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Intramolecular Cyclization of *N*-Aryl Amides for the Synthesis of 3-Amino Oxindoles

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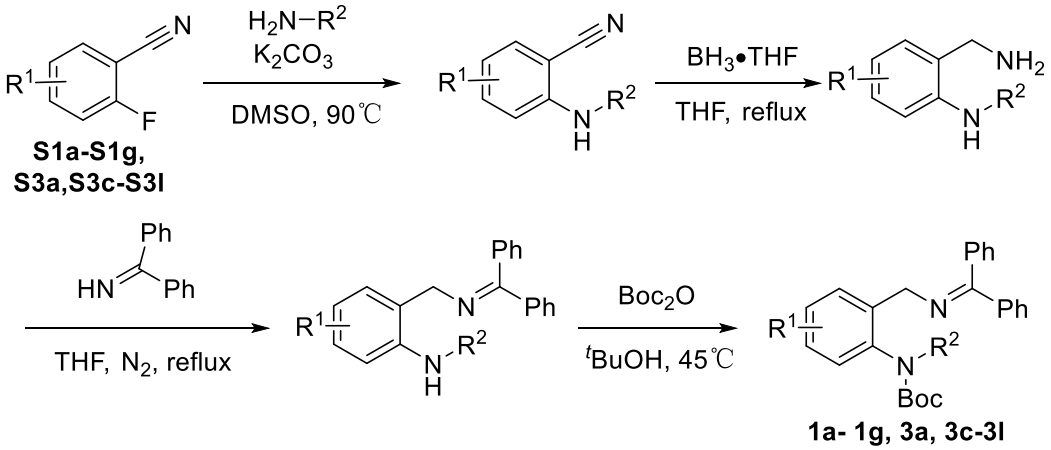
General methods

All air- and moisture-sensitive solutions and chemicals were handled under a nitrogen atmosphere in a glovebox and solutions were transferred via "Eppendorf" brand pipettors. Anhydrous solvents, including DME (dimethoxyethane), CPME (cyclopentyl methyl ether), MTBE (methyl *tert*-butyl ether), tetrahydrofuran (THF), 1,4-dioxane, acetonitrile, DMF (*N*,*N*-dimethylformaldehyde) and DMSO (dimethyl sulfoxide) were purchased from Sigma-Aldrich and used without further purification. Toluene was dried through activated alumina columns. Unless otherwise stated, all reagents were commercially available and used as received without further purification. Chemicals were obtained from Sigma-Aldrich, Acros or Adamas-beta, TCI and Alfa-Aesar. TLC was performed with Merck TLC Silica gel 60 F_{254} plates with detection under UV light at 254 nm. Silica gel (200-300 mesh, Qingdao) was used for flash chromatography. Deactivated silica gel was prepared by addition of 100 mL Et_3N to 1 L of silica gel. Proton nuclear magnetic resonance (^{1}H-NMR) spectra were recorded on a Bruker DRX 400 spectrometer at 400 MHz. Carbon-13 nuclear magnetic resonance (^{13}C-NMR) were recorded on a Bruker DRX 400 spectrometer at 100 MHz. Chemical shifts are reported in units of parts per million (ppm) downfield from tetramethylsilane (TMS), and all coupling constants were reported in hertz. The infrared (IR) spectra were measured on a Nicolet iS10 FTIR spectrometer with 4 cm^{-1} resolution and 32 scans between wavenumbers of 4000 cm^{-1} and 400 cm^{-1}. High Resolution Mass spectra were taken on AB QSTAR Pulsar mass spectrometer. Melting points were obtained on an XT-4 melting-point apparatus and were uncorrected.

Preparation of *N*-aryl amines

General Procedure 1 (GP1):



Fluorobenzonirile (5.0 mmol, 1.0 equiv), alkylamine (2.0 equiv), K_2CO_3 (3.0 equiv), and DMSO (0.5 M) were added into a round-bottomed flask. The mixture was heated at 90 °C (oil bath temperature) for 12 h. After cooling to room temperature, saturated aqueous ammonium chloride and ethyl acetate were added; the organic layer was separated, washed with saturated aqueous ammonium chloride and brine, dried over anhydrous $MgSO_4$, filtered and concentrated in vacuo. The residue was purified by silica gel column chromatography.

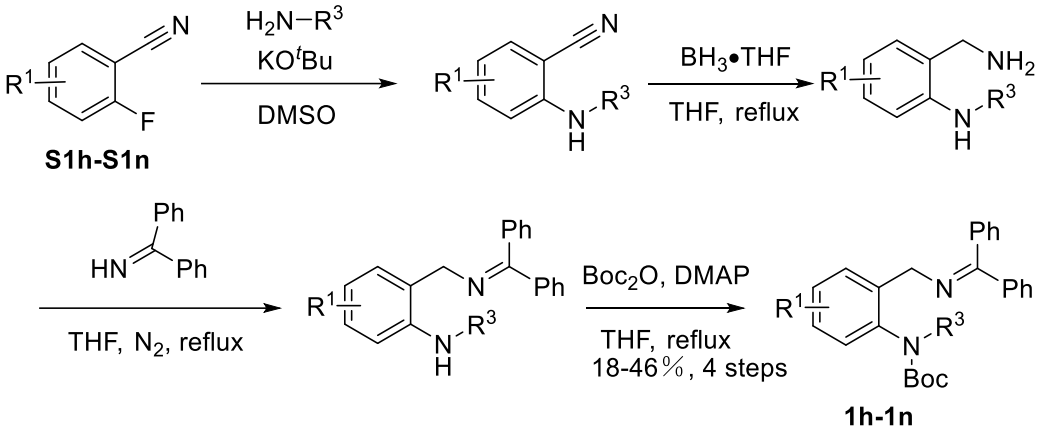
To a solution of 2-amino-benzonitrile (5.0 mmol, 1.0 equiv) in dry THF (15.0 mL) at 0 °C was added dropwise a solution of BH_3 (25.0 mL of 1.0 M solution in THF, 25.0 mmol, 5.0 equiv) and was refluxed for 2 h. The mixture was cooled to 0 °C, and 6.0 M HCl (2.5 mL) was added. The mixture was then made basic with 1.0 M NaOH solution and extracted with ethyl acetate. The organic layer was washed with water and brine, dried over $MgSO_4$, and concentrated to give 2-amino-phenylethylamine, which was used in the next step without purification.[1]

To a solution of the respective 2-amino-phenylethylamine (1.1 equiv) in anhydrous THF (0.4 M), benzophenone imine (1.0

equiv) was added under an argon atmosphere and was refluxed for 12~18 h. The solvent was removed in vacuo to obtain N-benzyl-1,1-diphenylmethanimine, which was used in the next step without purification.[2]

Di-*tert*-butyldicarbonate (1.5 equiv) was added to a solution of 2-(((diphenylmethylene)amino)methyl)-*N*-alkylaniline in ^{t}BuOH (0.5 M). The mixture was heated at 45 °C (oil bath temperature) for 6 h. The reaction was monitored by TLC until all 2-(((diphenylmethylene)amino)methyl)-*N*-alkylaniline was consumed (add extra di-*tert*-butyldicarbonate to the reaction). The reaction mixture was concentrated in vacuo, loaded onto a deactivated silica gel column via pipette and purified by flash chromatography on deactivated silica gel.[3]

General Procedure 2 (GP2):



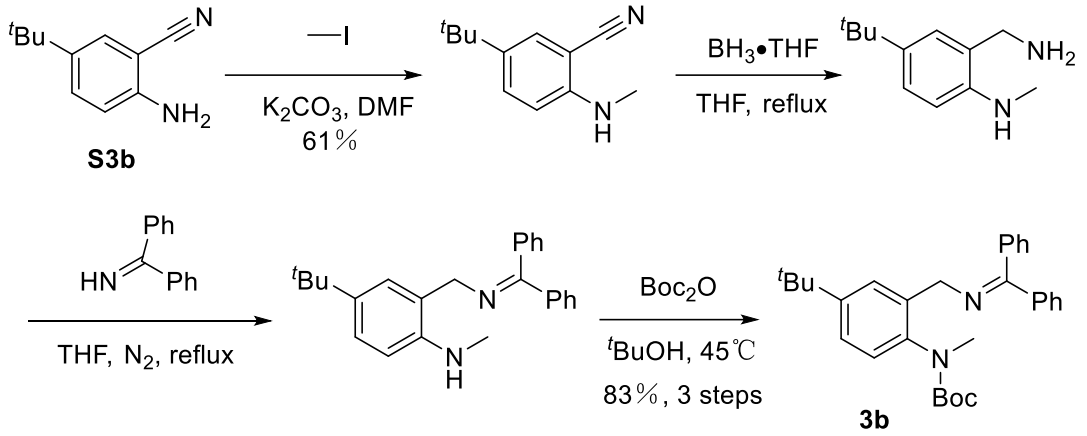
A round-bottomed flask was evacuated and refilled with argon, charged with arylamine (10.0 mmol), KO^{t}Bu (20.0 mmol), and dry DMSO (20 mL). The mixture was stirred at room temperature for 10 min and cooled to −10 °C, and fluorobenzonitrile was added. Then, the reaction mixture was stirred at room temperature until the complete consumption of arylamine (monitored by TLC). The resulted suspension was quenched with water (3.0 mL) and extracted with ethyl acetate (30.0 mL × 3). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered, and concentrated in vacuo. The residue was purified by silica gel column chromatography.[4]

To a solution of 2-amino-benzonitrile (5.0 mmol, 1.0 equiv) in dry THF (15.0 mL) at 0 °C was added dropwise a solution of BH_3 (25.0 mL of 1.0 M solution in THF, 25.0 mmol, 5.0 equiv) and was refluxed for 2 h. The mixture was cooled to 0 °C, and 6.0 M HCl (2.5 mL) was added. The mixture was then made basic with 1.0 M NaOH solution and extracted with ethyl acetate. The organic layer was washed with water and brine, dried over $MgSO_4$, and concentrated to give 2-amino-phenylethylamine, which was used in the next step without purification.[1]

To a solution of the respective 2-amino-phenylethylamine (1.1 equiv) in anhydrous THF (0.4 M), benzophenone imine(1.0 equiv) was added under an argon atmosphere and was refluxed for 12~18 h. The solvent was removed in vacuo to obtain *N*-benzyl-1,1-diphenylmethanimine, which was used in the next step without purification.[2]

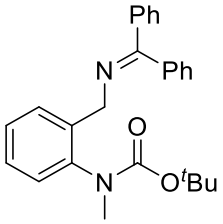
Di-*tert*-butyldicarbonate (2.5 equiv) and 4-(dimethylamino)pyridine (0.4 equiv) was added to a solution of 2-(((diphenylmethylene)amino)methyl)-*N*-arylaniline in THF (0.5 M). The mixture was refluxed for 6 h. The reaction was monitored by TLC until 2-(((diphenylmethylene)amino)methyl)-*N*-alkylaniline was consumed (add extra di-*tert*-butyldicarbonate to the reaction). The reaction mixture was concentrated in vacuo, loaded onto a deactivated silica gel column via pipette and purified by flash chromatography on deactivated silica gel.[5]

General Procedure 3 (GP3):



The 5-(*tert*-butyl)-2-(methylamino)benzonitrile (**S3b**) was prepared according to literature procedures.[6] Other compounds were prepared according to **GP1**.

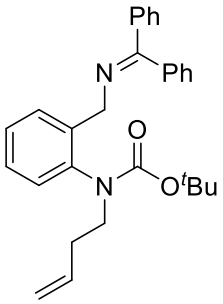
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(methyl)carbamate (1a)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (1.21 g, 10.0 mmol) and methylamine hydrochloride (1.35 g, 20.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1a** (3.28 g, 82%) as a white solid.

R_f = 0.33 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.61 (d, *J* = 6.8 Hz, 2H), 7.37 – 7.19 (m, 7H), 7.18 – 7.13 (m, 2H), 7.10 – 7.08 (m, 2H), 6.97 (d, *J* = 7.2 Hz, 1H), 4.42 (q, *J* = 16.4 Hz, 2H), 2.97 (s, 3H), 1.31 & 1.05 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.6, 154.9, 141.5, 139.6, 138.0, 136.6, 130.2, 128.8, 128.57, 128.5, 128.1, 127.6, 127.4, 127.3, 126.9, 79.6, 53.3, 37.2, 28.1 ppm; IR (thin film): 3058, 2974, 2928, 1697, 1491, 1364, 1303, 1152, 769, 696, 646 cm^{-1}; HRMS calc'd for $C_{26}H_{29}N_2O_2^+$ 401.2222, found 401.2224 $[M+H]^+$.

***tert*-Butyl but-3-en-1-yl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1b)**

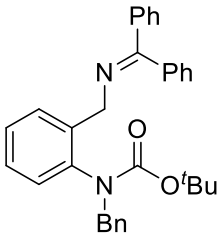


The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (1.21 g, 10.0 mmol) and 1-amino-3-butene hydrochloride (2.15 g, 20.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1b** (1850.4 mg, 42%) as a colorless oil oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.71 – 7.69 (m, 2H), 7.51 – 7.50 (m, 1H), 7.47 – 7.38 (m, 4H), 7.36 – 7.31 (m, 2H), 7.31 – 7.28 (m, 1H), 7.25 – 7.22 (m, 1H), 7.20 – 7.17 (m, 2H), 7.15 – 7.05 (m, 1H),

5.74 – 5.64 (m, 1H), 5.04 – 4.96 (m, 2H), 4.57 – 4.43 (m, 2H), 3.66 – 3.59 (m, 1H), 3.39 – 3.32 (m, 1H), 2.22 (q, *J* = 7.2 Hz, 2H), 1.39 & 1.14 (s, 9H) ppm; $^{13}C\{^{1}H\}$ NMR (100 MHz, Chloroform-d) δ 169.6, 154.7, 140.0, 139.8, 138.6, 136.8, 135.5, 130.3, 128.8, 128.7, 128.6, 128.5, 128.2, 127.7, 127.4, 127.1, 116.5, 79.7, 53.3, 49.2, 32.7, 28.2 ppm; IR (thin film): 3061, 2976, 2929, 1697, 1624, 1490, 1390, 1365, 1313, 1151, 769, 696 cm^{-1}; HRMS calc'd for $C_{29}H_{33}N_2O^+$ 441.2540, found 441.2537 $[M+H]^+$.

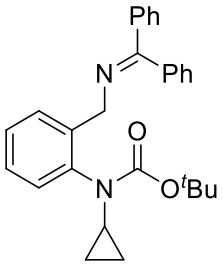
***tert*-Butyl benzyl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1c)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (605.5 mg, 5.0 mmol) and benzylamine (1071.5 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1c** (929.4 mg, 39%) as a white solid.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.70 – 7.68 (m, 2H), 7.65 – 7.47 (m, 1H), 7.46 – 7.42 (m, 3H), 7.41 – 7.38 (m, 1H), 7.36 – 7.32 (m, 2H), 7.27 – 7.21 (m, 4H), 7.20 – 7.18 (m, 2H), 7.16 – 7.09 (m, 3H), 6.94 – 6.71 (m, 1H), 4.98 – 4.87 (m, 1H), 4.44 – 4.33 (m, 2H), 4.33 – 4.18 (m, 1H), 1.37 & 1.16 (s, 9H) ppm; $^{13}C\{^{1}H\}$ NMR (100 MHz, Chloroform-d) δ 169.5, 155.1, 139.8, 138.5, 136.8, 130.2, 128.8, 128.6, 128.4, 128.2, 127.7, 127.5, 127.4, 126.9, 79.9, 53.5, 53.4, 28.2 ppm; IR (thin film): 3060, 2975, 2928, 1695, 1490, 1389, 1293, 1167, 1016, 767, 697cm^{-1}; HRMS calc'd for $C_{32}H_{33}N_2O_2^+$ 477.2536, found 477.2537 $[M+H]^+$.

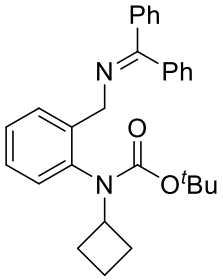
***tert*-Butyl cyclopropyl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1d)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (605.5 mg, 5.0 mmol) and aminocyclopropane (570.9 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1d** (874.4 mg, 41%) as a pale yellow oil.

R_f = 0.21 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.71 – 7.69 (m, 2H), 7.55 – 7.52 (m, 1H), 7.47 – 7.37 (m, 4H), 7.36 – 7.32 (m, 2H), 7.29 – 7.25 (m, 1H), 7.22 (td, *J* = 7.6, 2.0 Hz, 1H), 7.18 – 7.16 (m, 2H), 7.01 – 7.00 (m, 1H), 4.49 – 4.39 (m, 2H), 2.90 – 2.88 (m, 1H), 1.22 (s, 9H), 0.64 – 0.54 (m, 2H), 0.40 – 0.29 (m, 2H) ppm; $^{13}C\{^{1}H\}$ NMR (100 MHz, Chloroform-d) δ 169.4, 155.7, 139.8, 138.5, 136.8, 130.2, 128.8, 128.63, 128.58, 128.2, 128.1, 127.7, 127.1, 127.0, 80.0, 53.4, 31.0, 28.3, 8.1, 7.0 ppm; IR (thin film): 3058, 2975, 2929, 1703, 1490, 1365, 1342, 1165, 1073, 769, 696 cm^{-1}; HRMS calc'd for $C_{28}H_{31}N_2O_2^+$ 427.2381, found 427.2380 $[M+H]^+$.

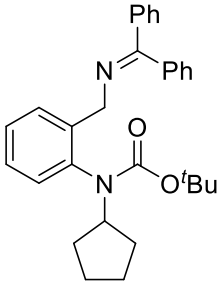
***tert*-Butyl cyclobutyl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1e)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (605.5 mg, 5.0 mmol) and cyclobutylamine (711.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1e** (837.1 mg, 38%) as a white solid.

R_f = 0.33 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.73 – 7.70 (m, 2H), 7.63 – 7.50 (m, 1H), 7.46 – 7.30 (m, 7H), 7.26 – 7.22 (m, 1H), 7.19 – 7.17 (m, 2H), 6.99 – 6.95 (m, 1H), 4.56 – 4.42 (m, 3H), 2.02 – 2.00 (m, 1H), 1.91 – 1.79 (m, 2H), 1.66 – 1.56 (m, 1H), 1.53 – 1.13 (m, 11H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.7, 154.3, 139.9, 136.8, 130.2, 129.3, 128.8, 128.64, 128.61, 128.3, 128.2, 127.7, 127.5, 126.7, 79.6, 53.4, 51.8, 29.2, 28.7, 28.2, 15.0 ppm; IR (thin film): 3059, 2976, 1696, 1365, 1328, 1288, 1166, 1046, 768, 696 cm^{-1}; HRMS calc'd for $C_{29}H_{33}N_2O_2^+$ 441.2541, found 441.2537 $[M+H]^+$.

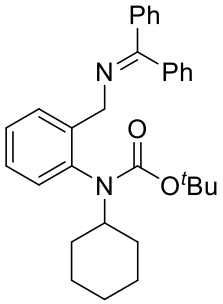
***tert*-Butyl cyclopentyl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1f)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (605.5 mg, 5.0 mmol) and cyclopentylamine (851.5 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1f** (818.2 mg, 36%) as a white solid.

R_f = 0.33 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.76 – 7.68 (m, 2H), 7.65 – 7.49 (m, 1H), 7.46 – 7.27 (m, 7H), 7.24 – 7.15 (m, 3H), 7.00 (d, J = 7.8 Hz, 1H), 4.50 (q, J = 16.9 Hz, 2H), 4.36 – 4.05 (m, 1H), 1.96 – 1.83 (m, 1H), 1.67 – 1.33 (m, 7H), 1.21 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.5, 154.7, 139.8, 139.7, 136.8, 130.2, 129.1, 128.8, 128.64, 128.59, 128.2, 128.1, 127.6, 127.4, 127.3, 126.7, 79.5, 59.6, 53.3, 31.2, 29.0, 28.3, 23.2, 23.1 ppm; IR (thin film): 3059, 2967, 2870, 1693, 1365, 1313, 1165, 768, 696 cm^{-1}; HRMS calc'd for $C_{30}H_{35}N_2O_2^+$ 455.2696, found 455.2693 $[M+H]^+$.

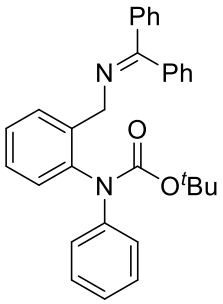
***tert*-Butyl cyclohexyl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1g)**



The synthesis was performed following the **GP1** with 2-fluorobenzonitrile (605.5 mg, 5.0 mmol) and cyclohexylamine (991.7 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1g** (866.9 mg, 37%) as a white solid.

R_f = 0.35 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.72 (d, *J* = 6.8 Hz, 2H), 7.59 – 7.48 (m, 1H), 7.46 – 7.35 (m, 5H), 7.35 – 7.28 (m, 2H), 7.22 – 7.17 (m, 3H), 7.02 (d, *J* = 8.0 Hz, 1H), 4.60 (d, *J* = 16.8 Hz, 1H), 4.45 (d, *J* = 16.8 Hz, 1H), 3.89 (s, 1H), 2.04 – 2.00 (m, 1H), 1.75 – 1.69 (m, 1H), 1.62 – 1.57 (m, 1H), 1.54 – 1.50 (m, 2H), 1.41 – 1.20 (m, 3H), 1.13 (s, 9H), 0.99 – 0.88 (m, 2H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.6, 154.4, 139.9, 136.9, 130.2, 129.0, 128.8, 128.7, 128.6, 128.2, 127.7, 127.4, 126.5, 79.5, 57.6, 53.4, 32.8, 30.7, 28.3, 26.2, 26.1, 25.6 ppm; IR (thin film): 2933, 1693, 1628, 1451, 1374, 1316, 1179, 1014, 772, 690 cm^{-1}; HRMS calc'd for $C_{31}H_{37}N_2O_2^+$ 469.2853, found 469.2850 $[M+H]^+$.

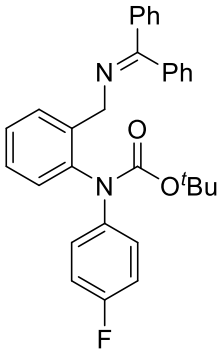
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(phenyl)carbamate (1h)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and aniline (1.02 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1h** (971.4 mg, 21%) as a white solid.

R_f = 0.33 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.62 – 7.59 (m, 2H), 7.54 (d, *J* = 7.6, 1H), 7.36 – 7.29 (m, 4H), 7.28 – 7.23 (m, 3H), 7.20 – 7.15 (m, 1H), 7.11 – 7.02 (m, 7H), 6.97 – 6.92 (m, 1H), 4.41 (d, *J* = 14.8 Hz, 2H), 1.19 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.6, 153.6, 142.3, 140.1, 139.8, 138.7, 136.7, 130.2, 129.1, 128.8, 128.7, 128.6, 128.5, 128.2, 127.62, 127.58, 127.3, 125.0, 124.6, 81.0, 53.4, 28.2 ppm; IR (thin film): 3060, 2977, 1708, 1624, 1492, 1339, 1314, 1162, 766, 694 cm^{-1}; HRMS calc'd for $C_{31}H_{31}N_2O_2^+$ 463.2385, found 463.2380 $[M+H]^+$.

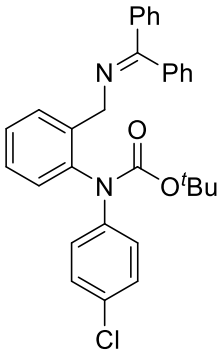
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(4-fluorophenyl)carbamate (1i)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and 4-fluoroaniline (1.22 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1i** (1.49 g, 31%) as a white solid.

R_f = 0.33 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.74 – 7.72 (m, 2H), 7.65 (d, *J* = 7.6 Hz, 1H), 7.46 – 7.42 (m, 4H), 7.40 – 7.35 (m, 3H), 7.32 – 7.29 (m, 1H), 7.19 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.17 – 7.11 (m, 4H), 6.89 (t, *J* = 8.8 Hz, 2H), 4.52 (d, *J* = 29.2 Hz, 2H), 1.33 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ169.7, 159.6 (d, $J_{C\text{-}F}$ = 242.8 Hz) 153.6, 140.0, 139.7,138.4, 138.3 (d, $J_{C\text{-}F}$ = 3.0 Hz), 136.6, 130.3, 128.94, 128.86, 128.8, 128.6, 128.2, 127.7, 127.5, 127.4, 126.6 (d, $J_{C\text{-}F}$ = 8.0 Hz), 115.1 (d, $J_{C\text{-}F}$ = 22.6 Hz), 81.1, 53.5, 28.1 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –118.0 ppm; IR (thin film): 3059, 2977, 1709, 1507, 1330, 1230, 1155, 1055, 801, 697 cm^{-1}; HRMS calc'd for $C_{31}H_{30}FN_2O_2^+$ 481.2284, found 481.2286 $[M+H]^+$.

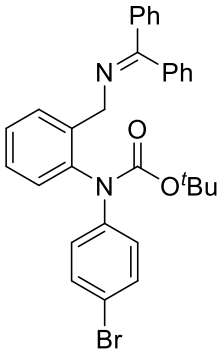
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(4-chlorophenyl)carbamate (1j)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and 4-chloroaniline (1.40 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1j** (2.29 g, 46%) as a white solid.

R_f = 0.35 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.67 – 7.64 (m, 2H), 7.59 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.41 – 7.37 (m, 4H), 7.35 – 7.31 (m, 3H), 7.39 – 7.24 (m, 1H), 7.14 – 7.09 (m, 2H), 7.09 – 7.03 (m, 5H), 4.49 (d, *J* = 16.8 Hz, 1H), 4.36 (d, *J* = 16.8 Hz, 1H), 1.27 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.8, 153.3, 140.9, 139.7, 139.7, 138.5, 136.6, 130.3, 129.7, 129.1, 128.9, 128.8, 128.6, 128.5, 128.2, 127.9, 127.5, 127.5, 125.9, 81.3, 53.5, 28.2 ppm; IR (thin film): 3059, 2976, 1709, 1623, 1490, 1367, 1323, 1159, 767, 696 cm^{-1}; HRMS calc'd for $C_{31}H_{30}ClN_2O_2^+$ 497.1991, found 497.1990 $[M+H]^+$.

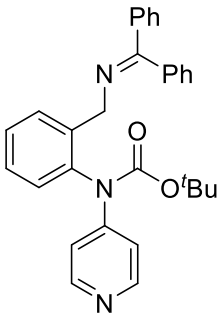
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl) (4-bromophenyl)carbamate (1k)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and 4-bromoaniline (1.89 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1k** (1.73 g, 32%) as a white solid.

R_f = 0.36 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.72 – 7.70 (m, 2H), 7.66 – 7.64 (m, 1H), 7.46 – 7.44 (m, 3H), 7.43 – 7.36 (m, 4H), 7.34 – 7.29 (m, 3H), 7.18 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.14 – 7.12 (m, 2H), 7.07 – 7.04 (m, 2H), 4.55 (d, *J* = 16.4 Hz, 1H), 4.41 (d, *J* = 16.0 Hz, 1H), 1.33 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.7, 153.2, 141.4, 139.6, 138.5, 136.5, 131.4, 130.3, 129.0, 128.9, 128.7, 128.6, 128.2, 127.9, 127.5, 126.1, 117.5, 81.3, 53.4, 28.1 ppm; IR (thin film): 3059, 2977, 1712, 1624, 1488, 1391, 1367, 1162, 829, 767, 697 cm^{-1}; HRMS calc'd for $C_{31}H_{30}BrN_2O_2^+$ 541.1481, found 541.1485 $[M+H]^+$.

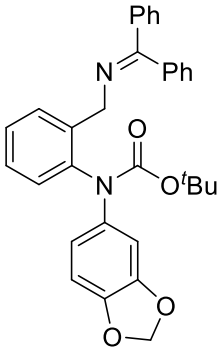
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(pyridin-4-yl)carbamate (1l)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and 4-aminopyridine (1.04 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 2:1) to give the product **1l** (1.48 g, 32%) as a brown solid.

R_f = 0.32 (petroleum ether:ethyl acetate = 1:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 8.32 – 8.30 (m, 2H), 7.64 – 7.59 (m, 3H), 7.43 – 7.29 (m, 8H), 7.10 – 7.08 (m, 3H), 7.06 – 7.02 (m, 2H), 4.44 (d, *J* = 16.8 Hz, 1H), 4.34 (d, *J* = 16.4 Hz, 1H), 1.26 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.8, 152.5, 150.0, 149.2, 139.4, 138.7, 138.2, 136.3, 130.3, 129.3, 129.0, 128.7, 128.63, 128.56, 128.5, 128.1, 127.9, 127.4, 116.0, 82.1, 53.2, 27.9 ppm; IR (thin film): 3027, 2976, 1719, 1590, 1490, 1314, 1282, 1155, 1056, 821, 697 cm^{-1}; HRMS calc'd for $C_{30}H_{30}N_3O_2^+$ 464.2337, found 464.2333 $[M+H]^+$.

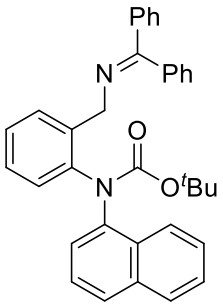
***tert*-Butyl benzo[*d*][1,3]dioxol-5-yl(2-(((diphenylmethylene)amino)methyl)phenyl)carbamate (1m)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and benzo[*d*][1,3]dioxol-5-amine (1.03 mg, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1m** (911.8 mg, 18%) as a pale yellow oil.

R_f = 0.2 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.70 – 7.67 (m, 2H), 7.59 (d, *J* = 7.6 Hz, 1H), 7.45 – 7.38 (m, 4H), 7.36 – 7.28 (m, 3H), 7.26 – 7.22 (m, 1H), 7.15 – 7.12 (m, 3H), 6.71 (d, *J* = 2.0 Hz, 1H), 6.58 (d, *J* = 8.4 Hz, 1H), 6.51 (dd, *J* = 8.4, 2.0 Hz, 1H), 5.89 (s, 2H), 4.48 (d, *J* = 14.0 Hz, 2H), 1.27 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.6, 153.8, 147.4, 144.8, 140.4, 139.8, 138.4, 136.7, 136.5, 130.3, 128.80, 128.76, 128.7, 128.6, 128.2, 127.6, 127.5, 127.3, 118.8, 107.7, 107.4, 101.3, 81.0, 53.5, 28.2 ppm; IR (thin film): 2975, 2892, 1706, 1487, 1366, 1323, 1240, 1164, 1038, 935, 768, 697 cm^{-1}; HRMS calc'd for $C_{32}H_{31}N_2O_4^+$ 507.2278, found 507.2278 $[M+H]^+$.

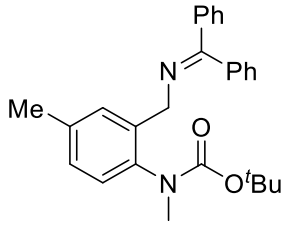
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)phenyl)(naphthalen-1-yl)carbamate (1n)**



The synthesis was performed following the **GP2** with 2-fluorobenzonitrile (1.21 g, 10 mmol) and 1-aminonaphthalene (1.58 g, 11.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **1n** (1.03 g, 20%) as a white solid.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.91 – 7.85 (m, 1H), 7.77 (d, *J* = 7.6 Hz, 2H), 7.72 (d, *J* = 8.4 Hz, 2H), 7.63 – 7.50 (m, 3H), 7.48 – 7.37 (m, 6H), 7.34 – 7.27 (m, 3H), 7.20 – 7.15 (m, 4H), 4.87 – 4.76 (m, 2H), 1.30 & 1.22 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ δ 169.3, 153.9, 141.3, 139.9, 137.9, 136.8, 134.4, 130.2, 128.8, 128.7, 128.6, 128.5, 128.4, 128.2, 127.7, 127.2, 127.0, 125.9, 125.7, 123.8, 80.9, 53.8, 28.1 ppm; IR (thin film): 3058, 2976, 1706, 1624, 1597, 1330, 1163, 1103, 1022, 772, 698 cm^{-1}; HRMS calc'd for $C_{35}H_{33}N_2O_2^+$ 513.2536, found 513.2537 $[M+H]^+$.

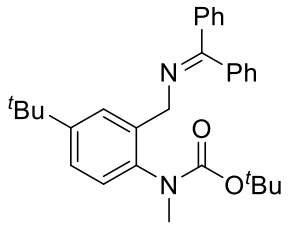
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-methylphenyl)(methyl)carbamate (3a)：**



The synthesis was performed following the **GP1** with 2-fluoro-5-methylbenzonitrile (675.7 mg, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3a** (1.64 g, 79%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.75 – 7.73 (m, 2H), 7.51 – 7.48 (m, 1H), 7.48 – 7.43 (m, 2H), 7.43 – 7.36 (m, 3H), 7.28 – 7.27 (m, 1H), 7.24 – 7.21 (m, 2H), 7.08 – 6.98 (m, 2H), 4.57 – 4.44 (m, 2H), 3.08 (s, 3H), 2.39 (s, 3H), 1.43 & 1.19 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.5, 155.1, 139.7, 139.0, 137.6, 136.9, 136.7, 130.2, 129.1, 128.8, 128.6, 128.2, 128.0, 127.6, 126.7, 79.5, 53.5, 37.3, 28.2, 21.4 ppm; IR (thin film): 3056, 2976, 2929, 1698, 1623, 1502, 1446, 1366, 1304, 1152, 770, 697 cm^{-1}; HRMS calc'd for $C_{27}H_{31}N_2O_2^+$ 415.2382, found 415.2380 $[M+H]^+$.

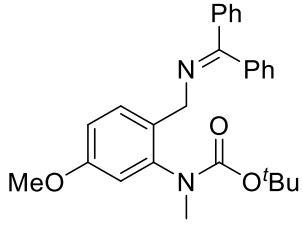
***tert*-Butyl (4-(*tert*-butyl)-2-(((diphenylmethylene)amino)methyl)phenyl)(methyl)carbamate (3b)**



The synthesis was performed following the **GP3** with 5-(*tert*-butyl)-2-(methylamino)benzonitrile (414.2 mg, 2.2 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3b** (833.7 mg, 83%) as a pale yellow oil.

R_f = 0.36 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.73 (d, J = 7.2 Hz, 2H), 7.61 – 7.45 (m, 4H), 7.43 – 7.36 (m, 3H), 7.32 – 7.23 (m, 3H), 7.13 – 7.01 (m, 1H), 4.61 – 4.46 (m, 2H), 3.12 (d, J = 10.0 Hz, 3H), 1.44 & 1.19 (s, 9H), 1.37 (s, 9H) ppm;^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.4, 155.2, 149.9, 139.8, 139.0, 137.1, 136.8, 130.2, 128.8, 128.6, 128.2, 127.7, 126.4, 125.6, 124.3, 79.5, 53.8, 37.4, 34.7, 31.5, 28.2 ppm; IR (thin film): 3058, 2965, 1699, 1624, 1504, 1365, 1154, 1119, 769, 696, 646 cm^{-1}; HRMS calc'd for $C_{30}H_{37}N_2O_2^+$ 457.2848, found 457.2850 $[M+H]^+$.

***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-5-methoxyphenyl)(methyl)carbamate (3c)**

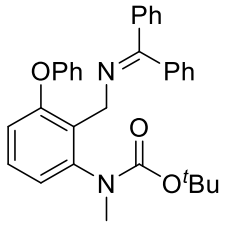


The synthesis was performed following the **GP1** with 2-fluoro-4-methoxybenzonitrile (755.7 mg, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 7:1) to give the product **3c** (1.53 g, 71%) as a pale yellow oil.

R_f = 0.35 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.59 (d, J = 7.6 Hz, 2H), 7.39 – 7.32 (m,

3H), 7.30 (d, J = 6.8 Hz, 1H), 7.27 – 7.20 (m, 3H), 7.10 (d, J = 7.2 Hz, 2H), 6.75 (dd, J = 8.4, 2.8 Hz, 1H), 6.63 – 6.55 (m, 1H), 4.41 – 4.29 (m, 2H), 3.70 (s, 3H), 2.98 (s, 3H), 1.31 & 1.07 (s, 9H) ppm; $^{13}C\{^1H\}$ NMR (100 MHz, Chloroform-d) δ 169.4, 158.8, 154.9, 142.4, 139.7, 136.7, 130.3, 130.2, 129.3, 128.8, 128.6, 128.1, 127.6, 112.7, 112.5, 79.7, 55.4, 53.0, 37.2, 28.1 ppm; IR (thin film): 3057, 2975, 2835, 1698, 1612, 1578, 1502, 1445, 1365, 1152, 1083, 1037, 769, 698, 641 cm^{-1}; HRMS calc'd for $C_{27}H_{31}N_2O_3^+$ 431.2328, found 431.2329 $[M+H]^+$.

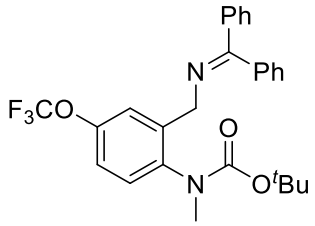
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-3-phenoxyphenyl)(methyl)carbamate (3d)**



The synthesis was performed following the **GP1** with 2-fluoro-6-phenoxybenzonitrile (1.07 g, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 7:1) to give the product **3d** (1.63 g, 66%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 5:1); ^1H NMR (400 MHz, Chloroform-d) δ 7.59 (d, J = 7.2 Hz, 2H), 7.47 – 7.42 (m, 3H), 7.38 – 7.35 (m, 1H), 7.32 – 7.26 (m, 5H), 7.16 (d, J = 6.8 Hz, 2H), 7.10 – 7.02 (m, 2H), 7.00 – 6.88 (m, 3H), 4.77 – 4.59 (m, 1H), 4.89 – 4.43 (m, 1H), 3.37 – 3.33 (m, 3H), 1.55 & 1.29 (s, 9H) ppm; $^{13}C\{^1H\}$ NMR (100 MHz, Chloroform-d) δ 168.2, 158.2, 155.6, 154.8, 144.6, 139.7, 136.8, 131.1, 129.7, 129.5, 128.5, 128.4, 128.2, 127.8, 127.7, 123.2, 122.5, 119.2, 117.7, 79.7, 49.1, 37.8, 28.1 ppm; IR (thin film): 3059, 2975, 2930, 1699, 1599, 1578, 1490, 1460, 1366, 1243, 1153, 1028, 770, 695 cm^{-1}; HRMS calc'd for $C_{32}H_{33}N_2O_3^+$ 493.2483, found 493.2486 $[M+H]^+$.

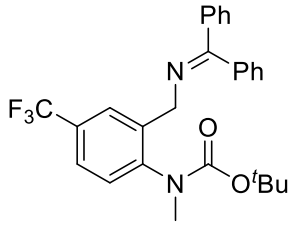
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-(trifluoromethoxy)phenyl)(methyl)carbamate (3e)**



The synthesis was performed following the **GP1** with 2-fluoro-5-(trifluoromethoxy)benzonitrile (1.03 g, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3e** (896.3 mg, 37%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^1H NMR (400 MHz, Chloroform-d) δ 7.73 (d, J = 7.2, 1.5 Hz, 2H), 7.62 – 7.46 (m, 3H), 7.46 – 7.38 (m, 4H), 7.22 – 7.13 (m, 4H), 4.52 (q, J = 16.8 Hz, 2H), 3.09 (s, 3H), 1.42 & 1.18 (s, 9H) ppm; $^{13}C\{^1H\}$ NMR (100 MHz, Chloroform-d) δ 170.5, 154.6, 148.1, 140.5, 139.9, 139.4, 136.5, 130.5, 128.9, 128.8, 128.6, 128.3, 127.6, 127.5, 121.0, 120.6 (q, $J_{C\text{-}F}$= 255.8 Hz), 119.5, 80.1, 52.9, 37.1, 28.1 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ -57.7 ppm; IR (thin film): 3060, 2977, 2932, 1703, 1625, 1497, 1367, 1258, 1219, 1153, 1088, 868, 769, 696 cm^{-1};HRMS calc'd for $C_{27}H_{28}F_3N_2O_3^+$ 485.2046, found 485.2047 $[M+H]^+$.

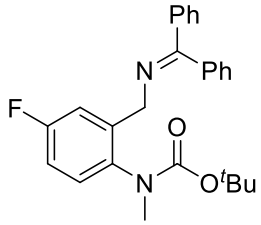
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-(trifluoromethyl)phenyl)(methyl)carbamate (3f)**



The synthesis was performed following the **GP1** with 3-cyano-4-fluorobenzotrifluoride (945.5 mg, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3f** (1.01 g, 43%) as a pale yellow oil.

R_f = 0.28 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.96 – 7.81 (m, 1H), 7.72 – 7.70 (m, 2H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.52 – 7.46 (m, 3H), 7.45 – 7.43 (m, 1H), 7.39 (t, *J* = 7.8 Hz, 2H), 7.33 – 7.23 (m, 1H), 7.22 – 7.20 (m, 2H), 4.53 (q, *J* = 17.2 Hz, 2H), 3.10 (s, 3H), 1.41 & 1.17 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 170.5, 154.4, 144.7, 139.4, 136.6, 130.5, 129.6, 129.3, 129.0, 128.9, 128.7, 128.3, 127.6, 127.5, 125.9, 124.6, 124.2 (q, $J_{C\text{-}F}$ = 270.4 Hz), 80.5, 53.0, 37.1, 28.2 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ -62.2 ppm; IR (thin film): 3060, 2977, 2932, 1704, 1616, 1367, 1329, 1162, 1126, 1096, 769, 696 cm^{-1}; HRMS calc'd for $C_{27}H_{28}F_3N_2O_2^+$ 469.2099, found 469.2097 $[M+H]^+$.

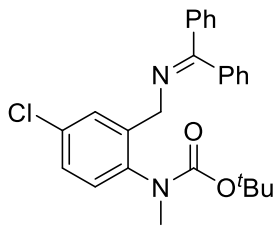
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-fluorophenyl)(methyl)carbamate (3g)**



The synthesis was performed following the **GP1** with 2,5-difluorobenzonitrile (695.5 mg, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3g** (962.5 mg, 46%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.74 (d, *J* = 7.6 Hz, 2H), 7.51 – 7.42 (m, 4H), 7.39 (t, *J* = 7.2 Hz, 2H), 7.33 – 7.24 (m, 1H), 7.22 – 7.19 (m, 2H), 7.14 – 7.05 (m, 1H), 6.97 – 6.93 (m, 1H), 4.50 (q, *J* = 16.8 Hz, 2H), 3.06 (d, *J* = 1.3 Hz, 3H), 1.41 & 1.18 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 170.3, 161.6 (d, $J_{C\text{-}F}$ = 243.9 Hz), 154.9, 140.7 (d, $J_{C\text{-}F}$ = 7.8 Hz), 139.4, 137.3, 136.5, 130.4, 128.9, 128.8, 128.6, 128.4 (d, $J_{C\text{-}F}$ = 8.7 Hz), 128.2, 127.5, 127.3, 115.2 (d, $J_{C\text{-}F}$ = 23.3 Hz), 114.0 (d, $J_{C\text{-}F}$ = 22.3 Hz), 79.9, 52.9, 37.1, 28.1 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –114.6 ppm; IR (thin film): 3059, 2976, 2930, 1700, 1625, 1495, 1366, 1289, 1152, 1115, 770, 697 cm^{-1}; HRMS calc'd for $C_{26}H_{28}FN_2O_2^+$ 419.2132, found 419.2129 $[M+H]^+$.

***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-chlorophenyl)(methyl)carbamate (3h)**

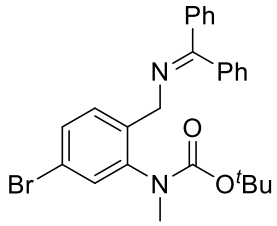


The synthesis was performed following the **GP1** with 5-chloro-2-fluorobenzonitirle (777.8 mg, 5.0 mmol) and methylamine

hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3h** (1.11 g, 51%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.73 (d, *J* = 7.6 Hz, 2H), 7.52 – 7.45 (m, 4H), 7.40 (q, *J* = 8.0 Hz, 3H), 7.25 – 7.20 (m, 3H), 7.13 – 7.03 (m, 1H), 4.48 (q, *J* = 16. Hz, 2H), 3.06 (s, 3H), 1.41 & 1.17 (m,9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 170.3, 154.7, 140.2, 140.0, 139.4, 136.5, 132.9, 130.5, 128.9, 128.8, 128.6, 128.3, 127.5, 80.1, 53.0, 37.1, 28.1 ppm; IR (thin film): 3058, 2976, 2930, 1701, 1488, 1366, 1152, 1101, 769, 696 cm^{-1}; HRMS calc'd for $C_{26}H_{28}ClN_2O_2^+$ 435.1838, found 435.1834 $[M+H]^+$.

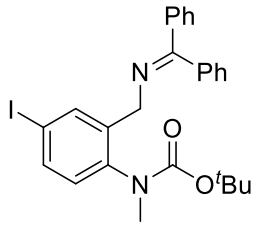
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-5-bromophenyl)(methyl)carbamate (3i)**



The synthesis was performed following the **GP1** with 4-bromo-2-fluorobenzonitrile (1.00 g, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3i** (1.29 g, 54%) as a pale yellow oil.

R_f = 0.31 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.60 (d, *J* = 7.2 Hz, 2H), 7.41 – 7.32 (m, 5H), 7.31 – 7.24 (m, 3H), 7.16 (s, 1H), 7.10 – 7.08 (m, 2H), 4.35 (q, *J* = 16.4 Hz, 2H), 2.97 (s, 3H), 1.31 & 1.07 (m, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 170.2, 154.5, 142.7, 139.5, 137.5, 136.6, 130.5, 130.1, 128.9, 128.8, 128.6, 128.3, 127.6, 120.1, 80.3, 52.9, 37.2, 28.2 ppm; IR (thin film): 3058, 2975, 2929, 1702, 1624, 1406, 1355, 1293, 1153, 866, 769, 697 cm^{-1}; HRMS calc'd for $C_{26}H_{28}BrN_2O_2^+$ 479.1332, found 479.1329 $[M+H]^+$.

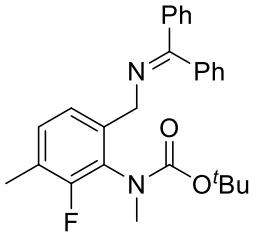
***tert*-Butyl (2-(((diphenylmethylene)amino)methyl)-4-iodophenyl)(methyl)carbamate (3j)**



The synthesis was performed following the **GP1** with 2-fluoro-5-iodobenzonitrile (1.24 g, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3j** (1.18 g, 45%) as a pale yellow oil.

R_f = 0.23 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.87 – 7.72 (m, 1H), 7.61 (d, *J* = 6.8 Hz, 2H), 7.48 (d, *J* = 7.2 Hz, 1H), 7.40 – 7.31 (m, 4H), 7.27 (t, *J* = 7.6 Hz, 2H), 7.10 – 7.08 (m, 2H), 6.82 – 6.72 (m, 1H), 4.40 – 4.28 (m, 2H), 2.95 (s, 3H), 1.29 & 1.06 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 170.2, 154.5, 141.4, 140.6, 139.4, 137.6, 136.6, 136.5, 130.4, 128.9, 128.8, 128.6, 128.2, 127.5, 92.7, 80.1, 52.8, 37.1, 28.1 ppm; IR (thin film): 3058, 2975, 1700, 1623, 1482, 1365, 1290, 1153, 1091, 851, 769, 696 cm^{-1}; HRMS calc'd for $C_{26}H_{28}IN_2O_2^+$ 527.1191, found 527.1190 $[M+H]^+$.

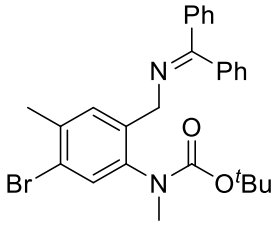
***tert*-Butyl (6-(((diphenylmethylene)amino)methyl)-2-fluoro-3-methylphenyl)(methyl)carbamate (3k)**



The synthesis was performed following the **GP1** with 2,3-difluoro-4-methyl-benzonitrile (765.7 mg, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 8:1) to give the product **3k** (1.02 g, 47%) as a pale yellow oil.

R_f = 0.35 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.73 – 7.69 (m, 2H), 7.51 – 7.44 (m, 3H), 7.44 – 7.33 (m, 3H), 7.23 – 7.19 (m, 2H), 7.19 – 7.10 (m, 2H), 4.56 – 4.44 (m, 2H), 3.08 – 3.05 (m, 3H), 2.30 – 2.29 (m, 3H), 1.45 & 1.21 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.7, 156.9 (d, $J_{C\text{-}F}$ = 245.1 Hz), 155.0, 139.6, 137.7, 136.6, 130.3, 129.8 (d, $J_{C\text{-}F}$ = 5.9 Hz), 128.8, 128.7, 128.6, 128.2, 128.0 (d, $J_{C\text{-}F}$ = 34 Hz), 127.6, 123.7, 123.6, 123.0 (d, $J_{C\text{-}F}$ = 3.9 Hz), 79.9, 53.2 (d, $J_{C\text{-}F}$ = 2.9 Hz), 36.1 (d, $J_{C\text{-}F}$ = 1.7 Hz), 28.1, 14.5 (d, $J_{C\text{-}F}$ = 4.3 Hz) ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ -127.6 ppm; IR (thin film): 3058, 2976, 2928, 1704, 1624, 1473, 1445, 1365, 1154, 771, 697 cm^{-1}; HRMS calc'd for $C_{27}H_{30}FN_2O_2^+$ 433.2282, found 433.2286 $[M+H]^+$.

***tert*-Butyl (5-bromo-2-(((diphenylmethylene)amino)methyl)-4-methylphenyl)(methyl)carbamate (3l)**



The synthesis was performed following the **GP1** with 4-bromo-2-fluoro-5-methylbenzonitrile (1.07 g, 5.0 mmol) and methylamine hydrochloride (675.2 mg, 10.0 mmol). The crude product was purified by flash chromatography on deactivated silica gel (eluted with petroleum ether:ethyl acetate = 10:1) to give the product **3l** (1.01 g, 41%) as a pale yellow oil.

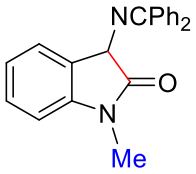
R_f = 0.21 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-d) δ 7.72 (d, J = 7.2 Hz, 2H), 7.51 – 7.45 (m, 3H), 7.45 – 7.40 (m, 2H), 7.39 – 7.30 (m, 3H), 7.22 – 7.20 (m, 2H), 4.44 (q, J = 16.4 Hz, 2H), 3.07 (s, 3H), 2.43 (s, 3H), 1.42 & 1.19 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 169.9, 154.6, 140.2, 139.5, 137.3, 136.8, 136.5, 130.54, 130.48, 130.3, 128.82, 128.67, 128.6, 128.2, 127.5, 122.3, 80.0, 53.0, 37.3, 28.1, 22.7 ppm; IR (thin film): 2976, 2928, 1704, 1624, 1473, 1391, 1313, 1251, 1154, 771, 697 cm^{-1}; HRMS calc'd for $C_{27}H_{30}BrN_2O_2^+$ 493.1481, found 493.1485 $[M+H]^+$.

Procedure and characterization for the Synthesis of oxindoles from *N*-aryl amines

General Procedure 4 (GP4):

An oven-dried 8 mL reaction vial equipped with a stir bar was charged with *N*-aryl amine **1** or **3** (0.1 mmol) under a nitrogen atmosphere in a glove box. A solution of $LiN(SiMe_3)_2$ (0.3 mmol) in 0.5 mL dry DME was added by a "Titan" brand 1000 µL pipettor to the reaction vial. The vial was sealed with a cap, removed from the glove box, and stirred for 1 h at room temperature. The reaction mixture was opened to air, quenched with three drops of H_2O, diluted with 3 mL of ethyl acetate, and filtered over a 2 cm pad of $MgSO_4$ and deactivated silica and the filtrate was concentrated *in vacuo*. The crude material was purified by recrystallization to give product **2** or **4**.

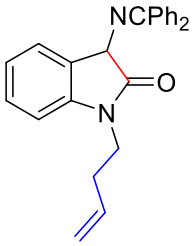
3-((Diphenylmethylene)amino)-1-methylindolin-2-one (2a)



The reaction was performed following the General **GP4** with *N*-aryl amine **1a** (200.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2a** (150.1 mg, 92% yield) as a white solid.

m.p. = 169 – 171 ºC, R_f = 0.23 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.63 (m, 2H), 7.57 – 7.54 (m, 2H), 7.52 – 7.43 (m, 3H), 7.40 – 7.36 (m, 1H), 7.33 – 7.27 (m, 3H), 7.12 – 7.09 (m, 1H), 7.03 (td, *J* = 7.6, 0.8 Hz, 1H), 6.82 (d, *J* = 7.6 Hz, 1H), 5.12 (s, 1H), 3.21 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.4, 174.1, 144.4, 139.5, 135.9, 130.7, 129.21, 129.18, 129.1, 128.8, 128.7, 128.4, 128.1, 124.6, 122.7, 108.3, 64.8, 26.5 ppm; IR (thin film): 2862, 1720, 1611, 1491, 1371, 1345, 1253, 1088, 779, 722, 692 cm^{-1}; HRMS calc'd for $C_{22}H_{19}N_2O^+$ 327.1488, found 327.1492 $[M+H]^+$.

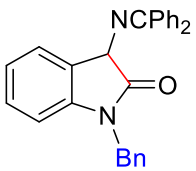
1-(But-3-en-1-yl)-3-((diphenylmethylene)amino)indolin-2-one (2b)



The reaction was performed following the General **GP4** with *N*-aryl amine **1b** (220.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2b** (178.5 mg, 98% yield) as a white solid.

m.p. = 157 – 159 ºC, R_f = 0.23 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.64 (m, 2H), 7.56 – 7.44 (m, 5H), 7.40 – 7.36 (m, 1H), 7.33 – 7.24 (m, 3H), 7.10 (d, *J* = 7.2 Hz, 1H), 7.02 (t, *J* = 7.2 Hz, 1H), 6.85 (d, *J* = 7.6 Hz, 1H), 5.88 – 5.77 (m, 1H), 5.12 – 5.04 (m, 3H), 3.89 – 3.82 (m, 1H), 3.72 – 3.64 (m, 1H), 2.49 – 2.39 (m, 2H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.3, 174.0, 143.7, 139.5, 136.0, 134.6, 130.6, 129.2, 129.1, 129.0, 128.78, 128.76, 128.6, 128.1, 124.8, 122.6, 117.5, 108.6, 64.8, 39.9, 31.9 ppm; IR (thin film): 3058, 2933, 1717, 1613, 1488, 1465, 1357, 782, 750, 696 cm^{-1}; HRMS calc'd for $C_{25}H_{23}N_2O^+$ 367.1807, found 367.1805 $[M+H]^+$.

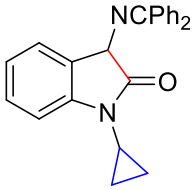
1-Benzyl-3-((diphenylmethylene)amino)indolin-2-one (2c)



The reaction was performed following the General **GP4** with *N*-aryl amine **1c** (238.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2c** (187.2 mg, 93% yield) as a pink solid.

m.p. = 189 – 191 ºC, R_f = 0.35 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.69 – 7.66 (m, 2H), 7.58 – 7.45 (m, 5H), 7.42 – 7.38 (m, 1H), 7.34 – 7.28 (m, 6H), 7.26 – 7.23 (m, 1H), 7.19 – 7.15 (m, 1H), 7.11 (d, *J* = 7.2 Hz, 1H), 7.00 (td, *J* = 7.6, 1.2 Hz, 1H), 6.72 (d, *J* = 7.6 Hz, 1H), 5.21 (s, 1H), 5.04 (d, *J* = 15.6 Hz, 1H), 4.79 (d, *J* = 15.6 Hz, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.6, 174.2, 143.6, 139.5, 136.0, 135.8, 130.7, 129.3, 129.2, 129.0, 128.9, 128.84, 128.80, 128.5, 128.2, 127.7, 127.5, 124.7, 122.8, 109.4, 64.9, 44.2 ppm; IR (thin film): 3059, 1719, 1613, 1487, 1466, 1359, 1168, 1100, 1077, 782, 750, 696 cm^{-1}; HRMS calc'd for $C_{28}H_{23}N_2O^+$ 403.1801, found 403.1805 $[M+H]^+$.

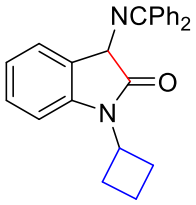
1-Cyclopropyl-3-((diphenylmethylene)amino)indolin-2-one (2d)



The reaction was performed following the General **GP4** with *N*-aryl amine **1d** (213.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2d** (162.1 mg, 92% yield) as a white solid.

m.p. = 135 – 138 ºC, R_f = 0.28 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.63 (m, 2H), 7.55 – 7.52 (m, 2H), 7.51 – 7.45 (m, 3H), 7.41 – 7.37 (m, 1H), 7.33 – 7.27 (m, 3H), 7.11 – 7.07 (m, 2H), 7.03 (td, *J* = 7.2, 0.8 Hz, 1H), 5.06 (s, 1H), 2.68 – 2.62 (m, 1H), 1.07 – 1.02 (m, 2H), 0.96 – 0.92 (m, 2H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.9, 174.1, 144.7, 139.5, 135.9, 130.5, 129.1, 129.0, 128.8, 128.7, 128.6, 128.1, 127.9, 124.4, 122.5, 109.6, 65.0, 22.3, 6.0, 5.9 ppm; IR (thin film): 2923, 1723, 1612, 1488, 1463, 1381, 1336, 1236, 1032, 807, 750, 696 cm^{-1};HRMS calc'd for $C_{24}H_{21}N_2O^+$ 353.1649, found 353.1648 $[M+H]^+$.

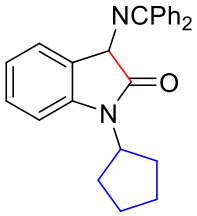
1-Cyclobutyl-3-((diphenylmethylene)amino)indolin-2-one (2e)



The reaction was performed following the General **GP4** with *N*-aryl amine **1e** (220.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2e** (179.5 mg, 98% yield) as a white solid.

m.p. = 147 – 149 ºC, R_f = 0.26 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.64 (m, 2H), 7.55 – 7.42 (m, 5H), 7.40 – 7.35 (m, 1H), 7.32 – 7.28 (m, 2H), 7.26 – 7.24 (m, 1H), 7.10 – 7.06 (m, 2H), 7.01 (td, *J* = 7.6, 1.2 Hz, 1H), 5.06 (s, 1H), 4.79 – 4.70 (m, 1H), 2.93 – 2.82 (m, 2H), 2.36 – 2.28 (m, 2H), 1.97 – 1.80 (m, 2H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.3, 174.1, 143.6, 139.6, 136.0, 130.6, 129.2, 129.1, 128.8, 128.7, 128.6, 128.1, 124.8, 122.3, 109.8, 65.0, 47.2, 27.2, 15.4 ppm; IR (thin film): 3056, 2955, 1715, 1612, 1574, 1485, 1464, 1357, 1327, 1197, 1094, 1031, 783, 749, 696 cm^{-1}; HRMS calc'd for $C_{25}H_{23}N_2O^+$ 367.1803, found 367.1805 $[M+H]^+$.

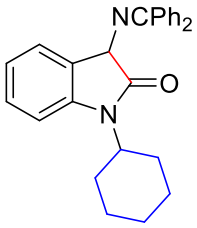
1-Cyclopentyl-3-((diphenylmethylene)amino)indolin-2-one (2f)



The reaction was performed following the General **GP4** with *N*-aryl amine **1f** (227.1 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2f** (186.4 mg, 98% yield) as a white solid.

m.p. = 162 – 165 ºC, R_f = 0.26 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.64 (m, 2H), 7.56 – 7.53 (m, 2H), 7.51 – 7.42 (m, 3H), 7.39 – 7.35 (m, 1H), 7.33 – 7.28 (m, 2H), 7.27 – 7.22 (m, 1H), 7.10 (d, *J* = 7.2 Hz, 1H), 7.00 (td, *J* = 7.6, 0.8 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 5.08 (s, 1H), 4.83 – 4.74 (m, 1H), 2.15 – 2.02 (m, 2H), 1.96 – 1.85 (m, 4H), 1.73 – 1.65 (m, 2H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.3, 174.1, 142.8, 139.6, 136.0, 130.6, 129.2, 129.1, 128.9, 128.74, 128.72, 128.6, 128.1, 124.8, 122.2, 109.9, 64.9, 52.5, 27.8, 27.5, 25.3 ppm; IR (thin film): 3056, 2957, 2871, 1713, 1611, 1597, 1484, 1465, 1358, 1328, 1228, 1153, 1027, 782, 749, 696 cm^{-1}; HRMS calc'd for $C_{26}H_{25}N_2O^+$ 381.1958, found 381.1961 $[M+H]^+$.

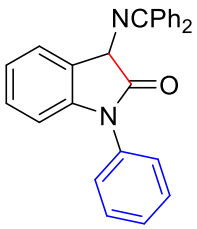
1-Cyclohexyl-3-((diphenylmethylene)amino)indolin-2-one (2g)



The reaction was performed following the General **GP4** with *N*-aryl amine **1g** (234.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2g** (191.3 mg, 97% yield) as a white solid.

m.p. = 117 – 119 ºC, R_f = 0.26 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.65 (m, 2H), 7.55 – 7.43 (m, 5H), 7.41 – 7.36 (m, 1H), 7.33 – 7.29 (m, 2H), 7.27 – 7.23 (m, 1H), 7.09 (dt, *J* = 7.2, 1.6 Hz, 1H), 7.04 – 6.98 (m, 2H), 5.06 (s, 1H), 4.15 (tt, *J* = 16, 4 Hz, 4.0 Hz, 1H), 2.21 – 2.01 (m, 2H), 1.91 – 1.68 (m, 5H), 1.46 – 1.33 (m, 2H), 1.25 (tt, *J* = 12.8, 3.2 Hz, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.1, 174.0, 143.4, 139.5, 136.0, 130.5, 129.1, 129.0, 128.8, 128.68, 128.65, 128.6, 128.0, 124.7, 122.0, 110.1, 64.8, 52.5, 29.2, 29.1, 26.0, 25.4 ppm; IR (thin film): 3056, 2933, 2855, 1713, 1611, 1596, 1483, 1465, 1358, 1343, 1220, 1197, 1028, 782, 749, 696 cm^{-1}; HRMS calc'd for $C_{27}H_{27}N_2O^+$ 395.2114, found 395.2118 $[M+H]^+$.

3-((Diphenylmethylene)amino)-1-phenylindolin-2-one (2h)

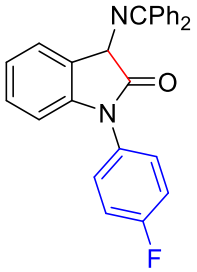


The reaction was performed following the General **GP4** with *N*-aryl amine **1h** (231.3 mg, 0.5 mmol). The crude product was

purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2h** (188.4 mg, 97% yield) as a white solid.

m.p. = 177 – 179 ºC, R_f = 0.37 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.71 – 7.68 (m, 2H), 7.57 (d, *J* = 6.4 Hz, 2H), 7.53 – 7.46 (m, 5H), 7.46 – 7.43 (m, 2H), 7.41 – 7.32 (m, 4H), 7.22 – 7.17 (m, 2H), 7.07 (td, *J* = 7.2, 0.8 Hz, 1H), 6.84 (d, *J* = 7.6 Hz, 1H), 5.31 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.5, 173.5, 144.2, 139.5, 135.9, 134.5, 130.7, 129.6, 129.21, 129.16, 128.8, 128.73, 128.71, 128.2, 128.1, 128.0, 126.4, 124.9, 123.2, 109.6, 65.0 ppm; IR (thin film): 3057, 1726, 1612, 1594, 1499, 1464, 1369, 1328, 1228, 1100, 807, 751, 694 cm^{-1}; HRMS calc'd for $C_{27}H_{21}N_2O^+$ 389.1651, found 389.1648 $[M+H]^+$.

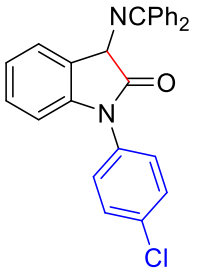
3-((Diphenylmethylene)amino)-1-(4-fluorophenyl)indolin-2-one (2i)



The reaction was performed following the General **GP4** with *N*-aryl amine **1i** (240.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2i** (180.8 mg, 89% yield) as a white solid.

m.p. = 160 – 162 ºC, R_f = 0.38 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.70 – 7.67 (m, 2H), 7.58 – 7.55 (m, 2H), 7.53 – 7.47 (m, 3H), 7.44 – 7.39 (m, 3H), 7.35 – 7.31 (m, 2H), 7.25 – 7.17 (m, 4H), 7.08 (td, *J* = 7.6, 1.2 Hz, 1H), 6.78 (d, *J* = 8.0 Hz, 1H), 5.30 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.7, 173.7, 161.9 (d, $J_{C\text{-}F}$ = 246.8 Hz), 144.1, 139.5, 135.9, 130.8, 130.5 (d, $J_{C\text{-}F}$ = 3.3 Hz), 129.3, 129.0, 128.81, 128.76, 128.5 (d, $J_{C\text{-}F}$ = 8.5 Hz), 128.23, 128.21, 125.0, 123.4, 116.7 (d, $J_{C\text{-}F}$ = 22.9 Hz), 109.4, 64.9 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –113.0 ppm; IR (thin film): 3058, 1726, 1614, 1510, 1463, 1373, 1328, 1225, 1200, 1171, 823, 734, 696 cm^{-1};HRMS calc'd for $C_{27}H_{20}FN_2O^+$ 407.1556, found 407.1554 $[M+H]^+$.

1-(4-Chlorophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2j)

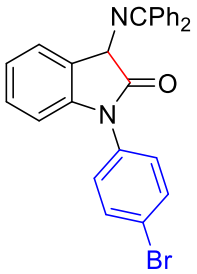


The reaction was performed following the General **GP4** with *N*-aryl amine **1j** (248.5 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2j** (207.2 mg, 98% yield) as a white solid.

m.p. = 181 – 183 ºC, R_f = 0.26 (petroleum ether:ethyl acetate = 10:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.70 – 7.67 (m, 2H), 7.57 – 7.46 (m, 7H), 7.43 – 7.38 (m, 3H), 7.36 – 7.31 (m, 2H), 7.26 – 7.21 (m, 1H), 7.20 – 7.17 (m, 1H), 7.09 (td, *J* = 7.2, 0.8 Hz, 1H), 6.82 (d, *J* = 8.0 Hz, 1H), 5.30 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) 174.8, 173.6, 143.8, 139.5,

135.9, 133.6, 133.1, 130.8, 129.9, 129.3, 129.0, 128.83, 128.77, 128.3, 128.2, 127.8, 125.1, 123.5, 109.5, 65.0 ppm; IR (thin film): 3057, 1729, 1612, 1496, 1481, 1369, 1327, 1173, 1091, 1015, 832, 782, 749, 696 cm^{-1}; HRMS calc'd for $C_{27}H_{20}ClN_2O^+$ 423.1263, found 423.1259 $[M+H]^+$.

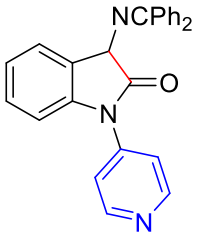
1-(4-Bromophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2k)



The reaction was performed following the General **GP4** with *N*-aryl amine **1k** (257.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2k** (212.6 mg, 91% yield) as a white solid.

m.p. = 195 – 197 ºC, R_f = 0.36 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.69 – 7.67 (m, 2H), 7.64 – 7.60 (m, 2H), 7.57 – 7.52 (m, 2H), 7.52 – 7.44 (m, 3H), 7.43 – 7.38 (m, 1H), 7.35 – 7.31 (m, 4H), 7.25 – 7.17 (m, 2H), 7.08 (td, *J* = 7.6, 1.2 Hz, 1H), 6.82 (d, *J* = 8.0 Hz, 1H), 5.30 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.7, 173.5, 143.6, 139.4, 135.9, 133.6, 132.8, 130.8, 129.3, 129.0, 128.8, 128.7, 128.3, 128.2, 128.1, 125.1, 123.5, 121.6, 109.5, 64.9 ppm; IR (thin film): 3057, 1728, 1611, 1492, 1463, 1369, 1326, 1173, 1069, 1012, 802, 724, 696 cm^{-1}; HRMS calc'd for $C_{27}H_{20}BrN_2O^+$ 467.0759, found 467.0754 $[M+H]^+$.

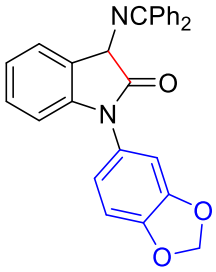
3-((Diphenylmethylene)amino)-1-(pyridin-4-yl)indolin-2-one (2l)



The reaction was performed following the General **GP4** with *N*-aryl amine **1l** (231.8 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2l** (179.1 mg, 92% yield) as a white solid.

m.p. = 179 – 181 ºC, R_f = 0.2 (petroleum ether:ethyl acetate = 1:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.77 – 8.75 (m, 2H), 7.70 – 7.67 (m, 2H), 7.57 – 7.48 (m, 7H), 7.45 – 7.41 (m, 1H), 7.37 – 7.33 (m, 2H), 7.32 – 7.30 (m, 1H), 7.22 (d, *J* = 24.4 Hz, 1H), 7.15 (td, *J* = 7.2, 0.8 Hz, 1H), 7.06 (d, *J* = 8.0 Hz, 1H), 5.33 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 175.1, 173.2, 151.4, 142.3, 142.2, 139.3, 135.8, 131.0, 129.4, 129.3, 129.1, 128.9, 128.7, 128.4, 128.3, 125.5, 124.2, 119.8, 109.9, 64.9 ppm; IR (thin film): 3059, 2959, 2924, 2854, 1735, 1611, 1503, 1464, 1369, 1315, 911, 750, 732, 702 cm^{-1}; HRMS calc'd for $C_{26}H_{20}N_3O^+$ 390.1605, found 390.1601 $[M+H]^+$.

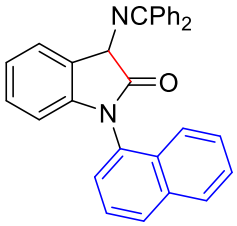
1-(Benzo[*d*][1,3]dioxol-5-yl)-3-((diphenylmethylene)amino)indolin-2-one (2m)



The reaction was performed following the General **GP4** with *N*-aryl amine **1m** (253.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2m** (196.7 mg, 91% yield) as a white solid.

m.p. = 176 – 178 ºC, R_f = 0.2 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.70 – 7.67 (m, 2H), 7.56 (d, *J* = 7.2 Hz, 2H), 7.52 – 7.46 (m, 3H), 7.43 – 7.38 (m, 1H), 7.35 – 7.31 (m, 2H), 7.24 – 7.20 (m, 1H), 7.16 (d, *J* = 7.6 Hz, 1H), 7.06 (td, *J* = 7.2, 0.8 Hz, 1H), 6.92 – 6.87 (m, 3H), 6.79 (d, *J* = 8.0 Hz, 1H), 6.02 (s, 2H), 5.28 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.6, 173.8, 148.5, 147.4, 144.6, 139.5, 135.9, 130.7, 129.3, 129.2, 129.0, 128.8, 128.19, 128.16, 124.9, 123.2, 120.4, 109.6, 108.8, 108.0, 101.8, 65.0 ppm; IR (thin film): 3057, 2892, 1725, 1611, 1503, 1491, 1447, 1240, 1036, 933, 793, 750, 696 cm^{-1}; HRMS calc'd for $C_{28}H_{21}N_2O_3^+$ 433.1545, found 433.1547 $[M+H]^+$.

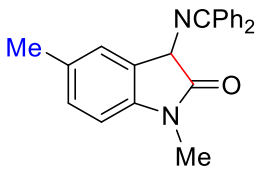
3-((Diphenylmethylene)amino)-1-(naphthalen-1-yl)indolin-2-one (2n)



The reaction was performed following the General **GP4** with *N*-aryl amine **1n** (256.4 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **2n** (208.3 mg, 95% yield) as a white solid.

m.p. = 210 – 213 ºC, R_f = 0.28 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.98 – 7.93 (m, 2H), 7.89 – 7.71 (m, 3H), 7.63 – 7.57 (m, 3H), 7.56 – 7.46 (m, 6H), 7.44 – 7.40 (m, 1H), 7.38 – 7.34 (m, 2H), 7.25 – 7.23 (m, 1H), 7.17 – 7.12 (m, 1H), 7.07 (td, *J* = 7.2, 1.2 Hz, 1H), 6.40 & 6.36 (d, *J* = 7.6 Hz, 1H), 5.41 & 5.49 (s, 1H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.5, 174.2, 145.5 (145.3), 139.5 (139.6), 136.0, 134.9 (134.8), 131.2, 130.7 (130.8), 129.9, 129.7, 129.4, 129.2, 129.1, 128.9, 128.8, 128.6, 128.4, 128.2, 127.3 (127.0), 126.8 (126.7), 126.3 (126.6), 125.8 (126.1), 125.0 (124.8), 123.5, 123.2 (122.9), 110.0 (110.2), 65.4 (65.1) ppm; IR (thin film): 3059, 2958, 2924, 1729, 1612, 1486, 1445, 1401, 1234, 1099, 800, 775, 750, 696 cm^{-1}; HRMS calc'd for $C_{31}H_{23}N_2O^+$ 439.1804, found 439.1805 $[M+H]^+$.

3-((Diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4a)

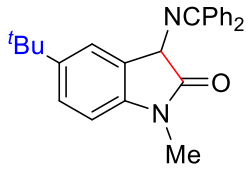


The reaction was performed following the General **GP4** with *N*-aryl amine **3a** (207.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4a** (120.8 mg, 71% yield) as a

white solid.

m.p. = 167 – 169 ºC, R_f = 0.23 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ δ 7.66 (dd, *J* = 7.2, 1.6 Hz, 2H), 7.56 (d, *J* = 7.2 Hz, 2H), 7.52 – 7.43 (m, 3H), 7.40 – 7.36 (m, 1H), 7.33 – 7.29 (m, 2H), 7.08 (d, *J* = 8.0 Hz, 1H), 6.92 (s, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 5.09 (s, 1H), 3.19 (s, 3H), 2.30 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.3, 174.0, 142.0, 139.5, 135.9, 132.3, 130.6, 129.2, 129.1, 128.8, 128.7, 128.5, 128.1, 125.5, 108.0, 64.9, 26.5, 21.2 ppm; IR (thin film): 1716, 1622, 1603, 1498, 1353, 1093, 809, 776, 753, 695, 660, 613 cm^{-1};HRMS calc'd for $C_{23}H_{21}N_2O^+$ 341.1643, found 341.1648 $[M+H]^+$.

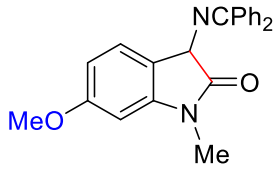
5-(*tert*-Butyl)-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4b)



The reaction was performed following the General **GP4** with *N*-aryl amine **3b** (228.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:20) to give product **4b** (139.6 mg, 73% yield) as a white solid.

m.p. = 168 – 170 ºC, R_f = 0.31 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.68 – 7.65 (m, 2H), 7.58 (d, J = 6.8 Hz, 2H), 7.53 – 7.46 (m, 3H), 7.41 – 7.37 (m, 1H), 7.34 – 7.30z (m, 3H), 7.12 (s, 1H), 6.76 (d, J = 8.0 Hz, 1H), 5.12 (s, 1H), 3.20 (s, 3H), 1.29 (s, 9H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) 174.5, 173.9, 145.9, 141.9, 139.6, 135.9, 130.6, 129.2, 129.1, 128.8, 128.6, 128.08, 128.05, 125.6, 121.7, 107.7, 65.0, 34.6, 31.6, 26.5 ppm; IR (thin film): 3059, 2961, 2904, 2868, 1717, 1620, 1498, 1367, 1317, 1276, 1112, 1077, 1029, 909, 816, 732, 699 cm^{-1}; HRMS calc'd for $C_{25}H_{27}N_2O^+$ 383.2117, found 383.2118 $[M+H]^+$.

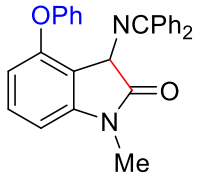
3-((Diphenylmethylene)amino)-6-methoxy-1-methylindolin-2-one (4c)



The reaction was performed following the General **GP4** with *N*-aryl amine **3c** (215.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:12) to give product **4c** (117.6 mg, 66% yield) as a white solid.

m.p. = 126 – 128 ºC, R_f = 0.25 (petroleum ether:ethyl acetate = 3:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.63 (m, 2H), 7.55 – 7.43 (m, 5H), 7.40 – 7.36 (m, 1H), 7.33 – 7.29 (m, 2H), 7.00 (dd, *J* = 8.0, 1.2 Hz, 1H), 6.52 (dd, *J* = 8.4, 2.4 Hz, 1H), 6.42 (d, *J* = 2.4 Hz, 1H), 5.06 (s, 1H), 3.81 (s, 3H), 3.19 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 175.1, 173.7, 161.0, 145.7, 139.6, 135.9, 130.6, 129.2, 129.1, 128.8, 128.7, 128.1, 125.3, 120.5, 106.4, 96.5, 64.3, 55.7, 26.5 ppm; IR (thin film): 3059, 2935, 1720, 1627, 1602, 1506, 1469, 1375, 1260, 1221, 1179, 1089, 1028, 783, 734, 697 cm^{-1};HRMS calc'd for $C_{23}H_{21}N_2O_2^+$ 357.1597, found 357.1598 $[M+H]^+$.

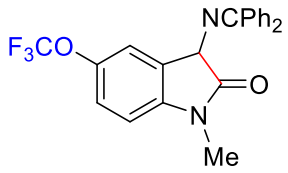
3-((Diphenylmethylene)amino)-1-methyl-4-phenoxyindolin-2-one (4d)



The reaction was performed following the General **GP4** with *N*-aryl amine **3d** (246.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:7) to give product **4d** (121.3 mg, 58% yield) as a pale yellow solid.

m.p. = 135 – 137 ºC, R_f = 0.21 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 – 7.38 (m, 7H), 7.33 – 7.29 (m, 1H), 7.27 – 7.20 (m, 5H), 7.05 – 7.01 (m, 1H), 6.93 – 6.90 (m, 2H), 6.63 (d, *J* = 7.6 Hz, 1H), 6.56 (d, *J* = 8.4 Hz, 1H), 5.25 (s, 1H), 3.23 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.2, 174.1, 157.0, 153.5, 146.3, 139.9, 136.1, 130.5, 130.3, 129.8, 129.1, 128.9, 128.9, 128.4, 127.9, 123.2, 118.6, 118.1, 113.9, 104.0, 63.7, 26.9 ppm; IR (thin film): 3059, 2935, 1723, 1618, 1588, 1489, 1468, 1368, 1341, 1244, 1074, 769, 733, 696 cm^{-1}; HRMS calc'd for $C_{28}H_{23}N_2O_2^+$ 419.1752, found 419.1754 $[M+H]^+$.

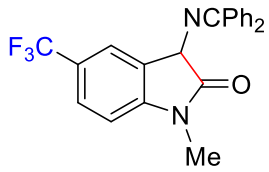
3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethoxy)indolin-2-one (4e)



The reaction was performed following the General **GP4** with *N*-aryl amine **3e** (242.2 mg, 0.5 mmol). The crude product was purified by flash chromatography on deactivated silica gel using ethyl acetate:petroleum ether (1:8) to give product **4e** (121.1 mg, 59% yield) as a pale yellow oil.

R_f = 0.26 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.62 (m, 2H), 7.57 – 7.47 (m, 5H), 7.43 – 7.39 (m, 1H), 7.35 – 7.31 (m, 2H), 7.19 – 7.16 (m, 1H), 7.00 – 6.99 (m, 1H), 6.81 (d, *J* = 8.8 Hz, 1H), 5.13 (s, 1H), 3.22 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 175.0, 174.1, 145.0, 144.9, 143.1, 139.3, 135.6, 130.9, 130.2, 129.9, 129.4, 129.2, 128.83, 128.76, 128.4, 128.2, 122.1, 120.6 (q, $J_{C\text{-}F}$ = 255.1 Hz), 118.8, 108.7, 64.7, 26.7. ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –58.3 ppm; IR (thin film): 3061, 2936, 1724, 1621, 1496, 1468, 1447, 1257, 1213, 1166, 734, 697 cm^{-1}; HRMS calc'd for $C_{23}H_{18}F_3N_2O_2^+$ 411.1311, found 411.1315 $[M+H]^+$.

3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethyl)indolin-2-one (4f)

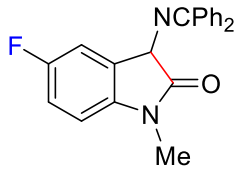


The reaction was performed following the General **GP4** with *N*-aryl amine **3f** (234.2 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:12) to give product **4f** (157.7 mg, 80% yield) as a pale yellow solid.

m.p. = 129 – 131 ºC, R_f = 0.26 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δδ 7.65 – 7.63 (m, 2H), 7.61 – 7.46 (m, 6H), 7.34 – 7.39 (m, 1H), 7.35 – 7.32 (m, 3H), 6.90 (d, *J* = 8.0 Hz, 1H), 5.15 (s, 1H), 3.25 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 175.2, 174.3, 147.4, 139.3, 135.6, 131.0, 129.4, 129.3, 129.1, 128.9, 128.7, 128.3,

126.9 (q, J_{C-F}= 4.3 Hz), 125.1 (q, J_{C-F}= 32.3 Hz), 124.5 (q, J_{C-F}= 269.7 Hz), 121.8 (q, J_{C-F}= 3.8 Hz), 108.1, 64.4, 26.8 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –61.4 ppm; IR (thin film): 3061, 2932, 1728, 1625, 1505, 1447, 1348, 1328, 1286, 1118, 1097, 733, 696 cm^{-1}; HRMS calc'd for $C_{23}H_{18}F_3N_2O^+$ 395.1369, found 395.1366 $[M+H]^+$.

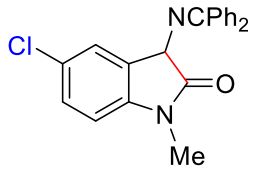
3-((Diphenylmethylene)amino)-5-fluoro-1-methylindolin-2-one (4g)



The reaction was performed following the General **GP4** with *N*-aryl amine **3g** (209.2 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4g** (96.4 mg, 56% yield) as a white solid.

m.p. = 129 – 131 ºC, R_f = 0.21 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.63 (m, 2H), 7.56 – 7.45 (m, 5H), 7.42 – 7.38 (m, 1H), 7.34 – 7.30 (m, 2H), 7.00 (td, *J* = 8.8, 2.4 Hz, 1H), 6.86 (dd, *J* = 8.0, 2.8 Hz, 1H), 6.74 (dd, *J* = 8.8, 4.4 Hz, 1H), 5.10 (s, 1H), 3.21 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.7, 174.1, 159.5, (d, J_{C-F} = 239.1 Hz) 140.4 (d, J_{C-F} = 1.5 Hz) 139.3, 135.7, 130.9, 130.0 (d, J_{C-F} = 8.4 Hz), 129.34, 129.25, 128.82, 128.77, 128.2, 115.2 (d, J_{C-F} = 23.6 Hz), 112.9 (d, J_{C-F} = 24.5 Hz), 108.7 (d, J_{C-F} = 7.2 Hz), 64.9, 26.7 ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –116.5 ppm; IR (thin film): 3059, 2935, 1720, 1613, 1493, 1467, 1448, 1351, 1274, 1123, 829, 733, 695 cm^{-1}; HRMS calc'd for $C_{22}H_{18}FN_2O^+$ 345.1396, found 345.1398 $[M+H]^+$.

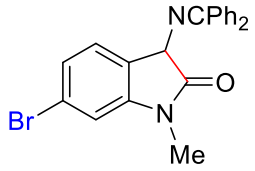
5-Chloro-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4h)



The reaction was performed following the General **GP4** with *N*-aryl amine **3h** (217.5 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4h** (129.9 mg, 72% yield) as a white solid.

m.p. = 171 – 173 ºC, R_f = 0.25 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.63 (m, 2H), 7.56 – 7.47 (m, 5H), 7.42 – 7.38 (m, 1H), 7.34 – 7.30 (m, 2H), 7.28 – 7.26 (m, 1H), 7.07 (dd, *J* = 2.4, 1.2 Hz, 1H), 6.74 (d, *J* = 8.0 Hz, 1H), 5.10 (s, 1H), 3.20 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.8, 173.9, 143.0, 139.3, 135.7, 130.9, 130.1, 129.3, 129.2, 128.9, 128.8, 128.7, 128.2, 128.1, 125.2, 109.2, 64.6, 26.7 ppm; IR (thin film): 3060, 2935, 1721, 1612, 1490, 1362, 1345, 1270, 1100, 911, 811, 731, 697 cm^{-1}; HRMS calc'd for $C_{22}H_{18}ClN_2O^+$ 361.1105, found 361.1102 $[M+H]^+$.

6-Bromo-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4i)

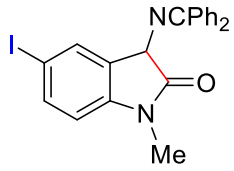


The reaction was performed following the General **GP4** with *N*-aryl amine **3i** (239.5 mg, 0.5 mmol). The crude product was

purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4i** (129.7 mg, 64% yield) as a white solid.

m.p. = 195 – 197 ºC, R_f = 0.24 (petroleum ether:ethyl acetate = 8:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.64 – 7.62 (m, 2H), 7.54 – 7.47 (m, 5H), 7.42 – 7.38 (m, 1H), 7.34 – 7.30 (m, 2H), 7.18 – 7.16 (m, 1H), 6.98 – 6.95 (m, 2H), 5.05 (s, 1H), 3.19 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.6, 174.3, 145.7, 139.3, 135.7, 130.8, 129.3, 129.2, 128.82, 128.76, 128.2, 127.4, 126.0, 125.5, 122.6, 111.8, 64.3, 26.7 ppm; IR (thin film): 1724, 1607, 1492, 1366, 1316, 1280, 1095, 1059, 833, 802, 698 cm^{-1}; HRMS calc'd for $C_{22}H_{18}BrN_2O^+$ 405.0599, found 405.0597 $[M+H]^+$.

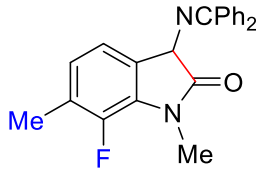
3-((Diphenylmethylene)amino)-5-iodo-1-methylindolin-2-one (4j)



The reaction was performed following the General **GP4** with *N*-aryl amine **3j** (263.2 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:5) to give product **4j** (156.1 mg, 69% yield) as a white solid.

m.p. = 203 – 205 ºC, R_f = 0.23 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.63 (m, 2H), 7.60 (ddd, *J* = 8.4, 2.0, 0.8 Hz, 1H), 7.55 – 7.44 (m, 5H), 7.42 – 7.38 (m, 1H), 7.36 (t, *J* = 1.2 Hz, 1H), 7.34 – 7.30 (m, 2H), 6.60 (d, *J* = 8.0 Hz, 1H), 5.09 (s, 1H), 3.18 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.7, 173.6, 144.1, 139.2, 137.8, 135.6, 133.4, 130.9, 130.8, 129.3, 129.2, 128.8, 128.7, 128.2, 110.3, 85.3, 64.4, 26.6 ppm; IR (thin film): 3058, 2935, 1720, 1606, 1487, 1445, 1360, 1342, 1097, 909, 808, 732, 696 cm^{-1}; HRMS calc'd for $C_{22}H_{18}IN_2O^+$ 453.0454, found 453.0458 $[M+H]^+$.

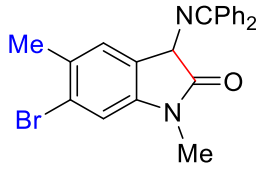
3-((Diphenylmethylene)amino)-7-fluoro-1,6-dimethylindolin-2-one (4k)



The reaction was performed following the General **GP4** with *N*-aryl amine **3k** (216.3 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4k** (121.8 mg, 68% yield) as a white solid.

m.p. = 132 – 134 ºC, R_f = 0.39 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.64 – 7.62 (m, 2H), 7.55 – 7.44 (m, 5H), 7.41 – 7.37 (m, 1H), 7.33 – 7.29 (m, 2H), 6.82 – 6.79 (m, 1H), 6.76 (dd, *J* = 7.6, 1.2 Hz, 1H), 5.08 (s, 1H), 3.42 (d, *J* = 2.8 Hz, 3H), 2.28 (d, *J* = 2.0 Hz, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.3, 174.1, 146.6 (d, $J_{C\text{-}F}$ = 240.6 Hz), 139.4, 135.8, 130.8, 130.7, 129.2, 128.79, 128.76, 128.4 (d, $J_{C\text{-}F}$ = 3.0 Hz), 128.2, 126.7 (d, $J_{C\text{-}F}$ = 15.3 Hz), 124.7 (d, $J_{C\text{-}F}$ = 3.1 Hz), 119.9 (d, $J_{C\text{-}F}$ = 3.4 Hz), 64.7 (d, $J_{C\text{-}F}$ = 2.3 Hz), 29.0 (d, $J_{C\text{-}F}$ = 6.1 Hz), 14.9 (d, $J_{C\text{-}F}$ = 4.5 Hz) ppm; ^{19}F NMR (376.8 MHz, Chloroform-d) δ –141.1 ppm; IR (thin film): 3059, 2924, 1720, 1638, 1481, 1367, 1284, 1162, 784, 732, 696 cm^{-1}; HRMS calc'd for $C_{23}H_{20}FN_2O^+$ 359.1552, found 359.1554 $[M+H]^+$.

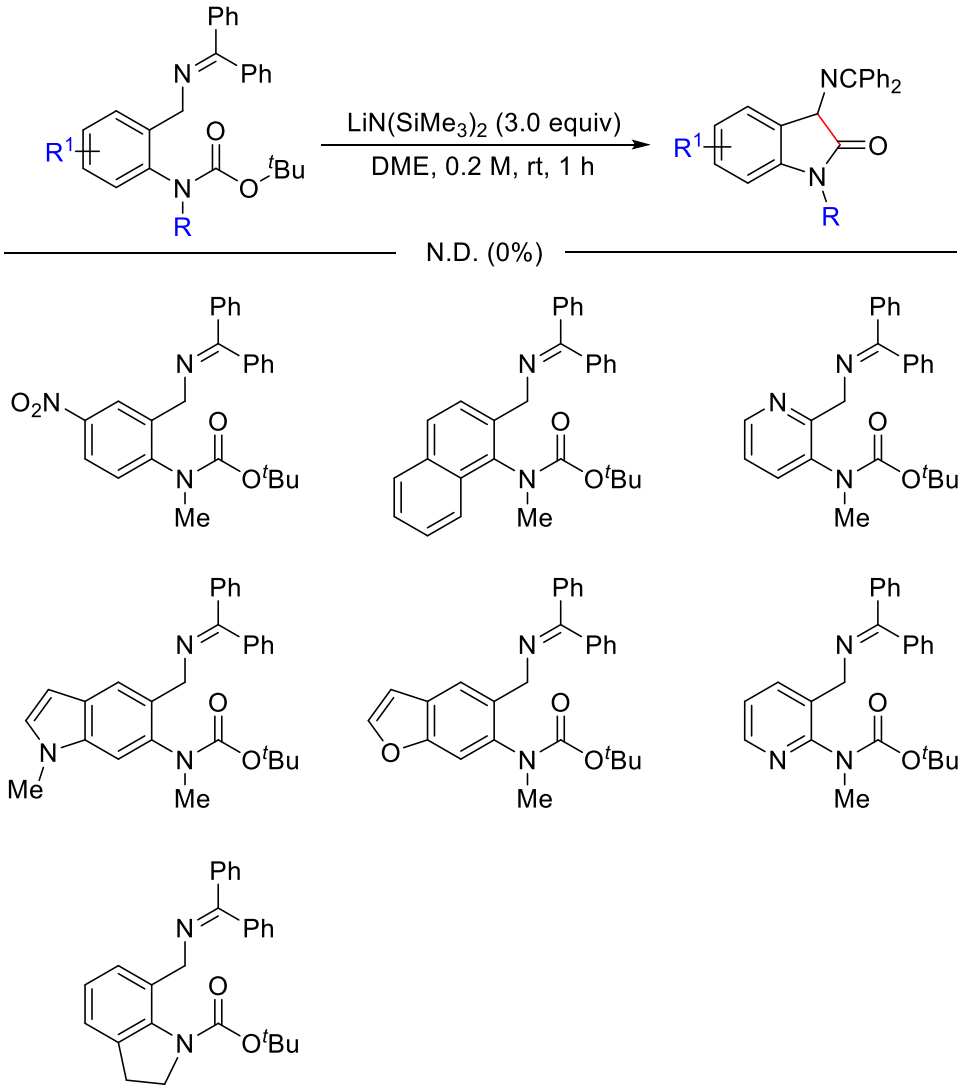
6-Bromo-3-((diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4l)



The reaction was performed following the General **GP4** with *N*-aryl amine **3l** (246.7 mg, 0.5 mmol). The crude product was purified by recrystallization using dichloromethane:petroleum ether (1:10) to give product **4l** (186.5 mg, 89% yield) as a white solid.

m.p. = 128 – 130 ºC, R_f = 0.32 (petroleum ether:ethyl acetate = 5:1); ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.65 – 7.63 (m, 2H), 7.55 – 7.46 (m, 5H), 7.42 – 7.38 (m, 1H), 7.34 – 7.30 (m, 2H), 7.01 (s, 1H), 6.95 (s, 1H), 5.04 (s, 1H), 3.18 (s, 3H), 2.34 (s, 3H) ppm; ^{13}C{^{1}H} NMR (100 MHz, Chloroform-d) δ 174.4, 174.1, 143.4, 139.3, 135.7, 131.7, 130.8, 129.3, 129.2, 128.78, 128.76, 128.2, 127.8, 126.8, 124.5, 112.3, 64.5, 26.7, 22.7 ppm; IR (thin film): 3060, 2924, 1723, 1619, 1588, 1494, 1359, 1261, 1000, 910, 777, 733, 696 cm^{-1}; HRMS calc'd for $C_{23}H_{20}BrN_2O^+$ 419.0755, found 419.0754 $[M+H]^+$.

Unsuccessful substrates



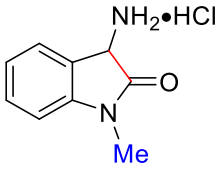
Gram scale synthesis of 2a

An oven-dried 100 mL round-bottomed flask with a stir bar was charged with *N*-aryl amine **1a** (2.6 g, 6.49 mmol) under a nitrogen atmosphere in a glove box. A solution of $LiN(SiMe_3)_2$ (3.3 g, 19.47 mmol) in 65.0 ml dry DME was added to the round-bottomed flask. The flask was sealed, removed from the glove box, and stirred for 1 h at room temperature. The reaction mixture was opened to air, quenched with three 5 ml of H_2O. The layers were separated and the aqueous layer was extracted with DCM (3 × 50 mL). The combined organic layers were concentrated in *vacuo*. The crude material was purified by recrystallization to give product **2a** (1.92 g, 91% yield) as a white solid.

Imine product hydrogenolysis

An oven-dried 25 mL round-bottom flask equipped with a stir bar was charged with **2a** (164 mg, 0.5 mmol). HCl (12 N, 0.5 mL) and MeOH (5 mL) were added to the reaction vial via syringe at 0 °C. The solution was warmed to room temperature, stirred at room temperature and was monitored by TLC until all **2a** was consumed. The reaction mixture was concentrated in *vacuo*. The crude product was purified by washing with DCM to give product **5a** (93.4mg, 94% yield)

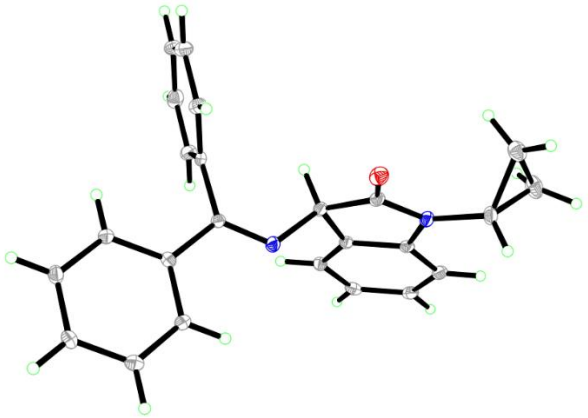
3-Amino-1-methyl-indolin-2-one hydrochloride (5a)



m.p. = 190 – 193 ºC; ^{1}H NMR (400 MHz, Methanol-*d*) δ 7.65 (d, *J* = 7.6 Hz, 1H), 7.49 (t, *J* = 8.0 Hz, 1H), 7.20 (t, *J* = 7.6 Hz, 1H), 7.11 (d, *J* = 8.0 Hz, 1H), 4.98 (s, 1H), 3.26 (s, 3H) ppm (amino protons were not observed). ^{13}C{^{1}H} NMR (100 MHz, Methanol-d) δ 172.5, 146.0, 132.2, 126.4, 124.5, 123.0, 110.6, 52.1, 27.0 ppm; IR (thin film): 3418, 2892, 1717, 1616, 1496, 1472, 1389, 1342, 1091, 790, 757 cm^{-1}; HRMS calc'd for $C_9H_{11}N_2O^+$ 163.0862, found 163.0866 $[M+H]^+$.

X-ray crystal structures of 2d

Sample preparation: To a 8 mL vial containing **2d** (10 mg) was added CH_2Cl_2/hexane (about 1.0 mL/2.0 mL). The single crystal **2d** was obtained by slowly evaporating solvent at room temperature under the air conditions.



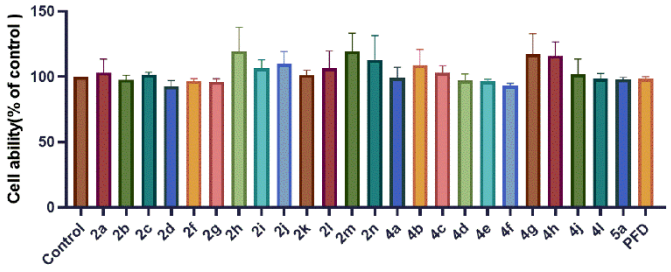
Supplementary Fig. 1. ORTEP drawing (30%) of the Crystal structure of **2d** (CCDC 2364285)

Crystal data and structure refinement for 2d

Identification code	mo_231220C	
Chemical formula	$C_{24}H_{20}N_2O$	
Formula weight	352.42 g/mol	
Wavelength	0.71073 Å	
Crystal size	0.160 x 0.180 x 0.210 mm	
Crystal system	monoclinic	
Space group	P 1 21/c 1	
Unit cell dimensions	a = 23.0317(8) Å	α = 90°
	b = 9.3673(4) Å	β = 112.123(2)°
	c = 18.4944(9) Å	γ = 90°
Volume	3696.3(3) $Å^3$	
Z	8	
Density (calculated)	1.267 g/cm^3	
Absorption coefficient	0.078 mm^{-1}	
F(000)	1488	
Theta range for data collection	2.20 to 28.32°	
Index ranges	-30<=h<=30, -12<=k<=12, -24<=l<=24	
Reflections collected	48869	
Independent reflections	9205 [R(int) = 0.1079]	
Max. and min. transmission	0.7457 and 0.7012	
Structure solution technique	direct methods	
Structure solution program	SHELXT 2018/2 (Sheldrick, 2018)	
Refinement method	Full-matrix least-squares on F^2	
Refinement program	SHELXL 2018/3 (Sheldrick, 2015)	
Function minimized	$\Sigma\ w(F_o^2 - F_c^2)^2$	
Data / restraints / parameters	9205 / 0 / 487	
Goodness-of-fit on F2	1.103	
Final R indices	5850 data; I>2σ(I)	R1 = 0.0777, wR2 = 0.1240
	all data	R1 = 0.1385, wR2 = 0.1462
Weighting scheme	$w=1/[\sigma^2(F_o^2)+(0.0283P)^2+3.1259P]$ where $P=(F_o^2+2F_c^2)/3$	
Largest diff. peak and hole	0.265 and -0.343 $eÅ^{-3}$	
R.M.S. deviation from mean	0.060 $eÅ^{-3}$	

Cell culture and cytotoxicity assay

3-Amino oxindoles (purity > 98%) were synthesized by our developed method. PFD was purchased from TargetMol (Boston, USA). HLFs (#GNHu28) were purchased from Shanghai Cell Bank of Chinese Academy of Sciences. The Cells were cultured in Ham's F-12K medium (FBS, Thermo Fisher Scientific) containing 10% fetal bovine serum (FBS, Thermo Fisher Scientific) and 1% penicillin-streptomycin (Thermo Fisher Scientific) in a humidified 5% CO_2 incubator at 37°C. According to the manufacturer's protocol, the cell cytotoxicity was measured using the MTS (Dojindo, Kyushu, Japan). The cells were seeded in 96-well plates at a density of 2×10^4 cells per well. After incubating for 24 h, the cells were treated with a medium containing 3-amino oxindoles (50 μM) for 48 h. Following incubation, each well was incubated at 37°C for 1 h with 10 μL of MTS solution. At the end of the incubation, the absorbance was measured at 490 nm on a full-function microplate reader (MOLECULAR DEVICES). For MTS assays, all data were represented as mean ± SEM from five independent experiments.



Supplementary Fig. 2. Cytotoxic effects on HLF cells

Picrosirius red for collagen staining

Since myofibroblasts localize at sites undergoing active ECM deposition and display elevated collagen synthetic capacity, myofibroblasts are considered to play a major role in the pathology of PF. HLF cells were seeded in 96-well plates at a density of 2×10^4 cells per well. After incubating for 24 h, the cells were treated with a medium containing 10 ng/mL TGF-β, 25 μM 3-amino oxindoles, or 10 mM PFD for 48 h. Then, cells were immediately fixed in 4% neutral paraformaldehyde for 30 min. Cells were washed twice with PBS and then incubated with a 0.1% picrosirius red solution dissolved in aqueous saturated picric acid for 4 h. The cells were washed twice with acidified water (0.5% hydrogen chloride). For the quantitative determinations of the accumulated collagen, the stained cells were destained with 0.1 M NaOH (100 μL per well) for 10 min. The absorbance was measured at 540 nm on a full-function microplate reader.

Supplementary references

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NMR Spectra

Fig. S1. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methylindolin-2-one (2a).

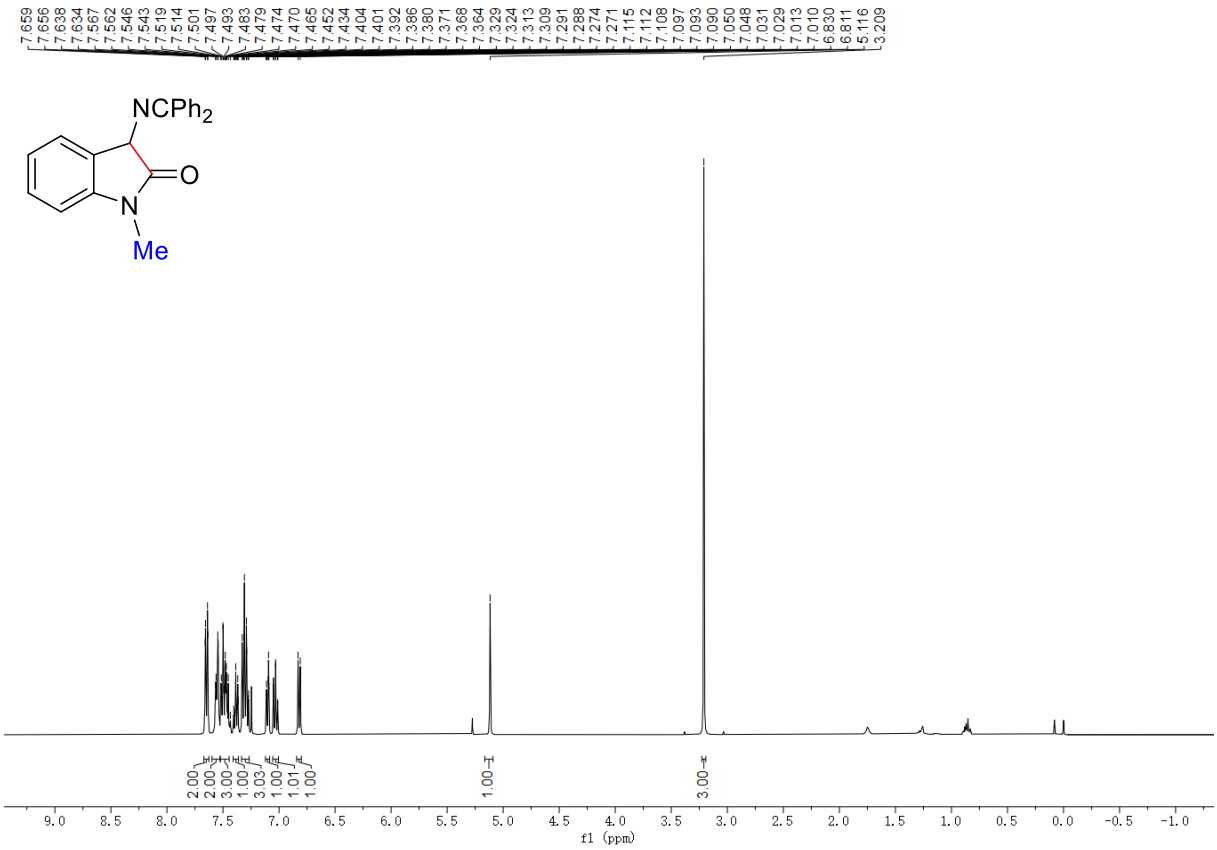

Fig. S2. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methylindolin-2-one (2a).

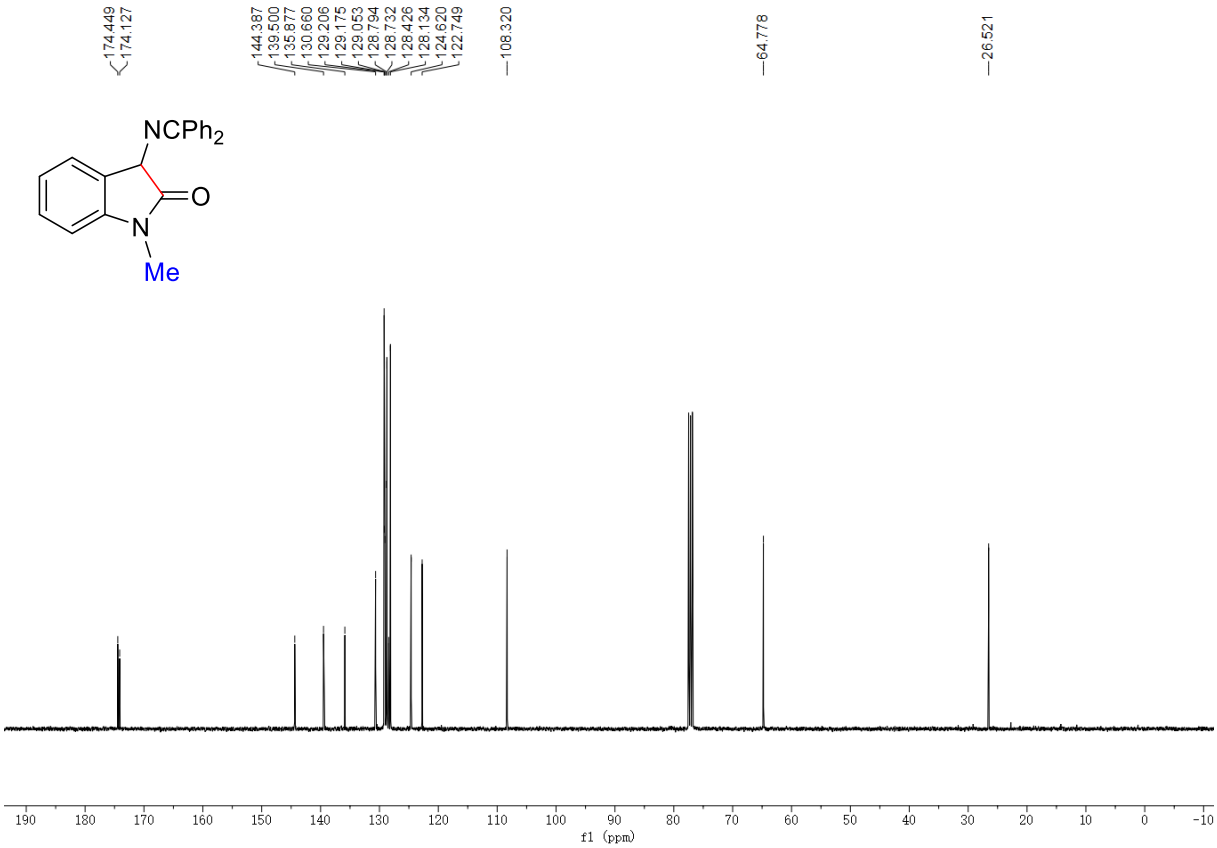

Fig. S3. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-(But-3-en-1-yl)-3-((diphenylmethylene)amino)indolin-2-one (2b).

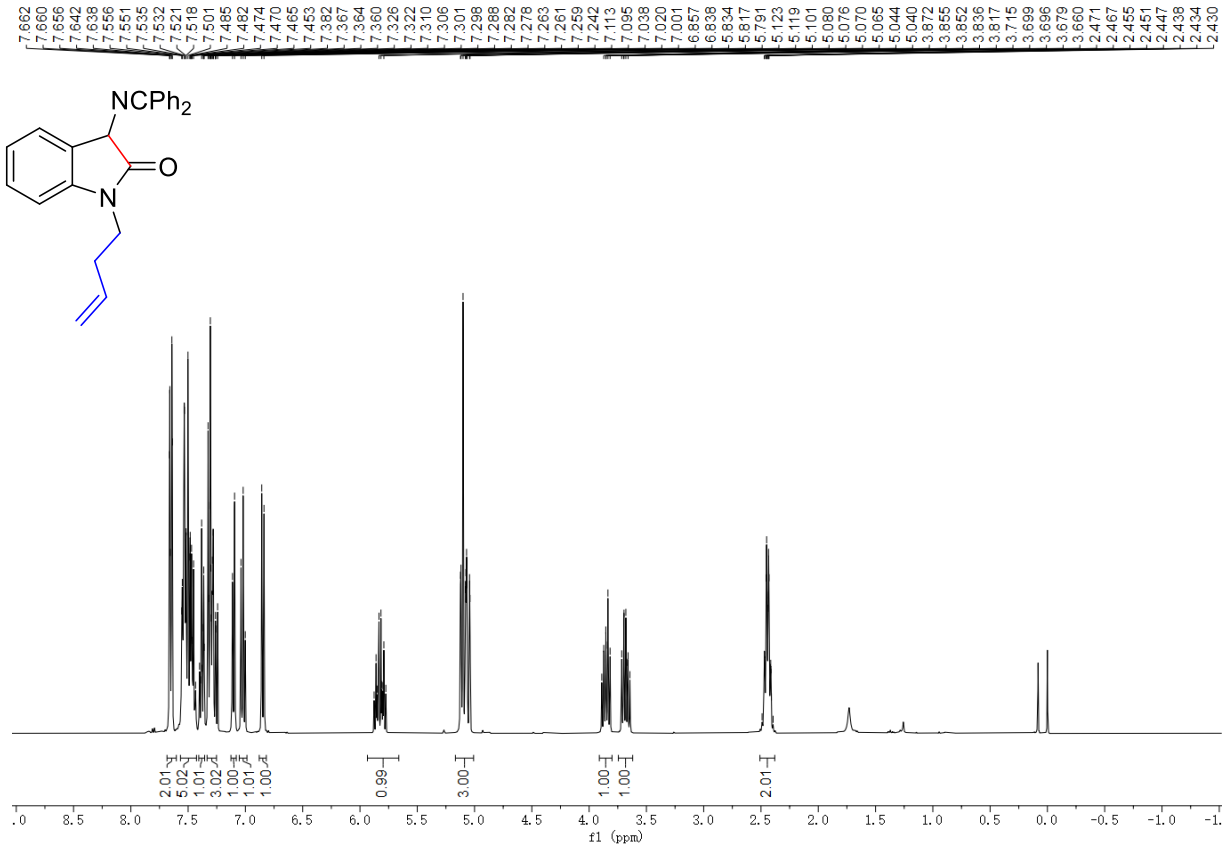

Fig. S4. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-(But-3-en-1-yl)-3-((diphenylmethylene)amino)indolin-2-one (2b).

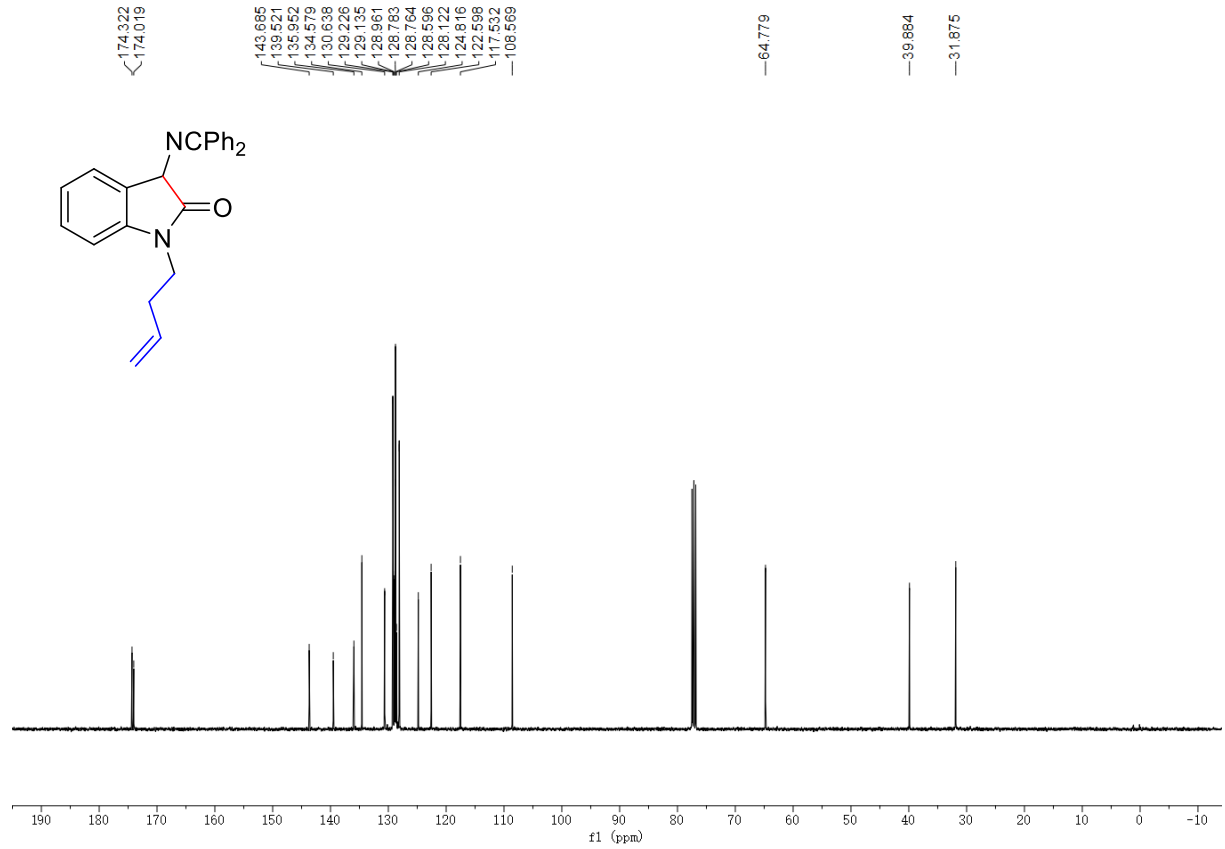

Fig. S5. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-Benzyl-3-((diphenylmethylene)amino)indolin-2-one (2c).

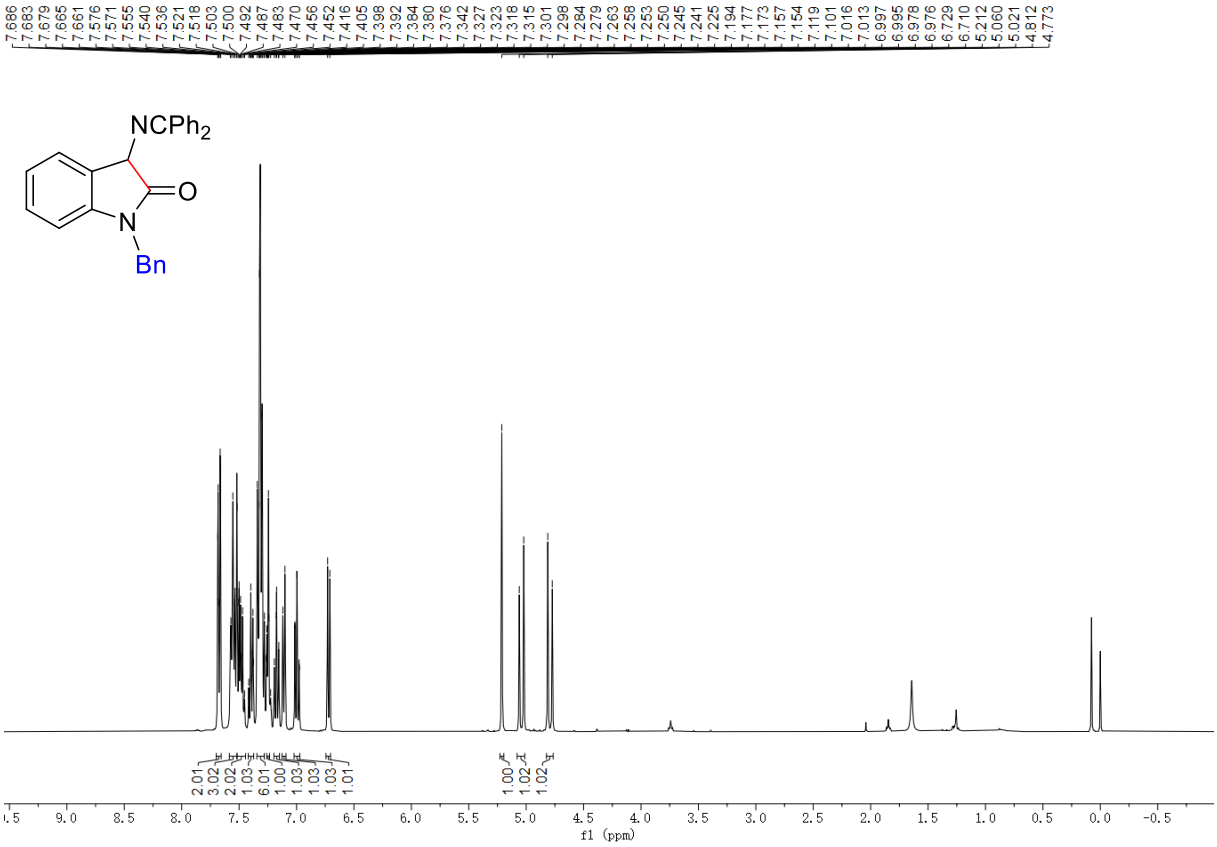

Fig. S6. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-Benzyl-3-((diphenylmethylene)amino)indolin-2-one (2c).

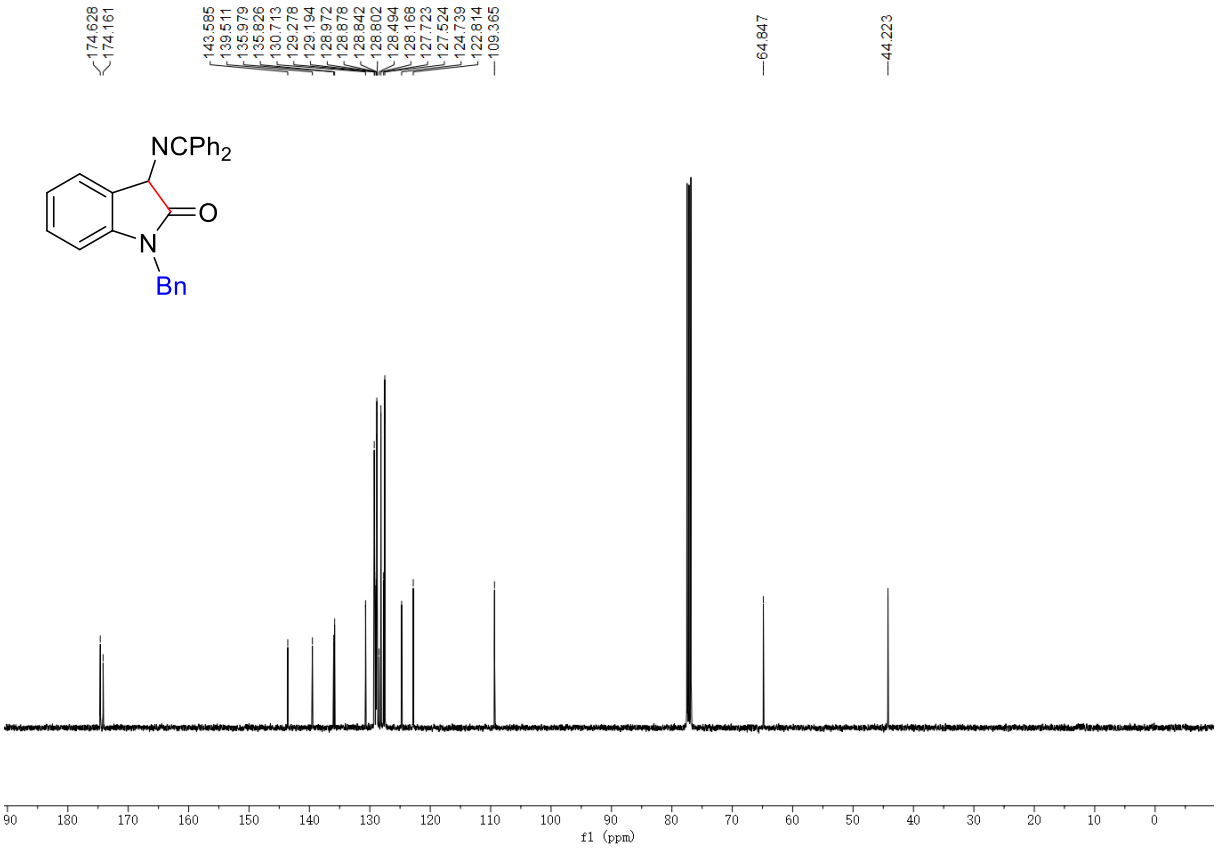

Fig. S7. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-Cyclopropyl-3-((diphenylmethylene)amino)indolin-2-one (2d).

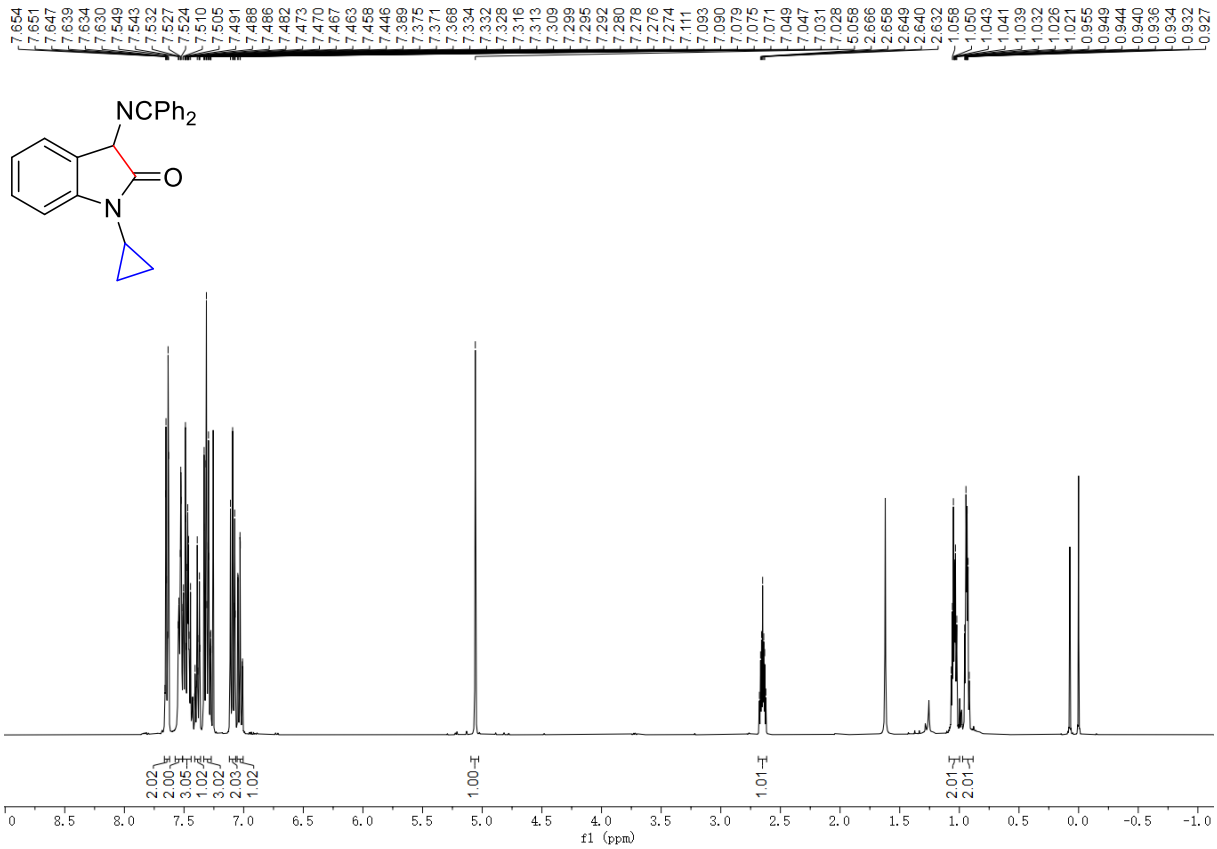

Fig. S8. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-Cyclopropyl-3-((diphenylmethylene)amino)indolin-2-one (2d).

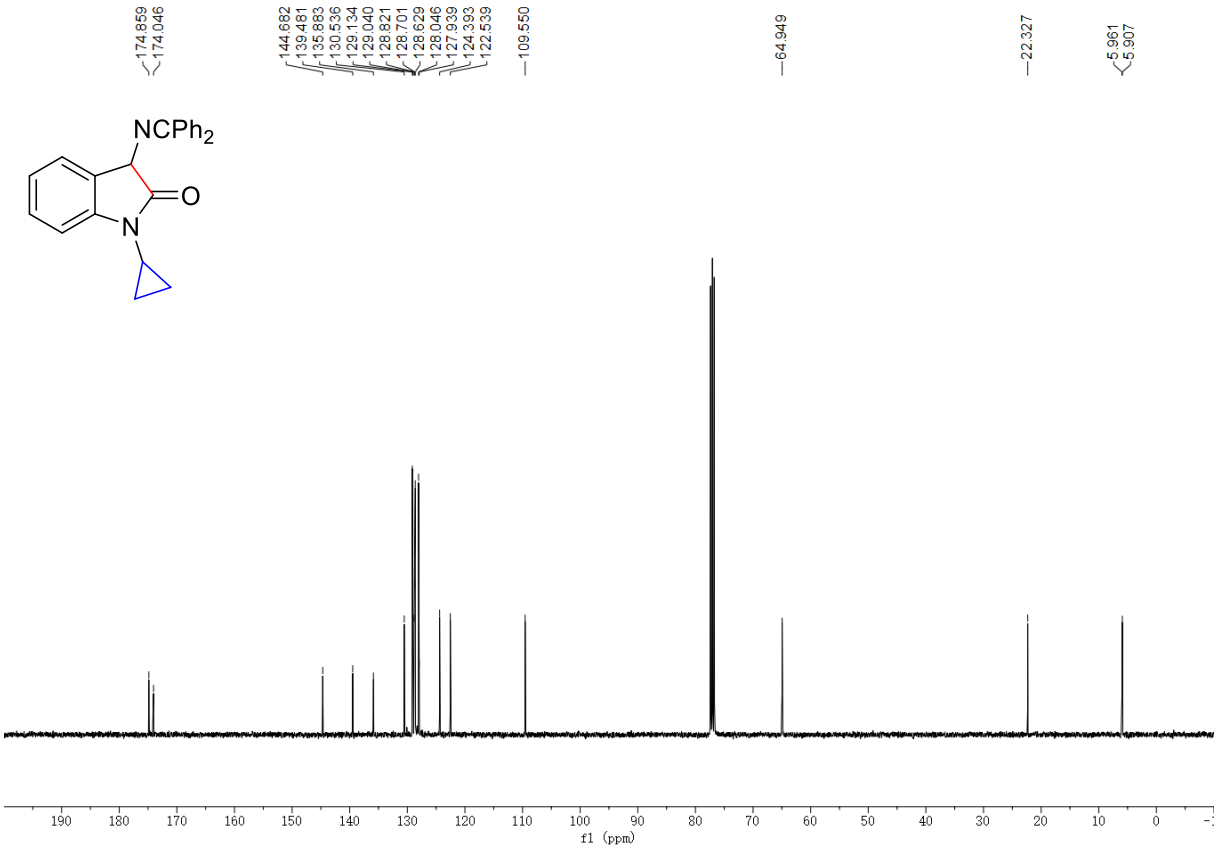

Fig. S9. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-Cyclobutyl-3-((diphenylmethylene)amino)indolin-2-one (2e).

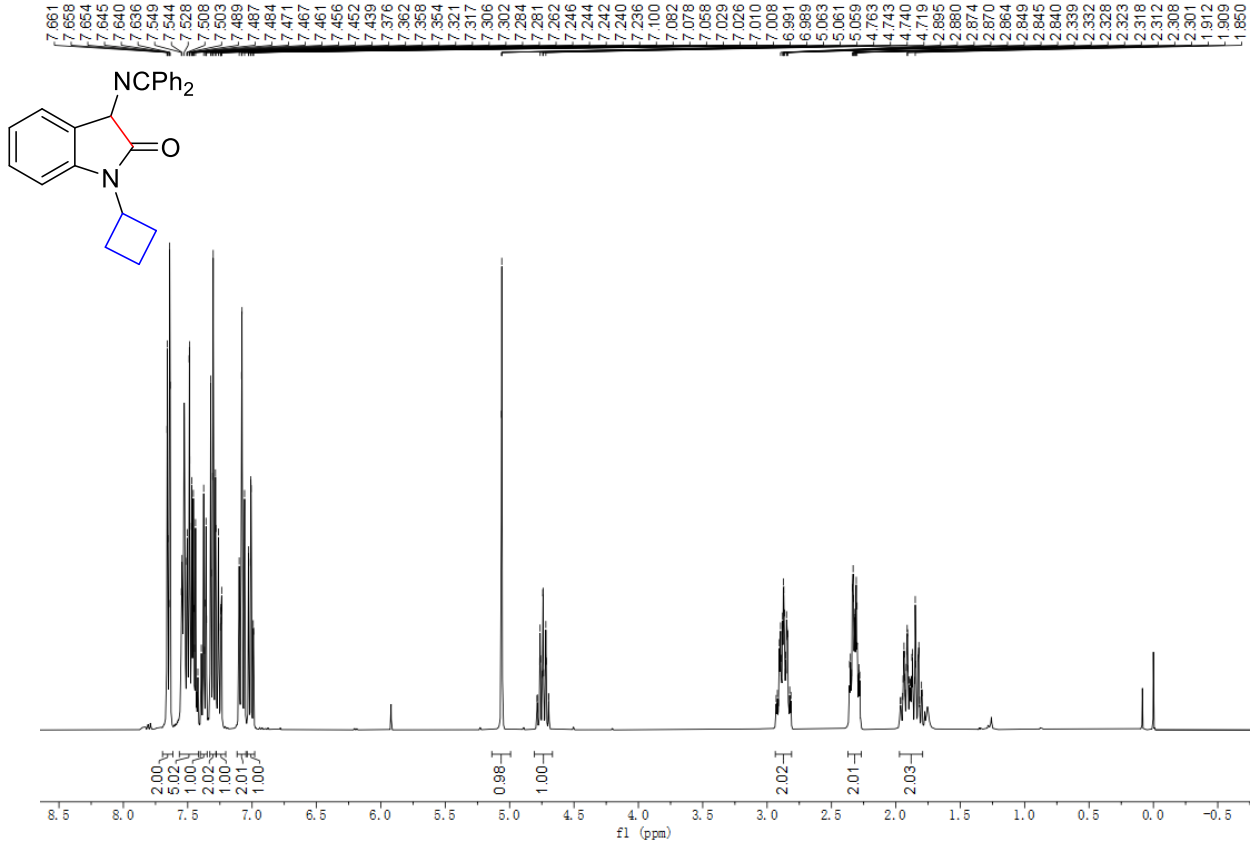

Fig. S10. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-Cyclobutyl-3-((diphenylmethylene)amino)indolin-2-one (2e).

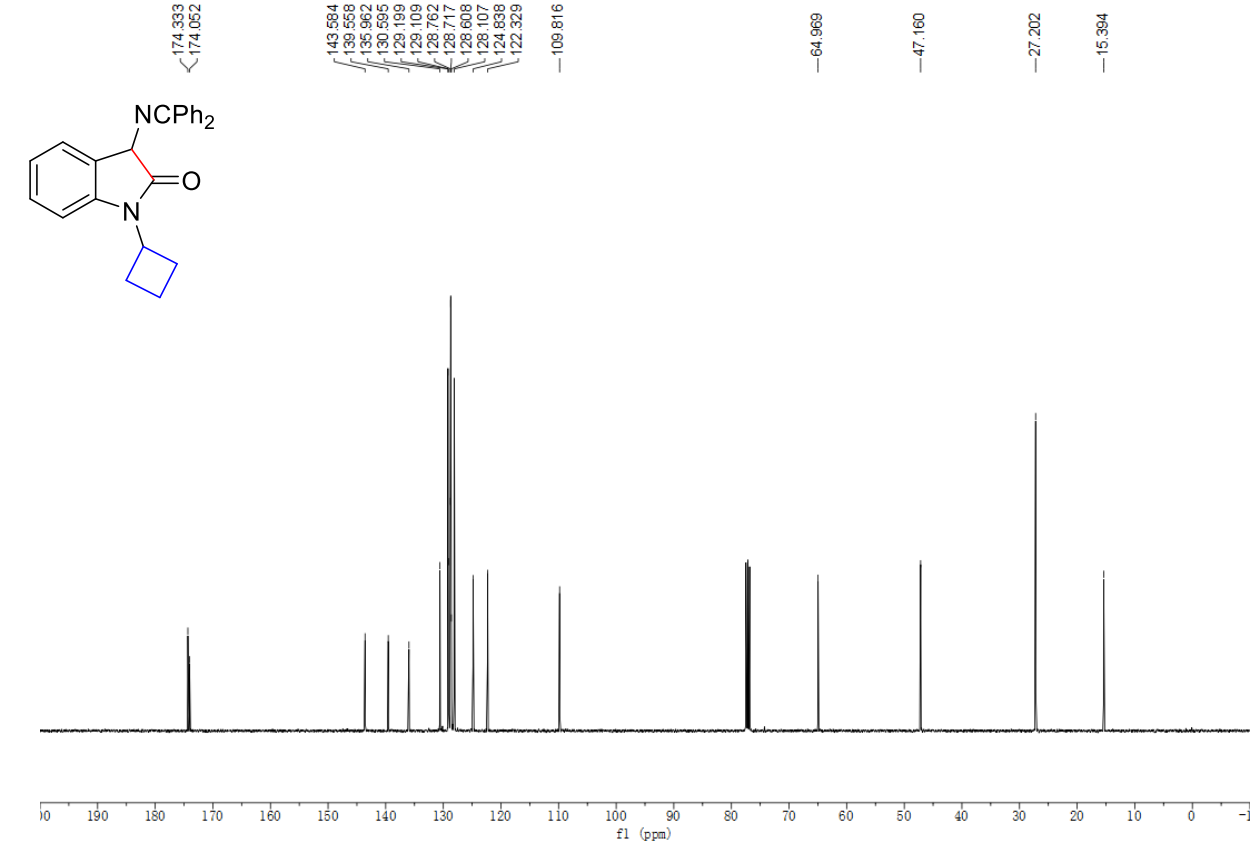

Fig. S11. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-Cyclopentyl-3-((diphenylmethylene)amino)indolin-2-one (2f).

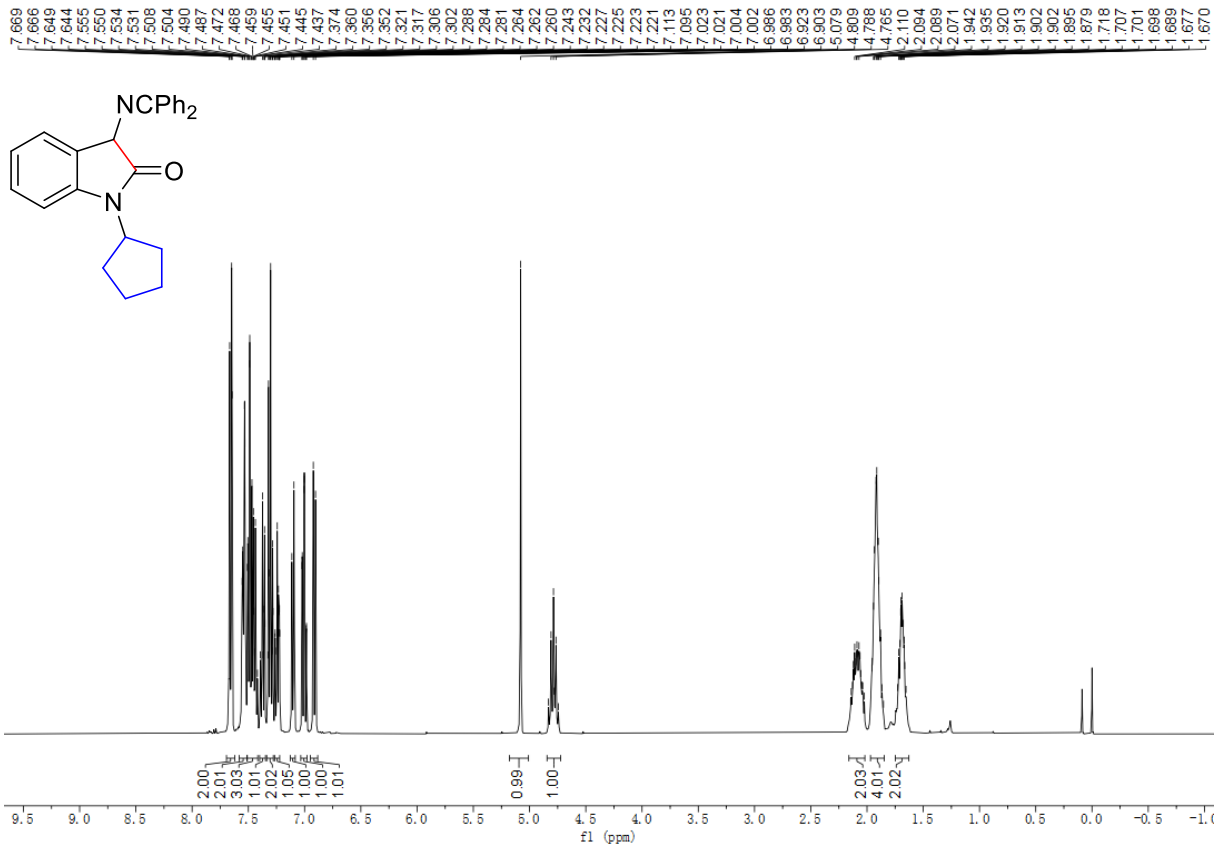

Fig. S12. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-Cyclopentyl-3-((diphenylmethylene)amino)indolin-2-one (2f).

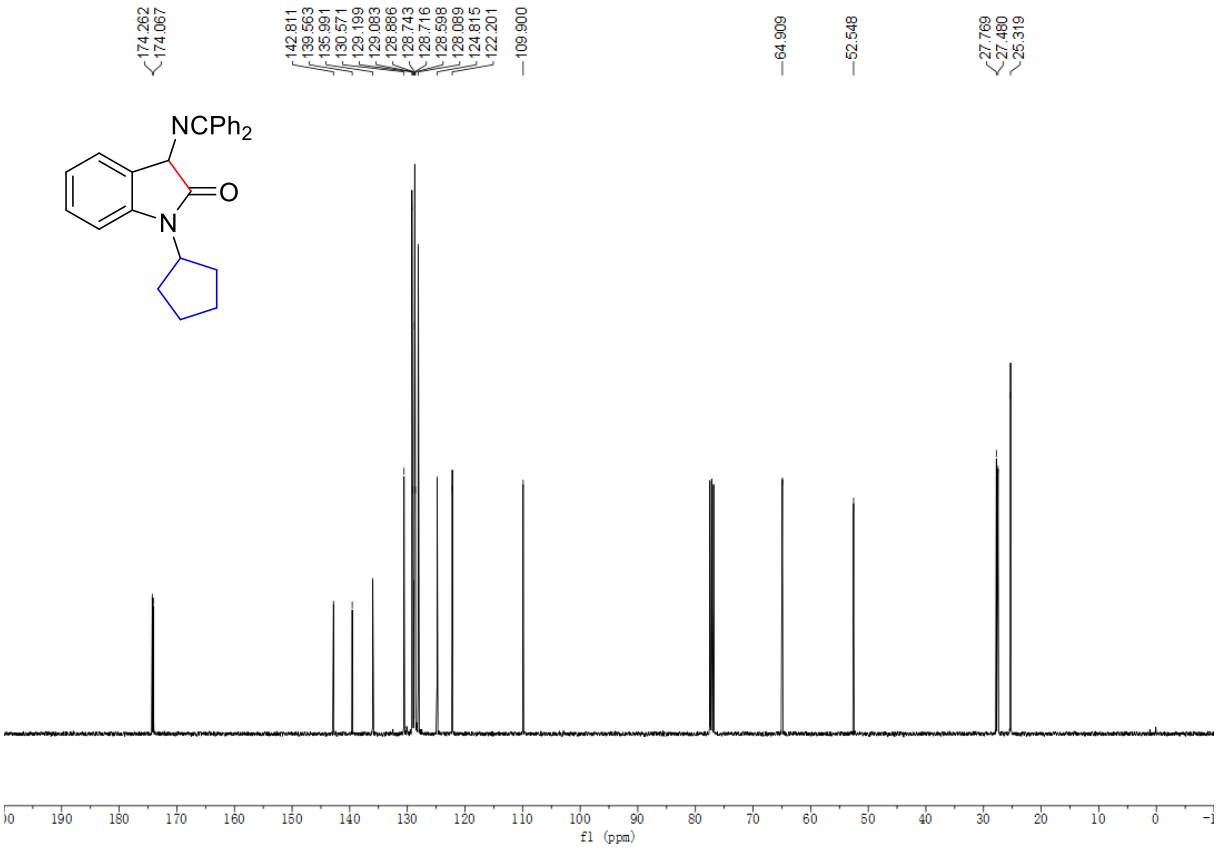

Fig. S13. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-Cyclohexyl-3-((diphenylmethylene)amino)indolin-2-one (2g).

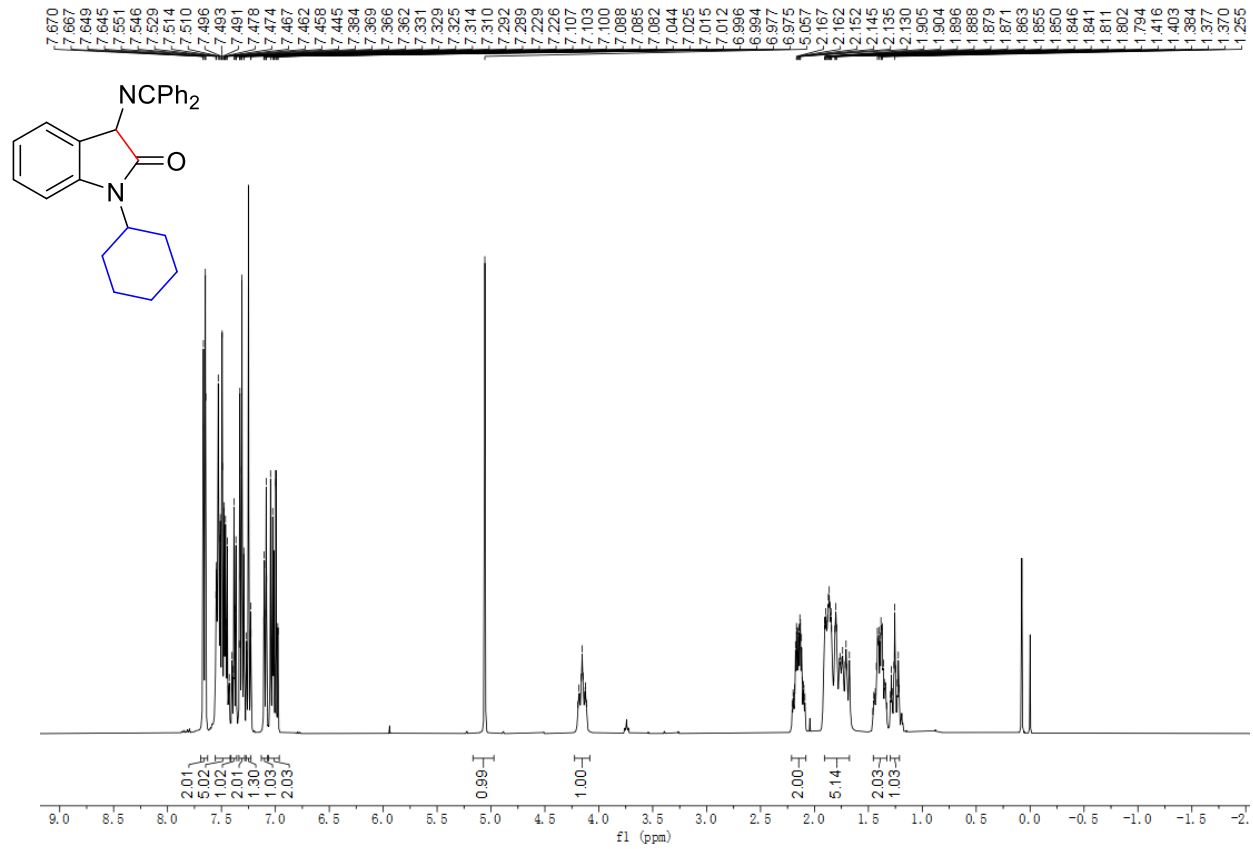

Fig. S14. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-Cyclohexyl-3-((diphenylmethylene)amino)indolin-2-one (2g).

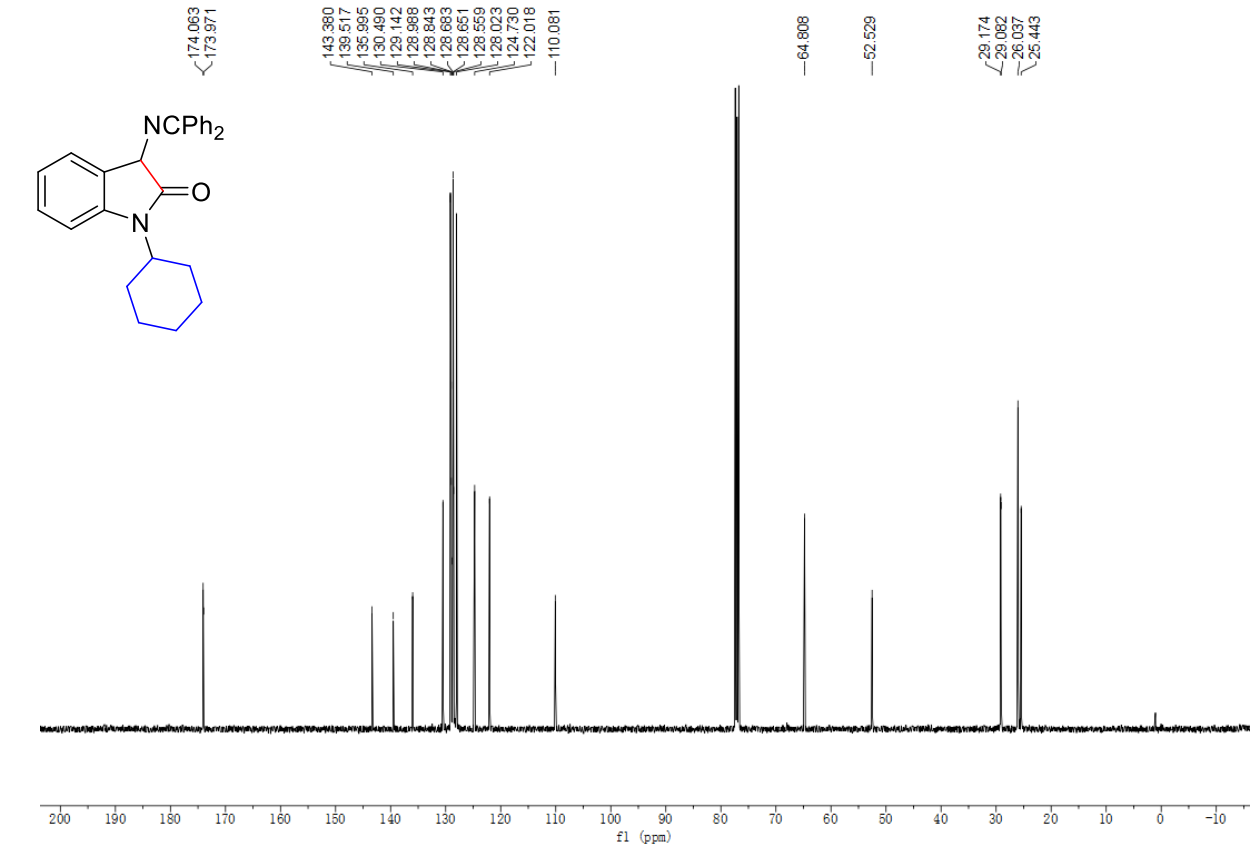

Fig. S15. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-phenylindolin-2-one (2h).

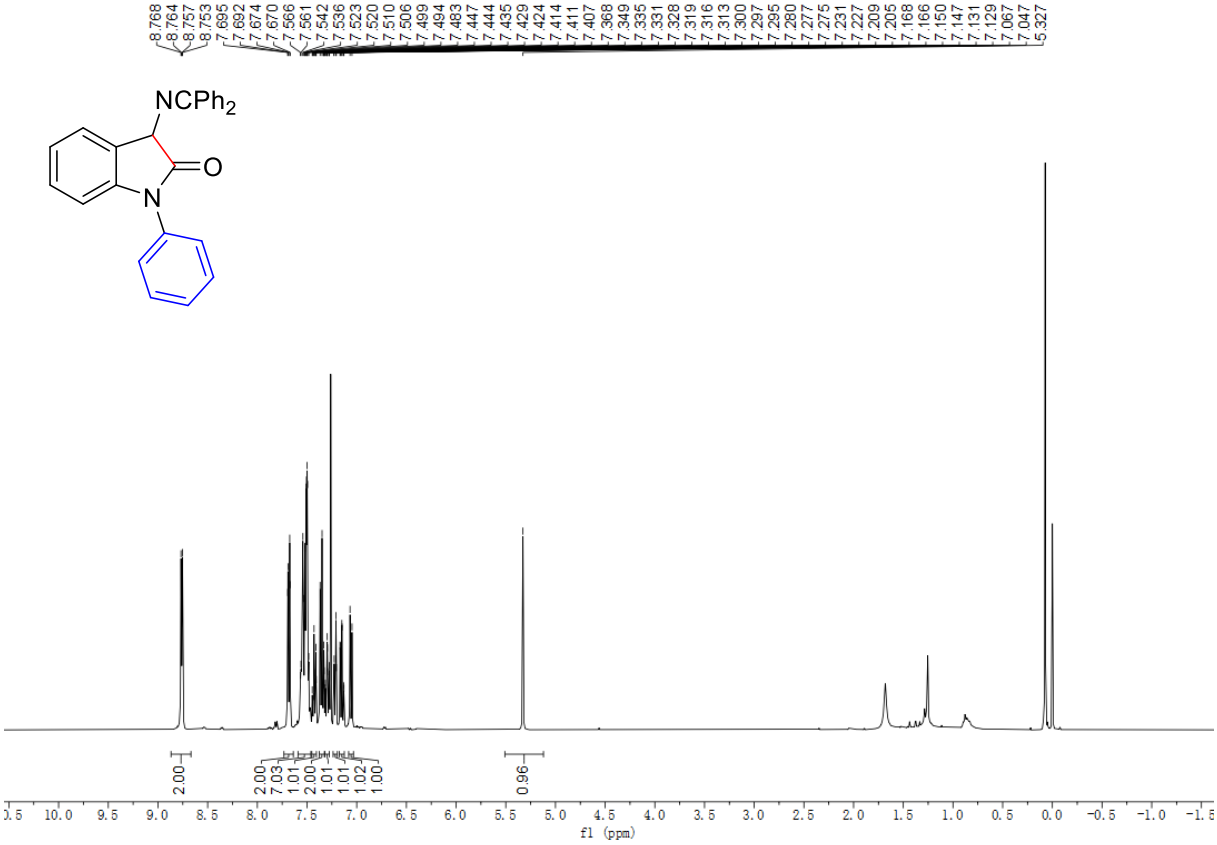

Fig. S16. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-phenylindolin-2-one (2h).

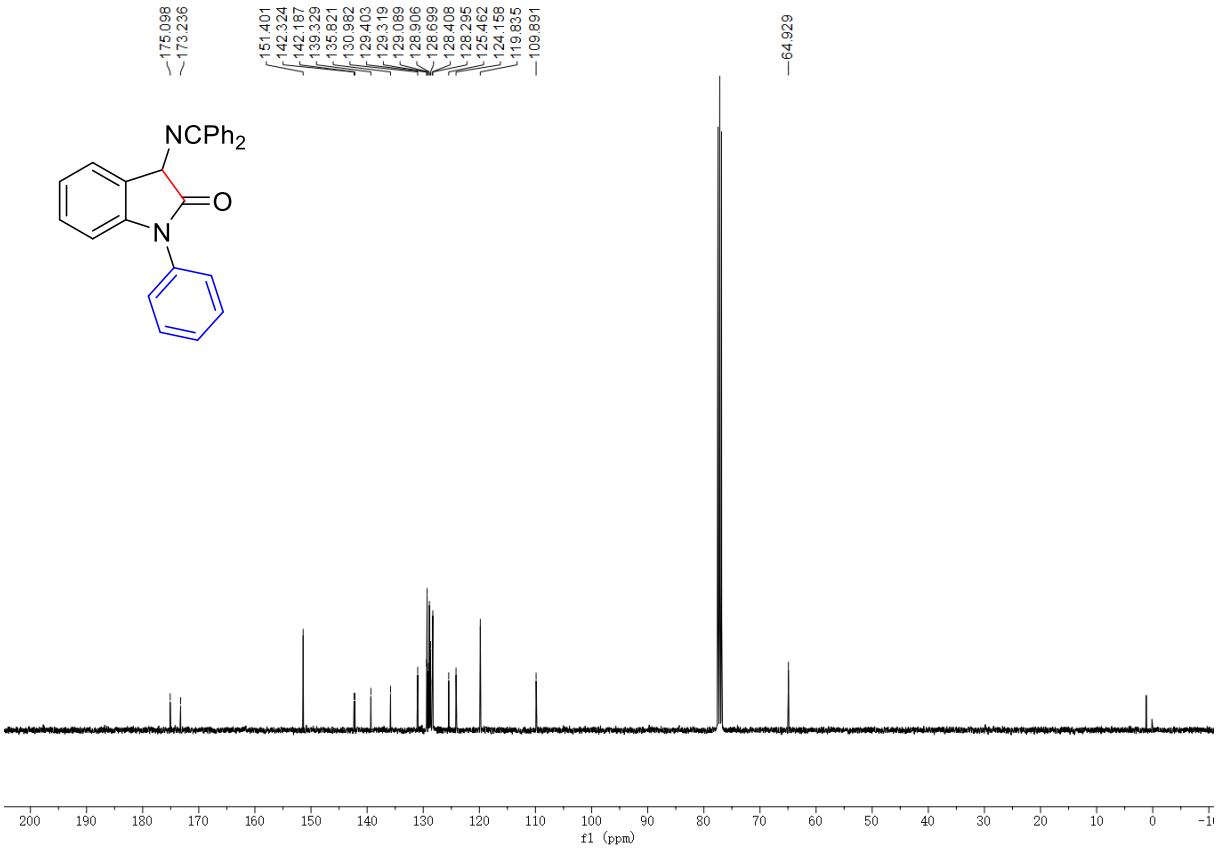

Fig. S17. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(4-fluorophenyl)indolin-2-one (2i).

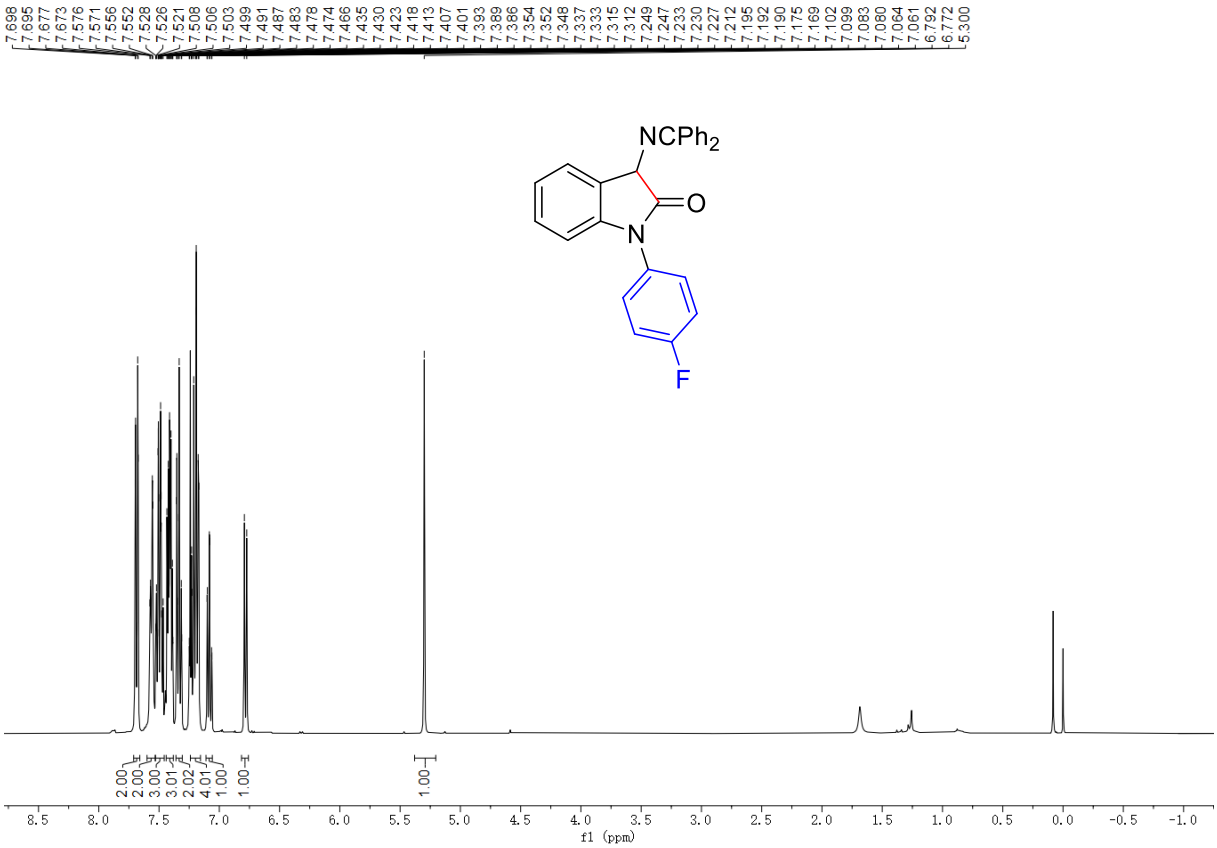

Fig. S18. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(4-fluorophenyl)indolin-2-one (2i).

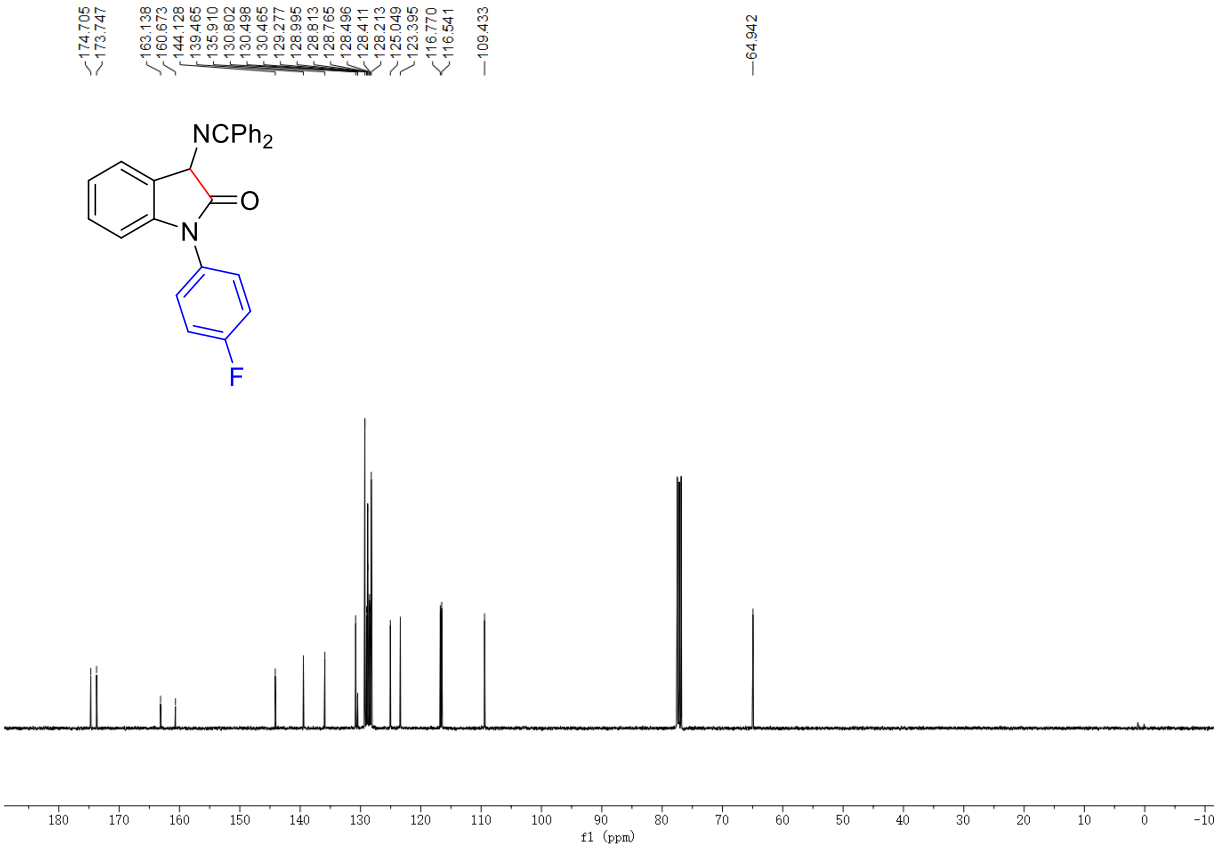

Fig. S19. ^{19}F NMR spectra (376.8 MHz, Chloroform-d) of 3-((Diphenylmethylene)amino)-1-(4-fluorophenyl)indolin-2-one (2i).

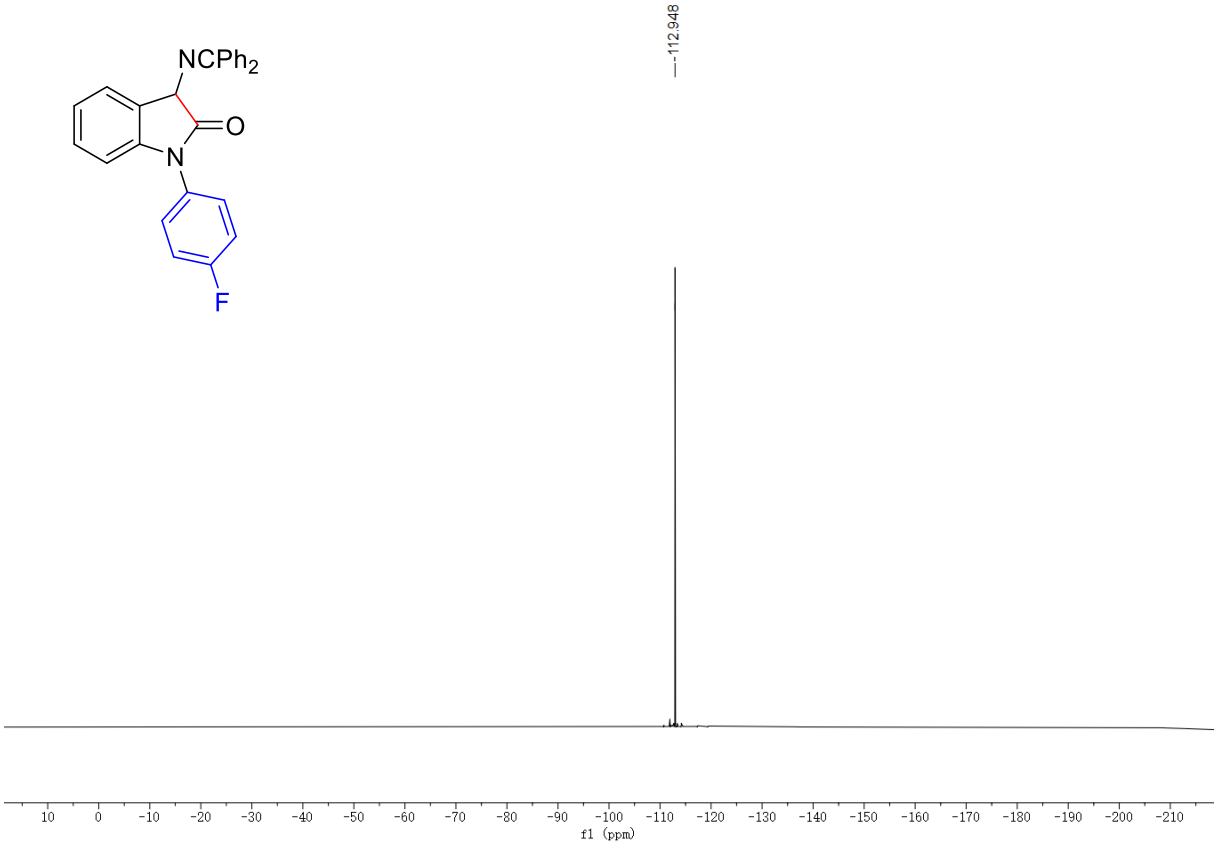

Fig. S20. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-(4-Chlorophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2j).

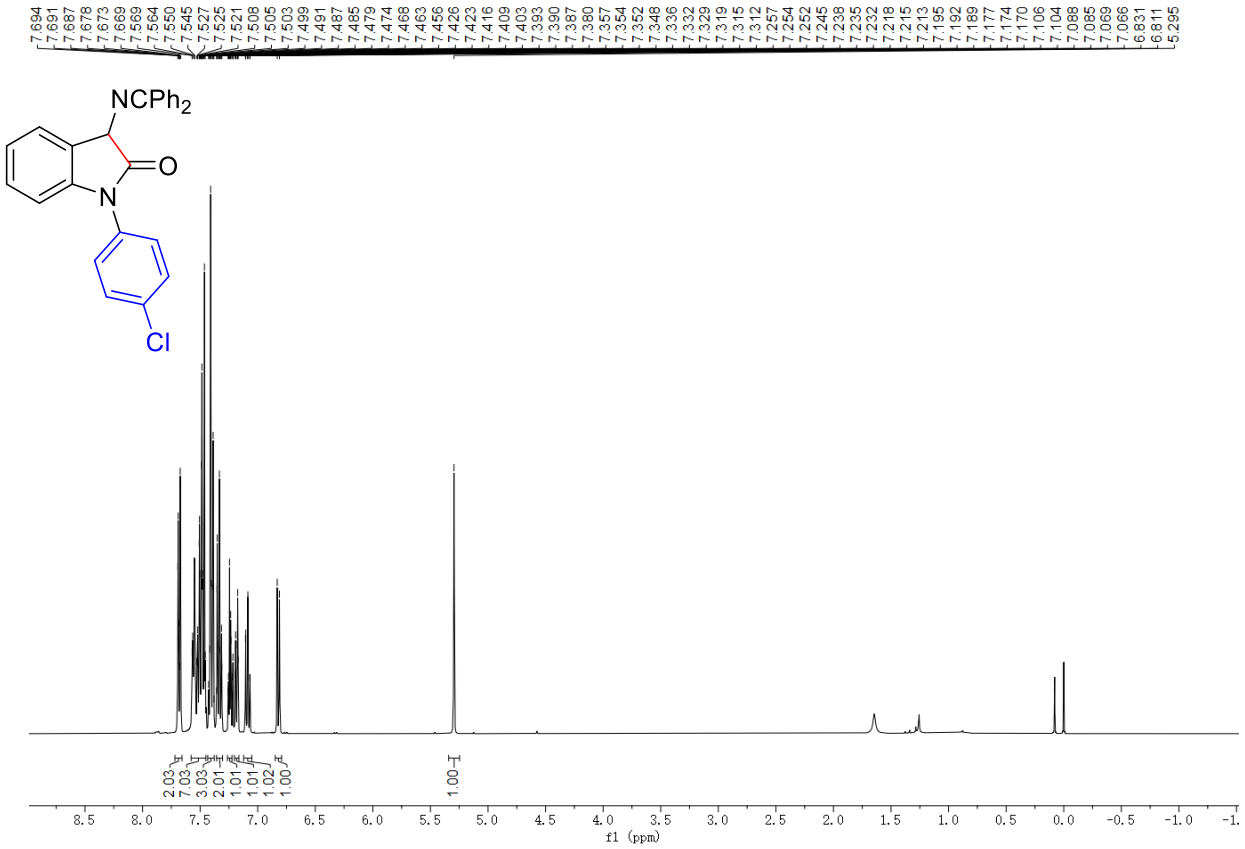

Fig. S21. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-(4-Chlorophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2j).

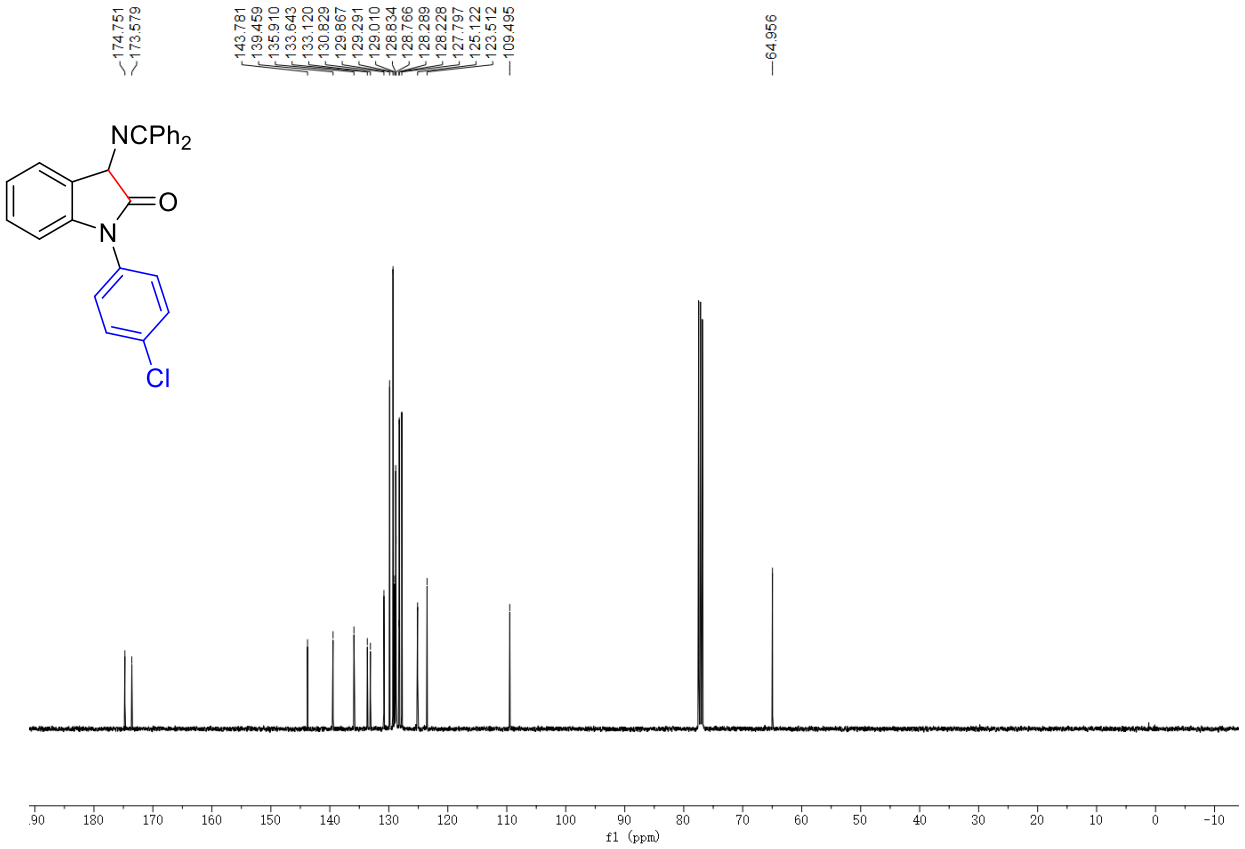

Fig. S22. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-(4-Bromophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2k).

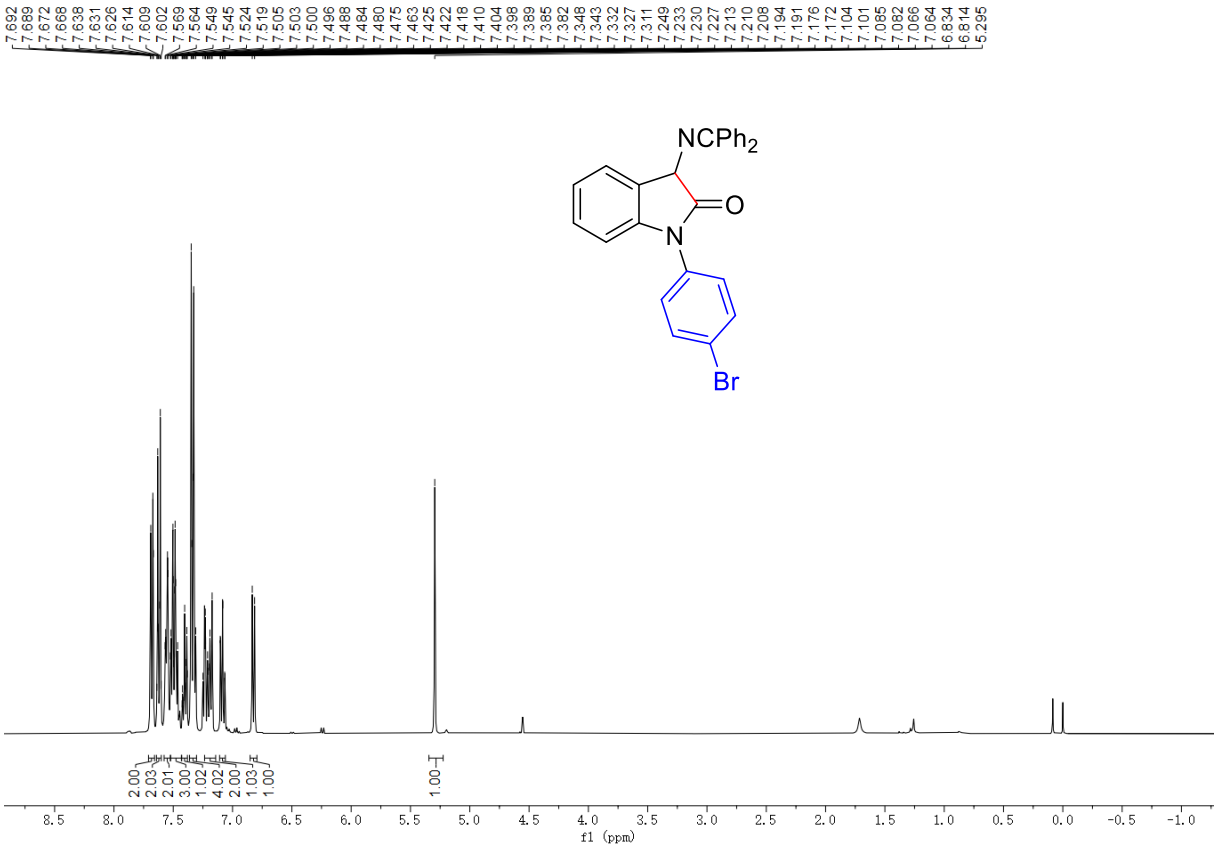

Fig. S23. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-(4-Bromophenyl)-3-((diphenylmethylene)amino)indolin-2-one (2k).

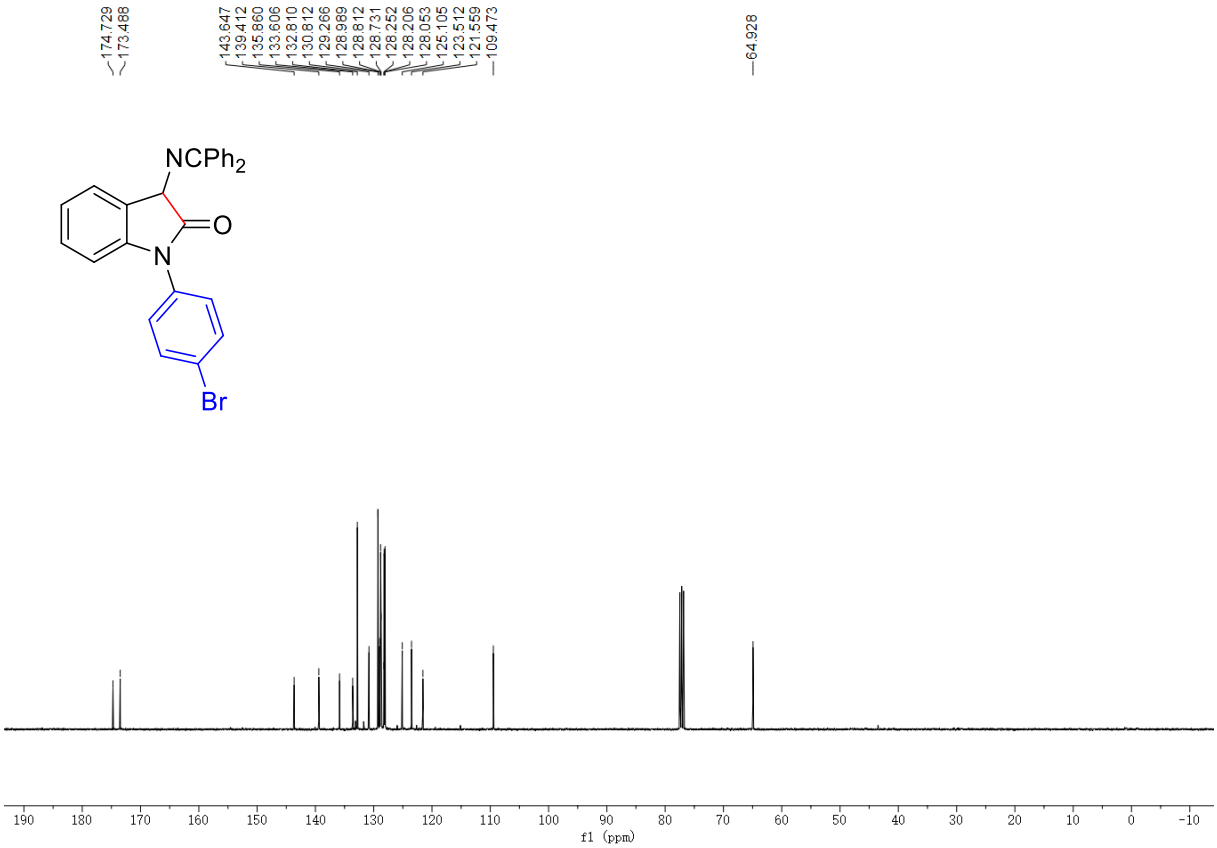

Fig. S24. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(pyridin-4-yl)indolin-2-one (2l).

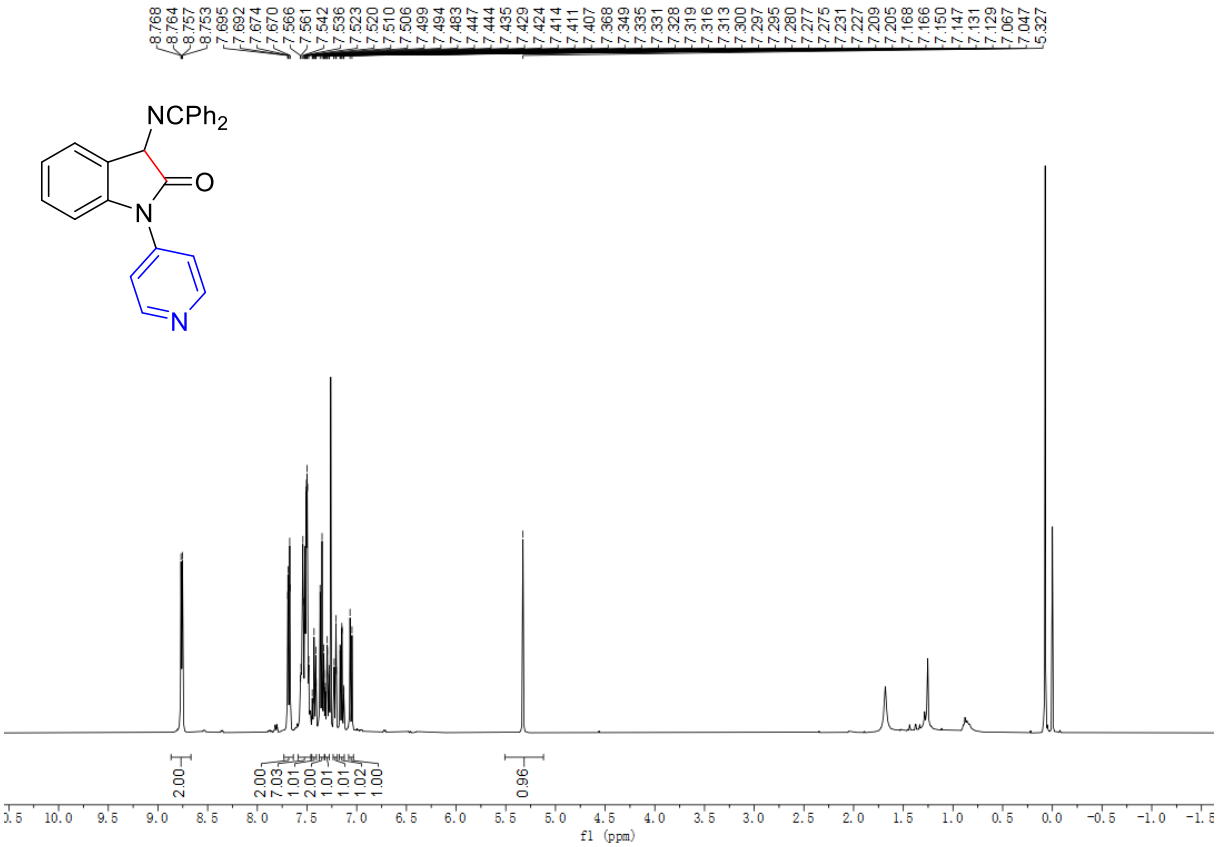

Fig. S25. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(pyridin-4-yl)indolin-2-one (2l).

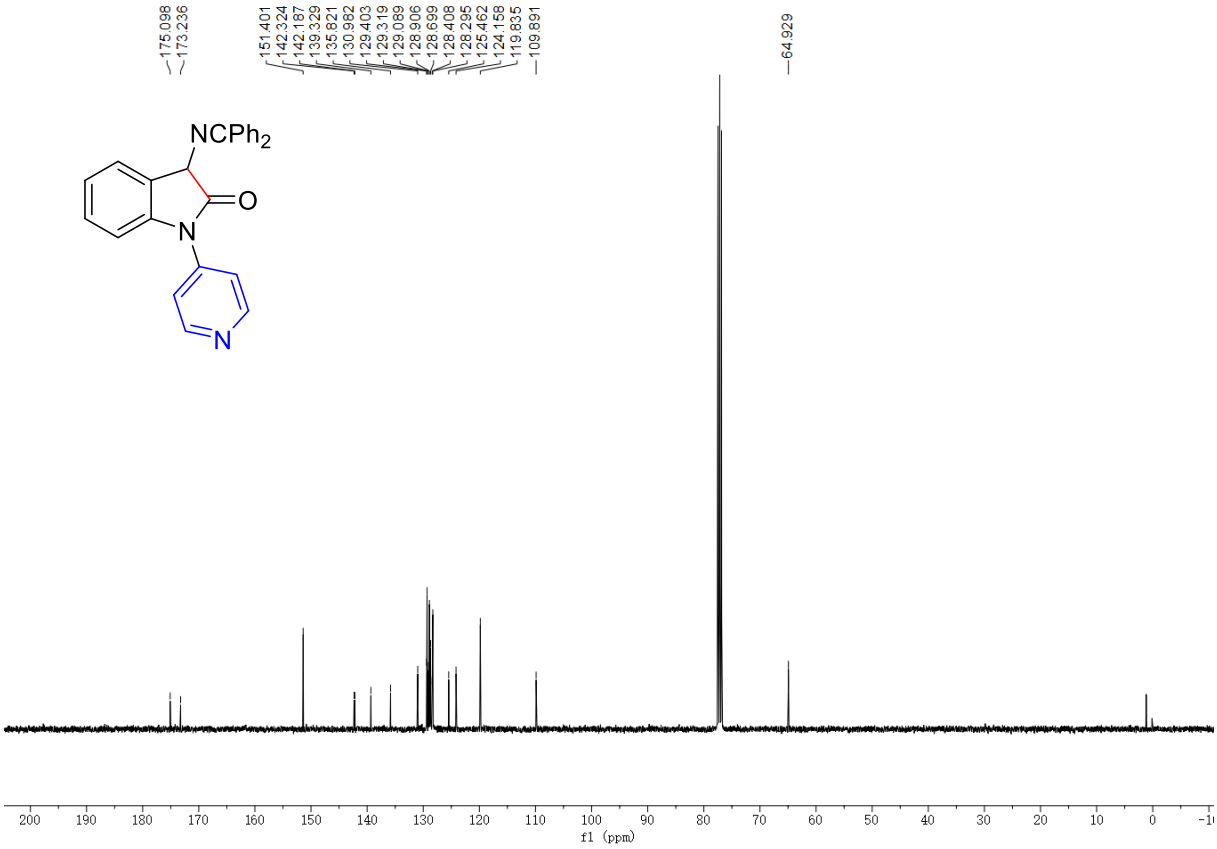

Fig. S26. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 1-(Benzo[*d*][1,3]dioxol-5-yl)-3-((diphenylmethylene)amino)indolin-2-one (2m).

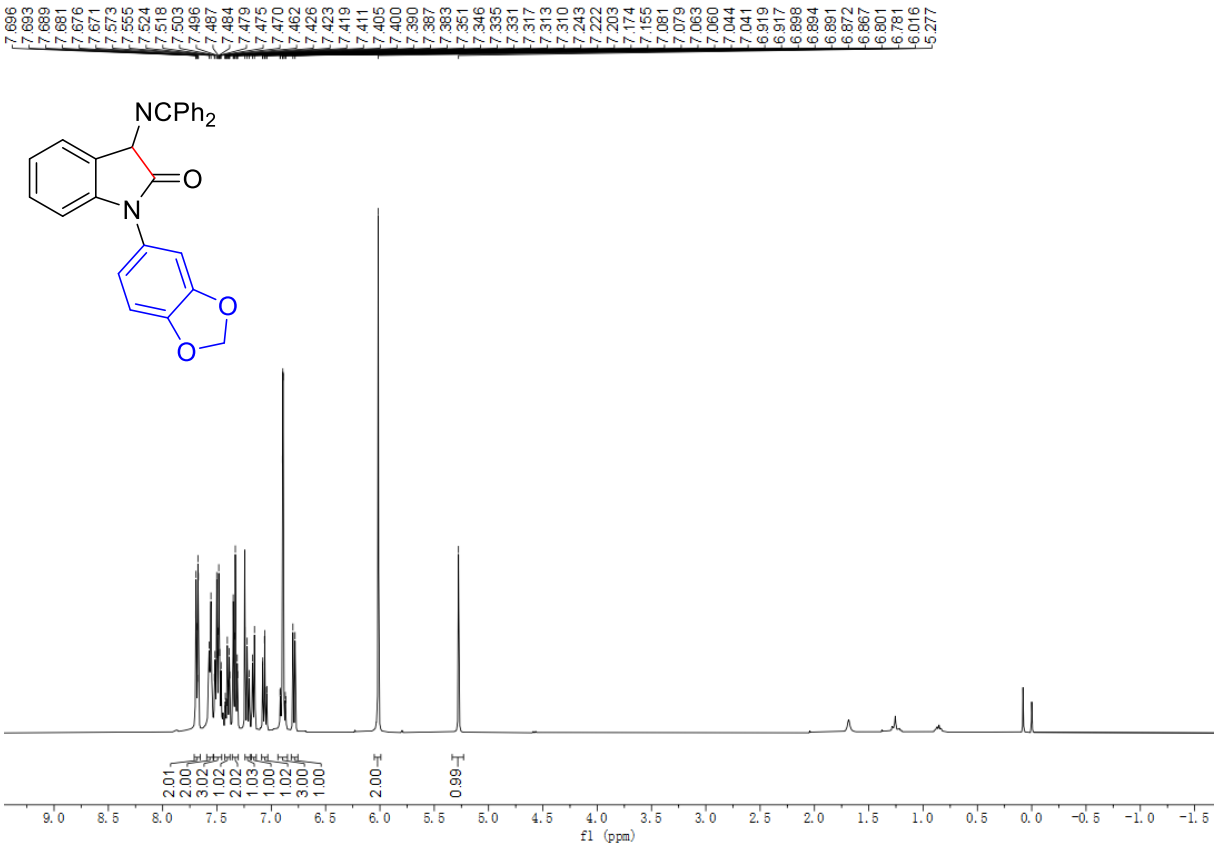

Fig. S27. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 1-(Benzo[*d*][1,3]dioxol-5-yl)-3-((diphenylmethylene)amino)indolin-2-one (2m).

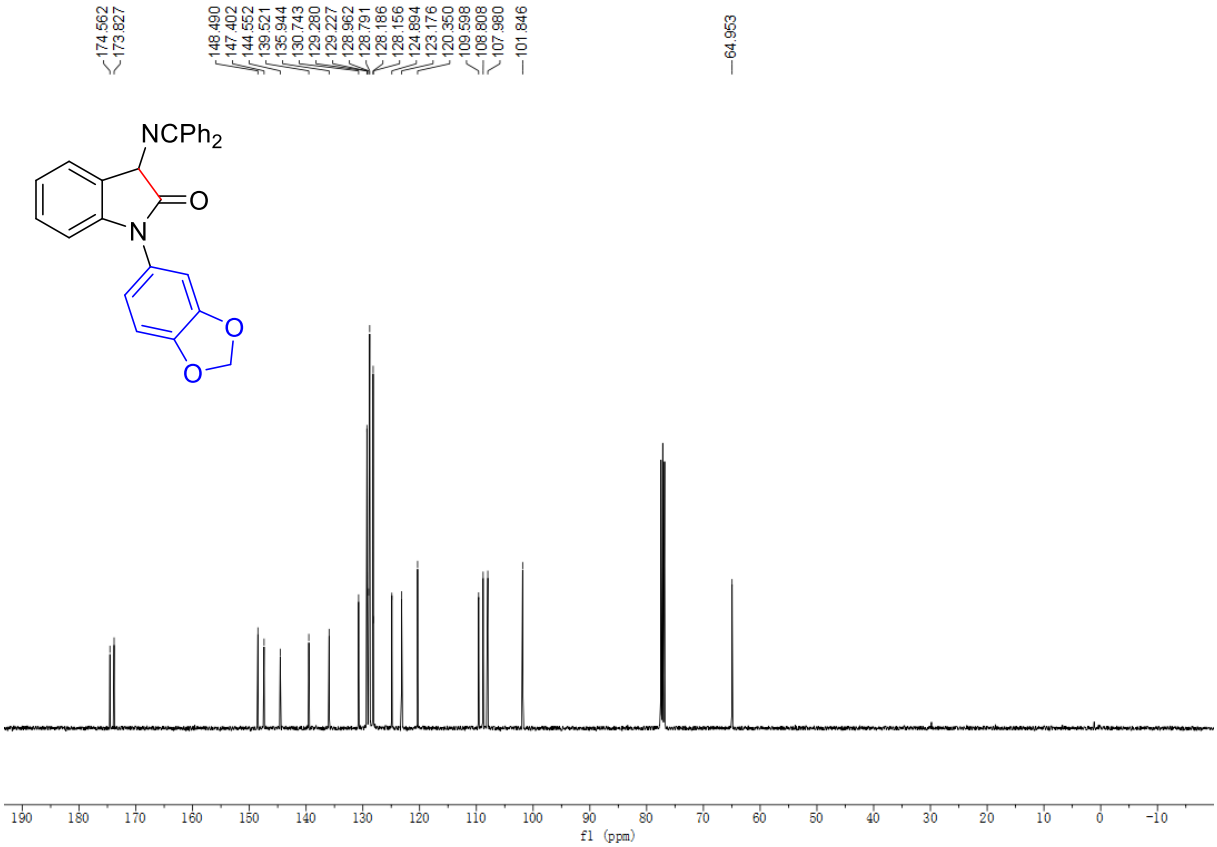

Fig. S28. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(naphthalen-1-yl)indolin-2-one (2n).

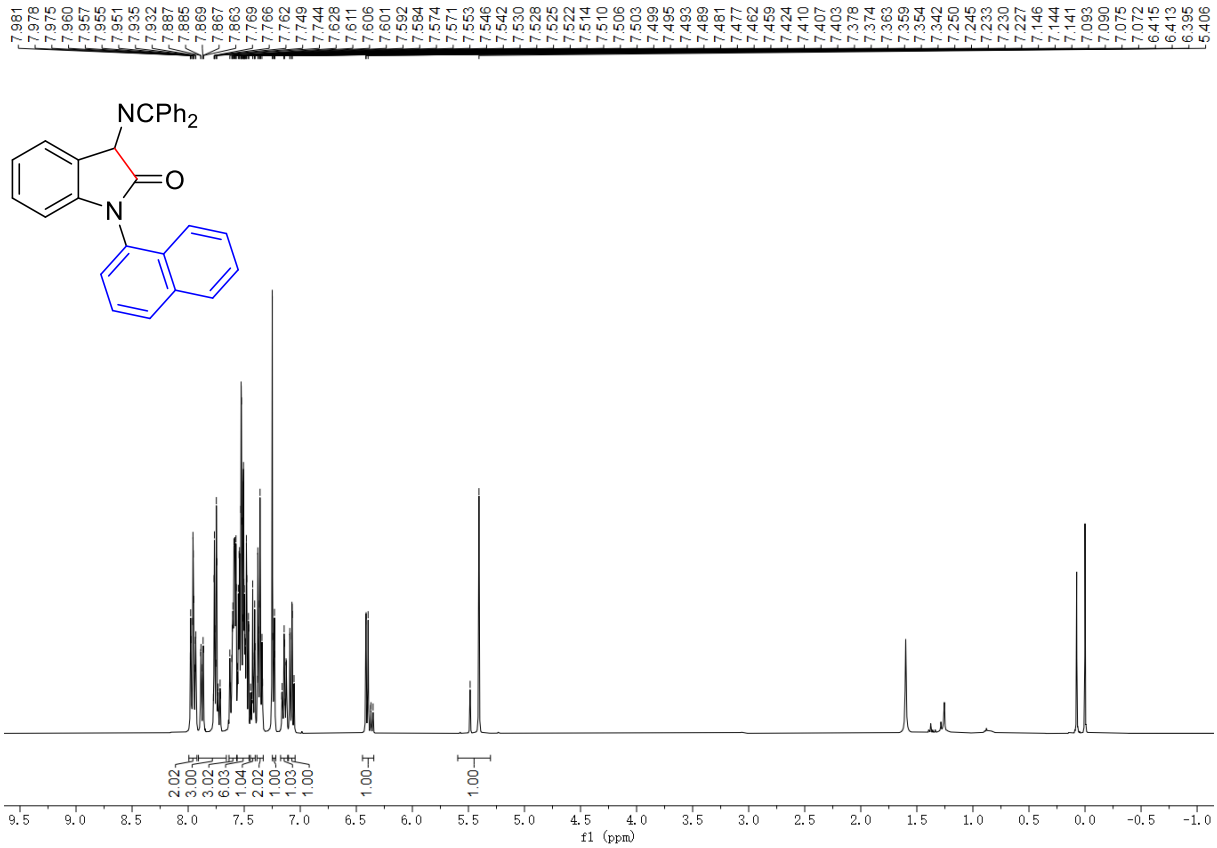

Fig. S29. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-(naphthalen-1-yl)indolin-2-one (2n).

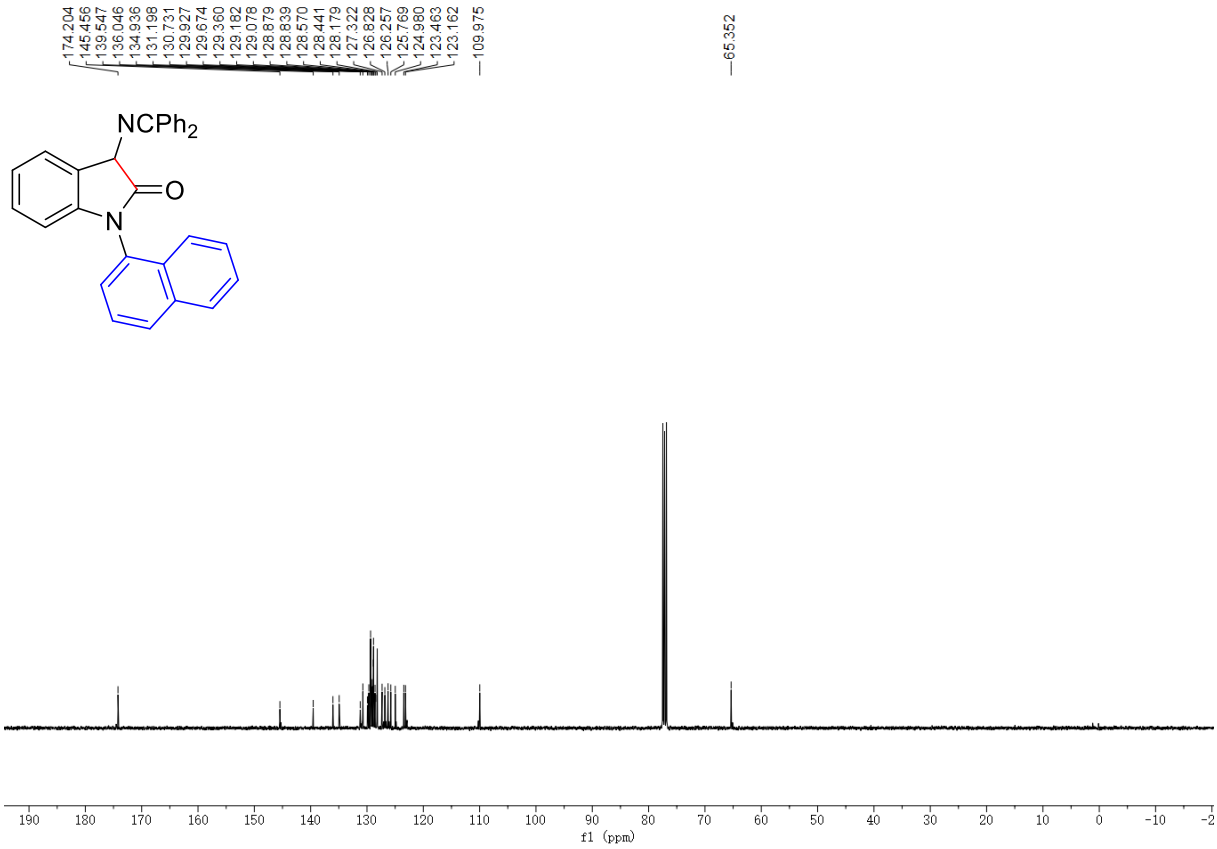

Fig. S30. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4a).

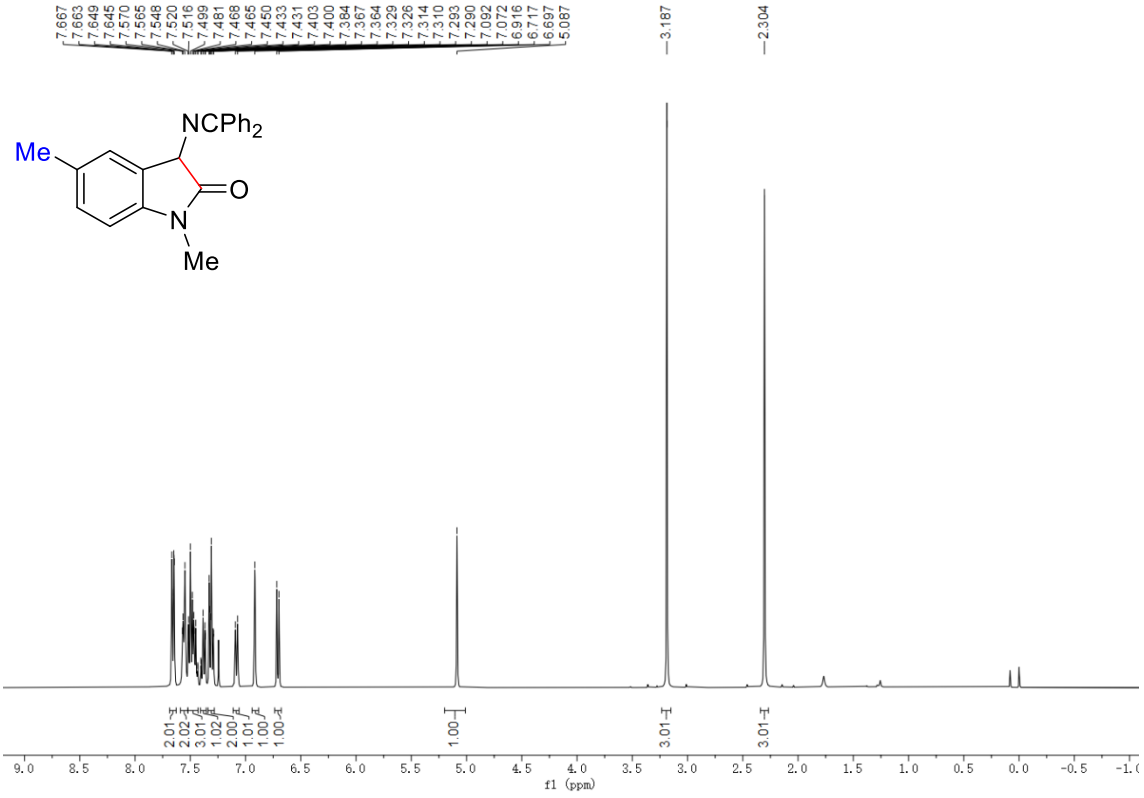

Fig. S31. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4a).

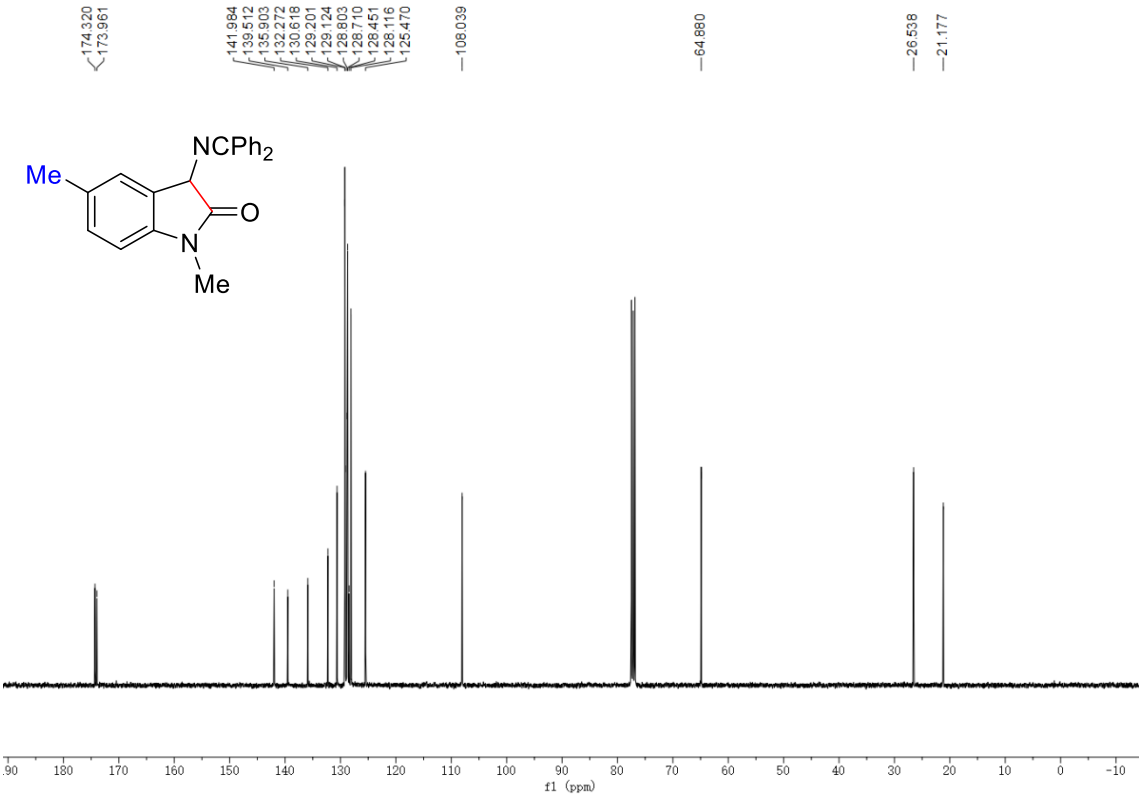

Fig. S32. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 5-(*tert*-Butyl)-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4b).

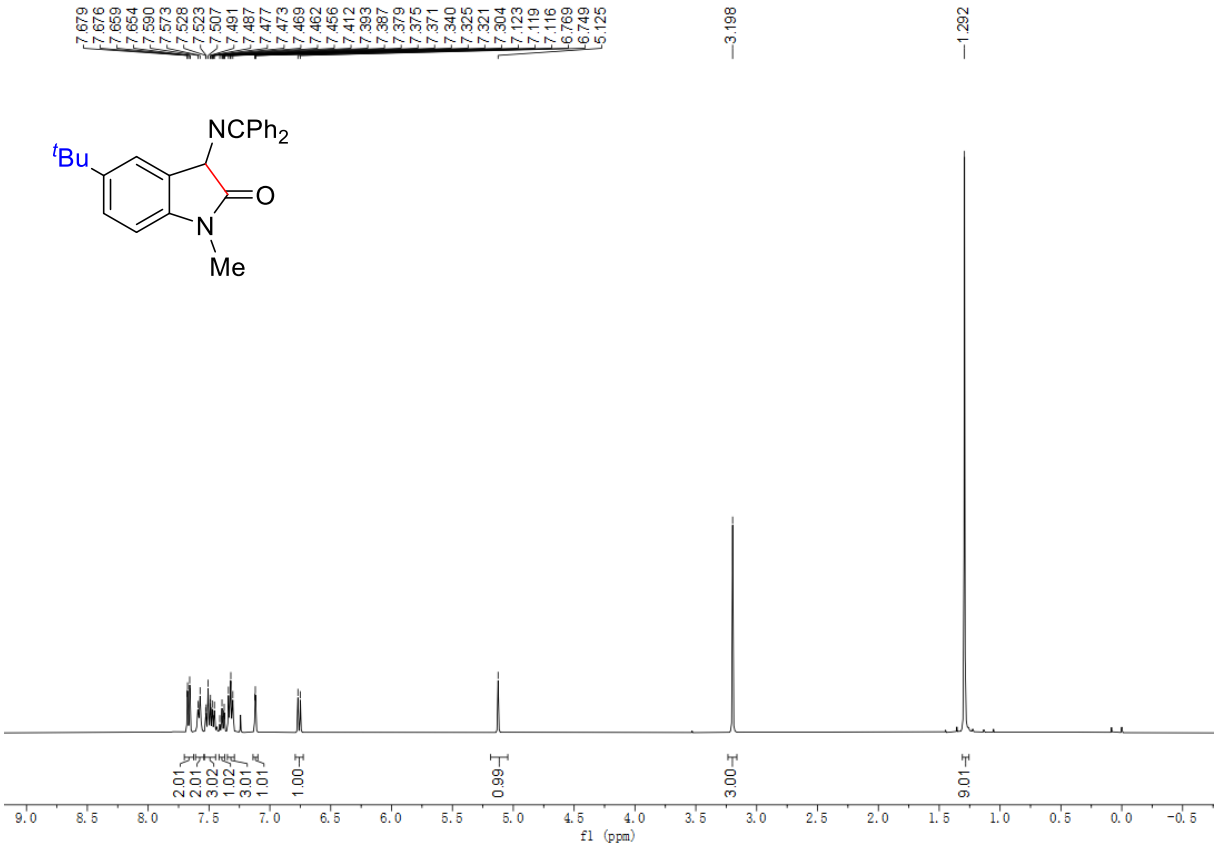

Fig. S33. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 5-(*tert*-Butyl)-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4b).

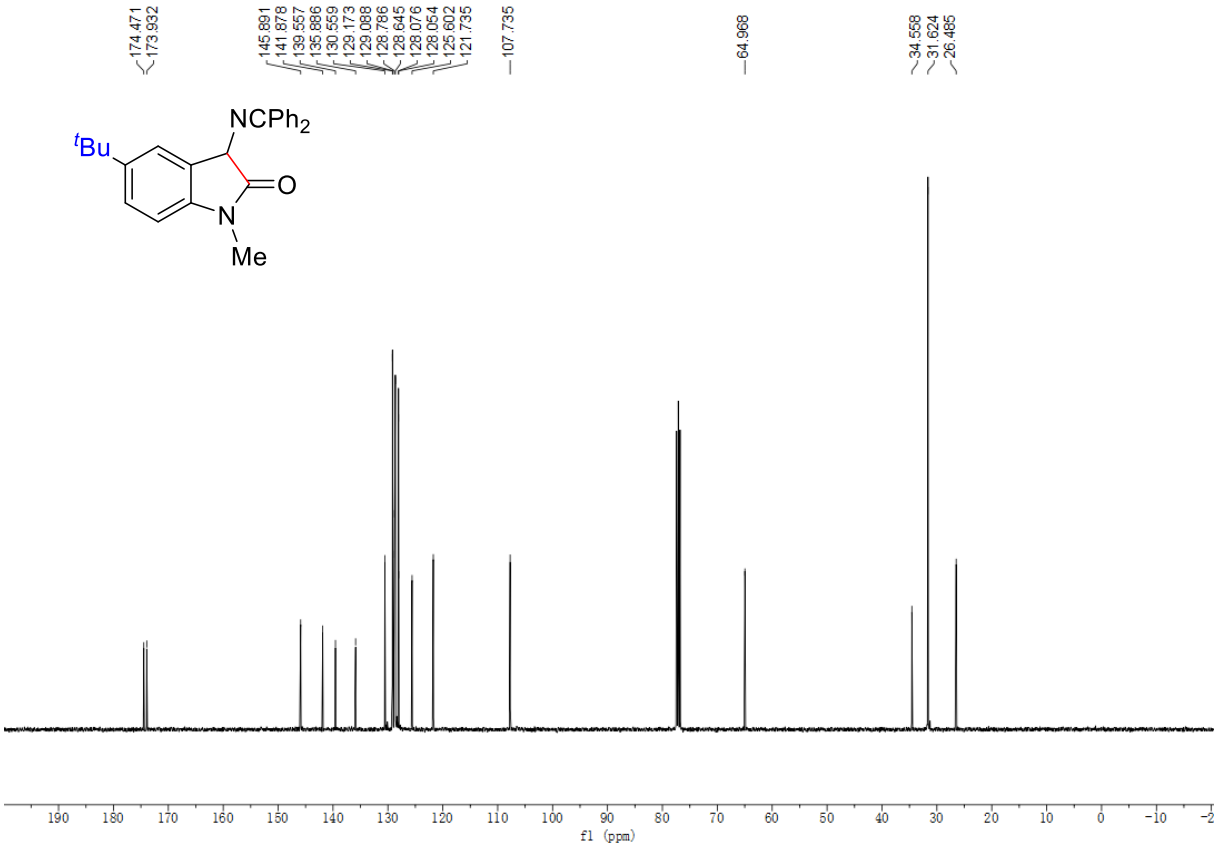

Fig. S34. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-6-methoxy-1-methylindolin-2-one (4c).

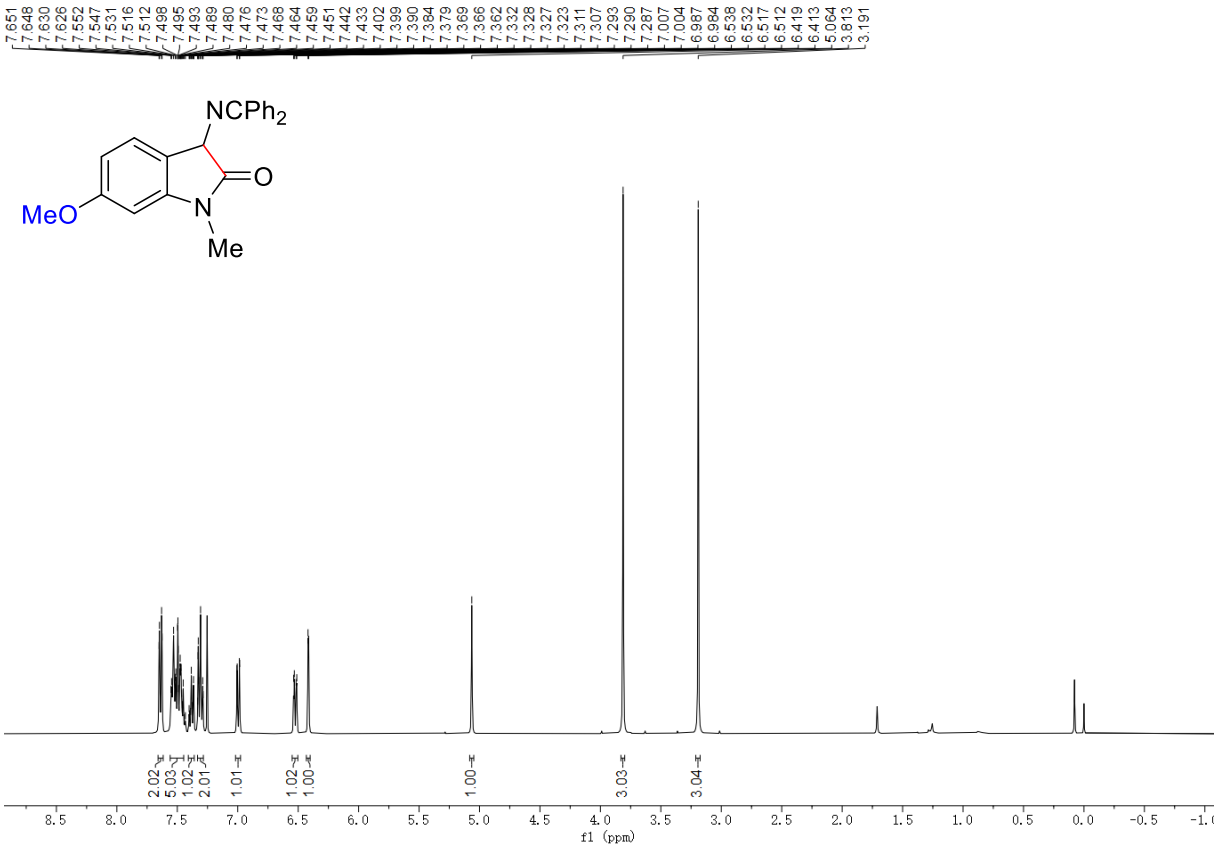

Fig. S35. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-6-methoxy-1-methylindolin-2-one (4c).

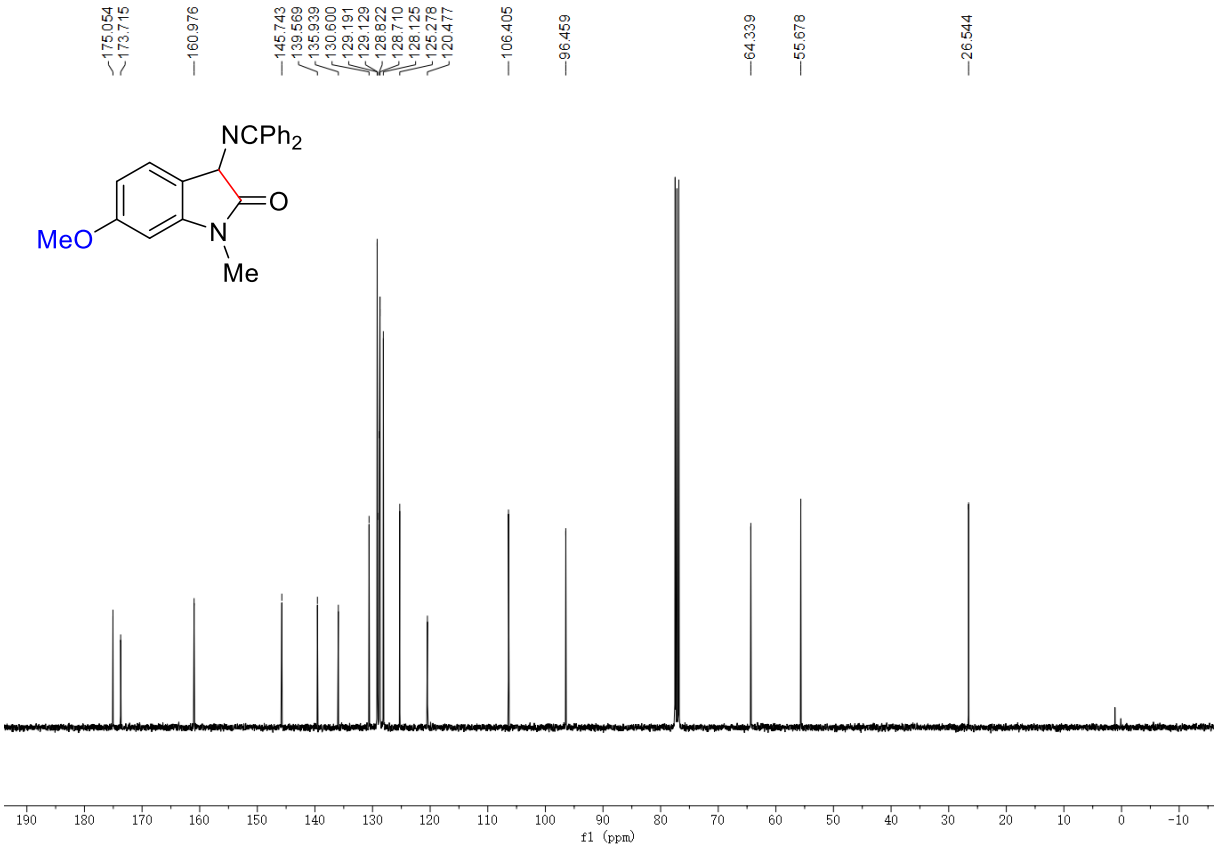

Fig. S36. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-4-phenoxyindolin-2-one (4d).

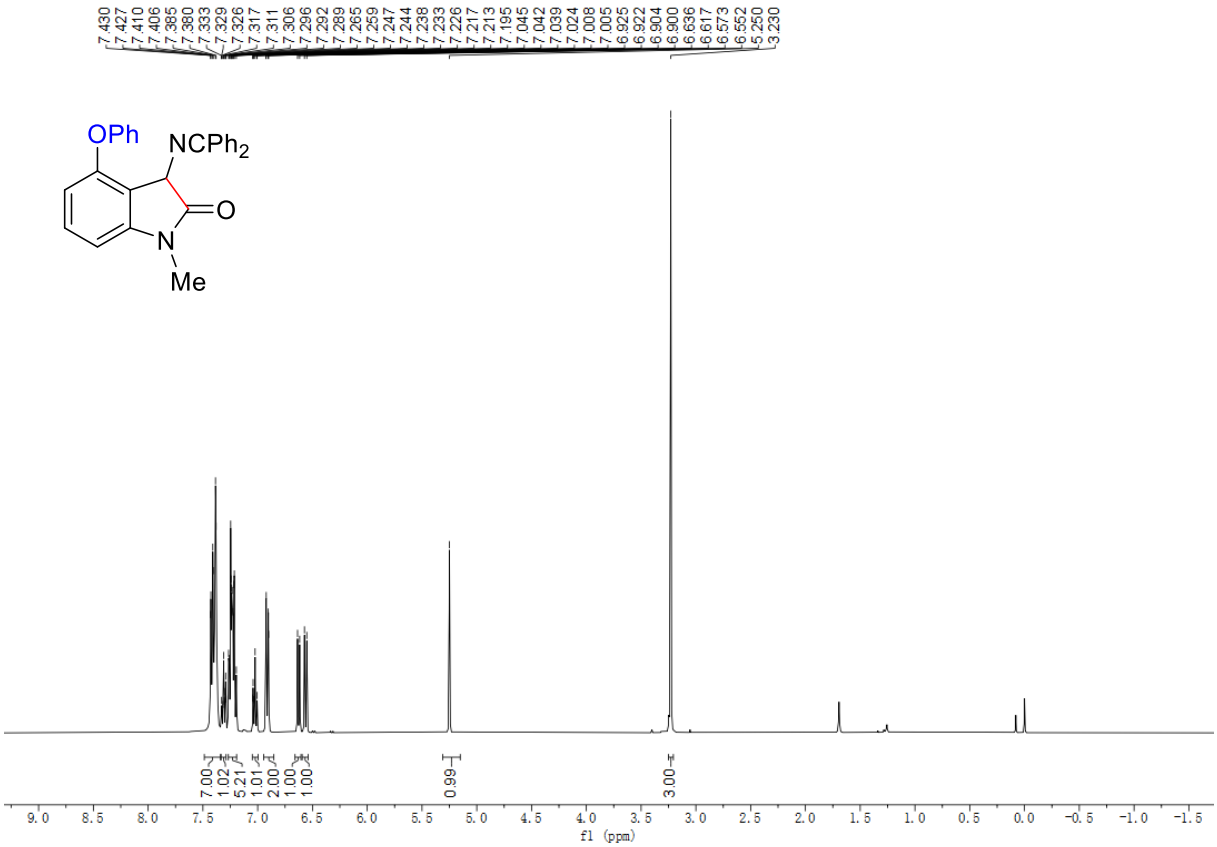

Fig. S37. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-4-phenoxyindolin-2-one (4d).

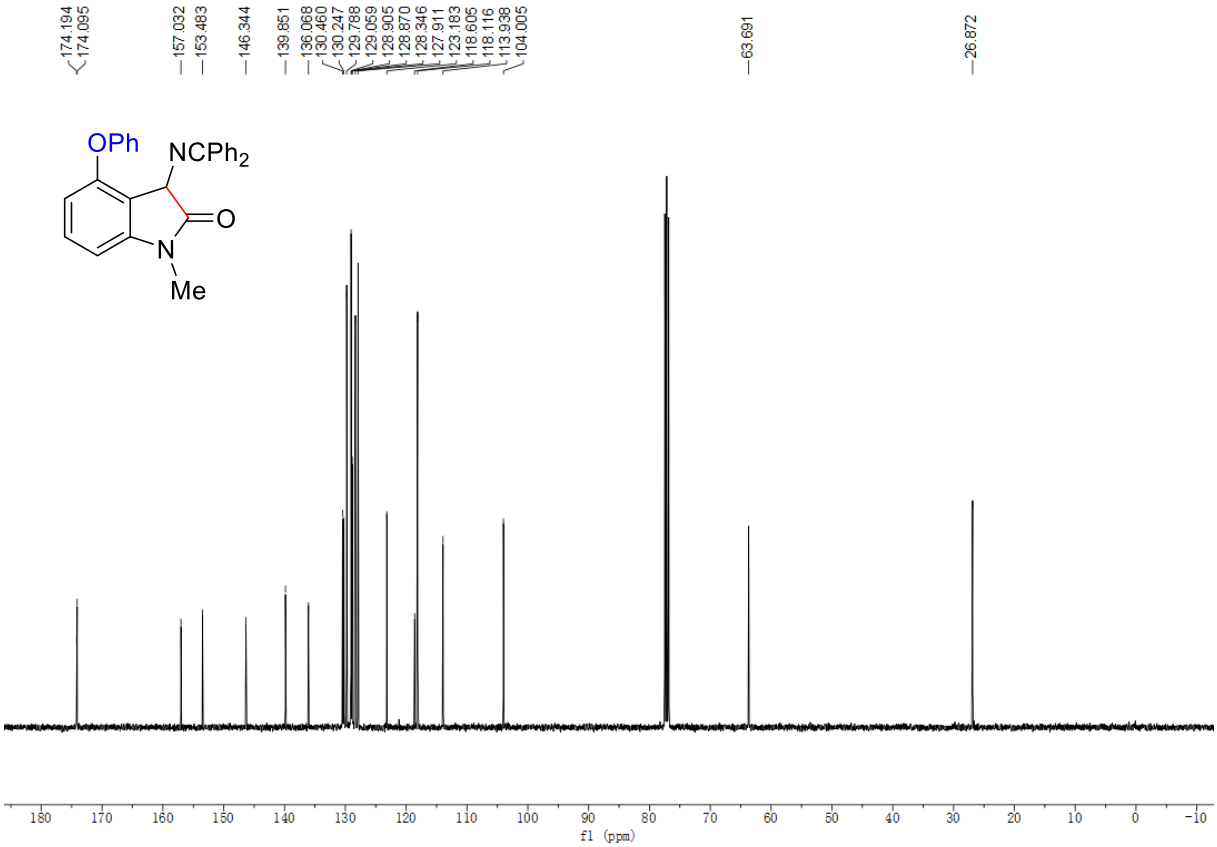

Fig. S38. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethoxy)indolin-2-one (4e).

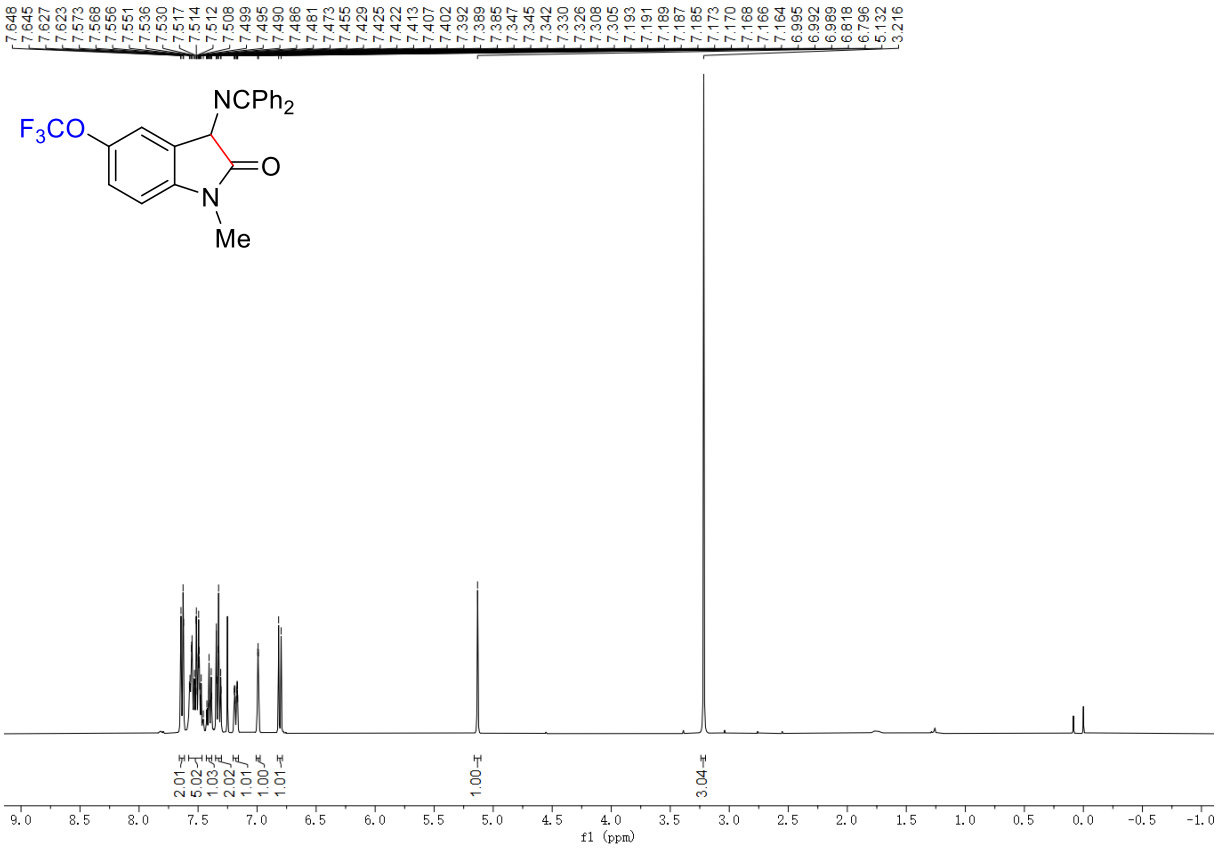

Fig. S39. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethoxy)indolin-2-one (4e).

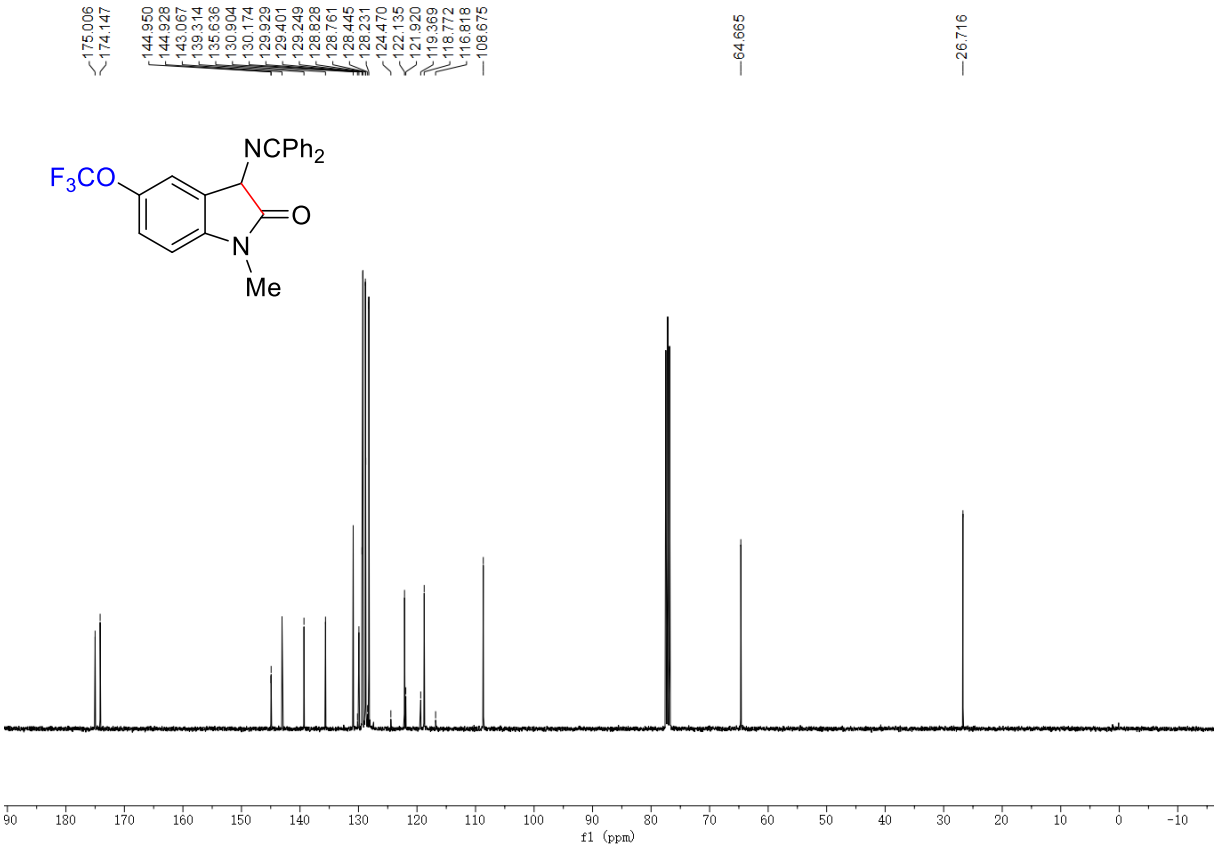

Fig. S40. ^{19}F NMR spectra (376.8 MHz, Chloroform-d) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethoxy)indolin-2-one (4e).

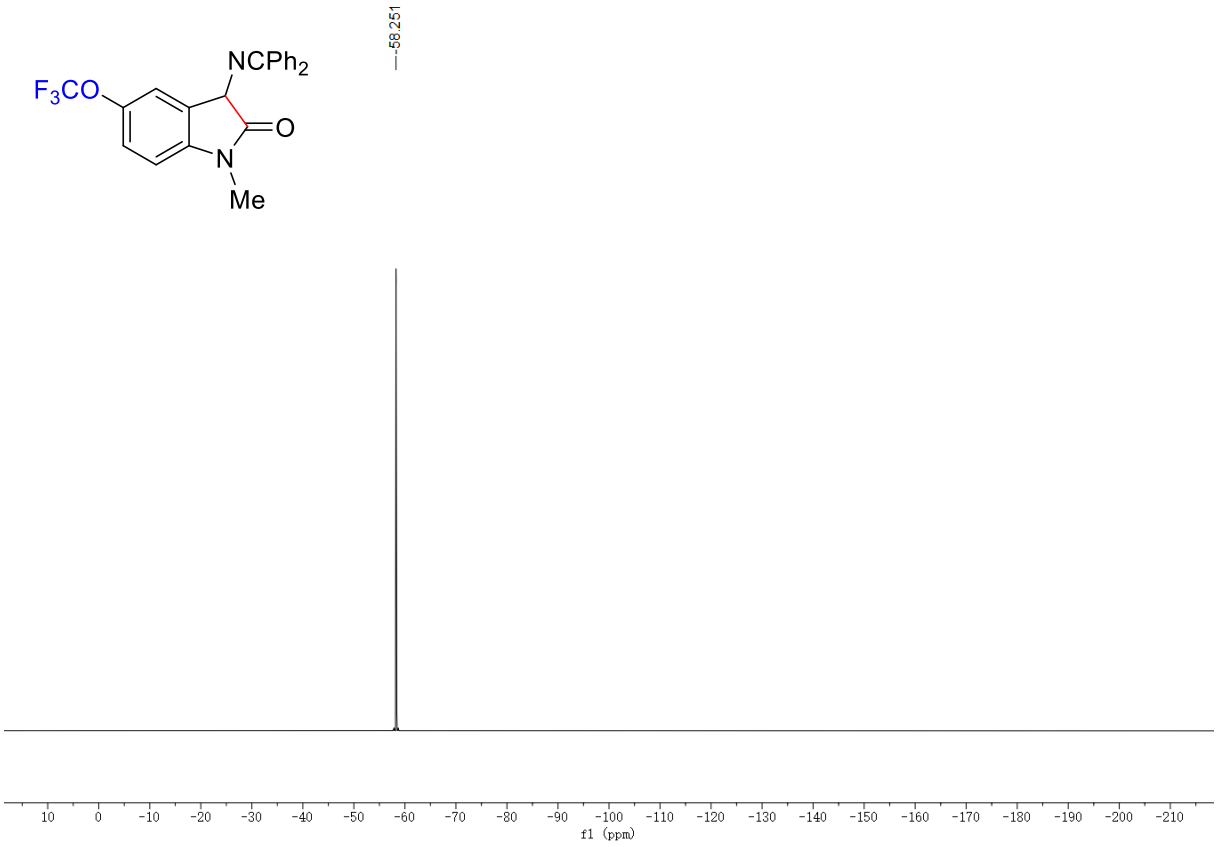

Fig. S41. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethyl)indolin-2-one (4f).

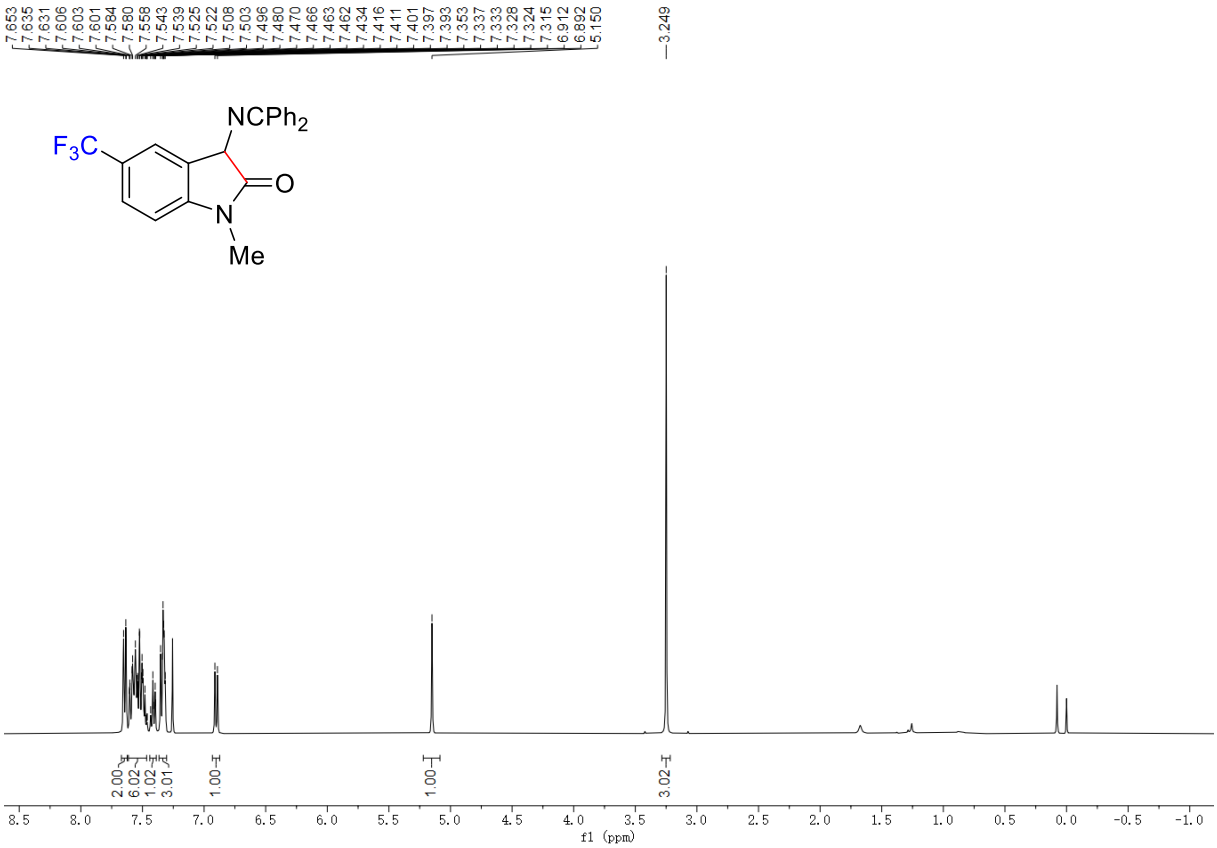

Fig. S42. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethyl)indolin-2-one (4f).

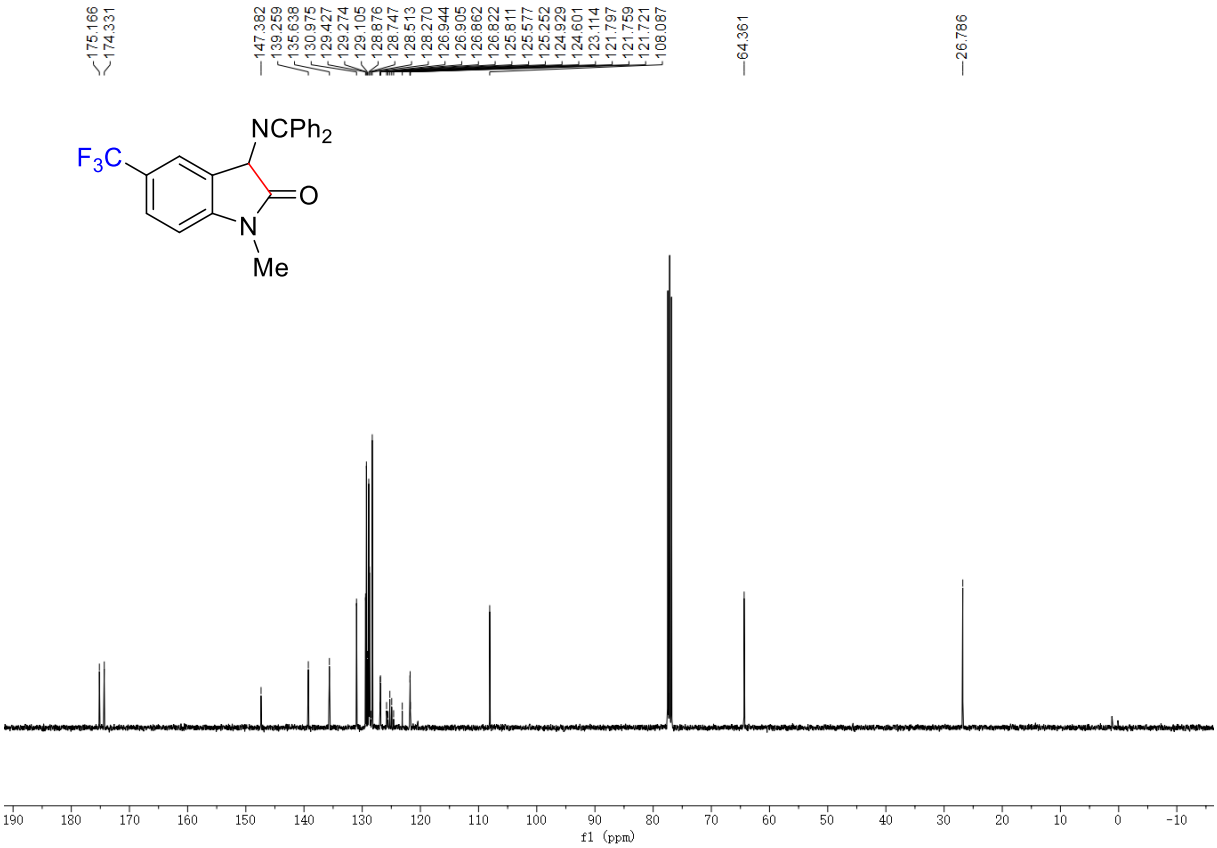

Fig. S43. ^{19}F NMR spectra (376.8 MHz, Chloroform-d) of 3-((Diphenylmethylene)amino)-1-methyl-5-(trifluoromethyl)indolin-2-one (4f).

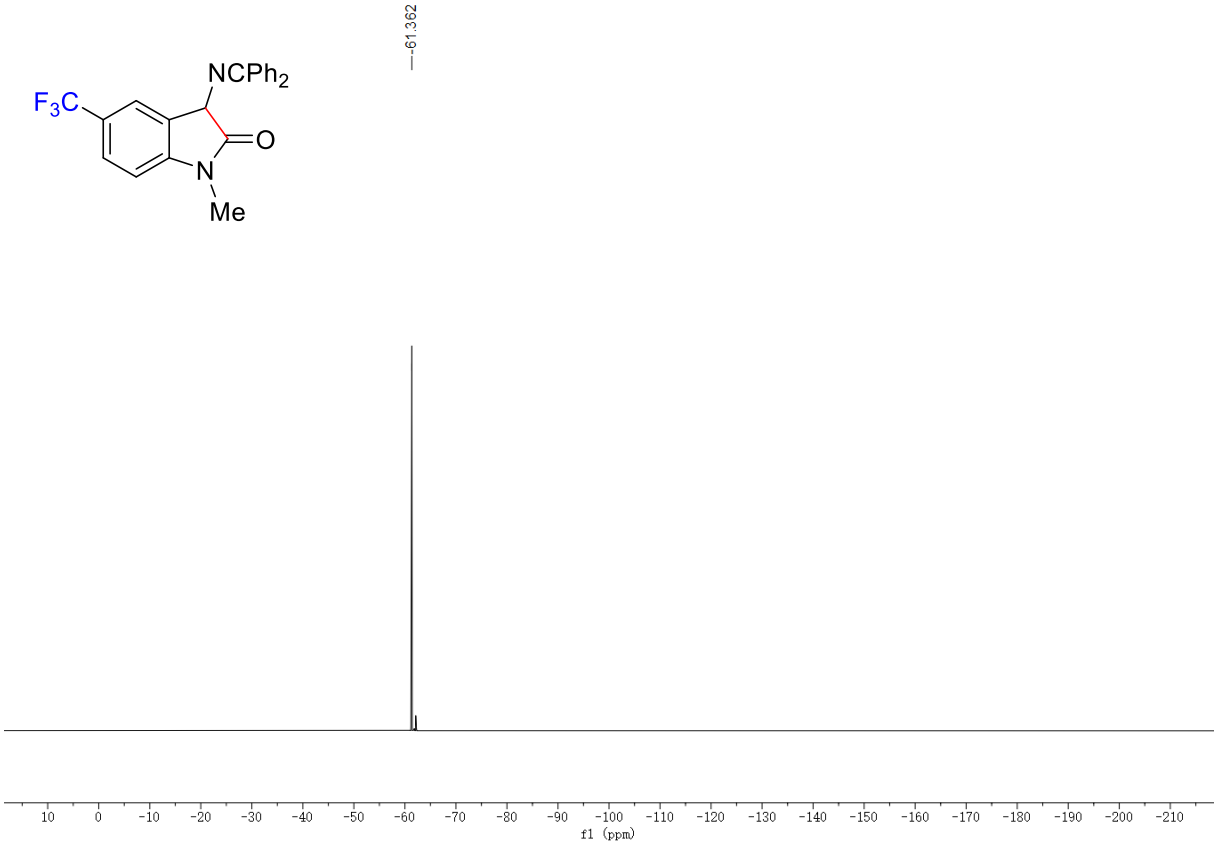

Fig. S44. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of (3-((Diphenylmethylene)amino)-5-fluoro-1-methylindolin-2-one (4g).

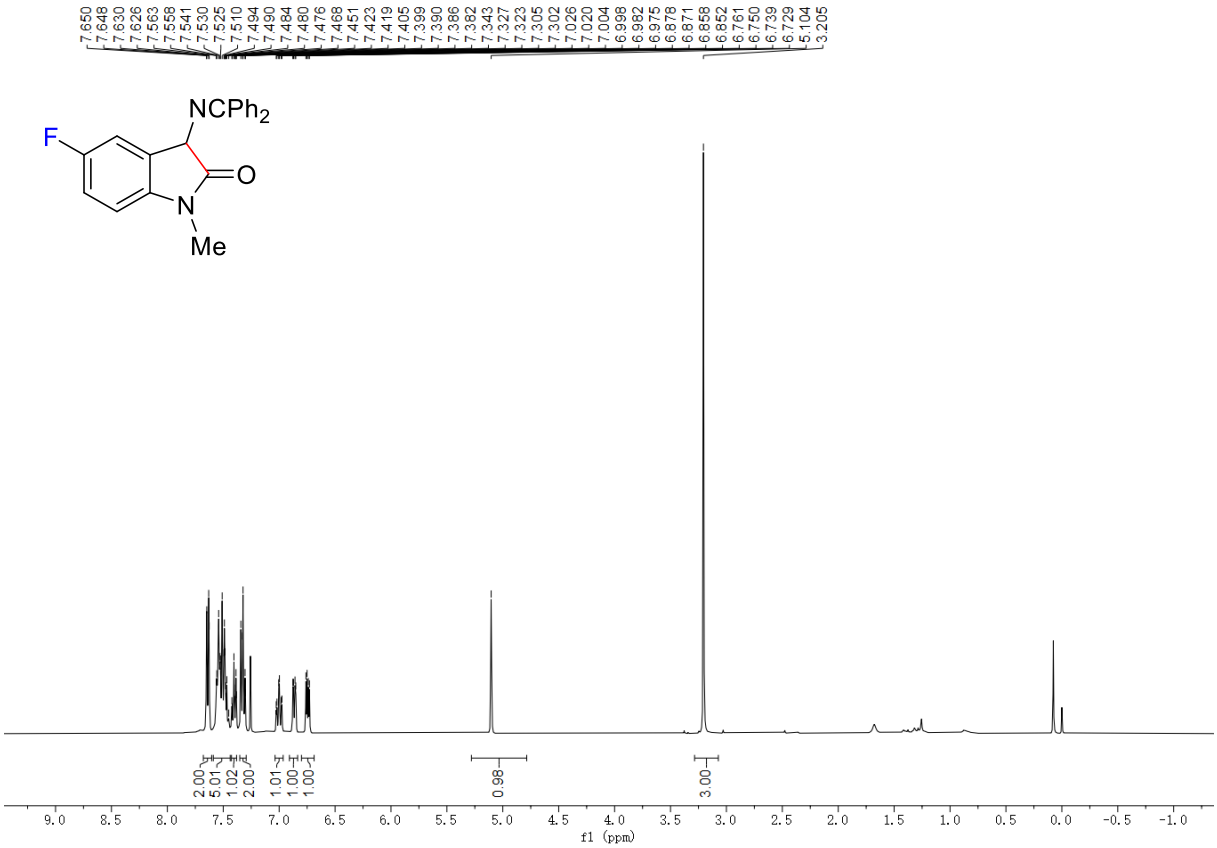

Fig. S45. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of (3-((Diphenylmethylene)amino)-5-fluoro-1-methylindolin-2-one (4g).

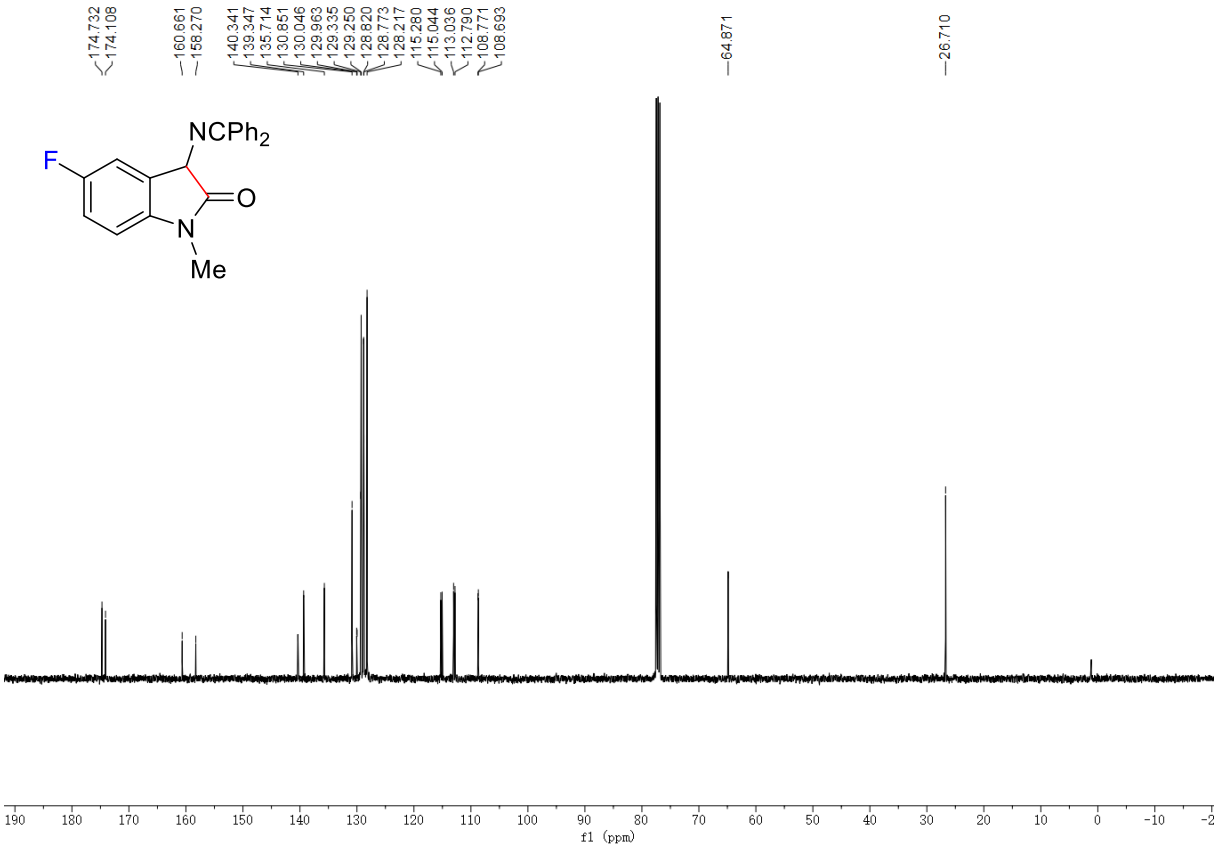

Fig. S46. ^{19}F NMR spectra (376.8 MHz, Chloroform-d) of (3-((Diphenylmethylene)amino)-5-fluoro-1-methylindolin-2-one (4g).

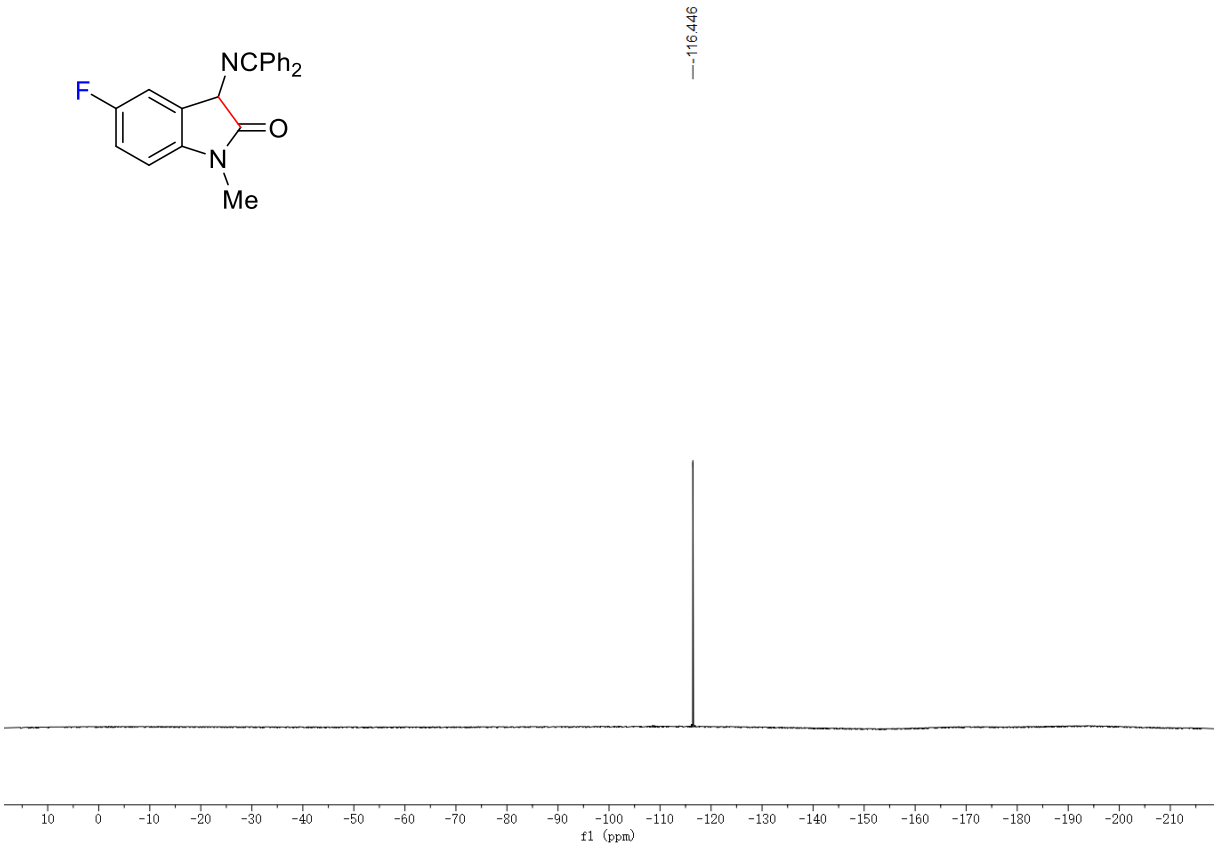

Fig. S47. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 5-Chloro-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4h).

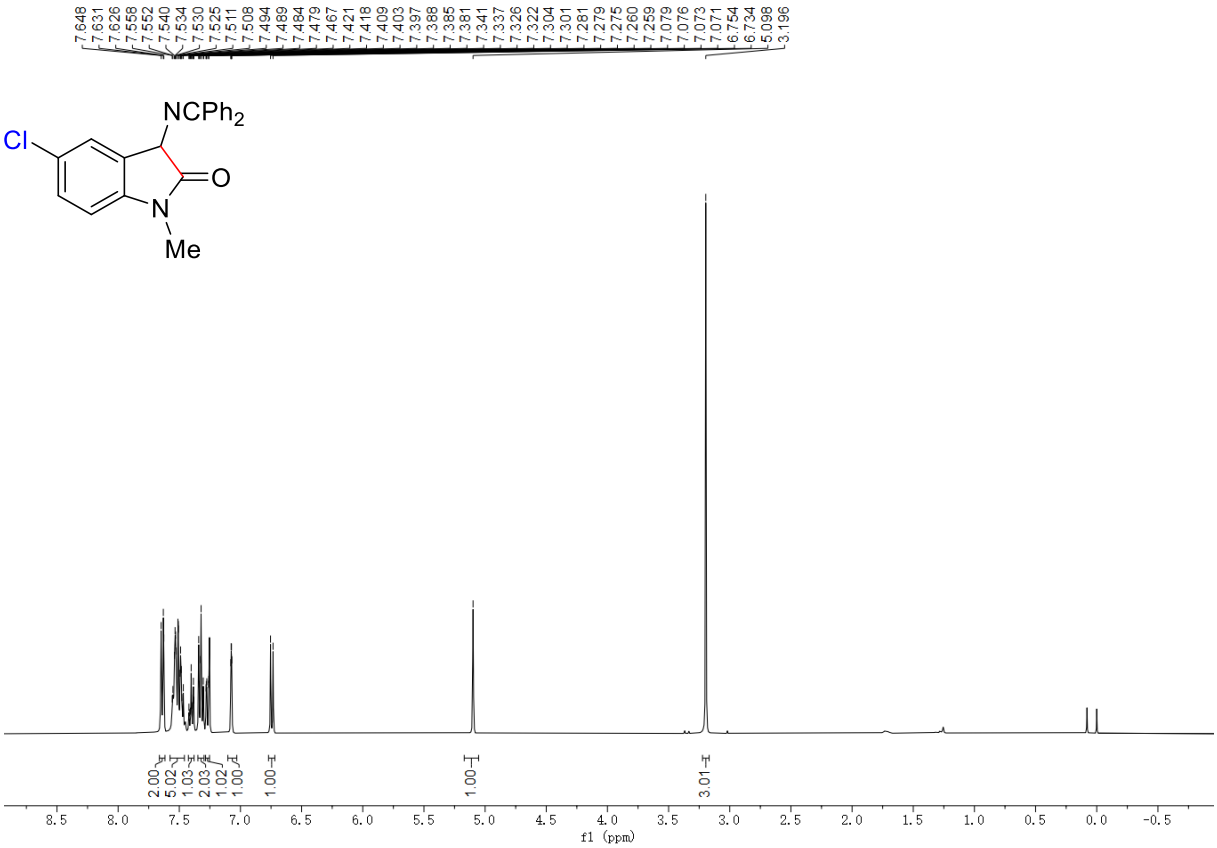

Fig. S48. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 5-Chloro-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4h).

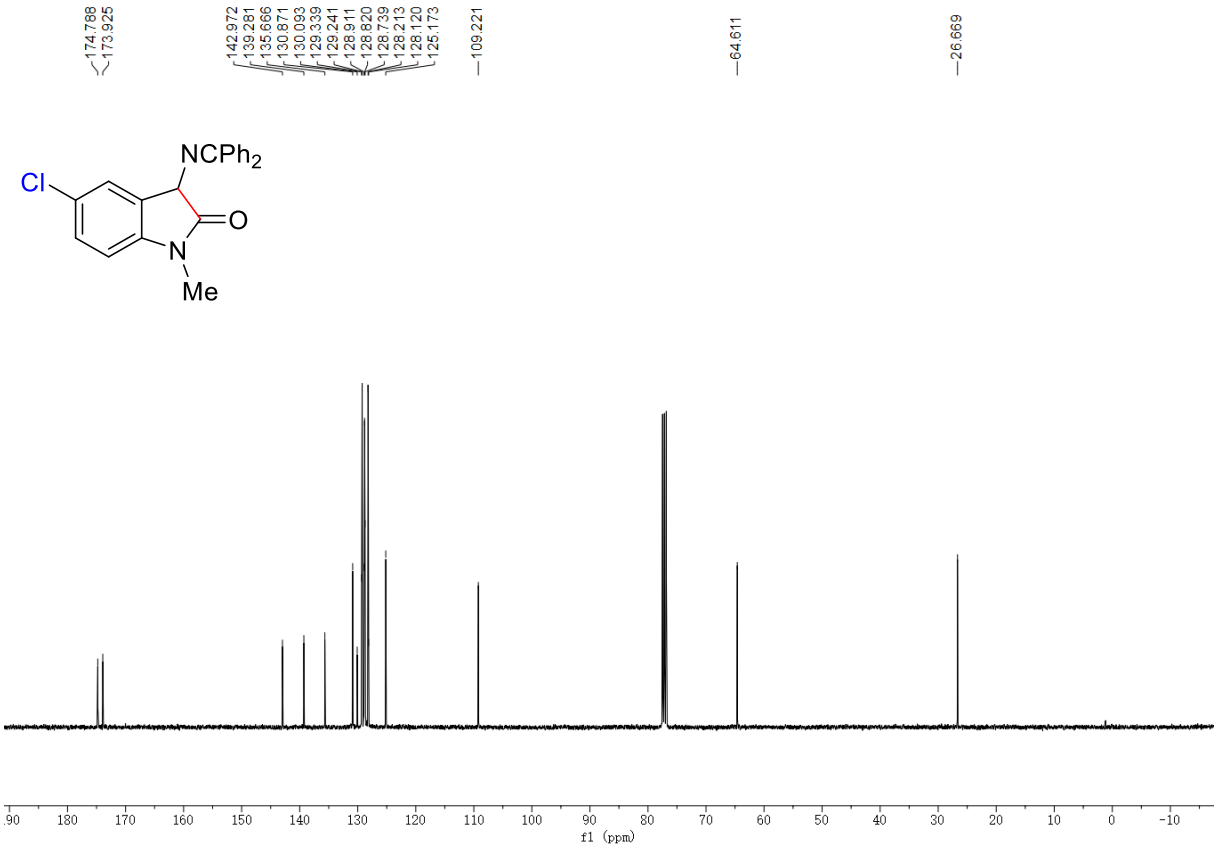

Fig. S49. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 6-Bromo-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4i).

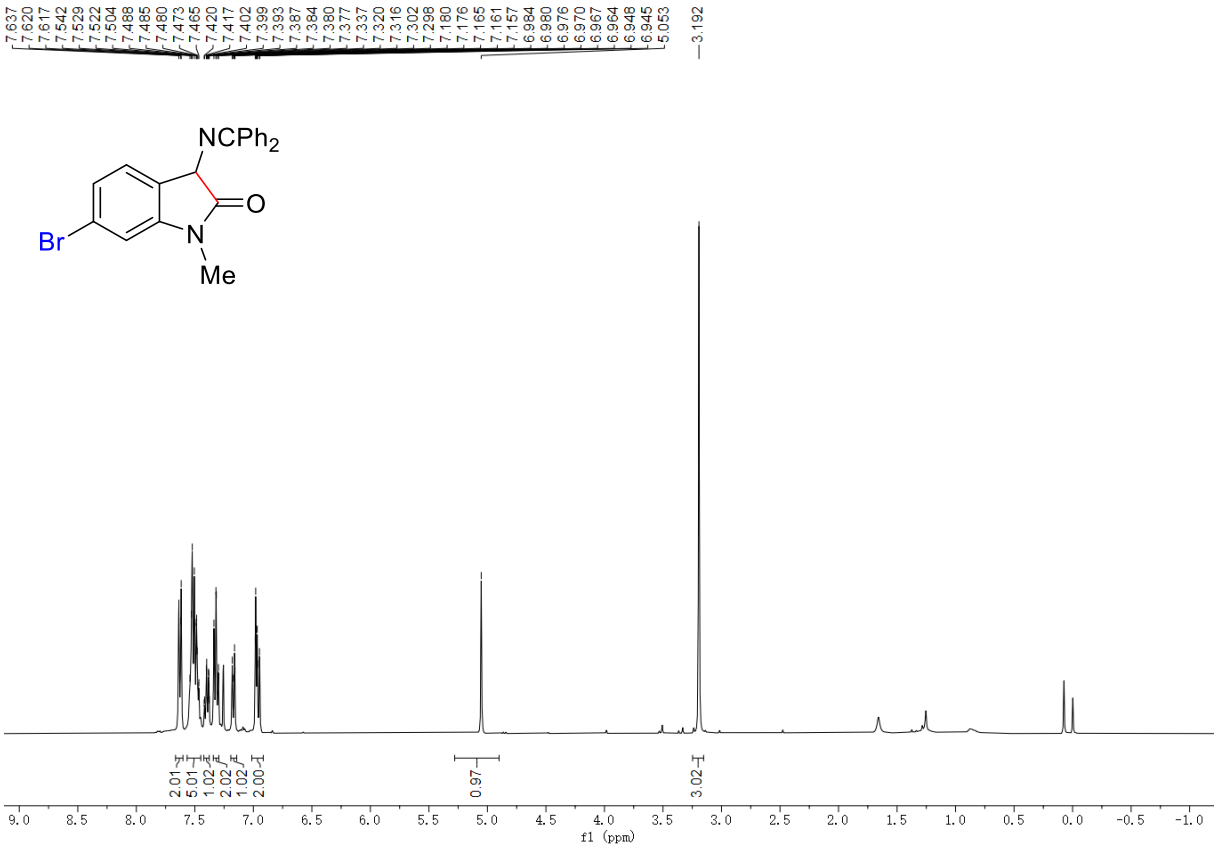

Fig. S50. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 6-Bromo-3-((diphenylmethylene)amino)-1-methylindolin-2-one (4i).

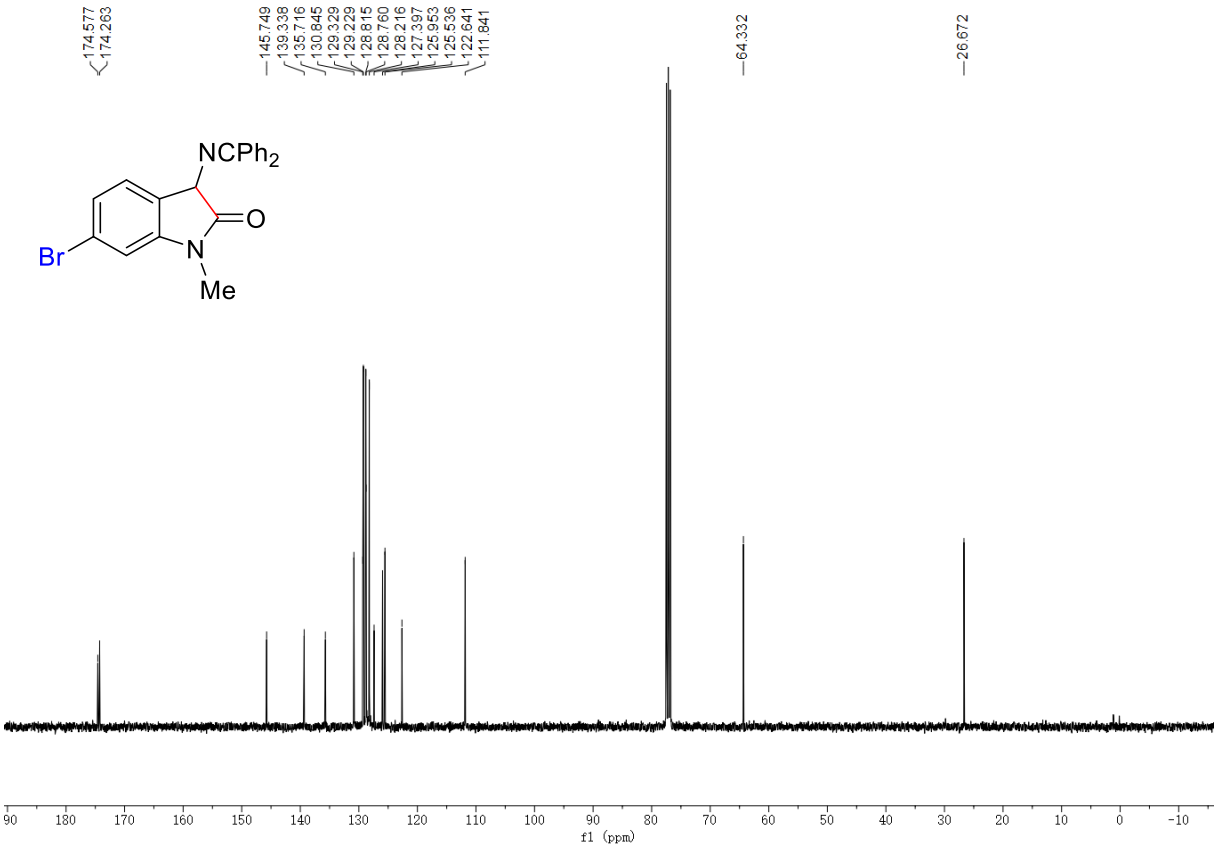

Fig. S51. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-5-iodo-1-methylindolin-2-one (4j).

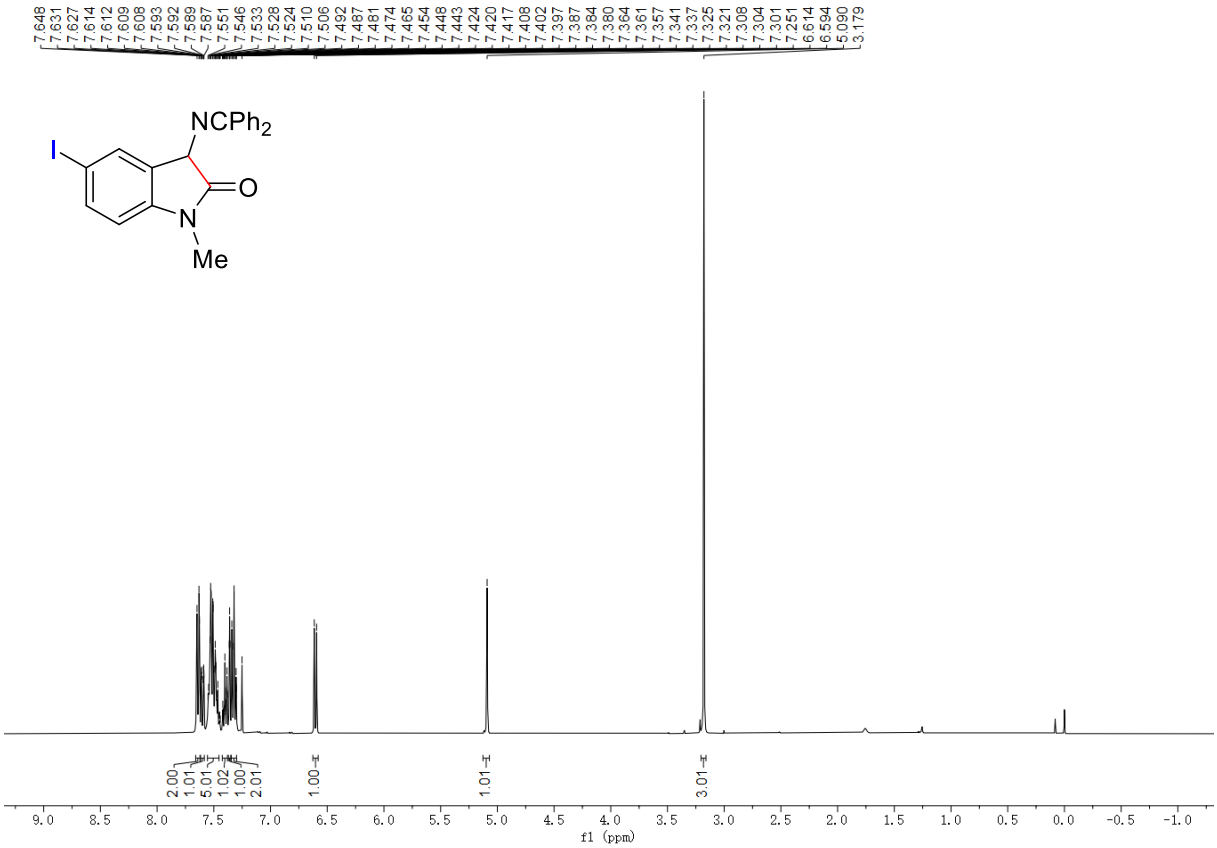

Fig. S52. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-5-iodo-1-methylindolin-2-one (4j).

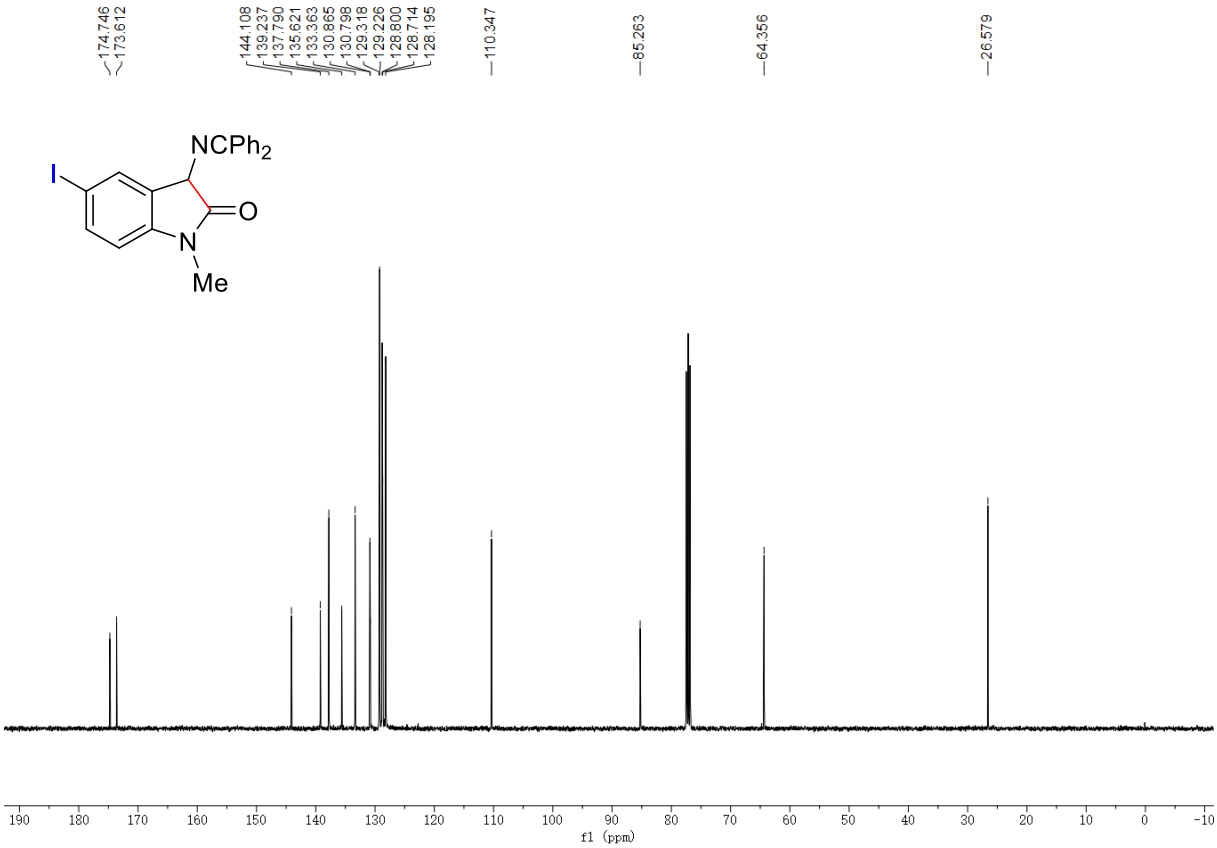

Fig. S53. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-7-fluoro-1,6-dimethylindolin-2-one (4k).

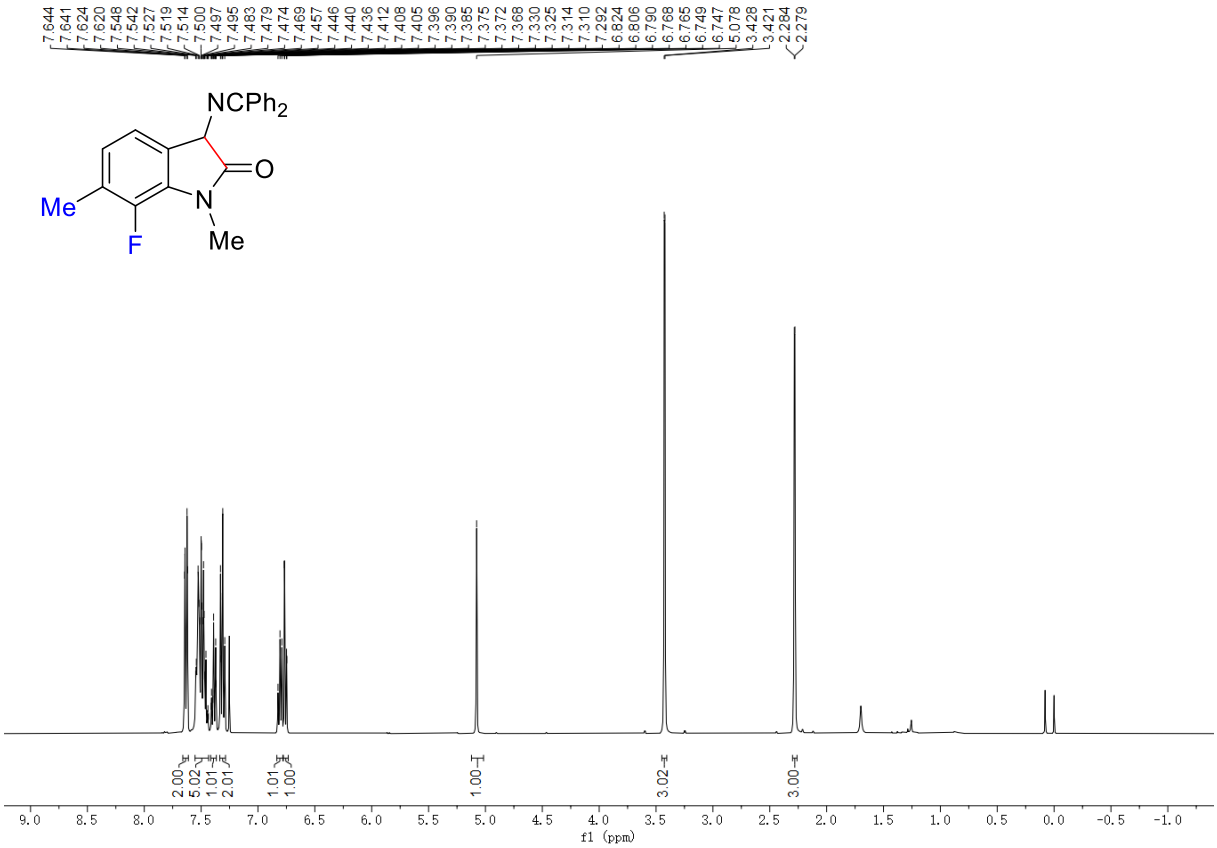

Fig. S54. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 3-((Diphenylmethylene)amino)-7-fluoro-1,6-dimethylindolin-2-one (4k).

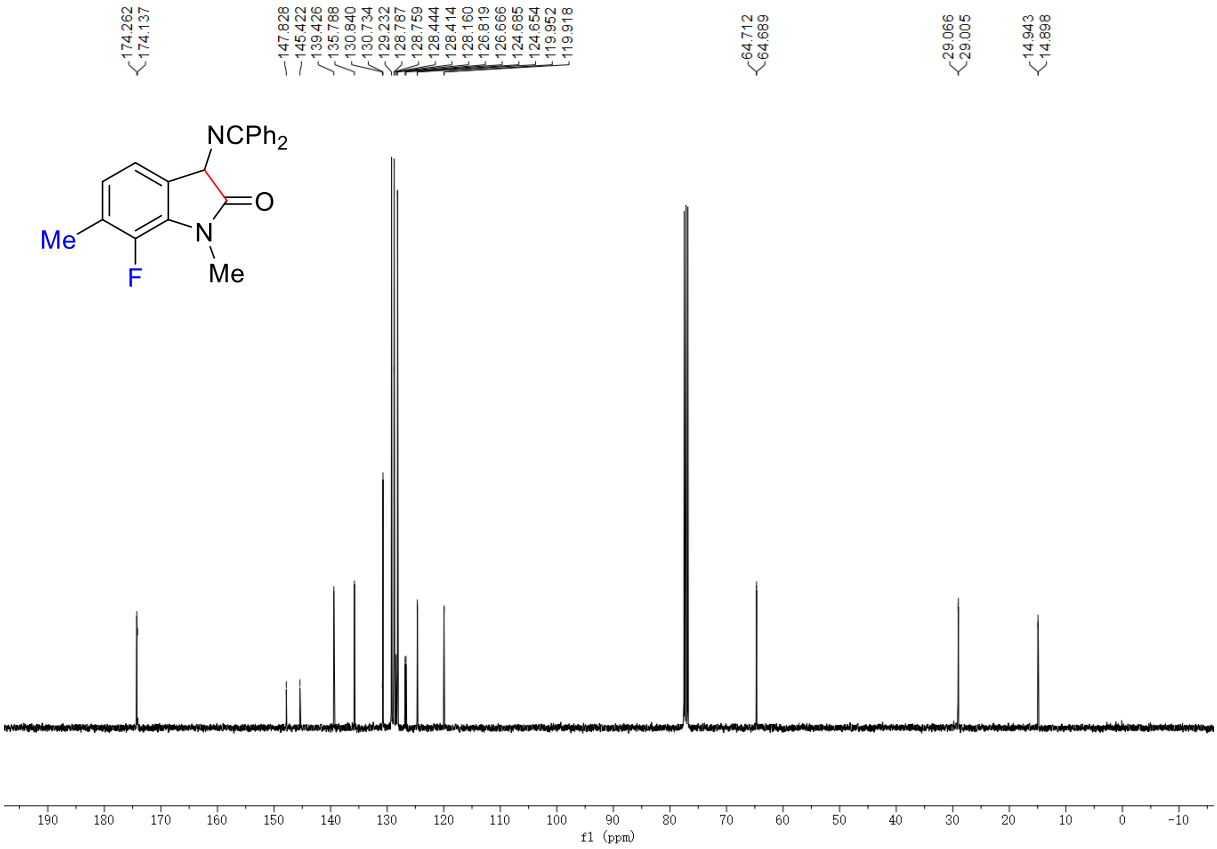

Fig. S55. ^{19}F NMR spectra (376.8 MHz, Chloroform-d) of 3-((Diphenylmethylene)amino)-7-fluoro-1,6-dimethylindolin-2-one (4k).

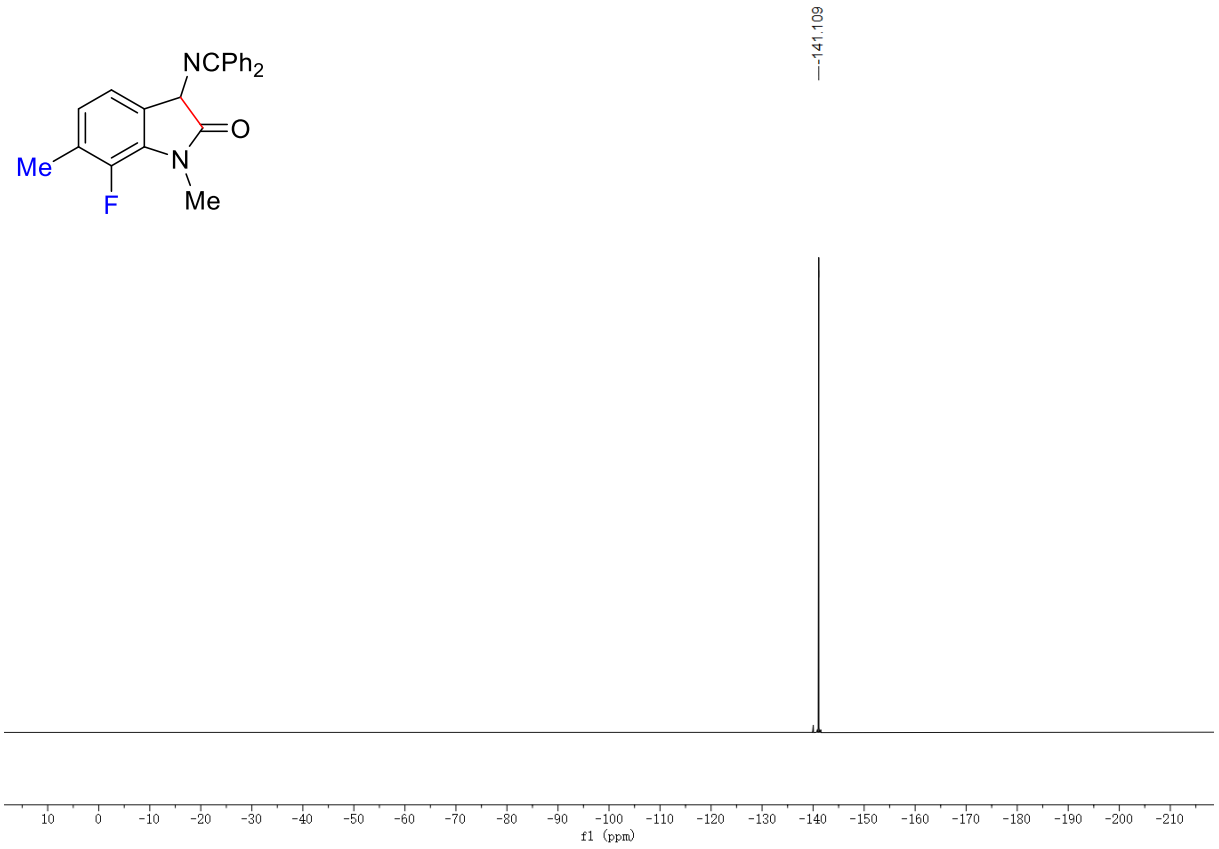

Fig. S56. ^{1}H NMR spectra (400 MHz, Chloroform-*d*) of 6-Bromo-3-((diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4l).

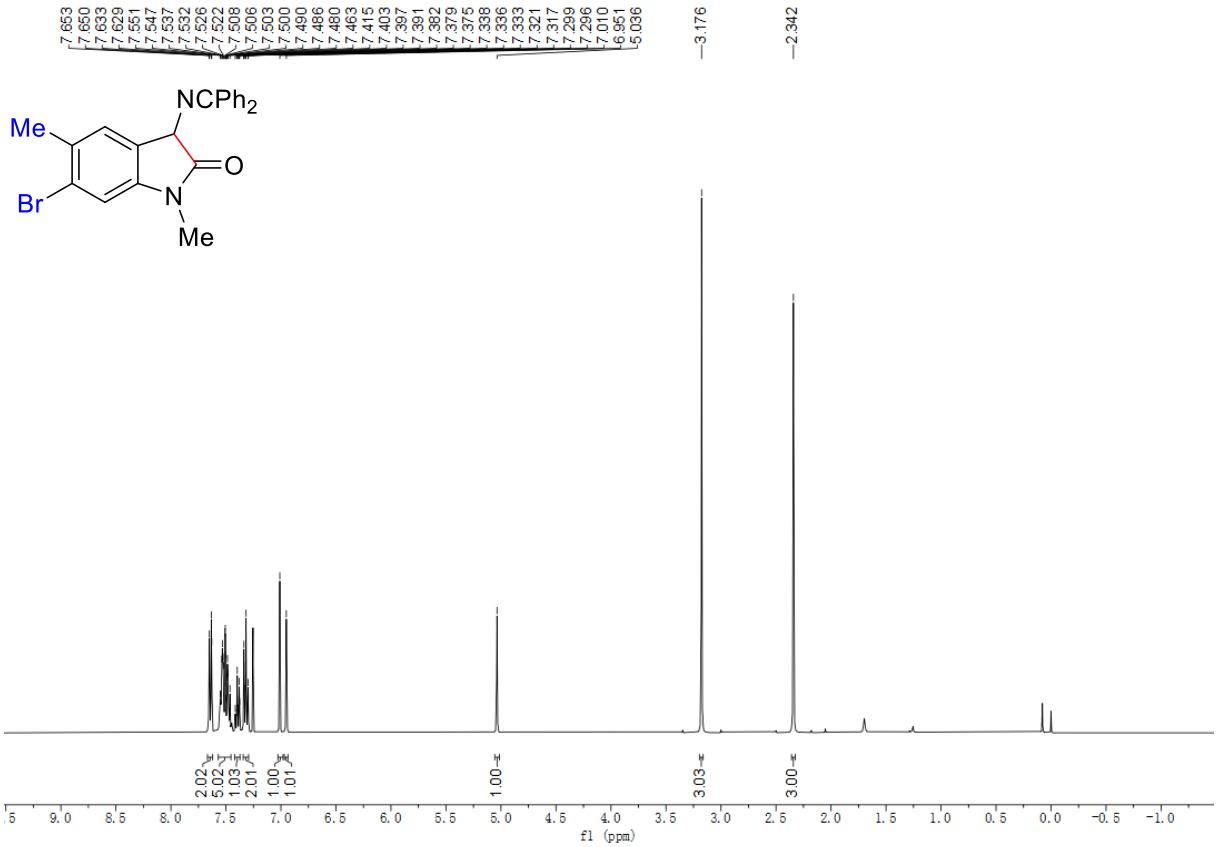

Fig. S57. ^{13}C NMR spectra (100 MHz, Chloroform-*d*) of 6-Bromo-3-((diphenylmethylene)amino)-1,5-dimethylindolin-2-one (4l).

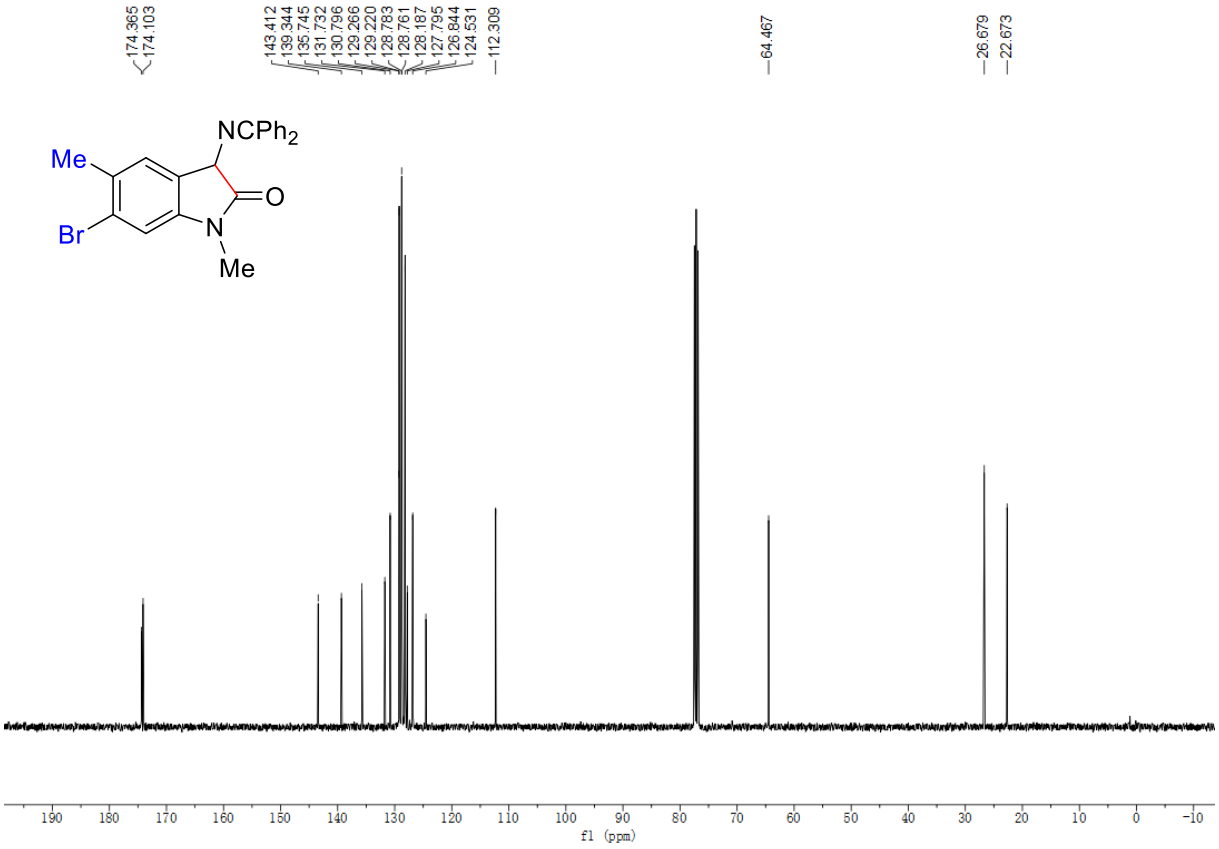

Fig. S58. ^{1}H NMR spectra (400 MHz, Methanol-*d*) of 3-Amino-1-methyl-indolin-2-one hydrochloride (5a).

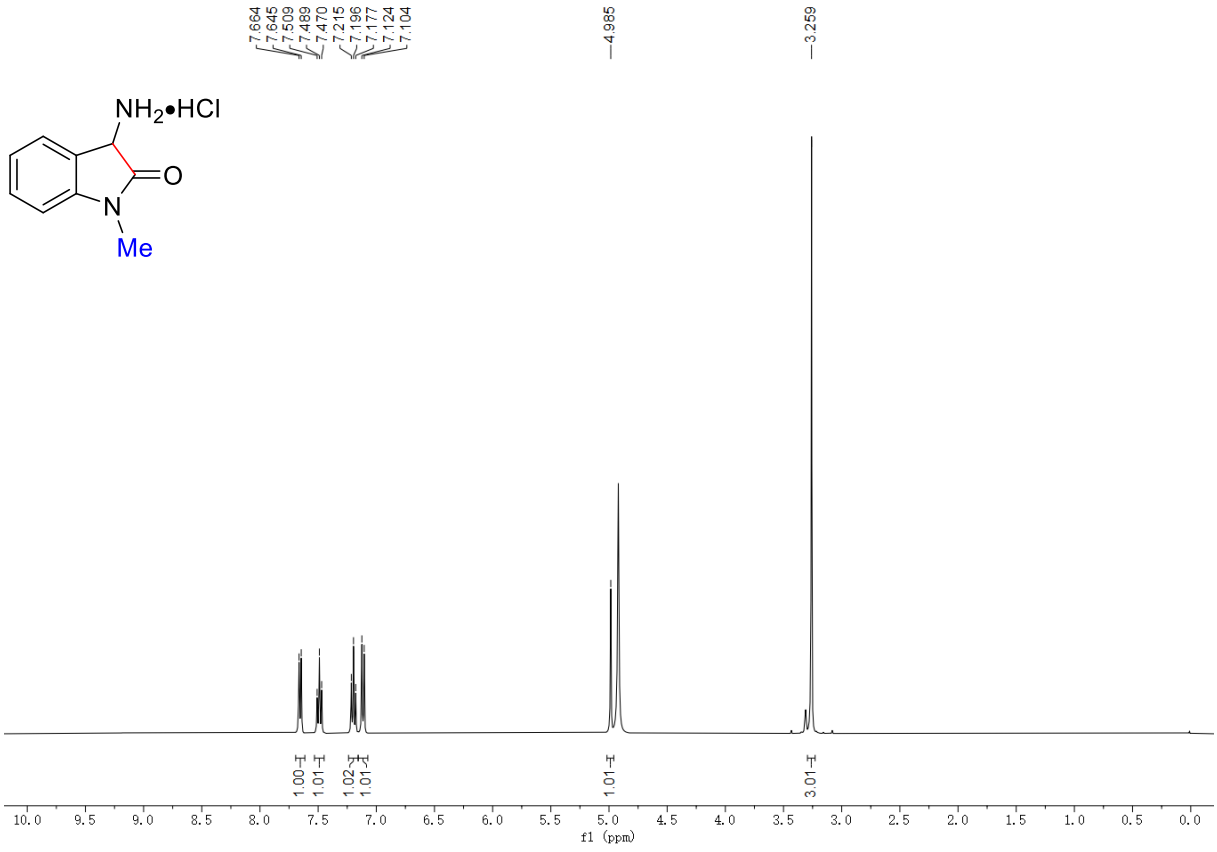

Fig. S59. ^{13}C NMR spectra (100 MHz, Methanol-*d*) of 3-Amino-1-methyl-indolin-2-one hydrochloride (5a).