Supporting Information for

Brønsted acid-catalyzed homogeneous O-H and S-H insertion reactions under metal- and ligand-free conditions

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1. General considerations

All reactions and manipulations were performed using standard Schlenk techniques. ^{1}H and $^{13}C\{^{1}H\}$ NMR spectra were recorded on a Bruker DRX-400 MHz spectrometer and all chemical shift values refer to $CDCl_3$ ($\delta(^{1}H)$, 7.26 ppm; $\delta(^{13}C)$, 77.16 ppm), $(CD_3)_2SO$ ($\delta(^{1}H)$, 2.50 ppm, $\delta(^{13}C)$, 39.52 ppm). X-ray Crystallographic analysis was achieved by the Analysis Center, Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences. The GC analysis was obtained on Agilent 7890/5975C. The HRMS analysis was obtained on a Waters GC-TOF CA156 mass spectrometer. All the melting points were uncorrected. Column chromatographic purifications were performed on SDZF silica gel 160. All the chemical reagents were purchased from commercial sources and used as received unless otherwise indicated. Compounds **3a**,[1] **3b-q**,[2] **3v**,[2] **3z**,[3] **3z2-z3**,[4] **3z7**,[5] **3z9-z12**,[6] **3v'**,[2] **4a'**,[7] **4g''**,[8] **5k**,[9] **7a**,[10] **7c**,[10] **7f**,[11] **7o**,[10] **7p**,[12] **7s**,[10] **9a**[13] and **11a**[2] were known and their spectroscopic features were in good agreement with that reported in the literatures.

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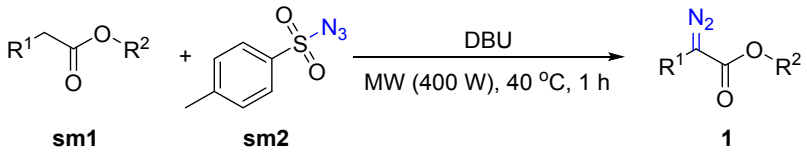
2. Experimental procedures

2.1 Preparation for synthesis of α-diazoesters[2,14]



A typical procedure for the synthesis of α-diazoesters 1 – *Synthesis of **1a***: DBU (2.24 mL, 15 mmol) was added slowly to a stirred solution of ethyl 2-phenylacetate (**sm1a**, 1.41 mL, 10.0 mmol) and tosylazide (**sm2**, 2.42 mL, 11.0 mmol) in the CH_3CN (20 mL) at 0 °C. After that, it was placed in microwave reactor that was heated to 40 °C (400 W, monitored by IR temperature sensor) and maintained at this temperature for 30 min. After cooling to room temperature, the reaction mixture was quenched with saturated aqueous solution of NH_4Cl (5 mL), extracted with DCM (3 × 30 mL), washed with brine (3 × 30 mL), dried over anhydrous Na_2SO_4, and concentrated under reduced pressure to give the product. The residue was purified by flash chromatography (petroleum ether (60-90 °C)/AcOEt, 10:1) to afford the corresponding ethyl-2-diazo-2-phenylacetate **1a** as a yellow oil (1.65 g, 87%).

2.2 Screening the optimum reaction conditions for the synthesis of 3a

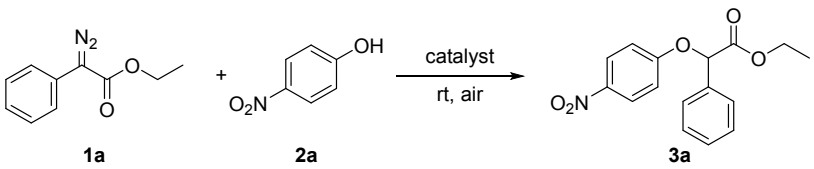


Table S1. Screening the optimum conditions for the synthesis of **3a**

Entry	Catalyst	**1a**:**2a** (equiv)	Solvent	Temp. (°C)	Yield (%)
1	—	1:1.5	DCE	rt	trace
2	HCl	1:1.5	DCE	rt	21
3	H_2SO_4	1:1.5	DCE	rt	32
4	H_3PO_4	1:1.5	DCE	rt	18
5	HNO_3	1:1.5	DCE	rt	25
6	HAc	1:1.5	DCE	rt	15
7	HCOOH	1:1.5	DCE	rt	21

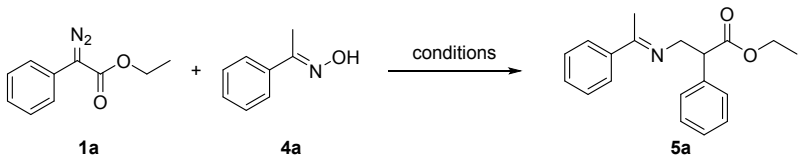
8	$HClO_4$	1:1.5	DCE	rt	54
9	C_6H_5COOH	1:1.5	DCE	rt	19
10	$C_6H_5SO_3H$	1:1.5	DCE	rt	41
11	CF_3SO_3H	1:1.5	DCE	rt	76
12	NaOH	1:1.5	DCE	rt	26
13	KOH	1:1.5	DCE	rt	23
14	Et_3N	1:1.5	DCE	rt	22
15	Py	1:1.5	DCE	rt	18
16	DBU	1:1.5	DCE	rt	16
17	$CF_3SO_3H^a$	1:1.5	DCE	rt	35
18	$CF_3SO_3H^b$	1:1.5	DCE	rt	46
19	$CF_3SO_3H^c$	1:1.5	DCE	rt	54
20	$CF_3SO_3H^d$	1:1.5	DCE	rt	67
21	CF_3SO_3H	1:1.5	CH_3CN	rt	19
22	CF_3SO_3H	1:1.5	DMF	rt	22
23	CF_3SO_3H	1:1.5	Toluene	rt	36
24	CF_3SO_3H	1:1.5	Dioxane	rt	45
25	CF_3SO_3H	1:1.5	DCM	rt	48
26	CF_3SO_3H	1:1.5	$CHCl_3$	rt	56
27	CF_3SO_3H	1:1.5	THF	rt	37
28	CF_3SO_3H	1:1.5	H_2O	rt	15
29	CF_3SO_3H	1:1.5	DCE	0	25
30	CF_3SO_3H	1:1.5	DCE	10	33
31	CF_3SO_3H	1:1.5	DCE	40	65
32	CF_3SO_3H	1:1.5	DCE	50	72
33[e]	CF_3SO_3H	1:1.5	DCE	60	73
34[e]	CF_3SO_3H	1:1.5	DCE	reflux	70
35	**CF_3SO_3H**	**1:1.4**	**DCE**	**rt**	**78**
36	CF_3SO_3H	1:1.3	DCE	rt	69
37	CF_3SO_3H	1:1.6	DCE	rt	75

Conditions: **1a** (0.5 mmol), **2a**, catalyst (20 mol%), solvent (5 mL), air, 20 min; symbol "-" means no catalyst, isolated yield. [a]5 mol%. [b]10 mol%. [c]15 mol%. [d]25 mol%. [e]5 min.

On the outset of this study, we chose ethyl 2-diazo-2-phenylacetate **1a** and *p*-nitrophenol **2a** as the model substrates to screen the optimum reaction conditions (Table S1). We found that the O-H insertion reaction hardly occurred in the absence of a catalyst in DCE at room temperature (entry 1). A variety of acids furnished the product **3a** (entries 2-10) with low to moderate yield (15-54%). To our delight, when CF_3SO_3H was chosen as a catalyst, the yield of **3a** obviously improved up to 76% in DCE at room temperature for 20 min (entry 11). By contrast, when bases were used as catalysts, the

desired product **3a** (entries 12-16) was got in lower yield (26%). Then, we went on to screen other reaction parameters to learn more about this catalytic system. When the amount of the CF_3SO_3H was reduced (entries 17-19) or increased (entry 20), affording the product in reduced yield. On the other hand, screening the solvent (entries 21-28) suggested that DCE was the best solvent for this transformation (entry 11). Lowing or elevating the reaction temperatures deteriorated the reaction efficiency, giving the product **3a** in diminished yield (entries 29-34). The yield was raised up to 78% when the quantity of **2a** (1.4 equiv) was decreased (entry 35), further decreasing or increasing the quantity of **2a** could not increase the yield (entry 36-37). Based on the above results, the optimum conditions for the synthesis of **3a** were identified as DCE at room temperature for 20 min, CF_3SO_3H (20 mol%) as catalyst, **1a**:**2a** (equiv) = 1:1.4 (entry 35).

2.3 Screening the optimum reaction conditions for the synthesis of 5a



1a **4a** **5a**

Table S2. Screening the optimum conditions for the synthesis of **5a**

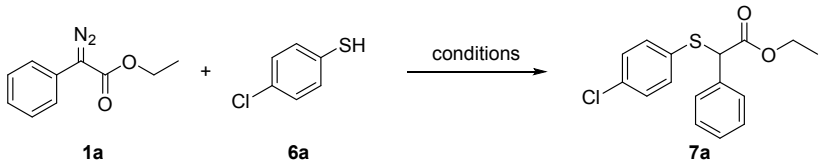
Entry	Catalyst	**1a**:**2a** (equiv)	Solvent	Temp. (°C)	Yield (%)
1	CF_3SO_3H	1:1.4	DCE	rt	22
2	CF_3SO_3H	1:1.4	DCE	40	75
3	**CF_3SO_3H**	**1:1.4**	**DCE**	**50**	**83**
4	CF_3SO_3H	1:1.4	DCE	60	79
5	—	1:1.4	DCE	50	trace
6	HCl	1:1.4	DCE	50	30
7	H_2SO_4	1:1.4	DCE	50	35
8	HNO_3	1:1.4	DCE	50	31
9	$HClO_4$	1:1.4	DCE	50	71
10	HAc	1:1.4	DCE	50	20
11	$C_6H_5SO_3H$	1:1.4	DCE	50	38
12	H_3PO_4	1:1.4	DCE	50	25
13	Et_3N	1:1.4	DCE	50	trace
14	$CF_3SO_3H^a$	1:1.4	DCE	50	35
15	$CF_3SO_3H^b$	1:1.4	DCE	50	65

16	$CF_3SO_3H^c$	1:1.4	DCE	50	75
17	$CF_3SO_3H^d$	1:1.4	DCE	50	79
18	CF_3SO_3H	1:1.4	CH_3CN	50	73
19	CF_3SO_3H	1:1.4	DMF	50	15
20	CF_3SO_3H	1:1.4	$CHCl_3$	50	67
21	CF_3SO_3H	1:1.5	DCE	50	80
22	CF_3SO_3H	1:1.3	DCE	50	77

Conditions: **1a** (0.5 mmol), **4a**, catalyst (20 mol%), solvent (5 mL), air, 30 min; symbol "-" means no catalyst, isolated yield. [a]5 mol%. [b]10 mol%. [c]15 mol%. [d]25 mol%.

Based on the optimized reaction conditions for O-H insertion of phenols, we optimized the reaction conditions for O-H insertion of oximes by employing ethyl 2-diazo-2-phenylacetate **1a** and (*E*)-1-phenylethan-1-one oxime **4a** as substrates (Table S2). After screening the temperature (entries 1-4), acid (entries 6-12) and base (entry 13) catalysts, the amount of acid (entries 14-17), solvent (entries 18-20), and material molar ratio (entries 21-22), we found the optimal reaction conditions for the synthesis of **5a** in DCE at 50 °C for 30 min, CF_3SO_3H (20 mol%) as catalyst, **1a**:**4a** (equiv) = 1:1.4 (entry 3).

2.4 Screening the optimum reaction conditions for the synthesis of 7a



1a **6a** **7a**

Table S3. Screening the optimum conditions for the synthesis of **7a**

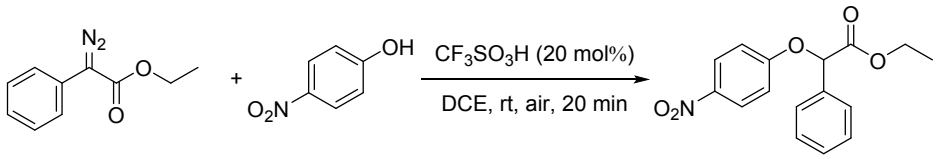
Entry	Catalyst	**1a**:**2a** (equiv)	Solvent	Temp. (°C)	Yield (%)
1	**CF_3SO_3H**	**1:1.4**	**DCE**	**rt**	**84**
2	CF_3SO_3H	1:1.4	DCE	0	57
3	CF_3SO_3H	1:1.4	DCE	40	77
4	—	1:1.4	DCE	rt	trace
5	HCl	1:1.4	DCE	rt	35
6	H_2SO_4	1:1.4	DCE	rt	38
7	HNO_3	1:1.4	DCE	rt	33
8	$HClO_4$	1:1.4	DCE	rt	75
9	HAc	1:1.4	DCE	rt	28

10	$C_6H_5SO_3H$	1:1.4	DCE	rt	39
11	H_3PO_4	1:1.4	DCE	rt	31
12	Et_3N	1:1.4	DCE	rt	17
13	$CF_3SO_3H^a$	1:1.4	DCE	rt	47
14	$CF_3SO_3H^b$	1:1.4	DCE	rt	69
15	$CF_3SO_3H^c$	1:1.4	DCE	rt	77
16	$CF_3SO_3H^d$	1:1.4	DCE	rt	81
17	CF_3SO_3H	1:1.4	CH_3CN	rt	78
18	CF_3SO_3H	1:1.4	DMF	rt	29
19	CF_3SO_3H	1:1.4	$CHCl_3$	rt	73
20	CF_3SO_3H	1:1.5	DCE	rt	82
21	CF_3SO_3H	1:1.3	DCE	rt	79

Conditions: **1a** (0.5 mmol), **6a**, catalyst (20 mol%), solvent (5 mL), air, 5 min; symbol "-" means no catalyst, isolated yield. [a]5 mol%. [b]10 mol%. [c]15 mol%. [d]25 mol%.

Based on the optimized reaction conditions for O-H insertion of phenols and oximes, we optimized the reaction conditions for S-H insertion of thiols by employing ethyl 2-diazo-2-phenylacetate **1a** and 4-chlorobenzenethiol **6a** as substrates (Table S3). After screening the temperature (entries 1-3), acid (entries 5-11) and base (entry 12) catalysts, the amount of acid (entries 13-16), solvent (entries 17-19), and material molar ratio (entries 20-21), the optimum conditions for the synthesis of **7a** were identified as DCE at room temperature for 5 min, CF_3SO_3H (20 mol%) as catalyst, **1a**:**6a** (equiv) = 1:1.4 (entry 1).

2.5 Typical procedure for O-H insertion of phenols and alcohols

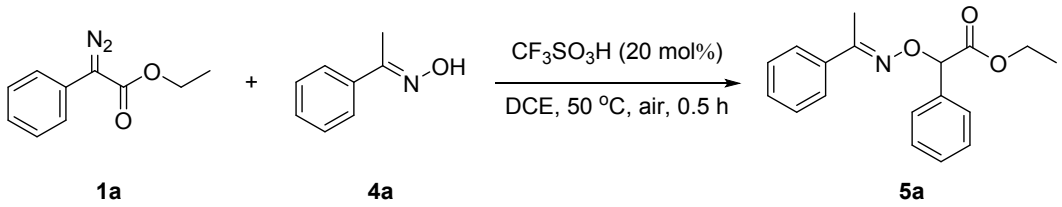


1a **2a** **3a**

A typical procedure for the synthesis of O-H insertion products (3) – *Synthesis of 3a*: A mixture of CF_3SO_3H (20 mol%), 4-nitrophenol (**2a**, 97 mg, 0.7 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 95 mg, 0.5 mmol) in DCE (5 mL) was stirred at room temperature under air for 20 min. Then, the crude product was got by removing

solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **3a** as a colorless oil (117 mg, 78%).

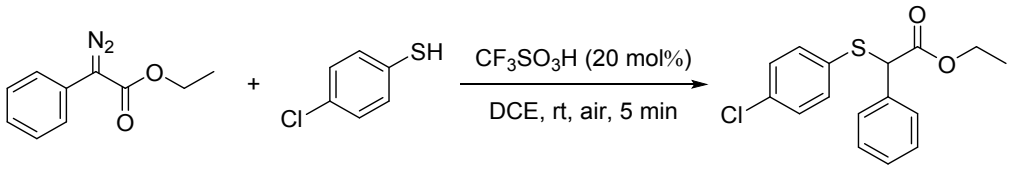
2.6 Typical procedure for O-H insertion of oximes



1a **4a** **5a**

A typical procedure for the synthesis of O-H insertion products of oximes (5) – *Synthesis of 5a*: A mixture of CF_3SO_3H (20 mol%), (*E*)-1-phenylethan-1-one oxime (**4a**, 95 mg, 0.7 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 95 mg, 0.5 mmol) in DCE (5 mL) was stirred at 50 °C under air for 0.5 h. After the reaction mixture was cooled to room temperature, removing solvent under reduced pressure to get the crude product. The crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **5a** as a colorless oil (123 mg, 83%).

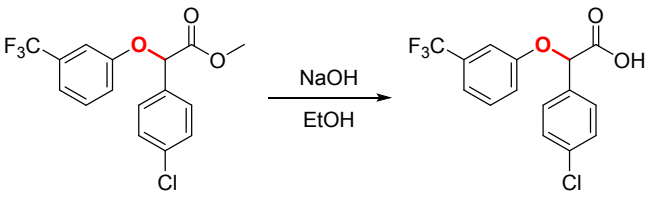
2.7 Typical procedure for S-H insertion of thiols



1a **6a** **7a**

A typical procedure for the synthesis of S-H insertion products of thiols (7) – *Synthesis of 7a*: A mixture of CF_3SO_3H (20 mol%), 4-chlorobenzenethiol (**6a**, 101 mg, 0.7 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 95 mg, 0.5 mmol) in DCE (5 mL) was stirred at room temperature under air for 5 min. Then, the crude product was got by removing solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **7a** as a colorless oil (129 mg, 84%).

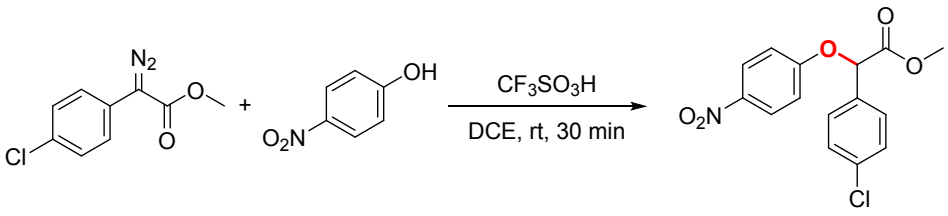
2.8 The synthesis of MBX-102 acid 3v'



3v **3v'**, 83%
MBX-102 acid

Synthesis of 3v': A mixture of **3v** (172 mg, 0.5 mmol) and NaOH (36 mg, 0.9 mmol) in EtOH (5 mL) was stirred at 90 °C reflux for 8 h. After the reaction was judged to be completed by TLC, adding slowly the 1 M HCl until the PH of reaction mixture reached 3-4. Then, 15 mL H_2O was added to the mixture. The aqueous layer was extracted with ethyl acetate (3 × 20 mL), washed with brine (3 × 20 mL), dried over anhydrous Na_2SO_4, concentrated under reduced pressure to give the crude product. The crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (2:1) to afford the corresponding **3v'** as a white syrup (137 mg, 83%).

2.9 A gram-scale experiment

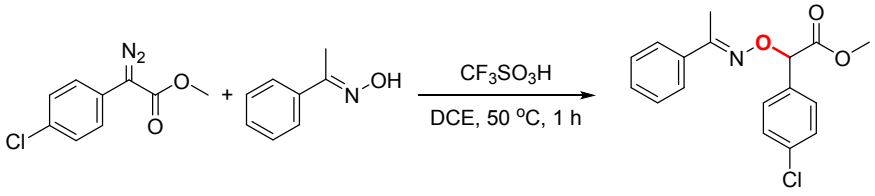


1l, 4.8 mmol
1.00 g

2a, 6.7 mmol
0.93 g

3t, 82%
1.26 g

1 gram-scale experiment for the synthesis of 3t: A mixture of CF_3SO_3H (20 mol%), 4-nitrophenol (**2a**, 0.93 g, 6.7 mmol) and methyl 2-(4-chlorophenyl)-2-diazoacetate (**1l**, 1.00 g, 4.8 mmol) in DCE (48 mL) was stirred at room temperature under air for 30 min. Then, the crude product was got by removing solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **3t** as a white solid (1.26 g, 82%).

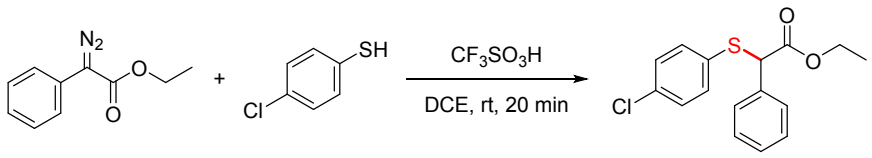


1l, 4.8 mmol
1.00 g

4a, 6.7 mmol
0.90 g

5l, 81%
1.23 g

1 gram-scale experiment for the synthesis of 5l: A mixture of CF_3SO_3H (20 mol%), (*E*)-1-phenylethan-1-one oxime (**4a**, 0.90 g, 6.7 mmol) and methyl 2-(4-chlorophenyl)-2-diazoacetate (**1l**, 1.00 g, 4.8 mmol) in DCE (48 mL) was stirred at 50 °C under air for 1 h. After the reaction mixture was cooled to room temperature, removing solvent under reduced pressure to get the crude product. The crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **5i** as a white solid (1.23 g, 81%).



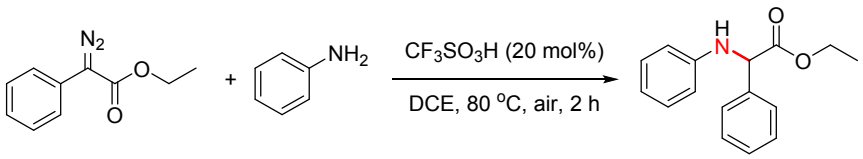
1a, 5.3 mmol
1.00 g

6a, 7.4 mmol
1.07 g

7a, 80%
1.30 g

1 gram-scale experiment for the synthesis of 7a: A mixture of CF_3SO_3H (20 mol%), 4-chlorobenzenethiol (**6a**, 1.07 g, 7.4 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 1.00 g, 5.3 mmol) in DCE (53 mL) was stirred at room temperature under air for 20 min. Then, the crude product was got by removing solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **7a** as a colorless oil (1.30 g, 80%).

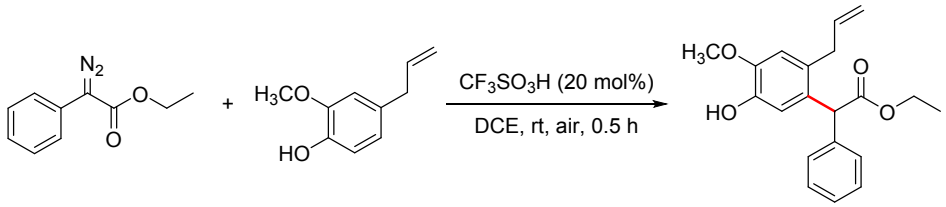
2.10 A typical procedure for the synthesis of N-H insertion product 9a



1a **8a** **9a**

Synthesis of 9a: A mixture of CF_3SO_3H (20 mol%), aniline (**8a**, 65 mg, 0.7 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 95 mg, 0.5 mmol) in DCE (5 mL) was stirred at 80 °C under air for 2 h. After the reaction mixture was cooled to room temperature, removing solvent under reduced pressure to get the crude product. The crude product was purified by flash chromatography with petroleum ether (60-90 °C)/AcOEt (10:1) to afford the corresponding **9a** as a colorless oil (77 mg, 60%).

2.11 A typical procedure for the synthesis of C-H insertion product 11a

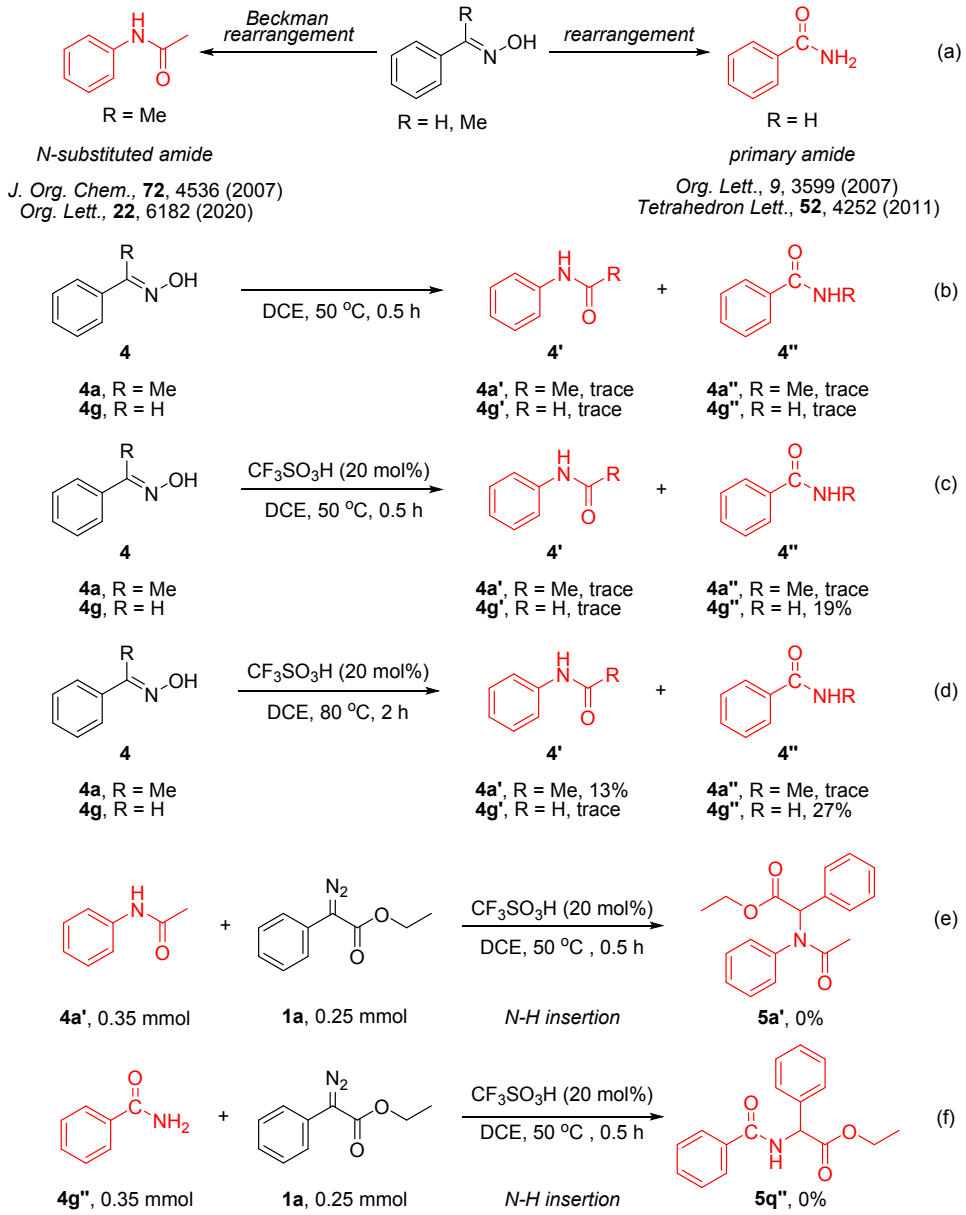


1a **10a** **11a**

Synthesis of 11a: A mixture of CF_3SO_3H (20 mol%), 4-allyl-2-methoxyphenol (**10a**, 115 mg, 0.7 mmol) and ethyl 2-diazo-2-phenylacetate (**1a**, 95 mg, 0.5 mmol) in DCE (5 mL) was stirred at room temperature under air for 0.5 h. Then, the crude product was got by removing solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 ºC)/AcOEt (10:1) to afford the corresponding **11a** as a colorless oil (99 mg, 61%).

3. Control experiments

As Shown in Scheme S1, ketoximes and aldoximes are prone to rearrangement[15] and give amide products (including N-substituted amide[15e-f] and primary amide[15g-h]) (Scheme S1a). Based on the control experiments, acid-free, ketoxime **4a** and aldoxime **4g** did not give the rearrangement products (Scheme S1b). Under the standard conditions, **4g** was easy to rearrange and furnish the primary amide product **4g''** in 19% yield (Scheme S1c). Furthermore, increasing the temperature to 80 °C and prolonging the reaction time to 2 h, **4a** could provide the Beckmann rearrangement product **4a'** (N-substituted amide) in 13% yield, and **4g** afforded the primary amide product **4g''** in 27% yield (Scheme S1d). Significantly, the N-substituted amide product **4a'** and the primary amide product **4g''** both could not afford the N-H insertion products **5a'** or **5q''** in this catalytic system (Scheme S1e-f). Combined with the above results, we could infer that the rearrangement of aldoximes lead to the O-H insertion in reduced yield.



Scheme S1 Control experiments

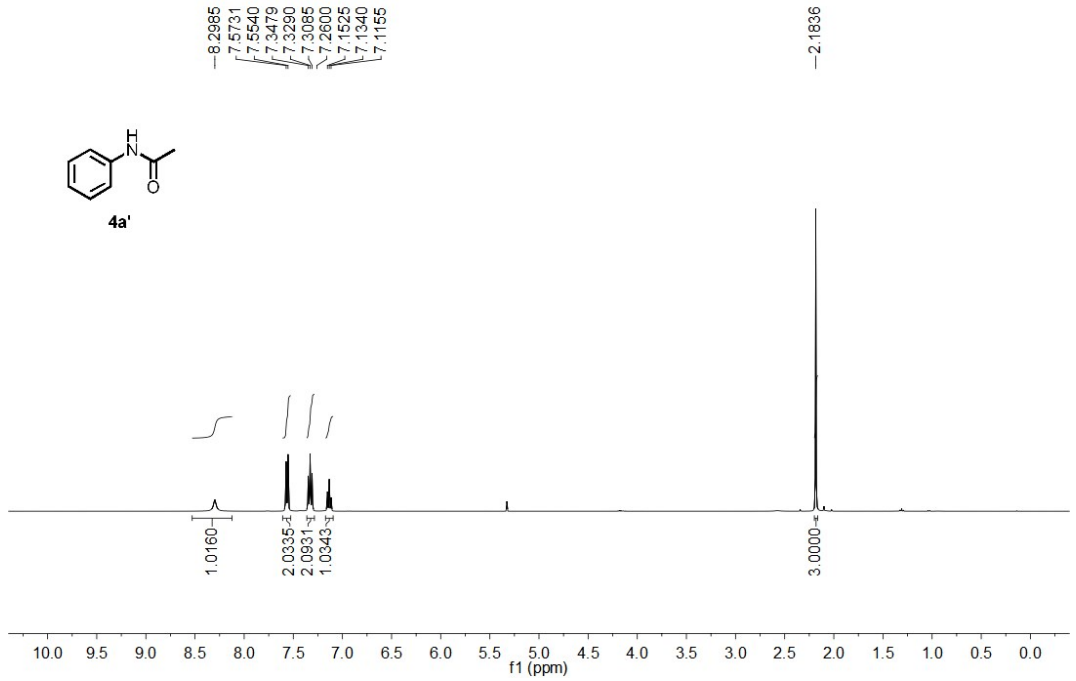
References

15 (*a*) K. T. Zuidhof, M. H. J. M. De Croon and J. C. chouten, *AIChE. J.*, 2010, **56**, 1297. (*b*) J.-S. Zhang, C. Dong, C.-C. Du and G.-S. Luo, *Org. Process Res. Dev.*, 2015, **19**, 352. (*c*) M. M. Maronna, E. C. Kruissink, J. T. Tinge, D. W. Agar and W. F. Hoelderich, *Ind. Eng. Chem. Res.*, 2016, **55**, 1202. (*d*) C.-C. Du, J.-S. Zhang, L.-T. Li, K. Wang and G.-S. Luo, *Ind. Eng. Chem. Res.*, 2017, **56**, 14207. (*e*) C. Ramalingan and Y.-T. Park, *J. Org. Chem.*, 2007, **72**, 4536. (*f*) L. Tang, Z.-L. Wang, H.-L. Wan, Y.-H. He and Z. Guan, *Org. Lett.*, 2020, **22**, 6182. (*g*) N. A. Owston, A. J. Parker and J. M. J. Williams, *Org. Lett.*, 2007, **9**, 3599. (*h*) S. K. Sharma, S. D. Bishopp, C. L. Allen, R.

Lawrence, M. J. Bamford, A. A. Lapkin, P. Plucinski, R. J. Watson and J. M. J. Williams, *Tetrahedron Lett*., 2011, **52**, 4252.

Copies of NMR spectra

ZZP-547-8



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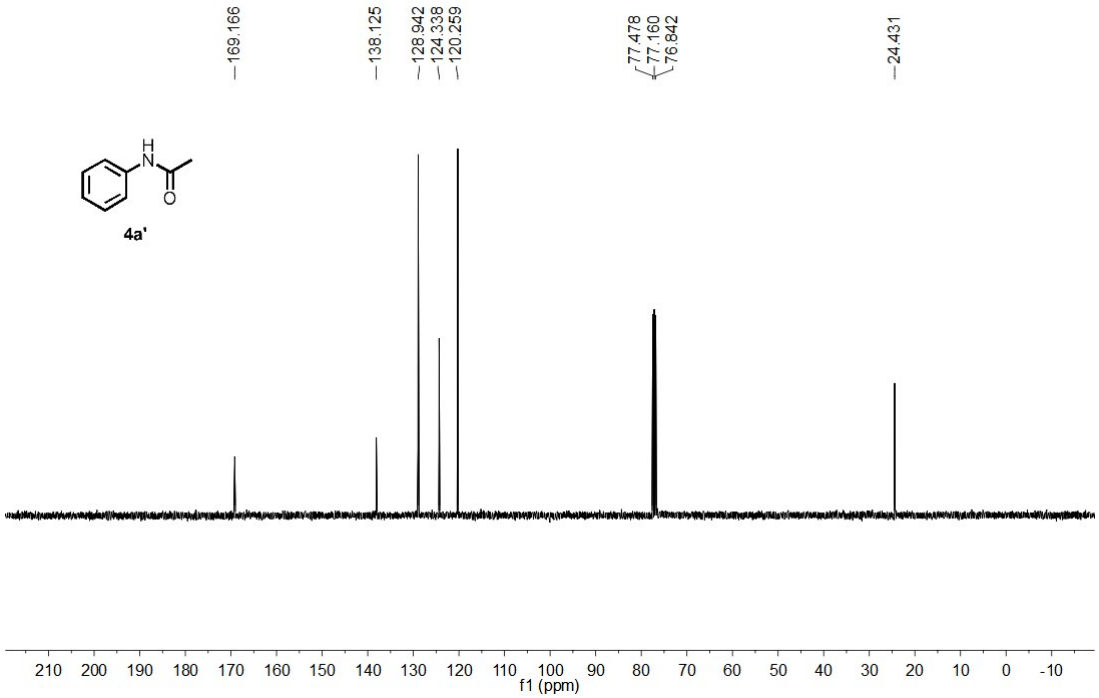
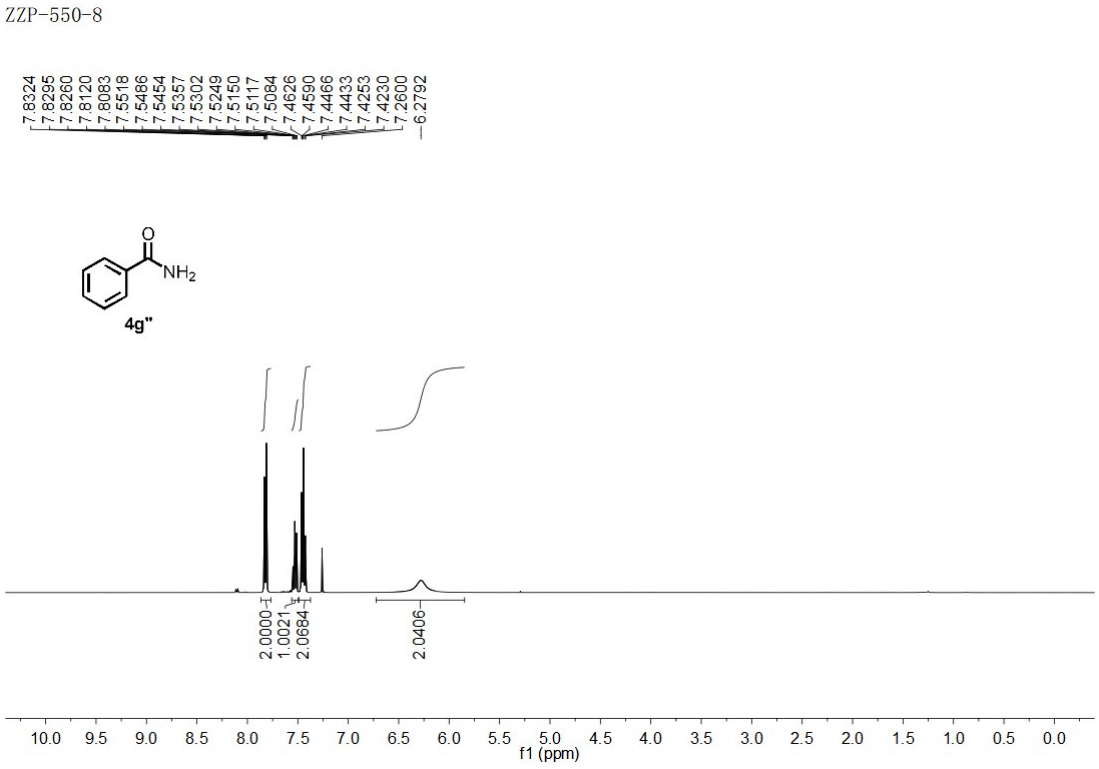
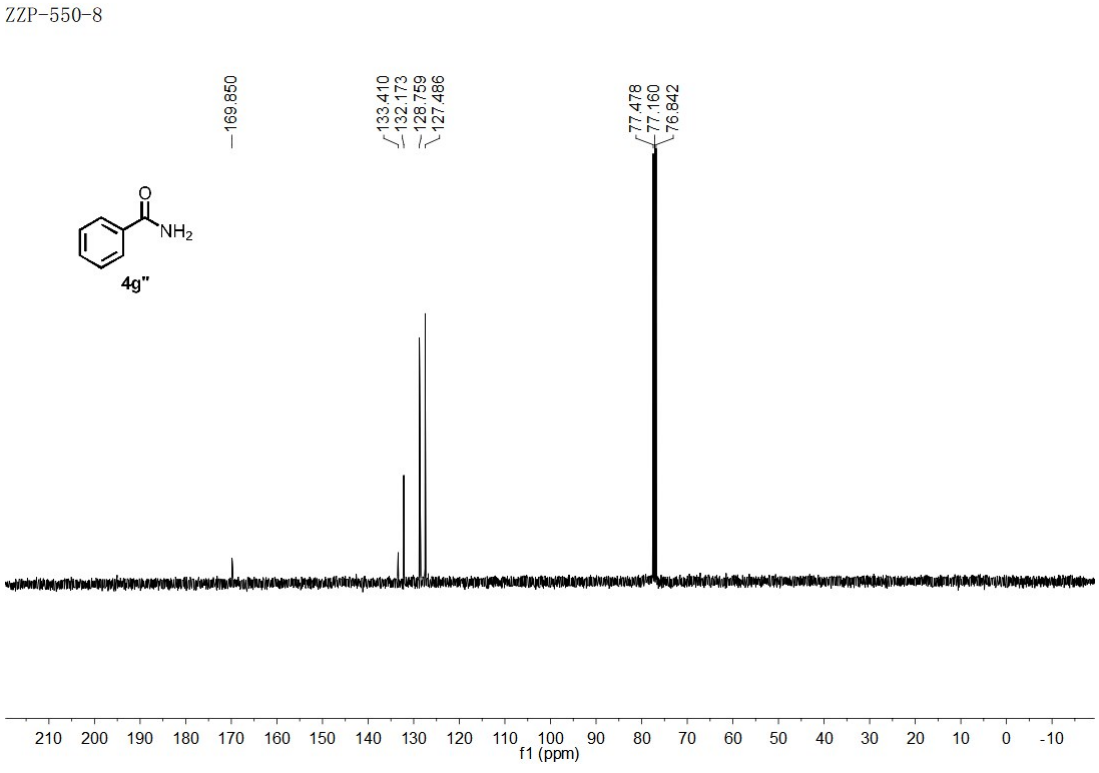






4. X-Ray crystallographic studies

Single crystals of compounds **3t and 5l** were grown in petroleum ether (60-90 °C)/CH_2Cl_2 (v/v, 5/1) at 25 °C and their X-ray diffraction studies were carried out on a

SMART APEX diffractometer with graphite-monochromated Mo radiation (λ = 0.71073 Å). Cell parameters were obtained by global refinement of the positions of all collected reflections. Intensities were corrected for Lorentz and polarization effects and empirical absorption. The structures were solved by direct methods and refined by full-matrix least squares on F^2. All non-hydrogen atoms were refined anisotropically. All hydrogen atoms were placed in calculated positions. Structure solution and refinement were performed by using the SHELXL-97 package. The X-ray crystallographic files, in CIF format, are available from the Cambridge Crystallographic Data Centre on quoting the deposition numbers CCDC 1975821 for **3t** and CCDC 1996648 for **5l** Copies of this information may be obtained free of charge from The Director, CCDC, 12 Union Road, Cambridge CB2 IEZ, UK (Fax: +44-1223-336033; e-mail: deposit@ccdc.cam.ac.uk or www: http://www. ccdc.cam.ac.uk).

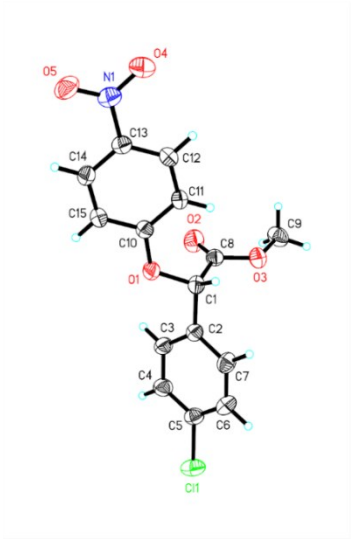


Figure S1. Molecular structure of compound **3t**

Table S4. Crystal data and structure refinement for **3t**

Empirical formula	$C_{15}H_{12}ClNO_5$	
Formula weight	321.71	
Temperature	293(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/c	
Unit cell dimensions	a = 16.5109(15) Å	□α = 90°
	b = 8.7483(6) Å	□β = 102.690(3)°
	c = 10.4253(8) Å	□γ = 90°

Volume	1469.1(2) Å^3
Z, Calculated density	4, 1.455 Mg/m^3
Absorption coefficient	0.283 mm^{-1}
F(000)	664
Crystal size	0.190 x 0.160 x 0.130 mm^3
Theta range for data collection	2.529 to 25.499°
Index ranges	-19<=h<=13, -10<=k<=10, -12<=l<=12
Reflections collected	6823
Independent reflections	2726 [R(int) = 0.0474]
Completeness to theta = 25.242°	99.2 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.5455
Refinement method	Full-matrix least-squares on F^2
Data/restraints/parameters	2726 / 0 / 201
Goodness-of-fit on F^2	1.030
Final R indices [I > 2 sigma(I)]	R1 = 0.0521, wR2 = 0.1337
R indices (all data)	R1 = 0.0684, wR2 = 0.1523
Extinction coefficient	0.016(6)
Largest diff. peak and hole	0.406 and -0.258 e.Å^{-3}

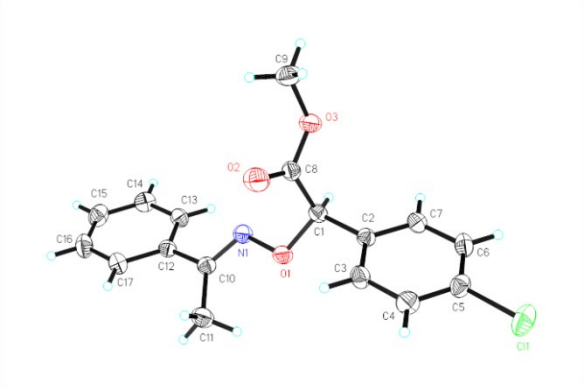


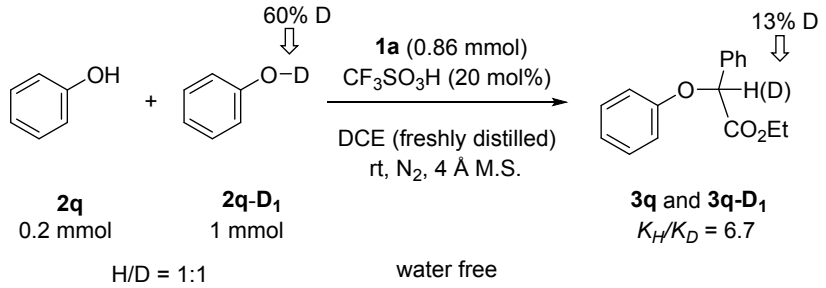
Figure S2. Molecular structure of compound **5l**

Table S5. Crystal data and structure refinement for **5l**

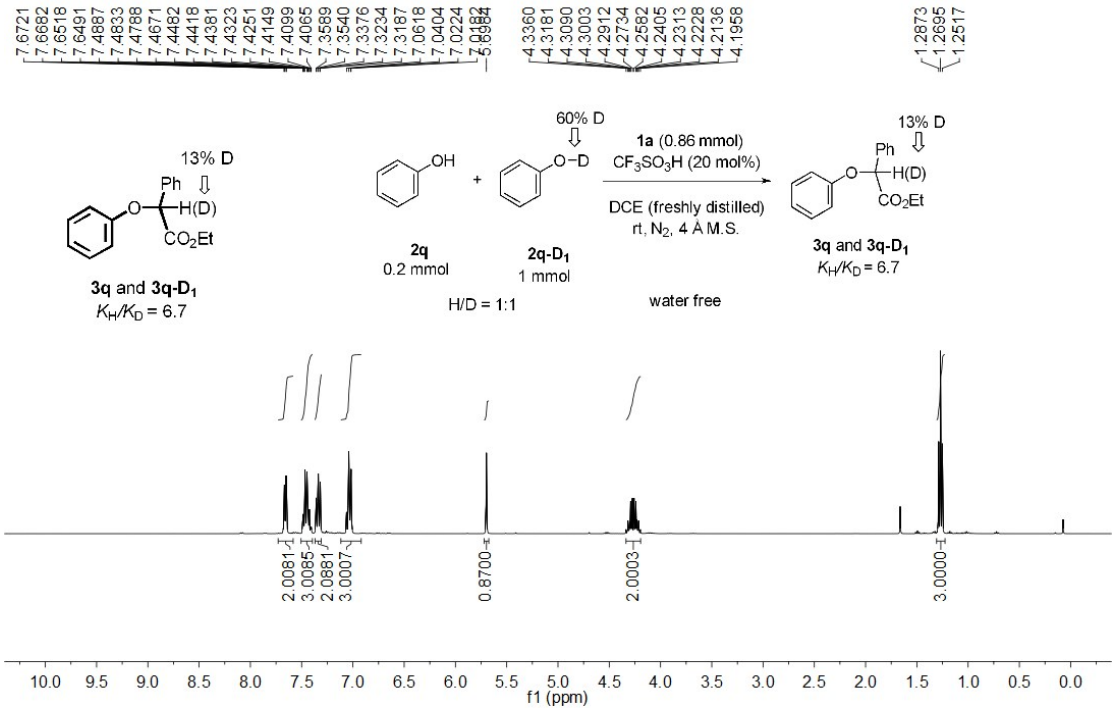
Empirical formula	$C_{17}H_{16}ClNO_3$	
Formula weight	317.76	
Temperature	293(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/n	
Unit cell dimensions	a = 14.6119(4) Å	□α = 90°
	b = 6.1374(2) Å	□β = 110.9320(10)°
	c = 18.9711(5) Å	□γ = 90°

Volume	1589.03(8) $Å^3$
Z, Calculated density	4, 1.328 Mg/m^3
Absorption coefficient	0.252 mm^{-1}
F(000)	664
Crystal size	0.180 x 0.160 x 0.140 mm^3
Theta range for data collection	2.985 to 25.999°
Index ranges	-17<=h<=18, -7<=k<=7, -23<=l<=21
Reflections collected	22988
Independent reflections	3101 [R(int) = 0.0293]
Completeness to theta = 25.242°	99.2 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.6449
Refinement method	Full-matrix least-squares on F^2
Data/restraints/parameters	3101 / 0 / 202
Goodness-of-fit on F^2	1.031
Final R indices [I > 2 sigma(I)]	R^1 = 0.0386, wR^2 = 0.1051
R indices (all data)	R^1 = 0.0458, wR^2 = 0.1123
Largest diff. peak and hole	0.236 and -0.200 $e.Å^{-3}$

5. Kinetic isotope effect of the O-H insertion reaction



A mixture of phenol (**2q**, 18.8 mg, 0.2 mmol, **2q**-D_1, 95.1 mg, 1 mmol), CF_3SO_3H (20 mol%), 4 Å M.S. (100 mg) and ethyl 2-diazo-2-phenylacetate (**1a**, 163.5 mg, 0.86 mmol) in DCE (5 mL, freshly distilled) was stirred at room temperature under N_2 for 20 min. Then, the crude product was got by removing solvent under reduced pressure. Finally, the crude product was purified by flash chromatography with petroleum ether (60-90 ºC)/AcOEt (10:1) to afford corresponding insertion product and conducted a ^1H NMR analysis to determine the H/D ratio.



6. NMR titration experiments

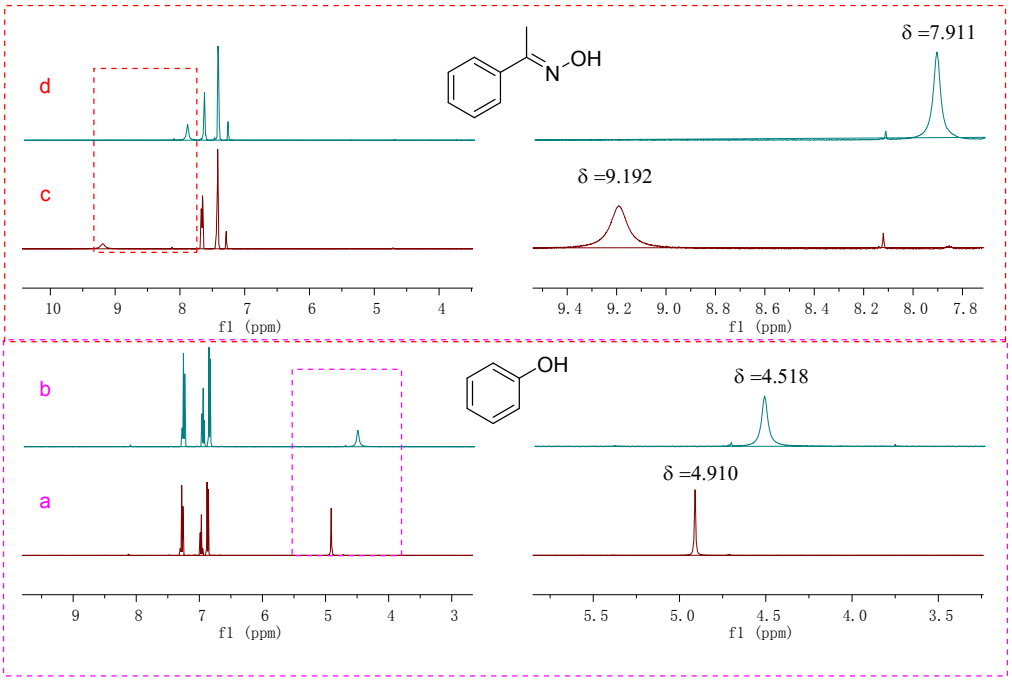
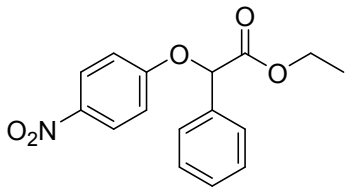


Figure S3. ^{1}H NMR spectra of the phenol and (*E*)-1-phenylethan-1-one oxime signals in $CDCl_3$. (a) phenol (0.35 mmol), (b) phenol (0.35 mmol) with CF_3SO_3H (10 mol%). (c) (*E*)-1-phenylethan-1-one oxime (0.35 mmol), (d) (*E*)-1-phenylethan-1-one oxime (0.35 mmol) with CF_3SO_3H (10 mol%),

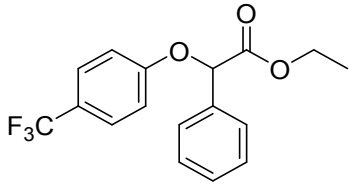
^{1}H-NMR titration experiments.

The preparation of mother liquor: (a) phenol (0.35 mmol), (b) phenol (0.35 mmol) with CF_3SO_3H (10 mol%), (c) (*E*)-1-phenylethan-1-one oxime (0.35 mmol), (d) (*E*)-1-phenylethan-1-one oxime (0.35 mmol) with CF_3SO_3H (10 mol%) were added in $CDCl_3$ (2.5 mL), respectively and stirred at room temperature under 0.1 Mpa air for 20 min. Then, the mother liquor of (a) 100 μL, (b) 100 μL, (c) 100 μL, (d) 100 μL were moved in $CDCl_3$ (0.5 mL), respectively. Last, conducted a ^{1}H NMR analysis to show the ^{1}H of OH in phenol and (*E*)-1-phenylethan-1-one oxime, as shown in Fig. S3.

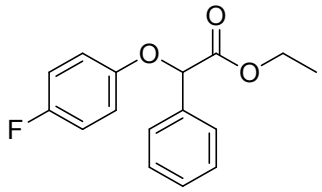
7. Analytical Data for known compounds



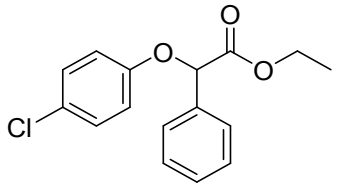
Ethyl 2-(4-nitrophenoxy)-2-phenylacetate (3a): Colorless oil; 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25–8.11 (m, 2H), 7.57 (dd, *J* = 7.6, 1.8 Hz, 2H), 7.46–7.36 (m, 3H), 7.07–6.96 (m, 2H), 5.72 (s, 1H), 4.32–4.12 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 168.79, 162.15, 142.26, 134.29, 129.50, 129.05, 127.15, 125.95, 115.46, 78.90, 77.48, 77.16, 76.84, 62.14, 14.05.



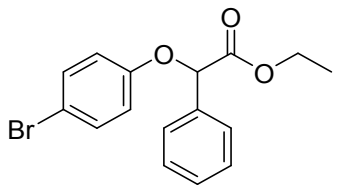
Ethyl 2-phenyl-2-(4-(trifluoromethyl) phenoxy) acetate (3b): Colorless oil; 80% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (dd, *J* = 7.6, 1.3 Hz, 2H), 7.54 (d, *J* = 8.6 Hz, 2H), 7.46–7.36 (m, 3H), 7.02 (d, *J* = 8.6 Hz, 2H), 5.67 (s, 1H), 4.30–4.14 (m, 2H), 1.22 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.40, 159.78, 134.88, 129.36, 129.03, 128.41, 127.19, 127.14, 127.10, 124.37 (q, *J* = 271.3 Hz), 124.04 (q, *J* = 32.8 Hz), 120.33, 115.50, 78.71, 62.03, 14.13.



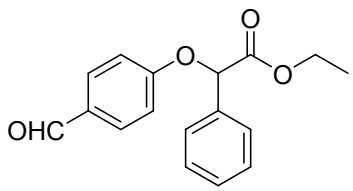
Ethyl 2-(4-fluorophenoxy)-2-phenylacetate (3c): Yellow oil; 74% yield; ^{1}H NMR (400 MHz, $CDCl_3$) ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (dd, *J* = 7.7, 1.4 Hz, 2H), 7.45–7.34 (m, 3H), 7.00–6.87 (m, 4H), 5.55 (s, 1H), 4.27–4.13 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.90, 157.95 (d, *J* = 239.7 Hz), 153.52 (d, *J* = 2.3 Hz), 135.44, 129.16, 128.93, 127.18, 116.98 (d, *J* = 8.1 Hz), 116.10 (d, *J* = 23.3 Hz), 79.57, 61.83, 14.16.



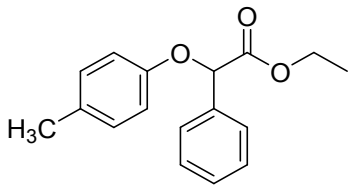
Ethyl 2-(4-chlorophenoxy)-2-phenylacetate (3d): Colorless oil; 77% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (dd, *J* = 7.6, 1.4 Hz, 2H), 7.44–7.34 (m, 3H), 7.22 (d, *J* = 9.0 Hz, 2H), 6.89 (d, *J* = 9.0 Hz, 2H), 5.57 (s, 1H), 4.27–4.12 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.70, 155.98, 135.19, 129.59, 129.22, 128.96, 127.17, 126.88, 116.97, 79.04, 61.90, 14.15.



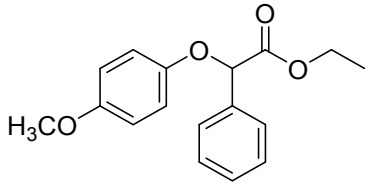
Ethyl 2-(4-bromophenoxy)-2-phenylacetate (3e): Colorless oil; 72% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (dd, *J* = 7.6, 1.6 Hz, 2H), 7.42–7.35 (m, 5H), 6.92–6.79 (m, 2H), 5.58 (s, 1H), 4.29–4.13 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.66, 156.50, 135.16, 132.54, 129.24, 128.97, 127.18, 117.46, 114.25, 78.96, 61.93, 14.17.



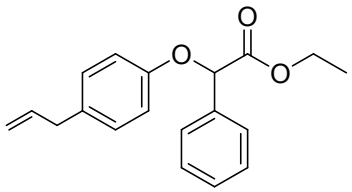
Ethyl 2-(4-formylphenoxy)-2-phenylacetate (3f): Colorless oil; 61% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.88 (s, 1H), 7.83 (d, *J* = 8.8 Hz, 2H), 7.58 (dd, *J* = 7.6, 1.5 Hz, 2H), 7.45–7.37 (m, 3H), 7.06 (d, *J* = 8.7 Hz, 2H), 5.71 (s, 1H), 4.28–4.15 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 190.88, 169.23, 162.24, 134.69, 132.12, 130.83, 129.44, 129.07, 127.21, 115.73, 78.70, 62.11, 14.15.



Ethyl 2-phenyl-2-(*p*-tolyloxy) acetate (3g): Colorless oil; 60% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (dd, *J* = 7.9, 1.5 Hz, 2H), 7.42–7.33 (m, 3H), 7.07 (d, *J* = 8.3 Hz, 2H), 6.90–6.83 (m, 2H), 5.59 (s, 1H), 4.28–4.12 (m, 2H), 2.27 (s, 3H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.21, 155.37, 135.81, 131.21, 130.11, 128.97, 128.85, 127.19, 115.54, 79.02, 61.69, 20.63, 14.17.

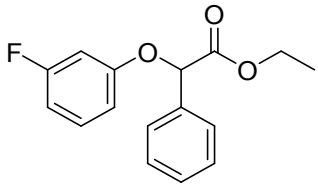


Ethyl 2-(4-methoxyphenoxy)-2-phenylacetate (3h): Colorless oil; 51% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (dd, *J* = 7.8, 1.4 Hz, 2H), 7.43–7.33 (m, 3H), 6.95–6.89 (m, 2H), 6.84–6.78 (m, 2H), 5.55 (s, 1H), 4.28–4.13 (m, 2H), 3.75 (s, 3H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.19, 154.69, 151.55, 135.86, 128.94, 128.79, 127.16, 116.98, 114.72, 79.80, 61.62, 55.69, 14.12.

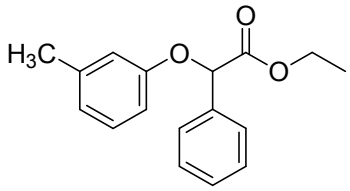


Ethyl 2-(4-allylphenoxy)-2-phenylacetate (3i): Colorless oil; 90% yield; ^{1}H NMR (400 MHz, $CDCl_3$) ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (dd, *J* = 7.8, 1.4 Hz, 2H), 7.43–7.34 (m, 3H), 7.09 (d, *J* = 8.7 Hz, 2H), 6.93–6.87 (m, 2H), 5.94 (dd, *J* = 17.7, 9.3 Hz, 1H), 5.60 (s, 1H), 5.09–5.05 (m, 1H), 5.03 (t, *J* = 1.4 Hz, 1H), 4.28–4.13 (m, 2H), 3.32

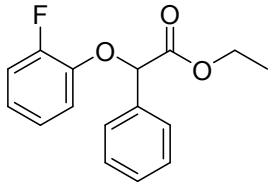
(d, J = 6.7 Hz, 2H), 1.21 (t, J = 7.1 Hz, 3H).$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 170.13, 155.88, 137.76, 135.75, 133.40, 129.70, 128.99, 128.85, 127.18, 115.71, 115.61, 78.96, 61.71, 39.45, 14.16.



Ethyl 2-(3-fluorophenoxy)-2-phenylacetate (3j): Colorless oil; 72% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 7.57 (dd, J = 7.8, 1.4 Hz, 2H), 7.43–7.37 (m, 3H), 7.21 (dd, J = 15.1, 8.2 Hz, 1H), 6.77–6.71 (m, 1H), 6.71–6.65 (m, 2H), 5.59 (s, 1H), 4.26–4.13 (m, 2H), 1.21 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 169.64, 163.61 (d, J = 245.9 Hz), 158.67 (d, J = 10.9 Hz), 135.13, 130.49 (d, J = 9.9 Hz), 129.24, 128.97, 127.19, 111.15 (d, J = 3.0 Hz), 108.81 (d, J = 21.3 Hz), 103.58 (d, J = 25.1 Hz), 78.92, 61.93, 14.15.

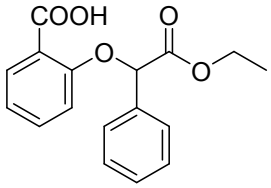


Ethyl 2-phenyl-2-(*m*-tolyloxy) acetate (3k): Colorless oil; 59% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 7.60 (dd, J = 7.8, 1.3 Hz, 2H), 7.44–7.34 (m, 3H), 7.16 (t, J = 7.8 Hz, 1H), 6.81 (d, J = 8.1 Hz, 2H), 6.75 (dd, J = 8.3, 2.2 Hz, 1H), 5.63 (s, 1H), 4.29-4.13 (m, 2H), 2.32 (s, 3H), 1.22 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 170.17, 157.47, 139.77, 135.71, 129.36, 128.99, 128.85, 127.17, 122.73, 116.56, 112.19, 78.67, 61.71, 21.63, 14.16.

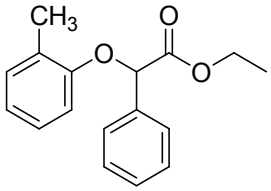


Ethyl 2-(2-fluorophenoxy)-2-phenylacetate (3l): Colorless oil; 66% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 7.59 (dd, J = 7.7, 1.6 Hz, 2H), 7.44–7.35 (m, 3H), 7.13–7.06 (m, 1H), 7.03–6.92 (m, 3H), 5.64 (s, 1H), 4.25–4.16 (m, 2H), 1.20 (t, J = 7.1 Hz, 3H).

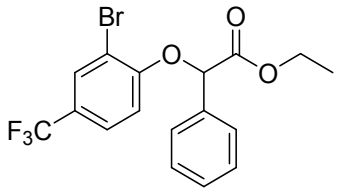
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 169.66, 153.42 (d, *J* = 246.9 Hz), 145.31 (d, *J* = 10.6 Hz), 135.29, 129.19, 128.87, 127.28, 124.36 (d, *J* = 3.9 Hz), 122.94 (d, *J* = 7.0 Hz), 117.78, 116.79 (d, *J* = 18.4 Hz), 80.26, 61.81, 14.12.



2-(2-ethoxy-2-oxo-1-phenylethoxy) benzoic acid (3m): Colorless oil; 90% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.44 (s, 1H), 7.99 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.58 (dd, *J* = 7.3, 2.2 Hz, 2H), 7.51–7.41 (m, 4H), 7.00 (d, *J* = 8.4 Hz, 1H), 6.94–6.88 (m, 1H), 6.14 (s, 1H), 4.30–4.16 (m, 2H), 1.24 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 169.42, 168.45, 161.96, 136.40, 133.63, 130.45, 129.60, 129.06, 127.76, 119.50, 117.78, 111.91, 75.28, 62.11, 14.14.

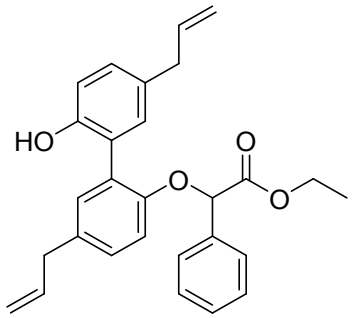


Ethyl 2-phenyl-2-(*o*-tolyloxy) acetate (3n): Colorless oil; 57% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (dd, *J* = 7.9, 1.2 Hz, 2H), 7.44-7.35 (m, 3H), 7.18 (dd, *J* = 7.3, 0.7 Hz, 1H), 7.14-7.06 (m, 1H), 6.94-6.87 (m, 1H), 6.76 (d, *J* = 8.1 Hz, 1H), 5.65 (s, 1H), 4.26-4.10 (m, 2H), 2.38 (s, 3H), 1.20 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.25, 155.70, 136.02, 131.17, 128.91, 128.80, 127.86, 127.03, 126.78, 121.59, 112.17, 78.78, 61.64, 16.57, 14.12.

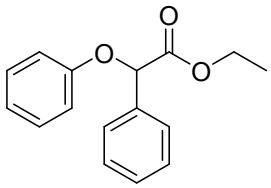


Ethyl 2-(2-bromo-4-(trifluoromethyl) phenoxy)-2-phenylacetate (3o): White solid, m.p.: 71-73 ^{o}C; 64% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, *J* = 1.8 Hz, 1H), 7.65 (dd, *J* = 7.7, 1.6 Hz, 2H), 7.51–7.37 (m, 4H), 6.87 (d, *J* = 8.6 Hz, 1H), 5.72 (s, 1H), 4.27–4.14 (m, 2H), 1.20 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 168.83,

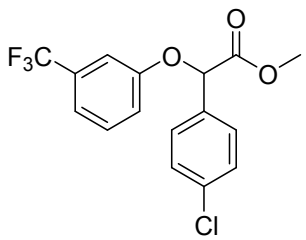
156.43, 134.40, 131.14 (q, J = 7.4, 3.7 Hz), 129.43, 129.03, 127.06, 125.86 (q, J = 3.8 Hz), 125.18 (q, J = 33.4 Hz), 123.45 (q, J = 271.9 Hz), 113.69, 113.30, 79.45, 62.17, 14.11.



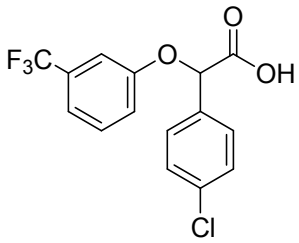
Ethyl 2-((5,5'-diallyl-2'-hydroxy-[1,1'-biphenyl]-2-yl) oxy)-2-phenylacetate (3p): White solid, m.p.: 74-76 ^{o}C.; 88% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (dd, J = 6.5, 3.0 Hz, 2H), 7.33 (dd, J = 5.0, 1.6 Hz, 3H), 7.20–7.09 (m, 3H), 7.03 (d, J = 8.5 Hz, 2H), 6.86 (d, J = 8.4 Hz, 1H), 6.01 (dd, J = 13.3, 6.1 Hz, 1H), 5.96 (dd, J = 13.4, 6.1 Hz, 1H), 5.75 (s, 1H), 5.20–4.97 (m, 4H), 4.30–4.11 (m, 2H), 3.40 (d, J = 6.7 Hz, 2H), 3.36 (d, J = 6.7 Hz, 2H), 1.20 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.93, 152.47, 151.80, 138.06, 137.43, 134.48, 134.27, 133.27, 132.02, 131.26, 129.48, 129.26, 129.12, 128.91, 128.06, 127.29, 125.79, 117.40, 116.12, 115.57, 78.06, 62.55, 39.56, 39.47, 14.07.



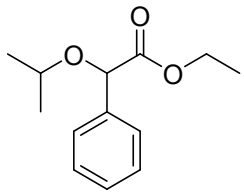
Ethyl 2-phenoxy-2-phenylacetate (3q): Colorless oil; 68% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (dd, J = 7.8, 1.4 Hz, 2H), 7.38–7.29 (m, 3H), 7.24–7.20 (m, 2H), 6.99–6.82 (m, 3H), 5.58 (s, 1H), 4.20–4.07 (m, 2H), 1.15 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.06, 157.40, 135.59, 129.65, 129.02, 128.86, 127.16, 121.87, 115.55, 78.71, 61.74, 14.13.



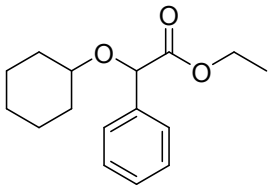
Methyl 2-(4-chlorophenyl)-2-(3-(trifluoromethyl) phenoxy) acetate (3v): White solid; m.p.: 84-86 ^{o}C; 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55–7.49 (m, 2H), 7.43–7.36 (m, 3H), 7.26 (t, *J* = 3.9 Hz, 1H), 7.20 (s, 1H), 7.08 (dd, *J* = 8.2, 2.4 Hz, 1H), 5.64 (s, 1H), 3.75 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.60, 157.25, 135.46, 133.38, 132.29 (q, *J* = 32.6 Hz), 130.39, 129.32, 128.56, 123.85 (d, *J* = 272.4 Hz), 118.94 (q, *J* = 3.9 Hz), 118.62, 112.90 (q, *J* = 3.9 Hz), 78.18, 53.04.



2-(4-chlorophenyl)-2-(3-(trifluoromethyl) phenoxy) acetic acid (3v'): White syrup; 83% yield; ^{1}H NMR (400 MHz, $(CD_3)_2SO$) δ 13.57 (s, 1H), 7.61 (d, *J* = 8.5 Hz, 2H), 7.57–7.49 (m, 3H), 7.31 (t, *J* = 9.1 Hz, 3H), 6.11 (s, 1H). ^{13}C{^{1}H} NMR (100 MHz, $(CD_3)_2SO$) δ 170.34, 157.27, 134.78, 133.58, 130.88, 130.37 (q, *J* = 31.8 Hz), 129.29, 128.77, 123.95 (q, *J* = 272.4 Hz), 119.50, 118.00 (q, *J* = 3.7 Hz), 111.92 (q, *J* = 3.7 Hz), 76.56.

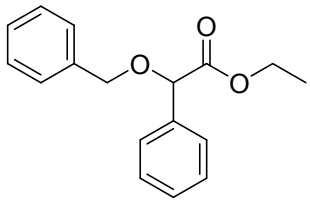


Ethyl 2-isopropoxy-2-phenylacetate (3z): Colorless oil; 54% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (dd, *J* = 8.0, 1.4 Hz, 2H), 7.38–7.29 (m, 3H), 4.97 (s, 1H), 4.22–4.11 (m, 2H), 3.74–3.62 (m, 1H), 1.26–1.23 (m, 3H), 1.23–1.17 (m, 6H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.68, 137.46, 128.60, 128.49, 127.22, 78.67, 71.05, 61.20, 22.21, 22.19, 14.20.

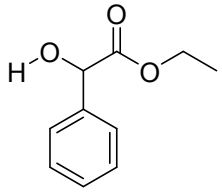


Ethyl 2-(cyclohexyloxy)-2-phenylacetate (3z3): Colorless oil; 47% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (dd, *J* = 7.9, 1.1 Hz, 2H), 7.37–7.27 (m, 3H), 5.03 (s, 1H),

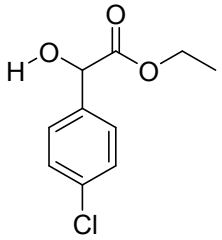
4.23–4.09 (m, 2H), 3.41–3.32 (m, 1H), 2.05–1.94 (m, 1H), 1.94–1.85 (m, 1H), 1.82–1.67 (m, 2H), 1.58–1.21 (m, 6H), 1.19 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.82, 137.69, 128.61, 128.46, 127.21, 78.38, 77.65, 61.19, 32.45, 32.30, 25.85, 24.31, 14.26.



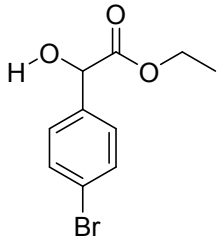
Ethyl 2-(benzyloxy)-2-phenylacetate(3z7): Colorless oil; 51% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (dd, J = 7.7, 1.6 Hz, 2H), 7.41–7.30 (m, 8H), 4.94 (s, 1H), 4.62 (s, 2H), 4.26–4.11 (m, 2H), 1.22 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.89, 137.33, 136.53, 128.74, 128.69, 128.54, 128.15, 128.00, 127.47, 79.80, 71.25, 61.30, 14.18.



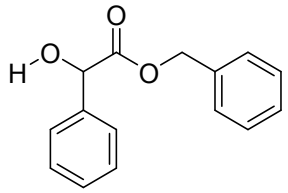
Ethyl 2-hydroxy-2-phenylacetate (3z9): Colorless oil; 50% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (dd, J = 8.0, 1.2 Hz, 2H), 7.40–7.29 (m, 3H), 5.16 (d, J = 5.8 Hz, 1H), 4.31–4.11 (m, 2H), 3.57 (d, J = 5.8 Hz, 1H), 1.22 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 173.78, 138.53, 128.66, 128.49, 126.63, 72.99, 62.33, 14.12.



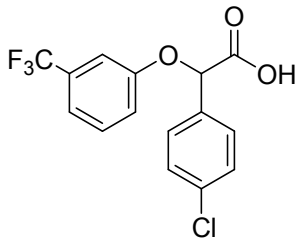
Ethyl 2-(4-chlorophenyl)-2-hydroxyacetate (3z10): White solid, 62% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 (d, J = 8.6 Hz, 2H), 7.31 (d, J = 8.5 Hz, 2H), 5.12 (d, J = 5.4 Hz, 1H), 4.31–4.10 (m, 2H), 3.75–3.63 (m, 1H), 1.21 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 173.35, 136.97, 134.30, 128.77, 127.98, 72.28, 62.50, 14.08.



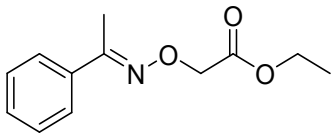
Ethyl 2-(4-bromophenyl)-2-hydroxyacetate (3z11): White solid, 65% yield; 1H NMR (400 MHz, $CDCl_3$) δ 7.51–7.43 (m, 2H), 7.29 (d, *J* = 8.3 Hz, 2H), 5.10 (d, *J* = 5.4 Hz, 1H), 4.30–4.09 (m, 2H), 3.79–3.69 (m, 1H), 1.20 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 173.22, 137.47, 131.69, 128.28, 122.44, 72.31, 62.48, 14.06.



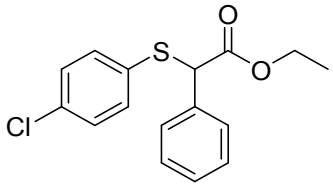
Benzyl 2-hydroxy-2-phenylacetate (3z12): White solid, 71% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 7.48–7.42 (m, 2H), 7.41–7.31 (m, 6H), 7.26–7.19 (m, 2H), 5.27–5.24 (m, 2H), 5.15 (d, *J* = 12.4 Hz, 1H), 3.67 (d, *J* = 5.8 Hz, 1H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 173.53, 138.27, 135.08, 128.64, 128.61, 128.54, 128.48, 128.00, 126.67, 73.06, 67.65.



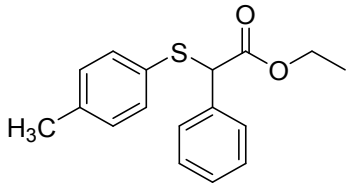
2-(4-chlorophenyl)-2-(3-(trifluoromethyl) phenoxy) acetic acid (3v'): White syrup; 83% yield; ^1H NMR (400 MHz, $(CD_3)_2SO$) δ 13.57 (s, 1H), 7.61 (d, *J* = 8.5 Hz, 2H), 7.57–7.49 (m, 3H), 7.31 (t, *J* = 9.1 Hz, 3H), 6.11 (s, 1H). $^{13}C\{^1H\}$ NMR (100 MHz, $(CD_3)_2SO$) δ 170.34, 157.27, 134.78, 133.58, 130.88, 130.37 (q, *J* = 31.8 Hz), 129.29, 128.77, 123.95 (q, *J* = 272.4 Hz), 119.50, 118.00 (q, *J* = 3.7 Hz), 111.92 (q, *J* = 3.7 Hz), 76.56.



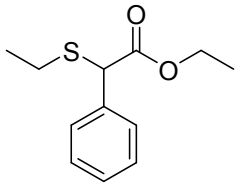
Ethyl (*E*)-2-(((1-phenylethylidene) amino) oxy) acetate (5k): Colorless oil; 50% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69–7.59 (m, 2H), 7.40–7.32 (m, 3H), 4.74 (s, 2H), 4.24 (q, *J* = 7.1 Hz, 2H), 2.32 (s, 3H), 1.29 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.25, 156.71, 136.29, 129.46, 128.51, 126.41, 70.98, 60.98, 14.34, 13.23.



Ethyl 2-((4-chlorophenyl) thio)-2-phenylacetate (7a): Colorless oil; 84% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (dd, *J* = 7.7, 1.8 Hz, 2H), 7.35–7.28 (m, 5H), 7.25–7.21 (m, 2H), 4.86 (s, 1H), 4.19–4.09 (m, 2H), 1.18 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.24, 135.48, 134.43, 134.34, 132.23, 129.20, 128.83, 128.63, 128.52, 61.96, 56.58, 14.12.

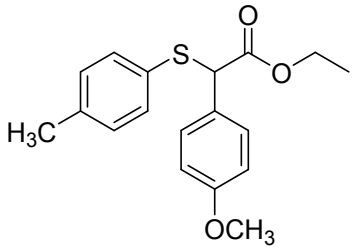


Ethyl 2-phenyl-2-(*p*-tolylthio) acetate (7c): Colorless oil; 91% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.9, 1.6 Hz, 2H), 7.35–7.28 (m, 5H), 7.08 (d, *J* = 7.9 Hz, 2H), 4.86 (s, 1H), 4.19–4.08 (m, 2H), 2.32 (s, 3H), 1.18 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.59, 138.38, 135.95, 133.41, 130.12, 129.79, 128.68, 128.63, 128.27, 61.72, 56.88, 21.23, 14.08.

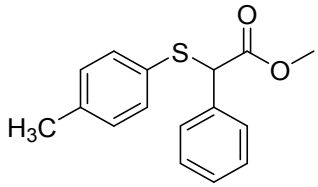


Ethyl 2-(ethylthio)-2-phenylacetate (7f): Colorless oil; 60% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (dd, *J* = 8.2, 1.3 Hz, 2H), 7.33 (dt, *J* = 7.3, 6.5 Hz, 3H), 4.59 (s,

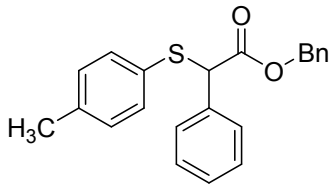
1H), 4.24–4.15 (m, 2H), 2.61–2.46 (m, 2H), 1.26 (t, J = 7.1 Hz, 3H), 1.23 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.00, 136.38, 129.30, 128.68, 128.54, 128.11, 61.70, 52.13, 26.01, 14.19, 14.17.



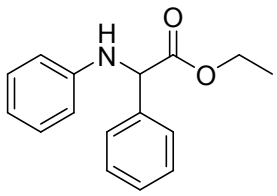
Ethyl 2-(4-methoxyphenyl)-2-(*p*-tolylthio) acetate (7o): Colorless oil; 65% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45–7.39 (m, 2H), 7.32 (dd, J = 6.8, 5.1 Hz, 2H), 7.12 (d, J = 7.9 Hz, 2H), 6.91–6.87 (m, 2H), 4.85 (s, 1H), 4.20–4.11 (m, 2H), 3.84 (s, 3H), 2.36 (s, 3H), 1.21 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.84, 159.62, 138.33, 133.38, 129.86, 129.81, 127.91, 114.13, 61.68, 56.22, 55.40, 21.28, 14.13.



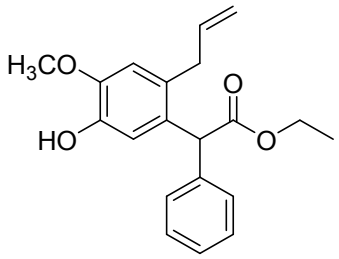
Methyl 2-phenyl-2-(*p*-tolylthio) acetate (7p): Colorless oil; 85% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (dd, J = 9.2, 3.1 Hz, 2H), 7.33–7.30 (m, 2H), 7.28 (d, J = 8.1 Hz, 2H), 7.08 (d, J = 7.9 Hz, 2H), 4.86 (s, 1H), 3.68 (s, 3H), 2.32 (s, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.09, 138.51, 135.89, 133.47, 130.01, 129.86, 128.74, 128.64, 128.35, 56.89, 52.74, 21.26.



Benzyl 2-phenyl-2-(*p*-tolylthio) acetate (7s): Colorless oil; 75% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (dd, J = 7.7, 1.8 Hz, 2H), 7.37–7.29 (m, 8H), 7.25–7.21 (m, 2H), 7.07 (d, J = 7.9 Hz, 2H), 5.19–5.05 (m, 2H), 4.95 (s, 1H), 2.34 (s, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.49, 138.42, 135.62, 135.43, 133.47, 129.93, 129.83, 128.70, 128.67, 128.52, 128.35, 128.29, 128.21, 67.30, 56.76, 21.24.

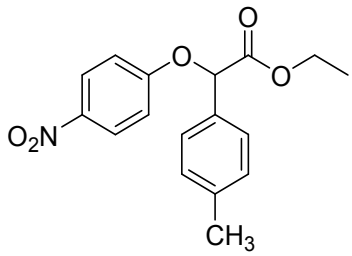


Ethyl 2-phenyl-2-(phenylamino) acetate (9a): Colorless oil; 60% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 7.1 Hz, 2H), 7.41–7.30 (m, 3H), 7.15 (dd, *J* = 8.5, 7.4 Hz, 2H), 6.73 (t, *J* = 7.3 Hz, 1H), 6.60 (d, *J* = 7.7 Hz, 2H), 5.11 (d, *J* = 5.3 Hz, 1H), 5.02 (s, 1H), 4.32–4.08 (m, 2H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.91, 146.08, 137.81, 129.31, 128.90, 128.30, 127.29, 118.10, 113.48, 61.90, 60.86, 14.12.



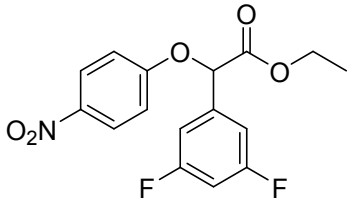
Ethyl 2-(2-allyl-5-hydroxy-4-methoxyphenyl)-2-phenylacetate (11a): Colorless oil; 61% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.17–7.12 (m, 2H), 7.08 (dd, *J* = 8.7, 7.3 Hz, 3H), 6.71 (s, 1H), 6.51 (s, 1H), 5.77 (dd, *J* = 17.0, 10.2 Hz, 1H), 5.32 (s, 1H), 5.02 (s, 1H), 4.93 (dd, *J* = 10.1, 1.5 Hz, 1H), 4.86 (dd, *J* = 17.1, 1.7 Hz, 1H), 4.04 (q, *J* = 7.1 Hz, 2H), 3.70 (s, 3H), 3.17 (dd, *J* = 5.8, 4.3 Hz, 2H), 1.10 (d, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 172.88, 145.74, 144.07, 138.70, 137.06, 129.92, 129.63, 128.82, 128.63, 127.16, 116.13, 115.40, 112.45, 61.27, 56.00, 52.66, 37.12, 14.28.

8. Analytical Data for unknown compounds

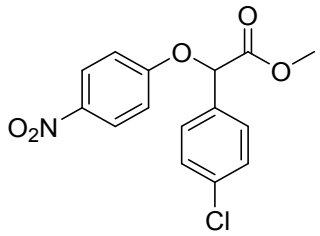


Ethyl 2-(4-nitrophenoxy)-2-(*p*-tolyl) acetate (3r): Light yellow oil; 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.23–8.14 (m, 2H), 7.44 (d, *J* = 8.1 Hz, 2H), 7.23 (d, *J* =

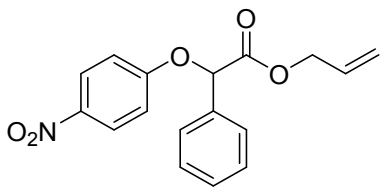
7.9 Hz, 2H), 7.03–6.97 (m, 2H), 5.67 (s, 1H), 4.28–4.15 (m, 2H), 2.37 (s, 3H), 1.22 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 168.98, 162.29, 142.28, 139.63, 131.37, 129.81, 127.18, 126.01, 115.52, 78.91, 62.13, 21.37, 14.14. HRMS (ESI) calcd for $C_{17}H_{17}NO_5Na$ $[M+Na]^+$: 338.0999; Found: 338.1001.



Ethyl 2-(3,5-difluorophenyl)-2-(4-nitrophenoxy) acetate (3s): Yellow oil, 68% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.23–8.17 (m, 2H), 7.44–7.34 (m, 1H), 7.11–7.04 (m, 2H), 6.98 (t, J = 8.2 Hz, 2H), 6.10 (s, 1H), 4.34–4.25 (m, 2H), 1.25 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 167.65, 162.28, 161.32 (d, J = 250.6 Hz), 161.25 (d, J = 250.7 Hz), 142.64, 132.06 (d, J = 10.5 Hz), 131.90, 126.02, 115.77, 112.19 (d, J = 5.5 Hz), 112.03 (d, J = 13.3 Hz), 69.08, 62.67, 14.12. HRMS (ESI) calcd for $C_{16}H_{13}F_2NO_5Na$ $[M+Na]^+$: 360.0654; Found: 360.0653.

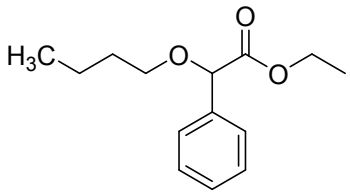


Methyl 2-(4-chlorophenyl)-2-(4-nitrophenoxy) acetate (3t): White solid, m.p.: 134-137 ^oC.; 85% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, J = 9.2 Hz, 2H), 7.51 (d, J = 8.5 Hz, 2H), 7.40 (d, J = 8.5 Hz, 2H), 7.00 (d, J = 9.2 Hz, 2H), 5.70 (s, 1H), 3.76 (s, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 168.97, 161.83, 142.50, 135.69, 132.70, 129.40, 128.54, 126.10, 115.46, 78.13, 53.20. HRMS (APCI) calcd for $C_{15}H_{11}NClO_5$ $[M-H]^-$: 320.0331; Found: 320.0330.

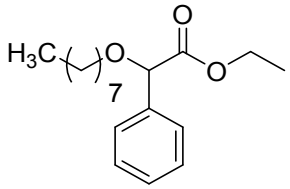


Allyl 2-(4-nitrophenoxy)-2-phenylacetate (3u): Colorless oil; 75% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.21–8.13 (m, 2H), 7.58 (dd, J = 7.6, 1.8 Hz, 2H), 7.47–7.37 (m,

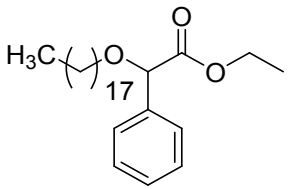
3H), 7.06–6.98 (m, 2H), 5.82 (dd, *J* = 17.4, 10.2 Hz, 1H), 5.76 (s, 1H), 5.23–5.20 (m, 1H), 5.18 (dd, *J* = 2.0, 1.3 Hz, 1H), 4.70–4.60 (m, 2H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 168.46, 162.08, 142.31, 134.19, 131.08, 129.60, 129.10, 127.19, 125.99, 119.17, 115.49, 78.86, 66.39. HRMS (ESI) calcd for $C_{17}H_{15}NO_5Na$ $[M+Na]^+$: 336.0842; Found: 336.0850.



Ethyl 2-butoxy-2-phenylacetate (3w): Colorless oil; 71% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.8, 1.5 Hz, 2H), 7.39–7.29 (m, 3H), 4.85 (s, 1H), 4.26–4.09 (m, 2H), 3.59–3.51 (m, 1H), 3.48–3.41 (m, 1H), 1.67–1.61 (m, 2H), 1.46–1.36 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H), 0.91 (t, *J* = 7.4 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.24, 137.03, 128.63, 128.58, 127.23, 81.26, 69.83, 61.22, 31.79, 19.38, 14.22, 13.97. HRMS (ESI) calcd for $C_{14}H_{20}O_3Na$ $[M+Na]^+$: 259.1305; Found: 259.1316.

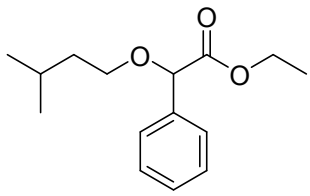


Ethyl 2-(octyloxy)-2-phenylacetate (3x): Colorless oil; 67% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.9, 1.3 Hz, 2H), 7.37–7.28 (m, 3H), 4.85 (s, 1H), 4.26–4.07 (m, 2H), 3.59–3.51 (m, 1H), 3.48–3.40 (m, 1H), 1.71–1.60 (m, 2H), 1.40–1.33 (m, 2H), 1.27 (d, *J* = 3.4 Hz, 8H), 1.20 (t, *J* = 7.1 Hz, 3H), 0.88 (t, *J* = 6.8 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.08, 136.95, 128.50, 128.46, 127.12, 81.17, 70.04, 61.06, 31.84, 29.63, 29.39, 29.25, 26.07, 22.67, 14.10. HRMS (ESI) calcd for $C_{18}H_{28}O_3Na$ $[M+Na]^+$: 315.1931; Found: 315.1945.

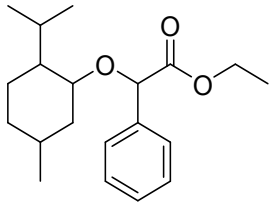


Ethyl 2-(octadecyloxy)-2-phenylacetate (3y): White solid; m.p.: 37-38 ^{o}C, 65% yield;

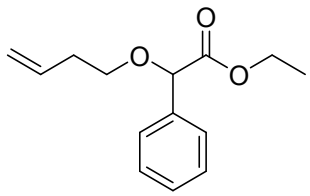
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (dd, *J* = 8.0, 1.3 Hz, 2H), 7.38–7.28 (m, 3H), 4.85 (s, 1H), 4.24–4.10 (m, 2H), 3.59–3.51 (m, 1H), 3.48–3.39 (m, 1H), 1.70–1.62 (m, 2H), 1.35–1.27 (m, 30 H), 1.21 (t, *J* = 7.1 Hz, 3H), 0.89 (t, *J* = 6.8 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.63, 137.96, 128.47, 128.34, 127.07, 78.61, 78.20, 61.07, 48.53, 40.34, 34.52, 31.58, 25.32, 23.21, 22.39, 21.30, 16.25, 14.15. HRMS (ESI) calcd for $C_{28}H_{48}O_3Na$ [M+Na]$^+$: 455.3496; Found: 455.3503.



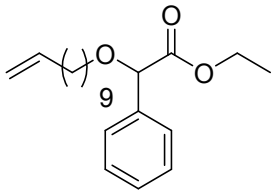
Ethyl 2-(isopentyloxy)-2-phenylacetate (3z1): Colorless oil; 55% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 6.5 Hz, 2H), 7.37–7.29 (m, 3H), 4.85 (s, 1H), 4.22–4.12 (m, 2H), 3.62–3.55 (m, 1H), 3.53–3.36 (m, 1H), 1.83–1.70 (m, 1H), 1.67–1.43 (m, 2H), 1.22 (t, *J* = 7.1 Hz, 3H), 0.92-0.87 (m, 6H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.21, 136.98, 128.60, 128.56, 127.18, 81.26, 68.46, 61.20, 38.47, 25.08, 22.70, 22.66, 14.20. HRMS (ESI) calcd for $C_{15}H_{22}O_3Na$ [M+Na]$^+$: 273.1461; Found: 273.1473.



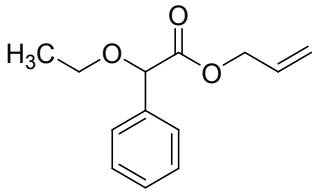
Ethyl 2-((2-isopropyl-5-methylcyclohexyl) oxy)-2-phenylacetate (3z4): Colorless oil; 47% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (dd, *J* = 7.9, 1.2 Hz, 2H), 7.36–7.29 (m, 3H), 5.09 (s, 1H), 4.22–4.11 (m, 2H), 3.33 (td, *J* = 10.5, 4.2 Hz, 1H), 2.60–2.47 (m, 1H), 2.13–2.02 (m, 1H), 1.70–1.62 (m, 2H), 1.40–1.29 (m, 2H), 1.22 (t, *J* = 7.1 Hz, 3H), 1.07–0.98 (m, 1H), 0.96 (d, *J* = 7.1 Hz, 2H), 0.94–0.77 (m, 9H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.82, 137.69, 128.61, 128.46, 127.21, 78.38, 77.65, 61.19, 32.45, 32.30, 25.85, 24.31, 14.26. HRMS (ESI) calcd for $C_{20}H_{30}O_3Na$ [M+Na]$^+$: 341.2087; Found: 341.2094.



Ethyl 2-(but-3-en-1-yloxy)-2-phenylacetate (3z5): Colorless oil; 75% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.9, 1.5 Hz, 2H), 7.38–7.28 (m, 3H), 5.84 (dd, *J* = 17.1, 10.3 Hz, 1H), 5.10 (dd, *J* = 17.2, 1.7 Hz, 1H), 5.06–5.00 (m, 1H), 4.87 (s, 1H), 4.26–4.11 (m, 2H), 3.66–3.56 (m, 1H), 3.54–3.45 (m, 1H), 2.48–2.37 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.92, 136.72, 134.77, 128.55, 127.15, 116.62, 81.15, 69.20, 61.15, 34.08, 14.11. HRMS (ESI) calcd for $C_{14}H_{18}O_3Na$ $[M+Na]^+$: 257.1148; Found: 257.1147.

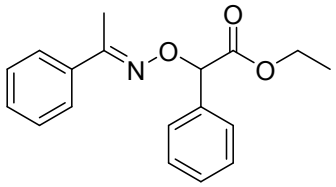


Ethyl 2-phenyl-2-(undec-10-en-1-yloxy) acetate (3z6): Colorless oil; 72% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.8, 1.5 Hz, 2H), 7.39–7.29 (m, 3H), 4.85 (s, 1H), 4.26–4.09 (m, 2H), 3.59–3.51 (m, 1H), 3.48–3.41 (m, 1H), 1.67–1.61 (m, 2H), 1.46–1.36 (m, 2H), 1.21 (t, *J* = 7.1 Hz, 3H), 0.91 (t, *J* = 7.4 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.05, 136.98, 128.49, 128.45, 127.12, 81.19, 70.04, 61.04, 32.00, 29.78, 29.73, 29.67, 29.63, 29.48, 29.44, 26.11, 22.75, 14.15, 14.11. HRMS (ESI) calcd for $C_{21}H_{32}O_3Na$ $[M+Na]^+$: 355.2244; Found: 355.2247.

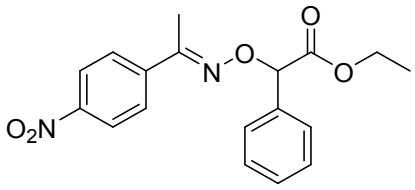


Allyl 2-ethoxy-2-phenylacetate (3z8): Colorless oil; 67% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (dd, *J* = 7.9, 1.3 Hz, 2H), 7.38–7.29 (m, 3H), 5.83 (dd, *J* = 17.2, 10.5 Hz, 1H), 5.21–5.11 (m, 2H), 4.90 (s, 1H), 4.66–4.55 (m, 2H), 3.64–3.48 (m, 2H), 1.27 (t, *J* = 7.0 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.68, 136.70, 131.66, 128.61, 128.58, 127.19, 118.30, 80.91, 65.49, 65.30, 15.12. HRMS (ESI) calcd for $C_{13}H_{16}O_3Na$

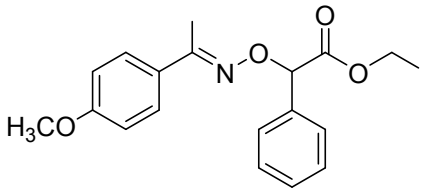
[M+Na]$^+$: 243.0992; Found: 243.0994.



Ethyl (*E*)-2-phenyl-2-(((1-phenylethylidene) amino) oxy) acetate (5a): Colorless oil; 83% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71–7.62 (m, 2H), 7.57 (dd, *J* = 7.7, 1.7 Hz, 2H), 7.44–7.33 (m, 6H), 5.75 (s, 1H), 4.28–4.14 (m, 2H), 2.38 (s, 3H), 1.25 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.92, 156.91, 136.26, 135.37, 129.46, 128.96, 128.69, 128.47, 127.71, 126.41, 83.77, 61.22, 14.24, 13.35. HRMS (ESI) calcd for $C_{18}H_{19}NO_3Na$ [M+Na]$^+$: 320.1257; Found: 320.1249.

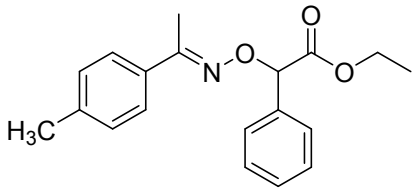


Ethyl (*E*)-2-(((1-(4-nitrophenyl) ethylidene) amino) oxy)-2-phenylacetate (5b): White solid; 61% yield; m.p 86-88 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (d, *J* = 8.9 Hz, 2H), 7.82 (d, *J* = 8.9 Hz, 2H), 7.54 (dd, *J* = 7.3, 2.0 Hz, 2H), 7.45–7.38 (m, 3H), 5.75 (s, 1H), 4.30–4.16 (m, 2H), 2.39 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.54, 154.90, 148.35, 142.20, 134.83, 129.25, 128.83, 127.79, 127.18, 123.74, 84.18, 77.48, 77.16, 76.84, 61.46, 14.26, 13.16. HRMS (APCI) calcd for $C_{18}H_{19}N_2O_5$ [M+H]$^+$: 343.1288; Found: 343.1281.

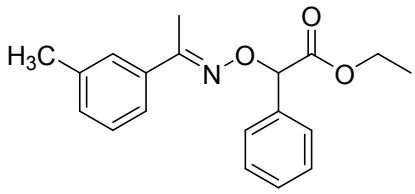


Ethyl (*E*)-2-(((1-(4-methoxyphenyl) ethylidene) amino) oxy)-2-phenylacetate (5c): Colorless oil; 70% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66–7.53 (m, 4H), 7.46–7.36 (m, 3H), 6.89 (d, *J* = 8.8 Hz, 2H), 5.72 (s, 1H), 4.27–4.16 (m, 2H), 3.82 (s, 3H), 2.35 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.04, 160.71, 156.43, 135.46, 128.90, 128.76, 128.67, 127.75, 127.69, 113.82, 83.67, 61.17, 55.39,

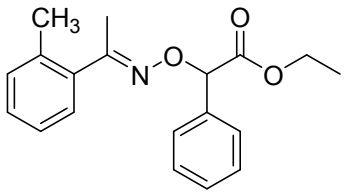
14.24, 13.20. HRMS (ESI) calcd for $C_{19}H_{21}NO_4Na$ $[M+Na]^+$: 350.1363; Found: 350.1368.



Ethyl (*E*)-2-phenyl-2-(((1-(*p*-tolyl) ethylidene) amino) oxy) acetate (5d): Colorless oil; 63% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60–7.52 (m, 4H), 7.45–7.38 (m, 3H), 7.18 (d, J = 8.1 Hz, 2H), 5.73 (s, 1H), 4.28–4.18 (m, 2H), 2.37 (d, J = 3.0 Hz, 6H), 1.25 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.01, 156.86, 139.51, 135.39, 133.42, 129.16, 128.93, 128.68, 127.70, 126.30, 83.69, 61.20, 21.40, 14.25, 13.31. HRMS (ESI) calcd for $C_{19}H_{22}NO_3$ $[M+H]^+$: 312.1594; Found: 312.1589.

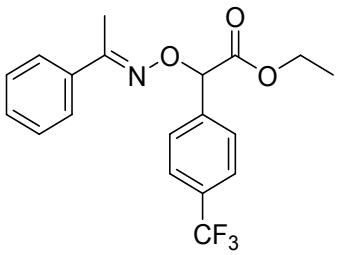


Ethyl (*E*)-2-phenyl-2-(((1-(*m*-tolyl) ethylidene) amino) oxy) acetate (5e): Colorless oil; 45% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (dd, J = 7.6, 1.7 Hz, 2H), 7.48–7.38 (m, 5H), 7.27 (t, J = 7.6 Hz, 1H), 7.19 (d, J = 7.5 Hz, 1H), 5.75 (s, 1H), 4.29–4.17 (m, 2H), 2.38 (d, J = 3.2 Hz, 6H), 1.25 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.97, 157.17, 138.09, 136.21, 135.36, 130.25, 128.95, 128.70, 128.38, 127.70, 127.03, 123.60, 83.71, 61.22, 21.57, 14.25, 13.51. HRMS (ESI) calcd for $C_{19}H_{21}NO_3Na$ $[M+Na]^+$: 334.1414; Found: 334.1409.

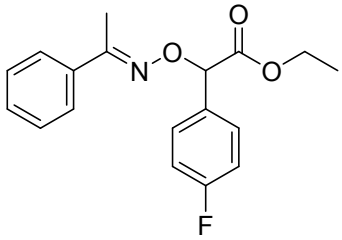


Ethyl (*E*)-2-phenyl-2-(((1-(*o*-tolyl) ethylidene) amino) oxy) acetate (5f): Light yellow oil; 27% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 (dd, J = 7.6, 1.8 Hz, 2H), 7.45–7.34 (m, 3H), 7.26–7.15 (m, 4H), 5.69 (s, 1H), 4.27–4.11 (m, 2H), 2.33 (d, J = 5.6 Hz, 6H), 1.23 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.98, 157.19,

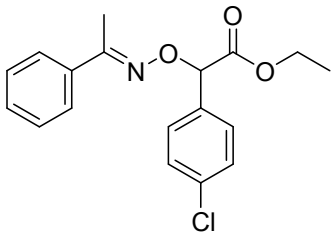
138.11, 136.26, 135.43, 130.26, 128.95, 128.71, 128.39, 127.72, 127.05, 123.63, 83.76, 61.23, 21.58, 14.26, 13.51. HRMS (ESI) calcd for $C_{19}H_{22}NO_3$ $[M+H]^+$: 312.1594; Found: 312.1588.



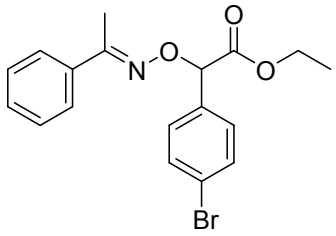
Ethyl (*E*)-2-(((1-phenylethylidene) amino) oxy)-2-(4-(trifluoromethyl) phenyl) acetate (5g): Colorless oil; 60% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70–7.61 (m, 6H), 7.37 (dd, *J* = 5.1, 1.9 Hz, 3H), 5.79 (s, 1H), 4.29–4.17 (m, 2H), 2.39 (s, 3H), 1.25 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.18, 157.44, 139.43, 136.04, 131.07 (q, *J* = 32.5 Hz), 129.67, 128.55, 127.94, 126.45, 125.68 (q, *J* = 3.8 Hz), 124.12 (q, *J* = 272.3 Hz), 83.10, 61.60, 14.23, 13.40. HRMS (ESI) calcd for $C_{19}H_{18}F_3NO_3Na$ $[M+Na]^+$: 388.1131; Found: 388.1136.



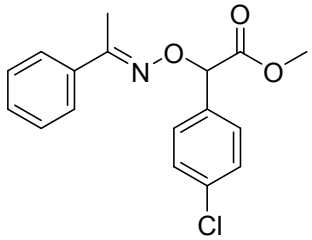
Ethyl (*E*)-2-(4-fluorophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate (5h): Colorless oil; 83% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 6.7, 3.0 Hz, 2H), 7.58–7.50 (m, 2H), 7.37 (dd, *J* = 5.0, 1.7 Hz, 3H), 7.14–7.05 (m, 2H), 5.70 (s, 1H), 4.28–4.17 (m, 2H), 2.36 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} (100 MHz, $CDCl_3$) δ 170.78, 163.16 (d, *J* = 247.6 Hz), 157.09, 136.18, 131.31 (d, *J* = 3.2 Hz), 129.64, 129.56, 128.51, 126.43, 115.81, 115.59, 83.03, 61.35, 14.25, 13.37. HRMS (ESI) calcd for $C_{18}H_{18}FNO_3Na$ $[M+Na]^+$: 338.1163; Found: 338.1158.



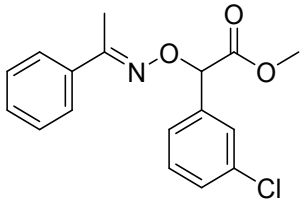
Ethyl (*E*)-2-(4-chlorophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate (5i): Colorless oil; 81% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 6.8, 3.0 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.40–7.35 (m, 5H), 5.70 (s, 1H), 4.28–4.15 (m, 2H), 2.36 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.51, 157.17, 136.13, 134.91, 134.00, 129.58, 129.06, 128.93, 128.51, 126.42, 83.02, 61.41, 14.24, 13.36. HRMS (ESI) calcd for $C_{18}H_{18}ClNO_3Na$ $[M+Na]^+$: 354.0867; Found: 354.0867.



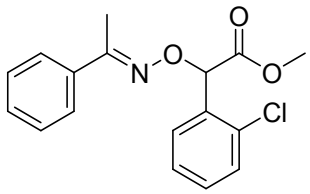
Ethyl (E)-2-(4-bromophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate (5j): Light yellow oil; 76% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68–7.61 (m, 2H), 7.53 (d, *J* = 8.5 Hz, 2H), 7.43 (d, *J* = 8.4 Hz, 2H), 7.40–7.33 (m, 3H), 5.68 (s, 1H), 4.28–4.14 (m, 2H), 2.36 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.43, 157.19, 136.11, 134.51, 131.88, 129.58, 129.35, 128.51, 126.42, 123.12, 83.06, 61.43, 14.24, 13.36. HRMS (ESI) calcd for $C_{18}H_{18}BrNO_3Na$ $[M+Na]^+$: 398.0362; Found: 398.0362.



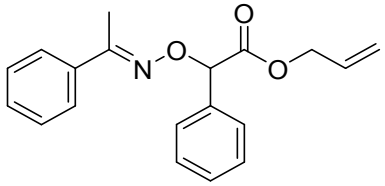
Methyl (*E*)-2-(4-chlorophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate (5l): White solid; 85% yield; m.p 84-86 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (dd, *J* = 6.5, 3.2 Hz, 2H), 7.48 (d, *J* = 8.4 Hz, 2H), 7.40–7.35 (m, 5H), 5.71 (s, 1H), 3.75 (s, 3H), 2.36 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.03, 157.28, 136.07, 135.02, 133.84, 131.64, 129.63, 129.09, 128.99, 128.53, 126.45, 82.93, 52.48, 13.40. HRMS (ESI) calcd for $C_{17}H_{16}ClNO_3Na$ $[M+Na]^+$: 340.0711; Found: 340.0721.



Methyl (*E*)-2-(3-chlorophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate(5m): Colorless oil; 70% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 6.5, 3.2 Hz, 2H), 7.55 (s, 1H), 7.46–7.41 (m, 1H), 7.39–7.30 (m, 5H), 5.72 (s, 1H), 3.76 (s, 3H), 2.38 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.82, 157.38, 137.26, 136.05, 134.66, 130.02, 129.64, 129.21, 128.53, 127.78, 126.46, 125.83, 82.98, 52.52, 13.44. HRMS (ESI) calcd for $C_{17}H_{17}ClNO_3$ $[M+H]^+$: 318.0891; Found: 318.0898.

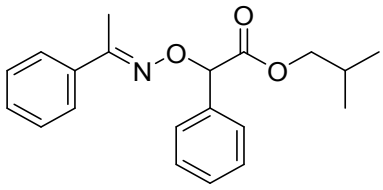


Methyl (*E*)-2-(2-chlorophenyl)-2-(((1-phenylethylidene) amino) oxy) acetate(5n): White solid; 60% yield; m.p 55-57 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67–7.63 (m, 2H), 7.62–7.58 (m, 1H), 7.46–7.42 (m, 1H), 7.37 (dd, *J* = 4.3, 2.4 Hz, 3H), 7.33–7.29 (m, 2H), 6.24 (s, 1H), 3.77 (s, 3H), 2.35 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.75, 157.08, 136.13, 134.12, 133.57, 130.18, 129.89, 129.54, 129.43, 128.48, 127.17, 126.46, 80.21, 52.45, 13.31. HRMS (ESI) calcd for $C_{17}H_{17}ClNO_3$ $[M+H]^+$: 318.0891; Found: 318.0902.

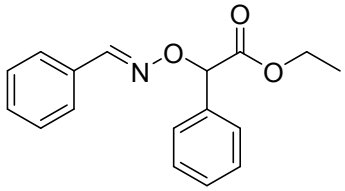


Allyl (*E*)-2-phenyl-2-(((1-phenylethylidene) amino) oxy) acetate (5o): Yellow oil; 72% yield; ^{1}H NMR (400 MHz, $CDCl_3$) ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68–7.63 (m, 2H), 7.57 (dd, *J* = 7.6, 1.7 Hz, 2H), 7.43–7.35 (m, 6H), 5.87 (dd, *J* = 17.2, 10.5 Hz, 1H), 5.79 (s, 1H), 5.25 (dd, *J* = 17.2, 1.5 Hz, 1H), 5.18 (dd, *J* = 10.5, 1.3 Hz, 1H), 4.67 (dt, *J* = 5.5, 1.4 Hz, 2H), 2.38 (s, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.61, 157.01, 136.22, 135.23, 131.85, 129.50, 129.06, 128.74, 128.48, 127.76, 126.44,

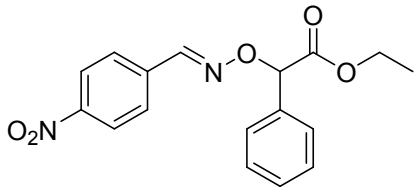
118.22, 83.77, 65.61, 13.37. HRMS (ESI) calcd for $C_{19}H_{20}NO_3$ $[M+H]^+$: 310.1438; Found: 310.1449.



Isobutyl (*E*)-2-phenyl-2-(((1-phenylethylidene) amino) oxy) acetate (5p): Colorless oil; 79% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68–7.63 (m, 2H), 7.57 (dd, *J* = 7.7, 1.6 Hz, 2H), 7.42–7.35 (m, 6H), 5.76 (s, 1H), 4.00–3.90 (m, 2H), 2.38 (s, 3H), 1.97–1.87 (m, 1H), 0.86 (dd, *J* = 6.7, 1.3 Hz, 6H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 171.01, 156.85, 136.28, 135.52, 129.46, 128.95, 128.68, 128.47, 127.69, 126.41, 83.89, 71.16, 27.89, 19.02, 19.01, 13.33. HRMS (ESI) calcd for $C_{20}H_{24}NO_3$ $[M+H]^+$: 326.1751; Found: 326.1764.

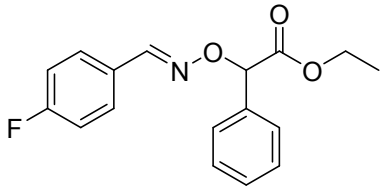


Ethyl (*E*)-2-((benzylideneamino)oxy)-2-phenylacetate (5q): Colorless oil; 63% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (s, 1H), 7.64–7.57 (m, 2H), 7.55 (dd, *J* = 7.6, 1.8 Hz, 2H), 7.43–7.36 (m, 6H), 5.73 (s, 1H), 4.35–4.16 (m, 2H), 1.26 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.66, 150.70, 134.93, 131.78, 130.31, 129.13, 128.78, 127.83, 127.48, 83.90, 61.38, 14.24. HRMS (ESI) calcd for $C_{17}H_{18}NO_3$ $[M+H]^+$: 284.1281; Found: 284.1275.

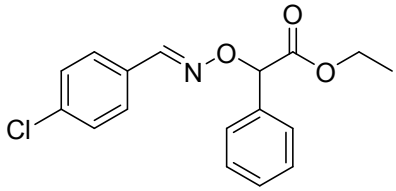


Ethyl (*E*)-2-(((4-nitrobenzylidene) amino) oxy)-2-phenylacetate (5r): White solid; 57% yield; m.p 101-104 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (s, 1H), 8.23 (d, *J* = 8.9 Hz, 2H), 7.78–7.72 (m, 2H), 7.55–7.49 (m, 2H), 7.42–7.40 (m, 2H), 7.36–7.32 (m, 1H), 5.75 (s, 1H), 4.29–4.19 (m, 2H), 1.25 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100

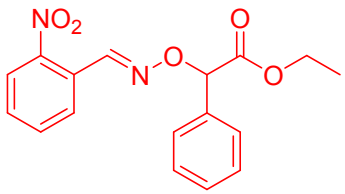
MHz, $CDCl_3$) δ 170.23, 148.72, 148.48, 137.86, 134.41, 129.41, 128.90, 128.10, 127.88, 124.10, 84.36, 61.60, 14.24. HRMS (ESI) calcd for $C_{17}H_{16}N_2O_5Na$ $[M+Na]^+$: 351.0951; Found: 351.0956.



Ethyl (*E*)-2-(((4-fluorobenzylidene) amino) oxy)-2-phenylacetate (5s): Colorless oil; 68% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.24 (s, 1H), 7.60–7.51 (m, 4H), 7.44–7.36 (m, 3H), 7.09–7.02 (m, 2H), 5.70 (s, 1H), 4.30–4.15 (m, 2H), 1.25 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 170.62, 164.01 (d, J = 250.6 Hz), 149.51, 134.87, 133.67 (d, J = 8.5 Hz), 129.39, 129.30, 129.18, 128.80, 128.02 (d, J = 3.2 Hz), 116.07, 115.85, 83.92, 61.41, 14.24. HRMS (ESI) calcd for $C_{17}H_{17}FNO_3$ $[M+H]^+$: 302.1187; Found: 302.1181.

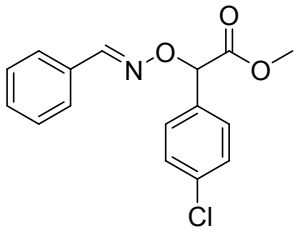


Ethyl (*E*)-2-(((4-chlorobenzylidene) amino) oxy)-2-phenylacetate (5t): Colorless oil; 59% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.22 (s, 1H), 7.52 (dd, J = 8.3, 2.0 Hz, 4H), 7.43–7.37 (m, 3H), 7.36–7.32 (m, 2H), 5.70 (s, 1H), 4.29–4.18 (m, 2H), 1.25 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) δ 170.56, 149.53, 136.25, 134.79, 130.31, 129.23, 129.11, 128.83, 128.67, 127.85, 84.00, 61.46, 14.26. HRMS (ESI) calcd for $C_{17}H_{16}ClNO_3Na$ $[M+Na]^+$: 340.0711; Found: 340.0709.

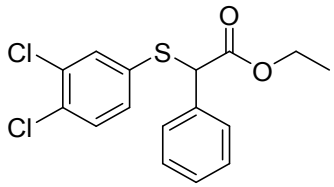


Ethyl (*E*)-2-(((2-nitrobenzylidene) amino) oxy)-2-phenylacetate (5u): Colorless oil; 31% yield; ^1H NMR (400 MHz, $CDCl_3$) δ 8.84 (s, 1H), 8.06 (dd, J = 8.2, 1.2 Hz, 1H), 7.94 (dd, J = 7.8, 1.4 Hz, 1H), 7.66–7.60 (m, 1H), 7.58–7.51 (m, 3H), 7.42–7.39 (m,

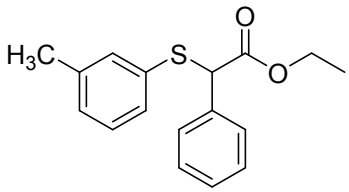
2H), 7.36–7.30 (m, 1H), 5.73 (s, 1H), 4.28–4.18 (m, 2H), 1.25 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.56, 149.53, 136.25, 134.80, 130.32, 129.22, 129.11, 128.83, 128.67, 127.85, 84.01, 61.46, 14.26. HRMS (ESI) calcd for $C_{17}H_{16}N_2O_5Na$ $[M+Na]^+$: 351.0951; Found: 351.0950.



Methyl (*E*)-2-((benzylideneamino)oxy)-2-(4-chlorophenyl) acetate (5v): White solid; 55% yield; m.p 50-52 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.26 (s, 1H), 7.58 (dd, J = 7.4, 2.2 Hz, 2H), 7.49–7.45 (m, 2H), 7.41–7.34 (m, 5H), 5.70 (s, 1H), 3.77 (s, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.73, 151.03, 135.17, 133.47, 131.57, 130.47, 129.16, 129.04, 128.82, 127.53, 83.03, 52.56. HRMS (ESI) calcd for $C_{16}H_{14}ClNO_3Na$ $[M+Na]^+$: 326.0554; Found: 326.0556.

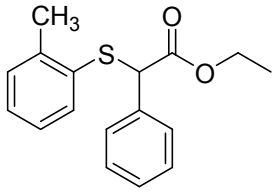


Ethyl 2-((3,4-dichlorophenyl) thio)-2-phenylacetate (7b): Colorless oil; 79% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47–7.40 (m, 3H), 7.36–7.30 (m, 4H), 7.17 (dd, J = 8.4, 2.1 Hz, 1H), 4.90 (s, 1H), 4.22–4.10 (m, 2H), 1.20 (t, J = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 169.96, 135.04, 133.99, 133.97, 132.86, 132.39, 131.70, 130.68, 128.91, 128.70, 128.60, 62.10, 56.23, 14.11. HRMS (APCI) calcd for $C_{16}H_{13}Cl_2O_2S$ $[M-H]^-$: 339.0019; Found: 339.0015.

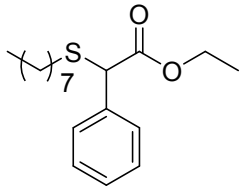


Ethyl 2-phenyl-2-(*m*-tolylthio) acetate (7d): Colorless oil; 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (dd, J = 7.9, 1.5 Hz, 2H), 7.38–7.29 (m, 3H), 7.24–7.13 (m, 3H), 7.08 (dd, J = 7.3, 0.6 Hz, 1H), 4.93 (s, 1H), 4.26–4.05 (m, 2H), 2.31 (s, 3H), 1.19 (t, J

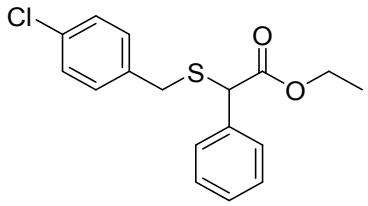
= 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.57, 138.76, 135.80, 133.67, 133.18, 129.51, 128.83, 128.79, 128.70, 128.60, 128.32, 61.74, 56.33, 21.29, 14.07. HRMS (ESI) calcd for $C_{17}H_{19}O_2S$ $[M+H]^+$: 287.1100; Found: 287.1090.



Ethyl 2-phenyl-2-(*o*-tolylthio) acetate (7e): Colorless oil; 67% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 7.7, 1.7 Hz, 2H), 7.38–7.28 (m, 4H), 7.20–7.14 (m, 2H), 7.13–7.06 (m, 1H), 4.84 (s, 1H), 4.19–4.04 (m, 2H), 2.39 (s, 3H), 1.16 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.61, 140.57, 135.84, 133.28, 133.13, 130.49, 128.77, 128.64, 128.40, 128.16, 126.59, 61.82, 55.64, 20.73, 14.10. HRMS (ESI) calcd for $C_{17}H_{18}O_2SNa$ $[M+Na]^+$: 309.0920; Found: 309.0913.

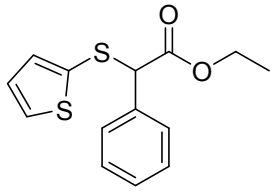


Ethyl 2-(octylthio)-2-phenylacetate (7g): Colorless oil; 65% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 7.0 Hz, 2H), 7.38–7.26 (m, 3H), 4.56 (s, 1H), 4.28–4.10 (m, 2H), 2.61–2.42 (m, 2H), 1.63–1.45 (m, 2H), 1.36–1.19 (m, 13H), 0.87 (t, *J* = 6.8 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 171.05, 136.43, 128.66, 128.55, 128.10, 61.70, 52.39, 32.04, 31.87, 29.21, 29.20, 29.06, 28.90, 22.73, 14.19. HRMS (ESI) calcd for $C_{18}H_{28}O_2SNa$ $[M+Na]^+$: 331.1702; Found: 331.1699.

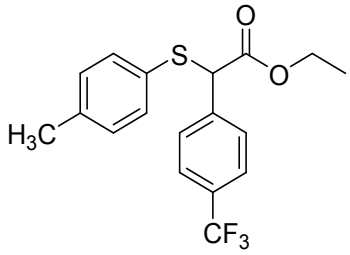


Ethyl 2-((4-chlorobenzyl) thio)-2-phenylacetate (7h): Colorless oil; 76% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (dd, *J* = 7.9, 1.5 Hz, 2H), 7.37–7.27 (m, 5H), 7.22 (d, *J* = 8.4 Hz, 2H), 4.39 (s, 1H), 4.23–4.09 (m, 2H), 3.75 (d, *J* = 13.6 Hz, 1H), 3.59 (d, *J* = 13.6 Hz, 1H), 1.25 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.63,

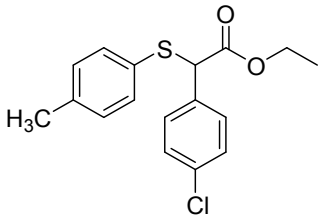
135.88, 135.78, 133.14, 130.50, 128.83, 128.80, 128.70, 128.36, 61.90, 51.73, 35.58, 14.20. HRMS (ESI) calcd for $C_{17}H_{18}ClO_2S$ $[M+H]^+$: 321.0711; Found: 321.0716.



Ethyl 2-phenyl-2-(thiophen-2-ylthio) acetate (7i): Colorless oil; 61% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42–7.36 (m, 3H), 7.35–7.29 (m, 3H), 7.06 (dd, J = 3.6, 1.2 Hz, 1H), 6.94 (dd, J = 5.3, 3.6 Hz, 1H), 4.77 (s, 1H), 4.22–4.11 (m, 2H), 1.21 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 170.15, 136.34, 135.38, 131.30, 131.23, 128.74, 128.71, 128.49, 127.62, 61.93, 59.20, 14.14. HRMS (ESI) calcd for $C_{14}H_{18}NO_2S_2$ $[M+NH_4]^+$: 296.0773; Found: 296.0763.

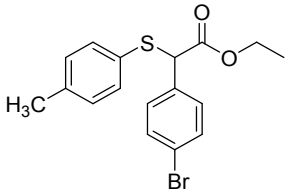


Ethyl 2-(*p*-tolylthio)-2-(4-(trifluoromethyl) phenyl) acetate (7j): Colorless oil; 62% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65–7.53 (m, 4H), 7.30 (d, J = 8.1 Hz, 2H), 7.11 (d, J = 7.9 Hz, 2H), 4.88 (s, 1H), 4.26–4.07 (m, 2H), 2.35 (s, 3H), 1.22 (t, J = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) δ 169.97, 140.19, 138.98, 133.88, 130.41 (q, J = 32.5 Hz), 129.97, 129.29, 129.12, 125.60 (q, J = 3.7 Hz), 124.11 (q, J = 272.2 Hz), 62.06, 56.50, 21.26, 14.08. HRMS (ESI) calcd for $C_{18}H_{17}F_3O_2SNa$ $[M+Na]^+$: 377.0794; Found: 377.0806.

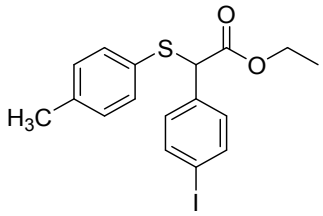


Ethyl 2-(4-chlorophenyl)-2-(*p*-tolylthio) acetate (7k): Colorless oil; 85% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43–7.38 (m, 2H), 7.31 (dd, J = 8.3, 6.8 Hz, 4H), 7.11 (d,

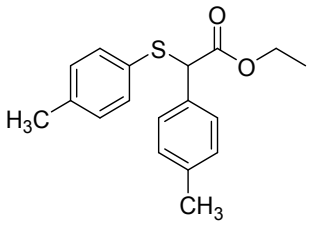
J = 7.9 Hz, 2H), 4.82 (s, 1H), 4.23–4.10 (m, 2H), 2.35 (s, 3H), 1.22 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.22, 138.74, 134.62, 134.19, 133.73, 130.04, 129.89, 129.54, 128.84, 61.90, 56.21, 21.27, 14.09. HRMS (ESI) calcd for $C_{17}H_{18}ClO_2S$ $[M+H]^+$: 321.0711; Found: 321.0716.



Ethyl 2-(4-bromophenyl)-2-(*p*-tolylthio) acetate (7l): Colorless oil; 81% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46–7.40 (m, 2H), 7.32–7.23 (m, 4H), 7.07 (d, *J* = 7.9 Hz, 2H), 4.76 (s, 1H), 4.19–4.05 (m, 2H), 2.31 (s, 3H), 1.17 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.10, 138.72, 135.13, 133.70, 131.77, 130.34, 129.88, 129.49, 122.36, 61.89, 56.25, 21.26, 14.07. HRMS (ESI) calcd for $C_{17}H_{17}BrO_2SNa$ $[M+Na]^+$: 387.0025; Found: 387.0028.

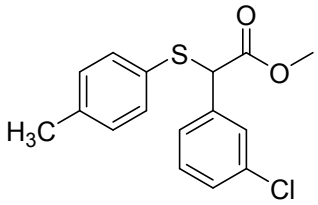


Ethyl 2-(4-iodophenyl)-2-(*p*-tolylthio) acetate (7m): Colorless oil; 70% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66–7.61 (m, 2H), 7.28–7.24 (m, 2H), 7.20–7.15 (m, 2H), 7.07 (d, *J* = 7.9 Hz, 2H), 4.75 (s, 1H), 4.21–4.03 (m, 2H), 2.32 (s, 3H), 1.18 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.10, 138.72, 137.76, 135.80, 133.67, 130.55, 129.90, 129.52, 94.11, 61.92, 56.39, 21.28, 14.09. HRMS (ESI) calcd for $C_{17}H_{17}IO_2SNa$ $[M+Na]^+$: 434.9886; Found: 434.9886.

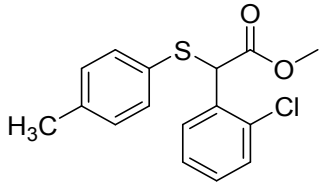


Ethyl 2-(*p*-tolyl)-2-(*p*-tolylthio) acetate (7n): Colorless oil; 80% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (d, *J* = 8.1 Hz, 2H), 7.33–7.28 (m, 2H), 7.14 (d, *J* = 8.0 Hz, 2H),

7.09 (d, *J* = 7.9 Hz, 2H), 4.84 (s, 1H), 4.19–4.06 (m, 2H), 2.34 (s, 3H), 2.32 (s, 3H), 1.17 (t, *J* = 7.1 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.75, 138.24, 138.10, 133.22, 132.87, 130.37, 129.78, 129.41, 128.49, 61.66, 56.58, 21.24, 14.09. HRMS (ESI) calcd for $C_{18}H_{20}O_2SNa$ $[M+Na]^+$: 323.1076; Found: 323.1081.



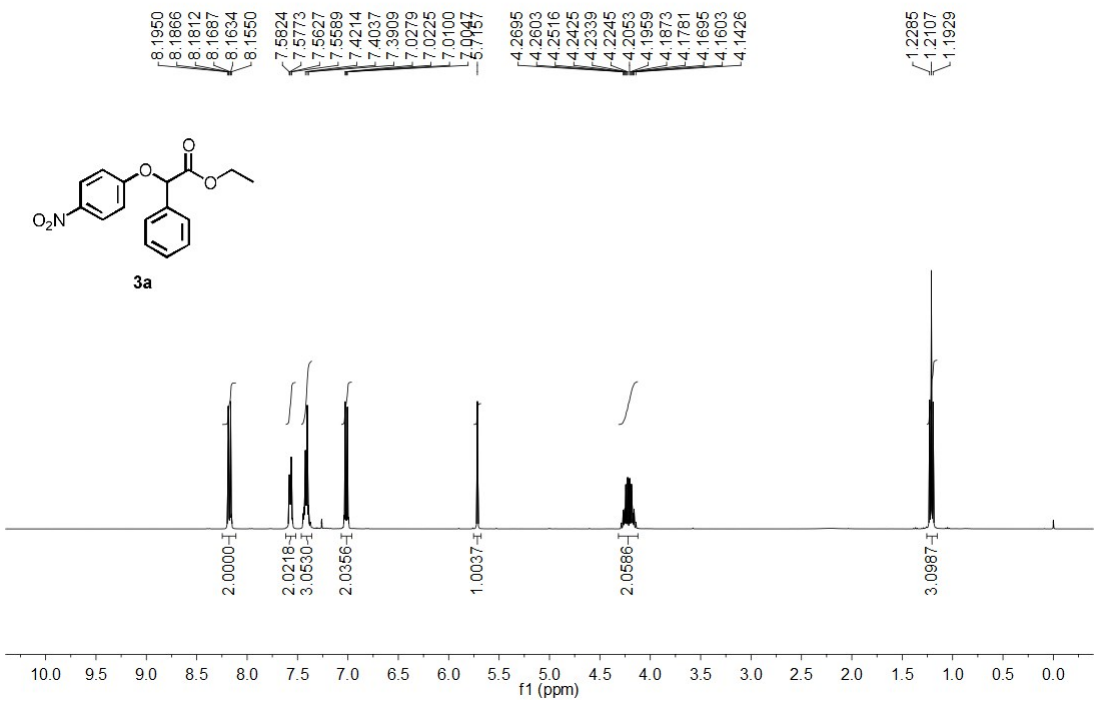
Methyl 2-(3-chlorophenyl)-2-(*p*-tolylthio) acetate (7q): Colorless oil; 78% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, *J* = 1.8 Hz, 1H), 7.38–7.27 (m, 5H), 7.13 (d, *J* = 8.0 Hz, 2H), 4.84 (s, 1H), 3.73 (s, 3H), 2.37 (s, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.50, 138.88, 137.87, 134.49, 133.77, 129.94, 129.87, 129.32, 128.77, 128.50, 126.86, 56.31, 52.86, 21.25. HRMS (ESI) calcd for $C_{16}H_{15}ClO_2SNa$ $[M+Na]^+$: 329.0373; Found: 329.0386.



Methyl 2-(2-chlorophenyl)-2-(*p*-tolylthio) acetate (7r): Colorless oil; 70% yield; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 7.5, 2.0 Hz, 1H), 7.34 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.30 (d, *J* = 8.1 Hz, 2H), 7.26–7.19 (m, 2H), 7.07 (d, *J* = 7.9 Hz, 2H), 5.40 (s, 1H), 3.68 (s, 3H), 2.31 (s, 3H). $^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) δ 170.64, 138.76, 133.88, 133.84, 133.77, 130.29, 129.88, 129.64, 129.53, 129.38, 127.23, 52.89, 52.78, 21.29. HRMS (ESI) calcd for $C_{16}H_{15}ClO_2SNa$ $[M+Na]^+$: 329.0373; Found: 329.0385.

9. Copies of NMR spectra

FYF-1



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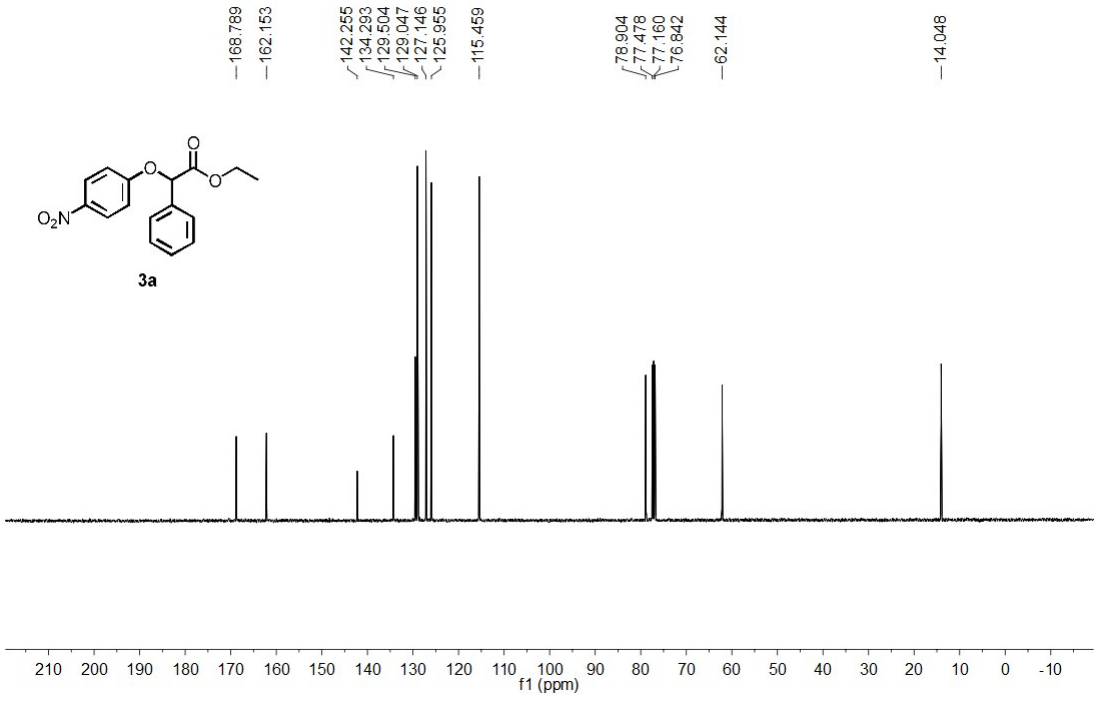

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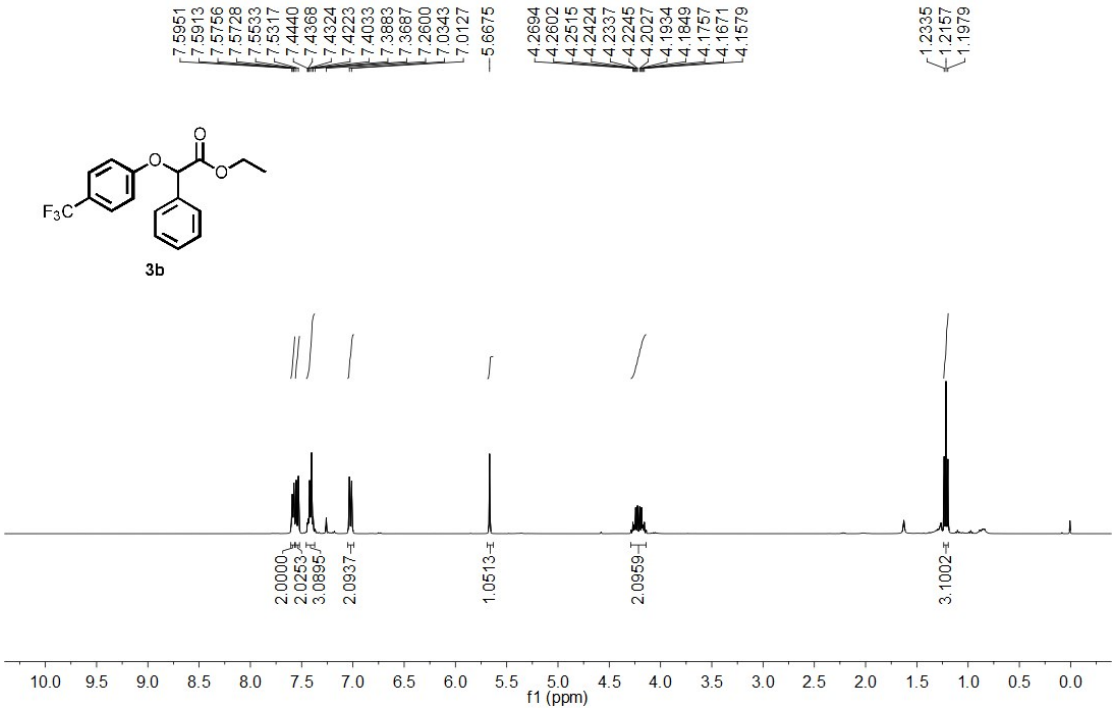
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3b
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1.0513
2.0959
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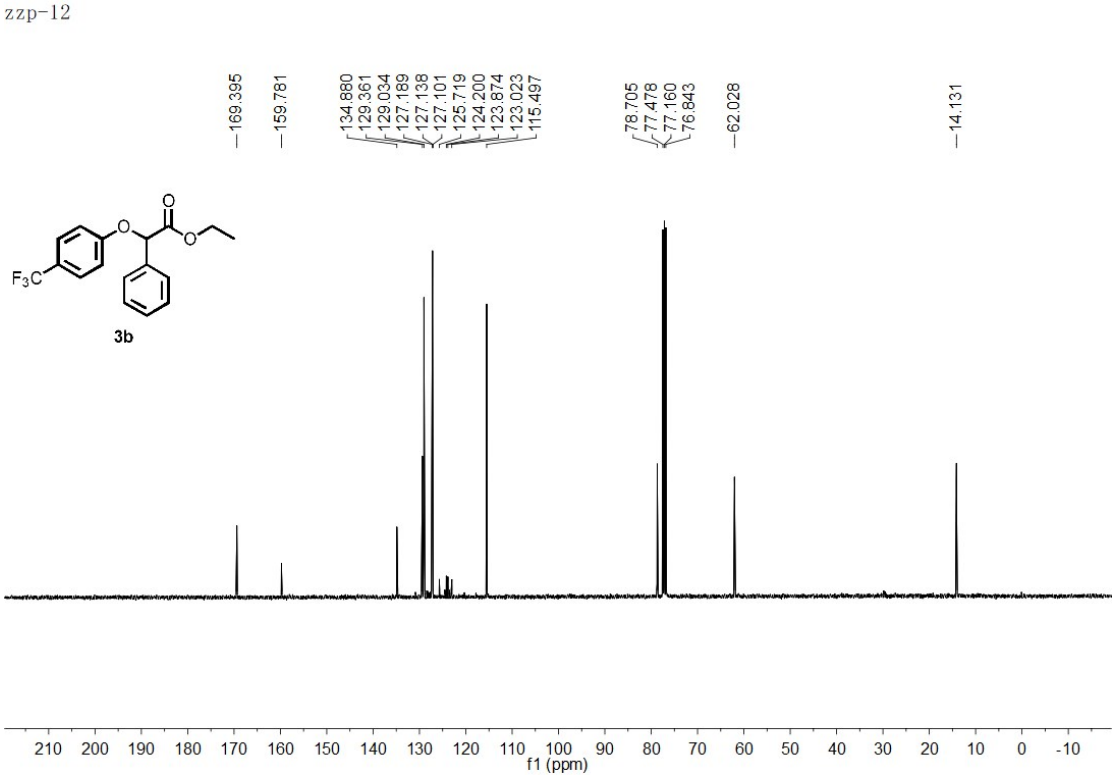
f1 (ppm)

zzp-12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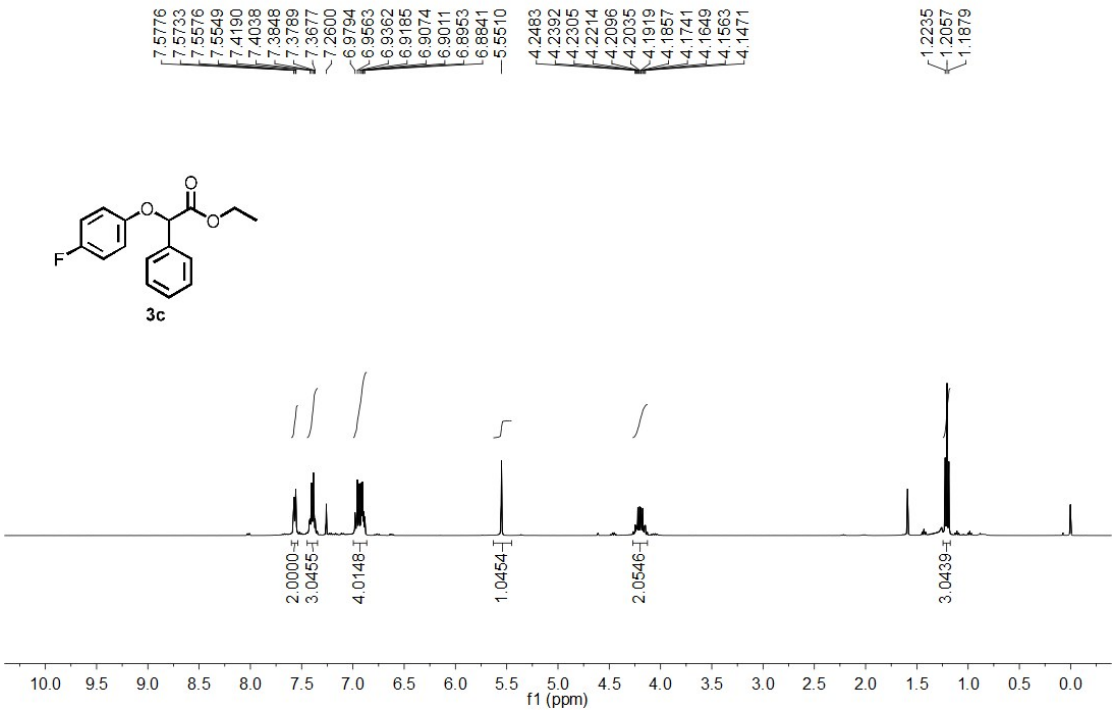
F3C
3b
f1 (ppm)

zzp-4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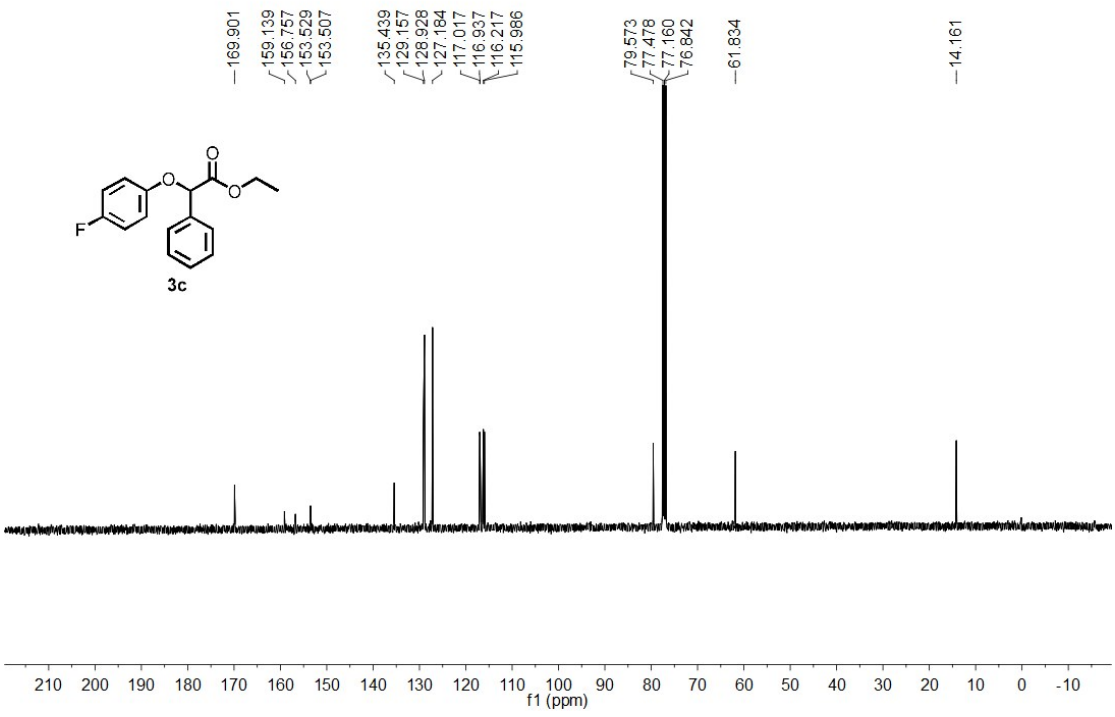
zzp-4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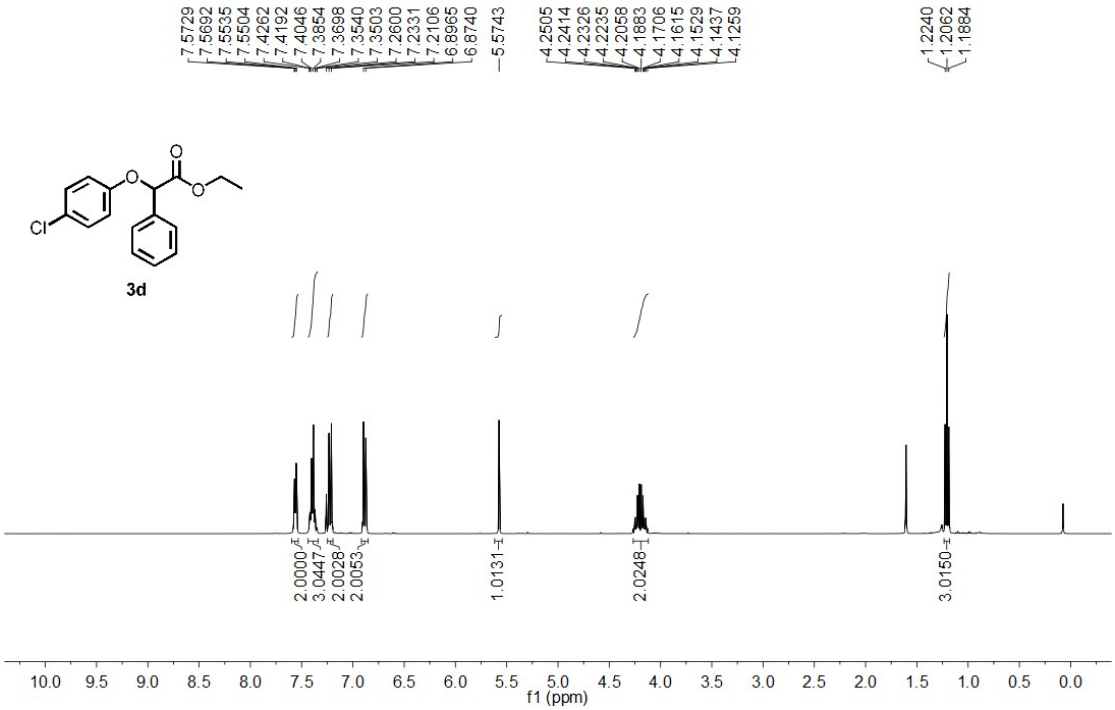
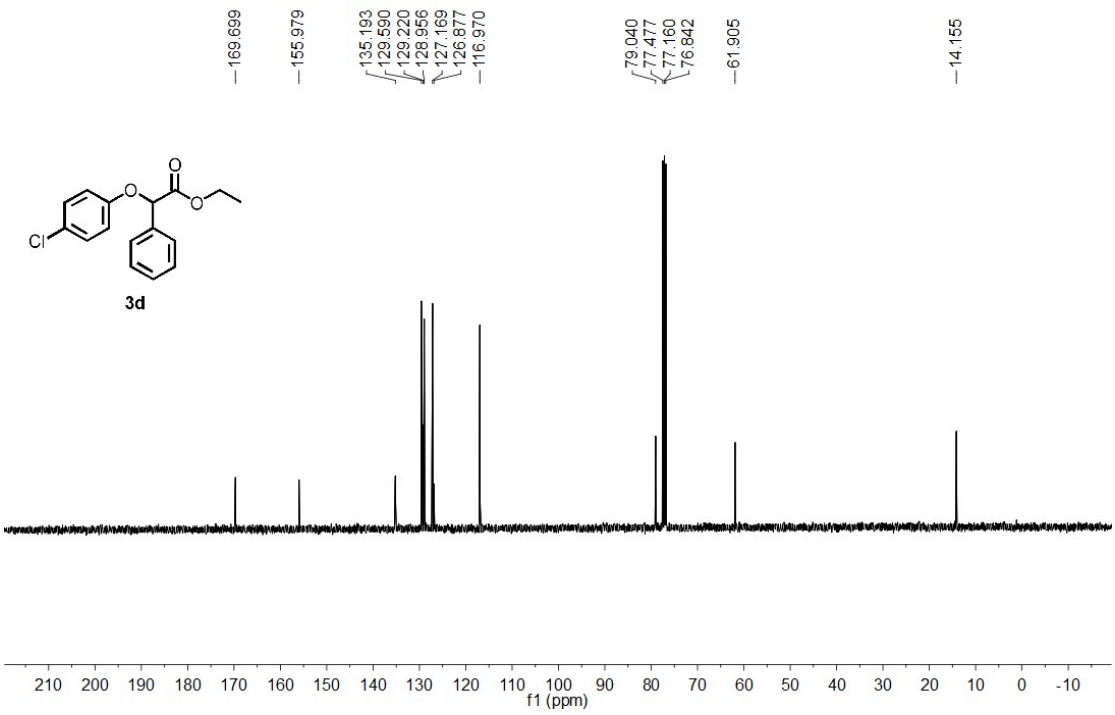
3c
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

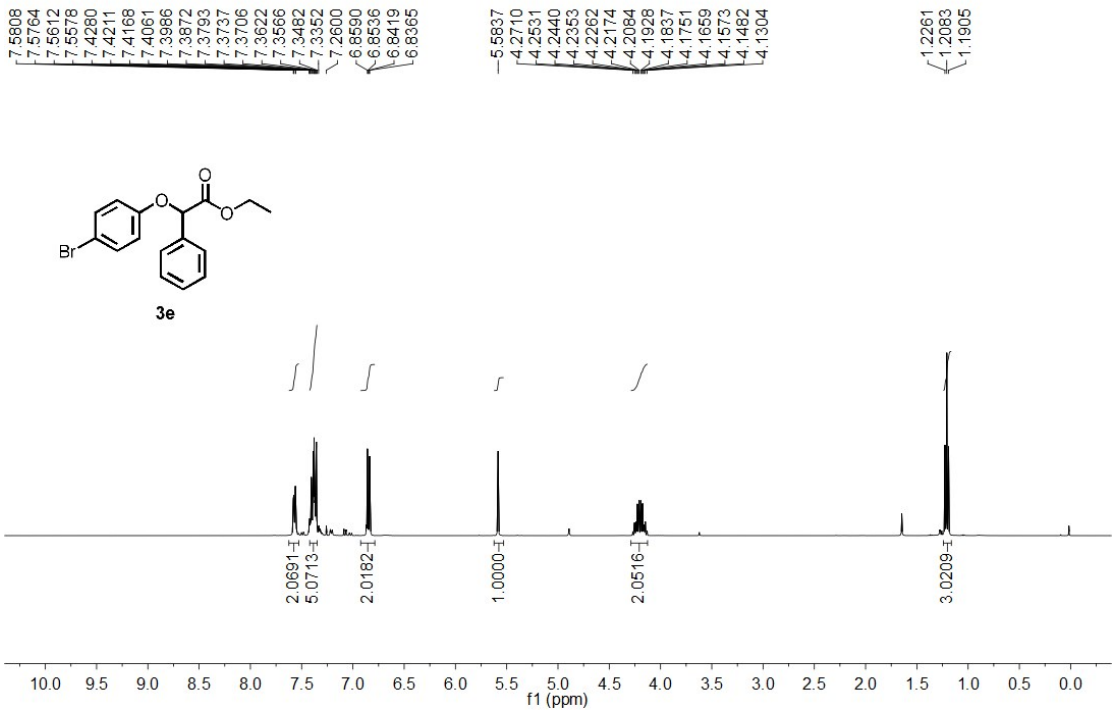
ZZP-3-2


7.5729
7.5692
7.5535
7.5504
7.4262
7.4192
7.4046
7.3854
7.3698
7.3540
7.3503
7.2600
7.2331
7.2106
6.8965
6.8740
5.5743
4.2505
4.2414
4.2326
4.2235
4.2058
4.1883
4.1706
4.1615
4.1529
4.1437
4.1259
1.2240
1.2062
1.1884
Cl
O
O
O
3d
2.0000
3.0447
2.0028
2.0053
1.0131
2.0248
3.0150
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

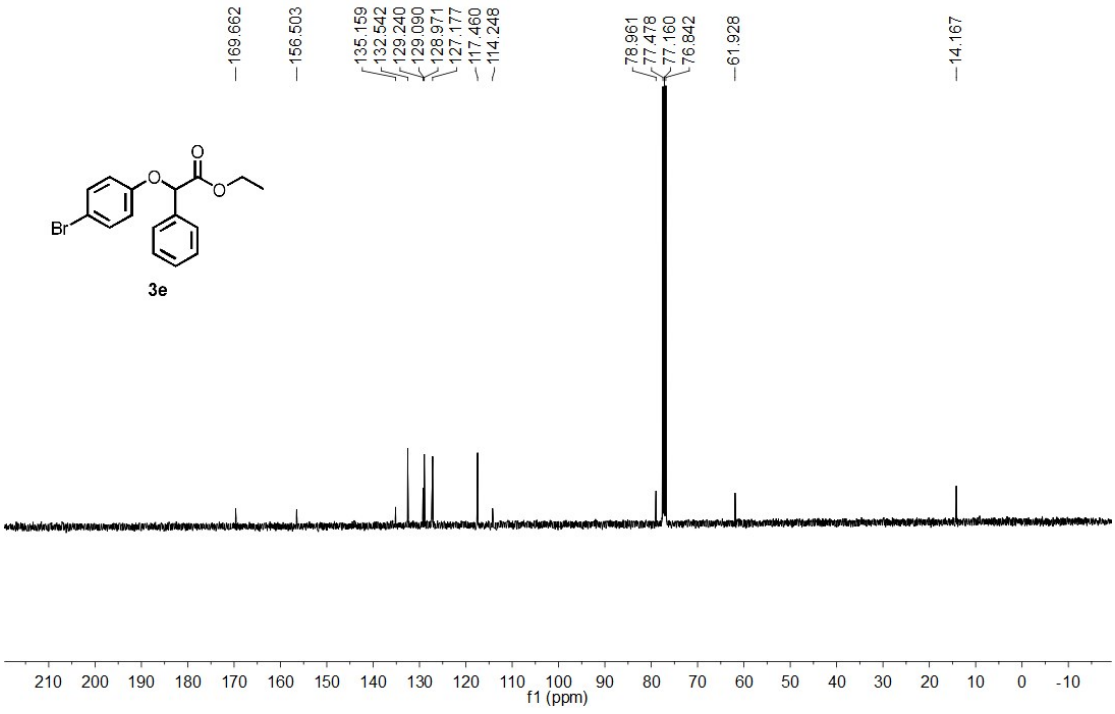
ZZP-3-2


169.699
155.979
135.193
129.590
129.220
128.956
127.169
126.877
116.970
79.040
77.477
77.160
76.842
61.905
14.155
Cl
O
O
O
3d
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

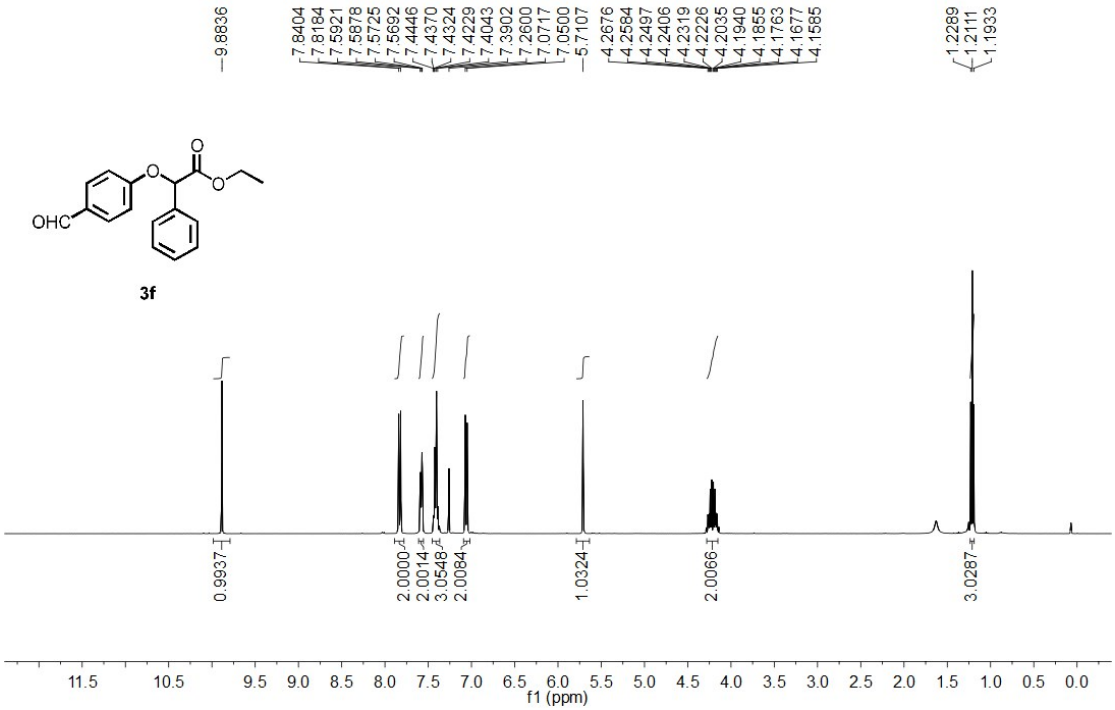
FYF-2


7.5808
7.5764
7.5612
7.5578
7.4280
7.4211
7.4168
7.4061
7.3986
7.3872
7.3793
7.3737
7.3706
7.3622
7.3566
7.3482
7.3352
7.2600
6.8590
6.8536
6.8419
6.8365
5.5837
4.2710
4.2531
4.2440
4.2353
4.2262
4.2174
4.2084
4.1928
4.1837
4.1751
4.1659
4.1573
4.1482
4.1304
1.2261
1.2083
1.1905
Br
O
O
O
3e
2.0691
5.0713
2.0182
1.0000
2.0516
3.0209
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

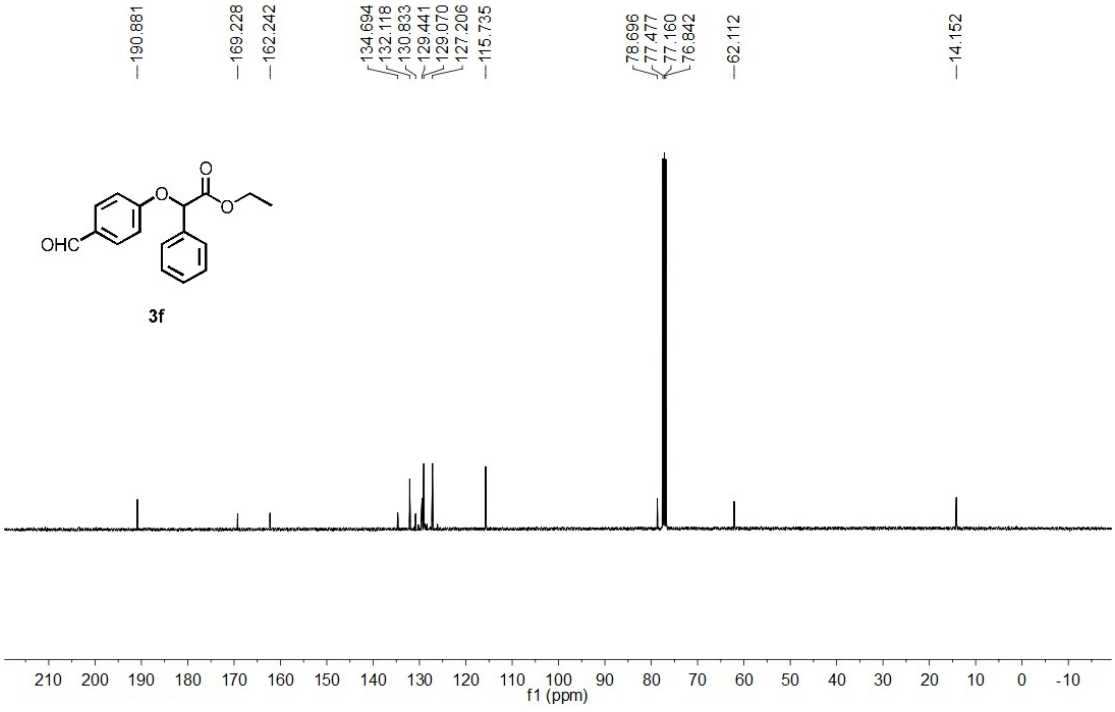
zzp-2


169.662
156.503
135.159
132.542
129.240
129.090
128.971
127.177
117.460
114.248
78.961
77.478
77.160
76.842
61.928
14.167
Br
O
O
O
3e
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

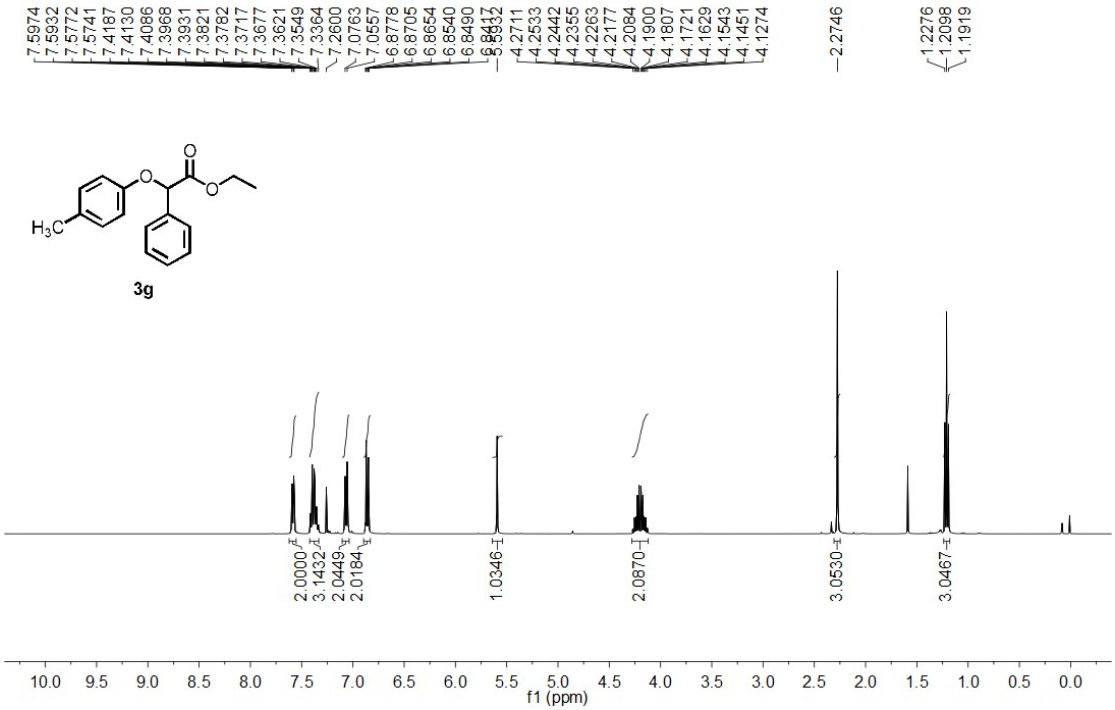
ZZP-18-2



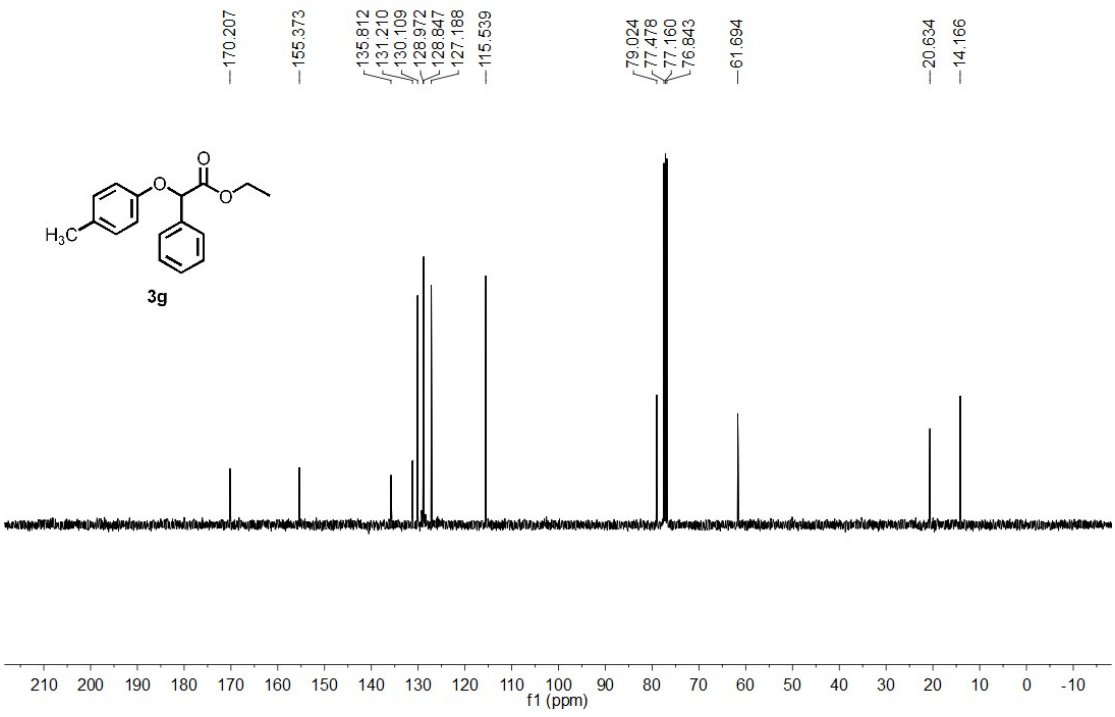
ZZP-18



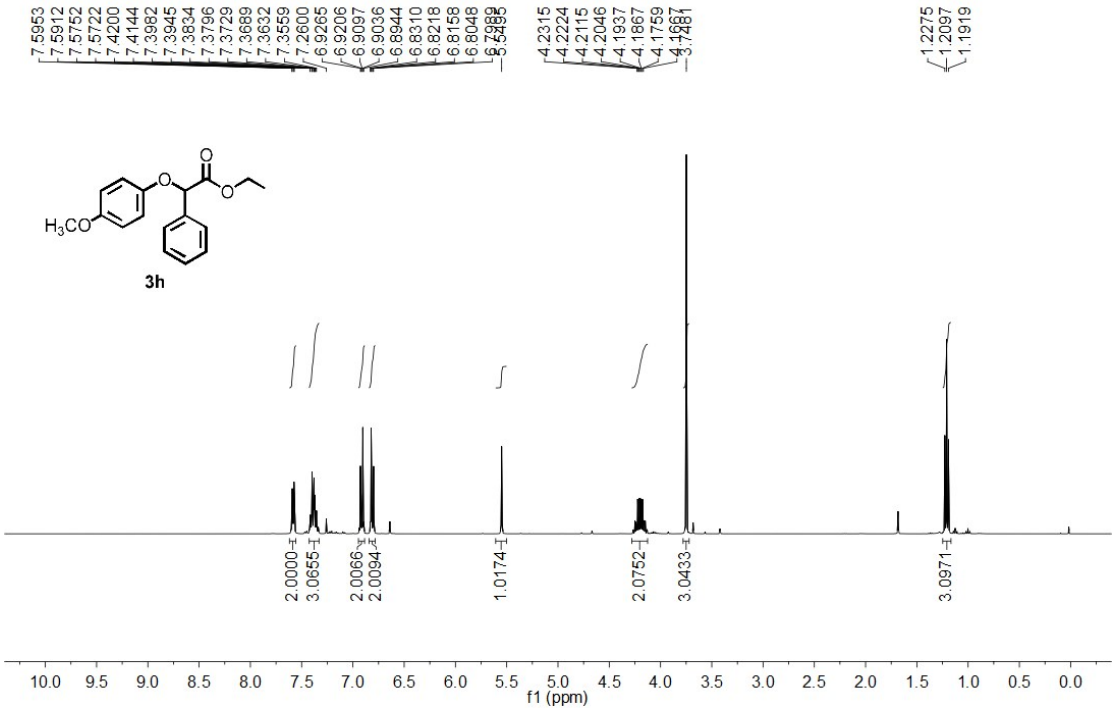
zzp-46


7.5974
7.5932
7.5772
7.5741
7.4187
7.4130
7.4086
7.3968
7.3931
7.3821
7.3782
7.3717
7.3677
7.3621
7.3549
7.3364
7.2600
7.0763
7.0557
6.8778
6.8705
6.8654
6.8540
6.8490
4.2711
4.2533
4.2442
4.2355
4.2263
4.2177
4.2084
4.1900
4.1807
4.1721
4.1629
4.1543
4.1451
4.1274
2.2746
1.2276
1.2098
1.1919
3g
2.0000
3.1432
2.0449
2.0184
1.0346
2.0870
3.0530
3.0467
f1 (ppm)

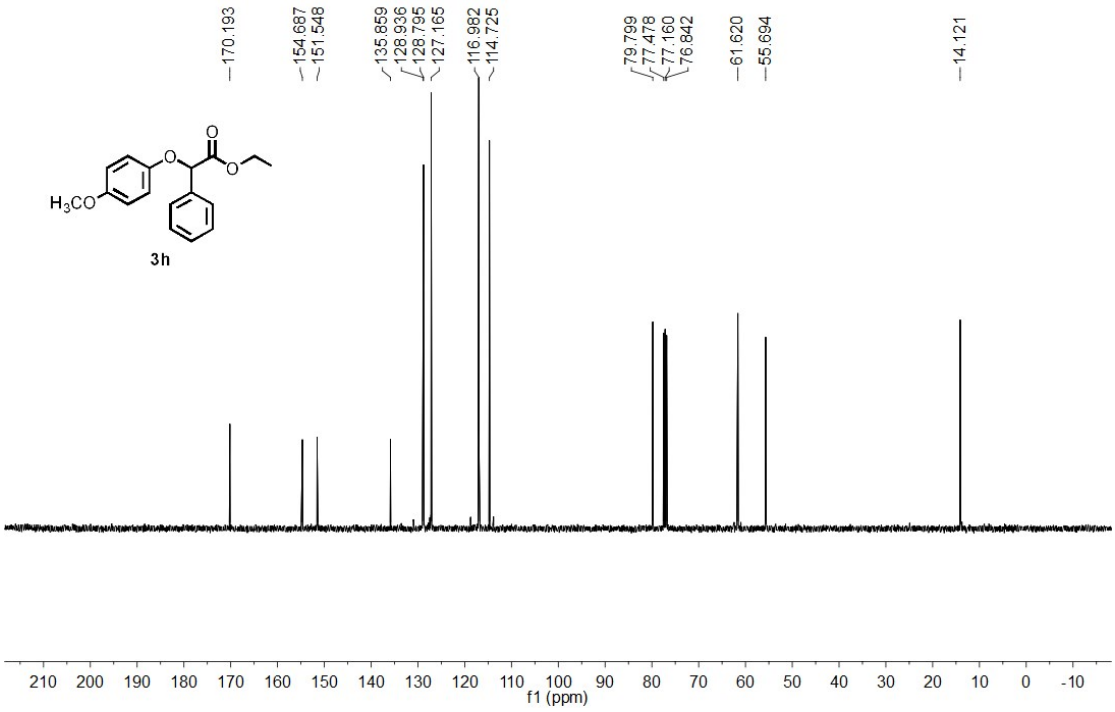
zzp-46


170.207
155.373
135.812
131.210
130.109
128.972
128.847
127.188
115.539
79.024
77.478
77.160
76.843
61.694
20.634
14.166
3g
f1 (ppm)

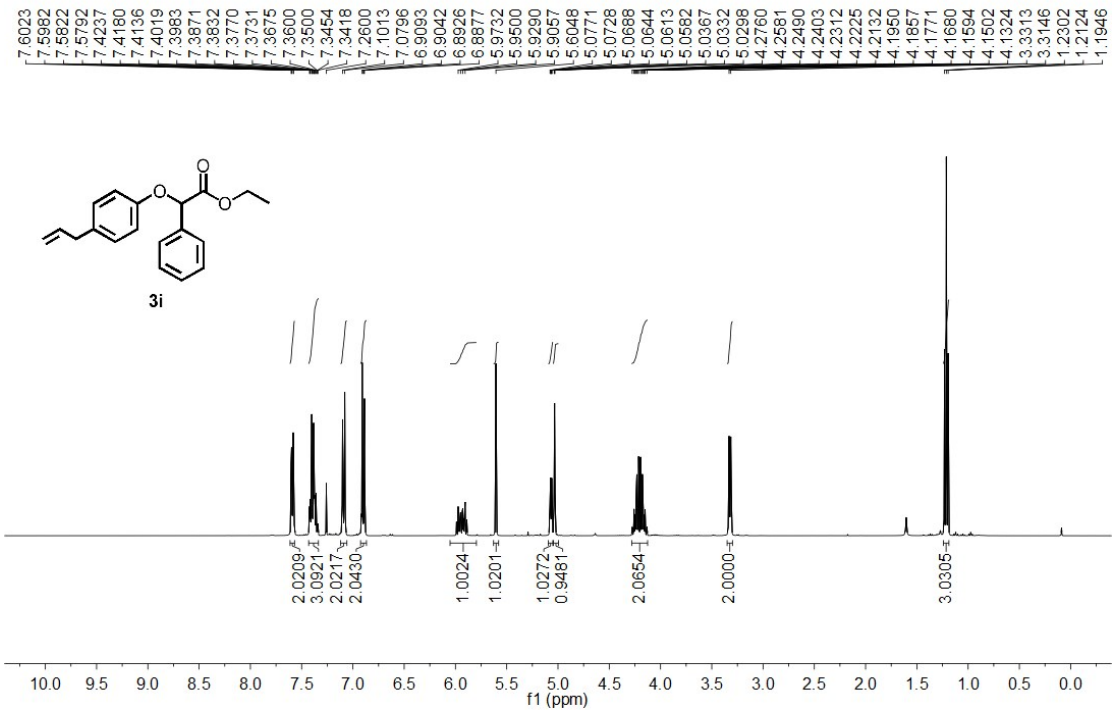
ZZP-78-1



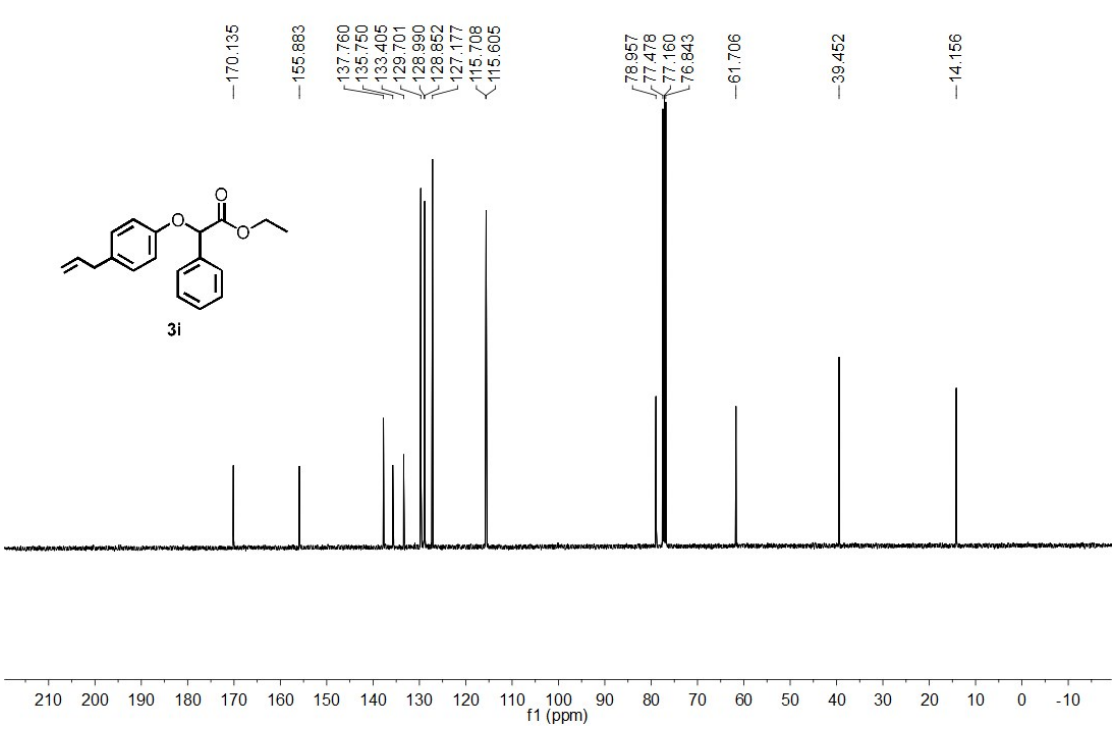
ZZP-78



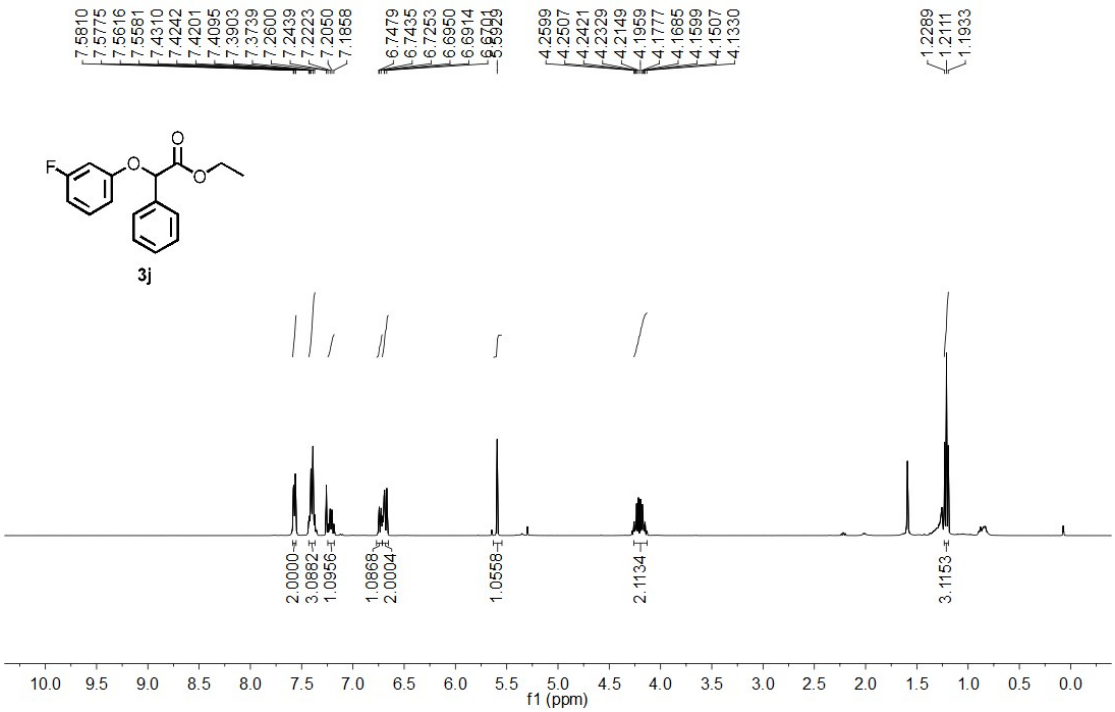
ZZP-96


7.6023
7.5982
7.5822
7.5792
7.4237
7.4180
7.4136
7.4019
7.3983
7.3871
7.3832
7.3770
7.3731
7.3675
7.3600
7.3500
7.3454
7.3418
7.2600
7.1013
7.0796
6.9093
6.9042
6.8926
6.8877
5.9732
5.9500
5.9290
5.9057
5.6048
5.0771
5.0728
5.0688
5.0644
5.0613
5.0582
5.0367
5.0332
5.0298
4.2760
4.2581
4.2490
4.2403
4.2312
4.2225
4.2132
4.1950
4.1857
4.1771
4.1680
4.1594
4.1502
4.1324
3.3313
3.3146
1.2302
1.2124
1.1946
3i
2.0209
3.0921
2.0217
2.0430
1.0024
1.0201
1.0272
0.9481
2.0654
2.0000
3.0305
f1 (ppm)

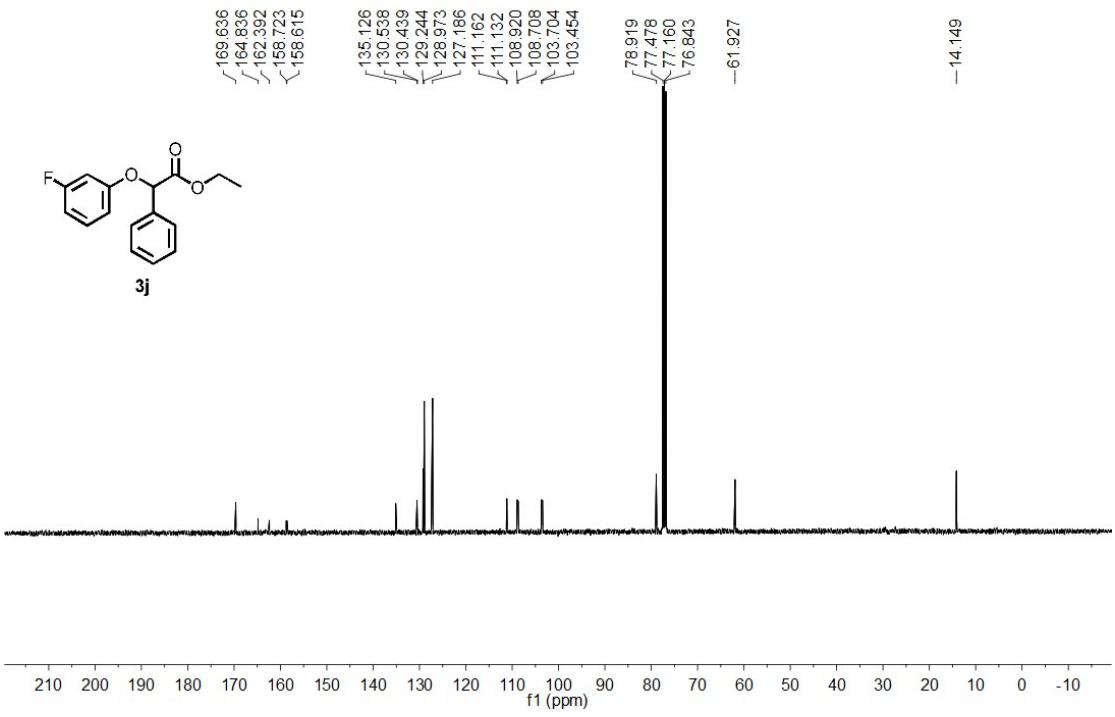
ZZP-96


170.135
155.883
137.760
135.750
133.405
129.701
128.990
128.852
127.177
115.708
115.605
78.957
77.478
77.160
76.843
61.706
39.452
14.156
3i
f1 (ppm)

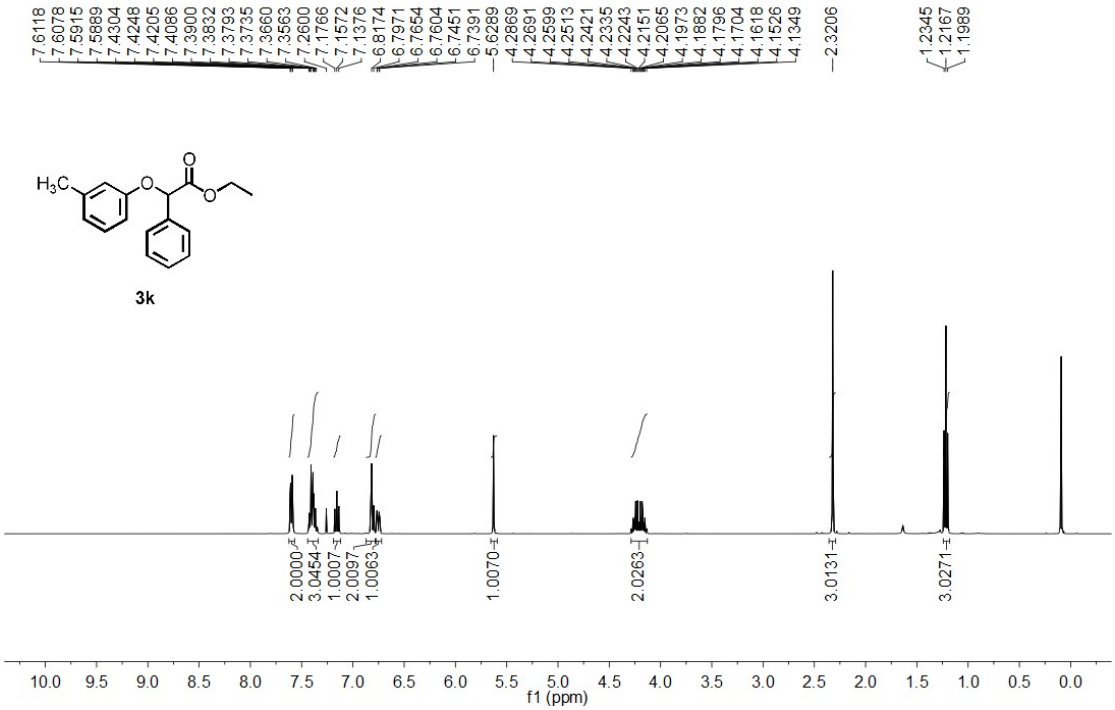
ZZP-20


7.5810
7.5775
7.5616
7.5581
7.4310
7.4242
7.4201
7.4095
7.3903
7.3739
7.2600
7.2439
7.2223
7.2050
7.1858
6.7479
6.7435
6.7253
6.6950
6.6914
6.6791
6.6757
4.2599
4.2507
4.2421
4.2329
4.2149
4.1959
4.1777
4.1685
4.1599
4.1507
4.1330
1.2289
1.2111
1.1933
F
O
O
O
3j
2.0000
3.0882
1.0956
1.0868
2.0004
1.0558
2.1134
3.1153
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

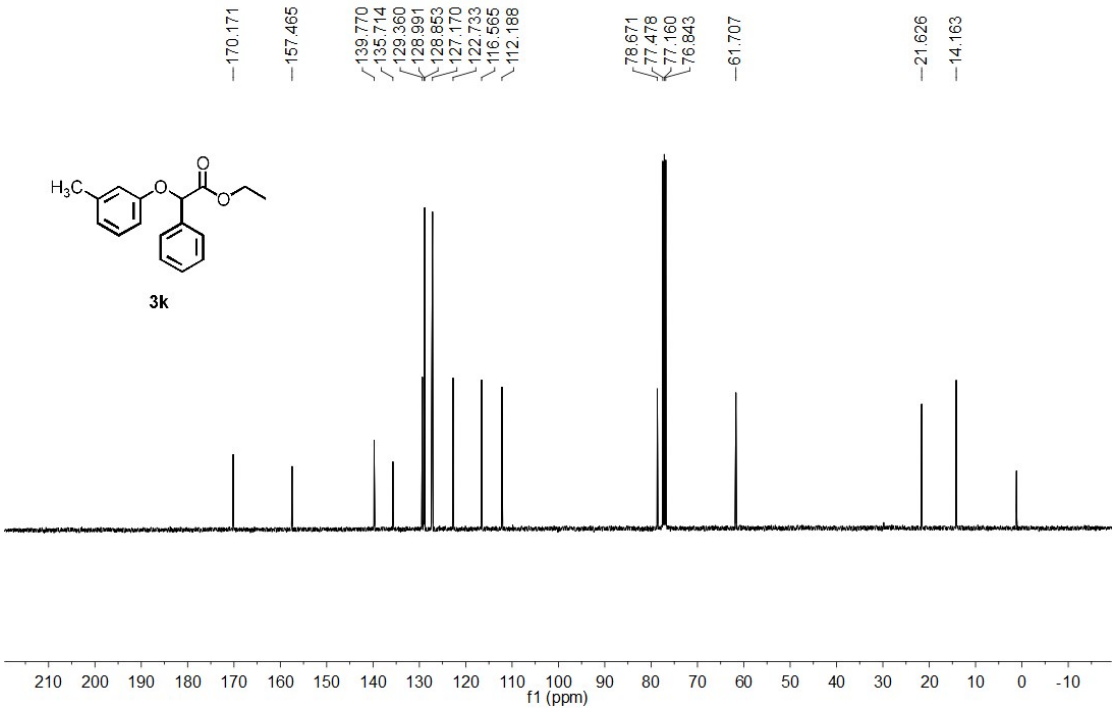
ZZP-20


169.636
164.836
162.392
158.723
158.615
135.126
130.538
130.439
129.244
128.973
127.186
111.162
111.132
108.920
108.708
103.704
103.454
78.919
77.478
77.160
76.843
61.927
14.149
F
O
O
O
3j
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

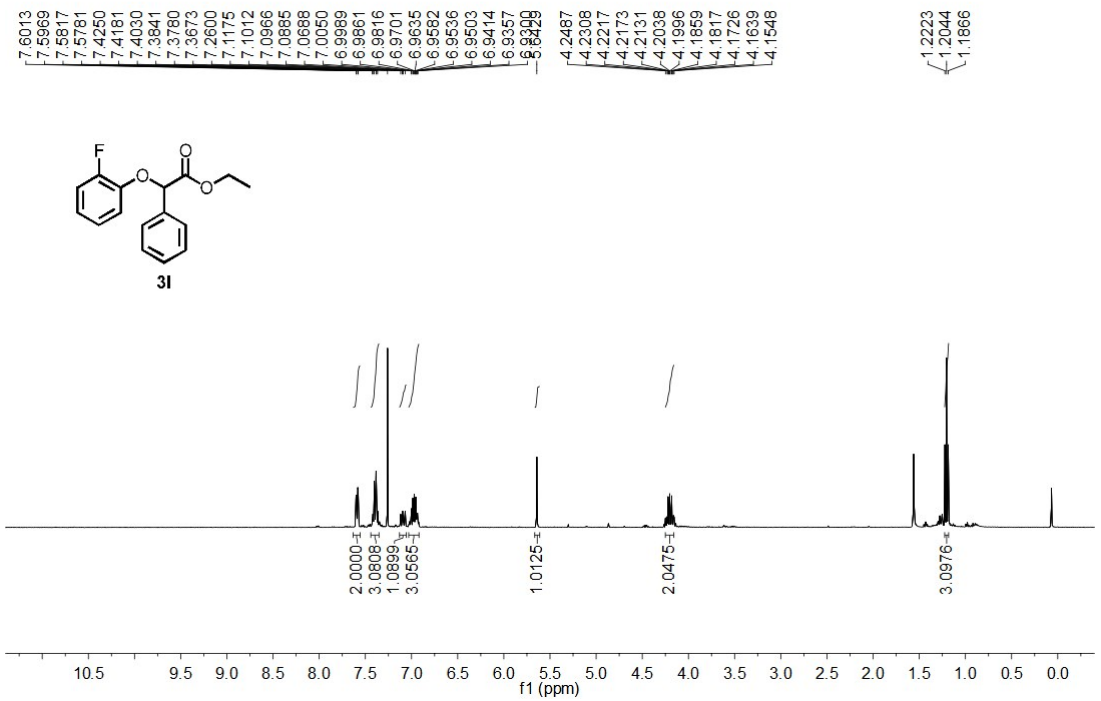
ZZP-90



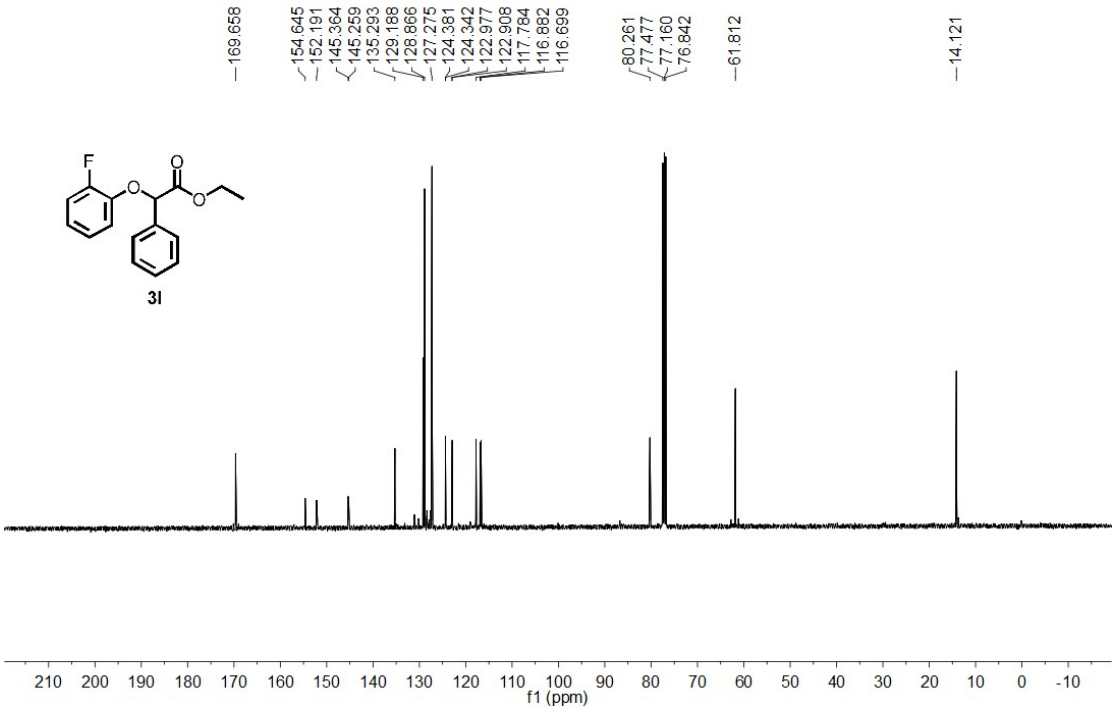
ZZP-90-3



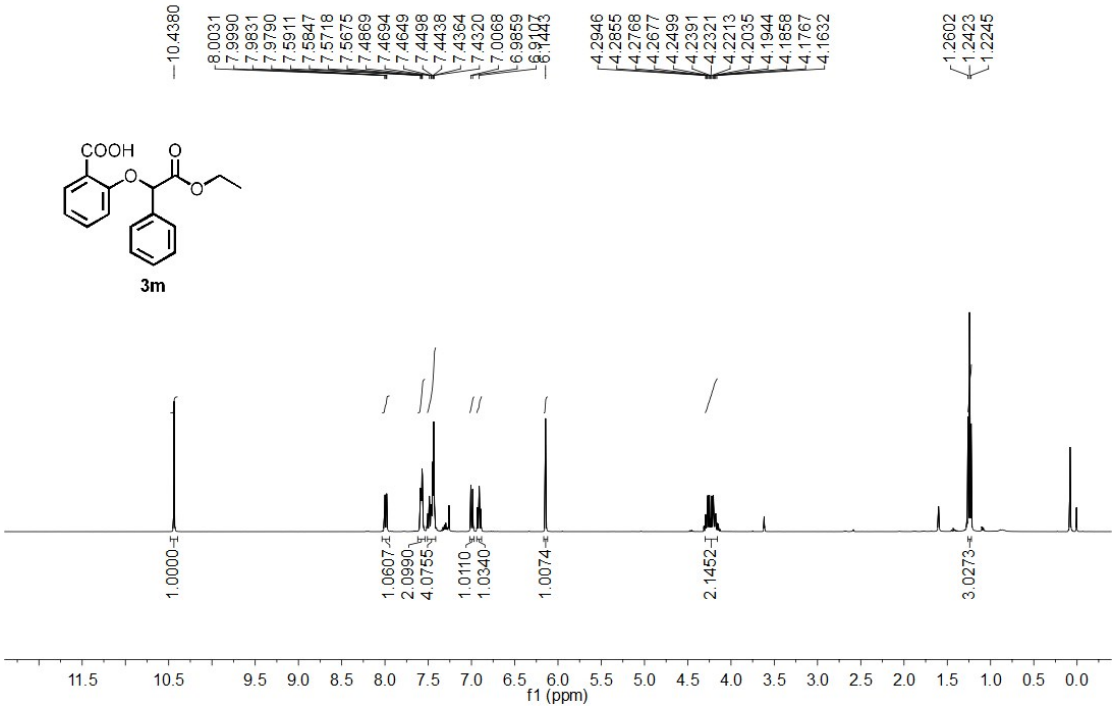
zzp-533-8



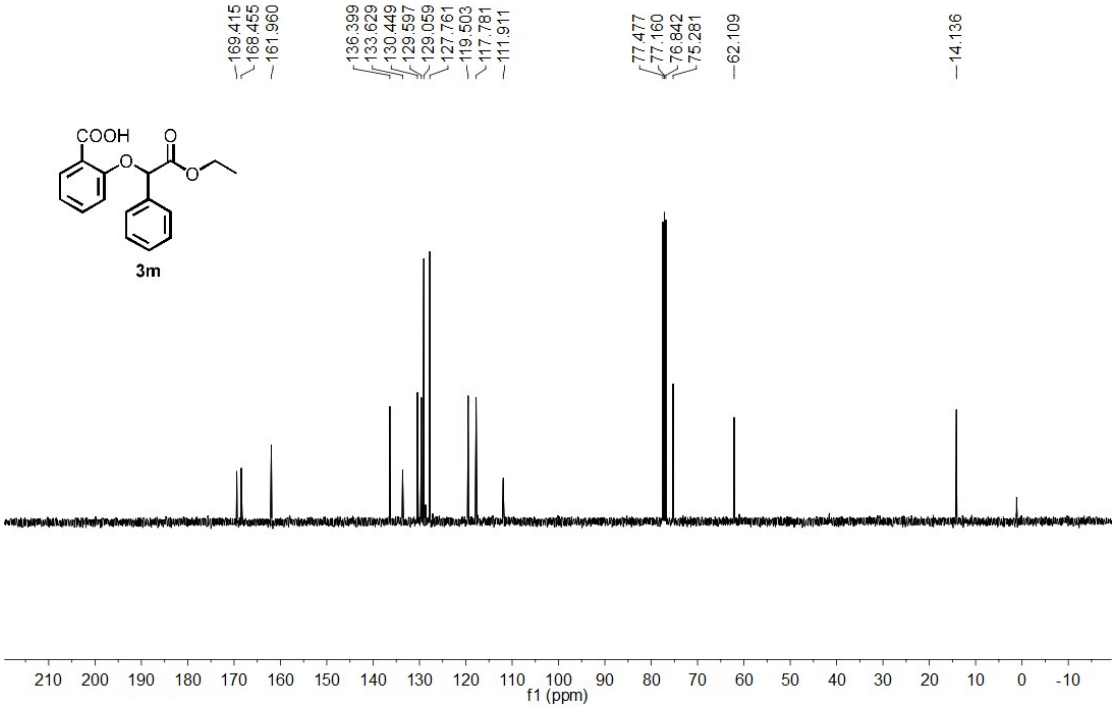
zzp-11



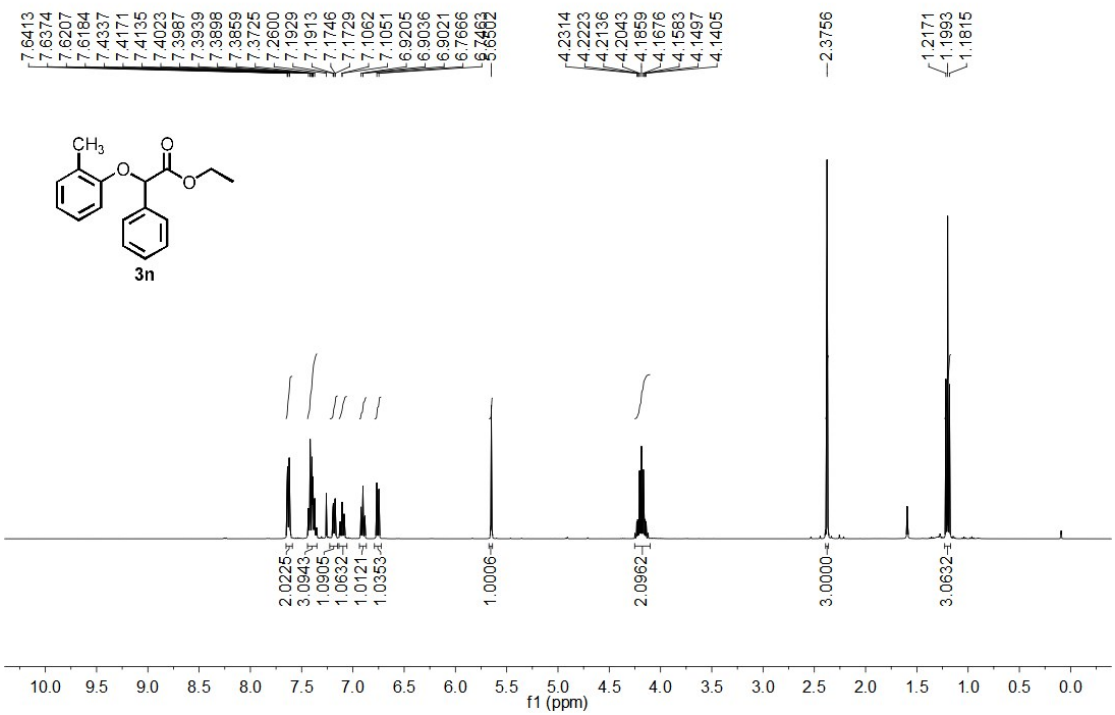
ZZP-225-1



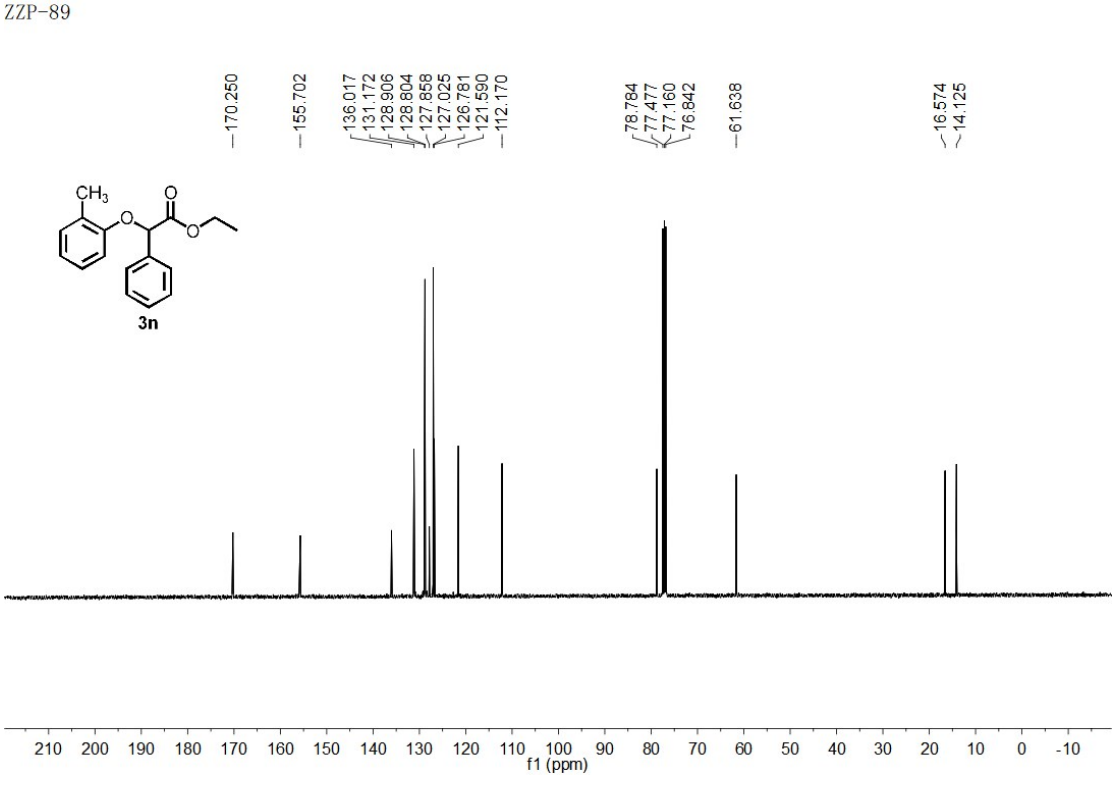
ZZP-225-1



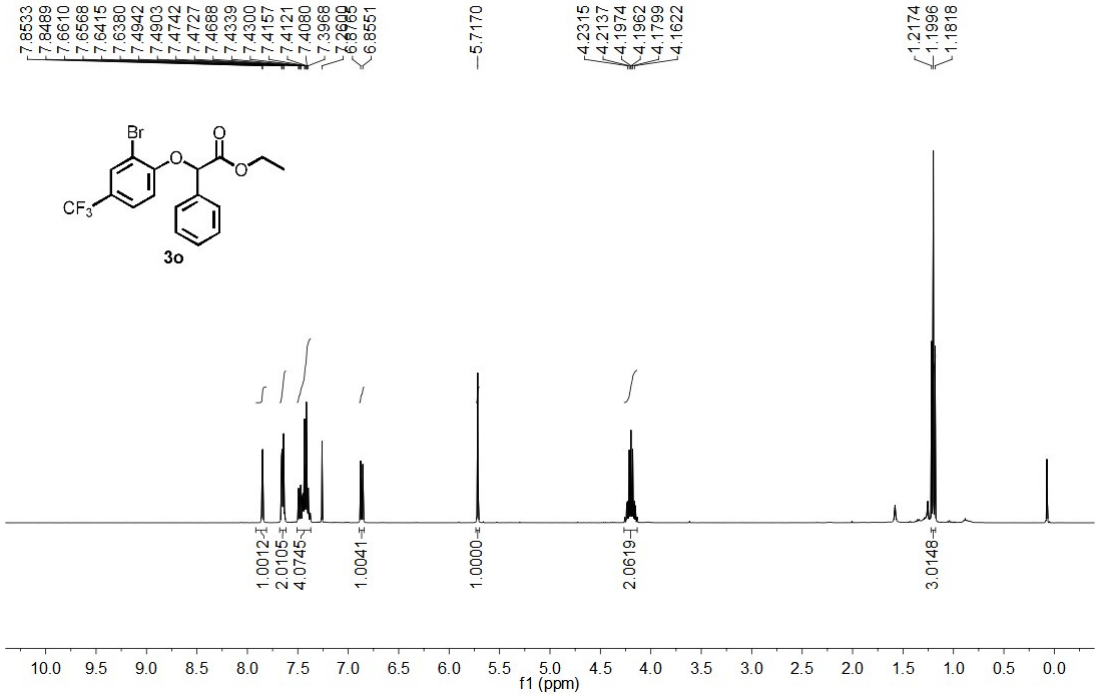
ZZP-89


7.6413
7.6374
7.6207
7.6184
7.4337
7.4171
7.4135
7.4023
7.3987
7.3939
7.3898
7.3859
7.3725
7.2600
7.1929
7.1913
7.1746
7.1729
7.1062
7.1051
6.9205
6.9036
6.9021
6.7666
4.2314
4.2223
4.2136
4.2043
4.1859
4.1676
4.1583
4.1497
4.1405
2.3756
1.2171
1.1993
1.1815
3n
2.0225
3.0943
1.0905
1.0632
1.0121
1.0353
1.0006
2.0962
3.0000
3.0632
f1 (ppm)

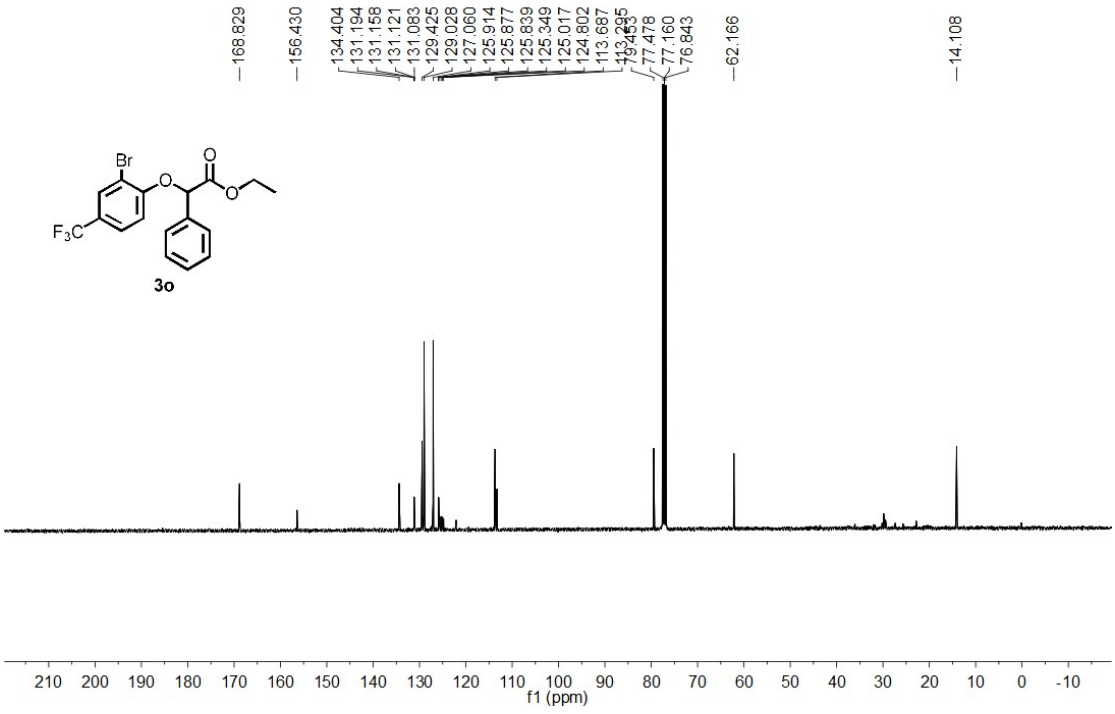
ZZP-89


170.250
155.702
136.017
131.172
128.906
128.804
127.858
127.025
126.781
121.590
112.170
78.784
77.477
77.160
76.842
61.638
16.574
14.125
3n
f1 (ppm)

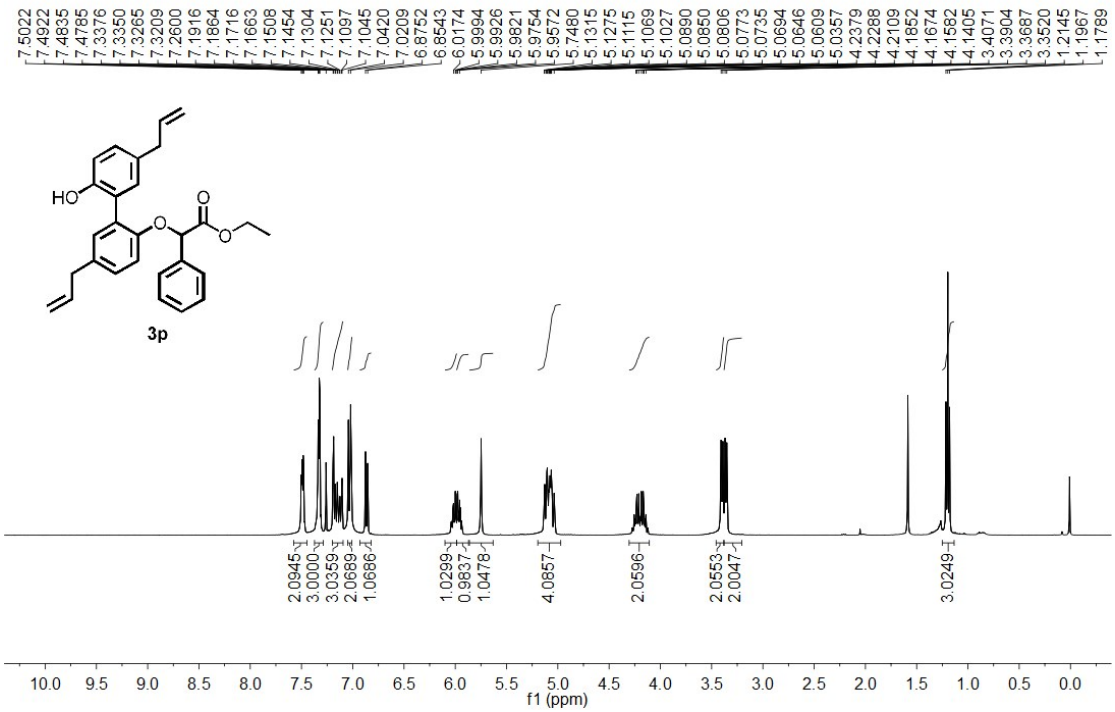
zzp-530-8



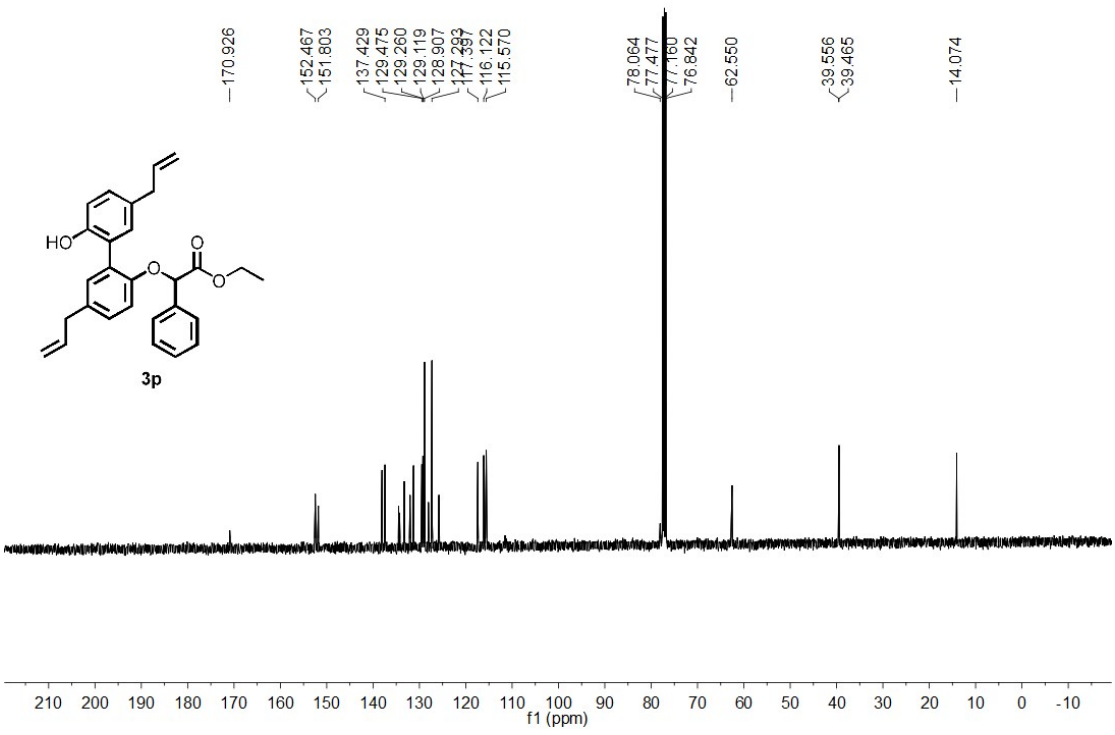
zzp-13



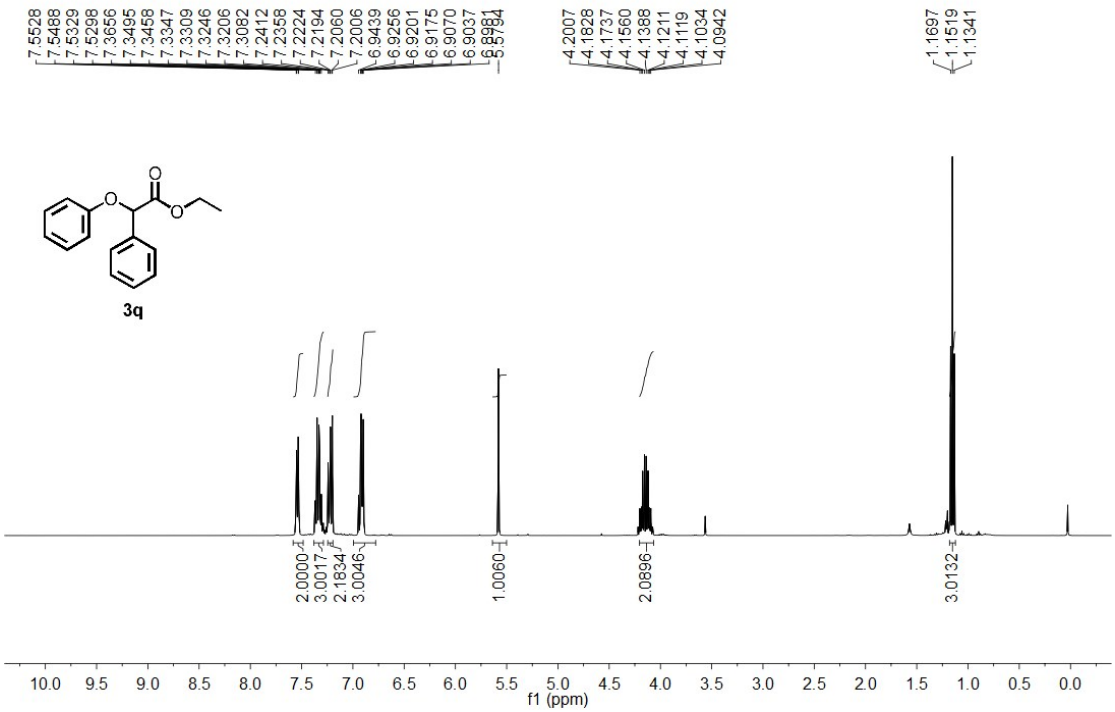
zzp-6


7.5022
7.4922
7.4835
7.4785
7.3376
7.3350
7.3265
7.3209
7.2600
7.1916
7.1864
7.1716
7.1663
7.1508
7.1454
7.1304
7.1251
7.1097
7.1045
7.0420
7.0209
6.8752
6.8543
6.0174
5.9994
5.9926
5.9821
5.9754
5.9572
5.7480
5.1315
5.1275
5.1115
5.1069
5.1027
5.0890
5.0850
5.0806
5.0773
5.0735
5.0694
5.0646
5.0609
5.0357
4.2379
4.2288
4.2109
4.1852
4.1674
4.1582
4.1405
3.4071
3.3904
3.3687
3.3520
1.2145
1.1967
1.1789
HO
O
O
O
3p
2.0945
3.0000
3.0359
2.0689
1.0686
1.0299
0.9837
1.0478
4.0857
2.0596
2.0553
2.0047
3.0249
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

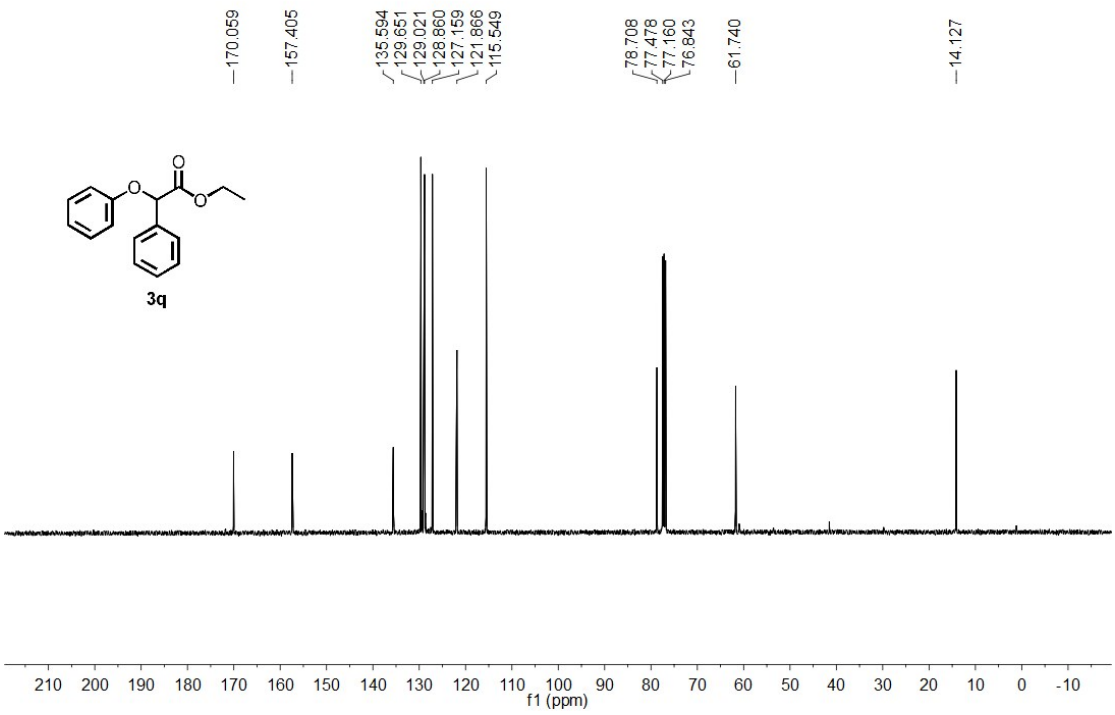
zzp-6


170.926
152.467
151.803
137.429
129.475
129.260
129.119
128.907
127.293
127.397
116.122
115.570
78.064
77.477
77.160
76.842
62.550
39.556
39.465
14.074
HO
O
O
O
3p
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

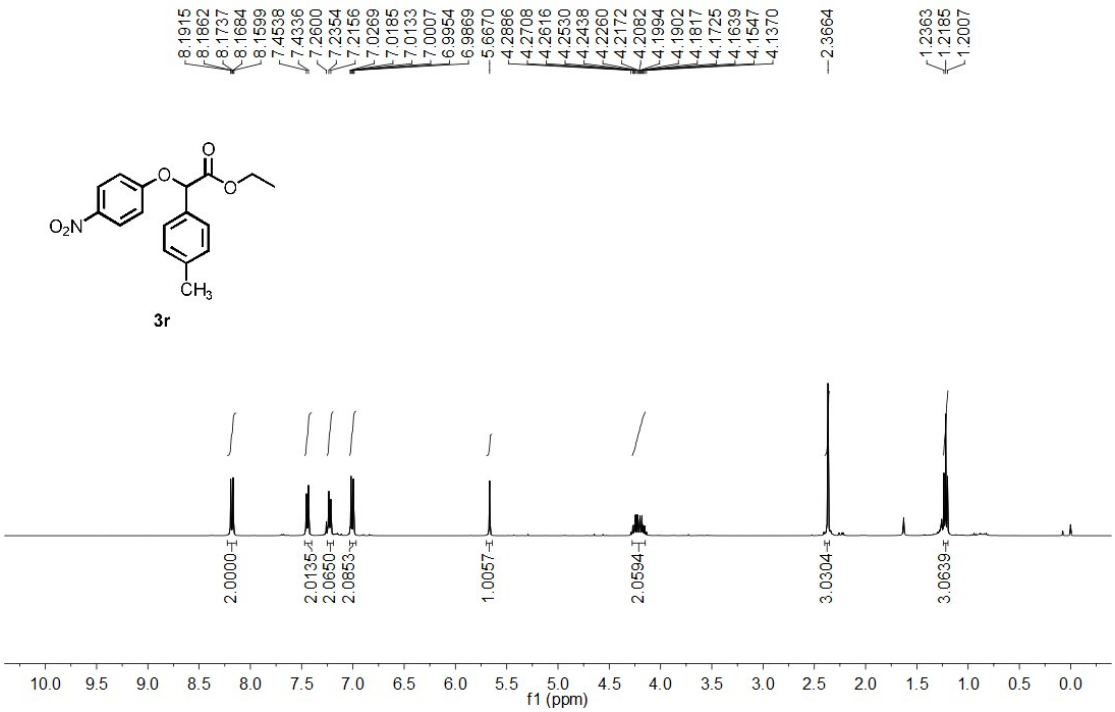
ZZP-1-H1



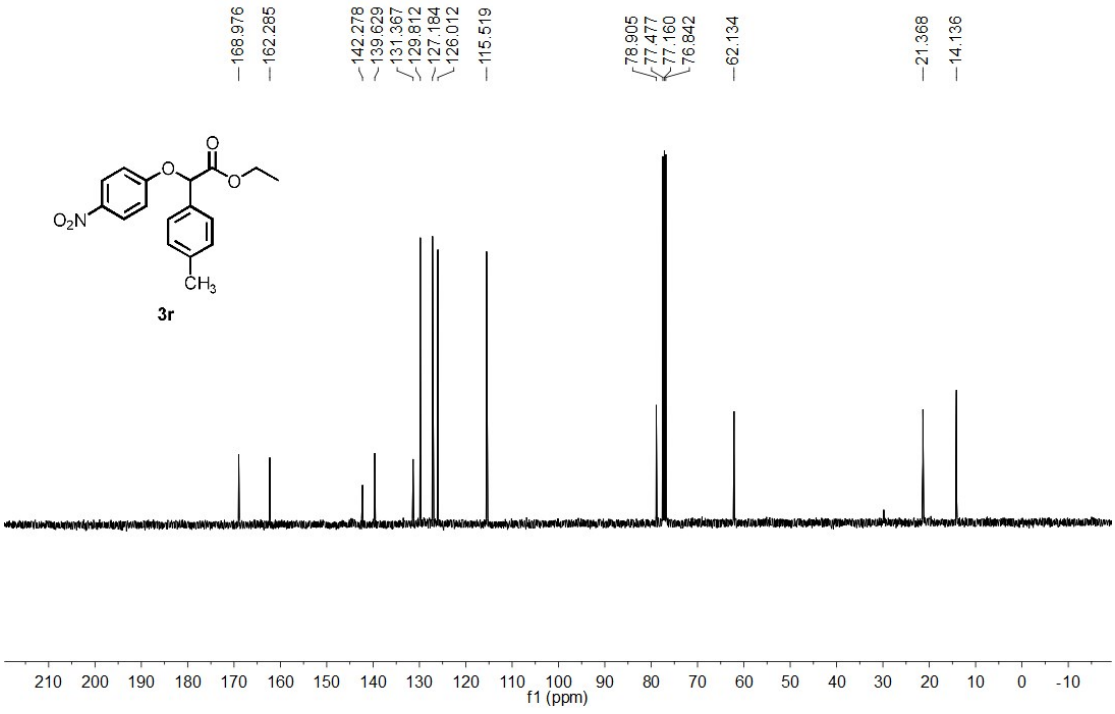
ZZP-1-C13



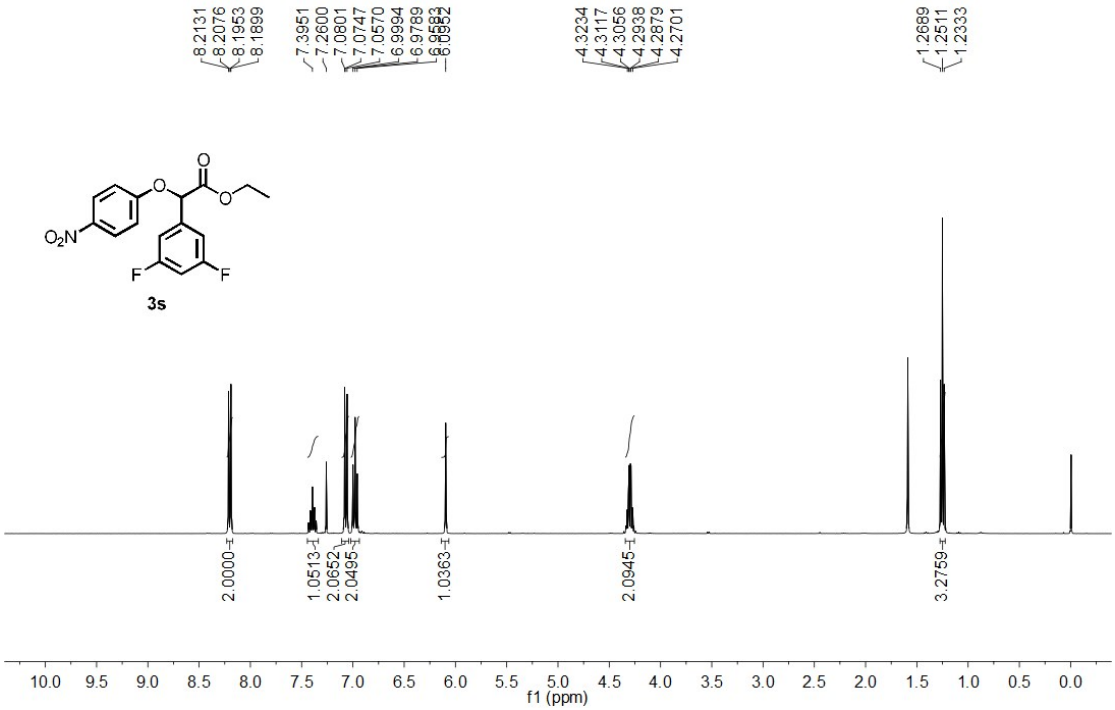
FYF-8


8.1915
8.1862
8.1737
8.1684
8.1599
7.4538
7.4336
7.2600
7.2354
7.2156
7.0269
7.0185
7.0133
7.0007
6.9954
6.9869
5.6670
4.2886
4.2708
4.2616
4.2530
4.2438
4.2260
4.2172
4.2082
4.1994
4.1902
4.1817
4.1725
4.1639
4.1547
4.1370
2.3664
1.2363
1.2185
1.2007
O2N
CH3
3r
2.0000
2.0135
2.0650
2.0853
1.0057
2.0594
3.0304
3.0639
f1 (ppm)

FYF-8

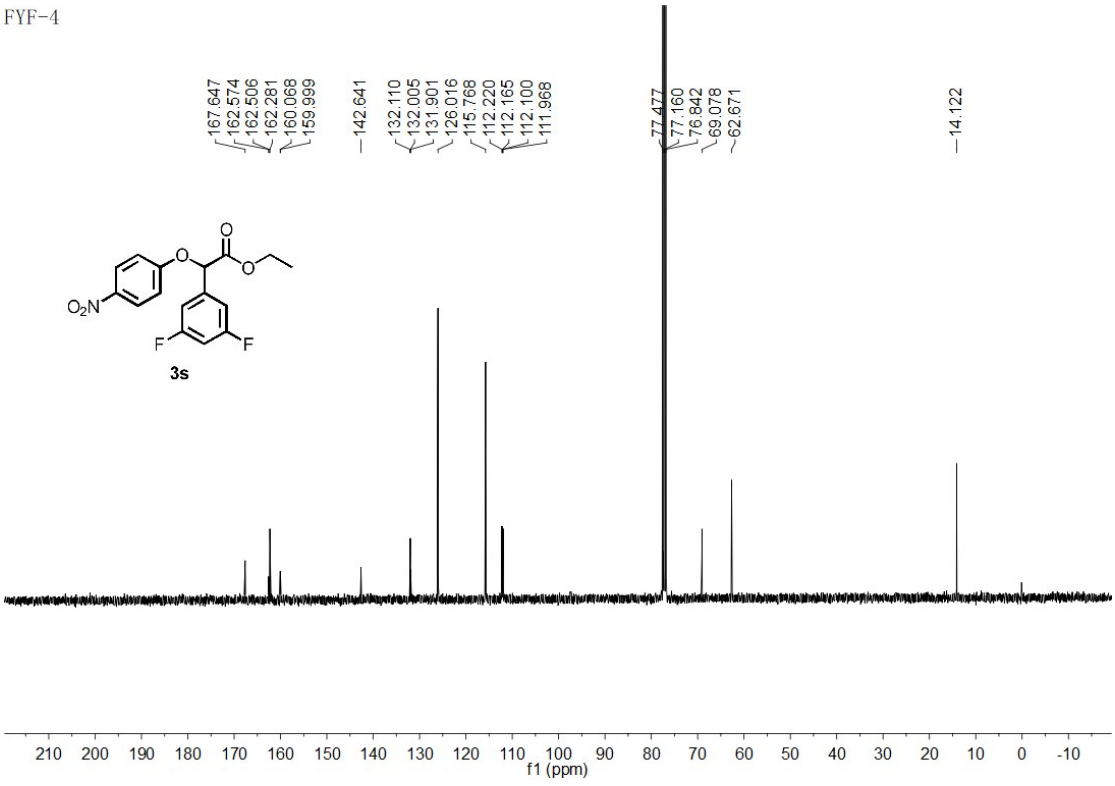

168.976
162.285
142.278
139.629
131.367
129.812
127.184
126.012
115.519
78.905
77.477
77.160
76.842
62.134
21.368
14.136
O2N
CH3
3r
f1 (ppm)

FYF-4



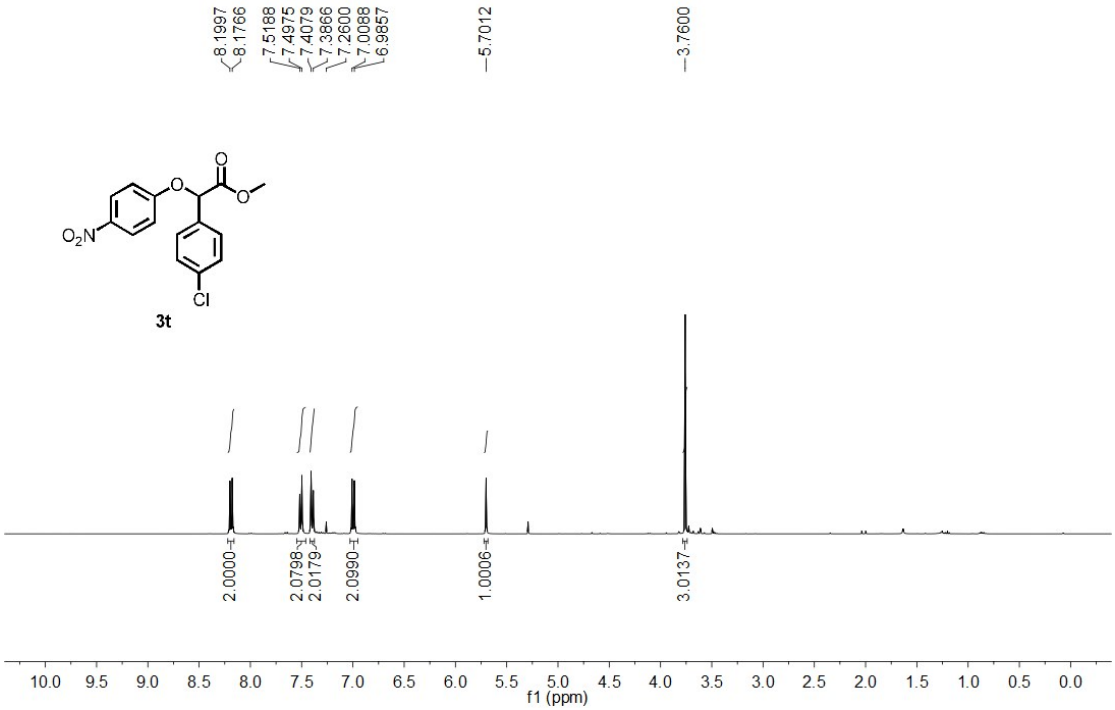
3s

FYF-4

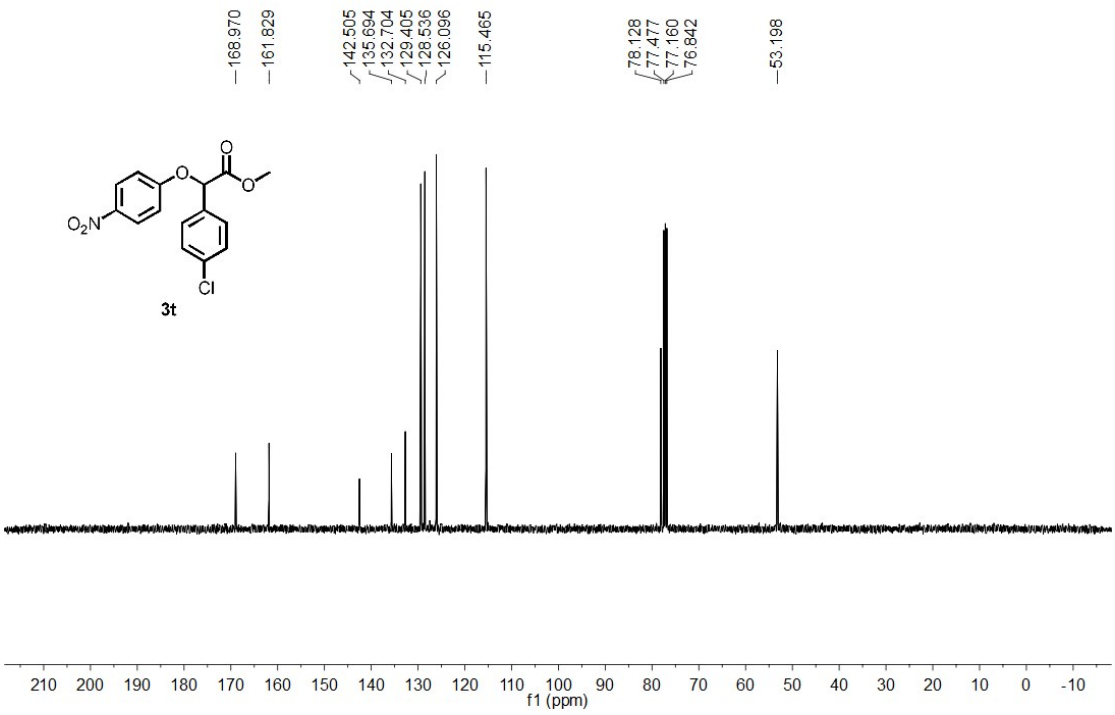


3s

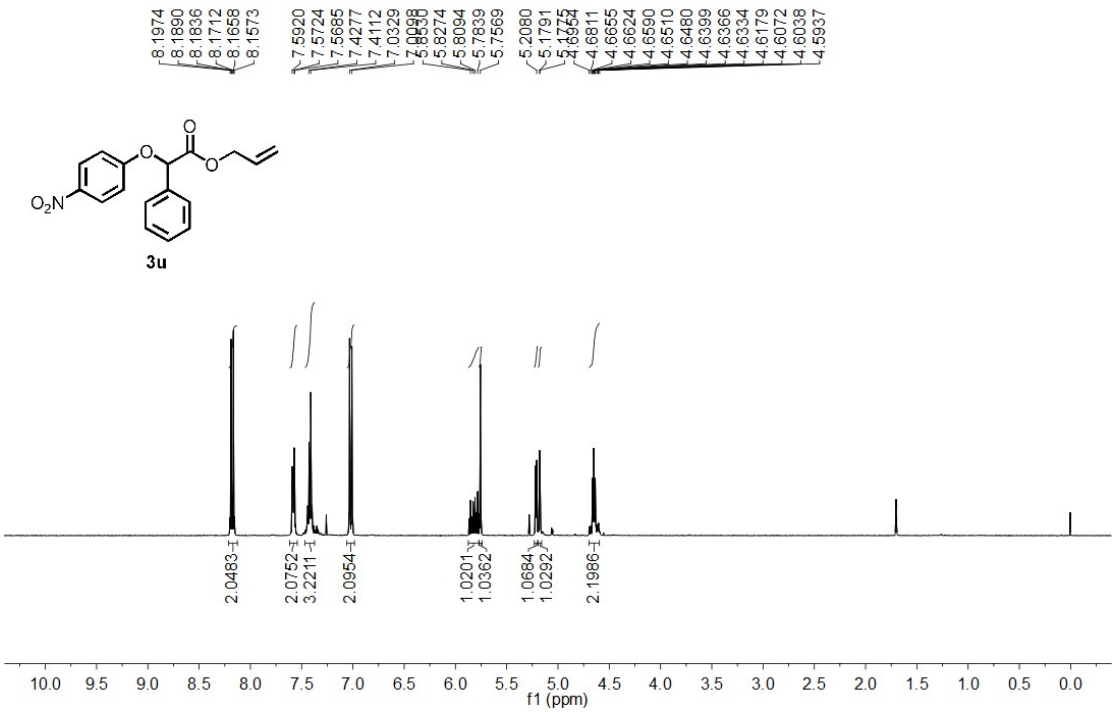
ZZP-181



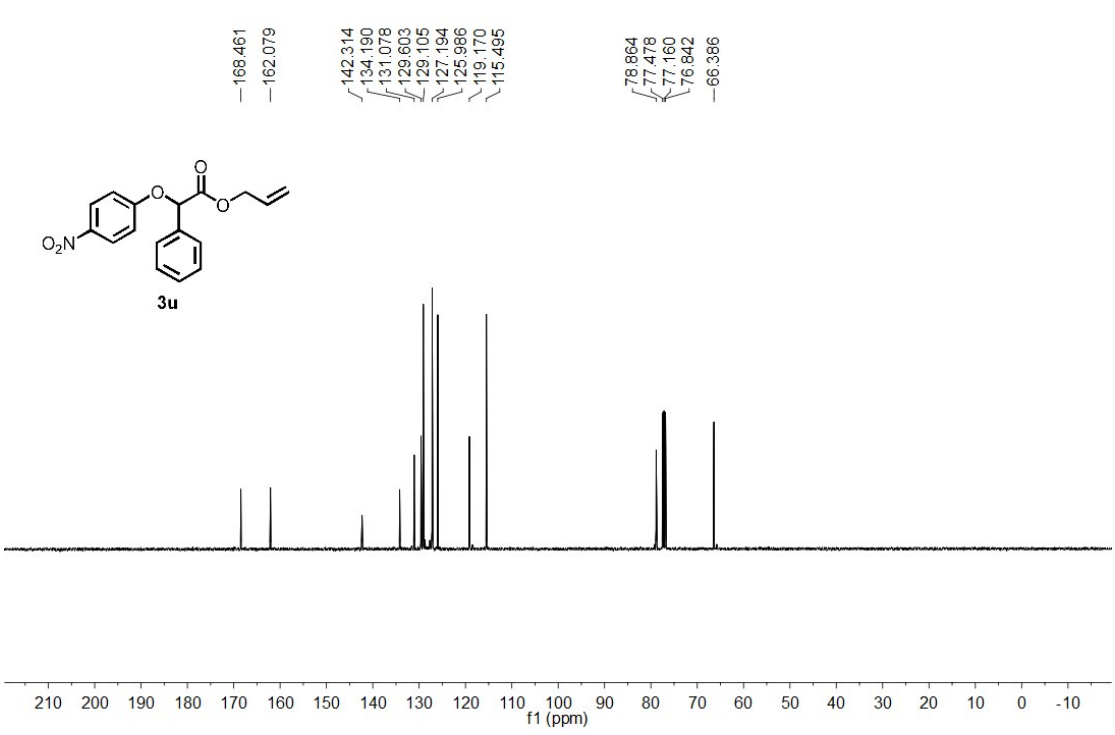
ZZP-181



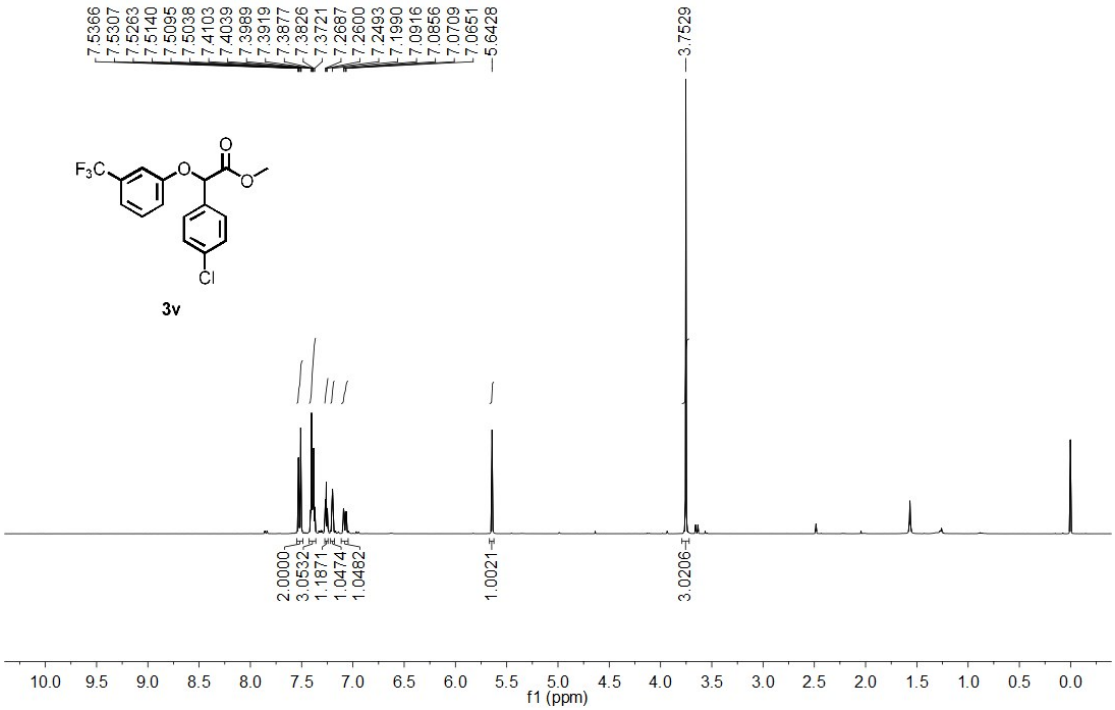
ZZP-118-1



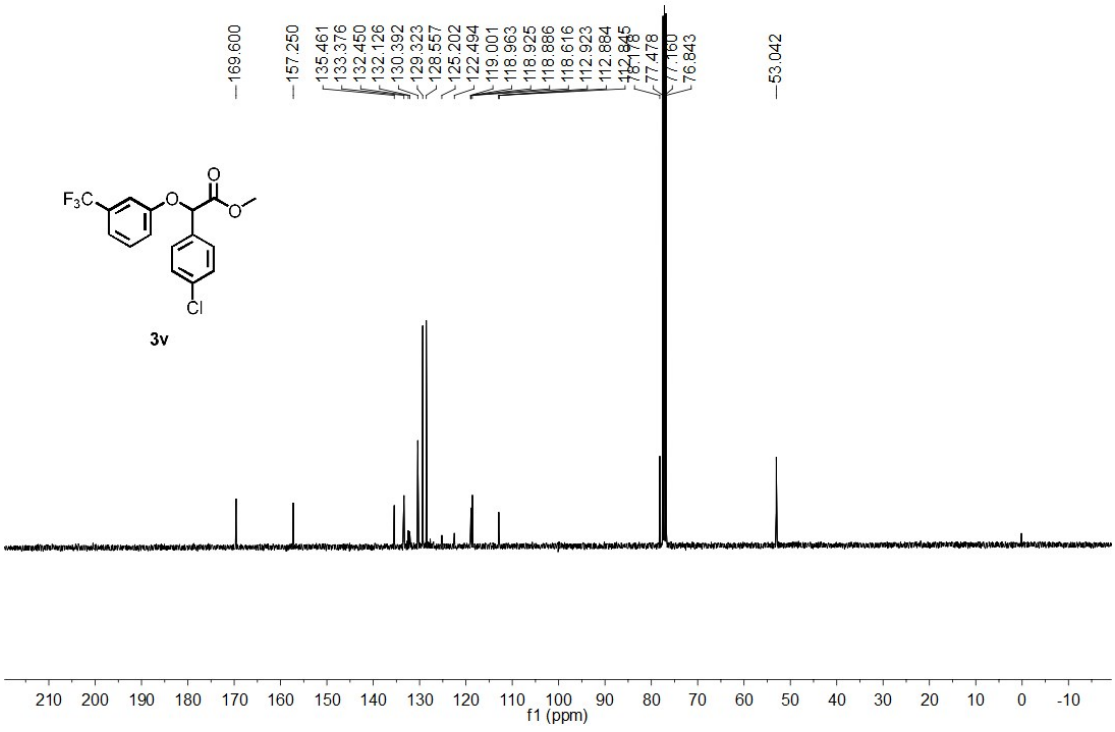
ZZP-118-1



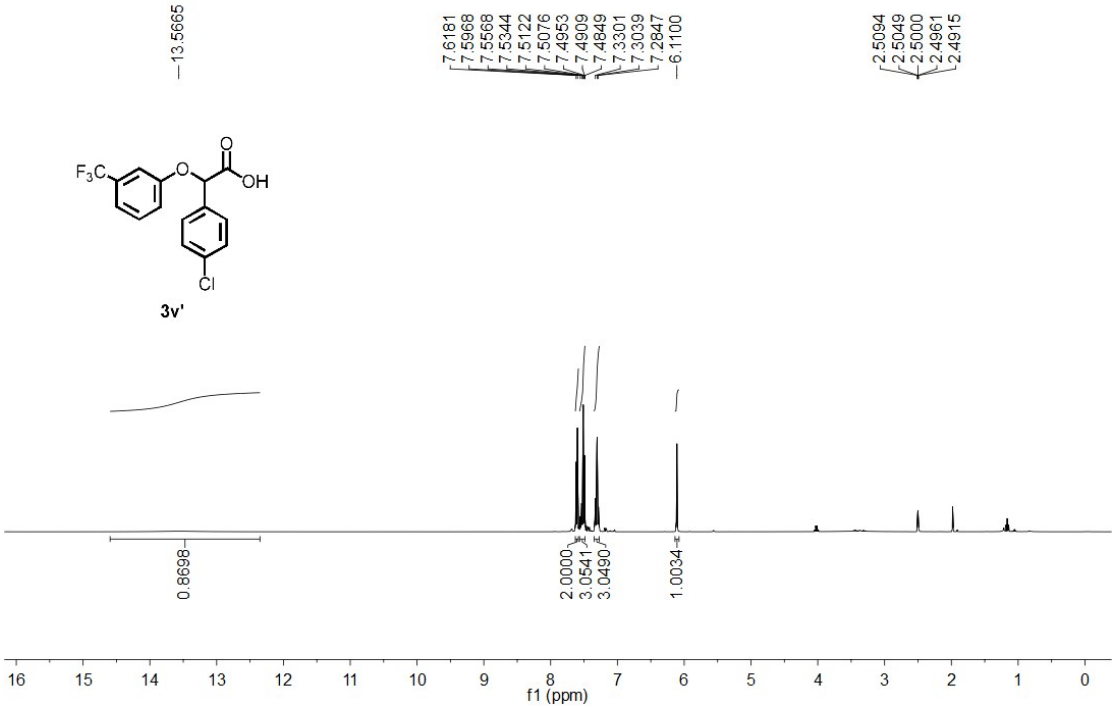
FYF-5


7.5366
7.5307
7.5263
7.5140
7.5095
7.5038
7.4103
7.4039
7.3989
7.3919
7.3877
7.3826
7.3721
7.2687
7.2600
7.2493
7.1990
7.0916
7.0856
7.0709
7.0651
5.6428
3.7529
F3C
O
O
O
Cl
3v
2.0000
3.0532
1.1871
1.0474
1.0482
1.0021
3.0206
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

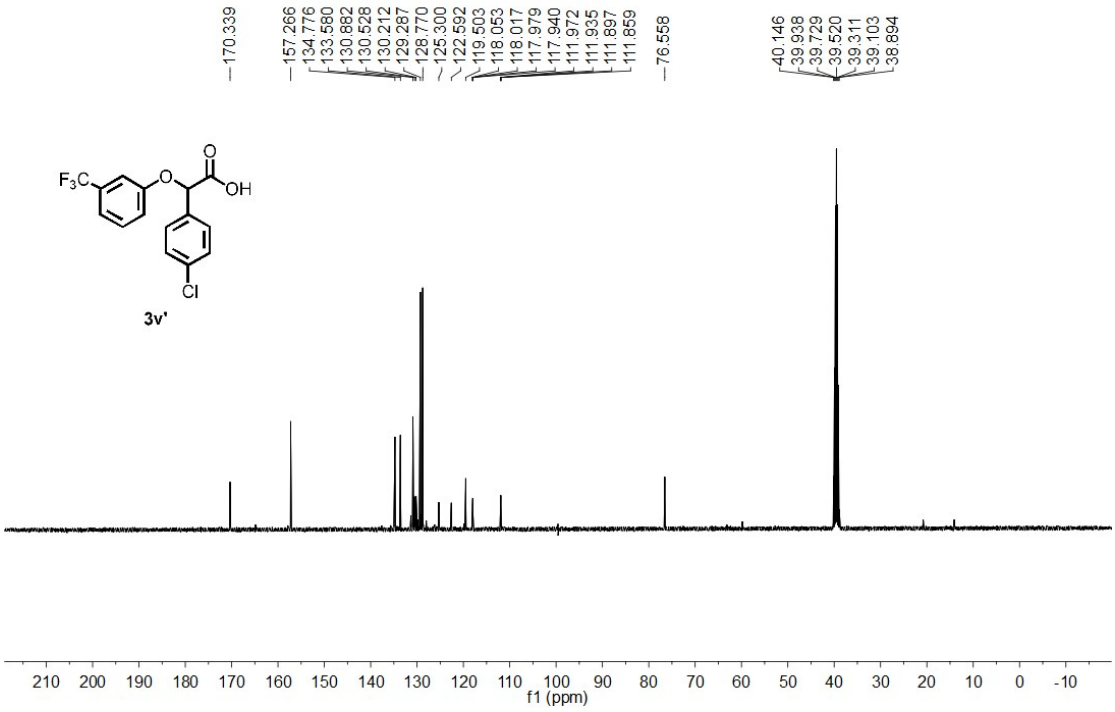
FYF-5-2


169.600
157.250
135.461
133.376
132.450
132.126
130.392
129.323
128.557
125.202
122.494
119.001
118.963
118.925
118.886
118.616
112.923
112.884
112.845
78.178
77.478
77.160
76.843
53.042
F3C
O
O
O
Cl
3v
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

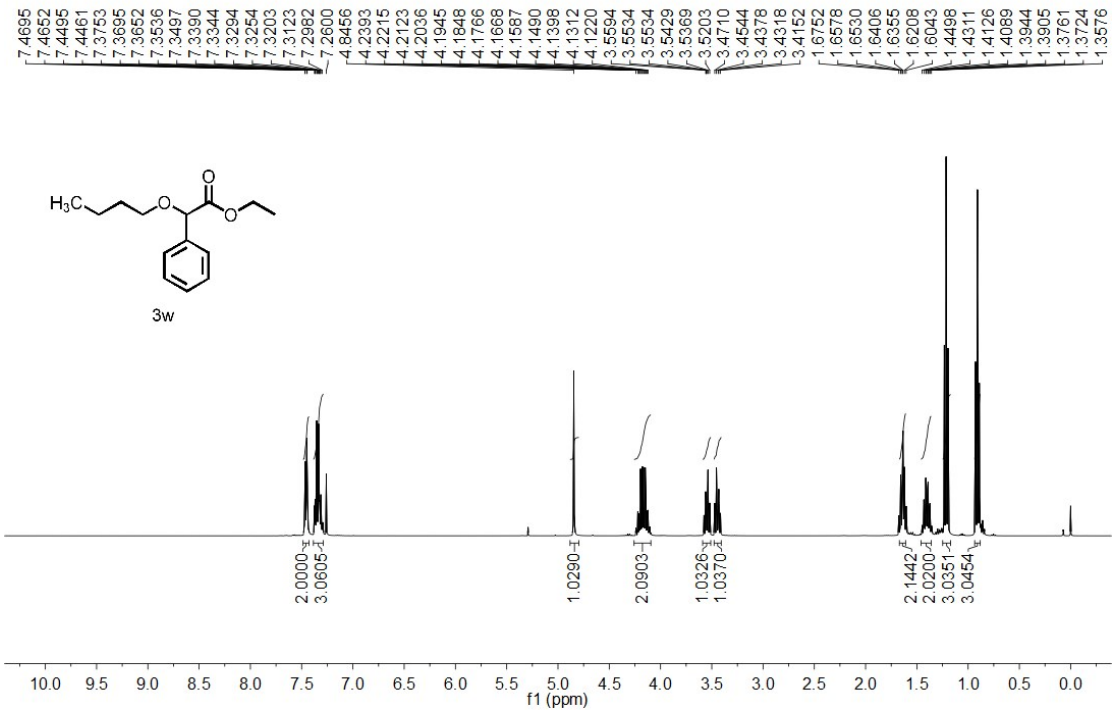
ZZP-78


13.5665
7.6181
7.5968
7.5568
7.5344
7.5122
7.5076
7.4953
7.4909
7.4849
7.3301
7.3039
7.2847
6.1100
2.5094
2.5049
2.5000
2.4961
2.4915
F3C
O
OH
Cl
3v'
0.8698
2.0000
3.0541
3.0490
1.0034
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
f1 (ppm)

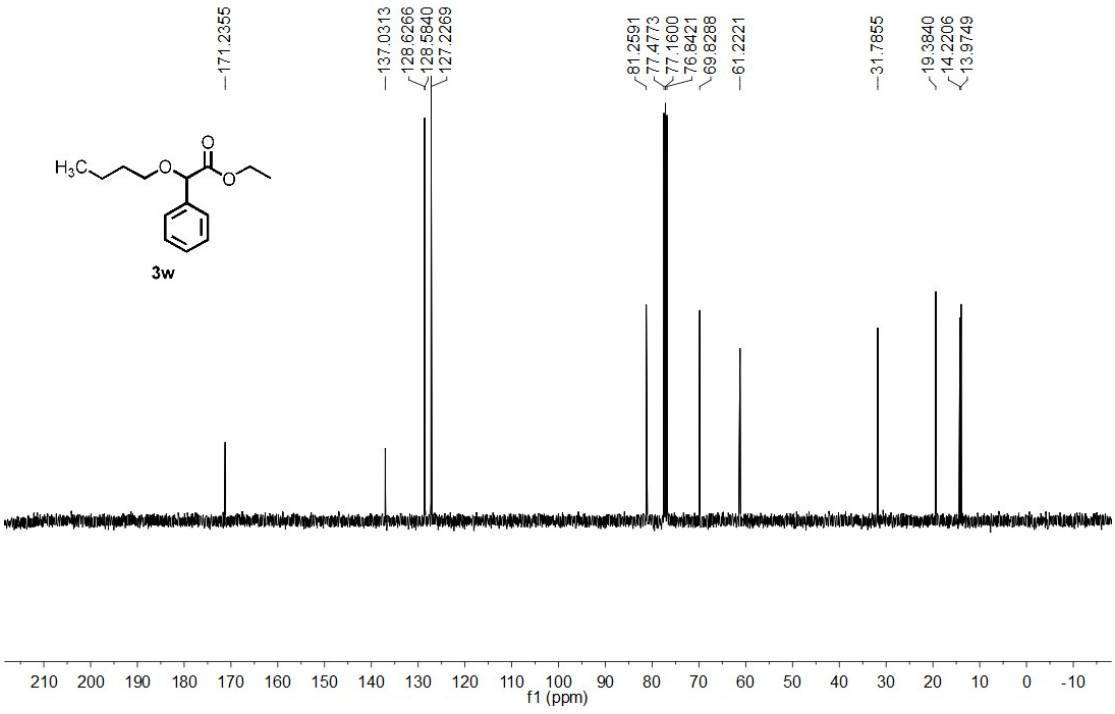
ZZP-78


170.339
157.266
134.776
133.580
130.882
130.528
130.212
129.287
128.770
125.300
122.592
119.503
118.053
118.017
117.979
117.940
111.972
111.935
111.897
111.859
76.558
40.146
39.938
39.729
39.520
39.311
39.103
38.894
F3C
O
OH
Cl
3v'
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

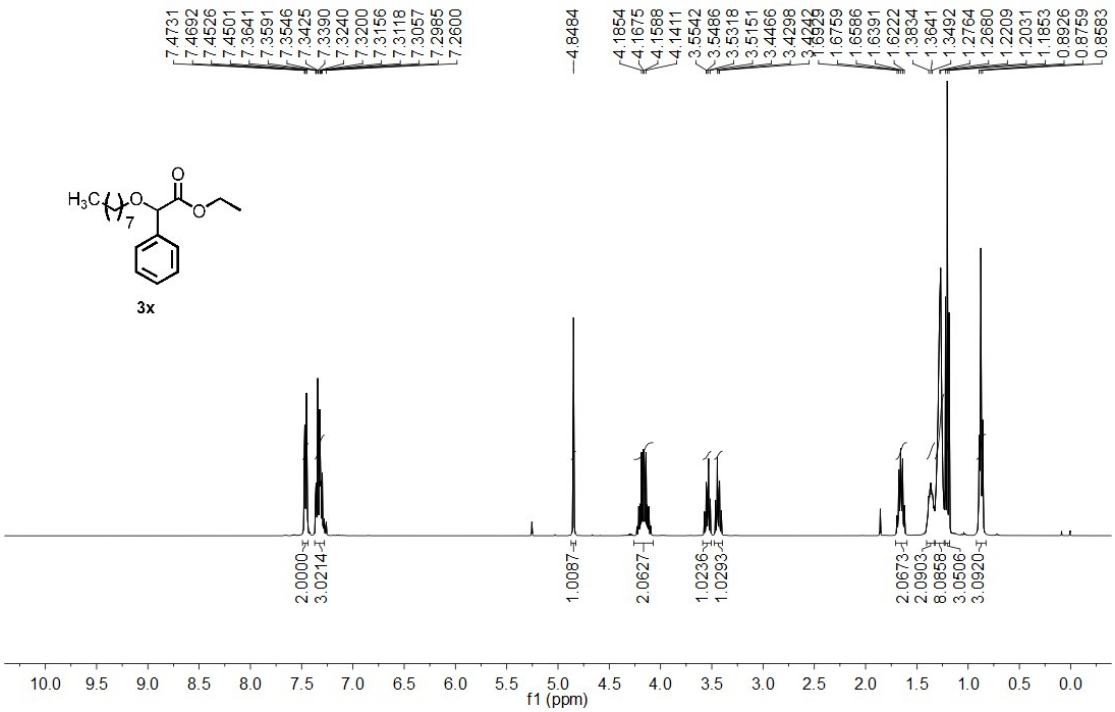
zzp-34


7.4695
7.4652
7.4495
7.4461
7.3753
7.3695
7.3652
7.3536
7.3497
7.3390
7.3344
7.3294
7.3254
7.3203
7.3123
7.2982
7.2600
4.8456
4.2393
4.2215
4.2123
4.2036
4.1945
4.1848
4.1766
4.1668
4.1587
4.1490
4.1398
4.1312
4.1220
3.5594
3.5534
3.5534
3.5429
3.5369
3.5203
3.4710
3.4544
3.4378
3.4318
3.4152
1.6752
1.6578
1.6530
1.6406
1.6355
1.6208
1.6043
1.4498
1.4311
1.4126
1.4089
1.3944
1.3905
1.3761
1.3724
1.3576
3w
2.0000
3.0605
1.0290
2.0903
1.0326
1.0370
2.1442
2.0200
3.0351
3.0454
f1 (ppm)

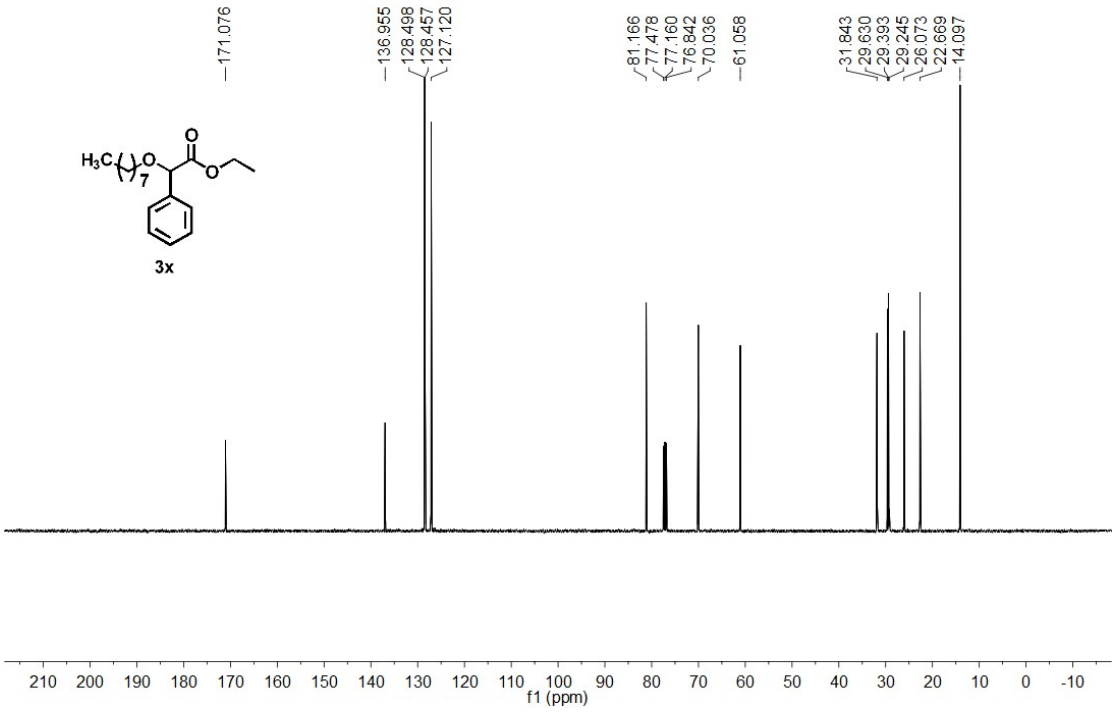
ZZP-34


171.2355
137.0313
128.6266
128.5840
127.2269
81.2591
77.4773
77.1600
76.8421
69.8288
61.2221
31.7855
19.3840
14.2206
13.9749
3w
f1 (ppm)

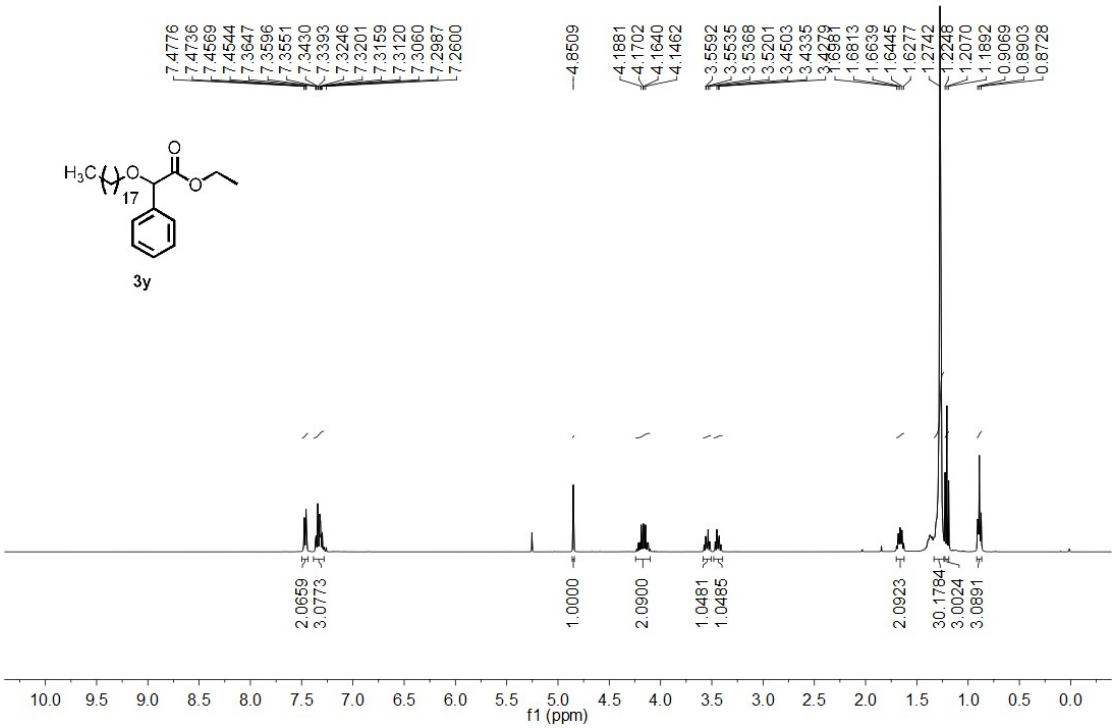
ZZP-62-1



ZZP-62

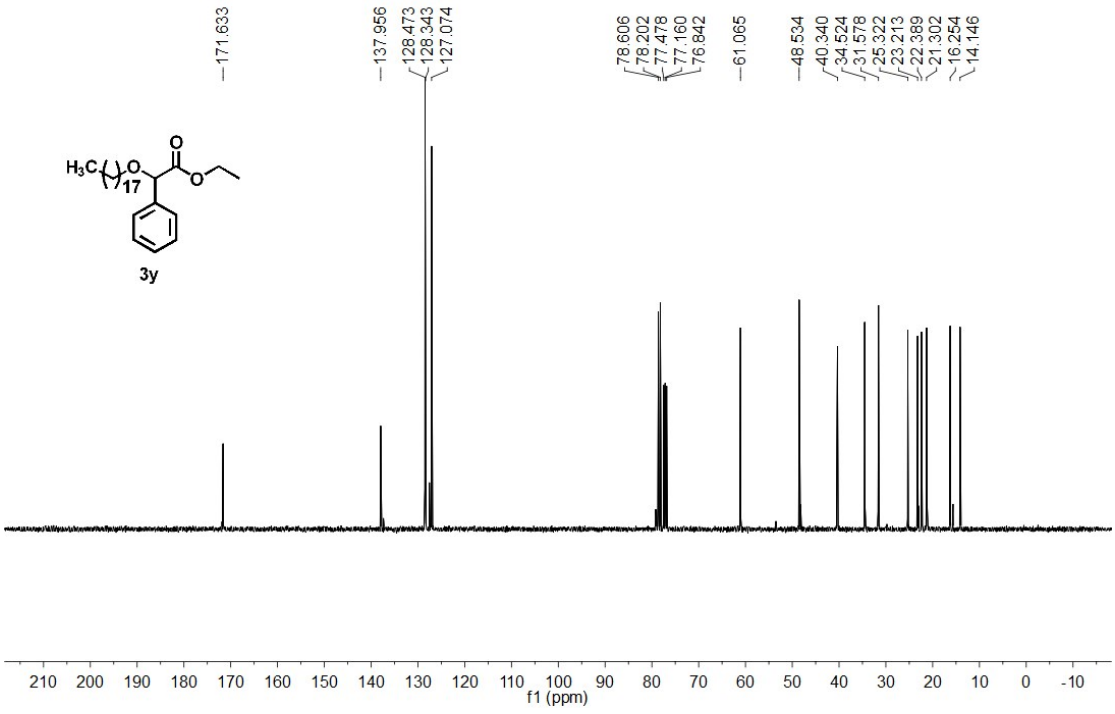


ZZP-57-1



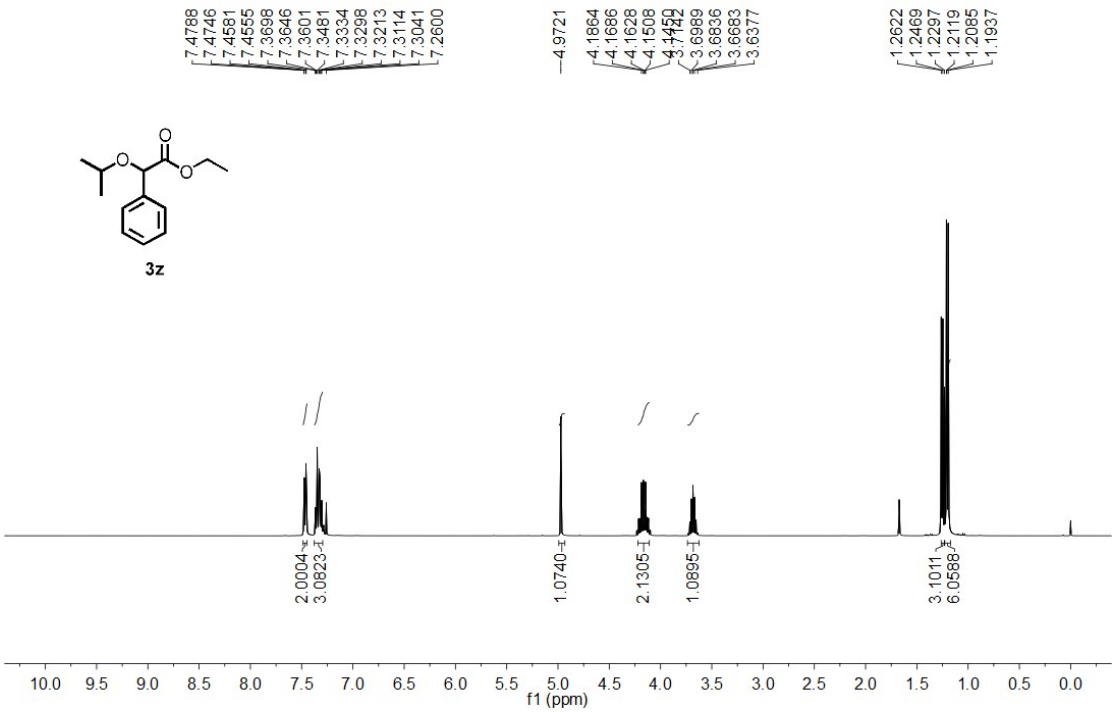
3y

ZZP-57

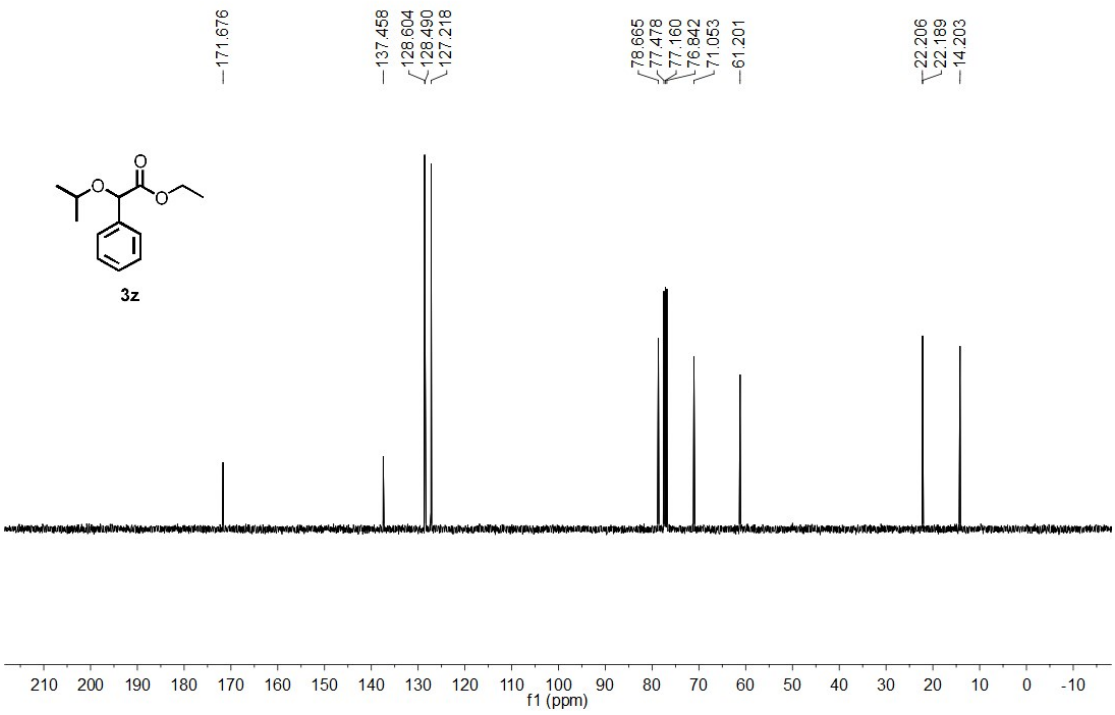


3y

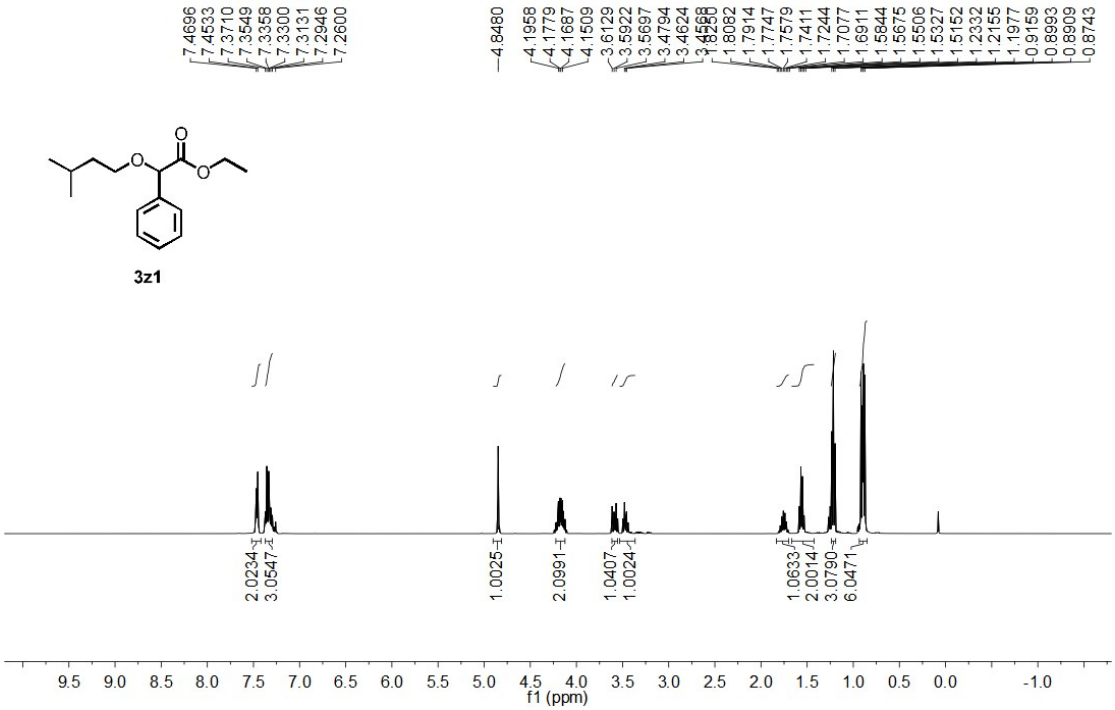
ZZP-22


7.4788
7.4746
7.4581
7.4555
7.3698
7.3646
7.3601
7.3481
7.3334
7.3298
7.3213
7.3114
7.3041
7.2600
4.9721
4.1864
4.1686
4.1628
4.1508
3.7142
3.6989
3.6836
3.6683
3.6377
1.2622
1.2469
1.2297
1.2119
1.2085
1.1937
3z
2.0004
3.0823
1.0740
2.1305
1.0895
3.1011
6.0588
f1 (ppm)

ZZP-22

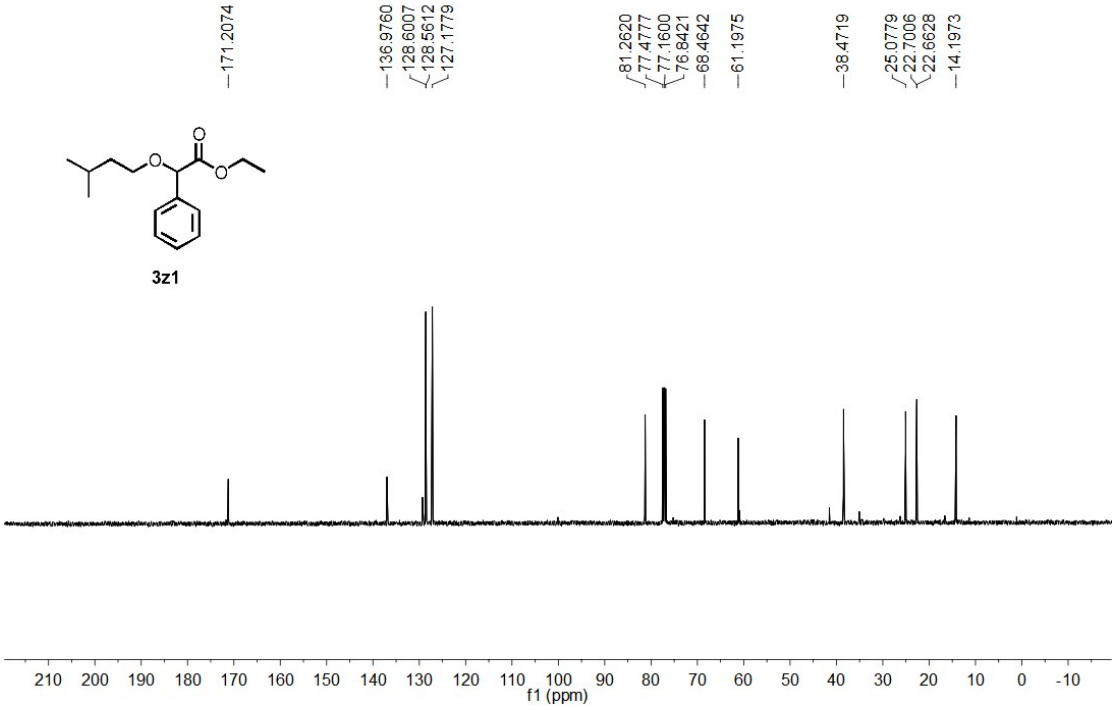

171.676
137.458
128.604
128.490
127.218
78.665
77.478
77.160
76.842
71.053
61.201
22.206
22.189
14.203
3z
f1 (ppm)

ZZP-500-4
1



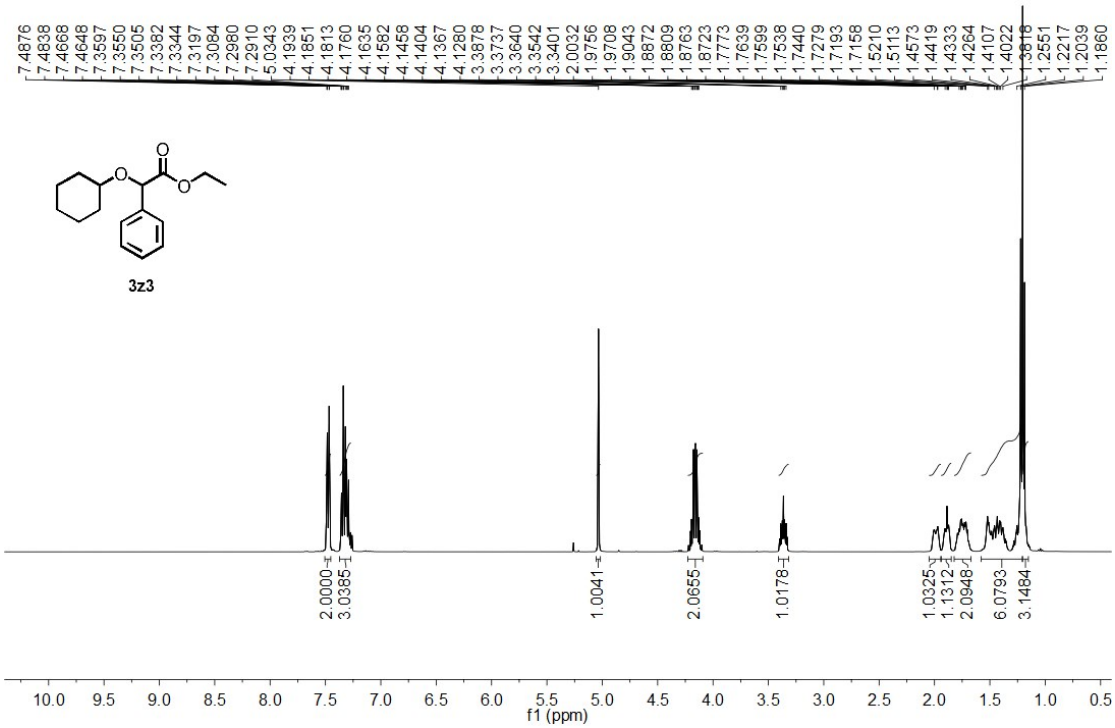
3z1

ZZP-500-5
1

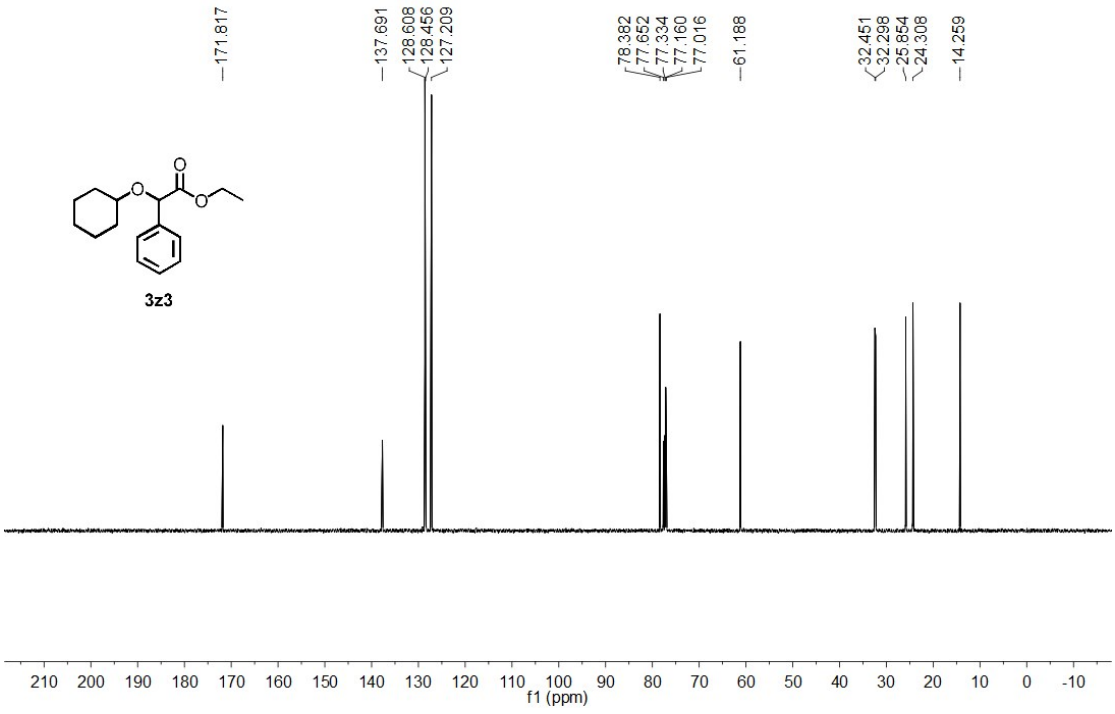


3z1

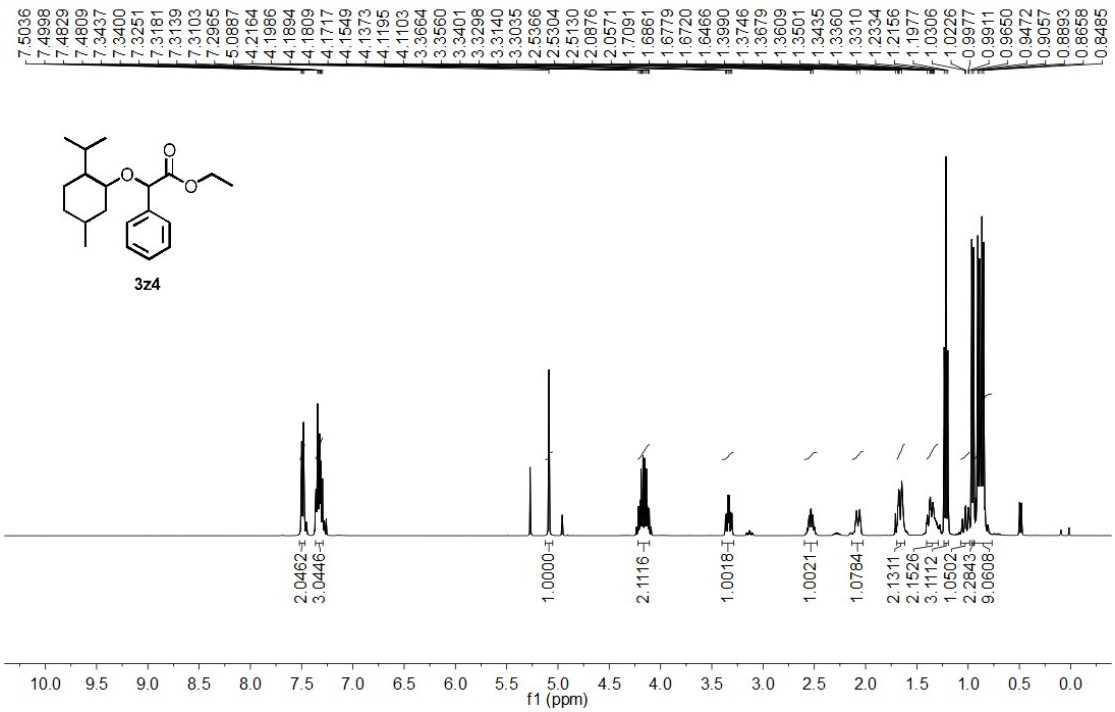
ZZP-61-1



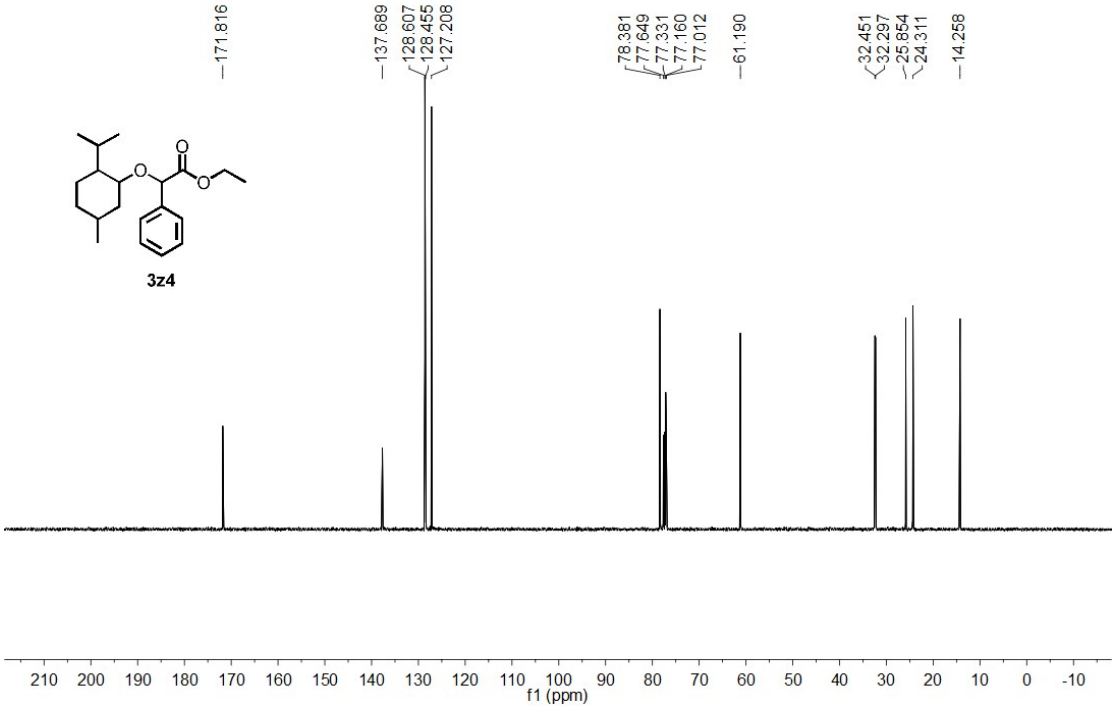
ZZP-61-1



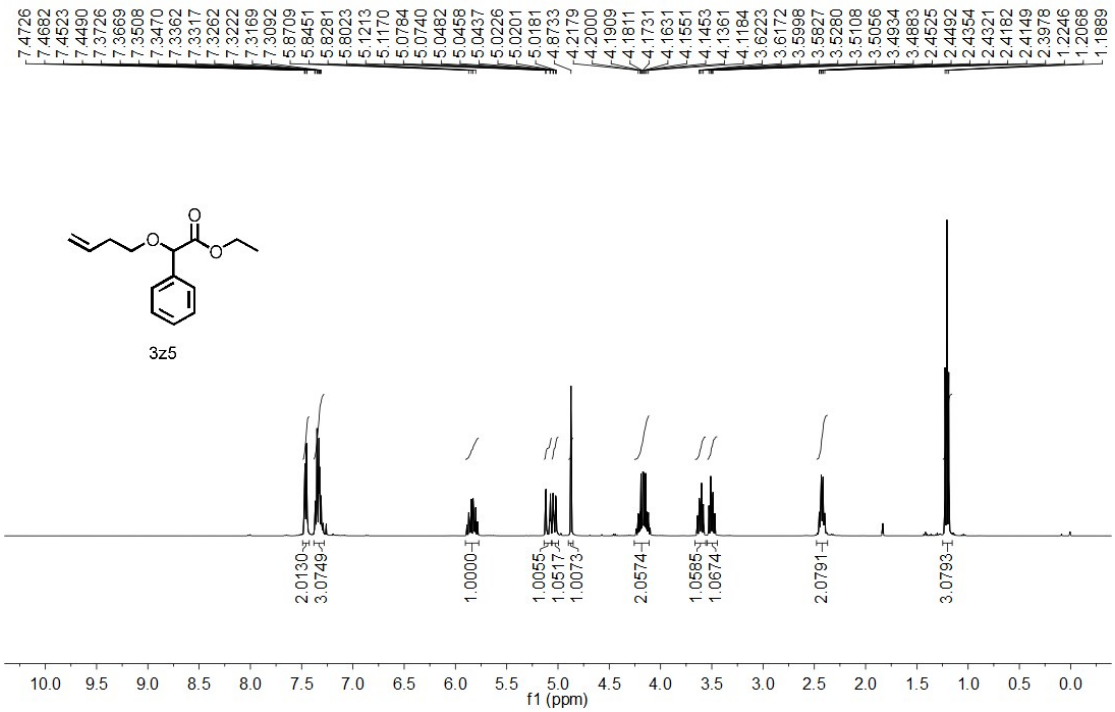
ZZP-59-1



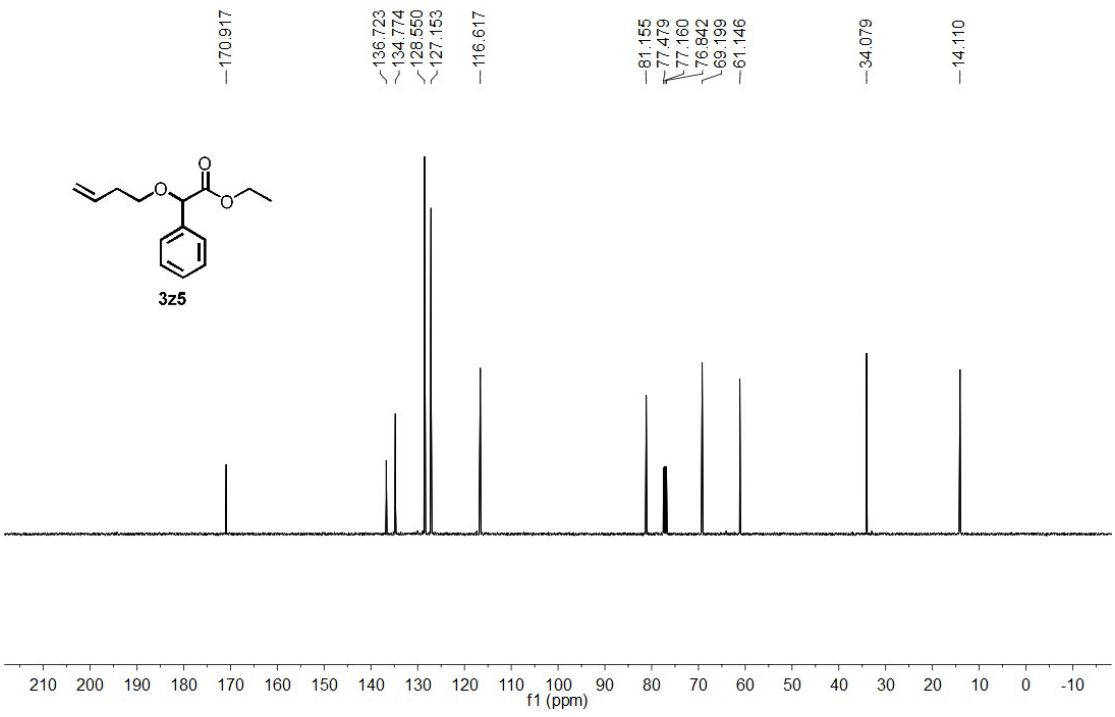
ZZP-59



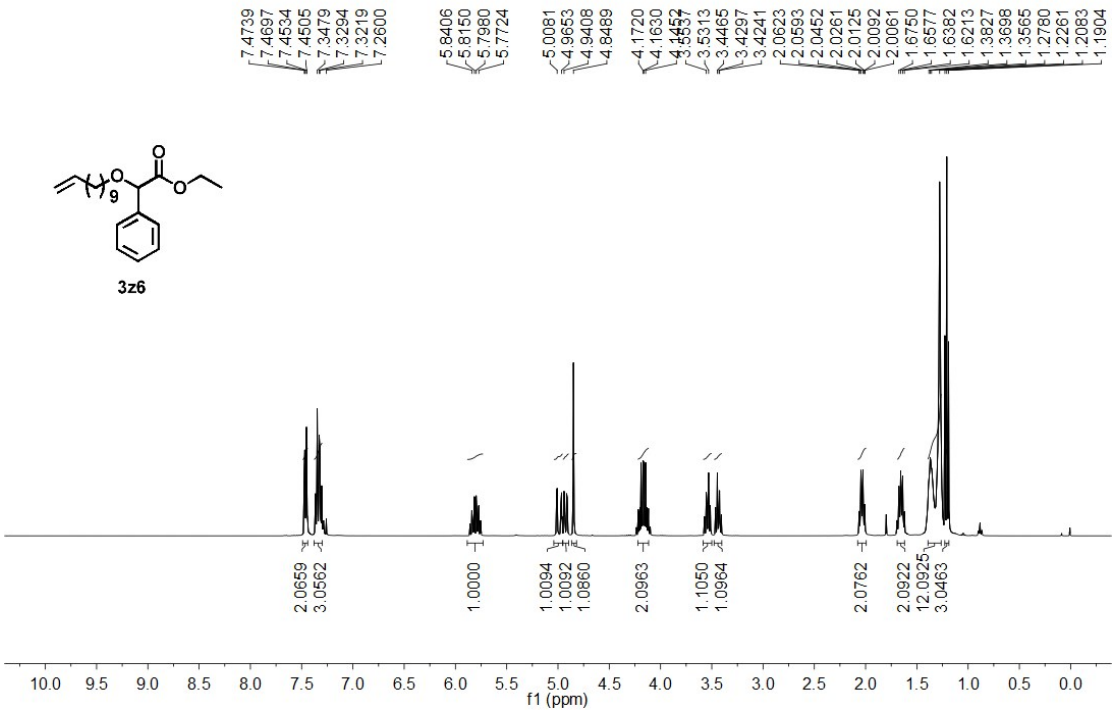
zzp-45


7.4726
7.4682
7.4523
7.4490
7.3726
7.3669
7.3508
7.3470
7.3362
7.3317
7.3262
7.3222
7.3169
7.3092
5.8709
5.8451
5.8281
5.8023
5.1213
5.1170
5.0784
5.0740
5.0482
5.0458
5.0437
5.0226
5.0201
5.0181
4.8733
4.2179
4.2000
4.1909
4.1811
4.1731
4.1631
4.1551
4.1453
4.1361
4.1184
3.6223
3.6172
3.5998
3.5827
3.5280
3.5108
3.5056
3.4934
3.4883
2.4525
2.4492
2.4354
2.4321
2.4182
2.4149
2.3978
1.2246
1.2068
1.1889
3z5
2.0130
3.0749
1.0000
1.0055
1.0517
1.0073
2.0574
1.0585
1.0674
2.0791
3.0793
f1 (ppm)

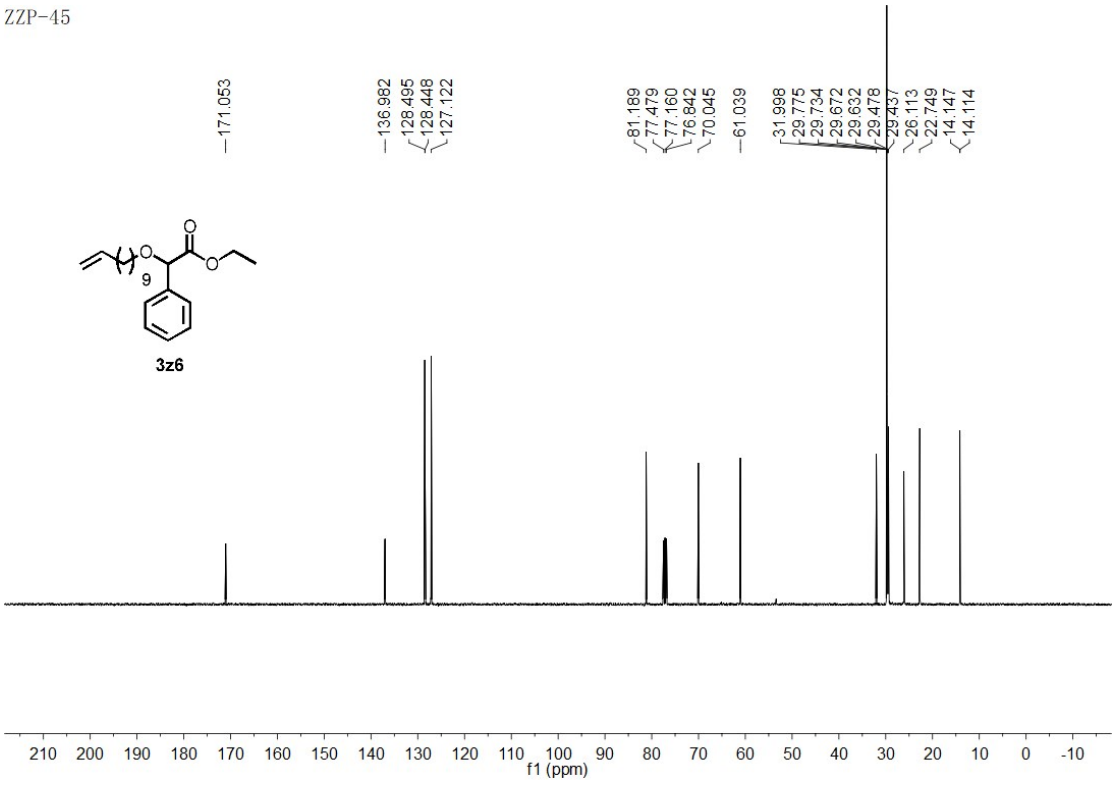
ZZP-44


170.917
136.723
134.774
128.550
127.153
116.617
81.155
77.479
77.160
76.842
69.199
61.146
34.079
14.110
3z5
f1 (ppm)

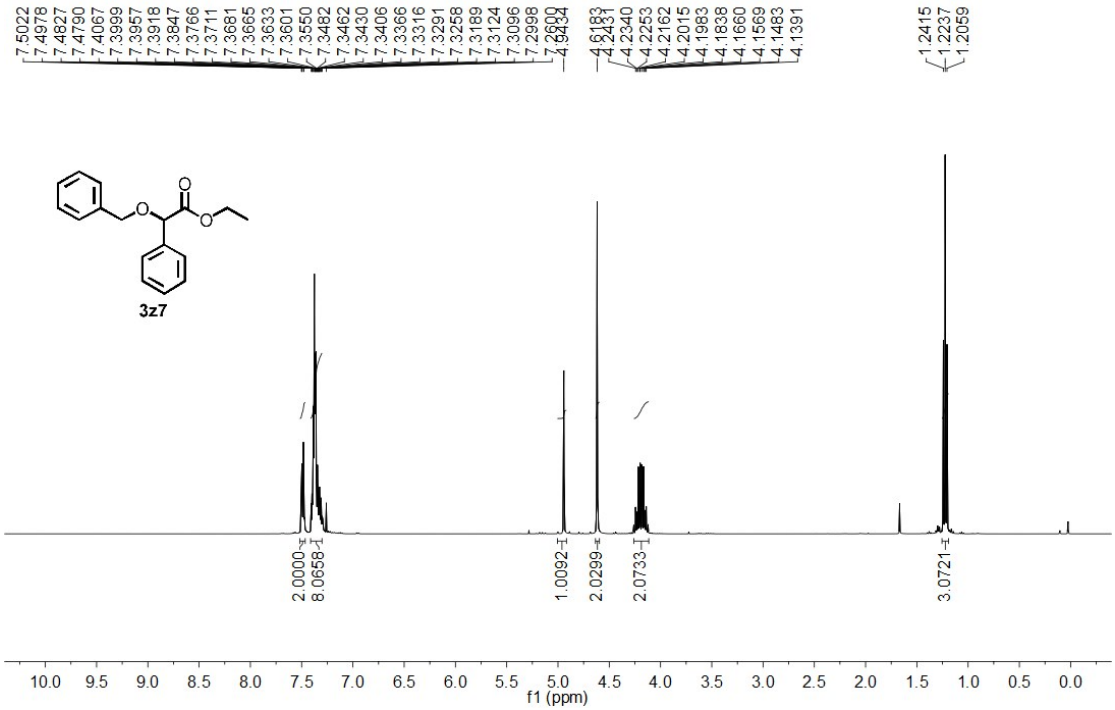
zzp-44


7.4739
7.4697
7.4534
7.4505
7.3479
7.3294
7.3219
7.2600
5.8406
5.8150
5.7980
5.7724
5.0081
4.9653
4.9408
4.8489
4.1720
4.1630
3.5513
3.4465
3.4297
3.4241
2.0623
2.0593
2.0452
2.0261
2.0125
2.0092
2.0061
1.6750
1.6577
1.6382
1.6213
1.3827
1.3698
1.3565
1.2780
1.2261
1.2083
1.1904
3z6
2.0659
3.0562
1.0000
1.0094
1.0092
1.0860
2.0963
1.1050
1.0964
2.0762
2.0922
12.0925
3.0463
f1 (ppm)

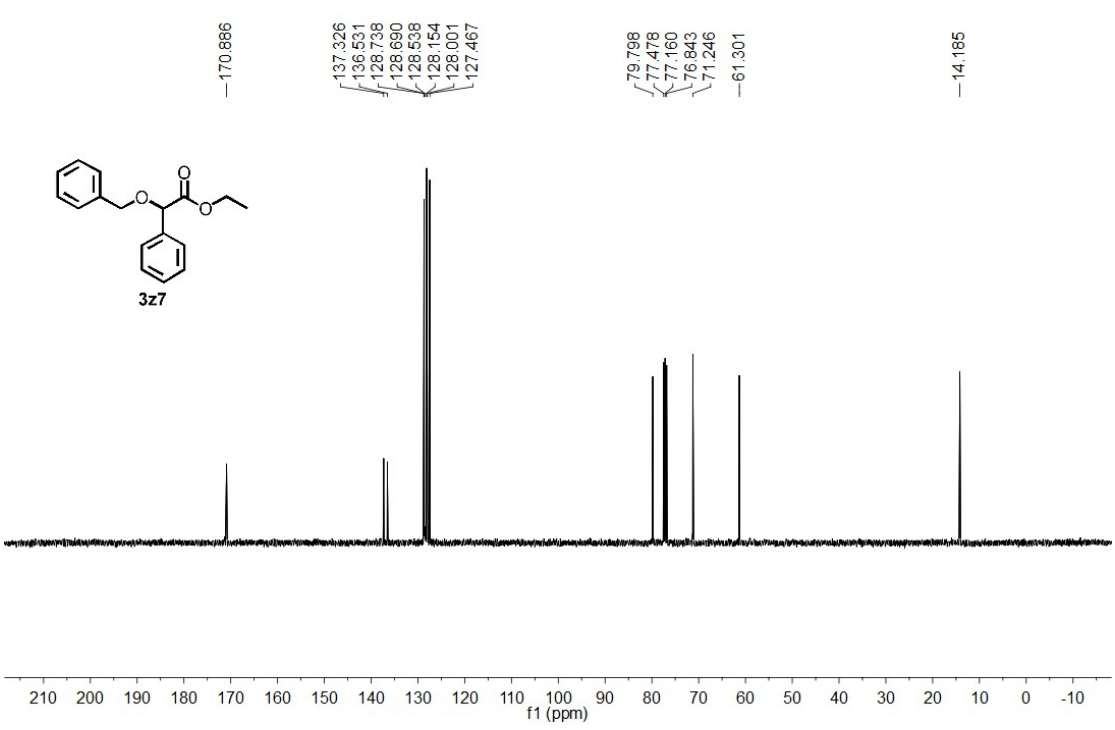
ZZP-45


171.053
136.982
128.495
128.448
127.122
81.189
77.479
77.160
76.842
70.045
61.039
31.998
29.775
29.734
29.672
29.632
29.478
29.437
26.113
22.749
14.147
14.114
3z6
f1 (ppm)

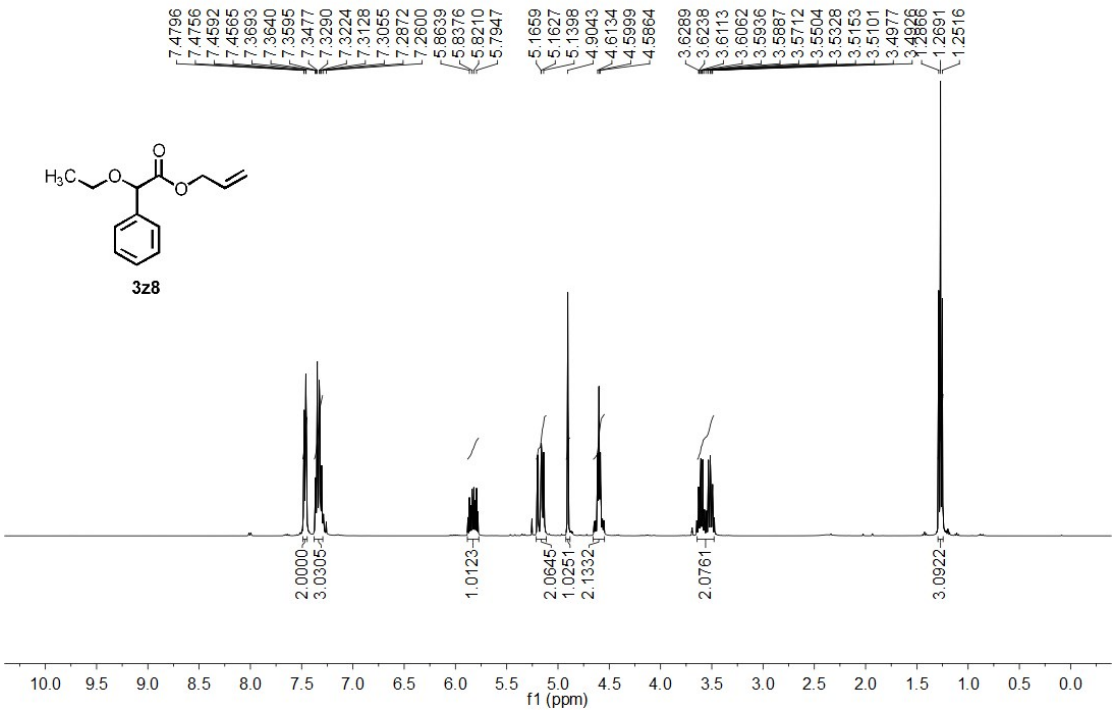
ZZP-42


7.5022
7.4978
7.4827
7.4790
7.4067
7.3999
7.3957
7.3918
7.3847
7.3766
7.3711
7.3681
7.3665
7.3633
7.3601
7.3550
7.3482
7.3462
7.3430
7.3406
7.3366
7.3316
7.3291
7.3258
7.3189
7.3124
7.3096
7.2998
4.6183
4.2431
4.2340
4.2253
4.2162
4.2015
4.1983
4.1838
4.1660
4.1569
4.1483
4.1391
1.2415
1.2237
1.2059
3z7
2.0000
8.0658
1.0092
2.0299
2.0733
3.0721
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

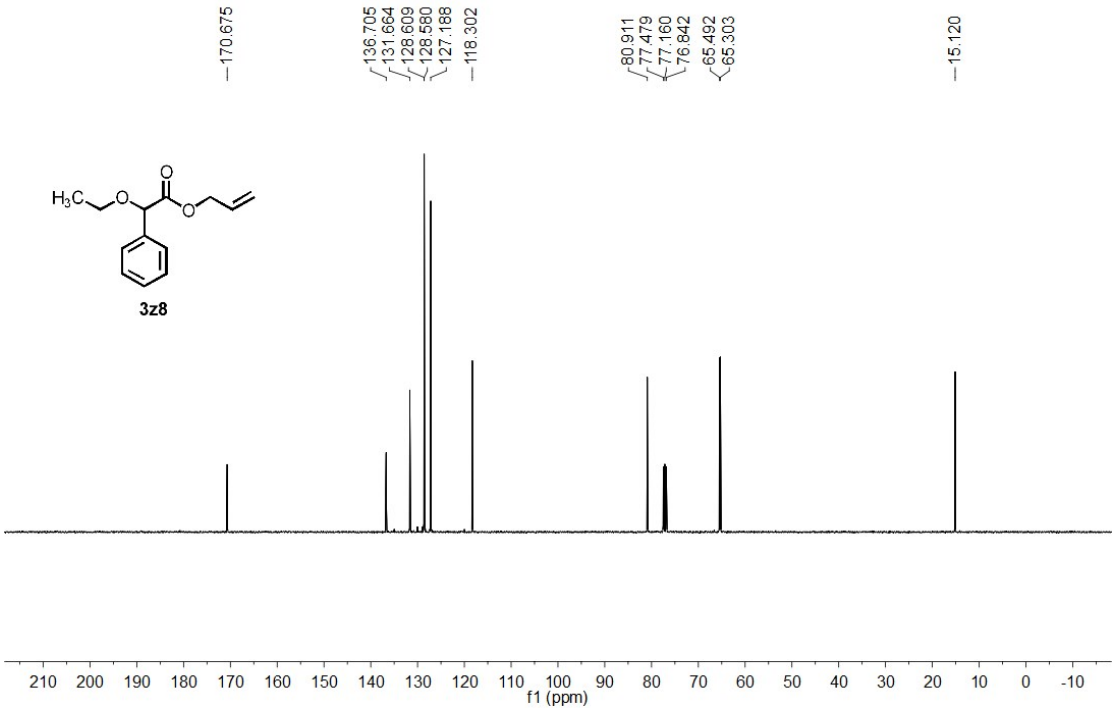
ZZP-42


170.886
137.326
136.531
128.738
128.690
128.538
128.154
128.001
127.467
79.798
77.478
77.160
76.843
71.246
61.301
14.185
3z7
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

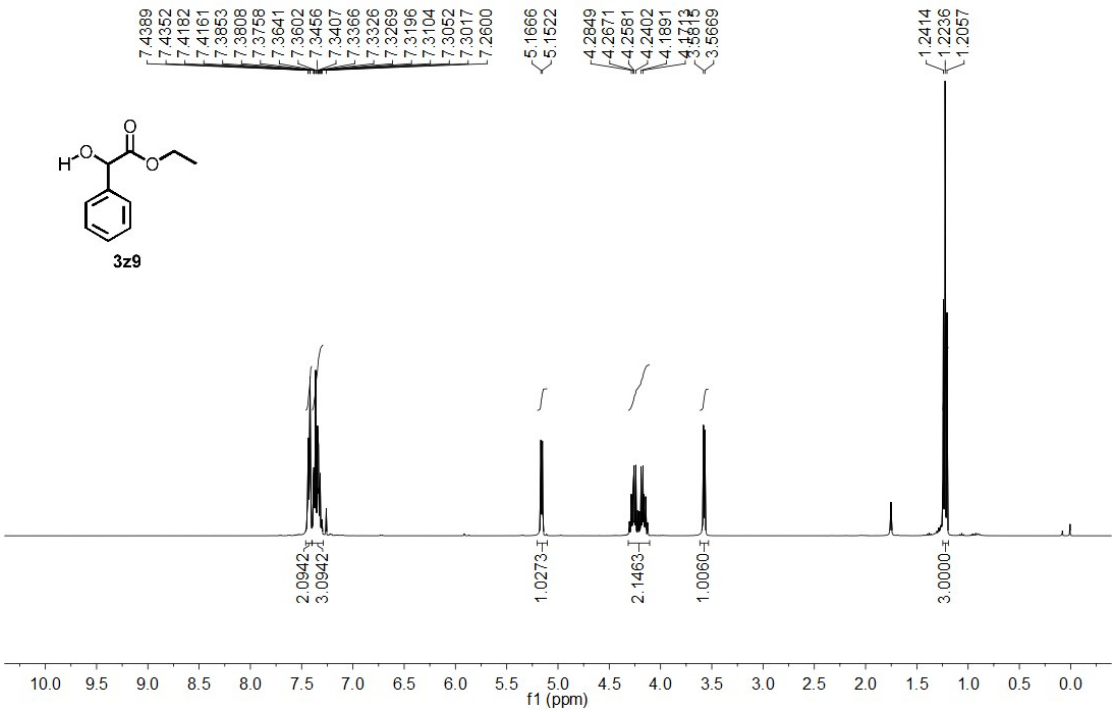
ZZP-184



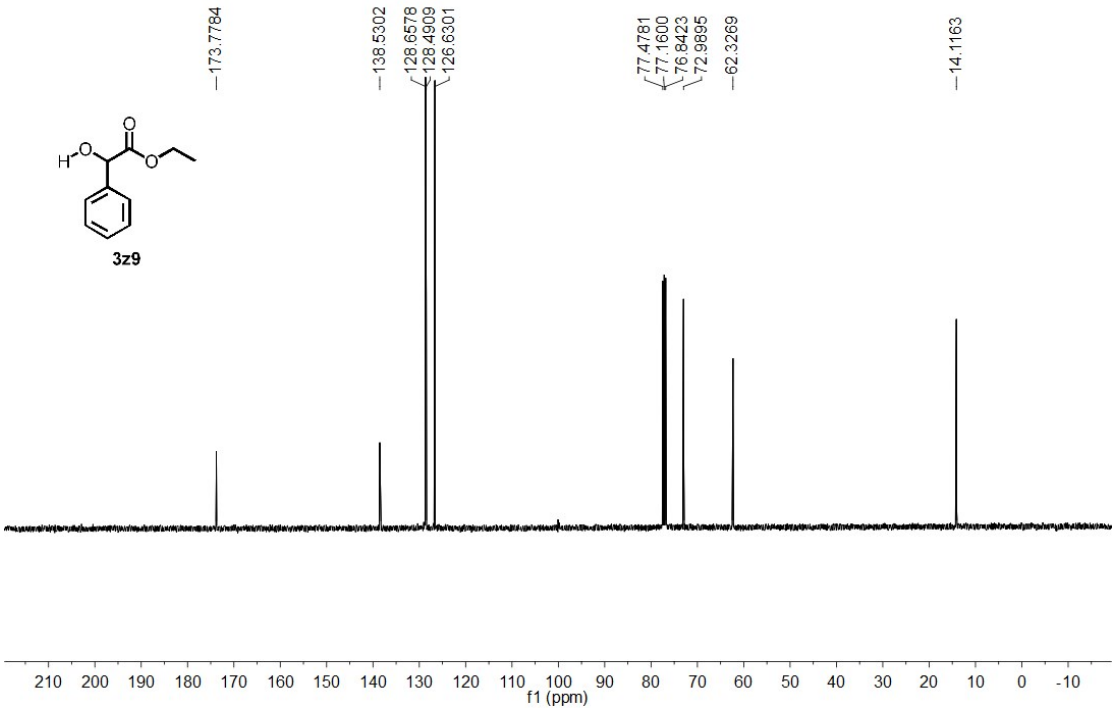
ZZP-184



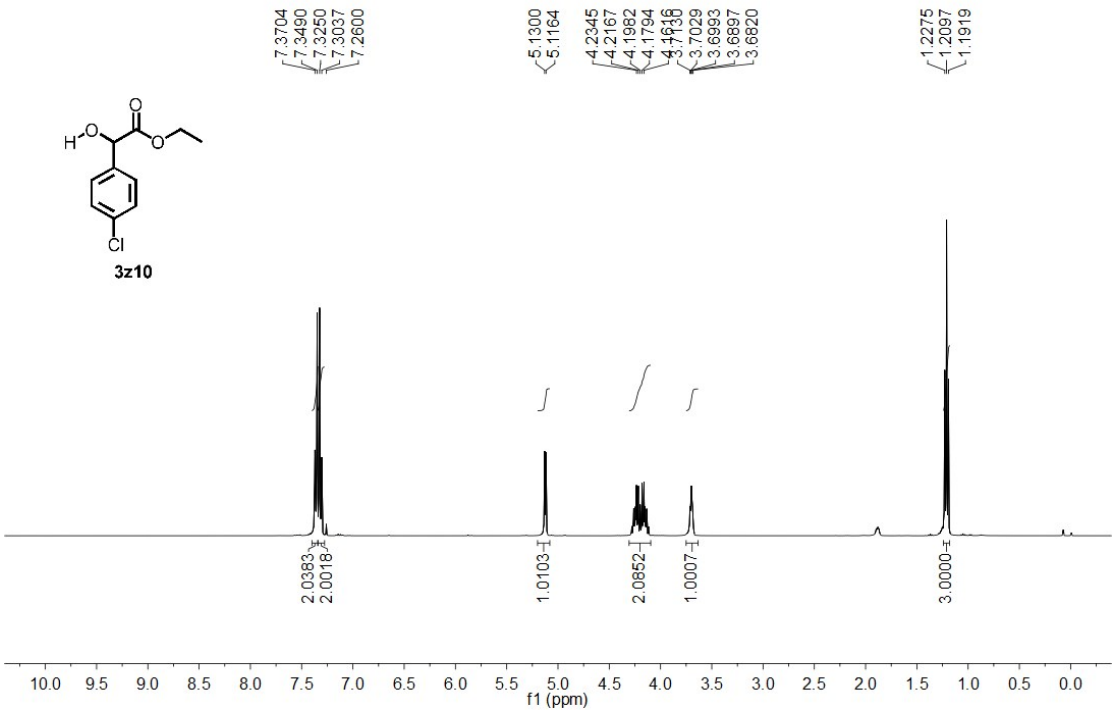
ZZP-504



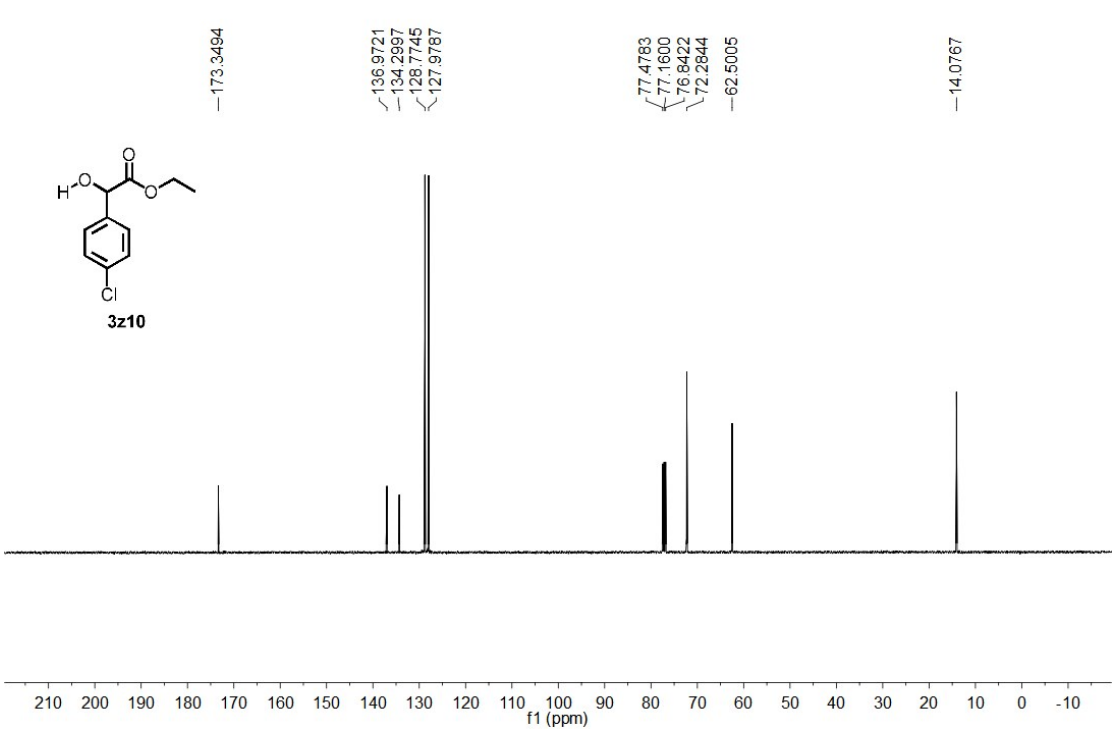
ZZP-504



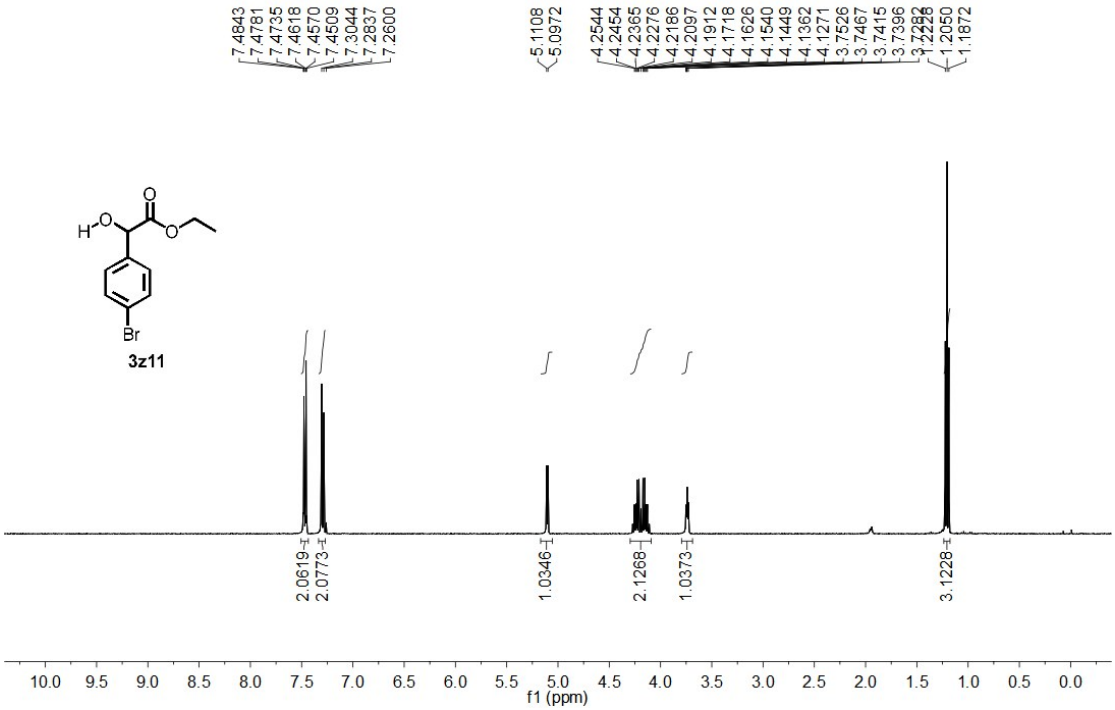
ZZP-515



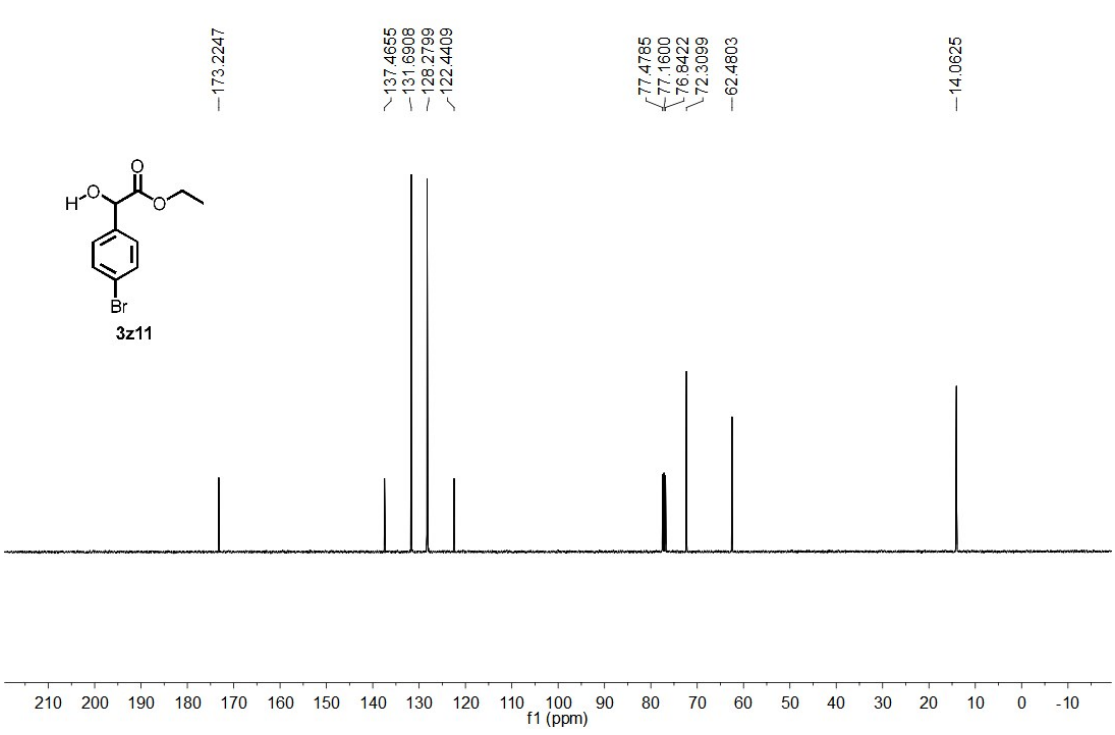
ZZP-515



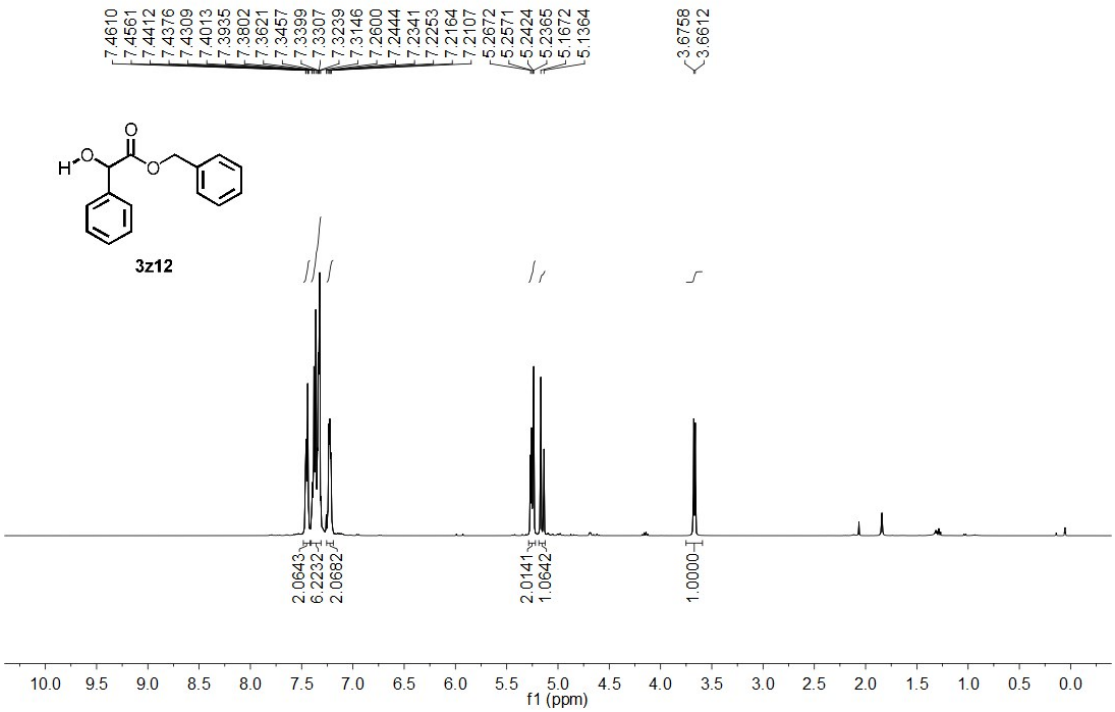
ZZP-516



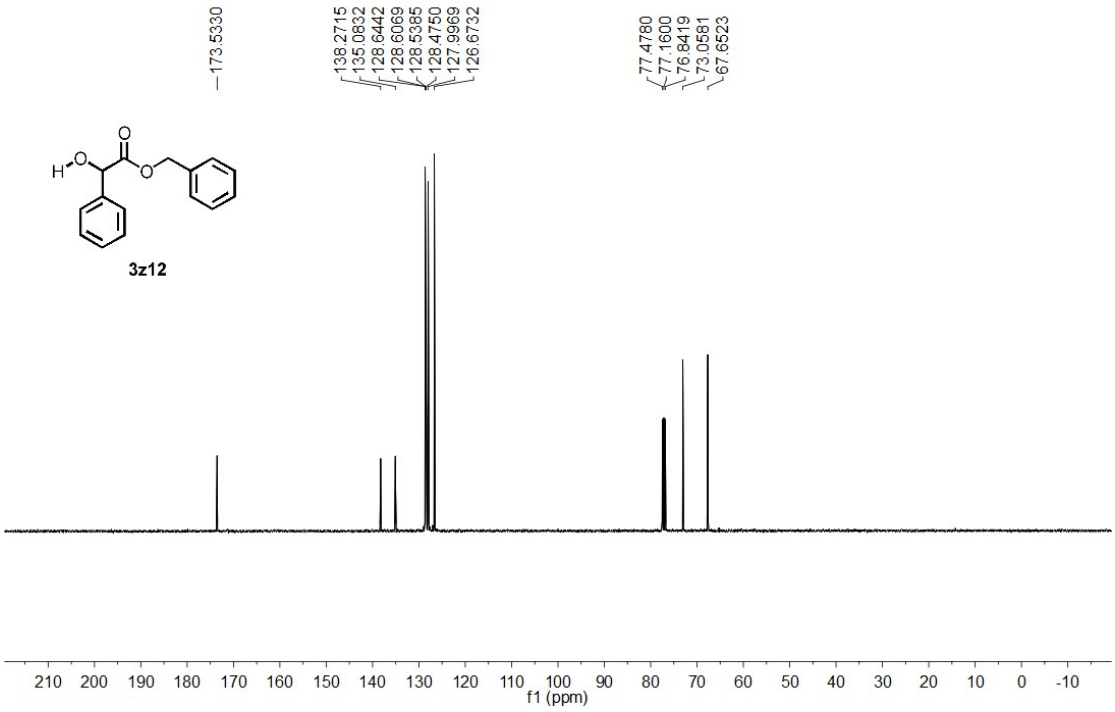
ZZP-516



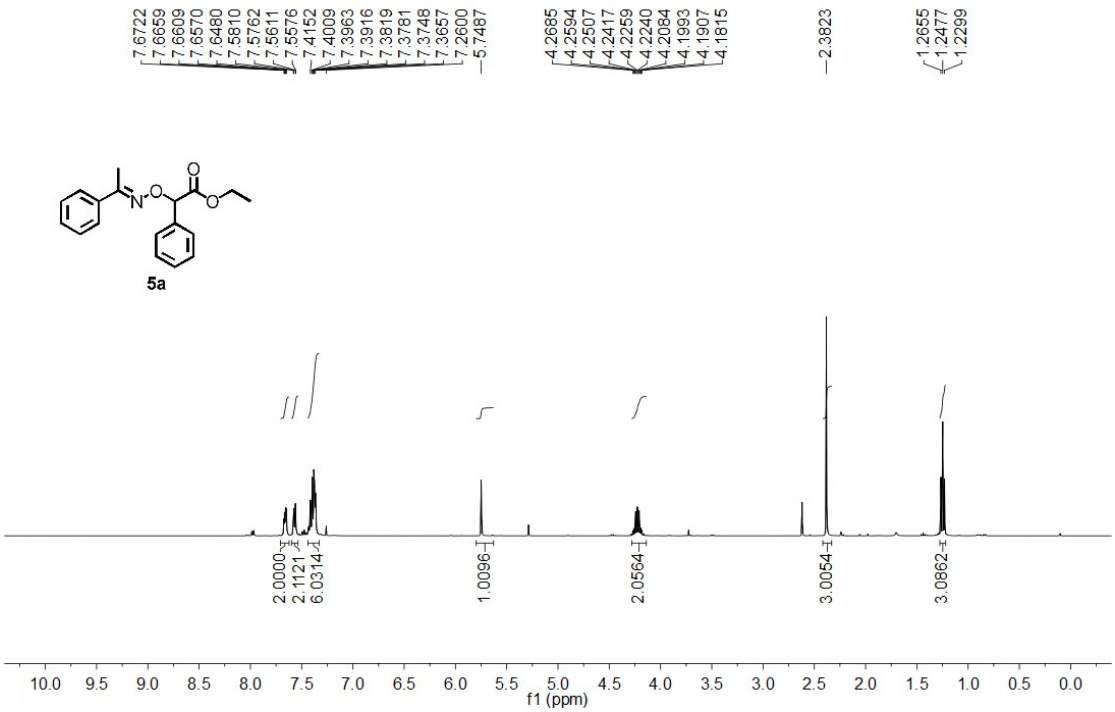
ZZP-506



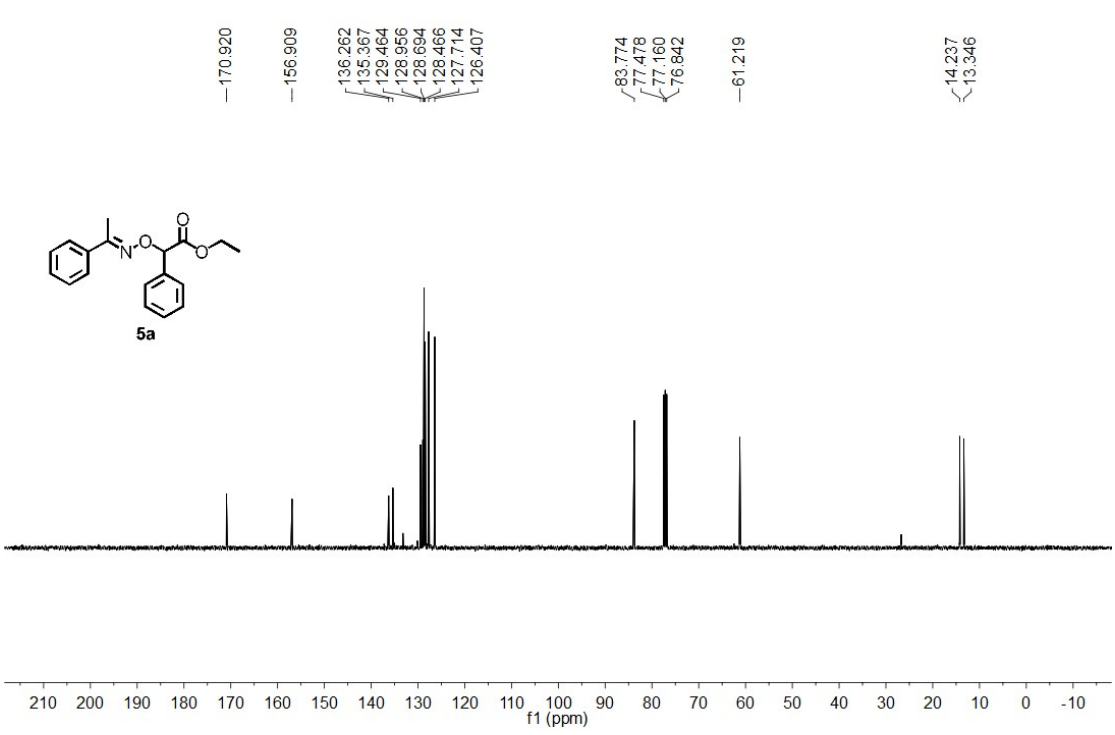
ZZP-506



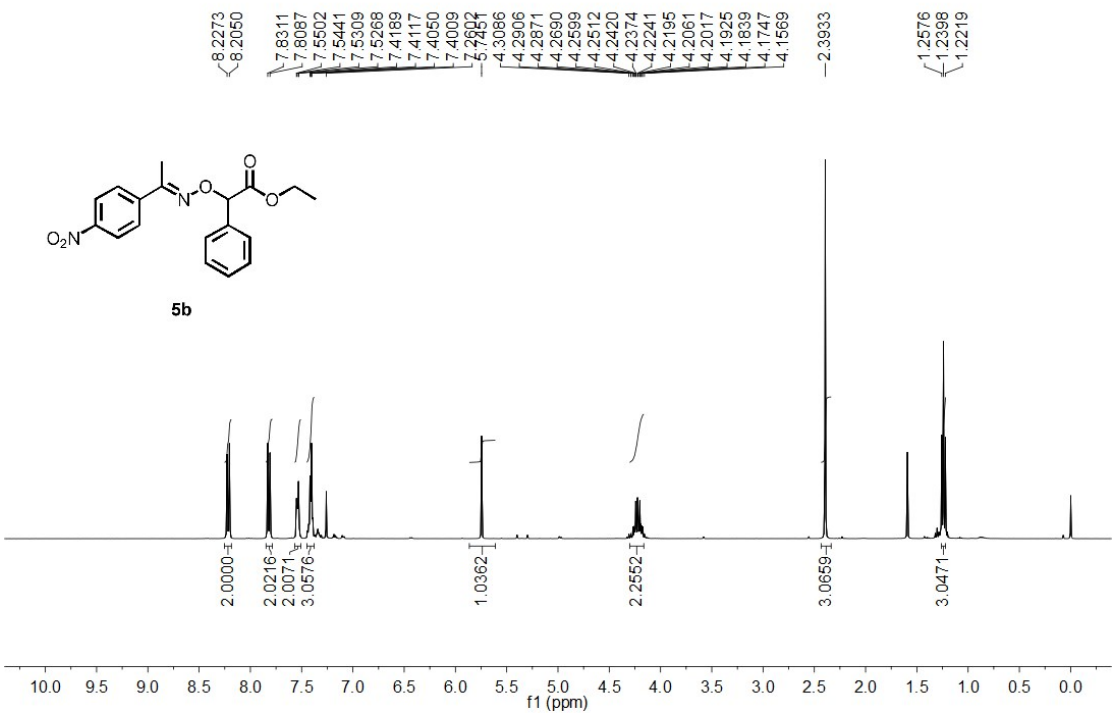
ZZP-167



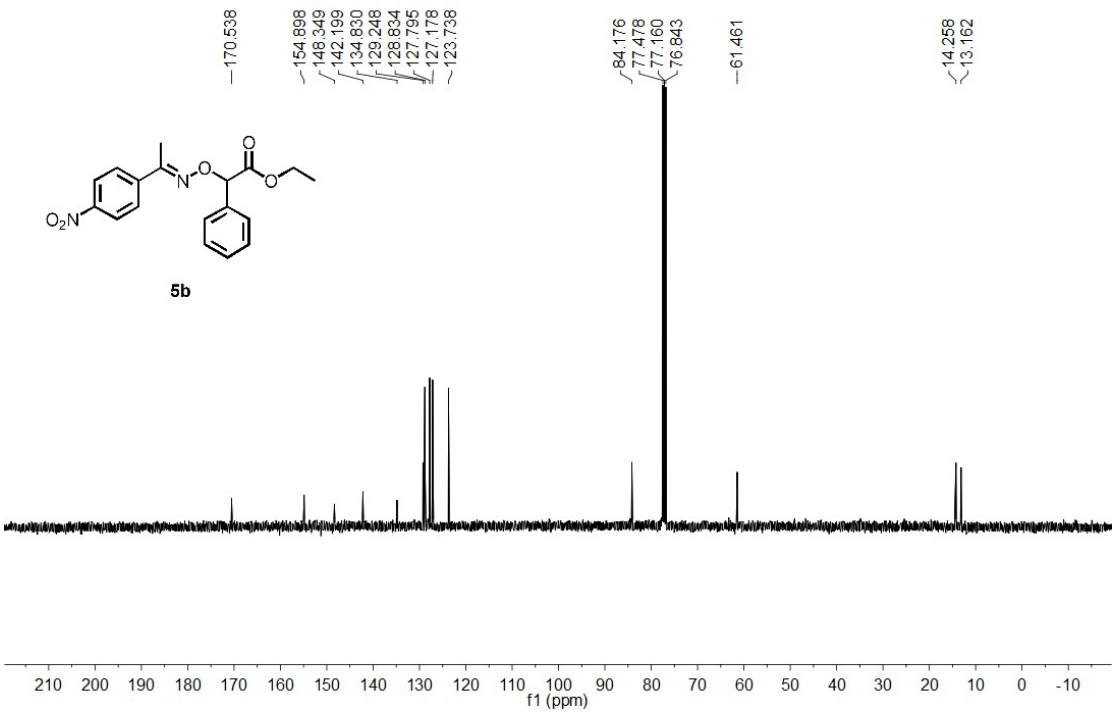
ZZP-167



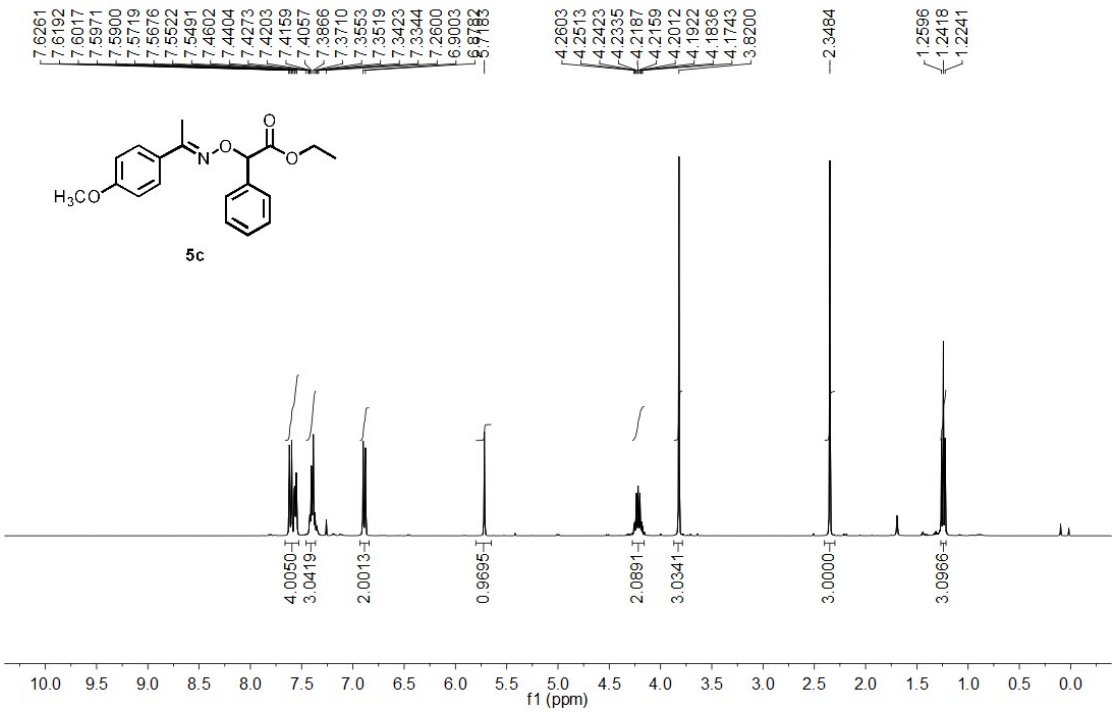
ZZP-438-1



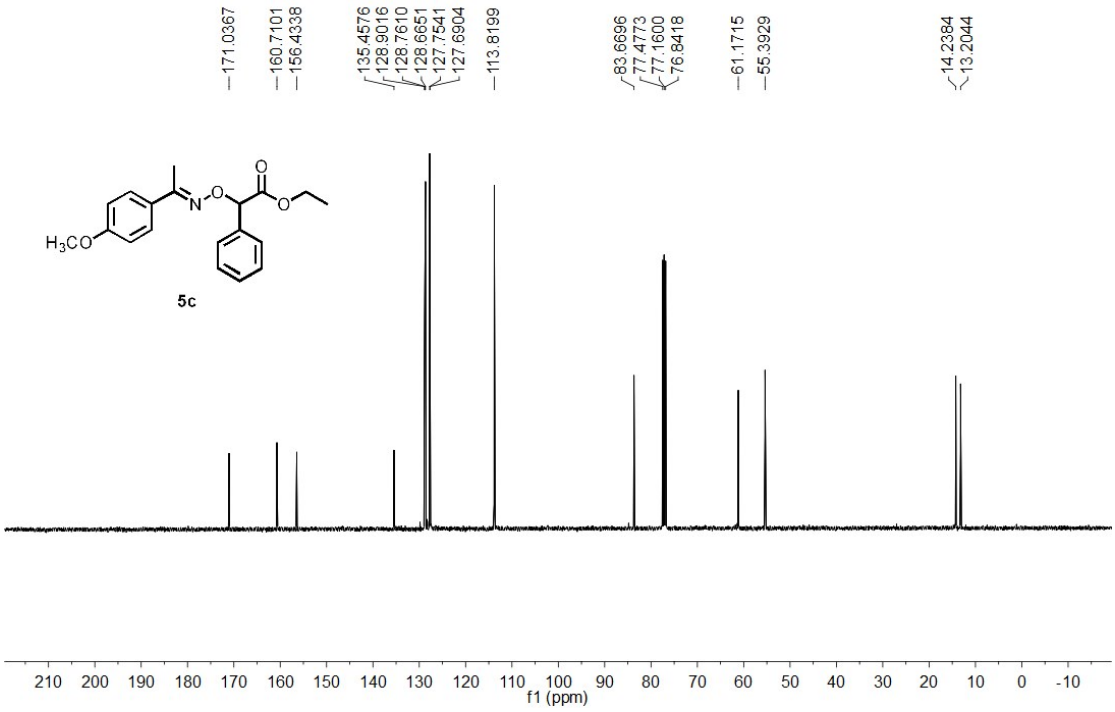
ZZP-438-1



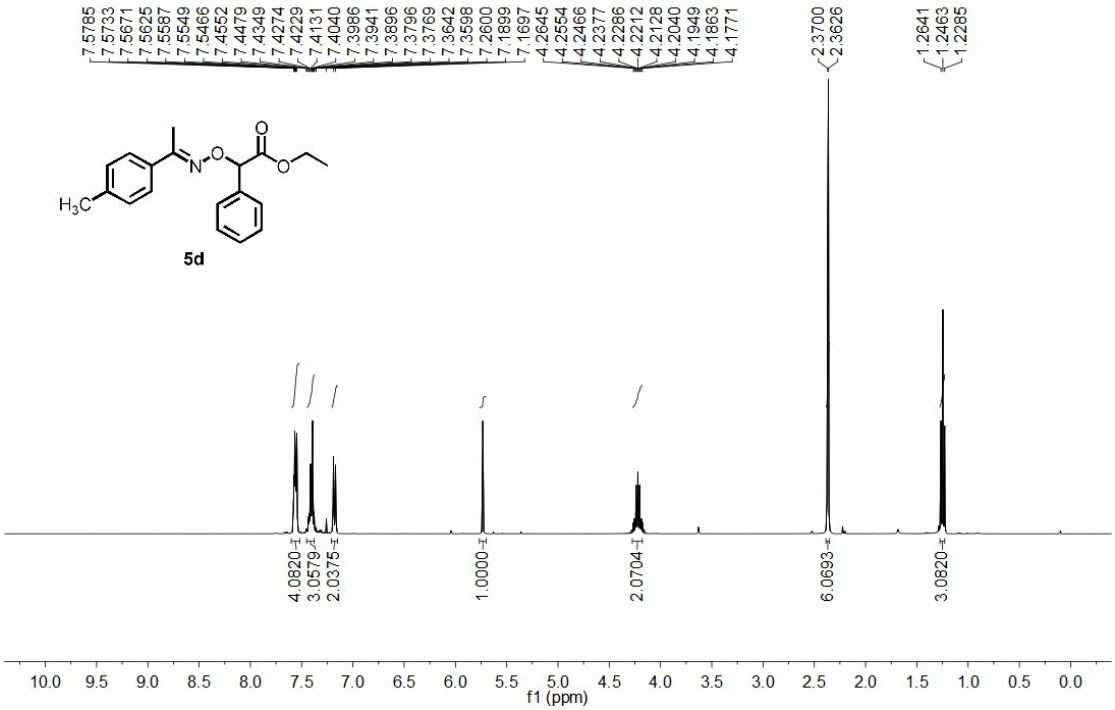
ZZP-507



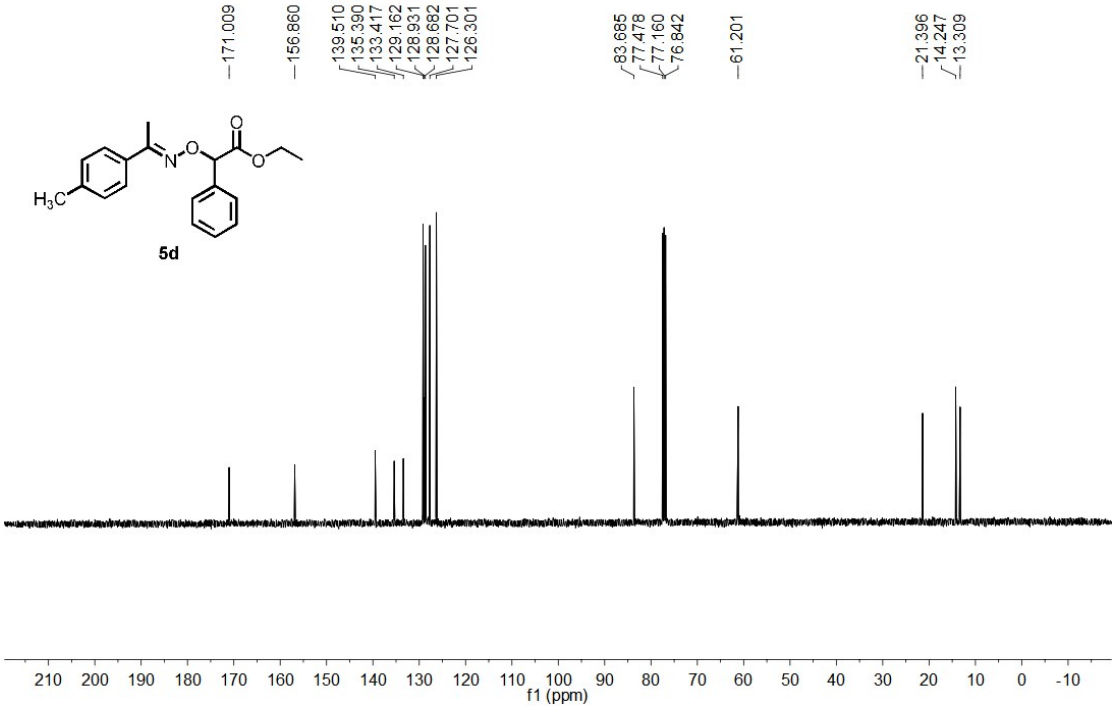
ZZP-507



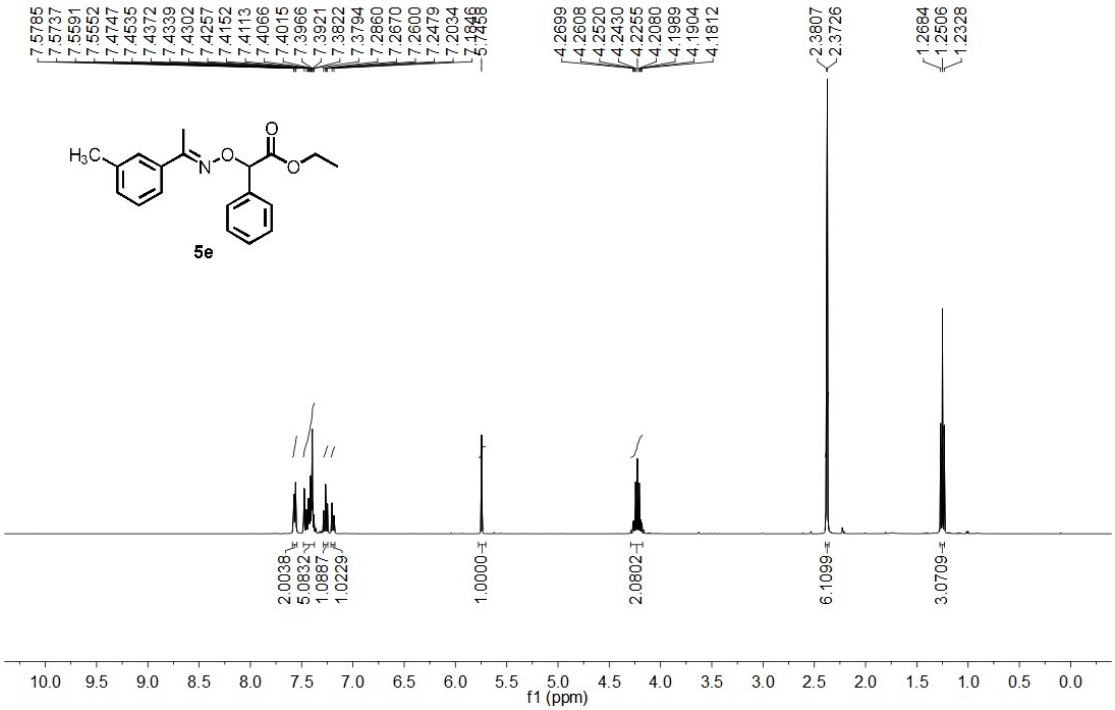
zzp-528-8



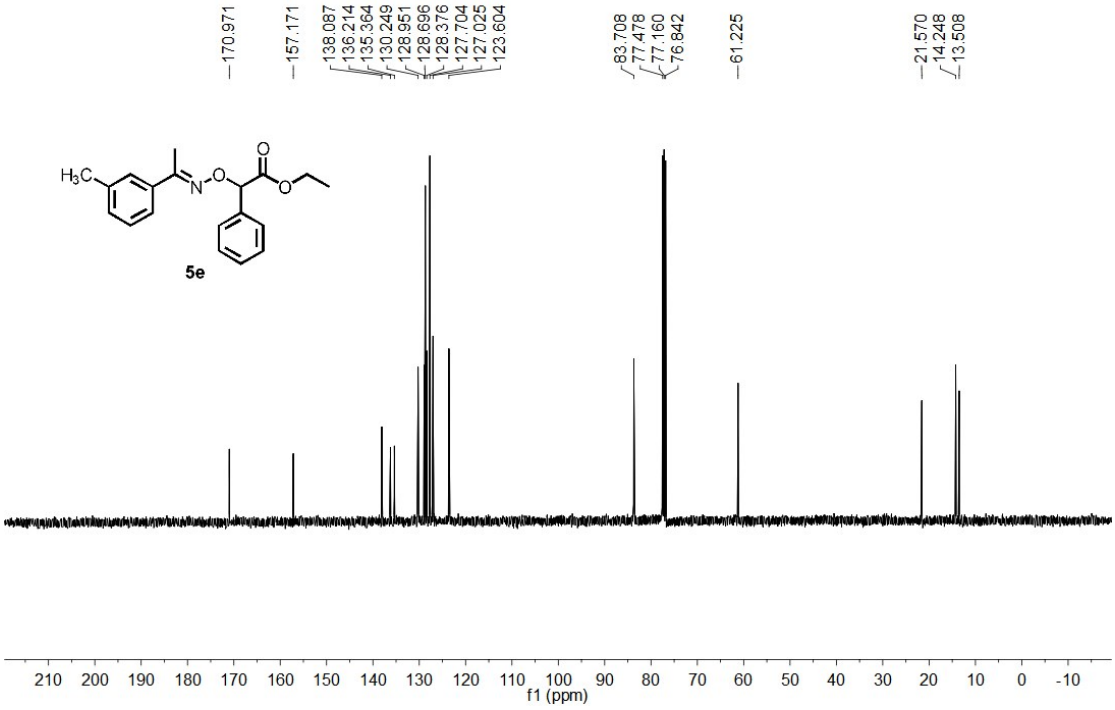
zzp-528-8



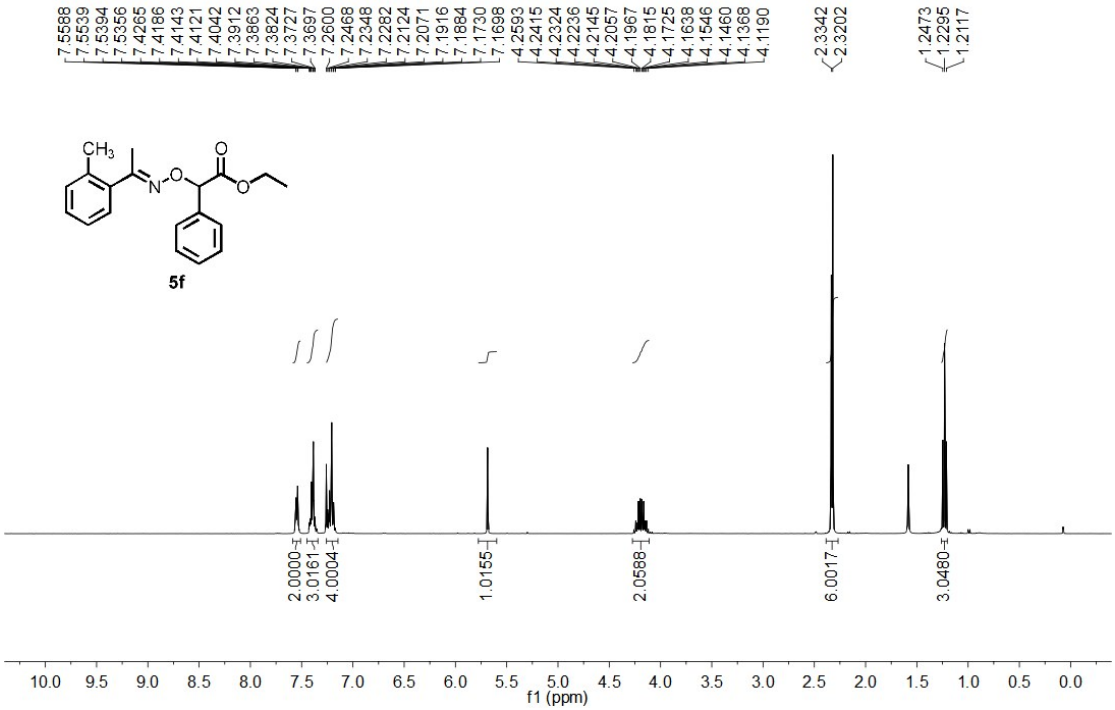
zzp-529-8



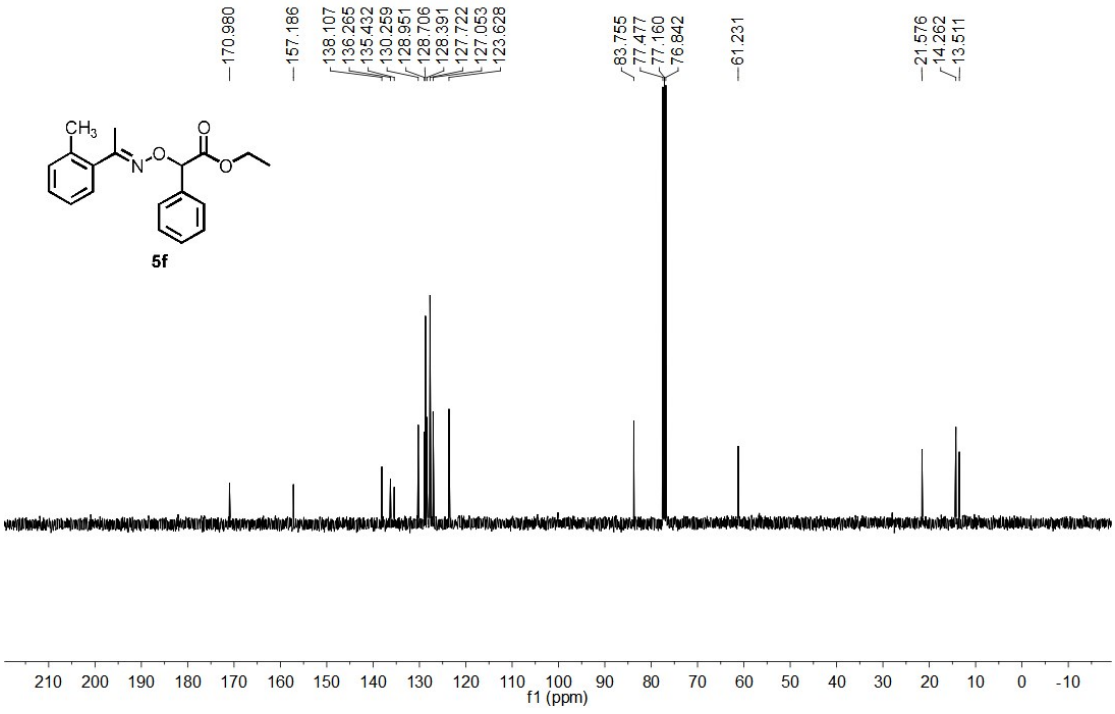
zzp-529-8



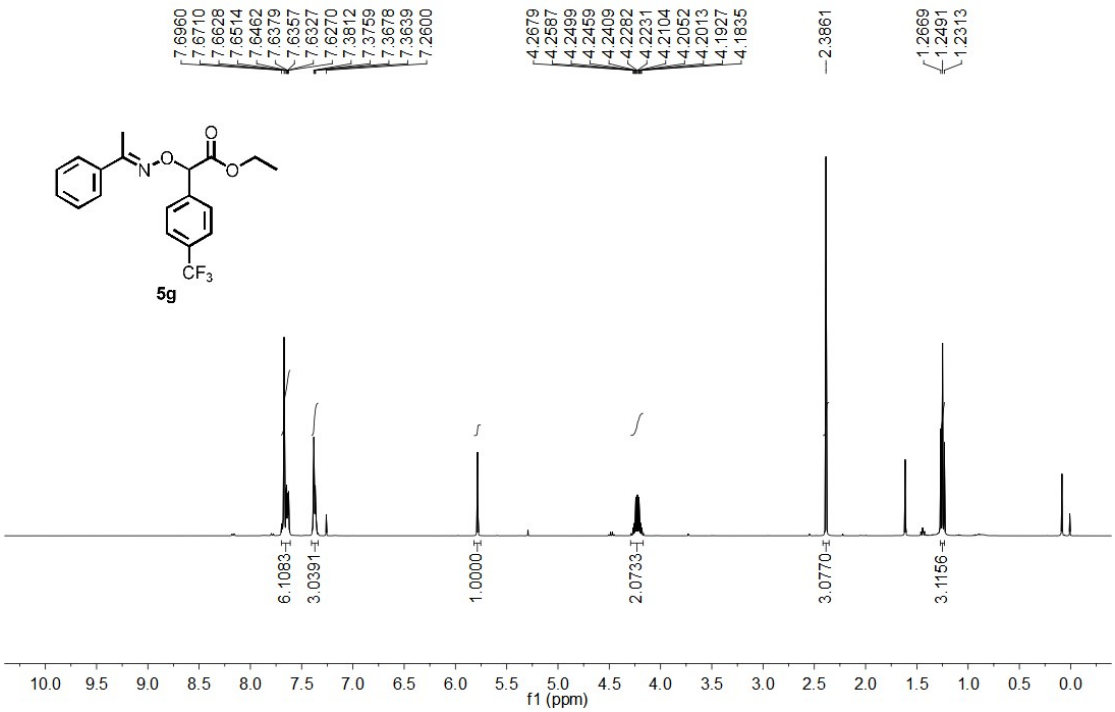
ZZP-569-8



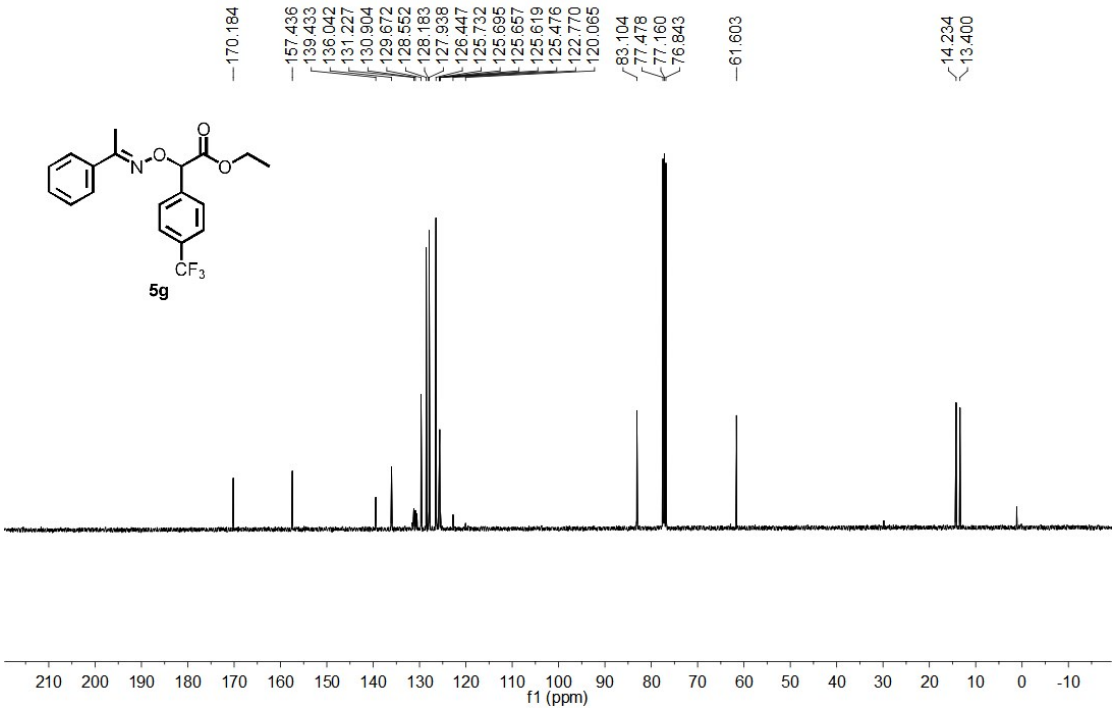
ZZP-568-8



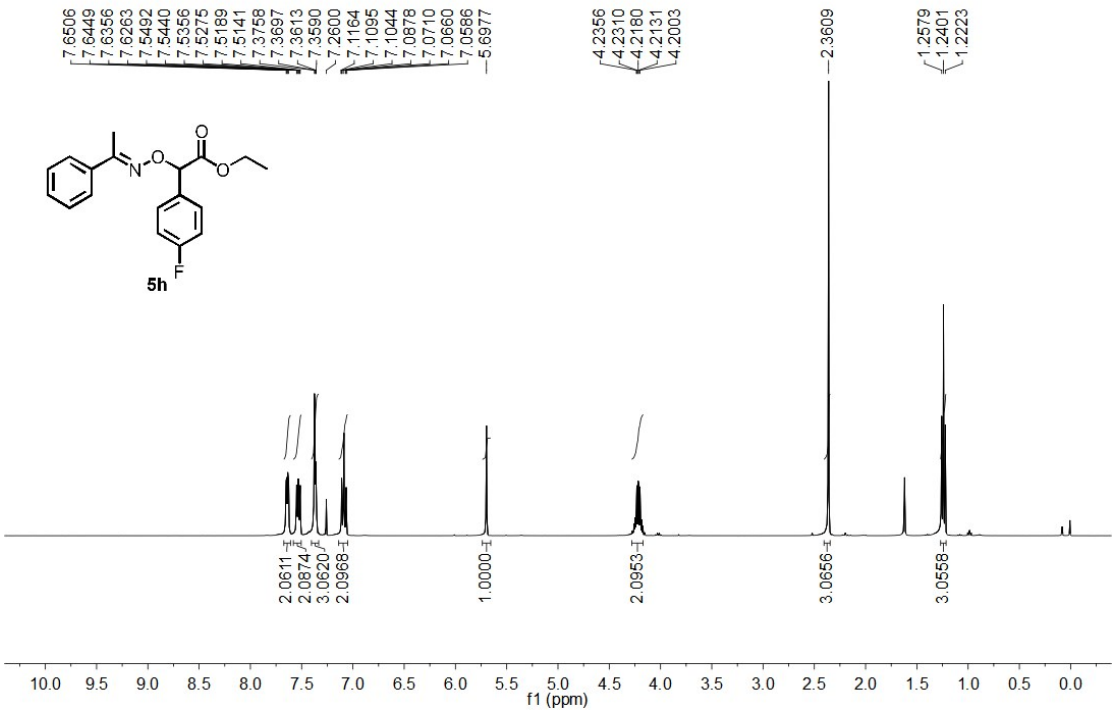
ZZP-124-2



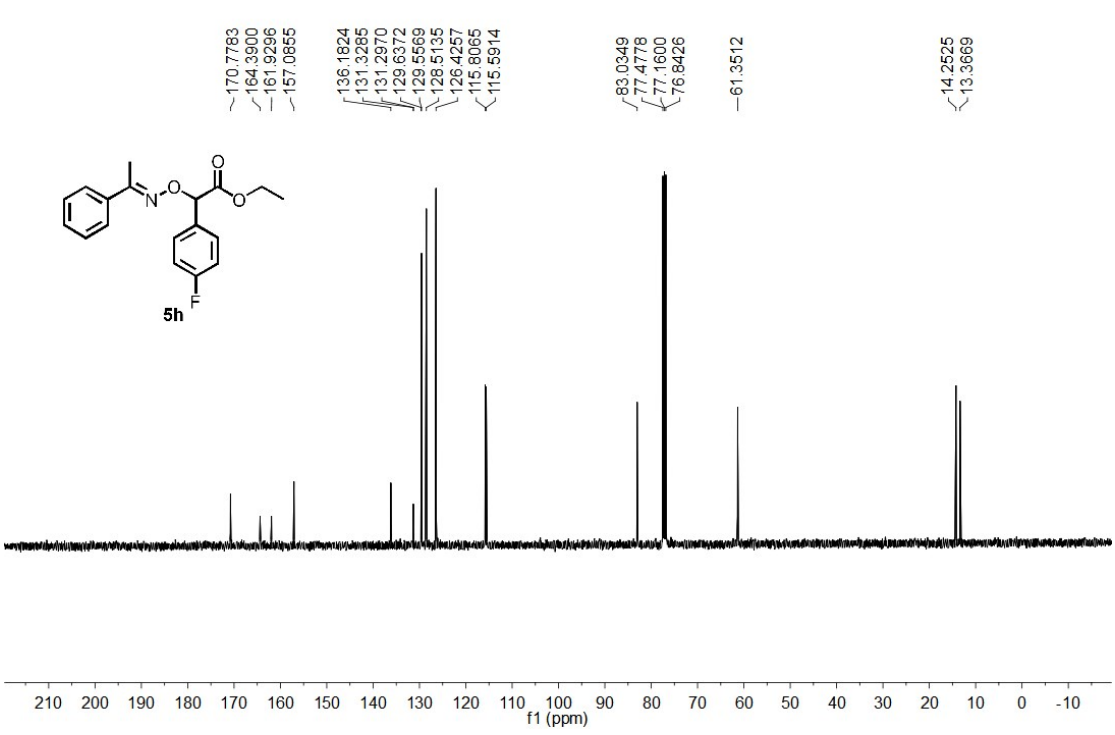
ZZP-124-2



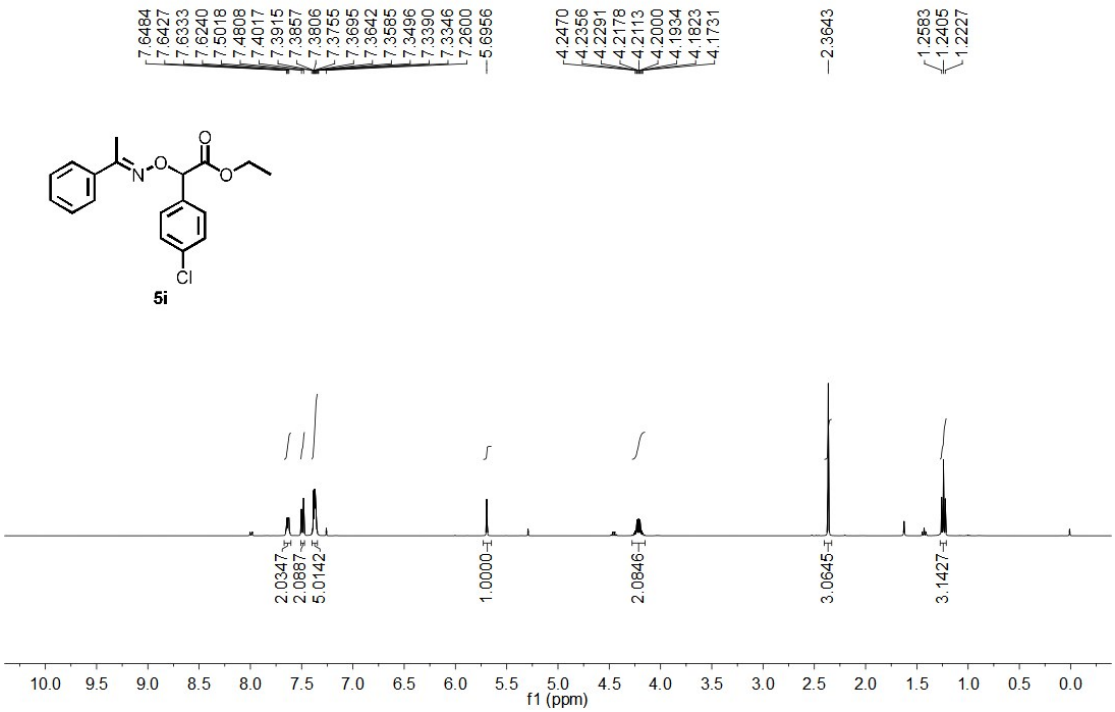
ZZP-509



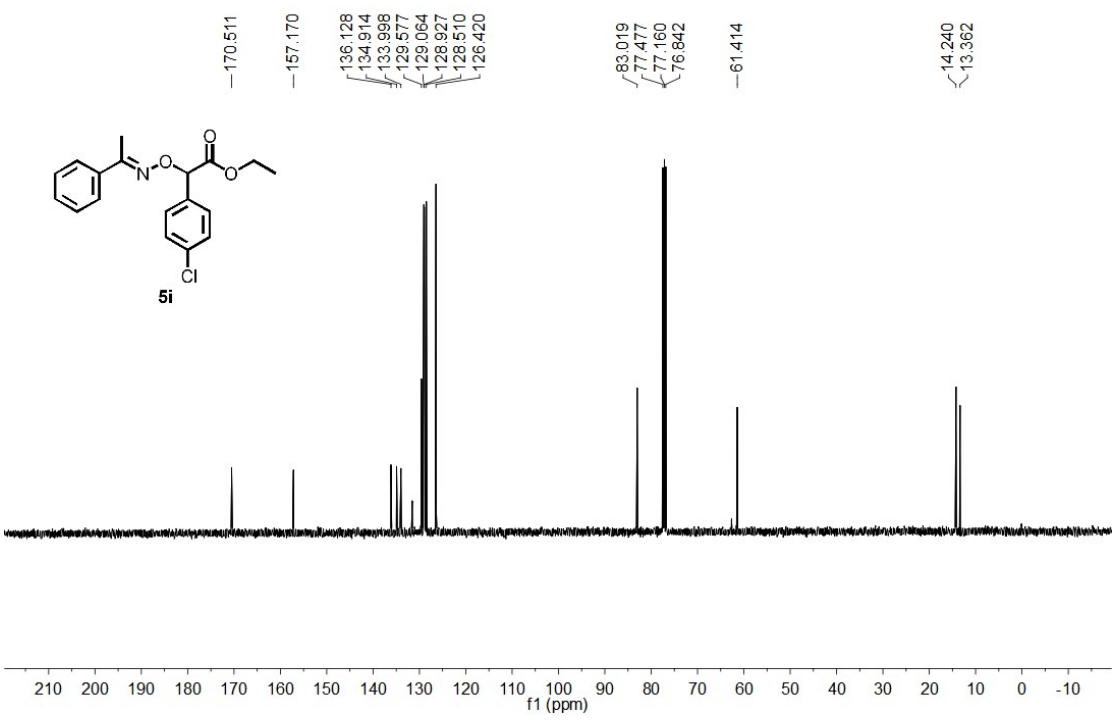
ZZP-509



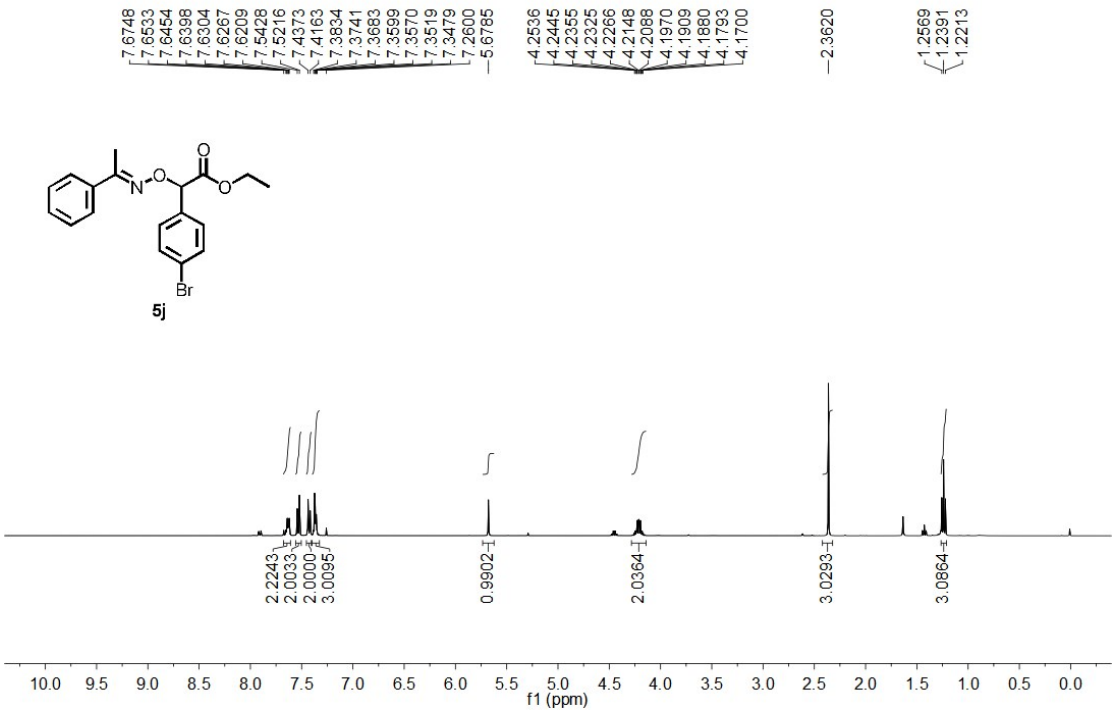
ZZP-120-3



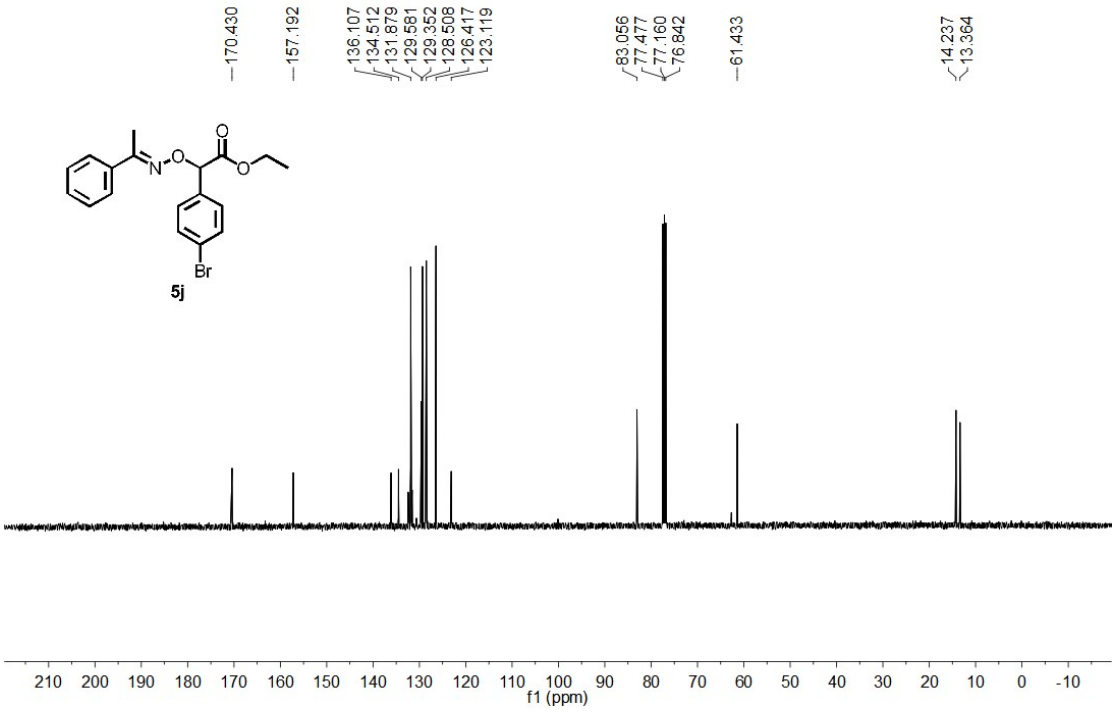
ZZP-120-3



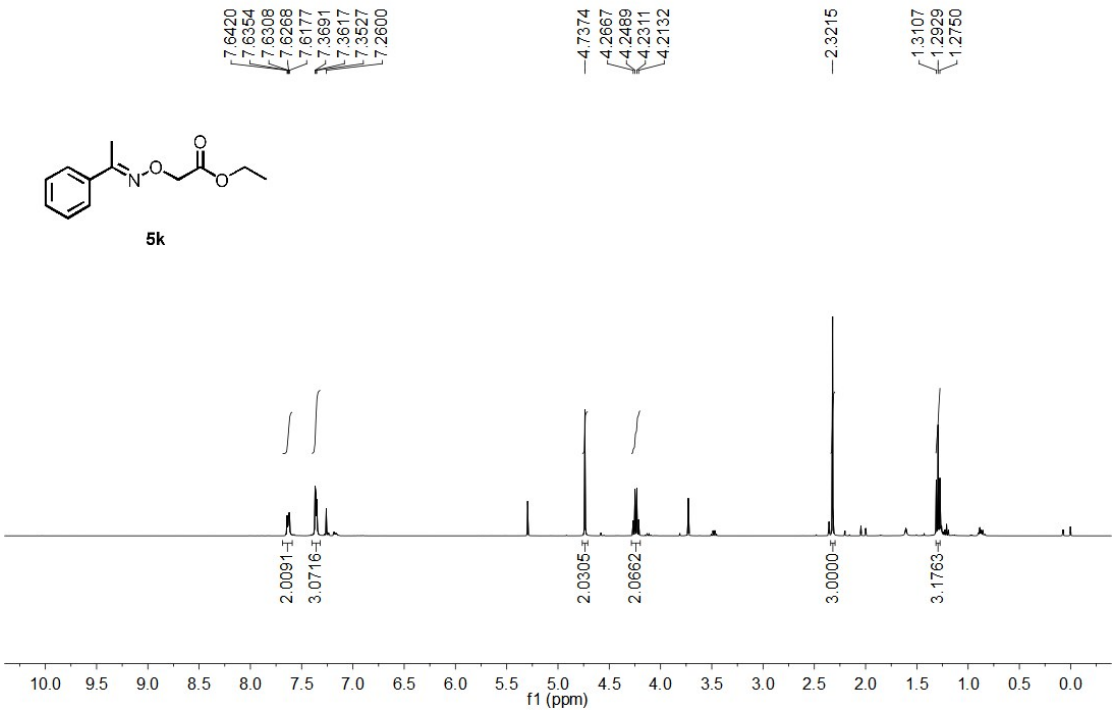
ZZP-123-2



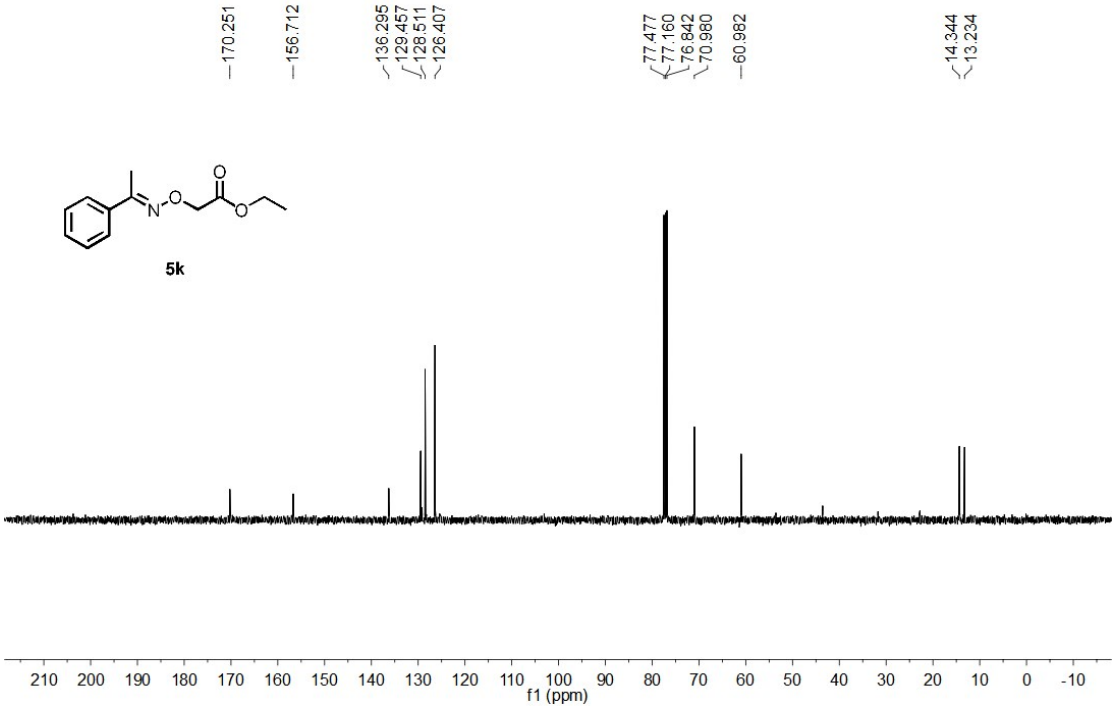
ZZP-123-2



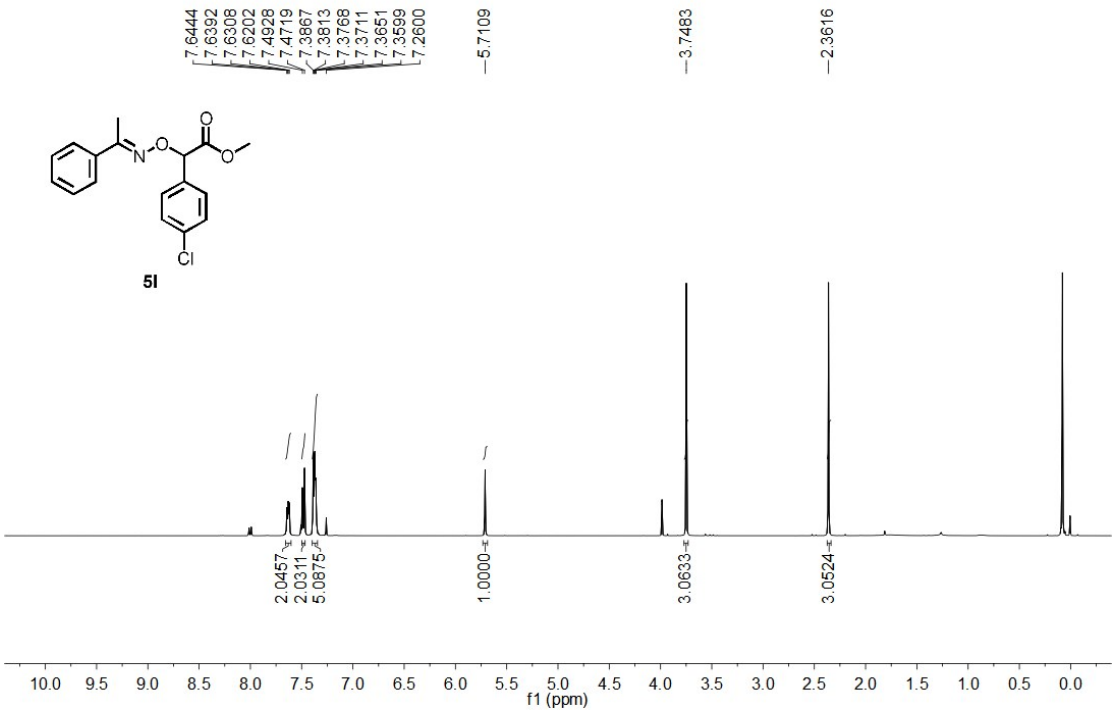
ZZP-18


7.6420
7.6354
7.6308
7.6268
7.6177
7.3691
7.3617
7.3527
7.2600
4.7374
4.2667
4.2489
4.2311
4.2132
2.3215
1.3107
1.2929
1.2750
5k
2.0091
3.0716
2.0305
2.0662
3.0000
3.1763
f1 (ppm)

ZZP-18

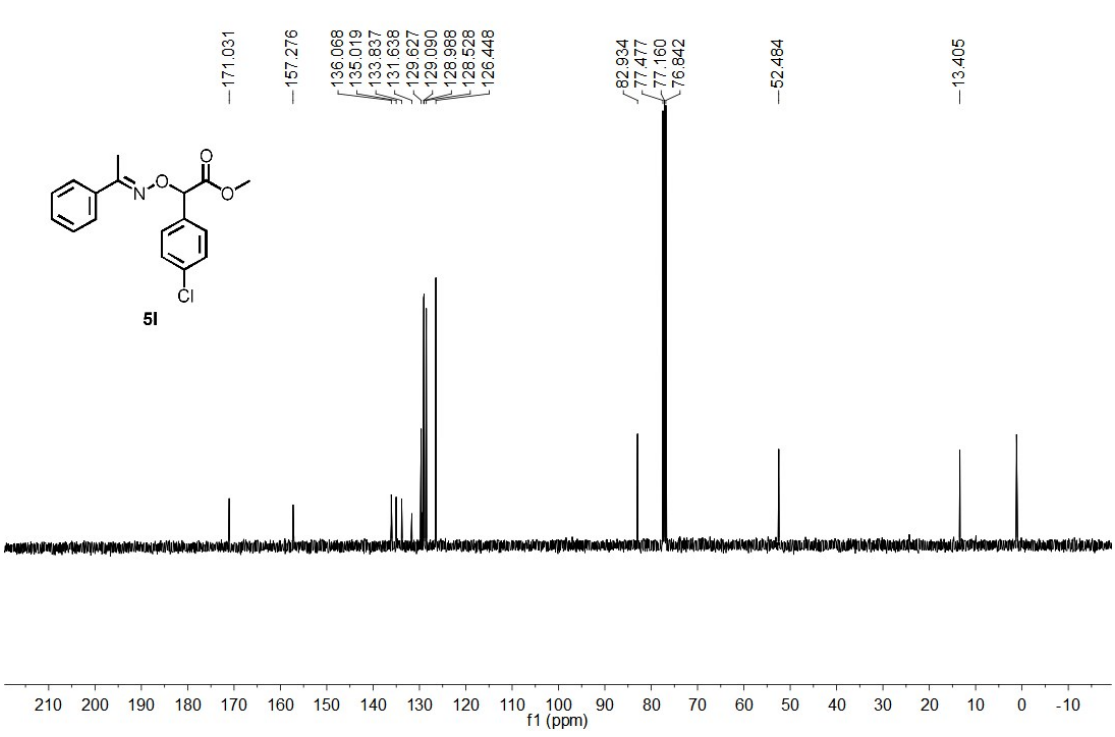

170.251
156.712
136.295
129.457
128.511
126.407
77.477
77.160
76.842
70.980
60.982
14.344
13.234
5k
f1 (ppm)

ZZP-WO



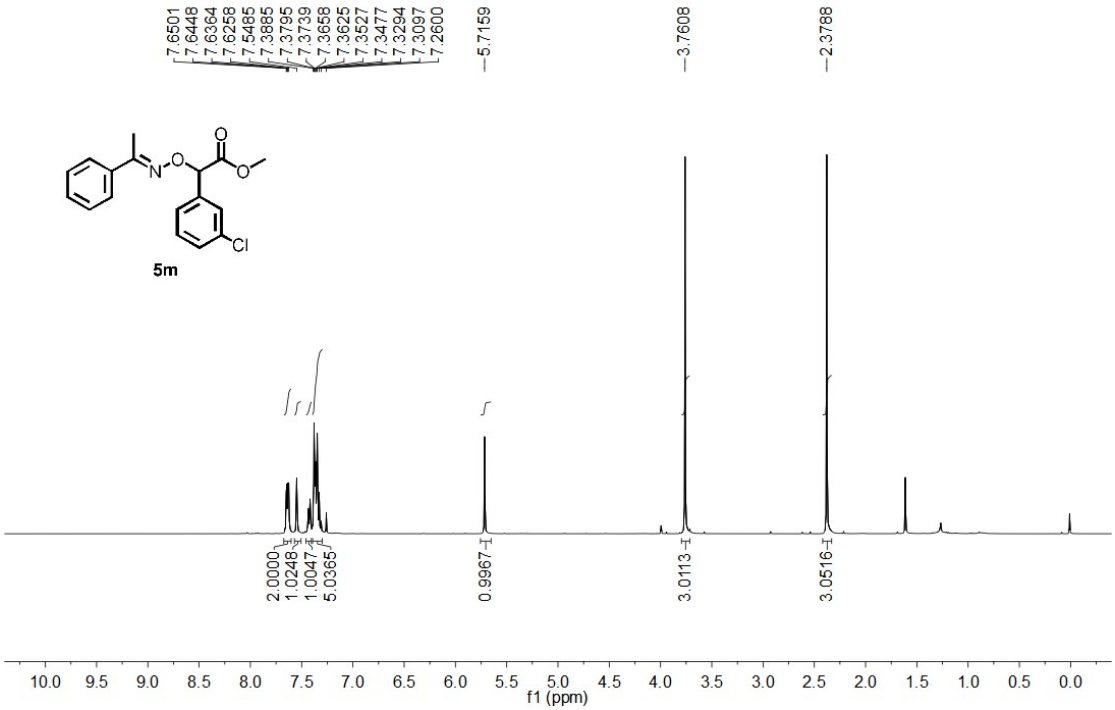
5l

ZZP-WO

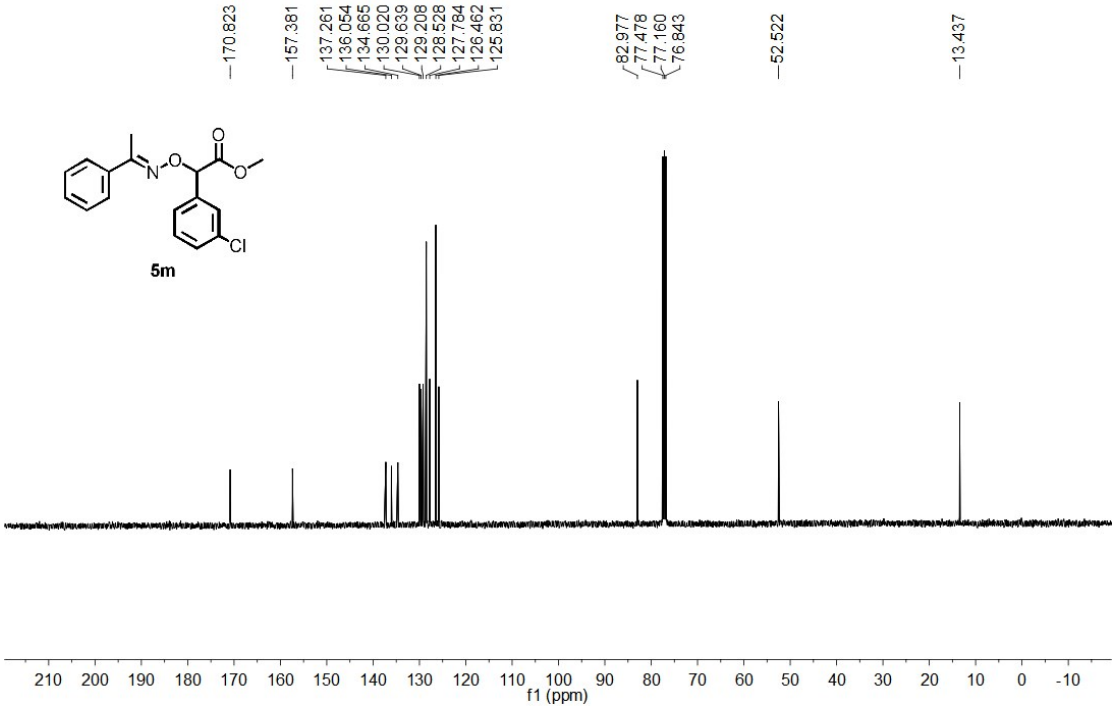


5l

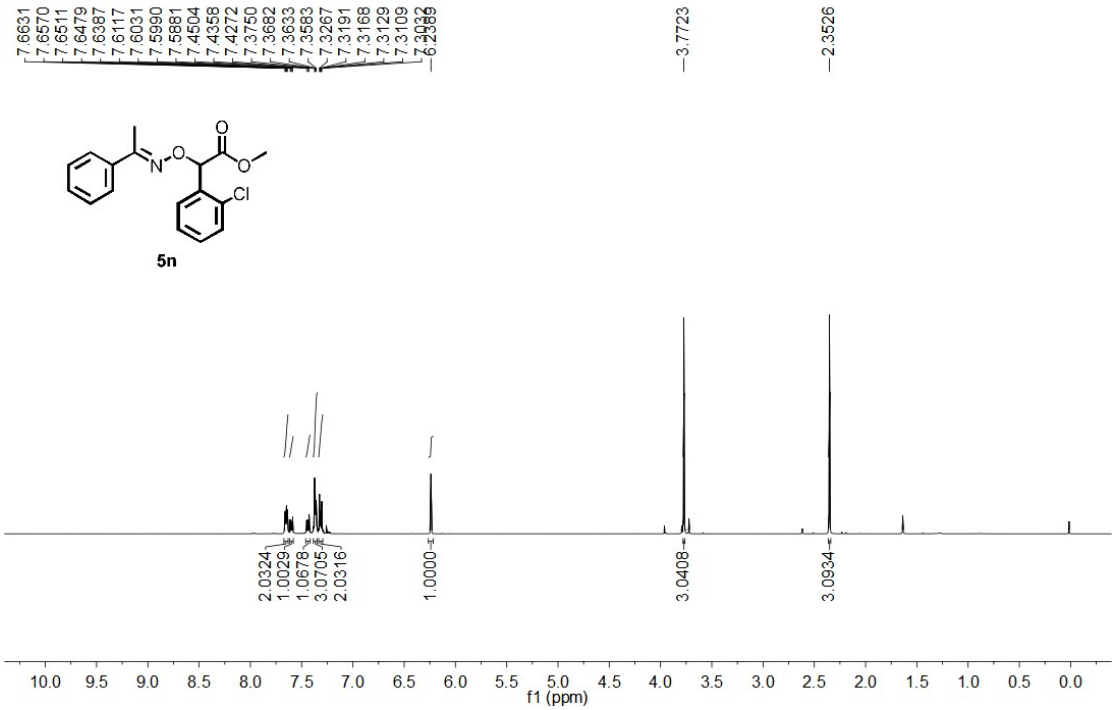
ZZP-128-1



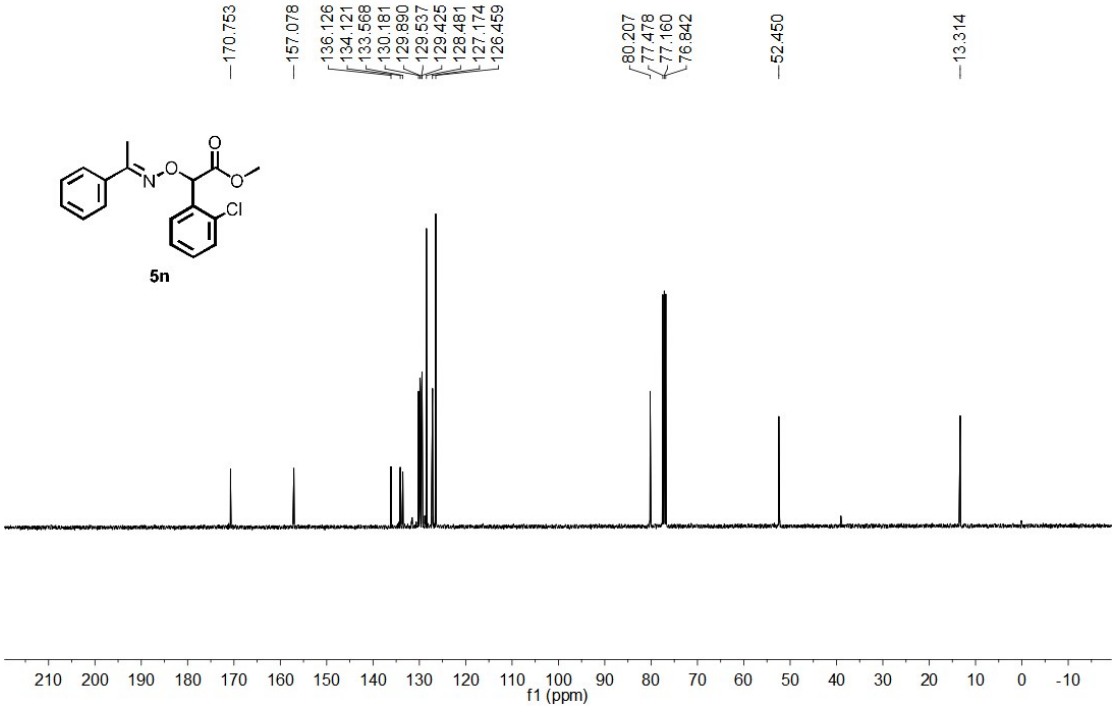
ZZP-128-1



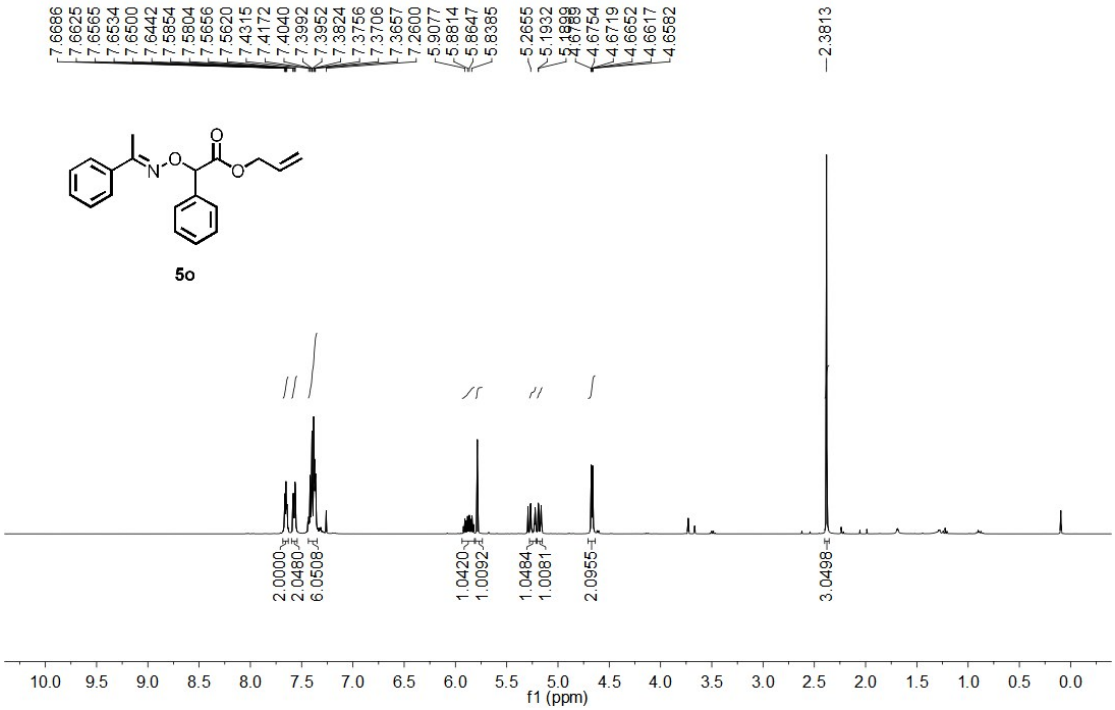
ZZP-135-1



ZZP-135-1

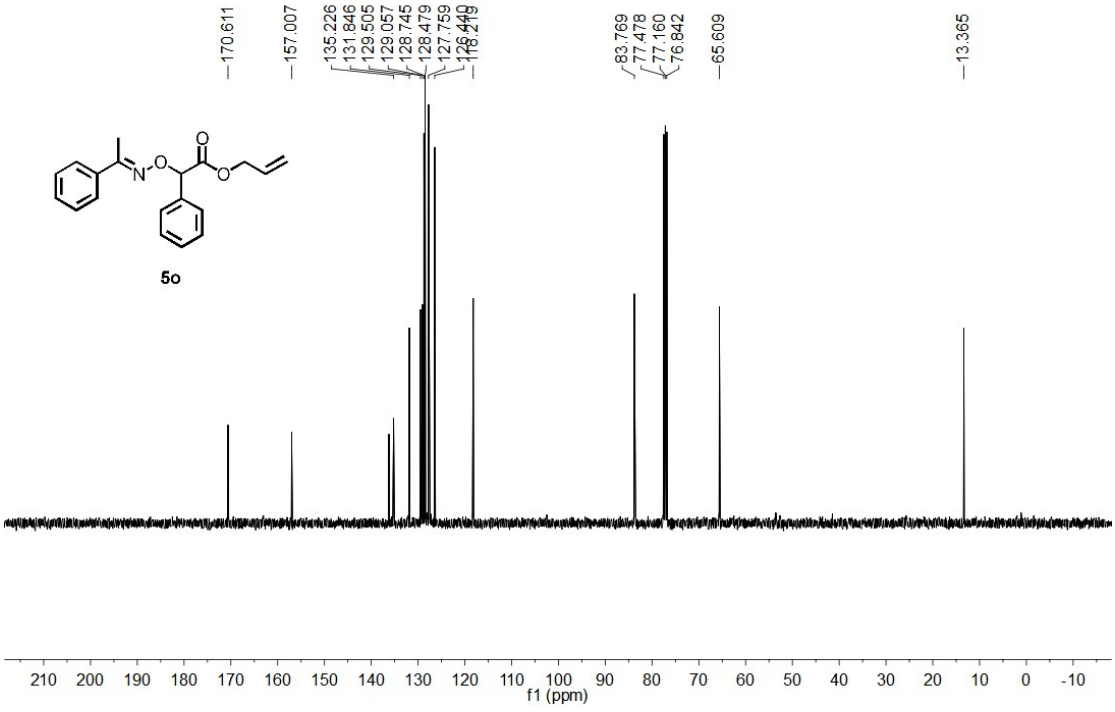


ZZP-186



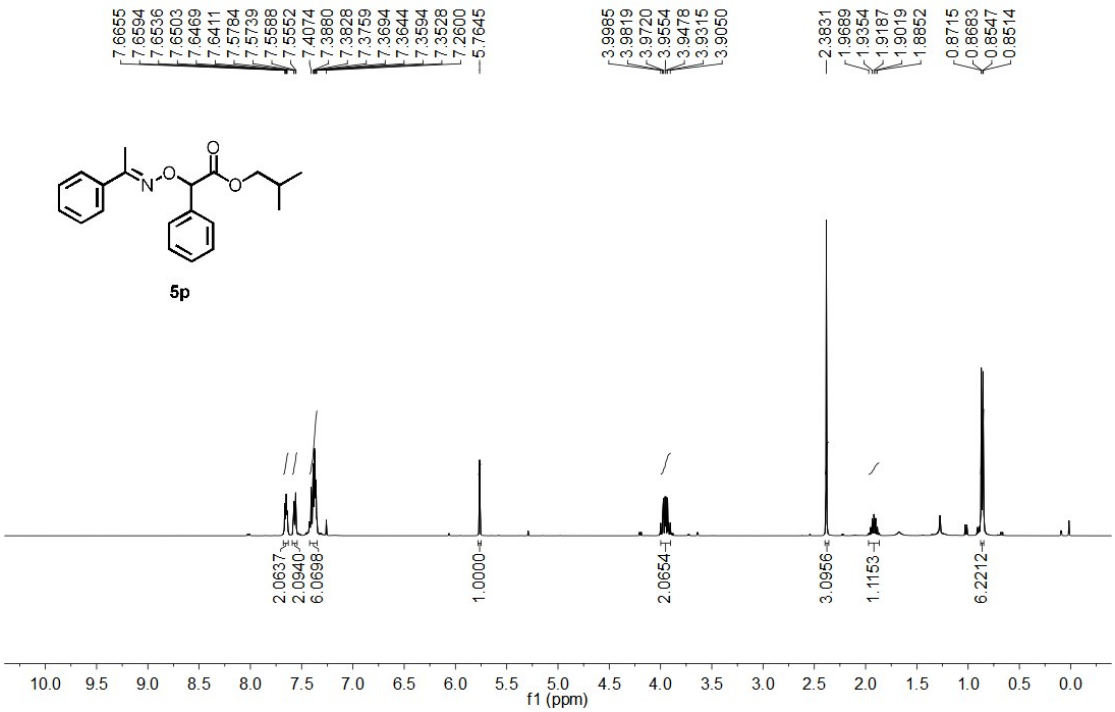
5o

ZZP-186

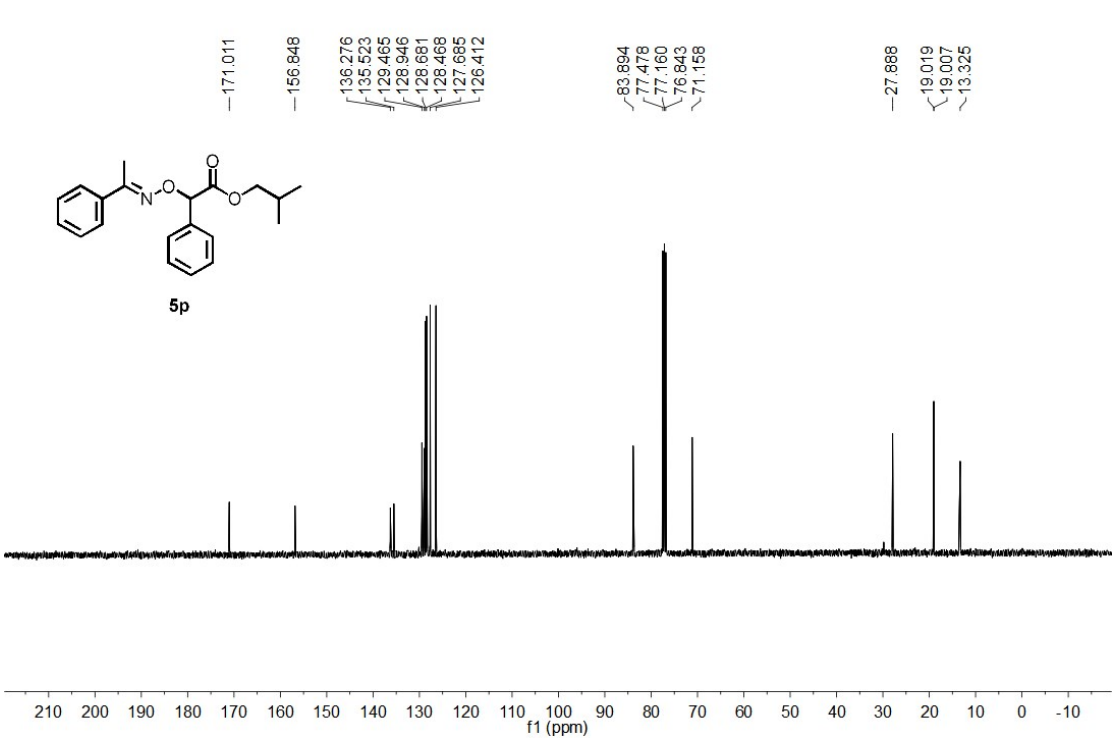


5o

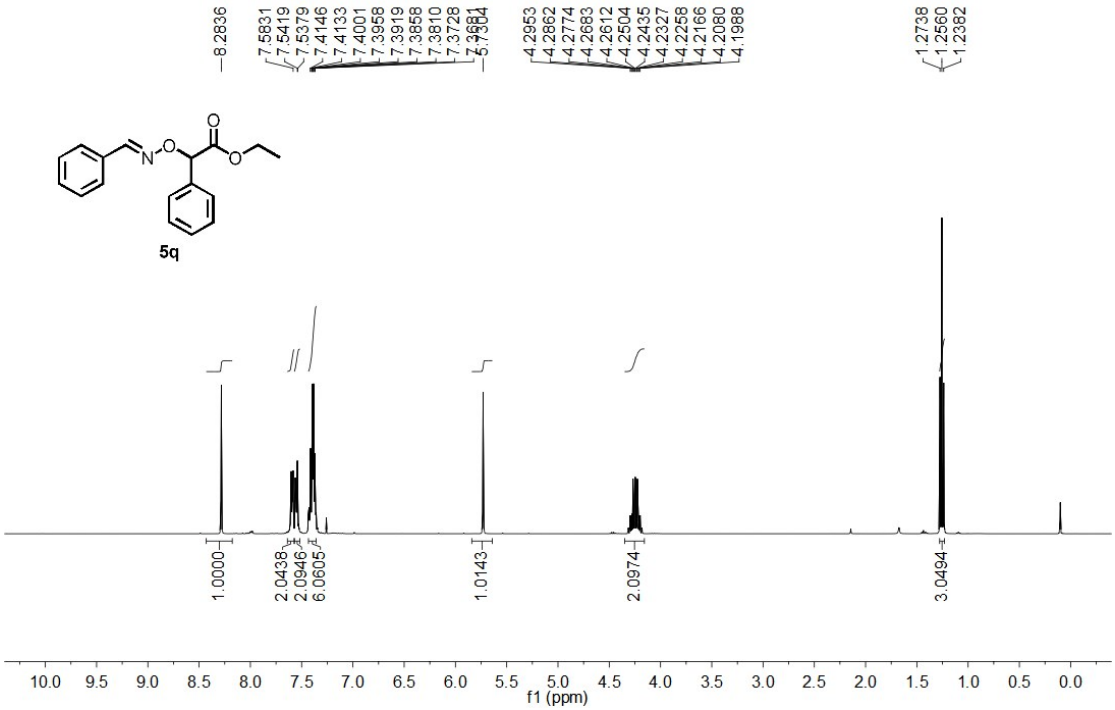
ZZP-126-1



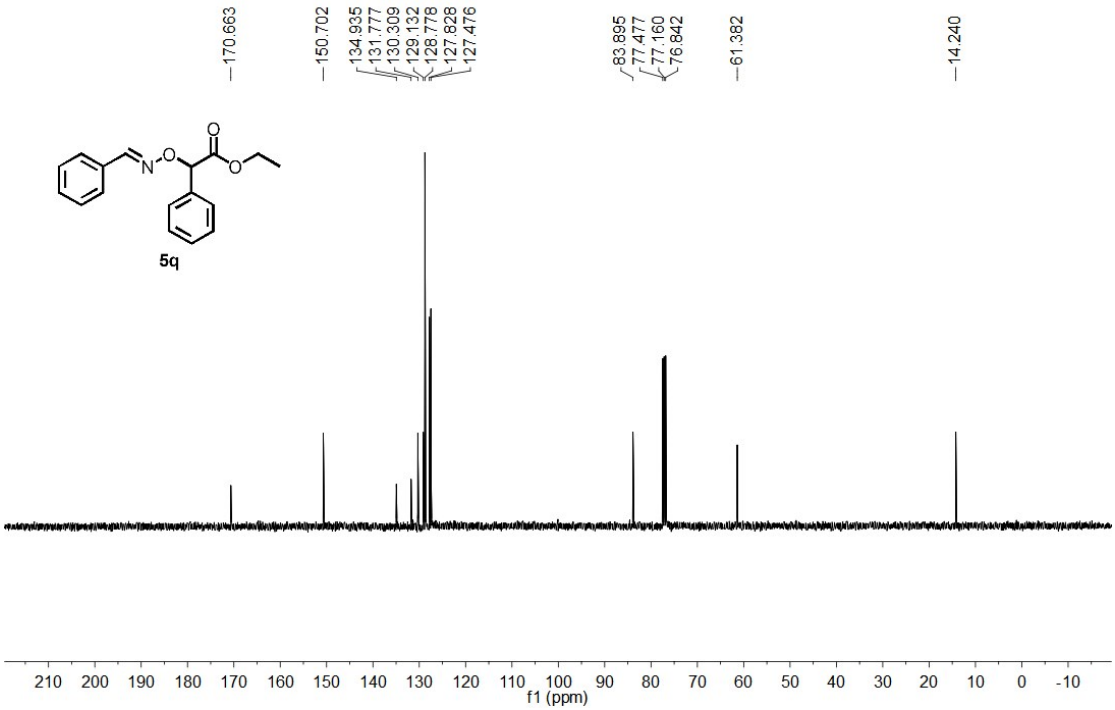
ZZP-126-1



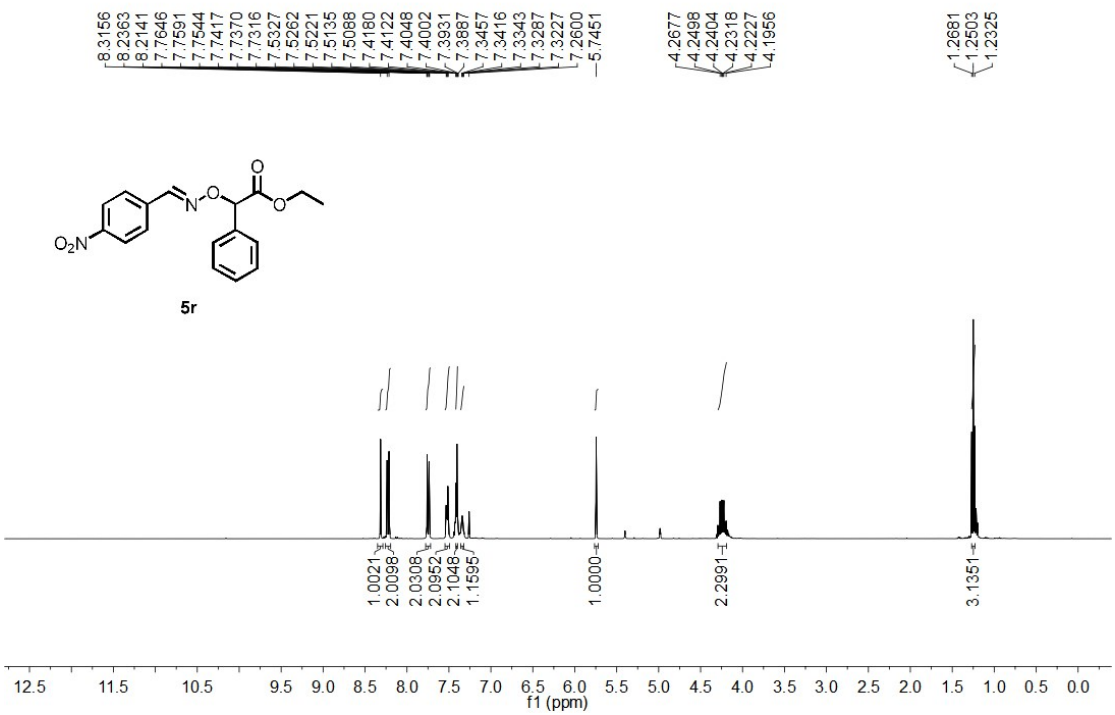
zzp-557-8



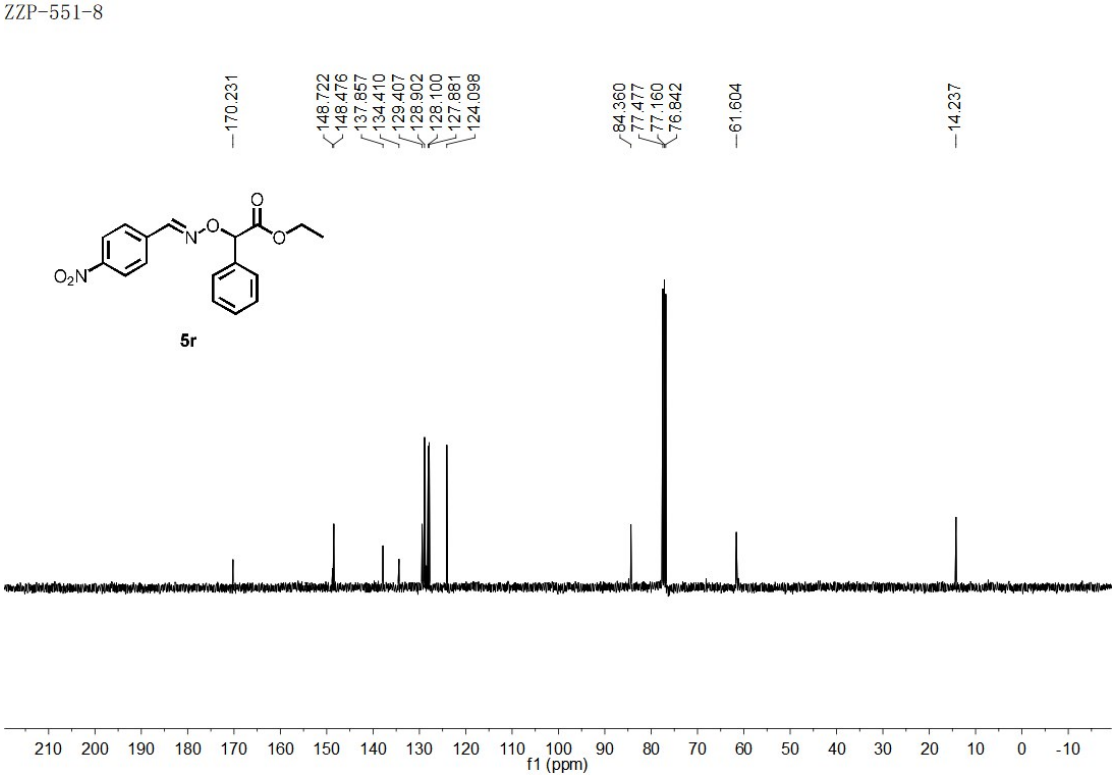
Z-557



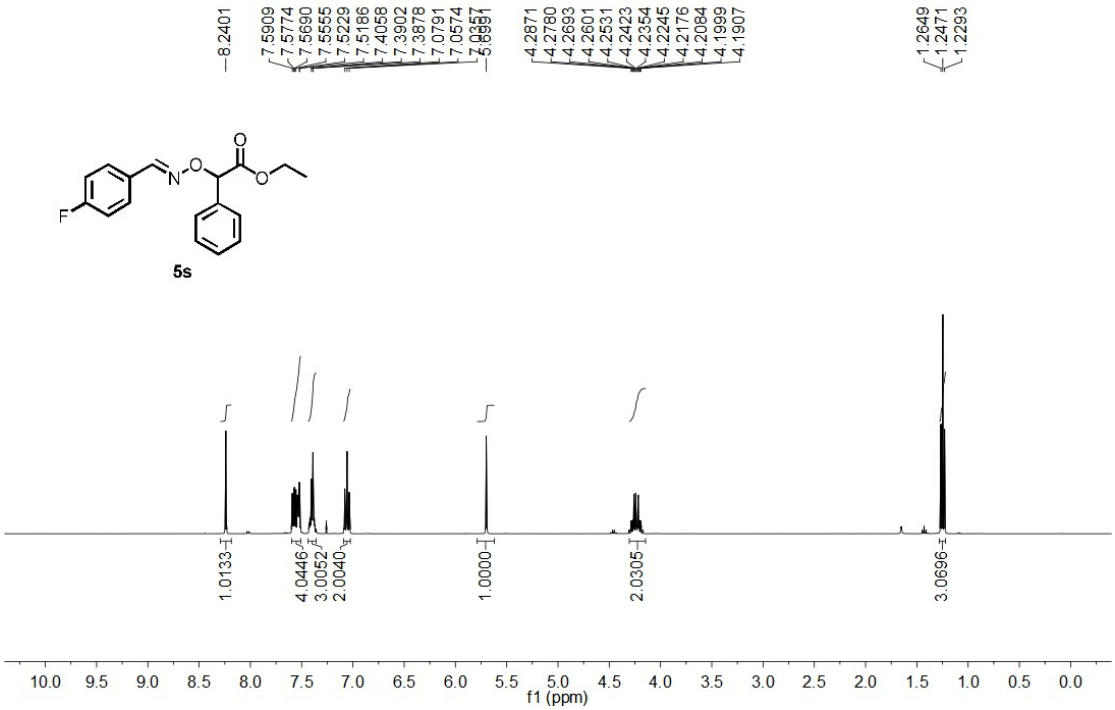
ZZP-551-8



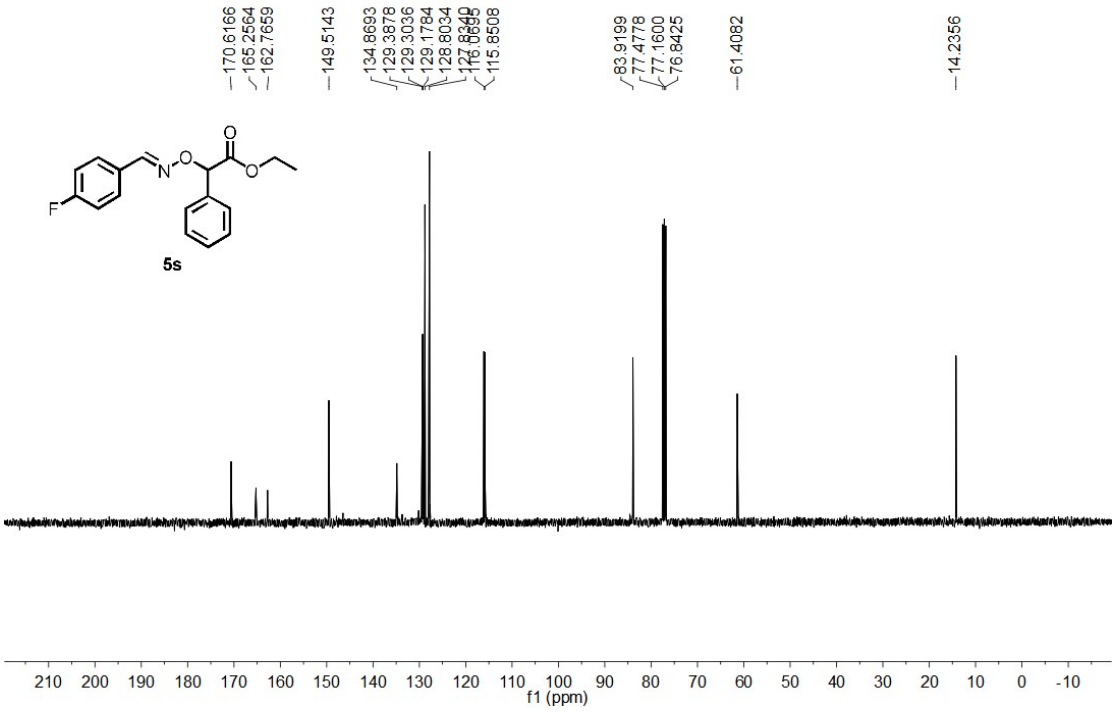
ZZP-551-8



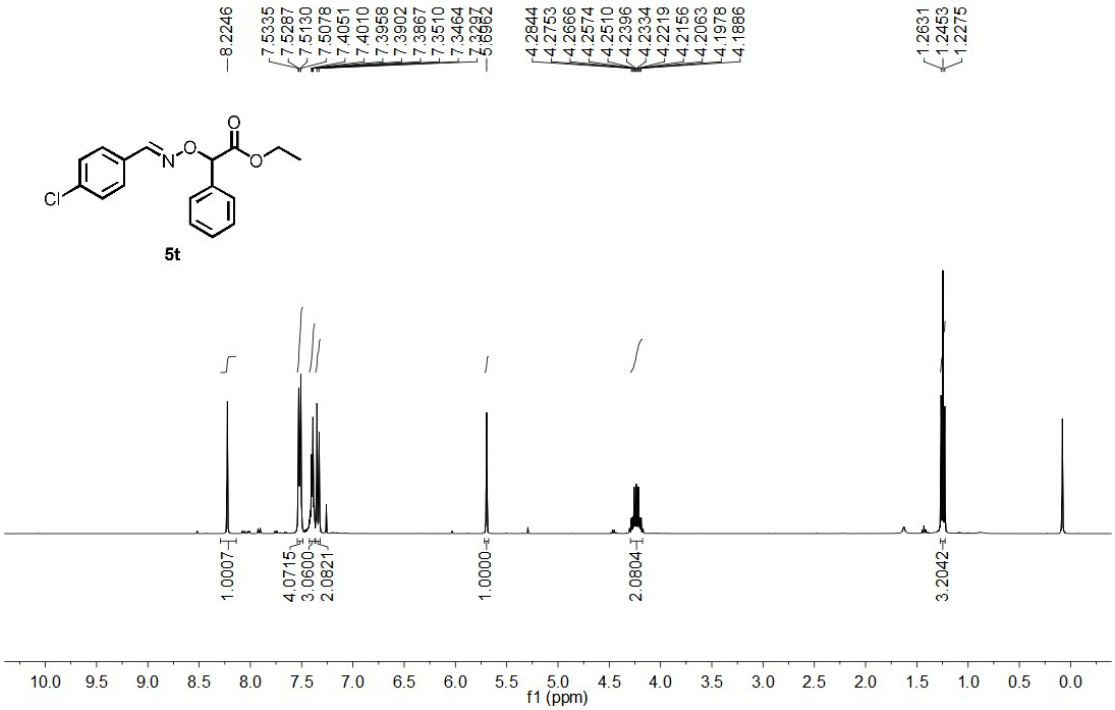
zzp-566-8



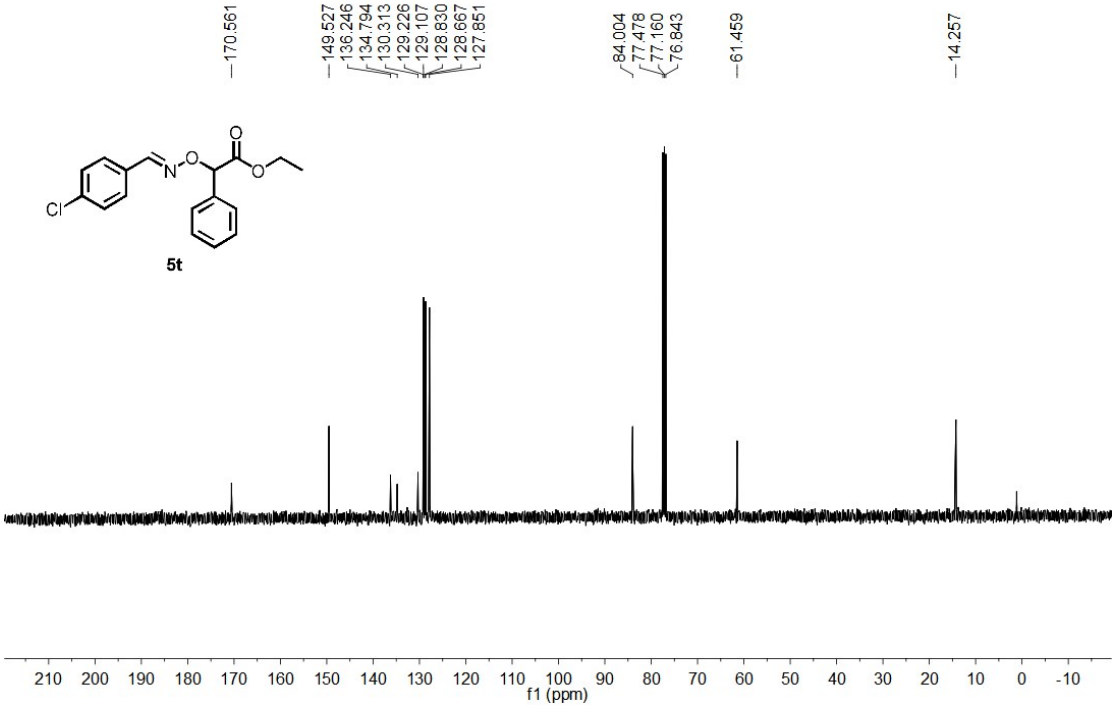
Z-566



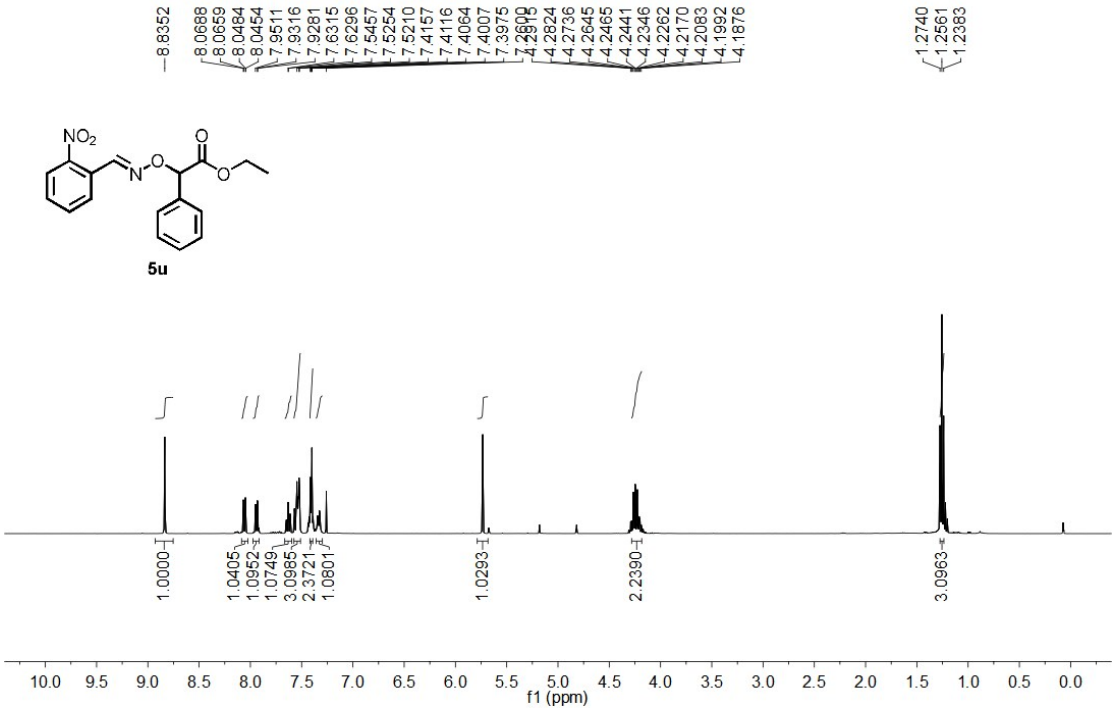
zzp-555-8



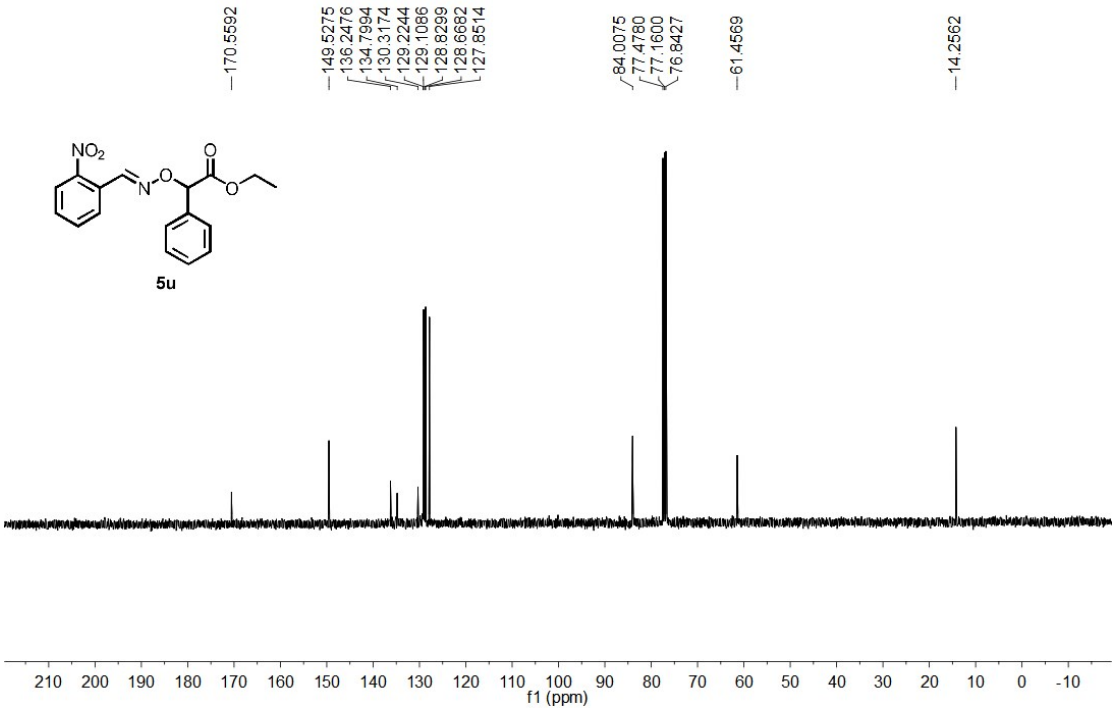
Z-555



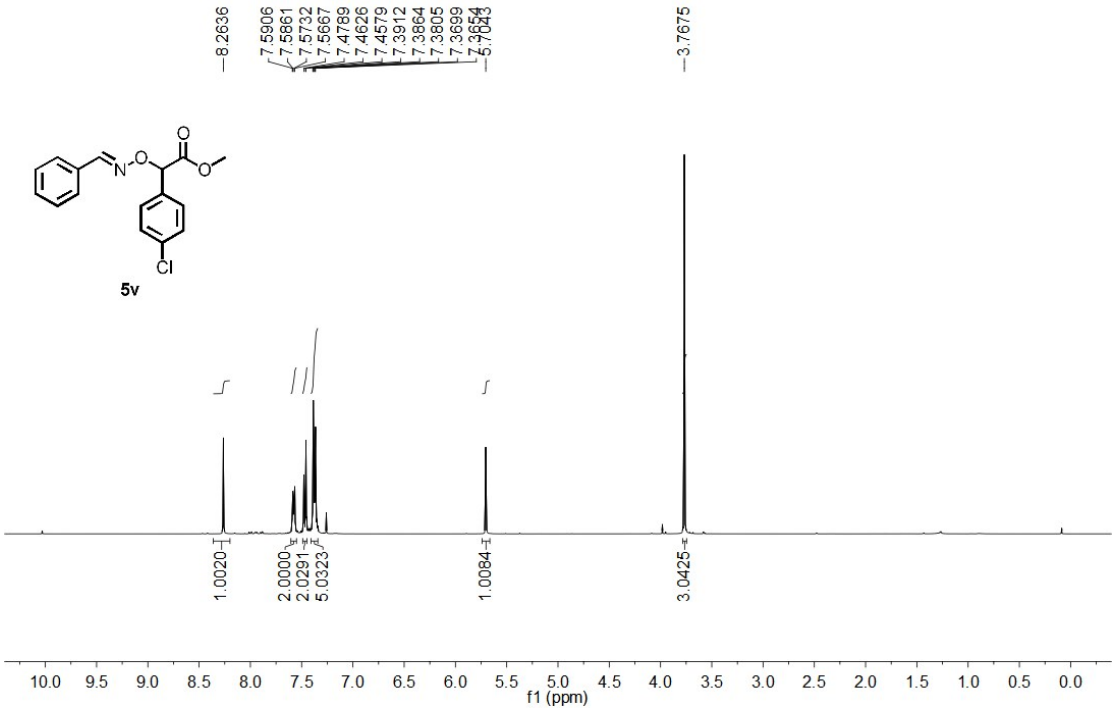
585-9



ZZP-553-8



ZZP-2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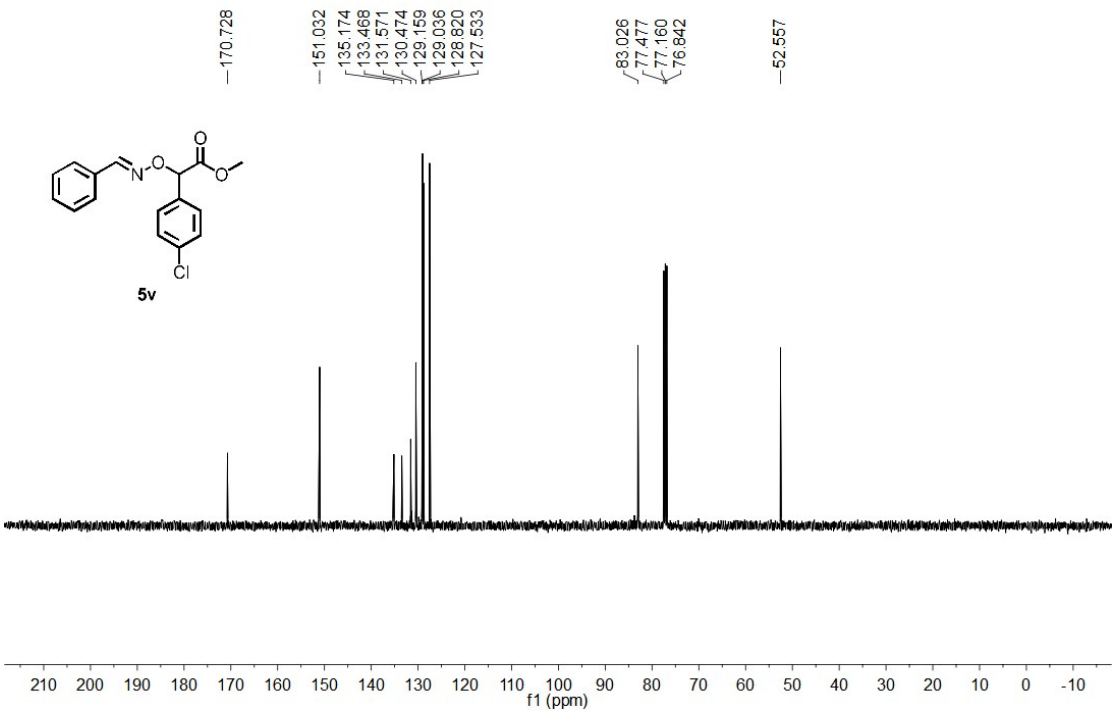
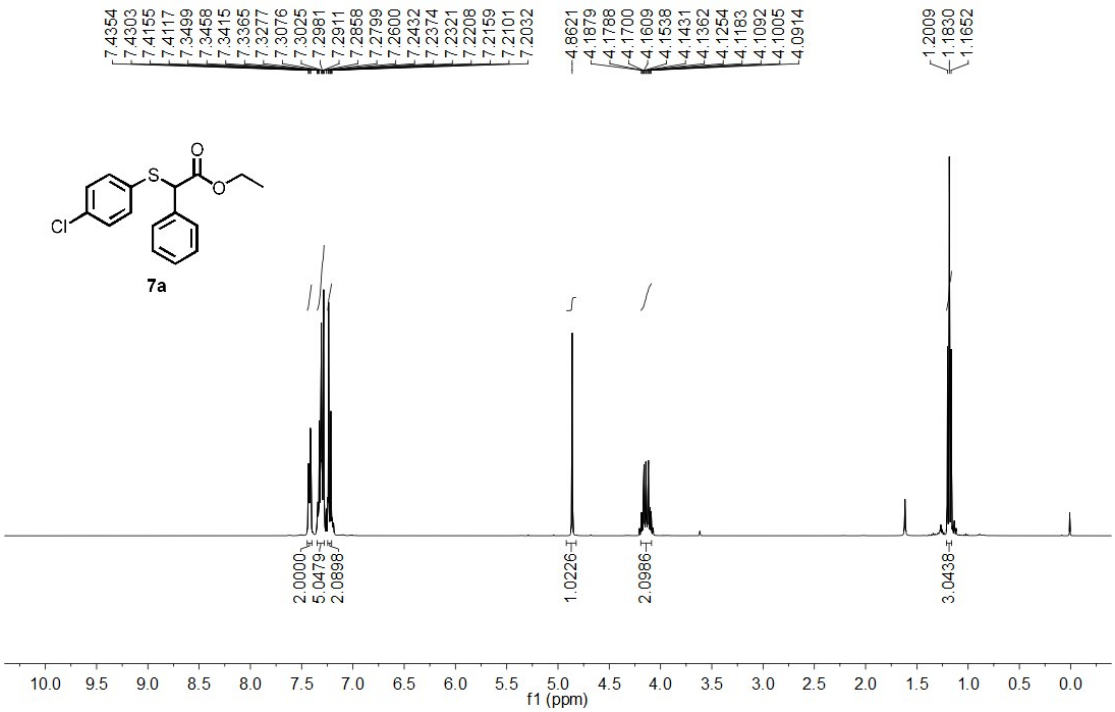
7.5906
7.5861
7.5732
7.5667
7.4789
7.4626
7.4579
7.3912
7.3864
7.3805
7.3699
7.3654
7.7043
3.7675
5v
1.0020
2.0000
2.0291
5.0323
1.0084
3.0425
f1 (ppm)

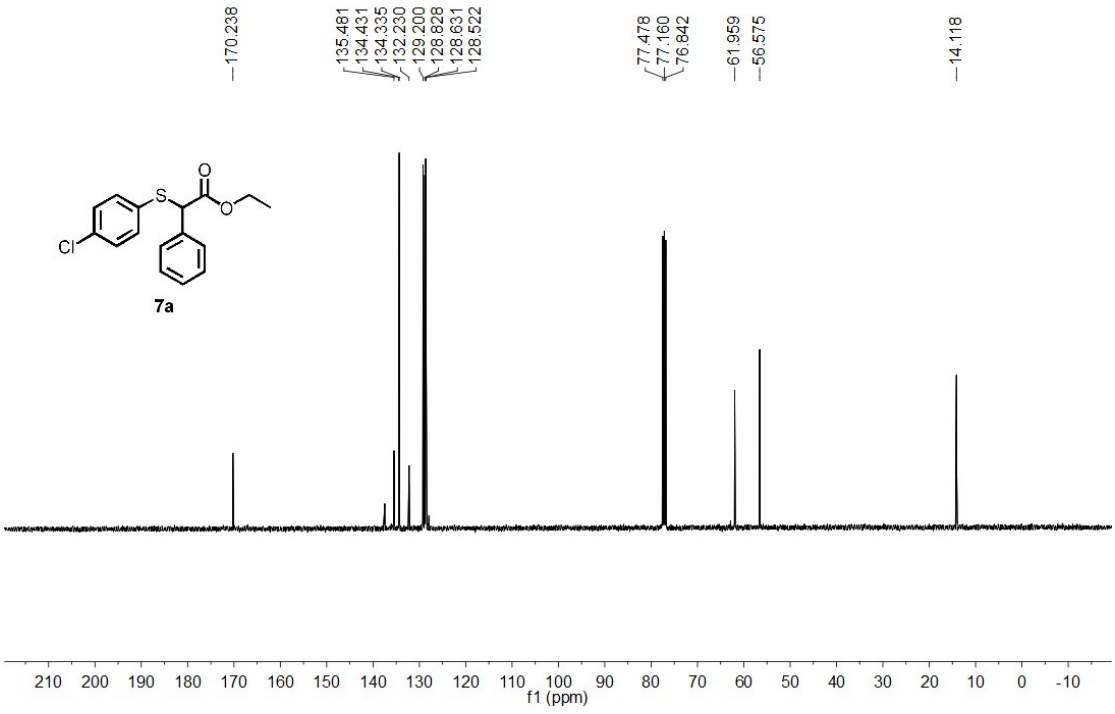
ZZP-2


170.728
151.032
135.174
133.468
131.571
130.474
129.159
129.036
128.820
127.533
83.026
77.477
77.160
76.842
52.557
5v
f1 (ppm)

FYF-9


7.4354
7.4303
7.4155
7.4117
7.3499
7.3458
7.3415
7.3365
7.3277
7.3076
7.3025
7.2981
7.2911
7.2858
7.2799
7.2600
7.2432
7.2374
7.2321
7.2208
7.2159
7.2101
7.2032
4.8621
4.1879
4.1788
4.1700
4.1609
4.1538
4.1431
4.1362
4.1254
4.1183
4.1092
4.1005
4.0914
1.2009
1.1830
1.1652
Cl
S
O
O
7a
2.0000
5.0479
2.0898
1.0226
2.0986
3.0438
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

FYF-9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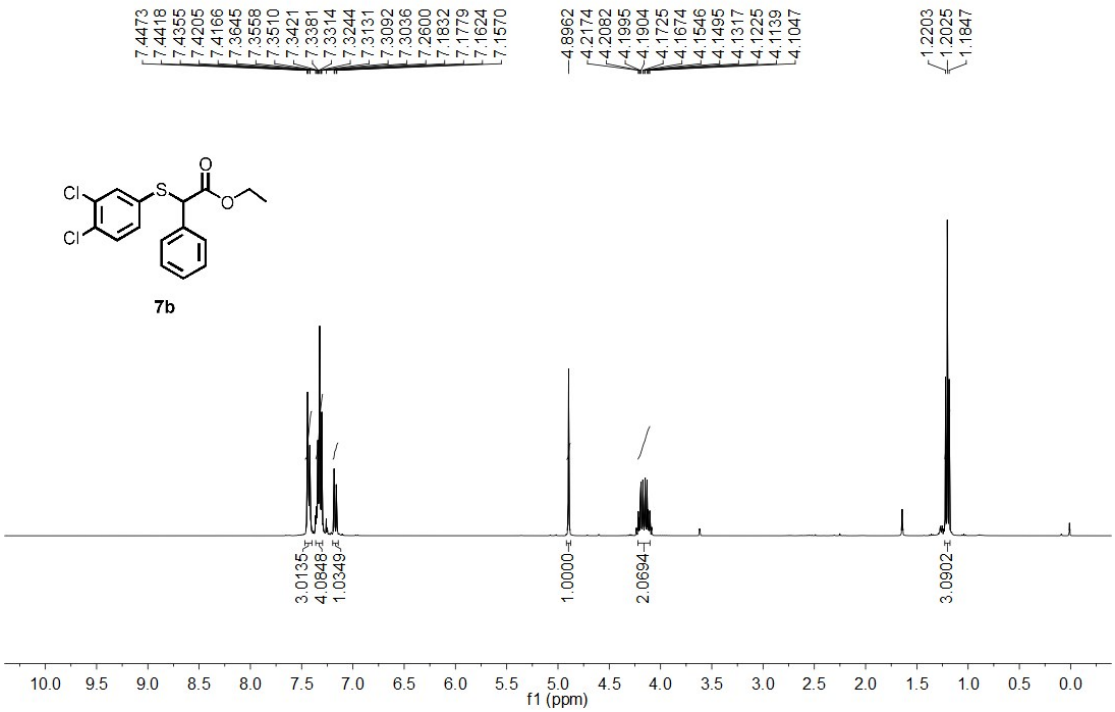
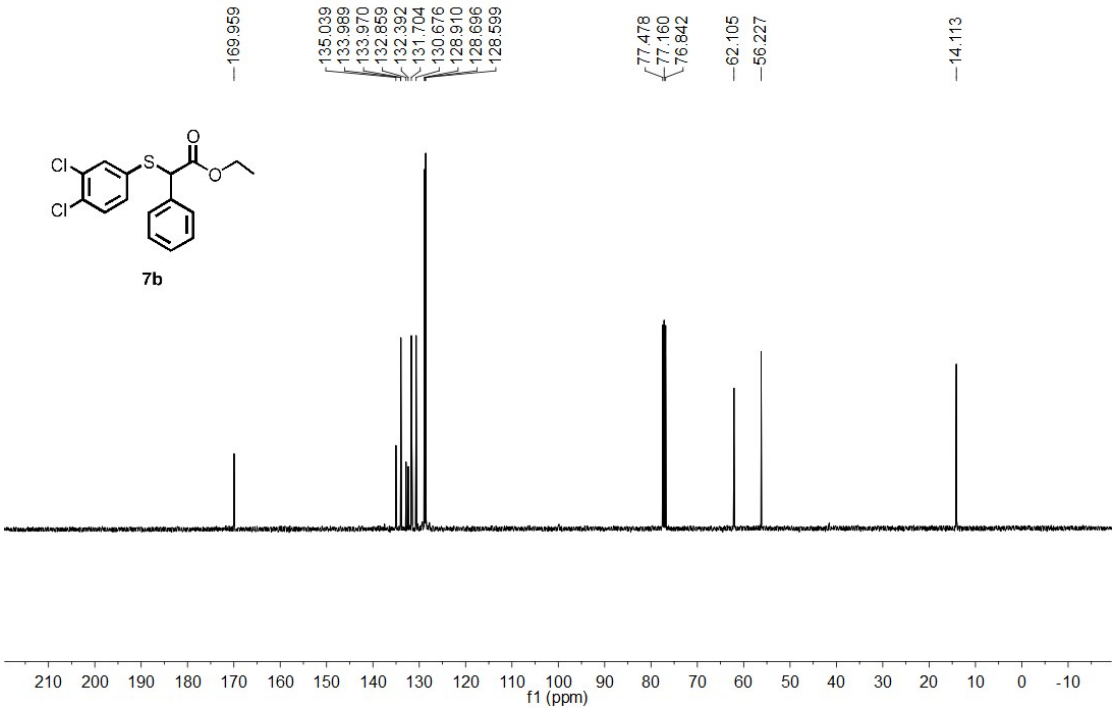
135.481
134.431
134.335
132.230
129.200
128.828
128.631
128.522
77.478
77.160
76.842
61.959
56.575
14.118
Cl
S
O
O
7a
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

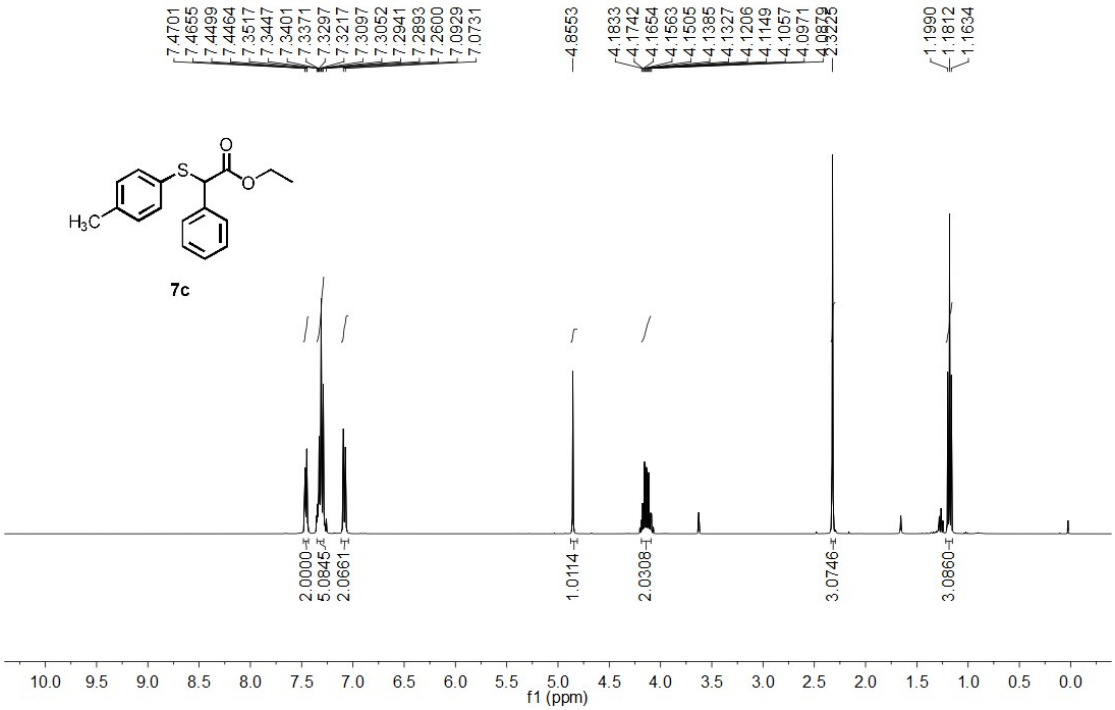
FYF-11-1



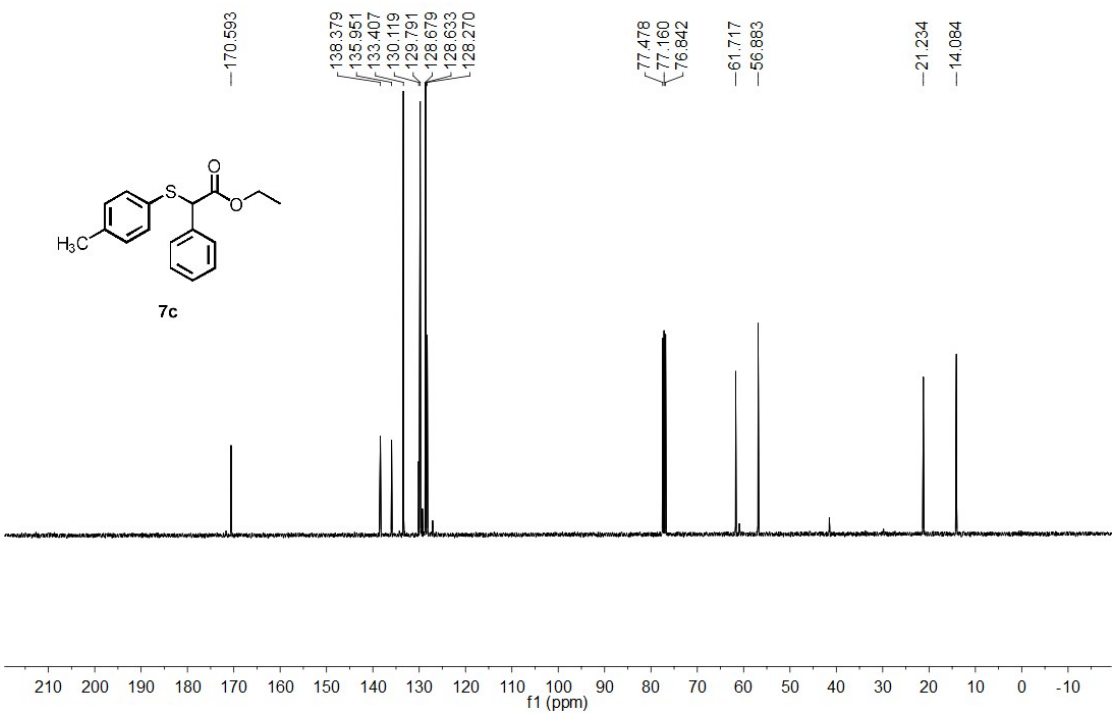
FYF-11-1



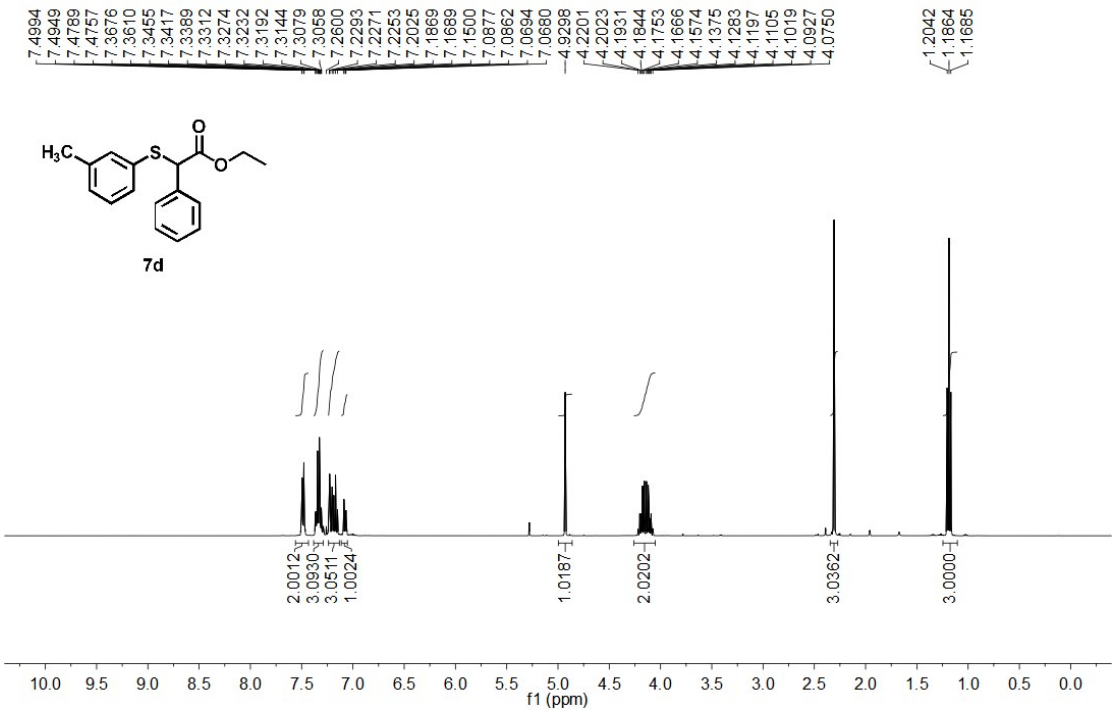
FYF-10


7.4701
7.4655
7.4499
7.4464
7.3517
7.3447
7.3401
7.3371
7.3297
7.3217
7.3097
7.3052
7.2941
7.2893
7.2600
7.0929
7.0731
4.8553
4.1833
4.1742
4.1654
4.1563
4.1505
4.1385
4.1327
4.1206
4.1149
4.1057
4.0971
2.3225
1.1990
1.1812
1.1634
7c
2.0000
5.0845
2.0661
1.0114
2.0308
3.0746
3.0860
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

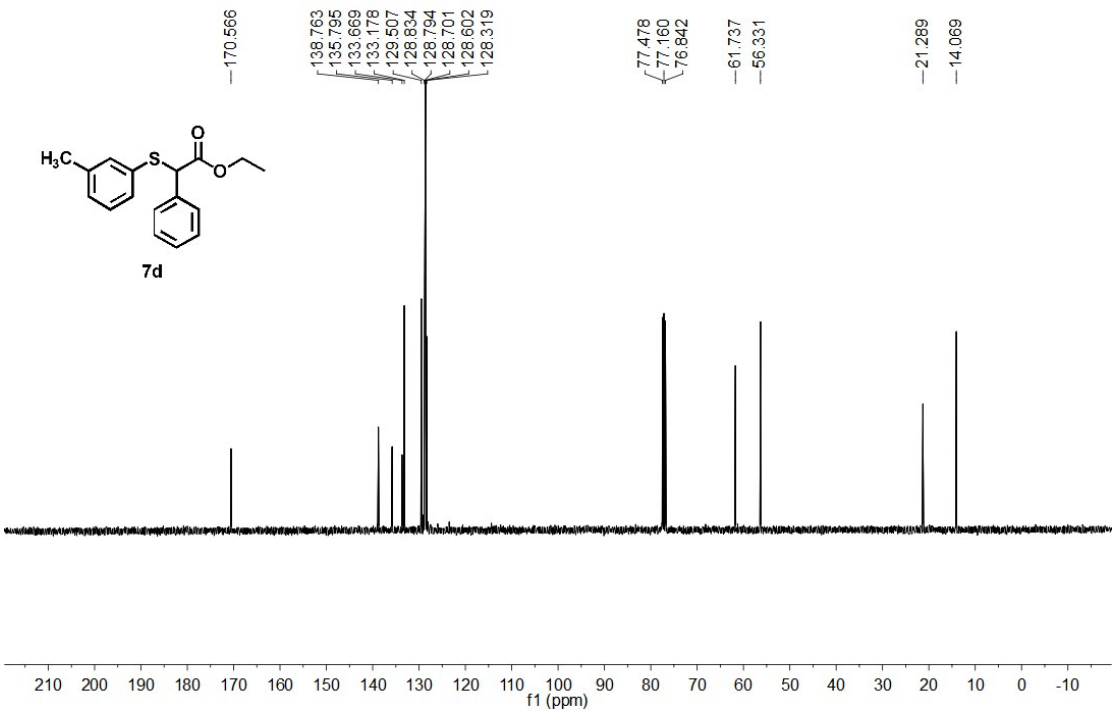
FYF-10


170.593
138.379
135.951
133.407
130.119
129.791
128.679
128.633
128.270
77.478
77.160
76.842
61.717
56.883
21.234
14.084
7c
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

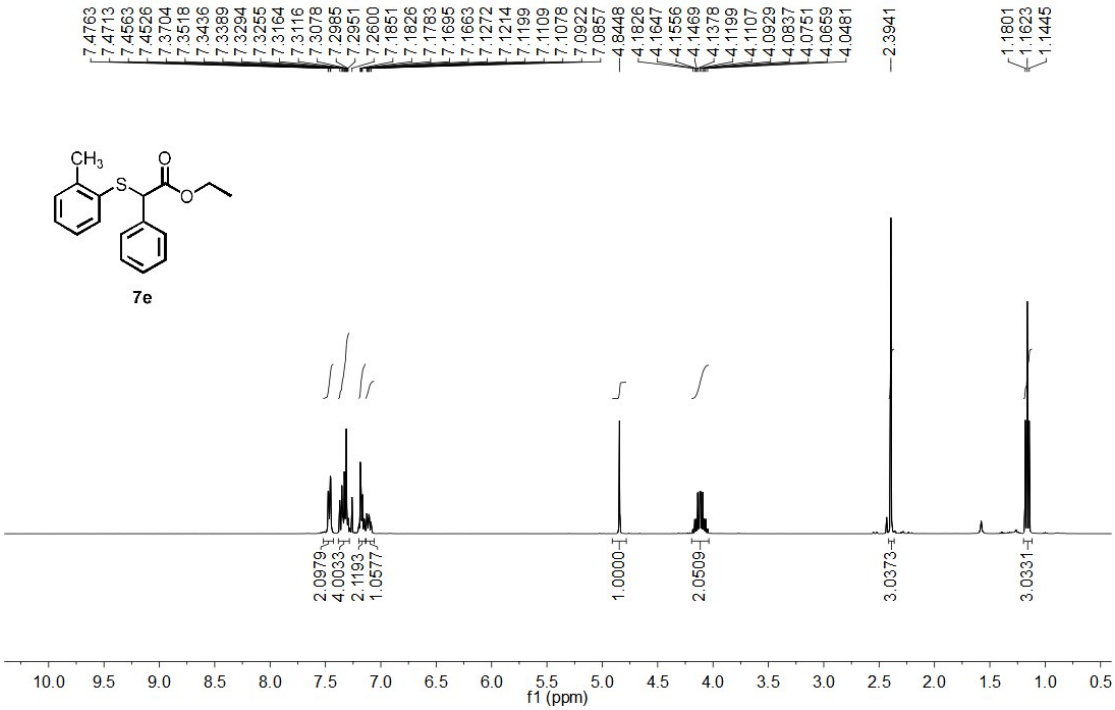
ZZP-545-8



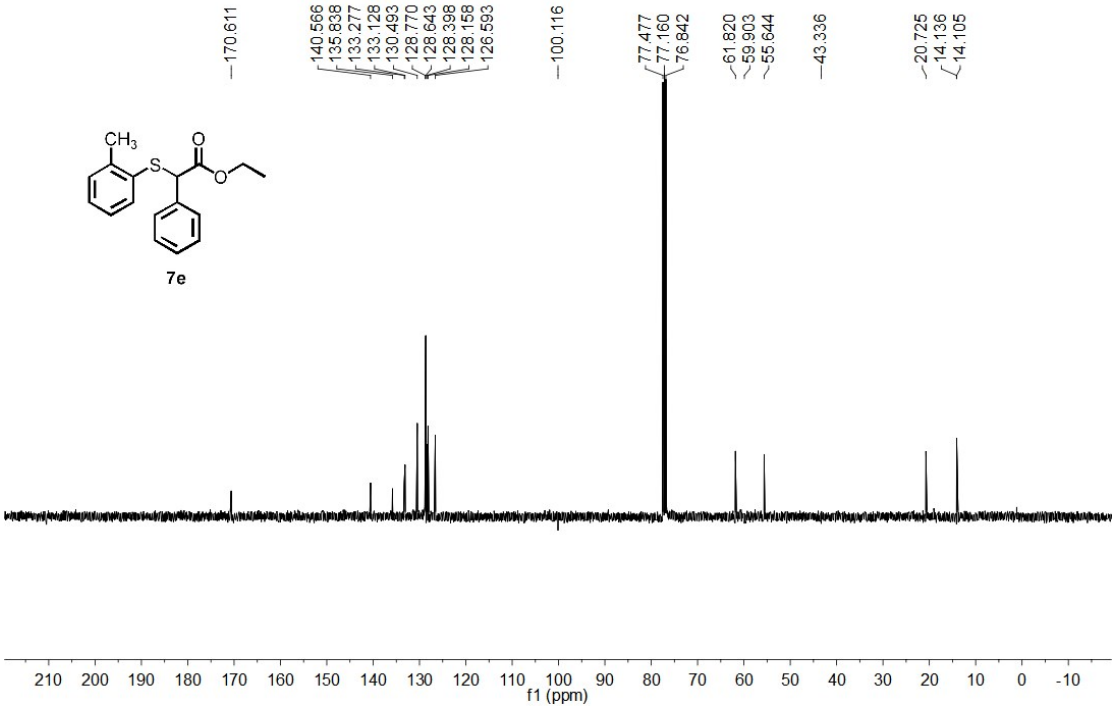
ZZP-545-8



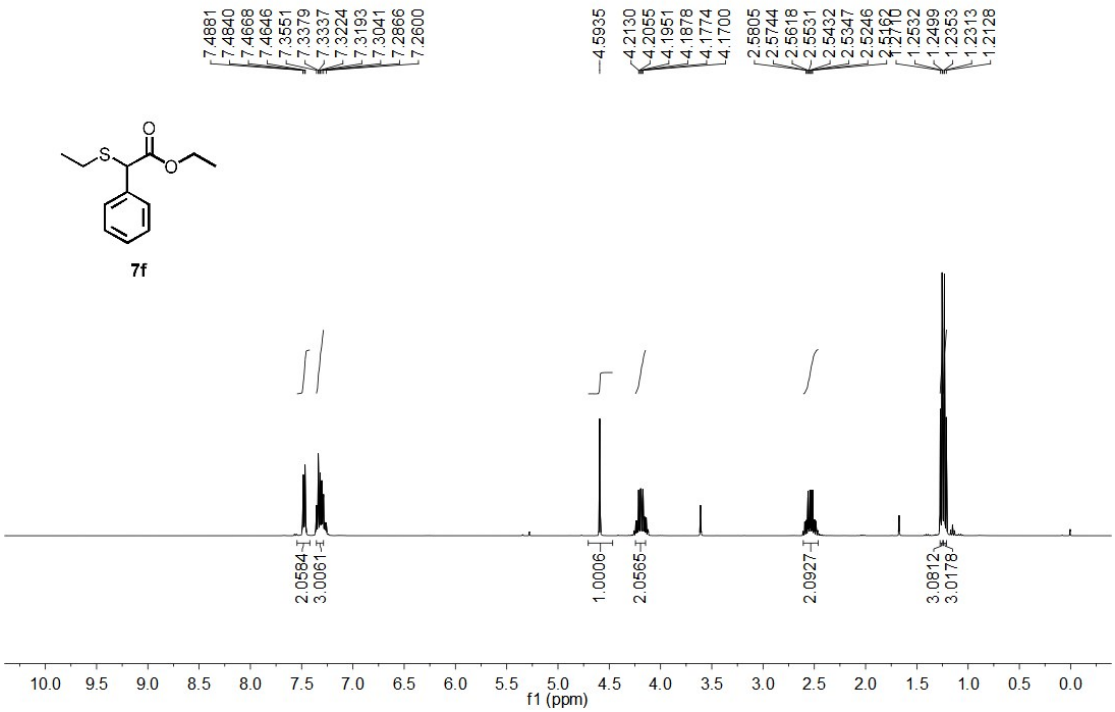
zzp-564-8



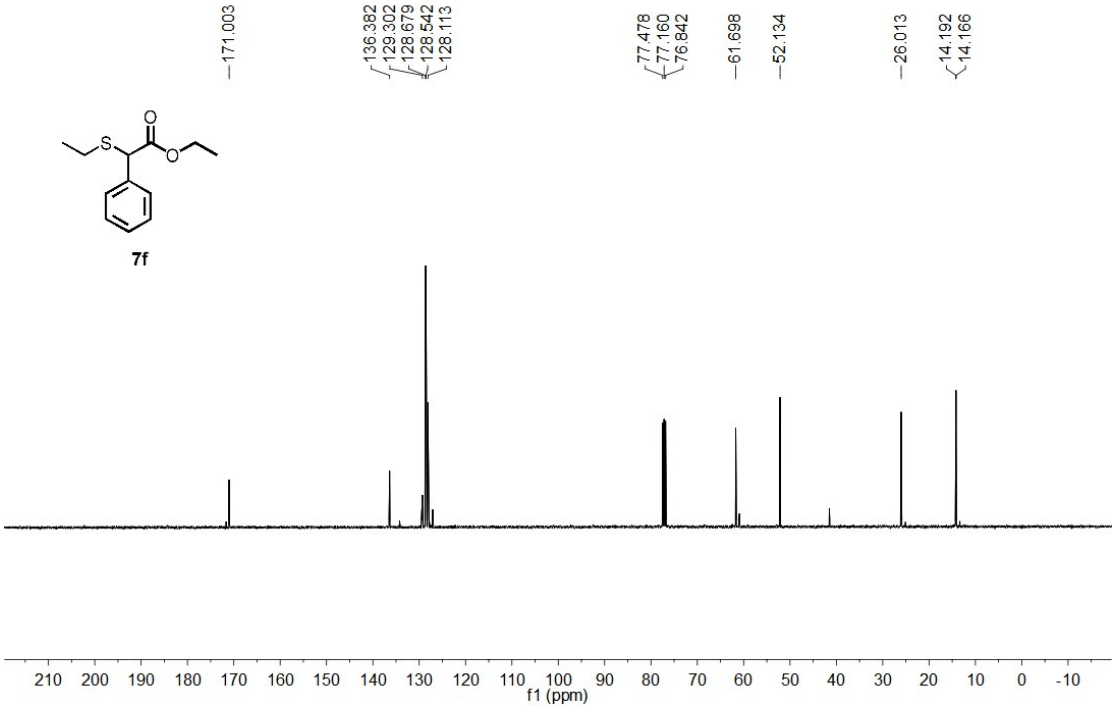
Z-564



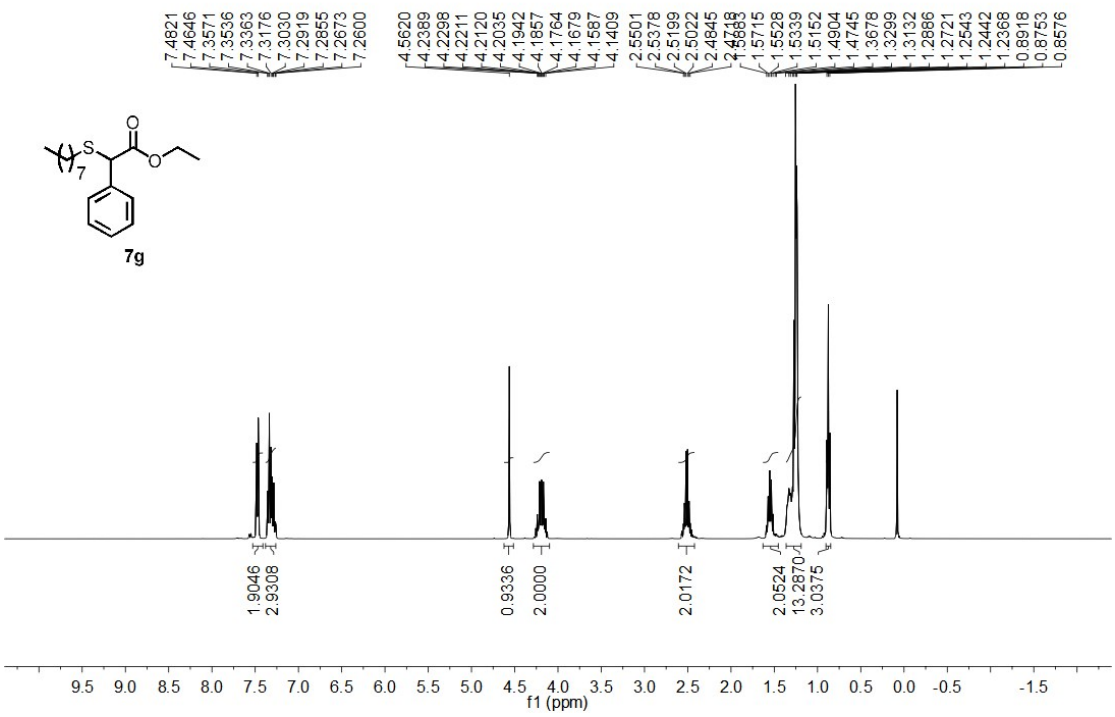
FYF-22


7.4881
7.4840
7.4668
7.4646
7.3551
7.3379
7.3337
7.3224
7.3193
7.3041
7.2866
7.2600
4.5935
4.2130
4.2055
4.1951
4.1878
4.1774
4.1700
2.5805
2.5744
2.5618
2.5531
2.5432
2.5347
2.5246
1.2532
1.2499
1.2353
1.2313
1.2128
7f
2.0584
3.0061
1.0006
2.0565
2.0927
3.0812
3.0178
f1 (ppm)

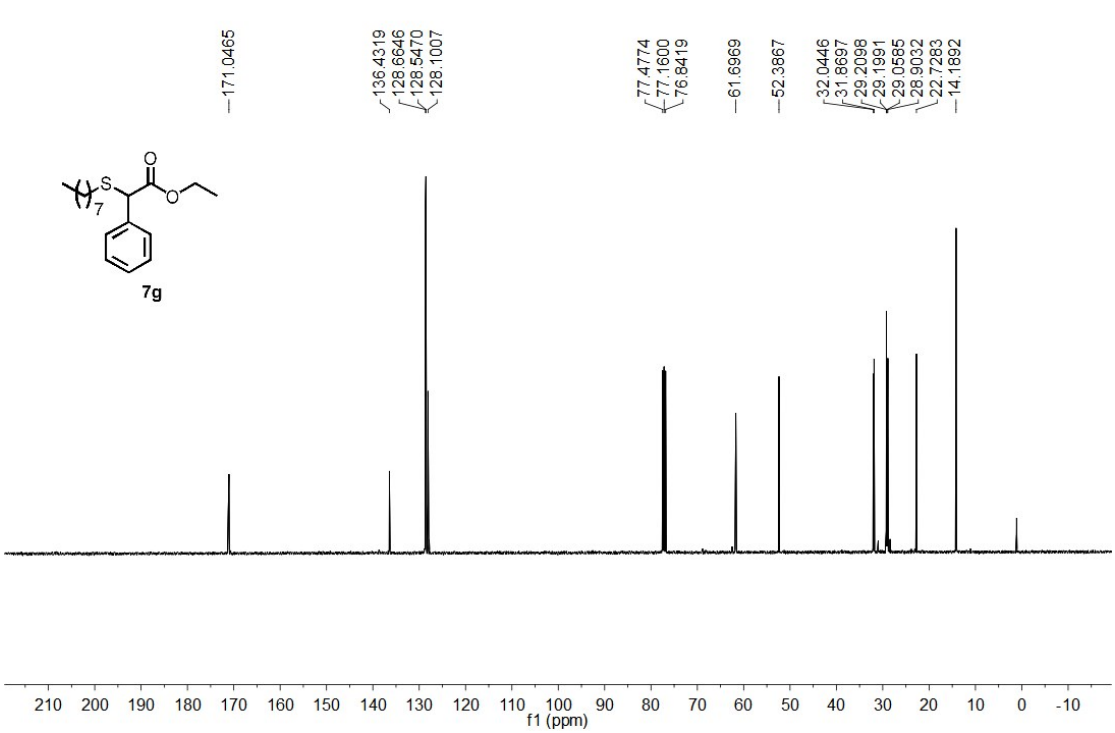
FYF-22


171.003
136.382
129.302
128.679
128.542
128.113
77.478
77.160
76.842
61.698
52.134
26.013
14.192
14.166
7f
f1 (ppm)

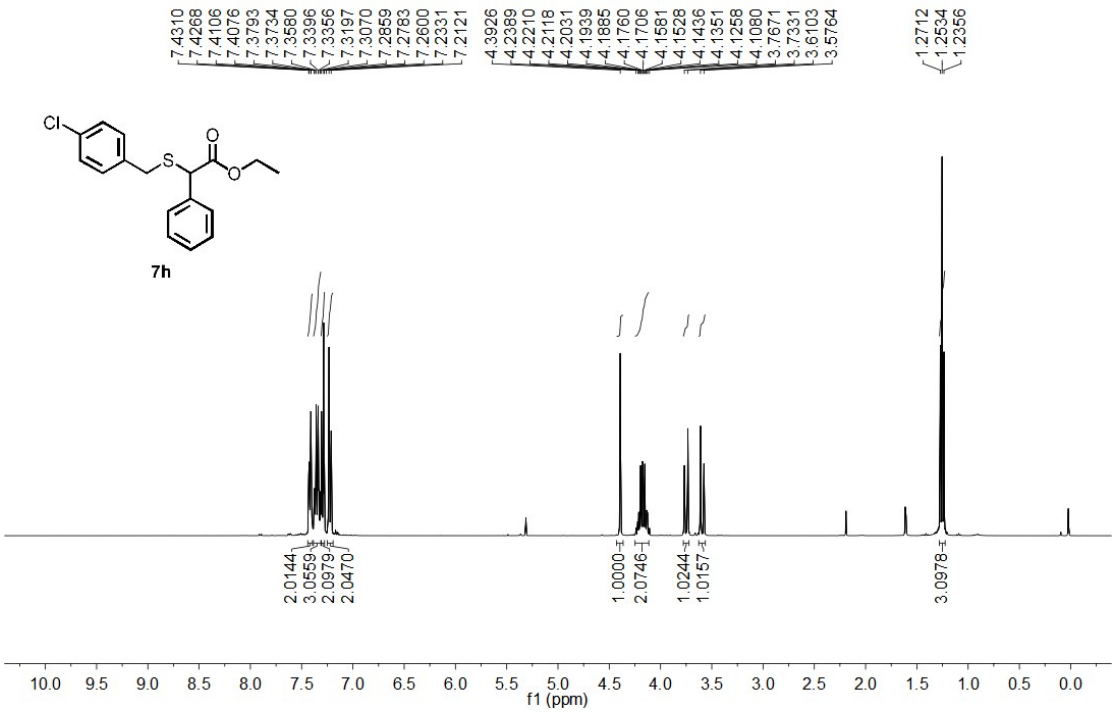
ZZP-506-8



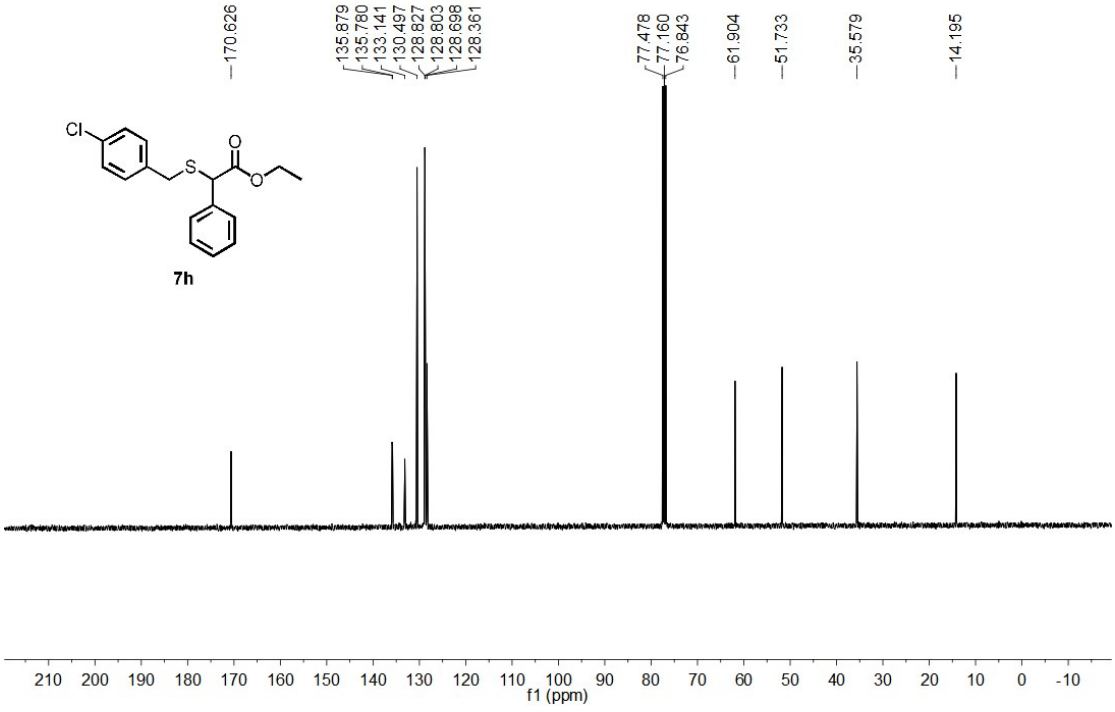
ZZP-506-8



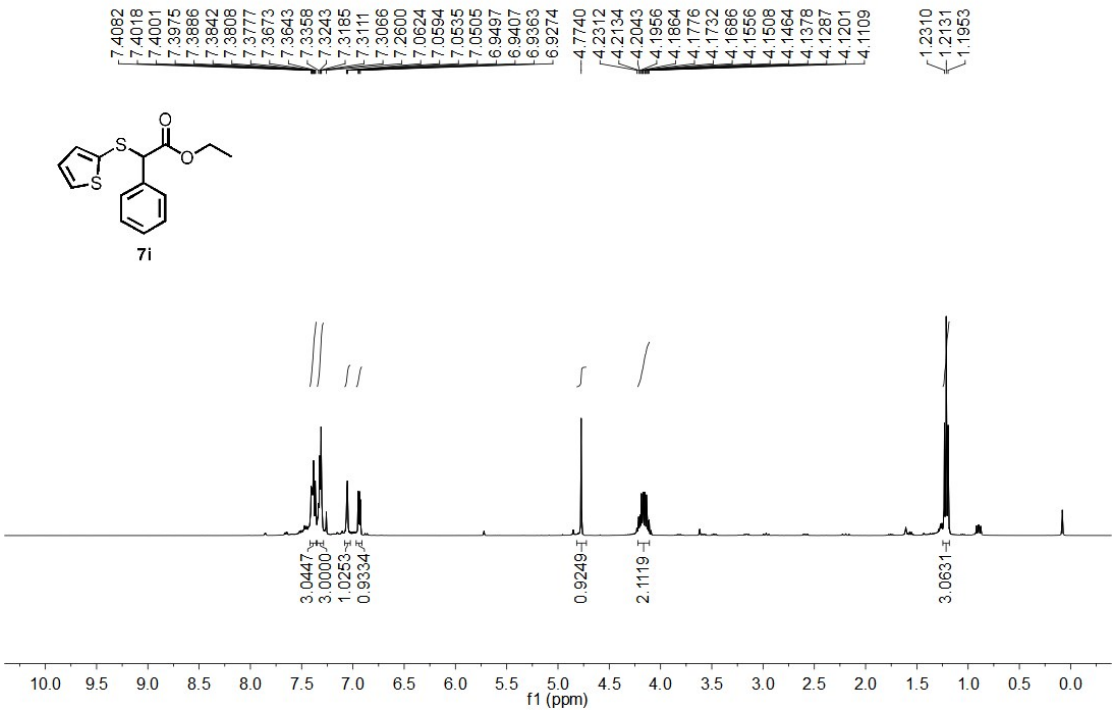
ZZP-119



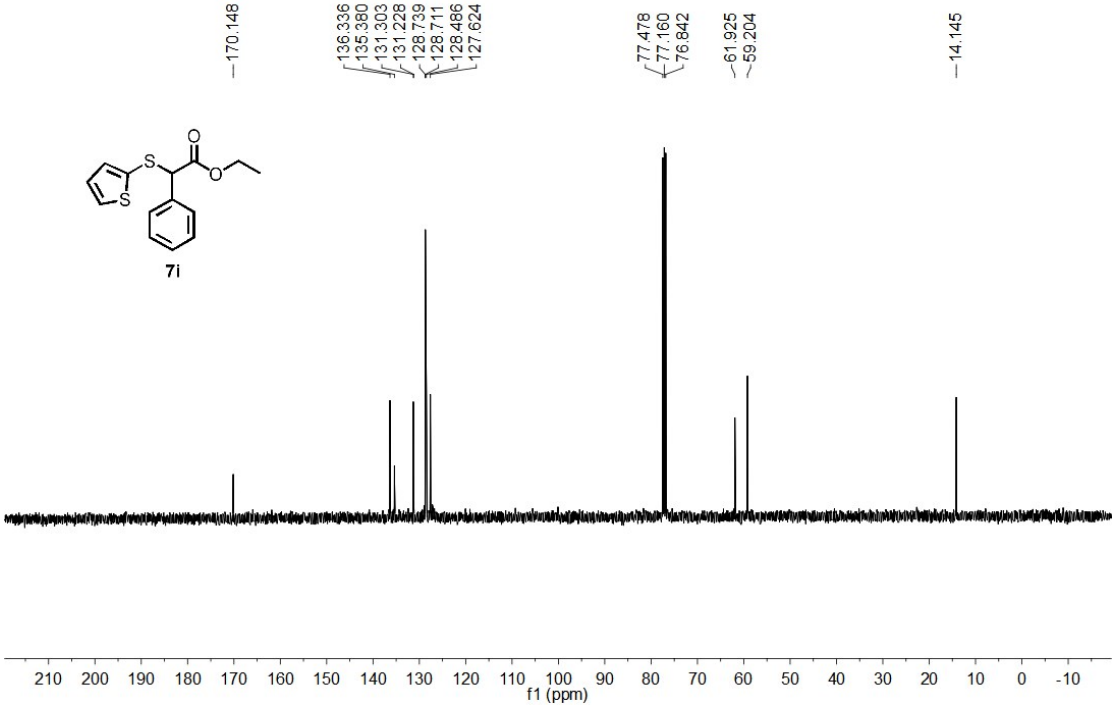
ZZP-119



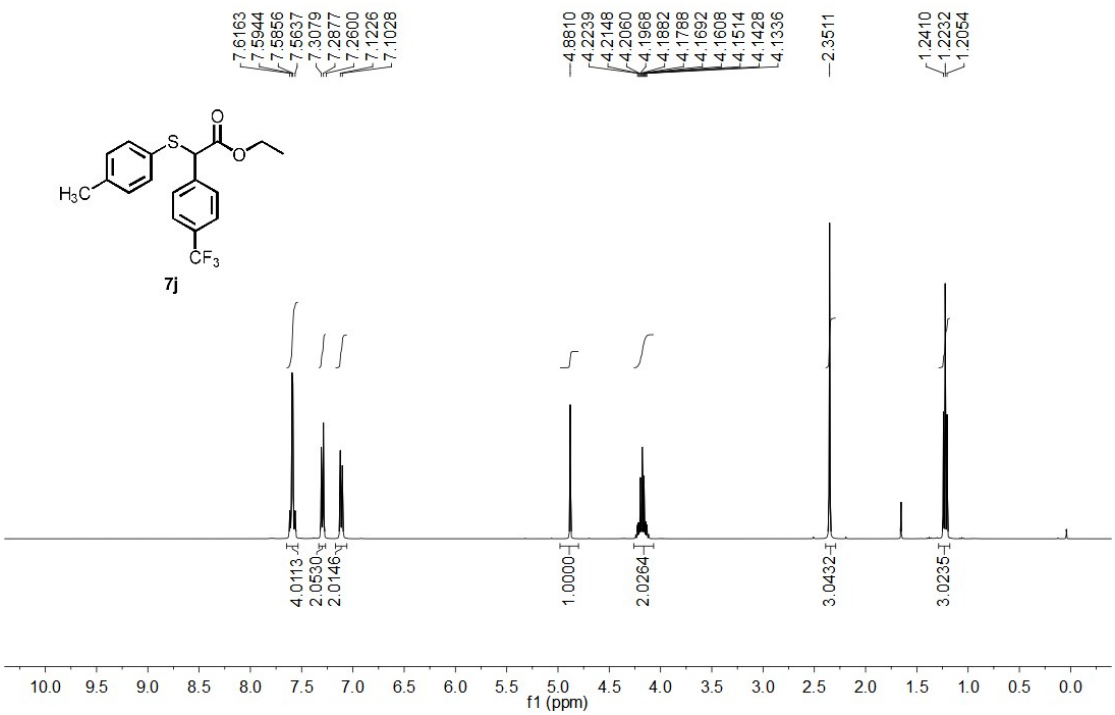
ZZP-505-9
XS-20201218-3



ZZP-505-9
XS-20201218-3

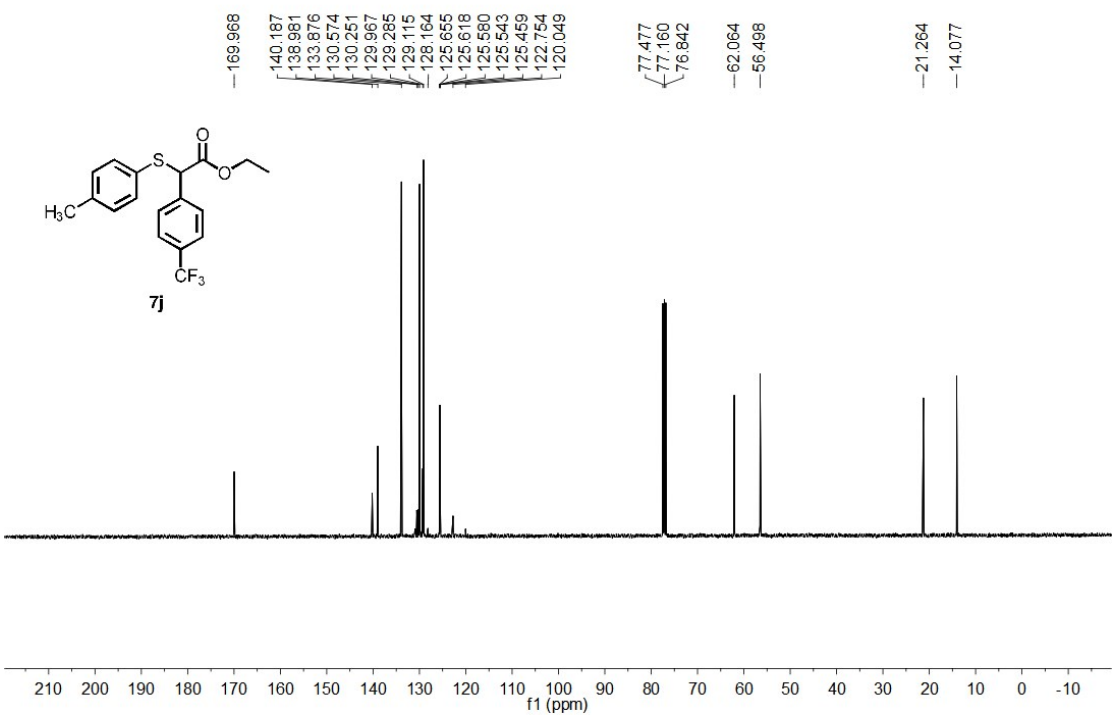


FYF-21



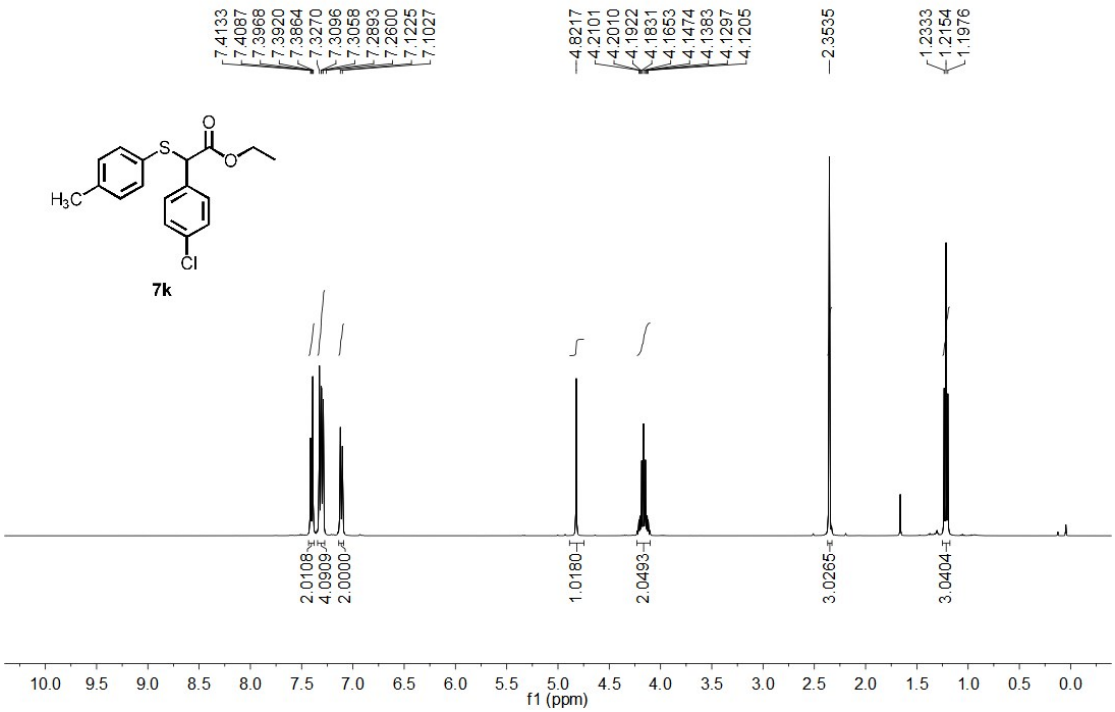
7j

FYF-21

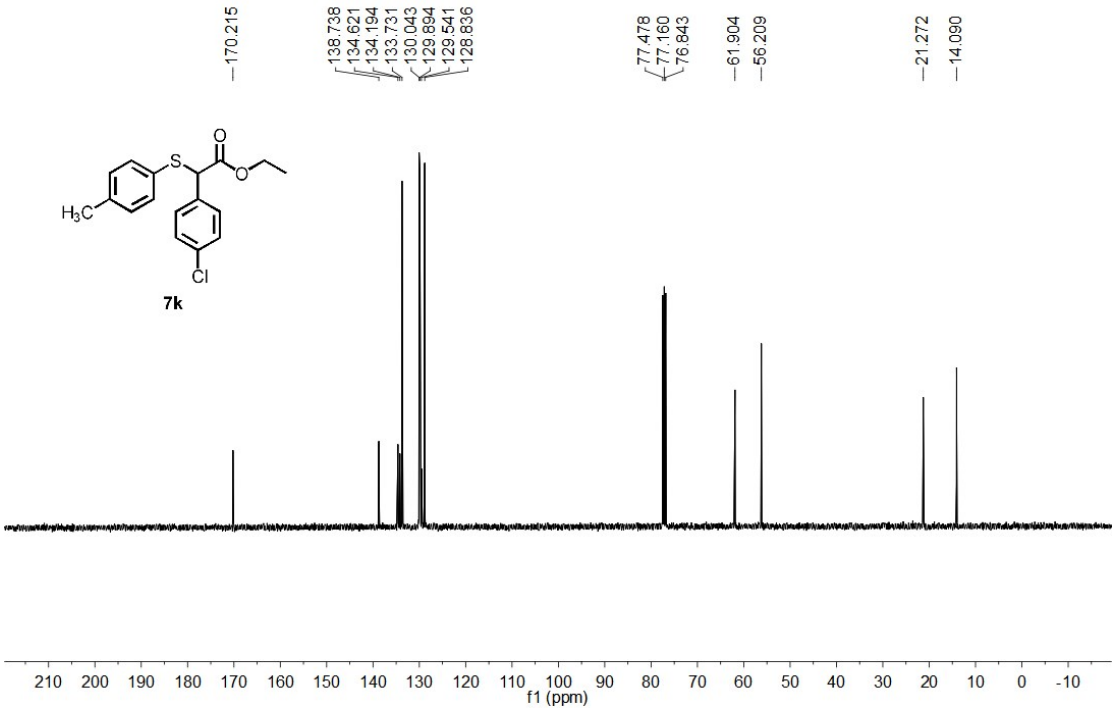


7j

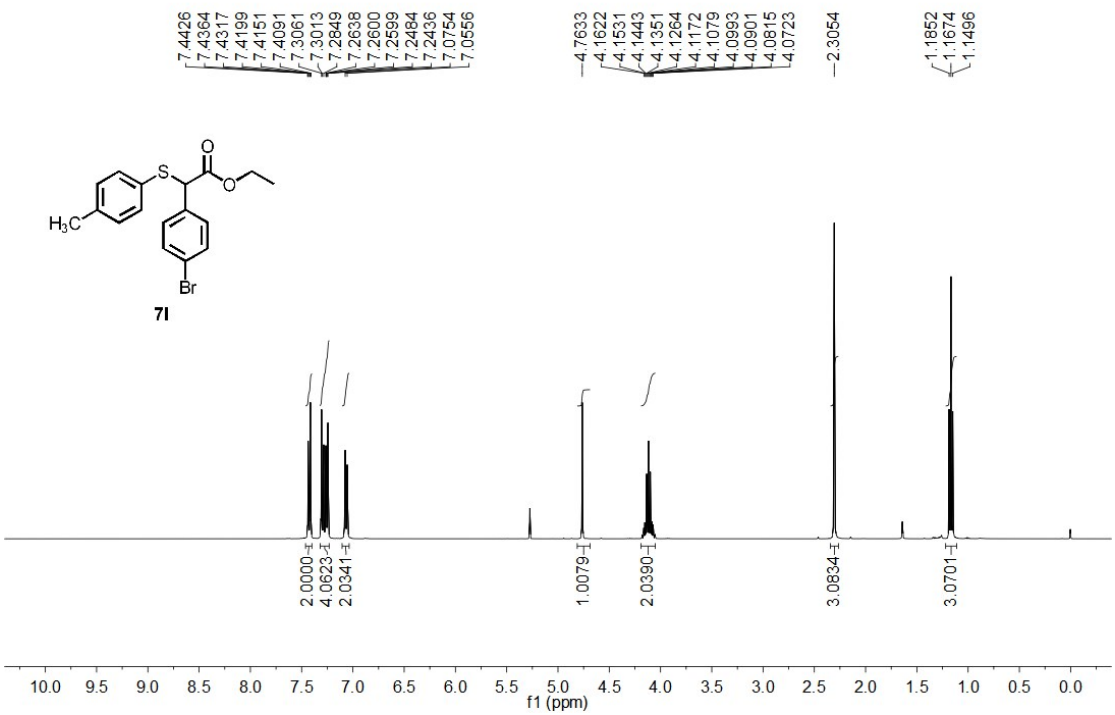
FYF-18


7.4133
7.4087
7.3968
7.3920
7.3864
7.3270
7.3096
7.3058
7.2893
7.2600
7.1225
7.1027
4.8217
4.2101
4.2010
4.1922
4.1831
4.1653
4.1474
4.1383
4.1297
4.1205
2.3535
1.2333
1.2154
1.1976
7k
2.0108
4.0909
2.0000
1.0180
2.0493
3.0265
3.0404
f1 (ppm)

FYF-18

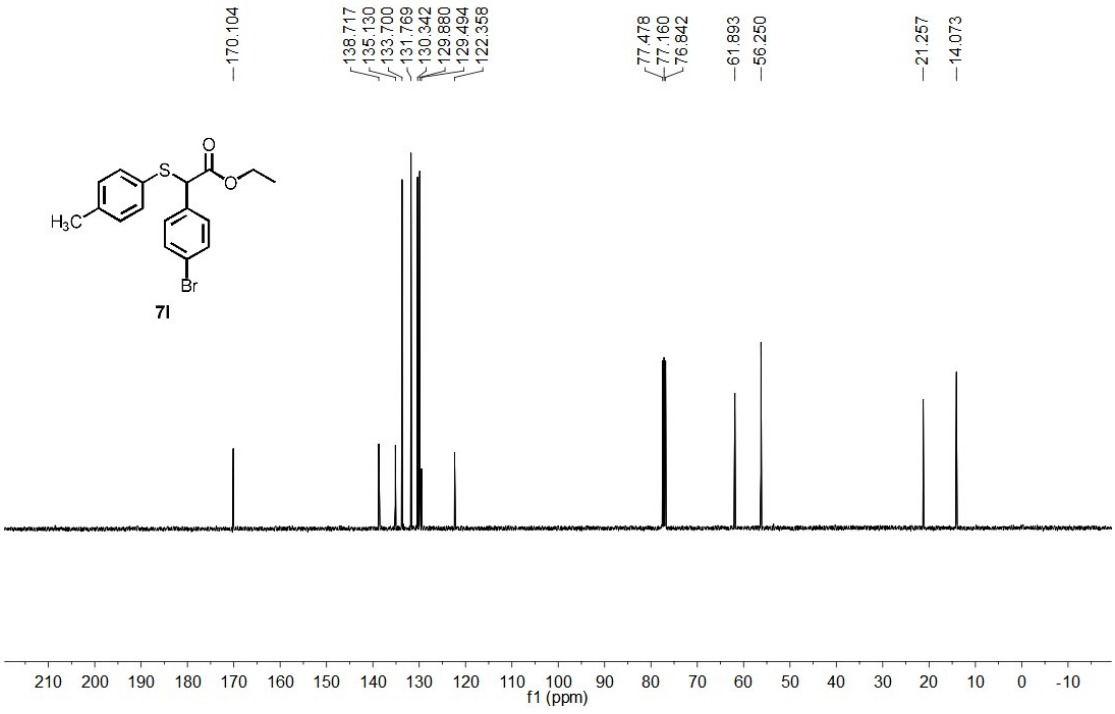

170.215
138.738
134.621
134.194
133.731
130.043
129.894
129.541
128.836
77.478
77.160
76.843
61.904
56.209
21.272
14.090
7k
f1 (ppm)

FYF-13



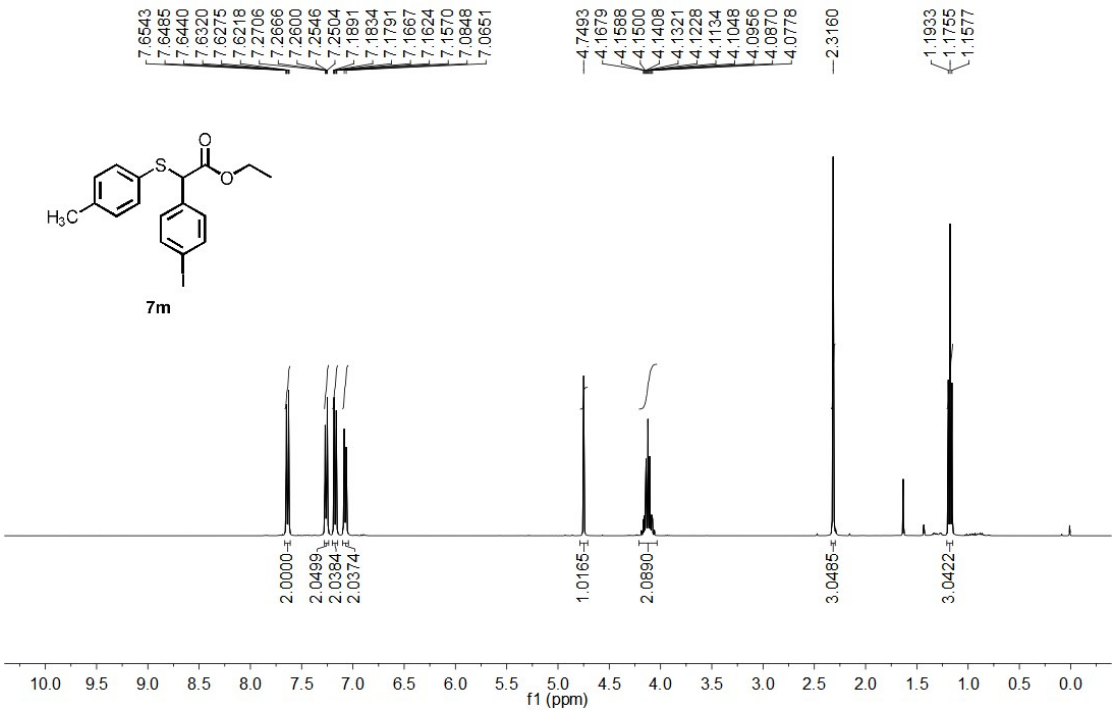
7l

FYF-13

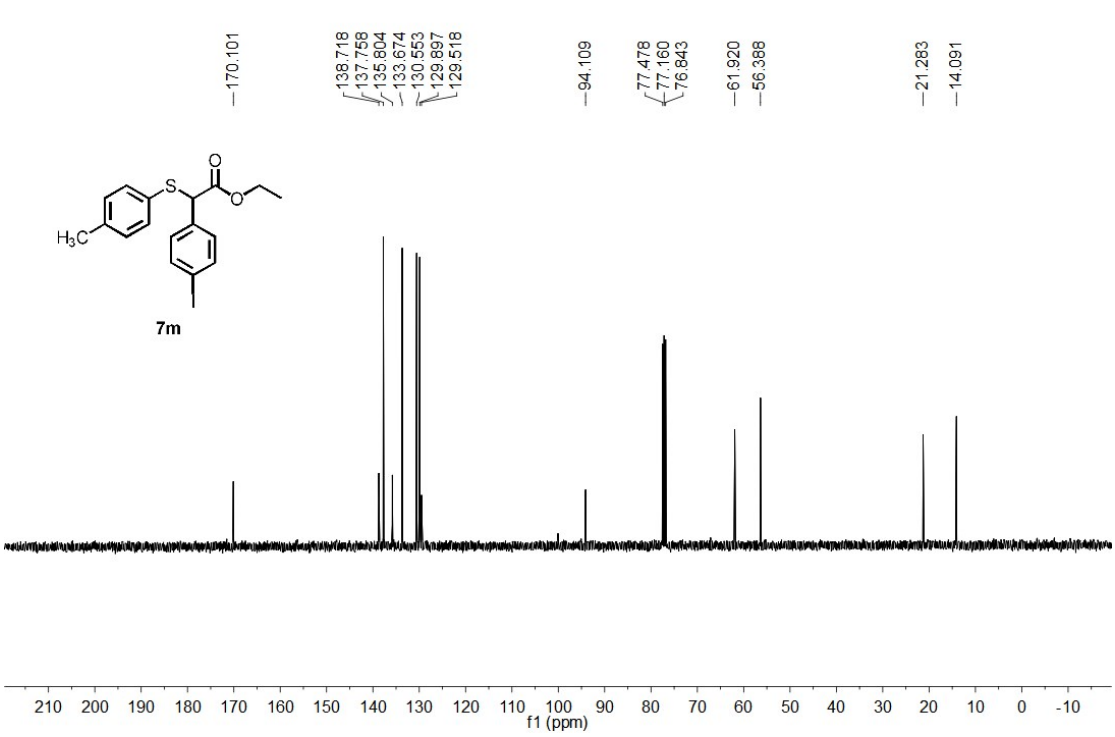


7l

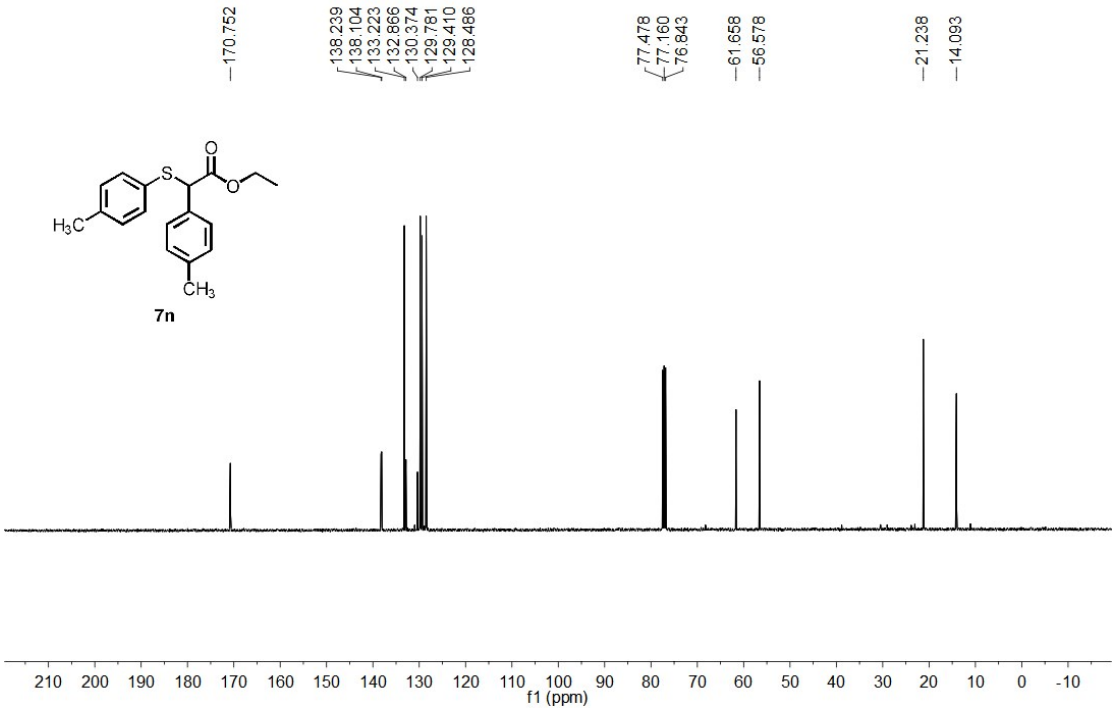
FYF-24


7.6543
7.6485
7.6440
7.6320
7.6275
7.6218
7.2706
7.2666
7.2600
7.2546
7.2504
7.1891
7.1834
7.1791
7.1667
7.1624
7.1570
7.0848
7.0651
4.7493
4.1679
4.1588
4.1500
4.1408
4.1321
4.1228
4.1134
4.1048
4.0956
4.0870
4.0778
2.3160
1.1933
1.1755
1.1577
7m
2.0000
2.0499
2.0384
2.0374
1.0165
2.0890
3.0485
3.0422
f1 (ppm)

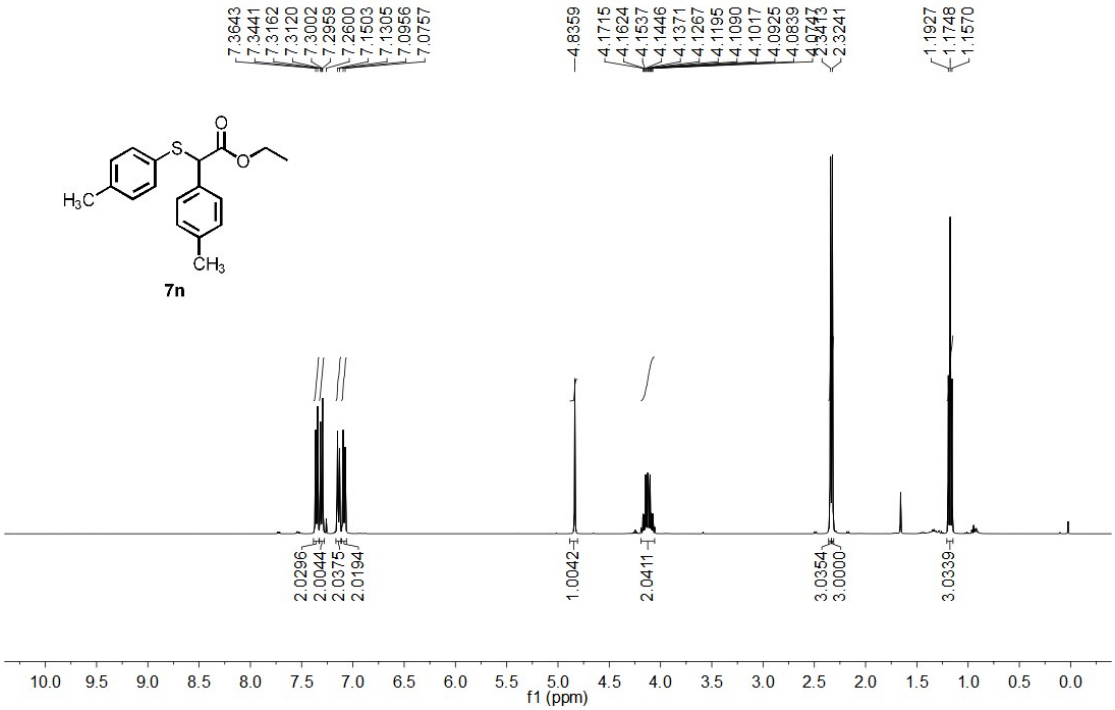
FYF-24


170.101
138.718
137.758
135.804
133.674
130.553
129.897
129.518
94.109
77.478
77.160
76.843
61.920
56.388
21.283
14.091
7m
f1 (ppm)

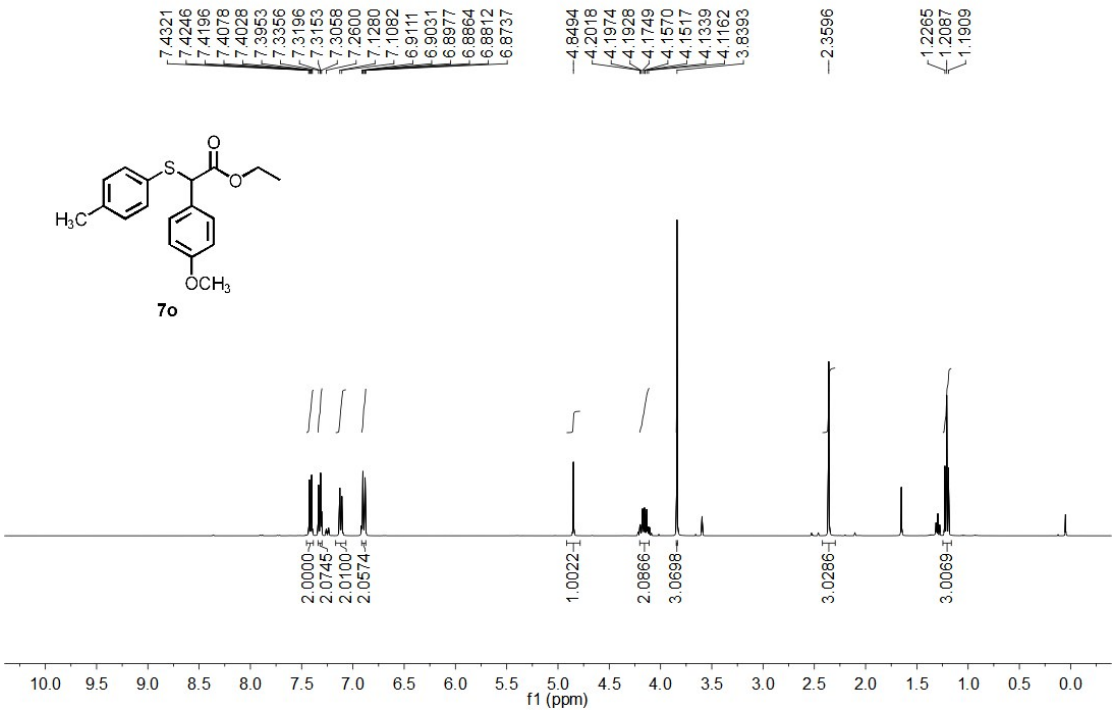
FYF-12


170.752
138.239
138.104
133.223
132.866
130.374
129.781
129.410
128.486
77.478
77.160
76.843
61.658
56.578
21.238
14.093
7n
f1 (ppm)

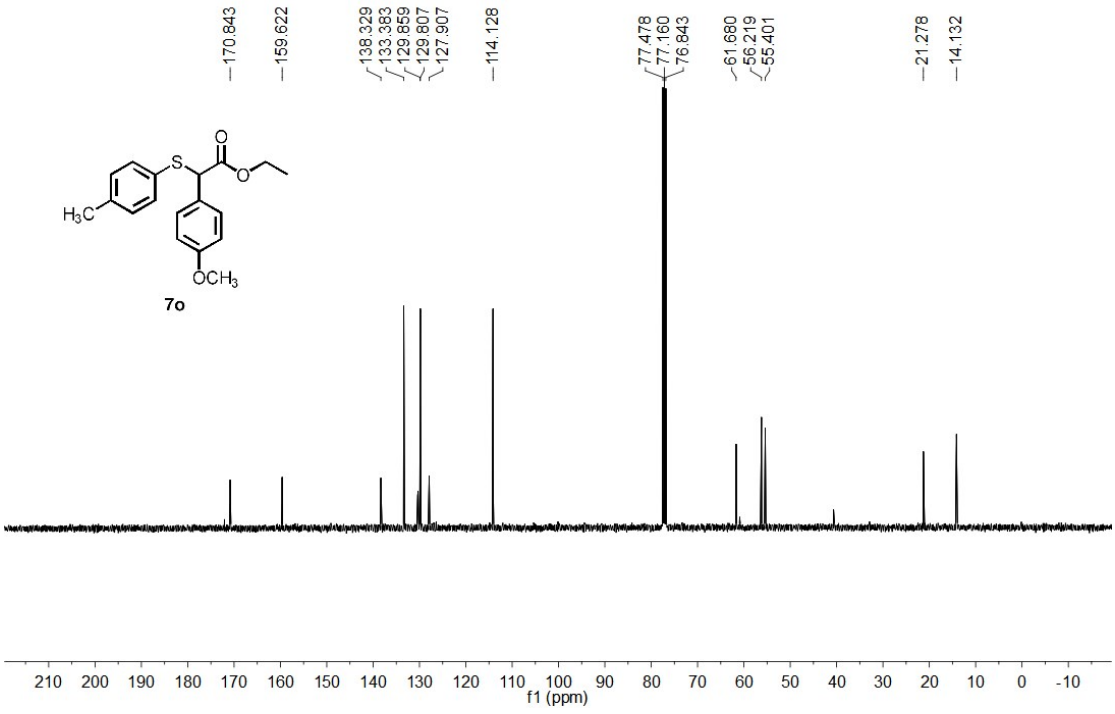
FYF-12


7.3643
7.3441
7.3162
7.3120
7.3002
7.2959
7.2600
7.1503
7.1305
7.0956
7.0757
4.8359
4.1715
4.1624
4.1537
4.1446
4.1371
4.1267
4.1195
4.1090
4.1017
4.0925
4.0839
4.0747
2.3413
2.3241
1.1927
1.1748
1.1570
2.0296
2.0044
2.0375
2.0194
1.0042
2.0411
3.0354
3.0000
3.0339
7n
f1 (ppm)

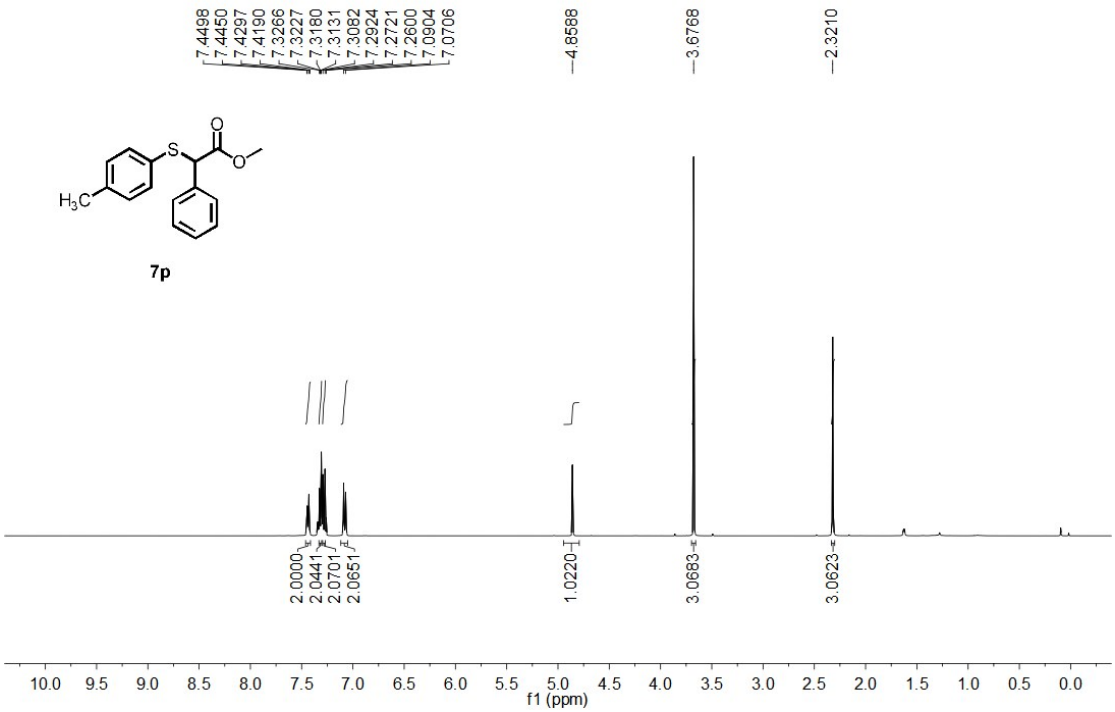
FYF-16


7.4321
7.4246
7.4196
7.4078
7.4028
7.3953
7.3356
7.3196
7.3153
7.3058
7.2600
7.1280
7.1082
6.9111
6.9031
6.8977
6.8864
6.8812
6.8737
4.8494
4.2018
4.1974
4.1928
4.1749
4.1570
4.1517
4.1339
4.1162
3.8393
2.3596
1.2265
1.2087
1.1909
7o
2.0000
2.0745
2.0100
2.0574
1.0022
2.0866
3.0698
3.0286
3.0069
f1 (ppm)

FYF-16

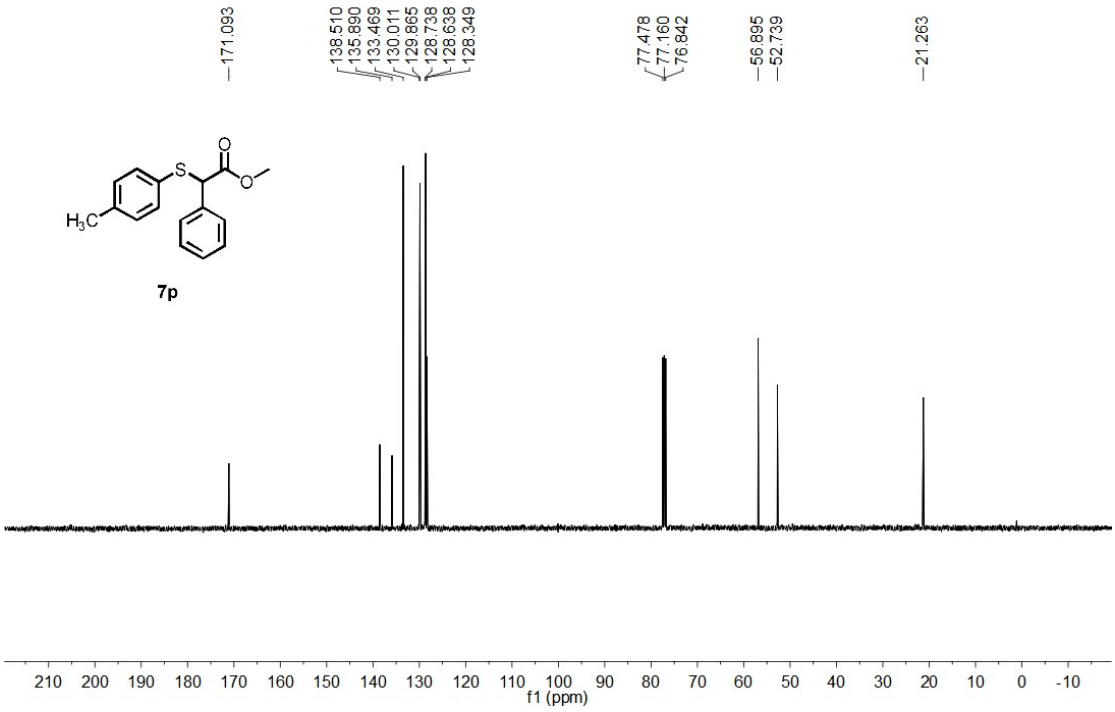

170.843
159.622
138.329
133.383
129.859
129.807
127.907
114.128
77.478
77.160
76.843
61.680
56.219
55.401
21.278
14.132
7o
f1 (ppm)

ZZP-206



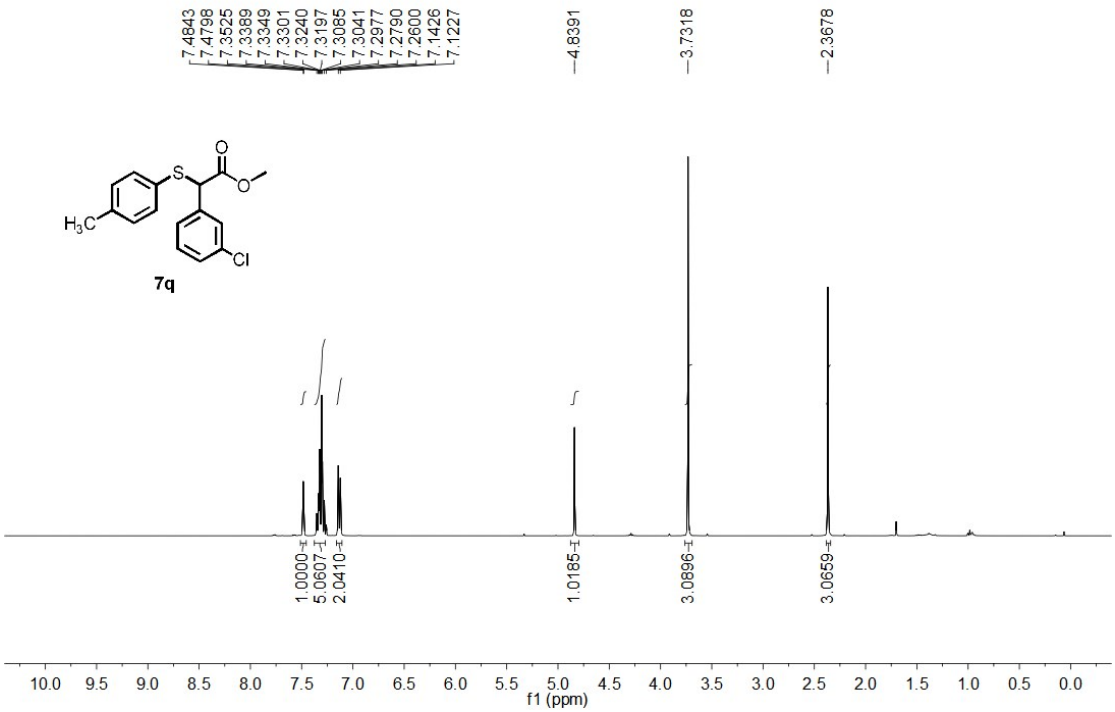
7p

ZZP-206

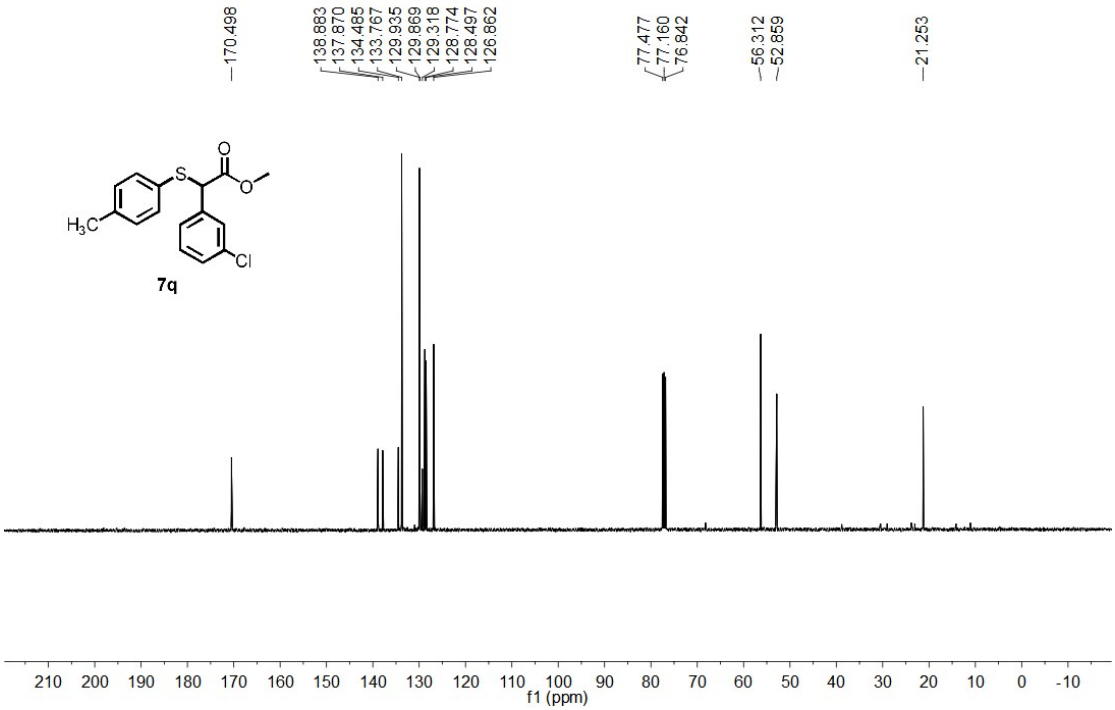


7p

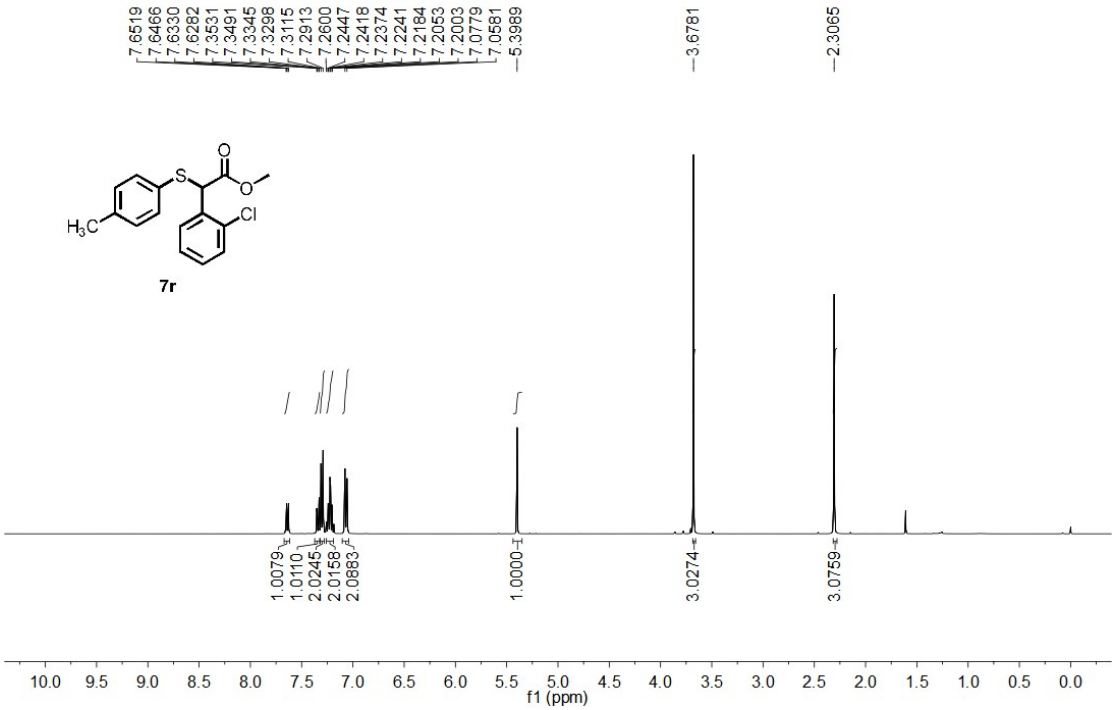
FYF-19


7.4843
7.4798
7.3525
7.3389
7.3349
7.3301
7.3240
7.3197
7.3085
7.3041
7.2977
7.2790
7.2600
7.1426
7.1227
4.8391
3.7318
2.3678
7q
1.0000
5.0607
2.0410
1.0185
3.0896
3.0659
f1 (ppm)

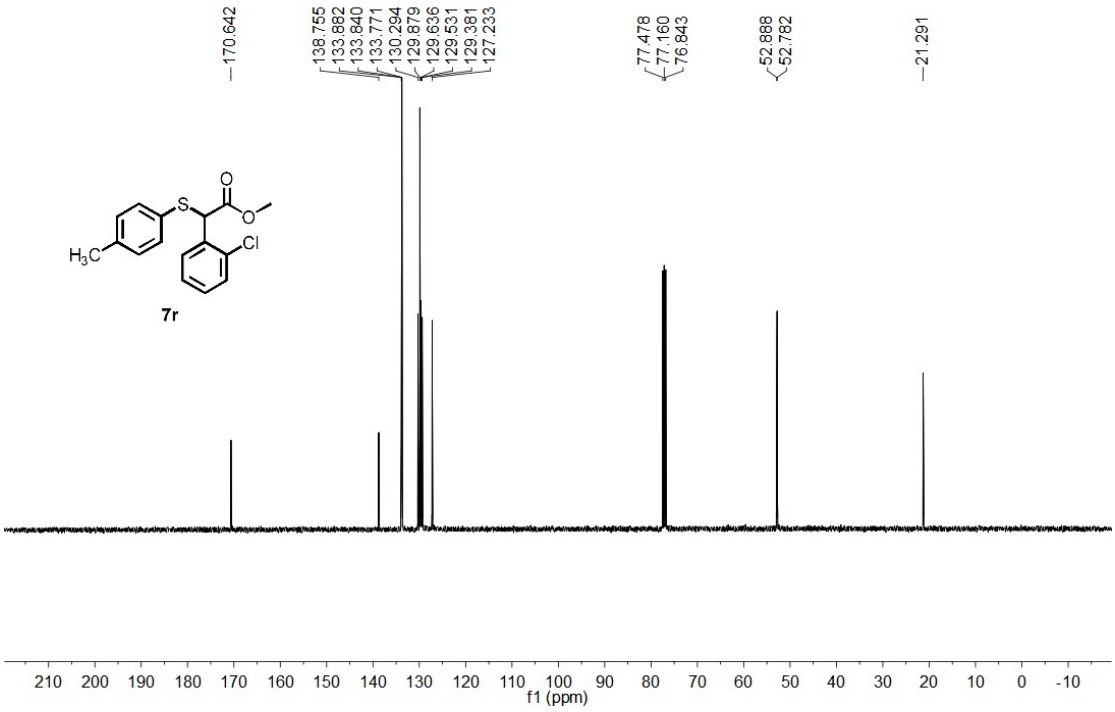
FYF-19


170.498
138.883
137.870
134.485
133.767
129.935
129.869
129.318
128.774
128.497
126.862
77.477
77.160
76.842
56.312
52.859
21.253
7q
f1 (ppm)

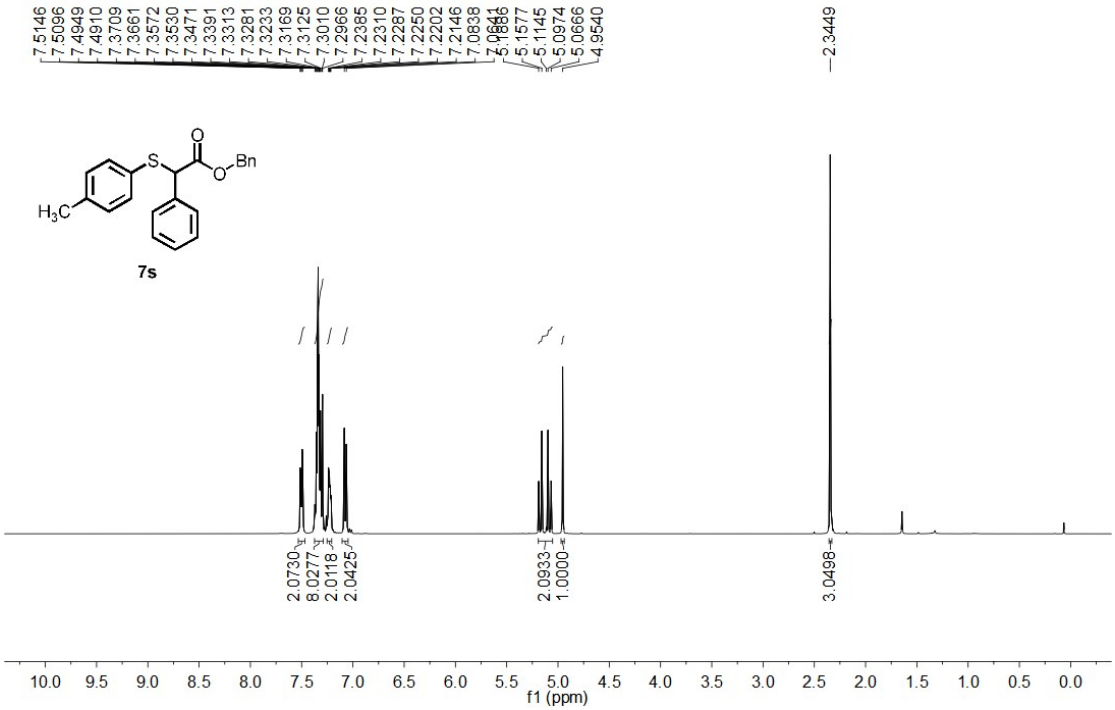
FYF-20


7.6519
7.6466
7.6330
7.6282
7.3531
7.3491
7.3345
7.3298
7.3115
7.2913
7.2600
7.2447
7.2418
7.2374
7.2241
7.2184
7.2053
7.2003
7.0779
7.0581
5.3989
3.6781
2.3065
7r
1.0079
1.0110
2.0245
2.0158
2.0883
1.0000
3.0274
3.0759
f1 (ppm)

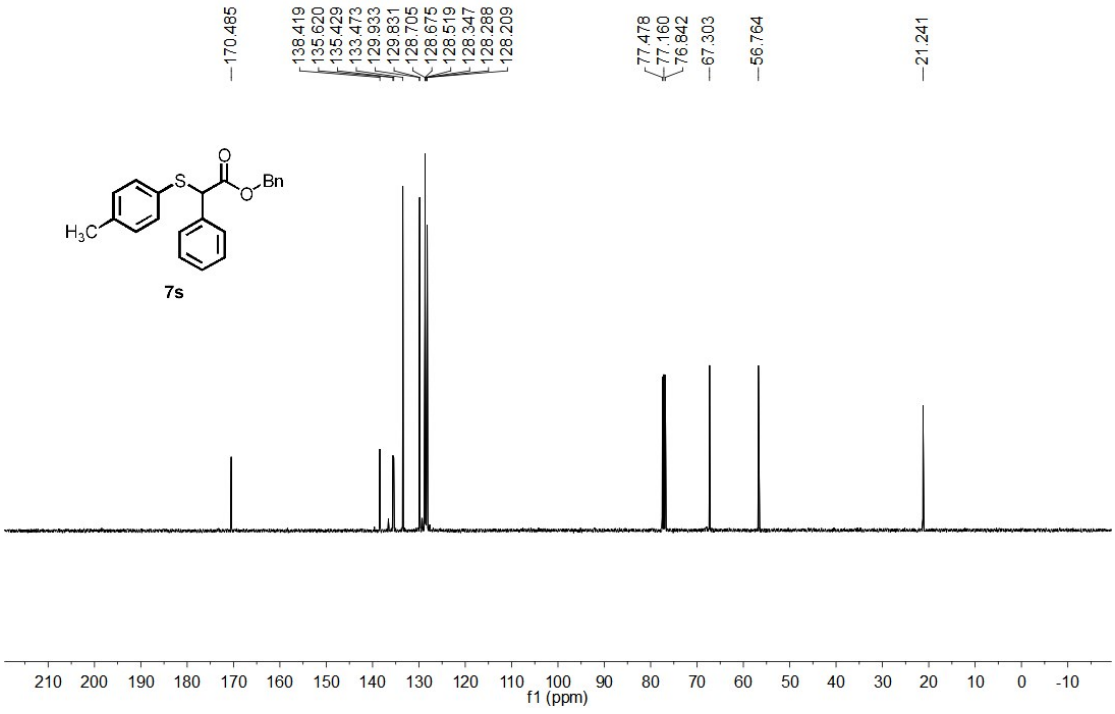
FYF-20


170.642
138.755
133.882
133.840
133.771
130.294
129.879
129.636
129.531
129.381
127.233
77.478
77.160
76.843
52.888
52.782
21.291
7r
f1 (ppm)

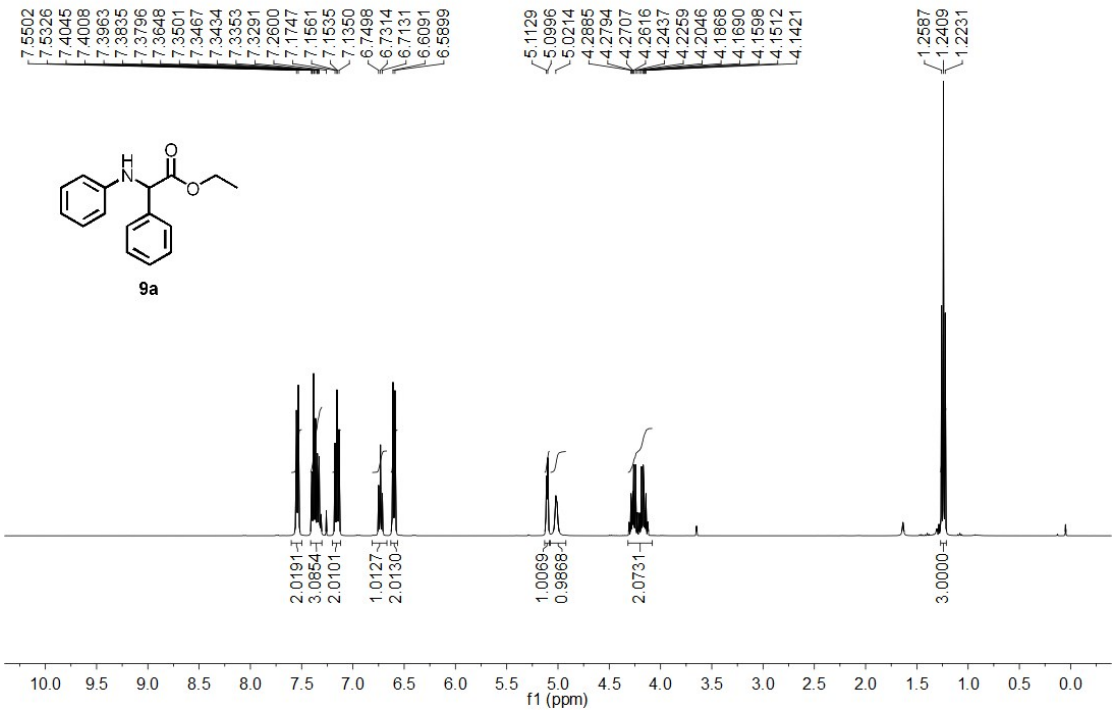
FYF-14


7.5146
7.5096
7.4949
7.4910
7.3709
7.3661
7.3572
7.3530
7.3471
7.3391
7.3313
7.3281
7.3233
7.3169
7.3125
7.3010
7.2966
7.2385
7.2310
7.2287
7.2250
7.2202
7.2146
7.0838
5.1577
5.1145
5.0974
5.0666
4.9540
2.3449
O
S
O
Bn
H3C
7s
2.0730
8.0277
2.0118
2.0425
2.0933
1.0000
3.0498
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

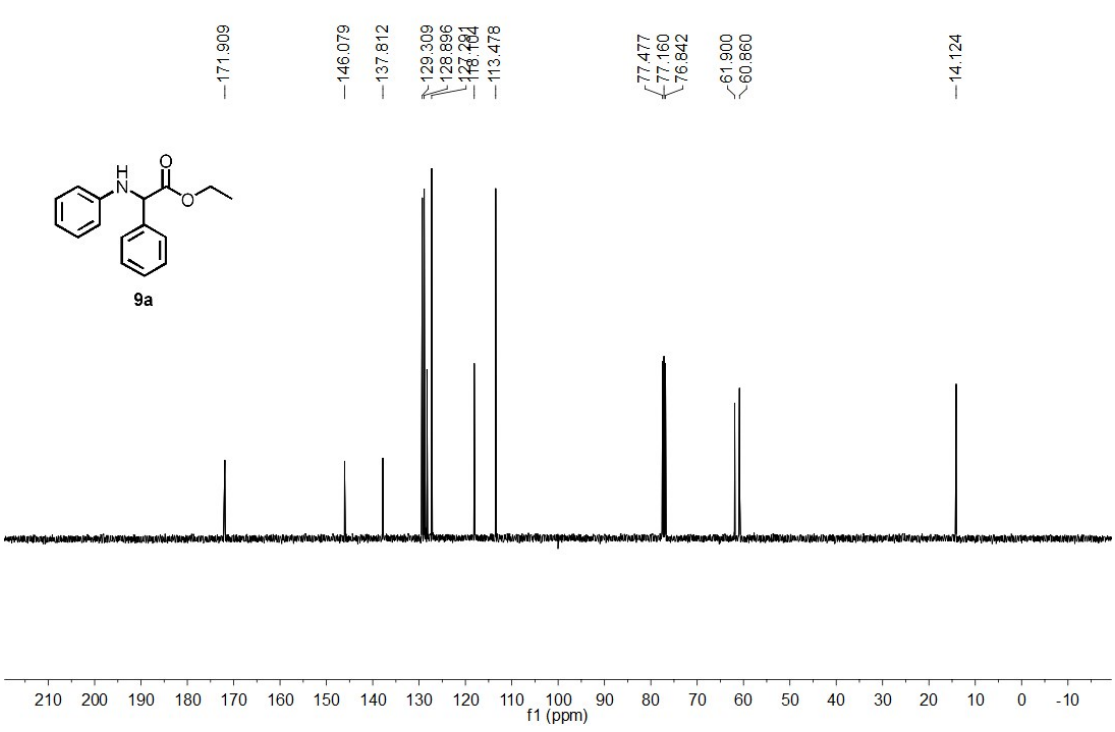
FYF-14


170.485
138.419
135.620
135.429
133.473
129.933
129.831
128.705
128.675
128.519
128.347
128.288
128.209
77.478
77.160
76.842
67.303
56.764
21.241
O
S
O
Bn
H3C
7s
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

D-435


7.5502
7.5326
7.4045
7.4008
7.3963
7.3835
7.3796
7.3648
7.3501
7.3467
7.3434
7.3353
7.3291
7.2600
7.1747
7.1561
7.1535
7.1350
6.7498
6.7314
6.7131
6.6091
6.5899
5.1129
5.0996
5.0214
4.2885
4.2794
4.2707
4.2616
4.2437
4.2259
4.2046
4.1868
4.1690
4.1598
4.1512
4.1421
1.2587
1.2409
1.2231
9a
2.0191
3.0854
2.0101
1.0127
2.0130
1.0069
0.9868
2.0731
3.0000
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

D-435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146.079
137.812
129.309
128.896
127.284
118.784
113.478
77.477
77.160
76.842
61.900
60.860
14.124
9a
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

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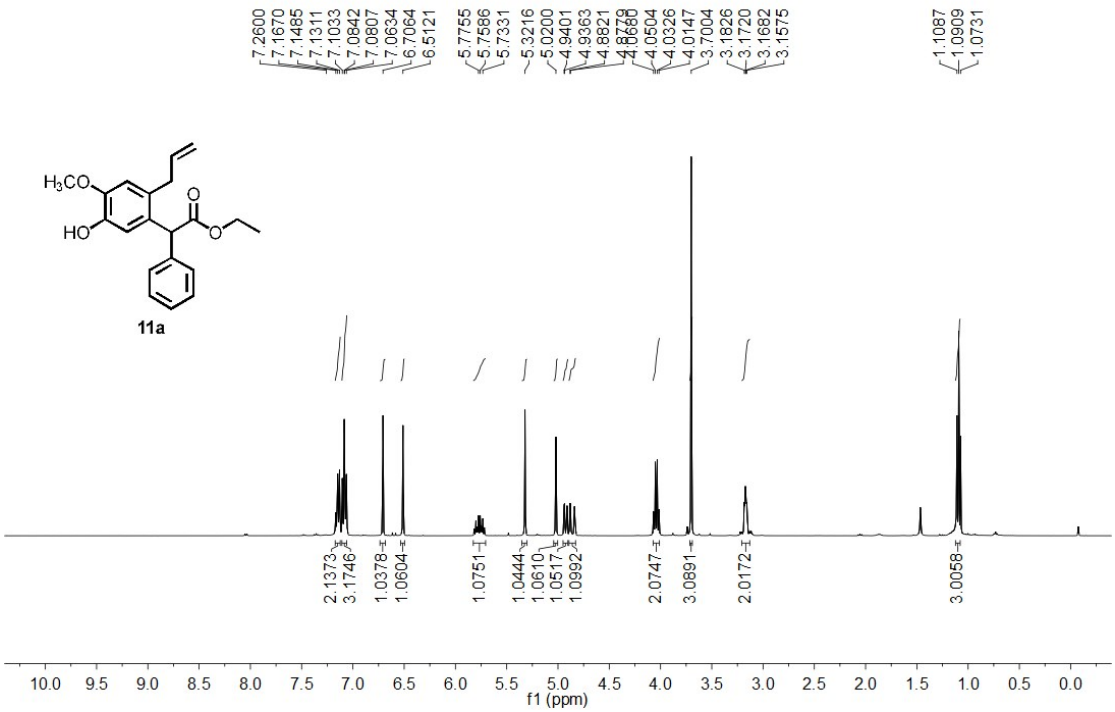

ZZP-17-1