Supplementary Information

Synthesis of *Gem*-Dibromo 1,3-Oxazines by NBS-Mediated Electrophilic Cyclization of Propargylic Amides

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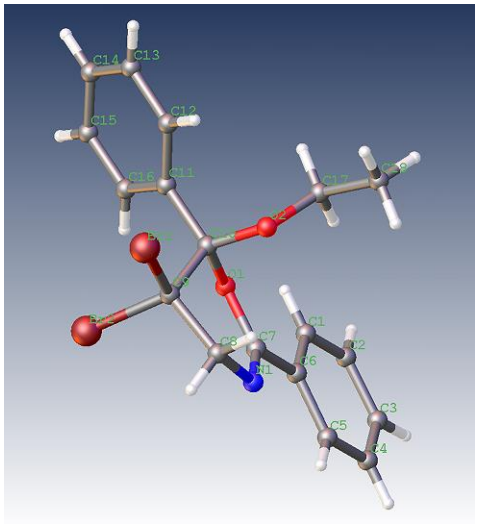
1. Crystal analysis of compound 2x



Datablock: 1

Bond precision: C-C = 0.0069 A Wavelength=0.71073

Cell: a=8.4782(13) b=14.044(2) c=14.818(2)
alpha=90 beta=90 gamma=90
Temperature: 296 K

	Calculated	Reported
Volume	1764.4(4)	1764.3(5)
Space group	P 21 21 21	P 21 21 21
Hall group	P 2ac 2ab	P 2ac 2ab
Moiety formula	C18 H17 Br2 N O2	?
Sum formula	C18 H17 Br2 N O2	C18 H17 Br2 N O2
Mr	439.13	439.15
Dx,g cm-3	1.653	1.653
Z	4	4
Mu (mm-1)	4.603	4.603
F000	872.0	872.0
F000'	870.11	
h,k,lmax	10,16,17	10,16,17
Nref	3100[1791]	3085
Tmin,Tmax	0.314,0.363	
Tmin'	0.291	

Correction method= Not given

Data completeness= 1.72/1.00 Theta(max)= 24.995

R(reflections)= 0.0302(2597) wR2(reflections)= 0.0629(3085)

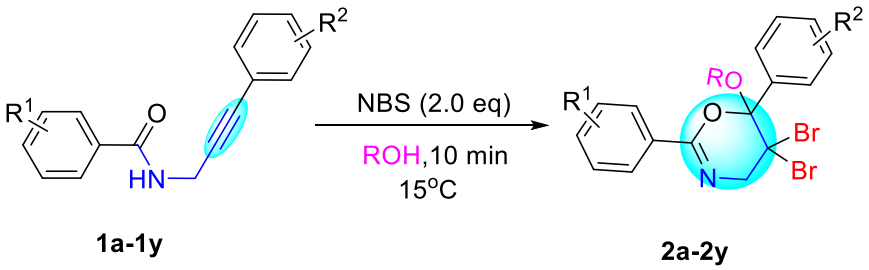
S = 0.919 Npar= 209

2. Typical Experimental Procedure

2.1 General

All reagents were purchased from commercial sources and used without further treatment, unless otherwise indicated. Methonal (CH_3OH) was purchased from Adamas Company, safedry, water<50ppm. ^{1}H and ^{13}C NMR spectra were recorded on Bruker 400 MHz spectrometers, chemical shifts are given in parts per million (ppm) relative to standard tetramethylsilane (0.00 ppm for ^{1} H NMR) or residual solvent peaks for ^{13} C NMR. Data collection for X-ray crystal analysis was performed on a Bruker Smart APEX-II single-crystal X-ray diffractometer using graphite monochromated Mo-Kα radiation (λ = 0.71073 Å) at 296 K. HRMS was obtained using a Q-TOF instrument equipped with ESI source. Standard column chromatography was performed on 200-300 mesh silica gel. using flash column chromatography techniques.

2.2 General procedure for the electrophilic cyclization reaction

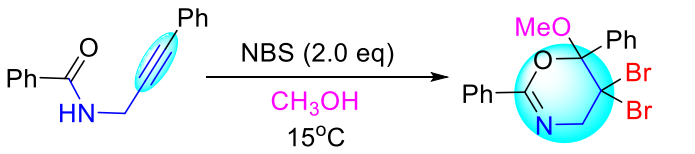


1a-1y **2a-2y**

2mL of ROH was added to a flask, then **1a**-**1y** (0.2 mmol) were added and the reaction was cooled to 15 °C by a magnetic refrigerator. Then NBS (70.8 mg, 0.4

mmol) was added into the resulting mixture in one pot and stirred at 15 ℃ for 10 min. The progress of the reaction was monitored by TLC. After completion of the reaction, quench the reaction mixture with water and use CH_2Cl_2 (3 × 5mL) extraction. The combined organic layer was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by column chromatography on silica gel to give the corresponding product **2a**–**2y**.

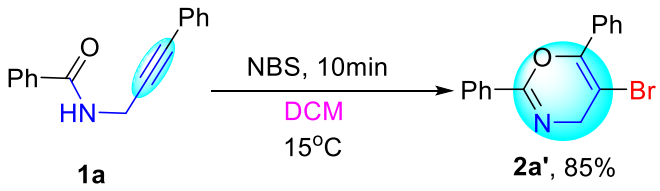
2.3 General procedure for gram scale reaction



1a, 1.0 g, 4.2 mmol　　**2a**,1.39 g, 78%

30 mL of CH_3OH was added to a flask, then **1a** (4.2 mmol) were added and the reaction was cooled to 15 °C by a magnetic refrigerator. Then NBS (1.49 g, 8.4 mmol) was added into the resulting mixture in one pot and stirred at 15 ℃ for 10 min. The progress of the reaction was monitored by TLC. After completion of the reaction, quench the reaction mixture with water and use CH_2Cl_2 (3 × 50 mL) extraction. The combined organic layer was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by column chromatography on silica gel to give the corresponding product **2a**.

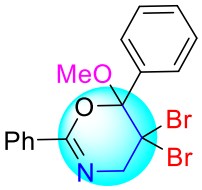
2.4 General procedure for the synthesis of 2a′



2 mL of CH_2Cl_2 was added to a flask, then **1a** (0.2 mmol) was added and the reaction was cooled to 15 °C by a magnetic refrigerator. Then NBS (70.8 mg, 0.4 mmol) was added into the resulting mixture in one pot and stirred at 15 ℃ for 10 min. The progress of the reaction was monitored by TLC. After completion of the reaction, quench the reaction mixture with water and use CH_2Cl_2 (3 × 5mL) extraction. The combined organic layer was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by column chromatography on silica gel to give the corresponding product **2a′**.

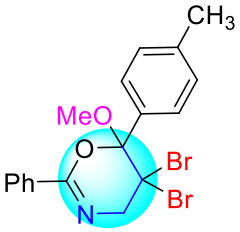
3. Analytical data

5,5-dibromo-6-methoxy-2,6-diphenyl-5,6-dihydro-4H-1,3-oxazine (2a)



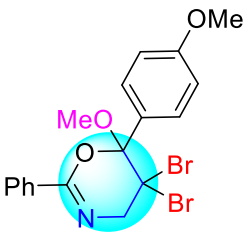
79% yield, 66.8 mg (0.2 mmol scale), white solid, mp 105-108 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.09 (d, *J* = 7.2 Hz, 2H), 7.86 (dd, *J* = 6.7, 3.0 Hz, 2H), 7.62 – 7.39 (m, 6H), 4.91 (d, *J* = 17.9 Hz, 1H), 4.46 (d, *J* = 17.9 Hz, 1H), 3.31 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.7, 133.0, 132.0, 131.3, 130.2, 129.8, 128.4, 127.4, 127.3, 101.7, 65.0, 60.6, 52.6. **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{17}H_{15}Br_2NO_2$: 423.9542; found: 423.9547.

5,5-dibromo-6-methoxy-2-phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-oxazine (2b)



83% yield, 72.5 mg (0.2 mmol scale), white solid, mp 116-118 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.16 – 8.04 (m, 2H), 7.75 (d, *J* = 8.2 Hz, 2H), 7.56 – 7.43 (m, 3H), 7.32 (d, *J* = 8.0 Hz, 2H), 4.92 (d, *J* = 17.9 Hz, 1H), 4.47 (d, *J* = 17.9 Hz, 1H), 3.31 (s, 3H), 2.46 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.8, 139.7, 132.0, 131.2, 130.1, 128.4, 128.2, 127.2, 101.8, 65.4, 60.6, 52.5, 21.3; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_2$: 437.9699; found: 4337.9686.

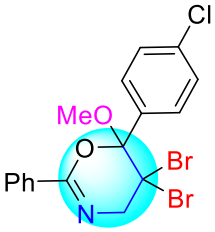
5,5-dibromo-6-methoxy-6-(4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxa zine (2c)



82% yield, 74.3 mg (0.2 mmol scale), white solid, mp 120-122 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.07 (d, *J* = 7.2

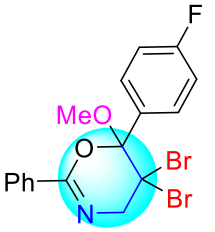
Hz, 2H), 7.76 (d, *J* = 8.8 Hz, 2H), 7.56 – 7.41 (m, 3H), 7.01 (d, *J* = 8.8 Hz, 2H), 4.88 (d, *J* = 17.9 Hz, 1H), 4.45 (d, *J* = 17.9 Hz, 1H), 3.88 (s, 3H), 3.30 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 160.6, 151.8, 132.0, 131.5, 131.3, 128.4, 127.2, 125.0, 112.8, 101.8, 66.0, 60.6, 55.3, 52.5; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_3$: 453.9648; found: 453.9642.

5,5-dibromo-6-(4-chlorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine(2d)



69% yield, 63.1 mg (0.2 mmol scale), white solid, mp 121-122 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 7.2 Hz, 2H), 7.78 (d, *J* = 8.6 Hz, 2H), 7.62 – 7.32 (m, 5H), 4.87 (d, *J* = 17.9 Hz, 1H), 4.44 (d, *J* = 17.9 Hz, 1H), 3.29 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.4, 136.1, 131.8, 131.6, 131.4, 128.5, 127.8, 127.2, 101.4, 64.5, 60.4, 52.7; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{17}H_{14}Br_2ClNO_2$: 457.9153; found: 457.9148.

5,5-dibromo-6-(4-fluorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine(2e)

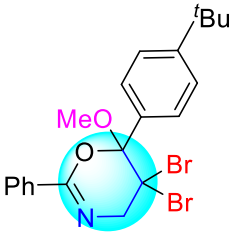


78% yield, 68.8 mg (0.2 mmol scale), white solid, mp 135-137 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (d, *J* = 7.3 Hz, 2H), 7.90 – 7.77 (m, 2H), 7.56 – 7.39 (m, 3H), 7.18 (t, *J* = 8.7 Hz, 2H), 4.88 (d, *J* = 17.9 Hz, 1H), 4.44 (d, *J* = 17.9 Hz, 1H), 3.29 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 163.6 (d, *J* = 248.0 Hz), 151.6, 132.2 (d, *J* = 9.0 Hz), 132.3, 131.8, 131.4,

128.9, 128.5, 127.2, 114.5 (d, J = 21.0 Hz), 101.4, 65.0, 60.5, 52.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -111.50.

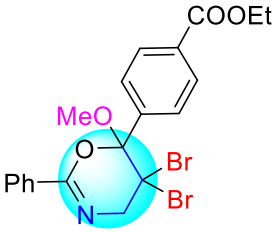
HRMS (ESI): m/z $[M+H]^+$ calcd for $C_{17}H_{14}Br_2FNO_2$: 441.9448; found: 441.9454.

5,5-dibromo-6-(4-(tert-butyl)phenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine(2f)



67% yield, 64.2 mg (0.2 mmol scale), white solid, mp 107-109 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.23 – 8.00 (m, 2H), 7.75 (d, J = 8.5 Hz, 2H), 7.60 – 7.34 (m, 5H), 4.90 (d, J = 17.9 Hz, 1H), 4.45 (d, J = 17.9 Hz, 1H), 3.30 (s, 3H), 1.39 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.7, 151.8, 132.0, 131.2, 129.9, 128.4, 127.3, 124.4, 101.8, 65.4, 60.7, 52.6, 34.7, 31.3; **HRMS** (ESI): m/z $[M+H]^+$ calcd for $C_{21}H_{23}Br_2NO_2$: 480.0168; found: 480.0168.

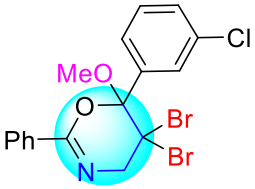
Ethyl-4-(5,5-dibromo-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazin-6-yl)benzoate(2g)



45% yield, 44.6 mg (0.2 mmol scale), white solid, mp 111-112 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.17 (d, J = 8.5 Hz, 2H), 8.09 – 8.02 (m, 2H), 7.92 (d, J = 8.5 Hz, 2H), 7.57 – 7.41 (m, 3H), 4.89 (d, J = 17.9 Hz, 1H), 4.55 – 4.37 (m, 3H), 3.29 (s, 3H), 1.42 (t, J = 7.1 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.1, 151.4, 137.6, 131.8×2, 131.4, 130.3, 128.6, 128.5, 127.3, 101.6, 63.9, 61.2, 60.4, 52.8, 14.5. **HRMS** (ESI): m/z

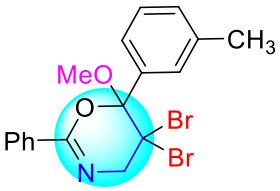
[M+H]$^+$ calcd for $C_{20}H_{19}Br_2NO_3$: 495.9754; found: 495.9750.

5,5-dibromo-6-(3-chlorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2h)



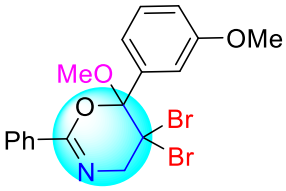
68% yield, 62.2 mg (0.2 mmol scale), white solid, mp 115-117 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.10 – 8.01 (m, 2H), 7.83 (t, *J* = 1.7 Hz, 1H), 7.77 – 7.71 (m, 1H), 7.56 – 7.40 (m, 5H), 4.88 (d, *J* = 17.9 Hz, 1H), 4.44 (d, *J* = 17.9 Hz, 1H), 3.30 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.4, 135.2, 133.7, 131.7, 131.4, 130.3, 130.0, 128.7, 128.5, 128.4, 127.3, 101.1, 64.1, 60.5, 52.8; **HRMS** (ESI): *m*/*z* [M+H]$^+$ calcd for $C_{17}H_{14}Br_2ClNO_2$: 457.9153; found: 457.9147.

5,5-dibromo-6-methoxy-2-phenyl-6-(m-tolyl)-5,6-dihydro-4H-1,3-oxazine (2i)



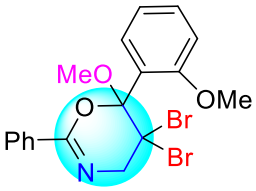
78% yield, 68.2 mg (0.2 mmol scale), white solid, mp 106-108 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.14 – 8.04 (m, 2H), 7.65 (s, 2H), 7.56 – 7.29 (m, 5H), 4.91 (d, *J* = 17.9 Hz, 1H), 4.46 (d, *J* = 17.9 Hz, 1H), 3.31 (s, 3H), 2.48 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.8, 137.1, 132.8, 132.0, 131.3, 130.7, 130.5, 128.4, 127.3×2, 101.7, 65.0, 60.7, 52.6, 21.7. **HRMS** (ESI): *m*/*z* [M+H]$^+$ calcd for $C_{18}H_{17}Br_2NO_2$: 437.9699; found: 437.9691.

5,5-dibromo-6-methoxy-6-(3-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2j)



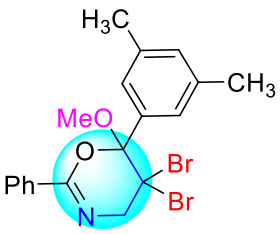
79% yield, 71.6 mg (0.2 mmol scale), white solid, mp 130-132 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.13 – 8.03 (m, 2H), 7.55 – 7.35 (m, 6H), 7.10 – 7.02 (m, 1H), 4.90 (d, *J* = 17.9 Hz, 1H), 4.45 (d, *J* = 17.9 Hz, 1H), 3.88 (s, 3H), 3.31 (s, 3H), **^{13}C NMR** (101 MHz, $CDCl_3$) δ 158.9, 151.6, 134.6, 131.9, 131.3, 128.4, 127.2, 122.6, 116.4, 114.9, 101.6, 64.7, 60.7, 55.4, 52.6. **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_3$: 453.9648; found: 453.9645.

5,5-dibromo-6-methoxy-6-(2-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2k)



76% yield, 68.9 mg (0.2 mmol scale), white solid, mp 140-142 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.13 – 8.02 (m, 2H), 7.90 – 7.78 (m, 1H), 7.55 – 7.37 (m, 4H), 7.17 – 6.98 (m, 2H), 4.89 (d, *J* = 17.8 Hz, 1H), 4.40 (d, *J* = 17.8 Hz, 1H), 3.90 (s, 3H), 3.39 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.4, 151.8, 134.1, 132.3, 131.6, 131.1, 128.3, 127.3, 120.2, 119.5, 112.2, 103.0, 64.6, 60.8, 55.4, 52.7; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_3$: 453.9648; found: 453.9642.

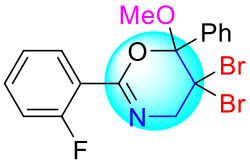
5,5-dibromo-6-(3,5-dimethylphenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2l)



73% yield, 64.7 mg (0.2 mmol scale), white solid, mp 115-117 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.13 – 7.99 (m,

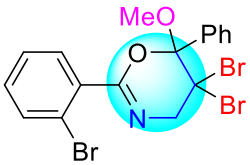
2H), 7.77 (d, *J* = 7.9 Hz, 1H), 7.55 – 7.40 (m, 3H), 7.20 – 7.07 (m, 2H), 4.91 (d, *J* = 17.9 Hz, 1H), 4.46 (d, *J* = 17.9 Hz, 1H), 3.31 (s, 3H), 2.74 (s, 3H), 2.39 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.6, 139.6, 133.8, 132.1, 131.3, 128.4, 127.8, 127.4, 125.7, 96.6, 66.0, 61.4, 52.4, 26.9, 21.0; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{19}H_{19}Br_2NO_2$: 451.9856; found: 451.9848.

5,5-dibromo-2-(2-fluorophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2m)



75% yield, 66.2 mg (0.2 mmol scale), white solid, mp 118-120 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.89 (td, *J* = 7.6, 1.7 Hz, 1H), 7.82 (dd, *J* = 6.5, 3.0 Hz, 2H), 7.51 – 7.41 (m, 4H), 7.25 – 7.12 (m, 2H), 4.90 (d, *J* = 17.8 Hz, 1H), 4.45 (d, *J* = 17.8 Hz, 1H), 3.35 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 160.9 (d, *J* = 254.0 Hz), 150.8, 132.7, 132.5 (d, *J* = 8.0 Hz), 130.8, 130.2, 129.7, 127.4, 124.1, 116.8 (d, *J* = 22.0 Hz), 102.2, 64.6, 60.6, 52.9; **^{19}F NMR** (376 MHz, $CDCl_3$) δ -111.31; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{17}H_{14}Br_2FNO_2$: 441.9448; found: 441.9437.

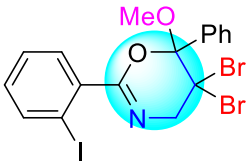
5,5-dibromo-2-(2-bromophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2n)



73% yield, 73.1 mg (0.2 mmol scale), white solid, mp 136-138 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.86 – 7.79 (m, 2H), 7.69 – 7.62 (m, 2H), 7.49 – 7.42 (m, 3H), 7.38 (td, *J* =

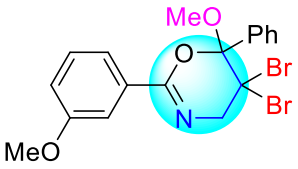
7.5, 1.0 Hz, 1H), 7.34 – 7.27 (m, 1H), 4.90 (d, *J* = 17.6 Hz, 1H), 4.45 (d, *J* = 17.6 Hz, 1H), 3.36 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 153.1, 134.9, 133.6, 132.6, 131.1, 130.5, 130.3, 129.8, 127.3, 120.9, 102.6, 64.4, 60.4, 53.1; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{17}H_{14}Br_3NO_2$: 501.8648; found: 501.8655.

5,5-dibromo-2-(2-iodophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2o)



81% yield, 88.9 mg (0.2 mmol scale), white solid, mp 135-136 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.9 Hz, 1H), 7.82 (dd, *J* = 7.3, 2.3 Hz, 2H), 7.61 (dd, *J* = 7.7, 1.4 Hz, 1H), 7.50 – 7.36 (m, 4H), 7.17 – 7.08 (m, 1H), 4.90 (d, *J* = 17.8 Hz, 1H), 4.46 (d, *J* = 17.8 Hz, 1H), 3.37 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 153.8, 140.5, 138.3, 132.6, 131.2, 130.3, 129.8, 129.6, 128.0, 127.3, 102.6, 94.2, 64.4, 60.3, 53.2; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{17}H_{14}Br_2INO_2$: 549.8509; found: 549.8507.

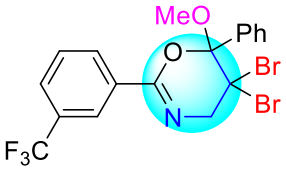
5,5-dibromo-6-methoxy-2-(3-methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2p)



68% yield, 61.6 mg (0.2 mmol scale), white solid, mp 127-129 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.84 (dd, *J* = 6.5, 3.3 Hz, 2H), 7.70 – 7.61 (m, 2H), 7.50 (dd, *J* = 5.1, 1.7 Hz, 3H), 7.36 (t, *J* = 8.0 Hz, 1H), 7.11 – 7.03 (m, 1H), 4.90 (d, *J* = 17.9 Hz, 1H), 4.45 (d, *J* = 17.9 Hz, 1H), 3.87 (s, 3H), 3.30 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ

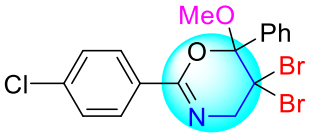
159.7, 151.6, 133.3, 132.9, 130.2, 129.8, 129.4, 127.4, 119.6, 117.5, 112.3, 101.7, 64.9, 60.6, 55.4, 52.7. **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_3$: 453.9648; found: 453.9638.

5,5-dibromo-6-methoxy-6-phenyl-2-(3-(trifluoromethyl)phenyl)-5,6-dihydro-4H-1,3-oxazine (2q)



76% yield, 74.6 mg (0.2 mmol scale), white solid, mp 136-137 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.35 (s, 1H), 8.26 (d, *J* = 7.8 Hz, 1H), 7.89 – 7.72 (m, 3H), 7.59 (t, *J* = 7.8 Hz, 1H), 7.56 – 7.48 (m, 3H), 4.92 (d, *J* = 18.0 Hz, 1H), 4.48 (d, *J* = 18.0 Hz, 1H), 3.31 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 150.6, 132.8, 131.1(q, *J* = 32.0 Hz), 130.4, 130.1, 129.9, 129.0, 127.8(q, *J* = 3.3 Hz), 127.6, 124.2 (q, *J* = 3.8 Hz), 123.8 (q, *J* =271.0 Hz), 102.0, 64.4, 60.6, 52.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ -62.63; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{14}Br_2F_3NO_2$: 491.9416; found: 491.9421.

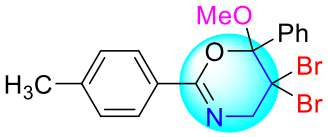
5,5-dibromo-2-(4-chlorophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2r)



80% yield, 73.1 mg (0.2 mmol scale), white solid, mp 134-135 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.6 Hz, 2H), 7.83 (d, *J* = 1.9 Hz, 2H), 7.50 (dd, *J* = 5.0, 1.7 Hz, 3H), 7.42 (d, *J* = 8.6 Hz, 2H), 4.88 (d, *J* = 17.9 Hz, 1H), 4.43 (d, *J* = 17.9 Hz, 1H), 3.28 (s, 3H); **^{13}C**

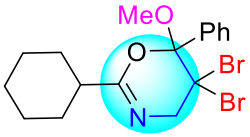
NMR (101 MHz, $CDCl_3$) δ 150.9, 137.6, 132.8, 130.4, 130.2, 129.8, 128.7, 128.6, 127.5, 101.8, 64.6, 60.6, 52.7; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{17}H_{14}Br_2ClNO_2$: 457.9153; found: 457.9161.

5,5-dibromo-6-methoxy-6-phenyl-2-(p-tolyl)-5,6-dihydro-4H-1,3-oxazine (2s)



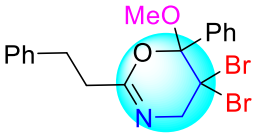
81% yield, 70.8 mg (0.2 mmol scale), white solid, mp 120-122 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.1 Hz, 2H), 7.92 – 7.81 (m, 2H), 7.57 – 7.43 (m, 3H), 7.25 (d, *J* = 8.0 Hz, 2H), 4.89 (d, *J* = 17.8 Hz, 1H), 4.43 (d, *J* = 17.8 Hz, 1H), 3.29 (s, 3H), 2.41 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.8, 141.7, 133.1, 130.2, 129.7, 129.1, 127.4, 127.3, 101.6, 65.2, 60.6, 52.6, 21.5; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_2$: 437.9699; found: 437.9703.

5,5-dibromo-2-cyclohexyl-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2t)



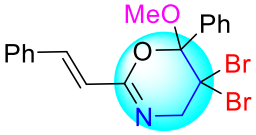
63% yield, 54.1 mg (0.2 mmol scale), white solid, mp 95-97 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (dd, *J* = 6.5, 2.9 Hz, 2H), 7.50 – 7.40 (m, 3H), 4.61 (d, *J* = 17.2 Hz, 1H), 4.14 (d, *J* = 17.2 Hz, 1H), 3.24 (s, 3H), 2.33 (ddd, *J* = 11.6, 7.5, 3.2 Hz, 1H), 2.02 (t, *J* = 14.2 Hz, 2H), 1.85 – 1.75 (m, 2H), 1.72-1.69 (m, 1H), 1.53 (ddd, *J* = 14.9, 12.7, 3.1 Hz, 2H), 1.38 – 1.20 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 159.7, 133.1, 130.1, 129.6, 127.3, 100.9, 65.5, 59.6, 52.4, 43.6, 30.0, 29.8, 25.9, 25.7; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{17}H_{21}Br_2NO_2$: 430.0012; found: 430.0019.

5,5-dibromo-6-methoxy-2-phenethyl-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2u)



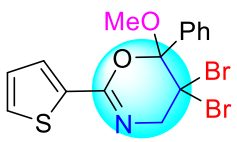
58% yield, 52.3 mg (0.2 mmol scale), white solid, mp 90-92 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.5 Hz, 2H), 7.43 (d, *J* = 6.3 Hz, 3H), 7.29 (d, *J* = 7.3 Hz, 4H), 7.24 – 7.18 (m, 1H), 4.64 (d, *J* = 17.2 Hz, 1H), 4.18 (d, *J* = 17.3 Hz, 1H), 3.19 (s, 3H), 3.06 (t, *J* = 8.0 Hz, 2H), 2.73-2.67 (m, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 156.2, 140.6, 132.8, 130.1, 129.6, 128.5, 128.4, 127.3, 126.2, 101.3, 65.1, 59.8, 52.4, 35.9, 32.2; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{19}H_{19}Br_2NO_2$: 451.9856; found: 451.9850.

(E)-5,5-dibromo-6-methoxy-6-phenyl-2-styryl-5,6-dihydro-4H-1,3-oxazine (2v)



75% yield, 67.3 mg (0.2 mmol scale), white solid, mp 108-109 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.84 (dd, *J* = 6.1, 2.5 Hz, 2H), 7.54-7.51 (m, 6H), 7.41-7.35 (m, 2H), 6.60 (d, *J* = 16.2 Hz, 1H), 4.86 (d, *J* = 18.1 Hz, 1H), 4.41 (d, *J* = 18.1 Hz, 1H), 3.31 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.3, 137.6, 135.1, 132.9, 130.2, 129.7, 129.5, 128.8, 127.5, 127.4, 121.1, 101.4, 64.8, 60.8, 52.5; **HRMS** (ESI): *m*/*z* $[M+H]^+$ calcd for $C_{19}H_{17}Br_2NO_2$: 449.9699; found: 449.9693.

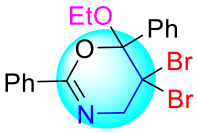
5,5-dibromo-6-methoxy-6-phenyl-2-(thiophen-2-yl)-5,6-dihydro-4H-1,3-oxazine (2w)



75% yield, 64.3 mg (0.2 mmol scale), white solid, mp 135-137

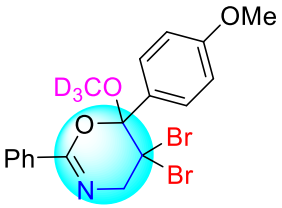
^{o}C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.90 (dd, *J* = 6.5, 3.1 Hz, 2H), 7.85 – 7.72 (m, 1H), 7.67 – 7.49 (m, 4H), 7.16 (dd, *J* = 4.9, 3.8 Hz, 1H), 4.94 (d, *J* = 17.9 Hz, 1H), 4.47 (d, *J* = 17.9 Hz, 1H), 3.38 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.6, 136.0, 132.7, 130.1, 129.8, 129.6, 128.8, 127.5, 127.4, 101.9, 64.6, 60.4, 52.6; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{15}H_{13}Br_2NO_2S$: 429.9107; found: 429.9113.

5,5-dibromo-6-ethoxy-2,6-diphenyl-5,6-dihydro-4H-1,3-oxazine (2x)



67% yield, 58.6 mg (0.2 mmol scale), white solid, mp 112-115 ^{o}C**;** **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.05 (d, *J* = 7.3 Hz, 2H), 7.85 (dd, *J* = 6.3, 2.7 Hz, 2H), 7.55 – 7.40 (m, 6H), 4.93 (d, *J* = 17.8 Hz, 1H), 4.44 (d, *J* = 17.8 Hz, 1H), 3.53 (q, *J* = 7.0 Hz, 2H), 1.14 (t, *J* = 7.0 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.0, 133.8, 132.1, 131.3, 130.0, 129.7, 128.4, 127.4, 127.3, 101.5, 65.3, 61.4, 60.6, 15.1; **HRMS** (ESI): *m/z* $[M+H]^+$ calcd for $C_{18}H_{17}Br_2NO_2$:437.9699; found: 437.9697.

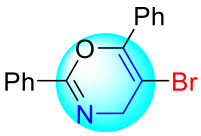
5,5-dibromo-6-(methoxy-d3)-6-(4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2y)



80% yield, 73.1 mg (0.2 mmol scale), white solid, mp 118-121 ^{o}C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.10 – 8.03 (m, 2H), 7.76 (d, *J* = 8.9 Hz, 2H), 7.53-7.43 (m, 3H), 7.01 (d, *J* = 8.9 Hz, 2H), 4.89 (d, *J* = 17.9 Hz, 1H), 4.45 (d, *J* = 17.9 Hz, 1H), 3.88 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 160.6, 151.8, 132.1, 131.5, 131.2, 128.4, 127.2, 125.1,

112.8, 101.7, 66.0, 60.6, 55.3; **HRMS** (EI): *m*/*z* $[M+H]^+$ calcd for $C_{18}H_{14}D_3Br_2NO_3$: 456.9836; found: 456.9832.

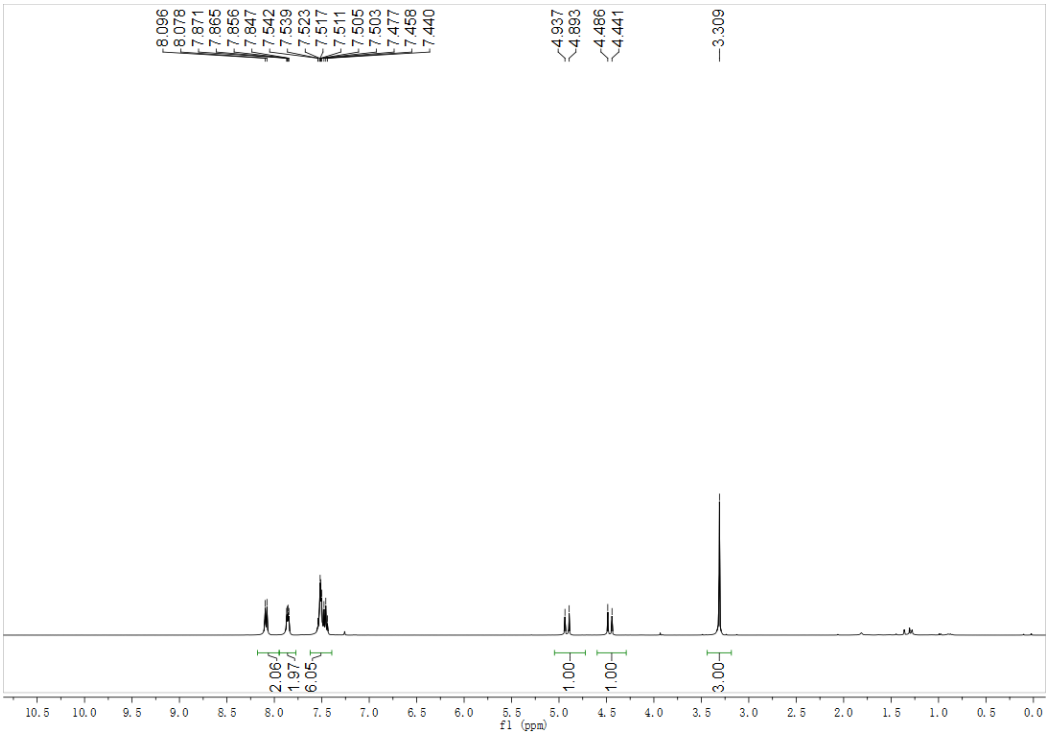
5-bromo-2,6-diphenyl-4H-1,3-oxazine (2a′)

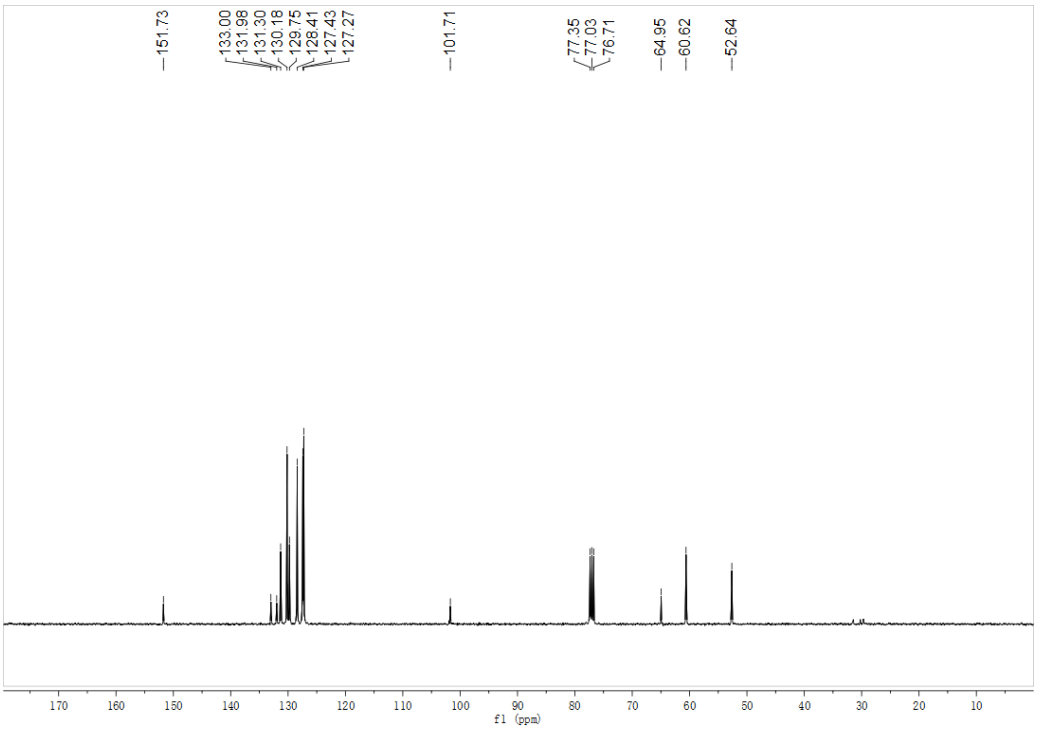


85% yield, 53.2 mg (0.2 mmol scale), white solid, mp 122-123 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.4 Hz, 2H), 7.80 – 7.70 (m, 2H), 7.44 (dt, *J* = 15.3, 8.2 Hz, 6H), 4.53 (s, 2H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.7, 145.2, 132.4, 131.4, 131.3, 129.5, 128.5, 128.31, 128.2, 127.3, 97.9, 51.6; **HRMS** (EI): *m*/*z* $[M+H]^+$ calcd for $C_{16}H_{13}BrNO$: 314.0175; found: 314.0183.

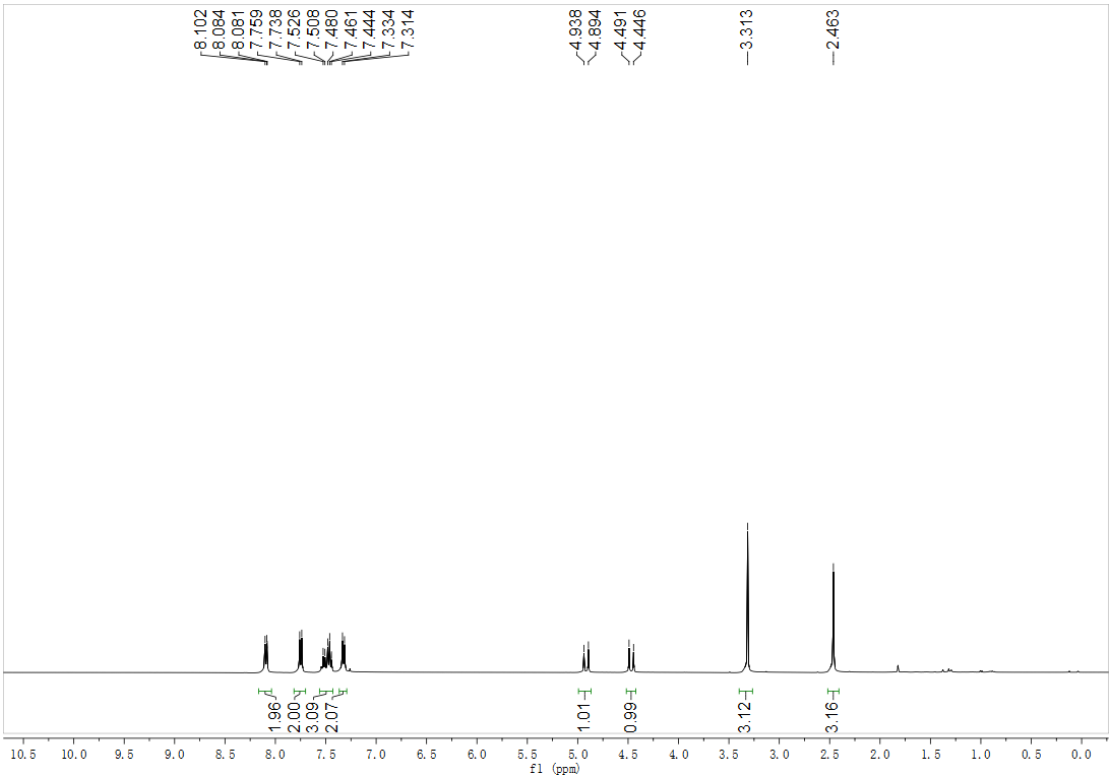
4. ^{1}H and ^{13}C NMR Spectrum

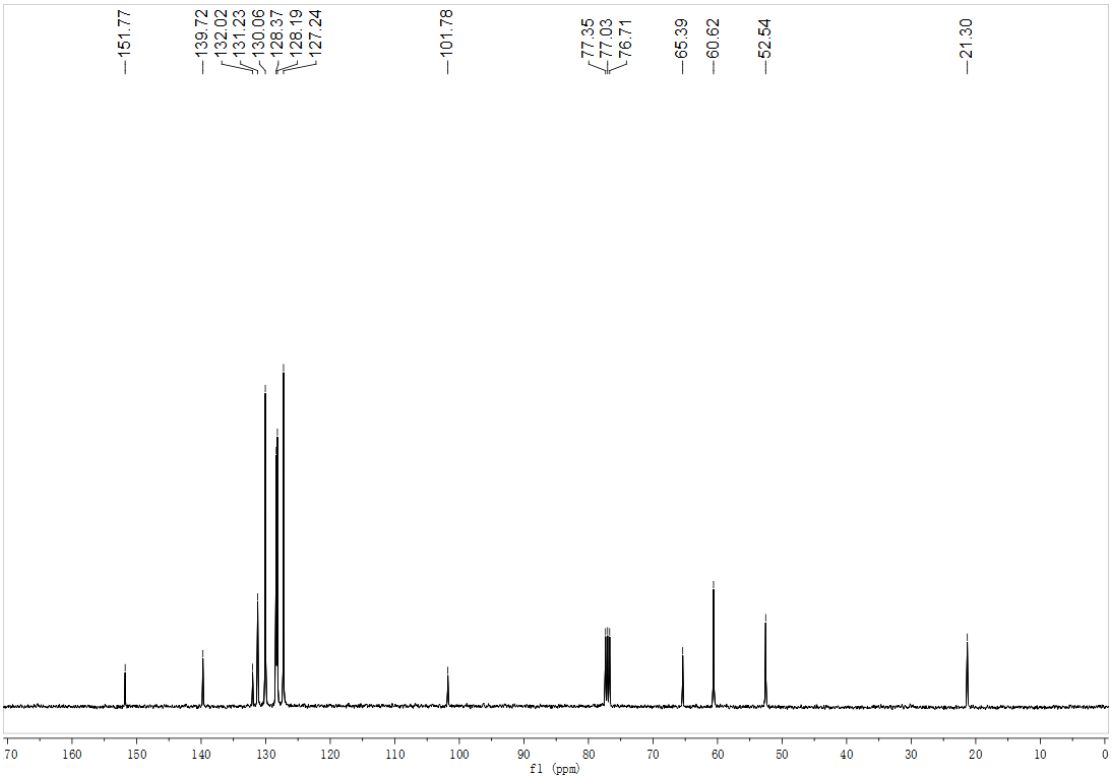
5,5-dibromo-6-methoxy-2,6-diphenyl-5,6-dihydro-4H-1,3-oxazine (2a)



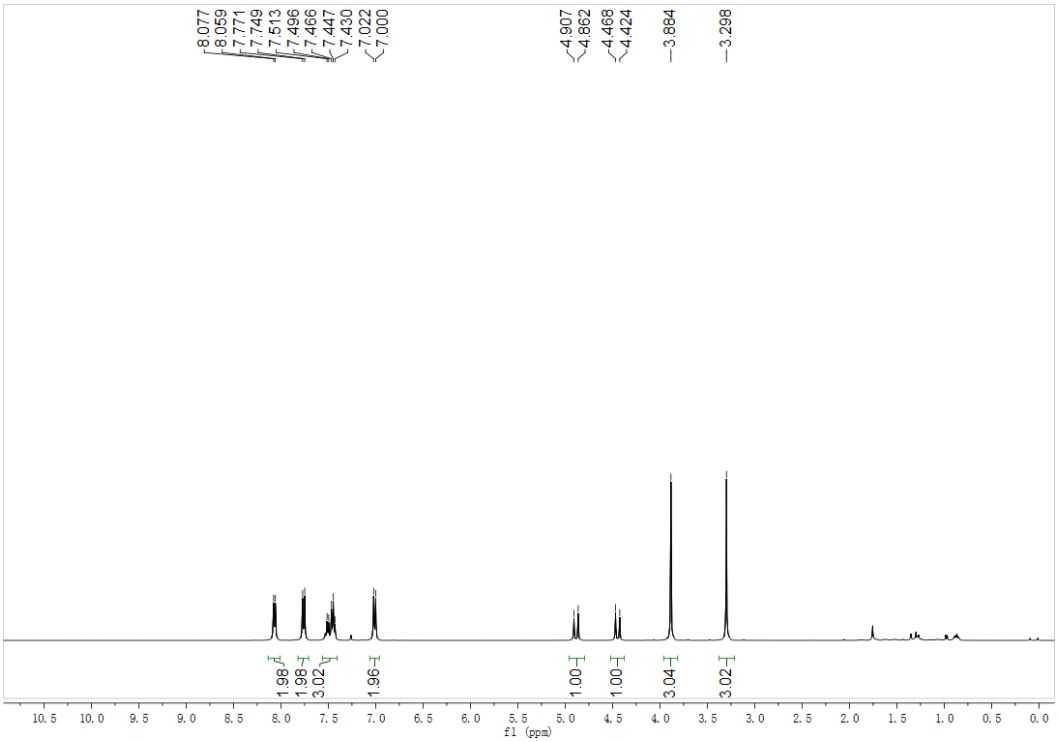


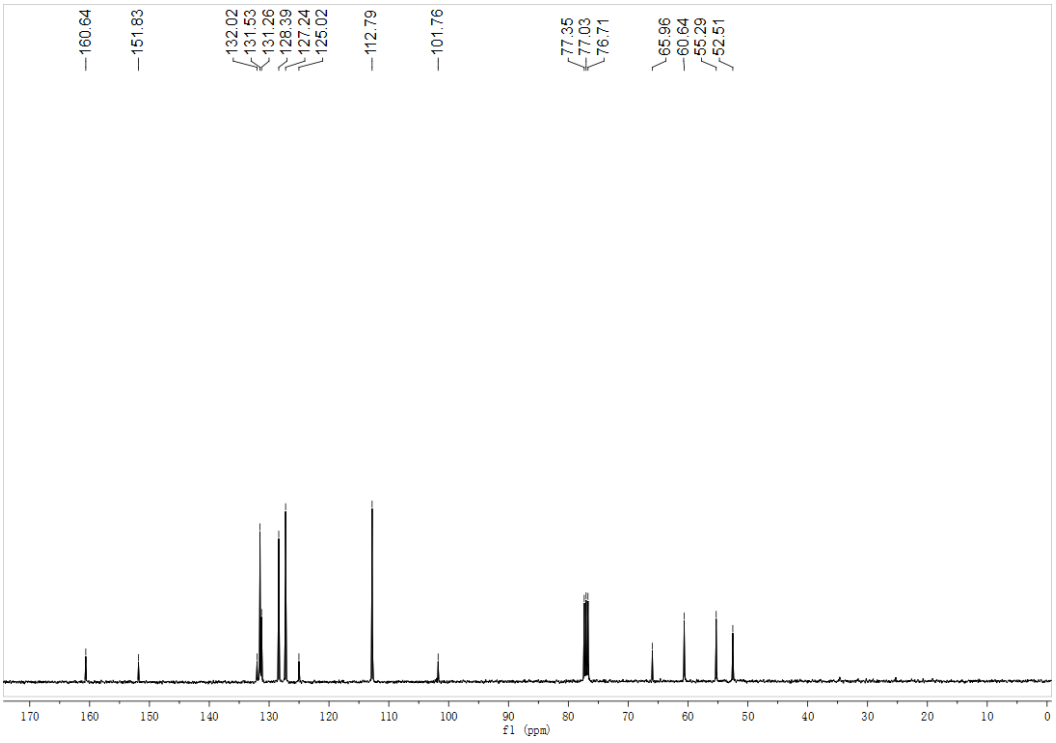
5,5-dibromo-6-methoxy-2-phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-oxazine (2b)



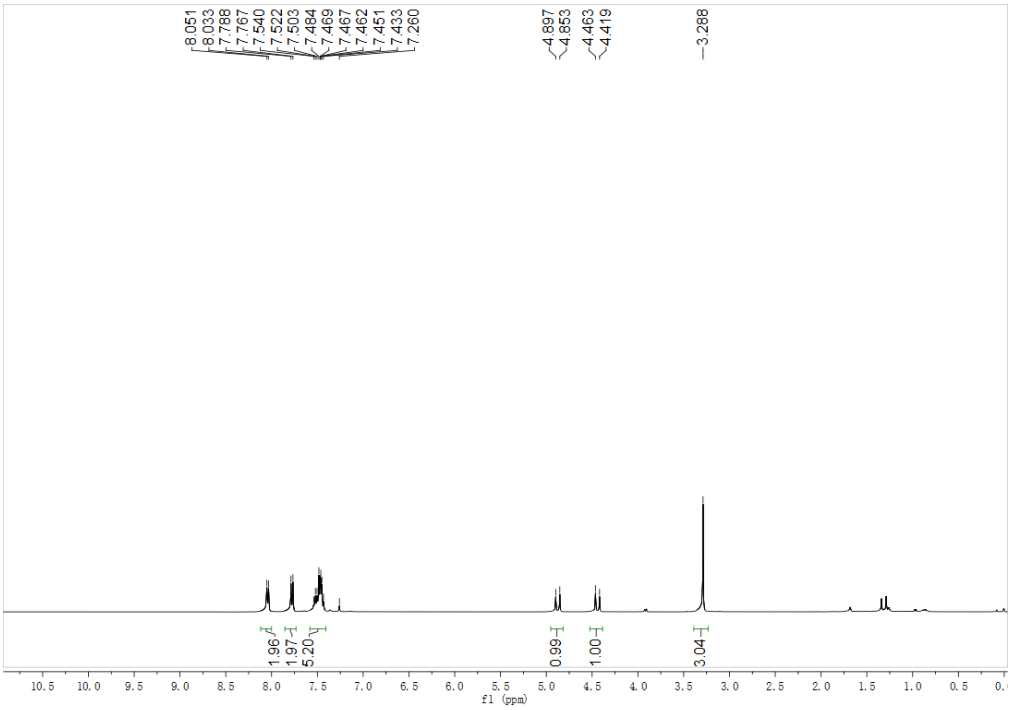


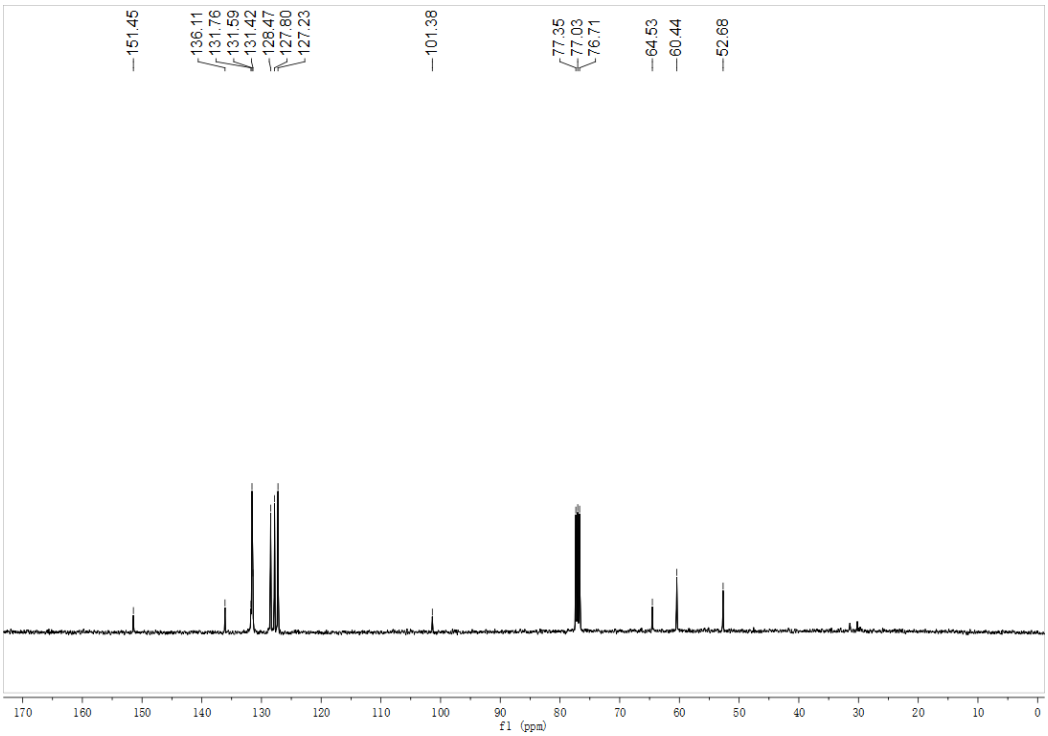
5,5-dibromo-6-methoxy-6-(4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2c)





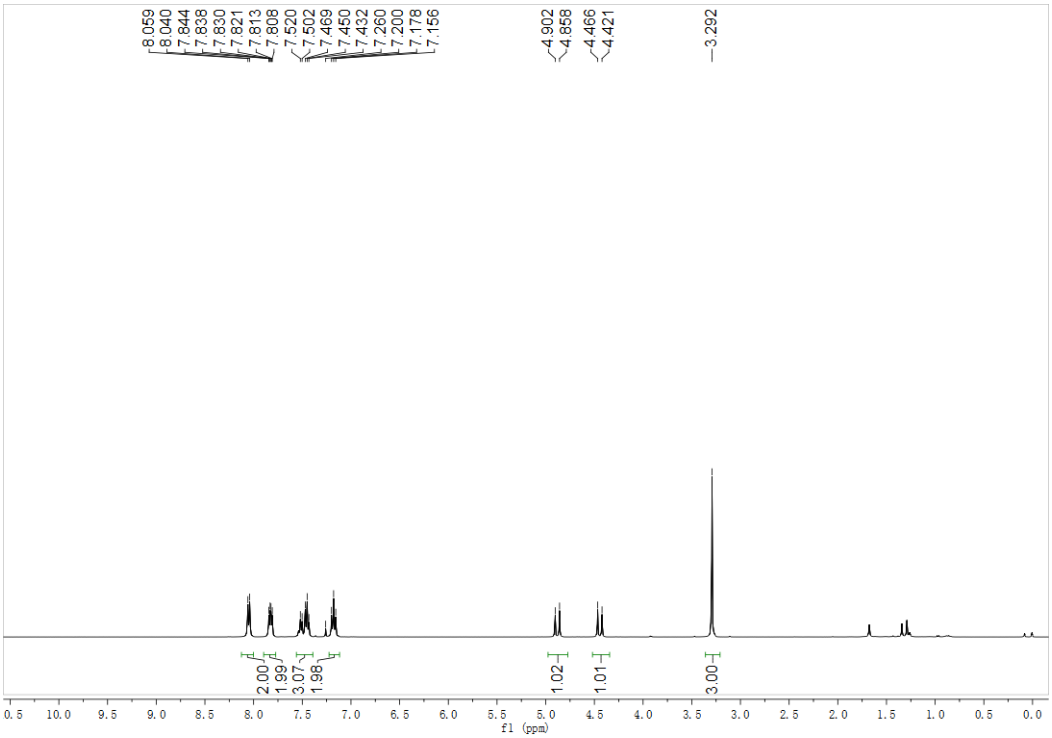
5,5-dibromo-6-(4-chlorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazin e(2d)

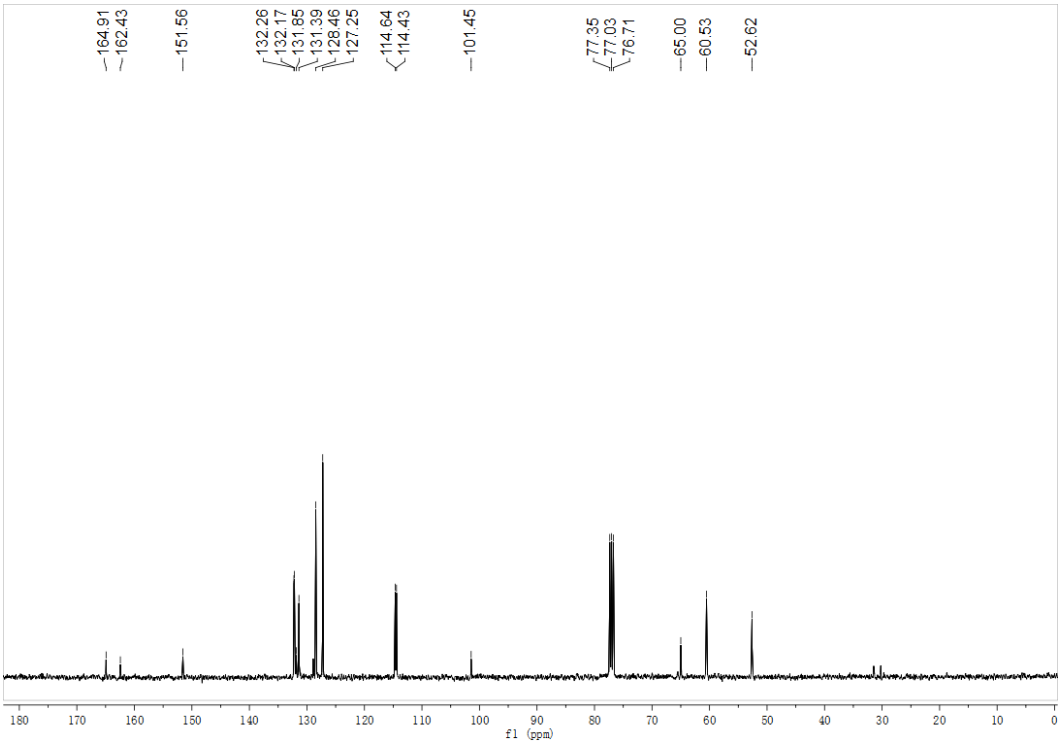


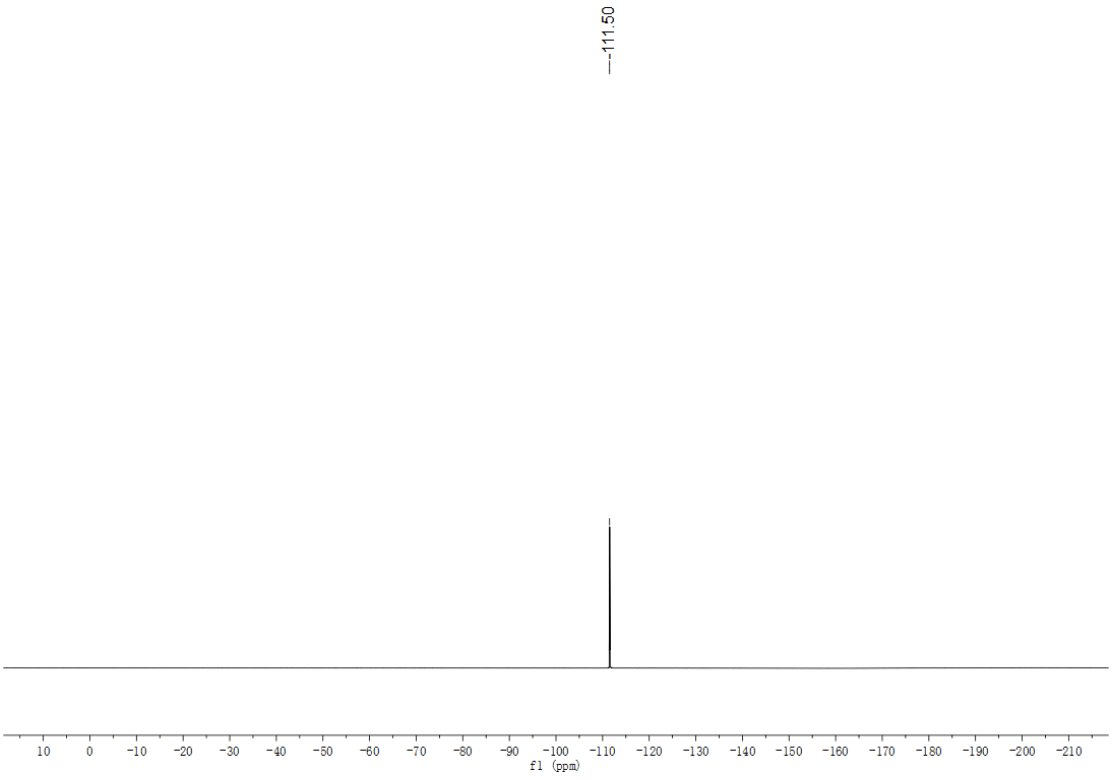


5,5-dibromo-6-(4-fluorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazin

e(2e)






-111.50
10
0
-10
-20
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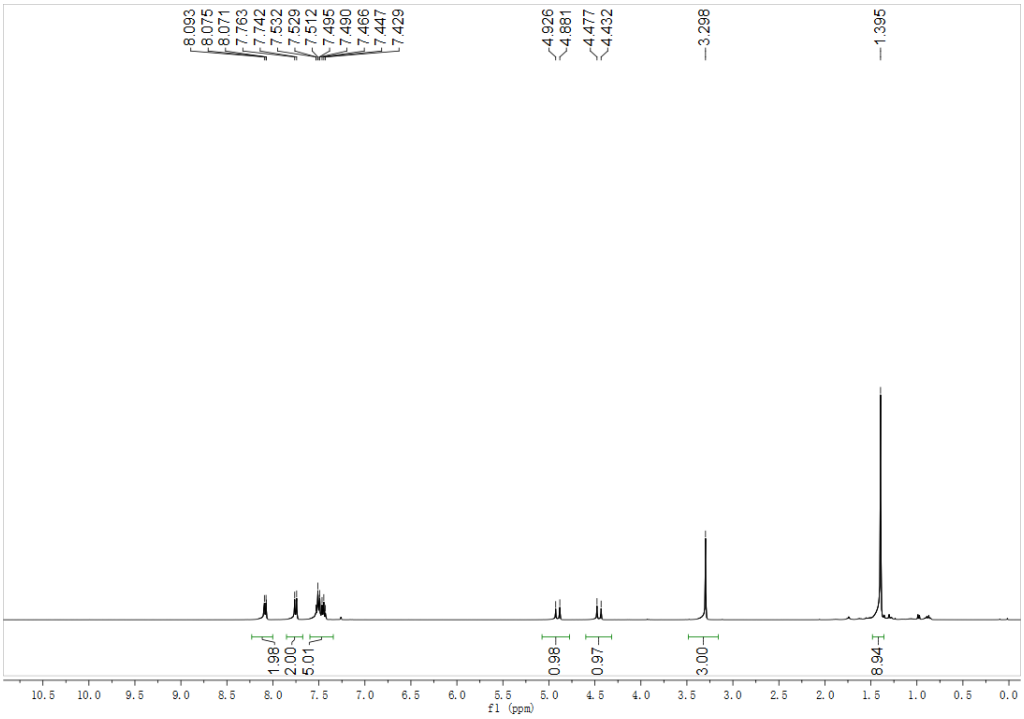
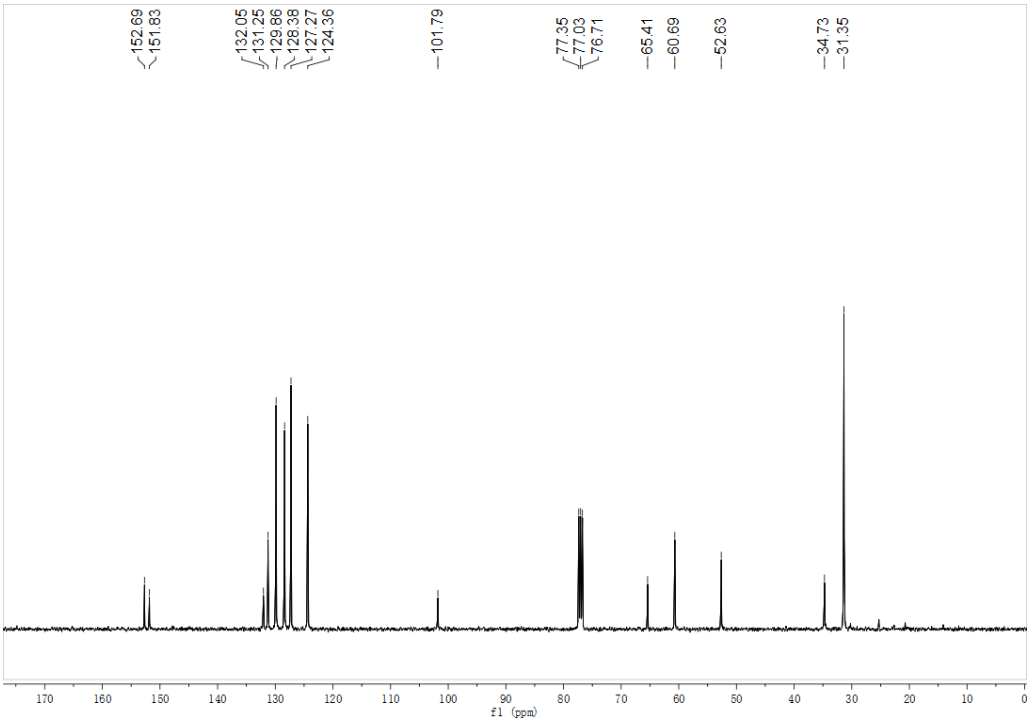
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

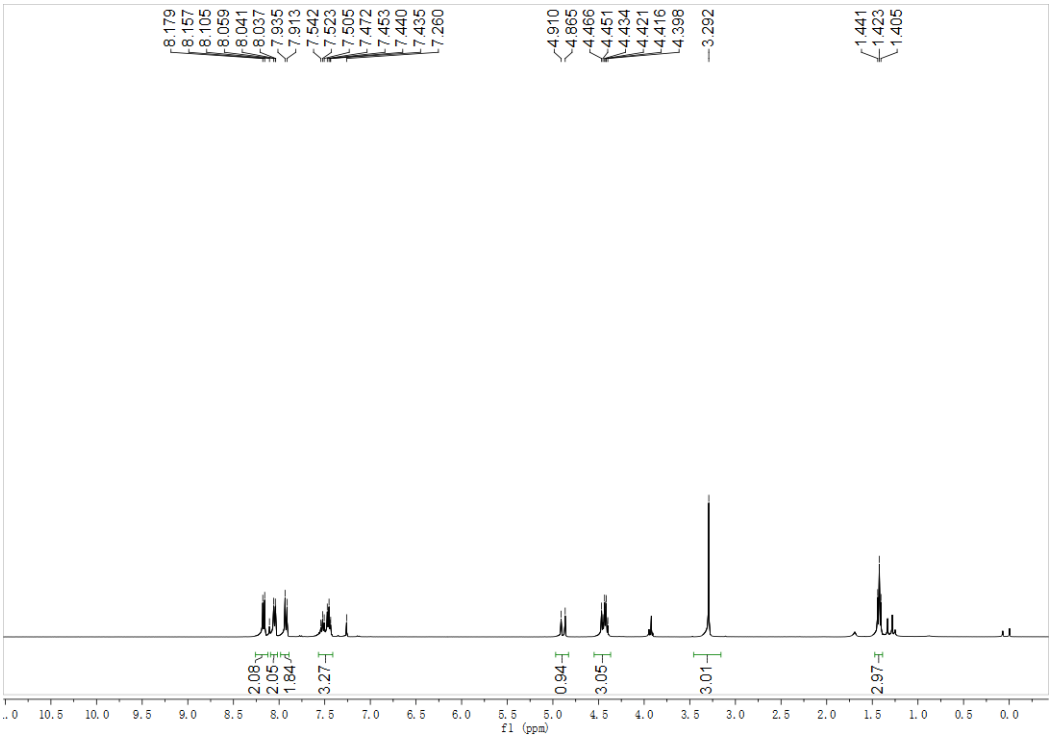
5,5-dibromo-6-(4-(tert-butyl)phenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine(2f)

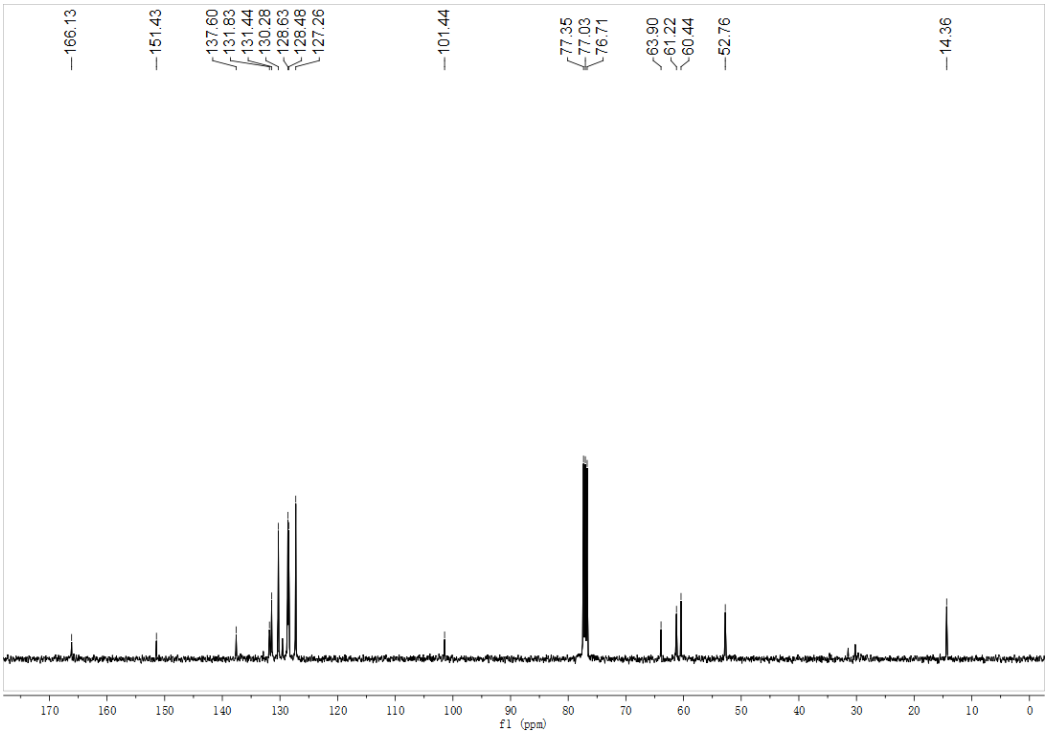




Ethyl-4-(5,5-dibromo-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazin-6-yl)benz

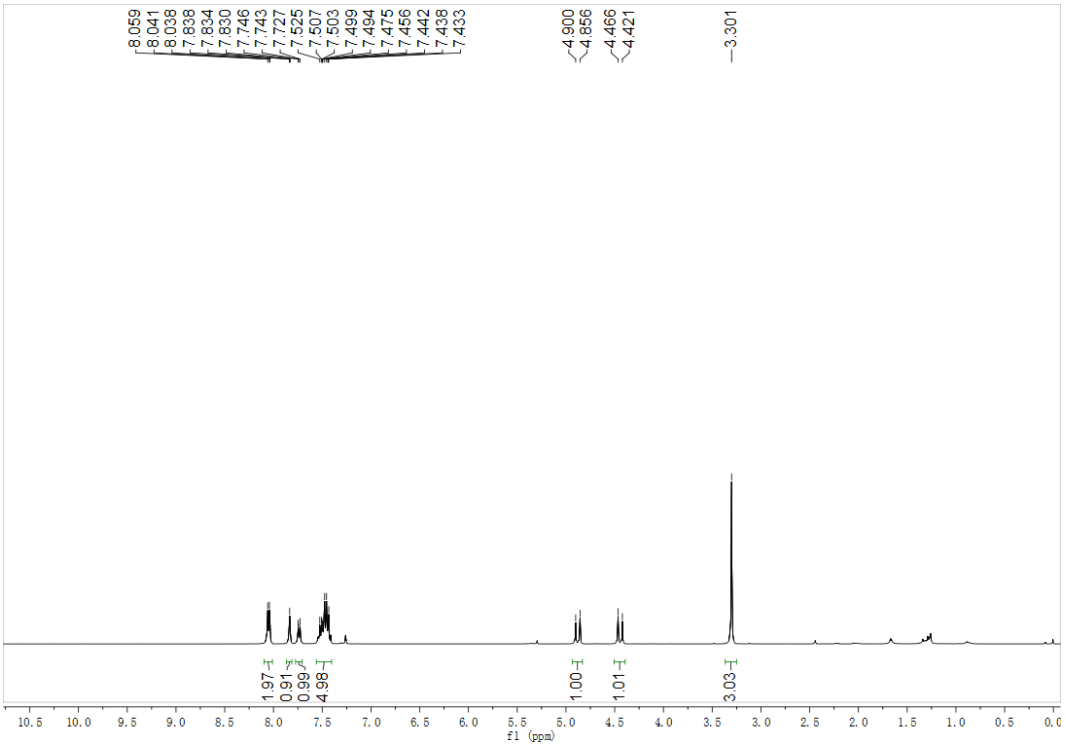
oate(2g)

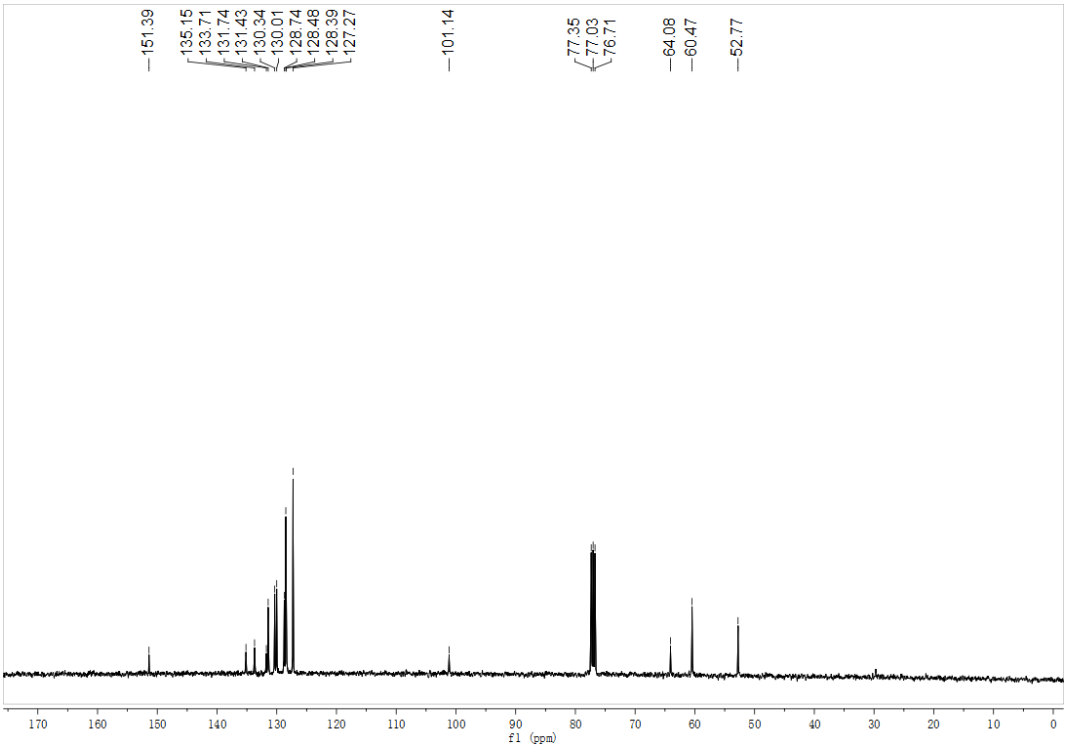




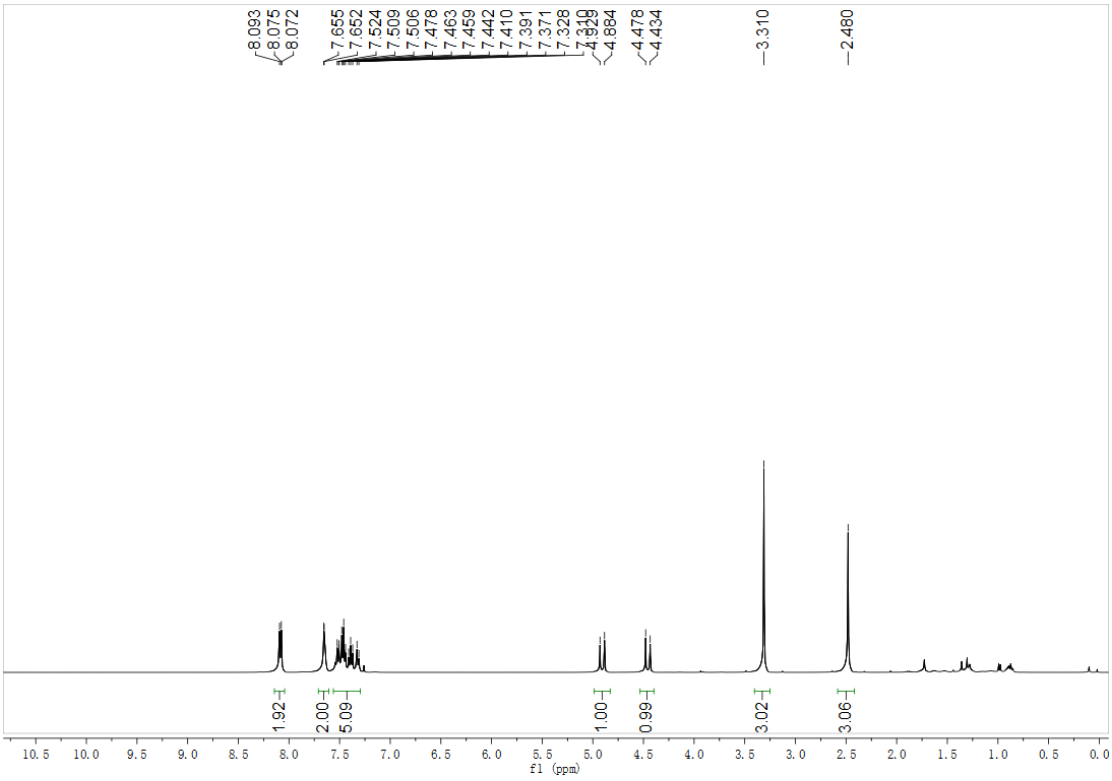
5,5-dibromo-6-(3-chlorophenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazin

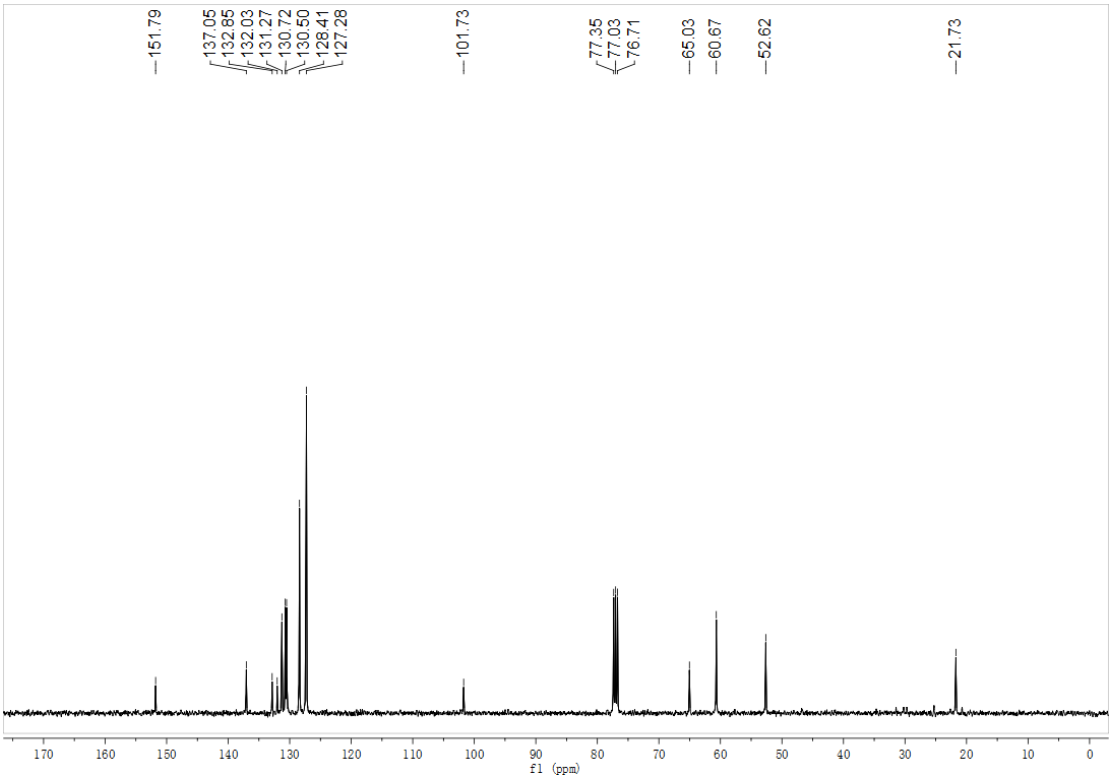
e (2h)



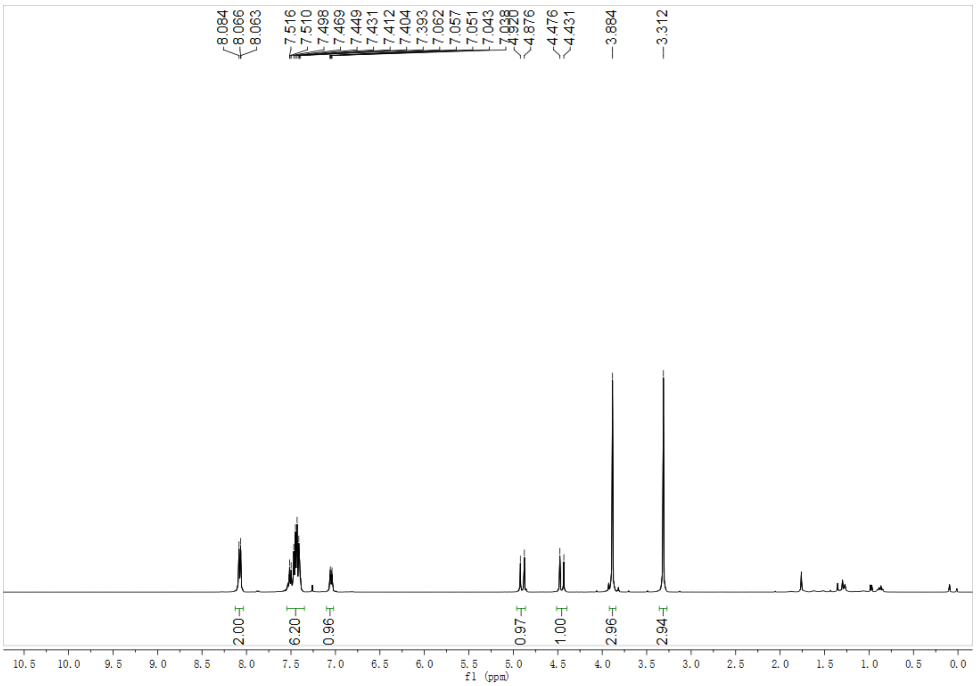


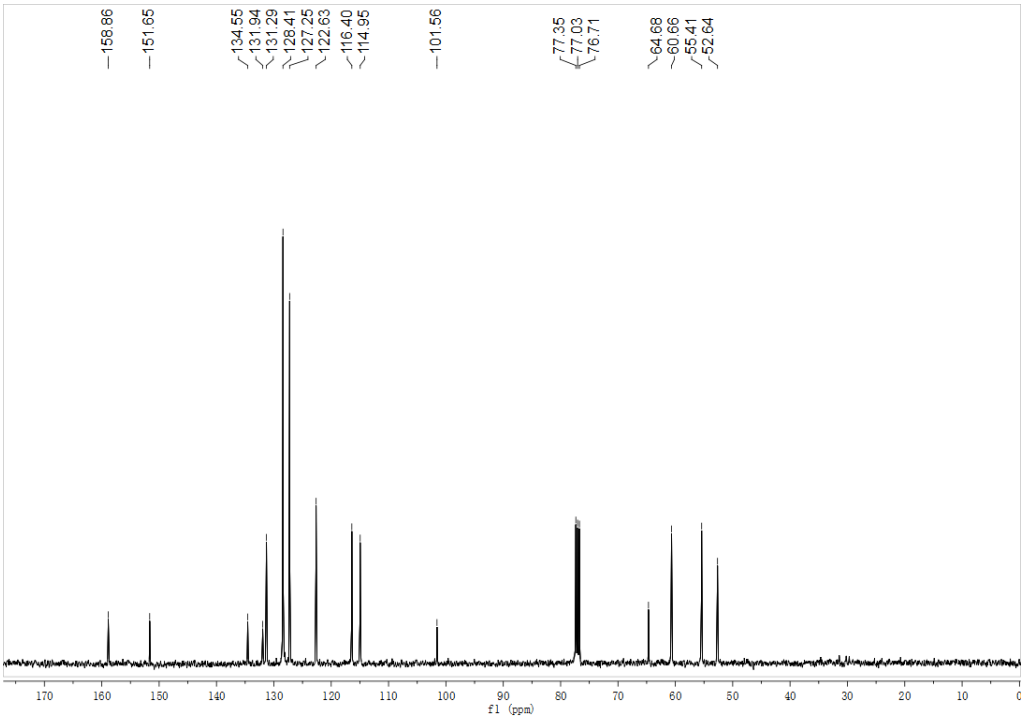
5,5-dibromo-6-methoxy-2-phenyl-6-(m-tolyl)-5,6-dihydro-4H-1,3-oxazine (2i)



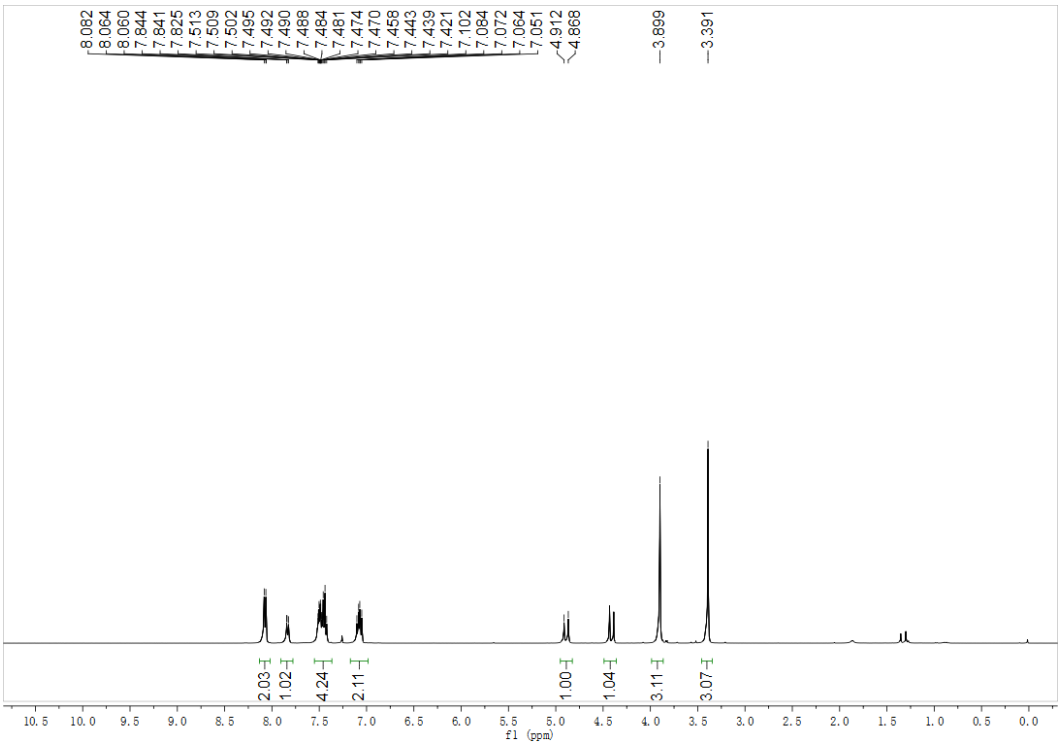


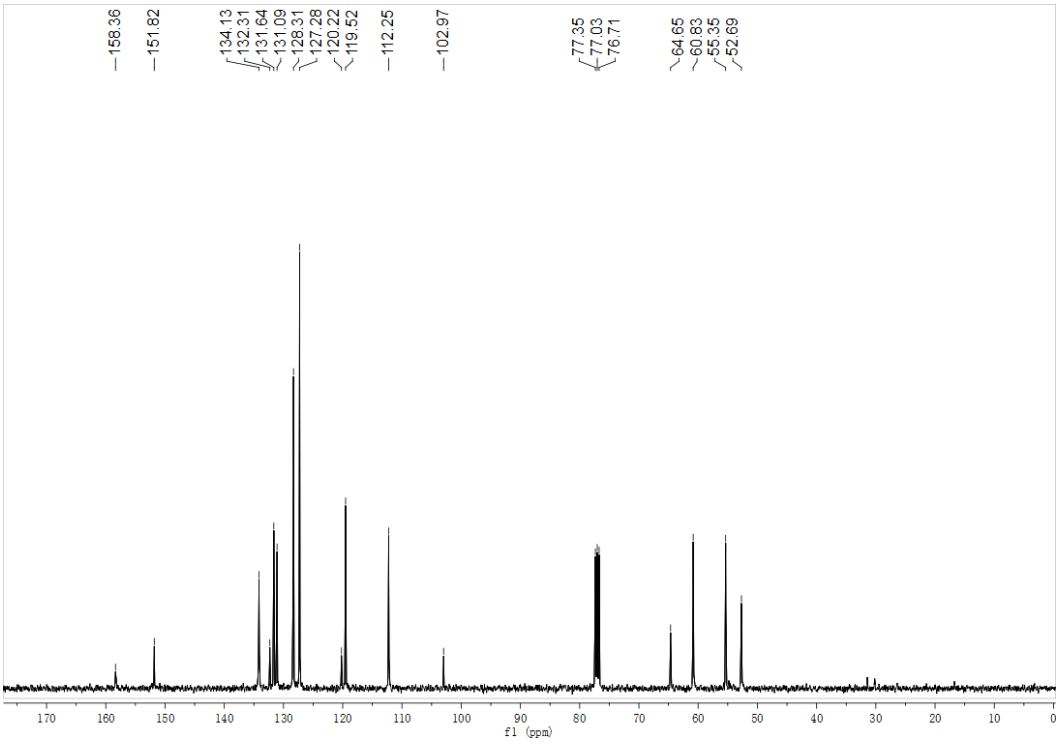
5,5-dibromo-6-methoxy-6-(3-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2j)



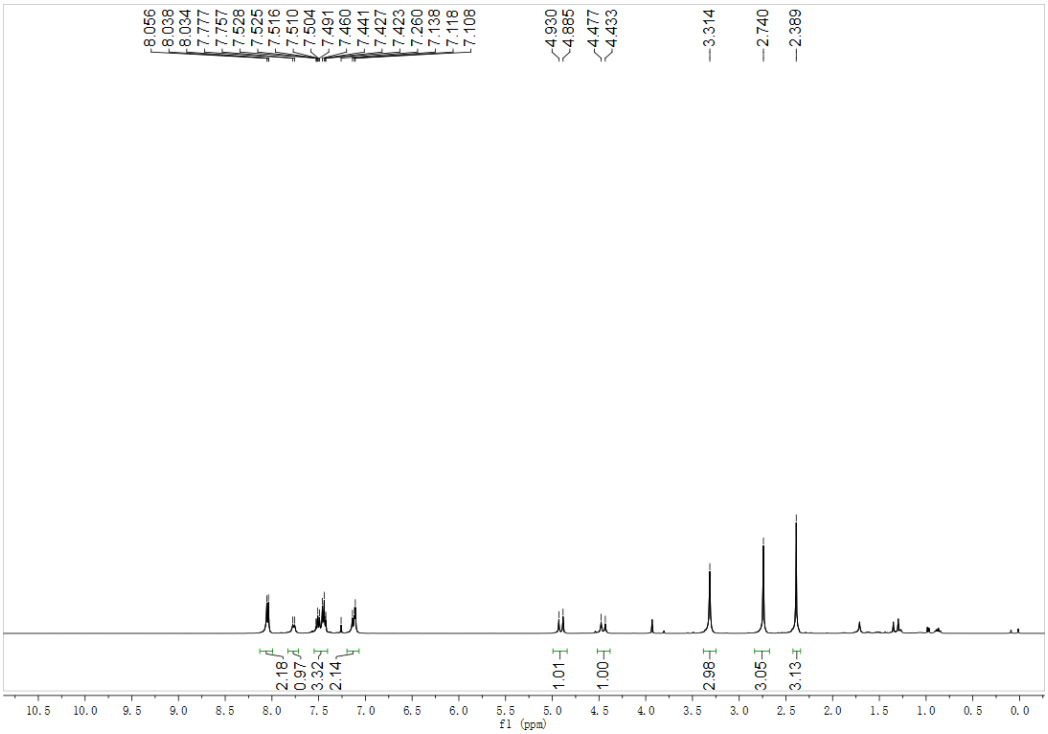


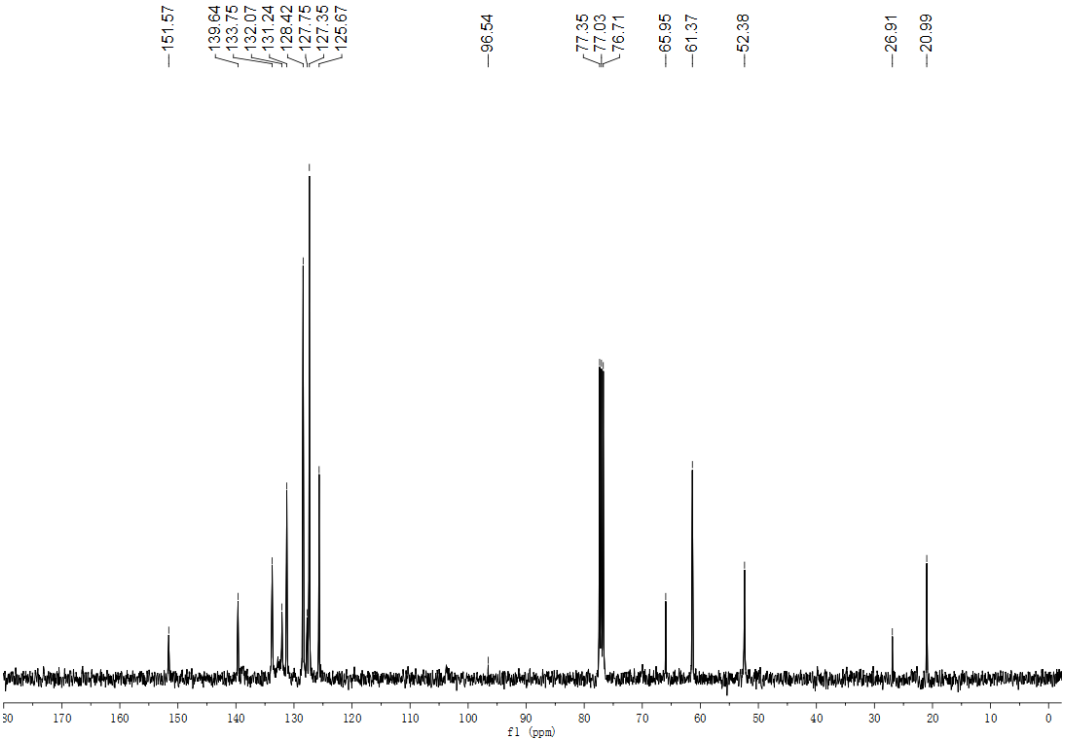
5,5-dibromo-6-methoxy-6-(2-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2k)





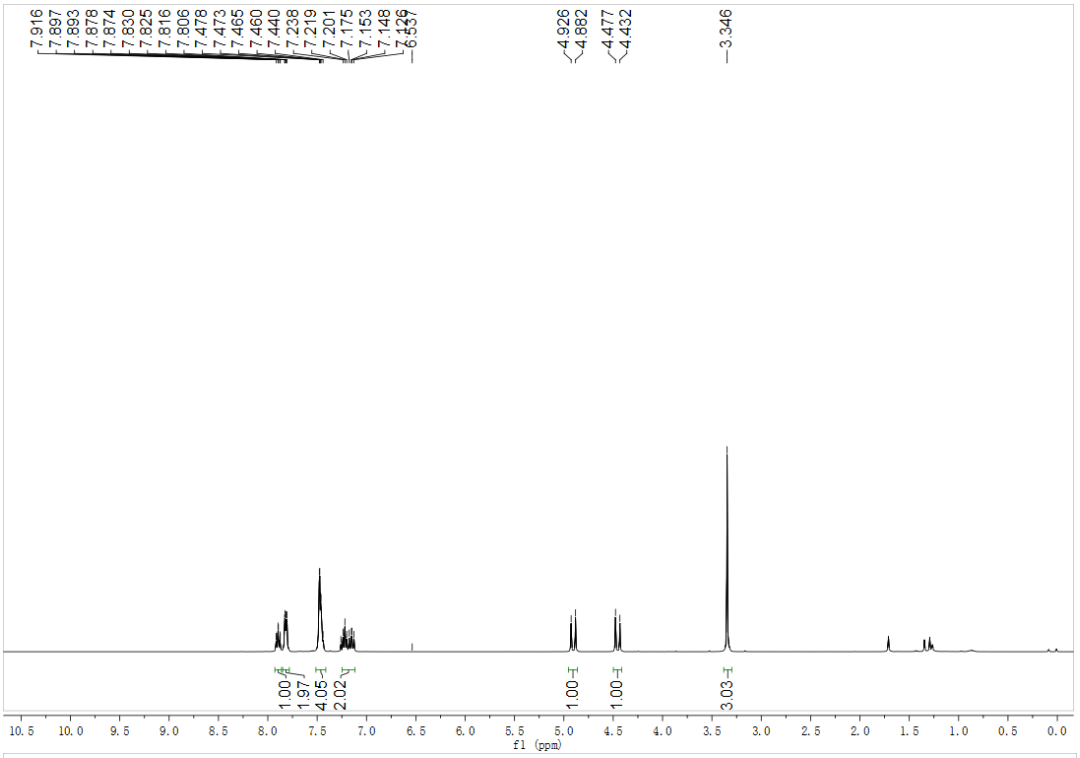
5,5-dibromo-6-(3,5-dimethylphenyl)-6-methoxy-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2l)

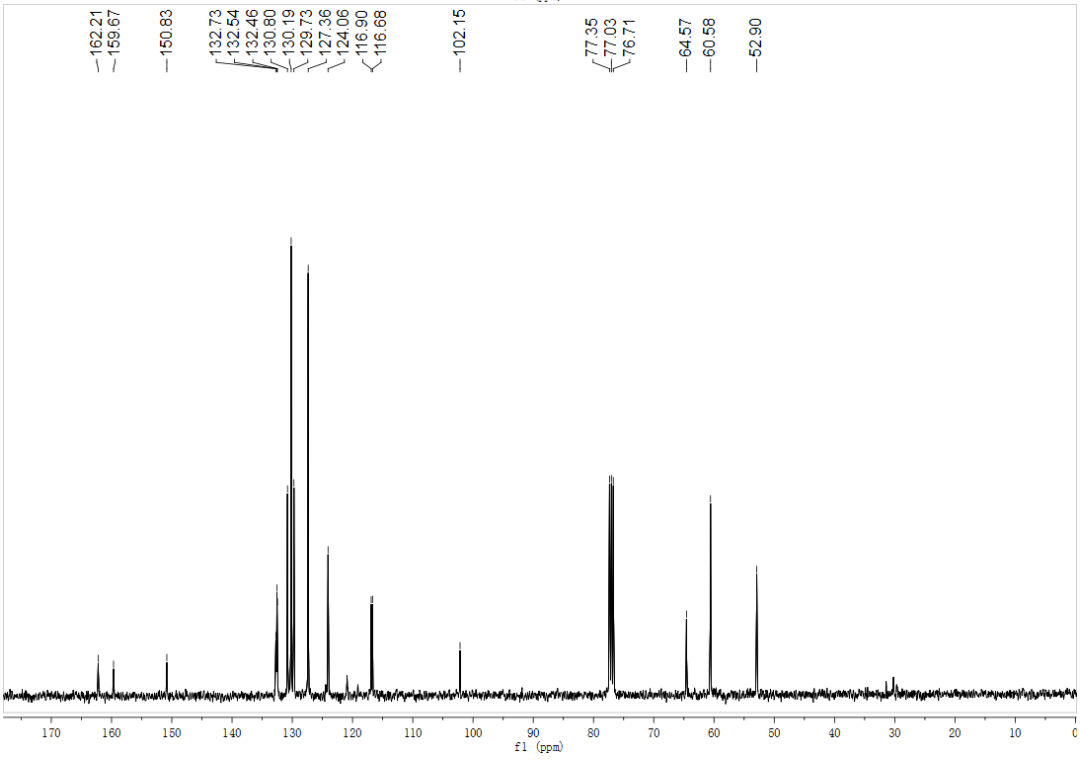


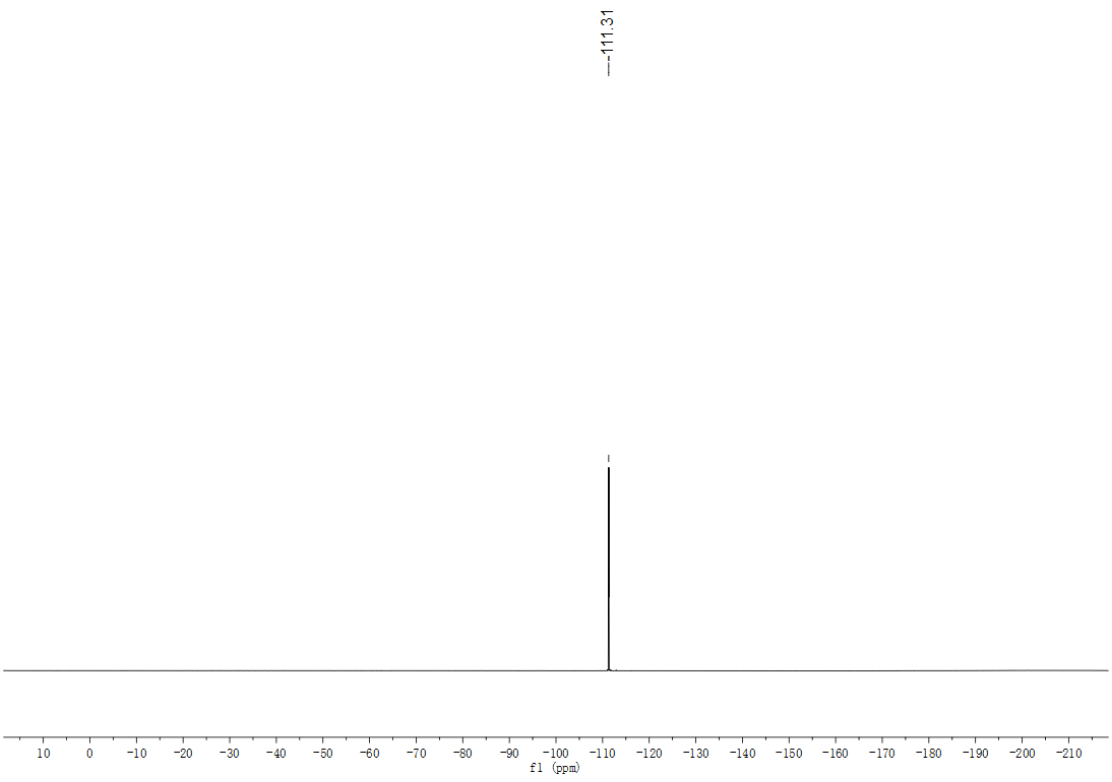


5,5-dibromo-2-(2-fluorophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazin

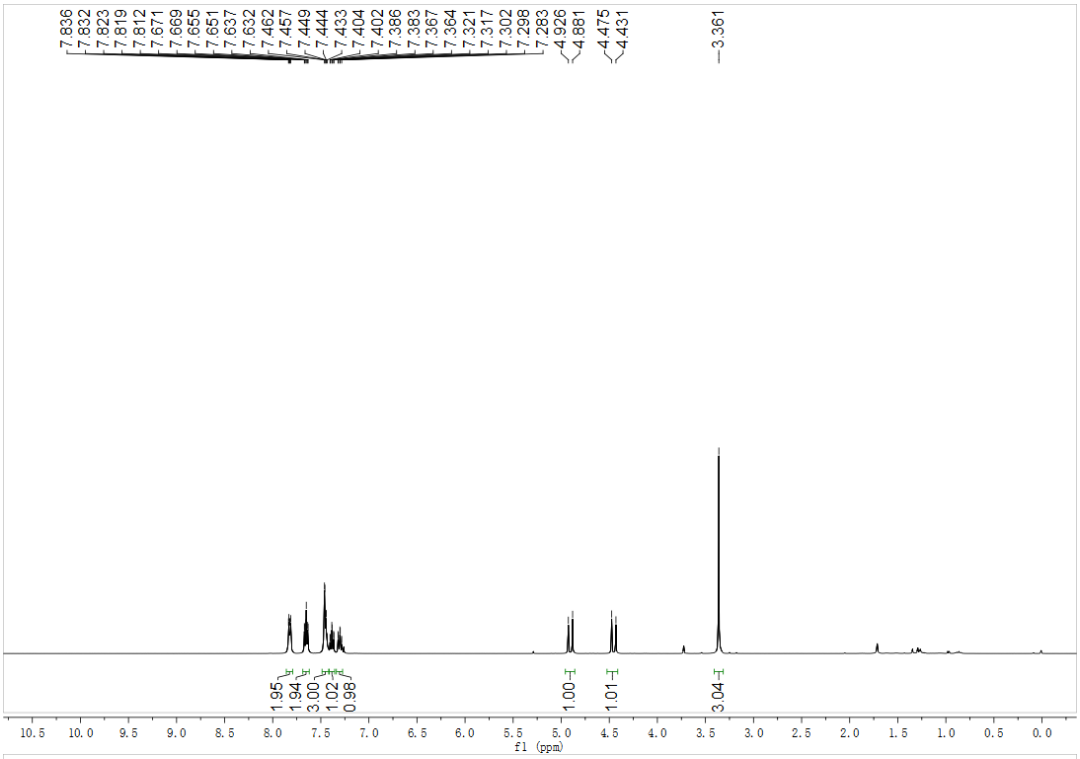
e (2m)

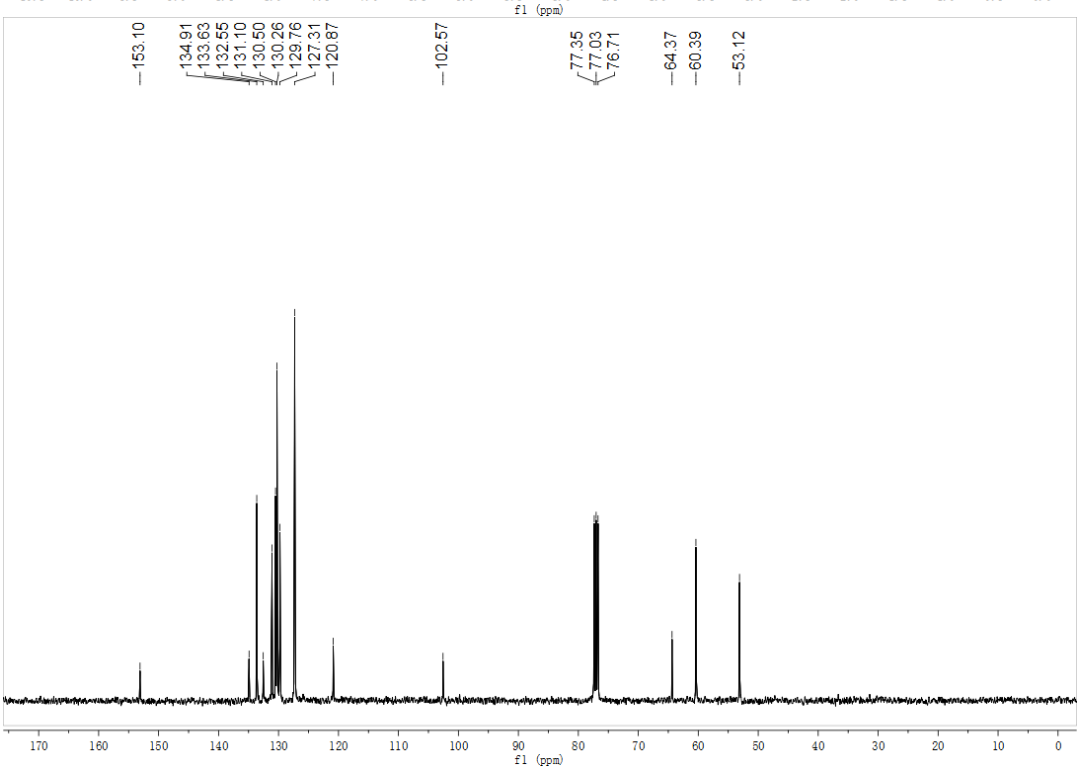





-111.31
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

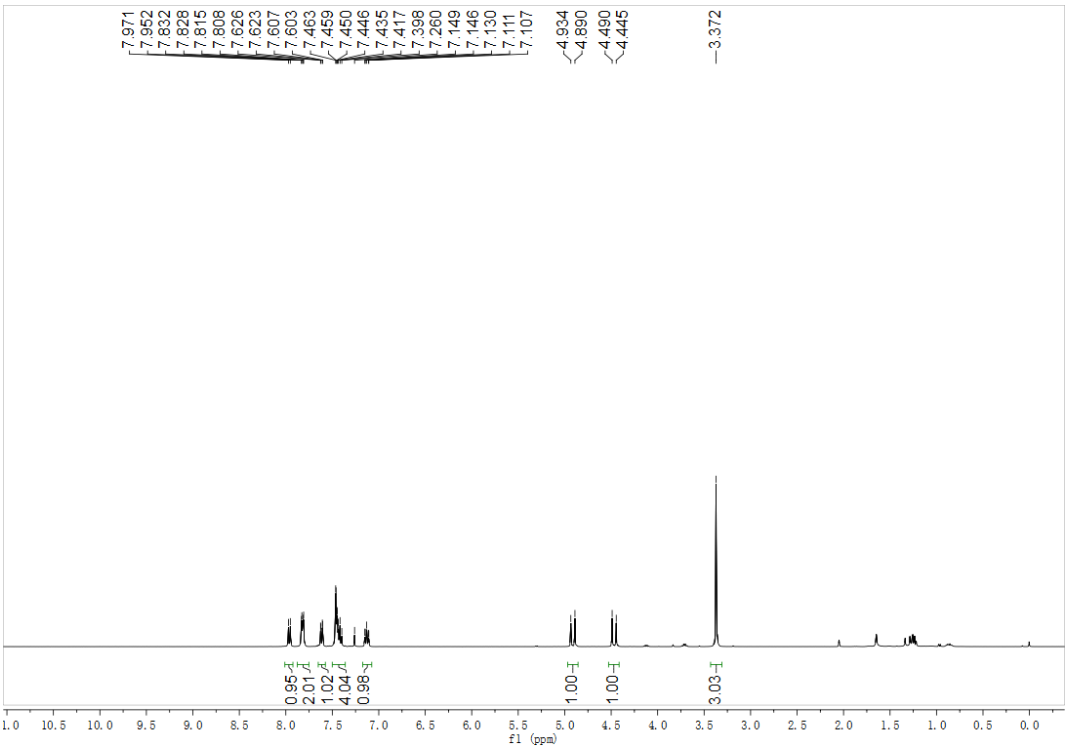
5,5-dibromo-2-(2-bromophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2n)

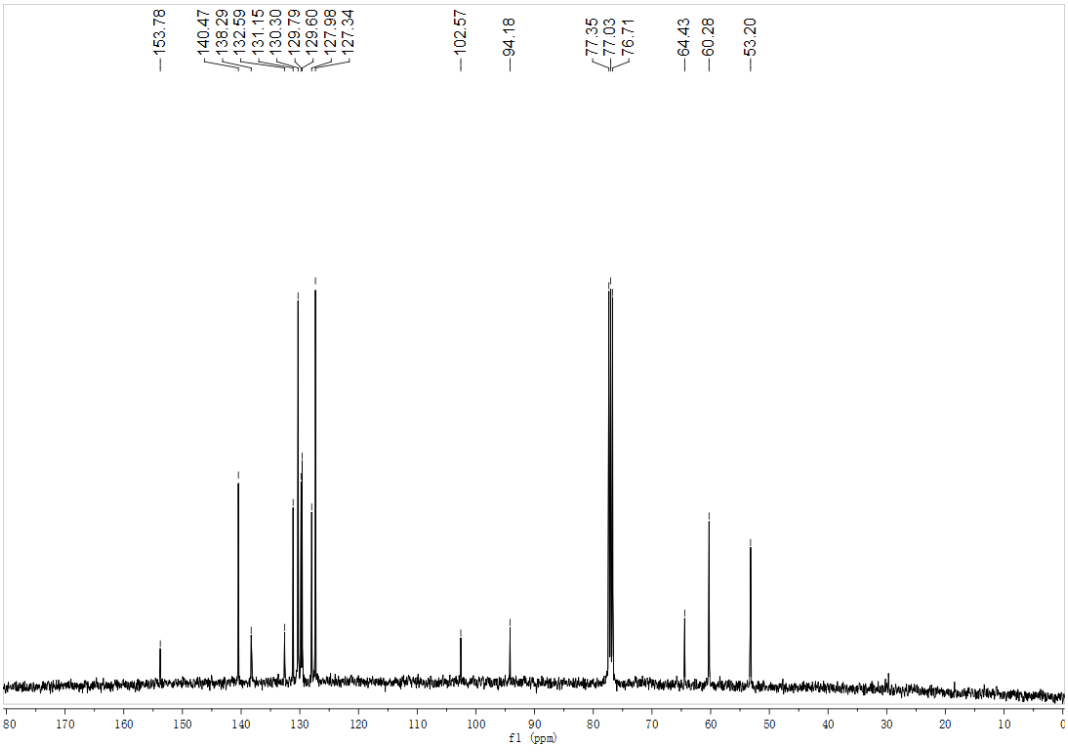




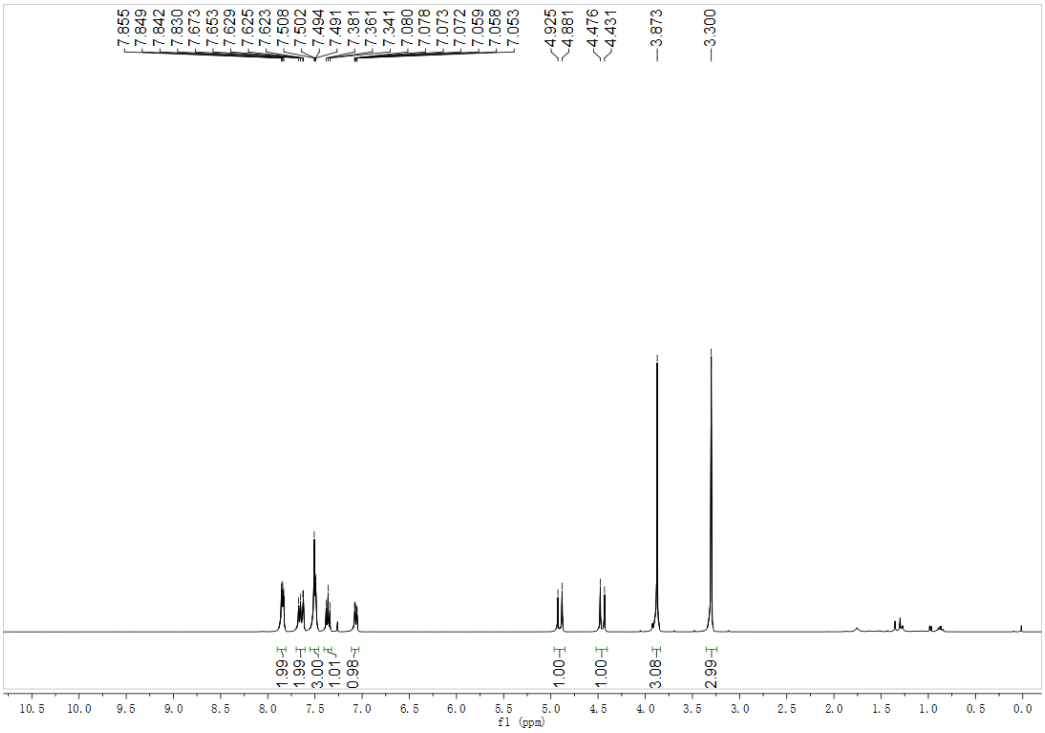
5,5-dibromo-2-(2-iodophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine

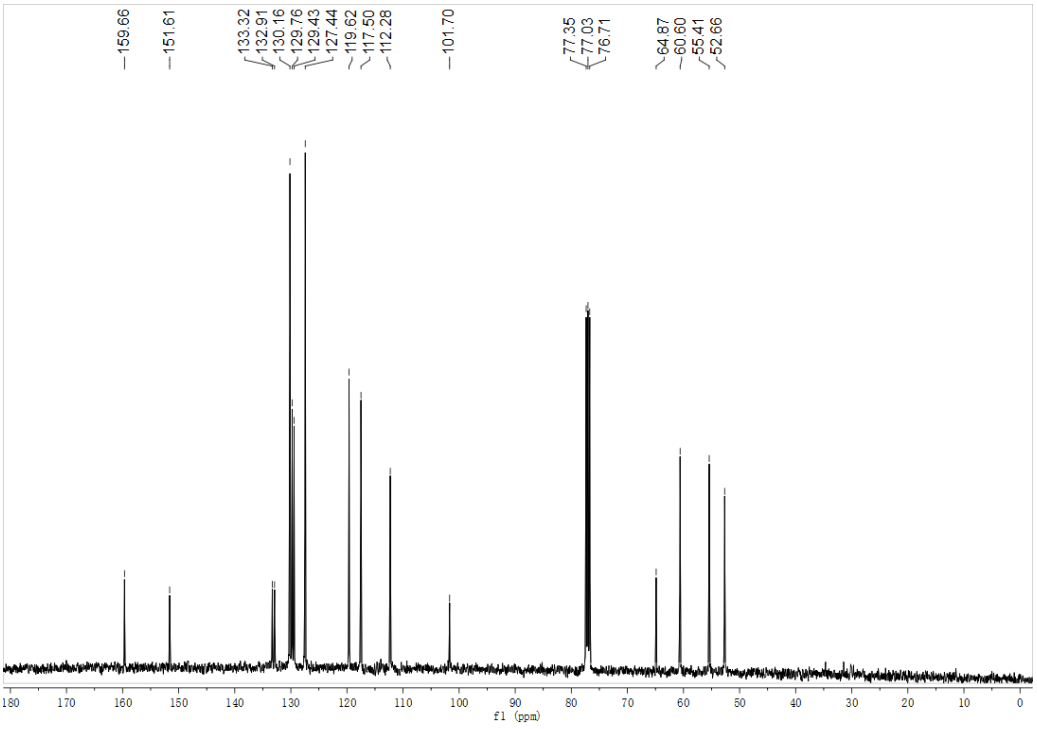
(2o)



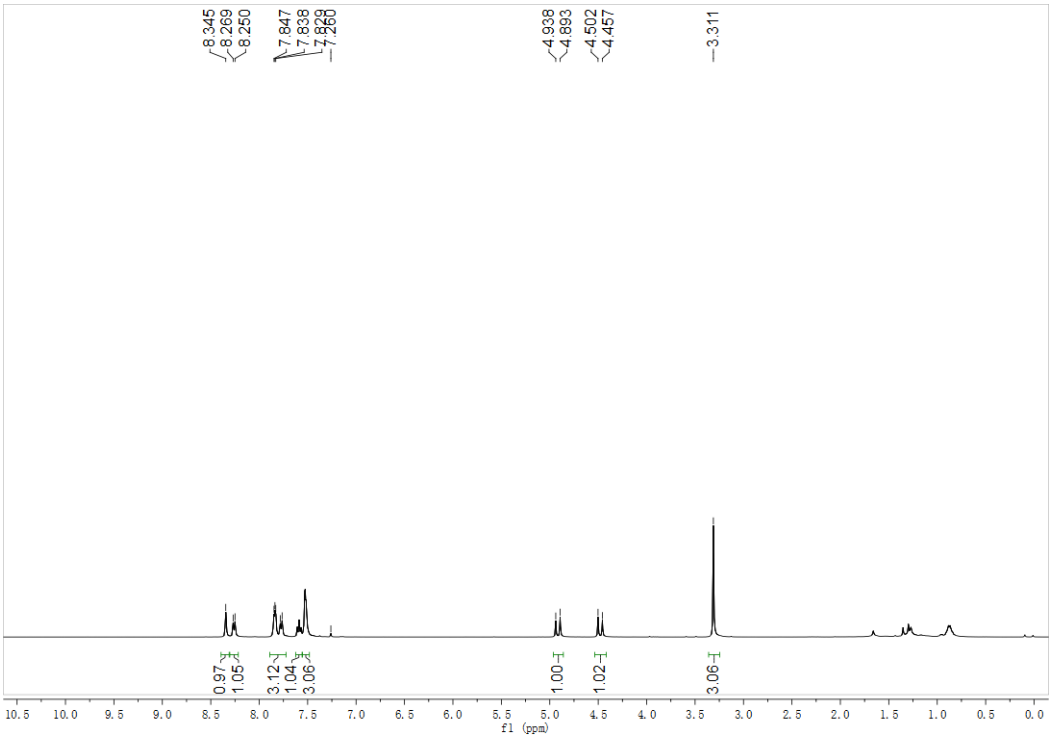


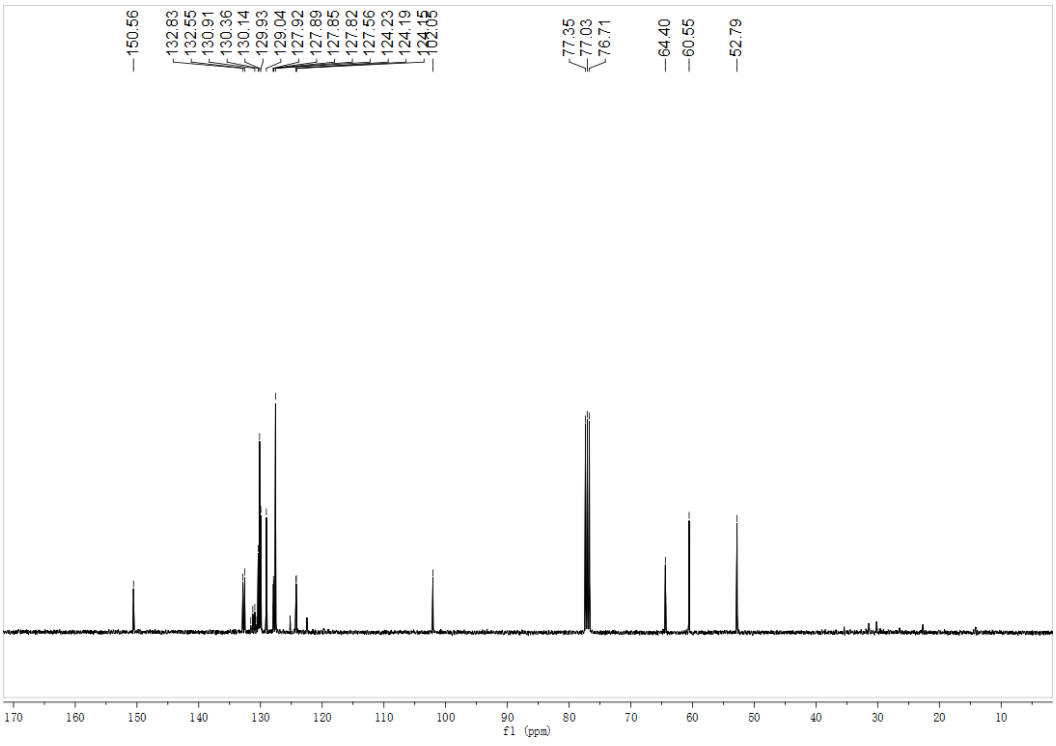
5,5-dibromo-6-methoxy-2-(3-methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2p)

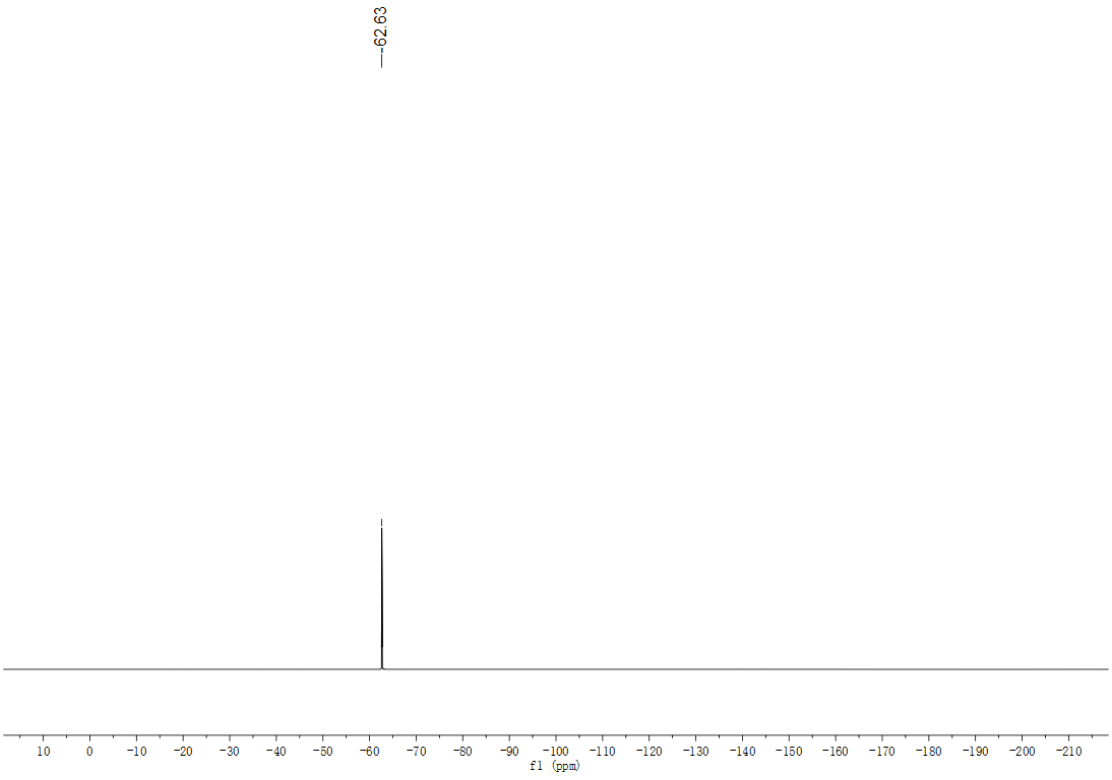




5,5-dibromo-6-methoxy-6-phenyl-2-(3-(trifluoromethyl)phenyl)-5,6-dihydro-4H -1,3-oxazine (2q)

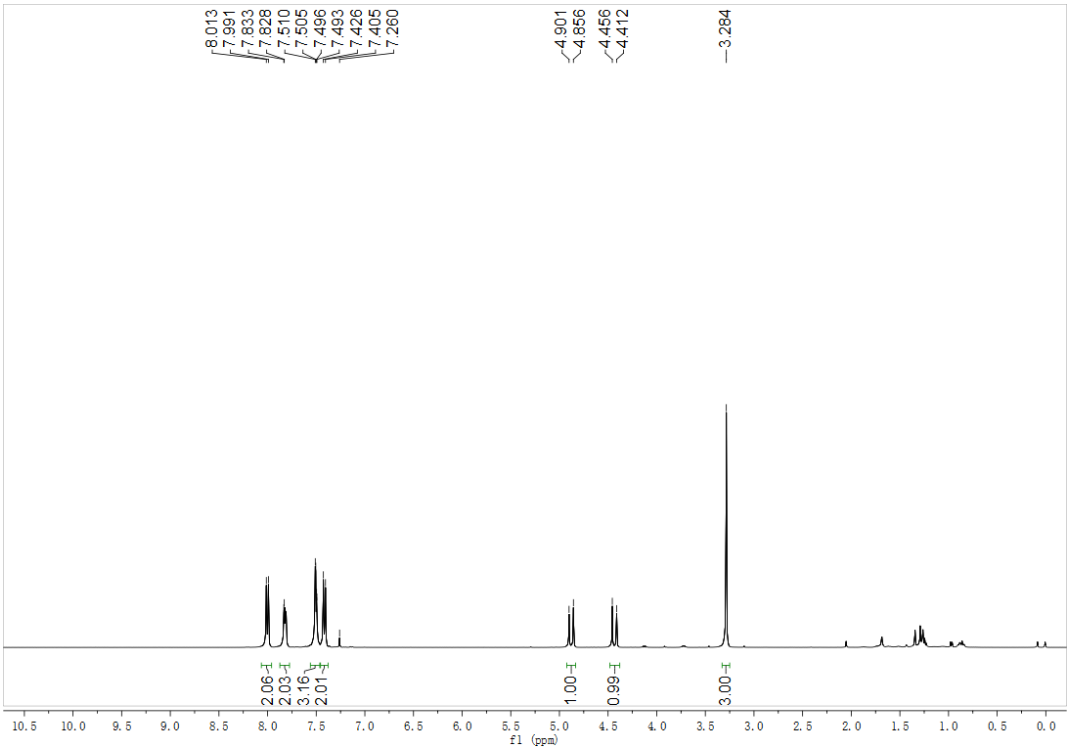


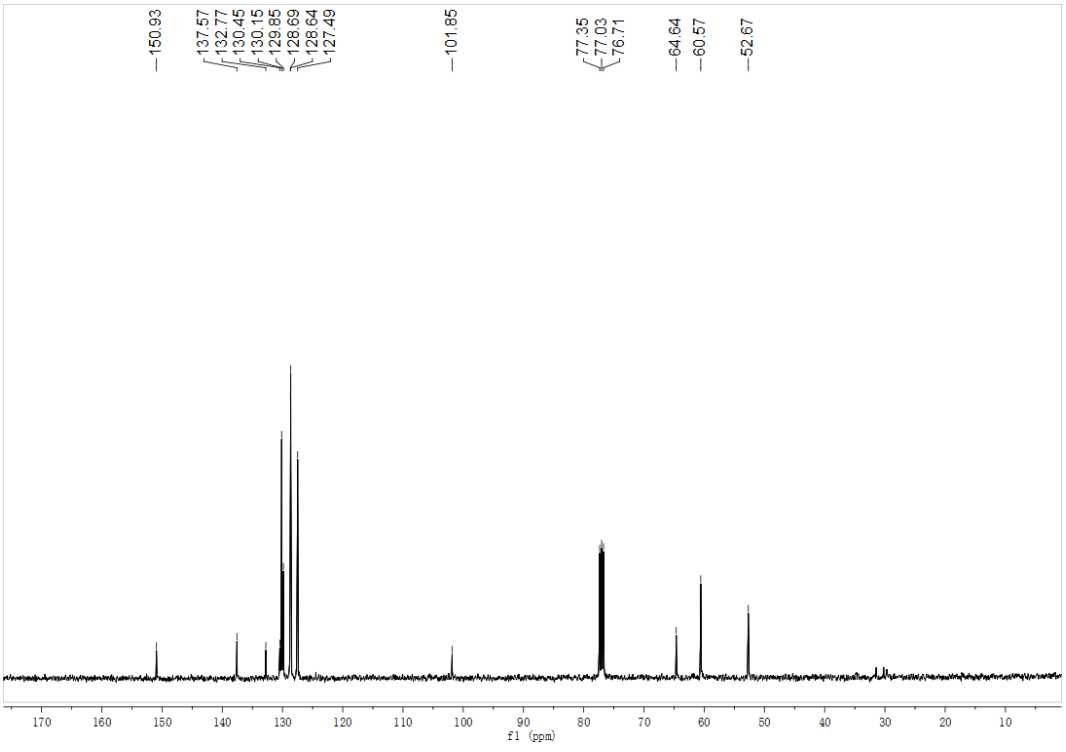



-62.63
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

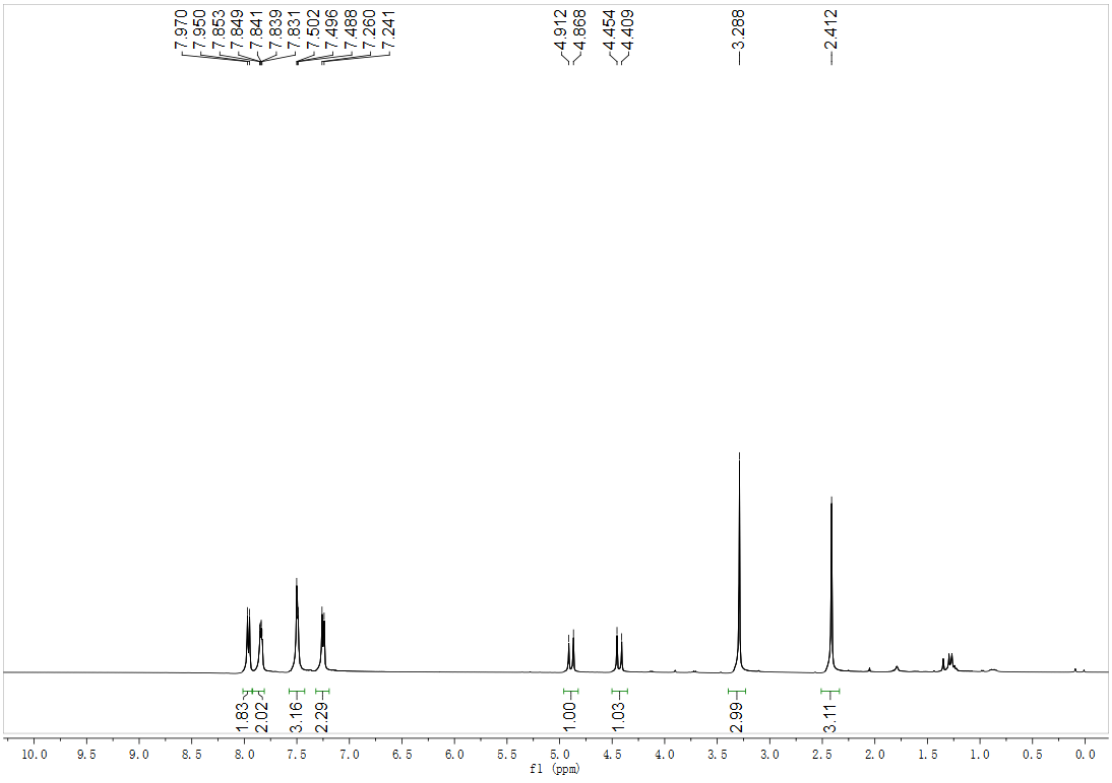
5,5-dibromo-2-(4-chlorophenyl)-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazin

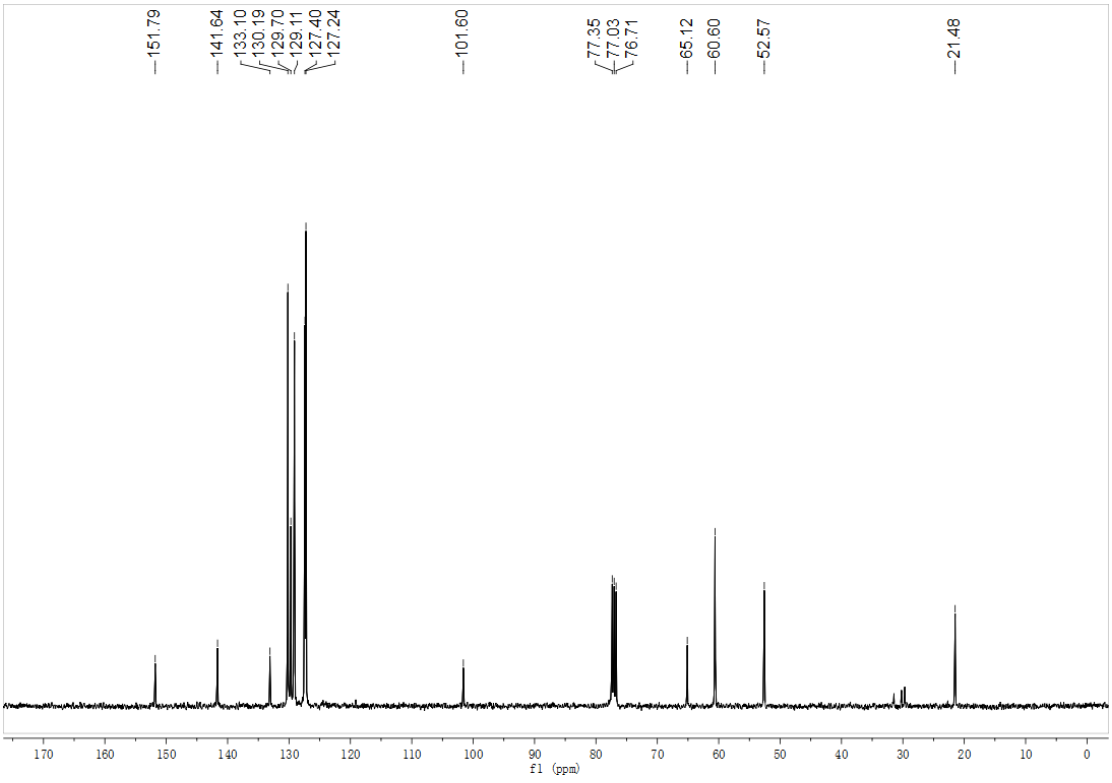
e (2r)



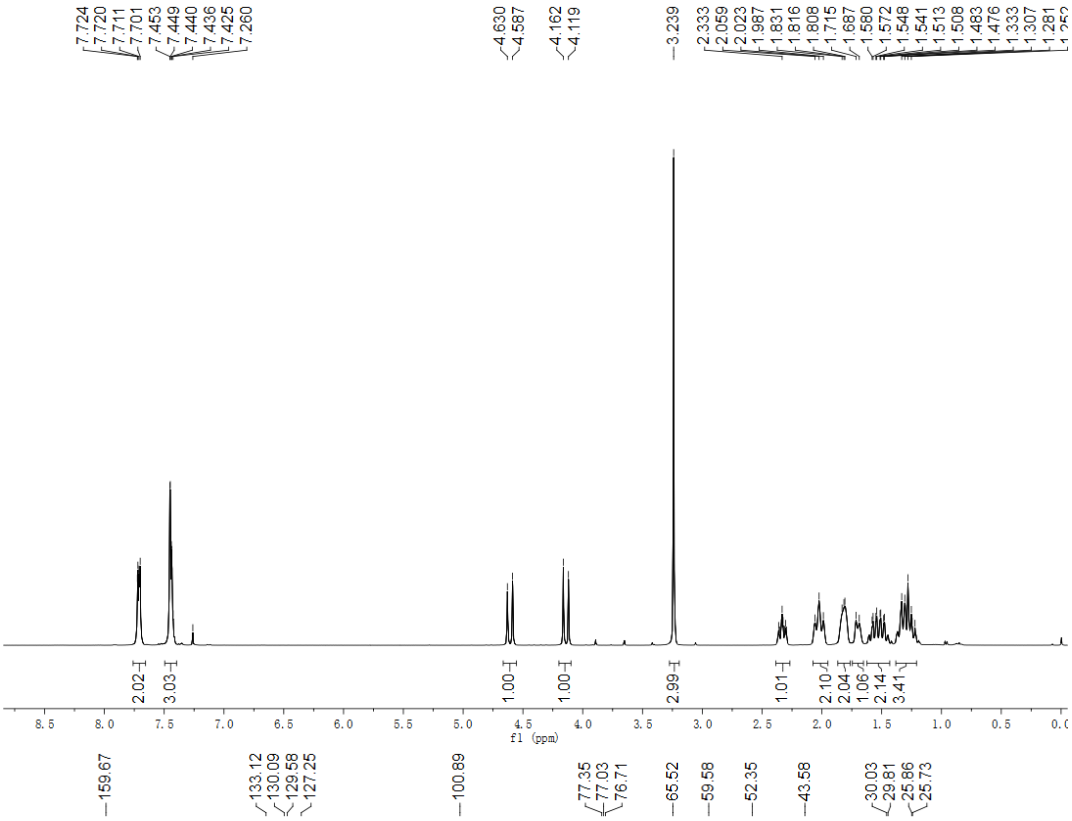


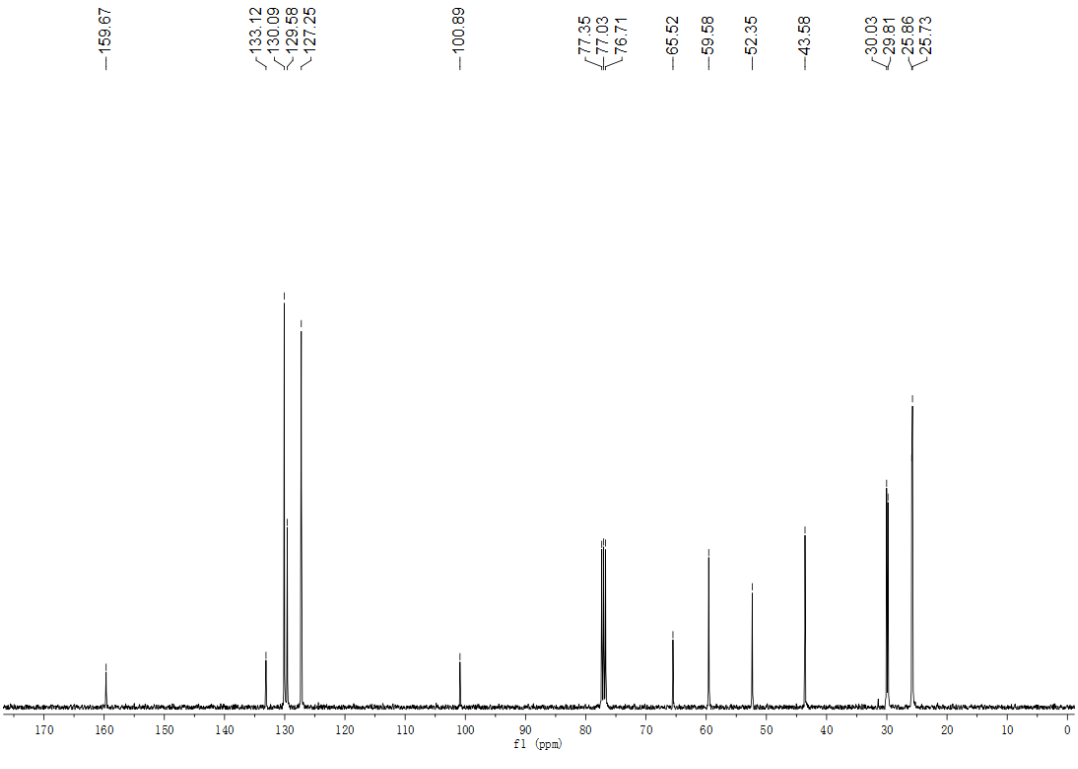
5,5-dibromo-6-methoxy-6-phenyl-2-(p-tolyl)-5,6-dihydro-4H-1,3-oxazine (2s)



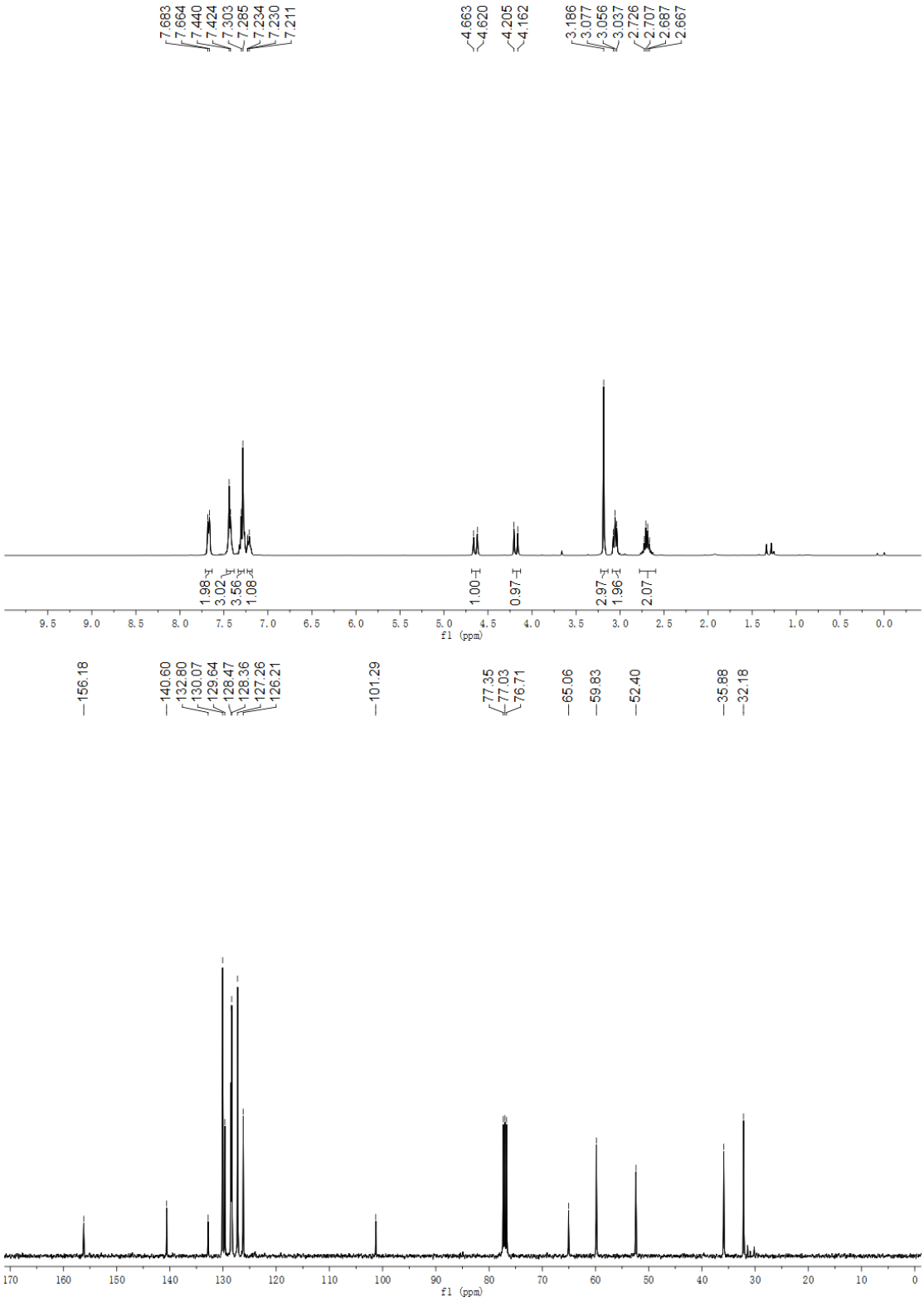


5,5-dibromo-2-cyclohexyl-6-methoxy-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2t)

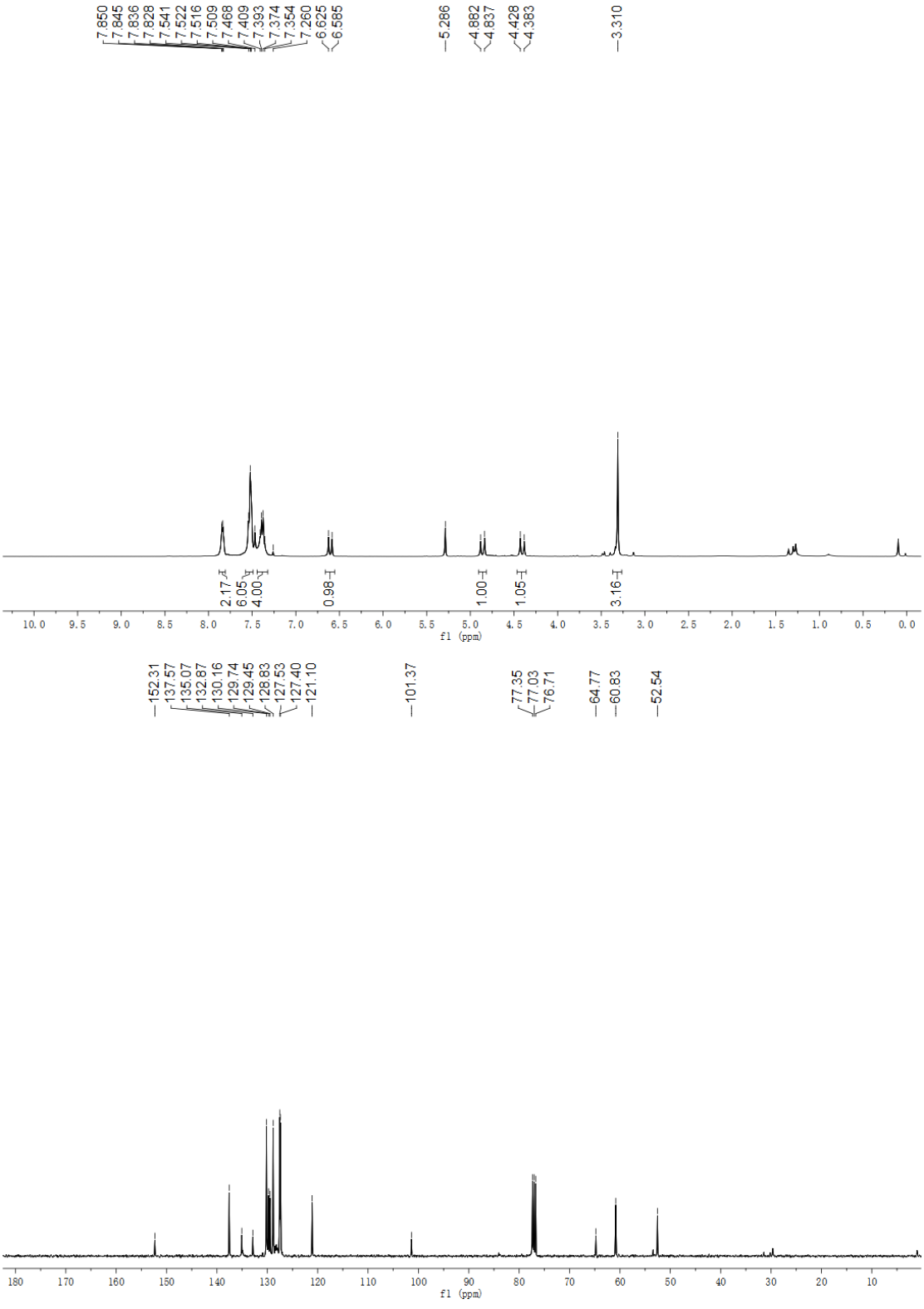




5,5-dibromo-6-methoxy-2-phenethyl-6-phenyl-5,6-dihydro-4H-1,3-oxazine (2u)

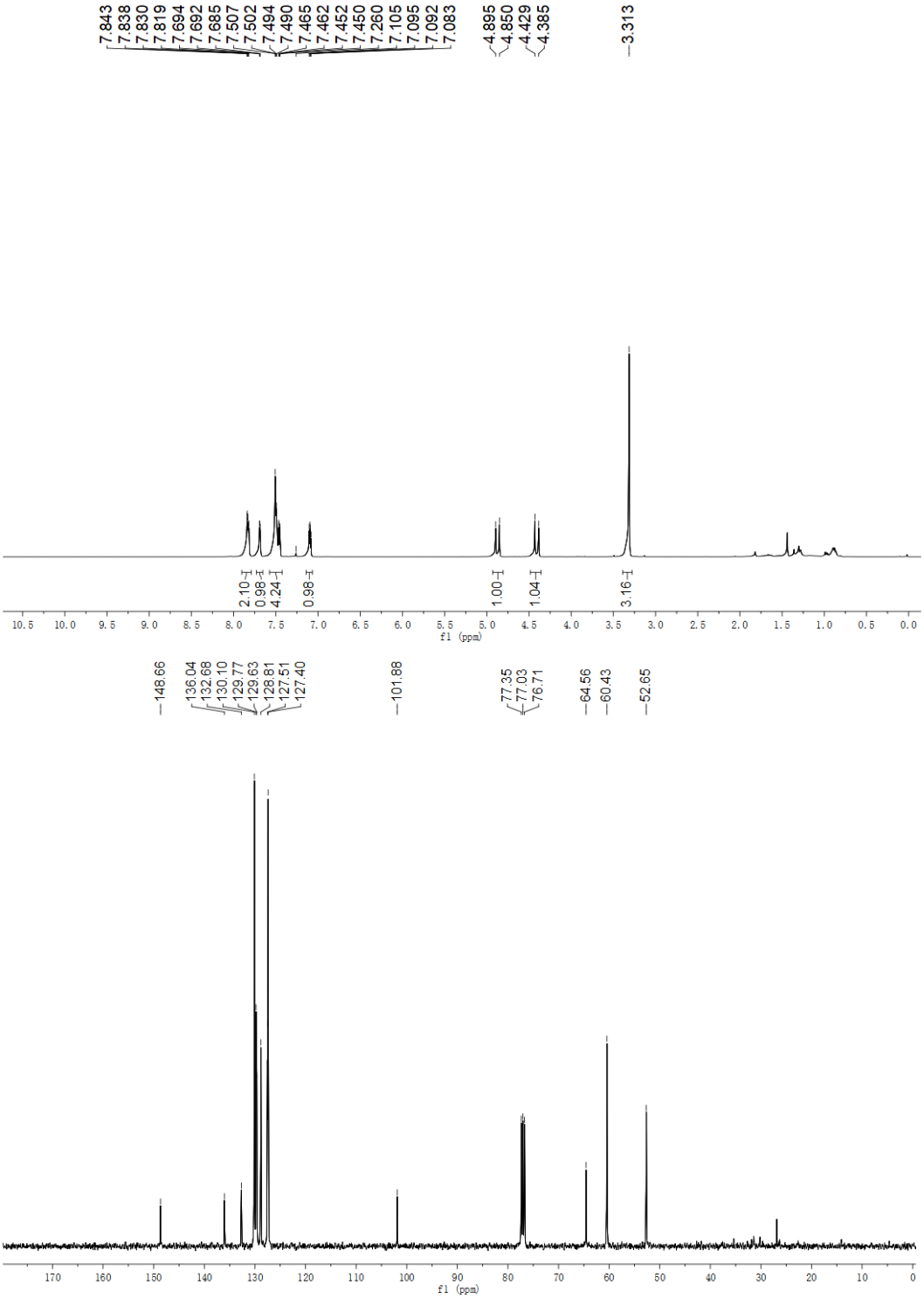


(E)-5,5-dibromo-6-methoxy-6-phenyl-2-styryl-5,6-dihydro-4H-1,3-oxazine (2v)

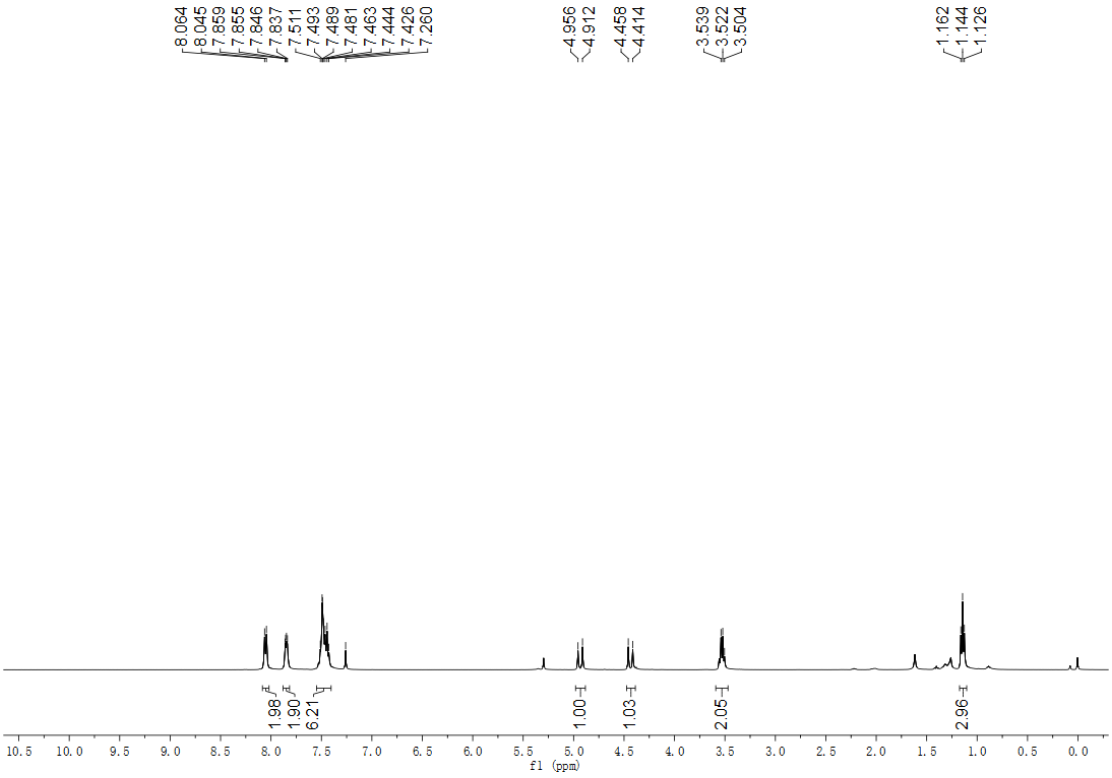


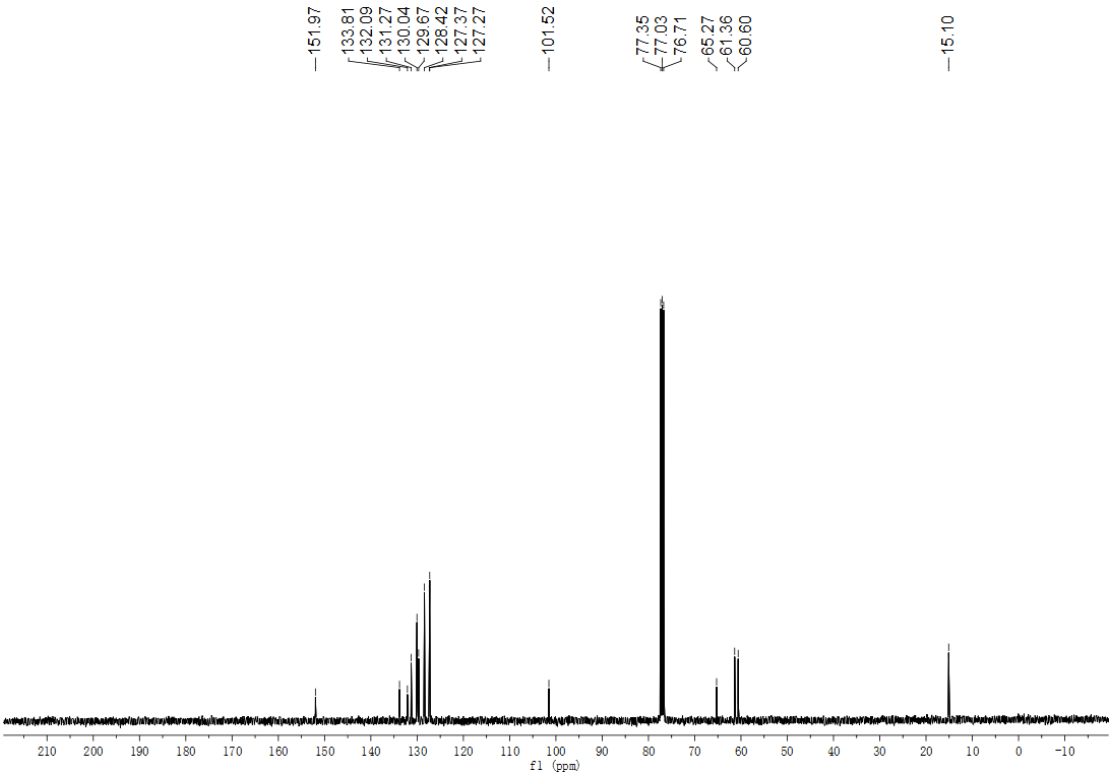
5,5-dibromo-6-methoxy-6-phenyl-2-(thiophen-2-yl)-5,6-dihydro-4H-1,3-oxazine

(2w)

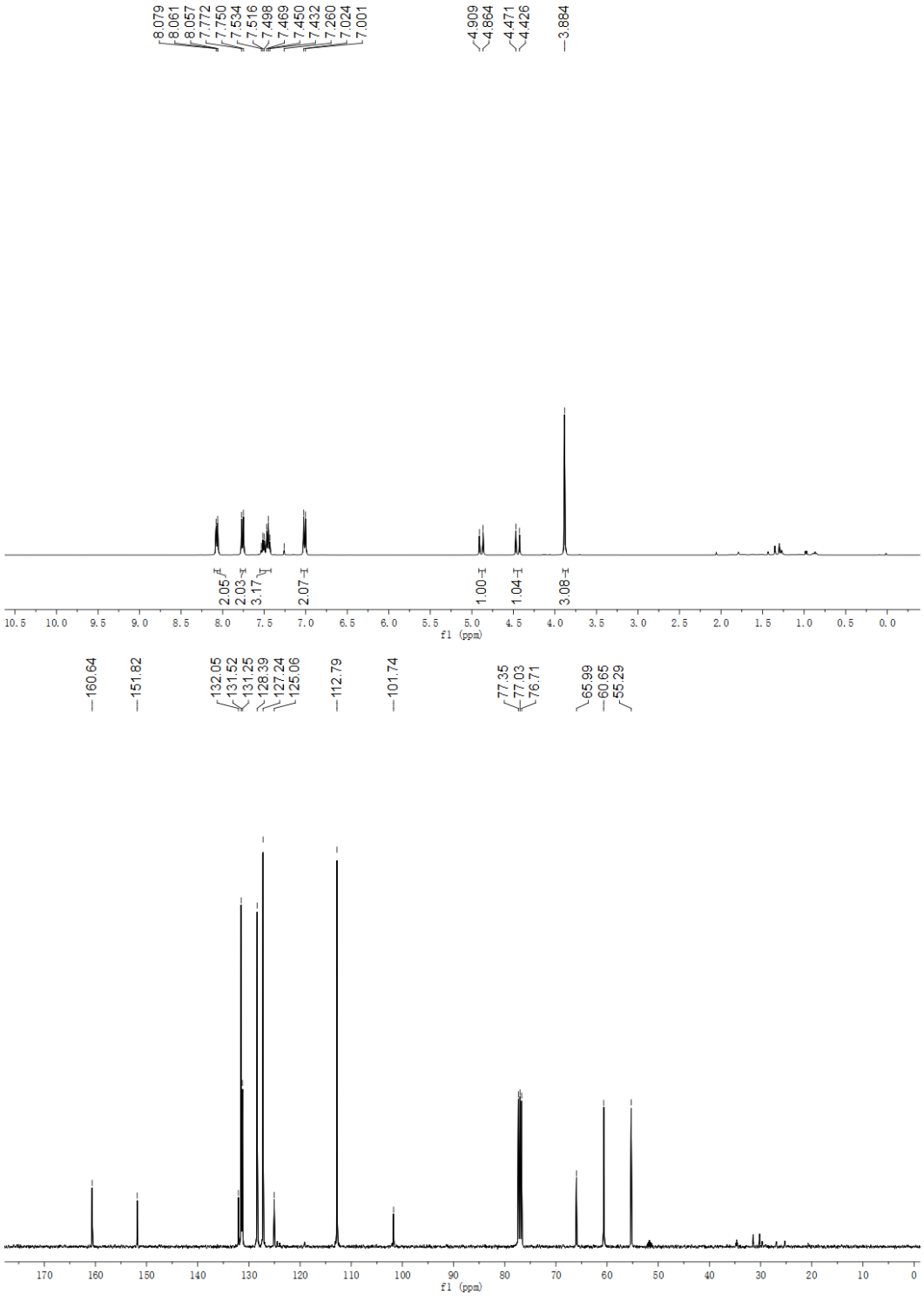


5,5-dibromo-6-ethoxy-2,6-diphenyl-5,6-dihydro-4H-1,3-oxazine (2x)





5,5-dibromo-6-(methoxy-d3)-6-(4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-oxazine (2y)



5-bromo-2,6-diphenyl-4H-1,3-oxazine (2a′)