Electronic Supplementary Information

Ni(II)-Catalyzed Intermolecular Selective Heck-Type Arylation of Unactivated Alkenes with Arylboronic Acids

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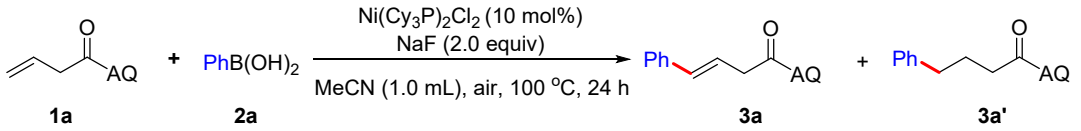
General Information

All reactions were performed in a 25 mL sealed tube. The materials and solvents were purchased from common commercial sources and used without additional purification, if there is no special version. Starting materials were synthesized according to literature procedures[1-2]. ^{1}H NMR spectra were recorded at 400 MHz using TMS as internal standard, ^{13}C NMR spectra was recorded at 100 MHz using TMS as internal standard. ^{19}F NMR spectra was recorded at 375 MHz using TMS as internal standard. The multiplicities are reported as follows: singlet (s), doublet (d), doublet of doublets (dd), multiplet (m), and andtriplet (t). Mass spectroscopy data of the products were collected on an HRMS-TOF instrument.

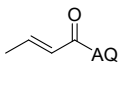
Optimization of Reaction Conditions[a]



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

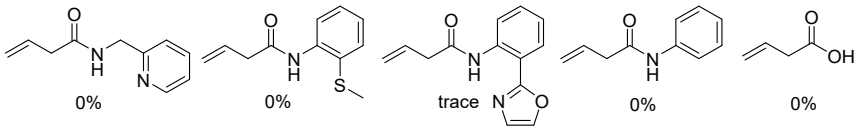
entry	deviation standard conditions	yield **3a** (%) (recovery of **1a**)[b]	yield **3a′** (%)[b]
1	**none**	**71 (10)**	**5**
2	no $Ni(Cy_3P)_2Cl_2$	0 (95)	0
3	$Ni(Ph_3P)_2Cl_2$ instead of $Ni(Cy_3P)_2Cl_2$	58 (20)	13
4	$Ni(acac)_2$ instead of $Ni(Cy_3P)_2Cl_2$	44 (36)	15
5	$Ni(OTf)_2$ instead of $Ni(Cy_3P)_2Cl_2$	49 (35)	10
6	$Cu(OAc)_2$, $Co(OAc)_2$, $Pd(OAc)_2$ or $Pd(Ph_3P)_2Cl_2$ instead of $Ni(Cy_3P)_2Cl_2$	0 (99)	0
7	$NaHCO_3$ instead of NaF	25 (53)	0
8	NaOAc instead of NaF	15 (76)	5
9	KF, CsF or TABF instead of NaF	0 (90)	0
10	no NaF	0 (94)	0
11	DCE, DMF, DMSO, *t*-AmylOH, toluene or 1,4-dioxane as solvent	0 (97)	0
12	110 °C instead of 100 °C	45 (44)	5
13	80 °C instead of 100 °C	34 (53)	5
14	O_2 atmosphere	60 (25)	10
15	N_2 atmosphere	10 (75)	3
16[c]	Using Zhao's reaction conditions	0 (0)	0

under Xue's conditions



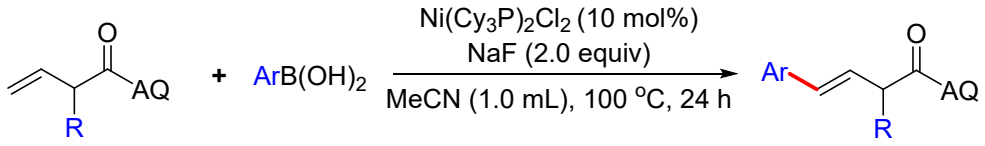
1a', 91%

reactions using other directing groups



[a]Reactions were carried out by using **1a** (0.1 mmol), **2a** (0.2 mmol), $Ni(Cy_3P)_2Cl_2$ (0.01 mmol), NaF (0.2 mmol), MeCN (1.0 mL), 100 °C, 24 h. [b]Isolated yield. [c]Zhao's condition: $Ni(cod)_2$ (0.01 mmol), n-Bu_3P (0.02 mmol), (*E*)-3-(3,4,5-trimethoxyphenyl)acrylaldehyde (0.1 mmol), CsOPiv (0.15 mmol), t-AmylOH (1.0 mL), 70 °C, 48 h.

Typical Procedure for the Nickel(II)-Catalyzed Intermolecular Heck-Type Reaction

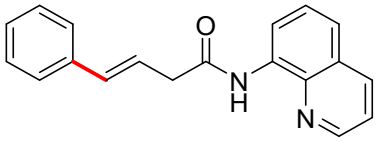


1 **2** **3 and 4**

A 25 mL thick wall pressure sealed tube was charged with **1** (0.1 mmol), **2** (0.2 mmol), $Ni(Cy_3P)_2Cl_2$ (6.9 mg, 0.01 mmol), NaF (8.4 mg, 0.2 mmol) and MeCN (1.0 mL), then stirred at 100 °C for 24 h. The mixture was then cooled to room temperature, diluted with EtOAc, filtered through a celite pad, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **3** and **4**.

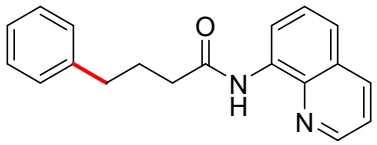
Analytical Data for Products

(*E*)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (3a)



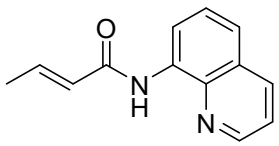
Rf 0.58 (PE/EtOAc = 2/1). 71%, 20.5mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.06 (s, 1H), 8.77 (d, J = 7.2Hz, 1H), 8.70 (dd, J_1 = 1.2 Hz, J_2 = 4.0 Hz, 1H), 8.10 (d, J = 8.4Hz, 1H), 7.53-7.43 (m, 4H), 7.39-7.31 (m, 1H), 7.26-7.22 (m, 2H), 6.99 (s, 1H), 6.69 (d, J = 15.6Hz, 1H), 6.51-6.45 (m, 1H), 3.48 (d, J = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.3, 148.2, 138.4, 137.0, 136.3, 134.9, 134.4, 128.6, 127.9, 127.7, 127.4, 126.5, 122.4, 121.6, 121.6, 116.5, 42.3. HRMS (EI-TOF) calcd fo r$C_{19}H_{16}N_2O$ (M^+): 288.1263, found: 288.1264.

2,2-dimethyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (3a')



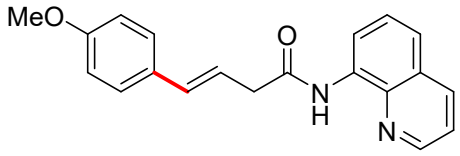
Rf 0.36 (PE/EtOAc = 20/1). Yield, 98%, 28.43 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ9.84 (s, 1H), 8.86 (d, J = 6.8 Hz, 1H), 8.79 (dd, J_1 = 1.6 Hz; J_2 = 4.0 Hz, 1H), 8.11 (d ,J = 8.0 Hz, 1H), 7.53 (t, J = 8.4 Hz, 1H), 7.47 (d, J = 8.4 Hz, 1H), 7.41-7.38 (m, 1H), 7.35-7.26 (m, 2H), 7.24-7.21 (m, 3H), 2.79 (t, J = 8.0 Hz, 2H), 2.59 (t, J = 7.2 Hz, 2H), 2.23-2.16 (m, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.7, 148.2, 141.6, 138.3, 136.4, 134.5, 128.6, 128.6, 128.5, 128.0, 127.4, 126.1, 121.6, 116.7, 37.3, 35.3, 27.1. HRMS (EI-TOF) calcd for $C_{19}H_{18}N_2O$ (M^+): 290.1419, found: 290.1420.

(*E*)-*N*-(quinolin-8-yl)but-2-enamide (1a′)



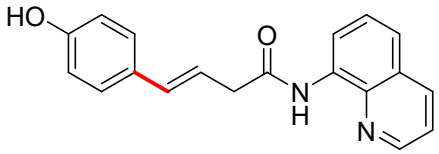
Rf 0.70 (PE/EtOAc = 2/1). Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 9.83 (s, 1H), 8.85-8.79 (m, 2H), 8.15 (d, *J* = 8.0 Hz, 1H), 7.56-7.42 (m, 3H), 7.14-7.02 (m, 1H),6.211 (d, *J* = 15.2 Hz, 1H), 1.96 (d, *J* = 6.8 Hz, 1H). ^{13}C NMR ($CDCl_3$, 100 Hz) δ 164.3, 148.1, 141.2, 138.5, 136.4, 134.6, 127.9, 127.5, 126.2, 121.6, 121.5, 116.7, 17.9. HRMS (EI-TOF) calcd for $C_{13}H_{12}N_2O$ (M^+): 212.0950, found: 212.0953.

(*E*)-4-(4-methoxyphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3b)



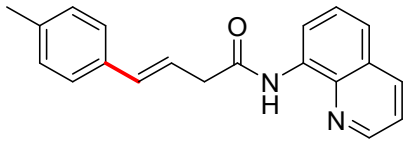
Rf 0.50 (PE/EtOAc = 2/1). 51%, 16.2 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.10 (s, 1H), 8.79-8.72 (m, 2H), 8.15 (d, *J* = 8.4 Hz, 1H), 7.56-7.49 (m, 2H), 7.44-7.39 (m, 3H), 6.88 (d, *J* = 8.0 Hz, 2H), 6.67 (d, *J* = 15.6 Hz, 1H), 6.37-6.33 (m, 1H), 3.82 (s, 3H), 3.48 (d, *J* = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 Hz) δ 169.6, 159.3, 148.2, 138.5, 136.3, 134.5, 129.8, 128.8, 127.9, 127.7, 127.4, 121.6, 120.1, 116.5, 114.0, 55.3, 42.3. HRMS (EI-TOF) calcd for $C_{20}H_{18}N_2O_2$(M^+): 318.1368, found: 318.1373.

(*E*)-4-(4-hydroxyphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3c)



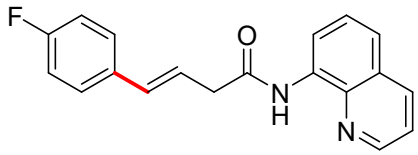
Rf 0.29 (PE/EtOAc = 2/1). 53%, 16.1 mg. Yellow solid; ^{1}H NMR (d_6-DMSO, 400 MHz) δ 10.22 (s, 1H), 9.51 (s, 1H), 8.88 (d, *J* = 3.6 Hz, 1H), 8.64 (d, *J* = 7.6 Hz, 1H), 8.41 (d, *J* = 8.4 Hz, 1H), 7.68-7.56 (m, 3H), 7.28 (d, *J* = 7.6 Hz, 2H), 6.73 (d, *J* = 7.6 Hz, 2H), 6.54 (d, *J* = 7.2 Hz, 1H), 6.27-6.23 (m, 1H), 3.48 (d, *J* = 6.8 Hz, 2H). ^{13}C NMR (d_6-DMSO, 100 MHz) δ 169.2, 156.5, 149.2, 148.3, 136.1, 133.9, 132.6, 127.3, 126.9, 126.4, 121.6, 121.3, 119.5, 115.9, 115.1, 114.9, 40.5, 39.6, 39.4, 39.2, 39.0, 38.8, 38.6, 38.4. HRMS (EI-TOF) calcd for $C_{19}H_{16}N_2O_2$(M^+): 304.1212, found: 304.1212.

(*E*)-*N*-(quinolin-8-yl)-4-(p-tolyl)but-3-enamide (3d)



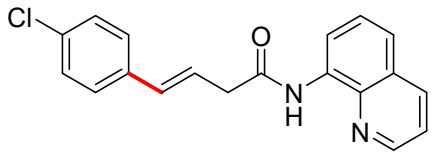
Rf 0.62 (PE/EtOAc = 2/1). 38%, 11.4 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.08 (s, 1H), 8.78-8.72 (m, 2H), 8.14 (d, J = 8.4 Hz, 1H), 7.55-7.49 (m, 2H), 7.43-7.40 (m, 1H), 7.36 (d, J = 8.0 Hz, 2H), 7.15 (d, J = 7.6 Hz, 2H), 6.69 (d, J = 15.6 Hz, 1H), 6.47-6.40 (m, 1H), 3.49 (d, J = 7.2 Hz, 2H), 2.35 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.5, 148.2, 138.5, 137.5, 136.3, 134.9, 134.4, 134.2, 129.3, 127.9, 127.4, 126.4, 121.6, 121.3, 116.5, 42.4, 21.2. HRMS (EI-TOF) calcd for $C_{20}H_{18}N_2O$ (M^+): 302.1419, found: 302.1415.

(*E*)-4-(4-fluorophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3e)



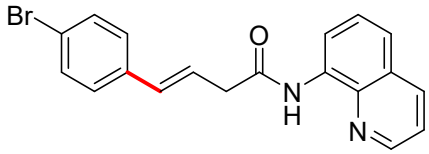
Rf 0.55 (PE/EtOAc = 2/1). 47%, 14.4 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.07 (s, 1H), 8.78-8.72 (m, 2H), 8.15 (d, J = 8.0 Hz, 1H), 7.56-7.50 (m, 2H), 7.45-7.40 (m, 3H), 7.05-7.00 (m, 2H), 6.67 (d, J = 15.6 Hz, 1H), 6.45-6.37 (m, 1H), 3.49 (d, J = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.2, 162.4 (d, $J_{C\text{-}F}$ = 245.0 Hz), 148.2, 138.4, 136.5, 134.3, 133.7, 128.0 (d, $J_{C\text{-}F}$ = 7.4 Hz), 127.4, 124.5, 124.0, 122.2, 121.6 (d, $J_{C\text{-}F}$ = 8.3 Hz), 116.6, 115.6, 115.4, 42.2. ^{19}F NMR (375 MHz, $CDCl_3$) δ -114.48 (m). HRMS (EI-TOF) calcd for $C_{19}H_{15}FN_2O$ (M^+):306.1168, found: 306.1168.

(*E*)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3f)



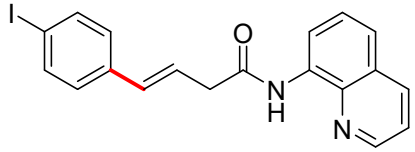
Rf 0.54 (PE/EtOAc = 2/1). 48%, 15.4 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.06 (s, 1H), 8.77-8.72 (m, 2H), 8.15 (d, *J* = 8.0 Hz, 1H), 7.56-7.48 (m, 2H), 7.45-7.42 (m, 1H), 7.37 (d, *J* = 8.4 Hz, 2H), 7.30 (d, *J* = 8.8 Hz, 2H), 6.65 (d, *J* = 16.0 Hz, 1H), 6.50-6.43 (m, 1H), 3.49 (d, *J* = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.1, 148.2, 138.4, 136.5, 135.4, 134.2, 133.6, 133.3, 128.7, 128.0, 127.7, 127.4, 123.1, 121.7, 121.6, 116.6, 42.2. HRMS (EI-TOF) calcd for $C_{19}H_{15}ClN_2O$ (M^+): 322.0873, found: 322.0879.

(*E*)-4-(4-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide(3g)



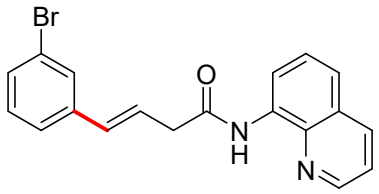
Rf 0.58 (PE/EtOAc = 2/1). 55%, 20.1 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.06 (s, 1H), 8.77-8.73 (m, 2H), 8.17-8.14 (m, 1H), 7.56-7.49 (m, 2H), 7.46-7.42 (m, 3H), 7.31 (d, *J* = 8.8 Hz, 2H), 6.64 (d, *J* = 16.0 Hz, 1H), 6.52-6.44 (m, 1H), 3.49 (d, *J* = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.1, 148.2, 136.5, 135.9, 134.2, 133.7, 131.7, 128.0, 127.4, 124.5, 124.0, 123.3, 121.8, 121.6, 117.4, 116.6, 42.2. HRMS (EI-TOF) calcd for $C_{19}H_{15}BrN_2O$ (M^+): 366.0368, found: 366.0369.

(*E*)-4-(4-iodophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3h)



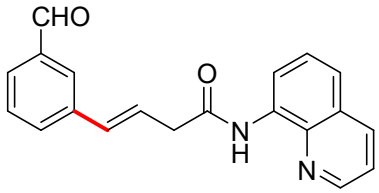
Rf 0.57 (PE/EtOAc = 2/1). 44%, 18.2 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.05 (s, 1H), 8.77-8.73 (m, 2H), 8.16 (dd, J_1 = 1.2 Hz; J_2 = 8.0 Hz, 1H), 7.66 (d, *J* = 8.0 Hz, 2H), 7.56-7.50 (m, 3H), 7.19 (d, *J* = 8.4 Hz, 2H), 6.63 (d, *J* = 16.4 Hz, 1H), 6.54-6.48 (m, 1H), 3.49 (d, *J* = 6.8 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.0, 148.2, 138.4, 137.7, 136.4, 134.3, 133.7, 128.2, 128.0, 127.4, 123.4, 121.7, 121.6, 116.6, 42.2. HRMS (EI-TOF) calcd for $C_{19}H_{15}IN_2O$ (M^+): 414.0229, found: 414.0231.

(*E*)-4-(3-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3i)



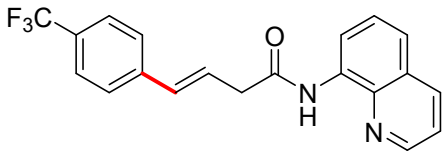
Rf 0.56 (PE/EtOAc = 2/1). 63%, 23.0 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.07 (s, 1H), 8.79-8.75 (m, 2H), 8.16 (d, *J* = 8.0 Hz, 1H), 7.61 (s, 1H), 7.56-7.48 (m, 3H), 7.46-7.34 (m, 3H), 6.63 (d, *J* = 16.0 Hz, 1H), 6.53-6.47 (m, 1H), 3.51 (d, *J* = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 169.0, 148.2, 139.1, 136.5, 134.2, 133.4, 130.5, 130.1, 129.4, 128.0, 127.4, 125.1, 124.1, 122.8, 121.8, 121.6, 116.7, 42.1. HRMS (EI-TOF) calcd for $C_{19}H_{15}BrN_2O$ (M^+): 366.0368, found: 366.0372.

(*E*)-4-(3-formylphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3j)



Rf 0.38 (PE/EtOAc = 2/1). 51%, 16.1 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.09 (s, 1H), 10.03 (s, 1H), 8.79-8.75 (m, 2H), 8.18 (d, *J* = 8.4 Hz, 1H), 7.96 (s, 1H), 7.78-7.70 (m, 2H), 7.58-7.49 (m, 4H), 6.77 (d, *J* = 16.0 Hz, 1H), 6.65-6.60 (m, 1H), 3.56 (d, *J* = 6.8 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 191.2, 167.9, 147.1, 137.2, 137.0, 135.6, 133.2, 132.3, 131.2, 128.3, 127.8, 127.0, 126.5, 123.6, 123.0, 120.8, 120.6, 115.8, 41.2. HRMS (EI-TOF) calcd for $C_{20}H_{16}N_2O_2$(M^+): 316.1212, found: 316.1213.

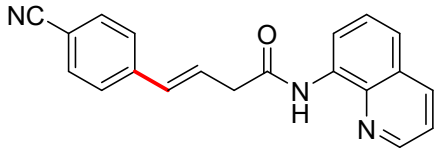
(*E*)-*N*-(quinolin-8-yl)-4-(4-(trifluoromethyl)phenyl)but-3-enamide (3k)



Rf 0.56 (PE/EtOAc = 2/1). 42%, 14.9 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.05 (s, 1H), 8.78-8.73 (m, 2H), 8.16 (d, *J* = 8.0 Hz, 1H), 7.59-7.50 (m, 6H), 7.45-

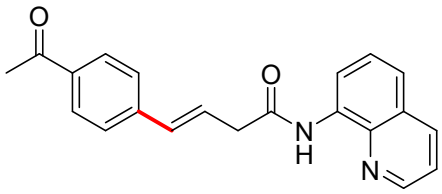
7.42 (m, 1H),6.73 (d, J = 16.0 Hz, 1H), 6.64-6.58 (m, 1H), 3.54 (d, J = 6.8 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 168.8, 148.2, 140.4, 138.3, 136.5, 134.2, 133.3, 130.9, 129.0, 128.9, 128.0, 127.4, 126.6, 125.6, 125.5, 125.3, 124.5, 121.8, 121.6, 116.7, 42.1. ^{19}F NMR (375 MHz, $CDCl_3$) δ -62.48 (m). HRMS (EI-TOF) calcd for $C_{20}H_{15}F_3N_2O$ (M^+): 356.1136, found: 356.1135.

(*E*)-4-(4-cyanophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3l)



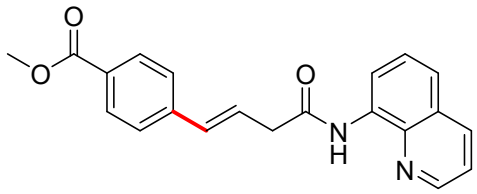
Rf 0.37 (PE/EtOAc = 2/1). 33%, 10.3 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.03 (s, 1H), 8.77-8.75 (m, 2H), 8.18 (d, J = 7.6 Hz, 1H), 7.62 (d, J = 8.4 Hz, 2H), 7.59-7.52 (m, 4H), 7.48-7.45 (m, 1H), 6.74-6.65 (m, 2H), 3.56 (d, J= 6.4 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 168.5, 148.2, 141.4, 136.5, 134.2, 132.9, 132.4, 129.4, 128.0, 127.4, 126.9, 126.7, 121.9, 121.7, 118.9, 116.6, 111.0, 42.1. HRMS (EI-TOF) calcd for $C_{20}H_{15}N_3O$ (M^+): 313.1215, found: 313.1217.

(*E*)-4-(4-acetylphenyl)-*N*-(quinolin-8-yl)but-3-enamide(3m)



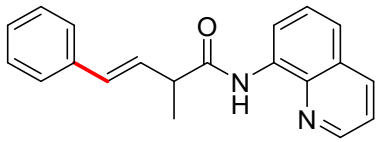
Rf 0.33 (PE/EtOAc = 2/1). 42%, 13.8 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ10.07 (s, 1H), 8.78-8.74 (m, 2H), 8.17 (d, J = 8.4 Hz, 1H), 7.94 (d, J = 8.0 Hz, 2H), 7.57-7.52 (m, 4H), 7.45 (dd, J_1 = 4.0 Hz; J_2 = 8.0 Hz, 1H), 6.75 (d, J = 15.6 Hz, 1H), 6.68-6.62 (m, 1H), 3.55 (d, J = 6.8 Hz, 2H), 2.60 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 196.6, 167.8, 147.2, 140.6, 137.3, 135.5, 135.2, 133.2, 132.7, 127.8, 126.9, 126.4, 125.5, 124.5, 120.8, 120.6, 115.6, 41.2, 25.5. HRMS (EI-TOF) calcd for $C_{21}H_{18}N_2O_2$(M^+):3 30.1368, found: 330.1368.

methyl (*E*)-4-(4-oxo-4-(quinolin-8-ylamino)but-1-en-1-yl)benzoate(3n)



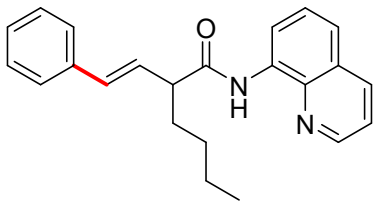
Rf 0.44 (PE/EtOAc = 2/1). 44%, 15.2 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.05 (s, 1H), 8.77-8.72 (m, 2H), 8.14 (d, J = 7.6 Hz, 1H), 8.01 (d, J = 8.0 Hz, 2H), 7.56-7.49 (m, 4H), 7.44-7.41 (m, 1H), 6.73 (d, J = 15.6 Hz, 1H), 6.66-6.60 (m, 1H), 3.91 (s, 3H), 3.53 (d, J = 6.8 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 168.4, 166.4, 147.8, 140.9, 137.9, 135.9, 133.8, 133.3, 129.5, 128.6, 127.4, 126.9, 125.8, 124.8, 121.3, 121.2, 116.0, 51.6, 41.7. HRMS (EI-TOF) calcd for $C_{21}H_{18}N_2O_3$(M^+): 346.1317, found: 346.1322.

(*E*)-2-methyl-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4a)



Rf 0.67 (PE/EtOAc = 2/1). 43%, 16.8 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.15 (s, 1H), 8.79-8.77 (m, 1H), 8.71 (dd, J_1 = 1.2 Hz; J_2 = 4.0 Hz, 1H), 8.14-8.12 (m, 1H), 7.55-7.50 (m, 2H), 7.48-7.39 (m, 4H),7.35-7.31 (m, 2H), 6.72 (d, J = 16.0 Hz, 1H), 6.44 (dd, J_1 = 8.4 Hz; J_2 = 16.0 Hz, 1H), 3.52 (t, J = 7.2 Hz, 1H), 3.08 (d, J = 6.8 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 172.6, 148.2, 138.6, 137.0, 136.3, 134.5, 132.4, 129.6, 128.6, 127.9, 127.6, 127.4, 126.5, 121.6, 116.4, 46.4, 17.5. HRMS (EI-TOF) calcd for $C_{20}H_{18}N_2O$ (M^+): 390.2056, found: 390.2057.

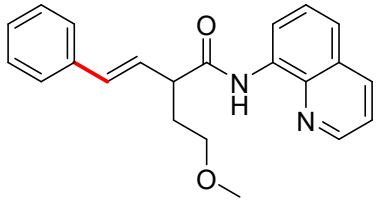
(*E*)-*N*-(quinolin-8-yl)-2-styrylhexanamide (4b)



Rf 0.70 (PE/EtOAc = 2/1). 52%, 17.9mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.08 (s, 1H), 8.80 (dd, J_1 = 1.6 Hz; J_2 = 7.2 Hz, 1H), 8.75-8.74 (m, 1H), 8.14-8.12

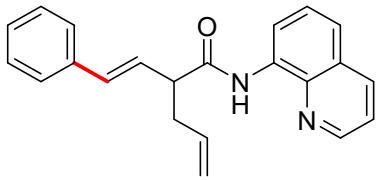
(m, 1H), 7.55-7.49 (m, 2H), 7.45-7.40 (m, 3H), 7.34-7.30 (m, 2H), 7.25-7.22 (m, 1H), 6.68 (d, J = 16.0 Hz, 1H), 6.43-6.36 (m, 1H), 3.36-3.30 (m, 1H), 1.43-1.34 (m, 4H), 1.28-1.24 (m, 2H), 0.93-0.89 (m, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 172.3, 148.2, 138.5, 137.0, 136.4, 134.5, 132.9, 128.7, 128.6, 127.9, 127.6, 127.4, 126.5, 121.6, 121.5, 116.4, 52.8, 32.3, 29.6, 22.7, 14.0. HRMS (EI-TOF) calcd for $C_{23}H_{24}N_2O(M^+)$: 344.1889, found: 344.1892.

(*E*)-2-(2-methoxyethyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4c)



Rf 0.40 (PE/EtOAc = 2/1). 60%, 20.7 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.12 (s, 1H), 8.79-8.75 (m, 2H), 8.13 (dd, J_1 = 1.6 Hz; J_2 = 8.4 Hz, 1H), 7.55-7.48 (m, 2H), 7.44-7.41 (m, 3H), 7.36-7.30 (m, 2H), 7.26-7.21 (m, 1H), 6.71 (d, J = 16.0 Hz, 1H), 6.43-6.37 (m, 1H), 3.62 (dd, J_1 = 7.6 Hz; J_2 = 16.0 Hz, 1H), 3.52 (t, J = 6.0 Hz, 2H), 3.35 (s, 3H), 2.40-2.32 (m, 1H), 2.03-1.98 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.9, 148.2, 138.5, 136.9, 136.3, 134.5, 133.2, 128.5, 128.0, 127.9, 127.6, 126.4, 124.5, 123.9, 121.6, 116.5, 69.9, 58.7, 49.0, 31.4. HRMS (EI-TOF) calcd for $C_{22}H_{22}N_2O_2(M^+)$: 346.1681, found: 346.1685.

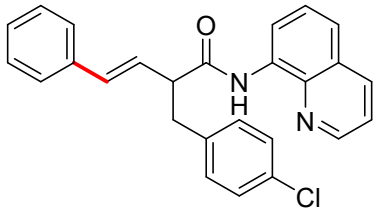
(E)-N-(quinolin-8-yl)-2-styrylpent-4-enamide (4d)



Rf 0.69 (PE/EtOAc = 2/1). 50%, 16.4 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.14 (s, 1H), 8.81-8.74 (m ,2H), 8.17 (d, J = 8.4 Hz, 1H), 7.57-7.50 (m, 2H), 7.46-7.43 (m, 3H), 7.36-7.31 (m, 3H), 6.72 (d, J = 16.0 Hz, 1H), 6.40 (dd, J_1 = 9.2 Hz; J_2 = 15.6 Hz, 1H), 5.90 (dd, J_1 = 10.0 Hz; J_2 = 16.8 Hz, 1H),5.19 (d, J = 17.2 Hz, 1H), 5.07

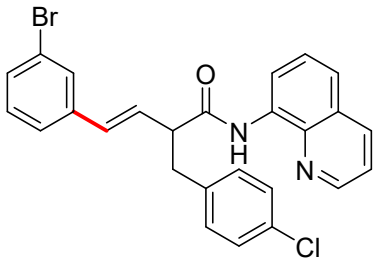
(d, J = 10.0 Hz, 1H), 3.48 (d, J = 8.0 Hz, 1H), 2.86-2.82 (m, 1H), 2.60-2.57 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.0, 147.5, 146.6, 136.2, 134.8, 133.0, 128.1, 127.3, 127.2, 127.0, 126.0, 124.0, 123.5, 121.2, 121.1, 118.6, 116.8, 116.3, 51.8, 36.2. HRMS (EI-TOF) calcd for $C_{22}H_{20}N_2O(M^+)$: 328.1576, found: 328.1576.

(*E*)-2-(4-chlorobenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4e)



Rf 0.67 (PE/EtOAc = 2/1). 80%, 32.9 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.05 (s, 1H), 8.79-8.70 (m, 2H), 8.17-8.15 (m, 1H), 7.57-7.50 (m, 3H), 7.45-7.36 (m, 4H), 7.33-7.29 (m, 2H), 7.24-7.19 (m, 3H), 6.62 (d, J = 16.0 Hz, 1H), 6.39 (dd, J_1 = 8.8 Hz; J_2 = 16.0 Hz, 1H), 3.64 (d, J = 8.0 Hz, 1H), 3.43-3.39 (m, 1H), 3.07-3.02 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.6, 147.4, 146.6, 137.1, 136.2, 133.3, 130.2, 128.1, 128.0, 127.3, 127.0, 126.9, 126.0, 124.0, 123.5, 121.3, 121.1, 118.6, 116.4, 53.8, 37.5. HRMS (EI-TOF) calcd for $C_{26}H_{21}ClN_2O$ (M^+): 412.1342,found: 412.1343.

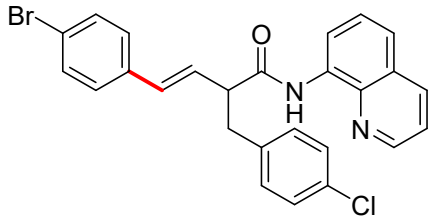
(*E*)-4-(3-bromophenyl)-2-(4-chlorobenzyl)-*N*-(quinolin-8-yl)but-3-enamide (4f)



Rf 0.69 (PE/EtOAc = 2/1). 46%, 22.5 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 9.99 (s, 1H), 8.76-8.71 (m, 2H), 8.14 (d, J = 8.0 Hz, 1H), 7.55-7.49 (m, 3H), 7.44-7.41 (m, 1H), 7.36 (d, J = 7.6 Hz, 1H), 7.22-7.14 (m, 6H), 6.51 (d, J = 15.6 Hz, 1H), 6.42-6.36 (m, 1H), 3.59 (d, J = 8.4 Hz, 1H), 3.42-3.37 (m, 1H), 3.03 (dd, J_1 = 7.2 Hz; J_2 = 13.6 Hz, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.8, 148.3, 137.3, 136.4, 134.0,

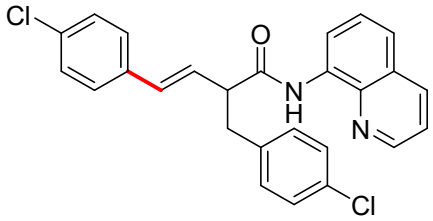
132.4, 130.6, 130.1, 129.4, 129.0, 128.6, 127.9, 127.3, 125.1, 123.4, 122.8, 121.9, 121.7, 118.9, 116.7, 114.4, 54.2, 38.0. HRMS (EI-TOF) calcd for $C_{26}H_{20}BrClN_2O$ (M^+): 490.0448, found: 490.0453.

(*E*)-4-(4-bromophenyl)-2-(4-chlorobenzyl)-*N*-(quinolin-8-yl)but-3-enamide (4g)



Rf 0.70 (PE/EtOAc = 2/1). 53%, 25.9 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ9.98 (s, 1H), 8.76-8.69 (m, 2H), 8.15-8.13 (m, 1H), 7.55-7.50 (m, 3H), 7.42 (dd, J_1 = 4.0 Hz; J_2 = 8.4 Hz, 3H), 7.23-7.16 (m, 5H), 6.51 (d, J = 15.6 Hz, 1H), 6.39-6.33 (m, 1H), 3.61-3.55 (m, 1H), 3.38 (dd, J_1 = 7.2 Hz; J_2 = 14.0 Hz, 1H), 3.05-3.00 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.0, 148.2, 138.3, 137.3, 136.5, 135.5, 133.9, 132.6, 132.4, 132.2, 131.7, 130.6, 128.6, 128.1, 127.4, 122.0, 121.7, 121.6, 117.3, 116.8, 54.3, 38.0. HRMS (EI-TOF) calcd for $C_{26}H_{20}BrClN_2O$ (M^+): 490.0448, found: 490.0450.

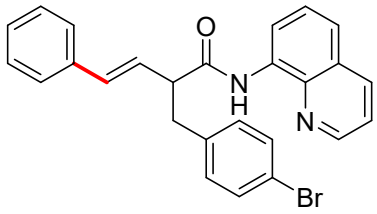
(*E*)-2-(4-chlorobenzyl)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide (4h)



Rf 0.69 (PE/EtOAc = 2/1). 54%, 24.1 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 9.98 (s, 1H), 8.76-8.69 (m, 2H), 8.14-8.12 (m, 1H), 7.55-7.49 (m, 2H), 7.43-7.40 (m, 1H), 7.30-7.27 (m, 4H), 7.18 (dd, J_1 = 8.8 Hz; J_2 = 18.8 Hz, 4H), 6.52 (d, J = 15.6 Hz, 1H), 6.35 (dd, J_1 = 8.8 Hz; J_2 = 16.0 Hz, 1H), 3.61-3.55 (m, 1H), 3.38 (dd, J_1 = 7.2 Hz; J_2 = 13.6 Hz, 1H), 3.03 (dd, J_1 = 7.2 Hz; J_2 = 13.6 Hz, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.0, 148.3, 138.4, 137.3, 136.4, 135.1, 133.5, 132.6, 132.2, 130..6, 129.4,

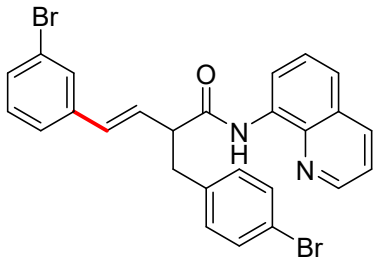
128.7, 128.6, 128.0, 127.7, 127.3, 122.0, 121.7, 116.8, 116.6, 54.3, 38.0. HRMS (EI-TOF) calcd for $C_{26}H_{20}Cl_2N_2O$ (M^+): 446.0953, found: 446.0959.

(*E*)-2-(4-bromobenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4i)



Rf 0.68 (PE/EtOAc = 2/1). 72%, 32.8 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.04 (s, 1H), 8.78-8.70 (m, 2H), 8.15 (d, J = 7.6 Hz, 1H), 7.56-7.50 (m, 3H), 7.44-7.30 (m, 7H), 7.17-7.12 (m, 2H), 6.62 (d,J = 15.6 Hz, 1H), 6.39 (dd, J_1 = 8.8 Hz; J_2 = 15.6 Hz, 1H), 3.63 (d,J = 8.4 Hz, 1H), 3.39 (dd, J_1 = 7.2 Hz; J_2 = 13.2 Hz, 1H), 3.03 (dd, J_1 = 7.2 Hz; J_2 = 13.6 Hz, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.5, 147.5, 137.6, 136.2, 133.6, 133.4, 131.0, 130.6, 128.1, 127.3, 127.0, 126.9, 126.0, 124.0, 123.5, 121.3, 121.1, 119.8, 118.6, 116.4, 53.7, 37.6. HRMS (EI-TOF) calcd for $C_{26}H_{21}BrN_2O$ (M^+): 456.0837, found: 456.0838.

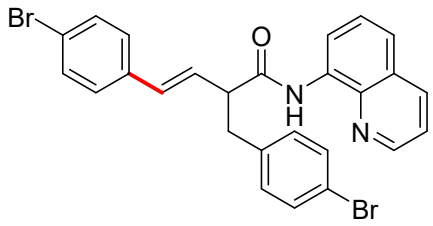
(*E*)-2-(4-bromobenzyl)-4-(3-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide (4j)



Rf 0.69 (PE/EtOAc = 2/1). 53%, 28.3 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 9.98 (s, 1H), 8.76-8.70 (m, 2H), 8.13 (d, J = 8.0 Hz, 1H), 7.55-7.49 (m, 4H), 7.41 (dd, J_1 = 4.0 Hz; J_2 = 8.4 Hz, 1H), 7.36 (d, J = 8.4 Hz, 3H), 7.18-7.13 (m, 3H), 6.52 (d, J = 15.6 Hz, 1H), 6.42-6.36 (m, 1H), 3.58 (dd, J_1 = 7.2 Hz; J_2 = 16.0 Hz, 1H), 3.38 (dd, J_1 = 6.8 Hz; J_2 = 13.6 Hz, 1H), 3.04-2.98 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.6, 148.3, 138.8, 138.4, 137.8, 136.4, 134.1, 132.4, 131.5, 131.0, 130.6, 130.1,

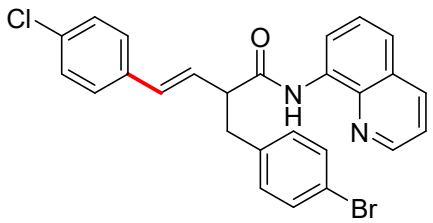
129.4, 129.0, 127.9,127.3, 125.2, 122.8, 121.9, 121.7, 120.4, 116.5, 54.2, 38.0. HRMS (EI-TOF) calcd for $C_{26}H_{20}Br_2N_2O$ (M^+): 533.9942, found: 533.9944.

(*E*)-2-(4-bromobenzyl)-4-(4-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide (4k)



Rf 0.70 (PE/EtOAc = 2/1). 52%, 27.7mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz)δ 9.98 (s, 1H), 8.75-8.69 (m, 2H), 8.14-8.12 (m, 1H), 7.55-7.49 (m, 3H), 7.43-7.40 (m, 3H), 7.29 (d, *J* = 8.8 Hz, 1H), 7.21 (d, *J* = 8.4 Hz, 2H), 7.12 (d, *J* = 8.4 Hz, 2H), 6.50(d, *J* = 16.0 Hz, 1H), 6.39-6.33 (m, 1H), 3.58 (d, *J* = 8.4 Hz, 1H), 3.38-3.33 (m, 1H), 3.04-2.98 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.1, 148.3, 138.3, 137.8, 136.5, 135.5, 133.9, 132.7, 132.4, 131.7, 131.5, 131.0, 128.0, 127.3, 122.1, 121.7, 120.4, 117.4, 116.8, 54.2, 38.0. HRMS (EI-TOF) calcd for $C_{26}H_{20}Br_2N_2O$ (M^+): 533.9942, found: 533.9947.

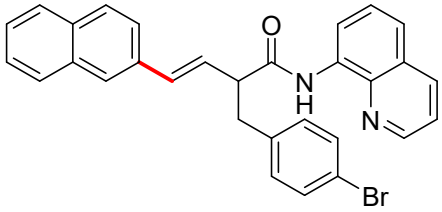
(*E*)-2-(4-bromobenzyl)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide (4l)



Rf 0.69 (PE/EtOAc = 2/1). 53%, 25.9 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ9.99 (s, 1H), 8.76-8.69 (m, 2H), 8.15 (d, *J* = 8.4 Hz, 1H), 7.56-7.50 (m, 2H), 7.44-7.41 (m, 1H), 7.36-7.34 (m, 2H), 7.31-7.28 (m, 3H),7.22-7.13 (m, 3H), 6.54 (d, *J* = 16.0 Hz, 1H), 6.39-6.32 (m, 1H),3.62-3.57 (m, 1H), 3.37 (dd, J_1 = 6.8 Hz; J_2 = 13.6 Hz, 1H), 3.02 (dd, J_1 = 7.2 Hz; J_2 = 13.2 Hz, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.9, 148.1, 137.9, 136.6, 135.1, 134.0, 133.4, 132.6, 131.5, 131.0, 129.4, 128.7, 128.0, 127.9, 127.7, 127.4, 121.9, 121.6, 120.3, 116.8, 54.2, 38.0. HRMS (EI-TOF)

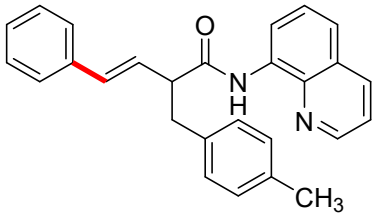
calcd for $C_{26}H_{20}BrClN_2O$ (M^+): 490.0448, found: 490.0451.

(*E*)-2-(4-bromobenzyl)-4-(naphthalen-2-yl)-*N*-(quinolin-8-yl)but-3-enamide (4m)



Rf 0.66 (PE/EtOAc = 2/1). 47%, 23.8 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.07 (s, 1H), 8.79 (dd, J_1 = 1.6 Hz; J_2 = 7.2 Hz, 1H), 8.70-8.69 (m, 1H), 8.14 (dd, J_1 = 1.2 Hz; J_2 = 8.4 Hz, 1H), 7.79-7.74 (m, 3H), 7.72 (d, J = 4.8 Hz, 1H), 7.61-7.58 (m, 1H), 7.57-7.50 (m, 2H), 7.47-7.39 (m, 3H), 7.35 (d, J = 8.4 Hz, 2H), 7.17 (d, J = 8.4 Hz, 2H), 6.75 (d, J = 16.0 Hz, 1H), 6.54-6.48 (m, 1H), 3.71-3.65 (m, 1H), 3.42 (dd, J_1 = 7.2 Hz; J_2 = 13.6 Hz, 1H), 3.09-3.04 (m, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.2, 148.1, 139.1, 138.0, 136.7, 133.9, 133.5, 133.1, 131.5, 131.1, 129.8, 128.2, 128.0, 127.7, 127.4, 126.5, 126.3, 126.0, 123.6, 123.5, 121.9, 121.6, 120.3, 117.9, 116.9, 109.5, 54.3, 38.1. HRMS (EI-TOF) calcd for $C_{30}H_{23}BrN_2O$(M^+): 506.0994, found: 506.0997.

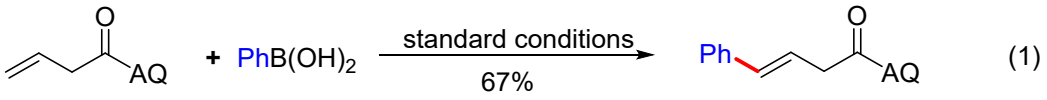
(*E*)-2-(4-methylbenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4n)



Rf 0.65 (PE/EtOAc = 2/1). 63%, 24.7 mg. Yellow solid; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.01 (s, 1H), 8.78 (d, J = 7.6 Hz, 1H), 8.69 (dd, J_1 = 1.2 Hz; J_2 = 4.0 Hz, 1H), 8.11 (dd, J_1 = 1.2 Hz; J_2 = 8.4 Hz, 1H), 7.55-7.45 (m, 2H), 7.41-7.37 (m, 3H), 7.30 (t, J = 7.6 Hz, 2H), 7.25-7.20 (m, 1H), 7.17 (d, J = 8.0 Hz, 2H), 7.04 (d, J = 7.6 Hz, 2H), 6.60 (d, J = 15.6 Hz, 1H), 6.41 (dd, J_1 = 1.2 Hz; J_2 = 16.0 Hz, 1H), 3.62 (dd, J_1 = 7.6 Hz; J_2 = 15.6 Hz, 1H), 3.40 (dd, J_1 = 7.2 Hz; J_2 = 15.0 Hz, 1H), 3.04 (dd, J_1 = 7.2 Hz;

J_2 = 15.0 Hz, 1H), 2.25 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.5, 148.1, 138.4, 136.3, 135.9, 135.7, 133.4, 129.6, 129.1, 128.5, 127.9, 127.6, 127.4, 126.5, 124.5, 124.0, 121.6, 121.5, 116.6, 115.4, 54.5, 38.3, 21.0. HRMS (EI-TOF) calcd for $C_{27}H_{24}N_2O(M^+)$: 392.1889, found:392.1891.

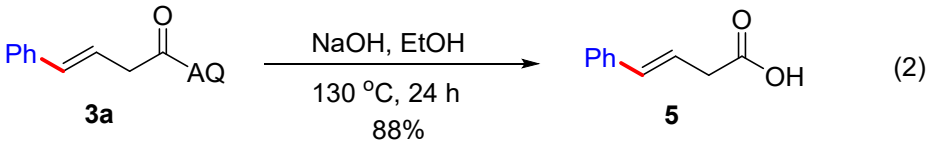
Sub-Gram-Scale of 3a



1a, 1.0 mmol **2a**, 2.0 mmol **3a**, 193.04 mg

A 25 mL thick wall pressure sealed tube was charged with **1a** (1.0mmol), **2a** (2.0 mmol), $Ni(Cy_3P)_2Cl_2$ (69.0 mg, 0.1mmol), NaF (84 mg, 2.0 mmol), MeCN (5.0 mL), then stirred at 100 °C for 24 h. The mixture was then cooled to room temperature, diluted with EtOAc, filtered through a celite pad, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **3a** (yield = 67%)**.**

Removal of Directing Group

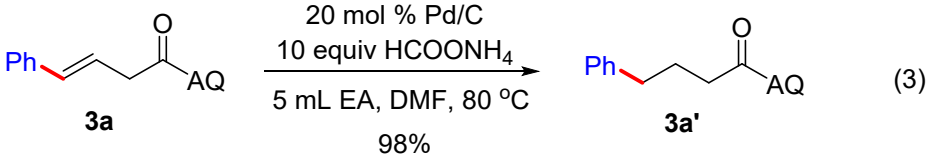


Removal of the 8-aminoquinoline directing group was carried out by adapting a literature procedure.[1] To a flame-dried 48-mL sealed vessel was added the product **3a** (0.25 mmol), NaOH (3.75 mmol, 15 equiv), and 11 mL of EtOH. The resulting mixture was stirred at 130 °C for 24 h. After this time, the reaction mixture was allowed to cool to room temperature, diluted by addition of EtOAc (50 mL) and washed with HCl (2 × 30 mL). The aqueous layers were combined and extracted with EtOAc (2 × 30 mL). The organic layers were combined, dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:5 ~ 1:2, v/v), to give pure hydrolysis free acid product **5**.

(*E*)-4-phenylbut-3-enoic acid (5)

88%, 35.65 mg. Yellow solid; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.37 (d, J = 7.6 Hz, 2H),

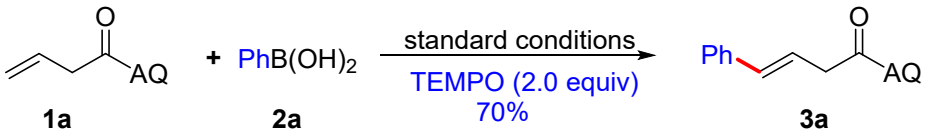
7.31 (t, J = 7.6 Hz, 2H), 7.22 (d, J = 8.0 Hz, 1H), 6.52 (d, J = 15.6 Hz, 1H), 6.32-6.26 (m, 1H), 3.30 (d, J = 7.2 Hz, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 176.4, 133.0, 128.5, 127.5, 126.7, 125.3, 119.9, 76.3, 76.0, 75.7, 37.0. HRMS (EI-TOF) calcd for $C_{10}H_{10}O_2(M^+)$: 162.0681, found: 162.0681.



(3)

To an oven-dried 25 mL round-bottom flask was added **3a** (28.8 mg, 0.1 mmol), HCO_2NH_4 (63 mg, 1.0 mmol), DMF (2 drops), Pd/C (2.8 mg, 0.02 mmol), in ethyl acetate (5.0 mL). The mixture was stirred for 8 h at 80 °C under air followed by cooling. The resulting mixture was filtered through a celite pad and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **3a'** (yield = 98%).

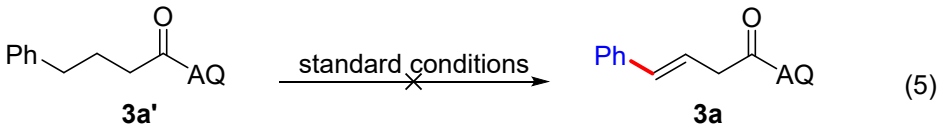
Radical Trapping Experiment



(4)

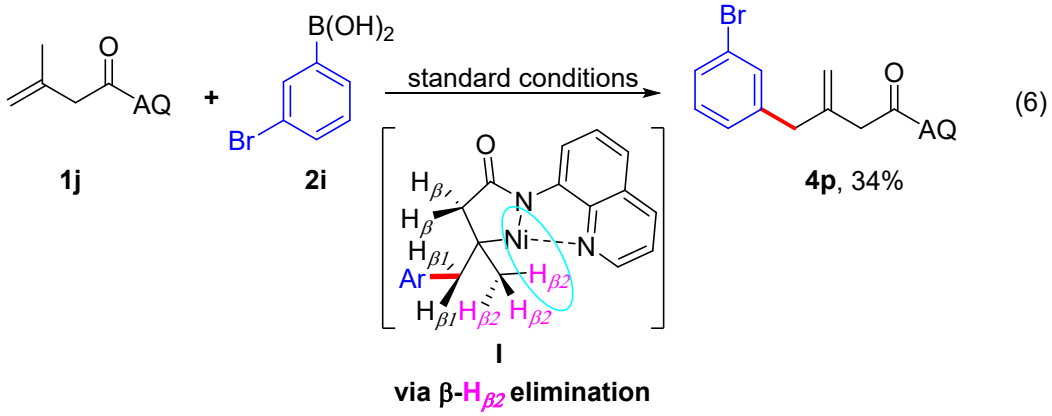
A 25 mL thick wall pressure sealed tube was charged with **1a** (0.1 mmol), **2a** (0.2 mmol), $Ni(Cy_3P)_2Cl_2$ (6.9 mg, 0.01mmol), NaF (8.4 mg, 0.2 mmol), tempo (31.25 mg, 0.2 mmol), MeCN (1.0 mL), then stirred at 100 °C for 24 h. The mixture was then cooled to room temperature, diluted with EtOAc, filtered through a celite pad, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **3a** (70%).

Control Experiments



(5)

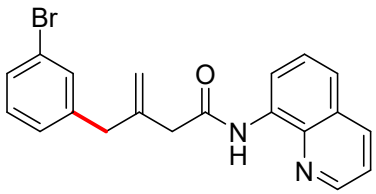
A 25 mL thick wall pressure sealed tube was charged with **3a'** (0.1 mmol), $Ni(Cy_3P)_2Cl_2$ (6.9 mg, 0.01mmol), NaF (8.4 mg, 0.2 mmol), tempo (31.25 mg, 0.2 mmol), MeCN (1.0 mL), then stirred at 100 °C with a blast shieldfor 24 h. The mixture was then cooled to room temperature, diluted with EtOAc, filtered through a celite pad, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **3a** (0%).



(6)

A 25 mL thick wall pressure sealed tube was charged with **1j** (0.1 mmol), **2i** (0.2 mmol), $Ni(Cy_3P)_2Cl_2$ (6.9 mg, 0.01mmol), NaF (8.4 mg, 0.2 mmol), MeCN (1.0 mL), then stirred at 100 °C for 24 h. The mixture was then cooled to room temperature, diluted with EtOAc, filtered through a celite pad, and concentrated in vacuo. The residue was purified by flash column chromatography on silica gel, eluting with EtOAc/PE (1:30 ~ 1:5, v/v), to afford the desired product **4o**.

3-(3-bromobenzyl)-*N*-(quinolin-8-yl)but-3-enamide (4o)



Rf 0.64 (PE/EtOAc = 2/1). 34%, 12.9 mg. Yellow solid;^{1}H NMR ($CDCl_3$, 400 MHz) δ 10.05 (s, 1H), 8.85 (d, *J* = 4.0 Hz, 1H), 8.76 (d, *J* = 6.4 Hz, 1H), 8.17 (d, *J* = 8.0 Hz, 1H),7.55-7.51 (m, 3H), 7.49-7.44 (m, 2H), 7.20 (d, *J* = 7.2 Hz, 1H), 7.16-7.12 (m, 1H), 5.27 (s, 1H), 5.10 (s, 1H), 3.50 (s, 2H), 3.27 (s, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz) δ 168.3, 147.9, 142.0, 140.5, 135.9, 133.8, 131.8, 129.5, 129.1, 127.6, 127.5, 126.9, 124.0, 123.5, 122.1, 121.2, 117.1, 116.0, 45.1, 41.8. HRMS (EI-TOF) calcd for $C_{20}H_{17}BrN_2O(M^+)$: 380.0524, found: 380.0525.

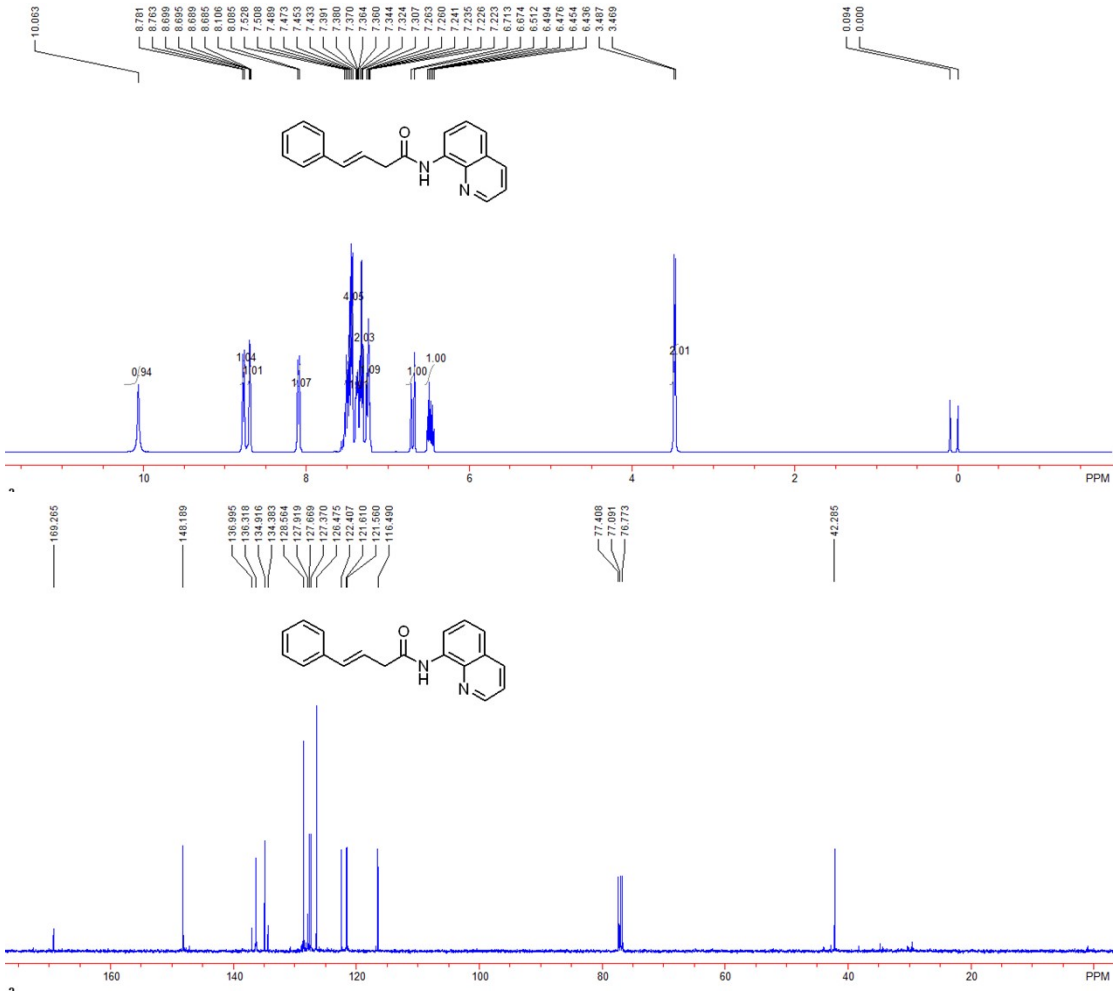
Reference

1. J. A. Jr. Gurak, K. S. Yang, Z. Liu, and K. M. Engle, Directed, Regiocontrolled Hydroamination of Unactivated Alkenes via Protodepalladation, *J. Am. Chem. Soc.,* 2016, **138**, 5805

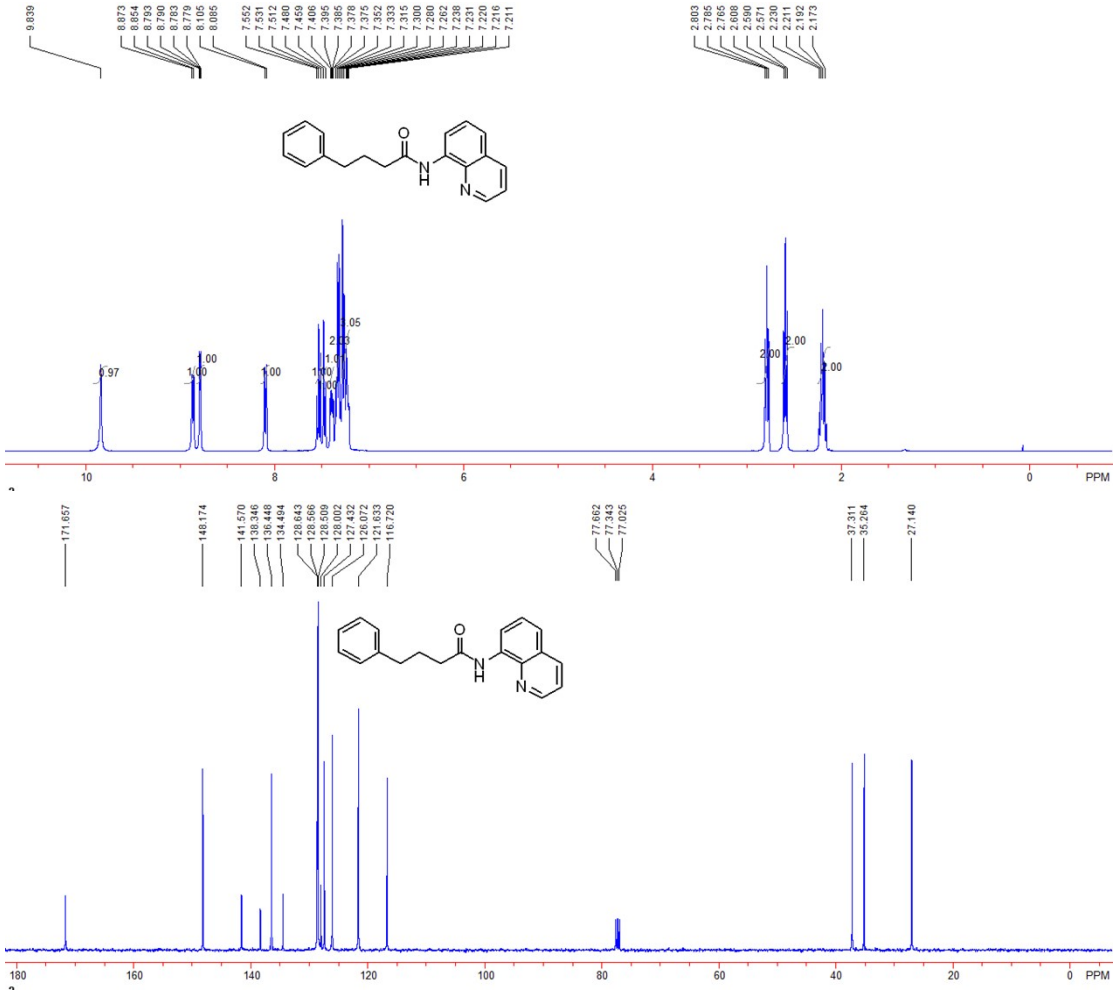
2. J. Derosa, V. A. van der Puyl, V. T. Tran, M. Liu, and K. M. Engle, Directed Nickel-catalyzed 1,2-dialkylation of Alkenyl Carbonyl Compounds, *Chem. Sci.,* 2018, **9**, 5278

Copies of ^{1}H and ^{13}C NMR Spectra

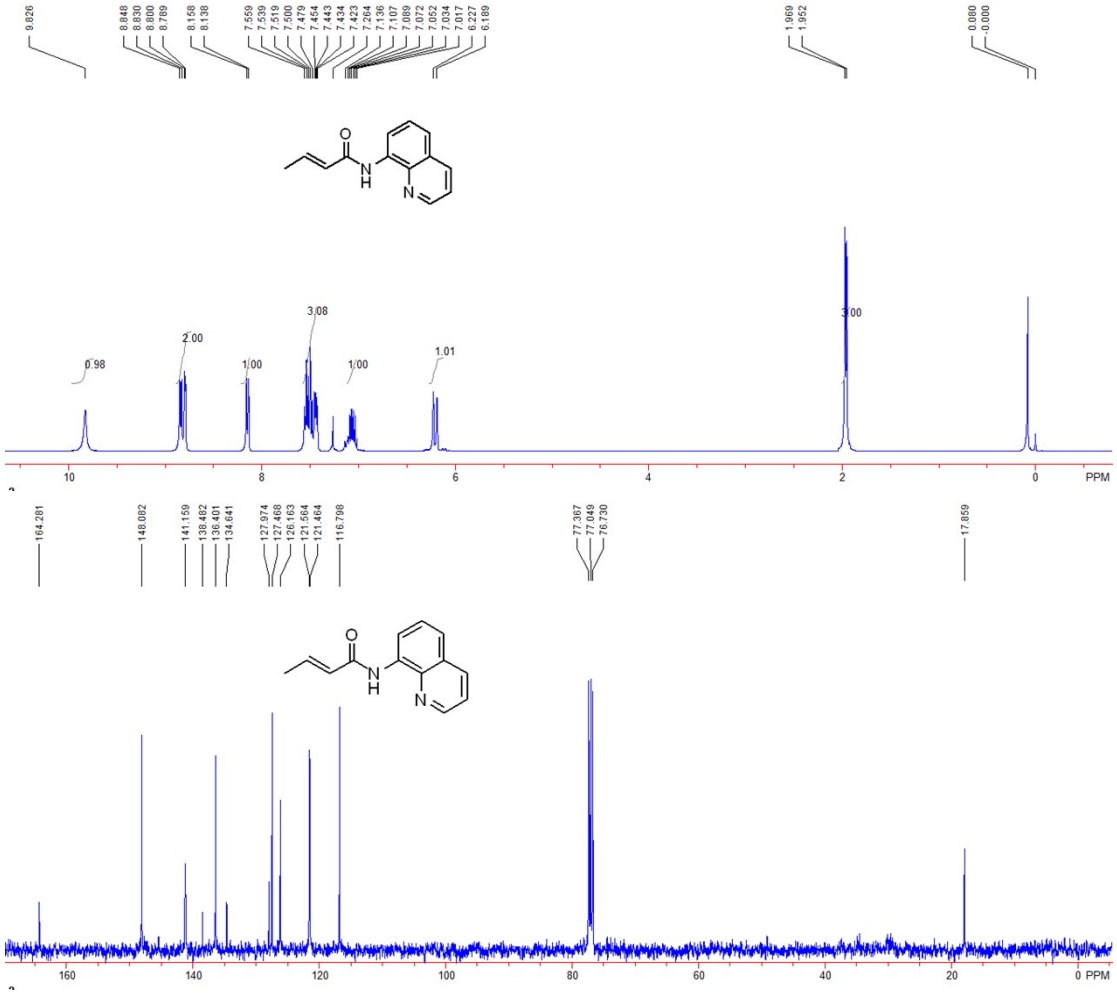
(*E*)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (3a)



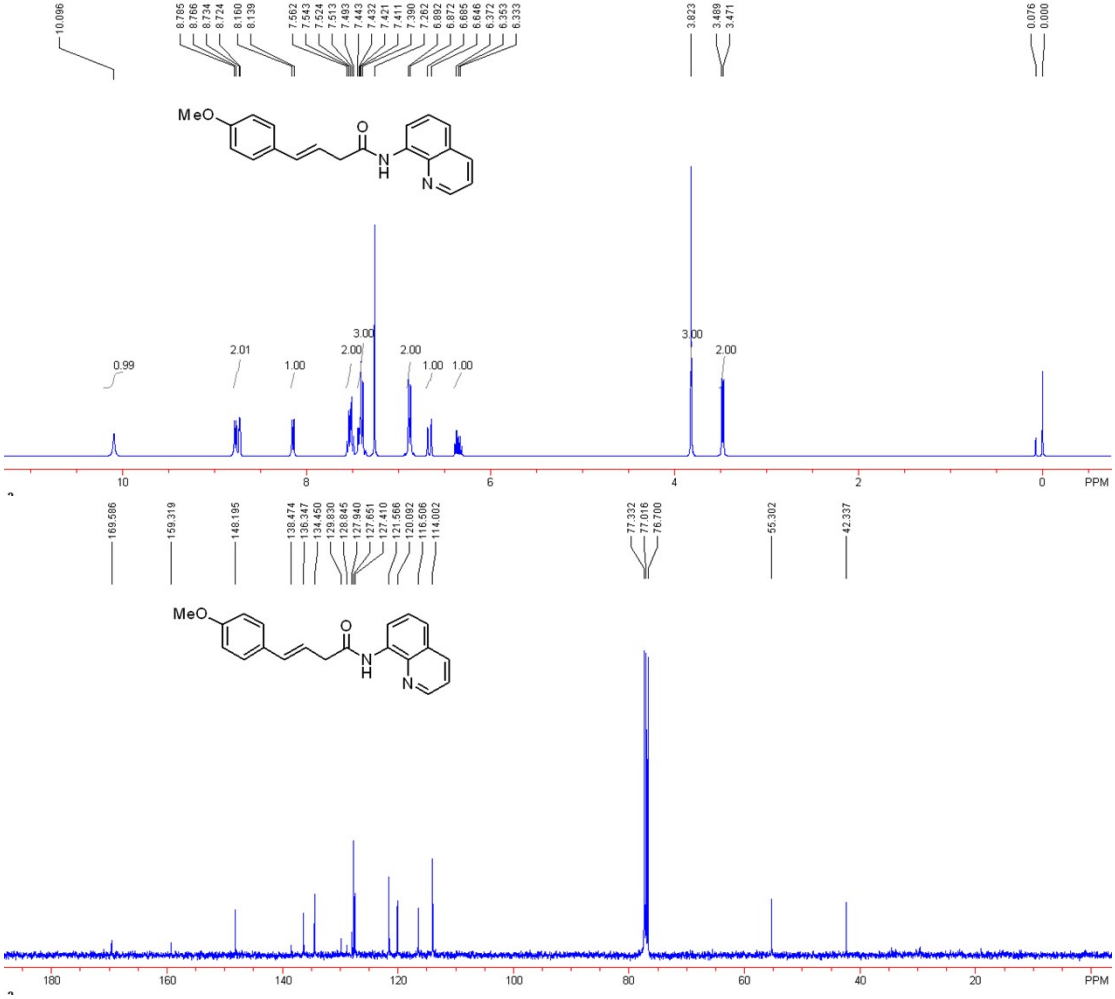
4-phenyl-*N*-(quinolin-8-yl)butanamide (6)



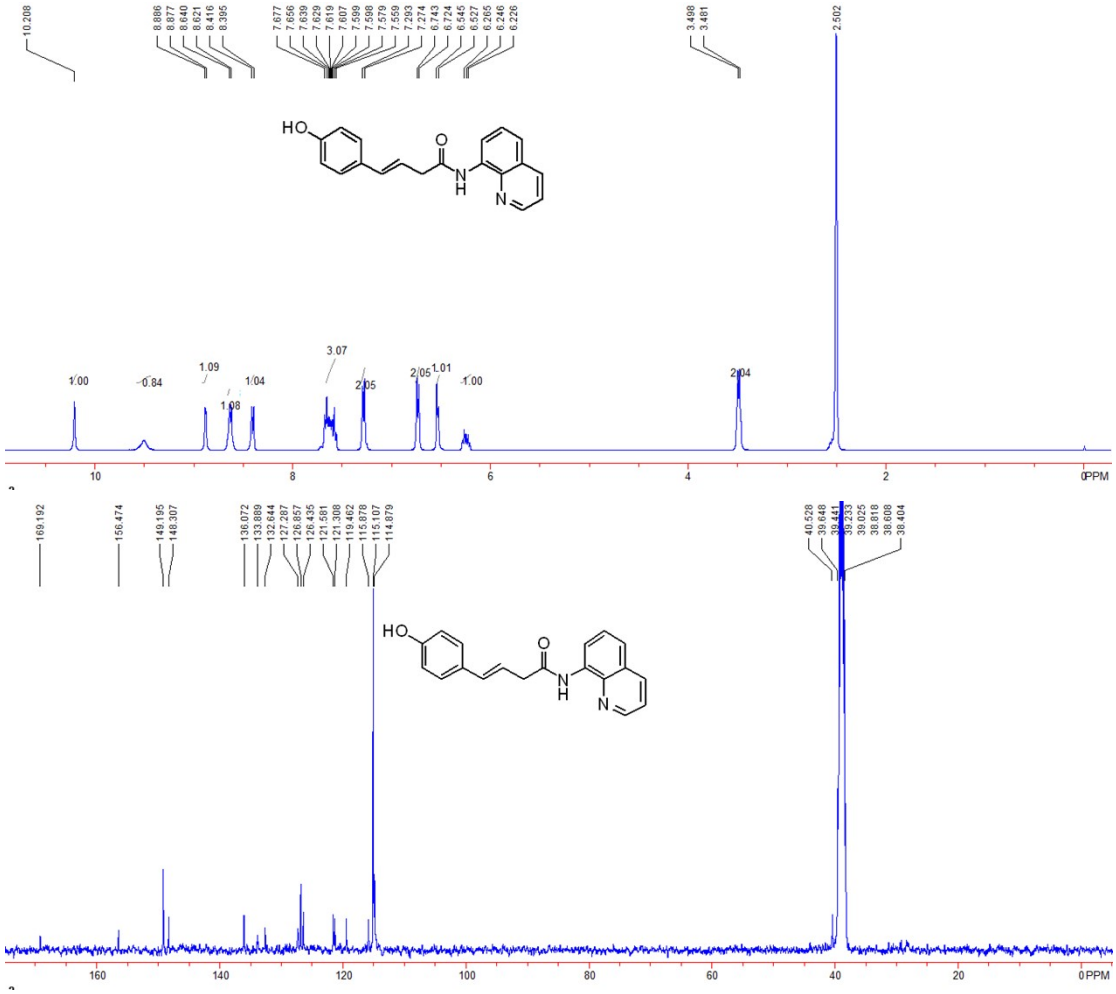
(E)-N-(quinolin-8-yl)but-2-enamide (1a′)



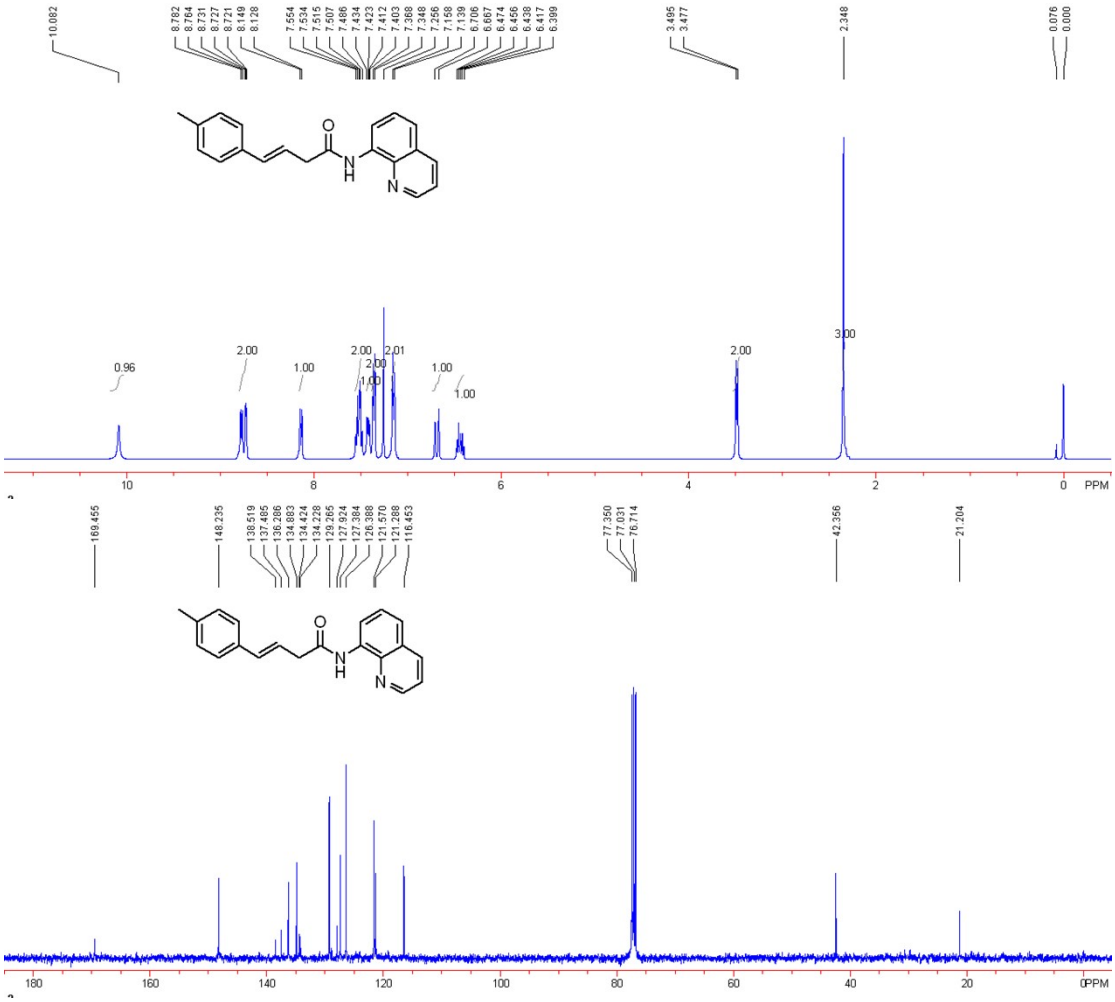
(*E*)-4-(4-methoxyphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3b)



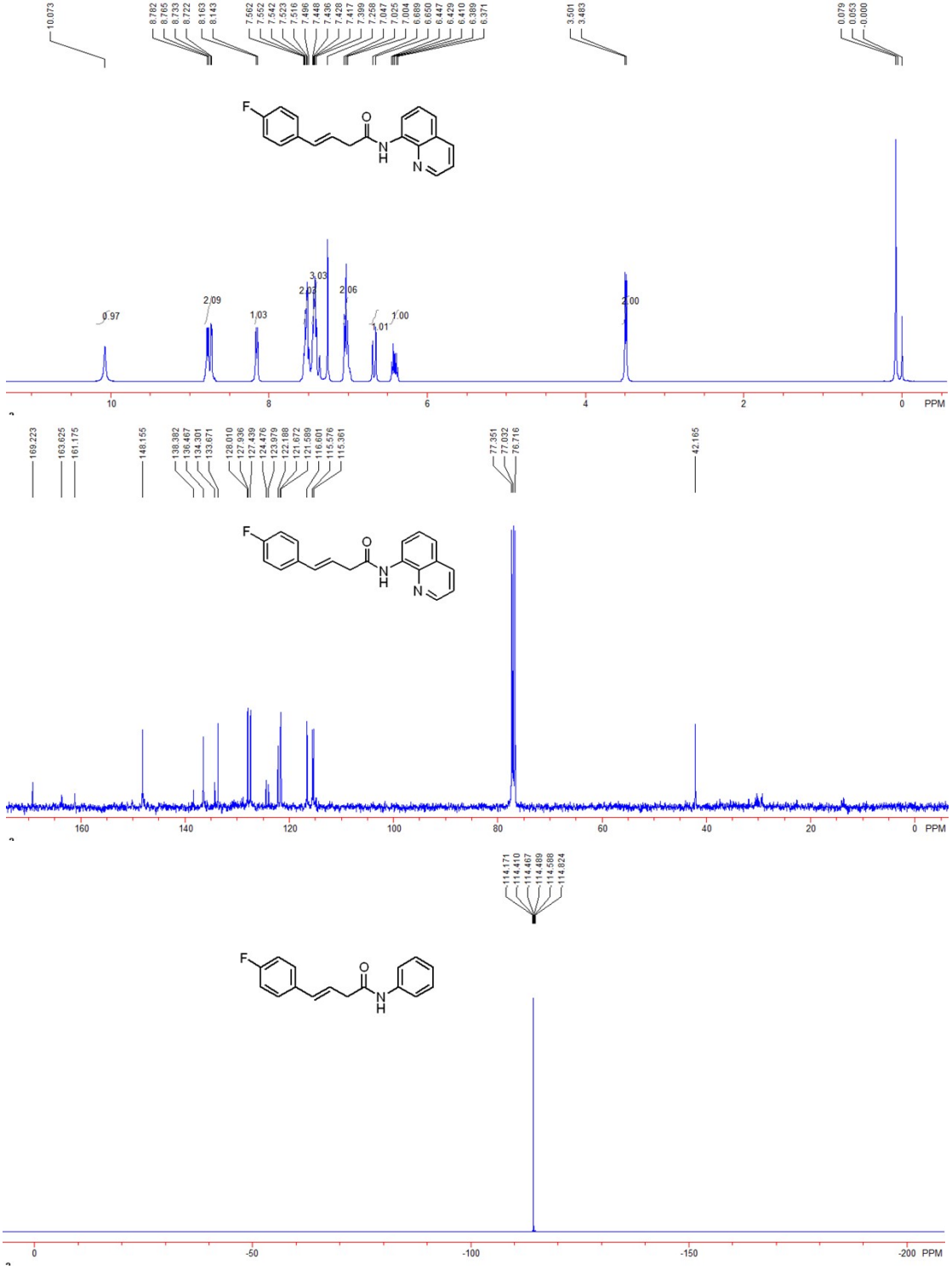
(*E*)-4-(4-hydroxyphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3c)



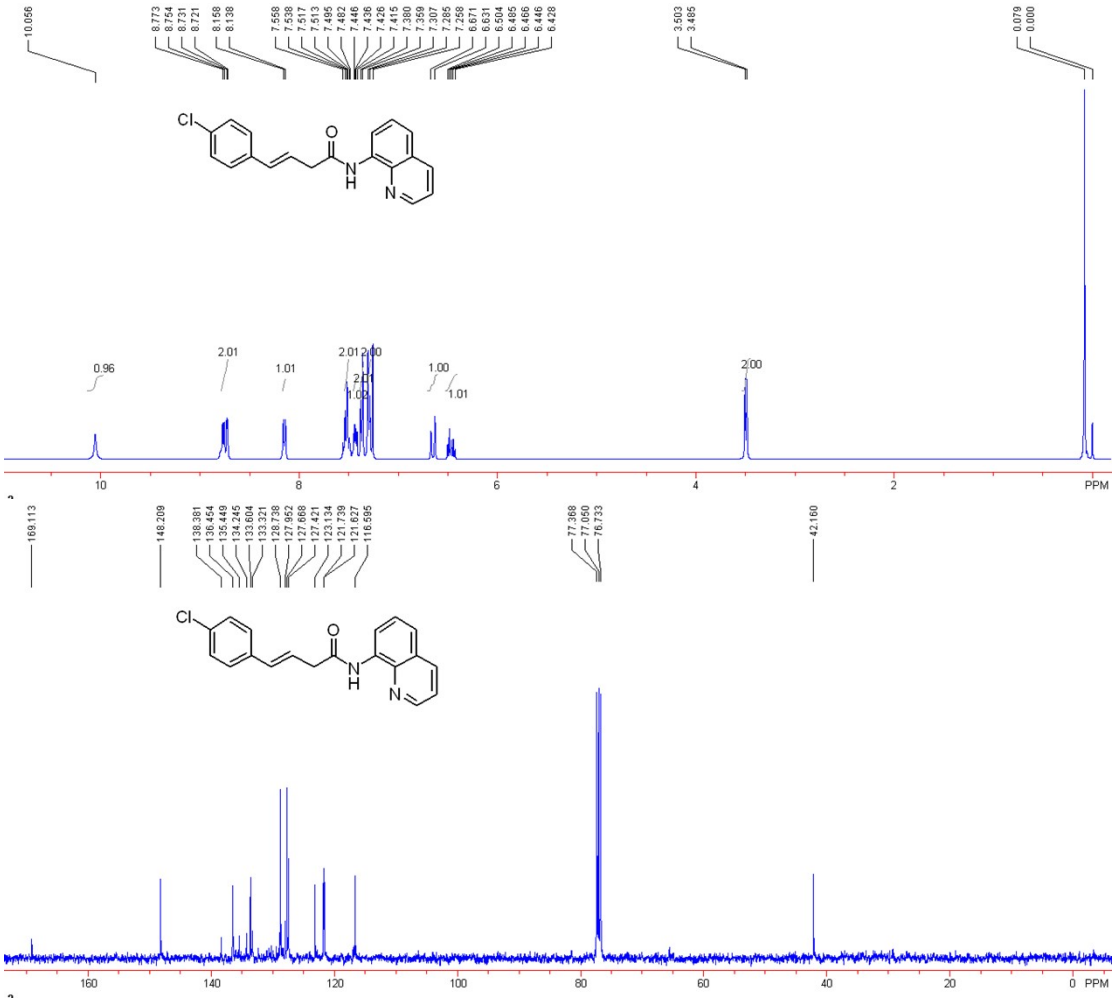
(*E*)-*N*-(quinolin-8-yl)-4-(p-tolyl)but-3-enamide (3d)



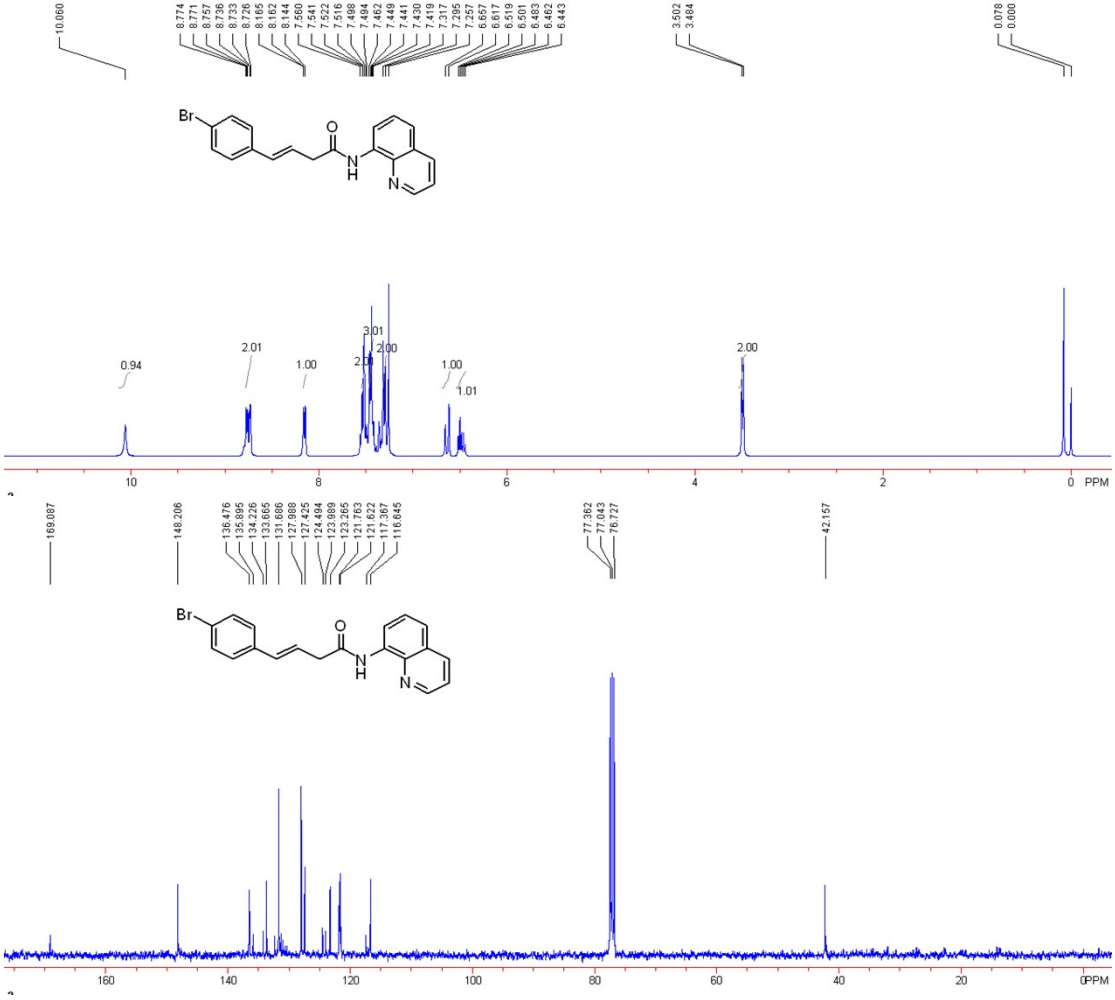
(*E*)-4-(4-fluorophenyl)-*N*-(quinolin-8-yl)but-3-enamide(3e)



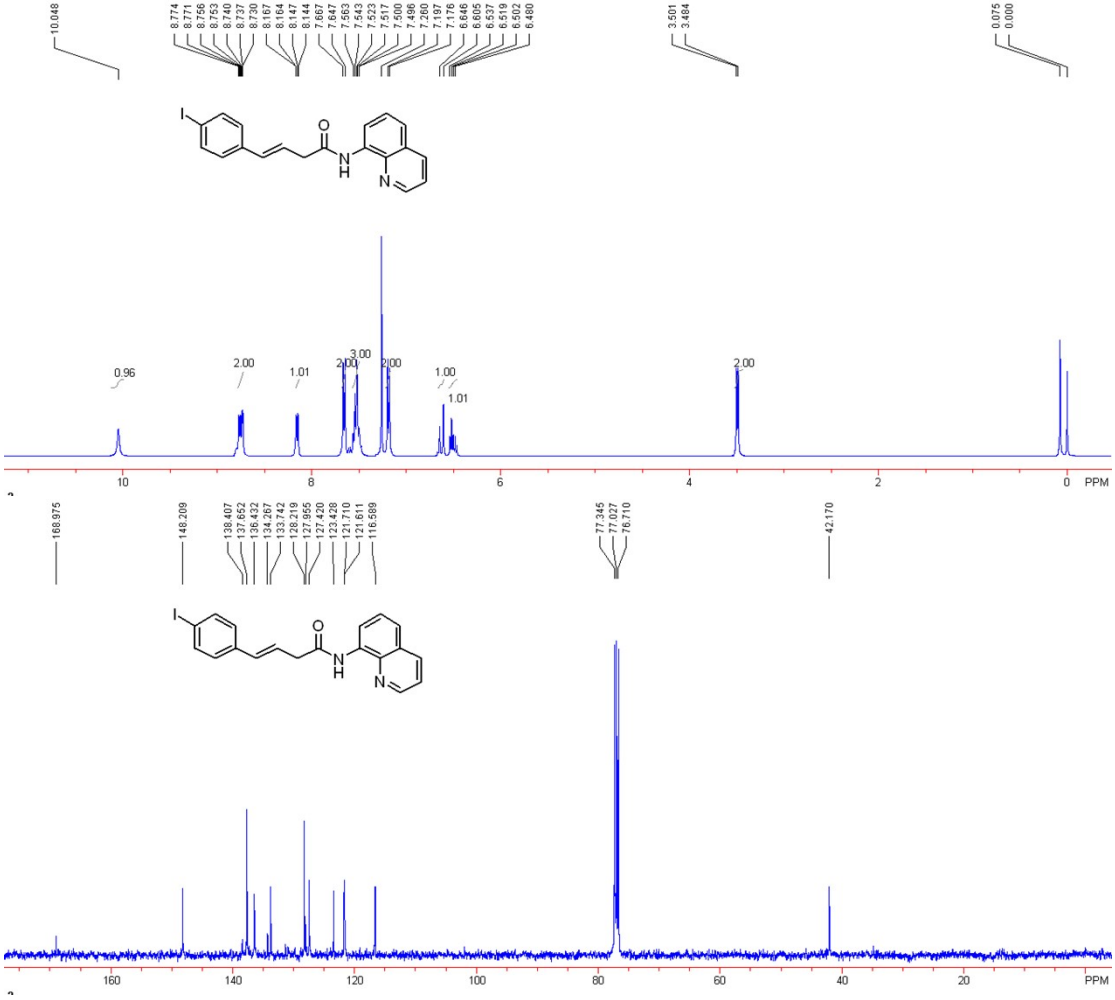
(*E*)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3f)



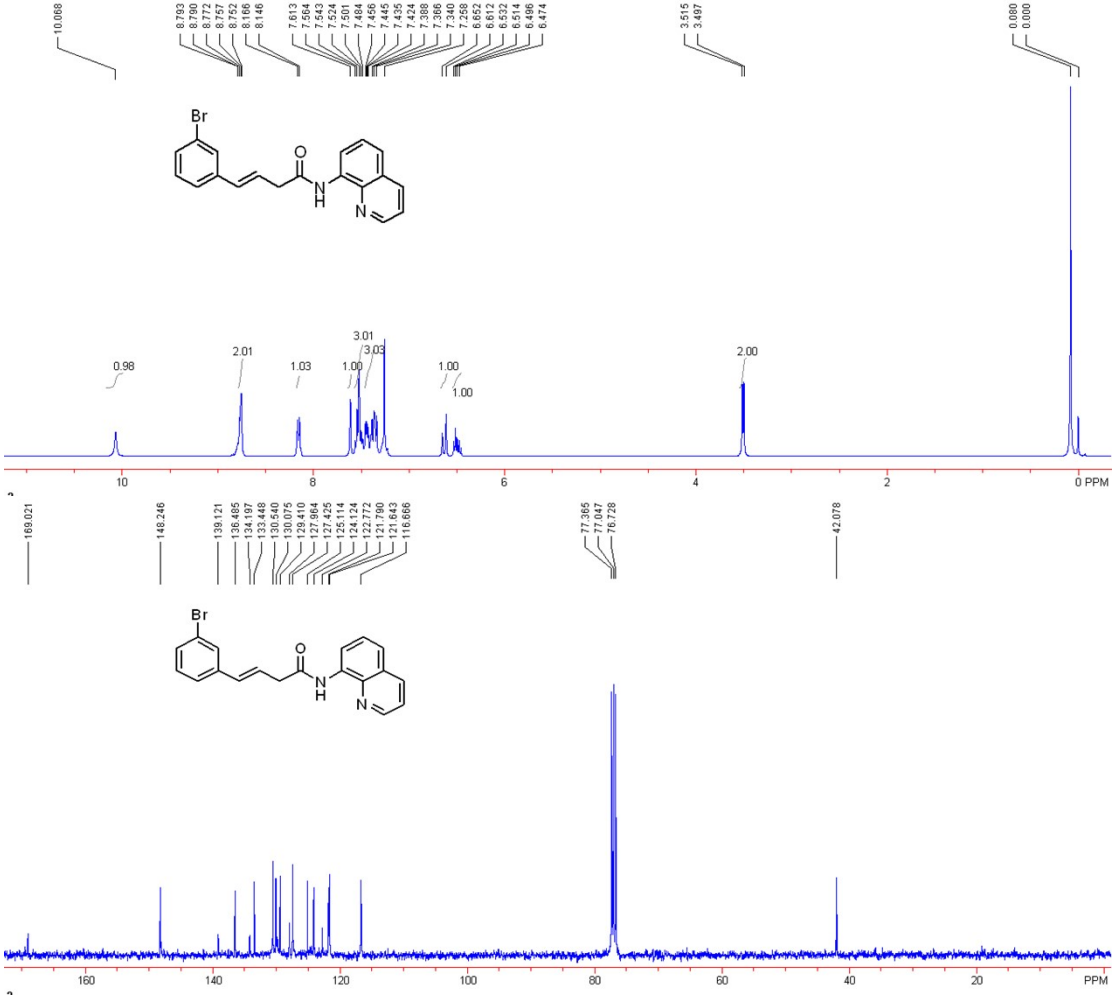
(*E*)-4-(4-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide(3g)



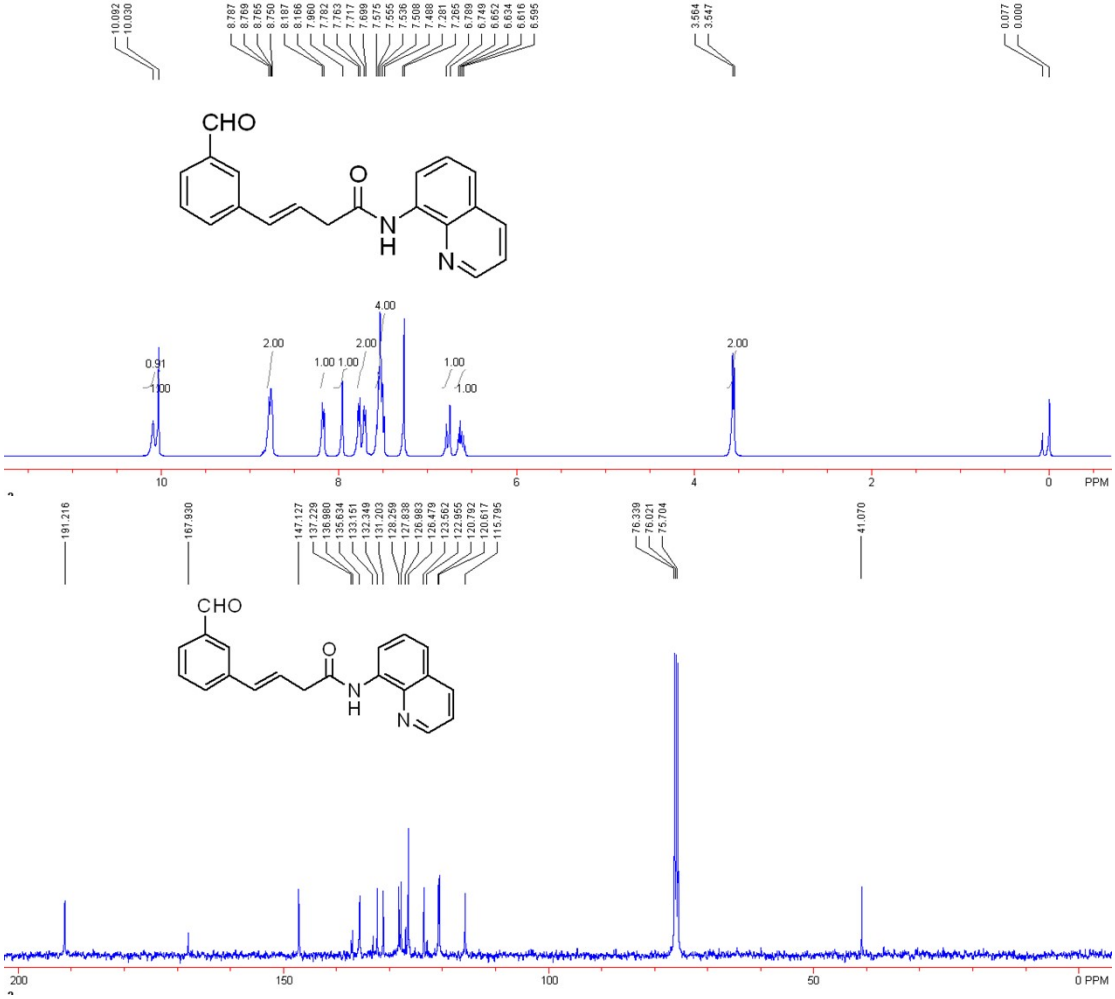
(*E*)-4-(4-iodophenyl)-*N*-(quinolin-8-yl)but-3-enamide(3h)



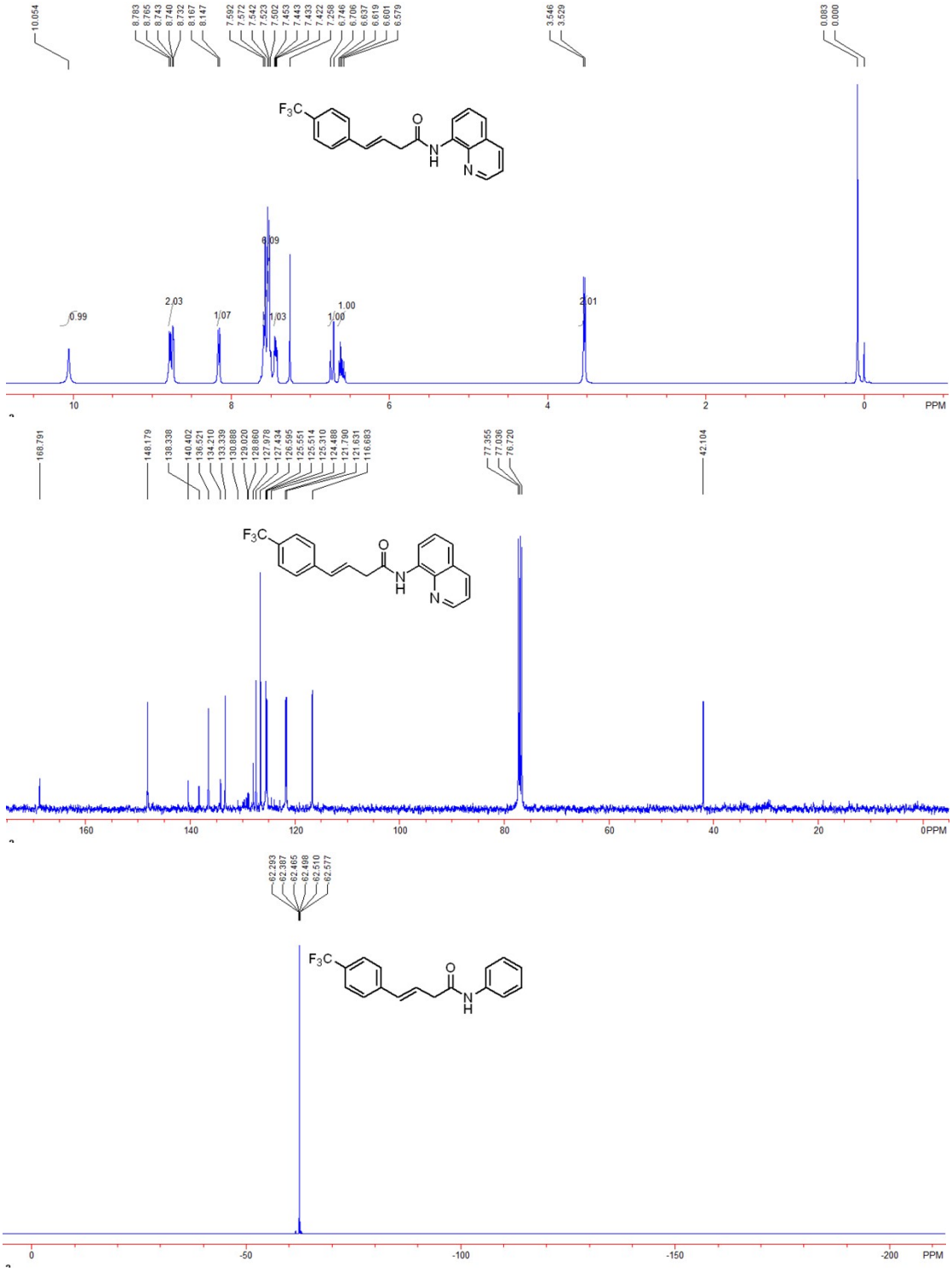
(*E*)-4-(3-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide(3i)



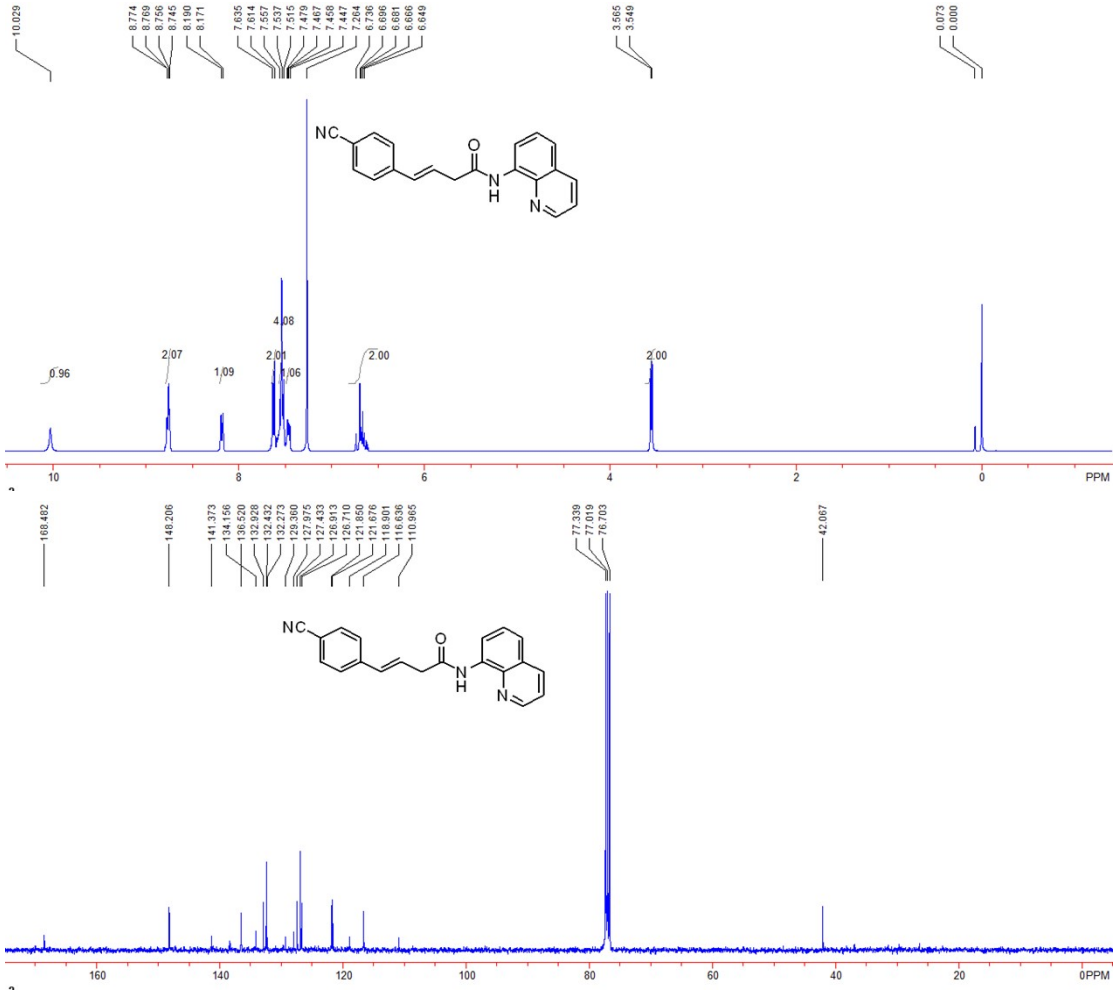
(*E*)-4-(3-formylphenyl)-*N*-(quinolin-8-yl)but-3-enamide (3j)



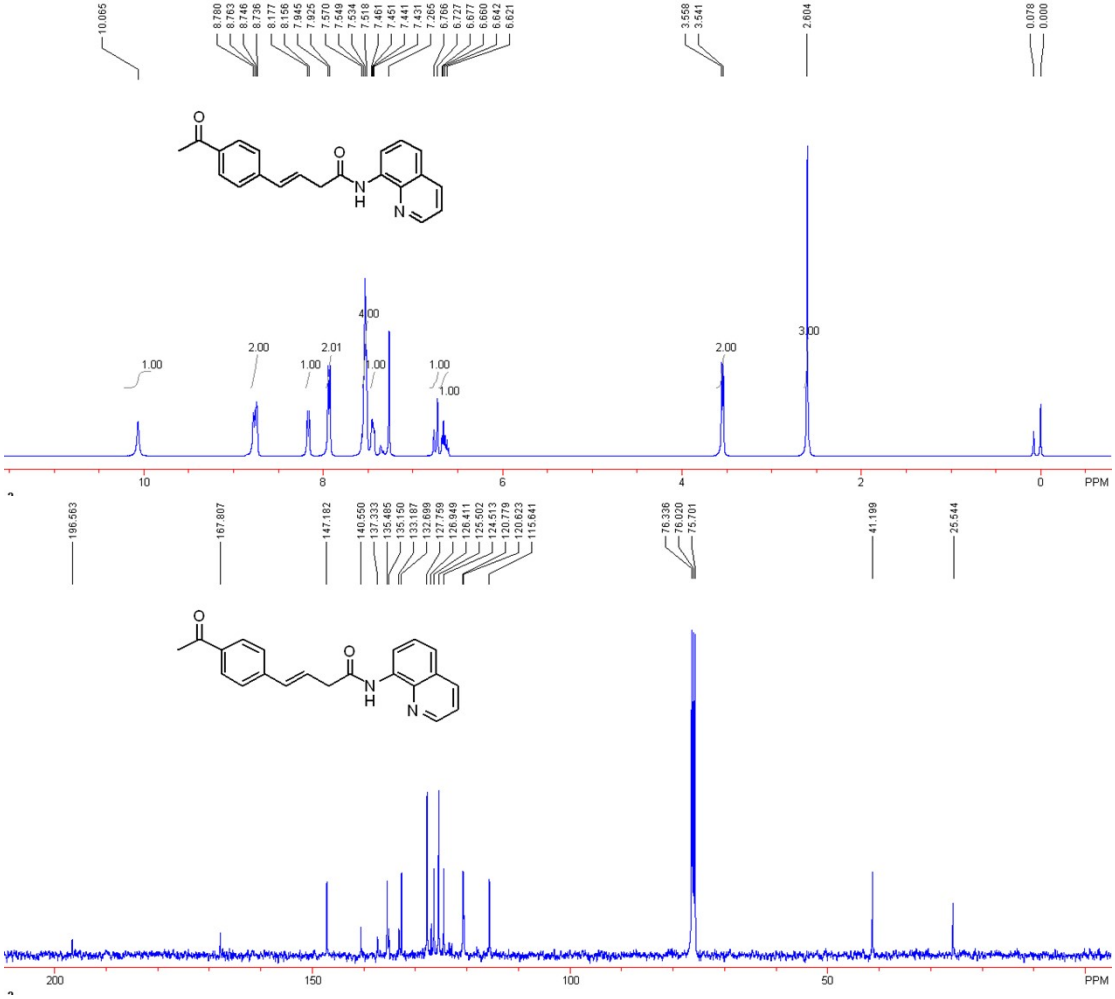
(*E*)-*N*-(quinolin-8-yl)-4-(4-(trifluoromethyl)phenyl)but-3-enamide (3k)



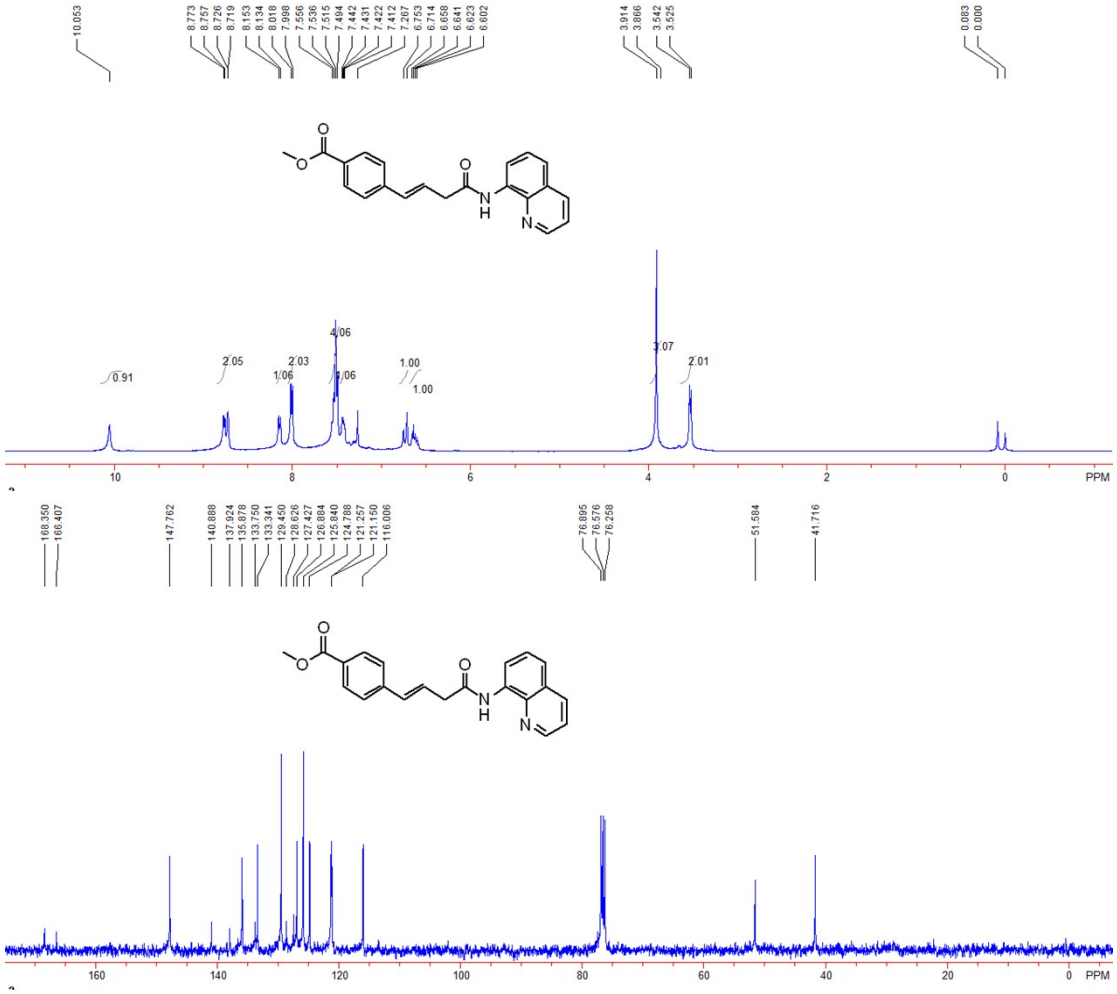
(*E*)-4-(4-cyanophenyl)-*N*-(quinolin-8-yl)but-3-enamide (3l)



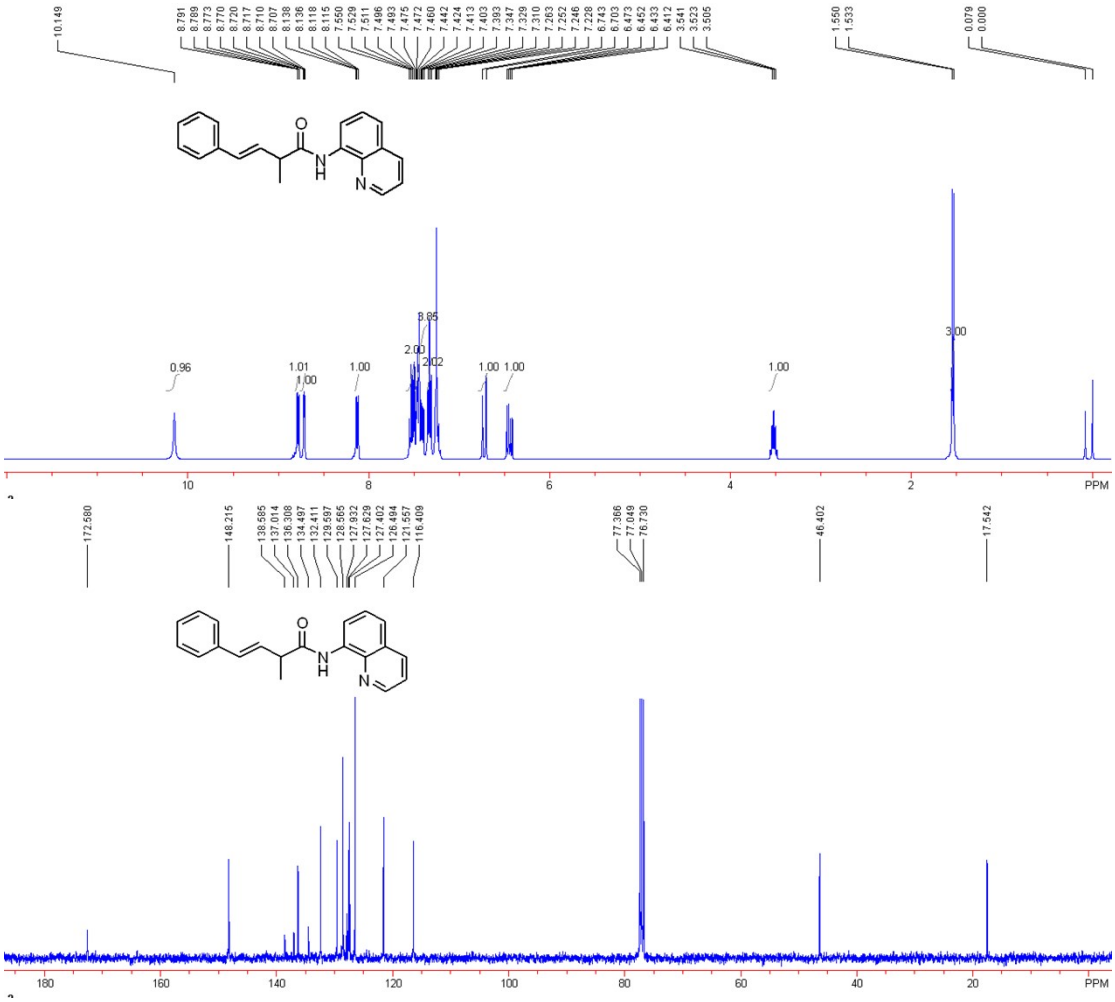
(*E*)-4-(4-acetylphenyl)-*N*-(quinolin-8-yl)but-3-enamide(3m)



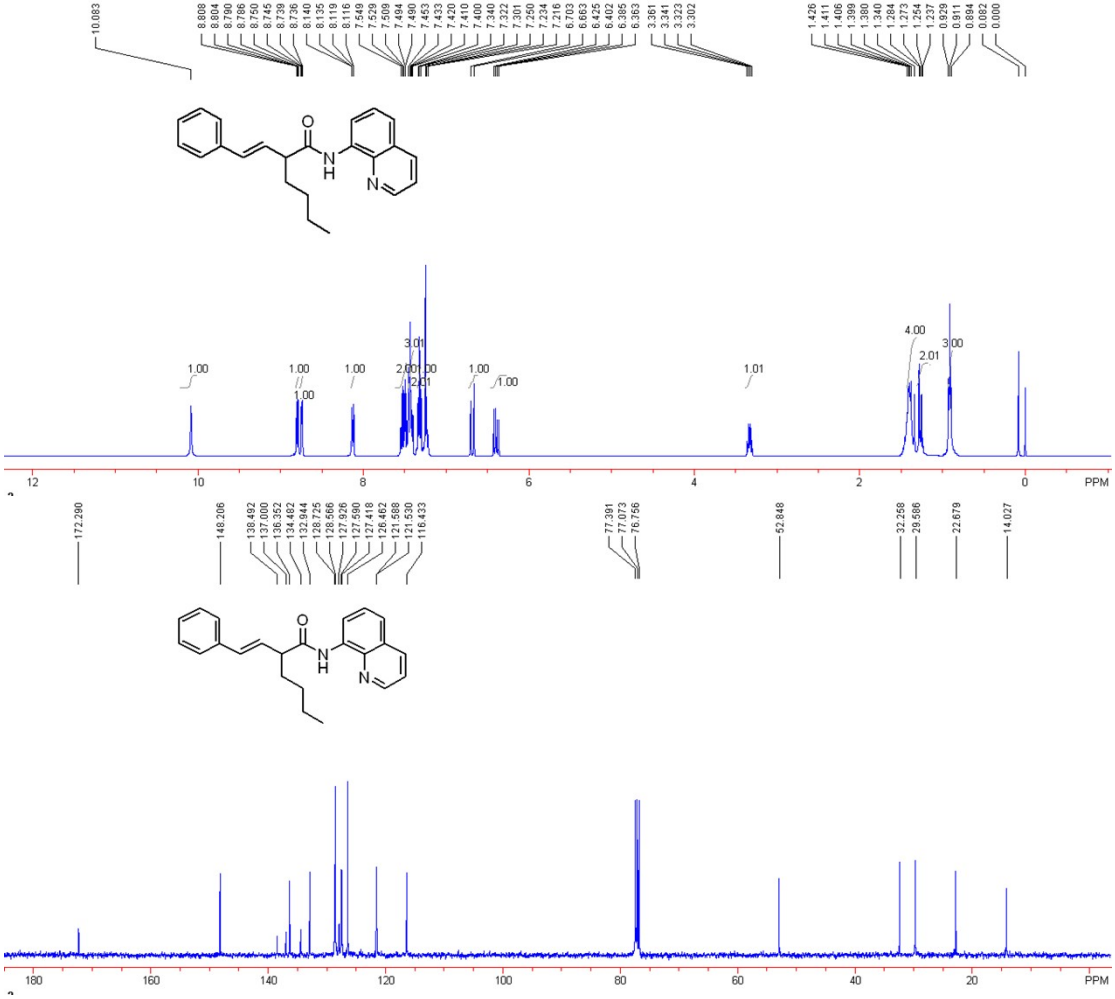
methyl (*E*)-4-(4-oxo-4-(quinolin-8-ylamino)but-1-en-1-yl)benzoate (3n)



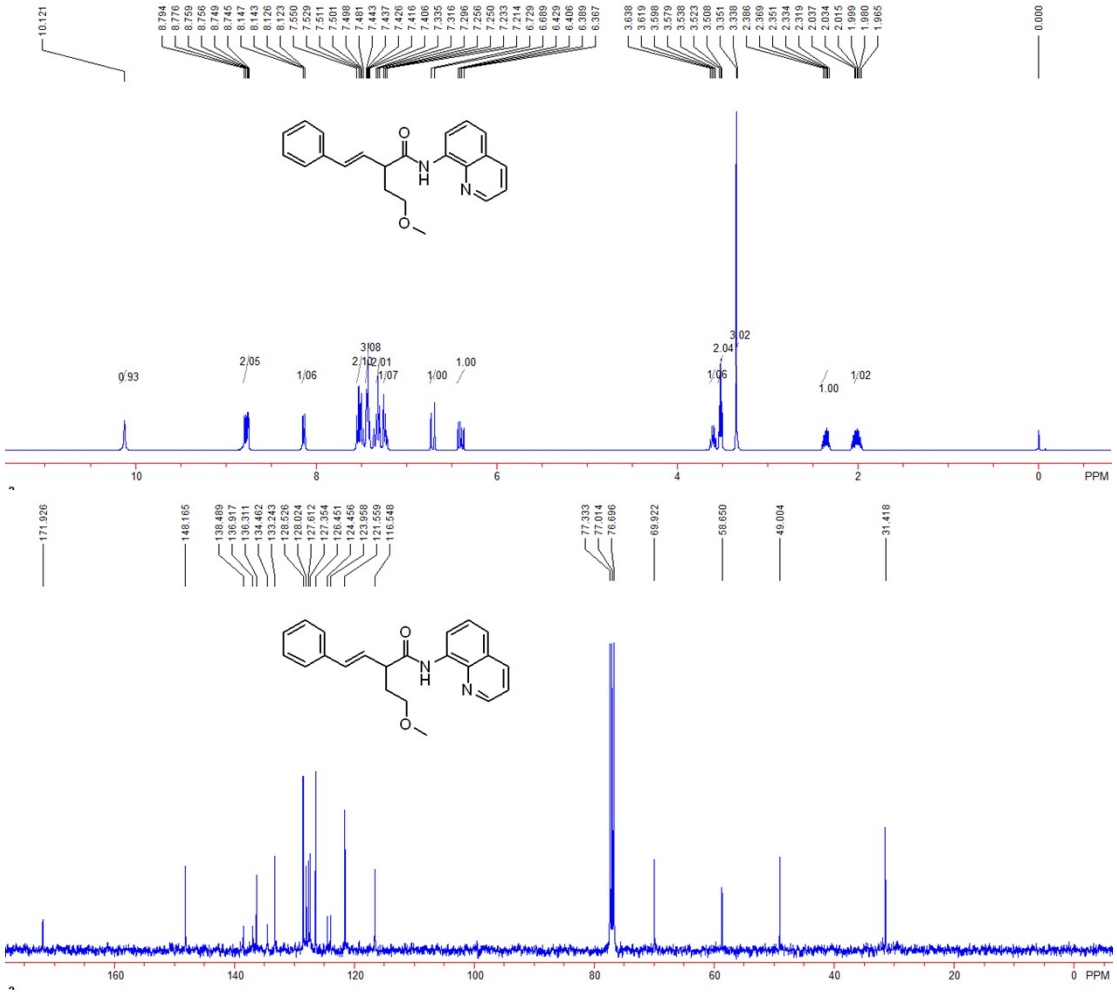
(*E*)-2-methyl-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide(4a)



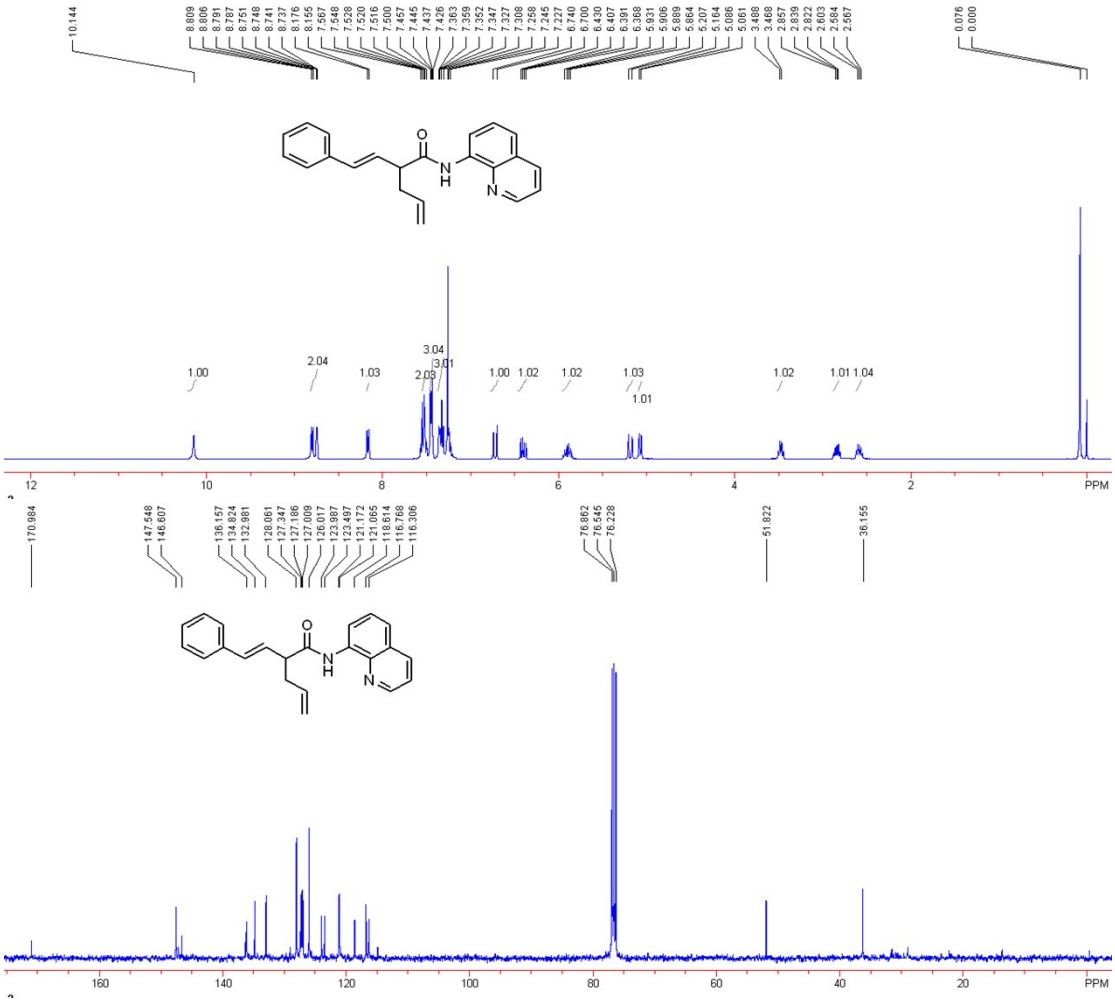
(*E*)-*N*-(quinolin-8-yl)-2-styrylhexanamide(4b)



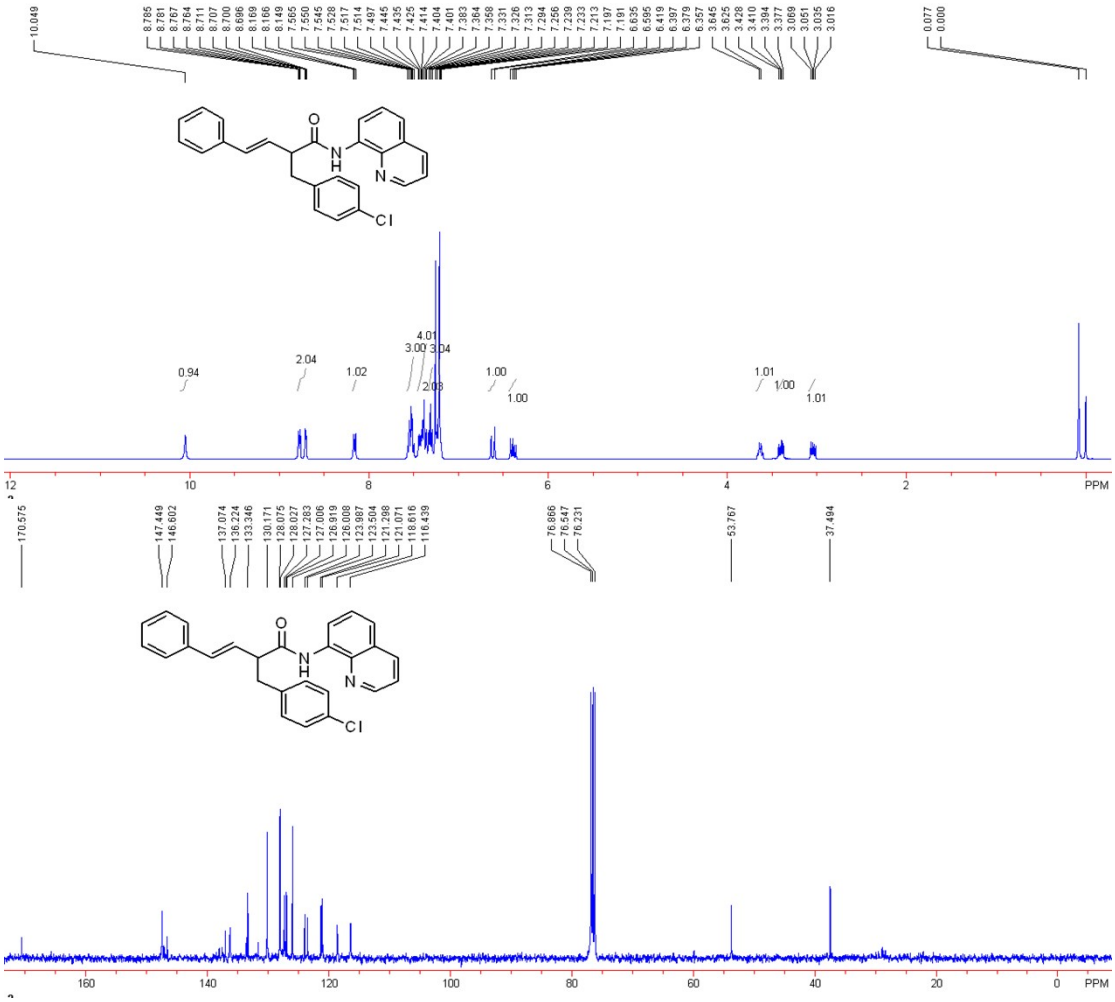
(*E*)-2-(2-methoxyethyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide (4c)



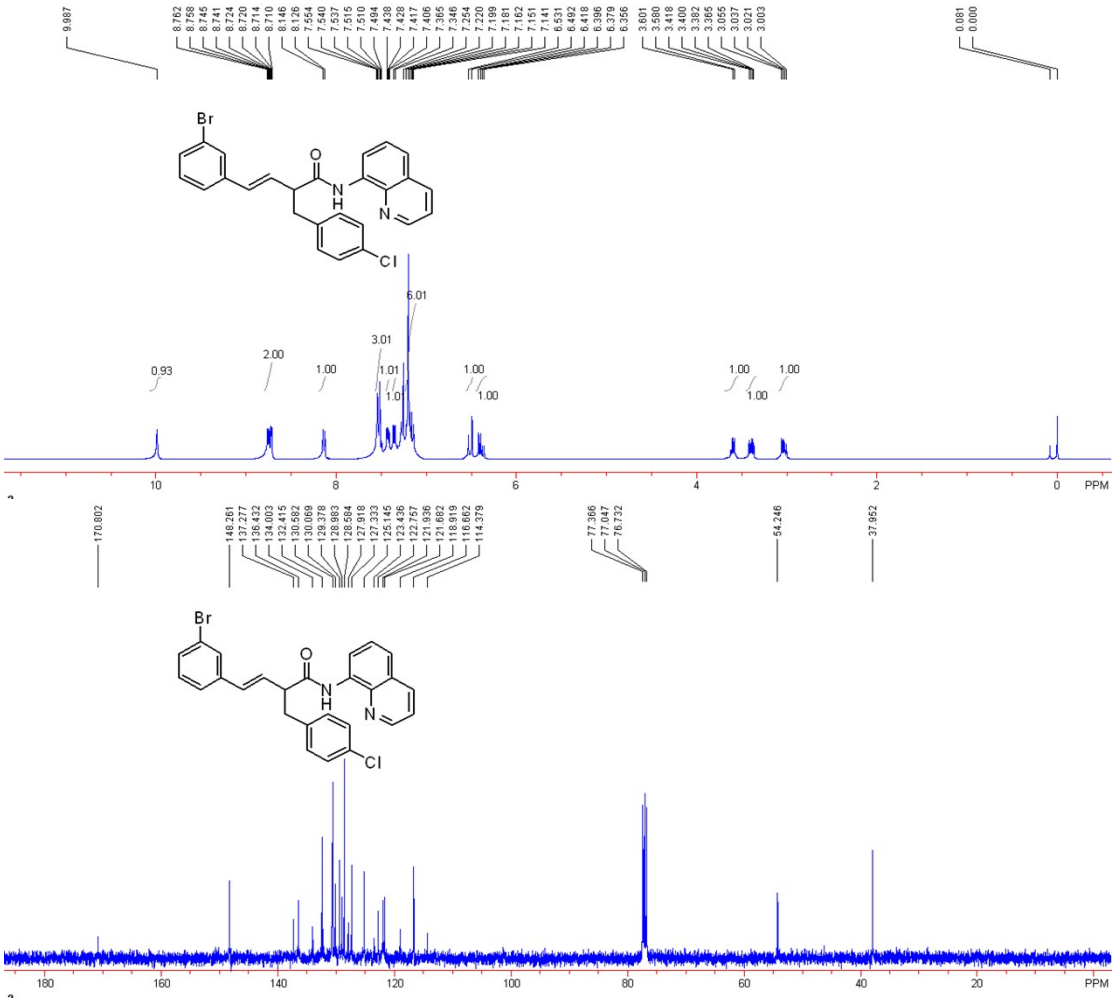
(*E*)-*N*-(quinolin-8-yl)-2-styrylpent-4-enamide(4d)



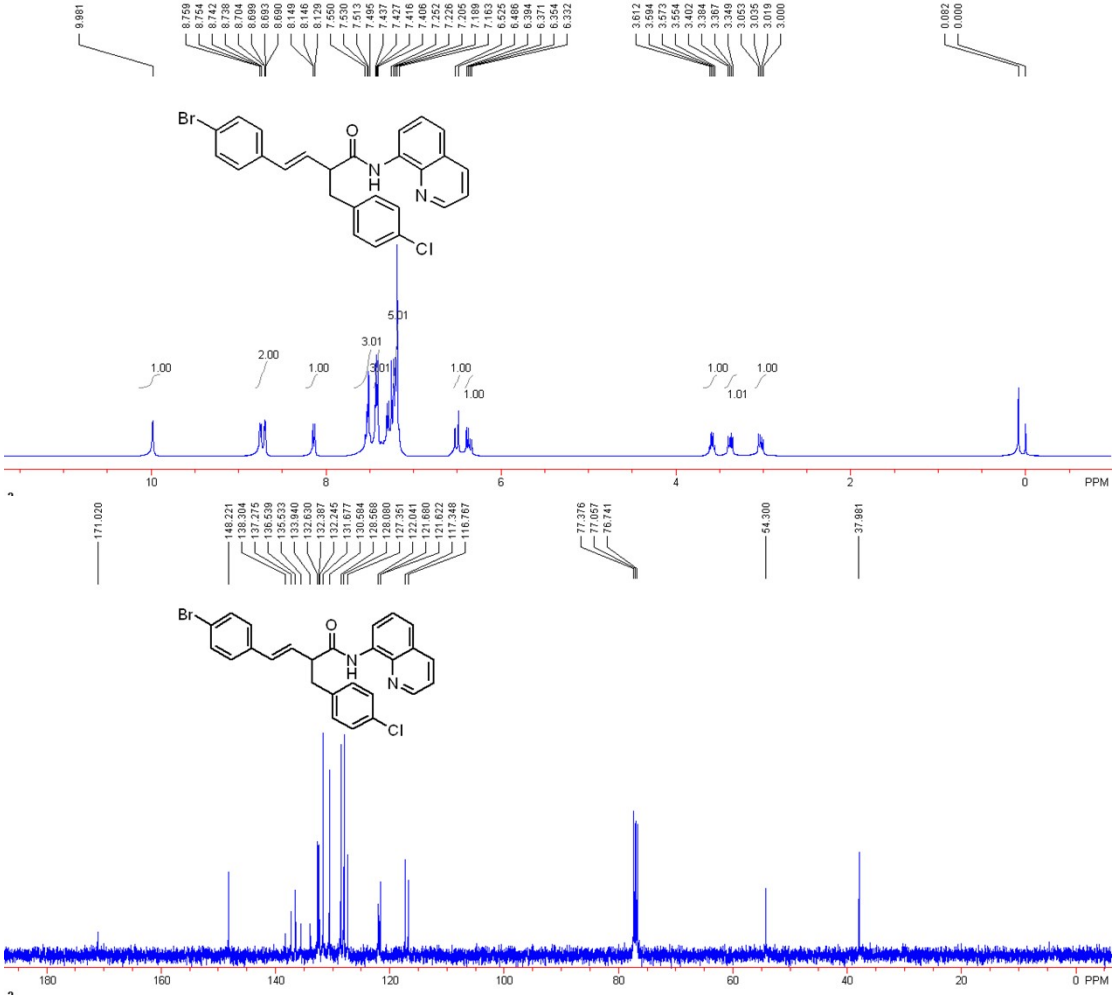
(*E*)-2-(4-chlorobenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide(4e)



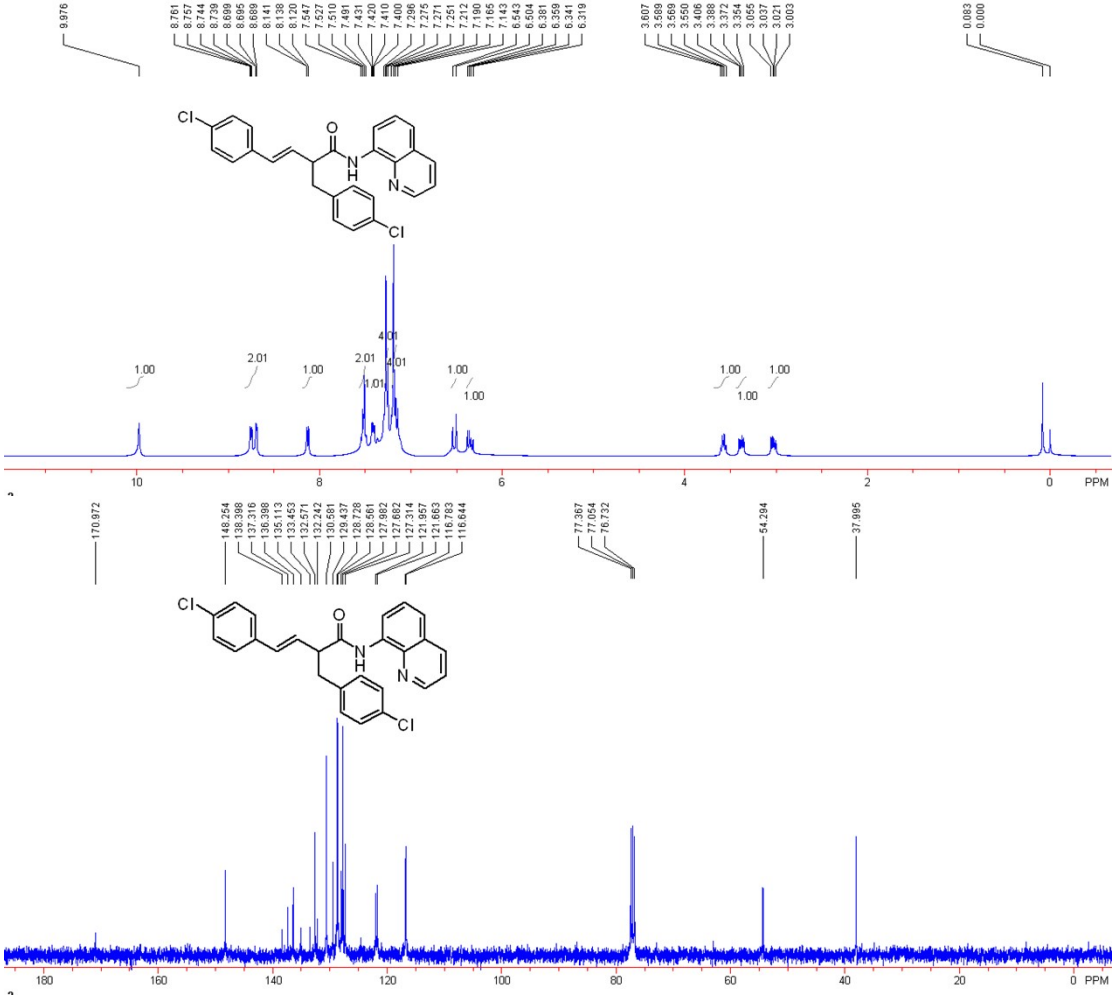
(*E*)-4-(3-bromophenyl)-2-(4-chlorobenzyl)-*N*-(quinolin-8-yl)but-3-enamide(4f)



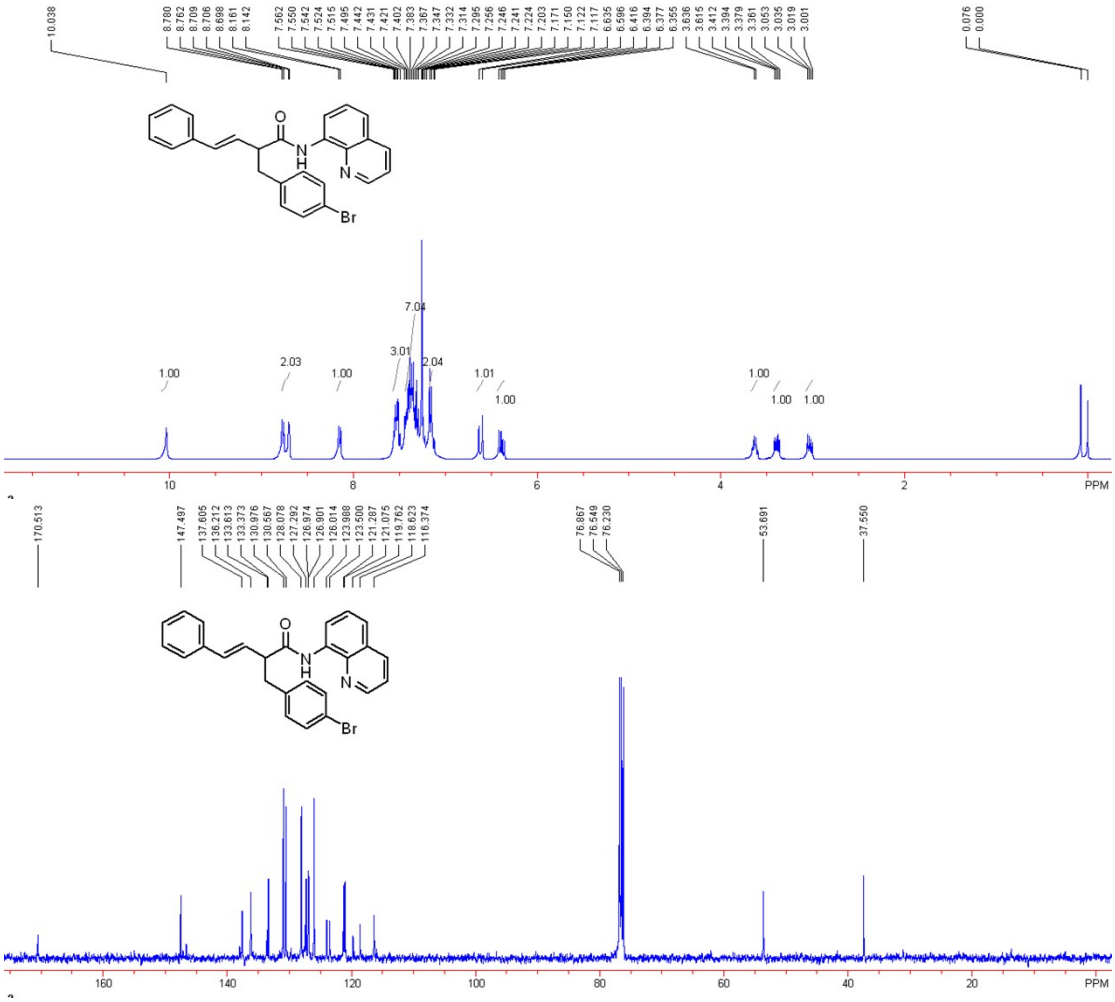
(*E*)-4-(4-bromophenyl)-2-(4-chlorobenzyl)-*N*-(quinolin-8-yl)but-3-enamide(4g)



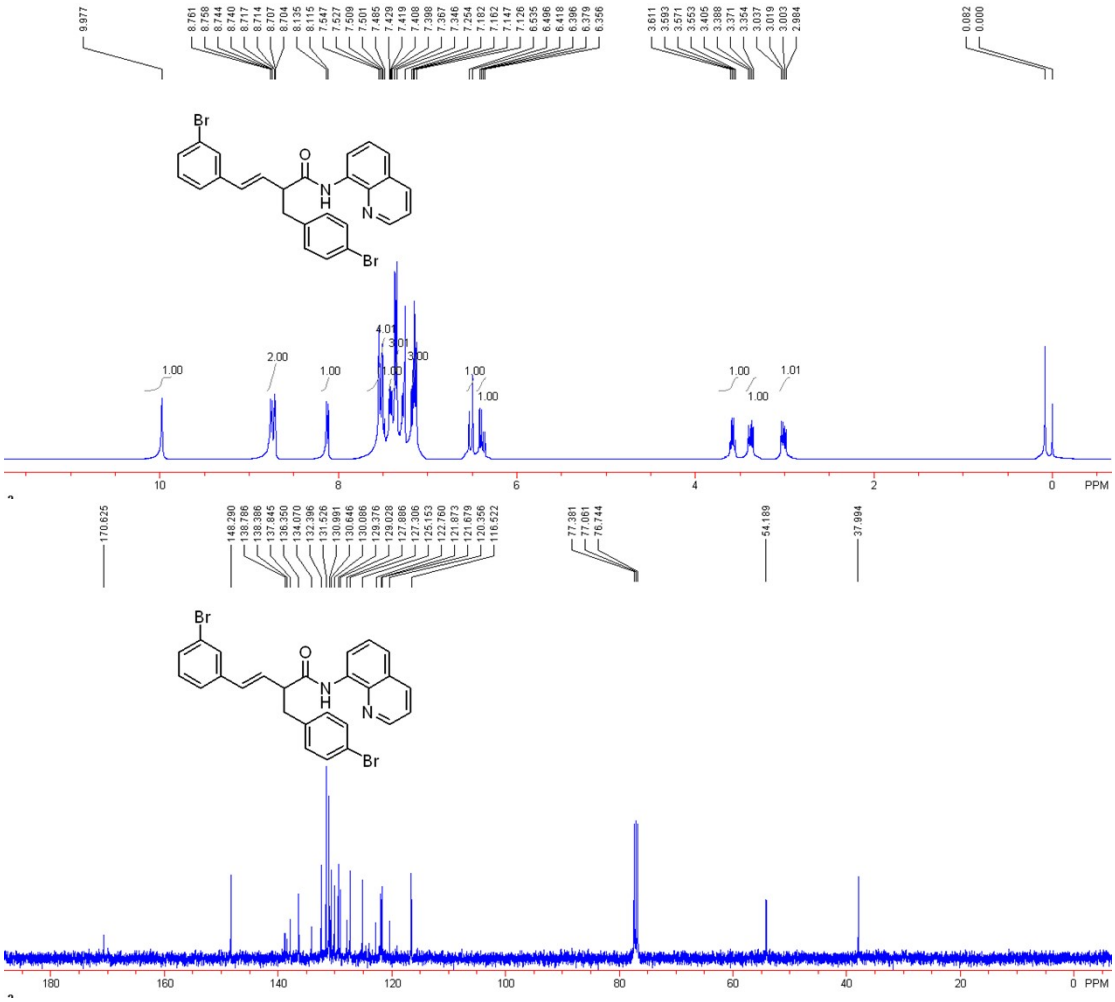
(*E*)-2-(4-chlorobenzyl)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide(4h)



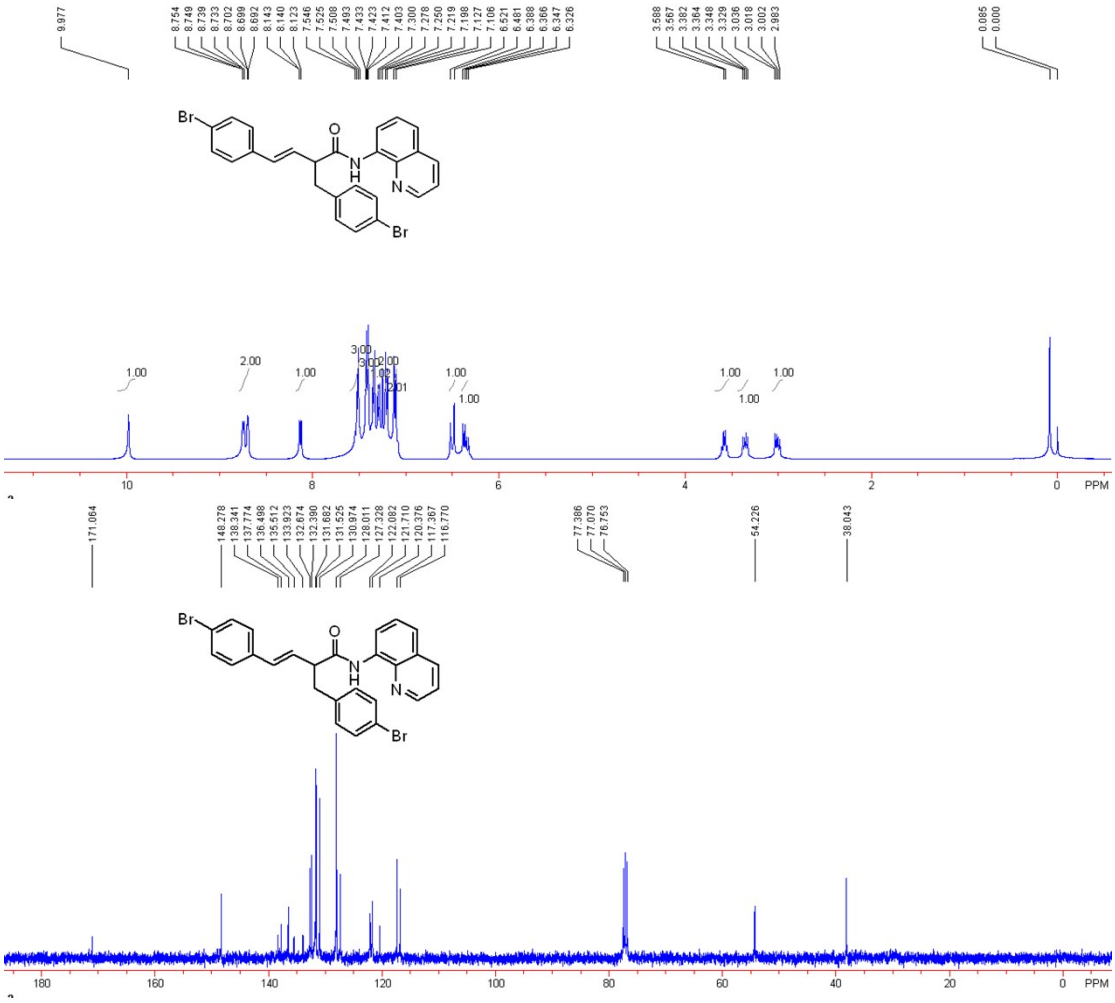
(*E*)-2-(4-bromobenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide(4i)



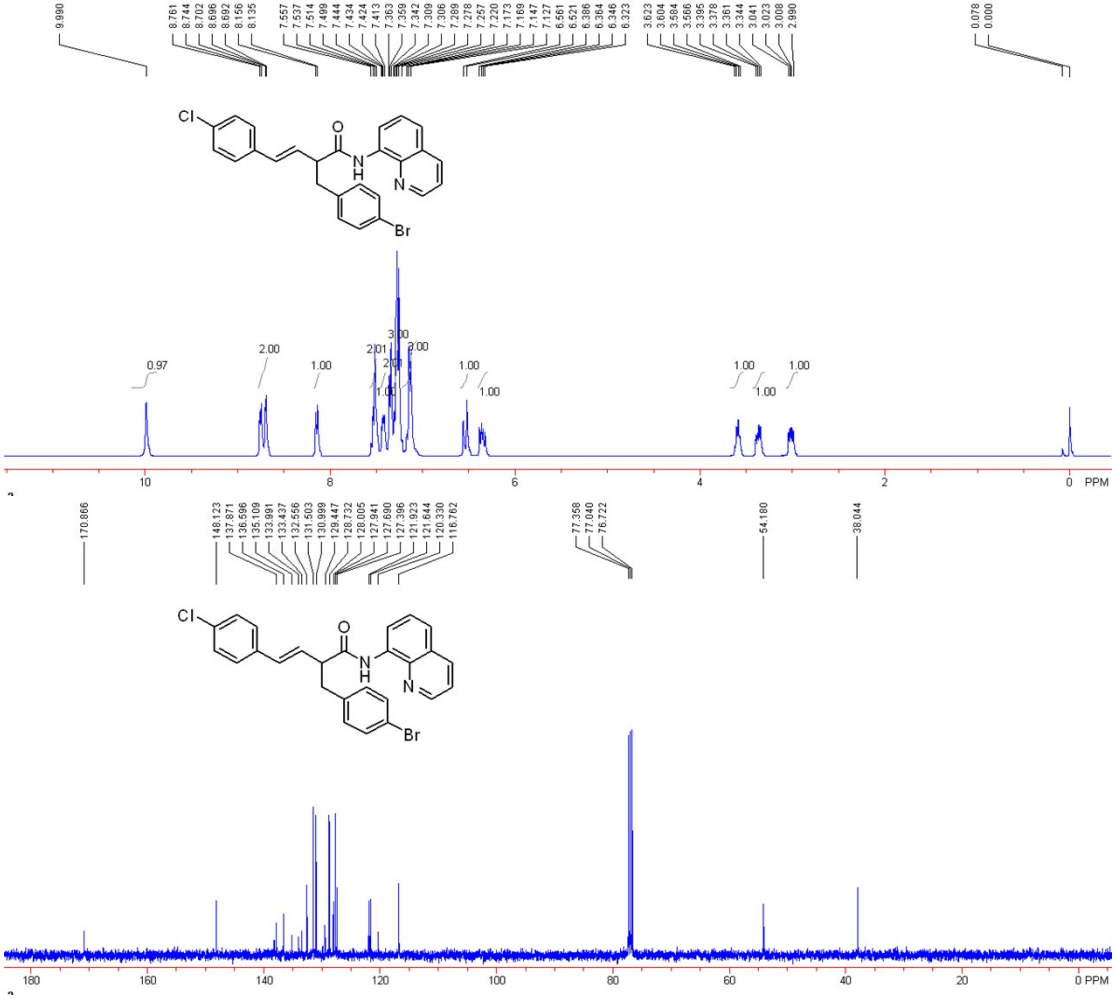
(*E*)-2-(4-bromobenzyl)-4-(3-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide(4j)



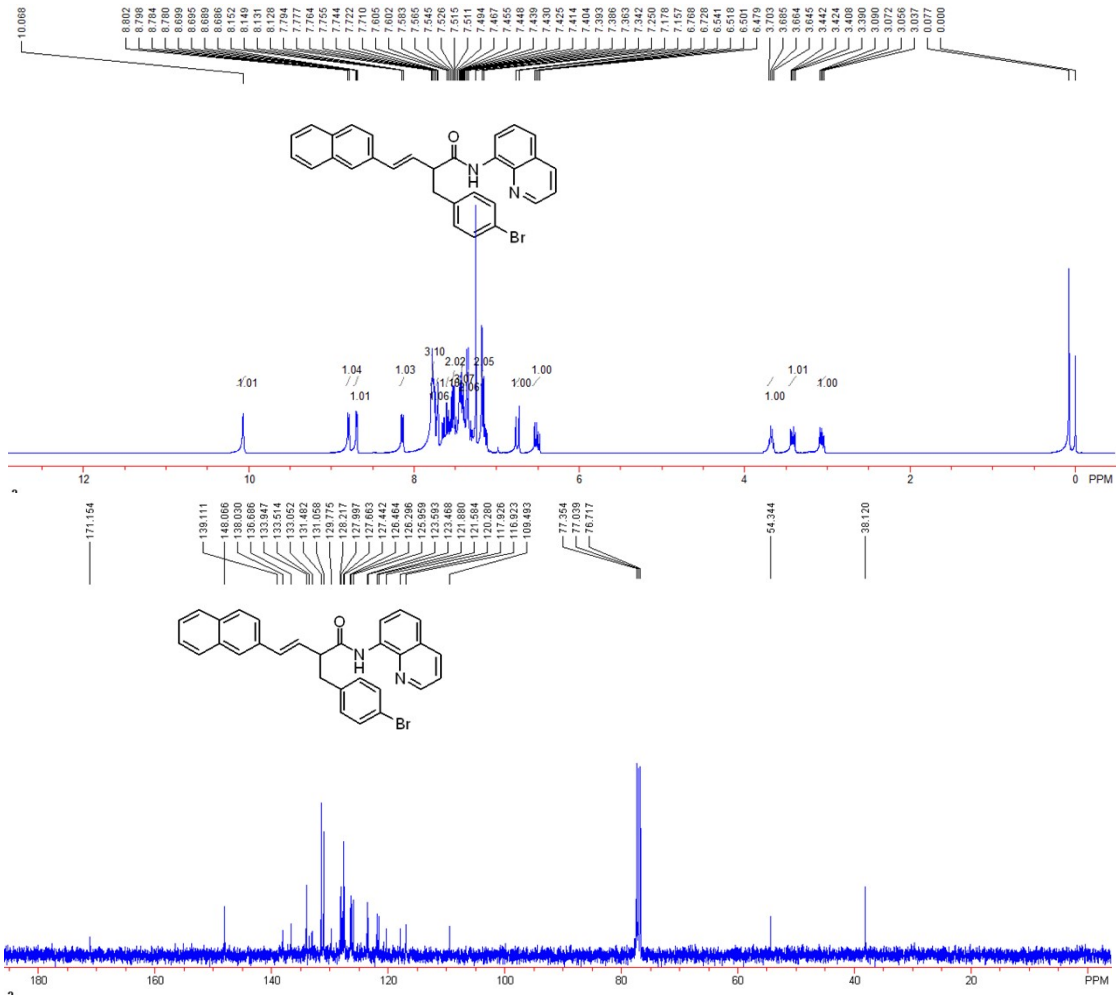
(*E*)-2-(4-bromobenzyl)-4-(4-bromophenyl)-*N*-(quinolin-8-yl)but-3-enamide(4k)



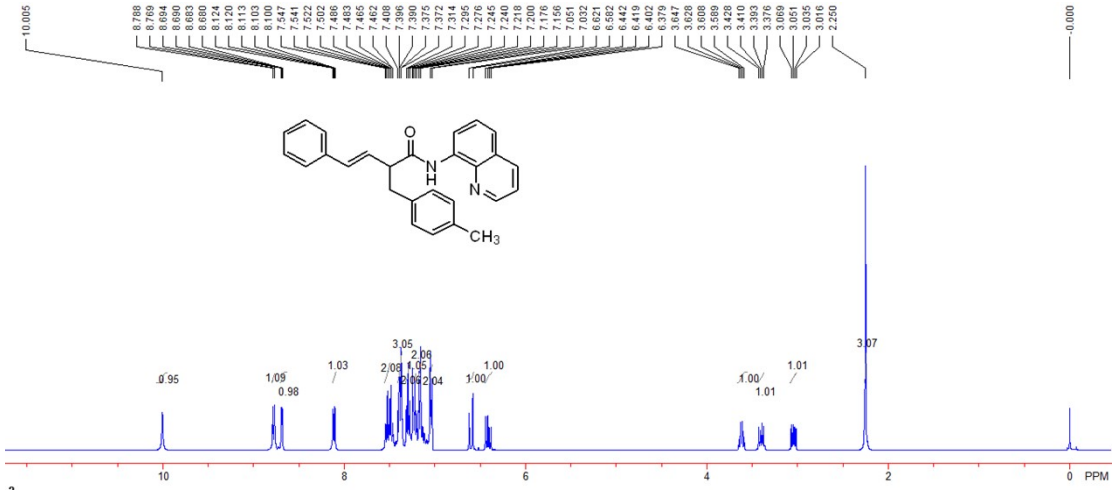
(*E*)-2-(4-bromobenzyl)-4-(4-chlorophenyl)-*N*-(quinolin-8-yl)but-3-enamide(4l)

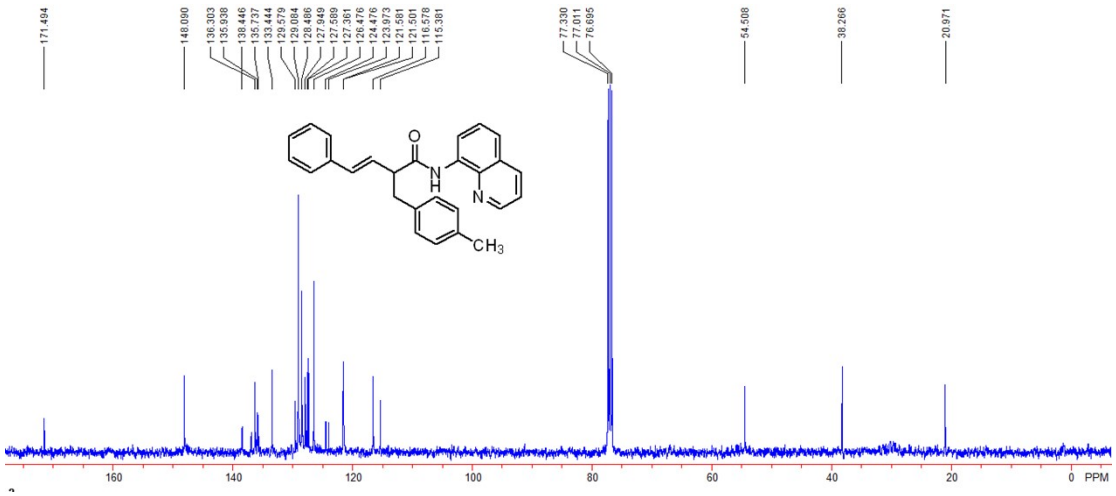


(*E*)-2-(4-bromobenzyl)-4-(naphthalen-2-yl)-*N*-(quinolin-8-yl)but-3-enamide (4m)

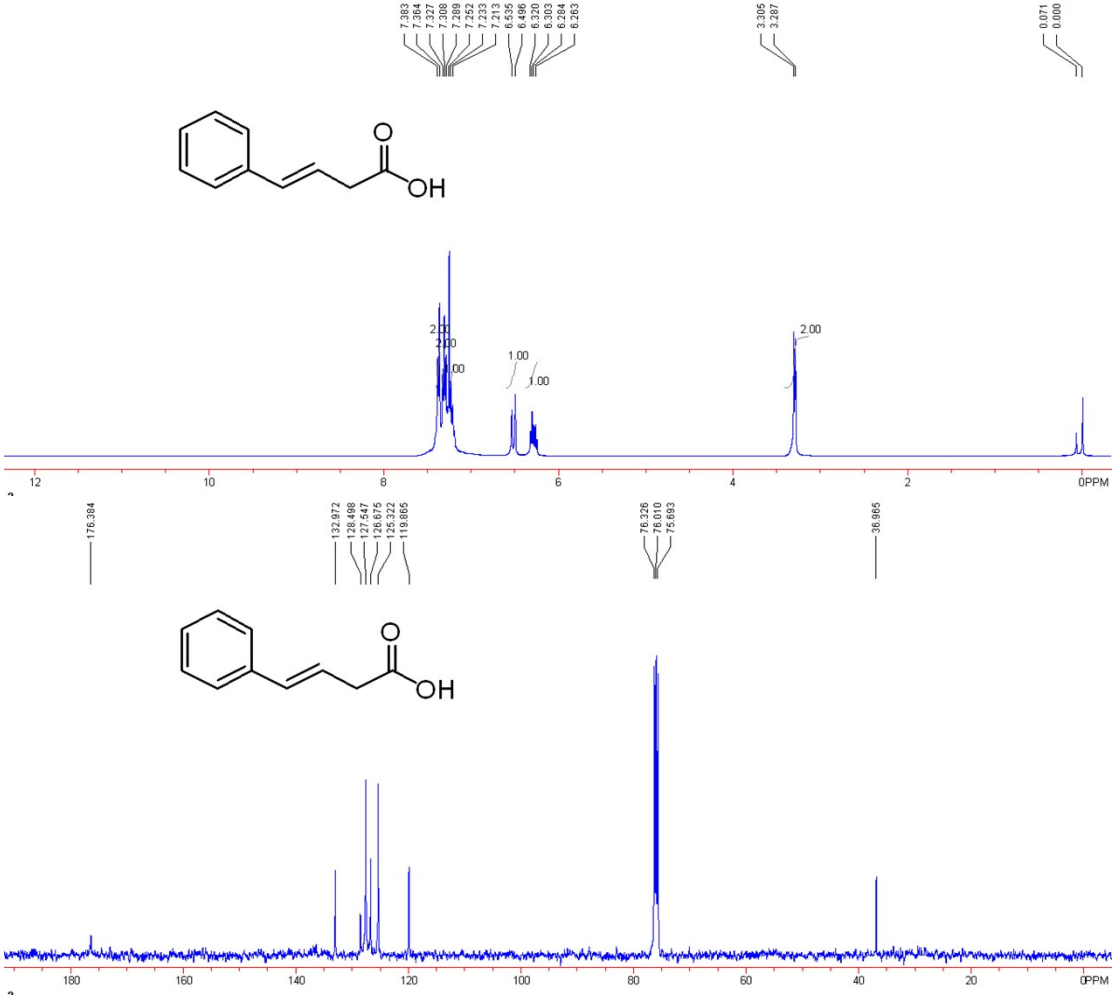


(*E*)-2-(4-methylbenzyl)-4-phenyl-*N*-(quinolin-8-yl)but-3-enamide(4n)





(*E*)-4-phenylbut-3-enoic acid (5)



3-(3-bromobenzyl)-*N*-(quinolin-8-yl)but-3-enamide(4o)