

Supporting Information

Ag₂O-promoted ring-opening reactions of cyclopropenones with oximes

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General information

All reagents and solvents were purchased from energy company, Innochem Company and used without further purification. Unless otherwise stated, all experiments were conducted in a Schlenk tube under N₂ atmosphere. Reactions were monitored by TLC or GC-MS analysis. Flash column chromatography was performed over silica gel (300-400 mesh). ¹H NMR (400 MHz) or ¹H NMR (500 MHz) and ¹³C NMR (125 MHz) spectra were recorded in CDCl₃ or DMSO solutions using a Burker AVANCE 500 and 400 spectrometer. Chemical shifts were reported in ppm. ¹H NMR spectra were referenced to CDCl₃ (7.26 ppm) or DMSO-*d*₆ (2.50 ppm), and ¹³C-NMR spectra were referenced to CDCl₃ (77.0 ppm) or DMSO-*d*₆ (39.5 ppm). High-resolution mass spectra were recorded on an ESI-Q-TOF mass spectrometer.

Unless otherwise noted, all reagents and solvents were obtained commercially and used without further purification. The 4-oxaspiro[2.4]hepta-1,6-dien-5-ones(2a')^[1] were prepared according to corresponding literature procedures.

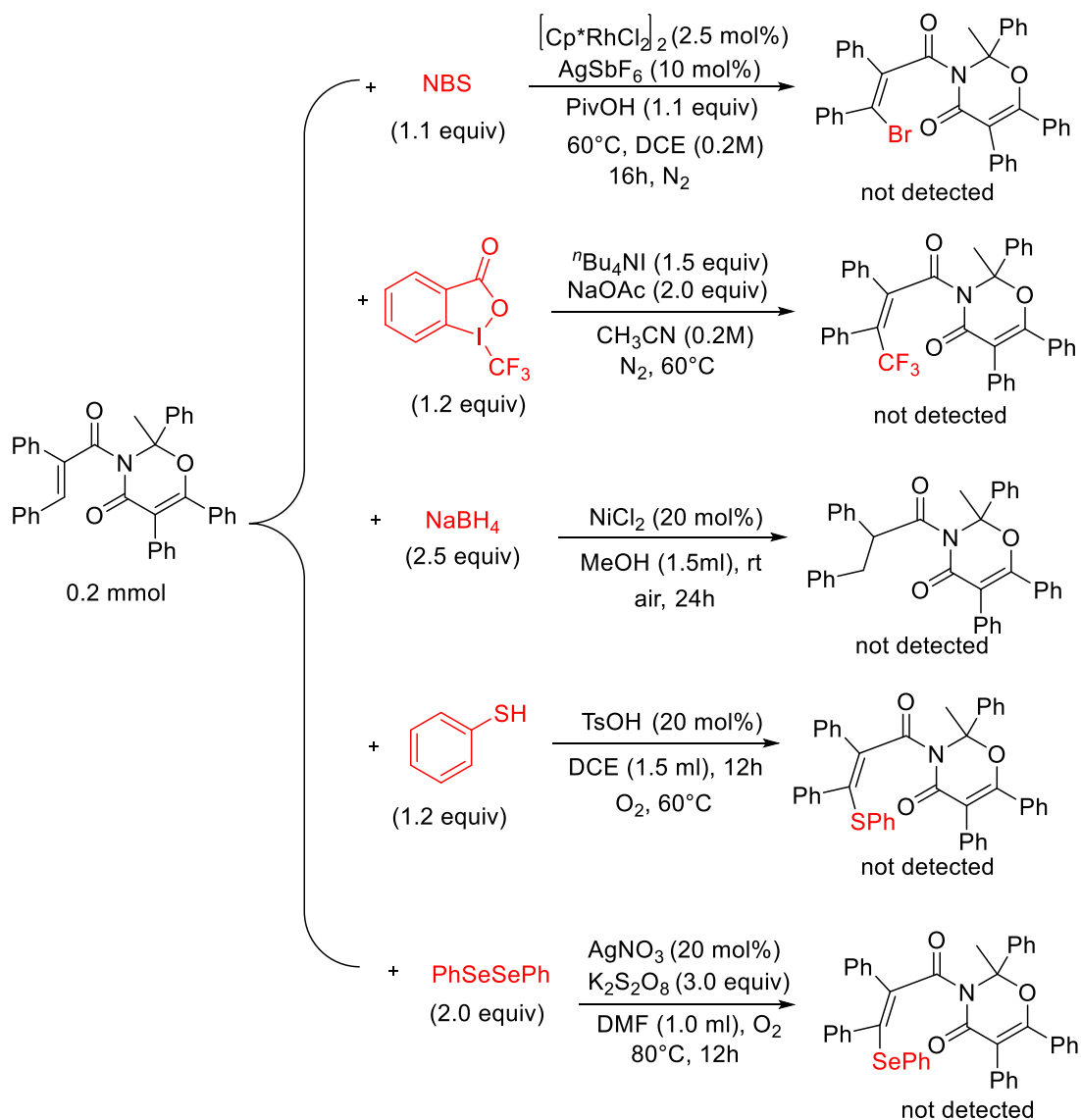
Reference:

1 O. Körner, R. Gleiter and F. Rominger, *Synthesis*, 2009, 3259.

General experimental procedures

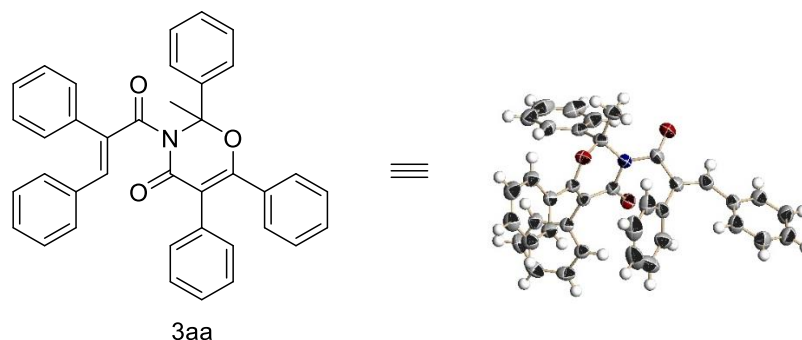
A 10 mL Schlenk tube equipped with a stir bar was charged with aryl oxime (0.15 mmol), 2,3-diphenylcycloprop-2enone (0.45 mmol), Ag₂O (0.15 mmol), and 3 mL cyclohexane. The tube was fitted with a rubber septum, then the septum was replaced by a Teflon screwcap. The reaction mixture was stirred at 80 °C for 18 h. After cooling down, the reaction mixture was diluted with 2 mL of ethyl ether, filtered through a pad of silica gel, followed by washing the pad of the silica gel with the same solvent (20 mL), concentrated under reduced pressure. The residue was then purified by flash chromatography on silica gel to provide the corresponding product.

Unsuccessful further transformations of the product 3aa



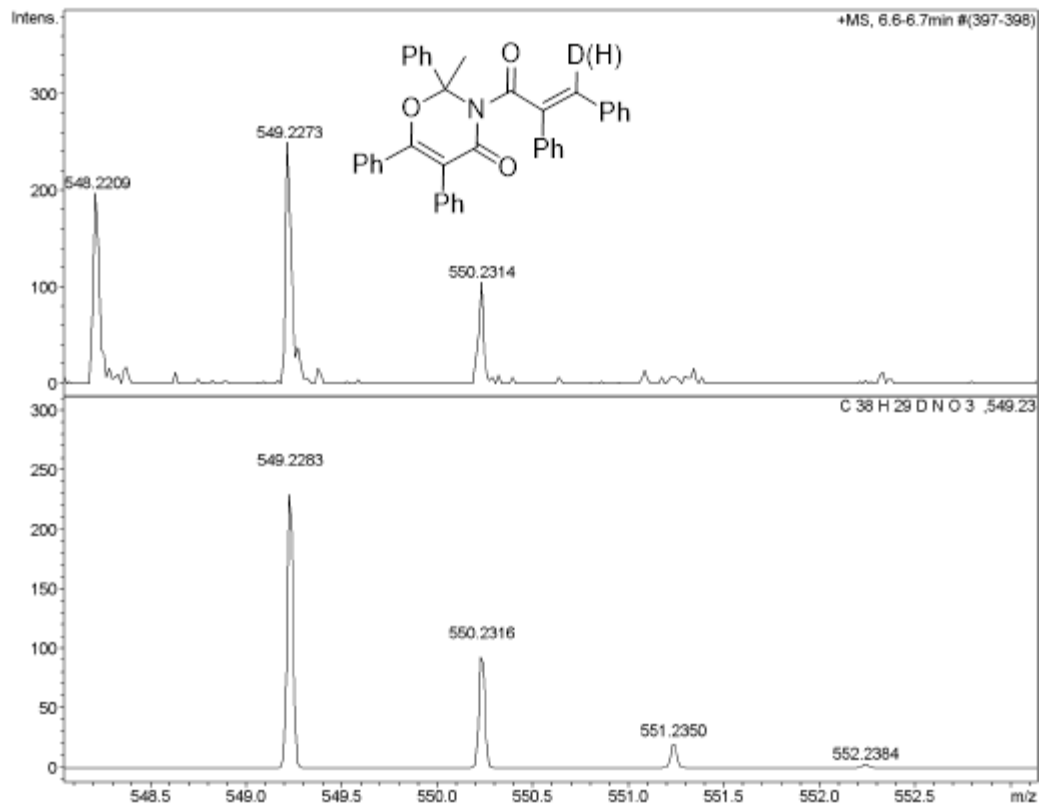
Unfortunately, most of the efforts made in further transformations of the products failed.

Crystal data and structure refinement of products



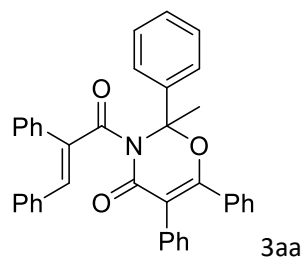
CCDC	1917041
Empirical formula	C ₃₈ H ₂₉ N O ₃
Formula weight	547.62
Temperature	296(2) K
Wavelength	0.71073 Å
Crystal system	Triclinic
Space group	P -1
Unit cell dimensions	a = 9.8324(3) Å a = 103.2290(10)°. b = 10.2354(3) Å b = 97.7420(10)°. c = 15.6234(5) Å g = 105.1910(10)°.
Volume	1445.05(8) Å ³
Z	2
Density (calculated)	1.259 Mg/m ³
Absorption coefficient	0.079 mm ⁻¹
F(000)	576
Crystal size	0.20 x 0.17 x 0.13 mm ³
Theta range for data collection	1.369 to 25.999°
Index ranges	-11<=h<=12, -12<=k<=12, -19<=l<=19
Reflections collected	25719
Independent reflections	5643 [R(int) = 0.0393]
Completeness to theta = 25.242°	99.4 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.7096
Refinement method	Full-matrix least-squares on F ²
Data / restraints / parameters	5643 / 0 / 381
Goodness-of-fit on F ²	1.044
Final R indices [I>2sigma(I)]	R1 = 0.0410, wR2 = 0.0995
R indices (all data)	R1 = 0.0554, wR2 = 0.1110
Extinction coefficient	0.052(5)
Largest diff. peak and hole	0.146 and -0.164 e.Å ⁻³

The HRMS shows an m/z peak of 549.2273, which is in good agreement with that of d_1 -3aa

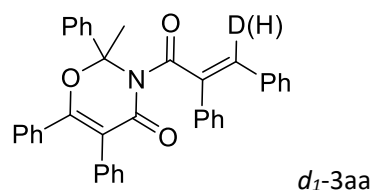


Characterization of Products in Details:

(*E*)-3-(2,3 -diphenylacryloyl)-2-methyl-2,5,6-triphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one

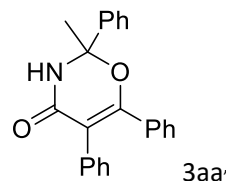


A pale yellow solid; (69 mg, 84% yield); m. p. 97.4-97.5 °C; ¹H NMR (500 MHz, DMSO): δ 7.68 (s, 1H), 7.65-7.63 (m, 2H), 7.48-7.45 (m, 2H), 7.42-7.33 (m, 7H), 7.29-7.18 (m, 9H), 7.10-7.03 (m, 3H), 6.44-6.43 (m, 2H), 2.24 (s, 3H). ¹³C NMR (125 MHz, DMSO): δ 173.9, 163.7, 161.8, 141.2, 138.3, 138.2, 135.5, 134.5, 132.4, 131.9, 130.9, 130.9, 130.3, 130.2, 129.8, 129.2, 128.9, 128.5, 128.3, 128.2, 128.1, 127.9, 127.7, 127.1, 125.4, 112.4, 94.9, 27.9 ppm. HRMS (ESI) Calcd. for C₃₈H₃₀NO₃: [M+H]⁺, 548.2220. Found: m/z 548.2228.



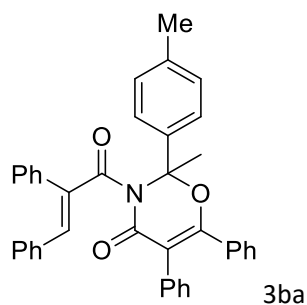
A pale yellow solid; (64 mg, 78% yield); m. p. 98.4-98.6 °C; ¹H NMR (500 MHz, DMSO): δ 7.68 (s, 0.1H), 7.64-7.63 (m, 2H), 7.48-7.45 (m, 2H), 7.42-7.35 (m, 7H), 7.30-7.23 (m, 5H), 7.21-7.18 (m, 4H), 7.10-7.02 (m, 3H), 6.43-6.42 (m, 2H), 2.24 (s, 3H). ¹³C NMR (125 MHz, DMSO): δ 173.9, 163.7, 161.8, 141.2, 138.1, 135.4, 134.4, 132.4, 131.9, 130.9, 130.9, 130.3, 130.2, 129.7, 129.3, 128.9, 128.5, 128.3, 128.2, 128.1, 128.0, 127.7, 127.2, 125.4, 112.4, 94.9, 27.8 ppm. HRMS (ESI) Calcd. for C₃₈H₂₉DNO₃: [M+H]⁺, 549.2273. Found: m/z 549.2283.

2-methyl-2,5,6-triphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



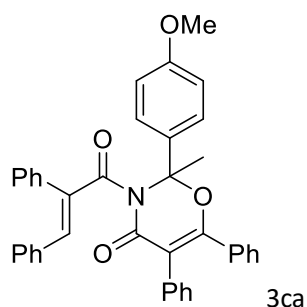
White solid; (37.5 mg, 55% yield); ¹H NMR (500 MHz, CDCl₃): δ 8.03 (s, 1H), 7.70-7.64 (m, 2H), 7.41-7.32 (m, 3H), 7.28-7.20 (m, 3H), 7.17-7.08 (m, 5H), 7.00-6.92 (m, 2H), 7.10-7.02 (m, 3H), 2.00 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 165.6, 159.6, 142.8, 133.2, 131.3, 129.8, 129.7, 128.6, 128.3, 127.8, 127.7, 127.0, 112.9, 89.6, 29.3 ppm. HRMS (ESI) Calcd. for C₂₃H₂₀NO₂: [M+H]⁺, 342.1489. Found: m/z 342.1487.

(*E*)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2-(*p*-tolyl)-2,3-dihydro-4*H*-1,3-oxazin-4-one



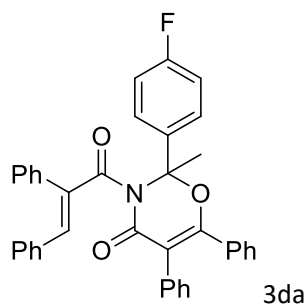
A pale yellow solid; (62.3 mg, 74% yield); m. p. 80.1-80.2 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.65 (s, 1H), 7.53 (d, *J* = 8.4Hz, 2H), 7.45-7.43 (m, 2H), 7.34-7.33 (m, 2H), 7.23-7.14 (m, 12H), 7.08-7.01 (m, 4H), 6.61-6.59 (m, 2H), 2.34 (s, 3H), 2.29 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.7, 164.3, 161.7, 139.0, 138.6, 138.5, 135.9, 135.2, 132.7, 132.6, 131.3, 130.7, 130.5, 130.4, 129.9, 129.2, 128.9, 128.3, 128.2, 128.1, 127.9, 127.9, 127.8, 127.2, 125.7, 113.3, 95.4, 28.6, 21.1 ppm. HRMS (ESI) Calcd. for C₃₉H₃₂NO₃: [M+H]⁺, 562.2377. Found: m/z 562.2377.

(*E*)-3-(2,3-diphenylacryloyl)-2-(4-methoxyphenyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



Yellow liquid; (69.7 mg, 80% yield); ¹H NMR (400 MHz, CDCl₃): δ 7.60 (s, 1H), 7.53-7.51 (m, 2H), 7.40-7.38 (m, 2H), 7.29-7.26 (m, 3H), 7.19 (s, 1H), 7.17-7.11 (m, 9H), 7.03-6.97 (m, 3H), 6.87-6.83 (m, 2H), 6.59-6.66 (m, 2H), 3.73 (s, 3H), 2.24 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.8, 164.4, 161.6, 159.9, 139.0, 138.7, 135.9, 135.1, 133.4, 132.7, 132.7, 131.4, 130.7, 130.5, 130.5, 129.9, 128.9, 128.3, 128.2, 127.9, 127.8, 127.2, 127.2, 113.9, 113.3, 95.4, 55.3, 28.6 ppm. HRMS (ESI) Calcd. for C₃₉H₃₂NO₄: [M+H]⁺, 578.2326. Found: m/z 578.2326.

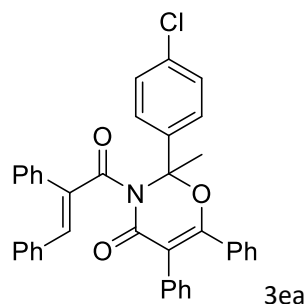
(*E*)-3-(2,3-diphenylacryloyl)-2-(4-fluorophenyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



Red solid; (60.2 mg, 71% yield); m.p. 147.1-148.6 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.68-7.64 (m, 3H), 7.46-7.43 (m, 2H), 7.36-7.34 (m, 3H), 7.24-7.20 (m, 7H), 7.18-7.15 (m, 3H), 7.11-7.06

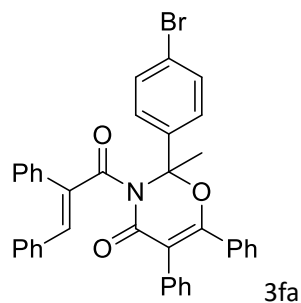
(m, 5H), 6.63-6.61 (m, 2H), 2.30 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.8, 162.9 (d, $J = 246.3\text{Hz}$), 162.8 (d, $J = 321.3\text{Hz}$), 139.0, 138.8, 137.4, 137.4, 135.8, 135.0, 132.4, 132.4, 131.3, 130.7, 130.6, 130.6, 129.8, 129.0, 128.3, 128.2, 128.0, 128.0, 127.9, 127.7 (d, $J = 8.8\text{Hz}$), 127.4, 115.5 (d, $J = 21.3\text{Hz}$), 113.4, 94.9, 28.6 ppm. HRMS (ESI) Calcd. for $\text{C}_{38}\text{H}_{29}\text{FNO}_3$: $[\text{M}+\text{H}]^+$, 566.2126. Found: m/z 566.2128.

(*E*)-2-(4-chlorophenyl)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



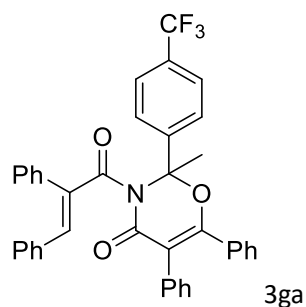
Yellow liquid; (66.7 mg, 76% yield); ^1H NMR (400 MHz, CDCl_3): δ 7.71 (s, 1H), 7.65-7.63 (m, 2H), 7.48-7.45 (m, 2H), 7.42-7.38 (m, 5H), 7.30 (s, 1H), 7.24-7.19 (m, 9H), 7.15-7.08 (m, 3H), 6.65 (d, $J = 6.8\text{Hz}$, 2H), 2.32 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.7, 164.0, 161.6, 140.2, 139.1, 138.7, 135.8, 135.0, 134.8, 132.4, 132.3, 131.2, 130.7, 130.6, 130.6, 130.0, 129.0, 128.8, 128.3, 128.2, 128.0, 128.0, 127.9, 127.4, 127.2, 113.4, 94.8, 28.5 ppm. HRMS (ESI) Calcd. for $\text{C}_{38}\text{H}_{29}\text{ClNO}_3$: $[\text{M}+\text{H}]^+$, 582.1831. Found: m/z 582.1830.

(*E*)-2-(4-bromophenyl)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



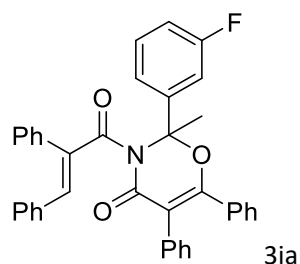
White solid; (48.5 mg, 52% yield); m.p. 132.8-133.8 $^\circ\text{C}$; ^1H NMR (400 MHz, CDCl_3): δ 7.67 (s, 1H), 7.54 (d, $J = 2.4\text{Hz}$, 4H), 7.44-7.42 (m, 2H), 7.35-7.29 (m, 4H), 7.21-7.19 (m, 6H), 7.18-7.14 (m, 3H), 7.11-7.07 (m, 3H), 6.62-6.60 (m, 2H), 2.28 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.7, 164.0, 161.6, 140.8, 139.2, 138.7, 135.8, 135.0, 132.3, 132.3, 131.8, 131.3, 130.7, 130.7, 130.6, 129.8, 129.0, 128.3, 128.2, 128.0, 128.0, 127.9, 127.5, 127.4, 123.0, 113.4, 94.8, 28.4 ppm. HRMS (ESI) Calcd. for $\text{C}_{38}\text{H}_{28}\text{BrNO}_3\text{Na}$: $[\text{M}+\text{Na}]^+$, 648.1151. Found: m/z 648.1152.

(*E*)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2-(4-(trifluoromethyl)phenyl)-2,3-dihydro-4*H*-1,3-oxazin-4-one



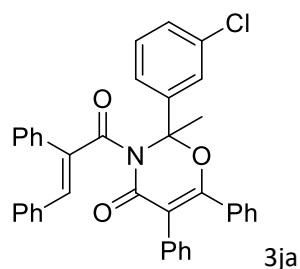
A pale red solid; (65.0 mg, 70% yield); m.p. 156.9-157.5 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.81 (d, *J* = 8.0Hz, 2H), 7.69-7.66 (m, 4H), 7.45-7.42 (m, 2H), 7.36-7.34 (m, 3H), 7.22-7.20(m, 6H), 7.18-7.15 (m, 3H), 7.10-7.05 (m, 3H), 6.59-6.57 (m, 2H), 2.30 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.7, 163.9, 161.7, 145.7, 139.4, 138.5, 135.7, 134.9, 132.2, 131.2, 131.0, 130.8, 130.7, 130.6, 129.8, 128.6 (q, *J* = 288.8Hz), 129.1, 128.4, 128.3, 128.2, 128.2 (q, *J* = 38.8Hz), 128.0, 127.9, 126.2, 125.7 (q, *J* = 3.8Hz), 125.5, 113.5, 94.6, 28.4 ppm. HRMS (ESI) Calcd. for C₃₉H₂₉F₃NO₃: [M+H]⁺, 616.2094. Found: m/z 616.2105.

(*E*)-3-(2,3-diphenylacryloyl)-2-(3-fluorophenyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



A pale yellow solid;(30.6 mg, 36% yield); m.p. 174.7-175.7 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.61 (s, 1H), 7.40-7.36 (m, 3H), 7.34-7.30 (m, 2H), 7.29-7.27 (m, 3H), 7.26-7.23 (m, 1H), 7.20 (s, 1H), 7.15-7.13 (m, 5H), 7.12-7.11 (m, 2H), 7.03-6.97 (m, 4H), 6.56-6.54 (m, 2H), 2.23(s,3H). ¹³C NMR (125 MHz, CDCl₃): δ 174.6, 162.9 (d, *J* = 245.0Hz), 162.8 (d, *J* = 281.3Hz), 144.4, 144.4, 139.2, 138.7, 135.8, 135.0, 132.4, 132.3, 131.2, 130.7, 130.6, 130.5, 130.2 (d, *J* = 7.5Hz), 129.8, 129.0, 128.3, 128.2, 128.0, 127.9, 127.9, 127.4, 121.6 (d, *J*=2.5Hz), 116.0 (d, *J*=21.3Hz), 113.4, 113.0 (d, *J* = 22.5Hz), 94.6, 28.4 ppm. HRMS (ESI) Calcd. for C₃₈H₂₈FNO₃Na: [M+Na]⁺, 588.1951. Found: m/z 588.1945.

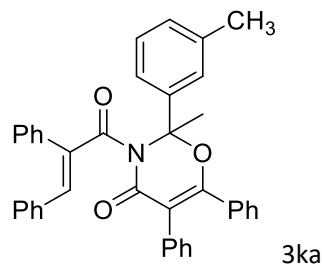
(*E*)-2-(3-chlorophenyl)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



A pale red solid; (51.0 mg, 61% yield); m.p. 175.3-175.4 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.62

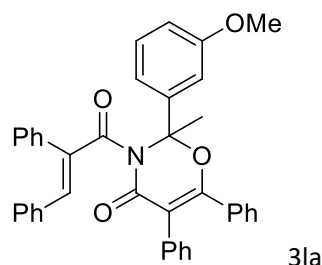
(s,2H), 7.50-7.47 (m, 1H), 7.38-7.35 (m, 2H), 7.30-7.23 (m, 6H), 7.21 (s, 1H), 7.17-7.14 (m, 6H), 7.12-7.11 (m, 2H), 7.05-6.98 (m, 3H), 6.57-6.55 (m,2H), 2.23 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.6, 163.8, 161.7, 143.8, 139.2, 138.6, 135.8, 135.0, 134.7, 132.3, 131.3, 130.7, 130.7, 130.6, 129.9, 129.8, 129.2, 129.0, 128.3, 128.2, 128.1, 128.0, 127.9, 127.4, 125.9, 124.2, 113.4, 94.5, 28.4 ppm. HRMS (ESI) Calcd. for C₃₈H₂₉ClNO₃: [M+H]⁺, 582.1831. Found: m/z 582.1830.

(*E*)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2-(*m*-tolyl)-2,3-dihydro-4*H*-1,3-oxazin-4-one



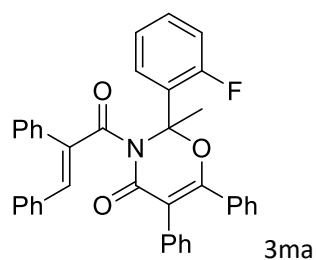
A pale yellow solid; (54.0 mg, 64% yield); m.p. 151.6-152.6 °C; ¹H NMR (500 MHz, CDCl₃): δ 7.61 (s, 1H), 7.40-7.38 (m, 4H), 7.31-7.26 (m, 3H), 7.17-7.09 (m, 11H), 7.04-6.97 (m, 4H), 6.54 (d, *J* = 7.5Hz, 2H), 2.30 (s, 3H), 2.24 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.7, 164.2, 161.8, 141.5, 138.9, 138.7, 138.3, 135.9, 135.2, 132.6, 131.3, 130.8, 130.5, 130.4, 129.9, 129.6, 128.9, 128.4, 128.2, 128.1, 127.9, 127.8, 127.2, 126.5, 122.7, 113.4, 95.4, 28.6, 21.6 ppm. HRMS (ESI) Calcd. for C₃₉H₃₂NO₃: [M+H]⁺, 562.2377. Found: m/z 562.2377.

(*E*)-3-(2,3-diphenylacryloyl)-2-(3-methoxyphenyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



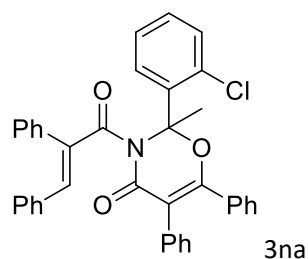
Yellow solid; (64.0 mg, 74% yield); m.p.149.3-150.9 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.68 (s, 1H), 7.45-7.43 (m, 2H), 7.35-7.31 (m, 3H), 7.30-7.27 (m, 2H), 7.25-7.22 (m, 6H), 7.20-7.14 (m, 5H), 7.09-7.06 (m, 2H), 7.04 (s, 1H), 6.90-6.87 (m, 1H), 6.62-6.60 (m, 2 H), 3.79 (s, 3H), 2.30 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.6, 164.2, 161.8, 159.8, 143.3, 138.9, 138.8, 135.9, 135.1, 132.6, 132.6, 131.3, 130.8, 130.5, 129.9, 129.6, 128.9, 128.3, 128.2, 128.1, 128.0, 127.9, 127.8, 127.2, 118.2, 114.4, 113.4, 111.6, 95.2, 55.3, 28.6 ppm. HRMS (ESI) Calcd. for C₃₉H₃₂NO₄: [M+H]⁺, 578.2326. Found: m/z 578.2326.

(*E*)-3-(2,3-diphenylacryloyl)-2-(2-fluorophenyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



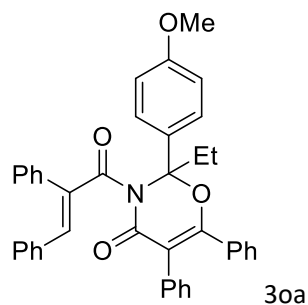
A pale yellow solid; (53.0 mg, 63% yield); m.p. 160.6-161.3 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.71 (s, 1H), 7.51-7.46 (m, 3H), 7.39-7.34 (m, 4H), 7.28-7.23 (m, 5H), 7.21-7.17 (m, 6H), 7.13-7.05 (m, 4H), 6.68-6.66 (m, 2H), 2.45 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.8, 163.3 (d, *J* = 257.5Hz), 159.8 (d, *J* = 247.5Hz), 139.0, 138.9, 135.8, 135.0, 132.5, 131.4, 131.0 (d, *J* = 7.5Hz), 130.7, 130.6, 130.5, 130.5, 130.0, 130.0, 129.0, 128.3, 128.2, 128.0, 127.9, 127.4, 127.3, 127.2, 124.2 (d, *J* = 3.8Hz), 116.8 (d, *J* = 22.5Hz), 112.3, 94.2 (d, *J* = 3.8Hz), 25.8 ppm. HRMS (ESI) Calcd. for C₃₈H₂₈FNO₃Na: [M+Na]⁺, 588.1951. Found: m/z 588.1945.

(*E*)-2-(2-chlorophenyl)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



A pale yellow solid; (46.7 mg, 54% yield); m.p. 130.7-131.2 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.75 (s, 1H), 7.66 (dd, *J* = 2.0Hz, 1H), 7.51-7.48 (m, 3H), 7.39-7.38 (m, 5H), 7.33-7.29 (m, 4H), 7.24-7.21(m, 6H), 7.15-7.11 (m, 3H), 6.74-6.72 (m, 2H), 2.59 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.8, 164.4, 162.4, 139.0, 138.9, 136.8, 135.8, 135.0, 132.6, 132.5, 132.3, 131.3, 131.1, 130.7, 130.6, 130.5, 130.3, 130.3, 129.0, 128.3, 128.2, 128.0, 127.9, 127.9, 127.8, 127.3, 126.9, 112.5, 95.3, 24.9 ppm. HRMS (ESI) Calcd. for C₃₈H₂₉ClNO₃: [M+H]⁺, 582.1831. Found: m/z 582.1830.

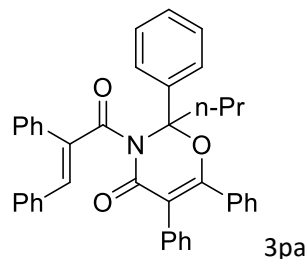
(*E*)-3-(2,3-diphenylacryloyl)-2-ethyl-2-(4-methoxyphenyl)-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



Red liquid; (73.2 mg, 83% yield); ¹H NMR (400 MHz, CDCl₃): δ 7.68-7.65 (m, 1H), 7.58-7.55 (m, 2H), 7.50-7.47 (m, 2H), 7.36-7.31 (m, 6H), 7.25-7.19 (m, 5H), 7.15-7.12 (m, 2H), 7.10-7.03(m, 3H),

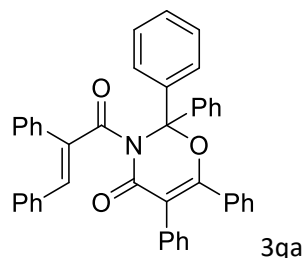
6.88(d, $J = 8.8\text{Hz}$, 2H), 6.68 (d, $J = 7.2\text{Hz}$, 2H), 3.79 (s, 3H), 2.79 (q, $J = 7.2\text{Hz}$, 1H), 2.55 (q, $J = 7.2\text{ Hz}$, 1H), 1.27 (t, $J = 6.8\text{Hz}$, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.8, 165.3, 161.7, 159.7, 138.8, 138.2, 136.1, 135.1, 132.9, 132.8, 132.7, 131.4, 130.6, 130.5, 130.5, 129.9, 128.8, 128.3, 128.1, 128.0, 127.9, 127.9, 127.5, 127.3, 113.7, 113.4, 98.1, 55.3, 33.4, 8.8 ppm. HRMS (ESI) Calcd. for $\text{C}_{40}\text{H}_{34}\text{NO}_4$: $[\text{M}+\text{H}]^+$, 592.2483. Found: m/z 592.2482.

(*E*)-3-(2,3-diphenylacryloyl)-2,5,6-triphenyl-2-propyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



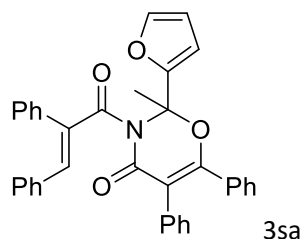
A pale red solid; (67.5 mg, 78% yield); m.p. 73.0-74.0 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.68-7.67 (m, 3H), 7.52-7.49 (m, 2H), 7.38-7.33 (m, 9H), 7.24-7.20 (m, 4H), 7.19-7.15 (m, 3H), 7.11-7.04 (m, 3H), 6.64 (d, $J = 7.2\text{Hz}$, 2H), 2.81-2.73 (m, 1H), 2.54-2.46 (m, 1H), 1.89-1.70 (m, 2H), 1.03 (t, $J = 7.6\text{Hz}$, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.7, 165.1, 161.9, 141.2, 138.8, 138.4, 136.1, 135.2, 132.8, 132.7, 131.3, 130.7, 130.6, 130.5, 130.0, 128.9, 128.7, 128.4, 128.3, 128.2, 128.1, 127.9, 127.9, 127.3, 126.1, 113.5, 97.8, 42.4, 17.5, 14.2 ppm. HRMS (ESI) Calcd. for $\text{C}_{40}\text{H}_{34}\text{NO}_3$: $[\text{M}+\text{H}]^+$, 576.2533. Found: m/z 576.2533.

(*E*)-3-(2,3-diphenylacryloyl)-2,2,5,6-tetraphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



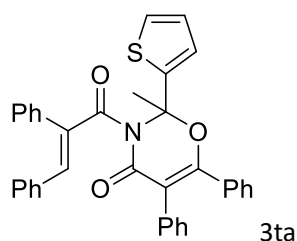
Yellow liquid; (46.3 mg, 51% yield); ^1H NMR (500 MHz, CDCl_3): δ 7.55-7.51 (m, 5H), 7.34-7.33 (m, 7H), 7.21-7.17 (m, 4H), 7.16 (s, 1H), 7.13-7.00 (m, 12H), 6.64 (d, $J = 6.5\text{Hz}$, 2H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.0, 164.6, 160.7, 139.2, 138.9, 138.7, 135.7, 135.0, 132.7, 132.6, 131.3, 130.8, 130.5, 130.0, 129.5, 129.4, 129.3, 129.2, 129.1, 129.0, 128.9, 128.6, 128.4, 128.2, 128.1, 128.0, 127.9, 127.4, 113.4, 98.5 ppm. HRMS (ESI) Calcd. for $\text{C}_{43}\text{H}_{32}\text{NO}_3$: $[\text{M}+\text{H}]^+$, 610.2377. Found: m/z 610.2377.

(*E*)-3-(2,3-diphenylacryloyl)-2-(furan-2-yl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



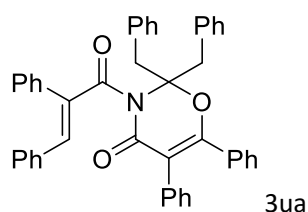
A pale red solid; (32.3 mg, 40% yield); m.p. 110.3-111.4 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.64 (s, 1H), 7.49 (s, 1H), 7.46-7.43 (m, 2H), 7.39-7.34 (m, 3H), 7.24-7.12 (m, 13H), 6.77-6.75 (m, 2H), 6.55 (d, $J = 3.2\text{Hz}$, 1H), 6.39-3.38 (m, 1H), 2.37 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.1, 164.0, 161.2, 151.6, 143.1, 138.8, 138.7, 135.8, 135.1, 132.5, 132.4, 131.5, 130.7, 130.6, 130.5, 130.1, 129.0, 128.3, 128.2, 127.9, 127.9, 127.3, 112.6, 111.0, 110.7, 90.3, 24.7 ppm. HRMS (ESI) Calcd. for $\text{C}_{36}\text{H}_{27}\text{NO}_4\text{Na}$: $[\text{M}+\text{Na}]^+$, 560.1838. Found: m/z 560.1832.

(*E*)-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2-(thiophen-2-yl)-2,3-dihydro-4*H*-1,3-oxazin-4-one



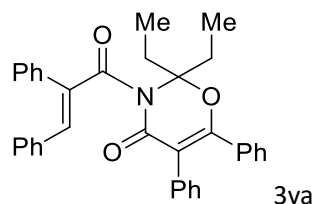
A pale red solid; (69.7 mg, 84% yield); m.p. 112.3-113.8 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.67 (s, 1H), 7.46-7.43 (m, 2H), 7.39-7.35 (m, 3H), 7.32-7.31 (m, 1H), 7.30-7.27 (m, 3H), 7.26-7.24 (m, 2H), 7.22-7.17 (m, 6H), 7.13-7.07 (m, 3H), 6.95-6.93 (m, 1H), 6.74-6.71 (m, 2H), 2.42 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 174.3, 164.1, 161.3, 144.7, 138.9, 138.8, 135.9, 135.1, 132.5, 131.4, 130.7, 130.6, 130.5, 130.3, 129.0, 128.3, 128.2, 128.1, 128.0, 127.9, 127.3, 126.7, 125.7, 112.9, 93.2, 29.2 ppm. HRMS (ESI) Calcd. for $\text{C}_{36}\text{H}_{28}\text{NO}_3\text{S}$: $[\text{M}+\text{H}]^+$, 554.1785. Found: m/z 554.1784.

(*E*)-2,2-dibenzyl-3-(2,3-diphenylacryloyl)-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



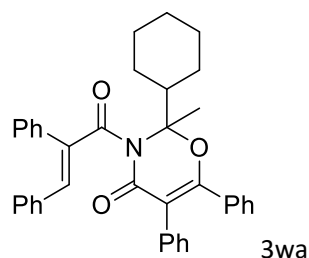
White solid; (77.8 mg, 81% yield); m. p. 151.5-152.3 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.38-7.34 (m, 5H), 7.32-7.28 (m, 8H), 7.24-7.19 (m, 8H), 7.13-7.05 (m, 5H), 6.99-6.97 (m, 2H), 6.80 (d, $J = 7.2\text{Hz}$, 2H), 6.43 (s, 1H), 4.02 (d, $J = 14.4\text{Hz}$, 2H), 3.55 (d, $J = 14.4\text{Hz}$, 2H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 175.8, 164.8, 160.2, 138.8, 137.1, 136.2, 135.2, 135.1, 132.8, 132.2, 131.6, 131.6, 130.7, 130.4, 130.3, 130.2, 128.4, 128.2, 128.2, 127.9, 127.8, 127.7, 127.6, 127.3, 111.1, 97.3, 42.4 ppm. HRMS (ESI) Calcd. for $\text{C}_{45}\text{H}_{36}\text{NO}_3$: $[\text{M}+\text{H}]^+$, 638.2690. Found: m/z 638.2690.

(*E*)-3-(2,3-diphenylacryloyl)-2,2-diethyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



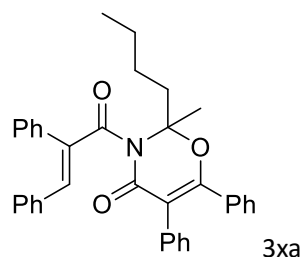
Red solid ; (70.2 mg, 91% yield); m.p. 122.5-123.4 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.50 (s, 1H), 7.45-7.43 (m, 2H), 7.36-7.32 (m, 4H), 7.30-7.27 (m, 2H), 7.23-7.16 (m, 8H), 7.12-7.10 (m, 2H), 7.04-7.01 (m, 2H), 2.62-2.53 (m, 2H), 2.44-2.34 (m, 2H), 1.19 (t, *J* = 7.6Hz, 6H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.6, 165.1, 161.6, 139.0, 137.1, 136.1, 135.2, 133.0, 132.9, 131.7, 130.5, 130.4, 130.0, 128.7, 128.3, 128.1, 127.9, 127.9, 127.3, 111.0, 98.5, 28.2, 8.4 ppm. HRMS (ESI) Calcd. for C₃₅H₃₂NO₃: [M+H]⁺, 514.2377. Found: m/z 514.2377.

(*E*)-2-cyclohexyl-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



White solid; (48.8 mg, 59% yield); m.p. 152.6-153.6 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.51 (s, 1H), 7.41-7.39 (m, 2H), 7.33-7.29 (m, 4H), 7.22-7.15 (m, 1H), 7.13-7.10 (m, 2H), 6.94-6.92 (m, 2H), 2.68-2.60 (m, 1H), 1.99 (s, 3H), 1.90-1.87 (m, 2H), 1.73-1.71 (m, 1H), 1.61 (s, 1H), 1.45 (q, *J* = 12.0Hz, 2H), 1.23-1.21 (m, 2H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.4, 164.3, 161.5, 139.1, 137.7, 136.0, 135.3, 132.9, 131.6, 130.6, 130.4, 130.4, 130.1, 128.7, 128.2, 128.1, 128.0, 127.8, 127.2, 111.2, 111.1, 98.1, 43.1, 28.0, 27.6, 26.5, 26.4, 26.3, 21.3 ppm. HRMS (ESI) Calcd. for C₃₈H₃₆NO₃: [M+H]⁺, 554.2690. Found: m/z 554.2690.

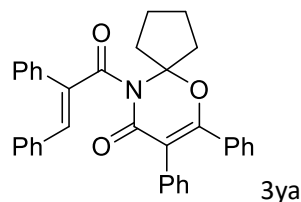
(*E*)-2-butyl-3-(2,3-diphenylacryloyl)-2-methyl-5,6-diphenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



White oil; (44.3 mg, 56% yield); ¹H NMR (500 MHz, CDCl₃): δ 7.52 (s, 1H), 7.42-7.38 (m, 2H), 7.33-7.28 (m, 3H), 7.28-7.24 (m, 1H), 7.21-7.08 (m, 12H), 7.00-6.96 (m, 2H), 2.56-2.46 (m, 1H), 2.33-2.23 (m, 1H), 2.02 (s, 3H), 1.74-1.52 (m, 2H), 1.44-1.35 (m, 2H), 0.95 (q, *J* = 6.0 Hz, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.8, 164.1, 161.2, 139.1, 137.5, 135.9, 135.0, 132.8, 132.7, 131.5, 130.4, 130.3, 129.8, 128.7, 128.2, 128.0, 127.9, 127.8, 127.7, 127.2, 111.0, 95.4, 36.8, 26.0, 23.5, 22.7, 13.9 ppm. HRMS (ESI) Calcd. for C₃₆H₃₄NO₃: [M+H]⁺, 528.2533. Found: m/z

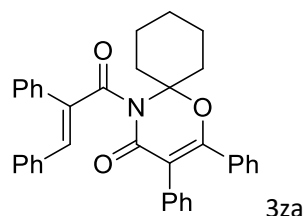
528.2536.

(*E*)-10-(2,3-diphenylacryloyl)-7,8-diphenyl-6-oxa-10-azaspiro[4.5]dec-7-en-9-one



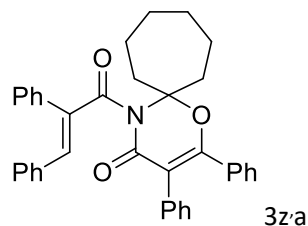
Red solid; (35.6 mg, 47% yield); m.p. 133.7-134.8 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.56 (s, 1H), 7.41-7.38 (m, 2H), 7.35-7.28 (m, 4H), 7.23-7.13 (m, 12H), 7.04-7.01 (m, 2H), 2.61-2.47 (m, 4H), 2.13-1.97 (m, 4H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 175.5, 164.4, 161.8, 139.3, 138.1, 135.9, 135.1, 133.0, 132.7, 131.6, 130.5, 130.5, 129.9, 128.9, 128.3, 128.1, 128.0, 128.0, 127.9, 127.3, 111.6, 103.1, 36.2, 24.0 ppm. HRMS (ESI) Calcd. for C₃₅H₃₀NO₃: [M+H]⁺, 512.2220. Found: m/z 512.2220.

(*E*)-5-(2,3-diphenylacryloyl)-2,3-diphenyl-1-oxa-5-azaspiro[5.5]undec-2-en-4-one



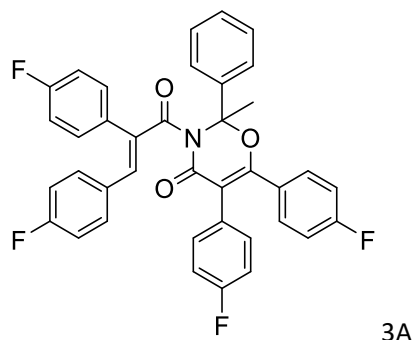
A pale yellow solid; (48.9 mg, 59% yield); m.p. 137.8-138.3 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.54 (s, 1H), 7.34-7.33 (m, 2H), 7.30-7.25 (m, 4H), 7.22-7.21 (m, 3H), 7.18-7.11 (m, 7H), 7.07-7.06 (m, 2H), 6.97-6.96 (m, 2H), 2.52-2.38 (m, 4H), 1.82 (s, 4H), 1.56 (s, 1H), 1.43-1.38 (m, 1H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 175.3, 164.0, 160.6, 139.5, 138.4, 135.9, 135.1, 133.1, 132.9, 131.6, 130.5, 130.5, 130.4, 130.1, 128.9, 128.2, 128.1, 128.1, 128.0, 127.8, 127.3, 111.3, 94.2, 32.6, 24.6, 22.6 ppm. HRMS (ESI) Calcd. for C₃₆H₃₁NO₃Na: [M+Na]⁺, 548.2202. Found: m/z 548.2196.

(*E*)-5-(2,3-diphenylacryloyl)-2,3-diphenyl-1-oxa-5-azaspiro[5.6]dodec-2-en-4-one



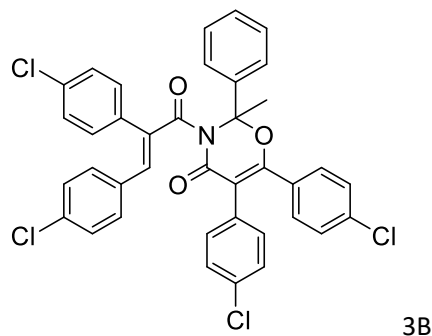
Red solid; (34.1 mg, 43% yield); m.p. 171.4-172.1 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.55 (s, 1H), 7.41-7.39 (m, 2H), 7.37-7.27 (m, 5H), 7.23-7.15 (m, 9H), 7.13-7.11 (m, 2H), 7.02-7.00 (m, 2H), 2.68-2.55 (m, 4H), 1.95-1.85 (m, 4H), 1.80-1.72 (m, 4H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 175.6, 164.2, 160.6, 139.6, 137.9, 136.0, 135.1, 133.1, 132.8, 131.6, 130.5, 130.5, 130.4, 129.9, 128.8, 128.3, 128.1, 128.0, 128.0, 127.9, 127.3, 111.3, 98.5, 37.5, 28.9, 22.6 ppm. HRMS (ESI) Calcd. for C₃₇H₃₃NO₃Na: [M+Na]⁺, 562.2358. Found: m/z 562.2329.

(*E*)-3-(2,3-bis(4-fluorophenyl)acryloyl)-5,6-bis(4-fluorophenyl)-2-methyl-2-phenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



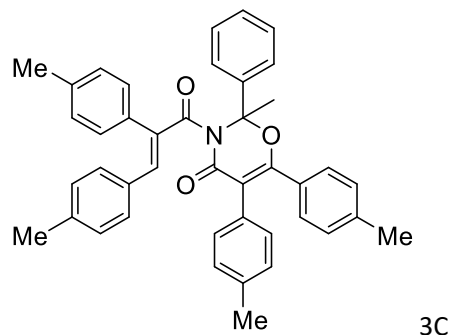
A pale orange solid; (47.5 mg, 51% yield); m.p.172.2-173.3 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.60-7.59 (m, 3H), 7.41-7.36 (m, 5H), 7.25-7.21 (m, 2H), 7.15-7.11 (m, 2H), 7.05 (t, *J* = 8.8Hz, 2H), 6.94-6.89 (m, 4H), 6.77 (t, *J* = 8.8Hz, 2H), 6.56-6.53 (m, 2H), 2.29 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 174.3, 164.2, 163.9 (d, *J* = 252.5Hz), 163.0 (d, *J* = 248.8Hz), 162.6 (d, *J* = 246.3Hz), 162.1 (d, *J* = 246.3Hz), 161.0, 141.1, 137.9, 137.5, 132.8 (d, *J* = 7.5Hz), 132.5 (d, *J* = 8.8Hz), 132.3 (d, *J* = 8.8Hz), 132.1 (d, *J* = 8.8Hz), 131.6 (d, *J* = 3.8Hz), 130.9 (d, *J* = 2.5Hz), 129.1, 128.7, 128.3 (d, *J* = 2.5Hz), 128.2 (d, *J* = 3.8Hz), 125.6, 115.5 (d, *J* = 21.3Hz), 115.4 (d, *J* = 21.3Hz), 115.2 (d, *J* = 21.3Hz), 112.2, 95.6, 28.4 ppm. HRMS (ESI) Calcd. for C₃₈H₂₆F₄NO₃: [M+H]⁺, 620.1844. Found: m/z 620.1818.

(*E*)-3-(2,3-bis(4-chlorophenyl)acryloyl)-5,6-bis(4-chlorophenyl)-2-methyl-2-phenyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



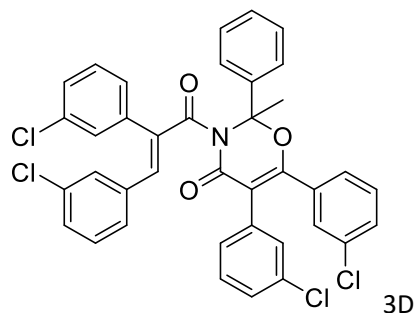
Luminous yellow solid; (63.6 mg, 62% yield); m.p. 112.0-113.0 °C; ¹H NMR (400 MHz, CDCl₃): δ 7.60-7.56 (m, 3H), 7.39-7.35 (m, 3H), 7.33-7.30 (m, 4H), 7.24-7.19 (m, 4H), 7.16-7.14 (m, 2H), 7.10-7.03 (m, 4H), 6.49 (d, *J* = 8.0Hz, 2H), 2.28 (s, 3H) ppm. ¹³C NMR (125 MHz, CDCl₃): δ 137.8, 163.9, 161.2, 140.9, 138.0, 137.3, 135.3, 134.3, 133.9, 133.7, 133.1, 132.4, 132.1, 131.6, 131.2, 130.6, 130.4, 129.2, 129.0, 128.7, 128.7, 128.7, 128.6, 128.4, 125.5, 112.5, 95.7, 28.4 ppm. HRMS (ESI) Calcd. for C₃₈H₂₅Cl₄NO₃Na: [M+Na]⁺, 706.0487. Found: m/z 706.0468.

(*E*)-3-(2,3-di-*p*-tolylacryloyl)-2-methyl-2-phenyl-5,6-di-*p*-tolyl-2,3-dihydro-4*H*-1,3-oxazin-4-one



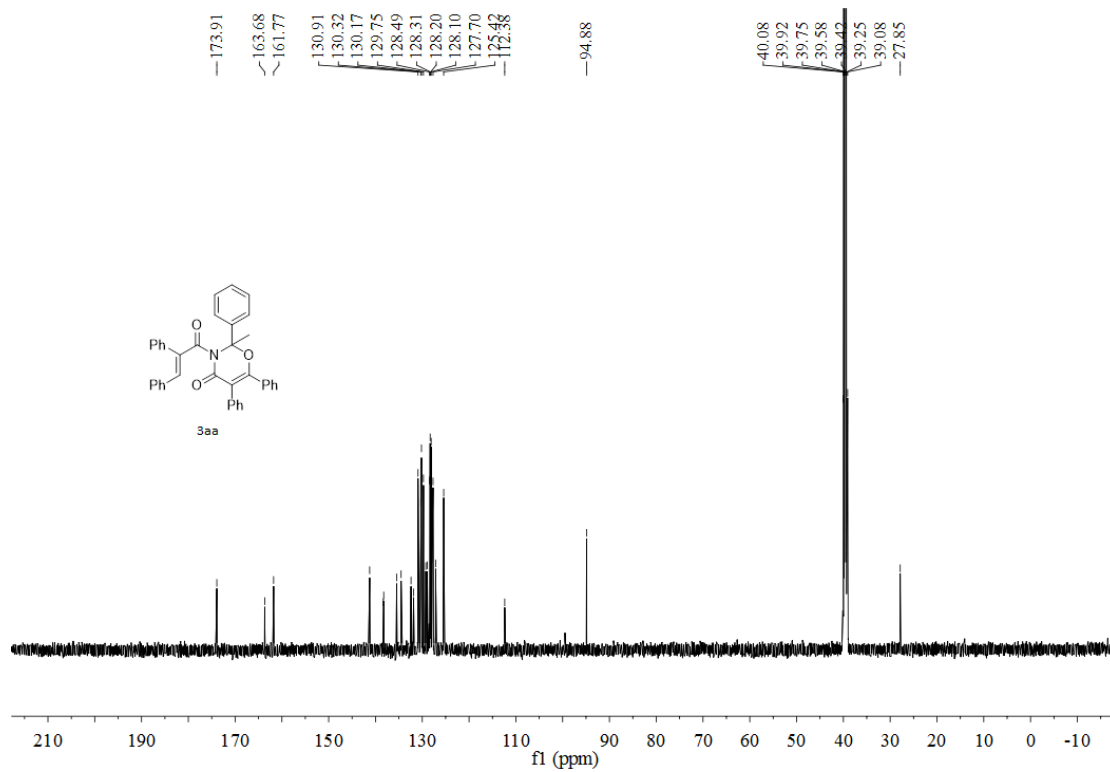
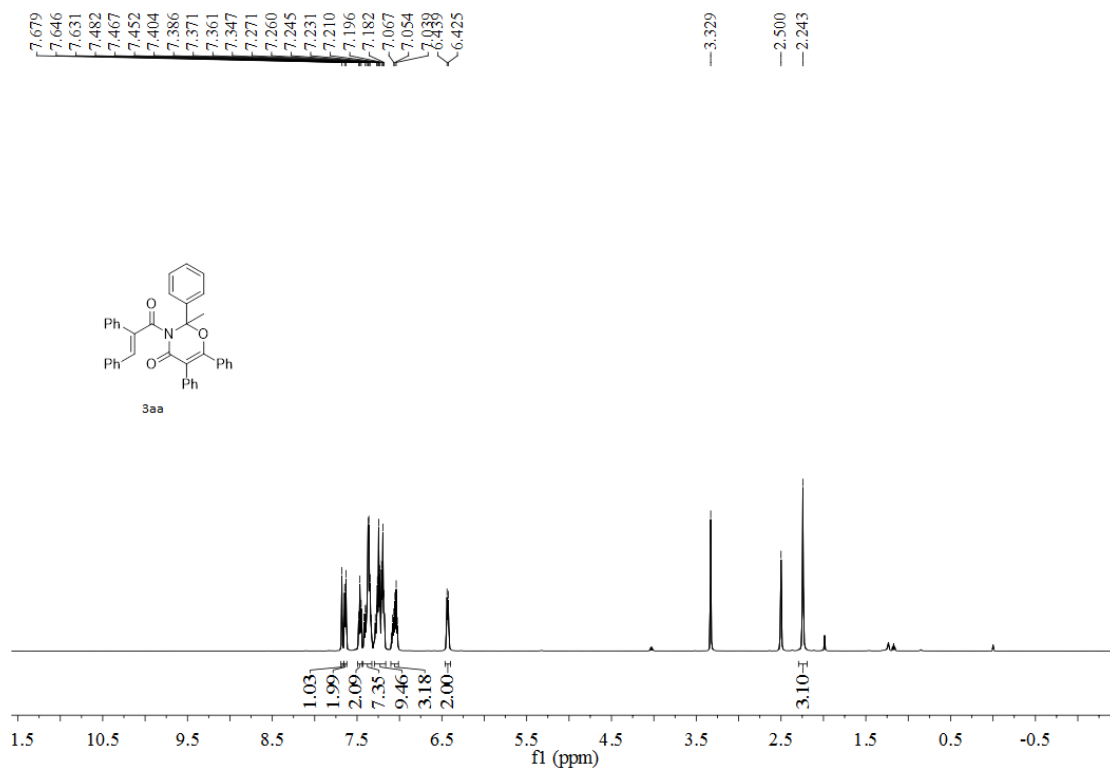
Yellow solid; (23.2 mg, 26% yield); m.p. 106.7-107.5 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.64-7.62 (m, 2H), 7.59 (s, 1H), 7.38-7.31 (m, 5H), 7.16-7.07 (m, 6H), 7.01 (t, $J = 7.6\text{Hz}$, 4H), 6.85 (d, $J = 8.0\text{Hz}$, 2H), 6.50 (d, $J = 8.0\text{Hz}$, 2H), 2.32 (s, 3H), 2.30 (d, $J = 2.4\text{Hz}$, 6H), 2.26 (s, 3H), 2.19 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 175.2, 164.5, 161.4, 141.8, 140.8, 139.0, 138.5, 138.0, 137.4, 136.7, 133.2, 132.5, 131.1, 130.6, 129.9, 129.9, 129.9, 129.0, 128.9, 128.7, 128.6, 128.6, 128.4, 125.7, 112.9, 95.0, 28.6, 21.4, 21.4, 21.3, 21.1 ppm. HRMS (ESI) Calcd. for $\text{C}_{42}\text{H}_{38}\text{NO}_3$: $[\text{M}+\text{H}]^+$, 604.2846. Found: m/z 604.2840.

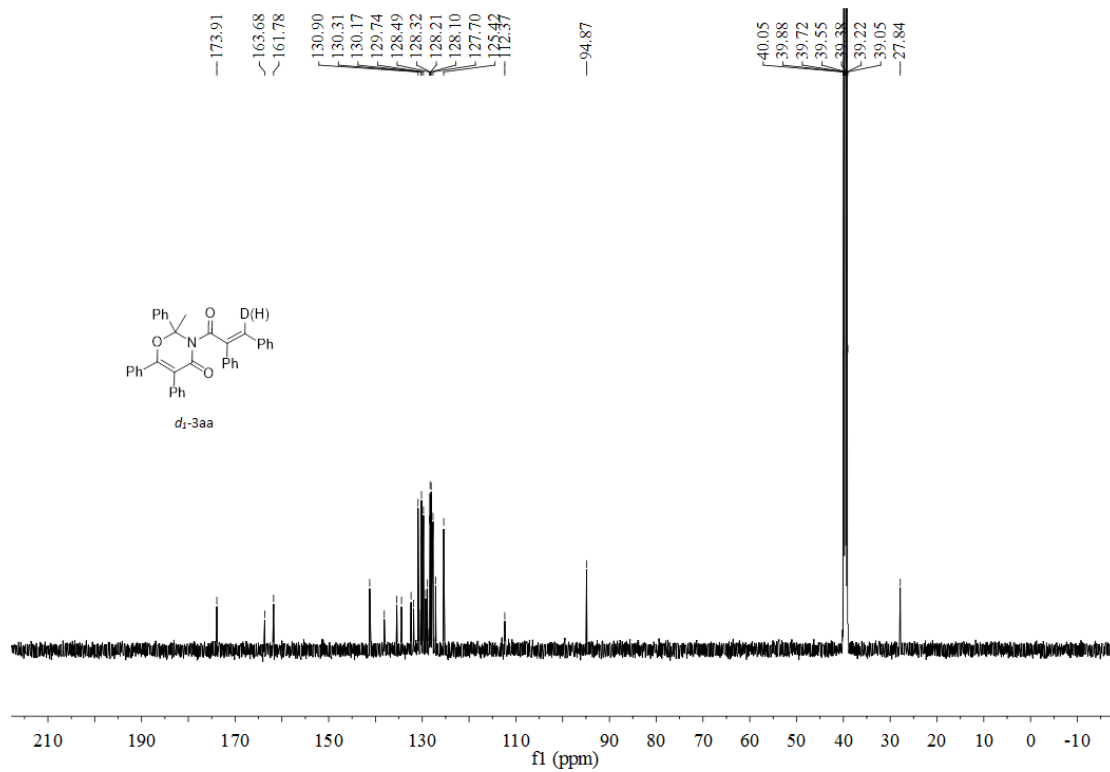
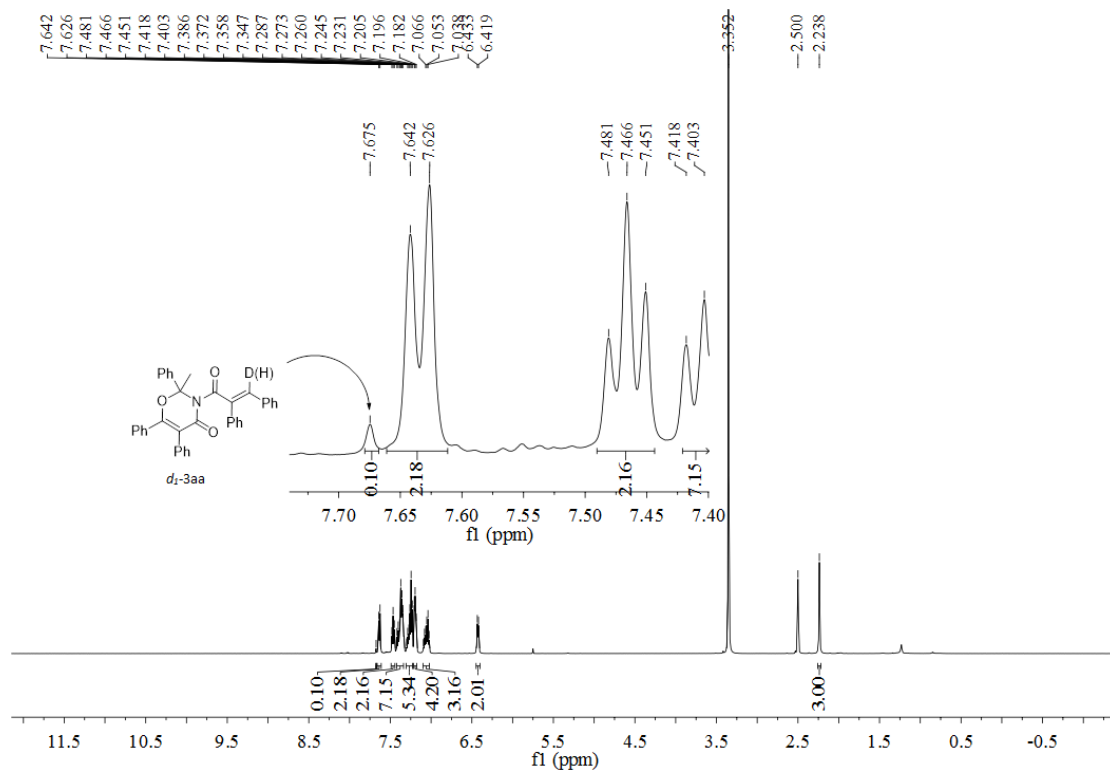
(*E*)-3-(2,3-bis(3-chlorophenyl)acryloyl)-5,6-bis(3-chlorophenyl)-2-methyl-2-phenyl-2,3-dihydro-4H-1,3-oxazin-4-one

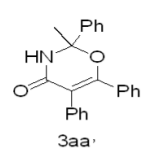
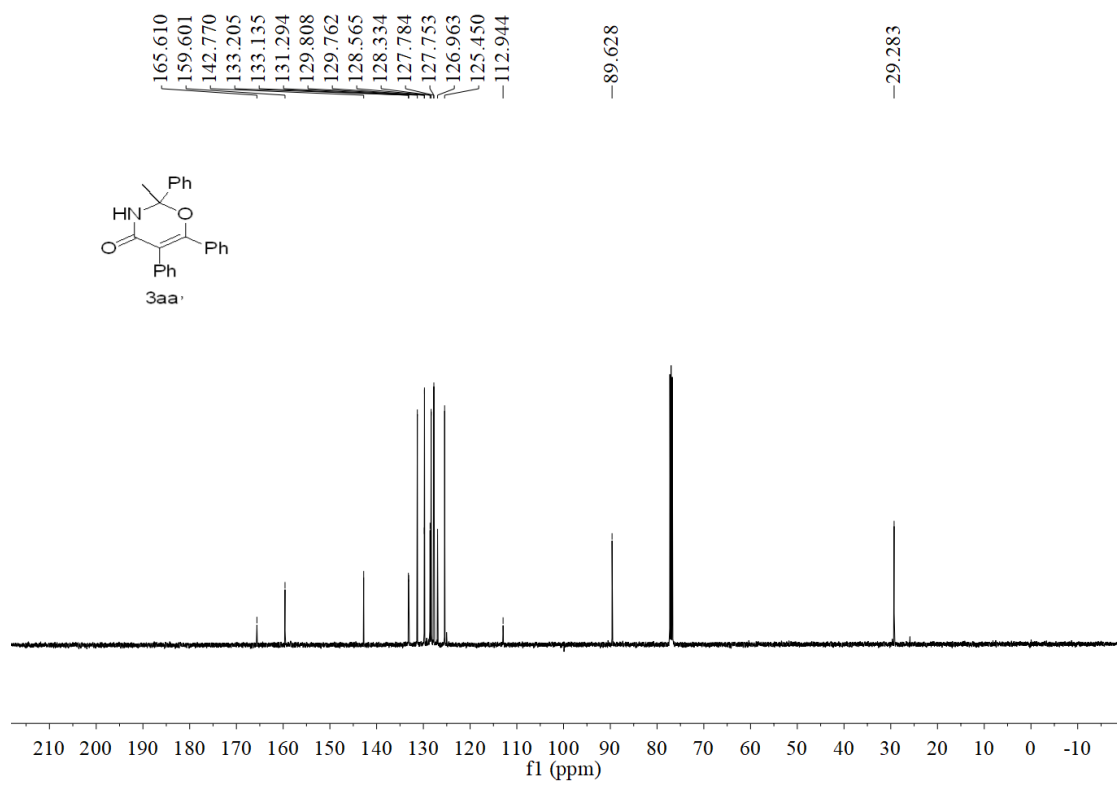
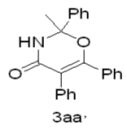
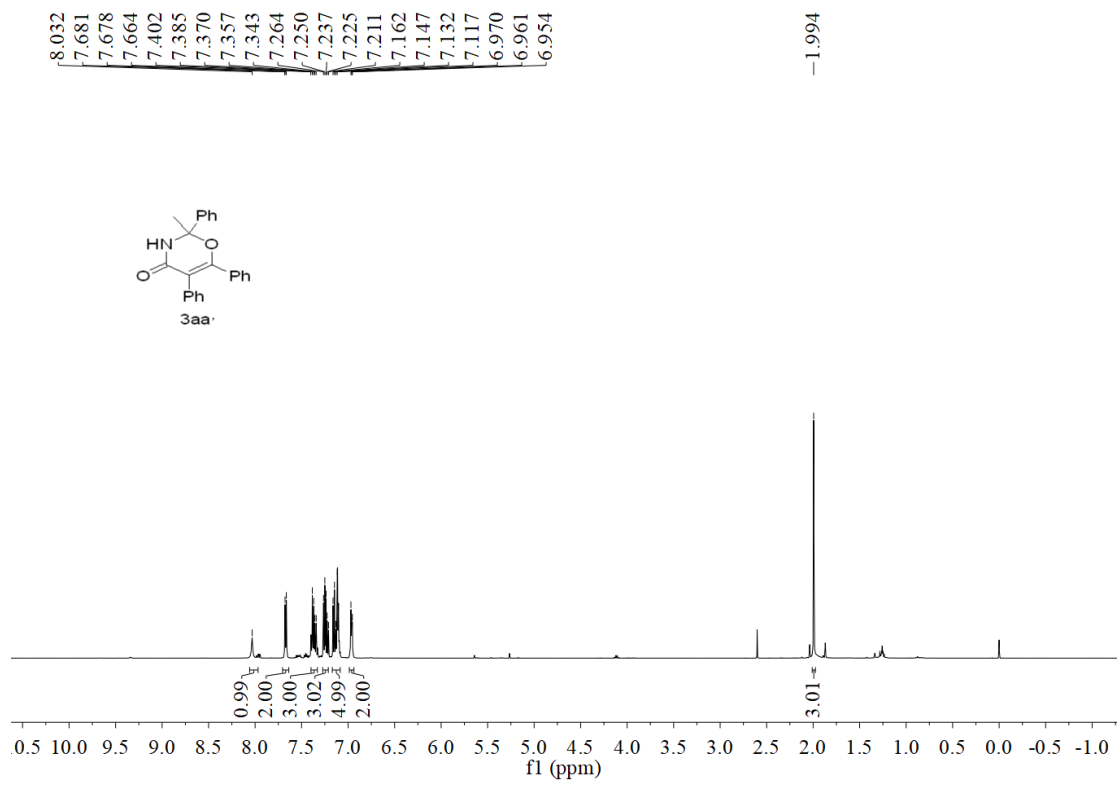


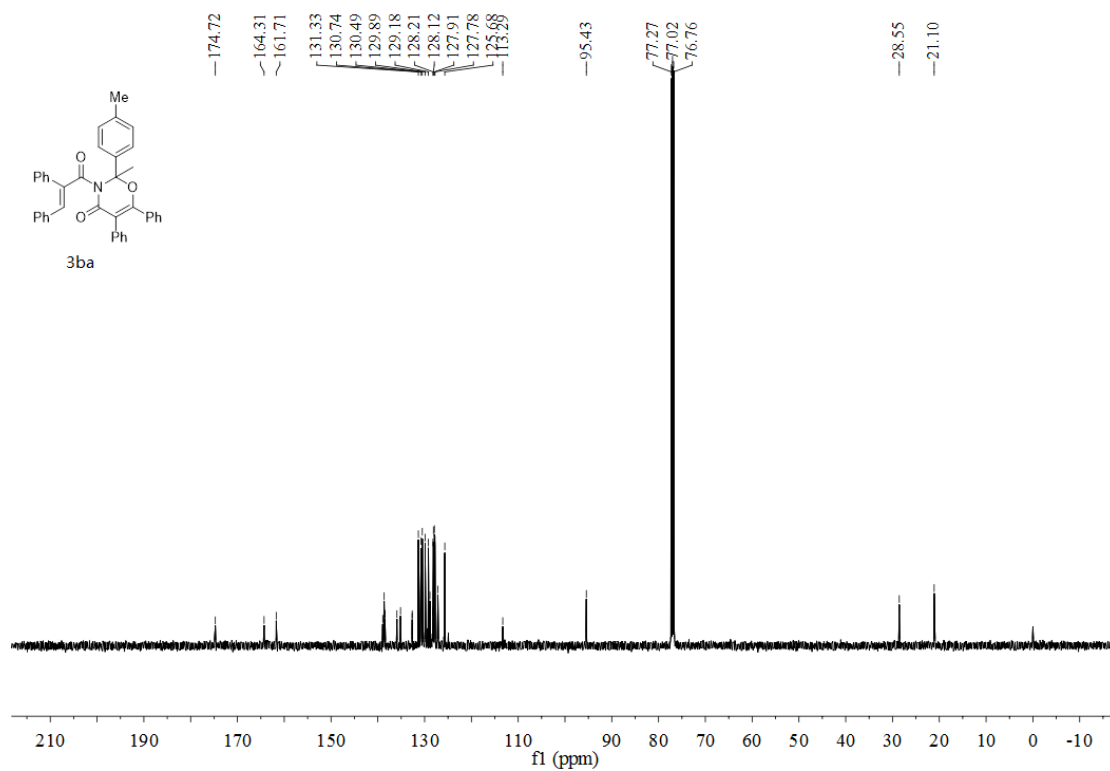
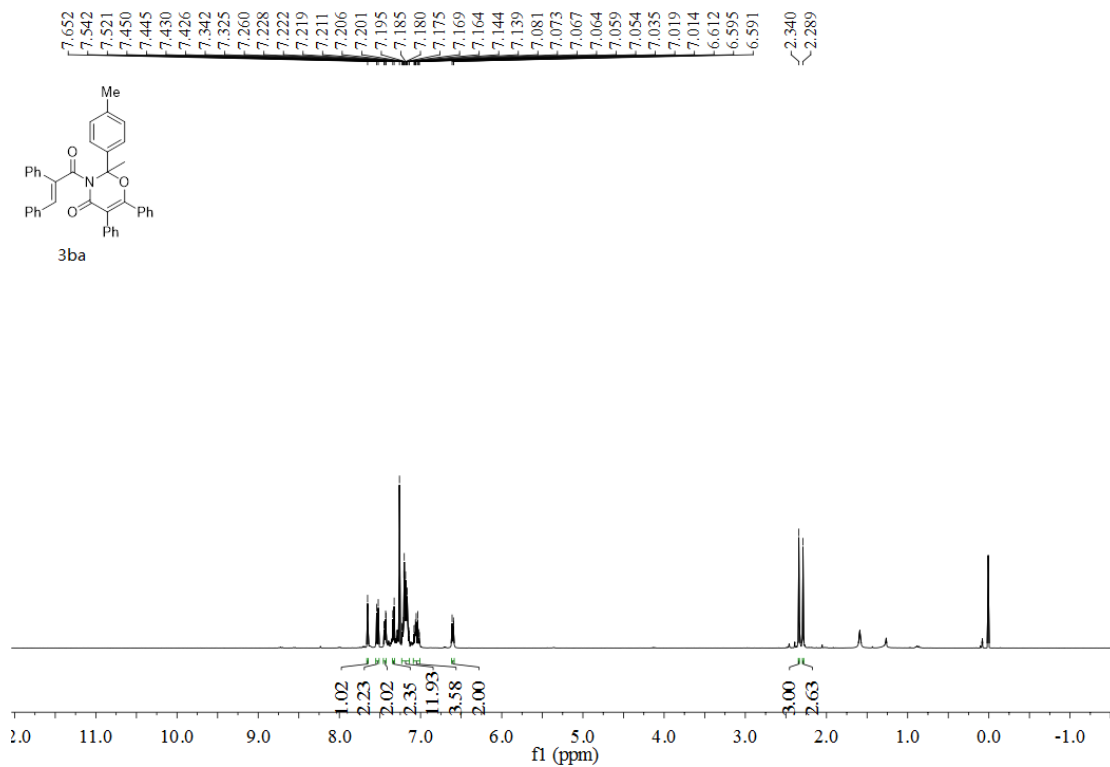
Yellow solid ;(86.2 mg, 84% yield); m.p. 141.9-142.3 °C; ^1H NMR (400 MHz, CDCl_3): δ 7.60-7.57 (m, 3H), 7.44-7.39 (m, 4H), 7.35-7.33 (m, 2H), 7.32-7.27 (m, 3H), 7.25-7.23 (m, 1H), 7.16-7.09 (m, 4H), 7.01-6.98 (m, 2H), 6.95-6.63 (m, 1H), 6.63 (s, 1H), 6.42 (d, $J = 8\text{Hz}$, 1H), 2.30 (s, 3H) ppm. ^{13}C NMR (125 MHz, CDCl_3): δ 173.4, 163.8, 161.0, 140.6, 138.5, 137.8, 130.7, 136.2, 134.4, 134.3, 133.9, 133.7, 133.6, 131.0, 131.0, 130.5, 130.3, 129.7, 129.6, 129.5, 129.4, 129.4, 129.3, 129.3, 128.9, 128.8, 128.5, 128.4, 128.2, 127.9, 125.6, 96.0, 28.3 ppm. HRMS (ESI) Calcd. for $\text{C}_{38}\text{H}_{25}\text{Cl}_4\text{NO}_3\text{Na}$: $[\text{M}+\text{Na}]^+$, 706.0487. Found: m/z 706.0468.

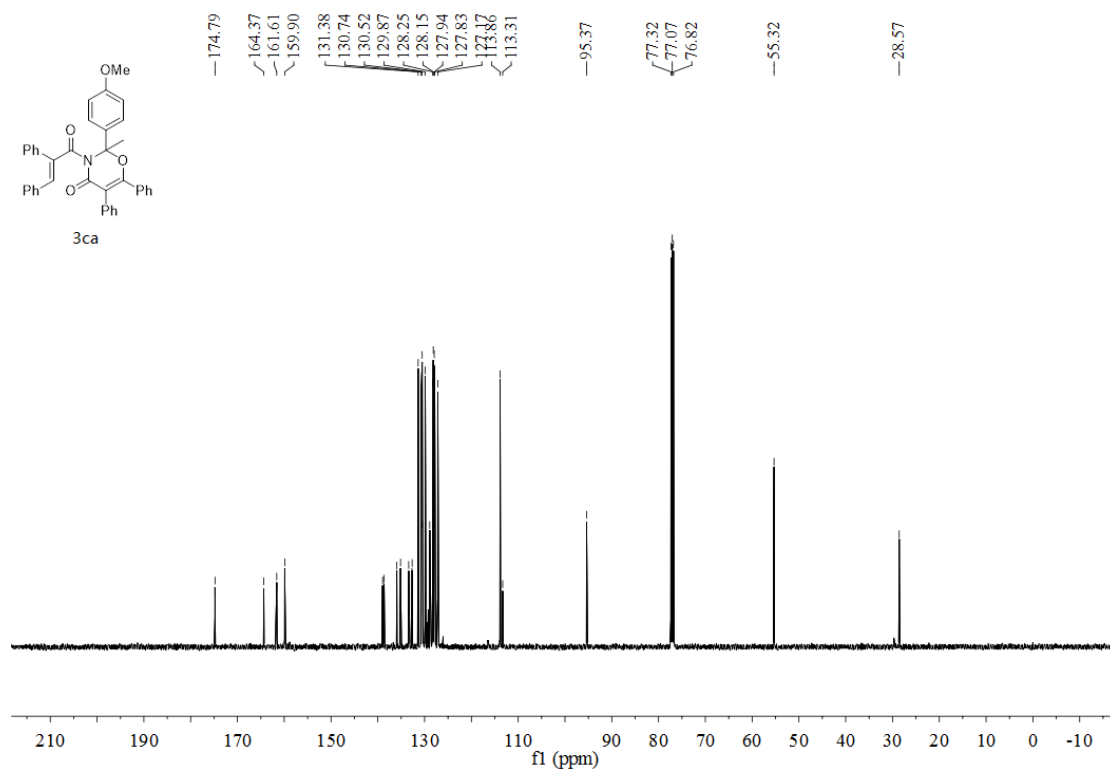
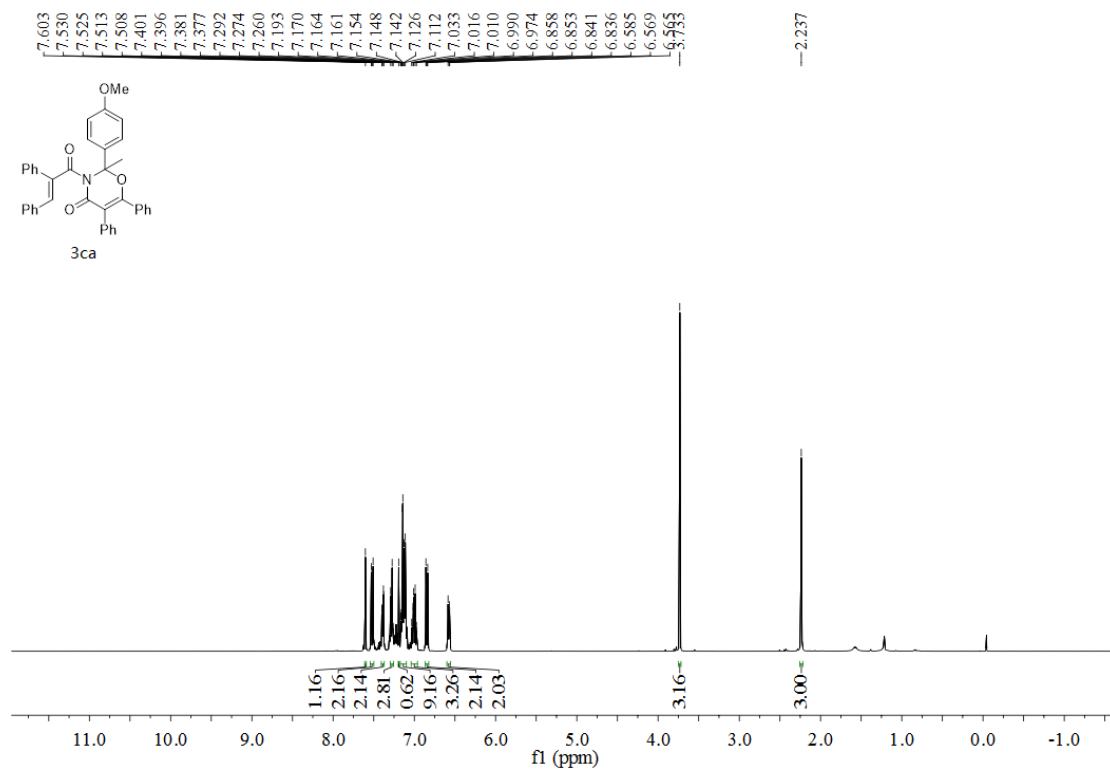
¹H and ¹³CNMR of products:

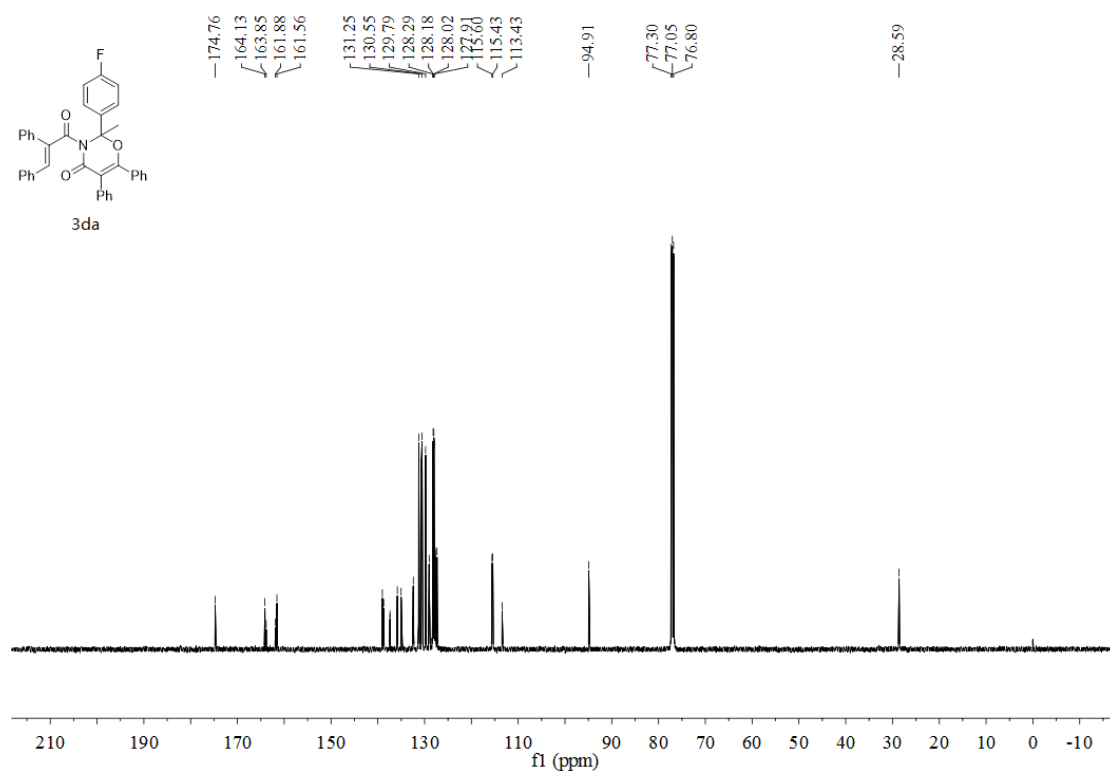
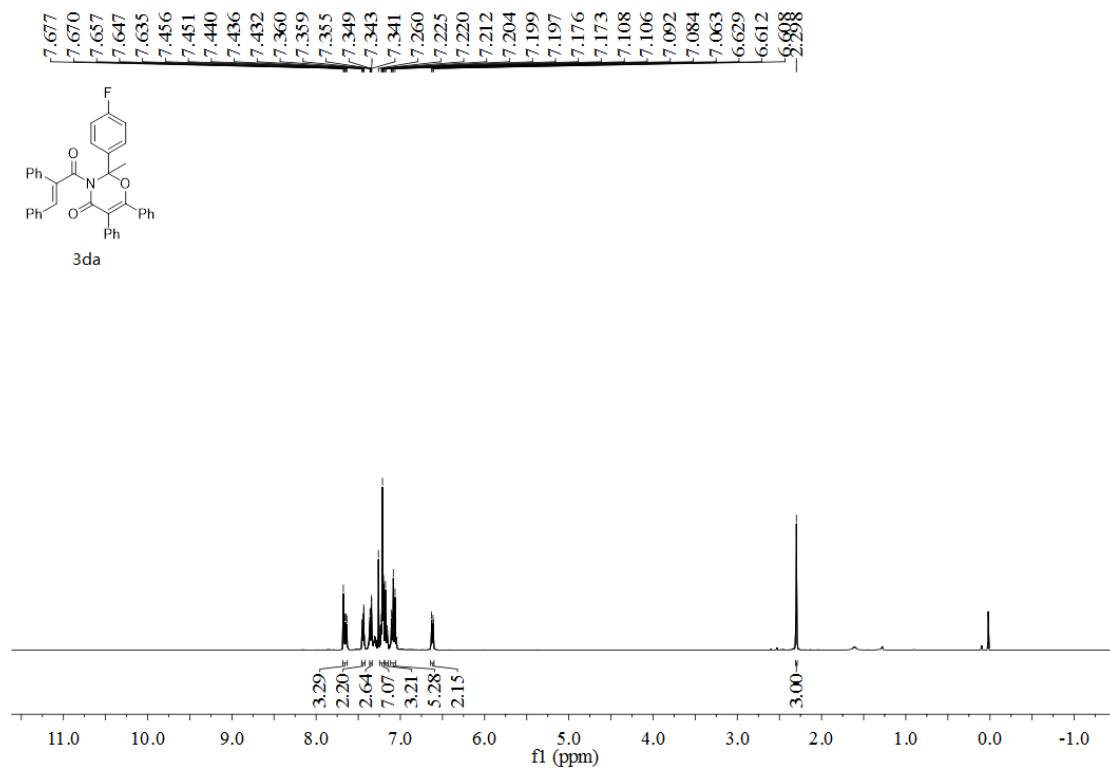


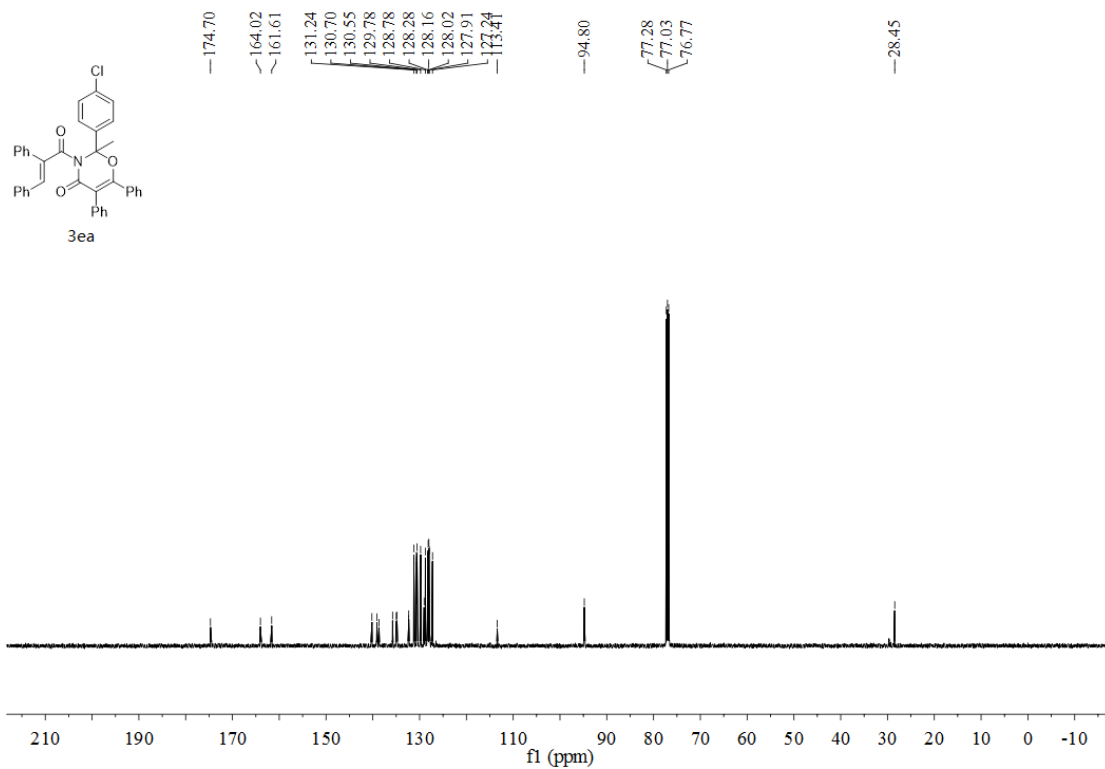
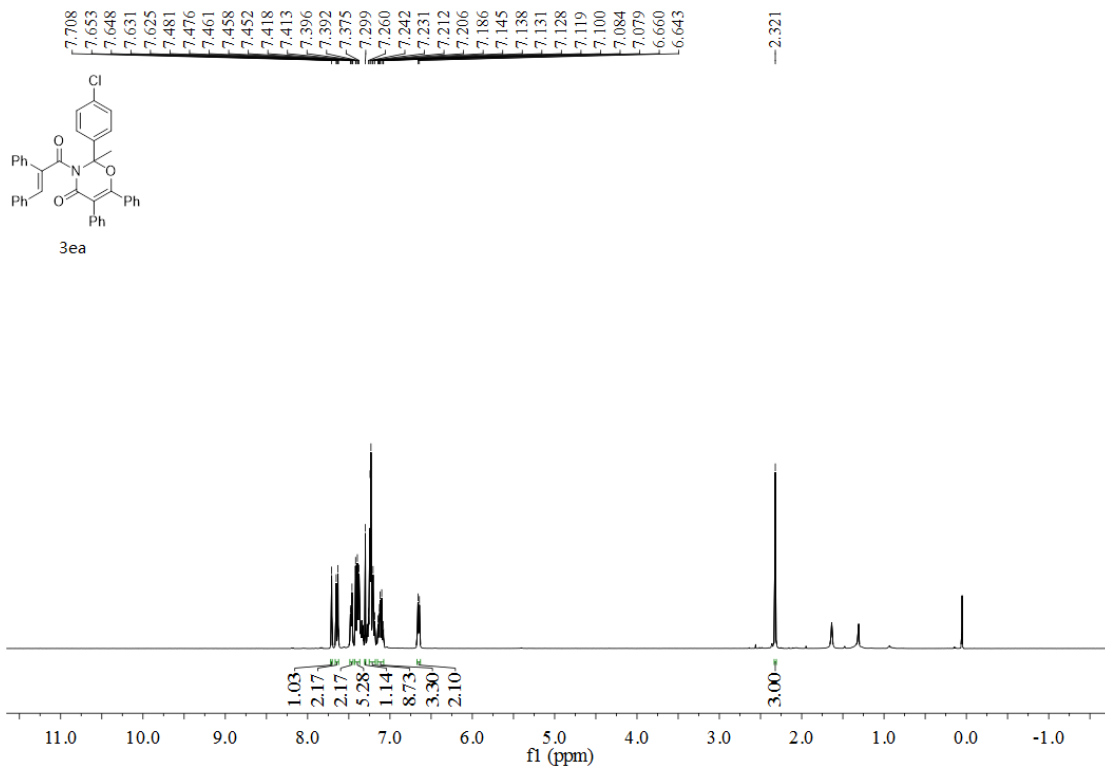


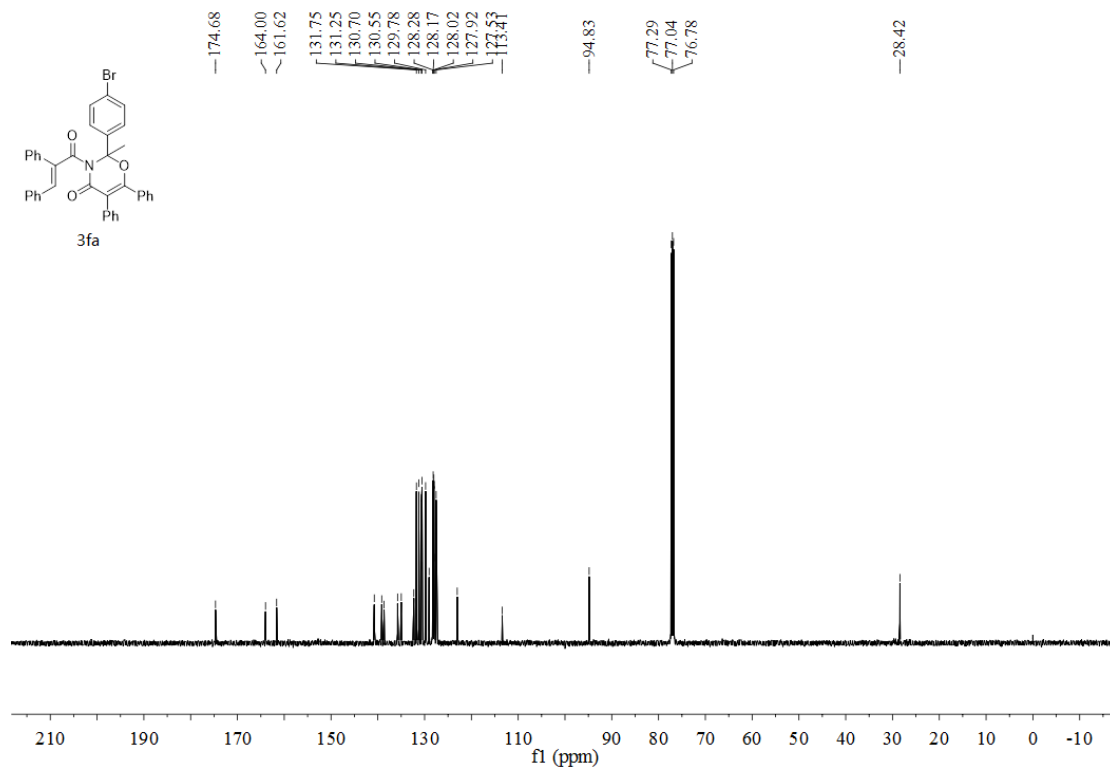
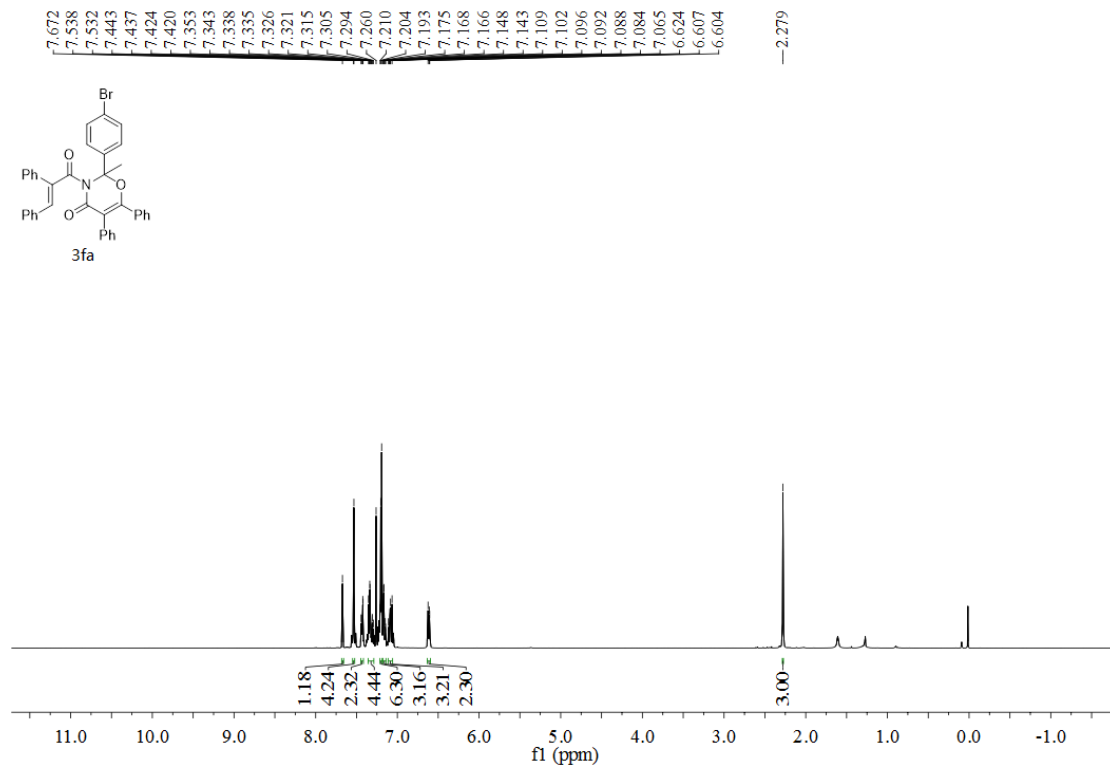


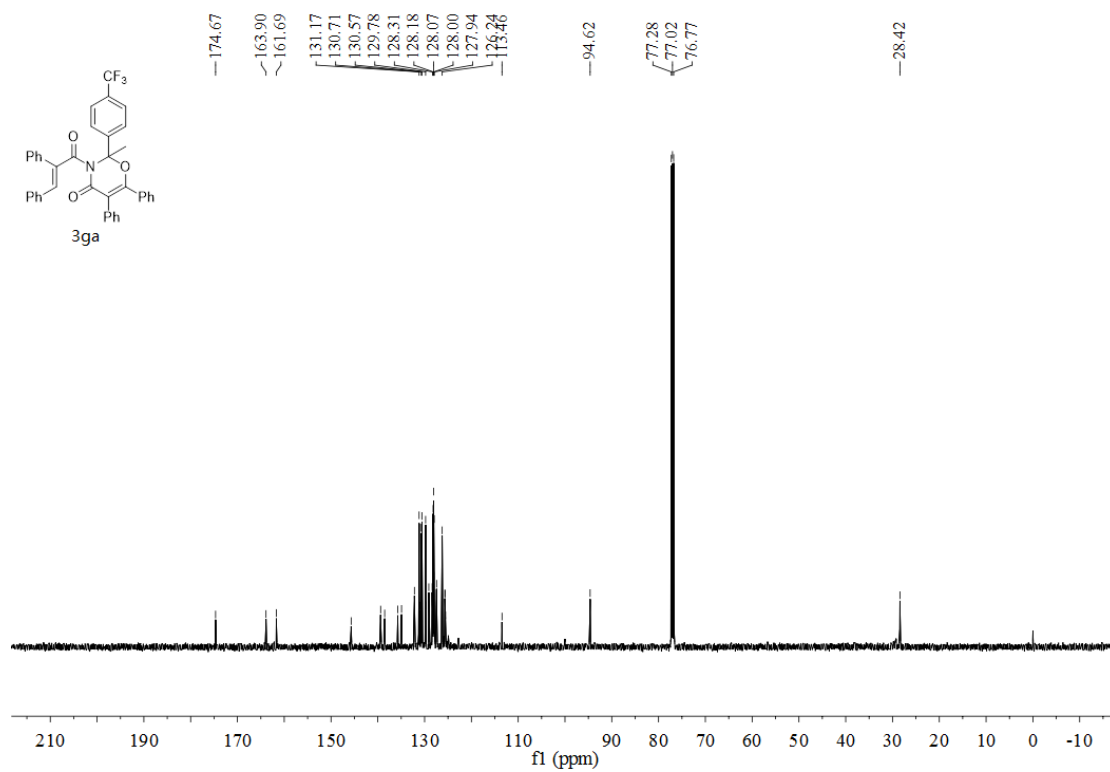
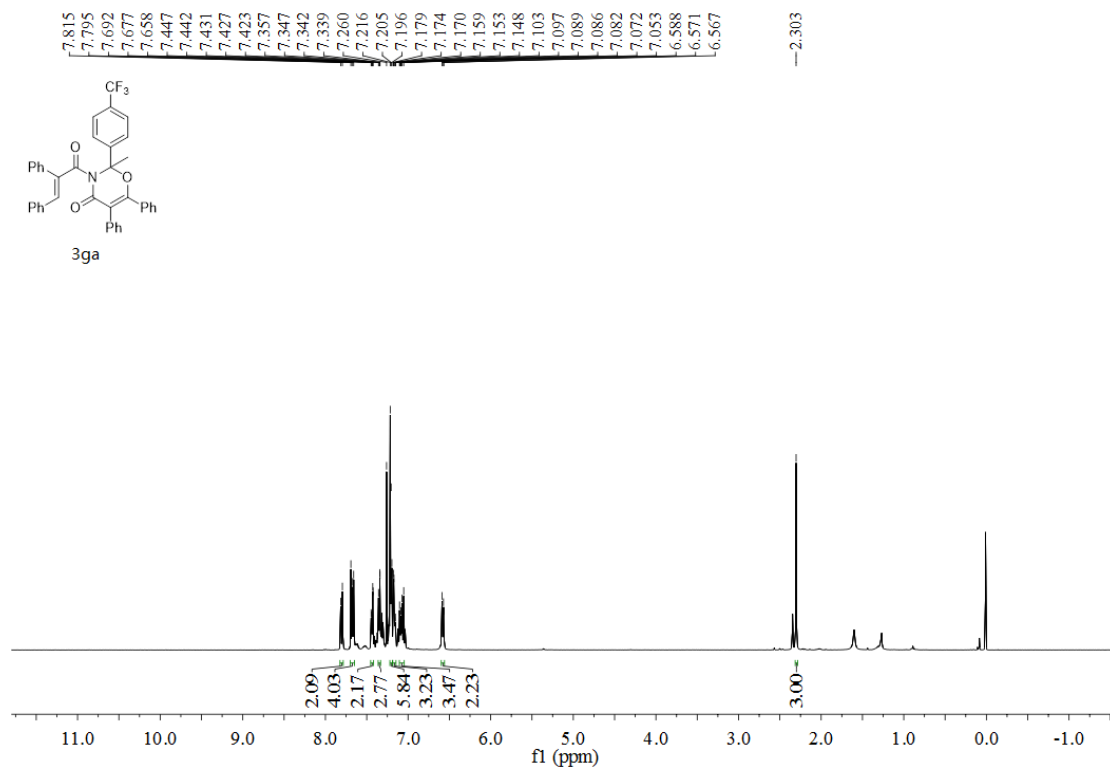


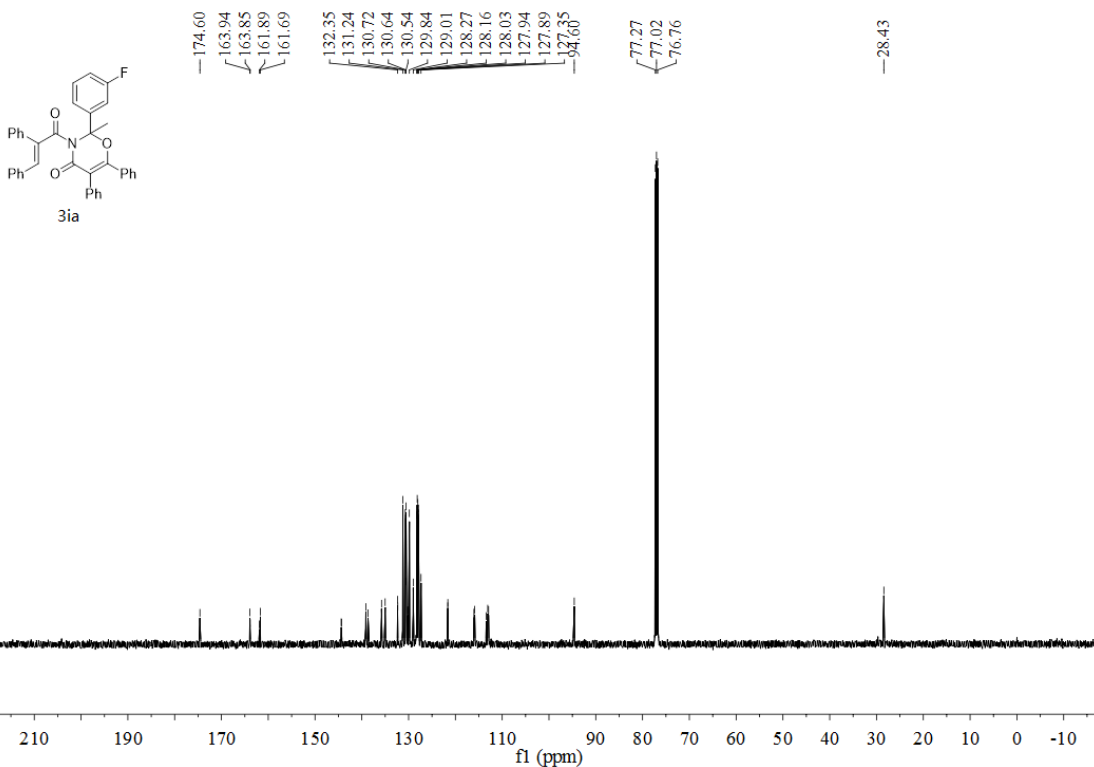
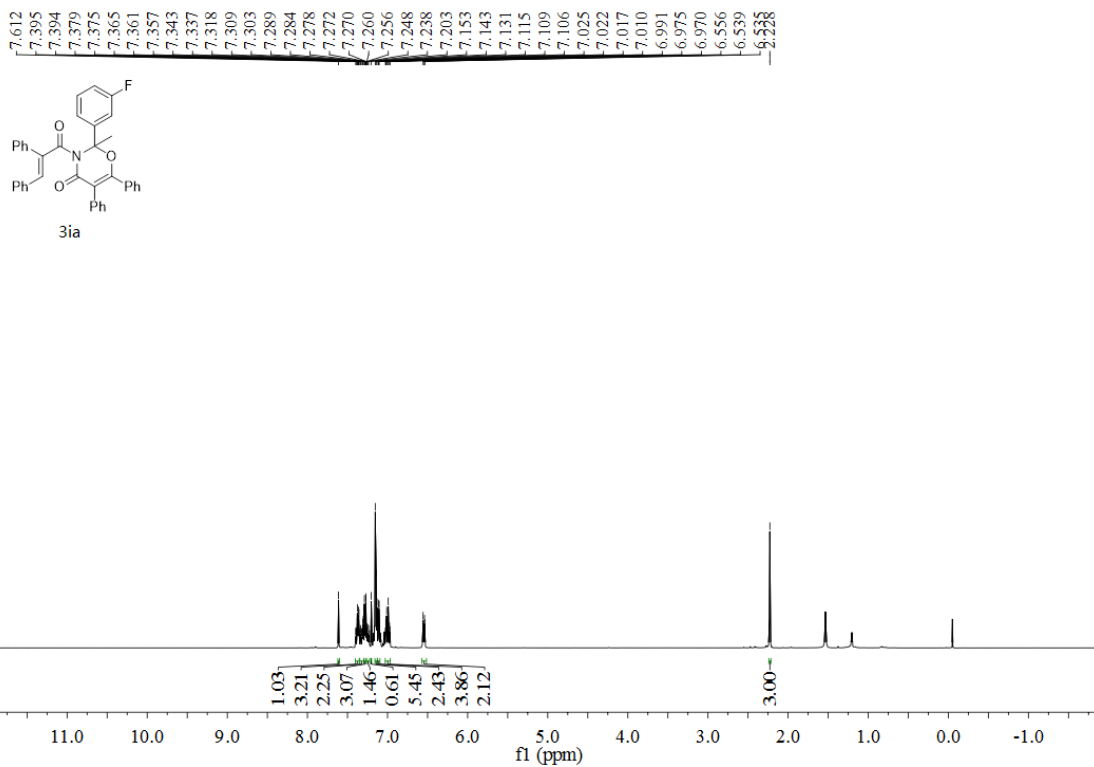


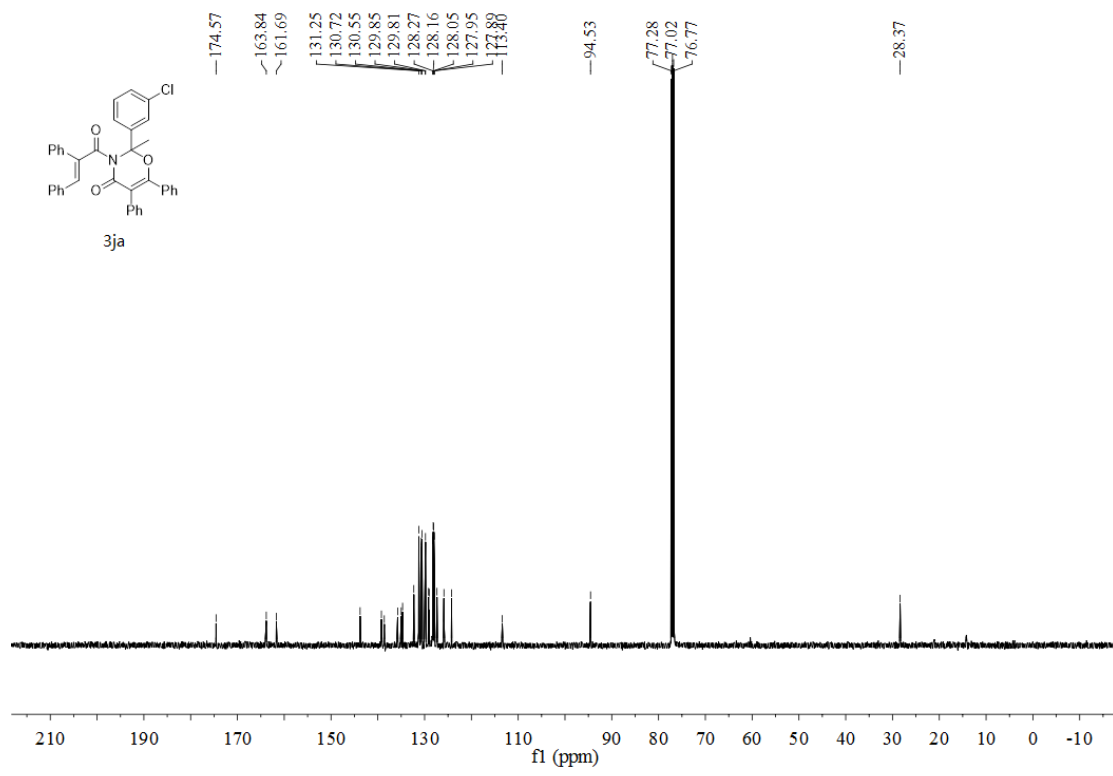
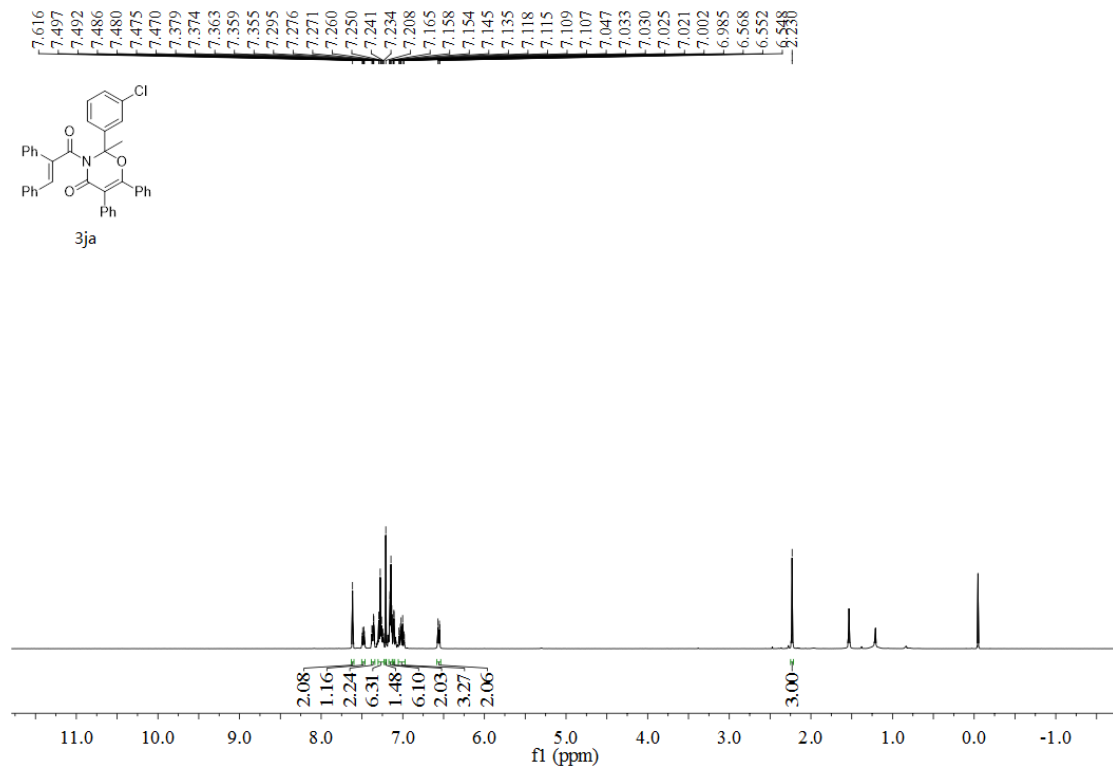


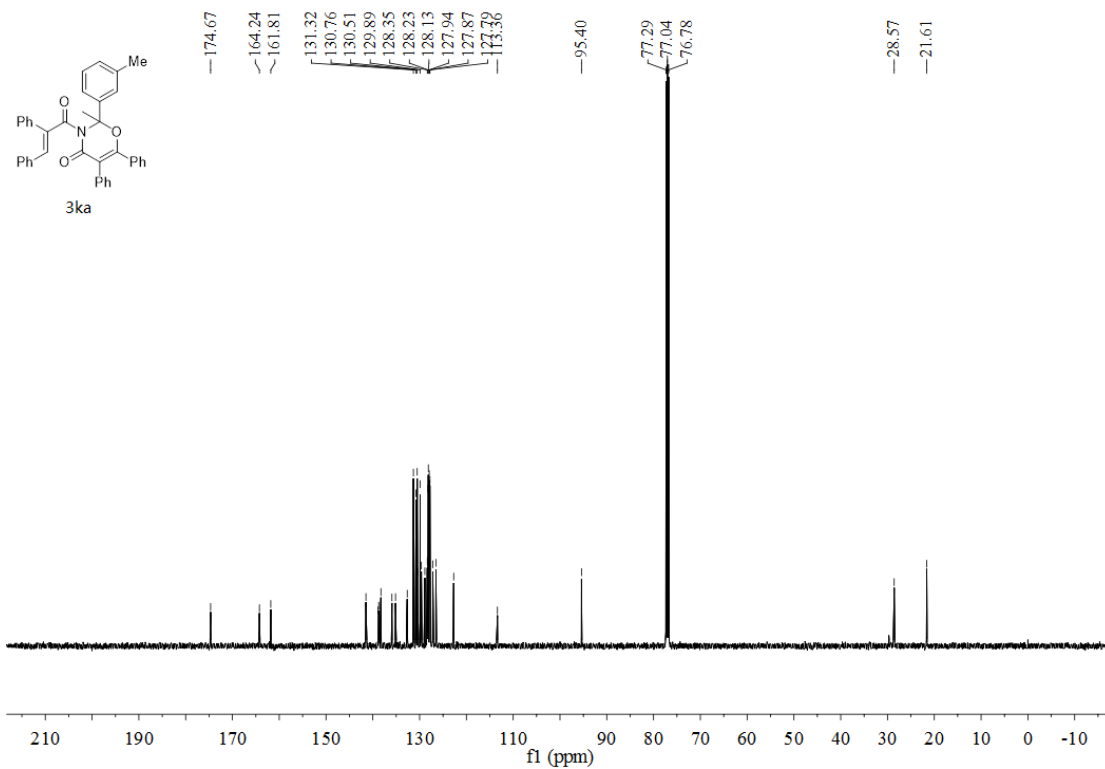
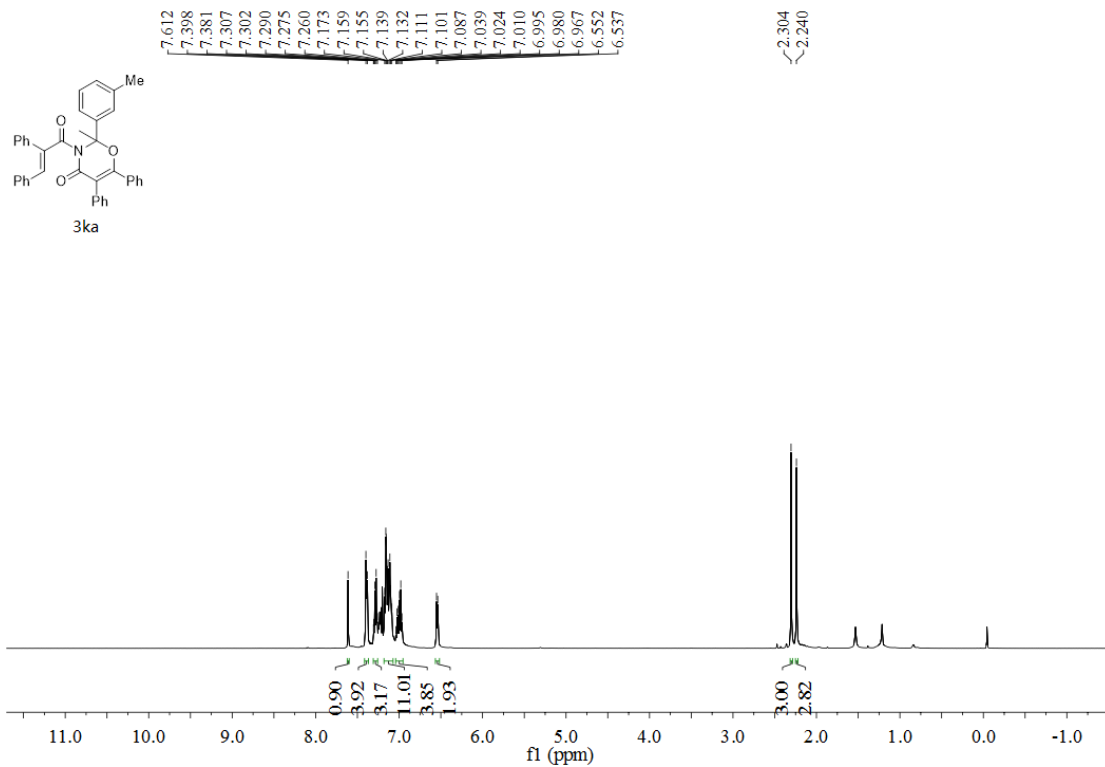


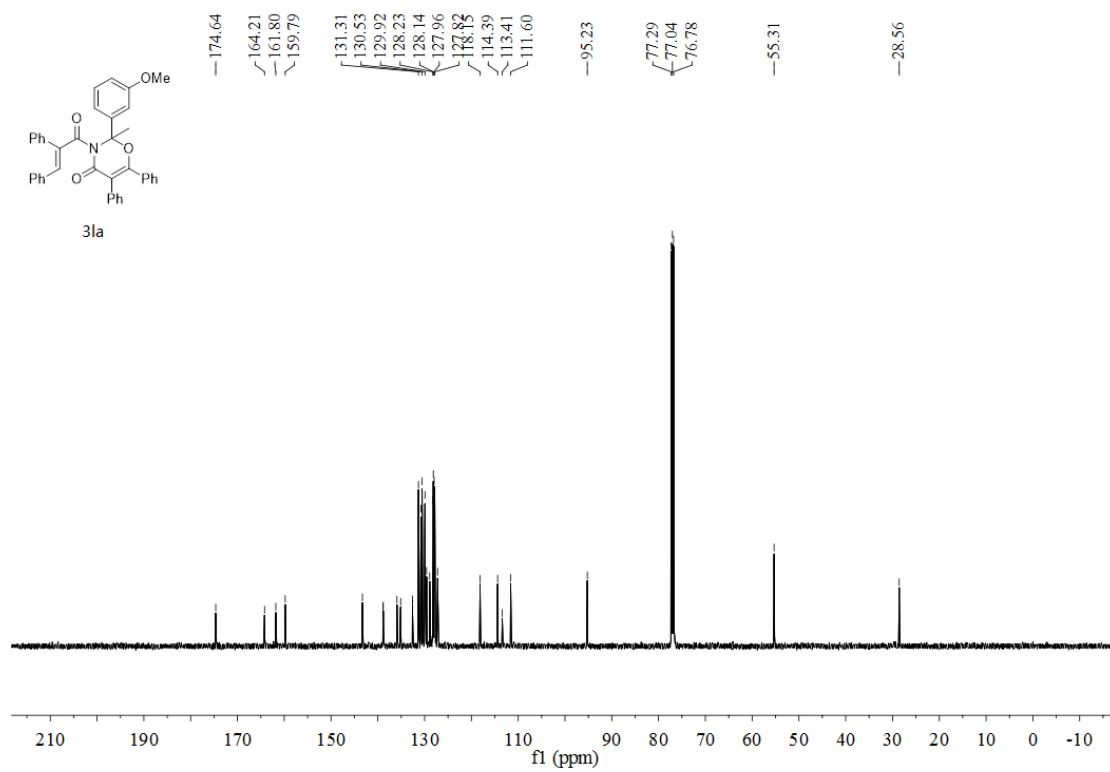
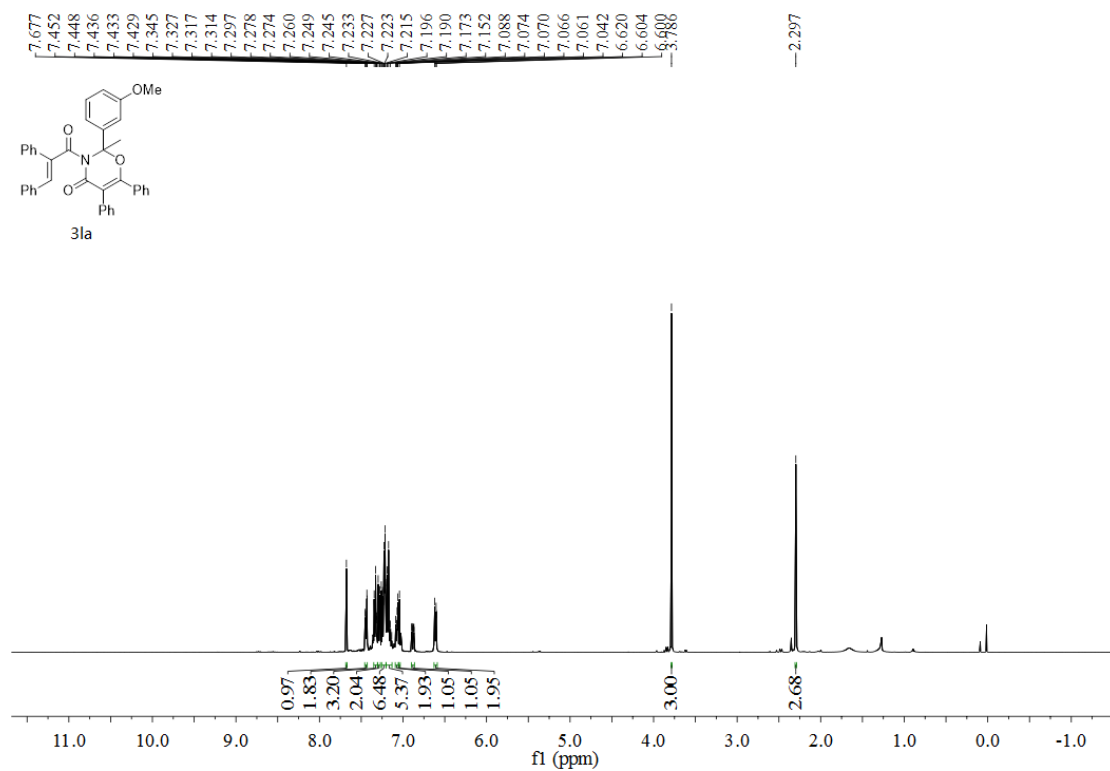


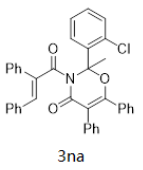
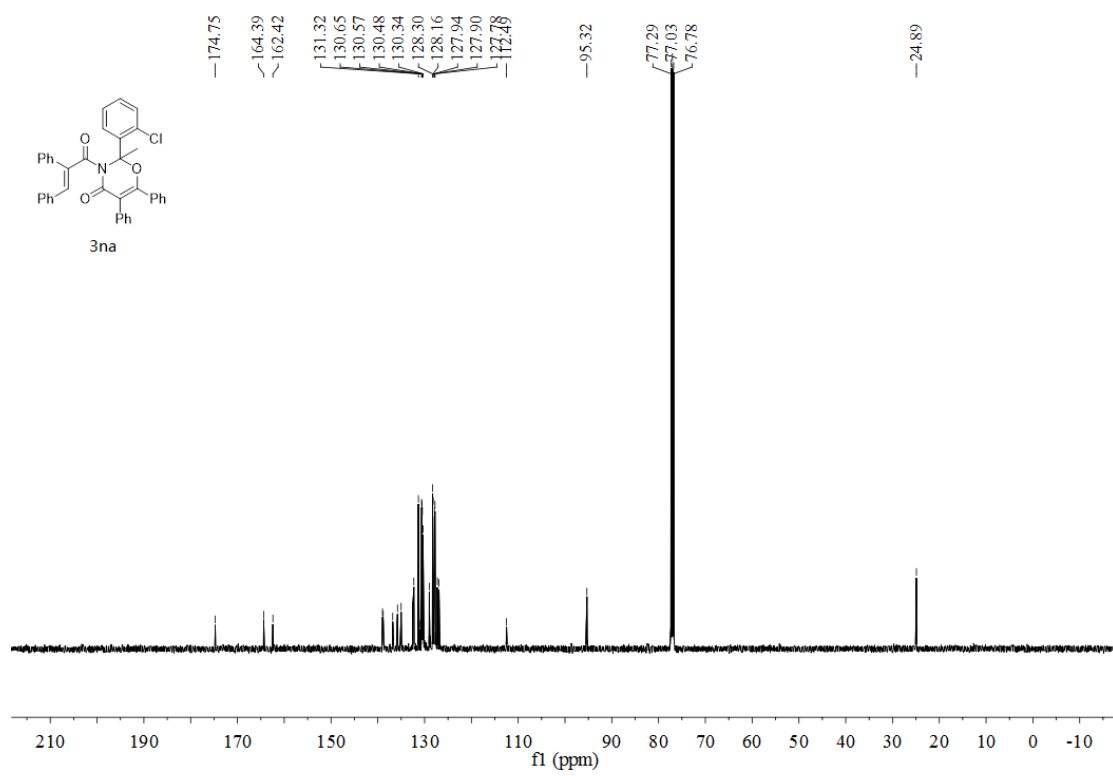
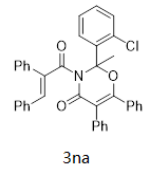
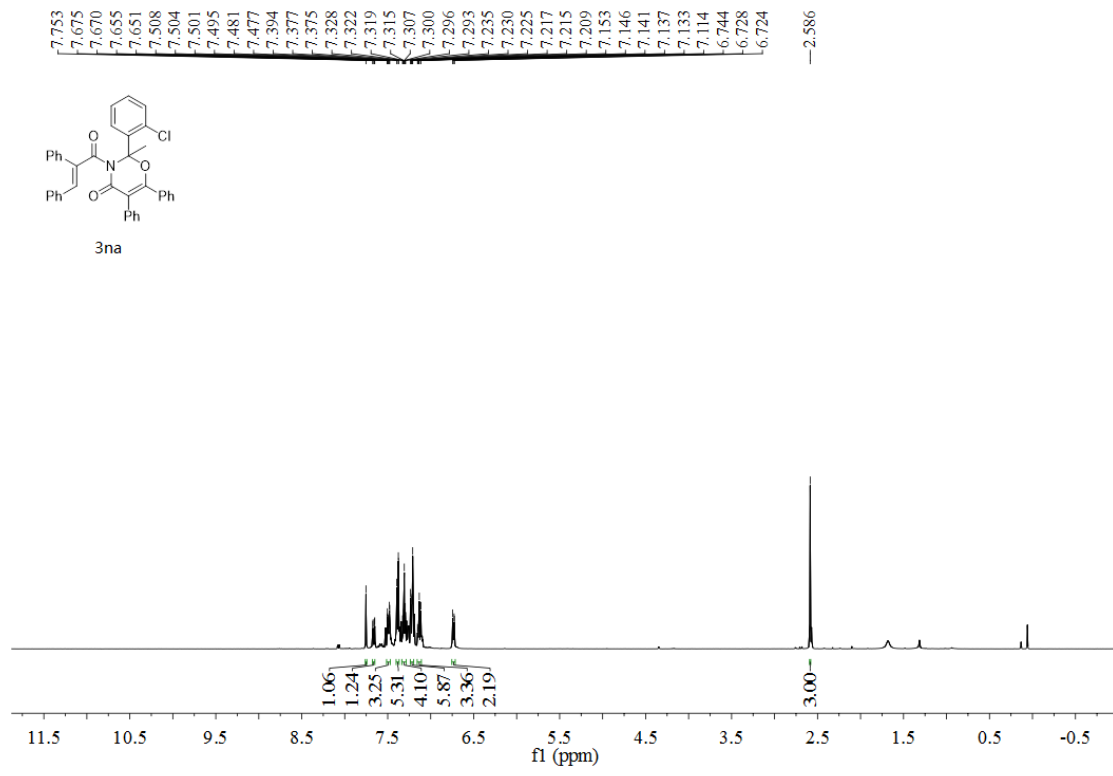


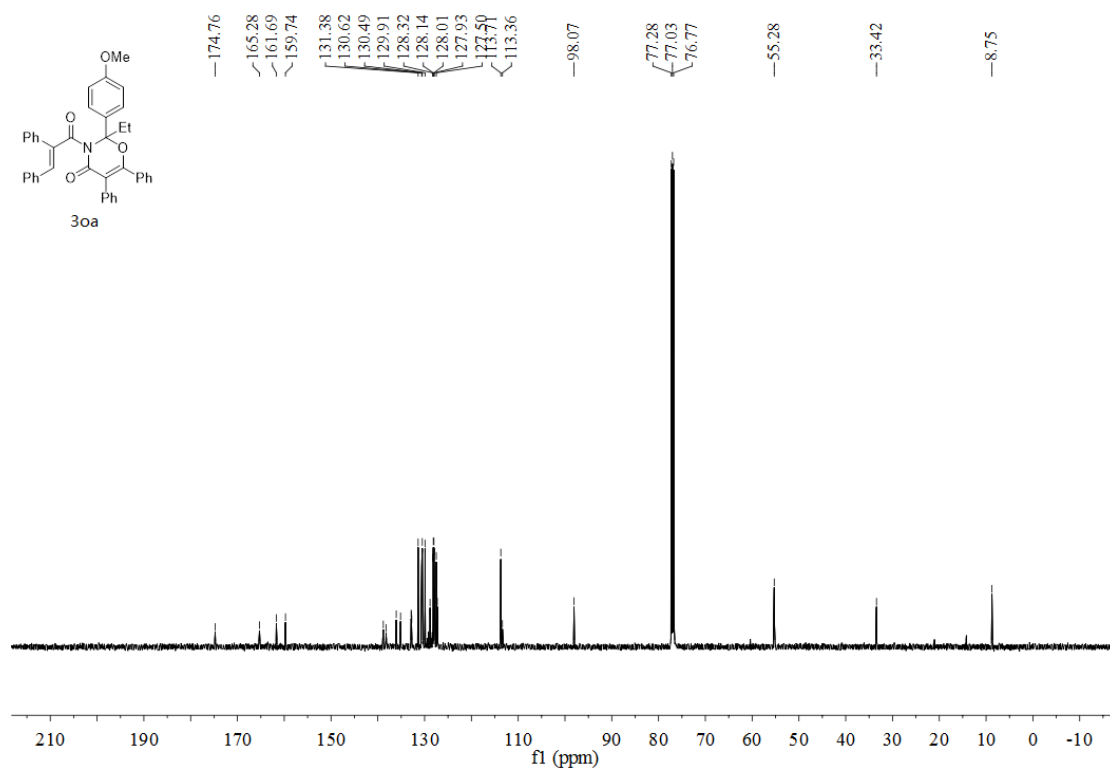
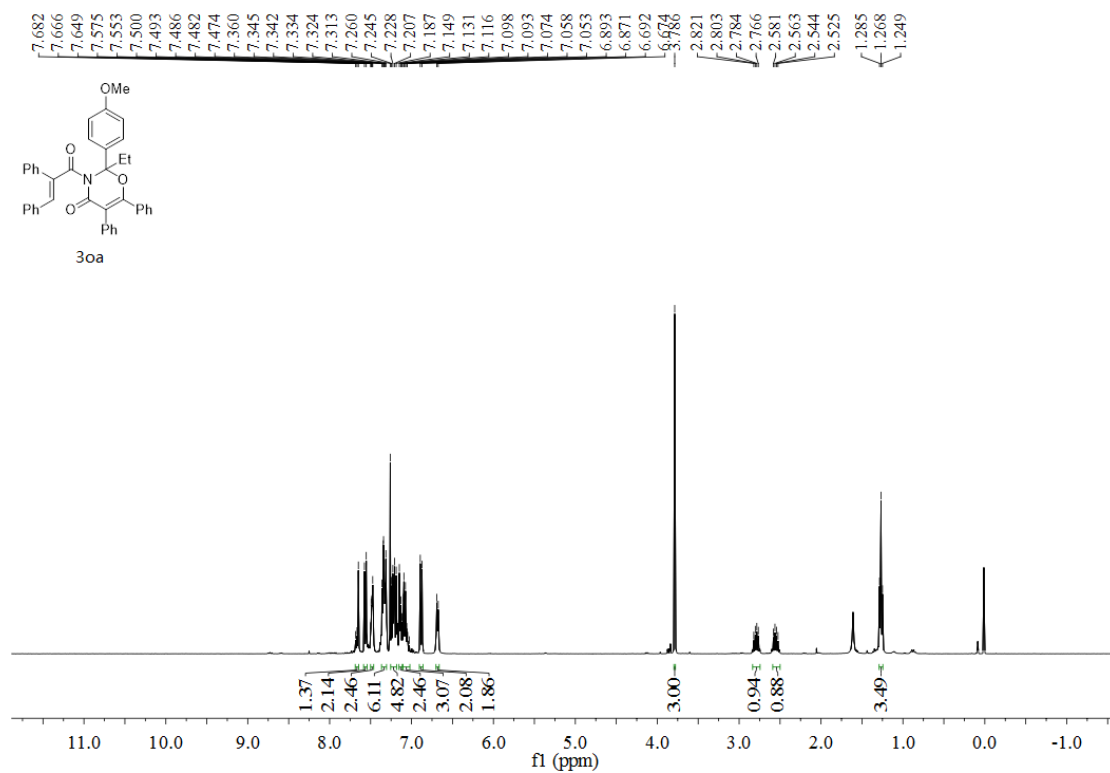


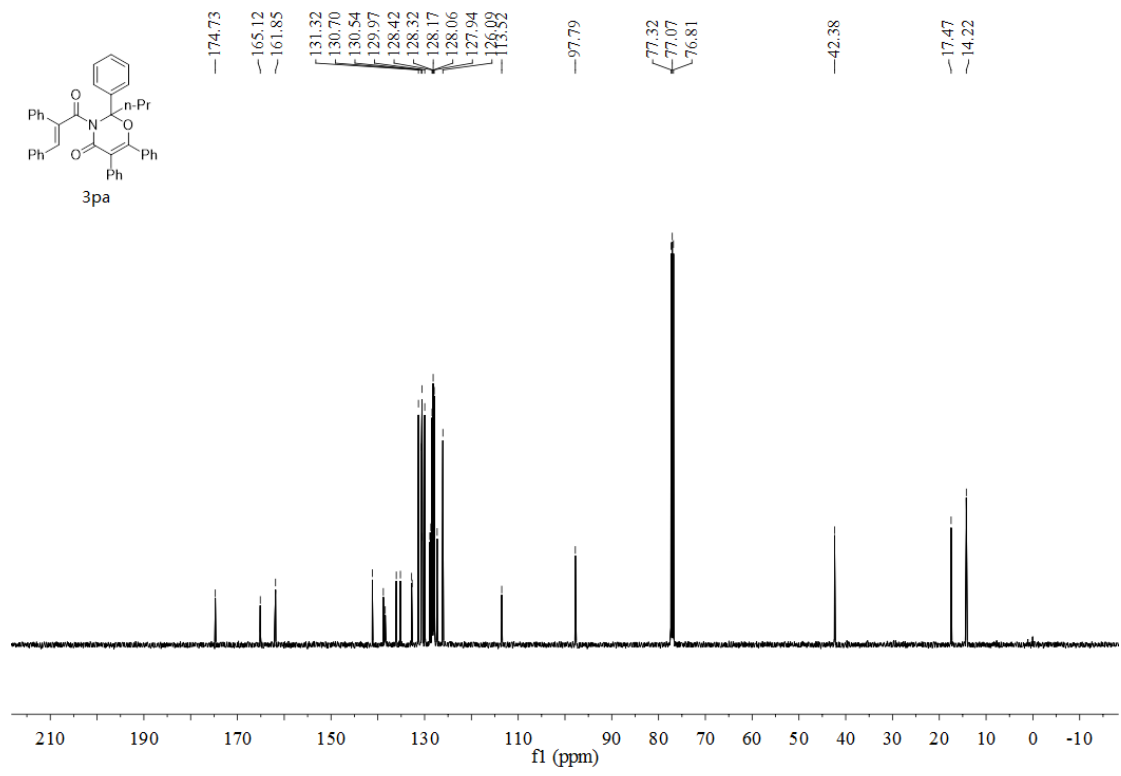
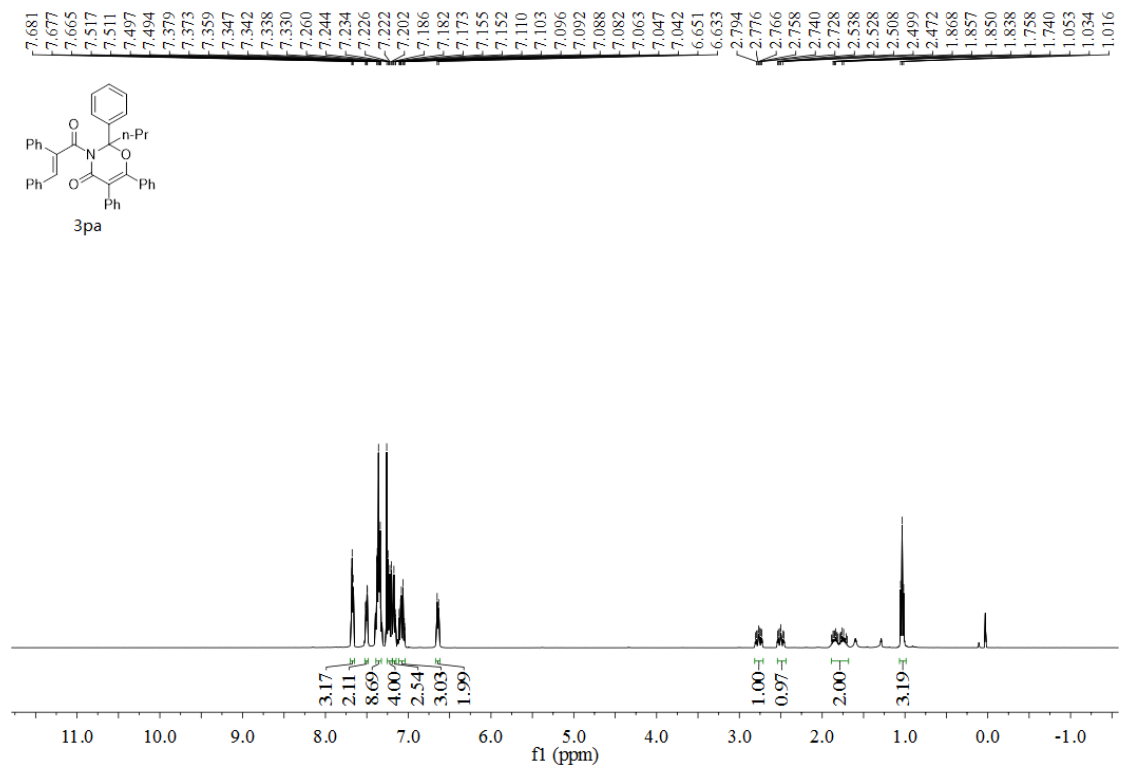


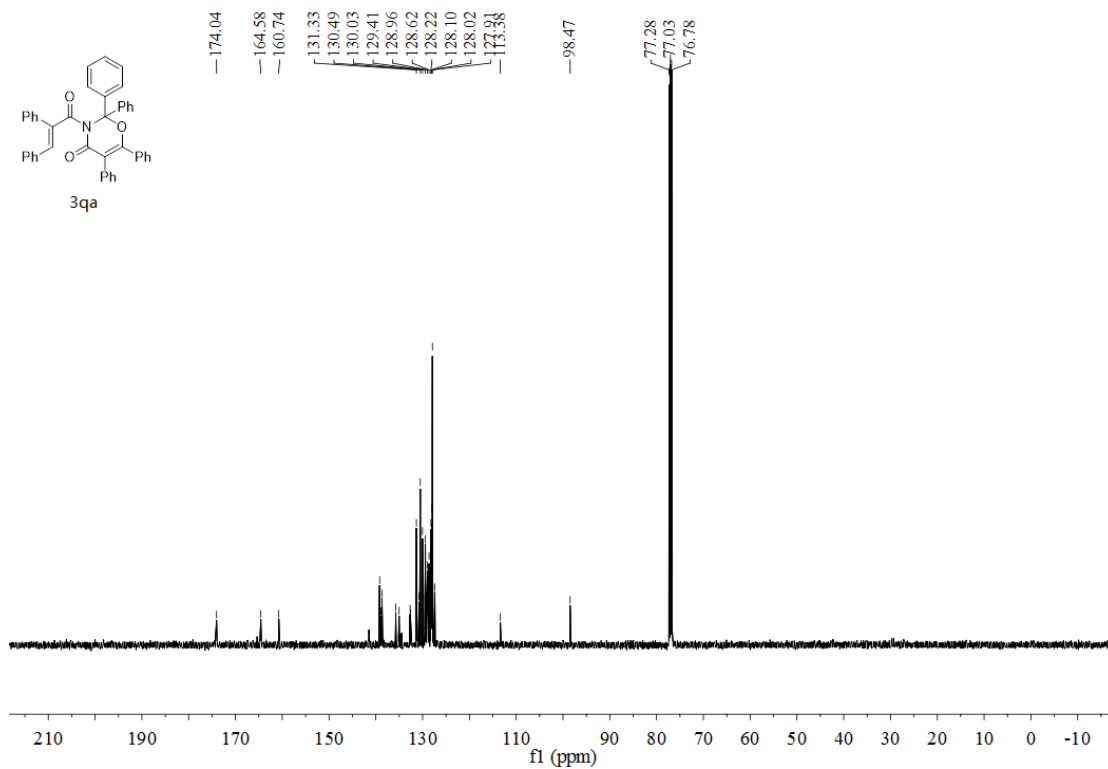
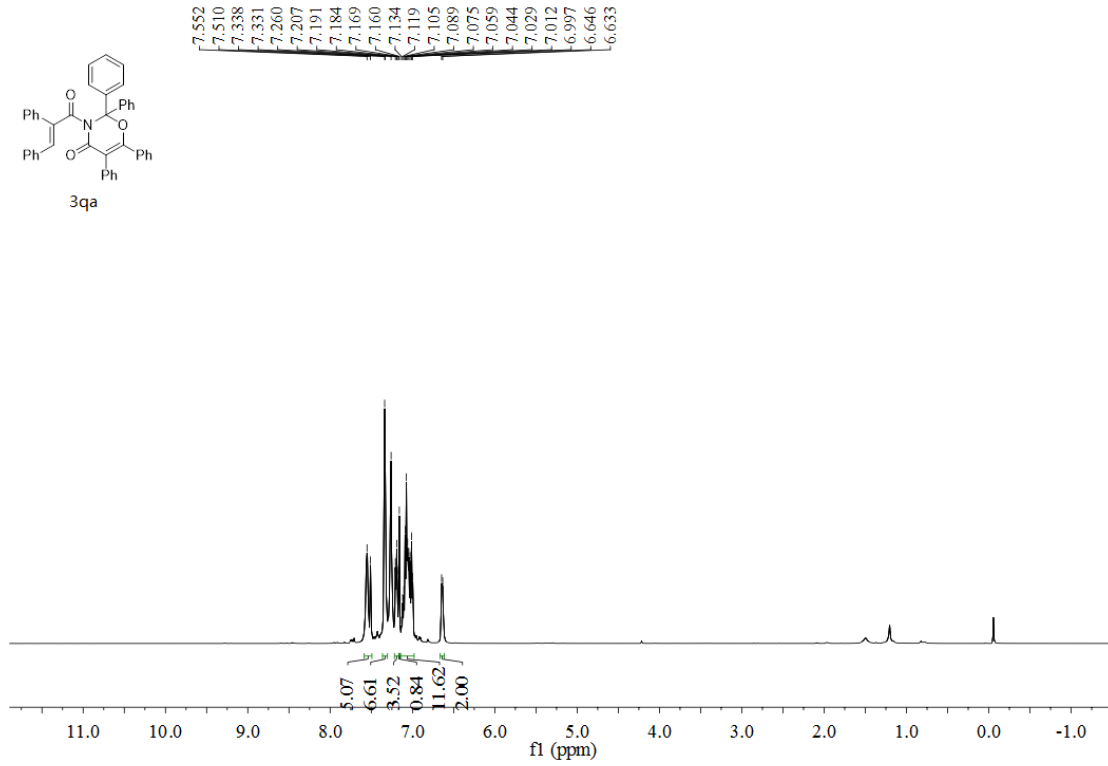
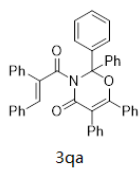


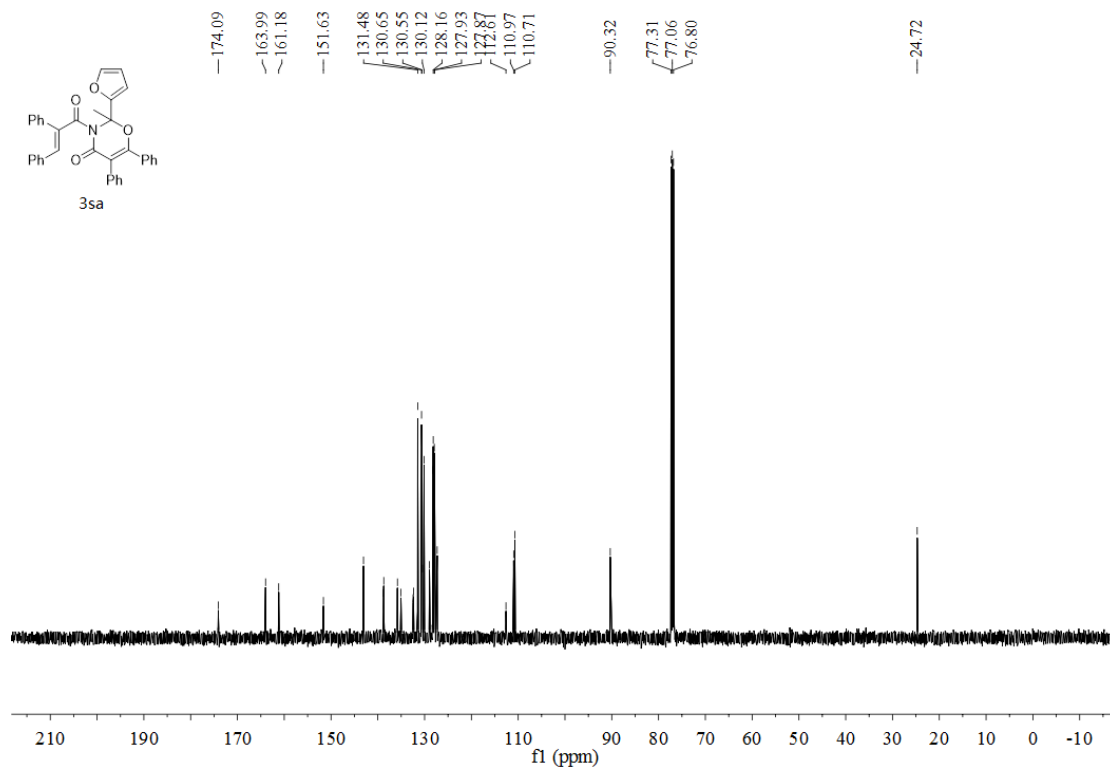
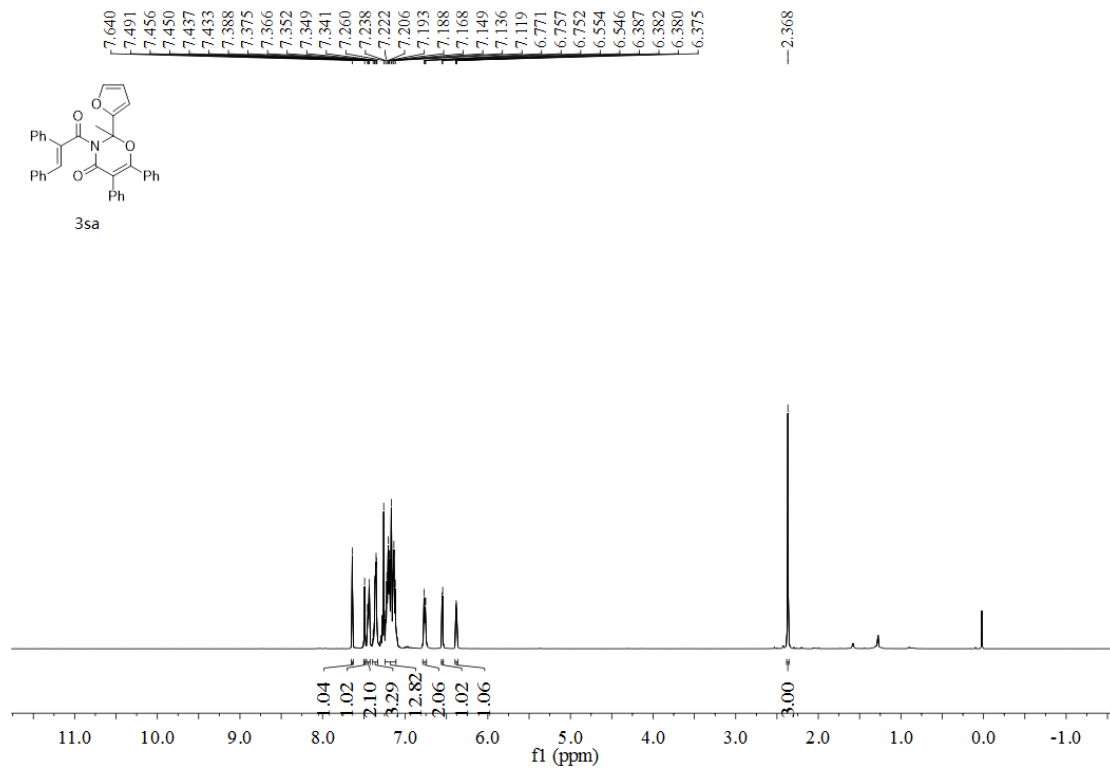












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