Electronic Supplementary Material (ESI) for Chemical Communications.

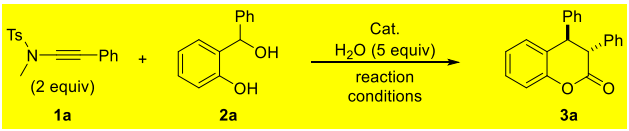
Institute of New Materials & Industry Technology, College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China

General Information. Acetonitrile (ACS grade), toluene (ACS grade), ethyl acetate (ACS grade) and hexanes (ACS grade) were obtained commercially and used without further purification. Methylene chloride, tetrahydrofuran and diethyl ether were purified according to standard methods unless otherwise noted. Commercially available reagents were used without further purification. Reactions were monitored by thin layer chromatography (TLC) using silicycle pre-coated silica gel plates. Flash column chromatography was performed over silica gel (300-400 mesh). Infrared spectra were recorded on a Nicolet AVATER FTIR330 spectrometer as thin film and are reported in reciprocal centimeter (cm^{-1}). Mass spectra were recorded with Micromass QTOF2 Quadrupole/Time-of-Flight Tandem mass spectrometer using electron spray ionization. ^{1}H NMR spectra and ^{13}C NMR spectra were recorded on a Bruker AV-400 spectrometer and a Bruker AV-500 spectrometer in chloroform-d_3. Chemical shifts are reported in ppm with the internal TMS signal at 0.0 ppm as a standard for ^{1}H NMR spectra and with the internal chloroform signal at 77.0 ppm as a standard for ^{13}C NMR spectra. The data is being reported as (s = singlet, d = doublet, t = triplet, m = multiplet or unresolved, brs = broad singlet, coupling constant(s) in Hz, integration).

More Reaction Condition Studies

1.For the optimization of reaction conditions

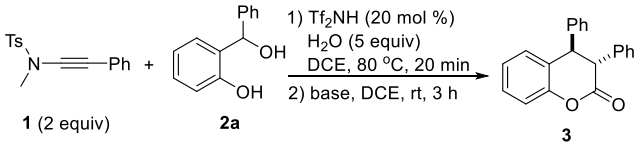
Table 1 Optimization of reaction conditions[a]



Entry	Catalyst	Conditions	Yield (%)[b]	*Trans*/*Cis*[c]
1[d]	$AlCl_3$	DCE, 80 °C, 30 min	<5	-
2[d]	$Cu(OTf)_2$	DCE, 80 °C, 30 min	40	1:1
3[d]	$Zn(OTf)_2$	DCE, 80 °C, 30 min	48	1:1
4[d]	$Sc(OTf)_3$	DCE, 80 °C, 20 min	72	1:1
5[d]	$Fe(OTf)_3$	DCE, 80 °C, 20 min	55	1:1
6[e]	TsOH	DCE, 80 °C, 30 min	20	1:1
7[e]	MsOH	DCE, 80 °C, 30 min	<2	-
8[e]	HOTf	DCE, 80 °C, 12 h	47	1:1
9[e]	$HNTf_2$	DCE, 80 °C, 20 min	90	1:1
10[e]	$HNTf_2$	THF, 80 °C, 24 h	<2	-
11[e]	$HNTf_2$	toluene, 80 °C, 30 min	64	1:1
12[d]	$HNTf_2$	DCE, 80 °C, 20 min	78	1:1
13[e,f]	$HNTf_2$	DCE, 60 °C, 20 min	80	1:1
14[e,f]	**$HNTf_2$**	**DCE, 80 °C, 20 min**	**90(86)**	**9:1**

[a] Reaction conditions: [**1a**] = 0.1 M; DCE: 1, 2-dichloroethane. [b] Measured by ^{1}H NMR using diethyl phthalate as the internal standard and isolated yield was shown in parentheses. [c] Diastereoselectivity was detected by crude ^{1}H NMR and relative configuration was detected by reference 5a. [d] 10 mol % of catalyst. [e] 20 mol % of catalyst. [f] after 20 min, Cs_2CO_3 (1.5 equiv) was added, rt, 3 h.

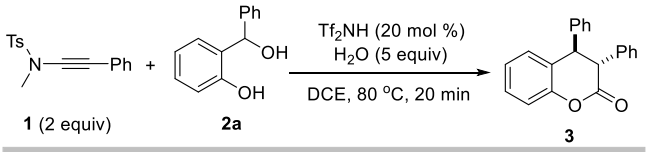
2. For the optimization of diastereoselectivity with bases conditions on the [4+2] annulation of ynamide **1a** and *o*-hydroxybenzyl alcohol **2a**, please see as followed:[a]



Entry	Base	Yield (%)[b]	*Trans*/*Cis*[c]
1	DBU (1.5 equiv)	86	8:1
2	Et_3N (1.5 equiv)	90	1:1
3	DMAP (1.5 equiv)	90	3:1
4	K_2CO_3 (1.5 equiv)	90	1:1
5	K_3PO_4 (1.5 equiv)	90	1:1
6	Cs_2CO_3 (1.5 equiv)	90	9:1
7	Cs_2CO_3 (2 equiv)	88	9:1
8[d]	Cs_2CO_3 (1.5 equiv)	86	9:1

[a]Reaction conditions: [**1a**] = 0.1 M; DCE: 1, 2-dichloroethane. [b]Measured by ^{1}H NMR using diethyl phthalate as the internal standard.[c]Diastereoselectivity was detected by crude ^{1}H NMR. [d]Reaction time is 4 h after Cs_2CO_3 was added.

3. For the optimization of other solvents and nucleophiles on the [4+2] annulation of ynamide **1a** and *o*-hydroxybenzyl alcohol **2a**, please see as followed:[a]



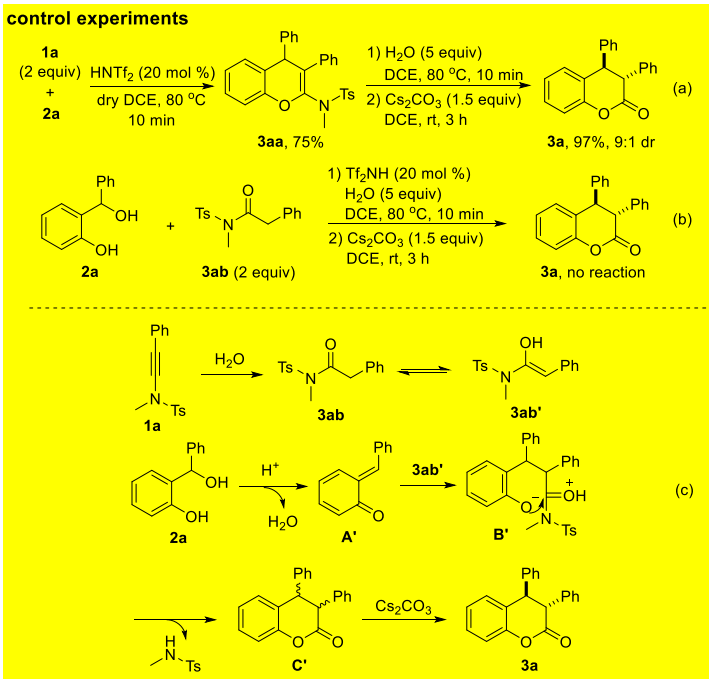
1 (2 equiv) **2a** **3**

Entry	Vriations from standard conditions	Yield (%)[b]	*Trans*/*Cis*[c]
1	PhCl instead of DCE	20	1:1
2	CH_3NO_2 instead of DCE	17	1:1
3	Dioxane instead of DCE	8	1:1
4	MeOH instead of DCE	< 2	1:1
5	MeOH instead of H_2O	36	1:1
6	EtOH instead of H_2O	32	1:1
7	PhOH instead of H_2O	< 19	1:1

[a]Reaction conditions: [**1a**] = 0.1 M; DCE: 1, 2-dichloroethane. [b]Measured by ^{1}H NMR using diethyl phthalate as the internal standard.[c]Diastereoselectivity was detected by crude ^{1}H NMR.

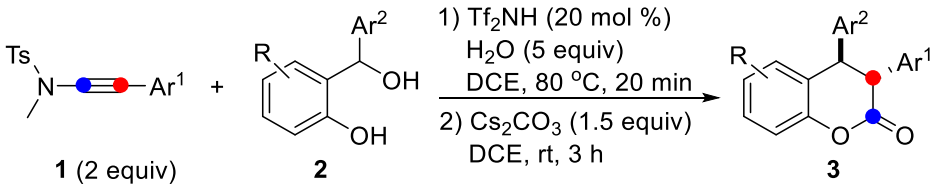
Mechanism Studies

4. For the enolate-type mechanism of this metal-free [4+2] annulation.



Scheme 1

Compounds **1a**–**1m**, **2a**–**2m** and **3ab** were known and the spectroscopic data match those reported.[1,4]

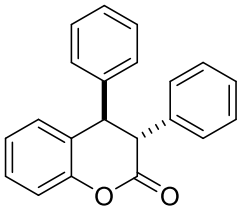


1 (2 equiv) **2** **3**

General procedure for the synthesis of *trans*-3,4-diaryldihydrocoumarins **3**:

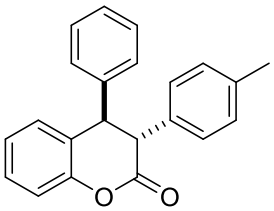
$HNTf_2$ (0.04 mmol, 11.2 mg) was added to a mixture of the ynamides **1** (0.40 mmol), *o*-hydroxybenzyl alcohols **2** and H_2O (1 mmol) in DCE (4.0 mL) at room temperature. Then, the reaction mixture was stirred at 80 °C and the progress of the reaction was monitored by TLC. The reaction typically took 20 min. Upon completion, the mixture was concentrated and the residue was purified by chromatography on silica gel (eluent: hexanes/ethyl acetate) to afford the diastereomers, which was add Cs_2CO_3 (0.3 mmol, 97.7 mg) in DCE (4.0 mL) at room temperature and stirred for 3 h. Upon completion, the mixture was filtered, concentrated and purified to produce the desired *trans*-3,4-diarylcoumarins **3**.

3,4-diphenylchroman-2-one (3a)



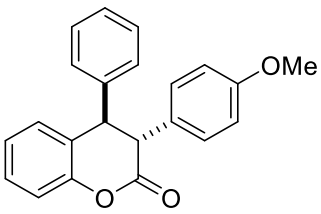
Starting from **2a** (40.0 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3a** in 86% yield (51.6 mg, 9:1 dr); White solid, mp 115-117 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27 – 6.97 (m, 13H), 6.86 (d, J = 7.6 Hz, 1H), 4.44 (d, J = 7.2 Hz, 1H), 4.15 (d, J = 7.2 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 151.2, 140.0, 135.8, 129.1, 129.0, 128.9, 128.7, 128.1, 128.0, 127.6, 127.5, 124.8(4), 124.8(2), 116.8, 53.2, 48.3; **HRMS (ESI, *m/z*)** calcd. for $C_{21}H_{16}NaO_2$ $[M+Na]^+$: 323.1043, found: 323.1065; IR (KBr, cm^{-1}) 3034, 2921, 2851, 1752, 1486, 1453, 1222, 1146, 1103, 772, 499.

4-phenyl-3-(*p*-tolyl)chroman-2-one (3b)



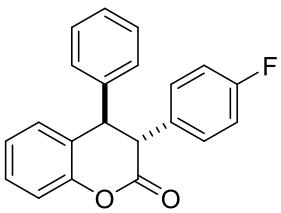
Starting from **2a** (40.0 mg, 0.20 mmol) and **1b** (119.6 mg, 0.4 mmol) according to the general procedure to provide **3b** in 79% yield (49.6 mg, 8:1 dr); White solid, mp 139-141 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 – 6.89 (m, 12H), 6.85 (d, *J* = 7.6 Hz, 1H), 4.42 (d, *J* = 7.2 Hz, 1H), 4.12 (d, *J* = 7.2 Hz, 1H) 2.16 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.5, 151.2, 140.2, 137.3, 132.7, 129.4, 129.1, 128.9(3), 128.8(6), 127.9, 127.8, 127.4, 124.9, 124.8, 116.8, 52.8 48.2, 22.0; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1201; IR (KBr, cm^{-1}) 3034, 2922, 1757, 1483, 1453, 1275, 1222, 1139, 1099, 954, 753.

3-(4-methoxyphenyl)-4-phenylchroman-2-one (3c)



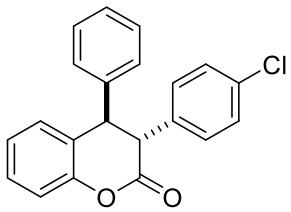
Starting from **2a** (40.0 mg, 0.20 mmol) and **1c** (126.0 mg, 0.4 mmol) according to the general procedure to provide **3c** in 70% yield (46.2 mg, 9:1 dr); White solid, mp 121-123 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 – 7.08 (m, 10H), 6.99 (d, *J* = 7.6 Hz, 1H), 6.80 (d, *J* = 8.8 Hz, 2H), 4.54 (d, *J* = 7.2 Hz, 1H), 4.23 (d, *J* = 7.2 Hz, 1H), 3.77 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.7, 158.8, 151.2, 140.1, 131.1, 129.1(3), 129.0(8), 128.9(5), 128.9, 128.0, 127.4, 125.0, 124.8, 116.8, 114.1, 55.1, 52.4, 48.3; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_3$ $[M+Na]^+$: 353.1148, found: 353.1157; IR (KBr, cm^{-1}) 3039, 2959, 2921, 1756, 1513, 1452, 1248, 1137, 770, 698.

3-(4-fluorophenyl)-4-phenylchroman-2-one (3d)



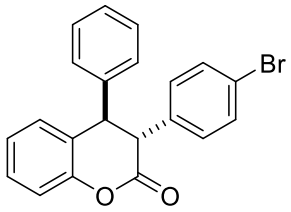
Starting from **2a** (40.0 mg, 0.20 mmol) and **1d** (121.2 mg, 0.4 mmol) according to the general procedure to provide **3d** in 77% yield (49.0 mg, 5:1 dr); White solid, mp 130-132 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 6.97 (m, 10H), 6.84 – 6.77 (m, 3H), 4.39 (d, J = 8.4 Hz, 1H), 4.10 (d, J = 8.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 162.0 (d, $J_{C,F}$ = 246.5 Hz), 151.2, 139.5, 131.5 (d, $J_{C,F}$ = 3.5 Hz), 130.0 (d, $J_{C,F}$ = 8.0 Hz), 129.0(1), 128.9(9), 128.9(7), 128.2, 127.6, 125.1, 124.9, 116.9, 115.6 (d, $J_{C,F}$ = 21.5 Hz), 52.4, 48.3; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}FNaO_2$ $[M+Na]^+$: 341.0948, found: 341.0948; IR (KBr, cm^{-1}) 3067, 2922, 1750, 1511, 1485, 1452, 1223, 752, 502.

3-(4-chlorophenyl)-4-phenylchroman-2-one (3e)



Starting from **2a** (40.0 mg, 0.20 mmol) and **1e** (128.0 mg, 0.4 mmol) according to the general procedure to provide **3e** in 73% yield (48.9 mg, 7:1 dr); White solid, mp 130-132 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.08 (m, 12H), 6.93 (d, J = 7.6 Hz, 1H), 4.53 (d, J = 8.8 Hz, 1H), 4.23 (d, J = 8.8 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.1, 151.1, 139.3, 134.2, 133.5, 129.7, 129.1, 129.0(3), 128.9(6), 128.8, 128.2, 127.7, 125.0, 124.9, 116.8, 52.6, 48.2; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}ClNaO_2$ $[M+Na]^+$: 357.0653, found: 357.0654; IR (KBr, cm^{-1}) 3027, 2921, 1761, 1484, 1450, 1223, 1149, 1090, 755, 499.

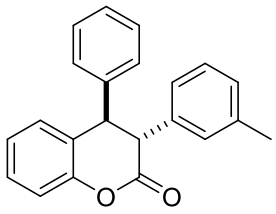
3-(4-bromophenyl)-4-phenylchroman-2-one (3f)



Starting from **2a** (40.0 mg, 0.20 mmol) and **1f** (145.6 mg, 0.4 mmol) according to the general procedure to provide **3f** in 73% yield (56.1 mg, 12:1 dr); White solid, mp 149-151 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28 – 6.98 (m, 10H), 6.90 (d, J = 8.4 Hz, 2H), 6.80 (d, J = 7.6 Hz, 1H), 4.40 (d, J = 8.8 Hz, 1H), 4.08 (d, J = 8.8 Hz, 1H); ^{13}C NMR

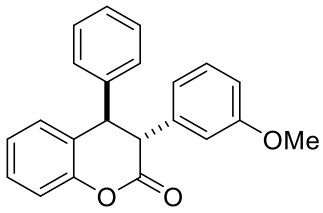
(125 MHz, $CDCl_3$) δ 168.0, 151.1, 139.3, 134.7, 131.8, 130.0, 129.0(6), 129.0(5), 128.9(6), 128.1, 127.7, 125.0, 124.9, 121.7, 116.8, 52.7, 48.1; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}BrNaO_2$ $[M+Na]^+$: 401.0148, found: 401.0146; IR (KBr, cm^{-1}) 3027, 2922, 1762, 1486, 1452, 1224, 1149, 754, 500.

4-phenyl-3-(*m*-tolyl)chroman-2-one (3g)



Starting from **2a** (40.0 mg, 0.20 mmol) and **1g** (119.6 mg, 0.4 mmol) according to the general procedure to provide **3g** in 72% yield (45.2 mg, 8:1 dr); White solid, mp 171-173 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.27 – 6.97 (m, 9H), 6.92 (d, J = 7.6 Hz, 1H), 6.87 (d, J = 7.2 Hz, 2H), 6.82 (d, J = 7.6 Hz, 1H), 4.43 (d, J = 6.8 Hz, 1H), 4.12 (d, J = 6.8 Hz, 1H), 2.16 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 151.3, 140.3, 138.3, 135.7, 129.1, 129.0, 128.9, 128.8(4), 128.7(5), 128.5, 128.4, 127.9, 127.4, 124.8, 124.7, 116.8, 53.2, 48.3, 21.3; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1207; IR (KBr, cm^{-1}) 3029, 2921, 2851, 1755, 1452, 1224, 1145, 1103, 768, 699.

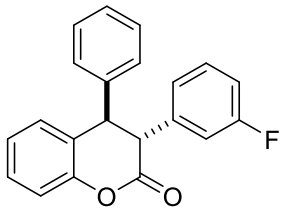
3-(3-methoxyphenyl)-4-phenylchroman-2-one (3h)



Starting from **2a** (40.0 mg, 0.20 mmol) and **1h** (126.0 mg, 0.4 mmol) according to the general procedure to provide **3h** in 72% yield (47.5 mg, 9:1 dr); White solid, mp 149-150 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.25 – 6.98 (m, 9H), 6.87 (d, J = 7.6 Hz, 1H), 6.65 (d, J = 7.6 Hz, 2H), 6.58 (s, 1H), 4.44 (d, J = 6.4 Hz, 1H), 4.13 (d, J = 6.4 Hz, 1H), 3.60 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.2, 159.6, 151.3, 140.1, 137.2, 129.7, 129.1, 128.9(9), 128.9(5), 127.9, 127.5, 124.9, 124.8, 120.3, 116.8, 114.0, 113.0, 55.1, 53.2, 48.2; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_3$ $[M+Na]^+$: 353.1148, found:

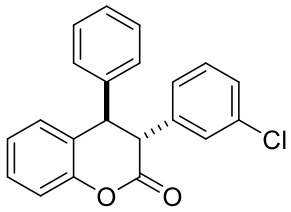
353.1156; IR (KBr, cm^{-1}) 3064, 2999, 2922, 2839, 1764, 1483, 1452, 1222, 1136, 760.

3-(3-fluorophenyl)-4-phenylchroman-2-one (3i)



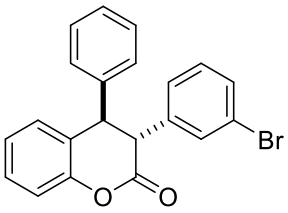
Starting from **2a** (40.0 mg, 0.20 mmol) and **1i** (121.2 mg, 0.4 mmol) according to the general procedure to provide **3i** in 77% yield (49.0 mg, 7:1 dr); White solid, mp 153-155 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28 – 6.98 (m, 10H), 6.85 – 6.75 (m, 3H), 4.42 (d, J = 8.4 Hz, 1H), 4.12 (d, J = 8.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.9, 162.7 (d, $J_{C,F}$ = 246.5 Hz), 151.1, 139.4, 138.0 (d, $J_{C,F}$ = 7.5 Hz), 130.1 (d, $J_{C,F}$ = 8.5 Hz), 129.0(7), 129.0(2), 128.9(6), 128.1, 127.6, 124.9(1), 124.8(6), 124.0 (d, $J_{C,F}$ = 3.0 Hz), 116.8, 115.4 (d, $J_{C,F}$ = 22.5 Hz), 114.7 (d, $J_{C,F}$ = 21.0 Hz), 52.9 (d, $J_{C,F}$ = 1.5 Hz), 48.1; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}FNaO_2$ $[M+Na]^+$: 341.0948, found: 341.0953; IR (KBr, cm^{-1}) 3071, 2922, 1757, 1486, 1452, 1225, 1160, 1153, 753, 695.

3-(3-chlorophenyl)-4-phenylchroman-2-one (3j)



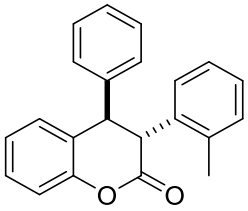
Starting from **2a** (40.0 mg, 0.20 mmol) and **1j** (128.0 mg, 0.4 mmol) according to the general procedure to provide **3j** in 70% yield (46.9 mg, 6:1 dr); White solid, mp 156-158 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30 – 6.98 (m, 11H), 6.90 (d, J = 6.4 Hz, 1H), 6.82 (d, J = 7.6 Hz, 1H), 4.41 (d, J = 8.4 Hz, 1H), 4.09 (d, J = 8.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.8, 151.1, 139.3, 137.6, 134.4, 129.8, 129.1, 129.0(4), 128.9(6), 128.6, 128.1, 127.9, 127.7, 126.4, 124.9, 124.8, 116.8, 52.8, 48.1; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}ClNaO_2$ $[M+Na]^+$: 357.0653, found: 357.0654; IR (KBr, cm^{-1}) 3072, 2921, 1760, 1483, 1453, 1222, 1155, 1103, 750, 500.

3-(3-bromophenyl)-4-phenylchroman-2-one (3k)



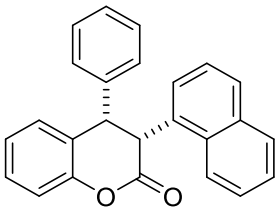
Starting from **2a** (40.0 mg, 0.20 mmol) and **1k** (145.6 mg, 0.4 mmol) according to the general procedure to provide **3k** in 74% yield (56.1 mg, 5:1 dr); White solid, mp 142-144 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30 – 6.93 (m, 12H), 6.82 (d, *J* = 7.6 Hz, 1H), 4.41 (d, *J* = 8.4 Hz, 1H), 4.08 (d, *J* = 8.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.8, 151.1, 139.3, 137.9, 131.5, 130.8, 130.1, 129.1, 129.0(4), 128.9(6), 128.1, 127.7, 126.8, 124.9, 124.8, 122.6, 116.8, 52.8, 48.1; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}BrNaO_2$ $[M+Na]^+$: 401.0148, found: 401.0148; IR (KBr, cm^{-1}) 3062, 2923, 1748, 1454, 1149, 751, 699.

4-phenyl-3-(*o*-tolyl)chroman-2-one (3l)



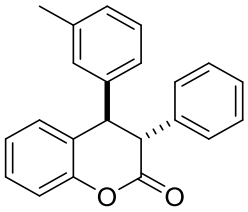
Starting from **2a** (40.0 mg, 0.20 mmol) and **1l** (119.6 mg, 0.4 mmol) according to the general procedure to provide **3l** in 81% yield (50.9 mg, 7:1 dr); White solid, mp 172-173 ℃; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 – 6.94 (m, 9H), 6.91 (d, *J* = 7.5 Hz, 1H), 6.86 (d, *J* = 8.5 Hz, 2H), 6.82 (d, *J* = 7.5 Hz, 1H), 4.43 (d, *J* = 7.0 Hz, 1H), 4.11 (d, *J* = 7.0 Hz, 1H), 2.16 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 151.3, 140.3, 138.3, 135.7, 129.1, 128.9(4), 128.8(8), 128.8(3), 128.5, 128.4, 127.9, 127.4, 124.8(1), 124.8(0), 124.7, 116.8, 53.2, 48.3, 21.3; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1212; IR (KBr, cm^{-1}) 3029, 2922, 2852, 1755, 1452, 1143, 1103, 749, 699, 499.

3-(naphthalen-1-yl)-4-phenylchroman-2-one (3m)



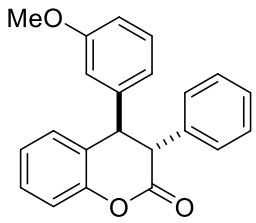
Starting from **2a** (40.0 mg, 0.20 mmol) and **1m** (134.0 mg, 0.4 mmol) according to the general procedure to provide **3m** in 93% yield (65.0 mg, >20:1 dr); White solid, mp 145-146 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, *J* = 8.4Hz, 1H), 7.72 (d, *J* = 8.0Hz, 1H), 7.58 (d, *J* = 8.0Hz, 1H), 7.47 (t, *J* = 7.6Hz, 1H), 7.38 (t, *J* = 7.6Hz, 1H), 7.20 – 7.03 (m, 10H), 6.90 (t, *J* = 7.2Hz, 1H), 6.75 (d, *J* = 7.6Hz, 1H), 4.91 (d, *J* = 5.6Hz, 1H), 4.55 (d, *J* = 5.6Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.3, 151.1, 140.8, 134.1, 132.0, 130.7, 129.4, 129.3(1), 129.1, 128.9, 128.6, 127.5(2), 127.4(5), 126.6, 125.8, 125.3, 125.1, 125.0, 124.4, 122.9, 116.9, 49.9, 48.2; **HRMS (ESI, *m*/*z*)** calcd. for $C_{25}H_{18}NaO_2$ $[M+Na]^+$: 373.1199, found: 373.1209; IR (KBr, cm^{-1}) 3062, 3027, 2917, 2876, 1759, 1484, 1451, 1224, 755, 696.

3-phenyl-4-(*m*-tolyl)chroman-2-one (3n)



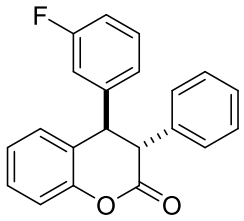
Starting from **2b** (42.8 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3n** in 74% yield (46.5 mg, 7:1 dr); White solid, mp 160-162 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 – 6.93 (m, 10H), 6.88 (d, *J* = 7.2 Hz, 1H), 6.82 – 6.78 (m, 2H), 4.40 (d, *J* = 6.8 Hz, 1H), 4.16 (d, *J* = 6.8 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 151.3, 140.2, 138.7, 136.0, 129.2, 128.8(8), 128.8(5), 128.7, 128.5, 128.2, 128.0, 127.6, 124.9, 124.8, 124.7, 116.8, 53.2, 48.3, 21.4; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1218; IR (KBr, cm^{-1}) 3062, 2923, 1756, 1483, 1453, 1278, 1224, 1147, 1104, 769, 699.

4-(3-methoxyphenyl)-3-phenylchroman-2-one (3o)



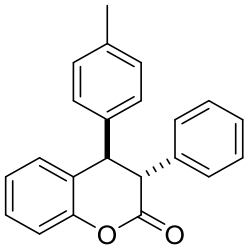
Starting from **2c** (46.0 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3**o in 60% yield (39.0 mg, 7:1 dr); White solid, mp 113-115 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 6.98 (m, 9H), 6.89 (d, *J* = 7.6 Hz, 1H), 6.68 – 6.66 (m, 1H), 6.61 (d, *J* = 7.6 Hz, 1H), 6.54 (s, 1H), 4.41 (d, *J* = 7.2 Hz, 1H), 4.15 (d, *J* = 7.2 Hz, 1H), 3.64 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.3, 159.9, 151.2, 141.7, 135.8, 130.0, 129.1, 129.0, 128.7, 128.0, 127.6, 124.8, 124.6, 120.2, 116.8, 114.0, 112.5, 55.2, 53.1, 48.3 **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_3$ $[M+Na]^+$: 353.1148, found: 353.1165; IR (KBr, cm^{-1}) 3032, 2922, 2840, 1758, 1483, 1454, 1224, 1144, 1102, 769, 698.

4-(3-fluorophenyl)-3-phenylchroman-2-one (3p)



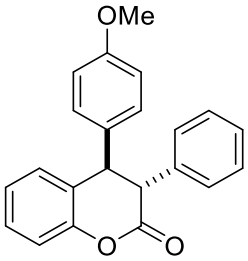
Starting from **2d** (43.6 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3p** in 60% yield (38.0 mg, 9:1 dr); White solid, mp 142-144 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27 – 7.18 (m, 1H), 7.13 - 6.94 (m, 8H), 6.81 – 6.67 (m, 4H), 4.41 (d, *J* = 7.6 Hz, 1H), 4.08 (d, *J* = 7.6 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.9, 162.9 (d, $J_{C,F}$ = 247.0 Hz), 151.1, 142.4 (d, $J_{C,F}$ = 6.8 Hz), 135.3, 130.5 (d, $J_{C,F}$ = 8.3 Hz), 129.1, 128.8, 128.7, 128.0, 127.7, 124.9, 124.2, 123.7 (d, $J_{C,F}$ = 2.7 Hz), 116.8, 114.9 (d, $J_{C,F}$ = 21.9 Hz), 114.4 (d, $J_{C,F}$ = 21.0 Hz), 52.9, 47.9; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}FNaO_2$ $[M+Na]^+$: 341.0948, found: 341.0967; IR (KBr, cm^{-1}) 3065, 1761, 1588, 1486, 1452, 1226, 1143, 1103, 743, 500.

3-phenyl-4-(*p*-tolyl)chroman-2-one (3q)



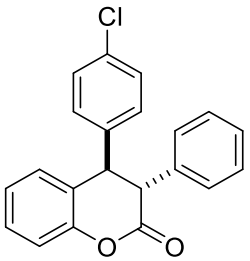
Starting from **2e** (42.8 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3q** in 73% yield (45.9 mg, 12:1 dr); White solid, mp 150-151 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 – 7.12 (m, 10H), 7.05 – 7.00 (m, 3H), 4.56 (d, *J* = 7.2 Hz, 1H), 4.29 (d, *J* = 7.2 Hz, 1H), 2.35 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.5, 151.2, 137.1, 137.0, 135.9, 129.6, 129.1, 128.8, 128.7, 128.1, 127.8, 127.6, 125.1, 124.8, 116.8, 53.3, 47.9, 21.0; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1222; IR (KBr, cm^{-1}) 3065, 2921, 1753, 1454, 1240, 1211, 1197, 1148, 763, 500.

4-(4-methoxyphenyl)-3-phenylchroman-2-one (3r)



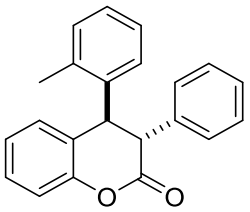
Starting from **2f** (46.0 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3r** in 63% yield (41.6 mg, 7:1 dr); White solid, mp 171-173 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.26 – 6.84 (m, 11H), 6.75 – 6.70 (m, 2H), 4.39 (d, *J* = 7.6 Hz, 1H), 4.11 (d, *J* = 7.6 Hz, 1H), 3.66 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.5, 158.8, 151.2, 135.9, 131.9, 129.0, 128.8, 128.7, 128.1, 127.9, 127.6, 125.3, 124.8, 116.8, 114.3, 55.2, 53.4, 47.5; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_3$ $[M+Na]^+$: 353.1148, found: 353.1161; IR (KBr, cm^{-1}) 3065, 2921, 2840, 1756, 1512, 1452, 1244, 1225, 1143, 1102, 762, 500.

4-(4-chlorophenyl)-3-phenylchroman-2-one (3s)



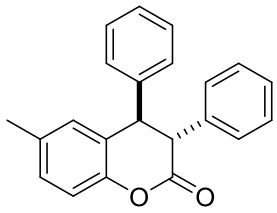
Starting from **2g** (46.9 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3s** in 63% yield (42.2 mg, 7:1 dr); White solid, mp 153-155 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 6.97 (m, 10H), 6.93 (d, *J* = 6.4 Hz, 2H), 6.70 (d, *J* = 7.6 Hz, 1H), 4.42 (d, *J* = 8.4 Hz, 1H), 4.07 (d, *J* = 8.4 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.1, 151.2, 138.4, 135.4, 133.3, 129.4, 129.1(4), 129.1(1), 128.8, 128.7, 128.1, 127.7, 124.9, 124.5, 116.9, 53.1, 47.7; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}ClNaO_2$ $[M+Na]^+$: 357.0653, found: 357.0659; IR (KBr, cm^{-1}) 3030, 2922, 2851, 1751, 1484, 1452, 1222, 1144, 1087, 757, 698.

3-phenyl-4-(*o*-tolyl)chroman-2-one (3t)



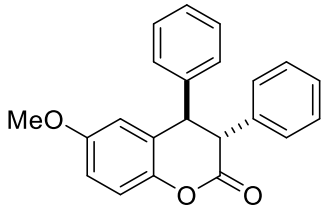
Starting from **2h** (42.8 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3t** in 70% yield (44.0 mg, 9:1 dr); White solid, mp 129-131 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 (t, *J* = 7.6 Hz, 1H), 7.16 – 6.96 (m, 10H), 6.82 – 6.79 (m, 1H), 6.76 (d, *J* = 7.6 Hz, 1H), 4.71 (d, *J* = 7.2 Hz, 1H), 4.10 (d, *J* = 7.2 Hz, 1H), 2.24 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 151.6, 138.0, 135.9, 135.8, 130.8, 129.0, 128.9, 128.7, 128.0, 127.7, 127.4, 127.3, 126.7, 125.0, 124.9, 116.7, 52.3, 44.0, 19.6; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1224; IR (KBr, cm^{-1}) 3026, 2922, 2852, 1760, 1485, 1451, 1225, 1146, 1101, 755, 699, 499.

6-methyl-3,4-diphenylchroman-2-one (3u)



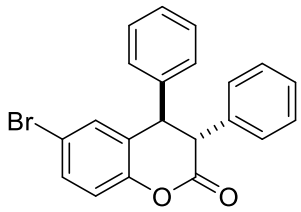
Starting from **2i** (42.8 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3u** in 70% yield (44.0 mg, 7:1 dr); White solid, mp 151-153 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20 – 6.96 (m, 12H), 6.67 (s, 1H), 4.37 (d, *J* = 6.4 Hz, 1H), 4.12 (d, *J* = 6.4 Hz, 1H), 2.14 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.5, 149.2, 140.4, 136.0, 134.5, 129.5, 129.4, 129.0, 128.7, 128.0, 127.9, 127.6, 127.4, 124.2, 116.6, 53.4, 48.5, 20.7; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_2$ $[M+Na]^+$: 337.1199, found: 337.1218; IR (KBr, cm^{-1}) 3030, 2921, 2851, 1753, 1494, 1163, 1143, 1124, 816, 532.

6-methoxy-3,4-diphenylchroman-2-one (3v)



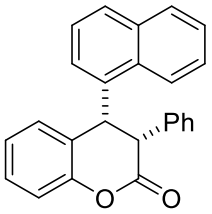
Starting from **2j** (46.0 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3w** in 78% yield (51.5 mg, 7:1 dr); White solid, mp 190-192 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20 – 7.00 (m, 11H), 6.80 – 6.66 (m, 1H), 6.39 (s, 1H), 4.38 (d, *J* = 6.8 Hz, 1H), 4.12 (d, *J* = 6.8 Hz, 1H), 3.59 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.4, 156.4, 145.2, 140.0, 136.0, 129.0, 128.7, 128.0, 127.9, 127.6, 127.5, 125.6, 117.6, 114.1, 114.0, 55.5, 53.2, 48.6; **HRMS (ESI, *m*/*z*)** calcd. for $C_{22}H_{18}NaO_3$ $[M+Na]^+$: 353.1148, found: 353.1164; IR (KBr, cm^{-1}) 3065, 2922, 2851, 1749, 1492, 1453, 1204, 1147, 1025, 754, 499.

6-bromo-3,4-diphenylchroman-2-one (3w)



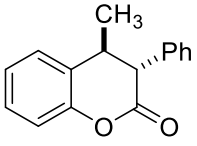
Starting from **2k** (55.8 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3w** in 63% yield (47.8 mg, 6:1 dr); White solid, (diastereomers could be isolated), mp 171-172 ℃; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 (d, *J* = 8.8z, 1H), 7.21 – 7.13 (m, 6), 7.03 – 6.95 (m, 6H), 4.40 (d, *J* = 7.2 Hz, 1H), 4.12 (d, *J* = 7.2Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.6, 150.3, 139.2, 135.3 132.0, 131.7, 129.1, 128.8, 127.9, 127.8(1), 127.7(7), 127.0, 118.6, 117.4, 52.81, 48.2; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{15}BrNaO_2$ $[M+Na]^+$: 401.0148, found: 401.0147; IR (KBr, cm^{-1}) 3063, 2921, 2850, 1764, 1480, 1212, 1151, 1121, 895, 701, 528.

4-(naphthalen-1-yl)-3-phenylchroman-2-one (3x)



Starting from **2l** (50.0 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3x** in 45% yield (31.6 mg, > 20:1dr); yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.05 (d, *J* = 8.5 Hz, 1H), 7.91 (d, *J* = 8.0 Hz, 1H), 7.75 (d, *J* = 8.0 Hz, 1H), 7.58 (t, *J* = 7.5 Hz, 1H), 7.53 (t, *J* = 7.0 Hz, 1H), 7.37 (t, *J* = 8.0 Hz, 1H), 7.30 (t, *J* = 7.5 Hz, 1H), 7.27 – 7.22 (m, 6H), 7.11 (t, *J* = 7.5 Hz, 1H), 7.04 (d, *J* = 7.5 Hz, 1H), 6.92 (d, *J* = 7.0 Hz, 1H), 5.36 (d, *J* = 4.0 Hz, 1H), 4.47 (d, *J* = 4.0 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.8, 152.0, 136.1, 135.9, 134.3, 130.7, 129.5, 129.2, 129.0, 128.4, 127.9, 127.6, 126.8, 125.9, 125.8, 125.6, 125.3, 123.9, 122.4, 116.9, 52.4, 44.0; **HRMS (ESI, *m*/*z*)** calcd. for $C_{25}H_{19}O_2$ $[M+H]^+$: 351.1380, found: 351.1370; IR (KBr, cm^{-1}) 3053, 2920, 2851, 1762, 1481, 1212, 1150, 1120, 893, 701, 526.

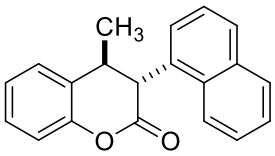
4-methyl-3-phenylchroman-2-one (3y)



Starting from **2m** (27.6 mg, 0.20 mmol) and **1a** (114.0 mg, 0.4 mmol) according to the general procedure to provide **3y** in 53% yield (25.2 mg, 6:1dr); yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.24 – 7.14 (m, 5H), 7.10 – 7.02 (m, 3H), 6.99 (d, *J* = 8.0 Hz, 1H),

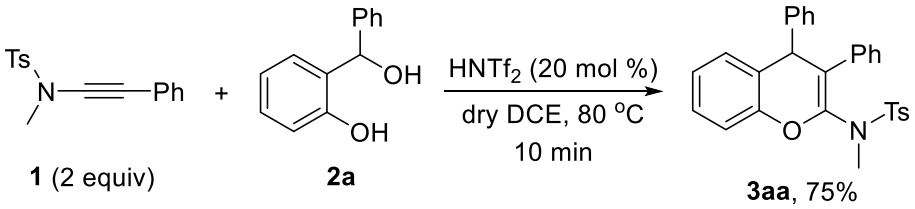
3.65 (d, J = 7.5 Hz, 1H), 3.27 (p, J = 7.0 Hz, 1H), 1.21 (d, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.0, 150.7, 136.0, 128.8, 128.4, 128.0, 127.7, 127.0, 126.9, 124.7, 116.7, 52.7, 36.0, 19.4; **HRMS (ESI, *m*/*z*)** calcd. for $C_{16}H_{14}NaO_2$ $[M+Na]^+$: 261.0886, found: 261.0878; IR (KBr, cm^{-1}) 3050, 2923, 2850, 1763, 1485, 1210, 1157, 1121, 893, 701, 529.

4-methyl-3-(naphthalen-1-yl)chroman-2-one (3z)



Starting from **2m** (27.6 mg, 0.20 mmol) and **1m** (142.0 mg, 0.4 mmol) according to the general procedure to provide **3z** in 60% yield (34.6 mg, 11:1dr); yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, J = 8.5 Hz, 1H), 7.87 (d, J = 8.0 Hz, 1H), 7.76 (d, J = 8.0 Hz, 1H), 7.57 – 7.54 (m, 1H), 7.52 – 7.49 (m, 1H), 7.33 – 7.28 (m, 2H), 7.18 (d, J = 8.0 Hz, 2H), 7.11 – 7.07 (m, 2H), 4.58 (d, J = 6.0 Hz, 1H), 3.53 (p, J = 7.0 Hz, 1H), 1.39 (d, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.0, 150.7, 134.2, 132.4, 131.1, 129.3, 128.5(2), 128.4(8), 127.4, 126.8, 126.6, 125.8, 125.2(9), 125.2(6), 124.9, 122.9, 116.9, 49.6, 36.7, 20.2; **HRMS (ESI, *m*/*z*)** calcd. for $C_{20}H_{17}O_2$ $[M+H]^+$: 289.1223, found: 289.1222; IR (KBr, cm^{-1}) 3057, 2922, 2855, 1767, 1481, 1212, 1150, 1122, 895, 705, 528.

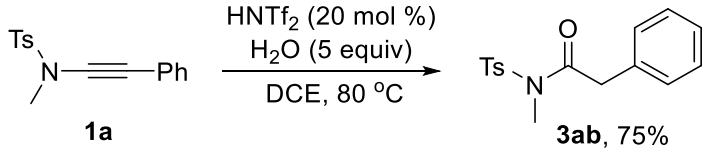
***N*-(3,4-diphenyl-4*H*-chromen-2-yl)-*N*,4-dimethylbenzenesulfonamide (3aa)**



$HNTf_2$ (0.04 mmol, 11.2 mg) was added to a mixture of the ynamide **1a** (0.40 mmol), *o*-hydroxybenzyl alcohols **2a** in dry DCE (4.0 mL) with N_2 at room temperature. Then, the reaction mixture was stirred at 80 °C for 10 min. Upon completion, the mixture was concentrated and the residue was purified by chromatography on silica gel (eluent: hexanes/ethyl acetate) to afford compound **3aa** in 75% yield (70.0 mg). White solid,

mp 160-161 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 7.6 Hz, 2H), 7.30 – 7.00 (m, 13H), 6.97 (d, *J* = 7.6 Hz, 1H), 6.89 (t, *J* = 7.6 Hz, 1H), 6.77 (d, *J* = 8.4 Hz, 1H), 4.77 (s, 1H), 2.82 (s, 3H), 2.35 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 150.3, 144.7, 143.6, 142.2, 136.9, 136.1, 129.3, 128.9, 128.7, 128.6, 128.2, 128.0(6), 127.9(9), 127.5, 127.1, 126.8, 124.5, 124.2, 116.0, 115.0, 48.4, 36.4, 21.5; **HRMS (ESI, *m/z*)** calcd. for $C_{29}H_{25}NNaO_3S$ $[M+Na]^+$: 490.1447, found: 490.1453; IR (KBr, cm^{-1}) 3032, 2921, 1686, 1454, 1349, 1151, 754, 697, 673, 545.

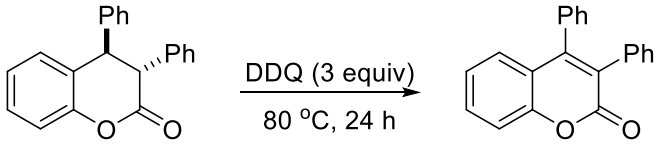
***N*-methyl-2-phenyl-*N*-tosylacetamide (3ab)**



1a **3ab**, 75%

Compound **3ab** was prepared in 75% yield (45.5 mg) according to the above known procedure (0.2 mmol scale).[1c] ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 (d, *J* = 6.8 Hz, 2H), 7.24 – 7.17 (m, 5H), 7.05 (d, *J* = 7.5 Hz, 2H), 3.96 (s, 2H), 3.20 (s, 3H), 2.36 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.2, 144.9, 135.9, 133.4, 129.8, 129.3, 128.5, 127.5, 127.1, 43.0, 33.2, 21.6.

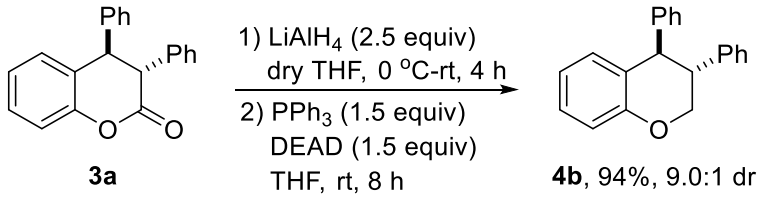
3,4-diphenyl-2*H*-chromen-2-one (4a)



3a **4a**, 60%

Compound **4a** was prepared in 60% yield (35.9 mg) according to the known procedures (0.2 mmol scale).[2] White solid, mp 233-237 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (t, *J* = 7.0 Hz, 1H), 7.34 (d, *J* = 8.1 Hz, 1H), 7.22 – 7.21 (m, 3H), 7.16 – 7.03 (m, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 161.2, 153.1, 151.5, 134.4, 133.8, 131.4, 130.5, 129.3, 128.3, 128.2, 127.7(2), 127.6(7), 127.6, 126.9, 124.2, 120.4, 116.7; **HRMS (ESI, *m/z*)** calcd. for $C_{21}H_{14}NaO_2$ $[M+Na]^+$: 321.0886, found: 321.0898; IR (KBr, cm^{-1}) 3027, 1708, 1684, 1595, 1444, 1357, 1296, 1132, 985, 769, 499.

3,4-diphenylchromane (4b)

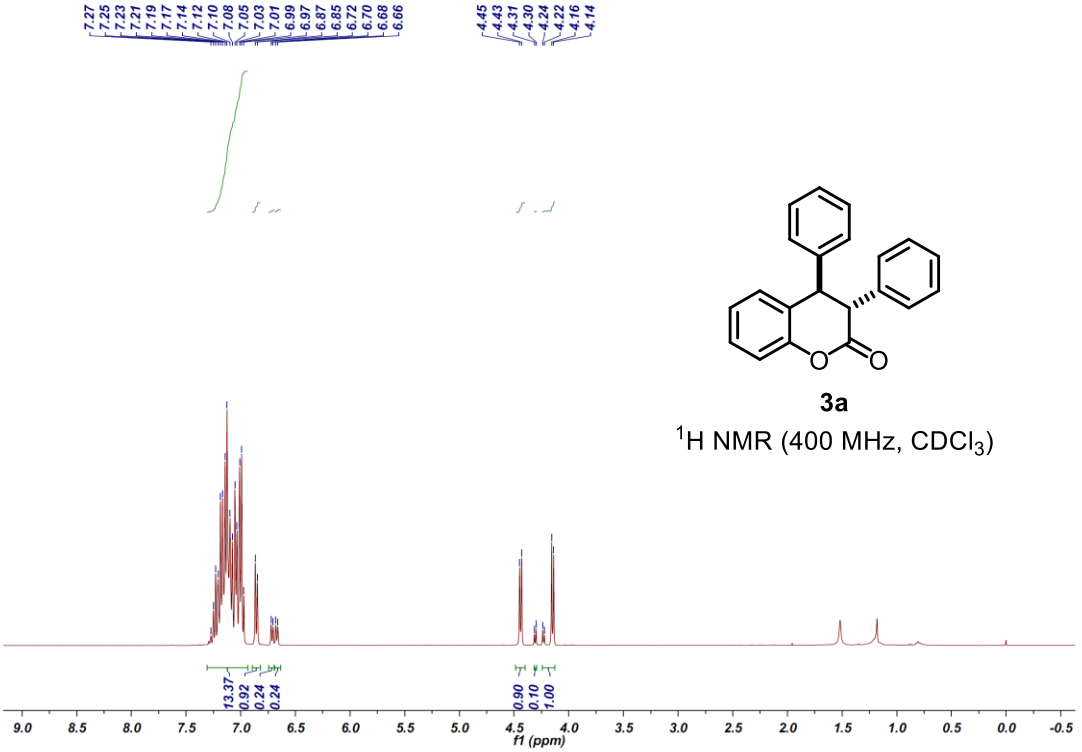


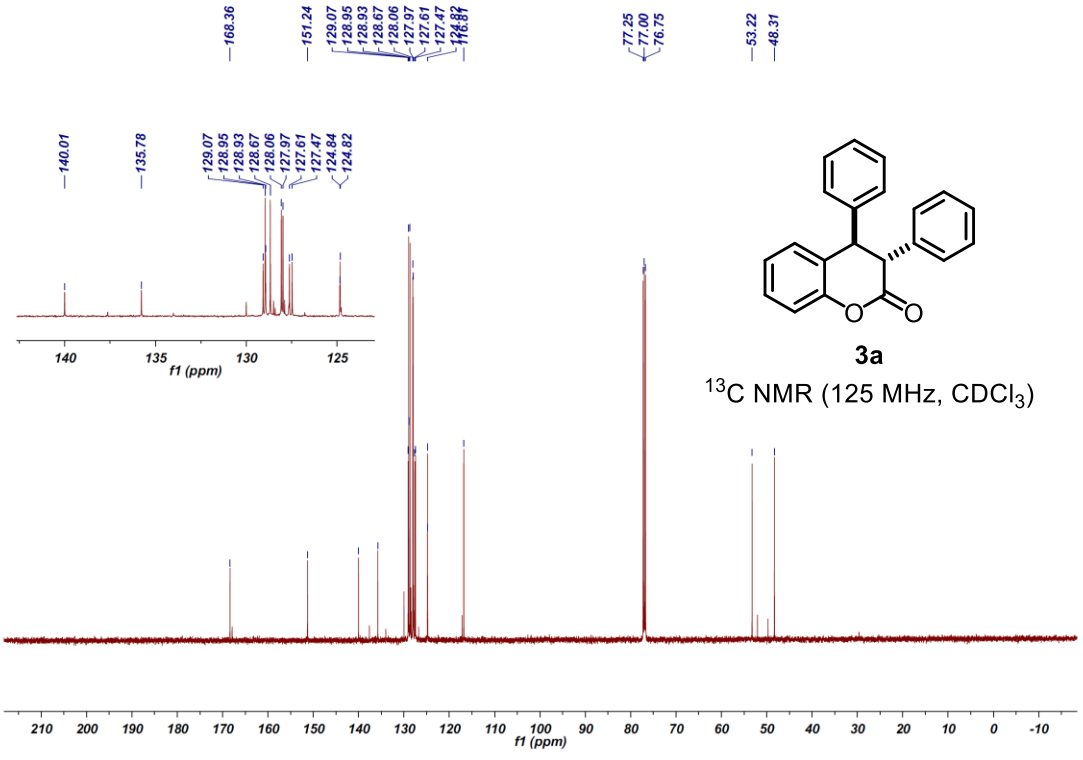
Compound **4b** was prepared in 94% yield (53.8 mg, 9:1 dr) according to the known procedures (0.2 mmol scale).[3] Pale yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.14 – 7.00 (m, 7H), 6.98 – 6.95 (m, 2H), 6.91 – 6.83 (m, 3H), 6.69 (d, *J* = 4.4 Hz, 2H), 4.28 - 4.12 (m, 3H), 3.22 (td, *J* = 9.6, 3.6 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 154.8, 143.7, 140.2, 130.7, 129.0, 128.5, 128.2, 127.8, 127.7 126.9, 126.5, 125.6, 120.6, 116.6, 69.6, 49.0, 47.6; **HRMS (ESI, *m*/*z*)** calcd. for $C_{21}H_{19}O$ $[M+H]^+$: 287.1430, found: 287.1436; IR (KBr, cm^{-1}) 3063, 2917, 1484, 1450, 1225, 1042, 1013, 755, 500.

Reference:

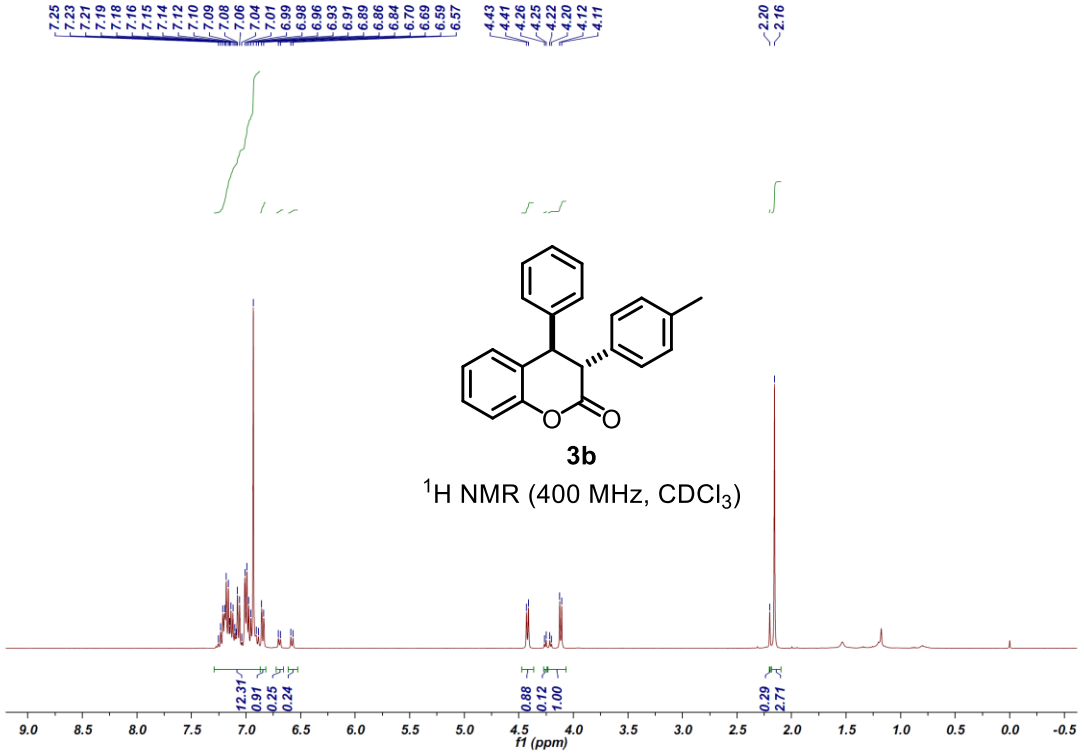
1. a) Bu, H.-Z.; Li, H.-H.; Luo, W.-F.; Luo, C.; Qian, P.-C.; Ye, L.-W. *Org. Lett*. **2020**, *22*, 648; b) Tu, Y.; Zeng, X.; Wang, H.; Zhao, J. *Org. Lett.* **2018**, *20*, 280; c) Jadhav, P. D.; Lu, X.; Liu, R.-S. *ACS Catal*. **2018**, *8*, 9697.
2. Li, L.; Chen, X.- M.; Wang, Z.-S.; Zhou, B.; Liu, X.; Lu, X.; Ye, L.-W. *ACS Catal.* **2017**, *7*, 4004.
3. Chen, X.; Song, R.; Liu, Y.; Ooi, C. Y.; Jin, Z.; Zhu, T.; Wang, H.; Hao, L.; Chi, Y. R. *Org. Lett.* **2017**, *19*, 5892.
4. (a) X.-Q. Zhu, Z.-S. Wang, B.-S. Hou, H.-W. Zhang, C. Deng and L.-W. Ye, *Angew. Chem., Int. Ed.*, 2020, **59**, 1666; (b) Z.-S. Wang, Y.-B. Chen, H.-W. Zhang, Z. Sun, C. Zhu and L.-W. Ye, *J. Am. Chem. Soc*., 2020, **142**, 3636; (c) Y. Tokimizu, S. Oishi, N. Fujii and H. Ohno, *Org. Lett*., **2014**, *16*, 3138; (d) S. Dutta, S. Yang, R. Vanjari, R. K. Mallick, V. Gandon and A. K. Sahoo, *Angew. Chem., Int. Ed.,* 2020, **59**, 10785; (e) L. Zeng, Y. Lin. J. Li, H. Sajiki, H. Xie and S. Cui, *Nat. Commun.*, 2020, **11**, 5639; (f) M. Chen, N. Sun, H. Chen and Y. Liu, *Chem. Commun*., **2016**, 52, 6324.

3,4-diphenylchroman-2-one (3a)



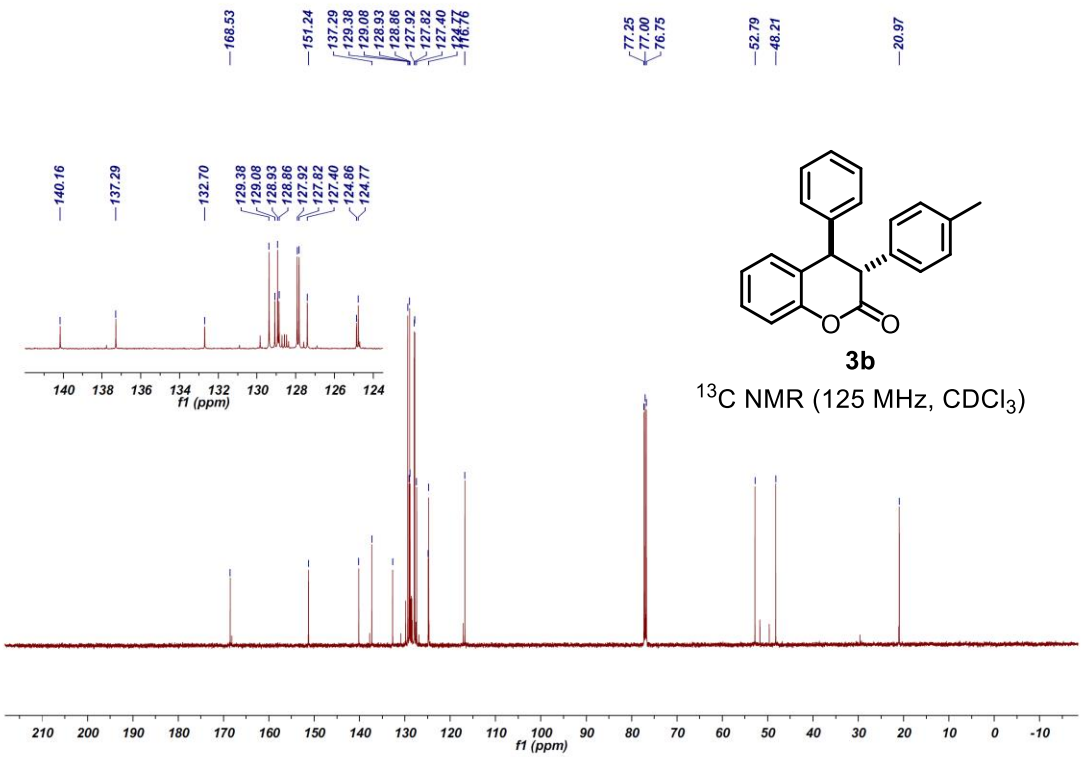


4-phenyl-3-(*p*-tolyl)chroman-2-one (3b)



3b

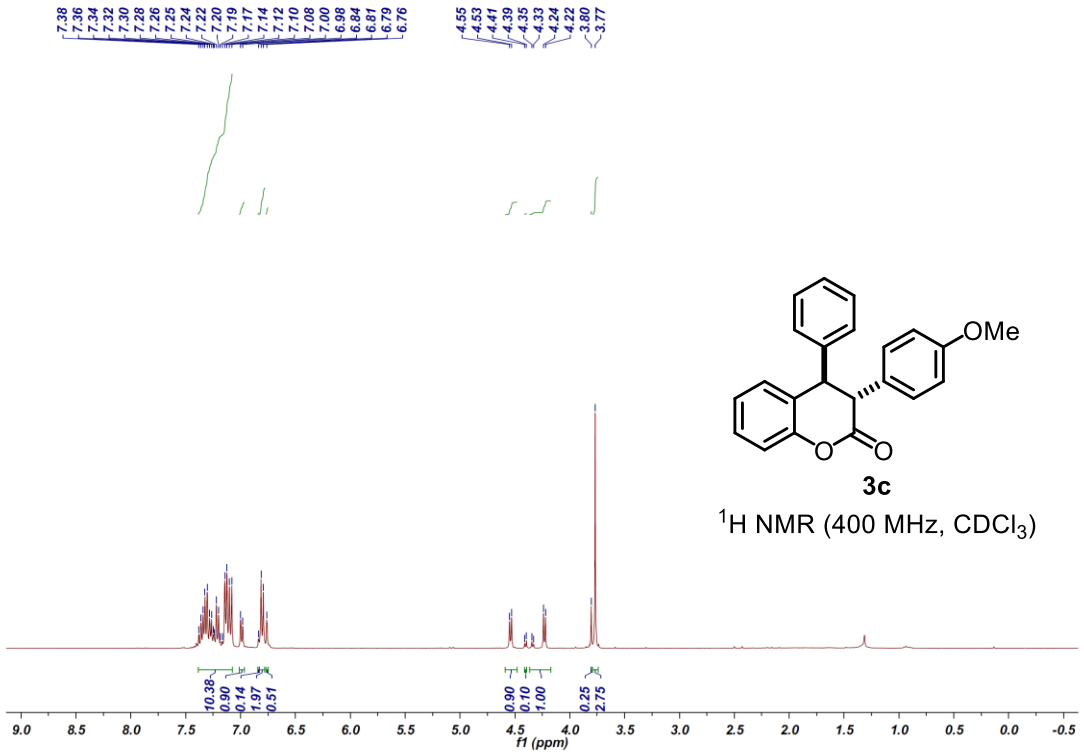
^{1}H NMR (400 MHz, $CDCl_3$)

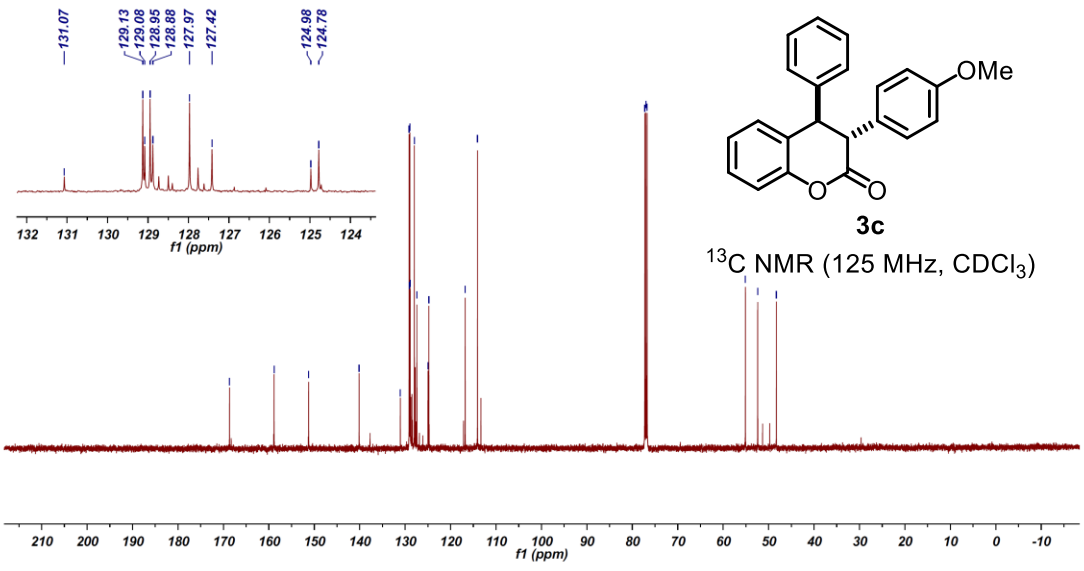


3b

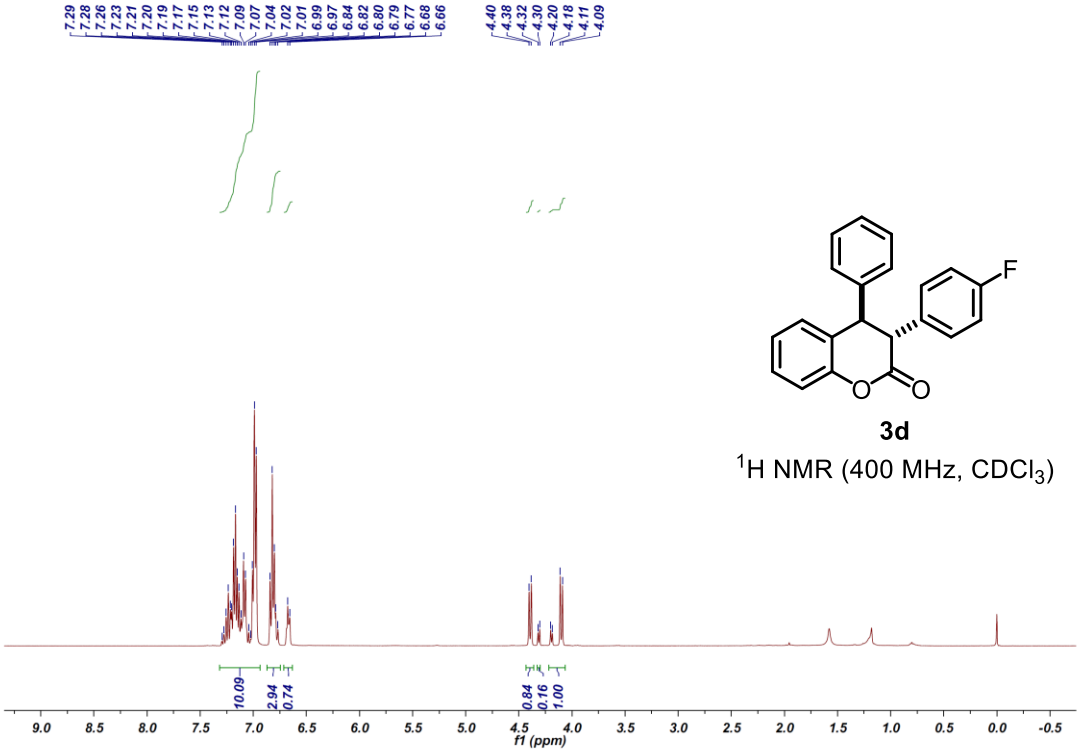
^{13}C NMR (125 MHz, $CDCl_3$)

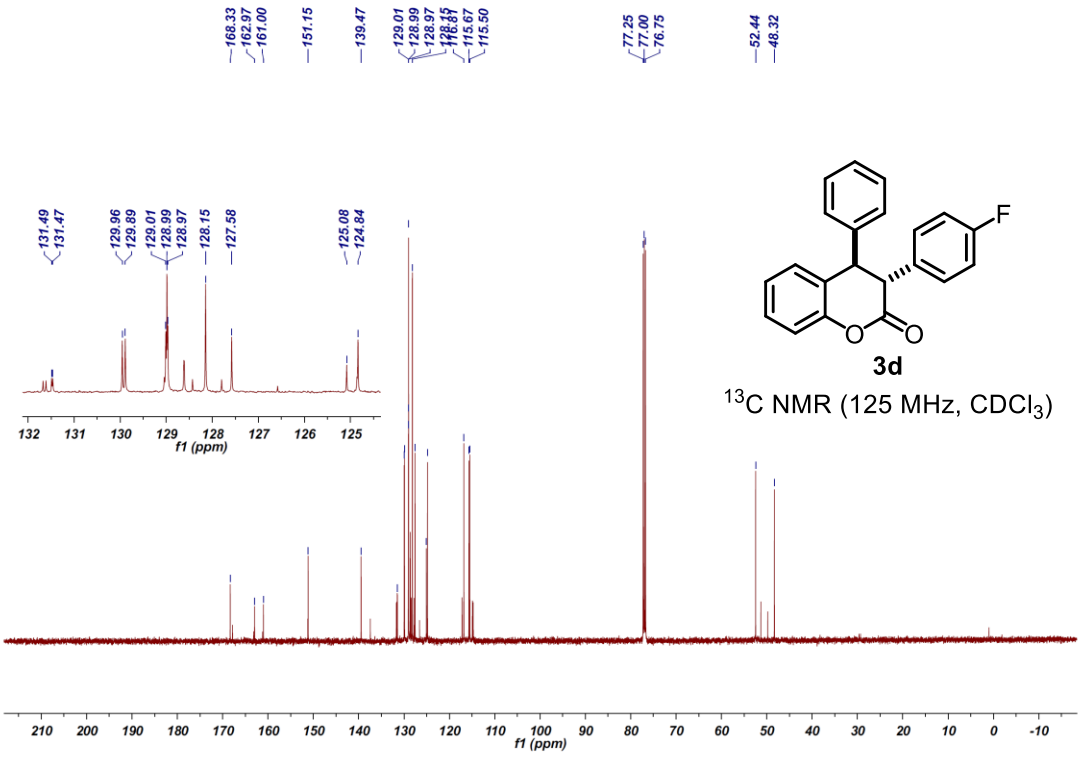
3-(4-methoxyphenyl)-4-phenylchroman-2-one (3c)



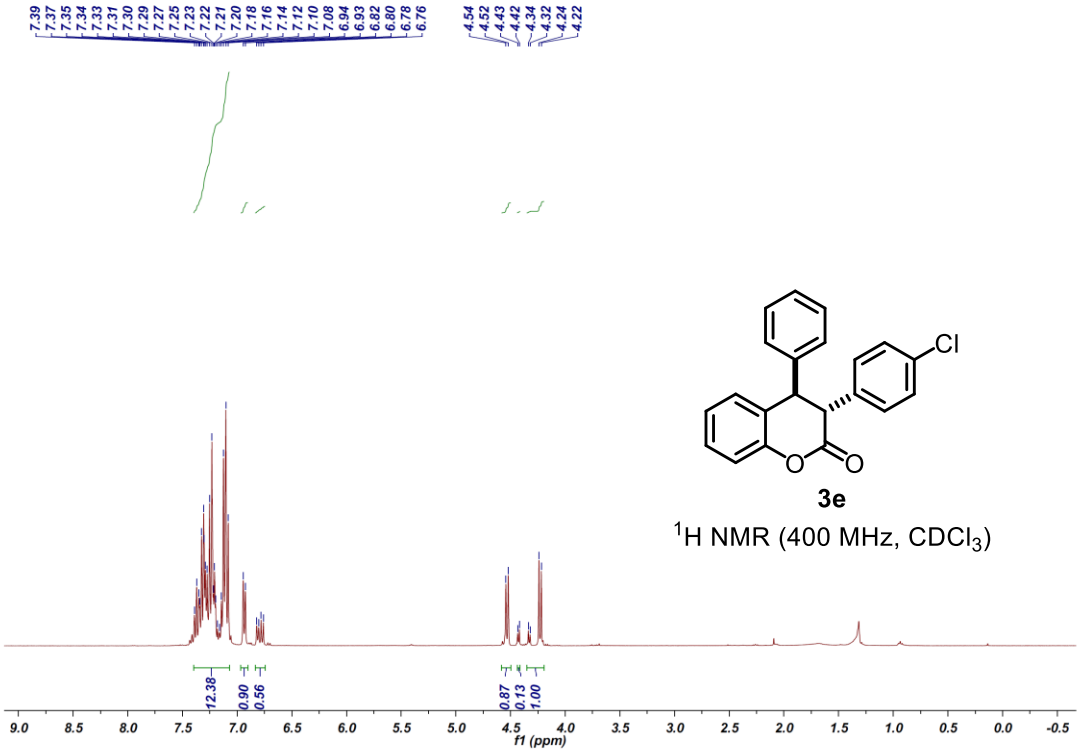


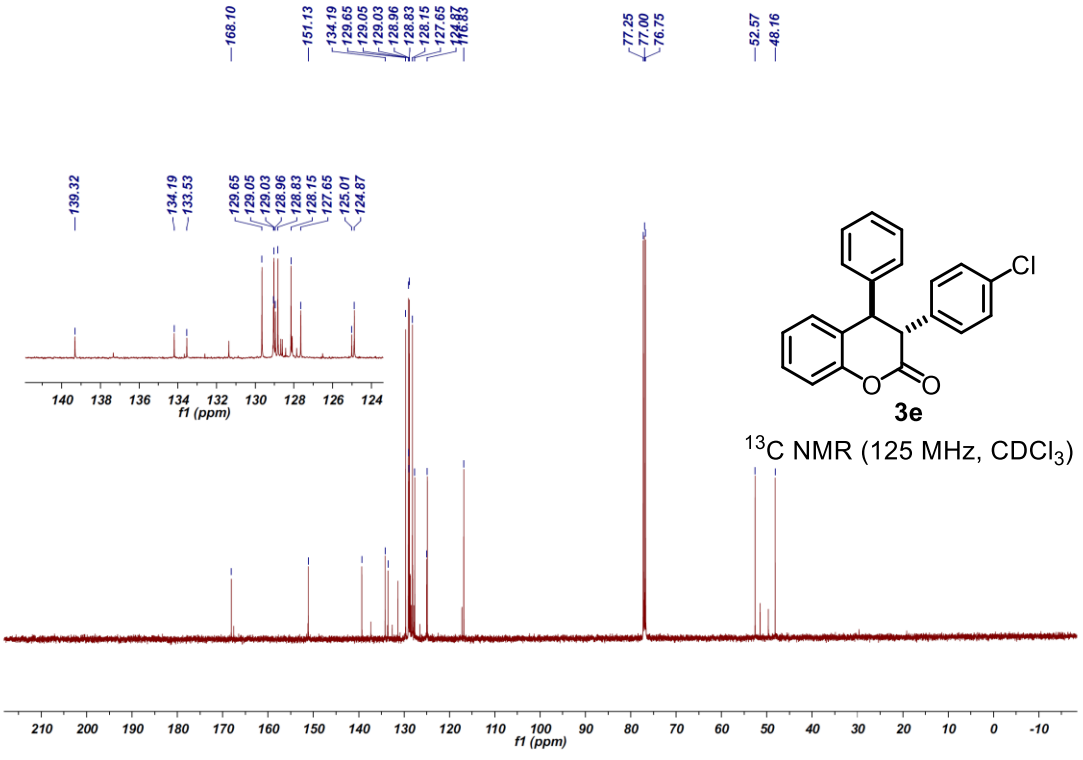
3-(4-fluorophenyl)-4-phenylchroman-2-one (3d)



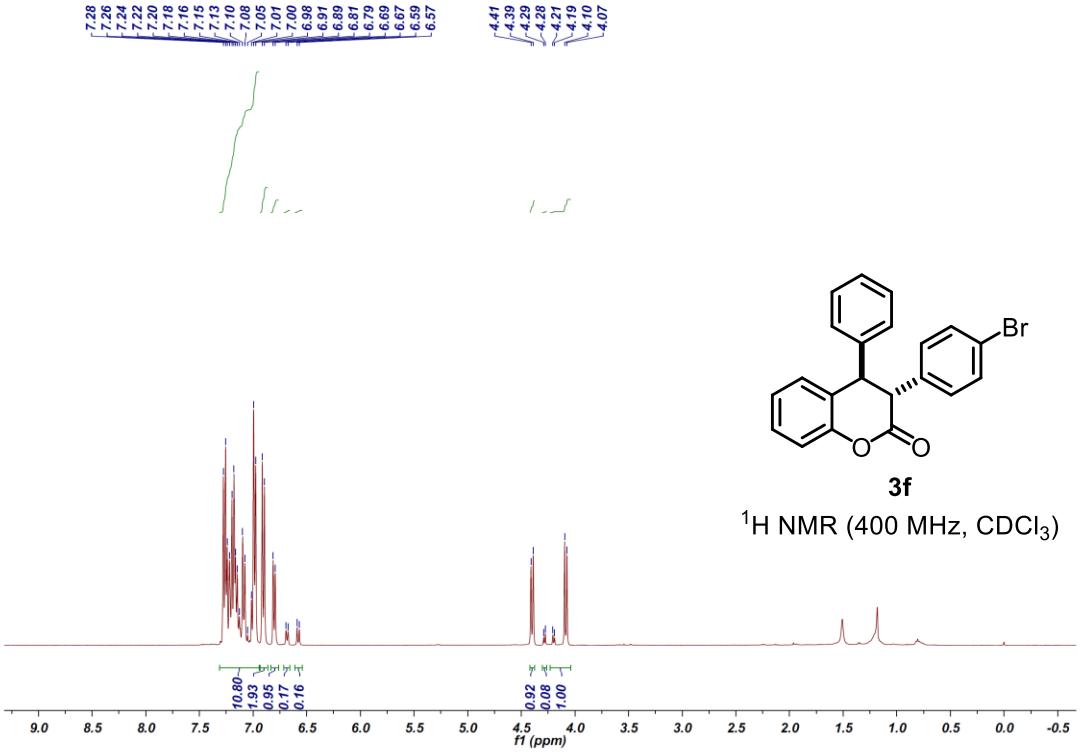


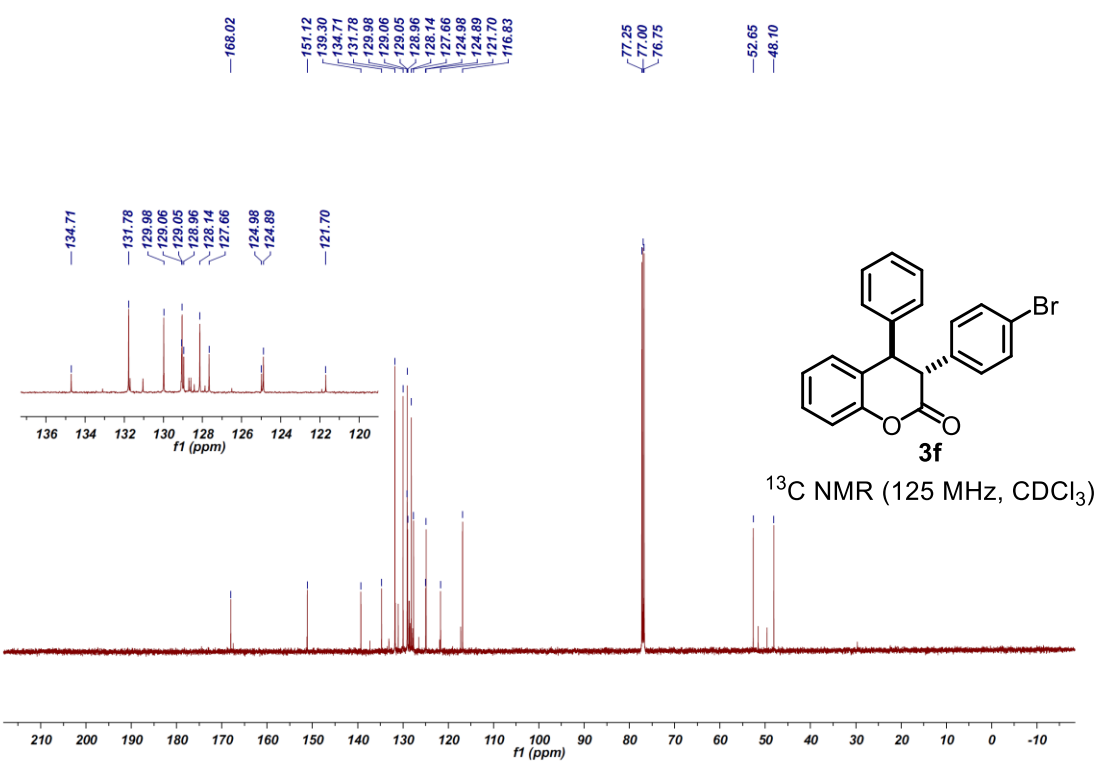
3-(4-chlorophenyl)-4-phenylchroman-2-one (3e)



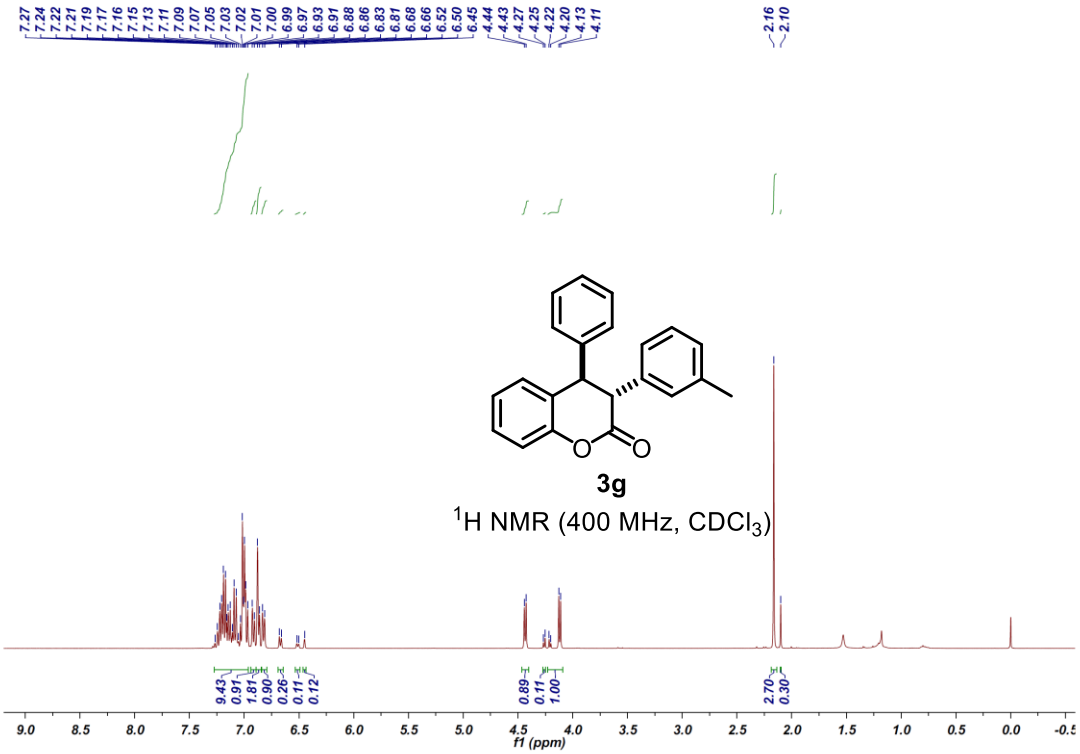


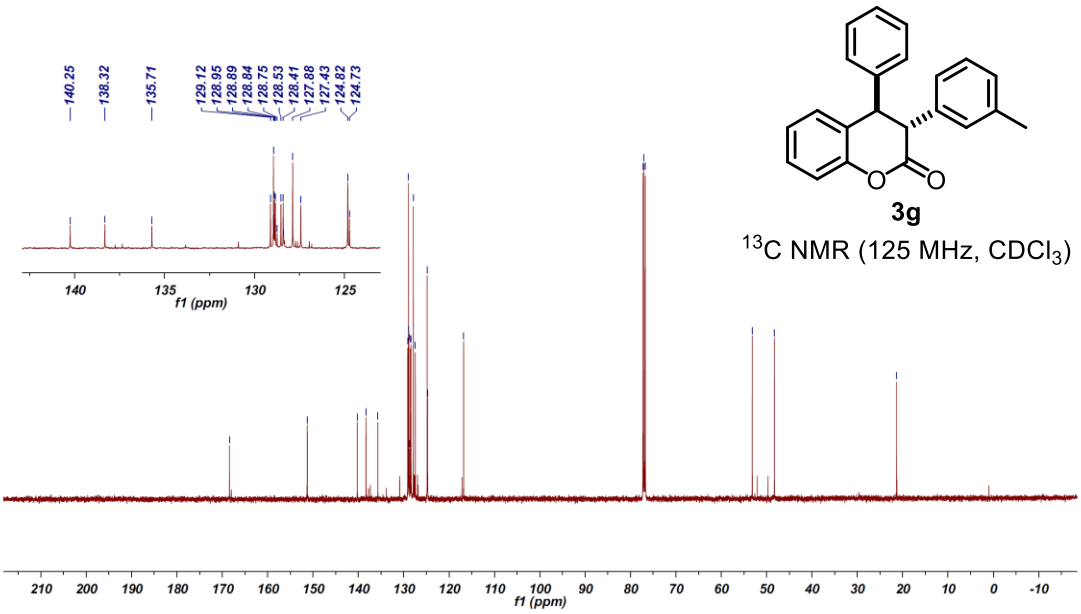
3-(4-bromophenyl)-4-phenylchroman-2-one (3f)



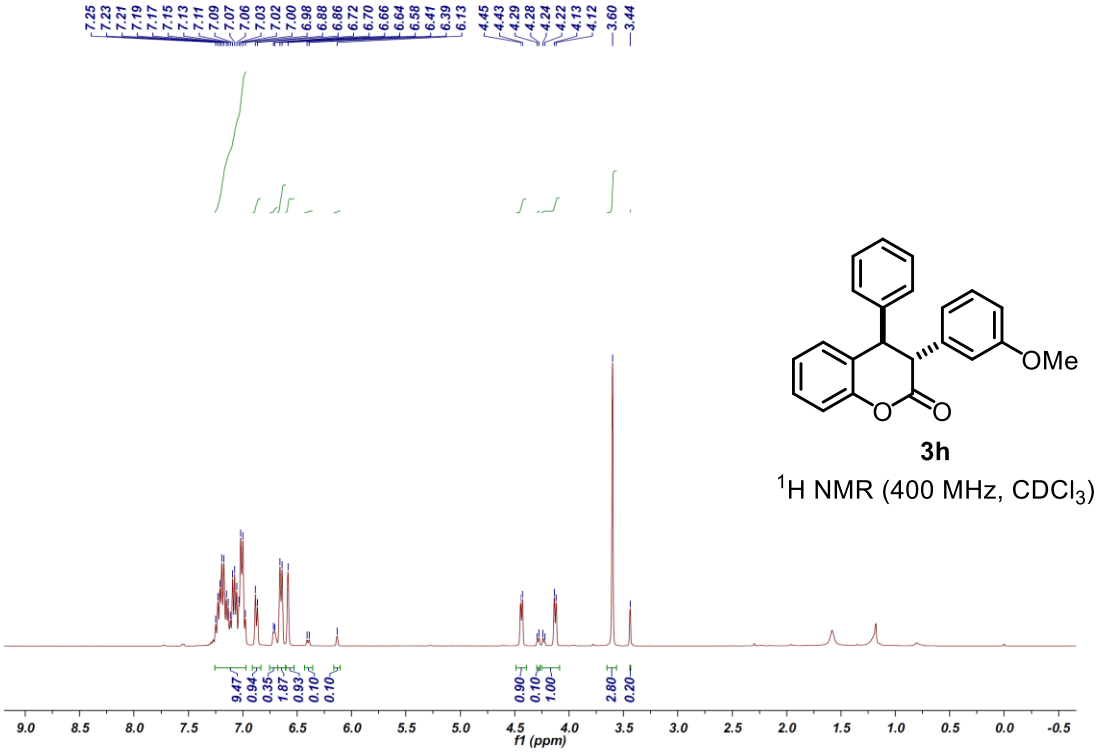


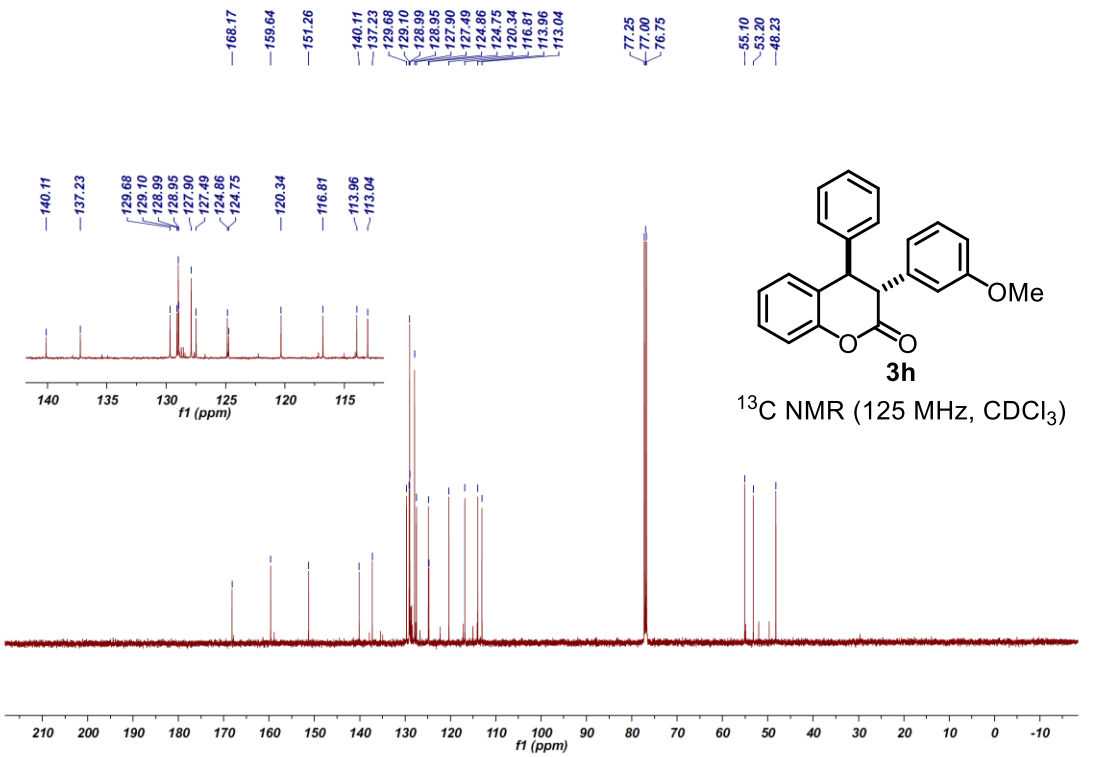
4-phenyl-3-(*m*-tolyl)chroman-2-one (3g)



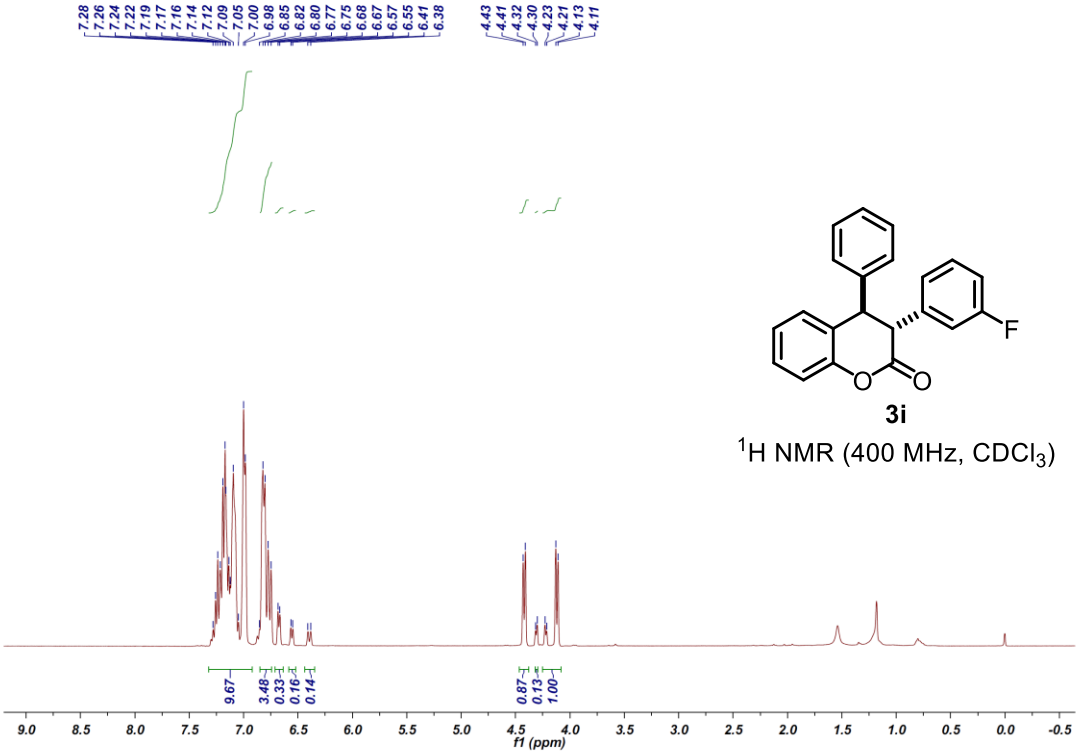


3-(3-methoxyphenyl)-4-phenylchroman-2-one (3h)



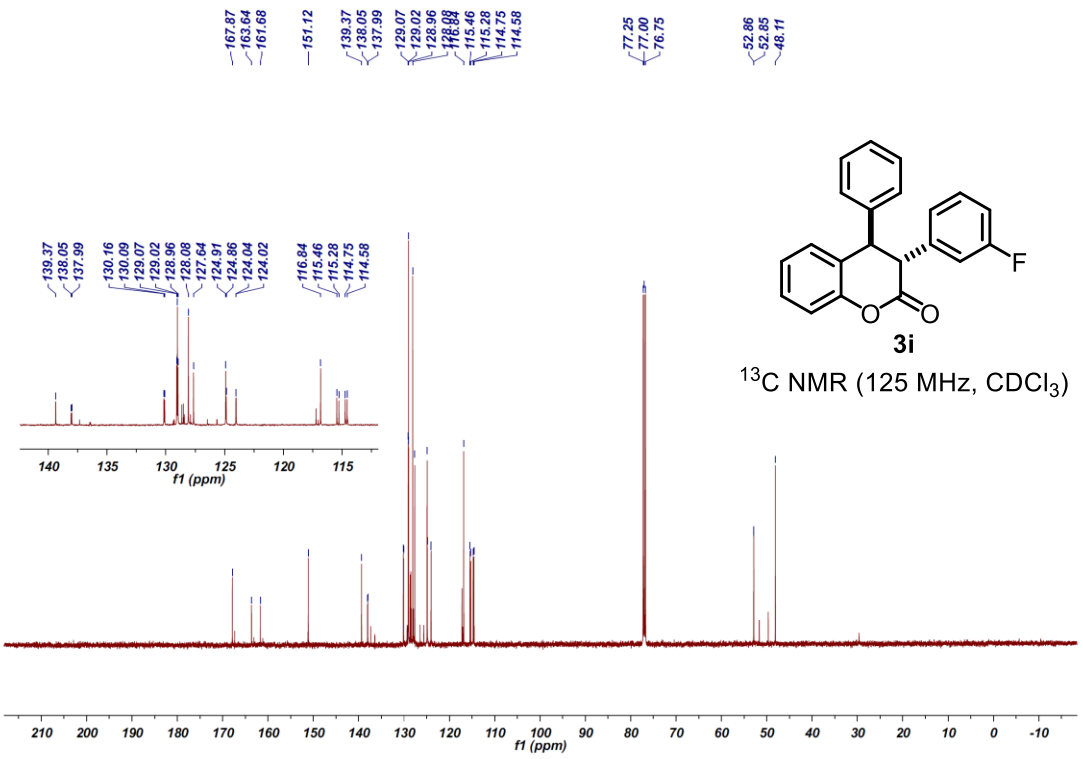


3-(3-fluorophenyl)-4-phenylchroman-2-one (3i)



3i

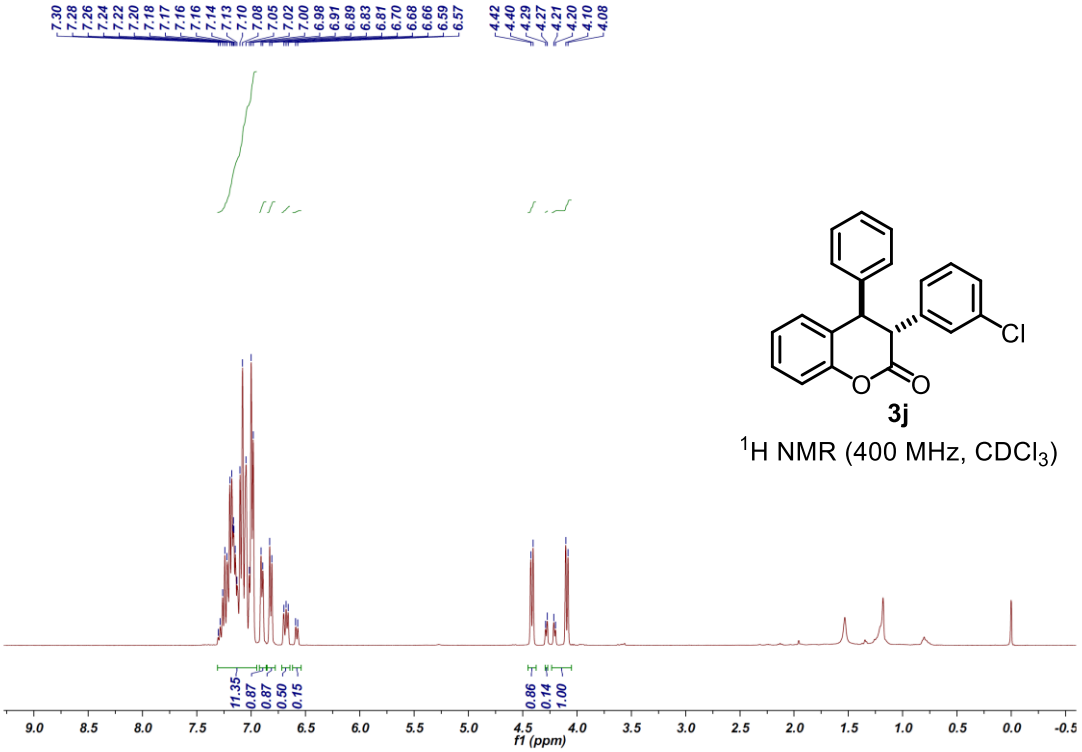
^{1}H NMR (400 MHz, $CDCl_3$)

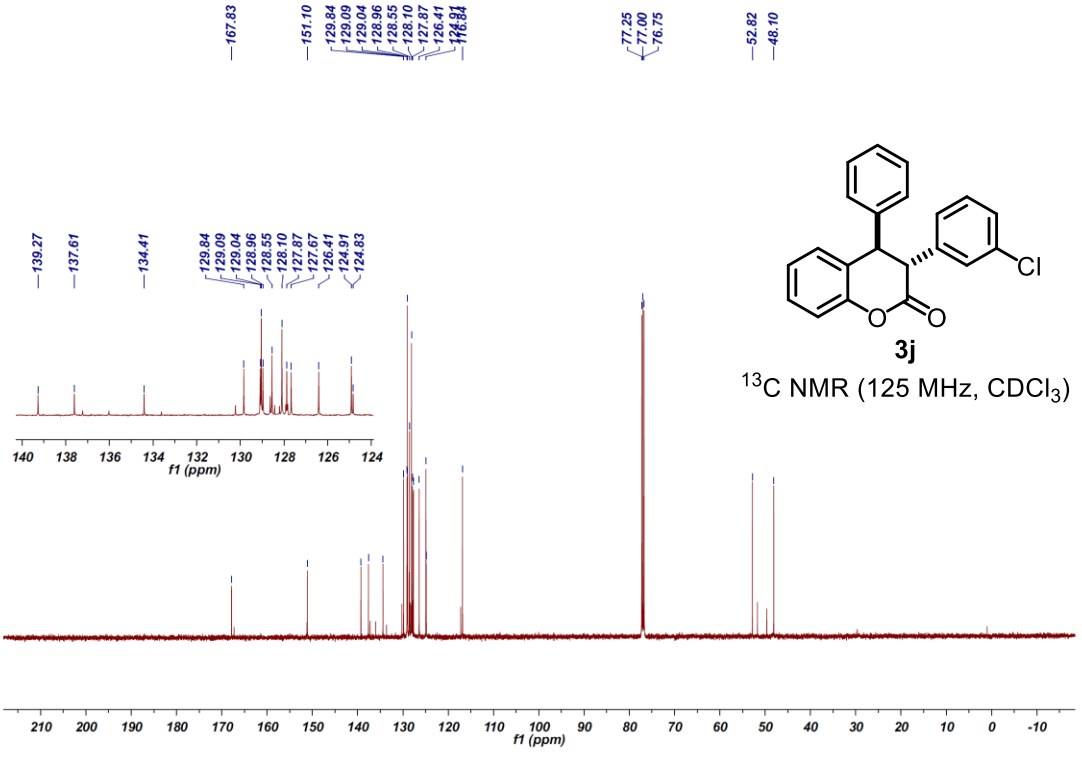


3i

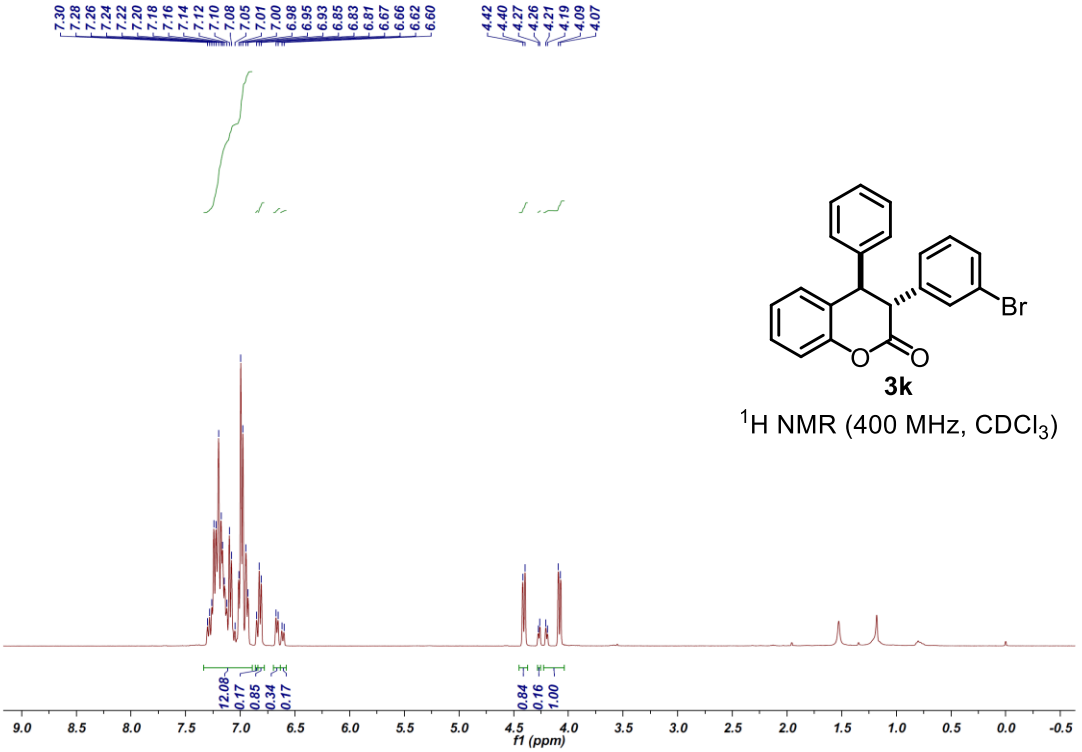
^{13}C NMR (125 MHz, $CDCl_3$)

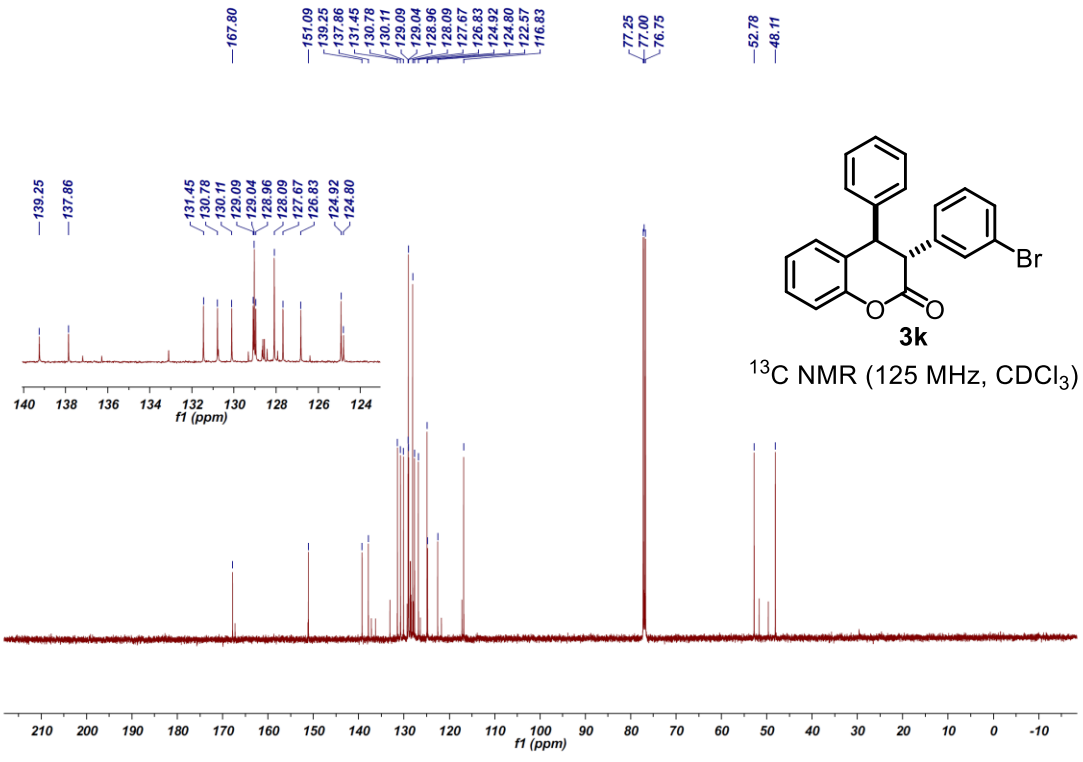
3-(3-chlorophenyl)-4-phenylchroman-2-one (3j)



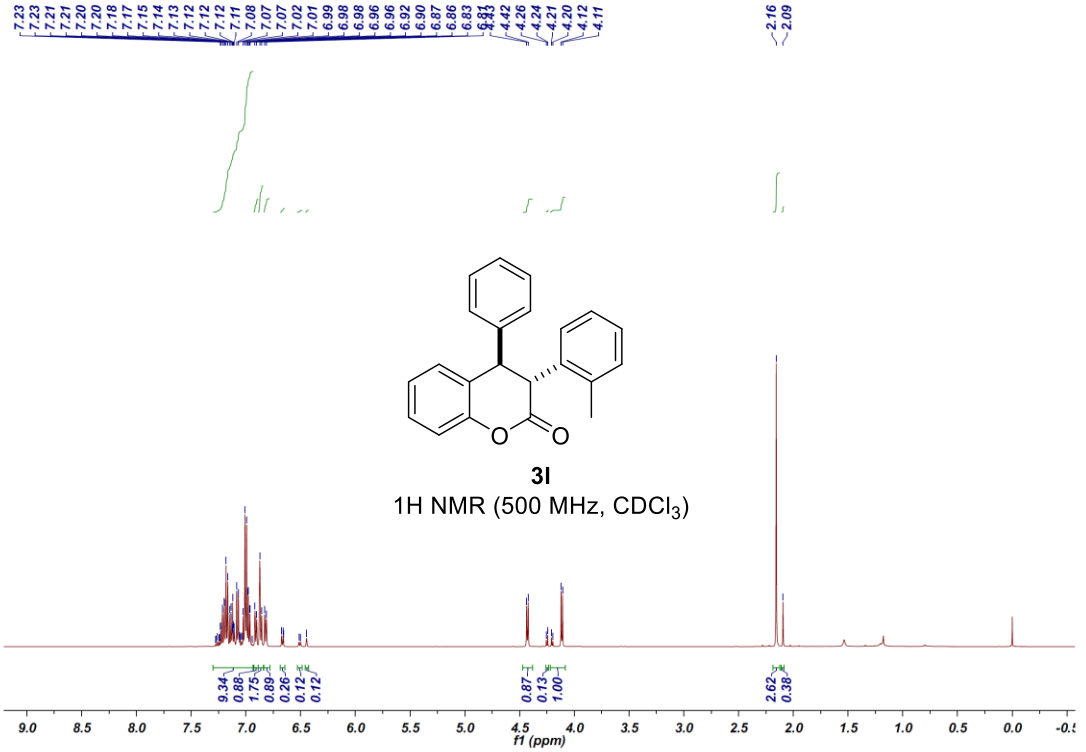


3-(3-bromophenyl)-4-phenylchroman-2-one (3k)



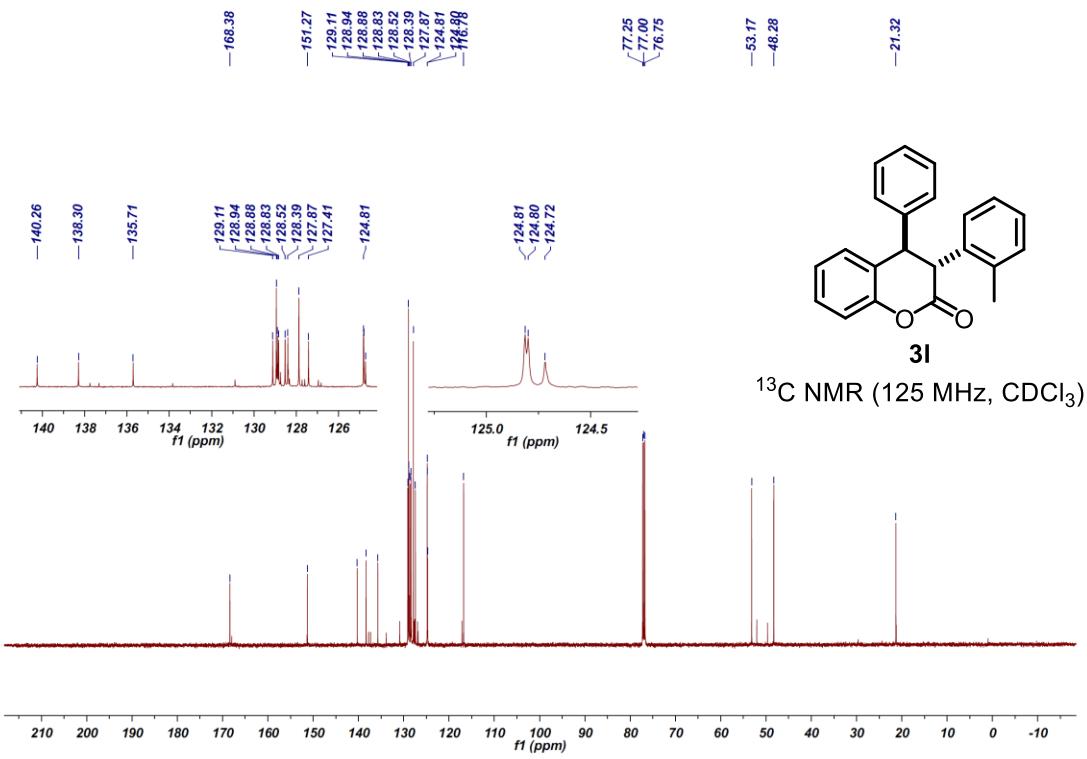


4-phenyl-3-(*o*-tolyl)chroman-2-one (3l)



3l

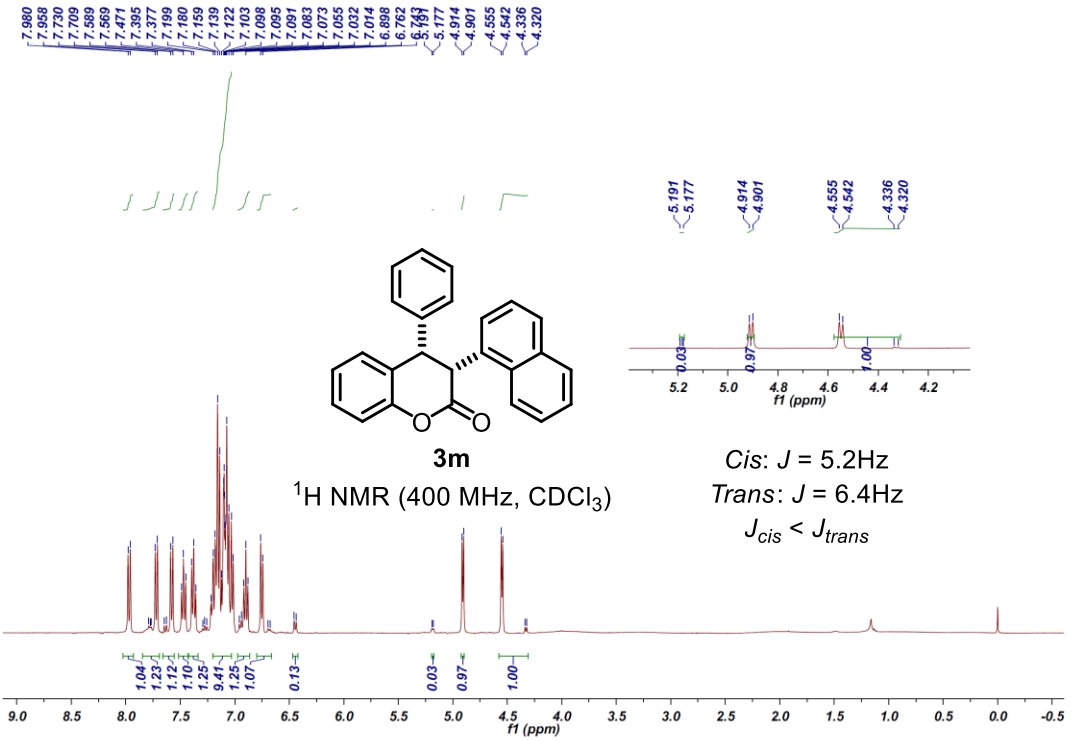
1H NMR (500 MHz, $CDCl_3$)

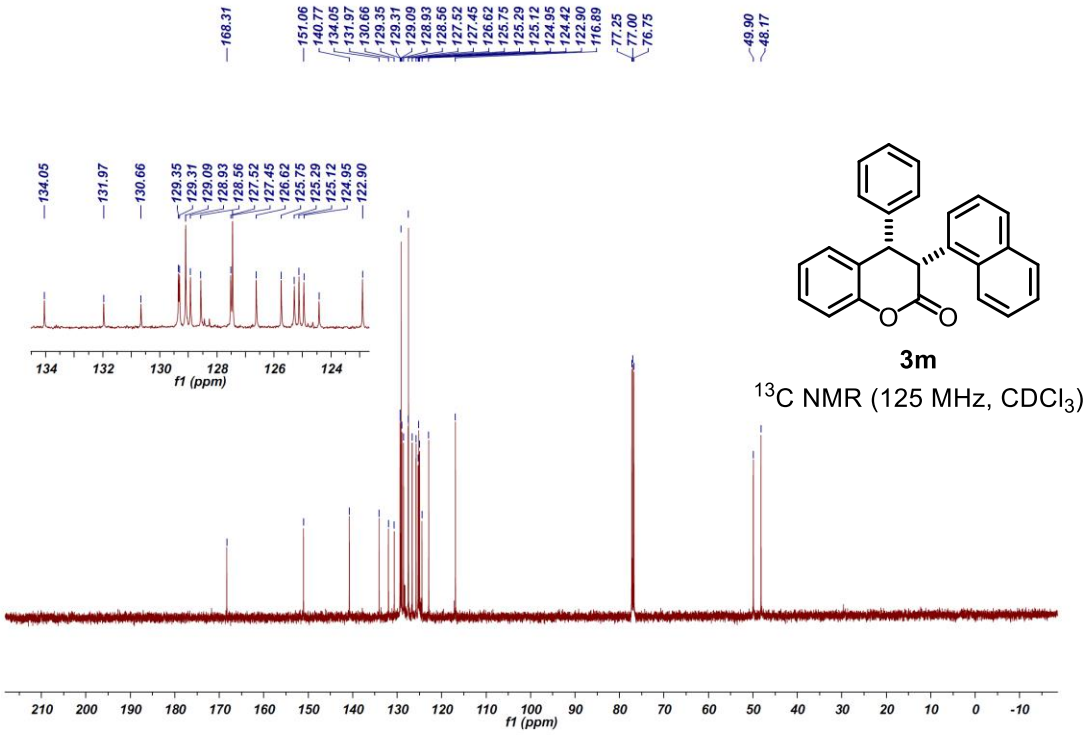


3l

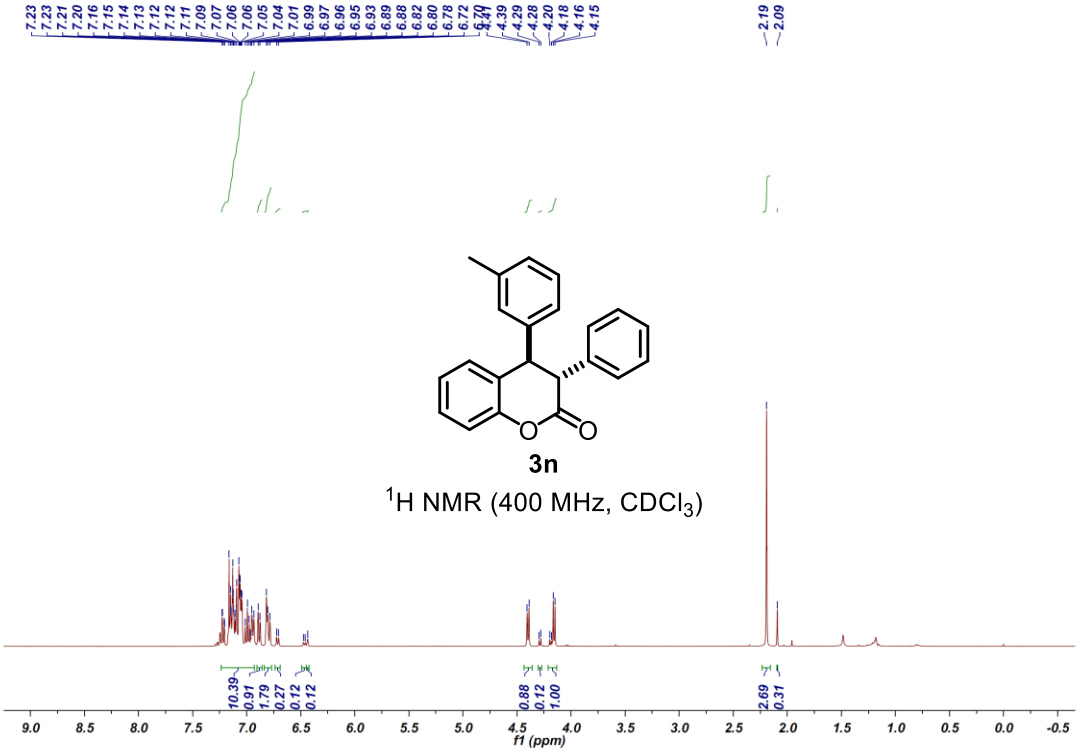
^{13}C NMR (125 MHz, $CDCl_3$)

3-(naphthalen-1-yl)-4-phenylchroman-2-one (3m)



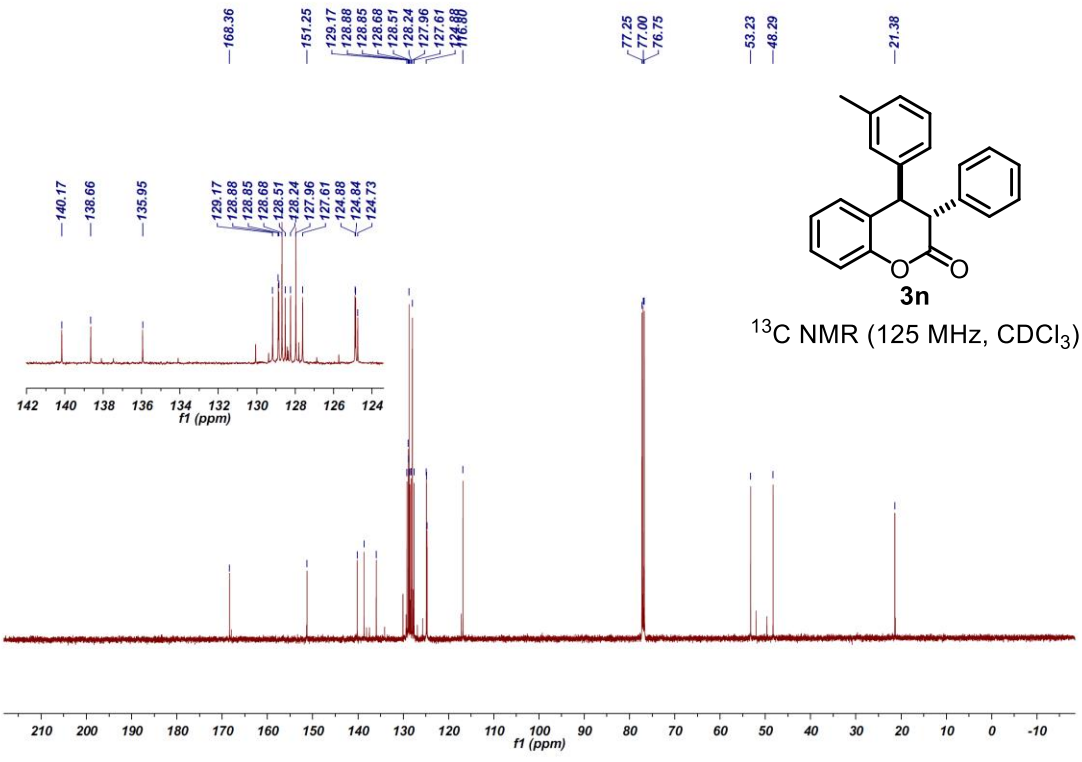


3-phenyl-4-(*m*-tolyl)chroman-2-one (3n)



3n

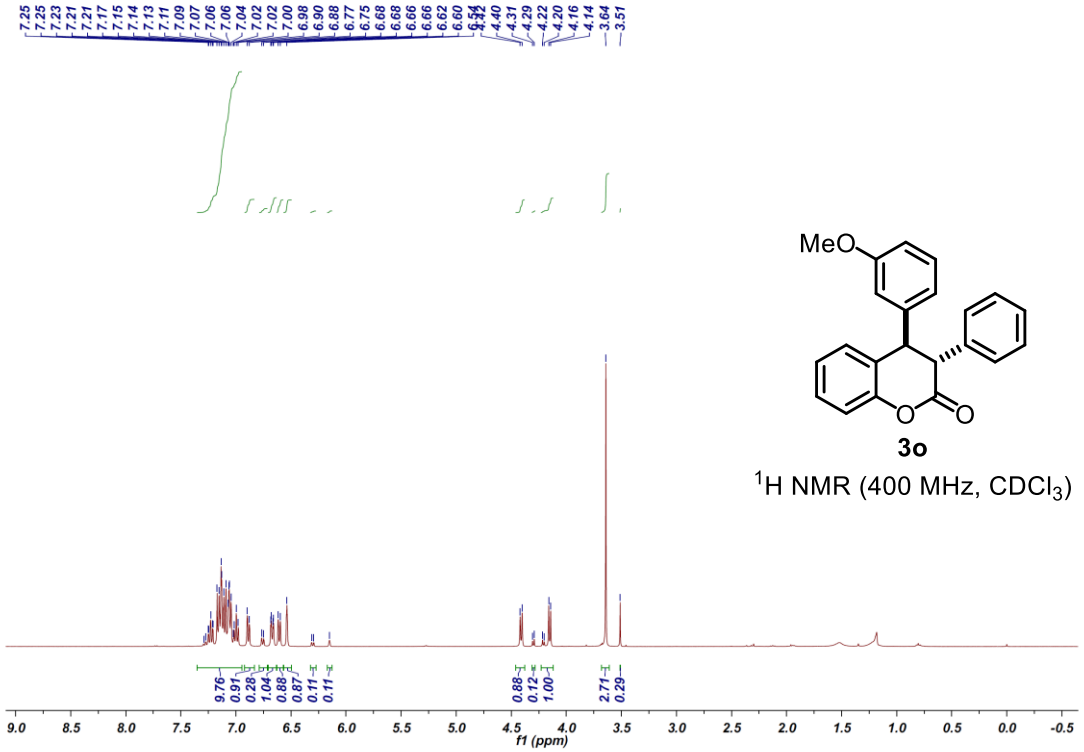
^{1}H NMR (400 MHz, $CDCl_3$)

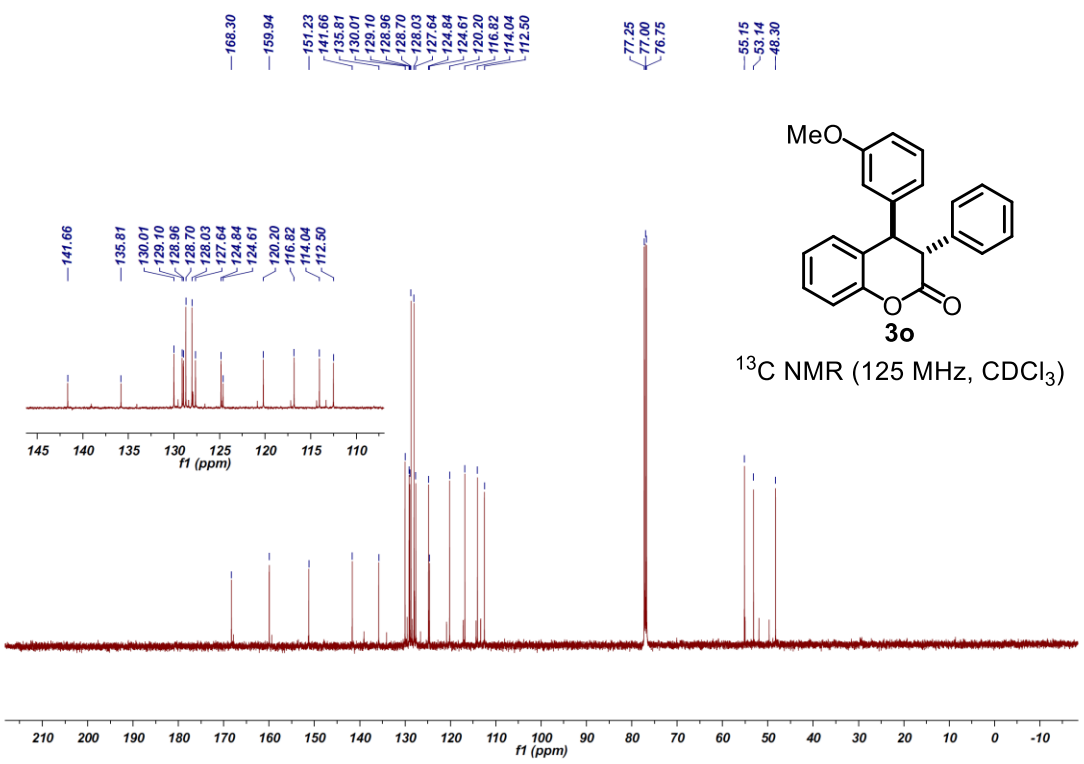


3n

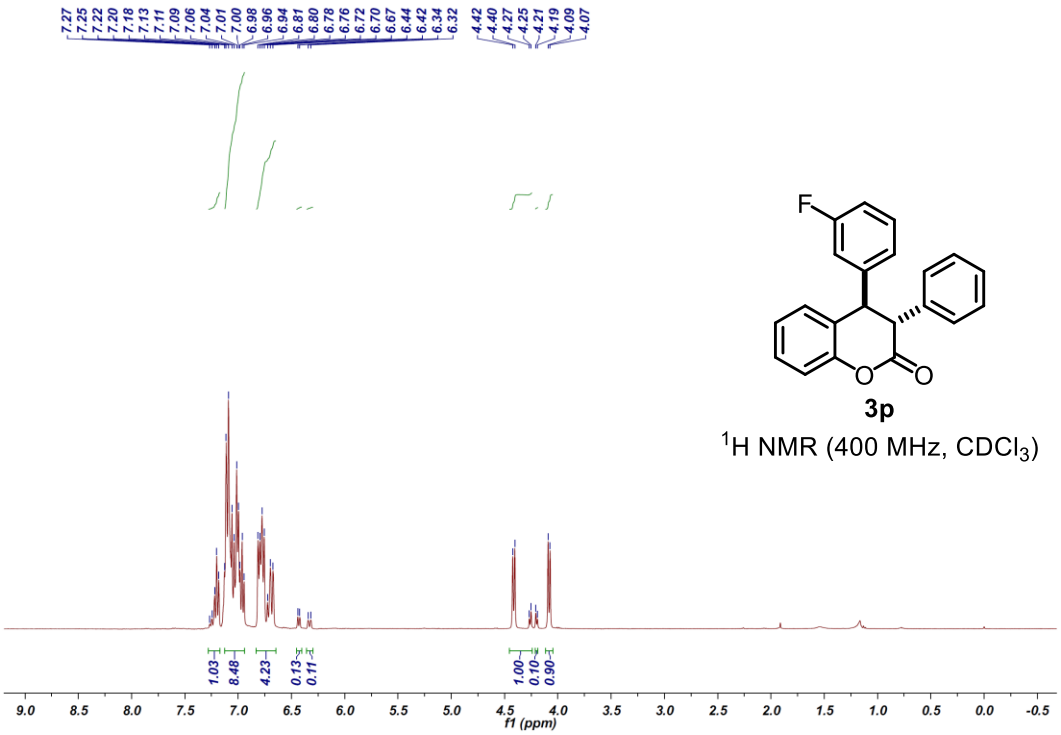
^{13}C NMR (125 MHz, $CDCl_3$)

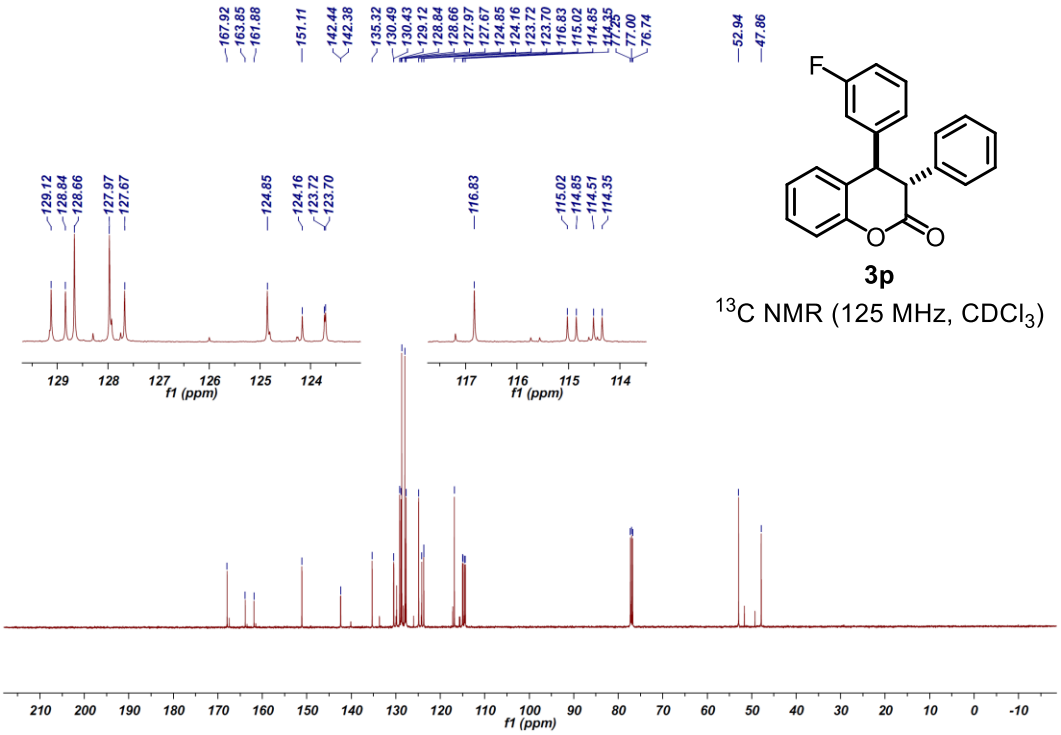
4-(3-methoxyphenyl)-3-phenylchroman-2-one (3o)



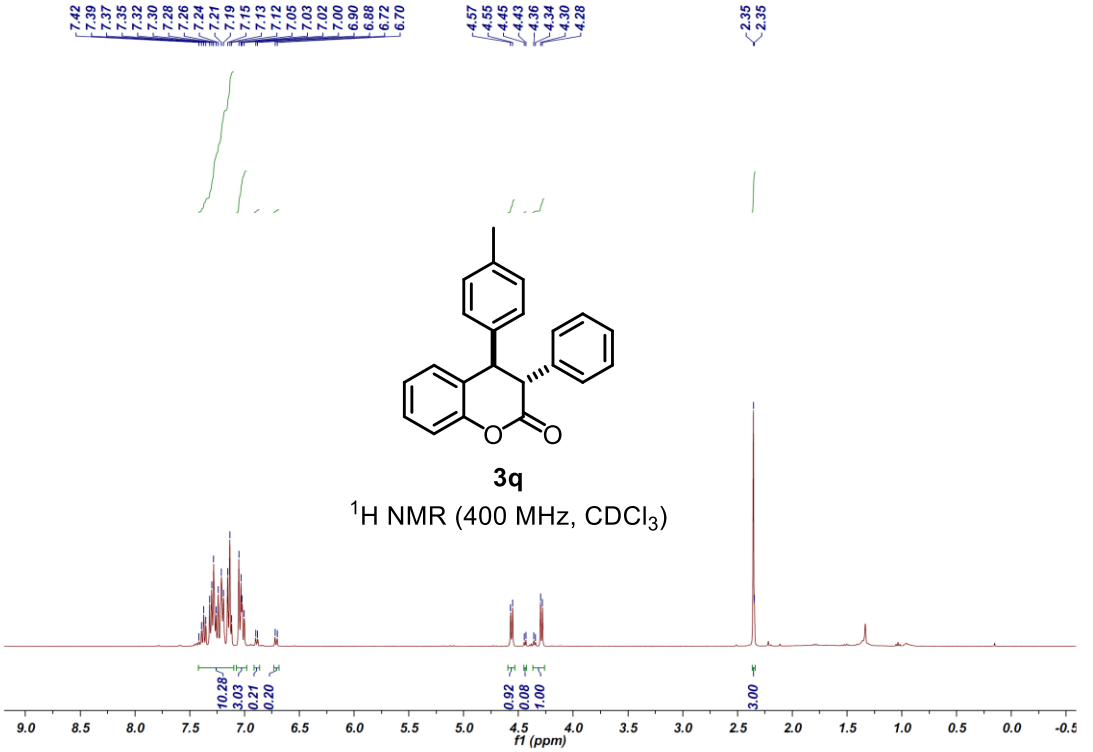


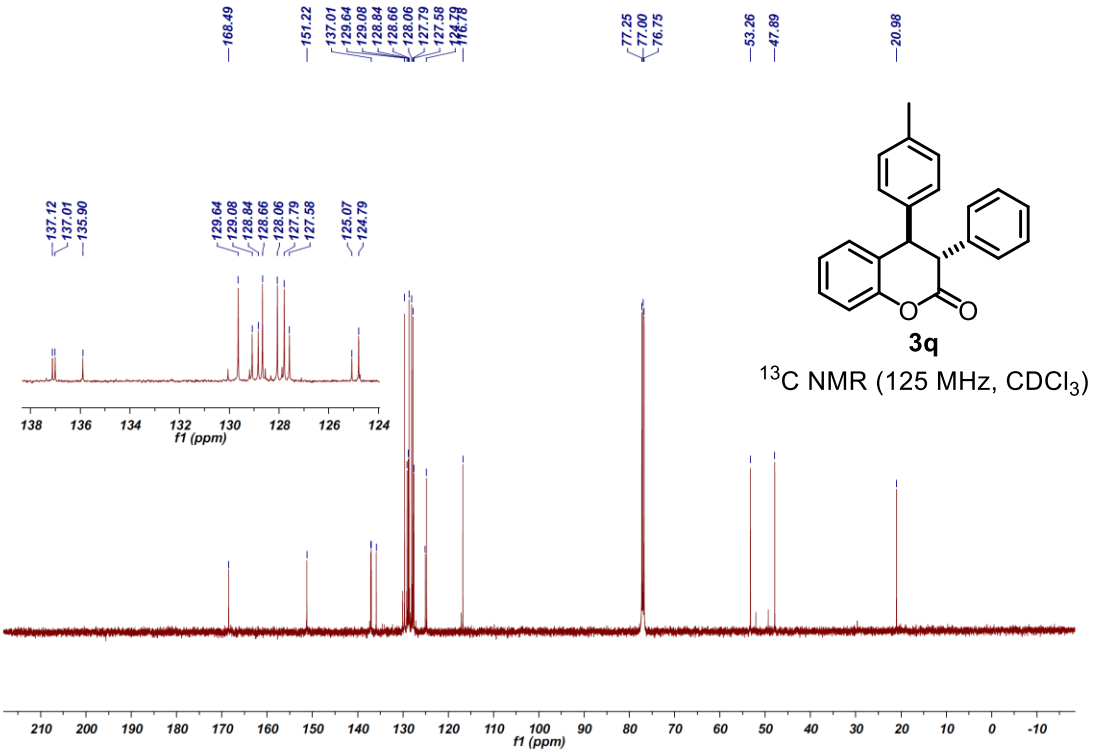
4-(3-fluorophenyl)-3-phenylchroman-2-one (3p)



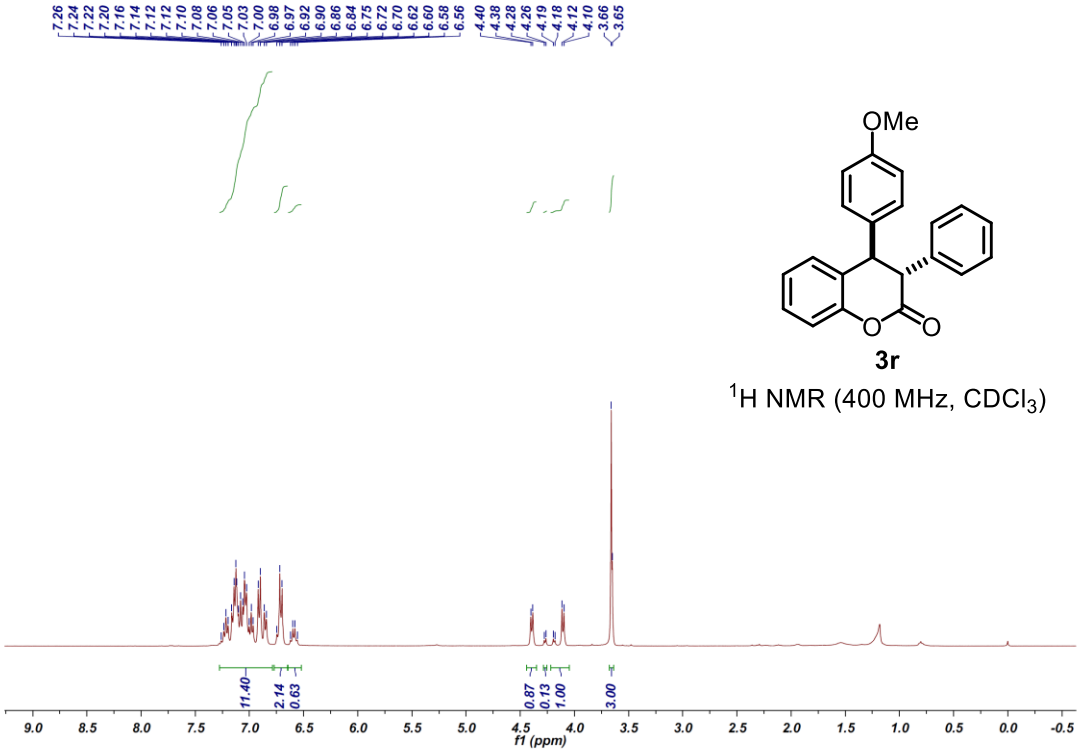


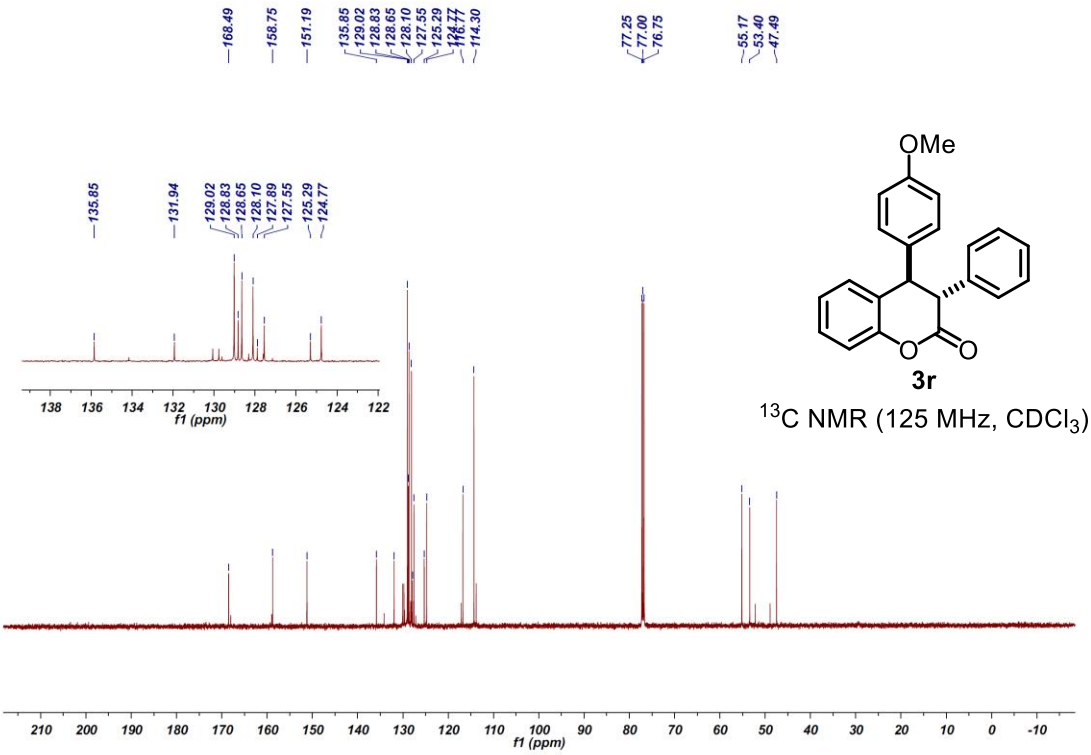
3-phenyl-4-(*p*-tolyl)chroman-2-one (3q)



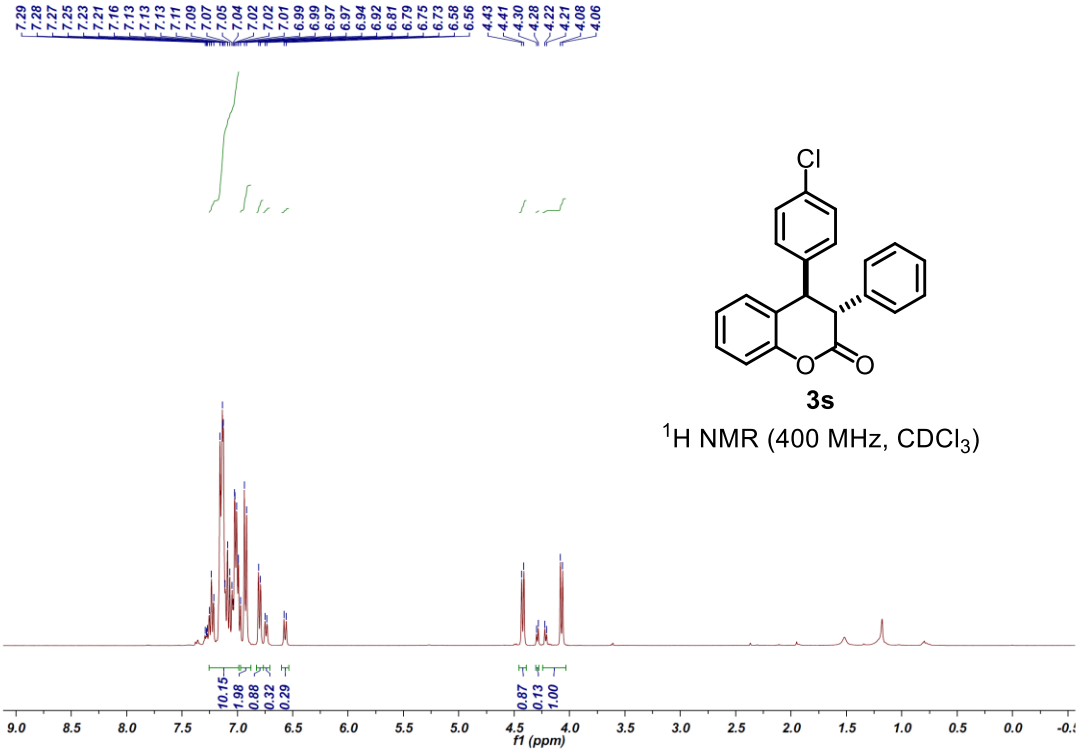


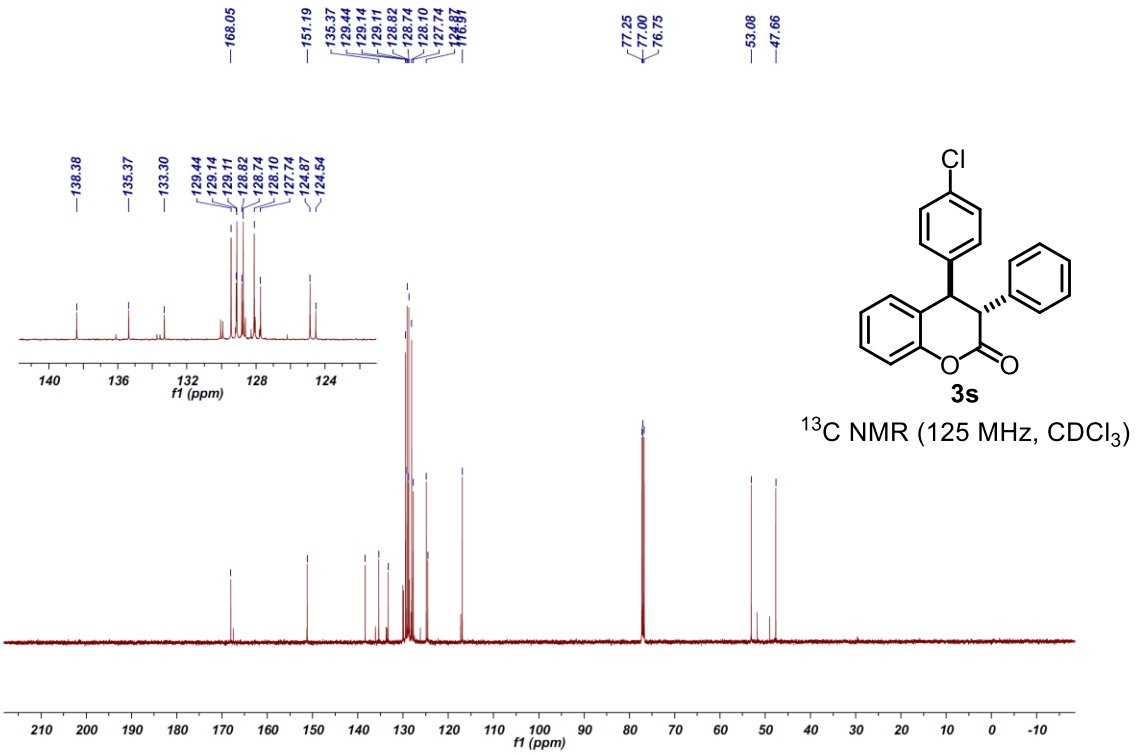
4-(4-methoxyphenyl)-3-phenylchroman-2-one (3r)



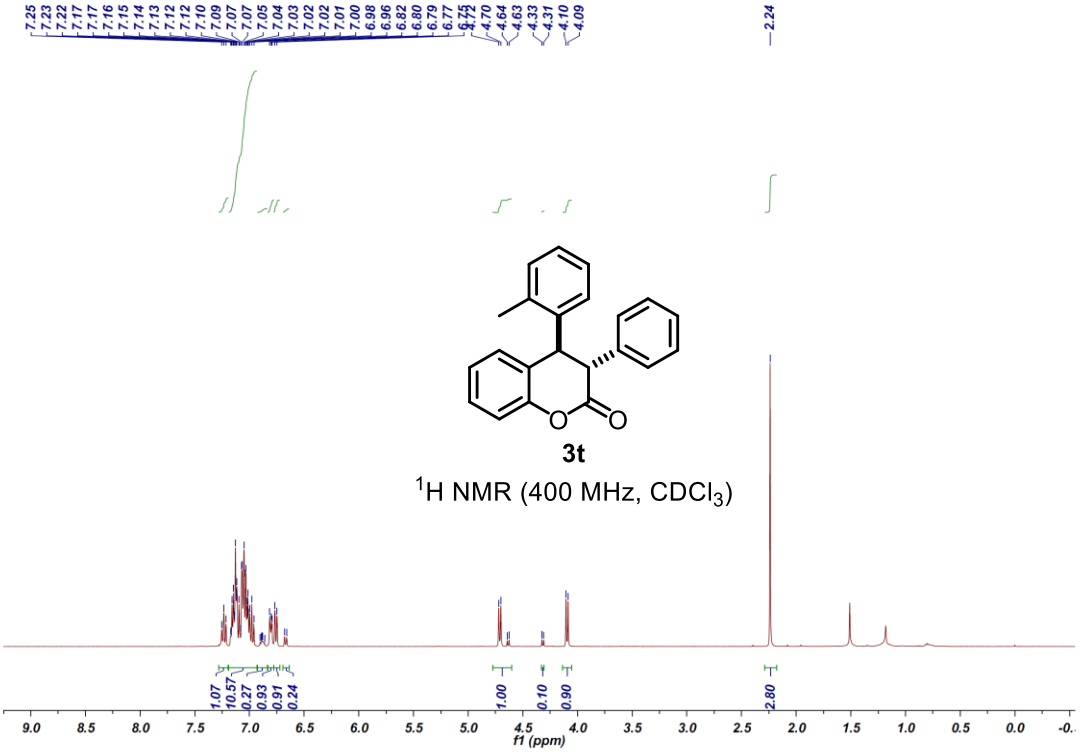


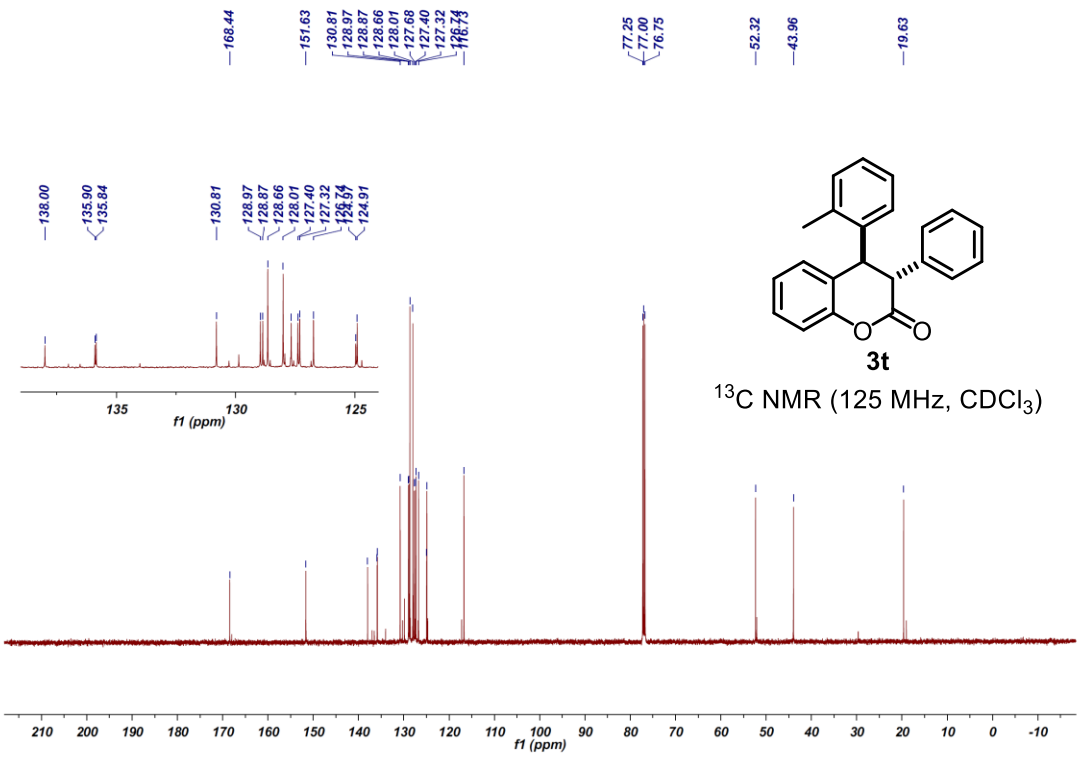
4-(4-chlorophenyl)-3-phenylchroman-2-one (3s)



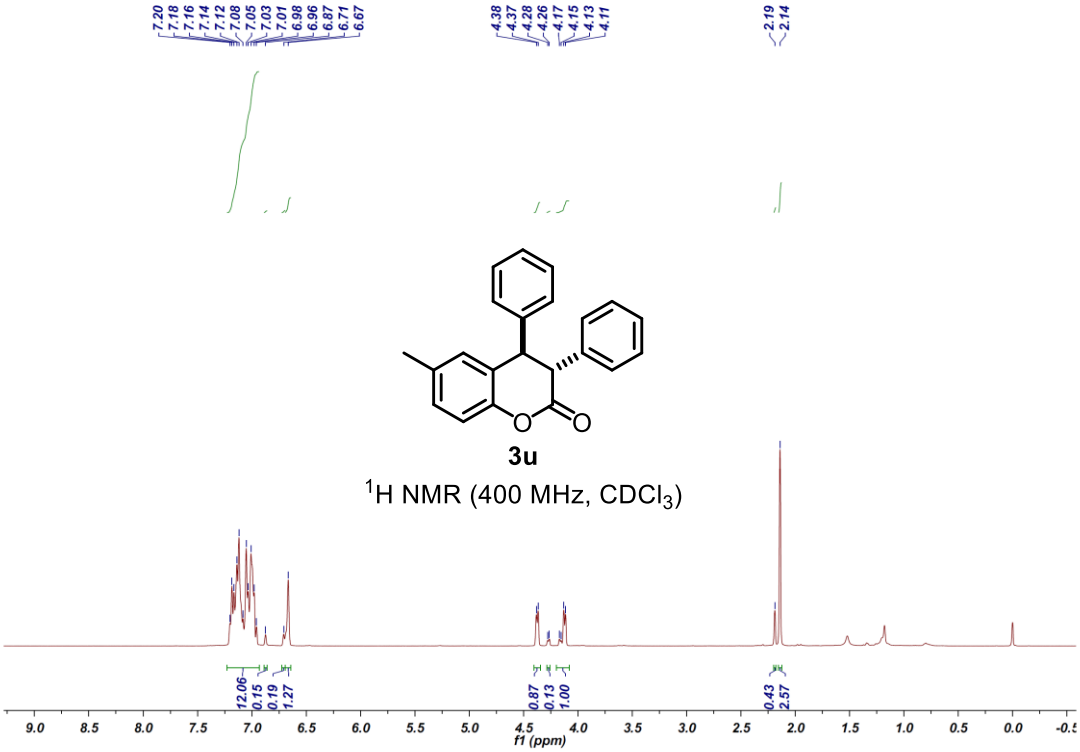


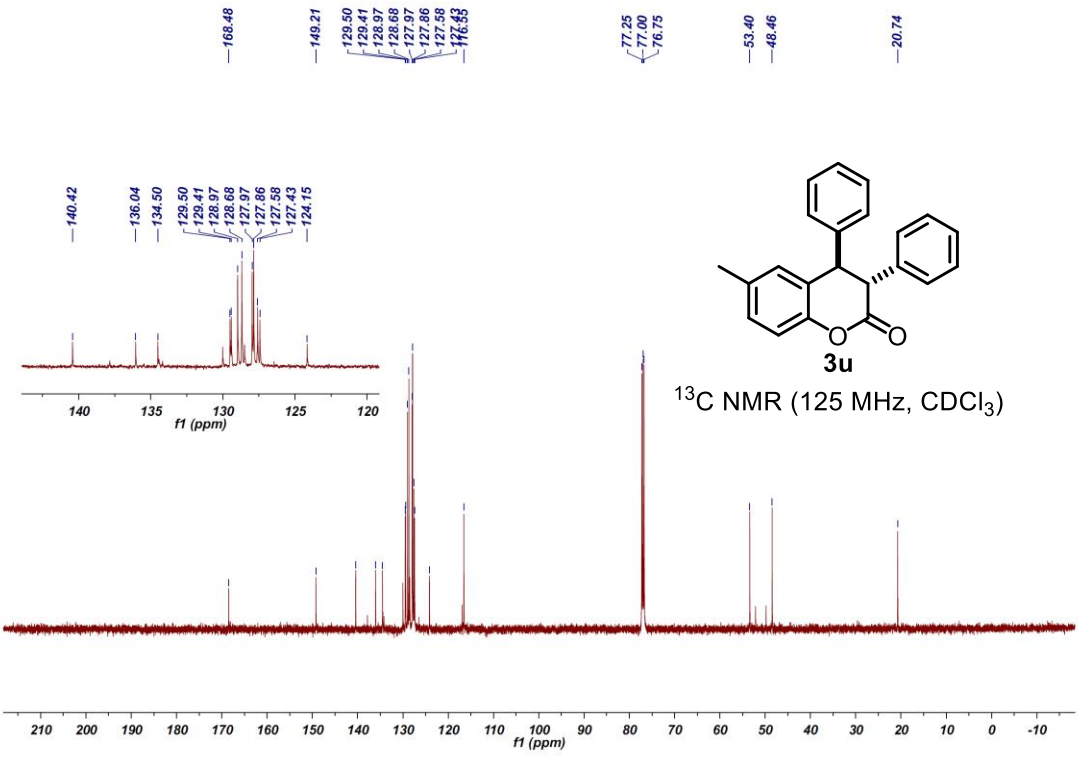
3-phenyl-4-(*o*-tolyl)chroman-2-one (3t)



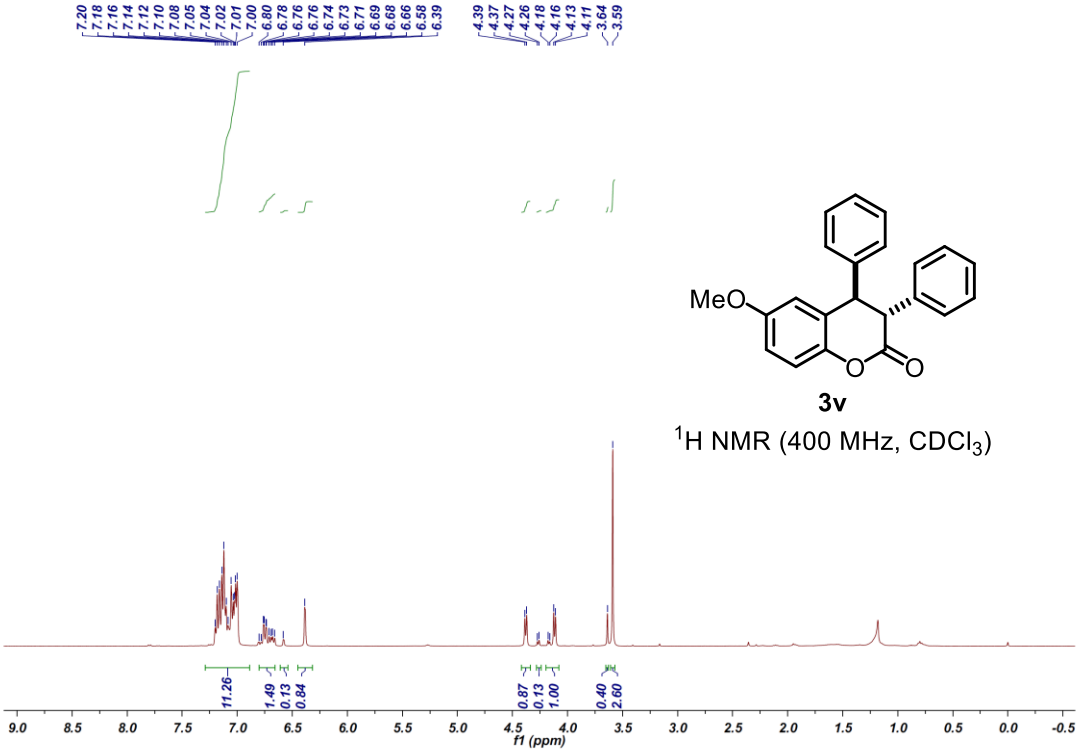


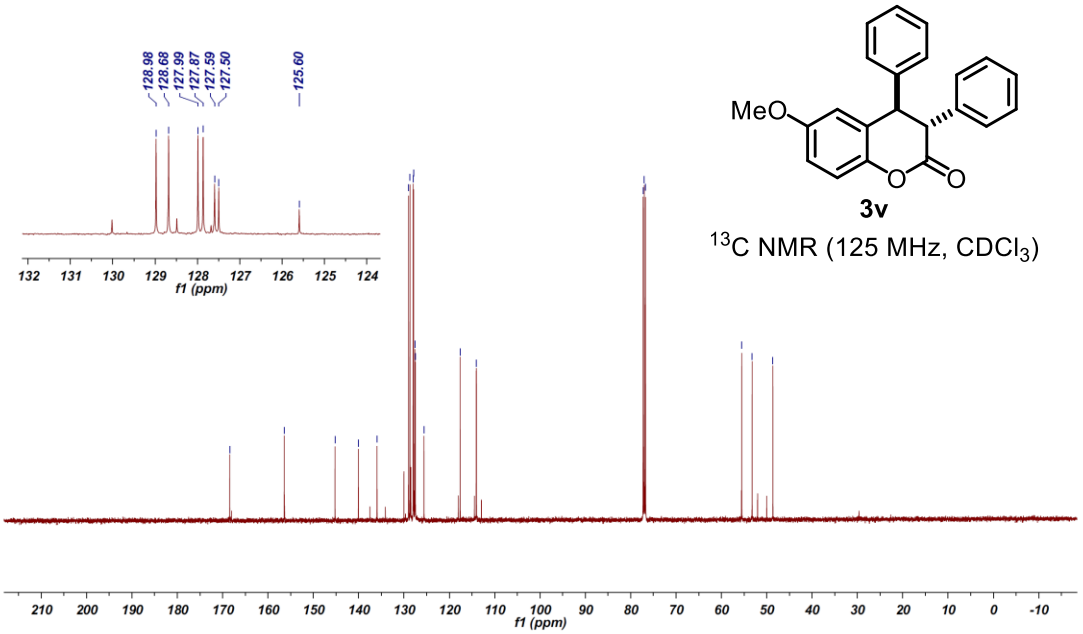
6-methyl-3,4-diphenylchroman-2-one (3u)



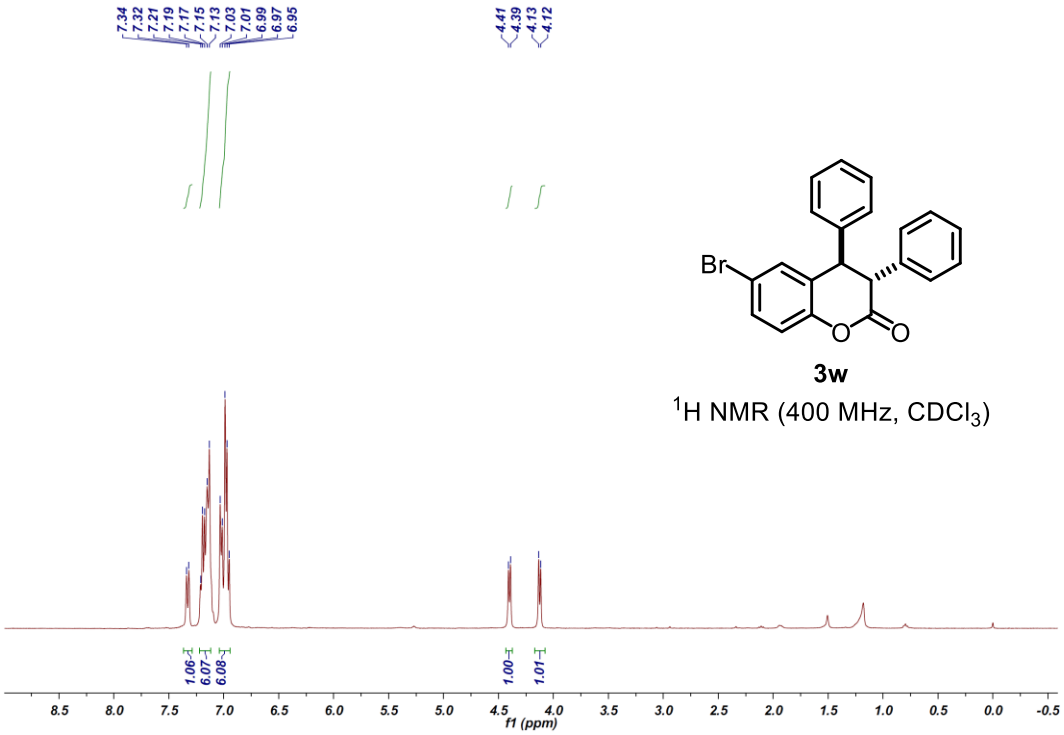


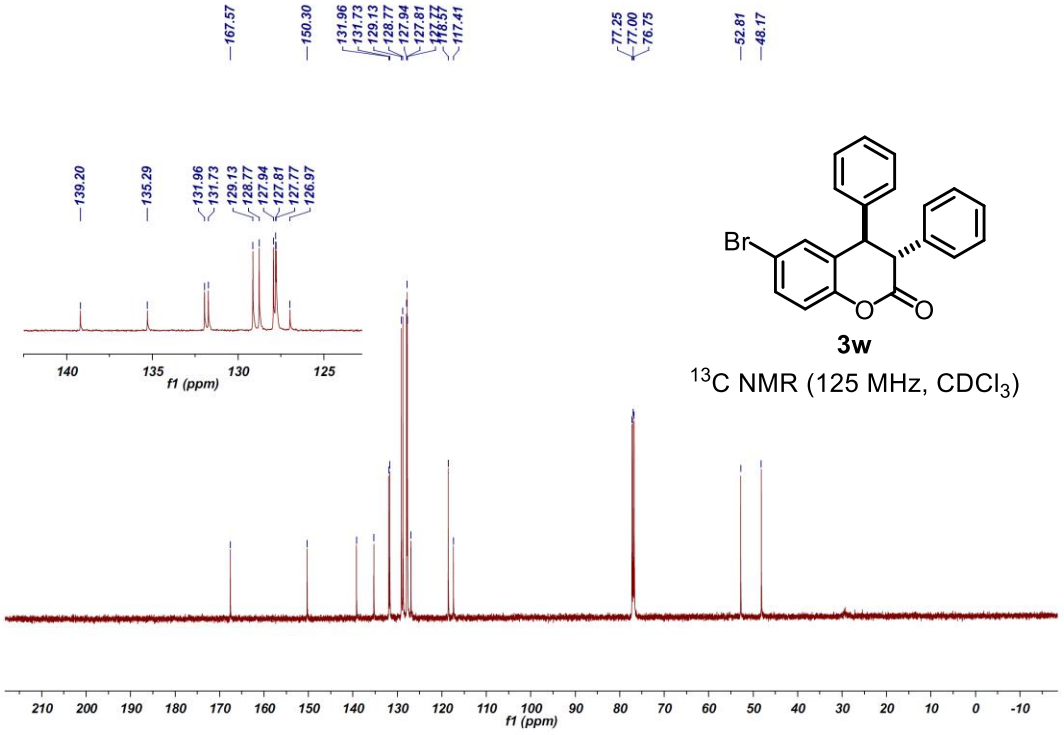
6-methoxy-3,4-diphenylchroman-2-one (3v)



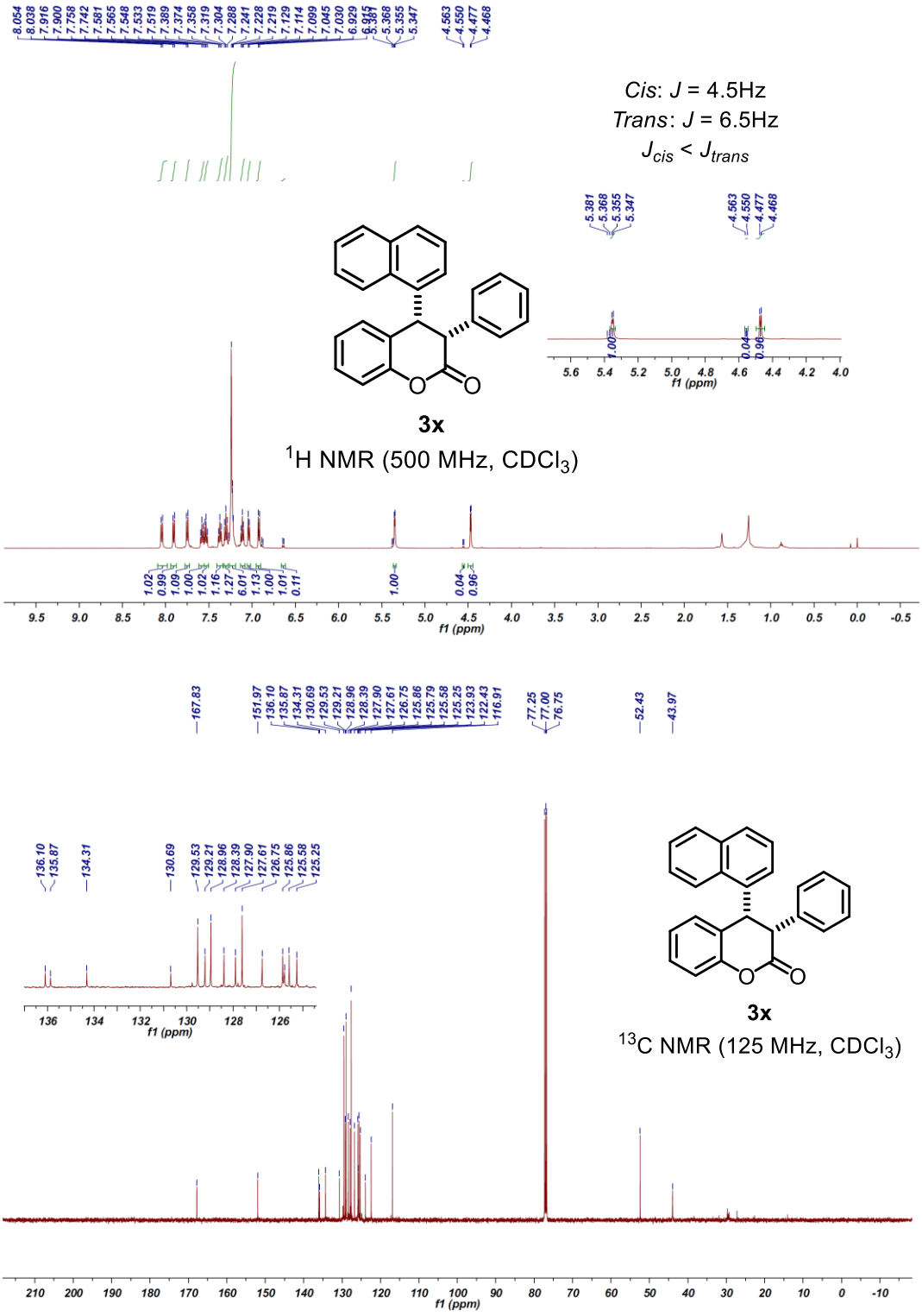


6-bromo-3,4-diphenylchroman-2-one (3w)

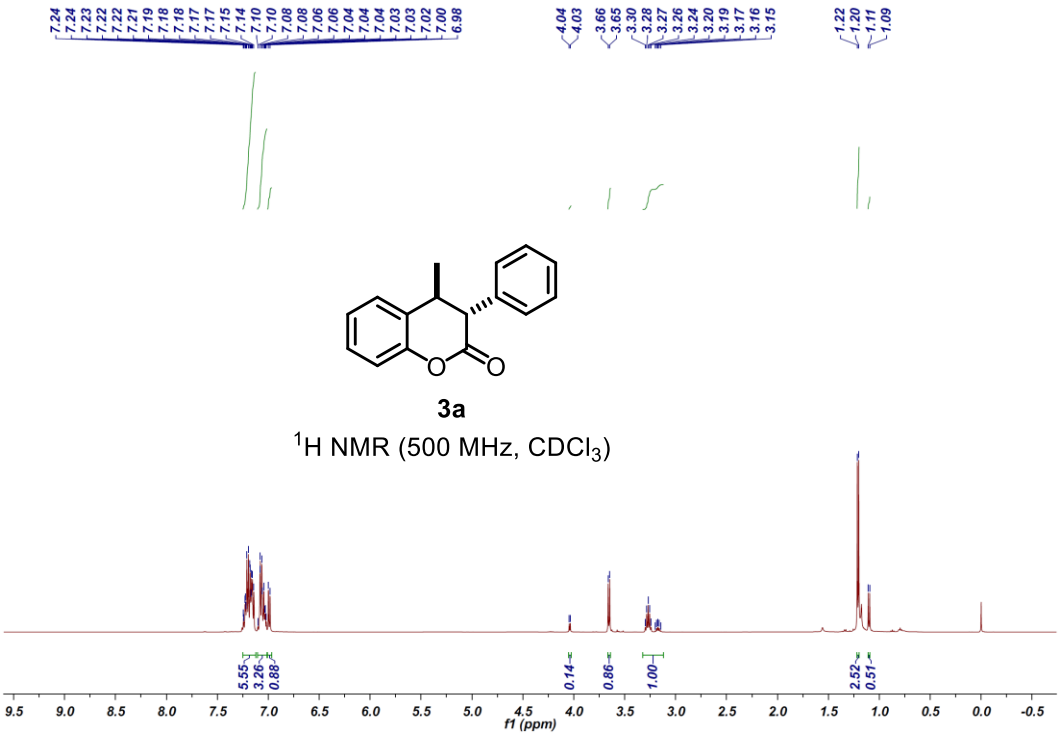


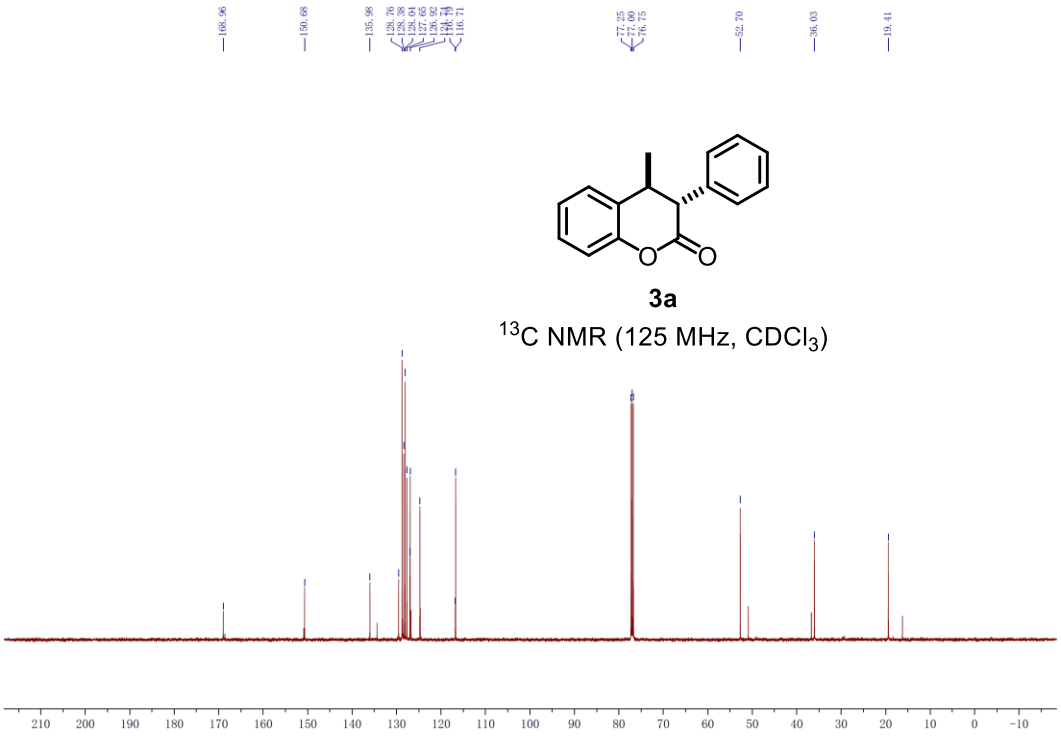


4-(naphthalen-1-yl)-3-phenylchroman-2-one (3x)

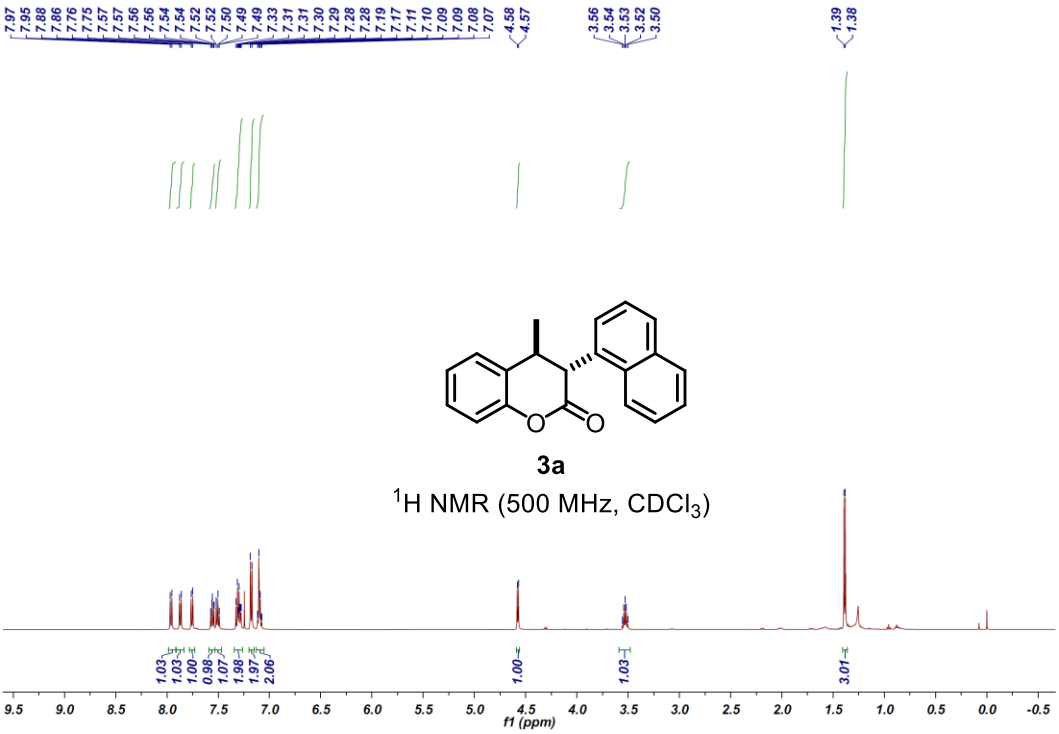


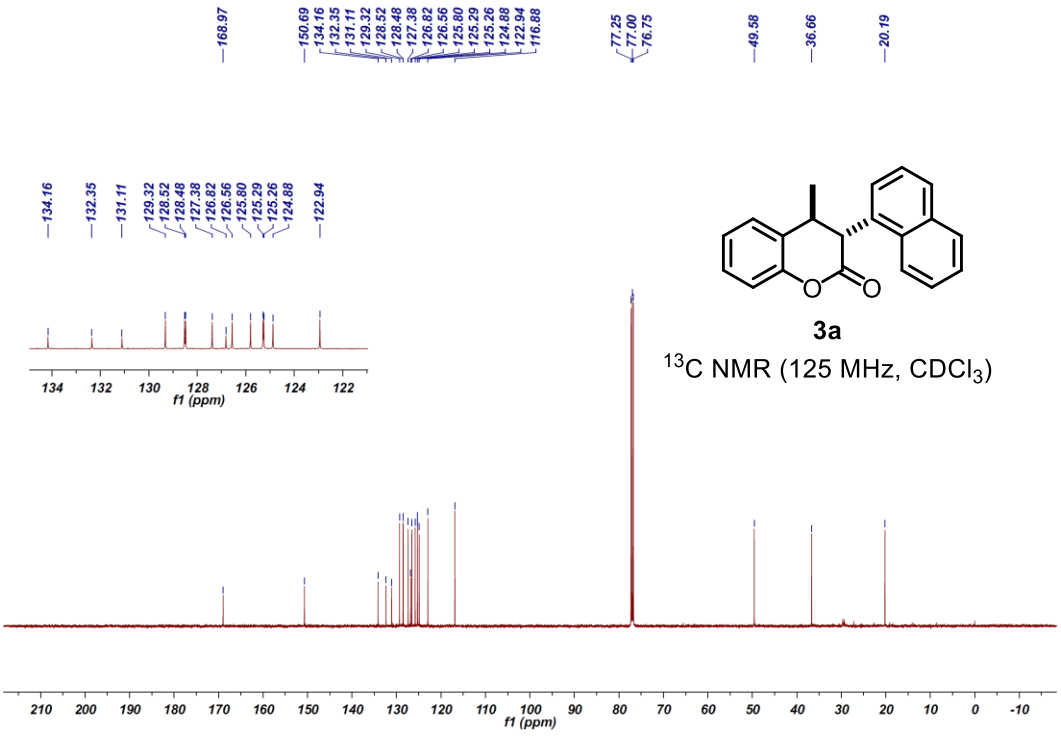
4-methyl-3-phenylchroman-2-one (3y)



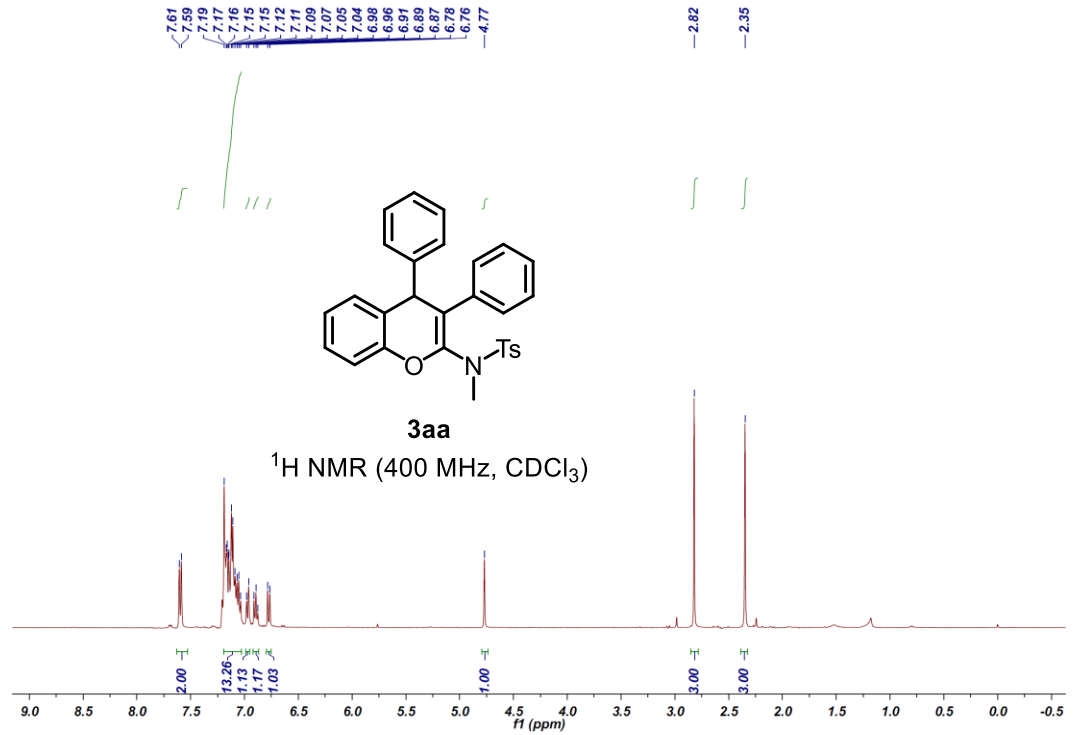


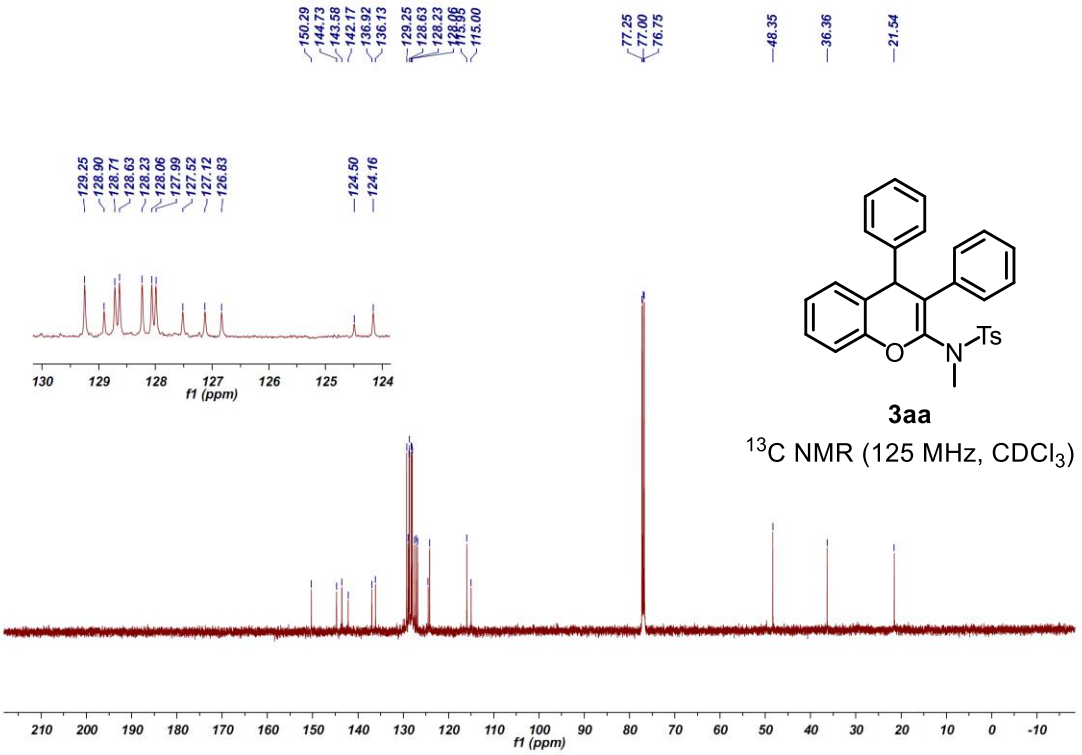
4-methyl-3-(naphthalen-1-yl)chroman-2-one (3z)



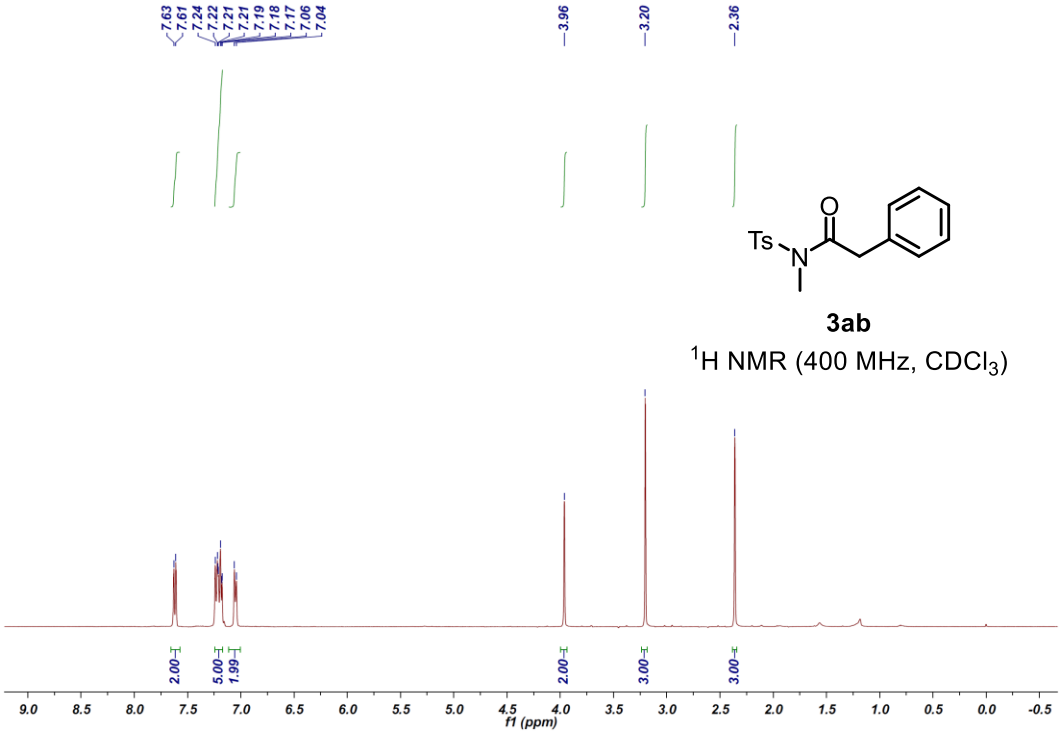


N-(3,4-diphenyl-4*H*-chromen-2-yl)-*N*,4-dimethylbenzenesulfonamide (3aa)



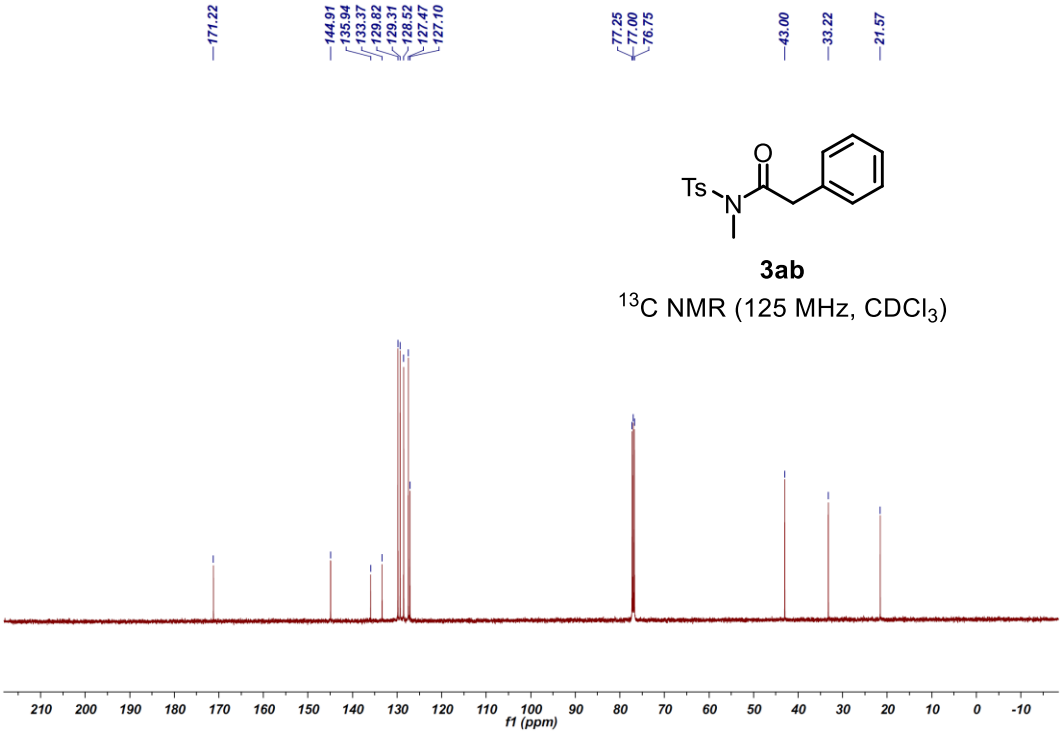


N-methyl-2-phenyl-*N*-tosylacetamide (3ab)



3ab

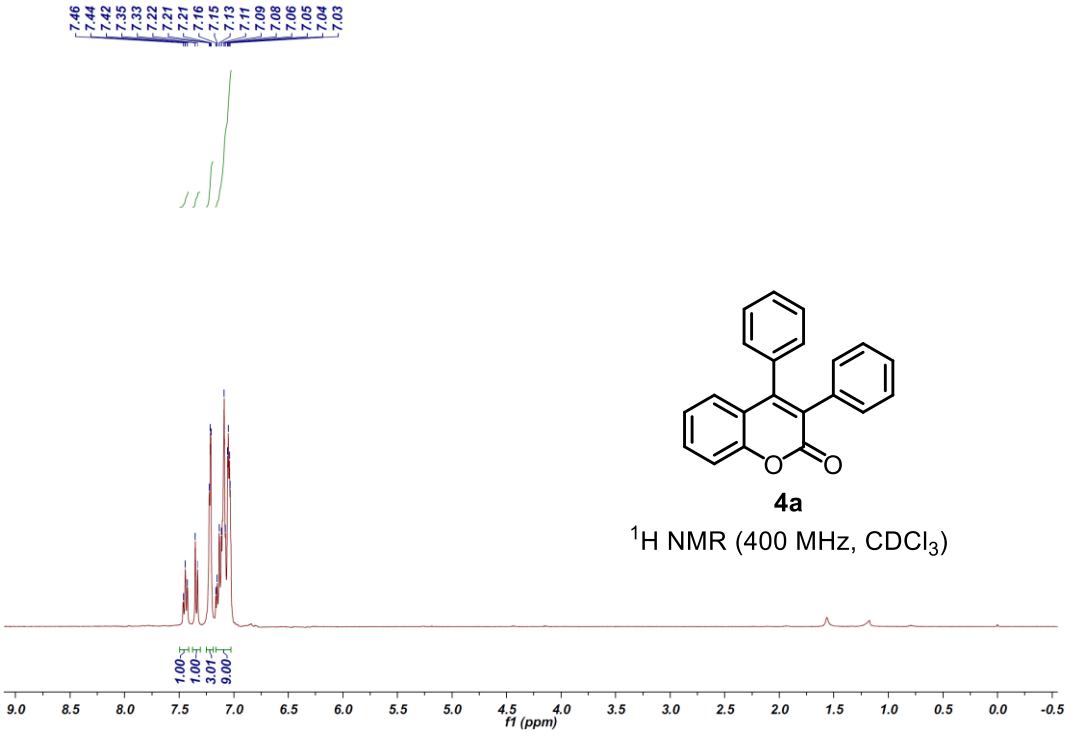
^{1}H NMR (400 MHz, $CDCl_3$)

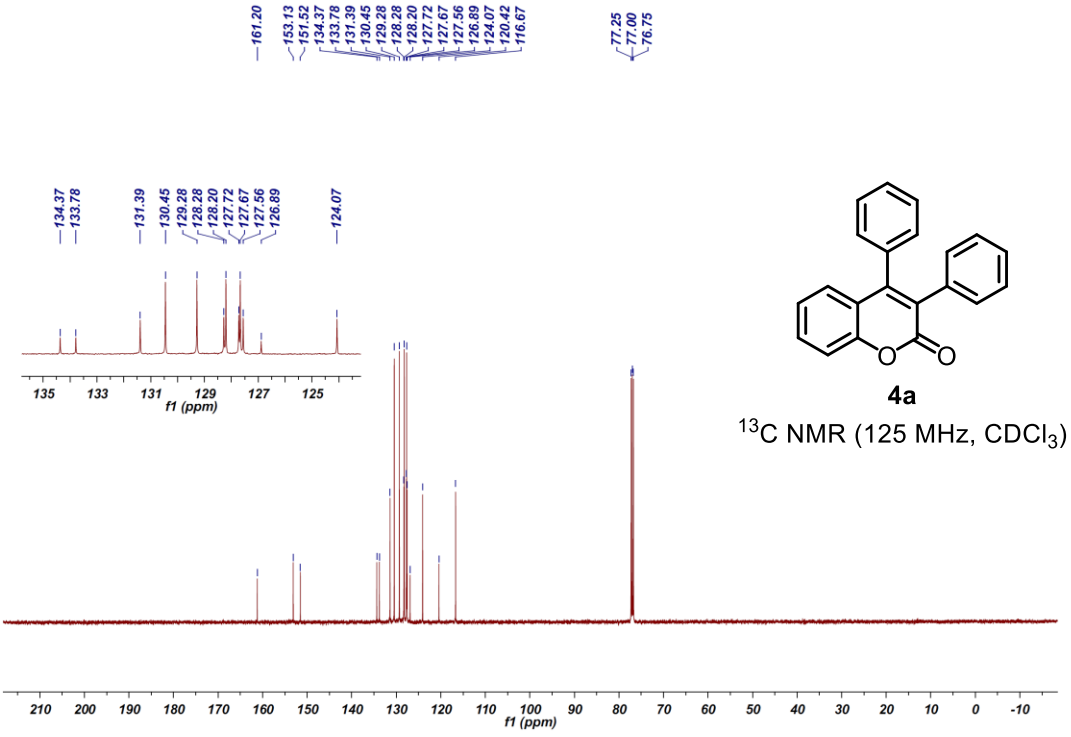


3ab

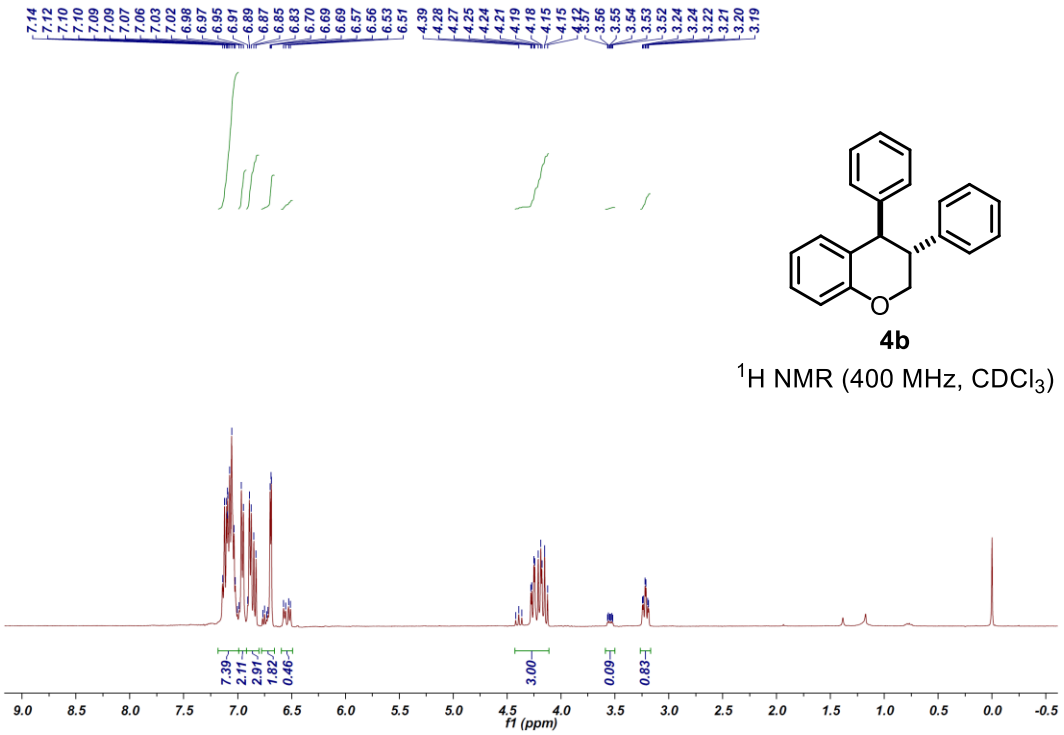
^{13}C NMR (125 MHz, $CDCl_3$)

3,4-diphenyl-2*H*-chromen-2-one (4a)



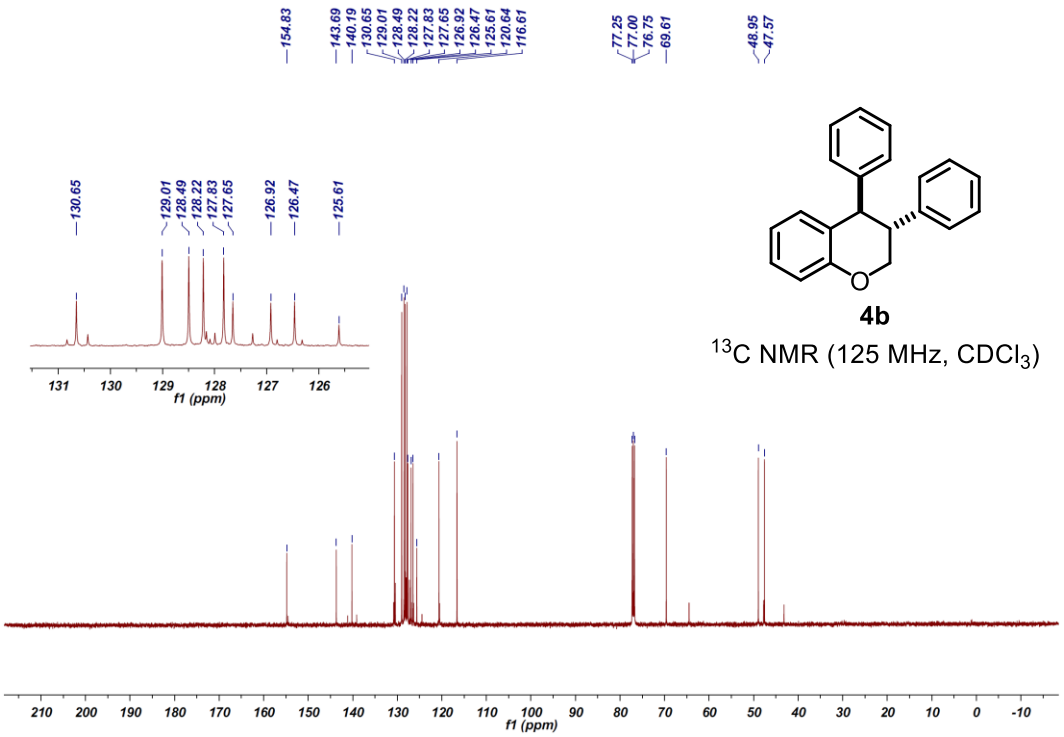


3,4-diphenylchromane (4b)



4b

^{1}H NMR (400 MHz, $CDCl_3$)



4b

^{13}C NMR (125 MHz, $CDCl_3$)