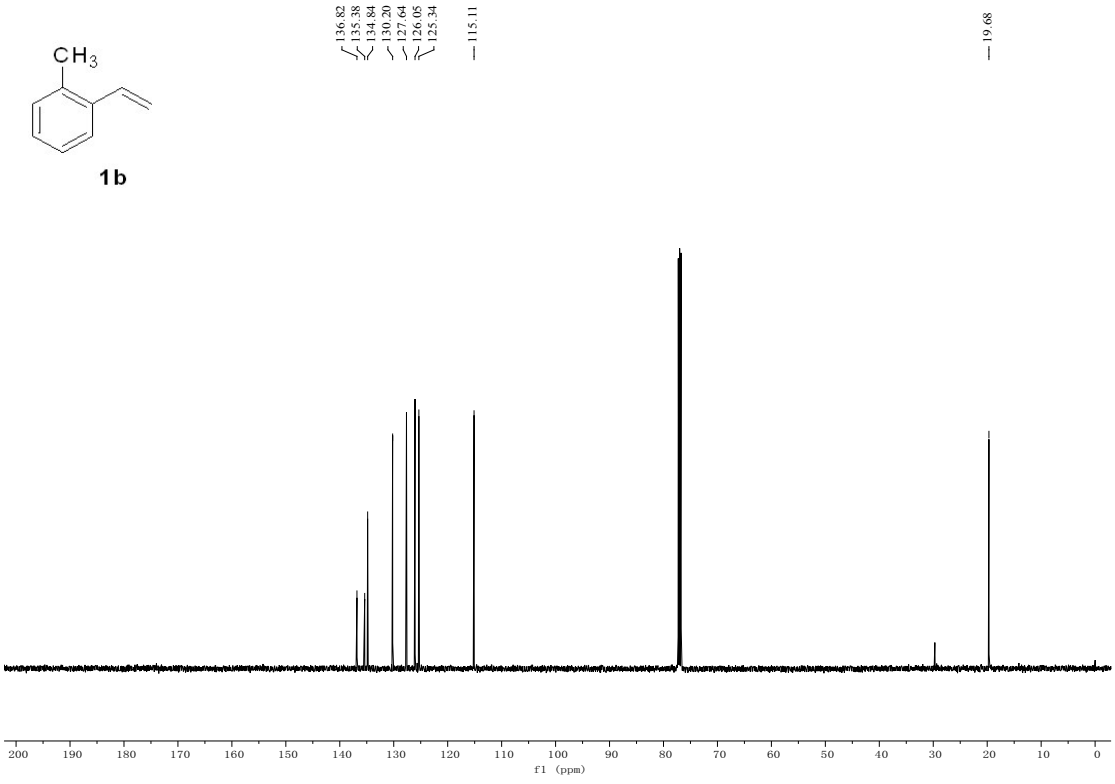
2-Methylstyrene (1b)

^{1}H NMR (500 MHz)



1b

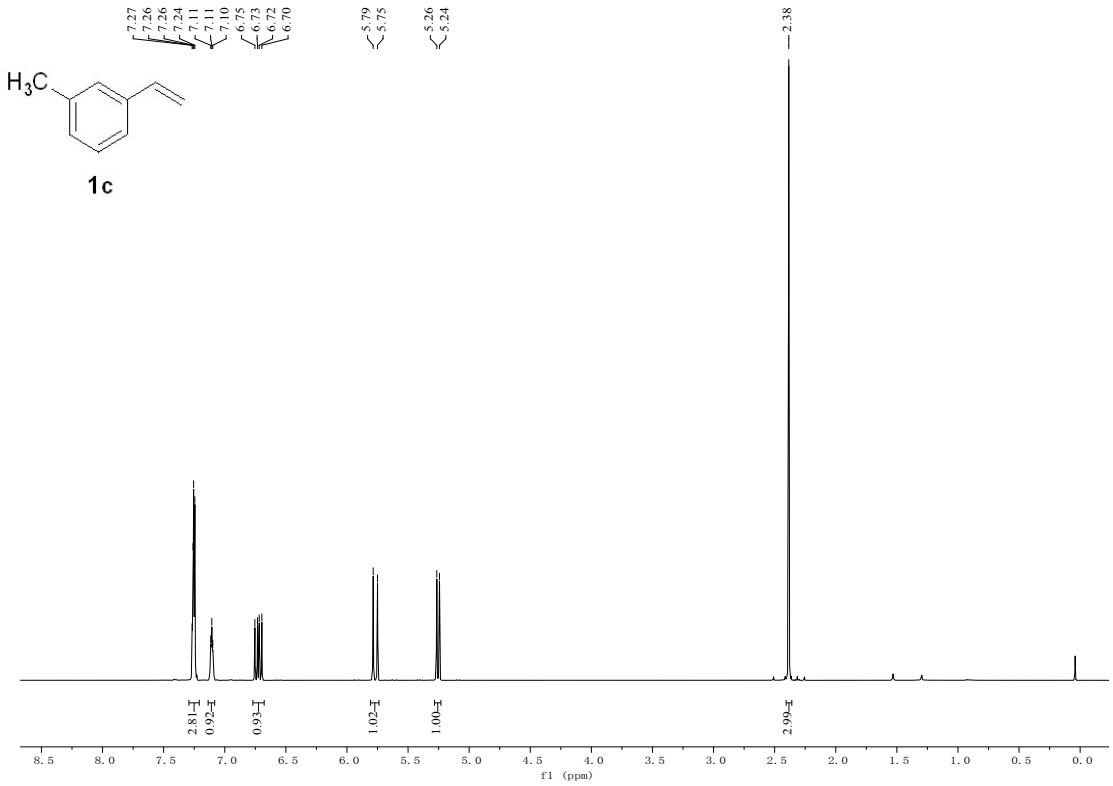
^{13}C NMR (125 MHz)



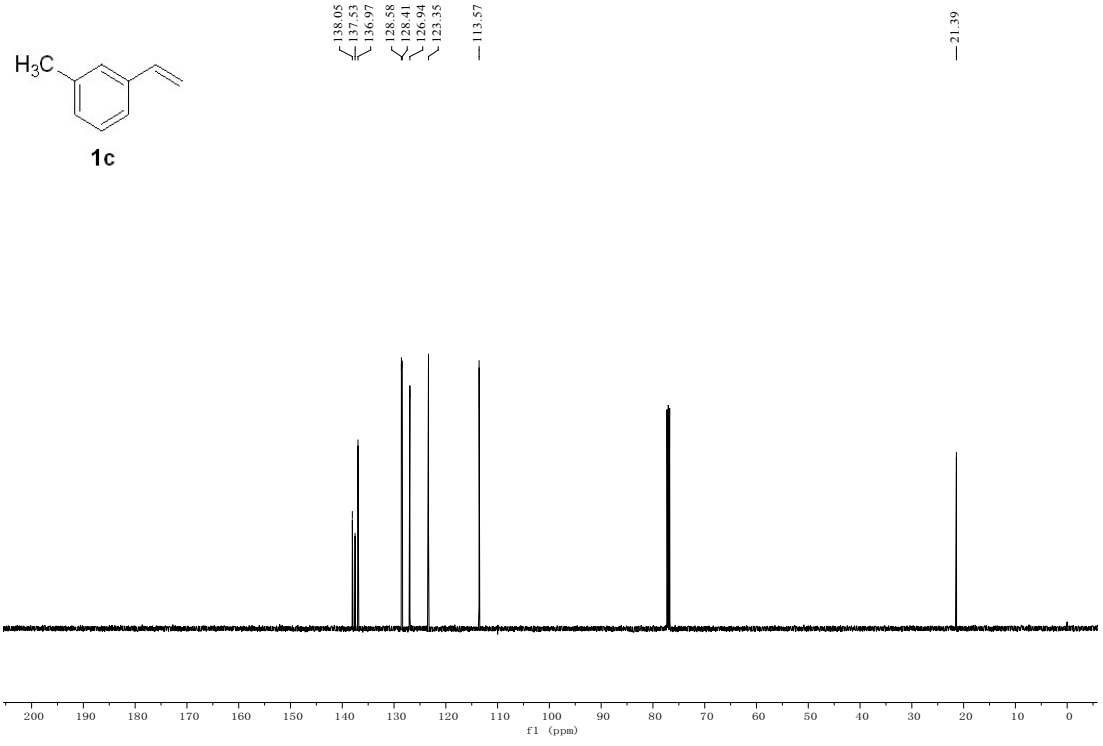
1b

3-Methylstyrene (1c)

^{1}H NMR (500 MHz)

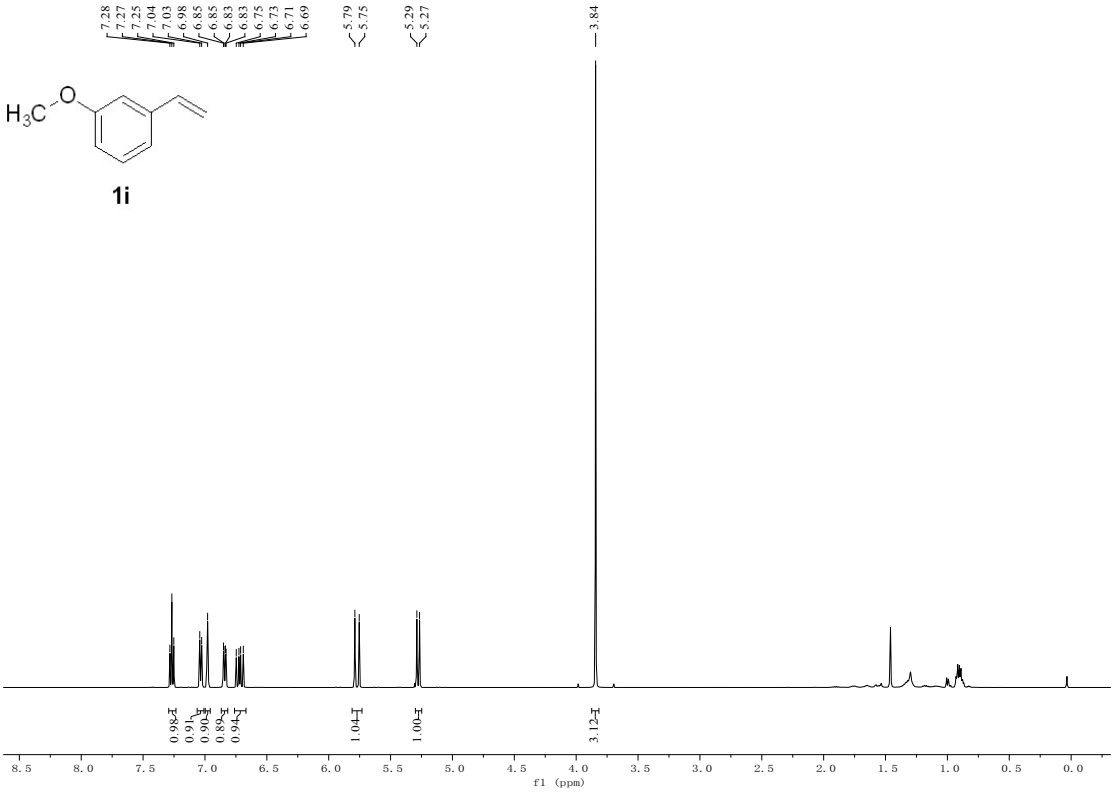


^{13}C NMR (125 MHz)



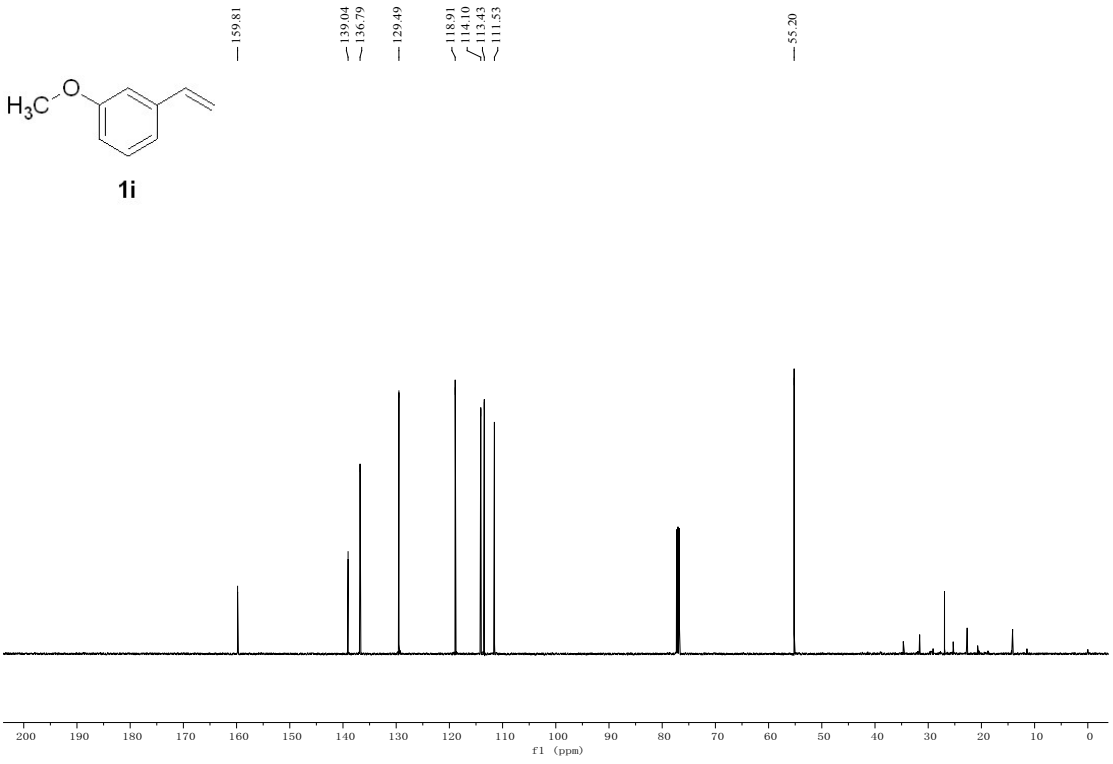
3-Methoxystyrene (1i)

^{1}H NMR (500 MHz)



1i

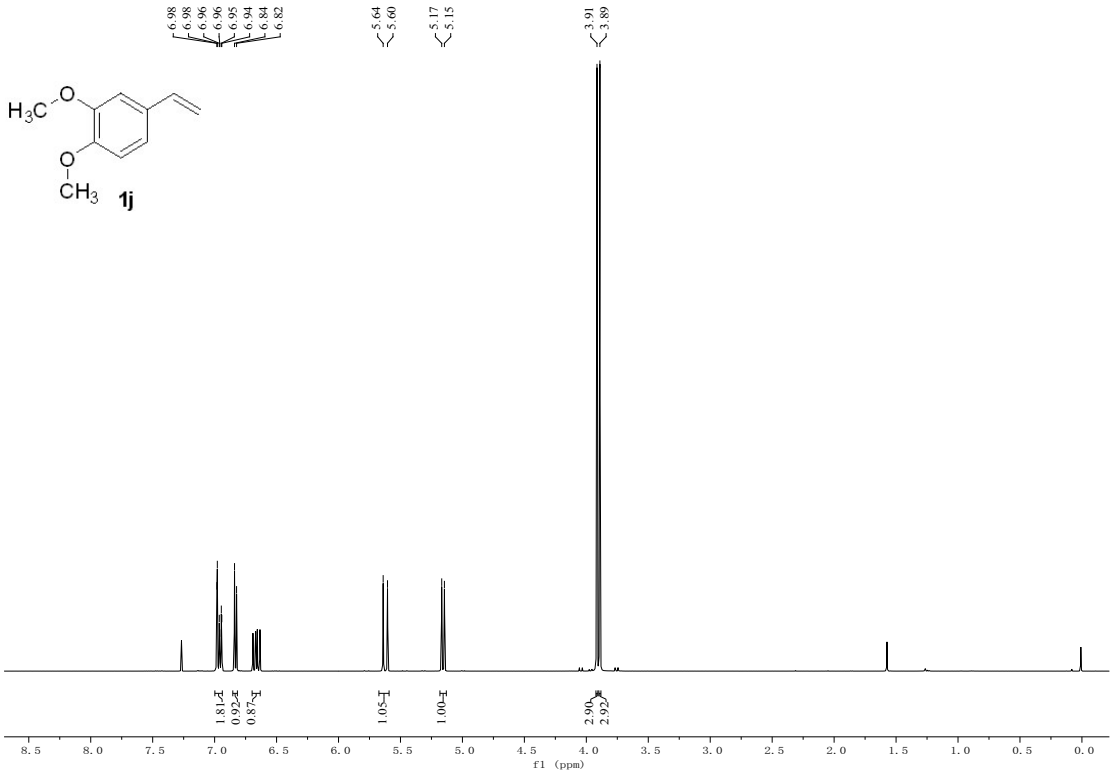
^{13}C NMR (125 MHz)



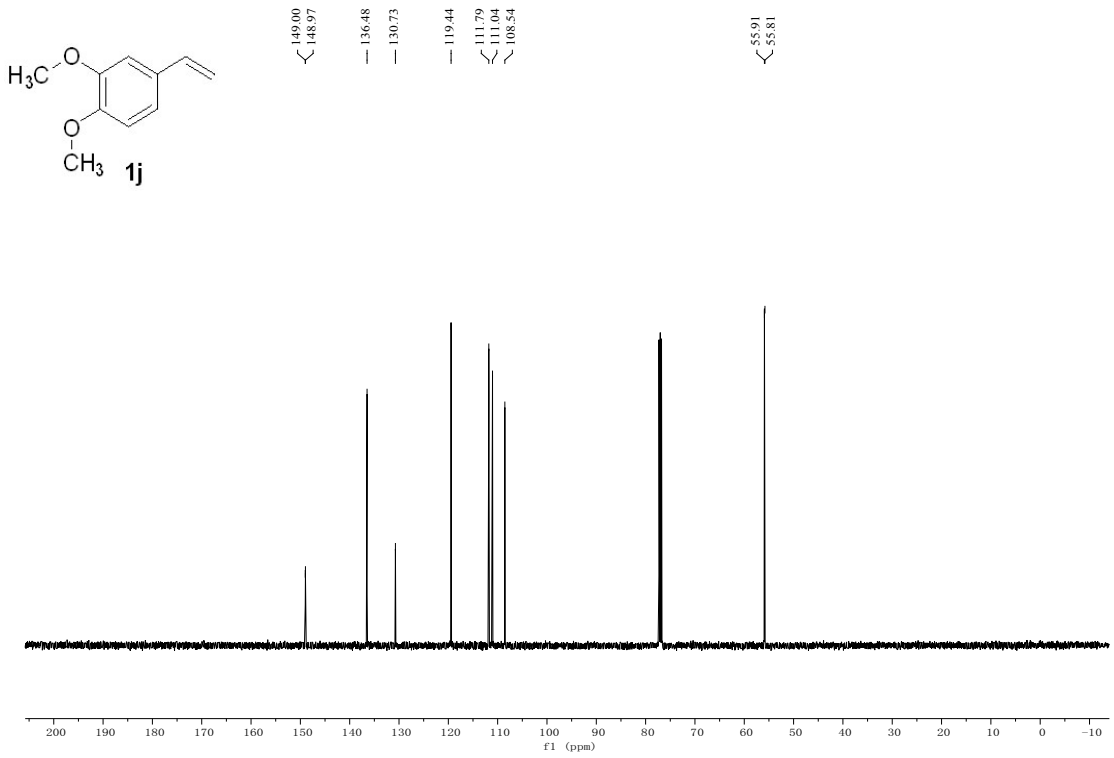
1i

3, 4-(Dimethoxy)styrene (1j)

^{1}H NMR (500 MHz)

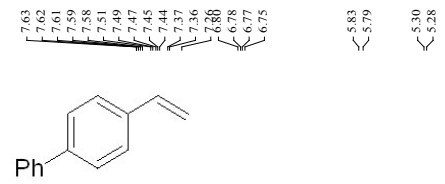


^{13}C NMR (125 MHz)

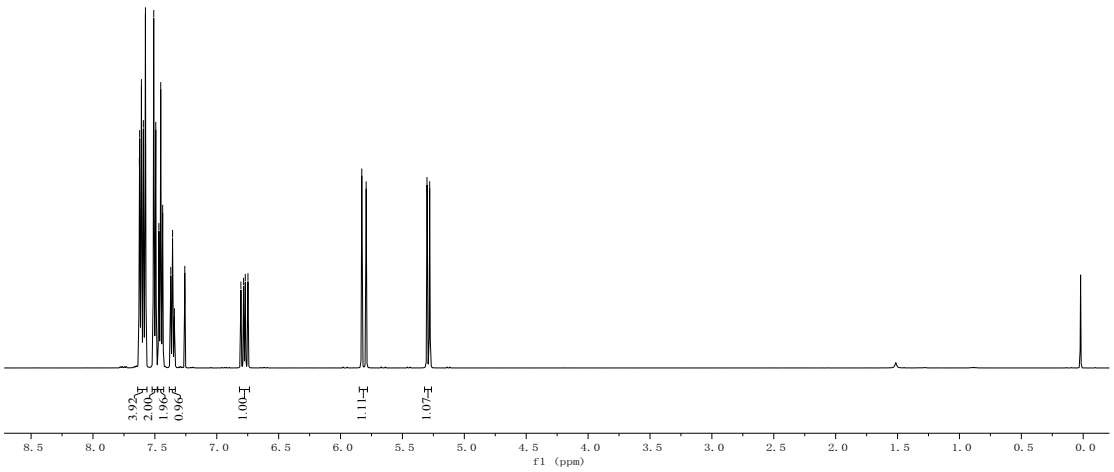


4-Phenylstyrene (1l)

^{1}H NMR (500 MHz)

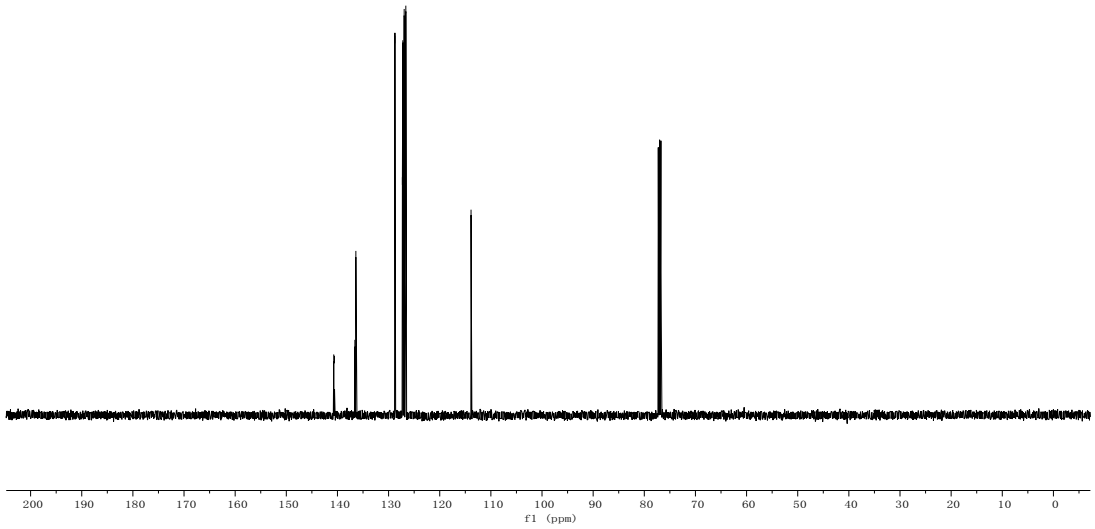


1l



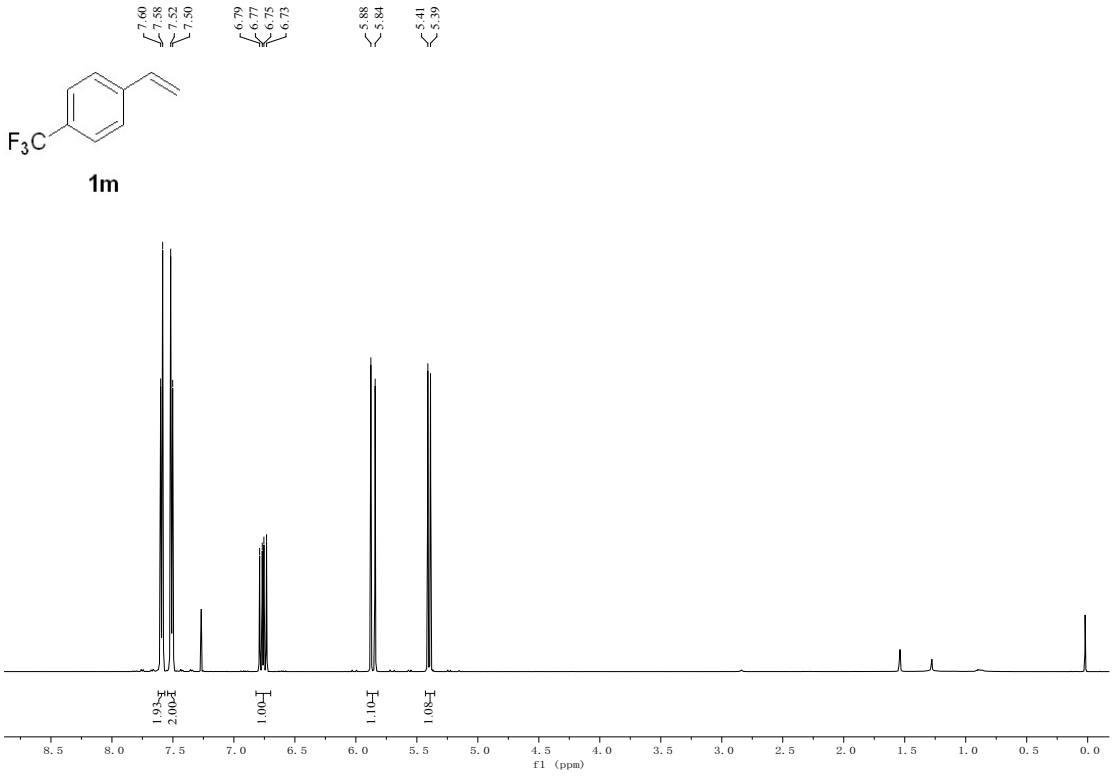
^{13}C NMR (125 MHz)

1l

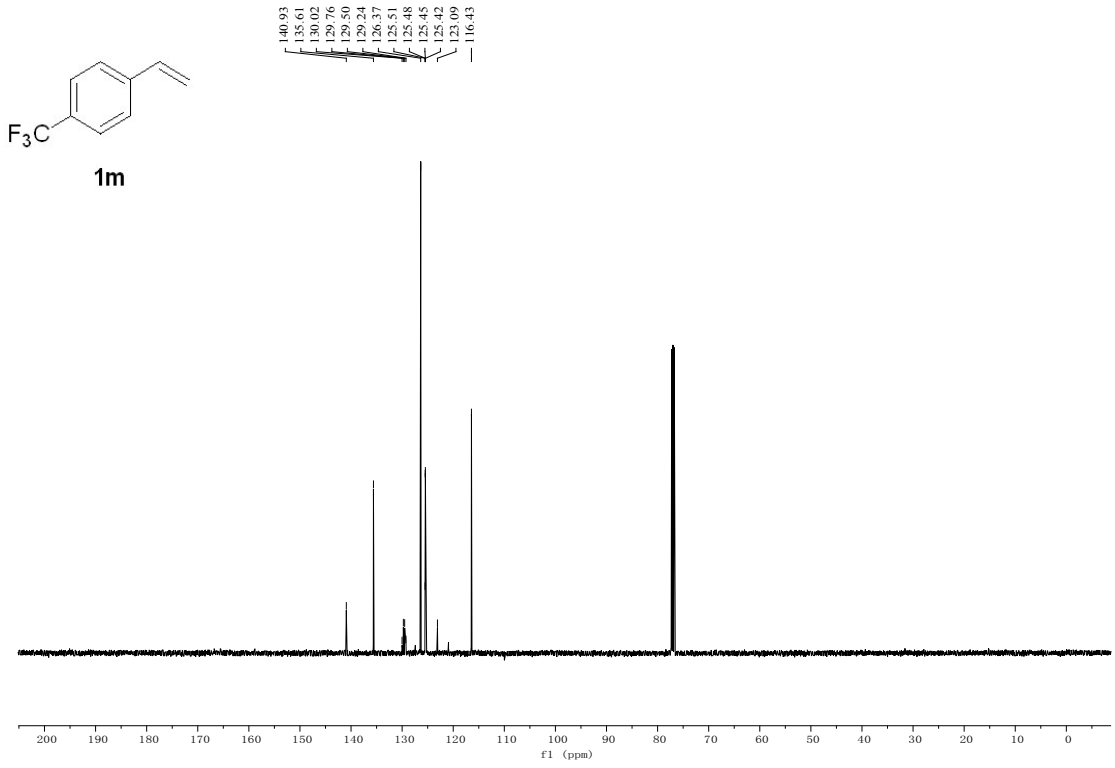


4-(Trifluoromethyl)styrene (1m)

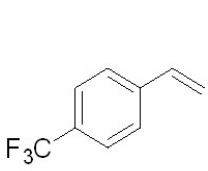
^{1}H NMR (500 MHz)



^{13}C NMR (125 MHz)



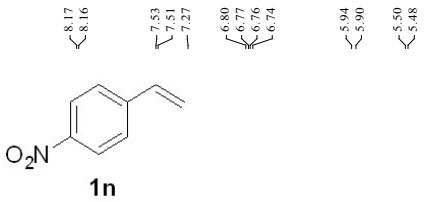
^{19}F NMR (470 MHz)



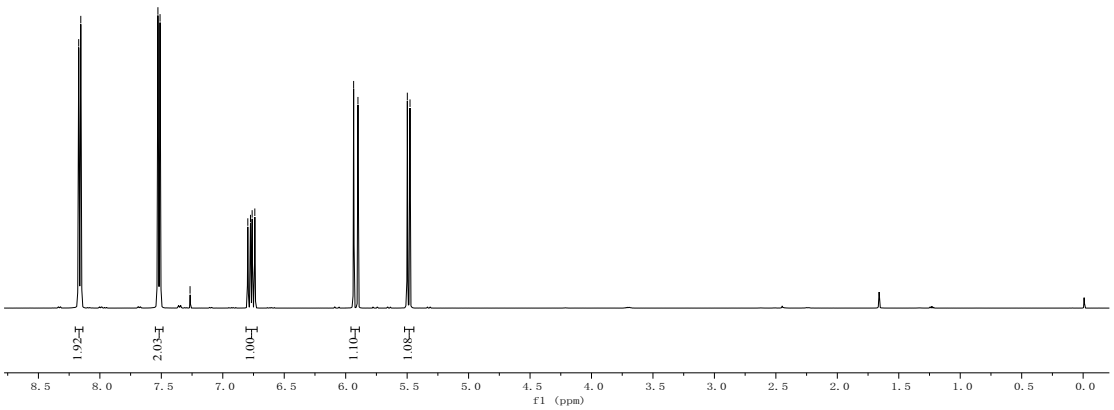
1m

4-Nitrostyrene (1n)

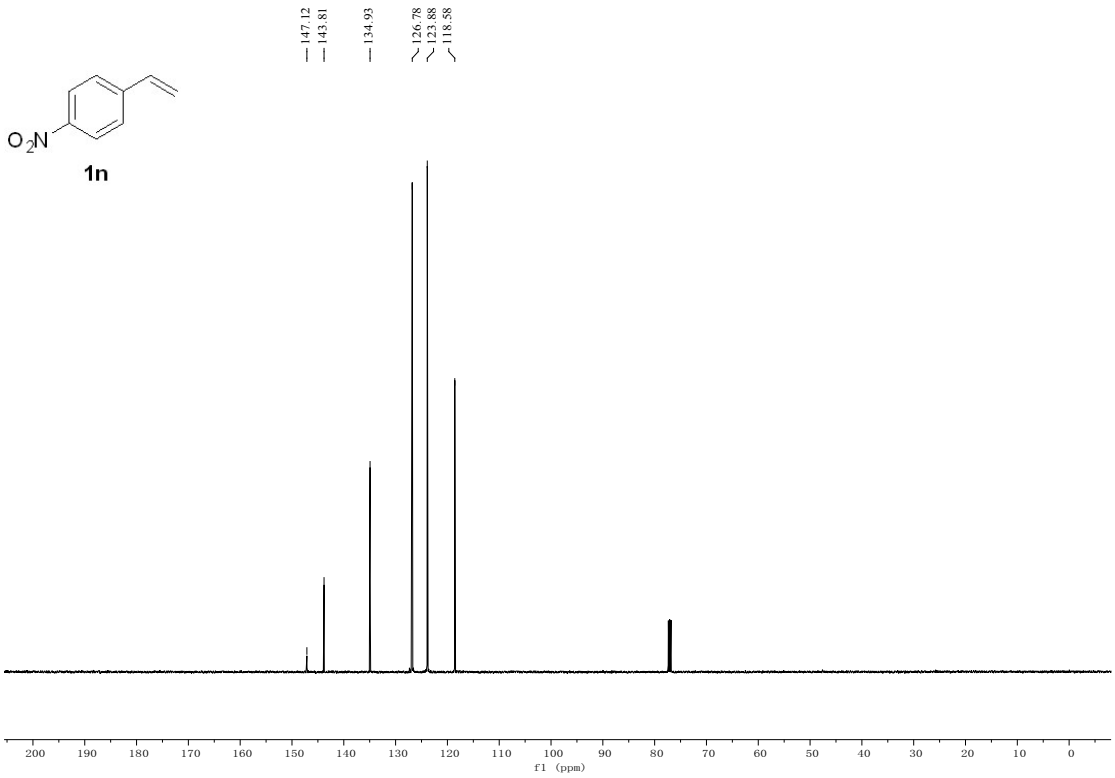
^{1}H NMR (500 MHz)



1n

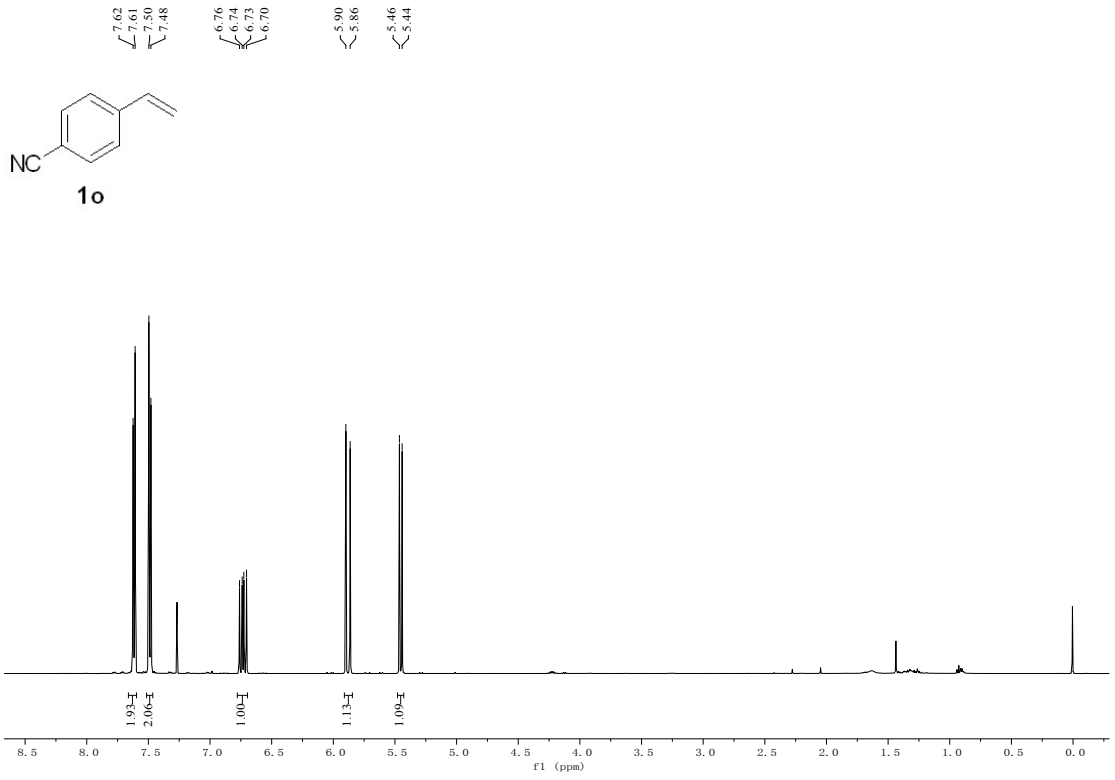


^{13}C NMR (125 MHz)

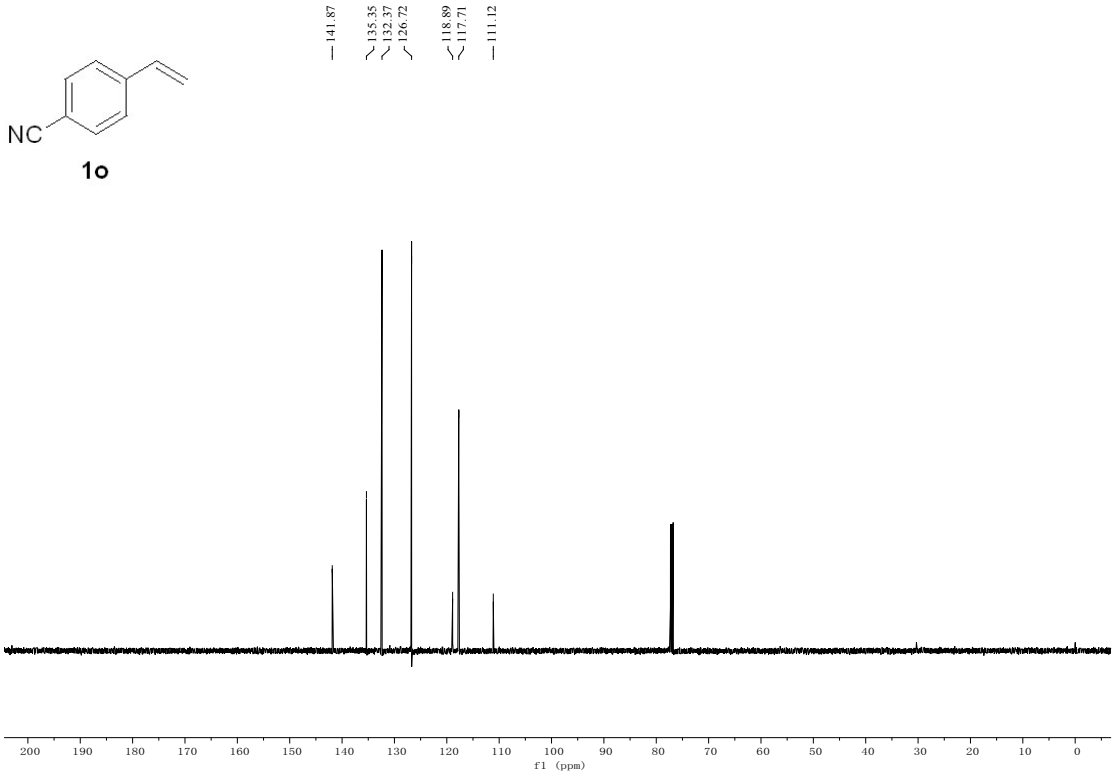


4-Cyanostyrene (1o)

^{1}H NMR (500 MHz)

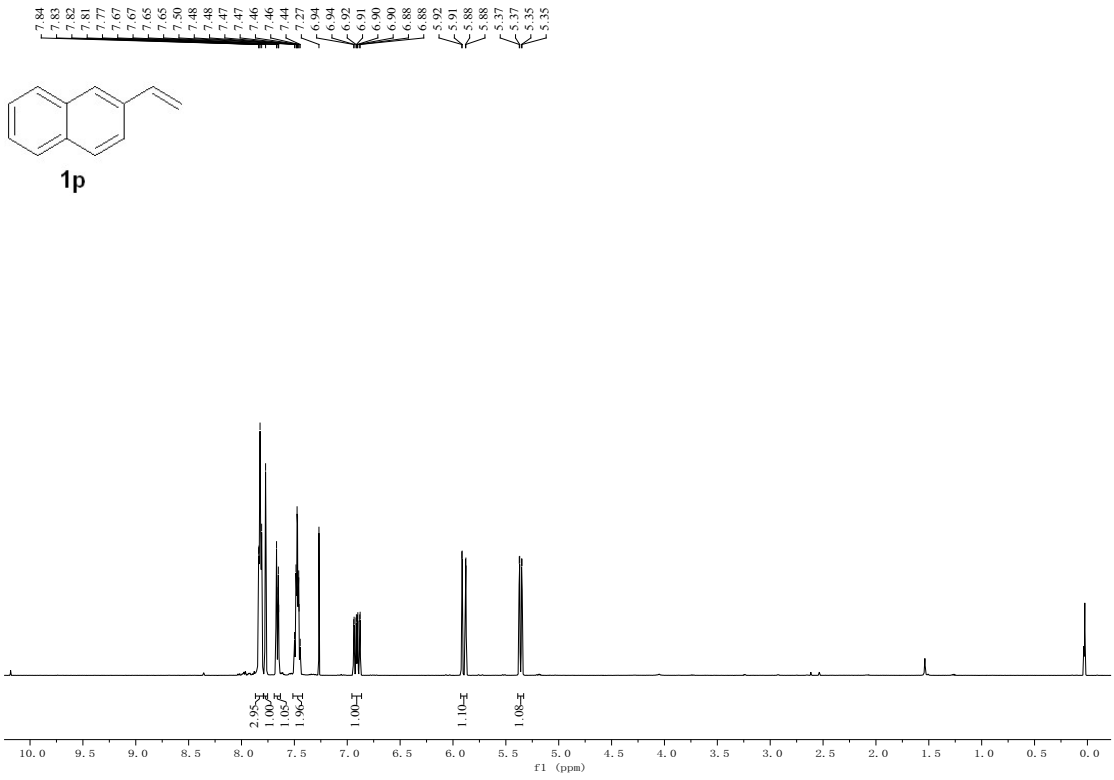


^{13}C NMR (125 MHz)

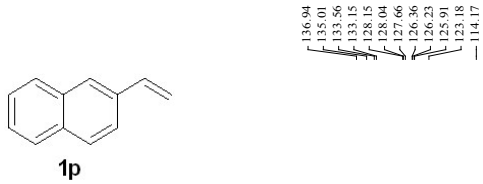


2-Vinylnaphthalene (1p)

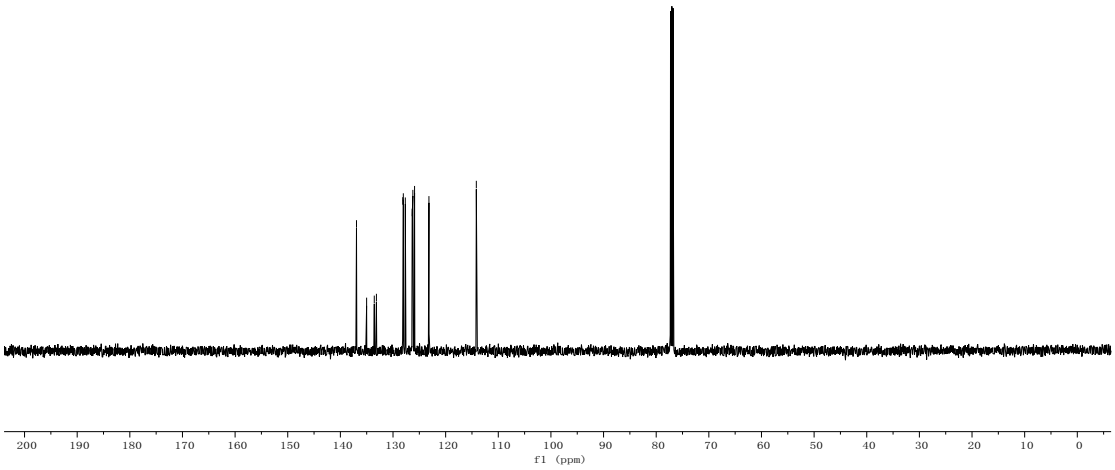
^{1}H NMR (500 MHz)



^{13}C NMR (125 MHz)

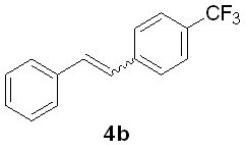


1p

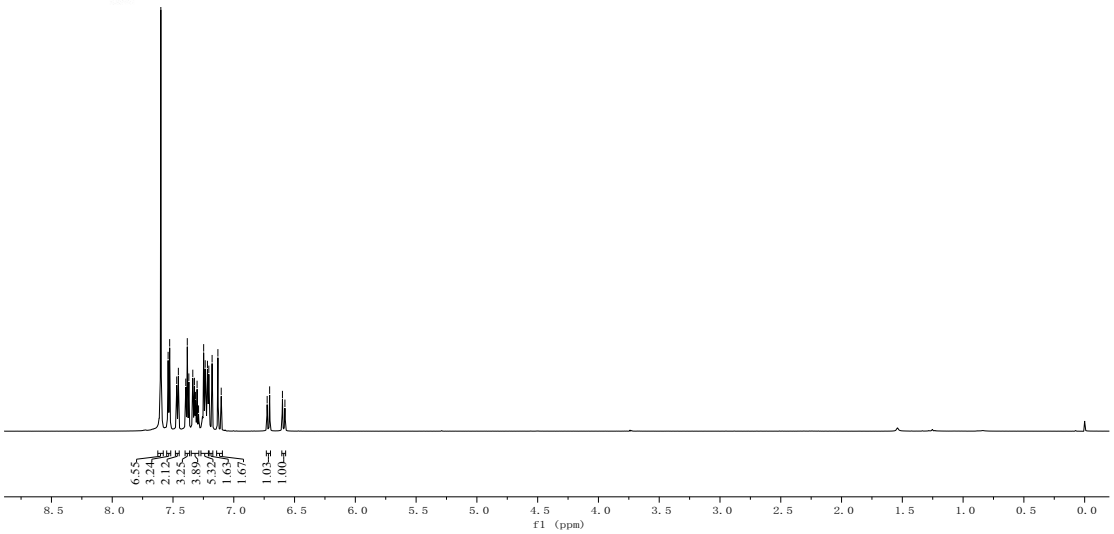


(*E*/*Z*)-1-Styryl-4-(trifluoromethyl)benzene (4b)

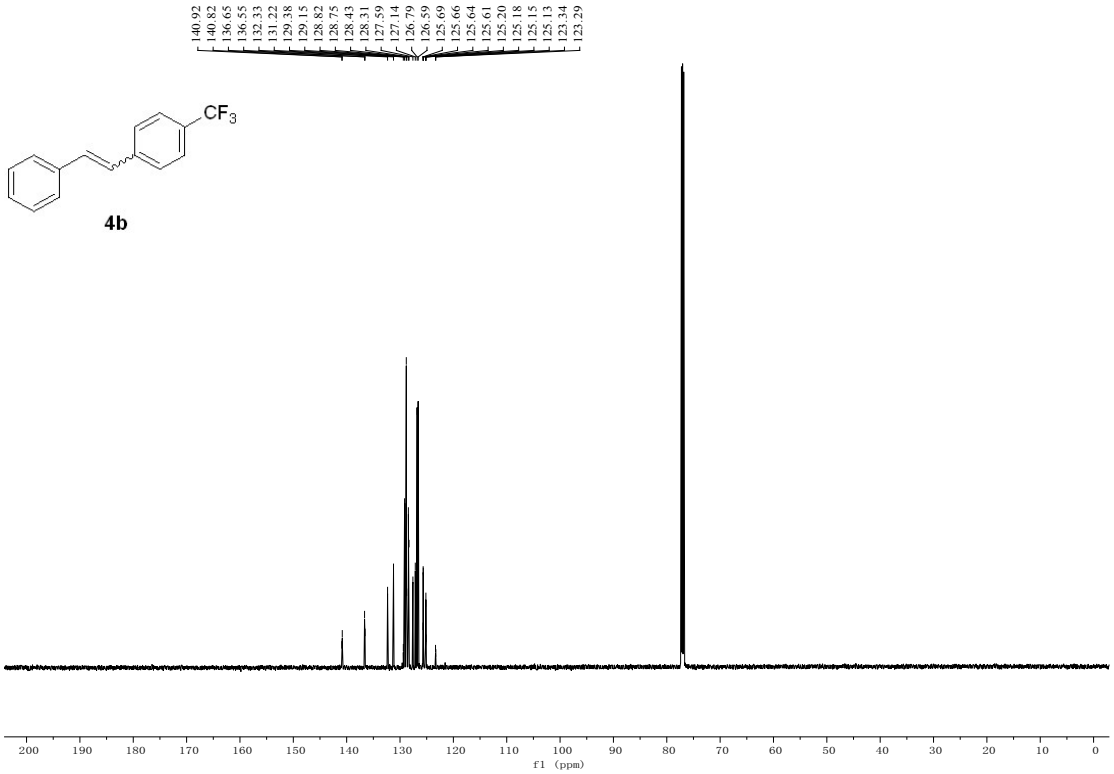
^{1}H NMR (600 MHz)



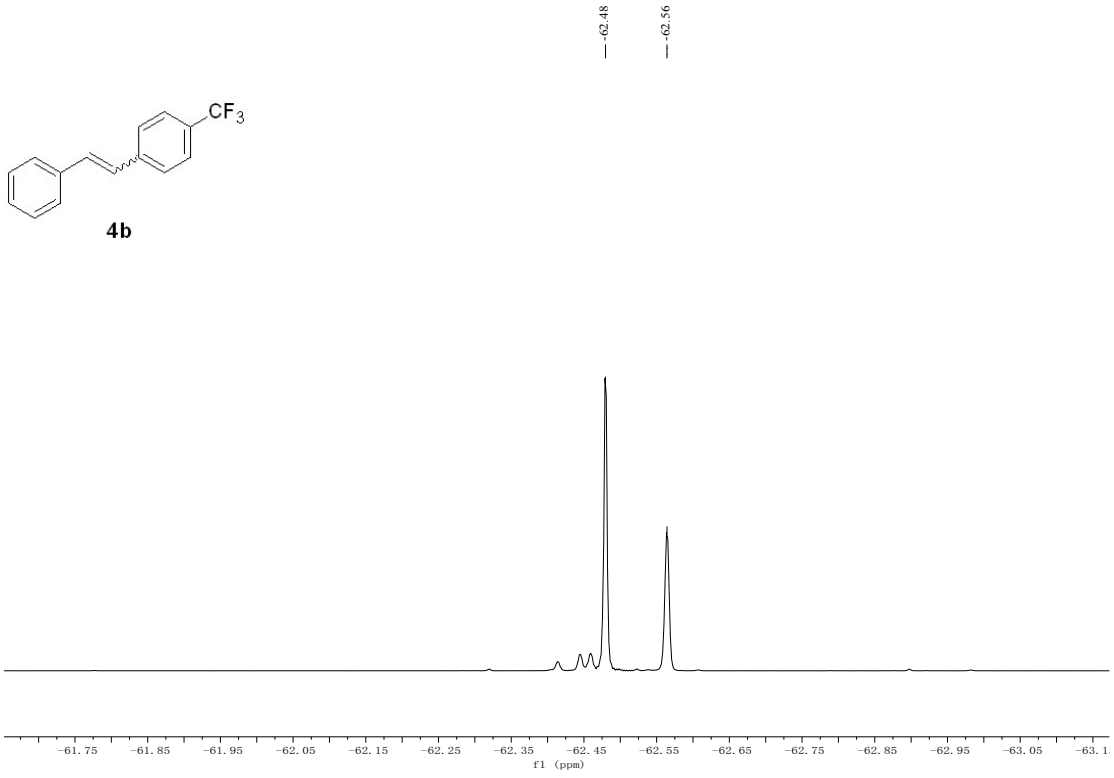
4b



^{13}C NMR (150 MHz)

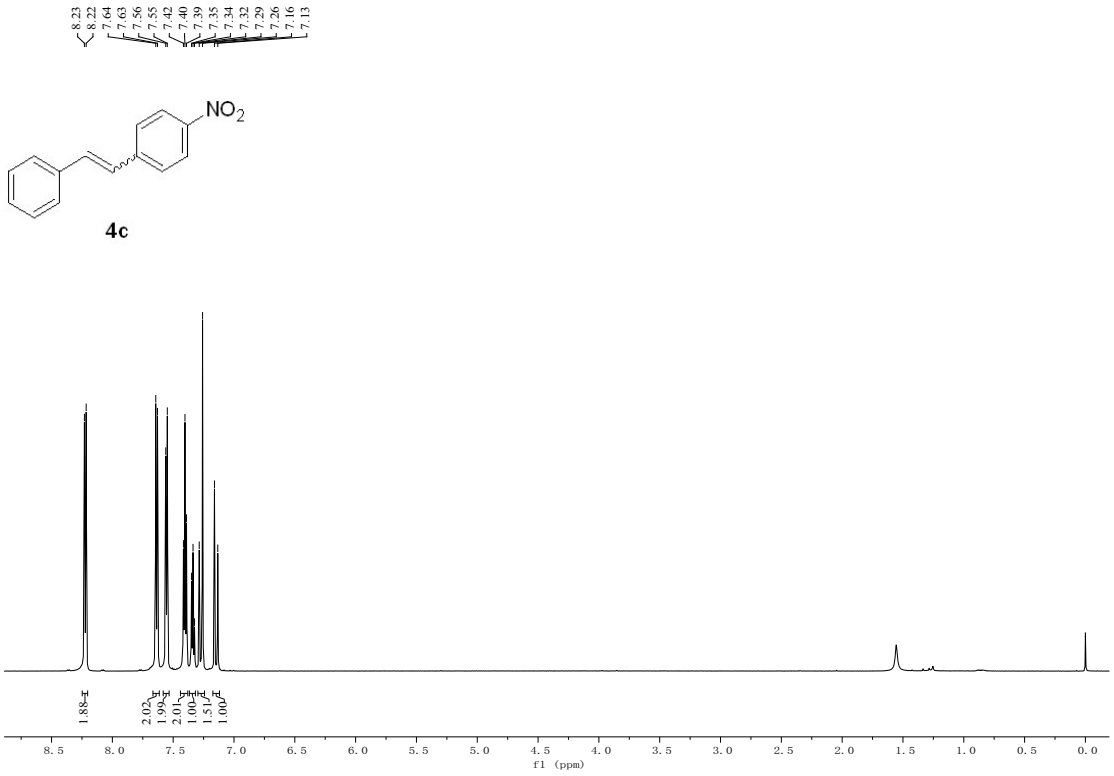


^{19}F NMR (564 MHz)

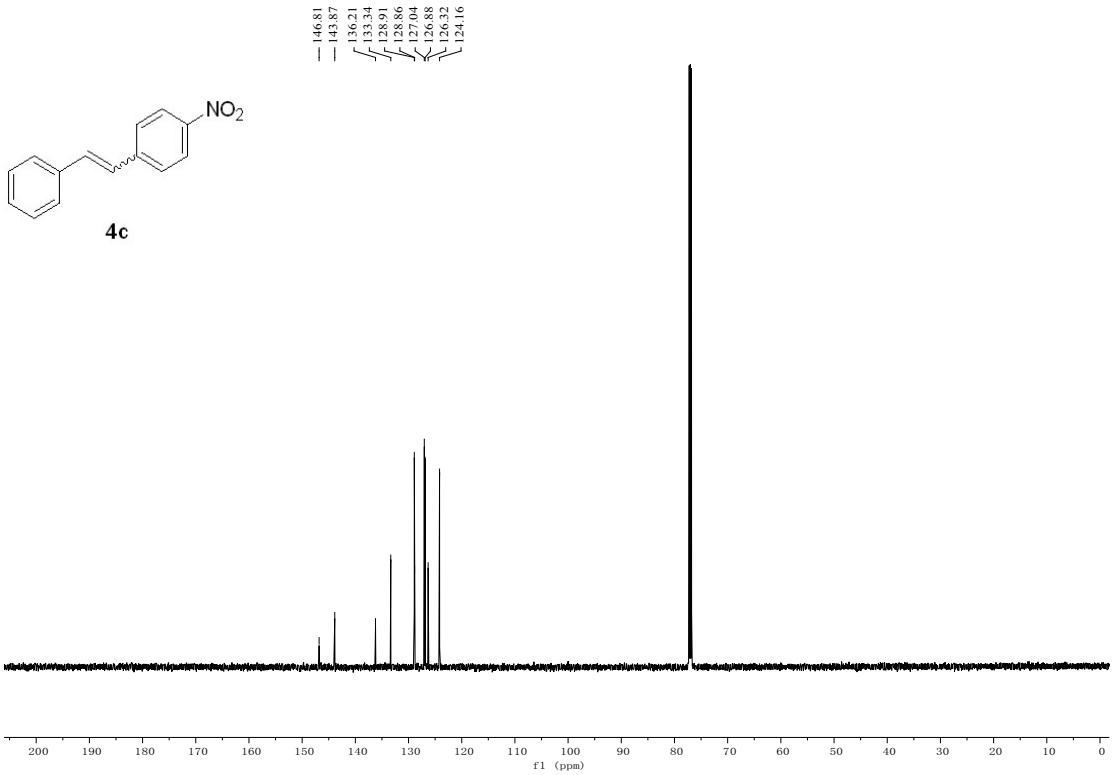


(*E*)-1-Nitro-4-styrylbenzene (4c)

^{1}H NMR (600 MHz)

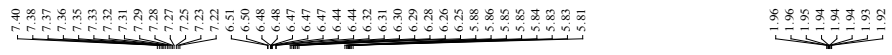


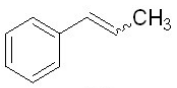
^{13}C NMR (150 MHz)



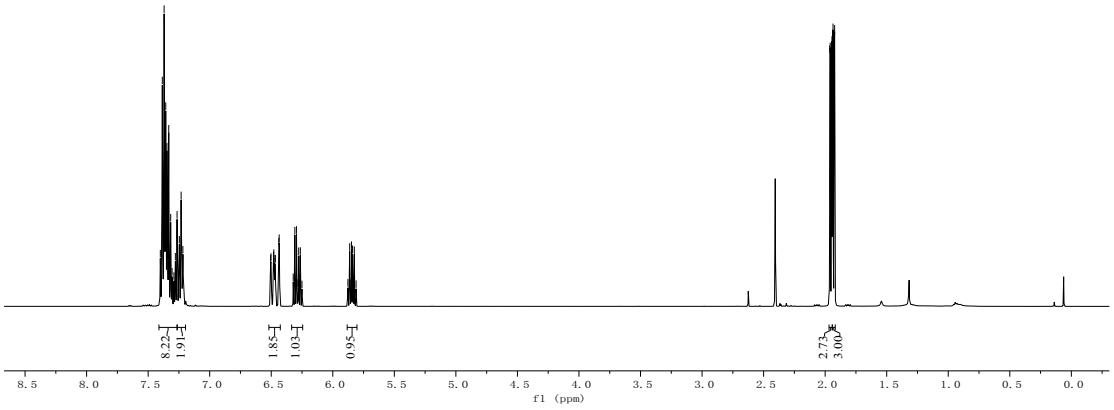
(*Z*/*E*)-β-Methylstyrene (4d)

^{1}H NMR (500 MHz)

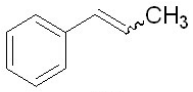




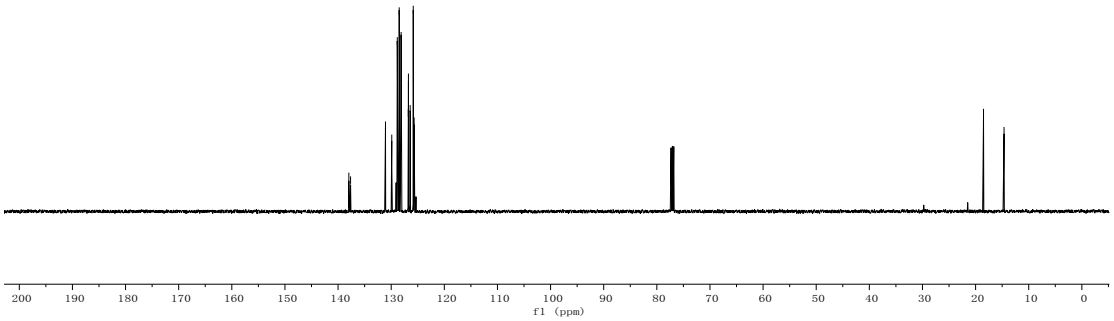
4d



^{13}C NMR (125 MHz)

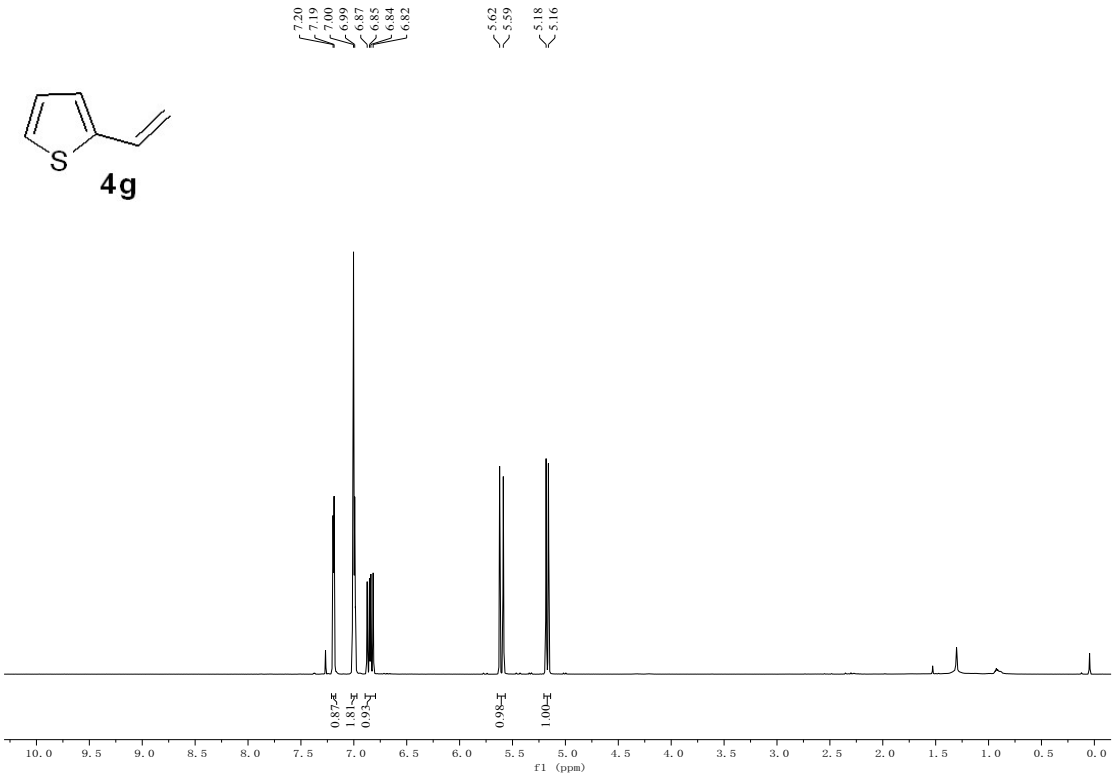


4d

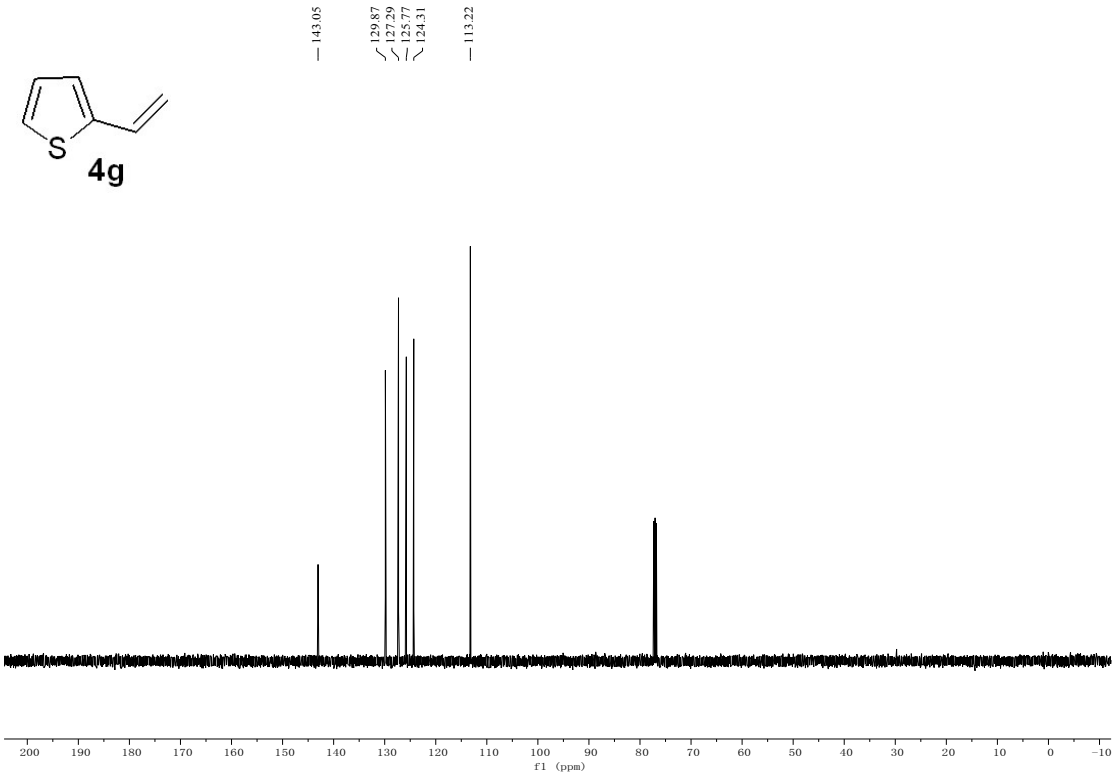


2-vinylthiophene (4g)

^{1}H NMR (500 MHz)

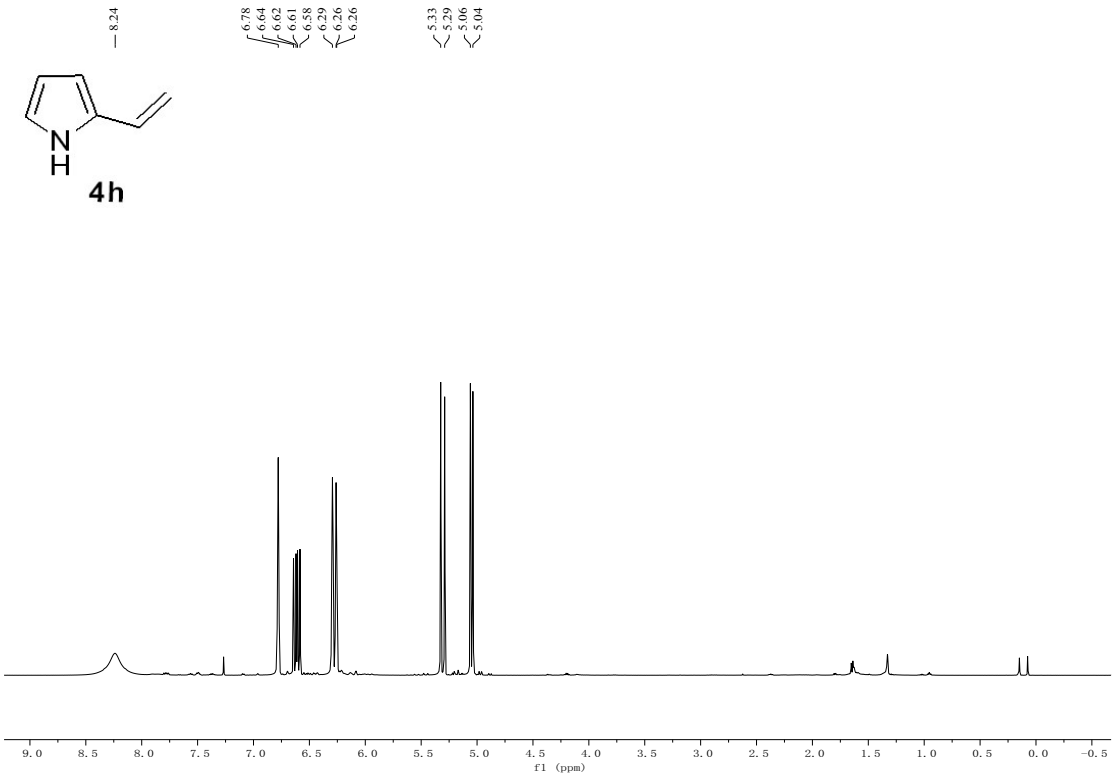


^{13}C NMR (125 MHz)

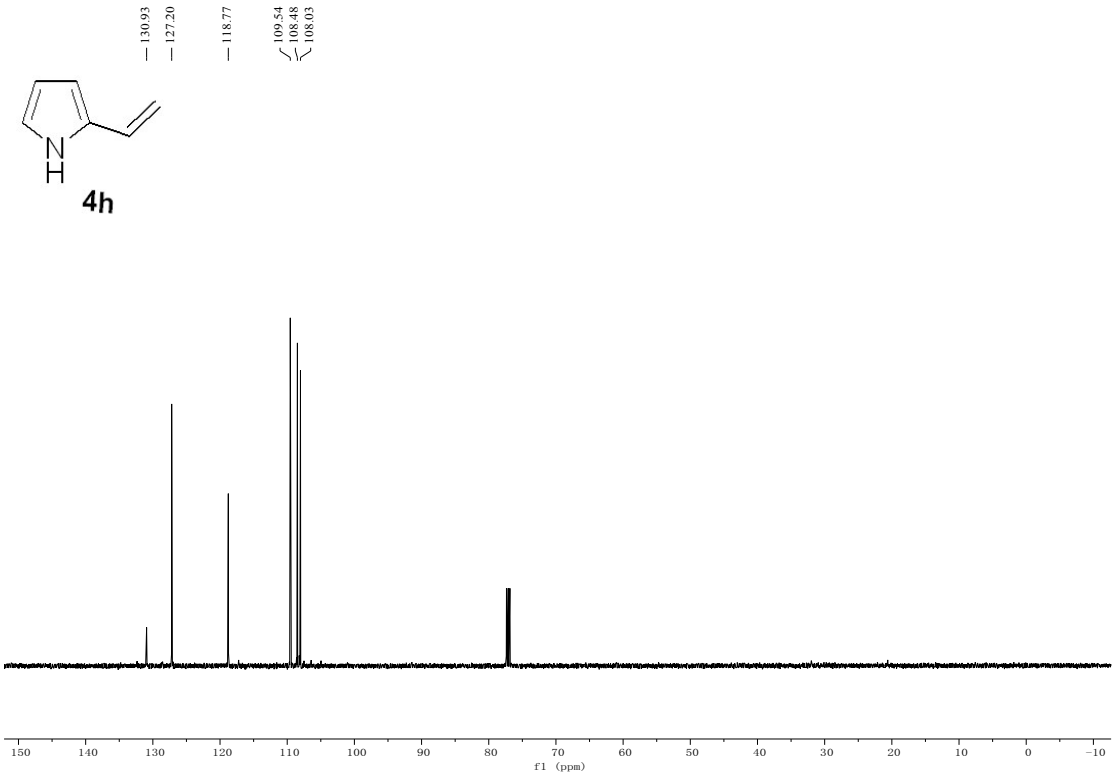


2-vinylpyrrole (4h)

^{1}H NMR (500 MHz)

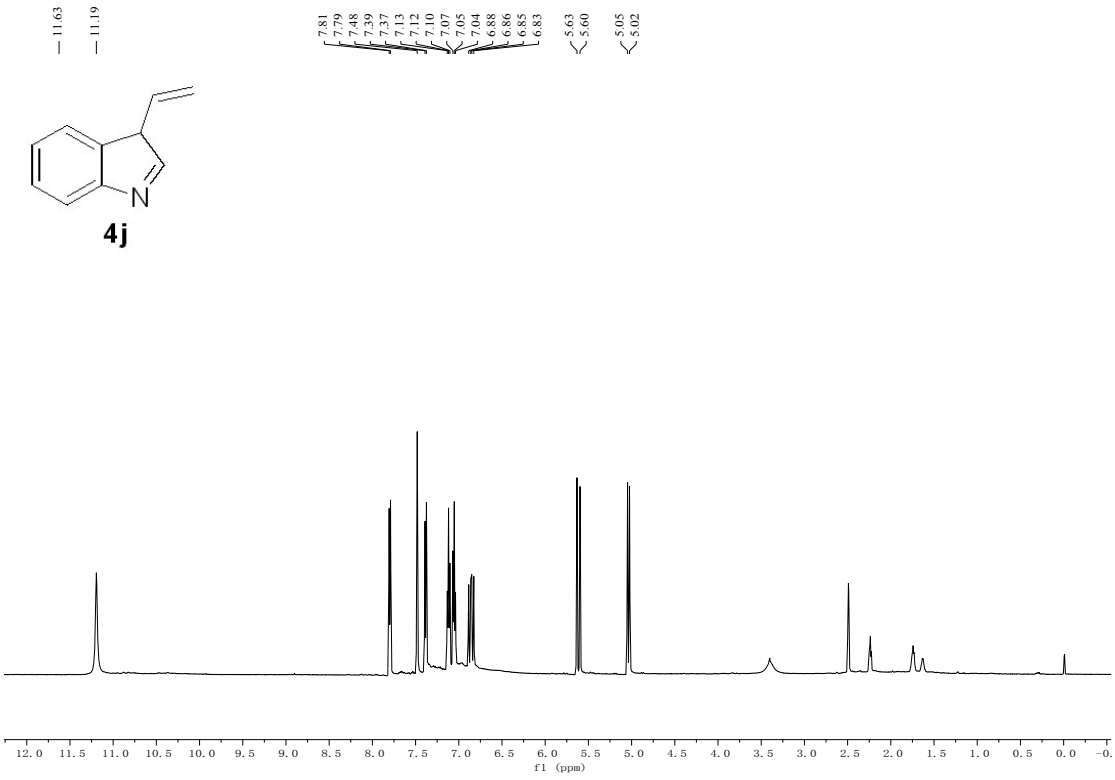


^{13}C NMR (125 MHz)

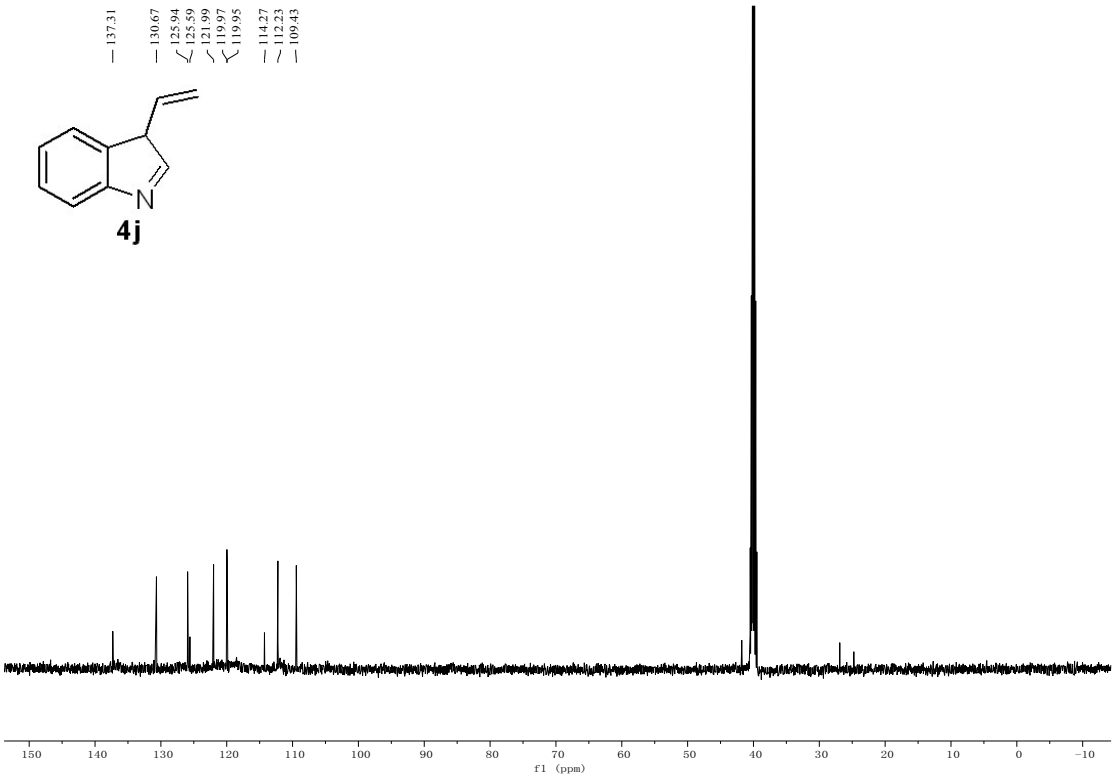


3-vinylindole (4j)

^{1}H NMR (500 MHz)

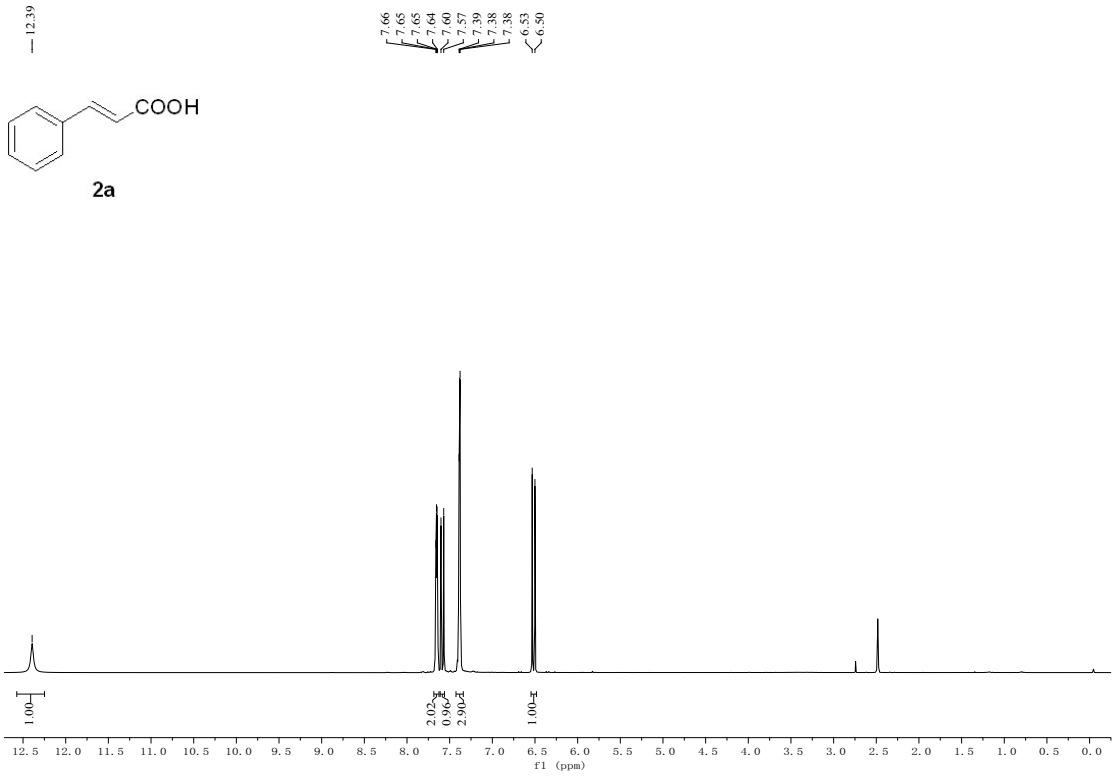


^{13}C NMR (125 MHz)

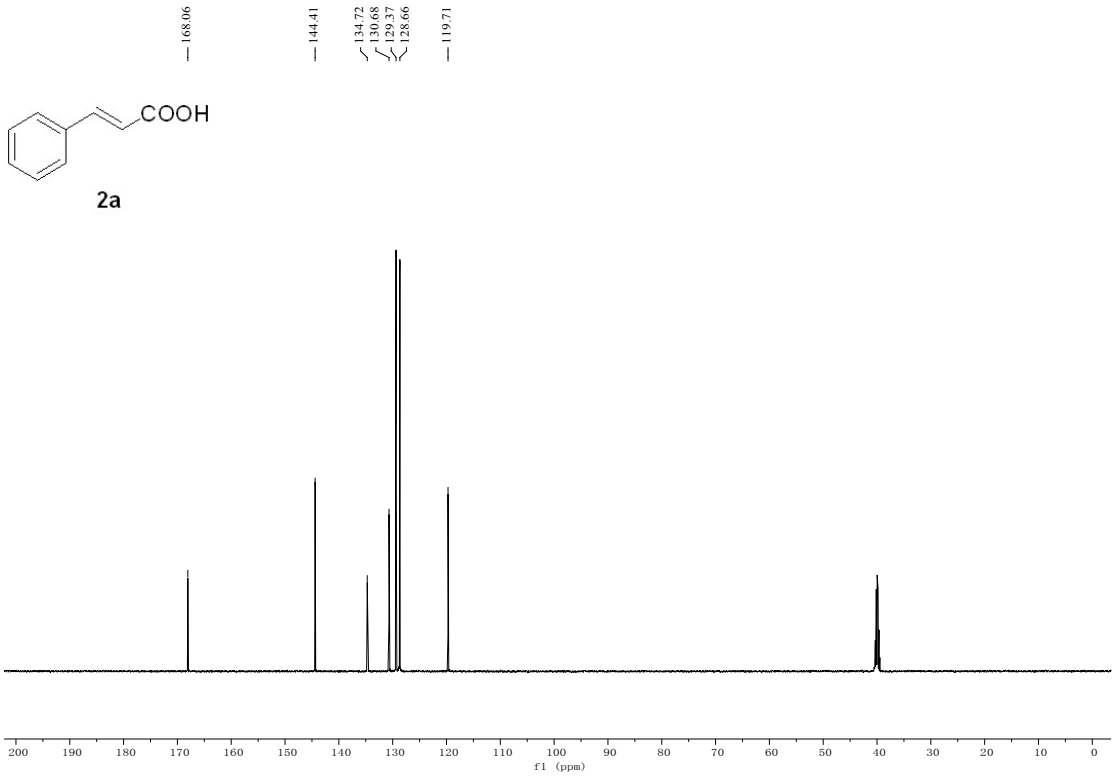


Cinnamic acid (2a)

^{1}H NMR (500 MHz)

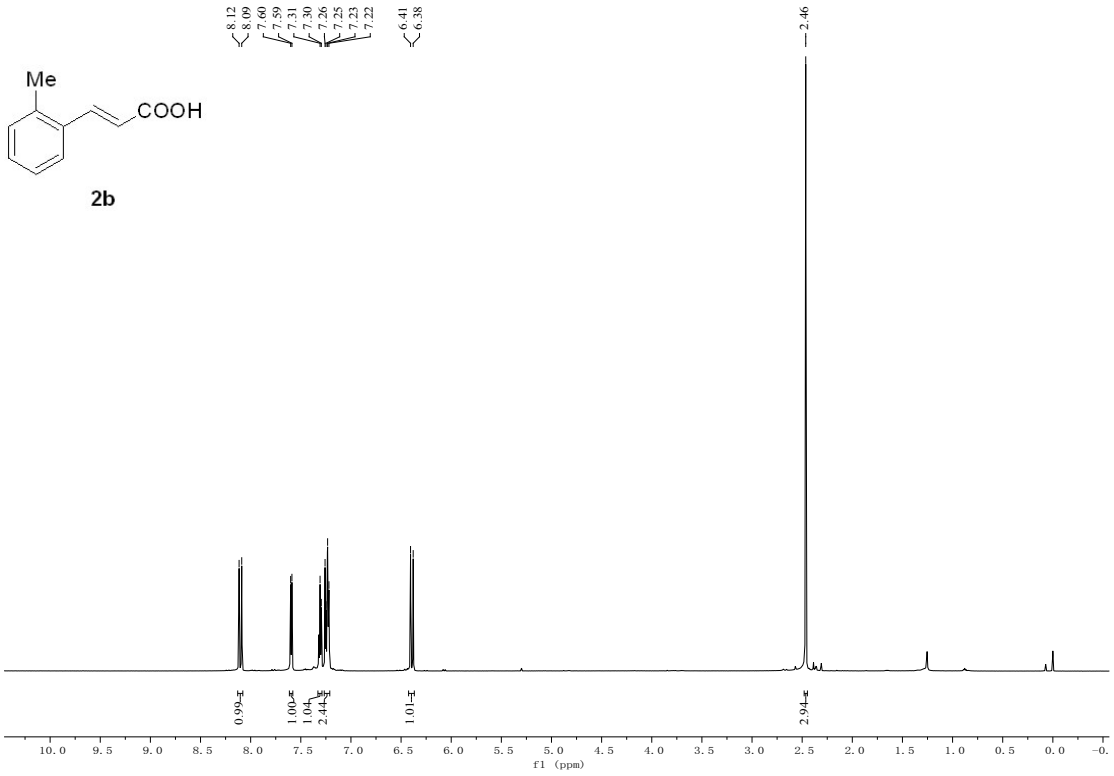


^{13}C NMR (125 MHz)

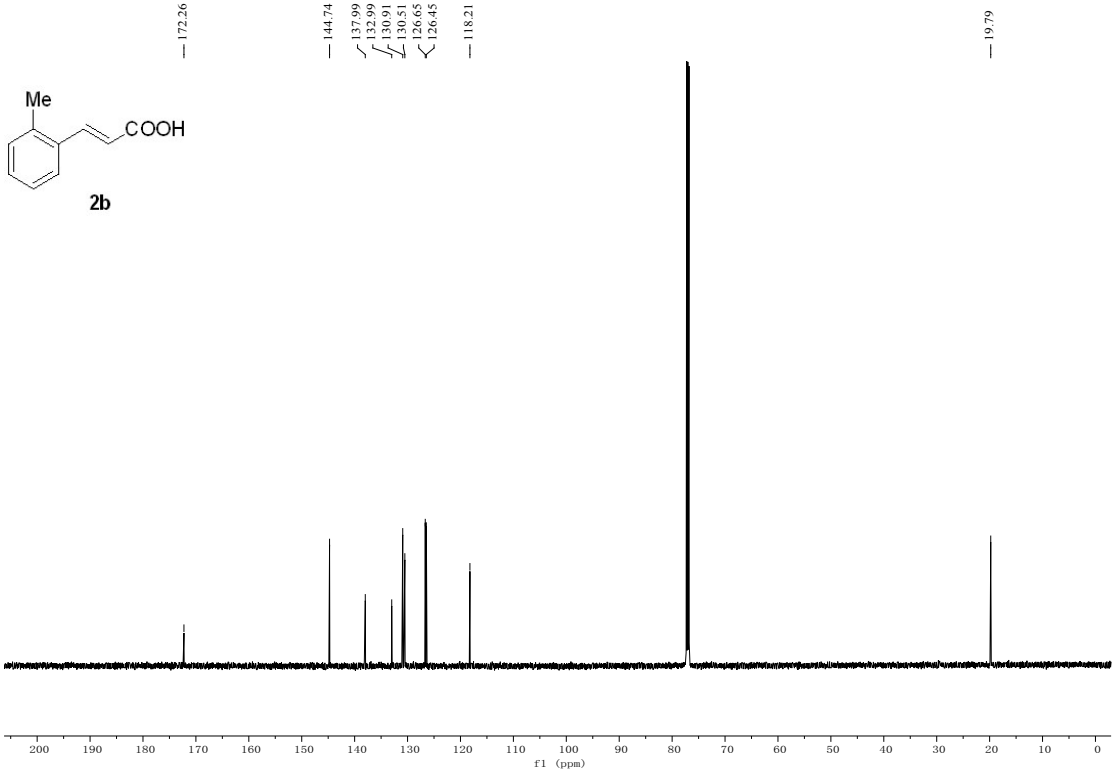


(*E*)-3-(o-tolyl)acrylic acid (2b)

^{1}H NMR (600 MHz)

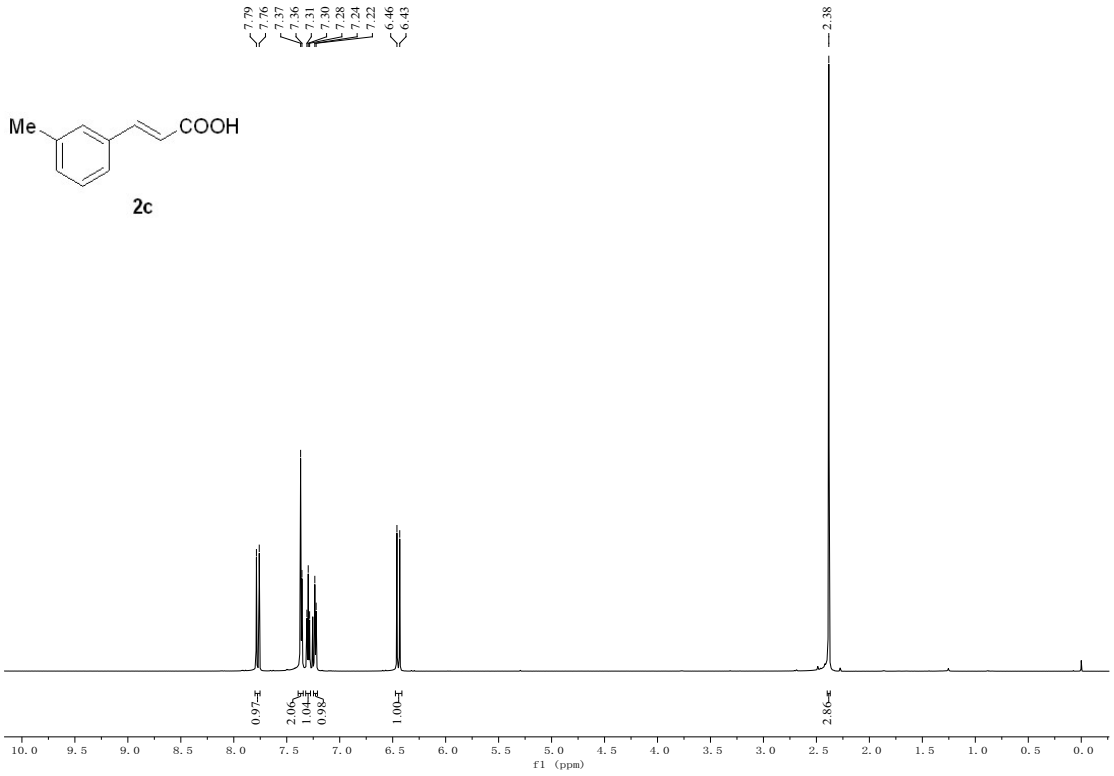


^{13}C NMR (150 MHz)

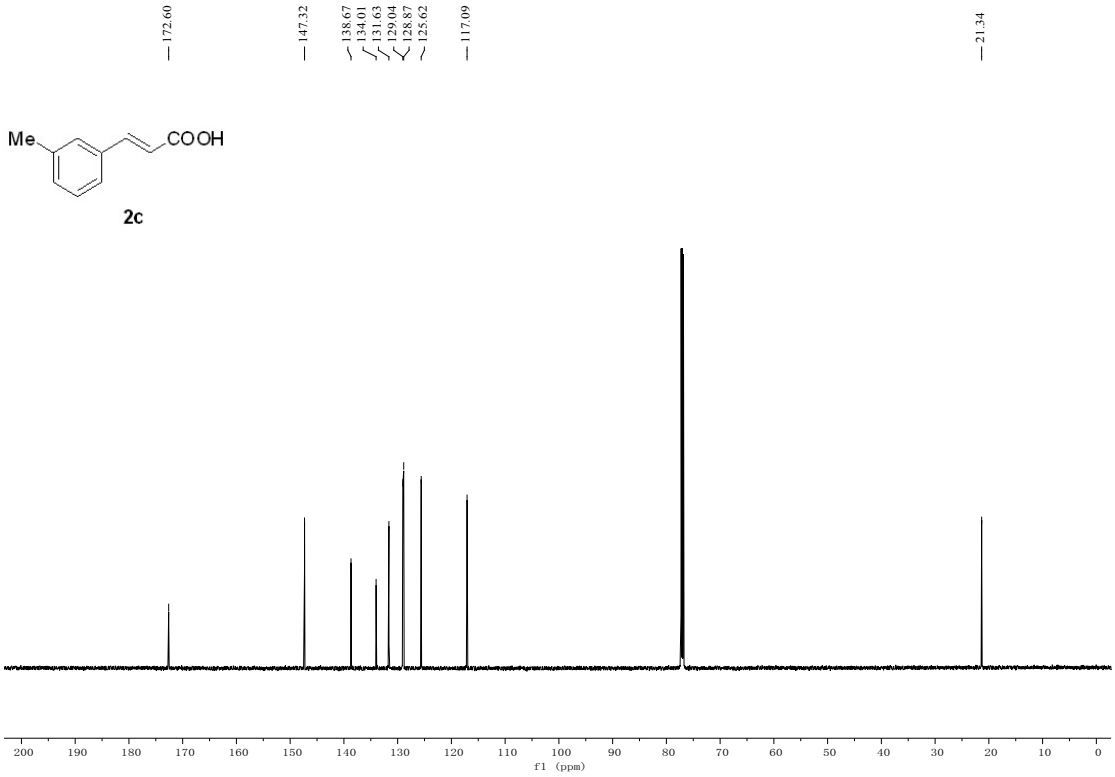


(*E*)-3-(m-tolyl)acrylic acid (2c)

^{1}H NMR (600 MHz)

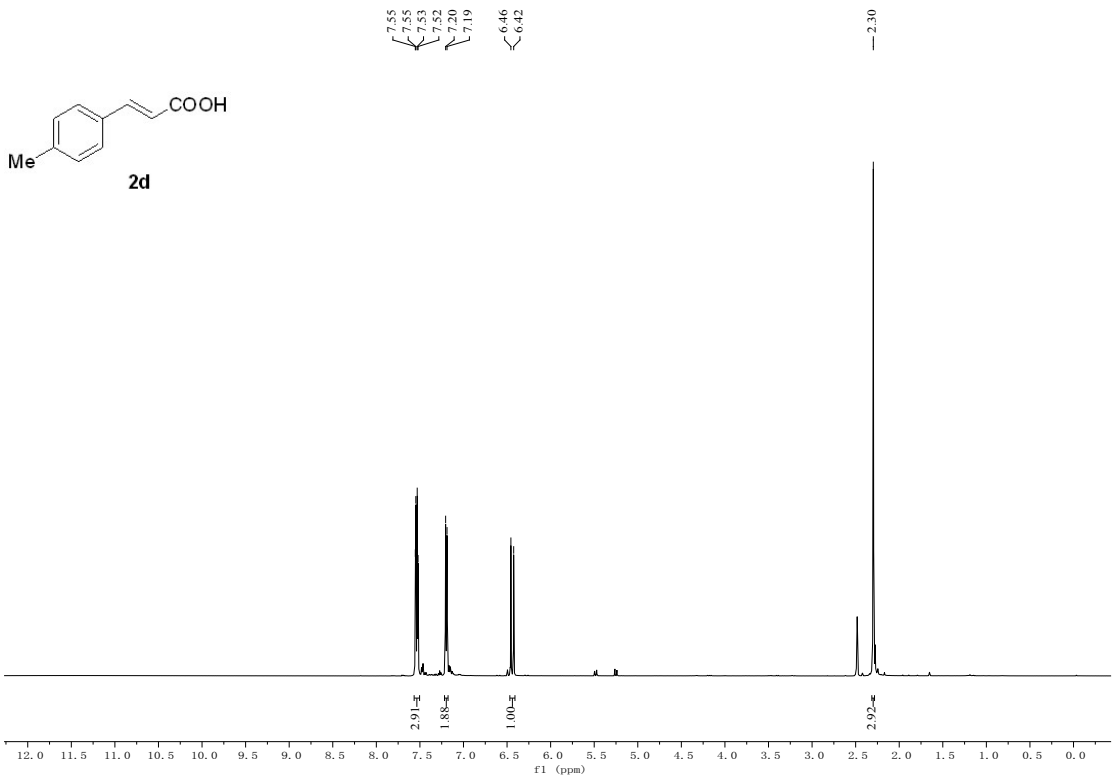


^{13}C NMR (150 MHz)

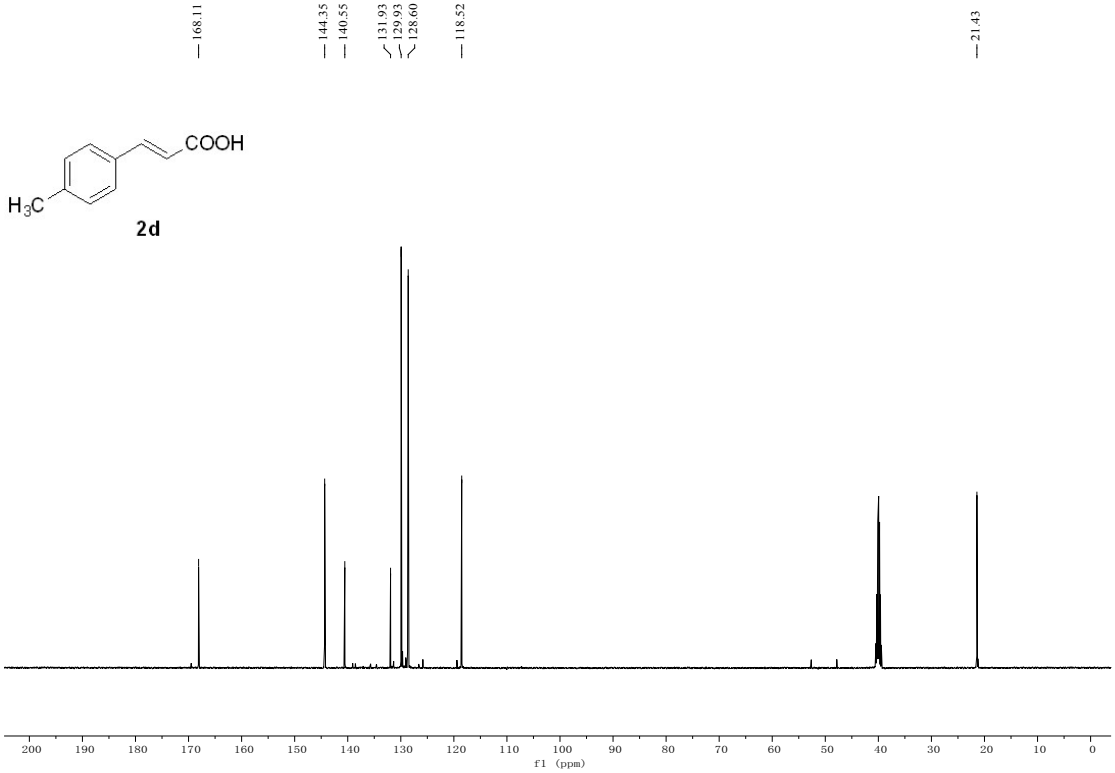


(*E*)-3-(p-tolyl)acrylic acid (2d)

^{1}H NMR (500 MHz)

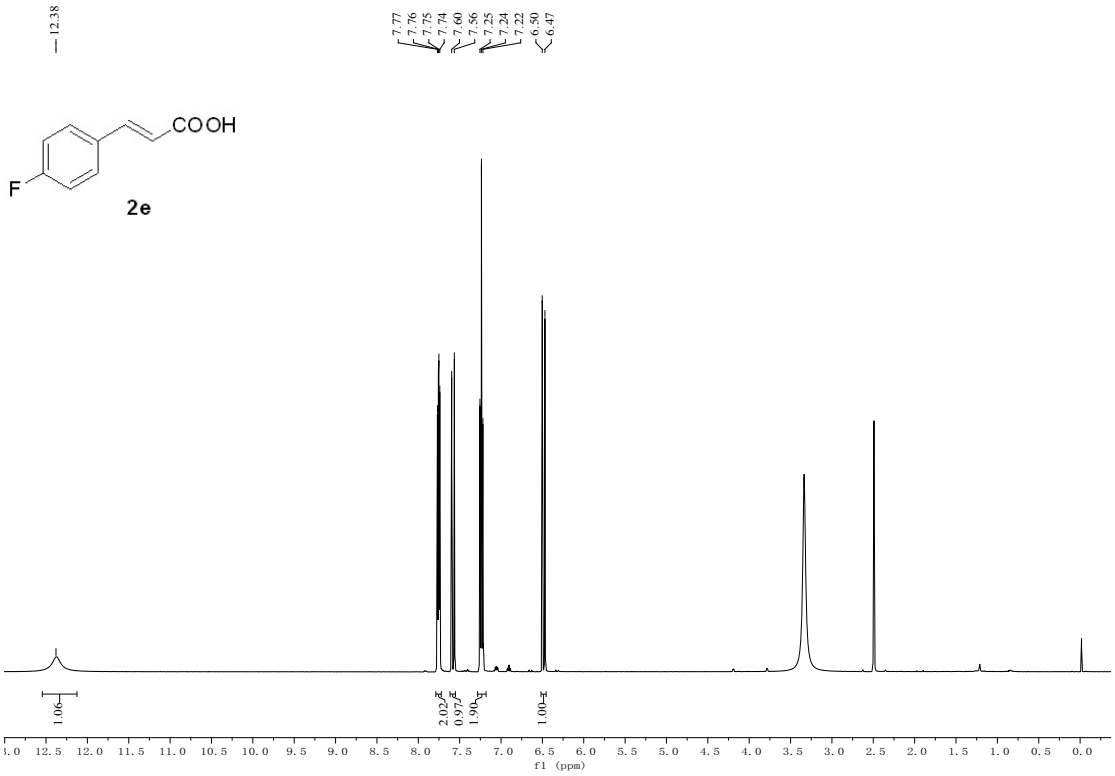


^{13}C NMR (125 MHz)

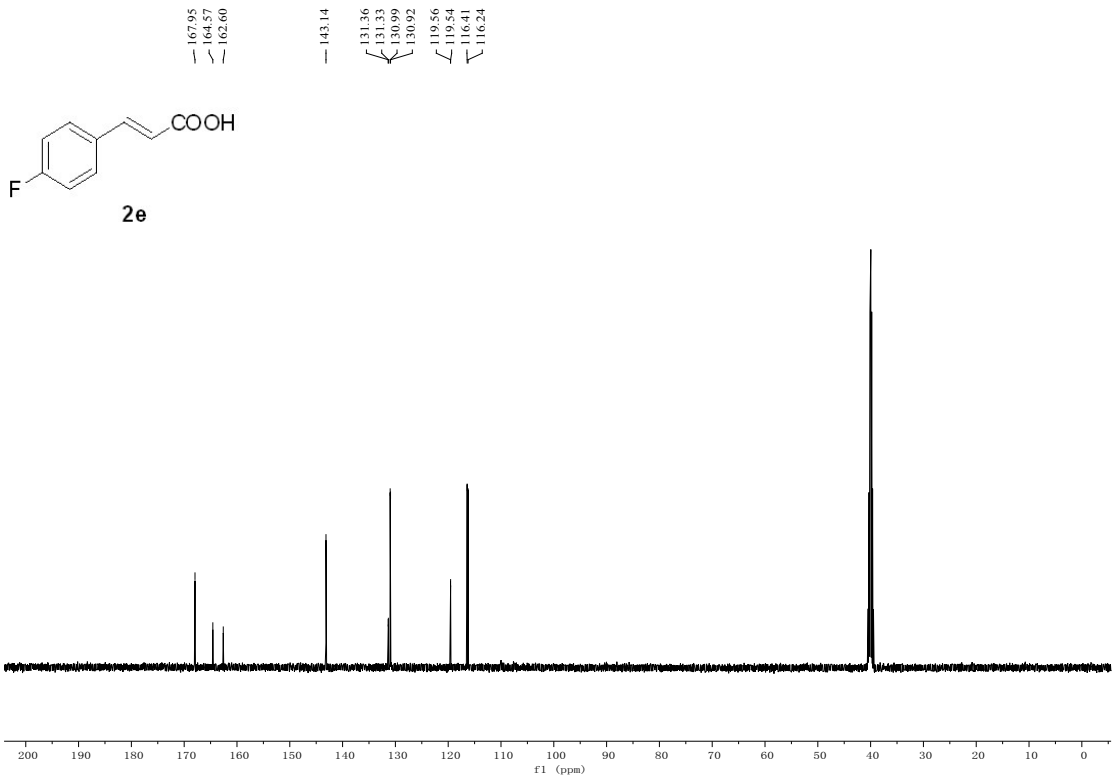


(*E*)-3-(4-fluorophenyl)acrylic acid (2e)

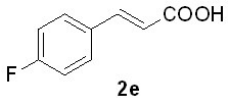
^{1}H NMR (500 MHz)



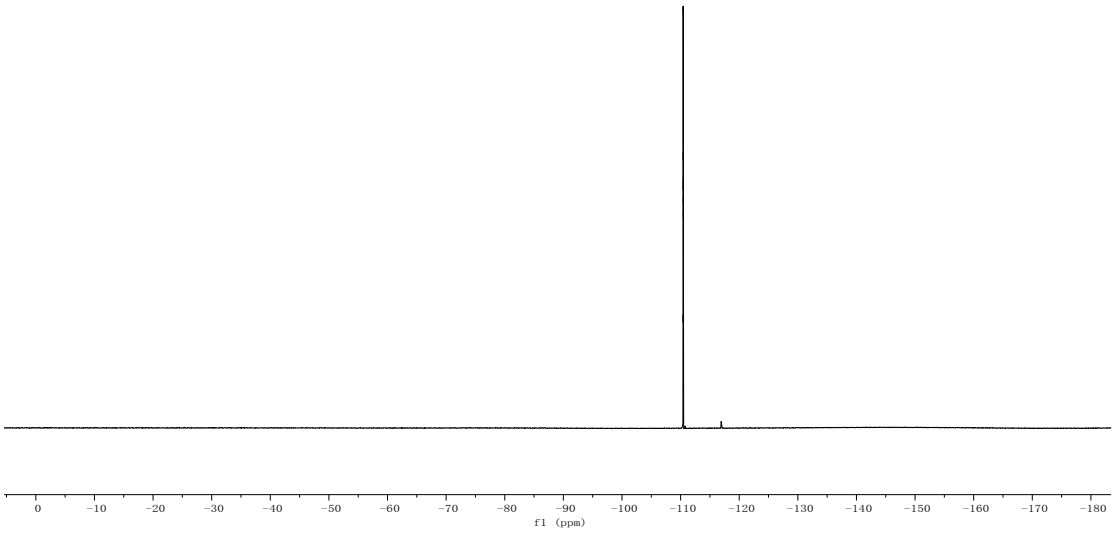
^{13}C NMR (125 MHz)



^{19}F NMR (470 MHz)

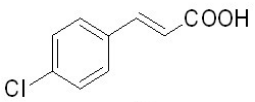


2e

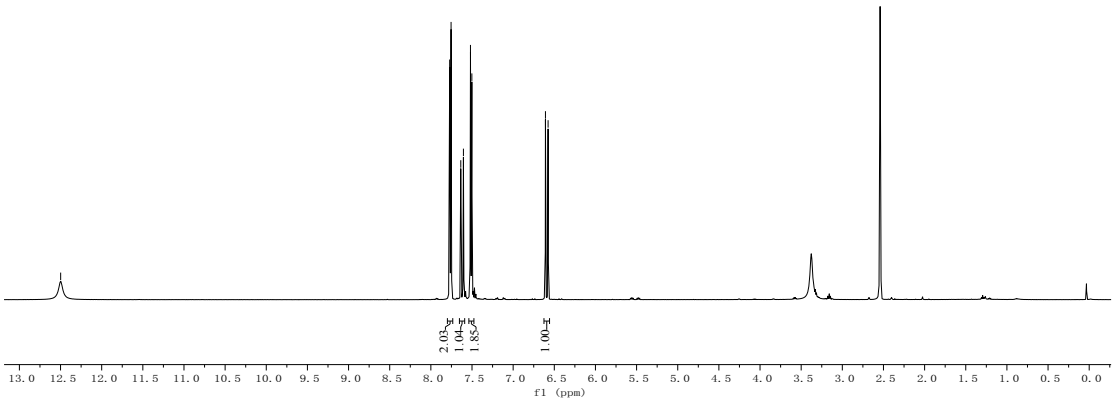


(*E*)-3-(4-chlorophenyl)acrylic acid (2f)

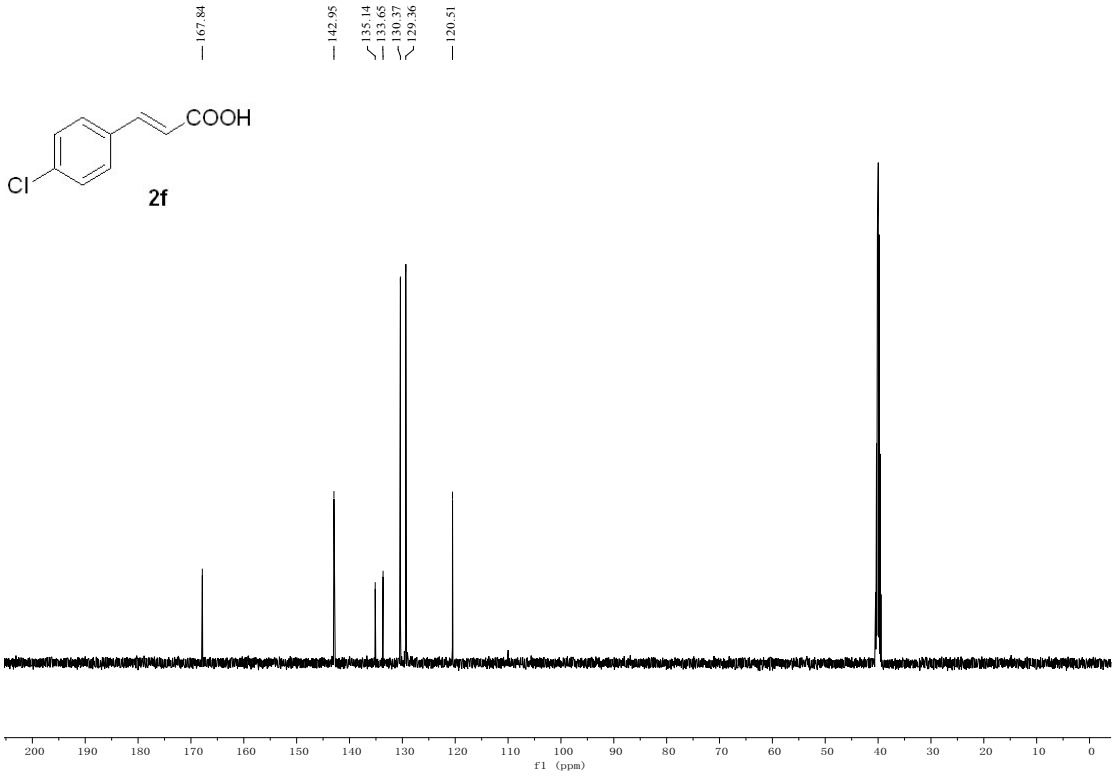
^{1}H NMR (500 MHz)



2f

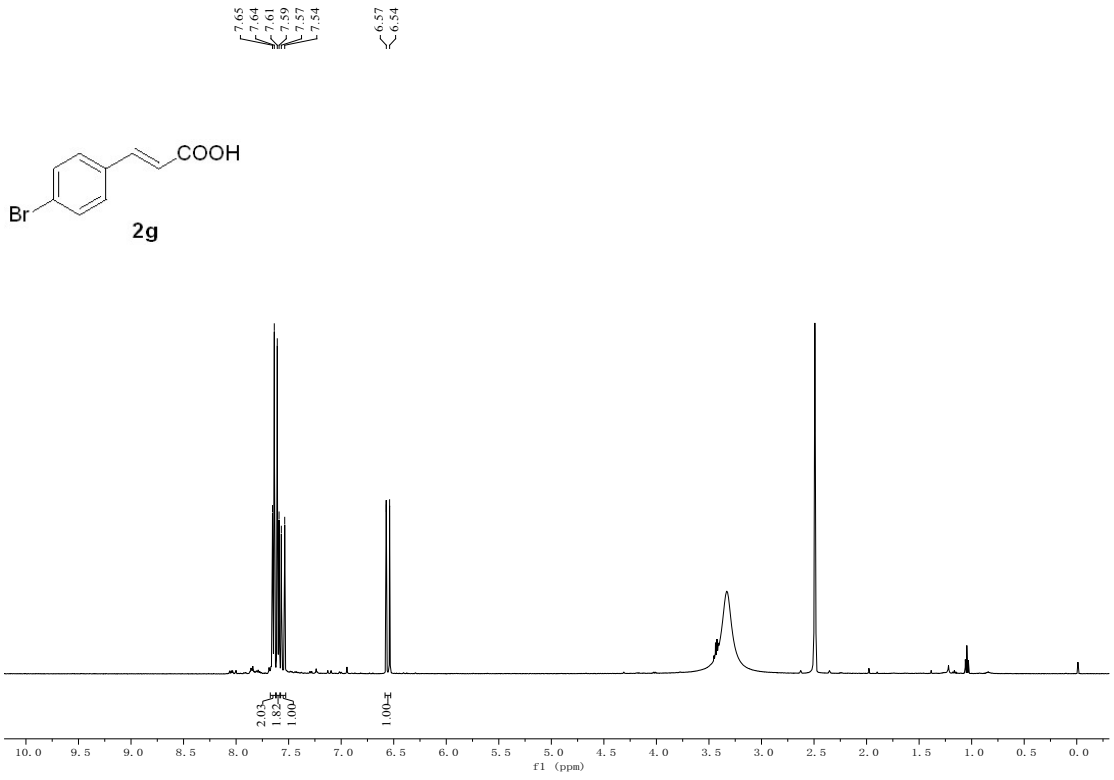


^{13}C NMR (125 MHz)

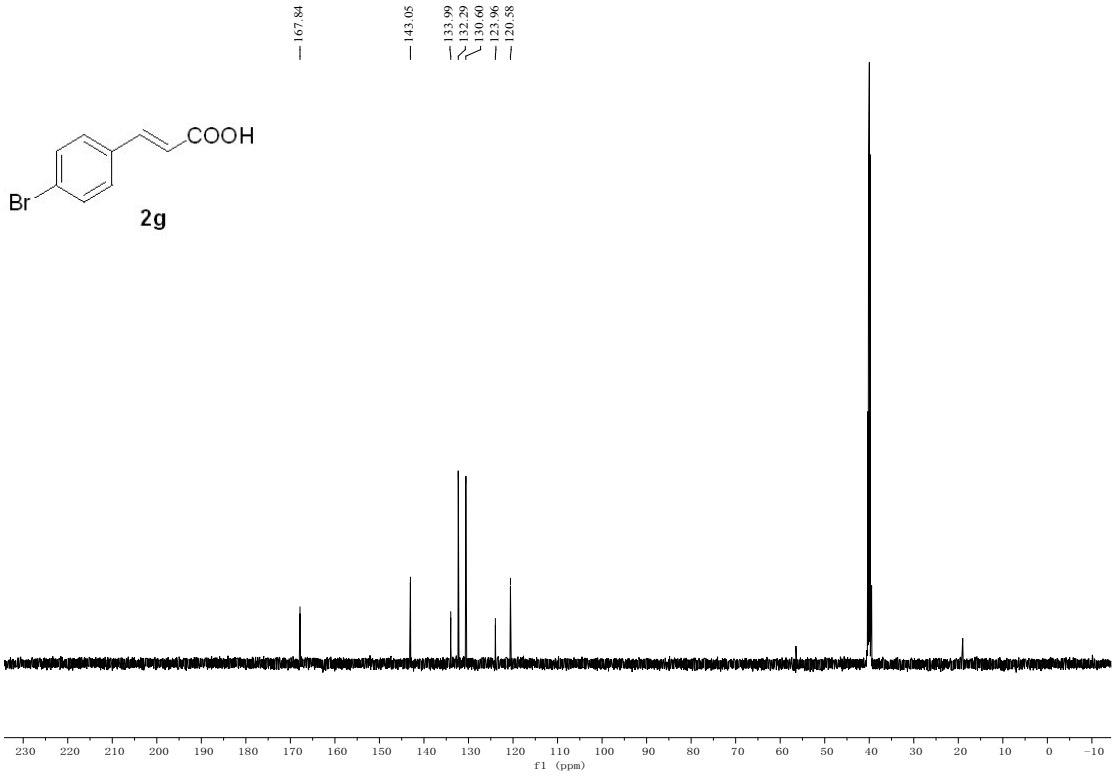


(*E*)-3-(4-bromophenyl)acrylic acid (2g)

^{1}H NMR (500 MHz)

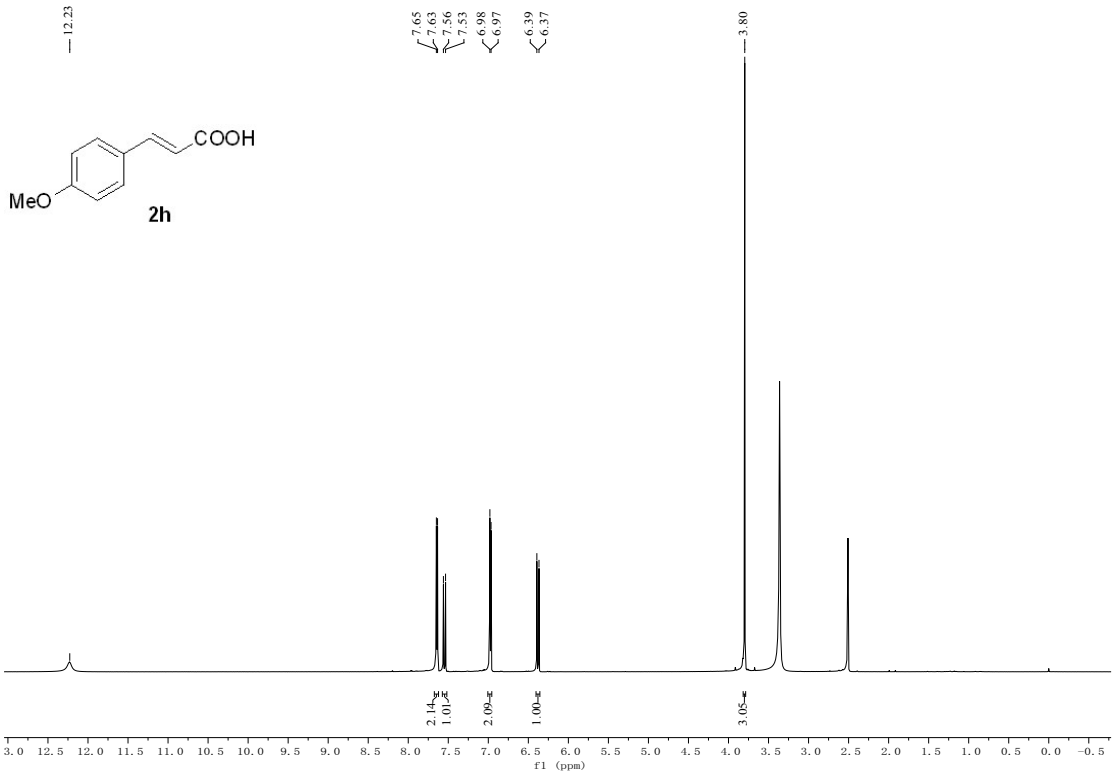


^{13}C NMR (125 MHz)

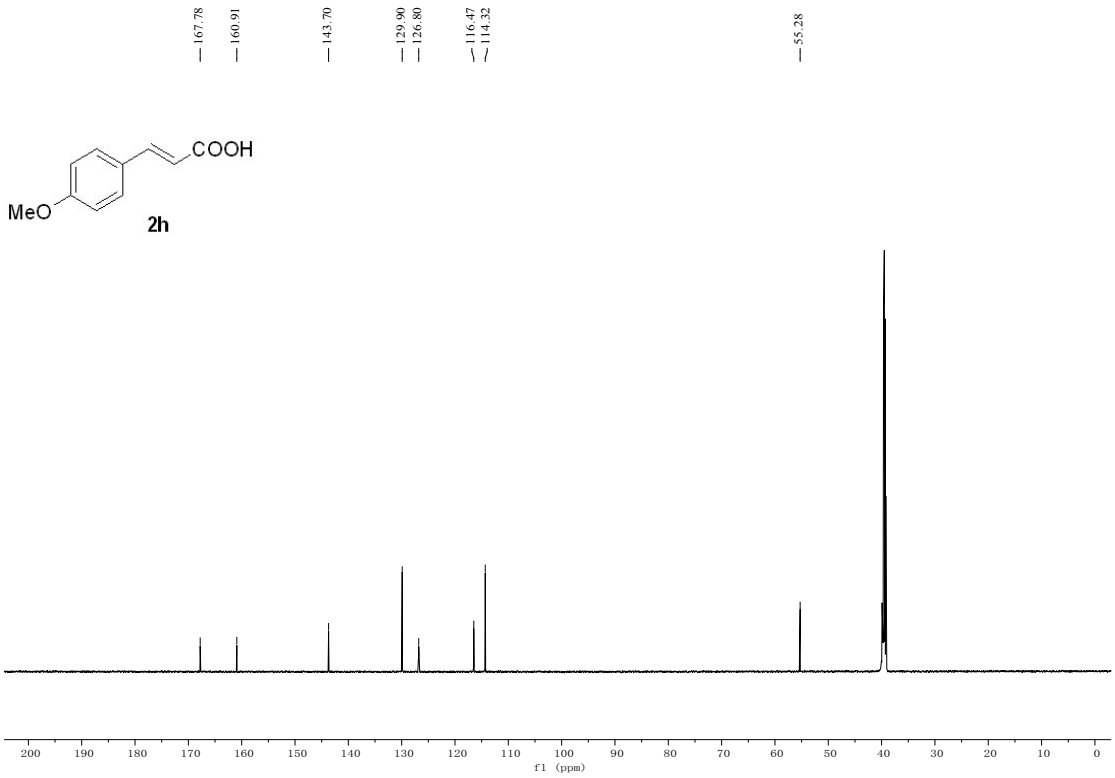


(*E*)-3-(4-methoxyphenyl)acrylic acid (2h)

^{1}H NMR (600 MHz)

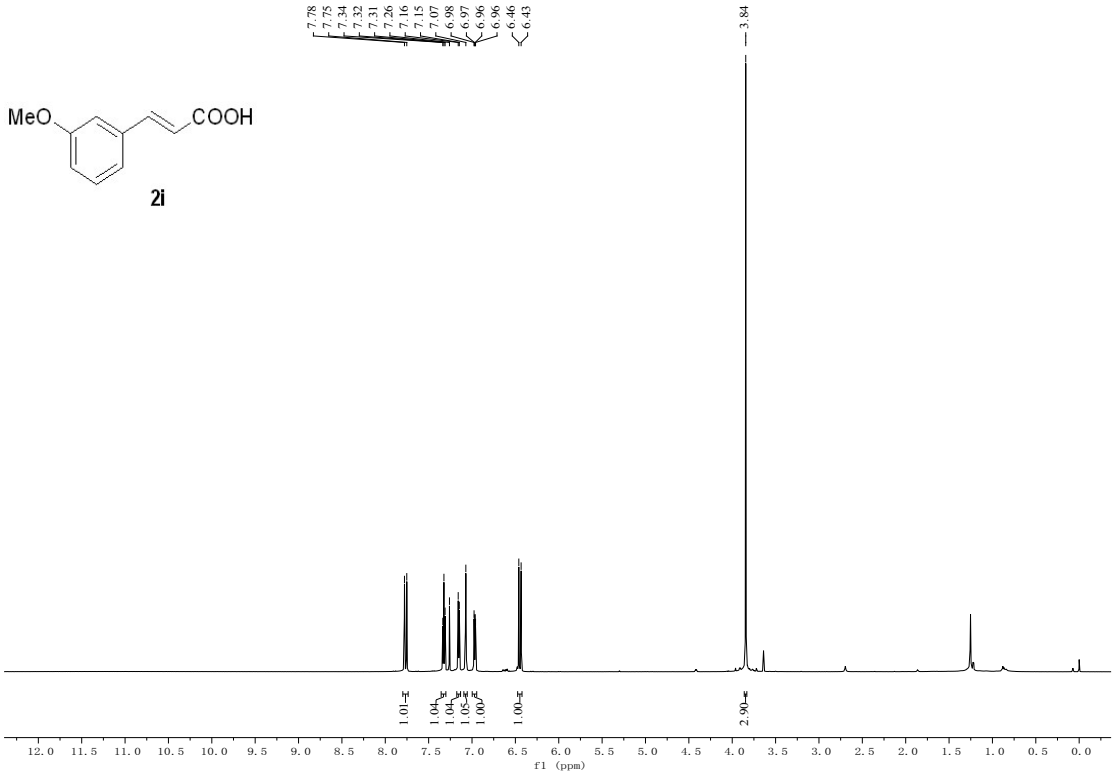


^{13}C NMR (150 MHz)

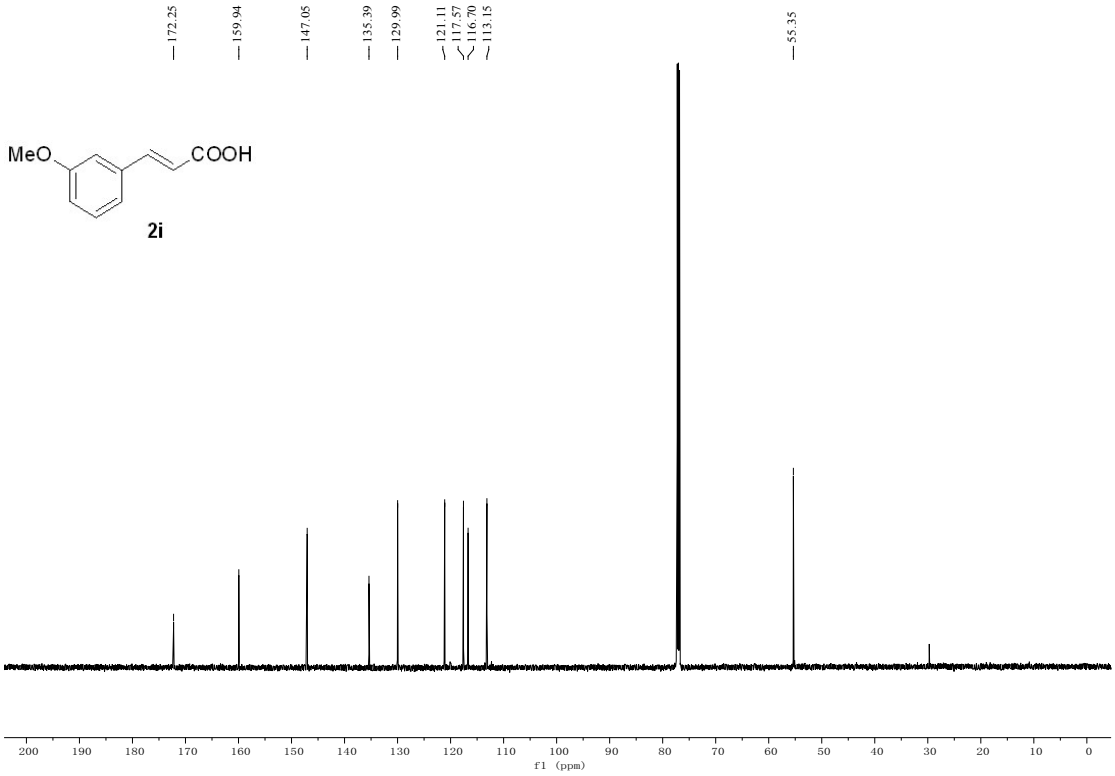


(*E*)-3-(3-methoxyphenyl)acrylic acid (2i)

^{1}H NMR (600 MHz)

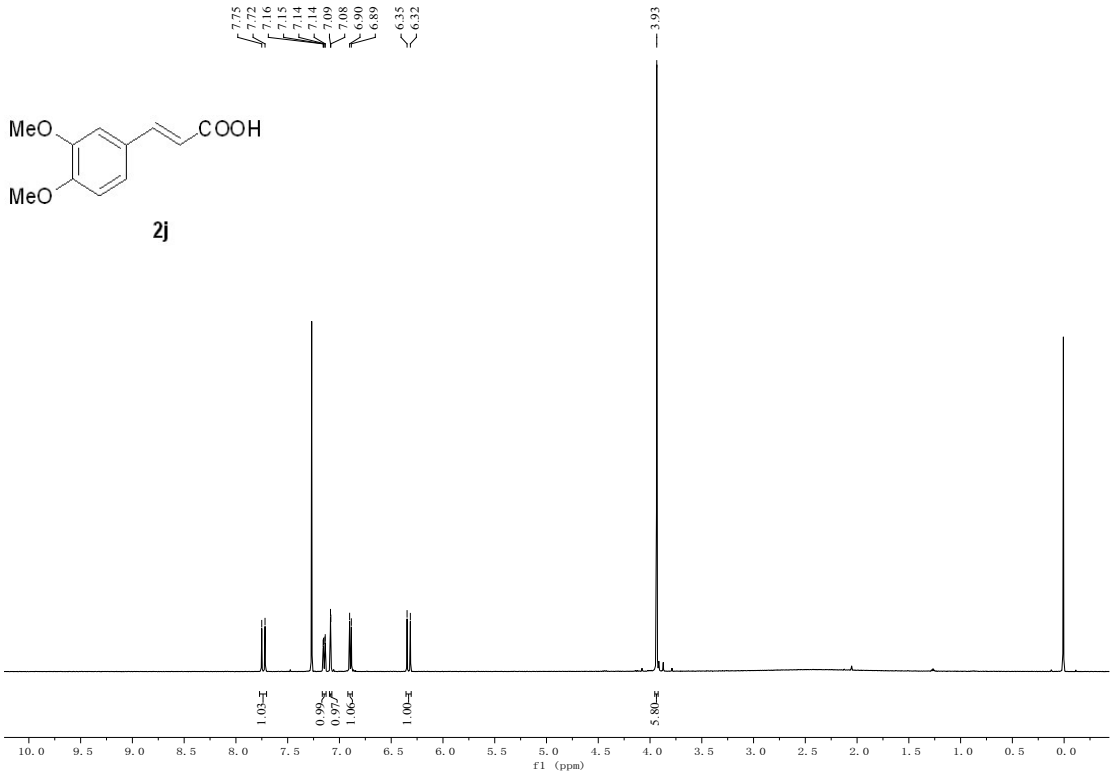


^{13}C NMR (150 MHz)

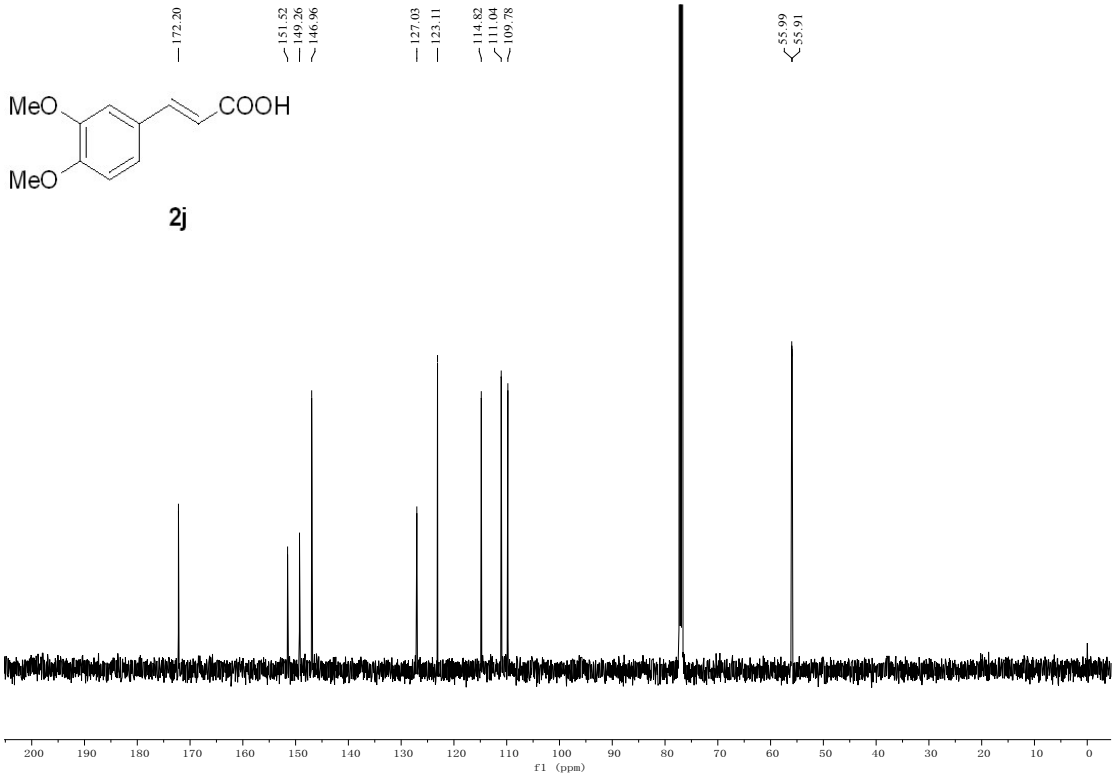


(*E*)-3-(3,4-dimethoxyphenyl)acrylic acid (2j)

^{1}H NMR (500 MHz)

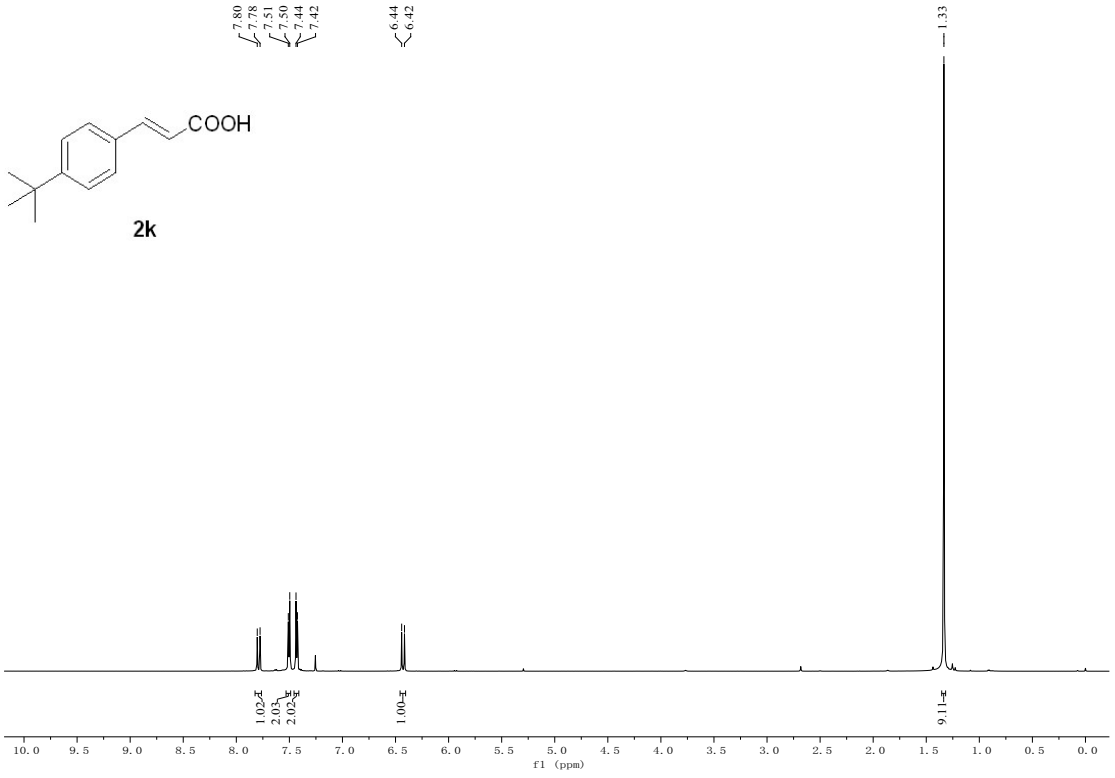


^{13}C NMR (125 MHz)

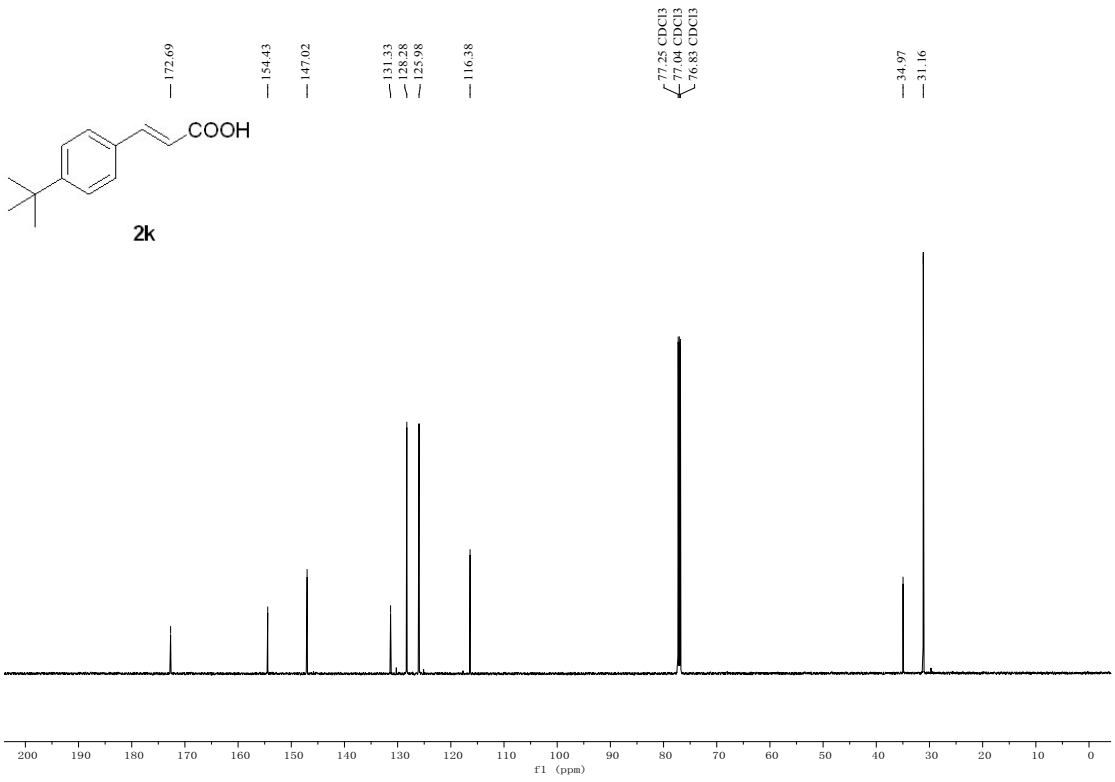


(*E*)-3-(4-(tert-butyl)phenyl)acrylic acid (2k)

^{1}H NMR (600 MHz)

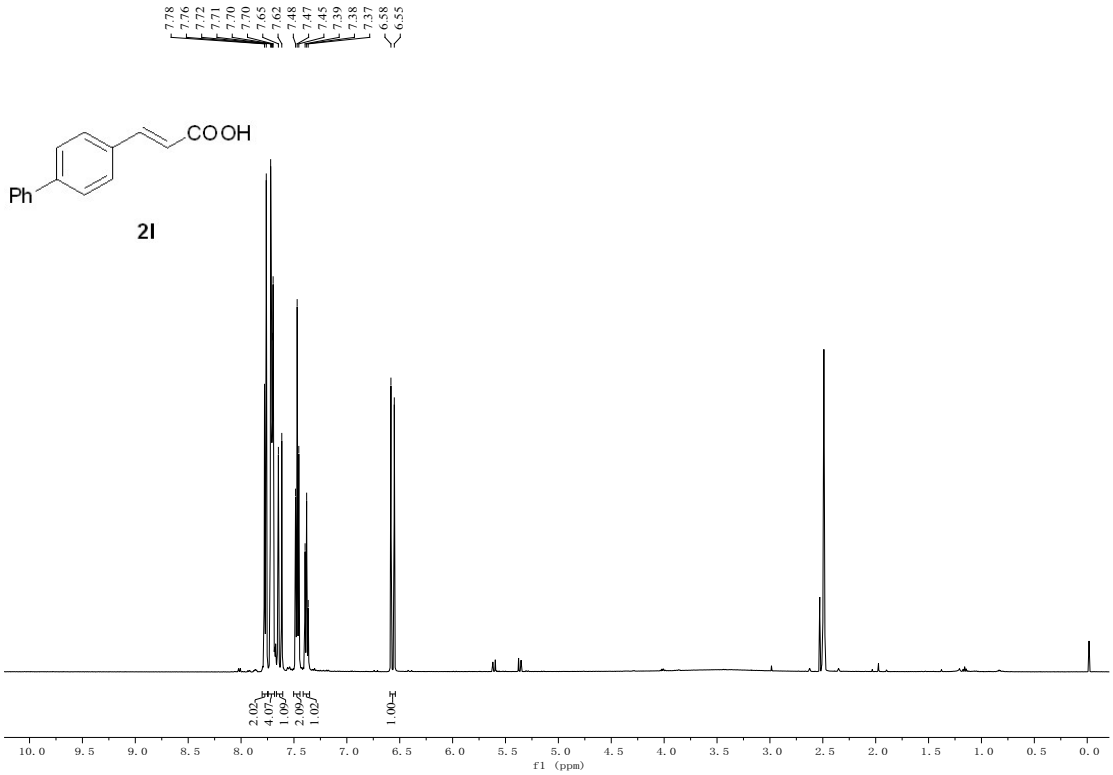


^{13}C NMR (150 MHz)

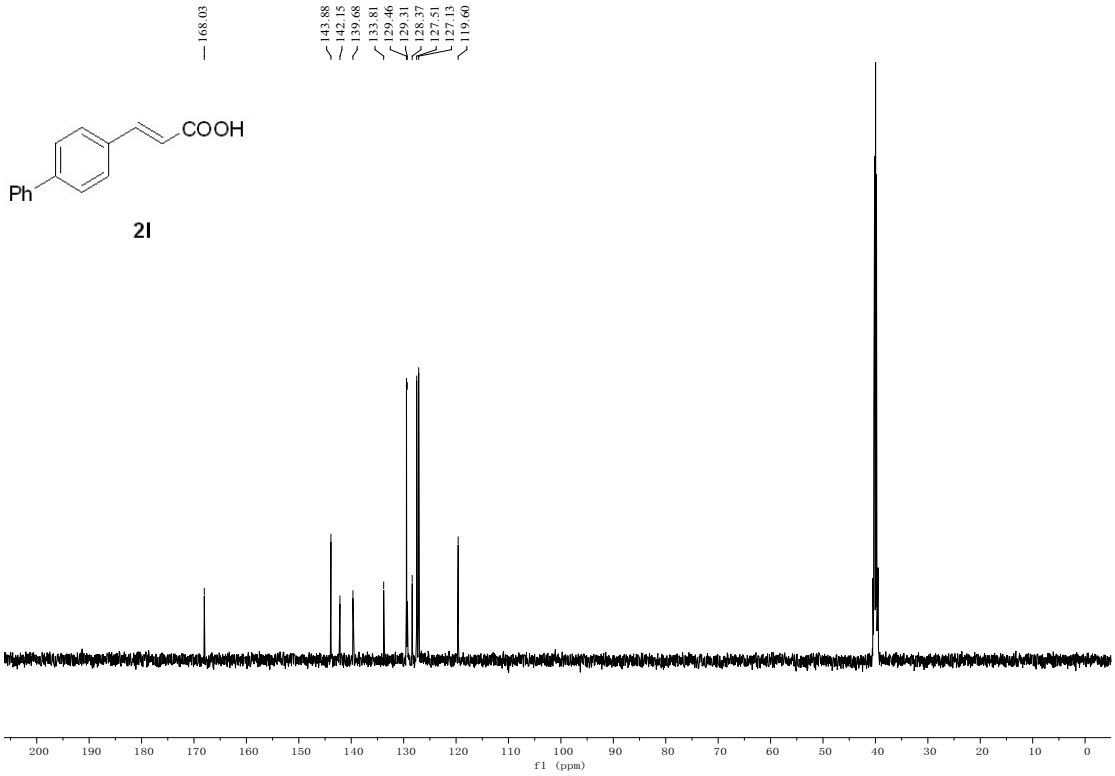


(*E*)-3-([1,1'-biphenyl]-4-yl)acrylic acid (2l)

^{1}H NMR (500 MHz)

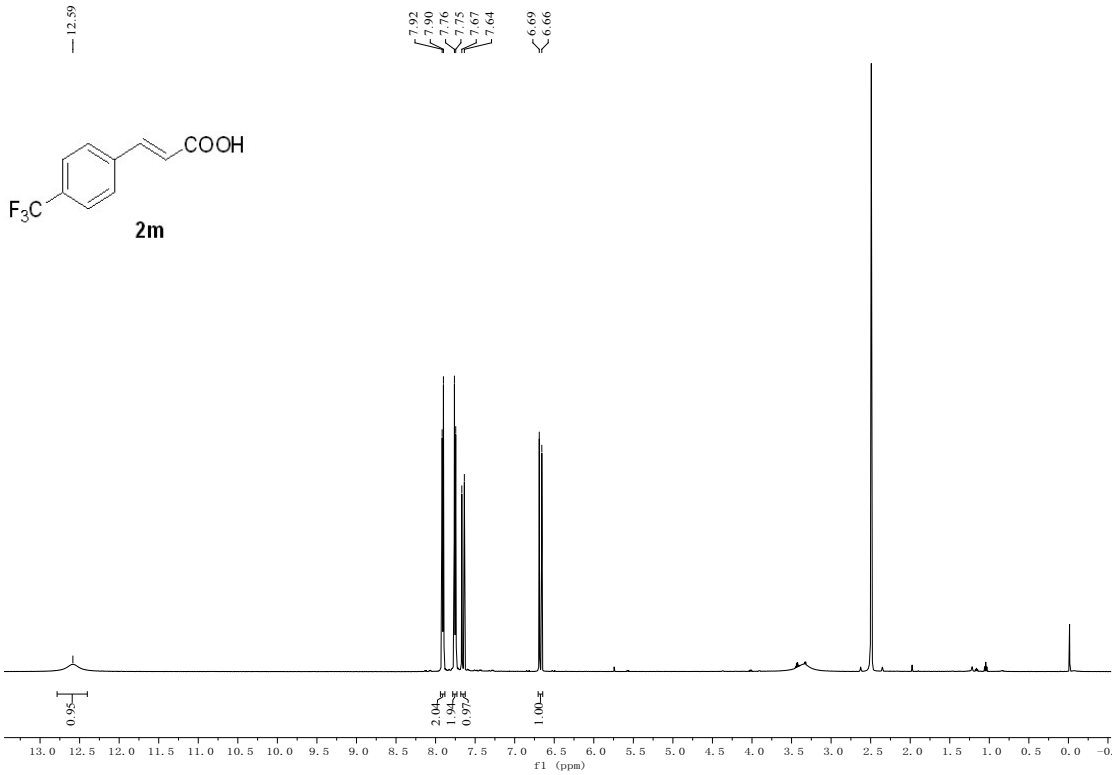


^{13}C NMR (125 MHz)

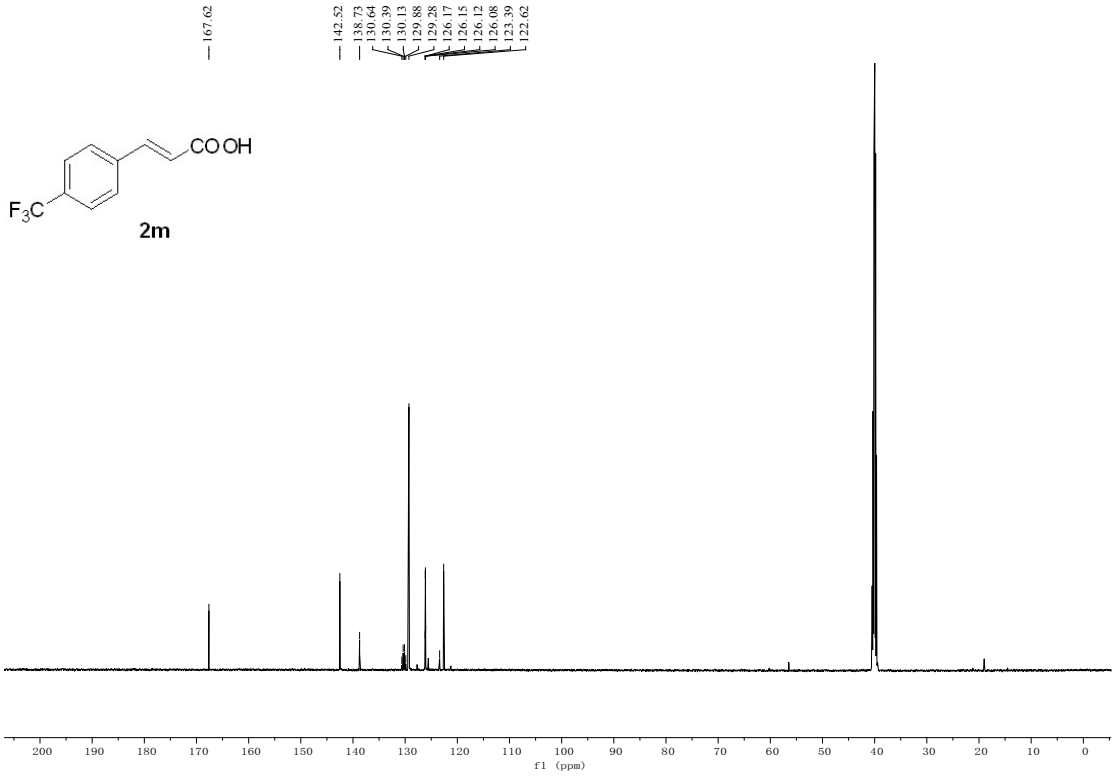


(*E*)-3-(4-(trifluoromethyl)phenyl)acrylic acid (2m)

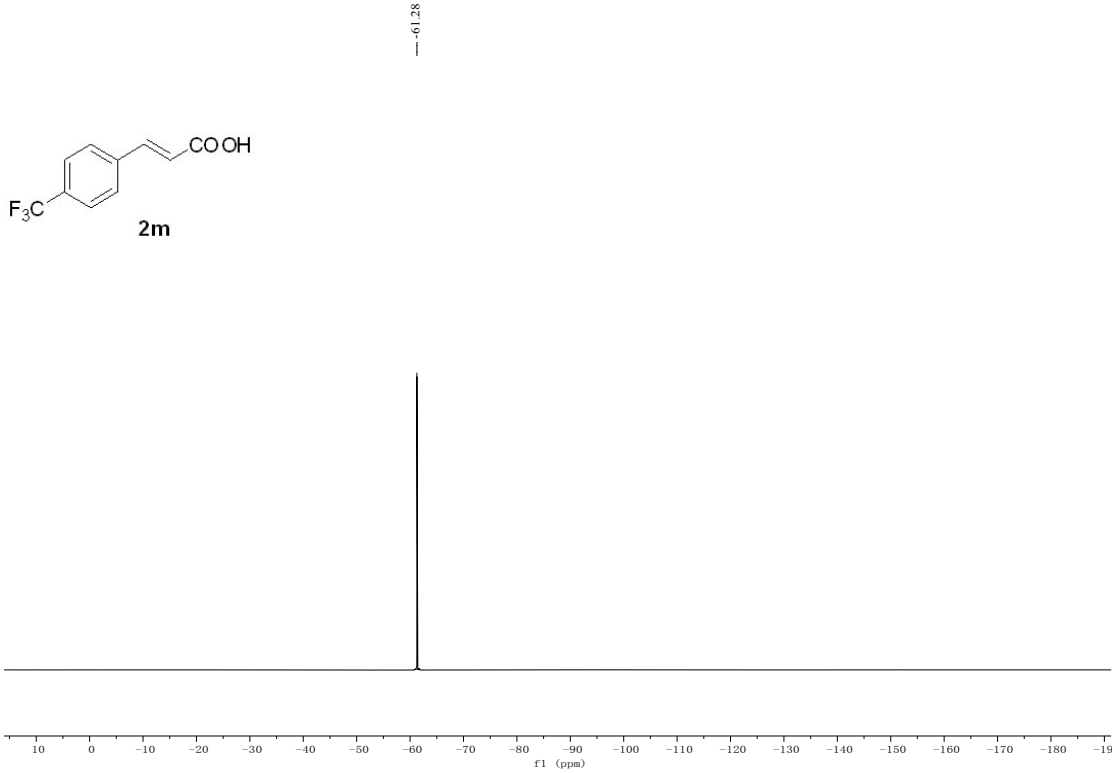
^{1}H NMR (500 MHz)



^{13}C NMR (125 MHz)

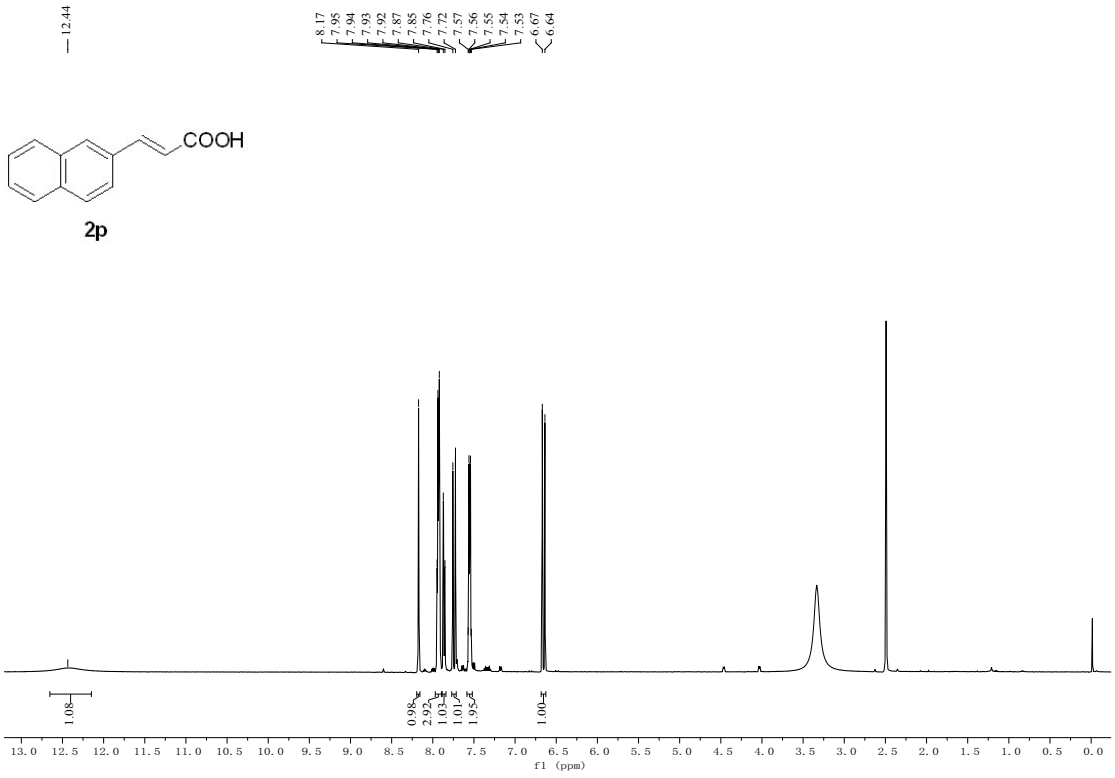


^{19}F NMR (470 MHz)

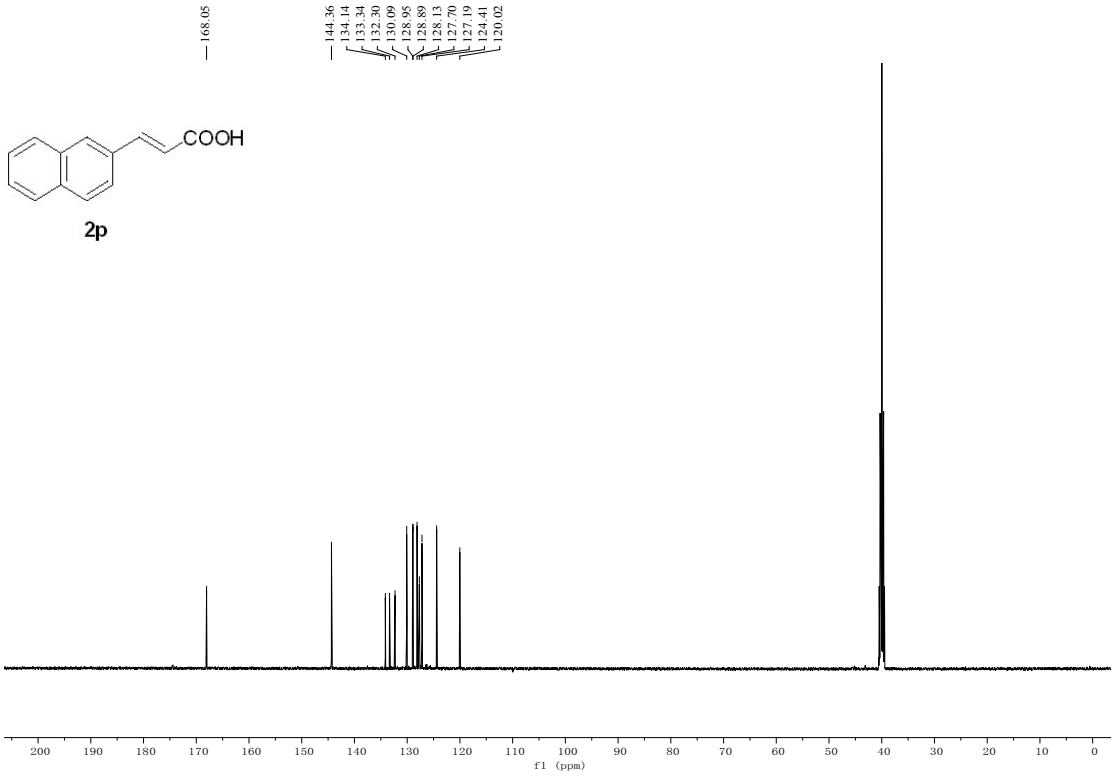


(*E*)-3-(naphthalen-2-yl)acrylic acid (2p)

^{1}H NMR (500 MHz)



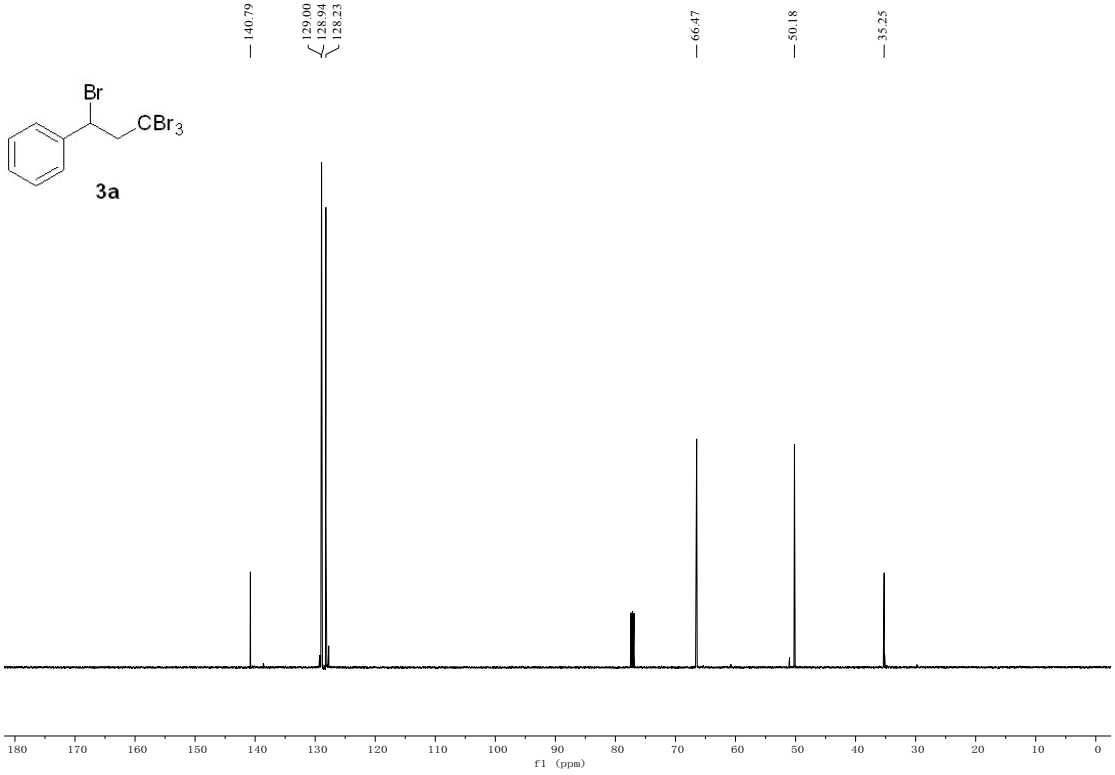
^{13}C NMR (125 MHz)



(1,3,3,3-tetrabromopropyl)benzene (3a)

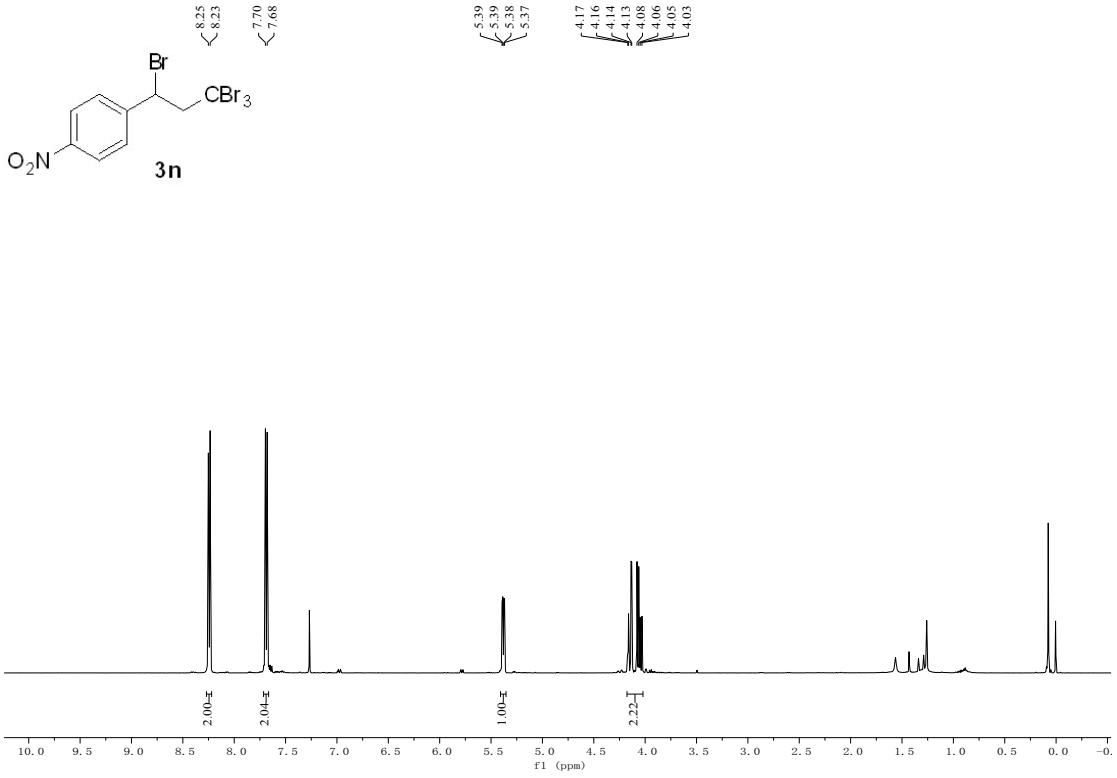
^{1}H NMR (500 MHz)

^{13}C NMR (125 MHz)

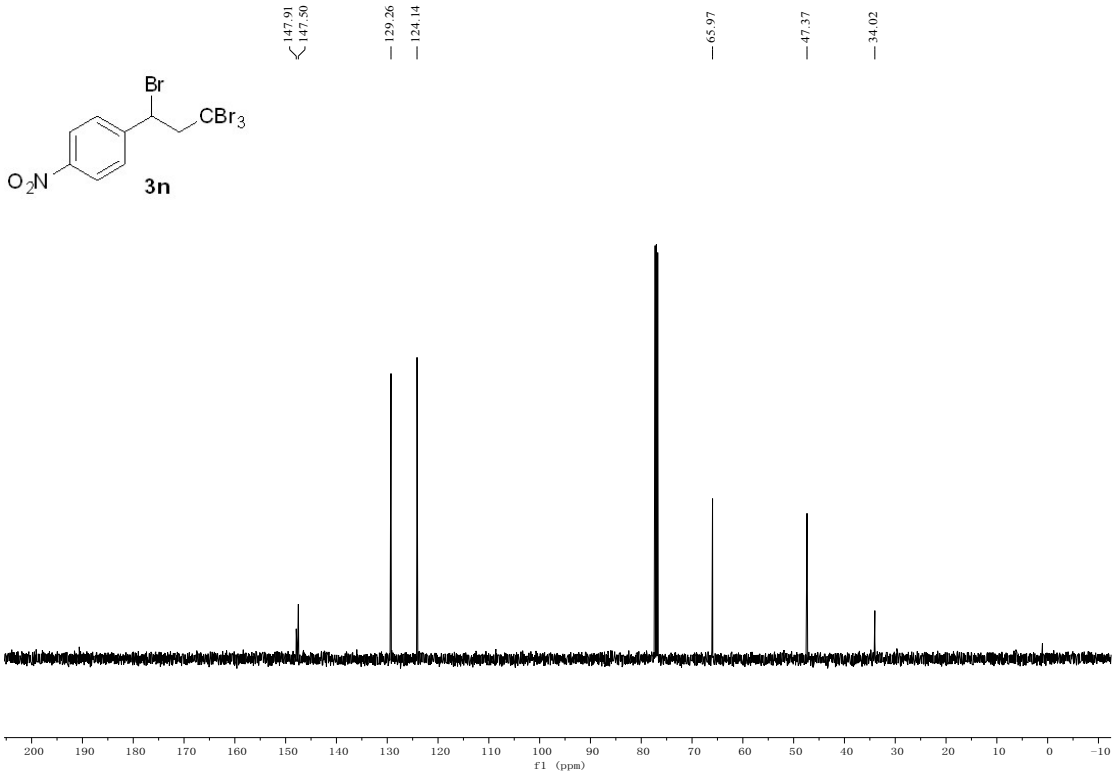


1-nitro-4-(1,3,3,3-tetrabromopropyl)benzene (3n)

^{1}H NMR (500 MHz)

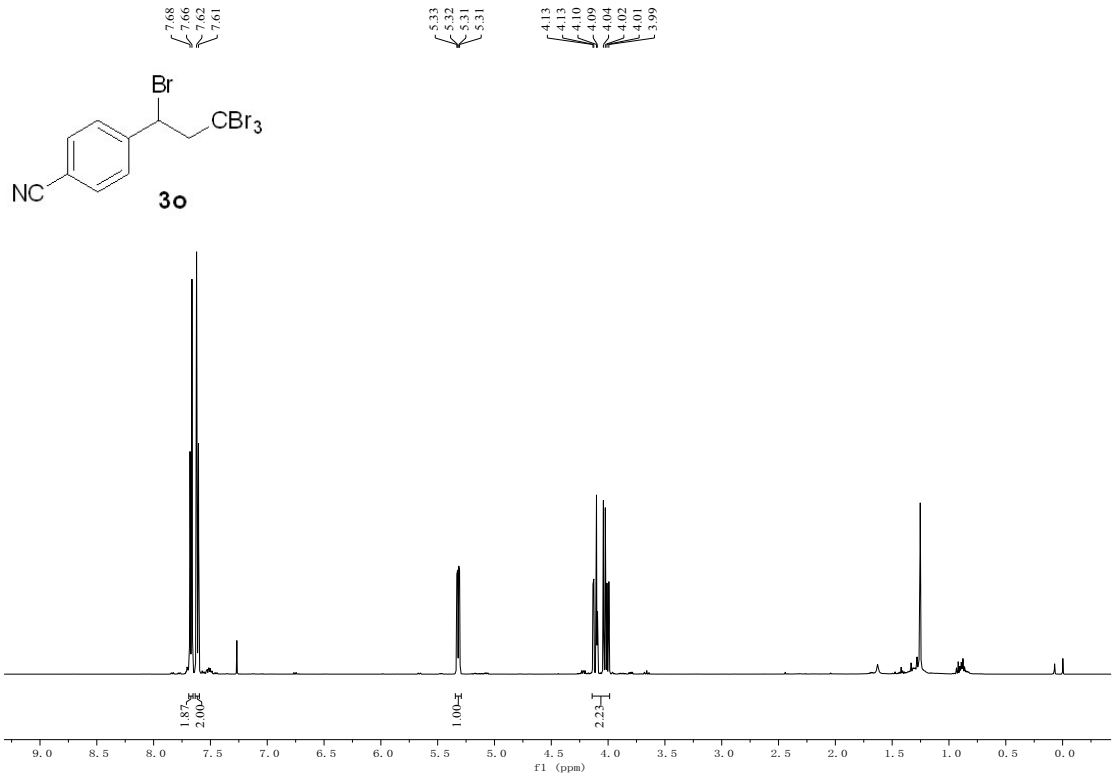


^{13}C NMR (125 MHz)

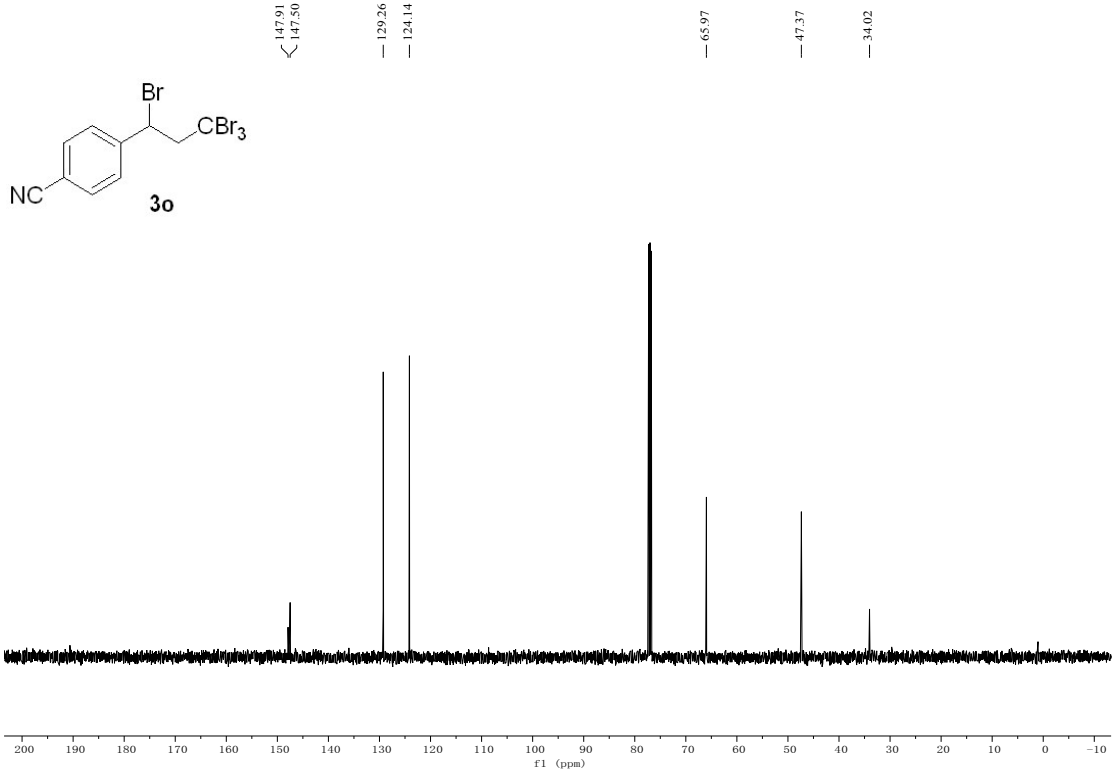


4-(1,3,3,3-tetrabromopropyl)benzonitrile (3o)

^{1}H NMR (500 MHz)

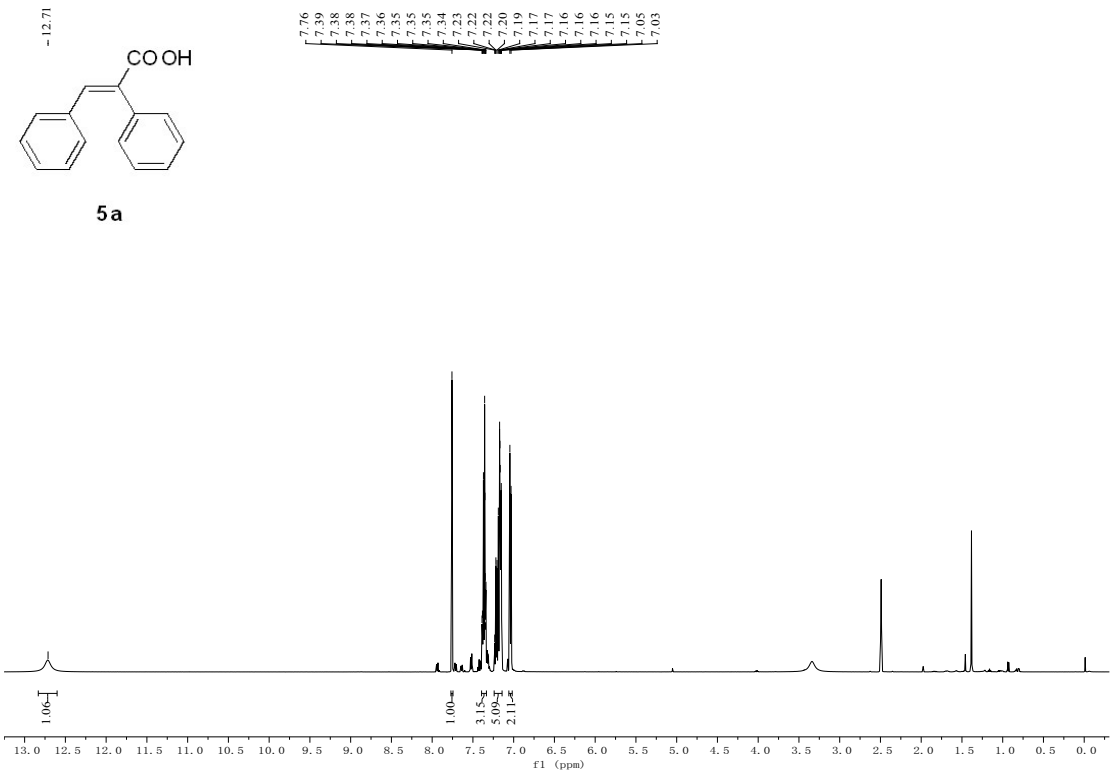


^{13}C NMR (125 MHz)



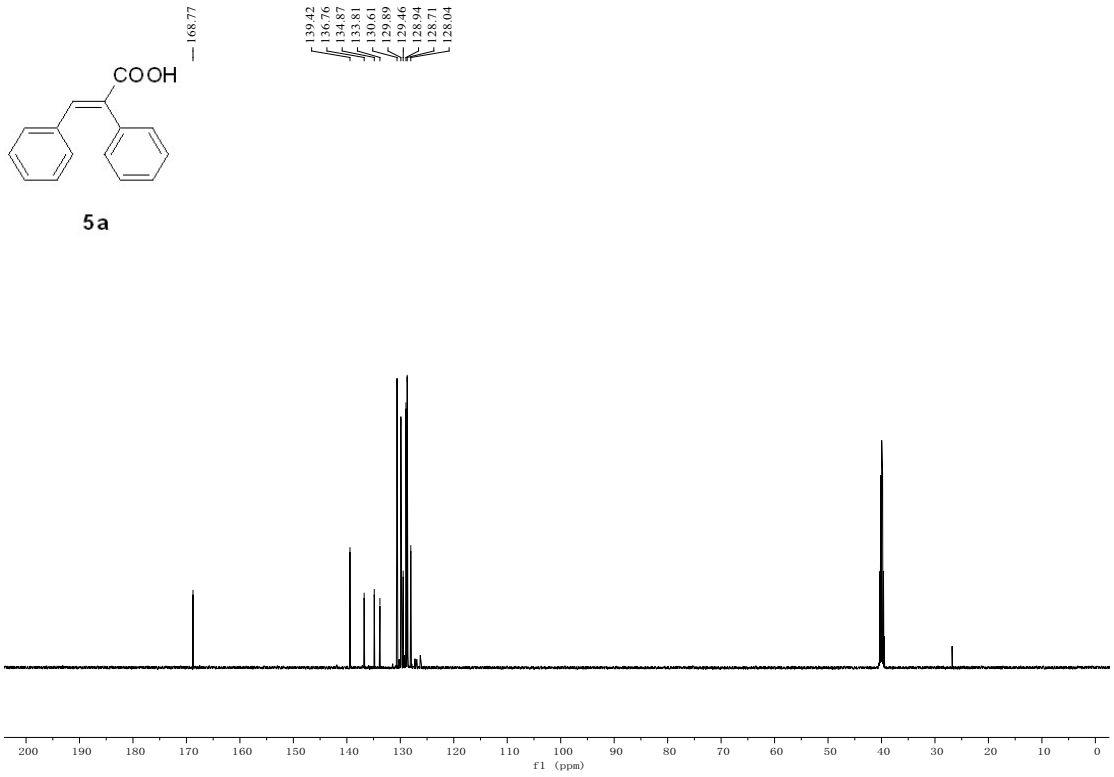
(*E*)-2,3-diphenylacrylic acid (5a)

^{1}H NMR (500 MHz)



5a

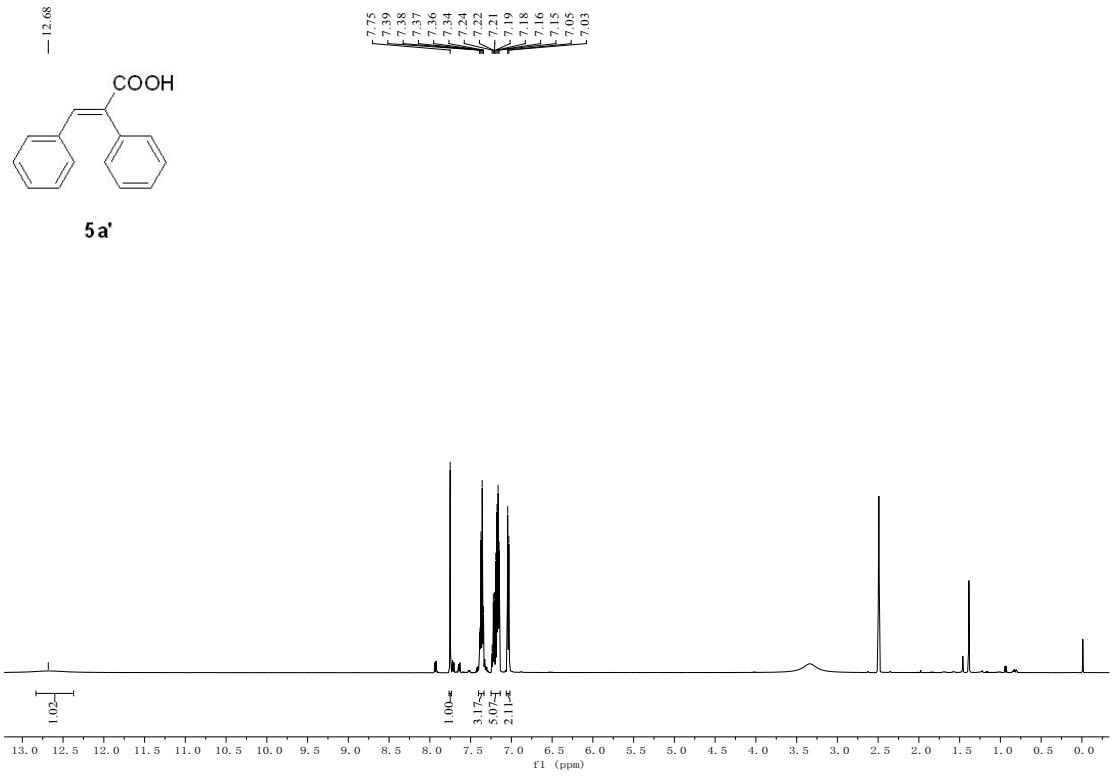
^{13}C NMR (125 MHz)



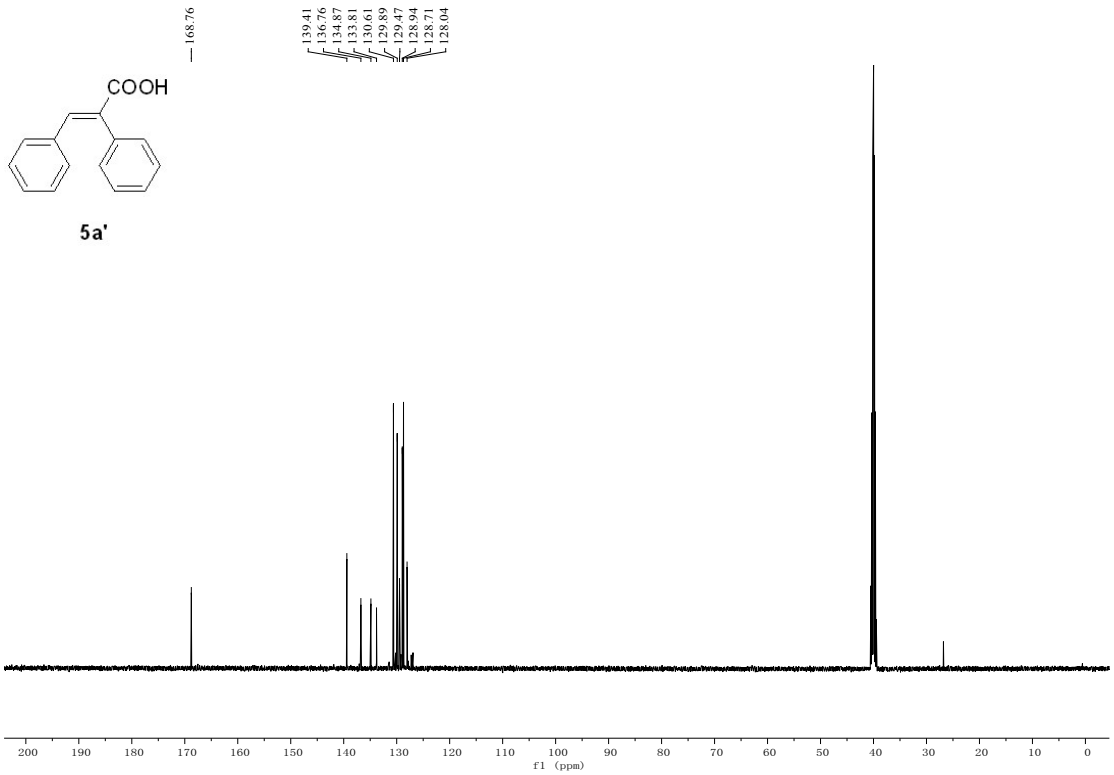
5a

(*E*)-2,3-diphenylacrylic acid (5a')

^{1}H NMR (500 MHz)

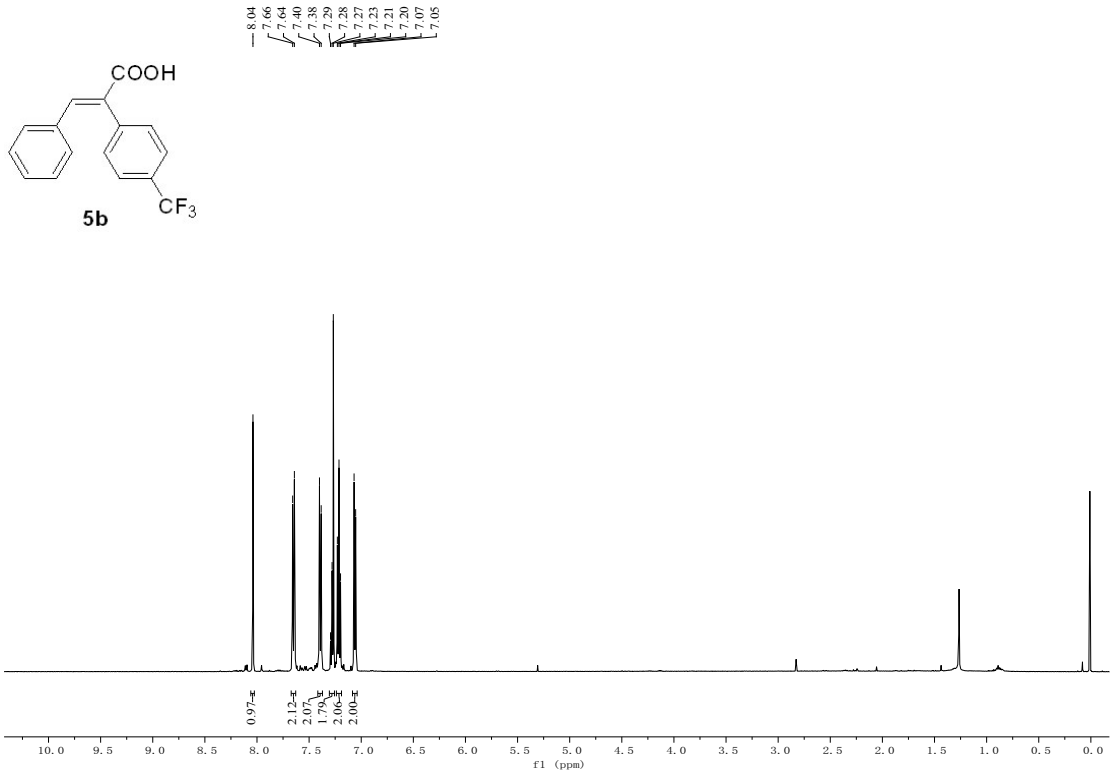


^{13}C NMR (125 MHz)

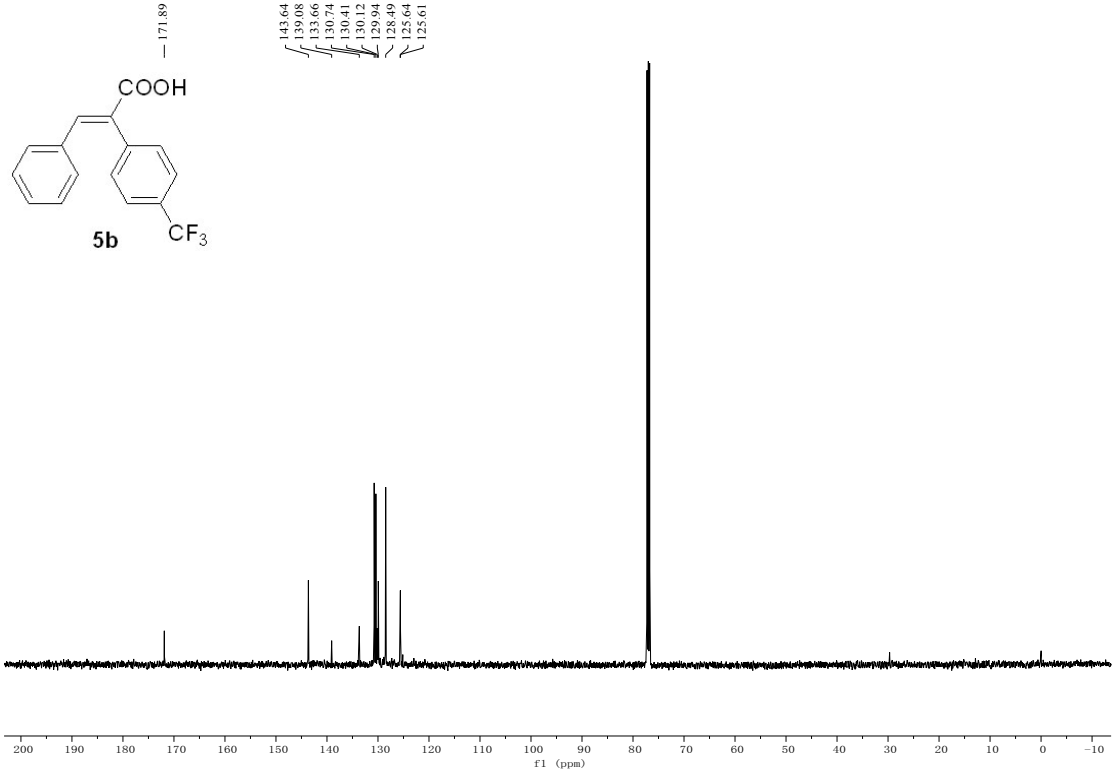


(*E*)-3-phenyl-2-(4-(trifluoromethyl)phenyl)acrylic acid (5b)

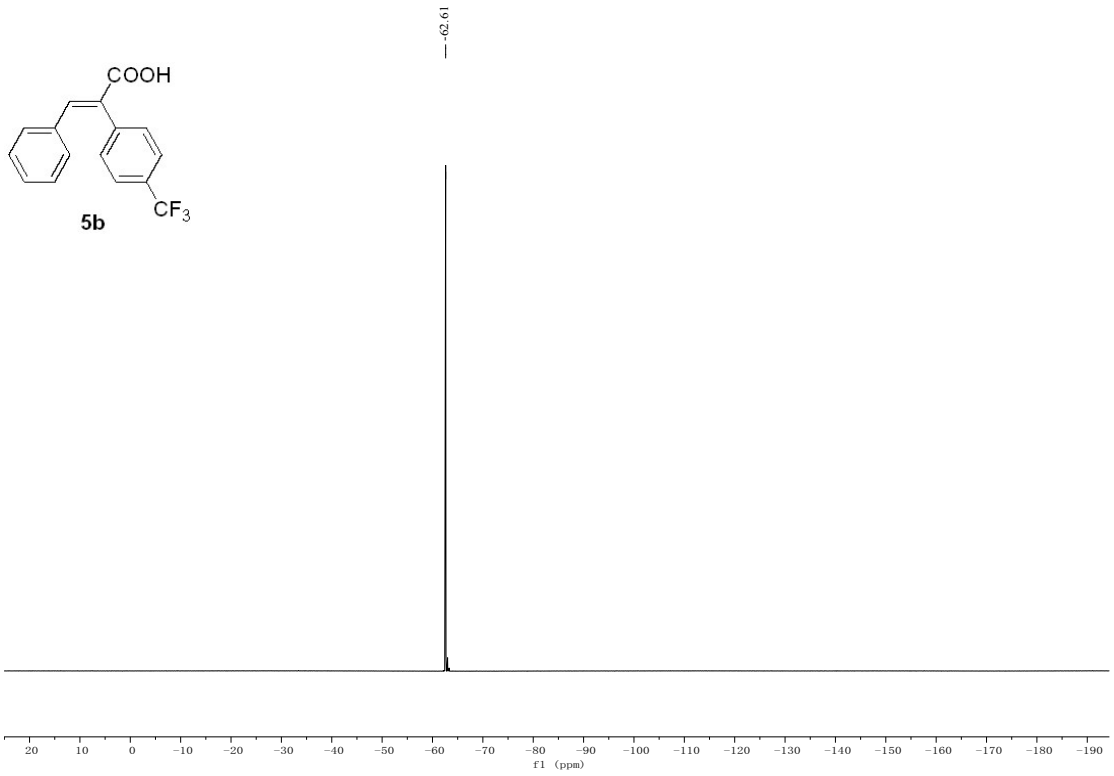
^{1}H NMR (500 MHz)



^{13}C NMR (125 MHz)

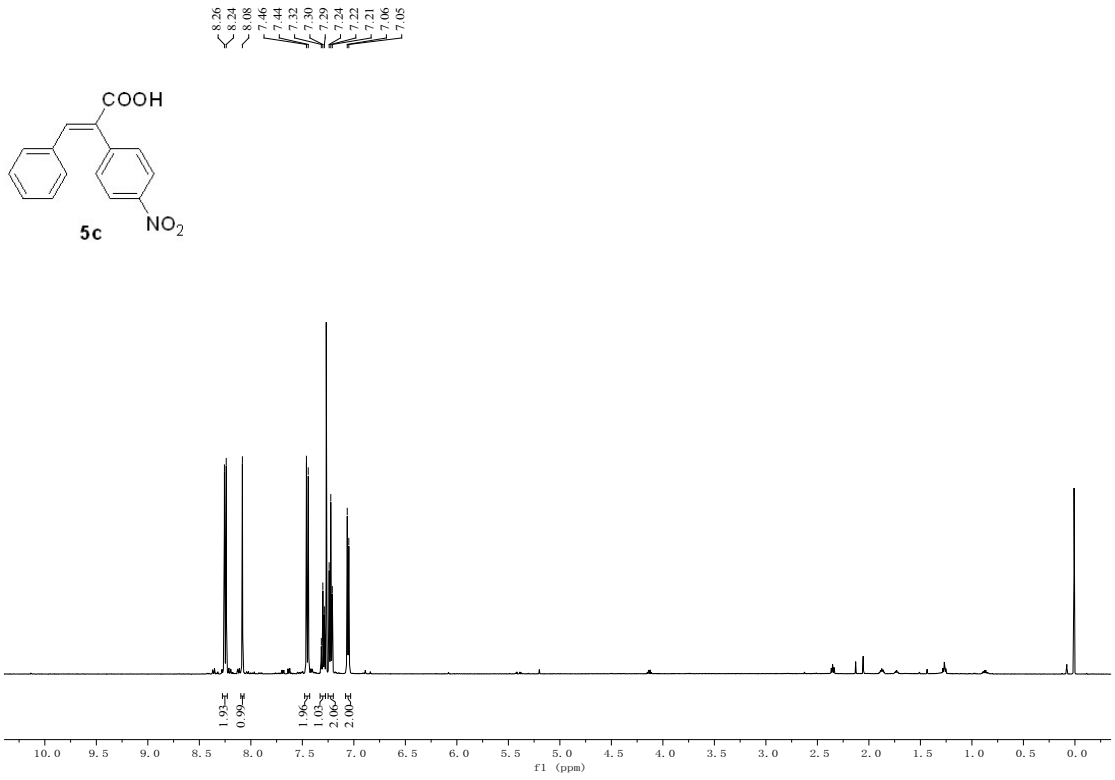


^{19}F NMR (470 MHz)

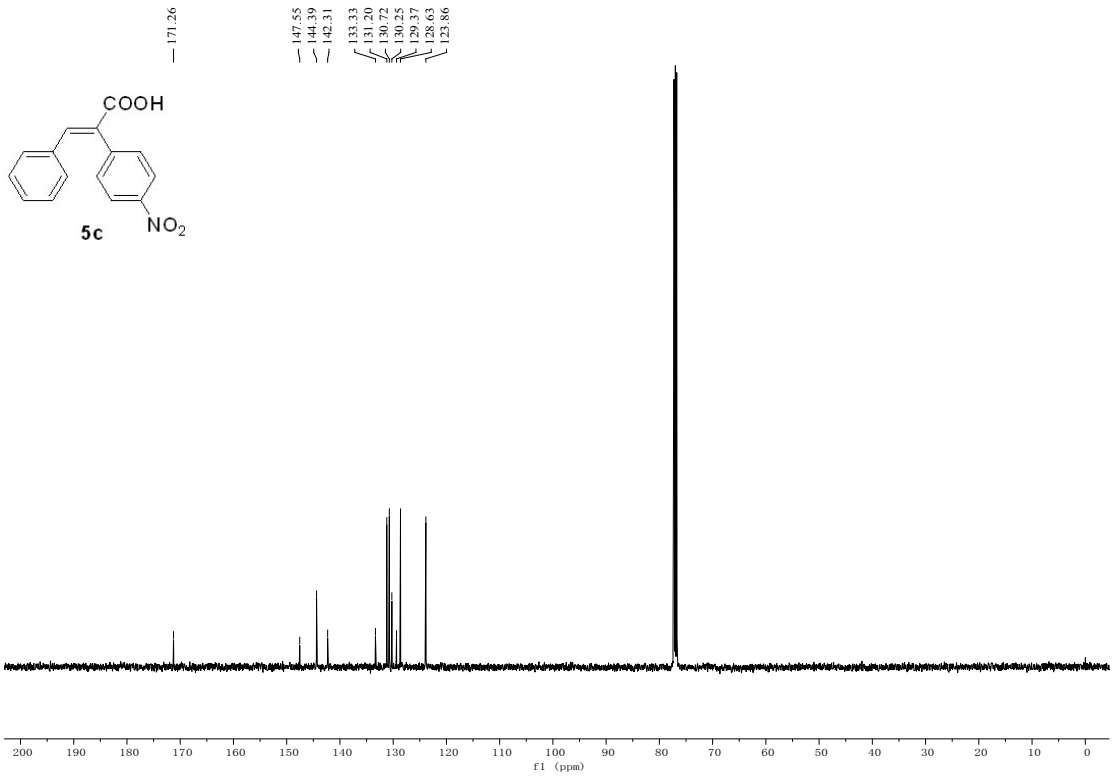


(*E*)-2-(4-nitrophenyl)-3-phenylacrylic acid (5c)

^{1}H NMR (500 MHz)

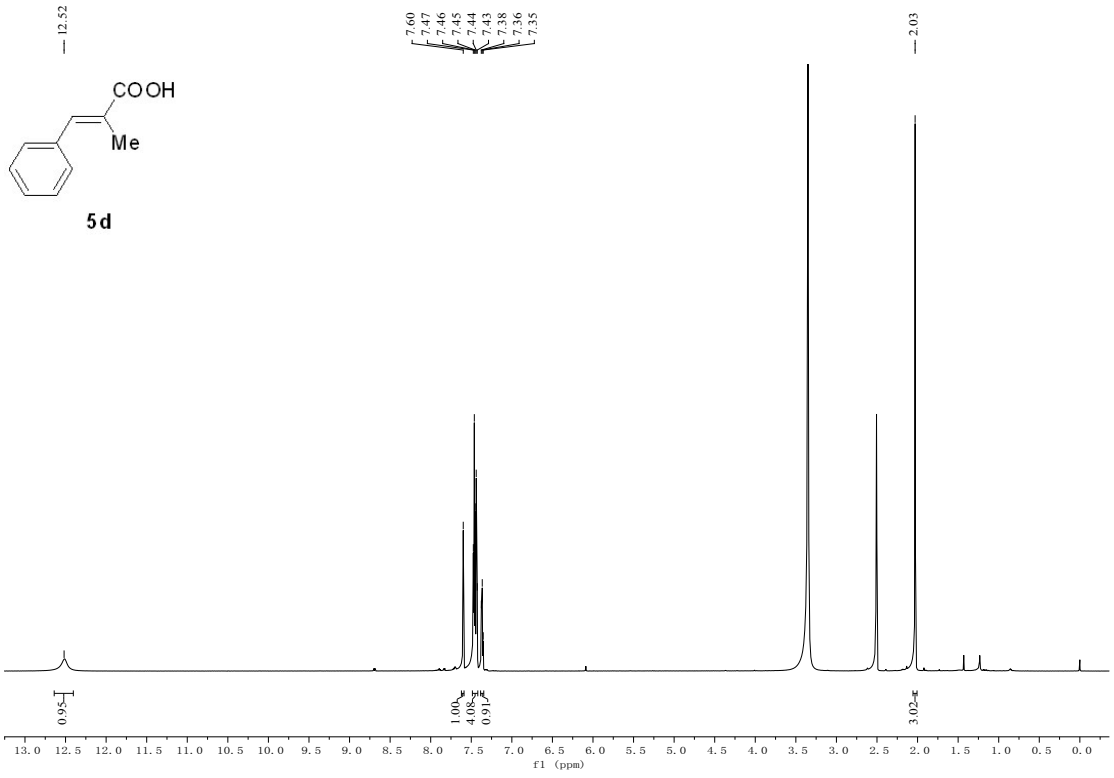


^{13}C NMR (125 MHz)

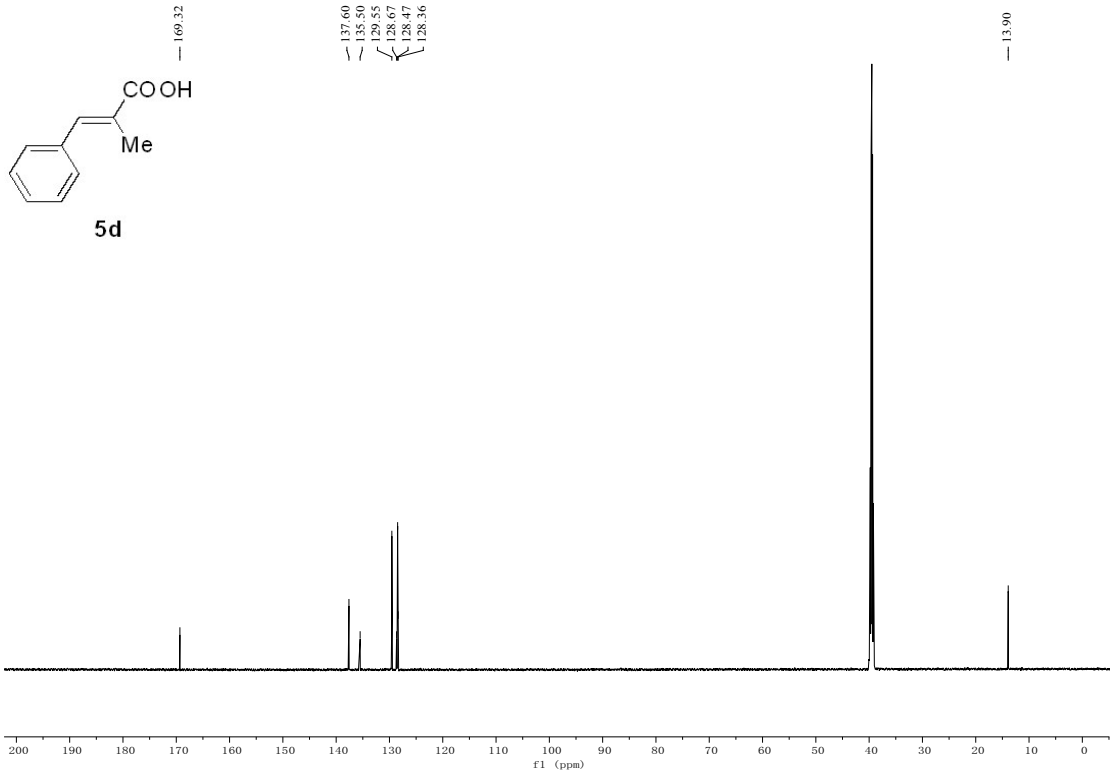


(*E*)-2-methyl-3-phenylacrylic acid (5d)

^{1}H NMR (600 MHz)

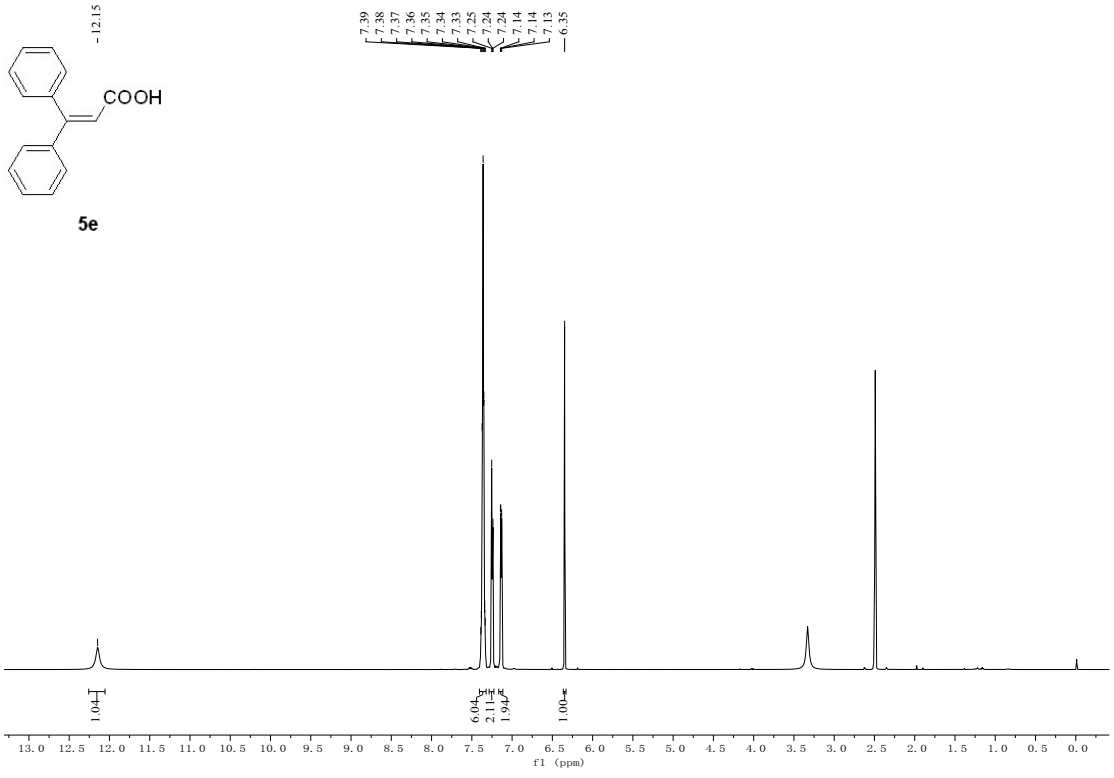


^{13}C NMR (150 MHz)

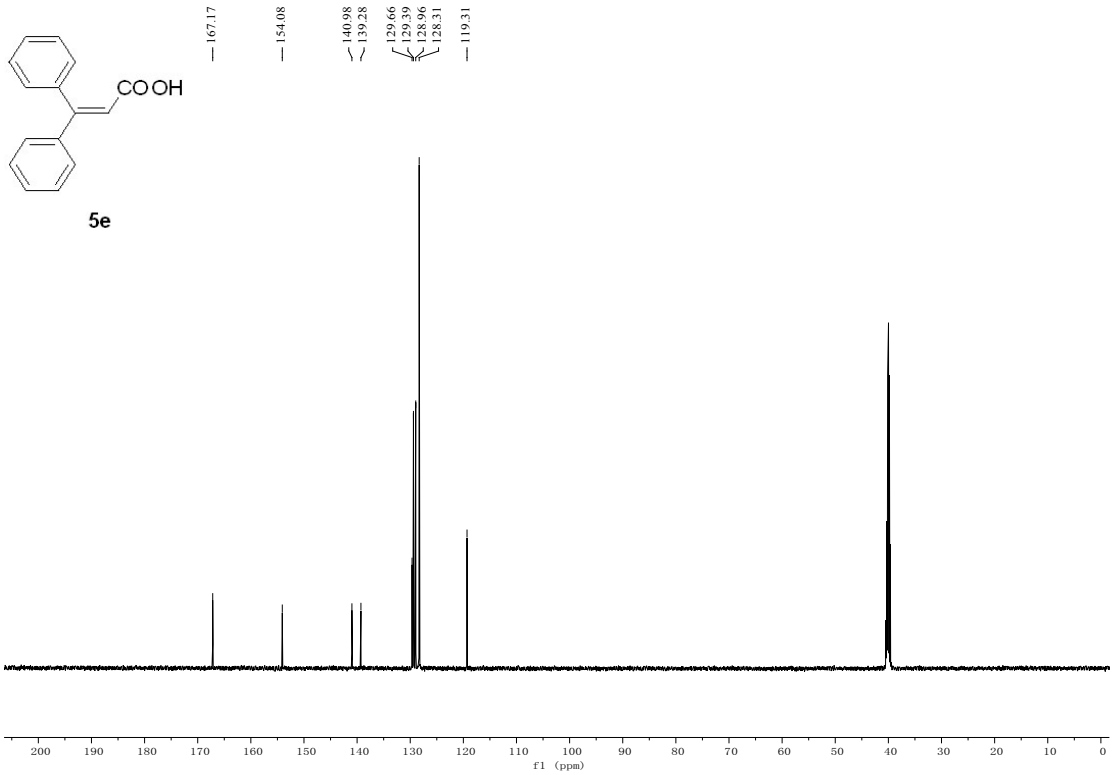


3,3-diphenylacrylic acid (5e)

^{1}H NMR (500 MHz)

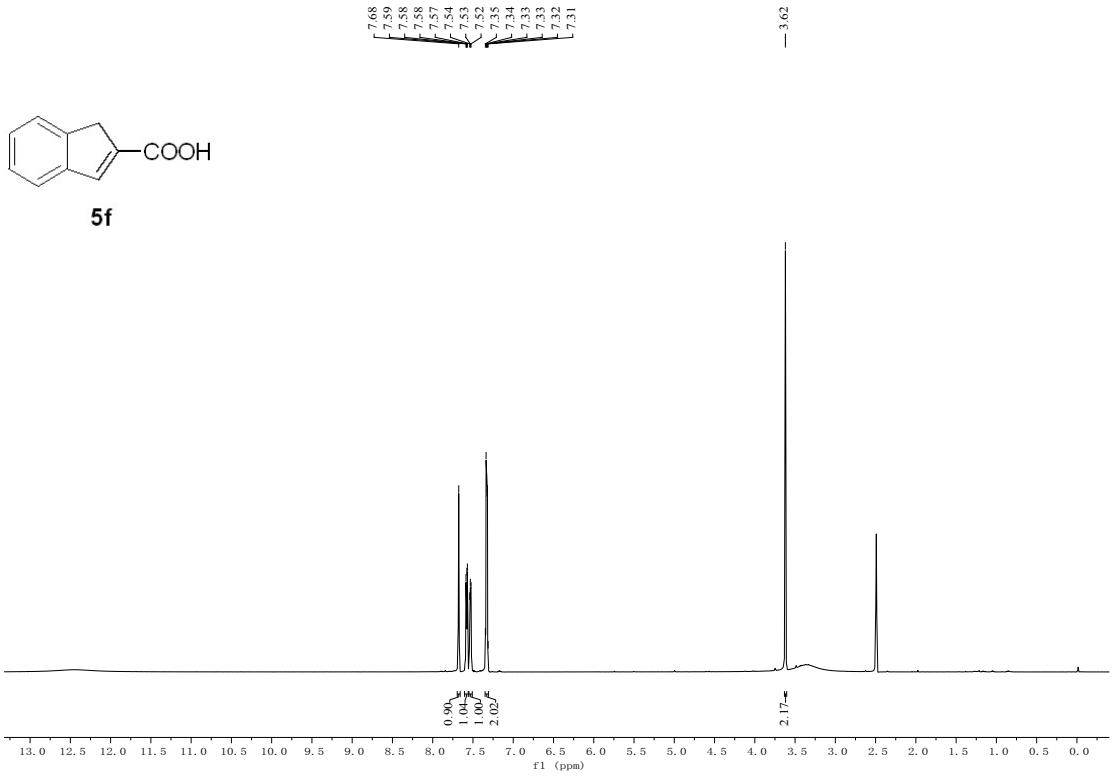


^{13}C NMR (125 MHz)

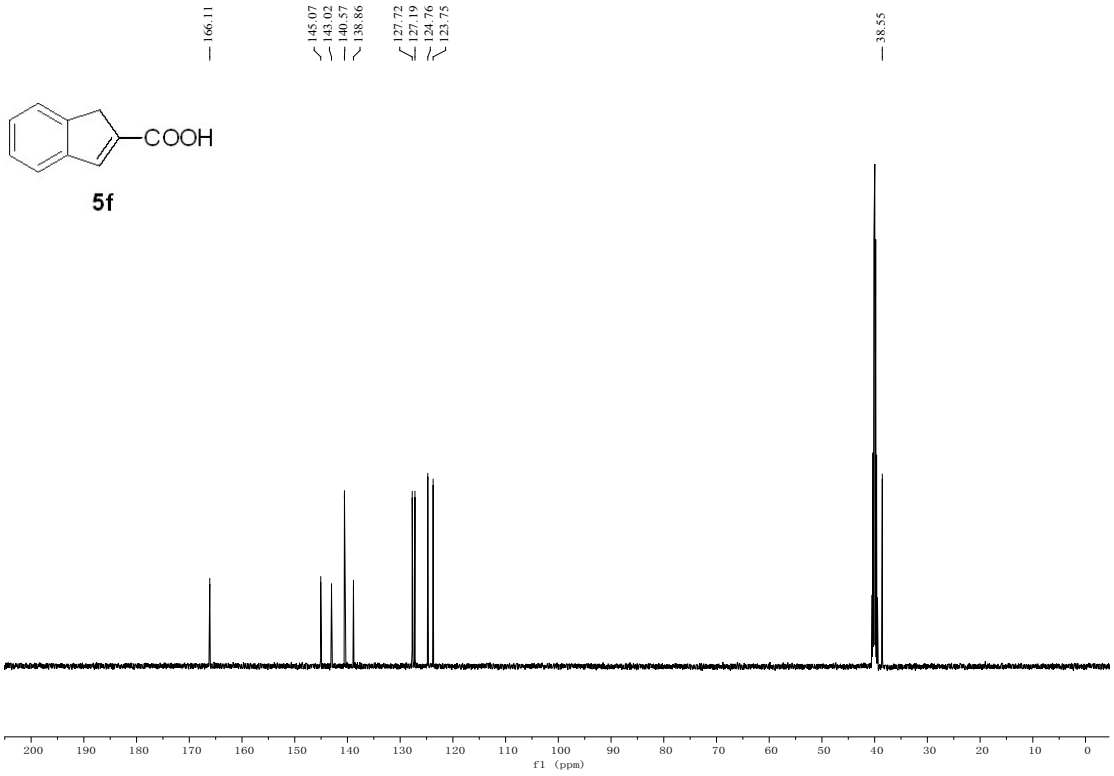


1H-indene-2-carboxylic acid (5f)

^{1}H NMR (500 MHz)

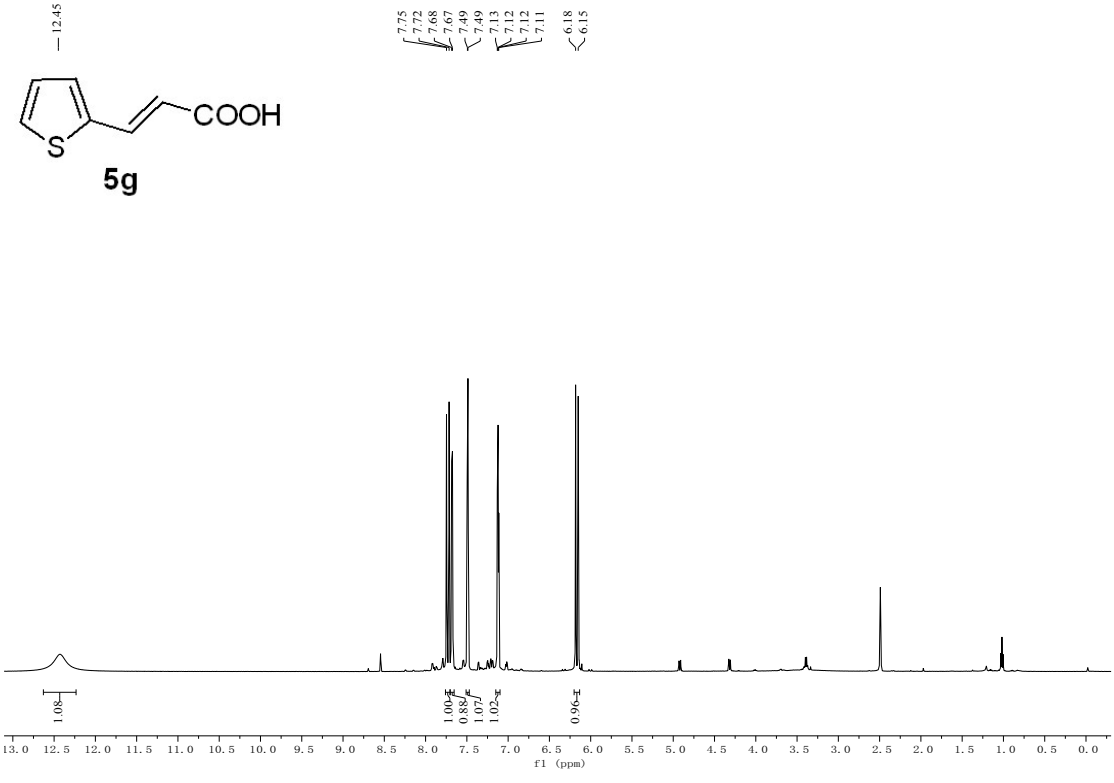


^{13}C NMR (125 MHz)

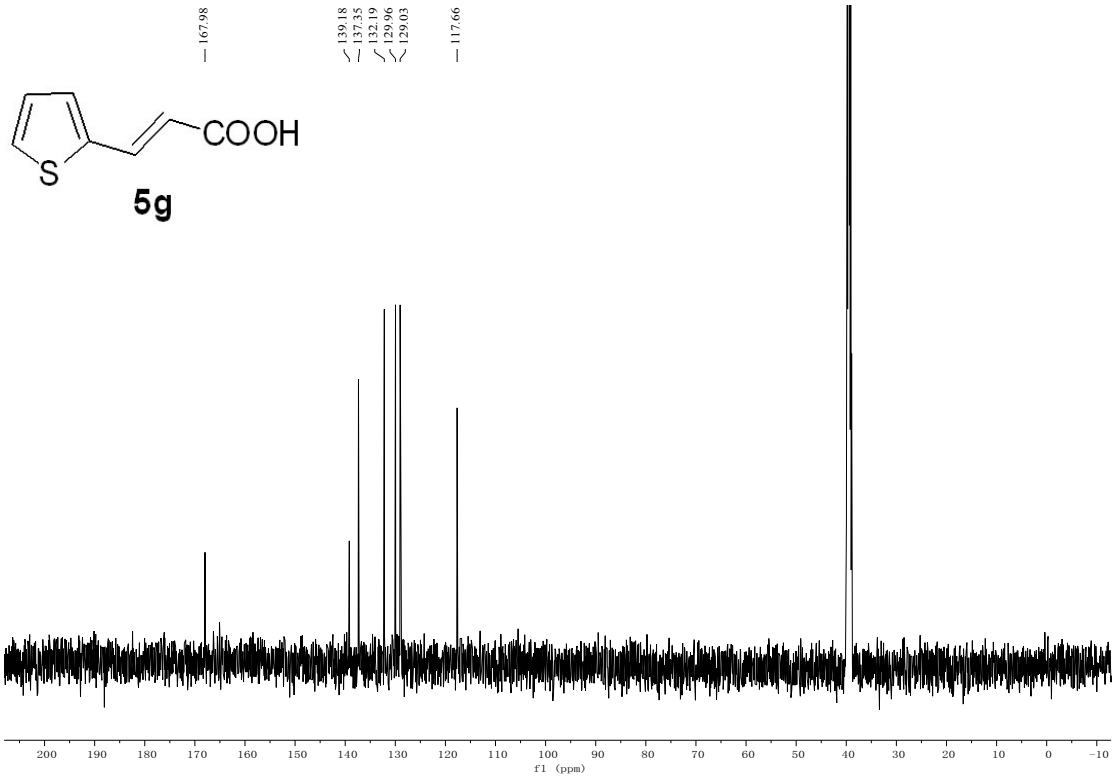


(*E*)-3-(Thiophen-2-yl)acrylic acid (5g)

^{1}H NMR (500 MHz)

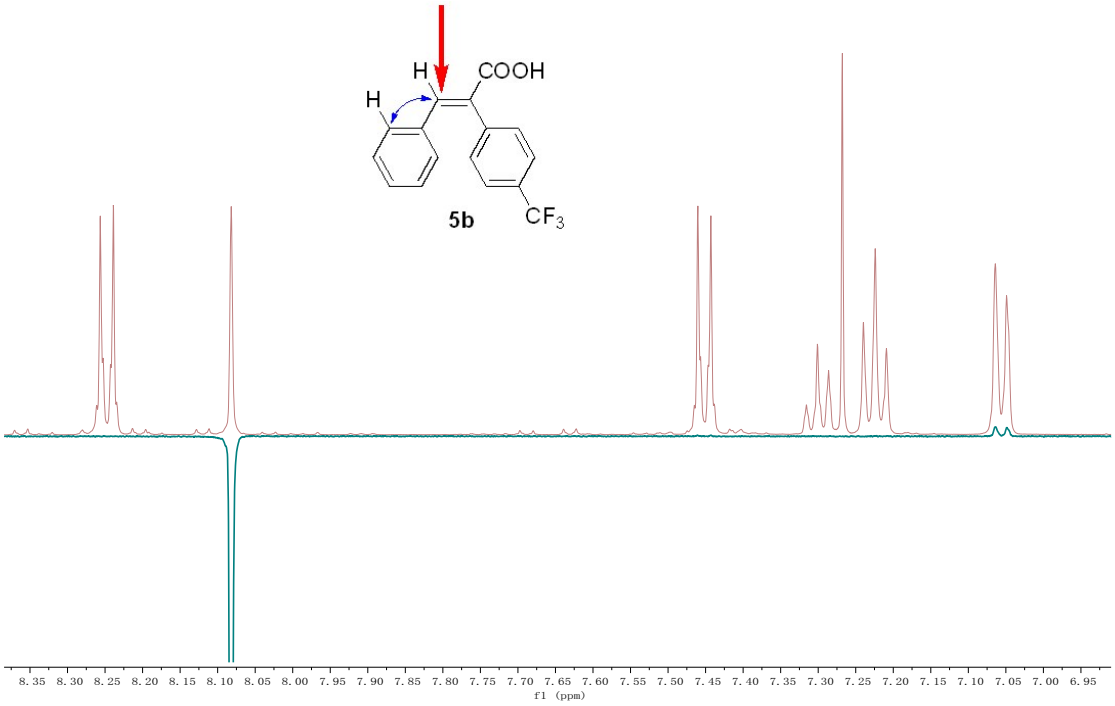


^{13}C NMR (125 MHz)

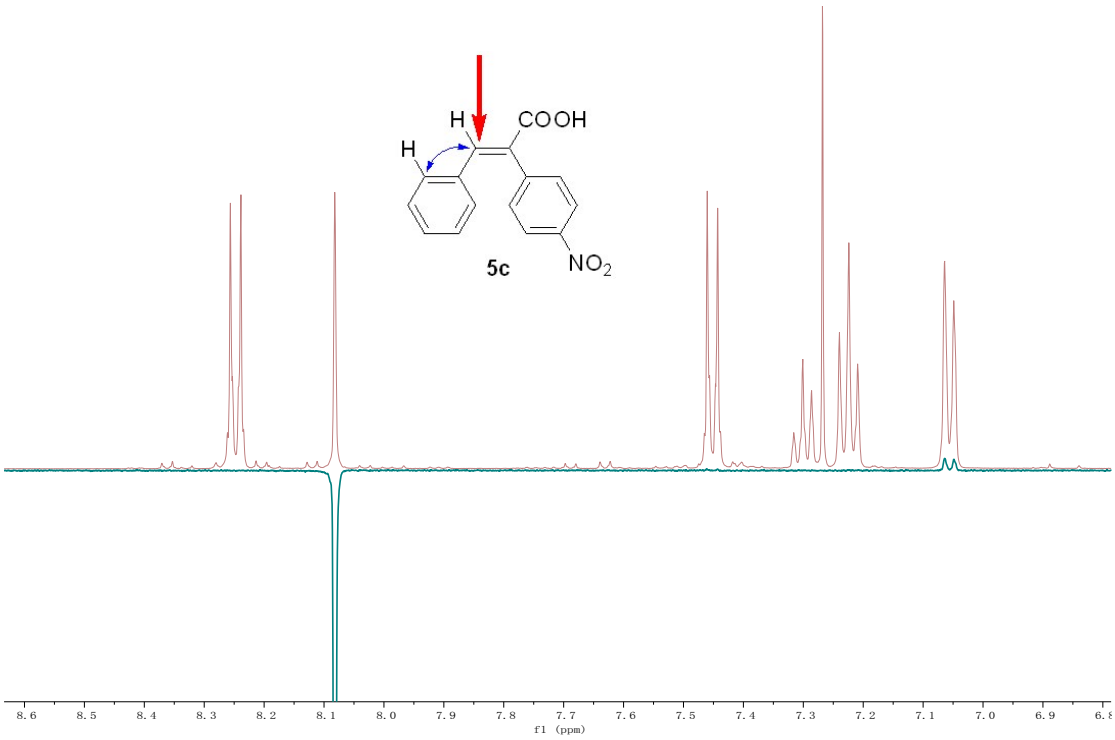


3. 1D-NOESY Spectra for Compounds 5b and 5c

(*E*)-3-phenyl-2-(4-(trifluoromethyl)phenyl)acrylic acid (5b)



(*E*)-2-(4-nitrophenyl)-3-phenylacrylic acid (5c)


H
COOH
H
NO2
5c
8.6
8.5
8.4
8.3
8.2
8.1
8.0
7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
7.0
6.9
f1 (ppm)