Supporting information for

Ammonium Iodide-Catalyzed Radical-mediated Tandem Cyclization of Aromatic Aldehydes, Arylamines and 1,4-Dioxane

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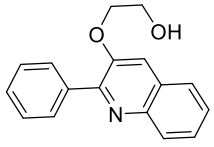
General information:

All reactions were performed under an atmosphere of air unless otherwise stated. Column chromatography was undertaken using silica gel (200-300 mesh). ^{1}H NMR and ^{13}C NMR spectra were registered on Bruker-AV (400 and 100 MHz, respectively) apparatus internal reference to tetramethylsilane (TMS) or chloroform signals. Mass spectra were recorded on bruker 15T HRMS instrument (maldi). The new compounds were characterized by ^{1}H NMR, ^{13}C NMR, MS and HRMS. The structure of known compounds was further corroborated by comparing their ^{1}H NMR, ^{13}C NMR data and MS data with those of literature. Melting points were measured with a YUHUA X-5 melting point instrument and were non-calibrated. All reagents were purchased from commercial suppliers and used without additional refinement.

General procedure for preparation 4a-4v:

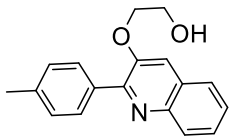
In a 10 mL tube was added ammonium iodide (0.04 mmol), benzaldehyde (0.2 mmol), aniline (0.4 mmol), dicumyl peroxide (0.6 mmol). Then, 1,4-dioxane (2.0 mL) was added to the tube by syringe and the tube was sealed. The reaction vessel was stirred in an oil bath at 130 ^{o}C for 16 h. The mixture was cooled to room temperature and concentrated under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/EtOAc : 1:1 to 10:1) to give the corresponding compounds.

2-((2-phenylquinolin-3-yl)oxy)ethan-1-ol (4a)



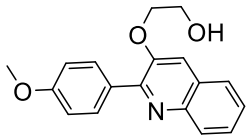
Yellow oily liquid (33.3 mg, 63% yield); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.11 (d, J = 8.4 Hz, 1H), 7.96-7.93 (m, 2H), 7.75 (d, J = 8.0 1H), 7.61-7.57 (m, 1H), 7.53-7.42 (m, 5H), 4.23 (t, J = 4.4 Hz, 2H), 3.98 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.1, 150.5, 143.2, 137.7, 129.6, 129.2, 128.8, 128.5, 128.1, 127.2, 126.9, 126.2, 114.4, 69.9, 61.0; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}NNaO_2$ $[M+Na]^+$ 288.1000, found 288.0989.

2-((2-(p-tolyl)quinolin-3-yl)oxy)ethan-1-ol (4b)



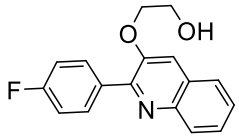
Brown oily liquid (30.6 mg, 55%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.12 (d, J = 8.4 Hz, 1H), 7.86 (d, J = 8.0 Hz, 2H), 7.74 (d, J = 7.6 Hz, 1H), 7.61-7.56 (m, 1H), 7.52-7.49 (m, 2H), 7.30 (d, J = 8.0 Hz, 2H), 4.24 (t, J = 4.6 Hz, 2H), 4.00 (t, J = 4.0 Hz, 2H), 2.43 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.1, 150.5, 143.3, 138.8, 134.8, 129.5, 129.2, 128.8, 128.4, 127.1, 126.7, 126.2, 114.4, 69.9, 61.1, 21.3; HRMS (maldi, m/z): calcd. for $C_{18}H_{18}NO_2$ $[M+H]^+$ 280.1338, found 280.1350.

2-((2-(4-methoxyphenyl)quinolin-3-yl)oxy)ethan-1-ol (4c)



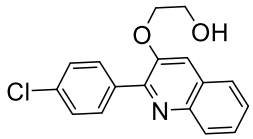
Brown oily liquid (17.6 mg, 30%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.09 (d, J = 8.4 Hz, 1H), 7.97-7.95 (m, 2H), 7.73 (d, J = 7.6 Hz, 1H), 7.59-7.55 (m, 1H), 7.51 -7.47 (m, 2H), 7.01 (d, J = 8.8 Hz, 2H), 4.22 (t, J = 4.4 Hz, 2H), 4.00 (t, J = 4.6 Hz, 2H), 3.87 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 160.2, 151.6, 150.5, 143.3, 131.1, 130.2, 129.1, 128.2, 127.1, 126.6, 126.2, 114.4, 113.5, 69.9, 61.1, 55.3; HRMS (maldi, m/z): calcd. for $C_{18}H_{18}NO_3$ $[M+H]^+$ 296.1287, found 296.1285.

2-((2-(4-fluorophenyl)quinolin-3-yl)oxy)ethan-1-ol (4d)



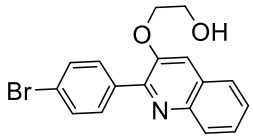
Red solid (20.1 mg, 35%); melting point (m.p.): 123.0-124.5 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.09 (d, J = 8.4 Hz, 1H), 7.99-7.95 (m, 2H), 7.73 (d, J = 8.0 Hz, 1H),7.61-7.57 (m, 1H), 7.53-7.49 (m, 2H), 7.17-7.13 (m, 2H), 4.22 (t, J = 4.6 Hz, 2H), 3.99 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 162.9 (d, J = 247.1 Hz), 150.8, 150.4, 143.2, 133.7 (d, J = 3.1 Hz), 131.6 (d, J = 8.2 Hz), 129.2, 128.4, 127.3, 127.0, 126.2, 115.0 (d, J = 22.8 Hz), 114.5, 69.9. 61.1; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}FNO_2$ $[M+H]^+$ 284.1087, found 284.1087.

2-((2-(4-chlorophenyl)quinolin-3-yl)oxy)ethan-1-ol (4e)



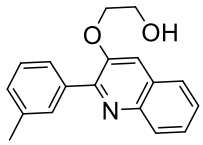
Brown oily liquid (25.7 mg, 43%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.09 (d, J = 8.4 Hz, 1H), 7.93 (d, J = 8.4 Hz, 2H), 7.74 (d, J = 8.0 Hz, 1H), 7.61-7.57 (m, 1H), 7.54-7.49 (m, 2H), 7.46-7.42 (m, 2H), 4.23 (t, J = 4.4 Hz, 2H), 4.00 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 150.6, 150.4, 143.2, 136.1, 134.9, 131.0, 129.2, 128.5, 128.2, 127.3, 127.1, 126.2, 114.5, 69.9, 61.0; HRMS (maldi, m/z): calcd. for $C_{17}H_{14}ClNNaO_2$ $[M+Na]^+$ 322.0611, found 322.0612.

2-((2-(4-bromophenyl)quinolin-3-yl)oxy)ethan-1-ol (4f)



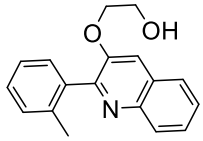
Brown oily liquid (21.0 mg, 31%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.08 (d, J = 8.4 Hz, 1H), 7.85 (d, J = 8.4 Hz, 2H), 7.74 (d, J = 8.0 Hz, 1H), 7.60-7.57 (m, 3H), 7.54-7.50 (m, 2H), 4.22 (t, J = 4.6 Hz, 2H), 3.99 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 150.6, 150.4, 143.2, 136.6, 131.3, 131.2, 129.2, 128.5, 127.3, 127.1, 126.3, 123.3, 114.5, 69.9, 61.0; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}BrNO_2$ $[M+H]^+$ 344.0286, found 344.0286.

2-((2-(m-tolyl)quinolin-3-yl)oxy)ethan-1-ol (4g)



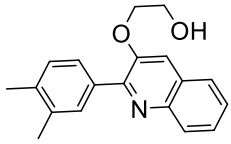
Brown oily liquid (27.4 mg, 43%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.12 (d, J = 8.4 Hz, 1H), 7.51-7.71 (m, 3H), 7.61-7.57 (m, 1H), 7.53-7.49 (m, 2H), 7.36 (t, J = 7.6 Hz, 2H), 7.25 (s, 1H), 4.22 (t, J = 4.6 Hz, 2H), 3.98 (t, J = 4.6 Hz, 2H), 2.45 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.4, 150.5, 143.3, 137.8, 137.6, 130.2, 129.6, 129.3, 128.4, 127.8, 127.1, 126.8, 126.6, 126.2, 114.5, 69.9, 61.1, 21.5; HRMS (maldi, m/z): calcd. for $C_{18}H_{17}NaNO_2$ $[M+Na]^+$ 302.1157, found 302.1154.

2-((2-(o-tolyl)quinolin-3-yl)oxy)ethan-1-ol (4h)



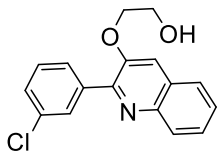
Brown oily liquid (21.0 mg, 38%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.10 (d, J = 8.4 Hz, 1H), 7.78 (dd, J = 1.2, 8.4 Hz, 1H), 7.62-7.53 (m, 3H), 7.38-7.29 (m, 4H), 4.16 (t, J = 4.6 Hz, 2H), 3.84 (t, J = 4.4 Hz, 2H), 2.20 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 154.1, 150.5, 143.1, 137.6, 136.4, 130.1, 129.2, 129.2, 128.6, 128.5, 127.2, 127.0, 126.3, 125.6, 114.1, 69.9, 60.9, 19.6; HRMS (maldi, m/z): calcd. for $C_{18}H_{18}NO_2$ $[M+H]^+$ 280.1338, found 280.1344.

2-((2-(3,4-dimethylphenyl)quinolin-3-yl)oxy)ethan-1-ol (4i)



Yellow oil (19.5 mg, 33%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.11 (d, J = 8.0 Hz, 1H), 7.73-7.71 (m, 2H), 7.69-7.66 (m, 1H), 7.59-7.55 (m, 1H), 7.51-7.46 (m, 2H), 7.22 (d, J = 8.0 Hz, 1H), 4.20 (t, J = 4.4 Hz, 2H), 3.97 (t, J = 4.6 Hz, 2H), 2.34 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.3, 150.6, 143.3, 137.5, 136.4, 135.2, 130.7, 129.2, 129.2, 128.3, 127.1, 127.0, 126.7, 126.2, 114.4, 69.9, 61.1, 19.9, 19.7; HRMS (maldi, m/z): calcd. for $C_{19}H_{20}NO_2$ $[M+H]^+$ 294.1494, found 294.1496.

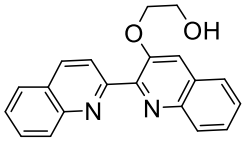
2-((2-(3-chlorophenyl)quinolin-3-yl)oxy)ethan-1-ol (4j)



Yellow solid (24.1 mg, 40%). melting point (m.p.): 137.0-139.8 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.10 (d, J = 8.4 Hz, 1H), 7.99 (s, 1H), 7.88-7.85 (m, 1H), 7.75 (d, J = 8.0 Hz, 1H), 7.62-7.58 (m, 1H), 7.54-7.51 (m, 2H), 7.41-7.40 (m, 2H), 4.24 (t, J = 4.4 Hz, 2H), 4.01 (t, J = 4.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 150.4, 150.3, 143.2, 139.4, 134.0, 129.8, 129.3, 129.3, 128.8, 128.6, 127.8, 127.4, 127.2, 126.2, 114.6, 69.9, 61.1; HRMS (maldi, m/z): calcd. for

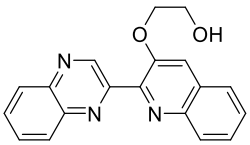
$C_{17}H_{15}ClNaNO_2$ $[M+Na]^+$ 322.0611, found 322.0610.

2-([2,2'-biquinolin]-3-yloxy)ethan-1-ol (4k)[1]



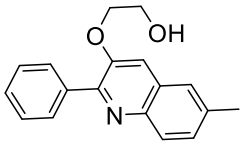
Brown oily liquid (31.0 mg, 49%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.33 (d, J = 8.8, 1H), 8.25 (d, J = 8.4 Hz, 1H), 8.17-8.12 (m, 2H), 7.85 (d, J = 8.4 Hz, 1H), 7.76-7.72 (m, 2H), 7.68 (s, 1H), 7.62-7.51 (m, 3H), 6.53 (brs, 1H), 4.45 (t, J = 4.2 Hz, 2H), 3.97 (t, J = 4.2 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 156.3, 151.7, 150.7, 146.8, 143.4, 137.3, 130.0, 129.4, 129.2, 128.7, 127.7, 127.6, 127.6, 127.5, 127.1, 126.3, 122.5, 118.8, 73.1, 60.6; HRMS (maldi, m/z): calcd. for $C_{20}H_{17}N_2O_2$ $[M+H]^+$ 317.1290, found 317.1293.

2-((2-(quinoxalin-2-yl)quinolin-3-yl)oxy)ethan-1-ol (4l) [1]



Yellow solid (18.8 mg, 30%), melting point (mp): 84.0-87.0 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 9.69 (s, 1H), 8.25-8.18 (m, 3H), 7.85-7.81 (m, 3H), 7.75 (s, 1H), 7.69-7.59 (m, 2H), 4.50 (t, J = 4.4 Hz, 2H), 4.03 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.2, 150.6, 147.9, 146.8, 143.6, 142.0, 140.7, 130.6, 129.8, 129.4, 129.3, 129.1, 128.2, 127.9, 126.4, 118.4, 72.6, 60.9; HRMS (maldi, m/z): calcd. for $C_{19}H_{15}N_3NaO_2$ $[M+Na]^+$ 340.1062, found 340.1058.

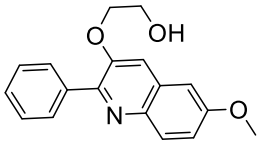
2-((6-methyl-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4m)



Brown oily liquid (34.8 mg, 62%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.01 (d, J = 8.4 Hz, 1H), 7.93 (t, J = 6.8 Hz, 2H), 7.52-7.41 (m, 6H), 4.22 (t, J = 4.4 Hz, 2H), 3.98 (t, J = 4.2 Hz, 2H), 2.54 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 151.1, 150.6, 141.9, 137.9, 136.8, 129.5, 129.4, 129.0, 128.7, 128.5, 128.1, 125.2, 114.0, 69.9, 61.1, 21.6; HRMS (maldi, m/z): calcd. for

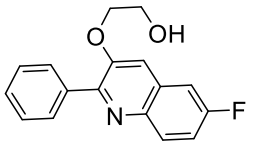
$C_{18}H_{18}NO_2$ $[M+H]^+$ 280.1338, found 280.1342.

2-((6-methoxy-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4n)



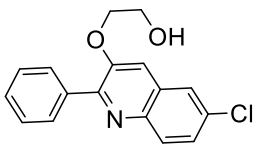
White solid (19.1 mg, 32%). melting point (m.p.): 161.6-162.8 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.00 (d, J = 9.2 Hz, 1H), 7.92 (d, J = 7.6 Hz, 2H), 7.50-7.40 (m, 4H), 7.24 (dd, J = 2.8, 9.2 Hz, 1H), 7.03 (d, J = 2.8 Hz, 1H), 4.21 (t, J = 4.4 Hz, 2H), 3.98 (t, J = 4.4 Hz, 2H), 3.94 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 158.3, 151.0, 149.4, 139.3, 137.9, 130.8, 129.7, 129.5, 128.5, 128.1, 119.5, 113.8, 104.3, 69.9, 61.2, 55.5; HRMS (maldi, m/z): calcd. for $C_{18}H_{18}NO_3$ $[M+H]^+$ 296.1287, found 296.1292.

2-((6-fluoro-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4o)



Brown solid (28.3 mg, 50%), melting point (m.p.): 181.0-182.2 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.11-8.08 (m, 1H), 7.93 (d, J = 6.8 Hz, 2H), 7.52-7.45 (m, 4H), 7.38-7.32 (m, 2H), 4.24 (t, J = 4.6 Hz, 2H), 4.01 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 161.0 (d, J = 246.3 Hz), 151.2, 140.3, 137.5, 131.8 (d, J = 9.6 Hz), 129.5, 129.4 (d, J = 10.2 Hz), 128.9, 128.6, 128.1, 117.1 (d, J = 25.5 Hz), 113.7 (d, J = 5.1 Hz), 109.4 (d, J = 22.1 Hz), 70.0, 61.1; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}FNaNO_2$ $[M+Na]^+$ 306.0906, found 306.0915.

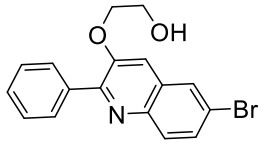
2-((6-chloro-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4p)



Yellow oily liquid (**21.5 mg**, 36%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.05 (d, J = 8.8 Hz, 1H), 7.94 (dd, J = 1.6 Hz, 8.4 Hz, 2H), 7.73 (d, J = 2.4 Hz 1H), 7.53-7.46 (m, 4H), 7.43 (s, 1H), 4.24 (t, J = 4.4 Hz, 2H), 4.01 (t, J = 4.2 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.4, 151.2, 141.7,

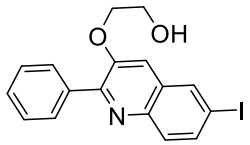
137.4, 132.7, 130.9, 129.6, 129.2, 129.0, 128.2, 128.0, 124.9, 113.3, 70.0, 61.1. HRMS (maldi, m/z): calcd. for $C_{17}H_{15}ClNaNO_2$ $[M+Na]^+$ 322.0611, found 322.0622.

2-((6-bromo-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4q)



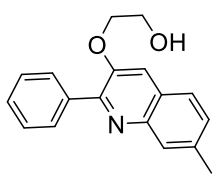
Brown oily liquid (20.6 mg, 30%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 7.97-7.93 (m, 3H), 7.90 (d, J = 2.0, 1H), 7.66-7.63 (m, 1H), 7.51-7.44 (m, 3H), 7.40 (s, 1H), 4.22 (t, J = 4.4 Hz, 2H), 3.99 (t, J = 4.2 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.5, 151.1, 141.8, 137.4, 131.0, 130.6, 129.7, 129.5, 129.1, 128.2, 128.2, 120.9, 113.1, 70.0, 61.0; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}BrNO_2$ $[M+H]^+$ 344.0286, found 344.0292.

2-((6-iodo-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4r)



Brown oily liquid (18.6 mg, 24%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.13 (s, 1H), 7.95-7.93 (m, 2H), 7.82 (m, 2H), 7.51-7.45 (m, 3H), 7.38 (s, 1H), 4.21 (t, J = 4.4 Hz, 2H), 3.99 (t, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.7, 150.9, 142.2, 137.4, 135.9, 134.9, 131.0, 130.2, 129.6, 129.1, 128.2, 112.9, 92.6, 70.0, 61.1; HRMS (maldi, m/z): calcd. for $C_{17}H_{15}INO_2$ $[M+H]^+$ 392.0147, found 392.0160.

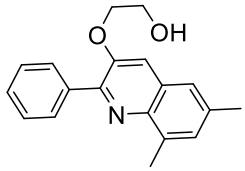
2-((7-methyl-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4s)



Brown oily liquid **(**22.6 mg, 41%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 7.93-7.90 (m, 3H), 7.61 (d, J = 8.0 Hz, 1H), 7.48-7.41 (m, 4H), 7.35-7.33 (m, 1H), 4.16 (t, J = 4.6 Hz, 2H), 3.93 (t, J = 4.6 Hz, 2H), 2.53 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 151.8, 150.0, 143.4, 137.8, 137.2, 129.6,

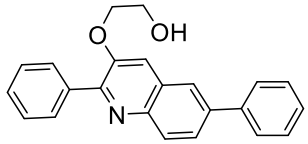
129.1, 128.7, 128.2, 128.0, 126.3, 125.8, 114.5, 69.9, 60.9, 21.6; HRMS (maldi, m/z): calcd. for $C_{18}H_{18}NO_2$ $[M+H]^+$ 280.1338, found 280.1336.

2-((6,8-dimethyl-2-phenylquinolin-3-yl)oxy)ethan-1-ol (4t)



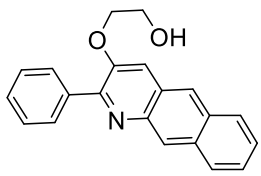
Yellow oily liquid (20.6 mg, 35%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.08 (d, J = 7.2 Hz, 2H), 7.50-7.42 (m, 4H), 7.35 (s, 1H), 7.28 (s, 1H), 4.22 (t, J = 4.6 Hz, 2H), 4.00 (t, J = 4.2 Hz, 2H)), 2.79 (s, 3H), 2.49 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 150.6, 149.0, 141.0, 138.3, 137.1, 136.6, 129.8, 129.7, 128.6, 128.0, 123.1, 114.4, 69.9, 61.2, 21.6, 17.8; HRMS (maldi, m/z): calcd. for $C_{19}H_{20}NO_2$ $[M+H]^+$ 294.1494, found 294.1496.

2-((2,6-diphenylquinolin-3-yl)oxy)ethan-1-ol (4u)



Yellow liquid (17.4 mg, 26%); ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.18 (d, J = 8.8 Hz, 1H), 7.97 (t, J = 7.4 Hz, 3H), 7.86 (dd, J = 2.0, 8.4 Hz, 1H), 7.74 (d, J = 7.6 Hz, 2H), 7.56 (s, 1H), 7.53-7.39 (m, 6H), 4.27 (t, J = 4.6 Hz, 2H), 4.02 (d, J = 4.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 152.0, 150.9, 142.7, 140.5, 139.6, 137.7, 129.7, 129.6, 128.9, 128.9, 128.7, 128.1, 127.7, 127.4, 126.9, 124.0, 114.6, 70.0, 61.1; HRMS (maldi, m/z): calcd. for $C_{23}H_{19}NNaO_2$ $[M+Na]^+$ 364.1313, found 364.1330

2-((2-phenylbenzo[g]quinolin-3-yl)oxy)ethan-1-ol (4v)

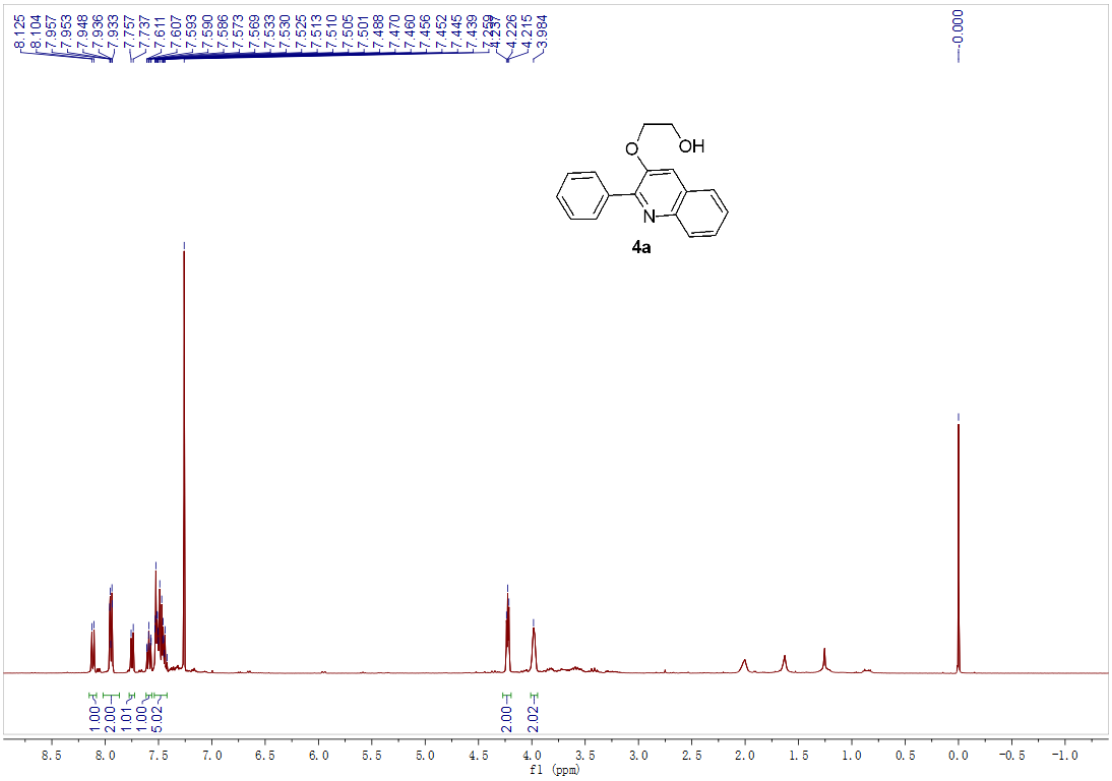


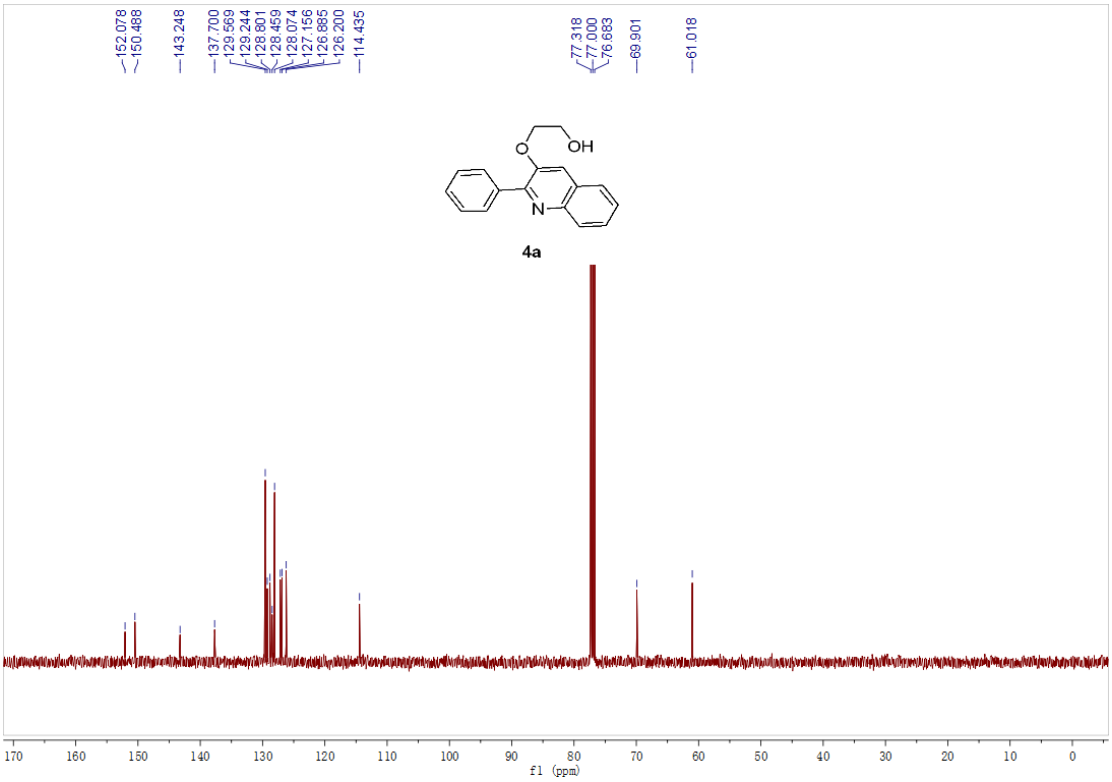
Red solid (29.4 mg, 47%). melting point (m.p.): 64.0-66.0 ℃; ^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 8.58 (d, J = 8.0 Hz, 1H), 8.40 (s, 1H), 8.06-8.03 (m, 3H), 7.96 (d, J = 7.6 Hz, 1H), 7.89 (d, J = 8.8 Hz, 1H), 7.72-7.64 (m, 2H), 7.54-7.44 (m, 3H), 4.37 (t, J = 4.6 Hz, 2H), 4.05 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm) δ 151.1, 150.4, 142.6, 137.7, 132.0, 129.6. 129.1, 128.8, 128.5, 128.2, 128.1, 127.2, 126.6, 125.5, 122.7, 112.1, 70.5, 61.3; HRMS (maldi, m/z): calcd. for $C_{21}H_{18}NO_2$ $[M+H]^+$ 316.1338, found 316.1350.

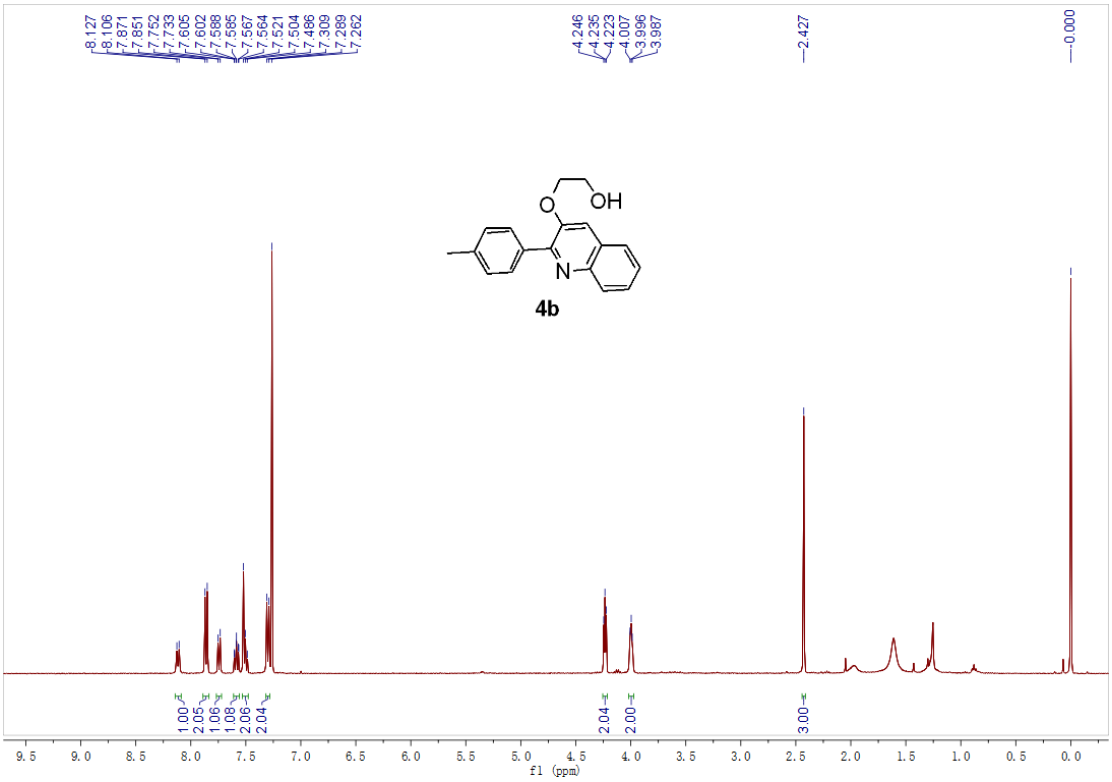
References

[1] H. Qi, Y. Yan, Y. Liao, F. Jiang, H. Gao, and G.-J. Deng, I_2-Catalyzed Oxidative Dehydrogenative Tandem Cyclization of 2-Methylquinolines, Arylamines and 1,4-Dioxane. *Org. Chem. Front.*, 2021, 8, 6108–6113.

^{1}H NMR and ^{13}C NMR spectra



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7.504
7.486
7.309
7.289
7.262
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4.223
4.007
3.996
3.987
2.427
0.000
O
OH
N
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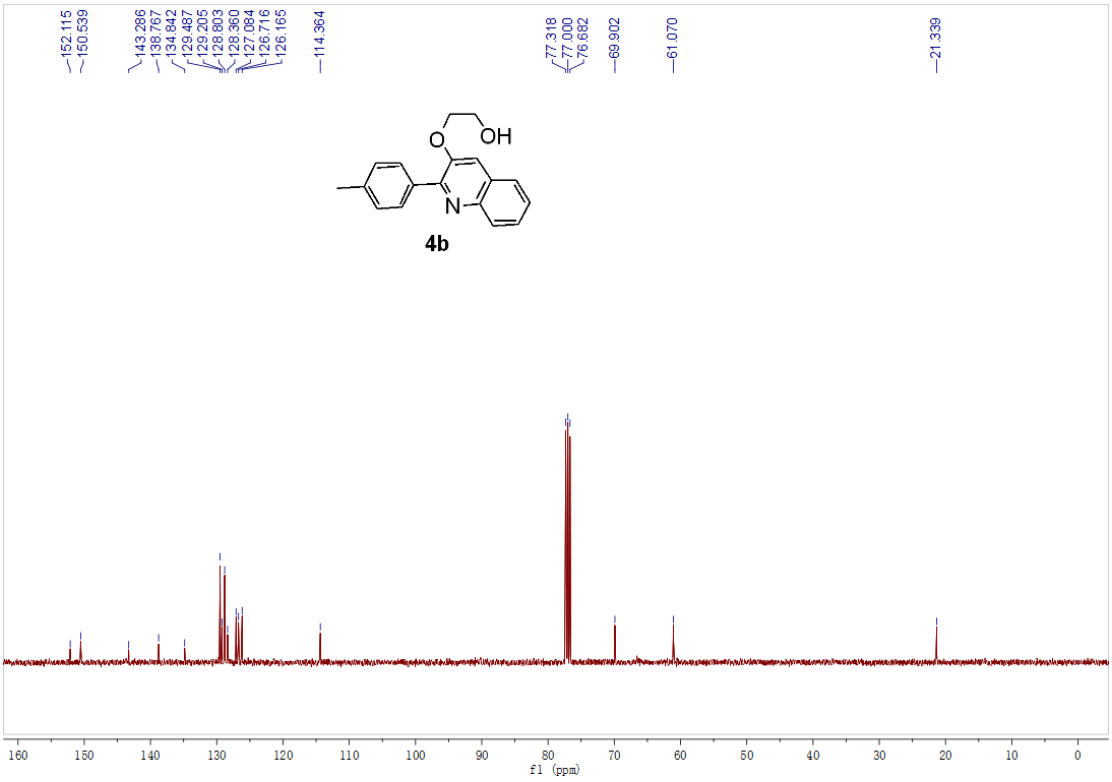
2.05
1.06
1.08
2.06
2.04
2.04
2.00
3.00
f1 (ppm)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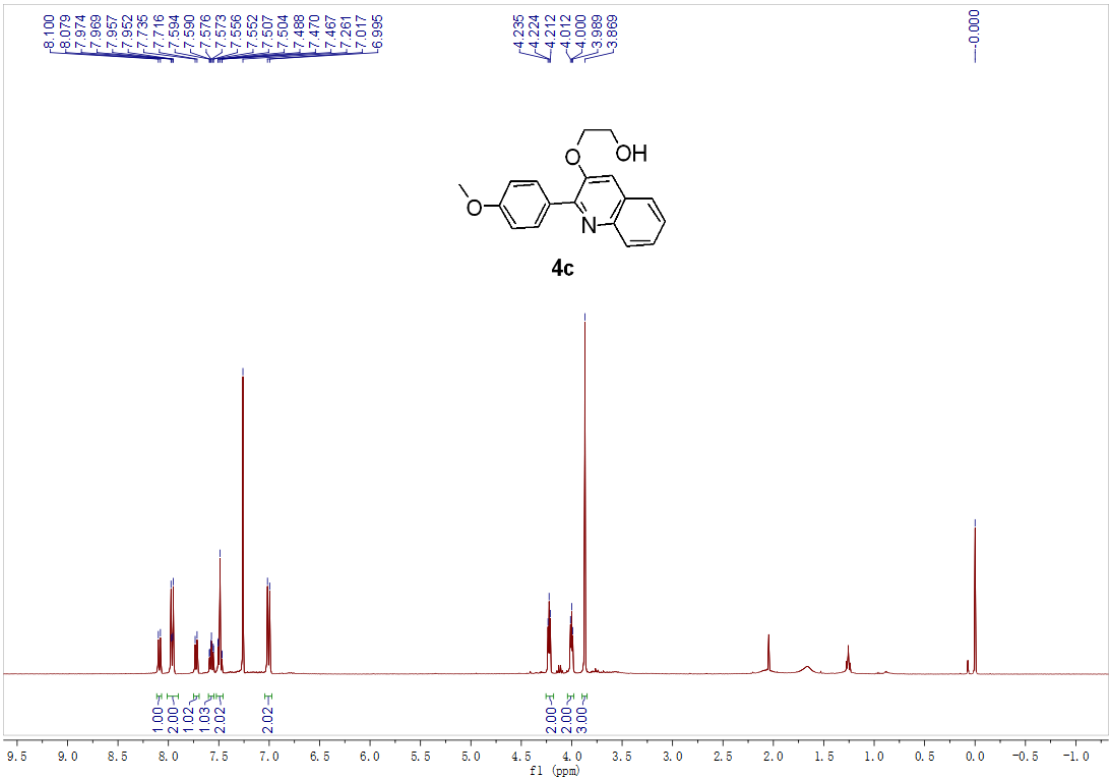
OH
N
4b
f1 (ppm)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7.590
7.576
7.573
7.556
7.552
7.507
7.504
7.488
7.470
7.467
7.261
7.017
6.995
4.235
4.224
4.212
4.012
4.000
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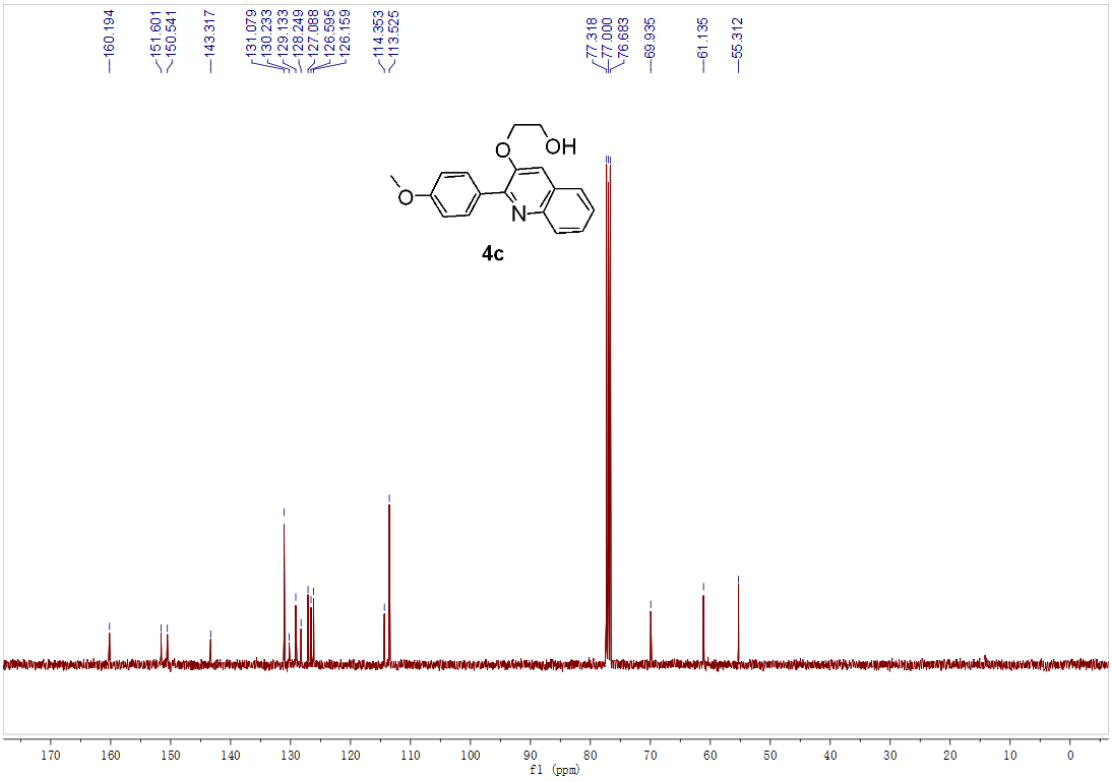
3.00
f1 (ppm)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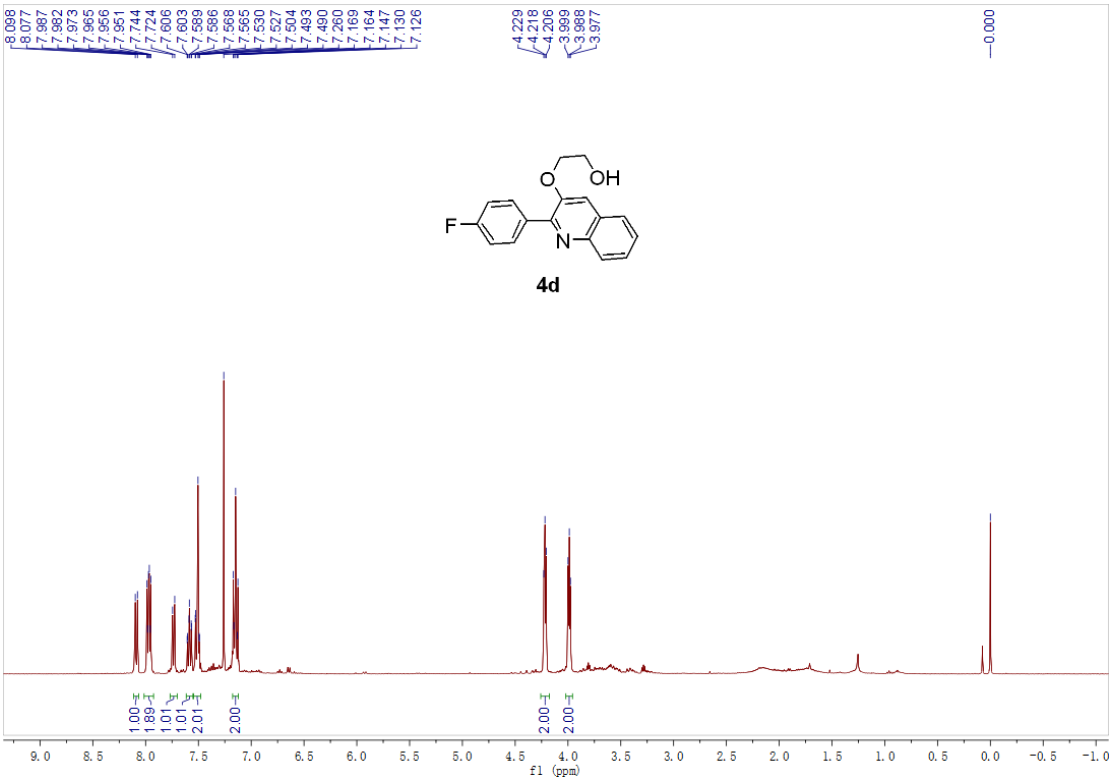
O
N
4c
f1 (ppm)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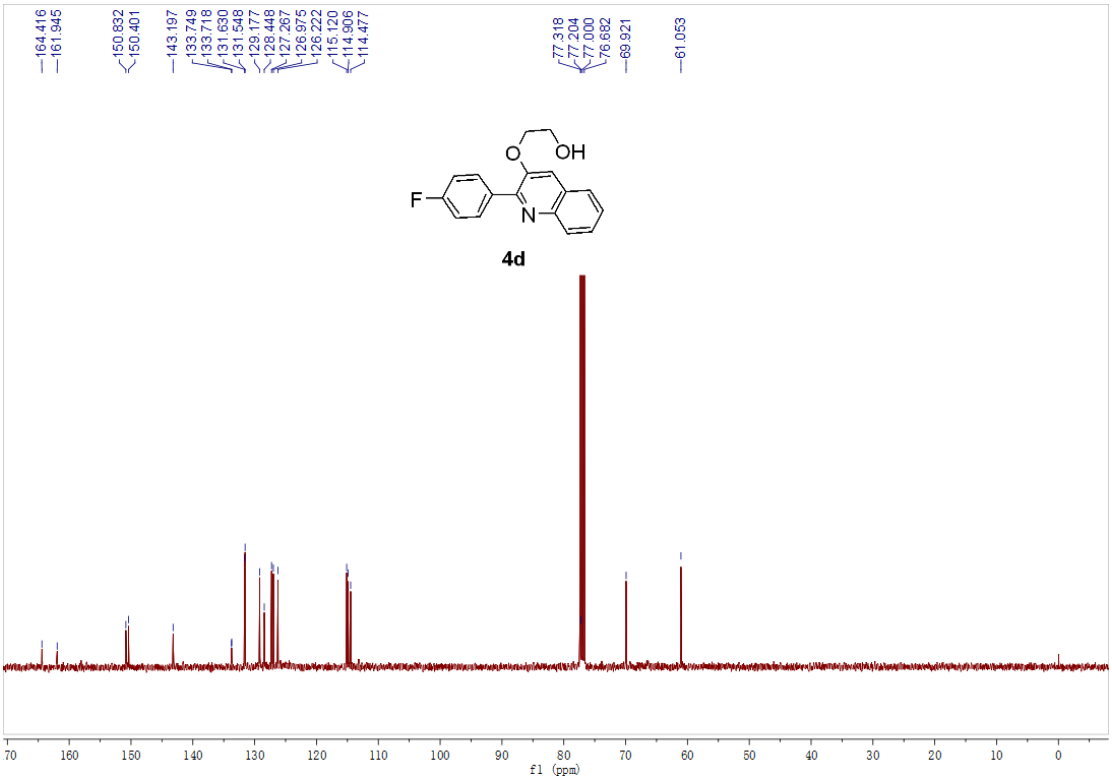
f1 (ppm)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77.000
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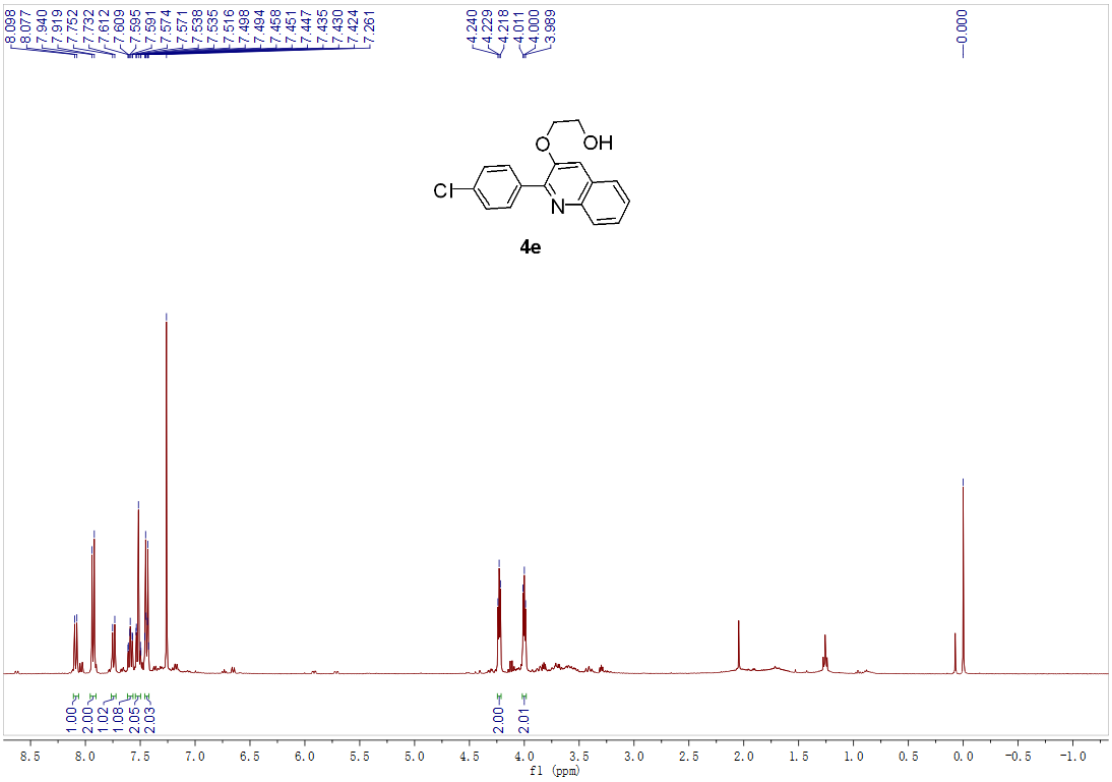
f1 (ppm)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7.538
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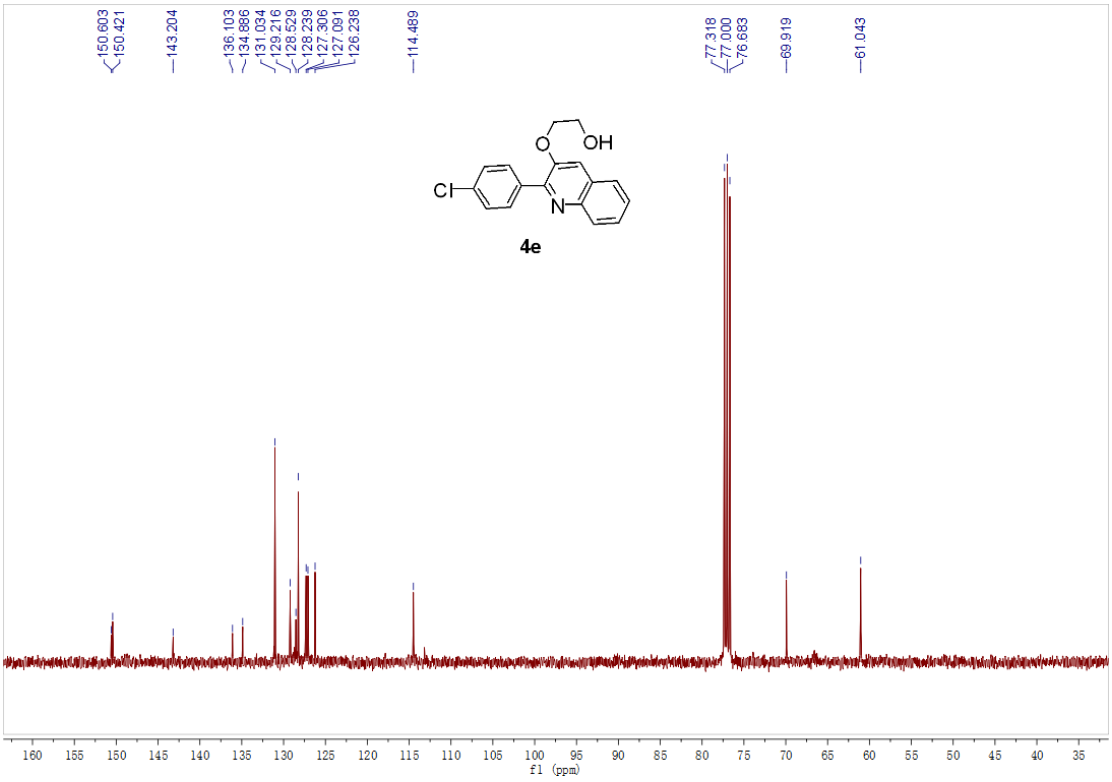
f1 (ppm)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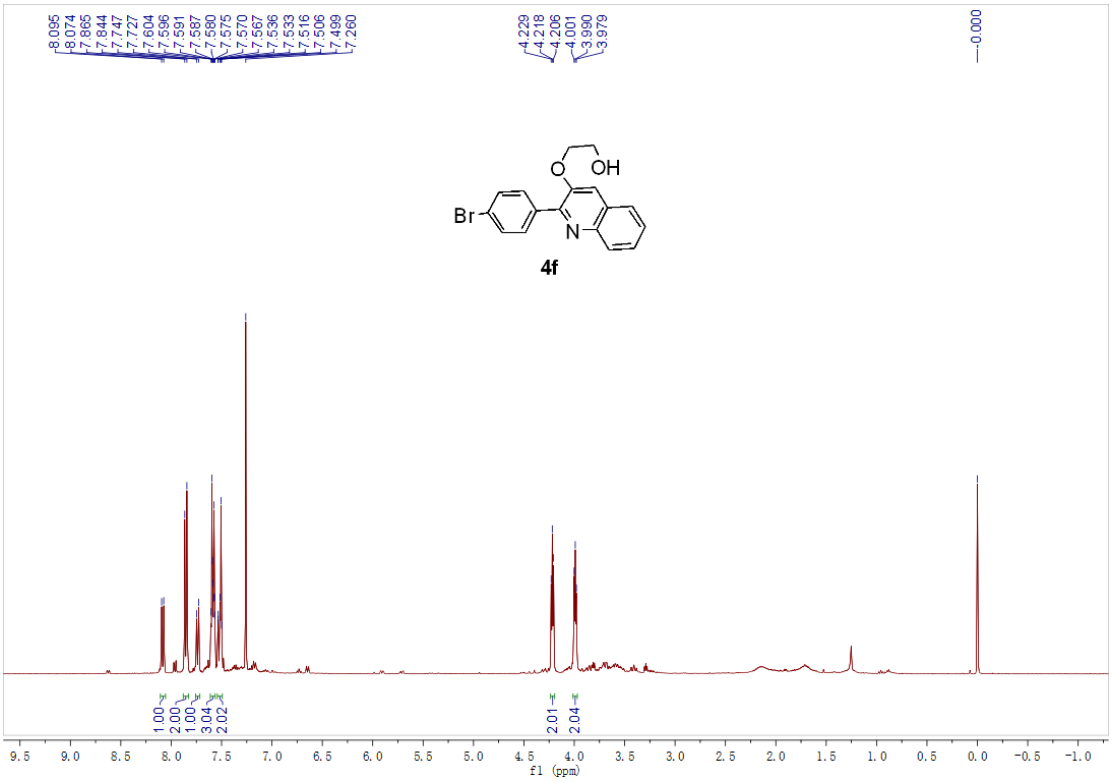
4e
f1 (ppm)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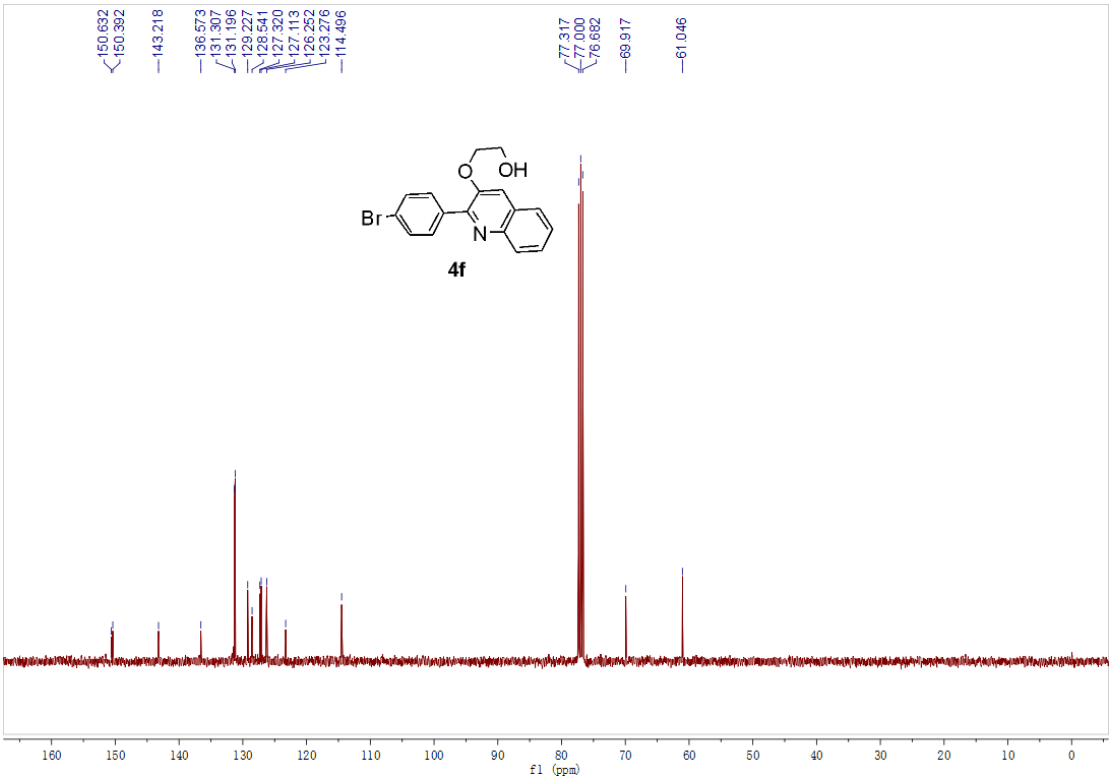
f1 (ppm)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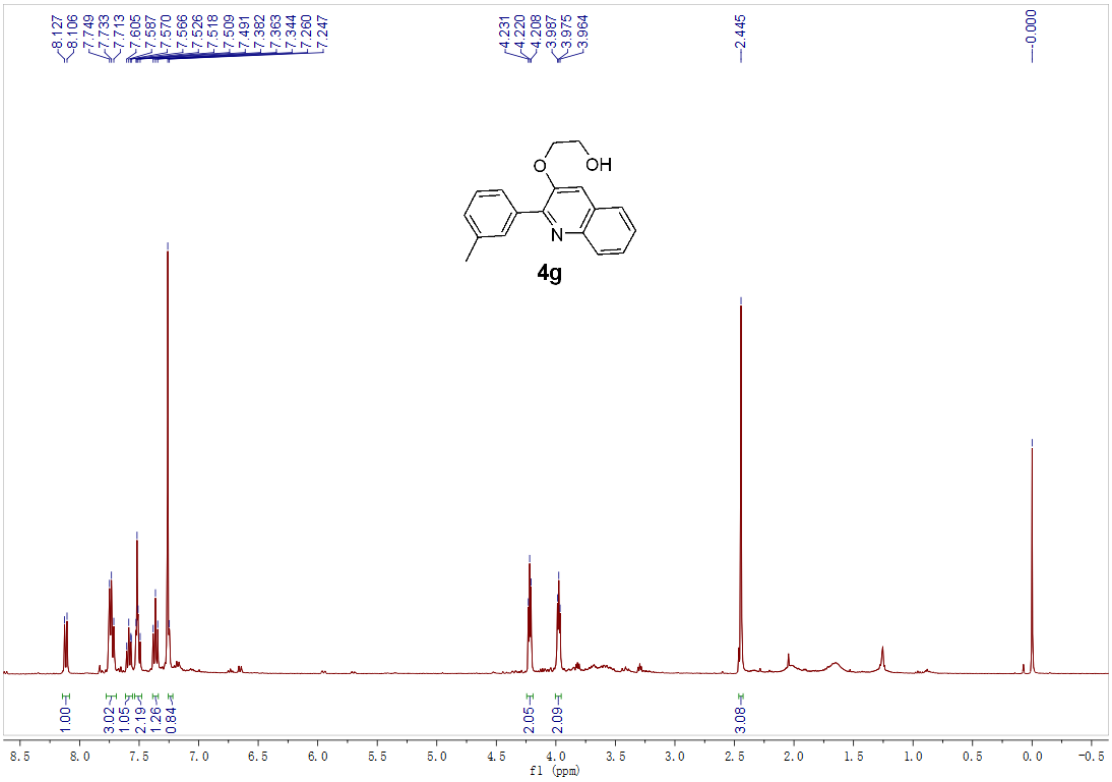
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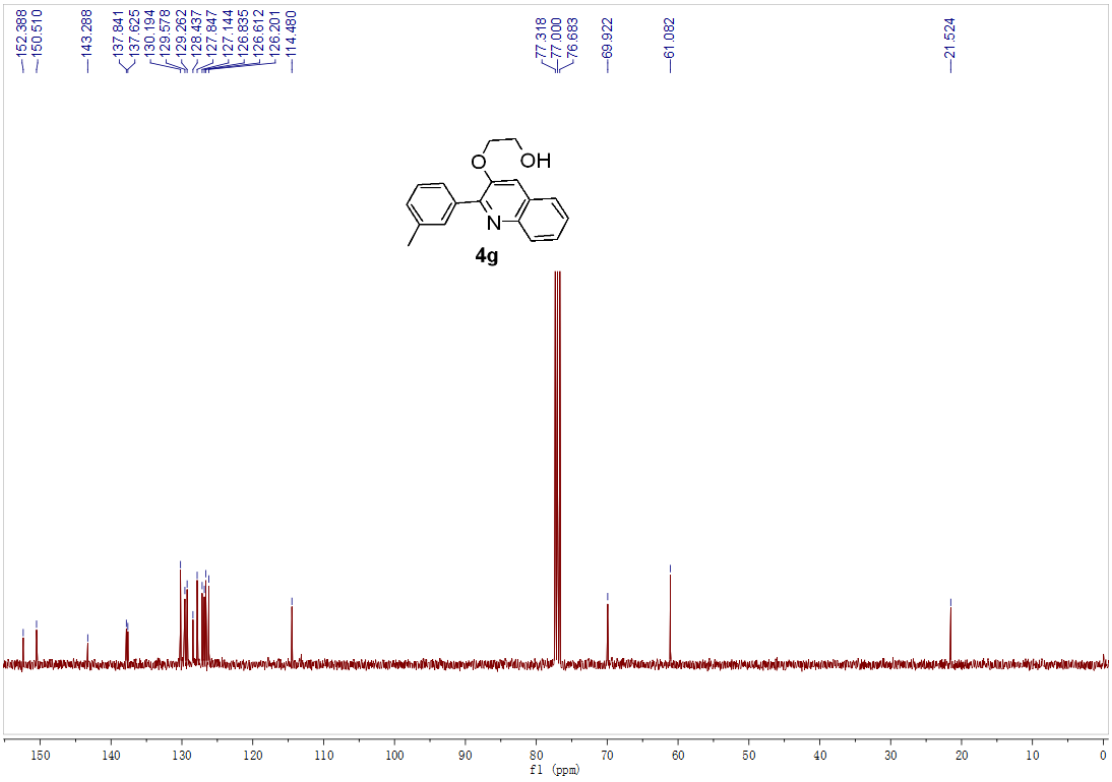
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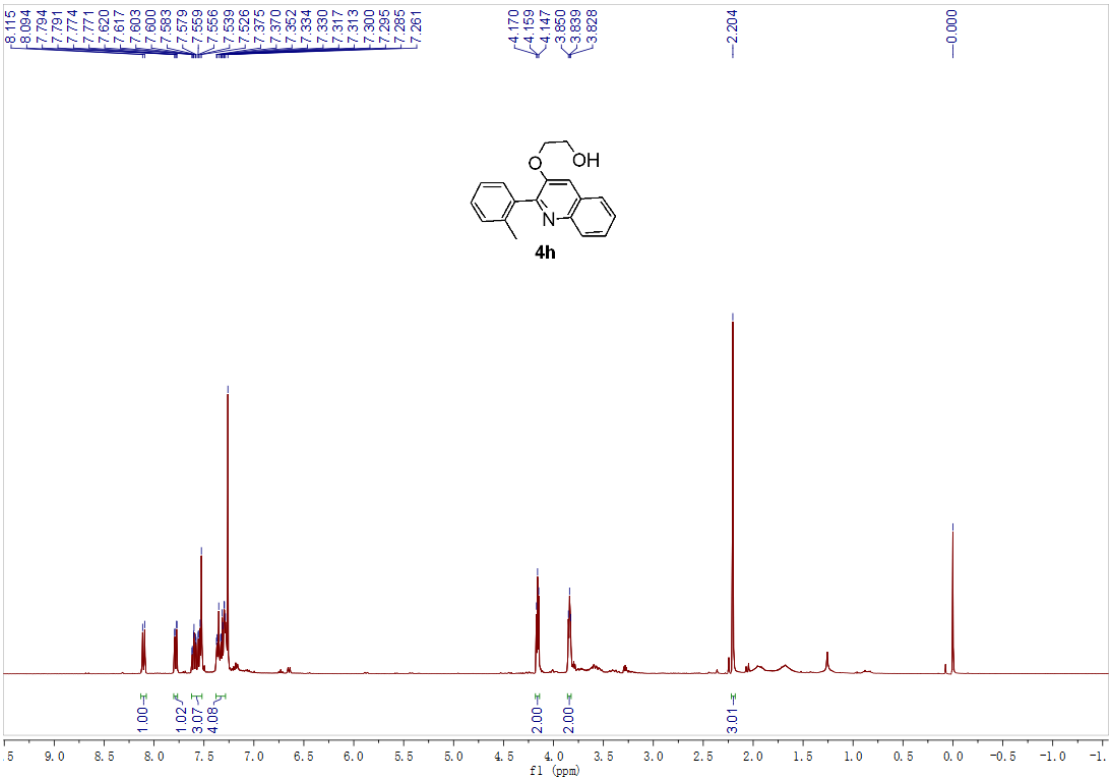
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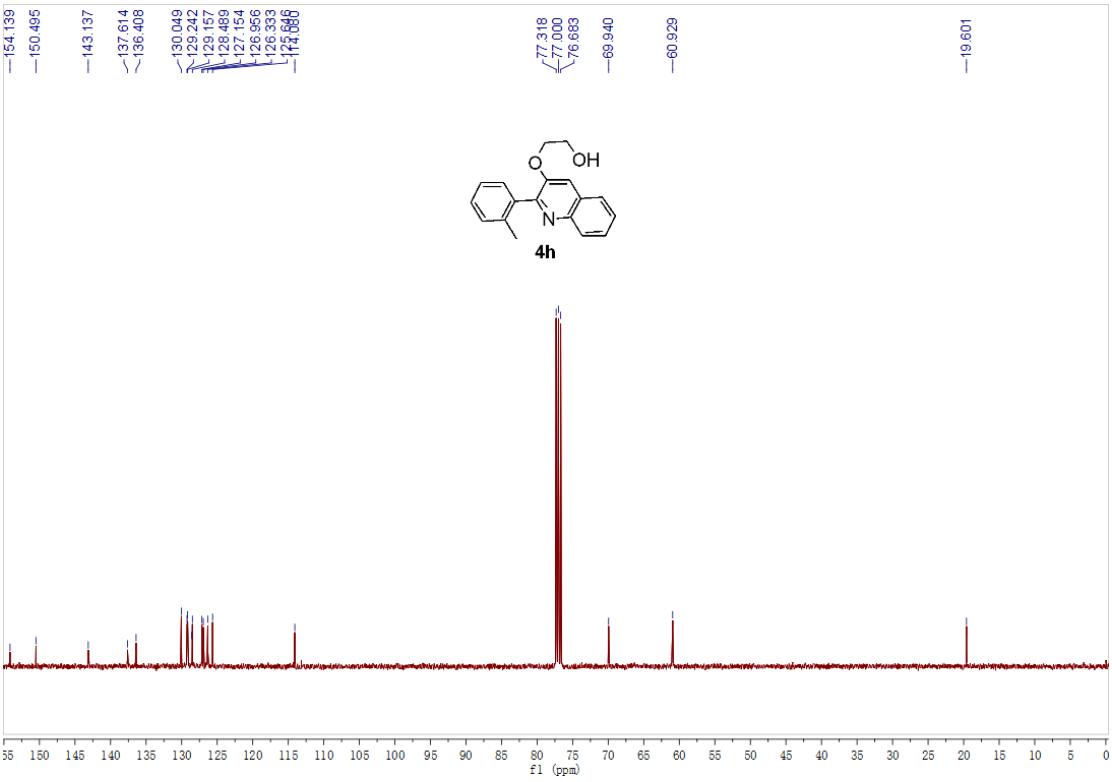
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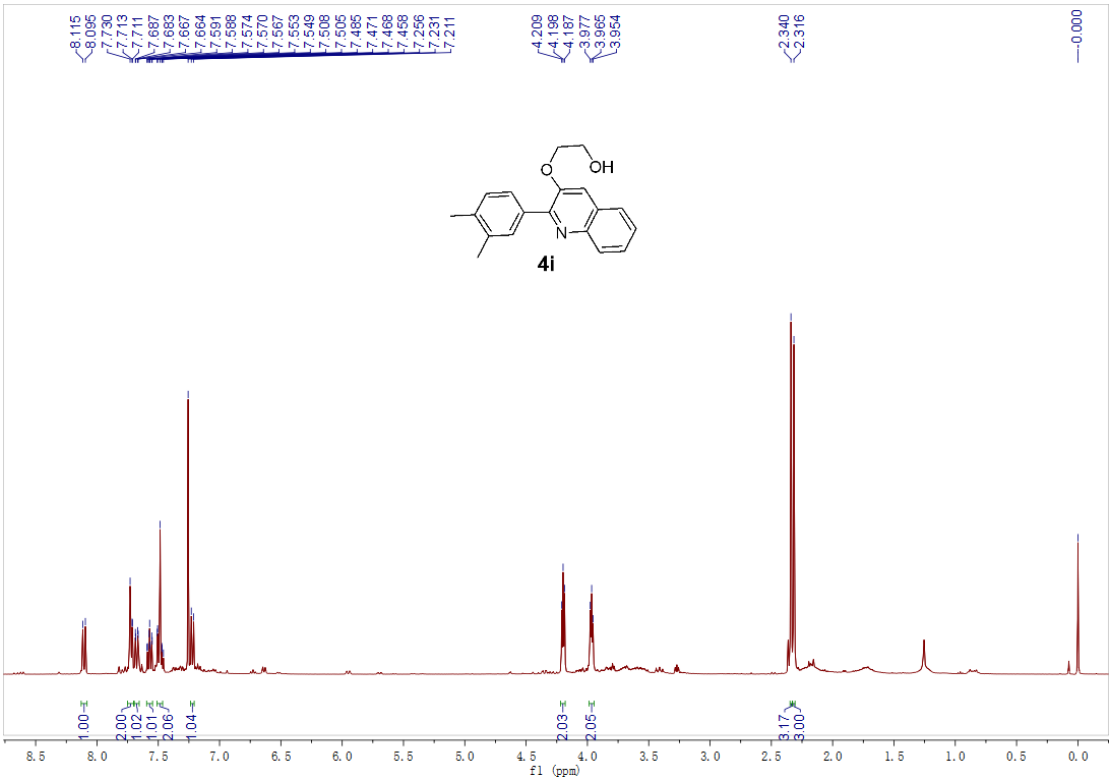
f1 (ppm)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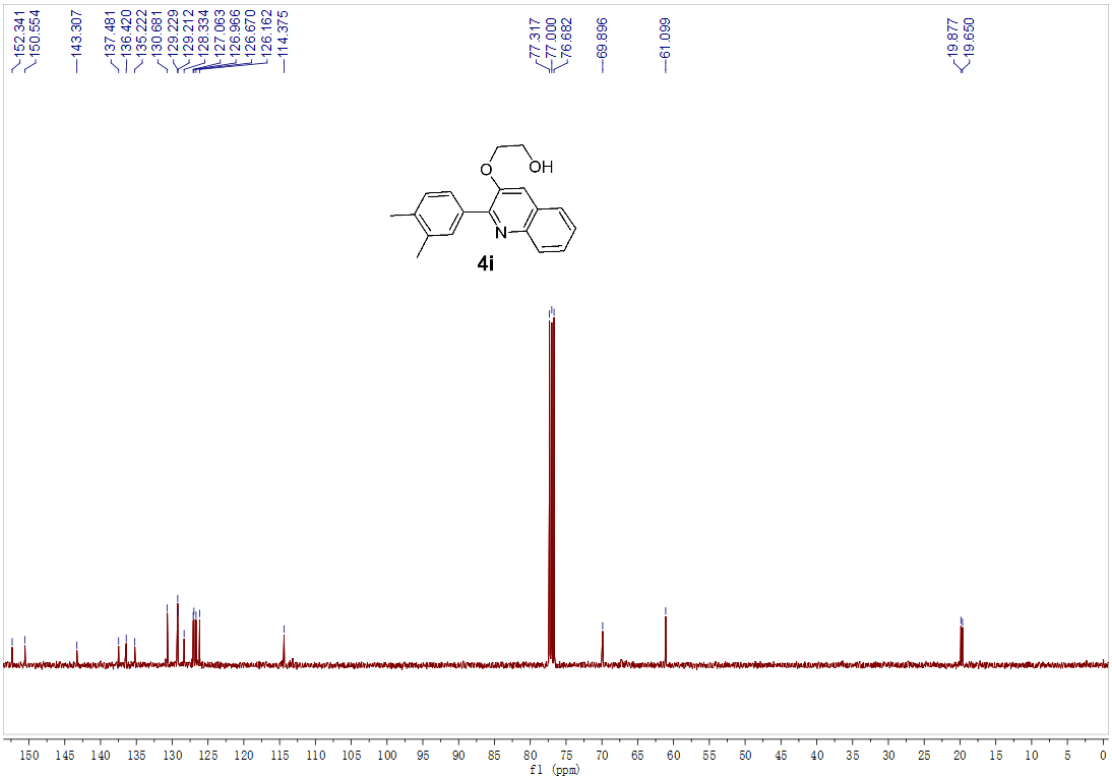
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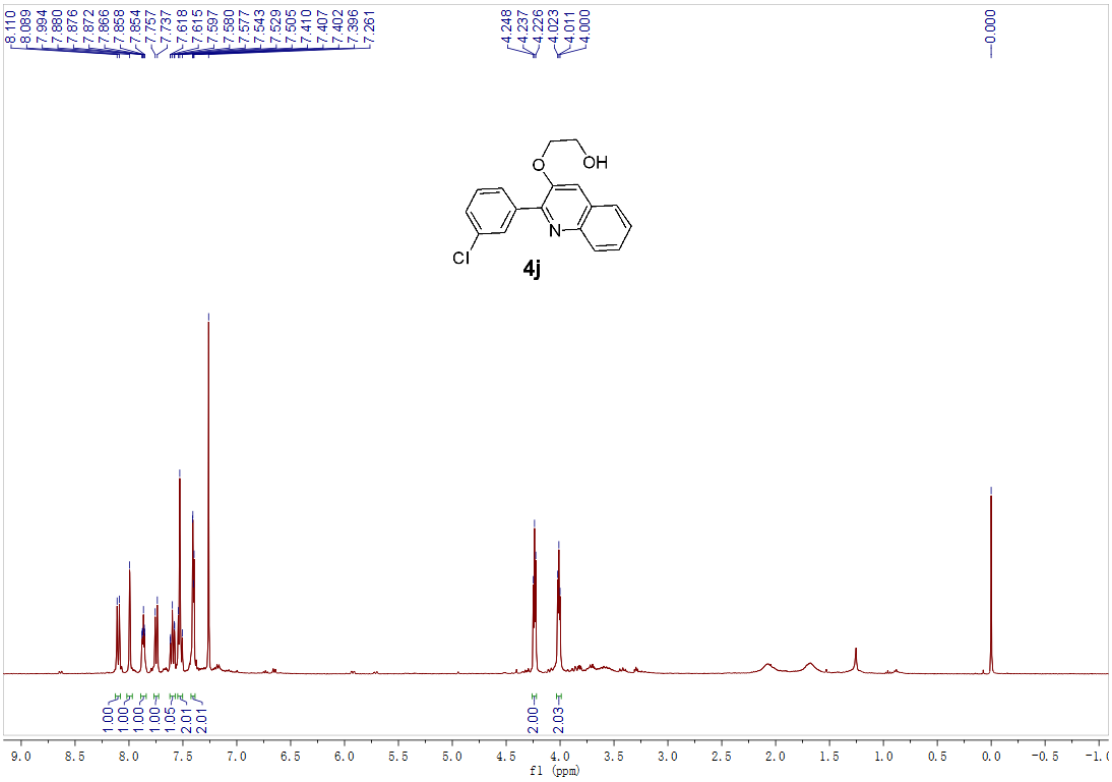
4i
f1 (ppm)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1.05
2.01
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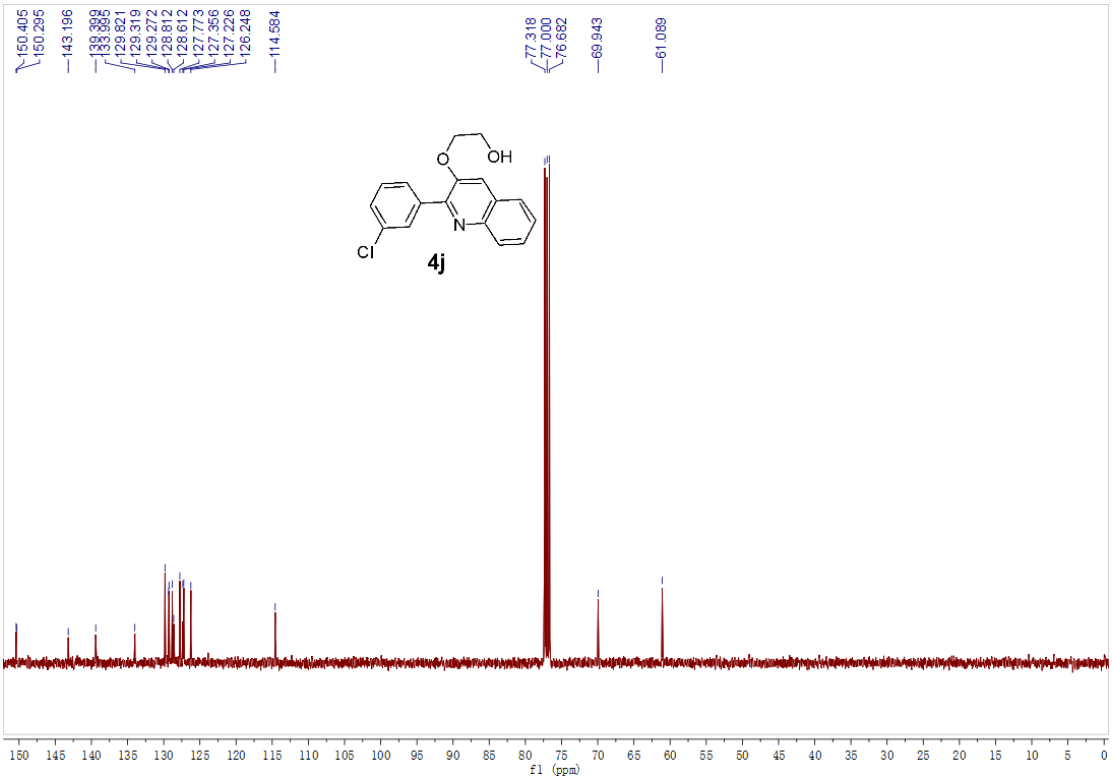
2.00
2.03
f1 (ppm)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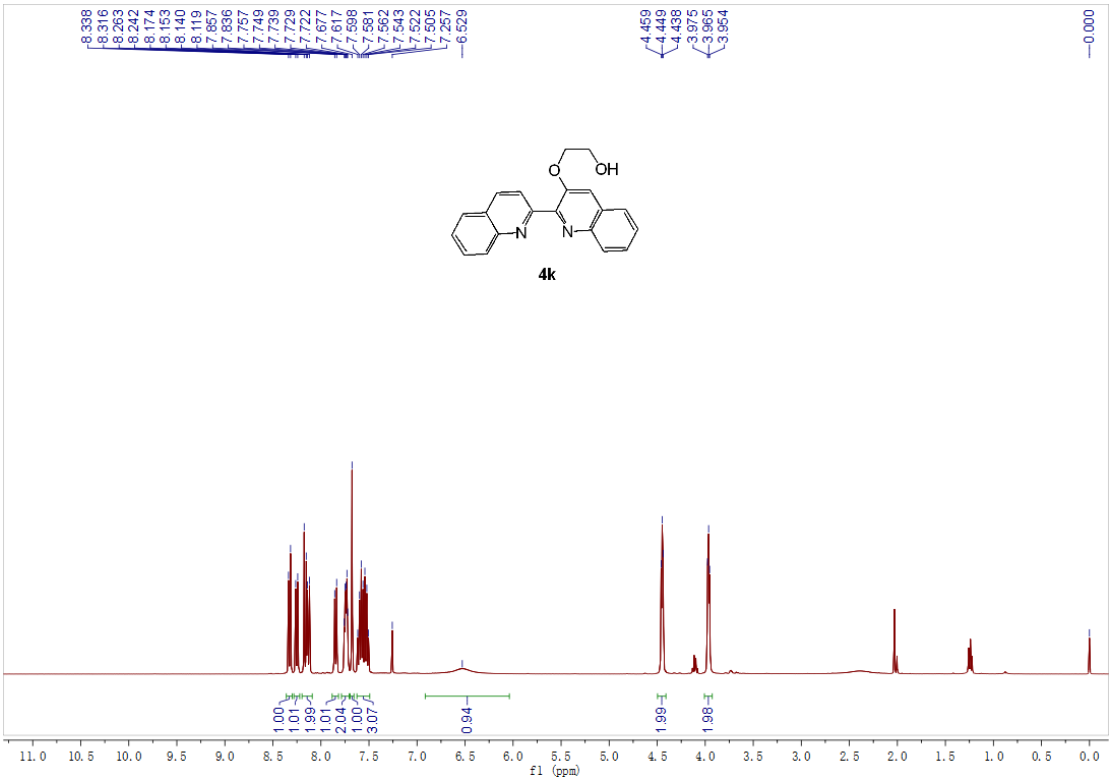
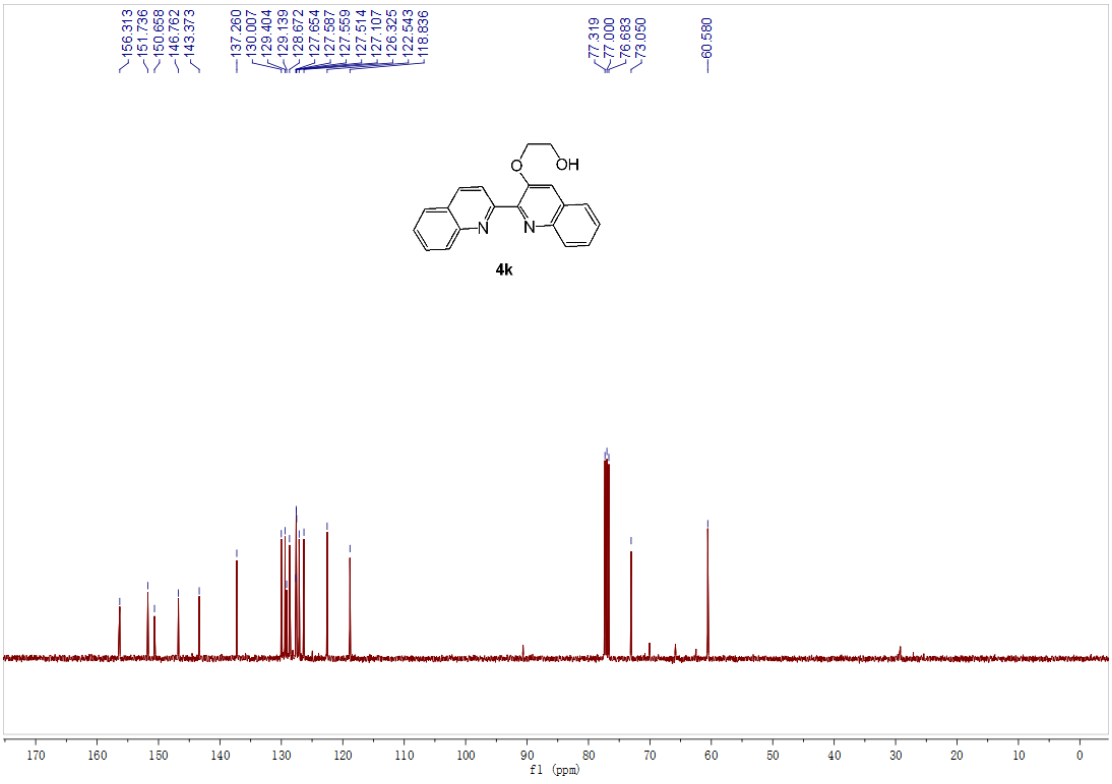
150.295
143.196
139.399
133.995
129.821
129.319
129.272
128.812
128.612
127.773
127.356
127.226
126.248
114.584
77.318
77.000
76.682
69.943
61.089
O
OH
N
Cl
4j
f1 (ppm)


8.338
8.316
8.263
8.242
8.174
8.153
8.140
8.119
7.857
7.836
7.757
7.749
7.739
7.729
7.722
7.677
7.617
7.598
7.581
7.562
7.543
7.522
7.505
7.257
6.529
4.459
4.449
4.438
3.975
3.965
3.954
0.000
O
OH
N
N
4k
1.00
1.01
1.99
1.01
2.04
1.00
3.07
0.94
1.99
1.98
11.0 10.5 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)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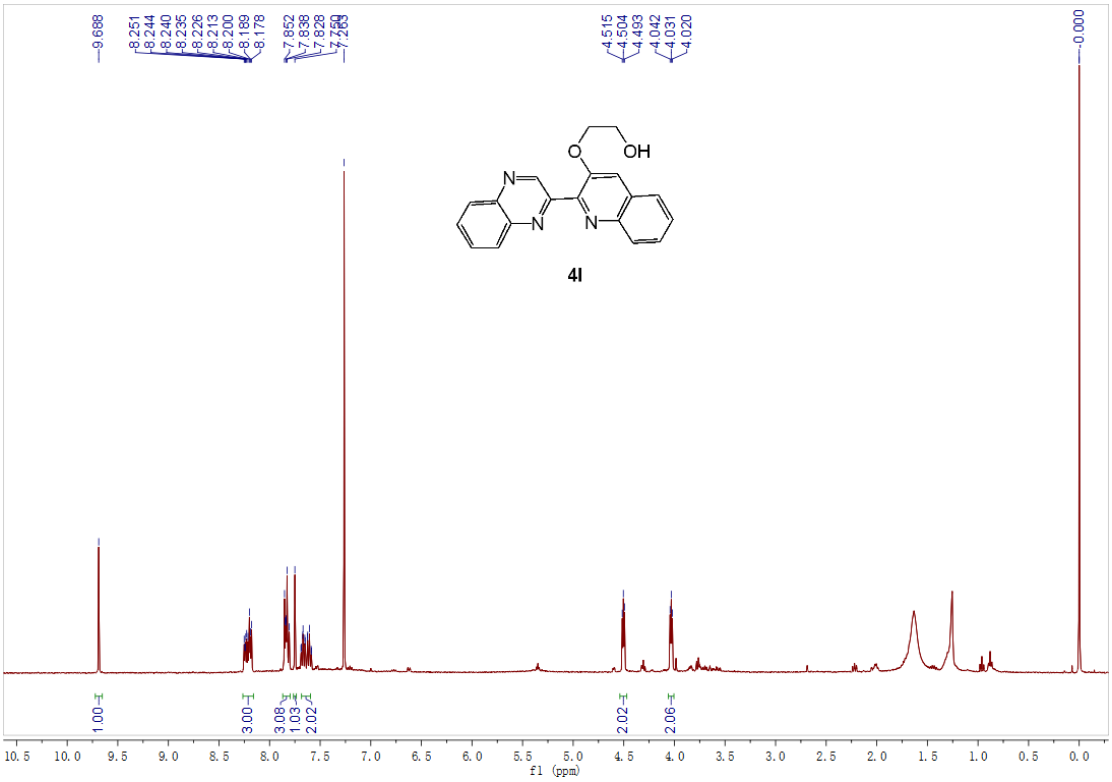
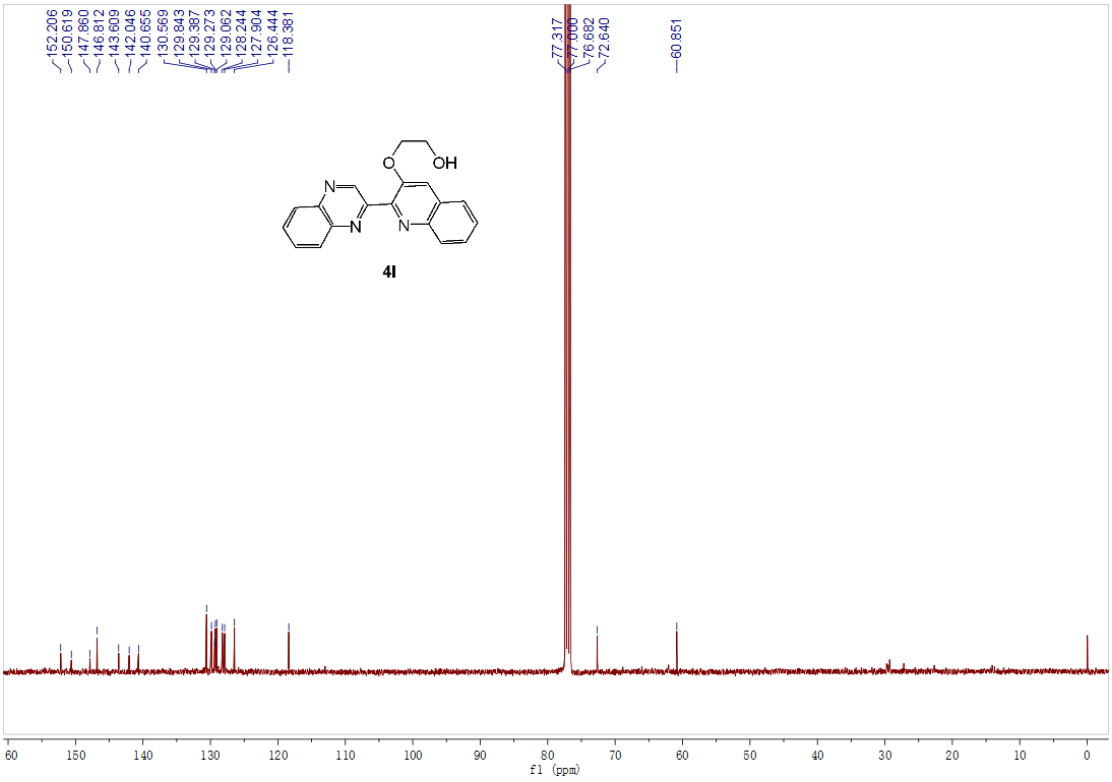
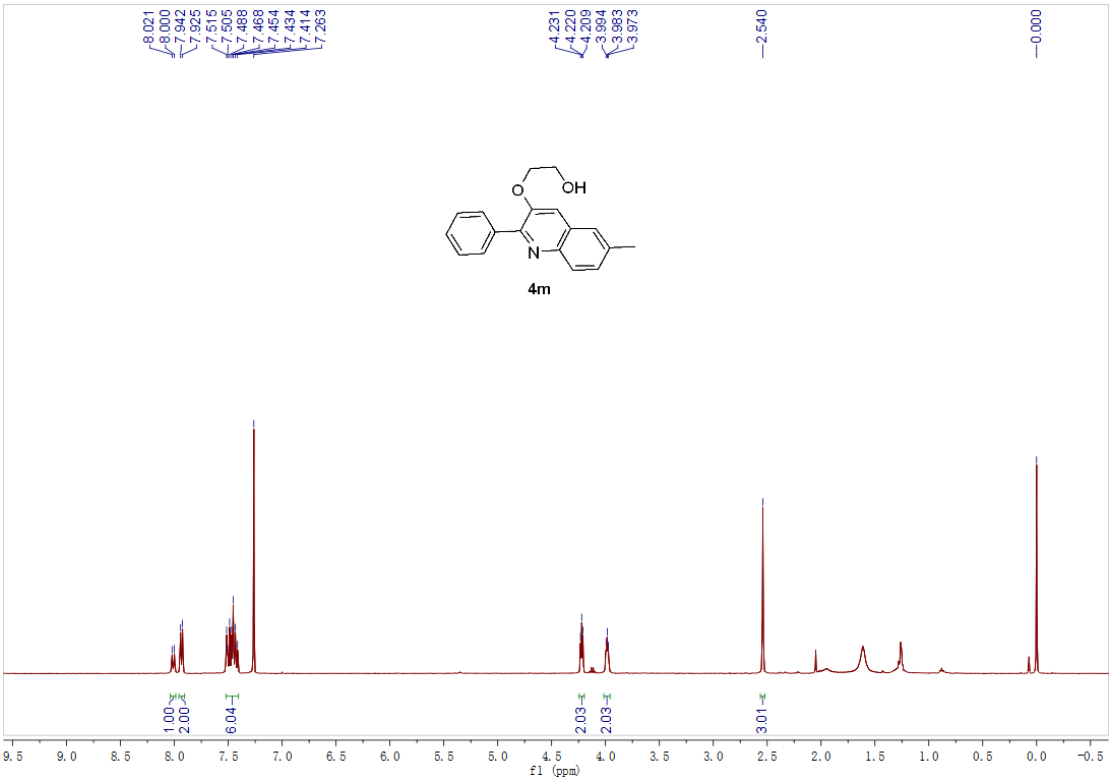
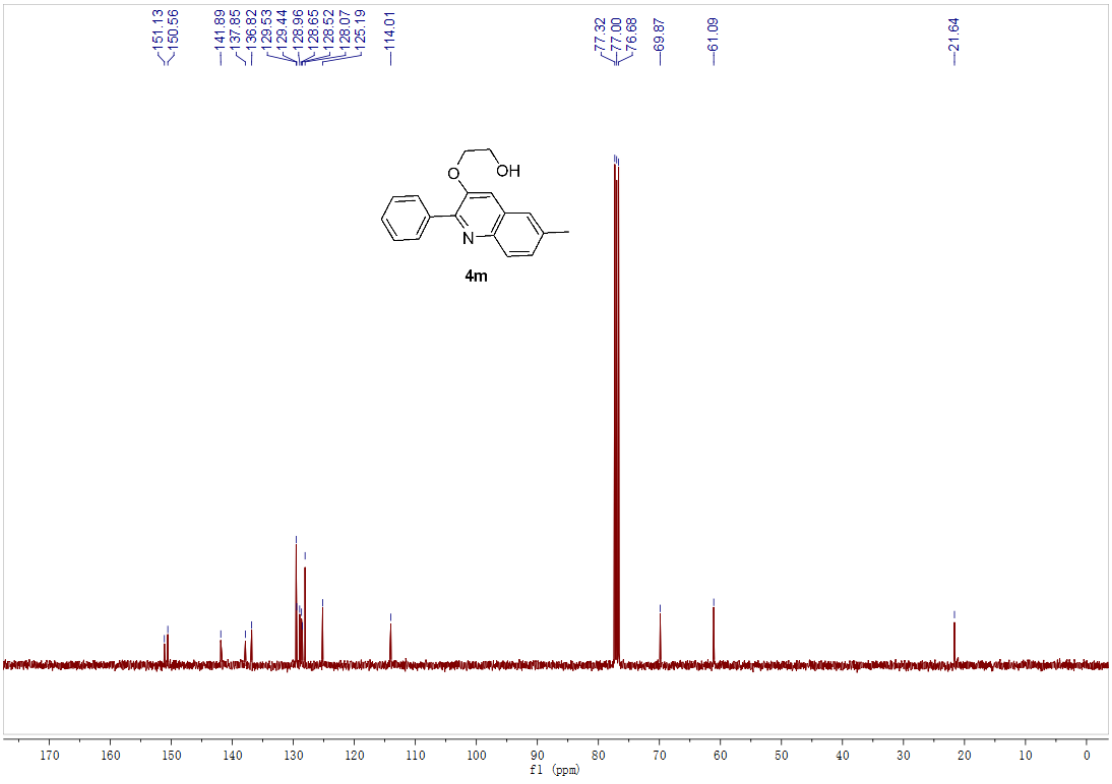
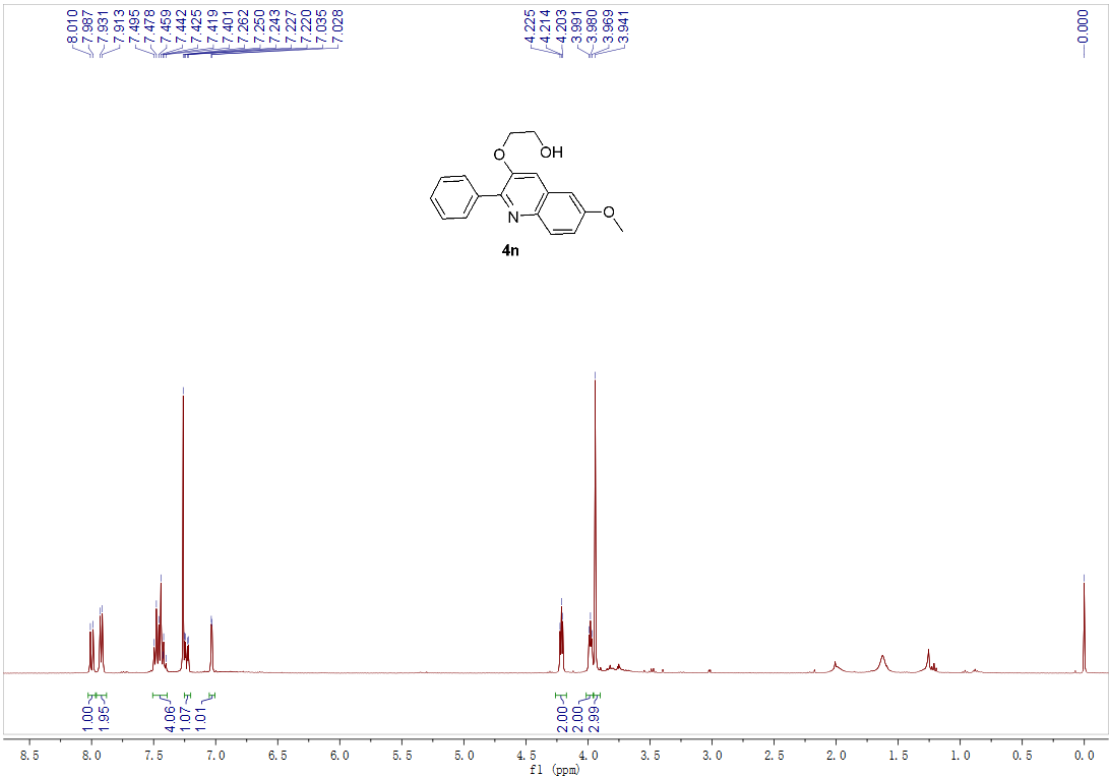
151.736
150.658
146.762
143.373
137.260
130.007
129.404
129.139
128.672
127.654
127.587
127.559
127.514
127.107
126.325
122.543
118.836
77.319
77.000
76.683
73.050
60.580
O
OH
N
N
4k
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

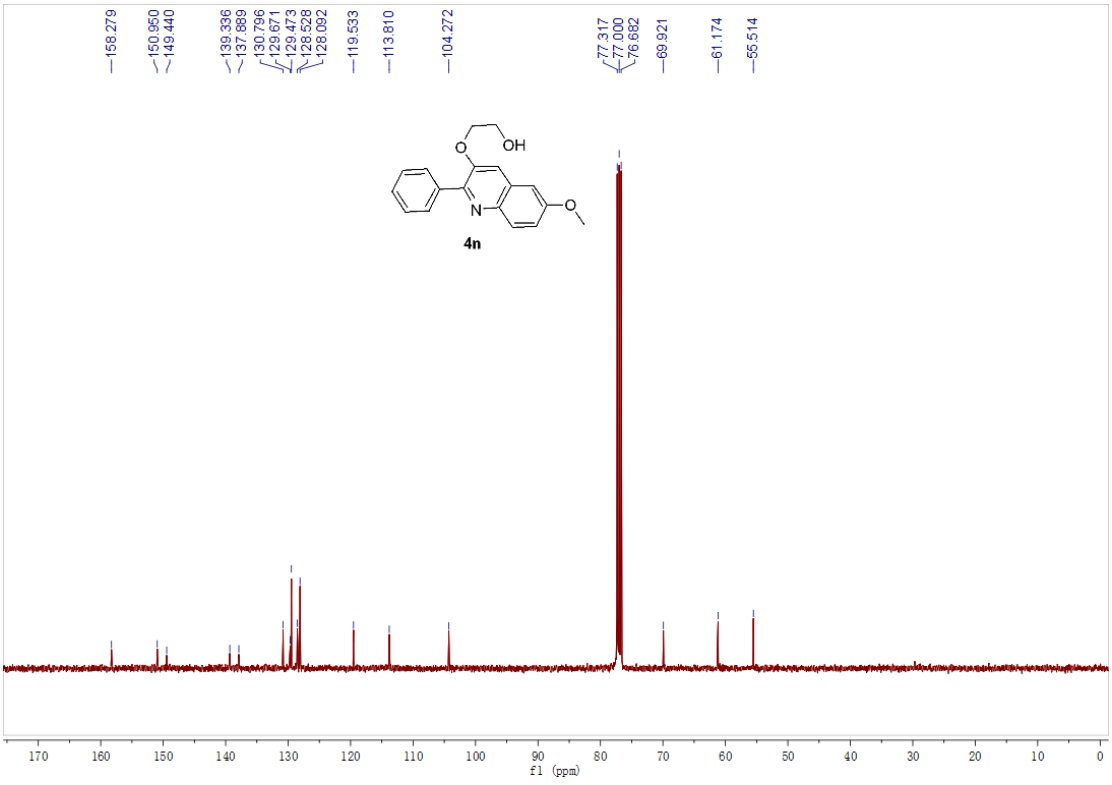

9.688
8.251
8.244
8.240
8.235
8.226
8.213
8.200
8.189
8.178
7.852
7.838
7.828
7.760
7.753
4.515
4.504
4.493
4.042
4.031
4.020
0.000
OH
N
N
N
4l
1.00
3.00
3.08
1.03
2.02
2.02
2.06
f1 (ppm)

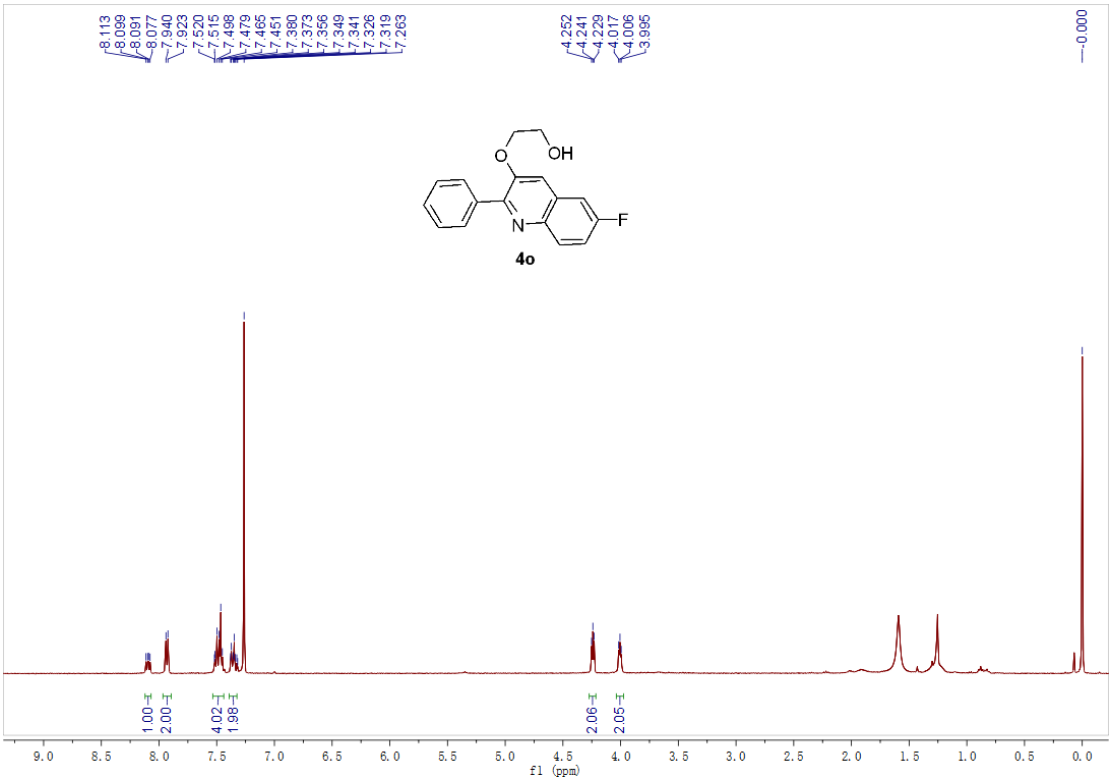

152.206
150.619
147.860
146.812
143.609
142.046
140.655
130.569
129.843
129.387
129.273
129.062
128.244
127.904
126.444
118.381
77.317
77.000
76.682
72.640
60.851
OH
N
N
N
4l
f1 (ppm)

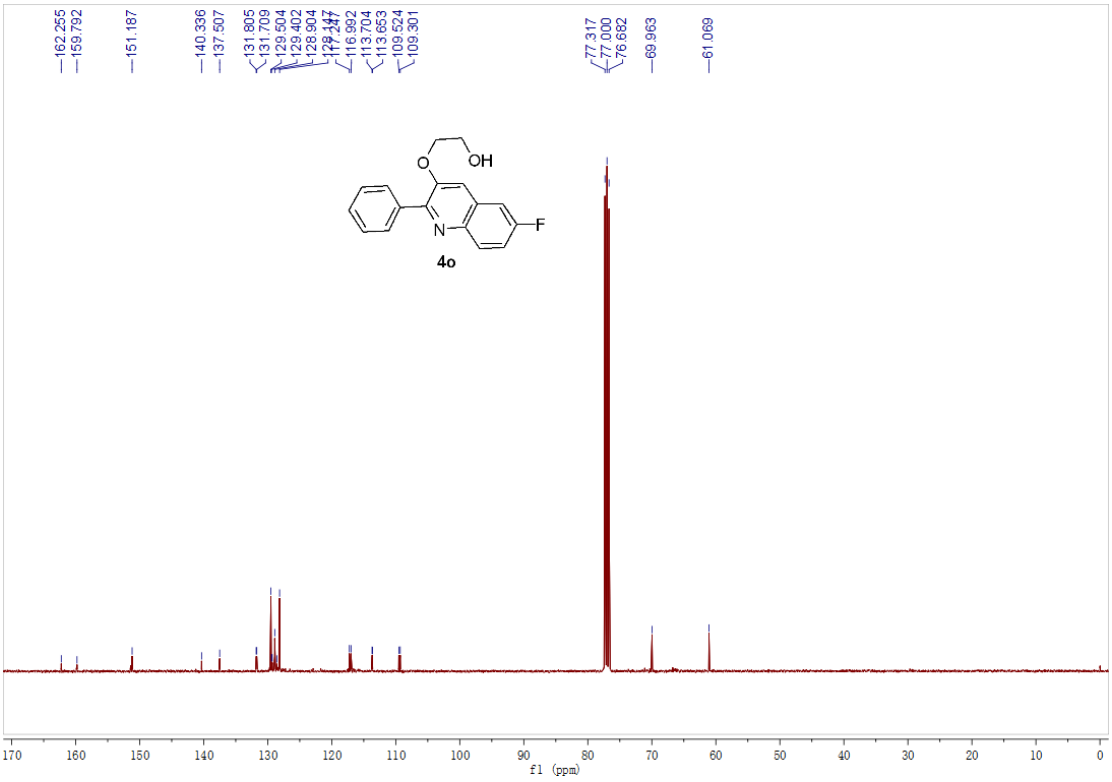

8.021
8.000
7.942
7.925
7.515
7.505
7.488
7.468
7.454
7.434
7.414
7.263
4.231
4.220
4.209
3.994
3.983
3.973
2.540
0.000
OH
O
N
4m
1.00
2.00
6.04
2.03
2.03
3.01
f1 (ppm)

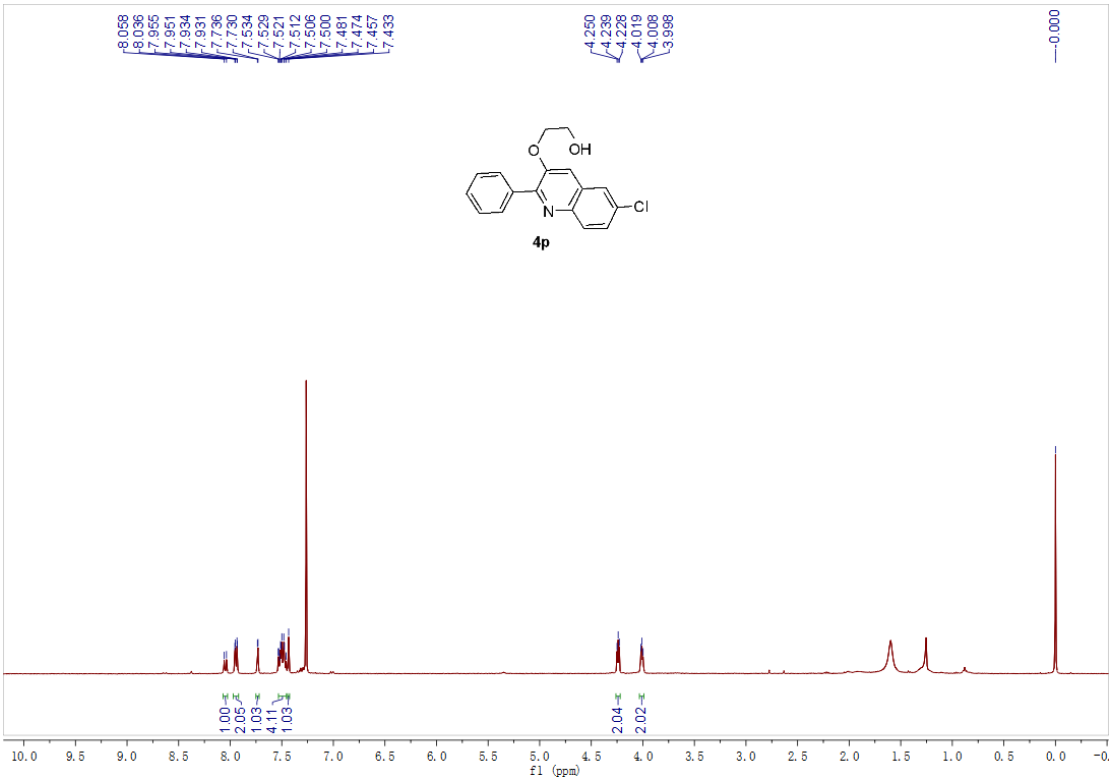

151.13
150.56
141.89
137.85
136.82
129.53
129.44
128.96
128.65
128.52
128.07
125.19
114.01
77.32
77.00
76.68
69.87
61.09
21.64
OH
O
N
4m
f1 (ppm)

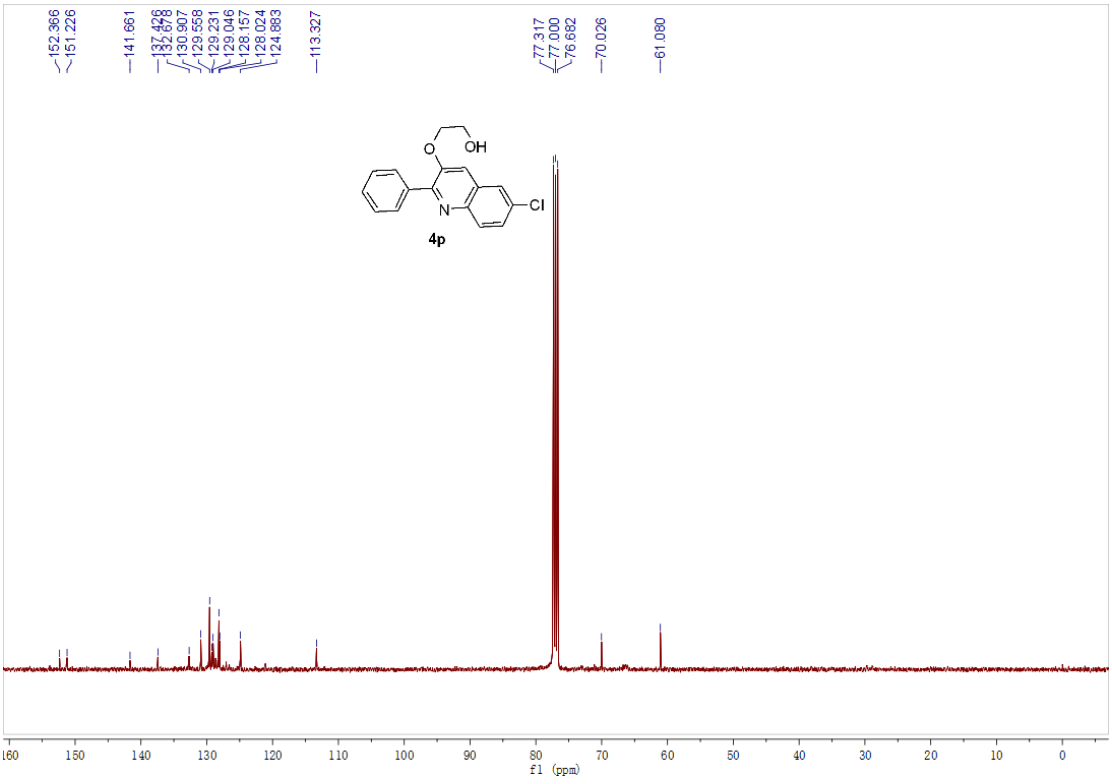

8.010
7.987
7.931
7.913
7.495
7.478
7.459
7.442
7.425
7.419
7.401
7.262
7.250
7.243
7.227
7.220
7.035
7.028
4.225
4.214
4.203
3.991
3.980
3.969
3.941
0.000
OH
O
N
O
4n
1.00
1.95
4.06
1.07
1.01
2.00
2.00
2.99
f1 (ppm)


158.279
150.950
149.440
139.336
137.889
130.796
129.671
129.473
128.528
128.092
119.533
113.810
104.272
77.317
77.000
76.682
69.921
61.174
55.514
OH
O
N
O
4n
f1 (ppm)


8.113
8.099
8.091
8.077
7.940
7.923
7.520
7.515
7.498
7.479
7.465
7.451
7.380
7.373
7.356
7.349
7.341
7.326
7.319
7.263
4.252
4.241
4.229
4.017
4.006
3.995
0.000
OH
O
N
F
4o
1.00
2.00
4.02
1.98
2.06
2.05
f1 (ppm)


162.255
159.792
151.187
140.336
137.507
131.805
131.709
129.504
129.402
128.904
116.992
113.704
113.653
109.524
109.301
77.317
77.000
76.682
69.963
61.069
OH
O
N
F
4o
f1 (ppm)


8.058
8.036
7.955
7.951
7.934
7.931
7.736
7.730
7.534
7.529
7.521
7.512
7.506
7.500
7.481
7.474
7.457
7.433
4.250
4.239
4.228
4.019
4.008
3.998
0.000
OH
O
N
Cl
4p
1.00
2.05
1.03
4.11
1.03
2.04
2.02
f1 (ppm)


152.366
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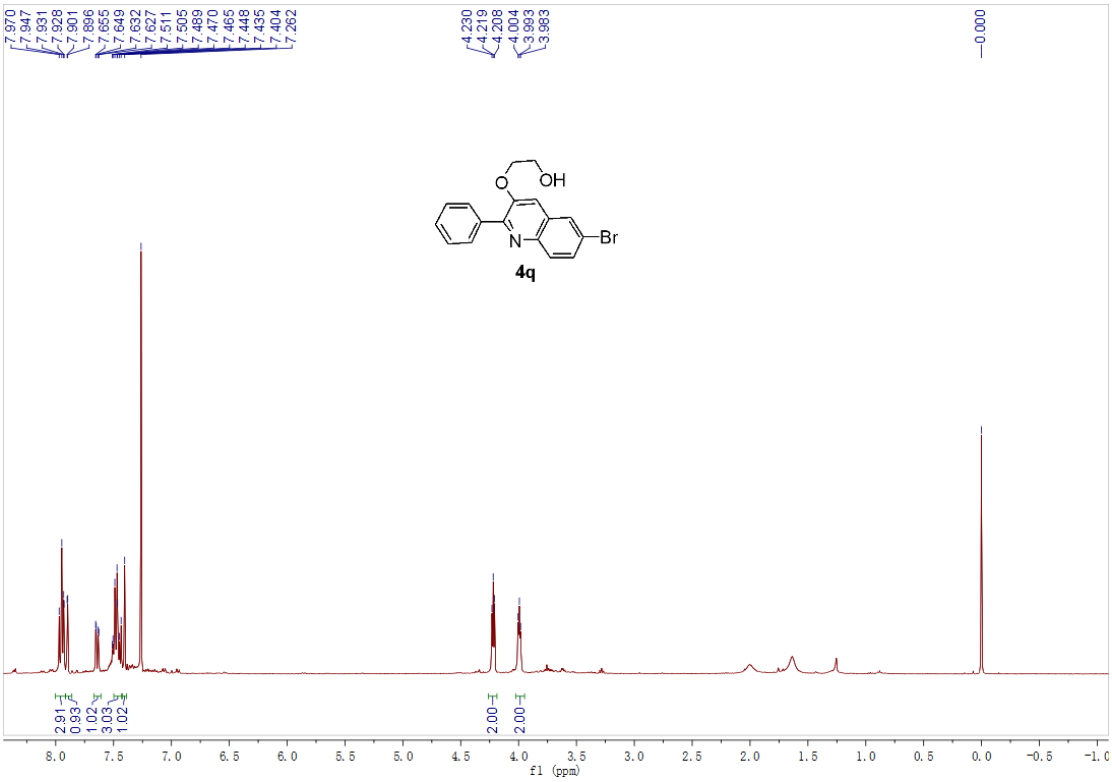
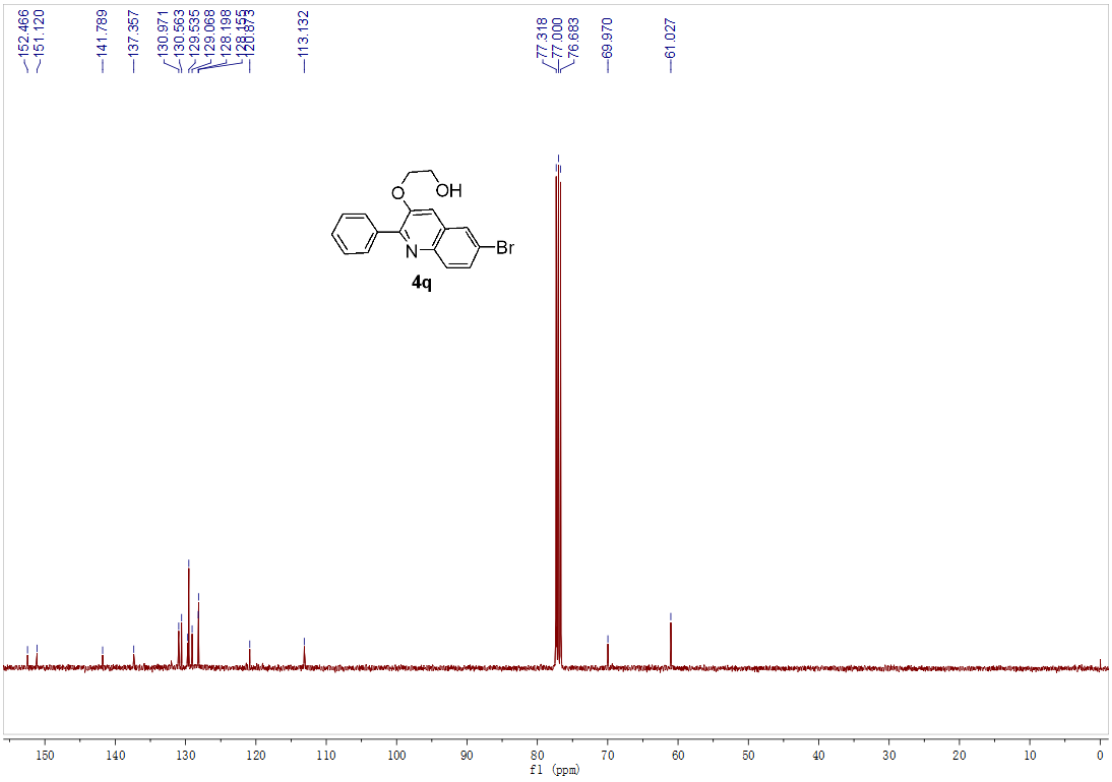
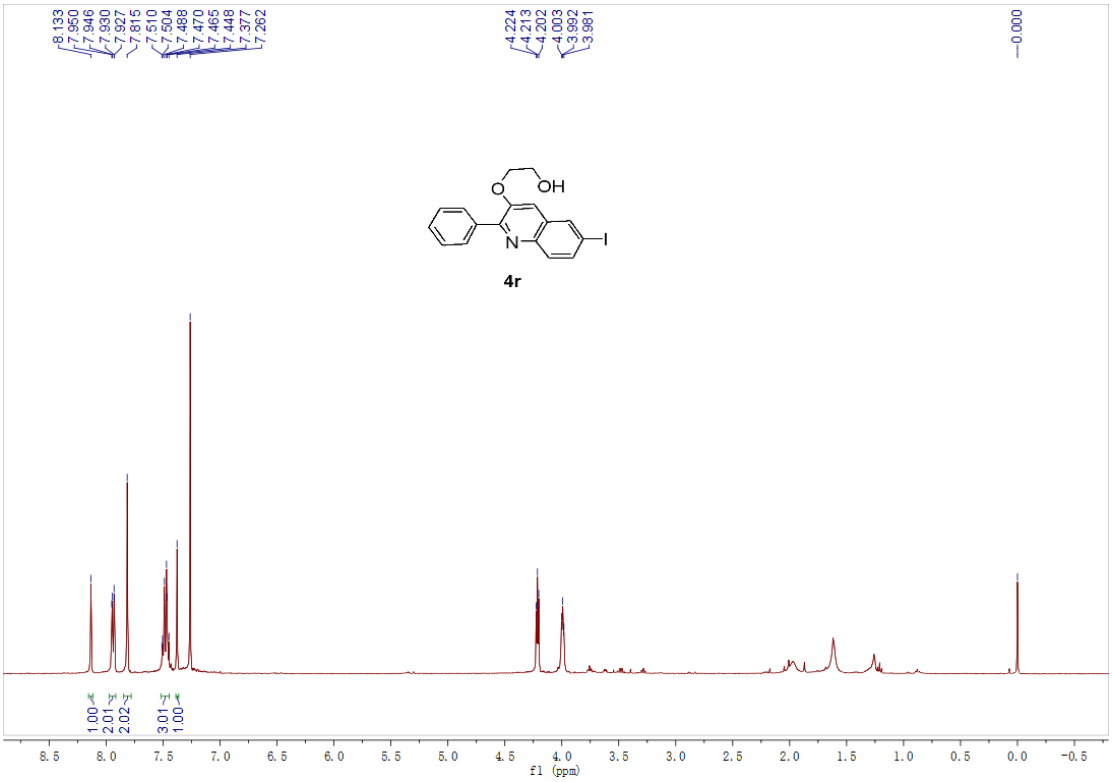
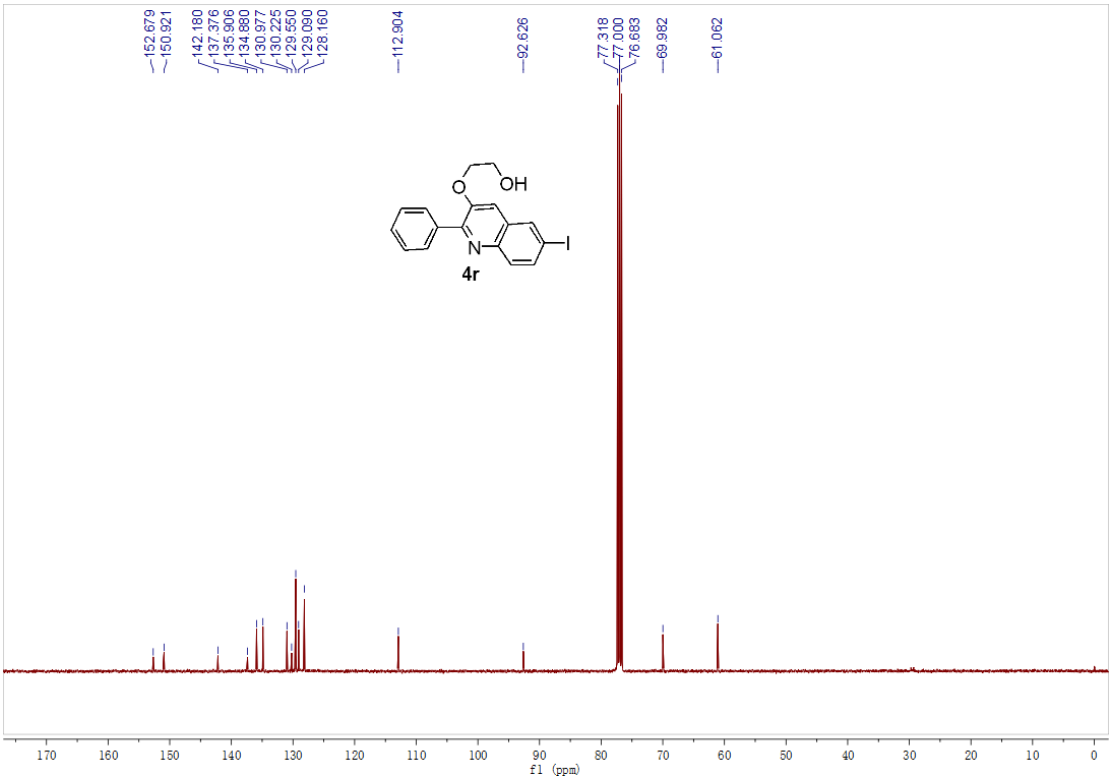
141.661
137.426
132.478
130.907
129.558
129.231
129.046
128.157
128.024
124.883
113.327
77.317
77.000
76.682
70.026
61.080
OH
O
N
Cl
4p
f1 (ppm)


7.970
7.947
7.931
7.928
7.901
7.896
7.655
7.649
7.632
7.627
7.511
7.505
7.489
7.470
7.465
7.448
7.435
7.404
7.262
4.230
4.219
4.208
4.004
3.993
3.983
0.000
OH
O
N
Br
4q
2.91
0.93
1.02
3.03
1.02
2.00
2.00
f1 (ppm)


152.466
151.120
141.789
137.357
130.971
130.563
129.535
129.068
128.198
113.132
77.318
77.000
76.683
69.970
61.027
OH
O
N
Br
4q
f1 (ppm)


8.133
7.950
7.946
7.930
7.927
7.815
7.510
7.504
7.488
7.470
7.465
7.448
7.377
7.262
4.224
4.213
4.202
4.003
3.992
3.981
0.000
OH
O
N
I
4r
1.00
2.01
2.02
3.01
1.00
f1 (ppm)


152.679
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135.906
134.880
130.977
130.225
129.550
129.090
128.160
112.904
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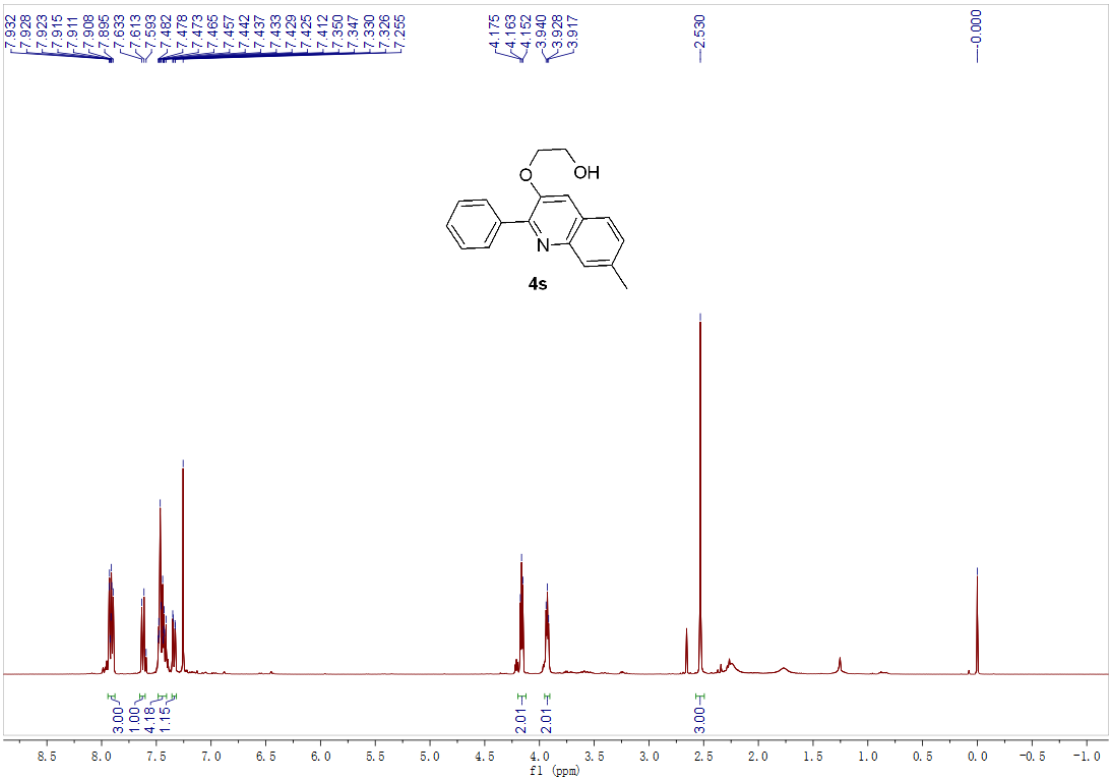
77.318
77.000
76.683
69.982
61.062
OH
O
N
I
4r
f1 (ppm)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7.928
7.923
7.915
7.911
7.908
7.895
7.633
7.613
7.593
7.482
7.478
7.473
7.465
7.457
7.442
7.437
7.433
7.429
7.425
7.412
7.350
7.347
7.330
7.326
7.255
4.175
4.163
4.152
3.940
3.928
3.917
2.530
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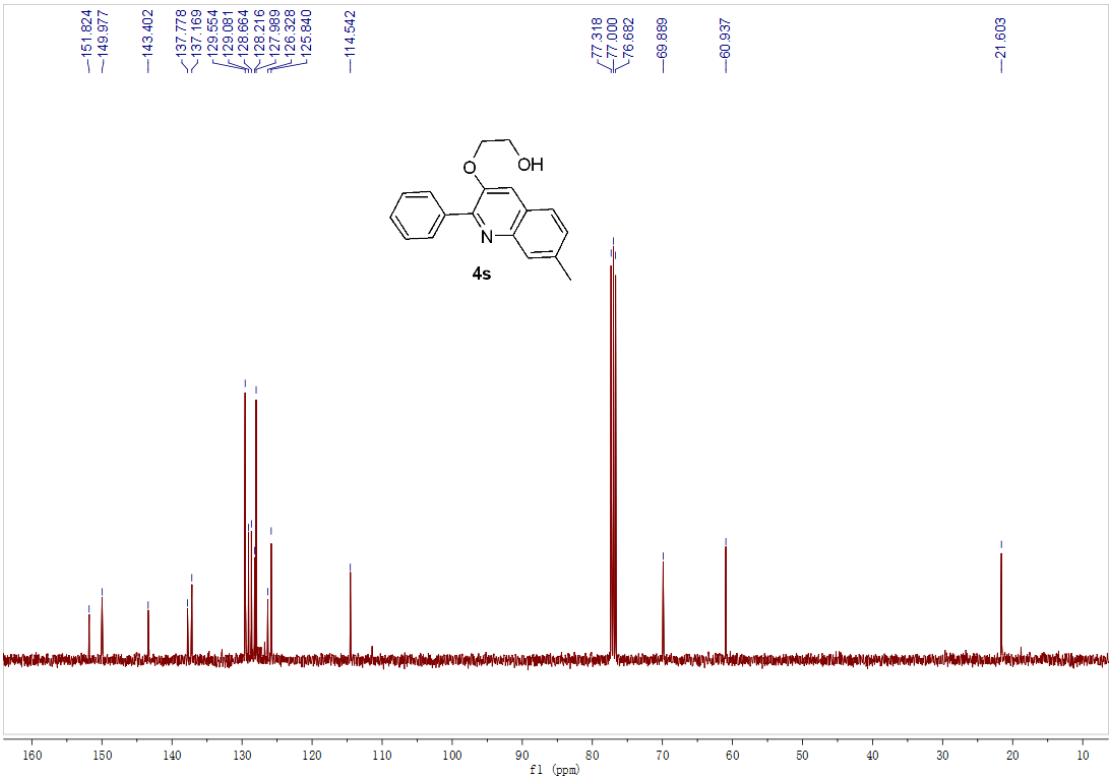
O
N
4s
3.00
1.00
4.18
1.15
2.01
2.01
3.00
f1 (ppm)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143.402
137.778
137.169
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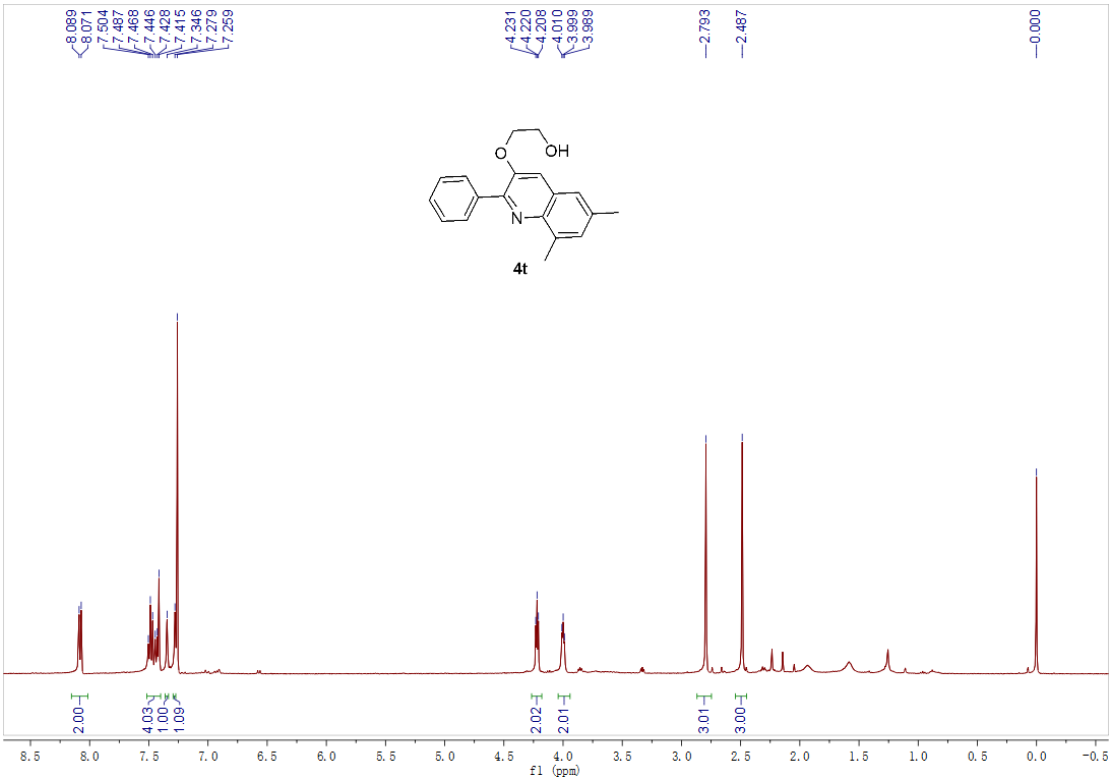
129.081
128.664
128.216
127.989
126.328
125.840
114.542
77.318
77.000
76.682
69.889
60.937
21.603
OH
O
N
4s
f1 (ppm)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8.071
7.504
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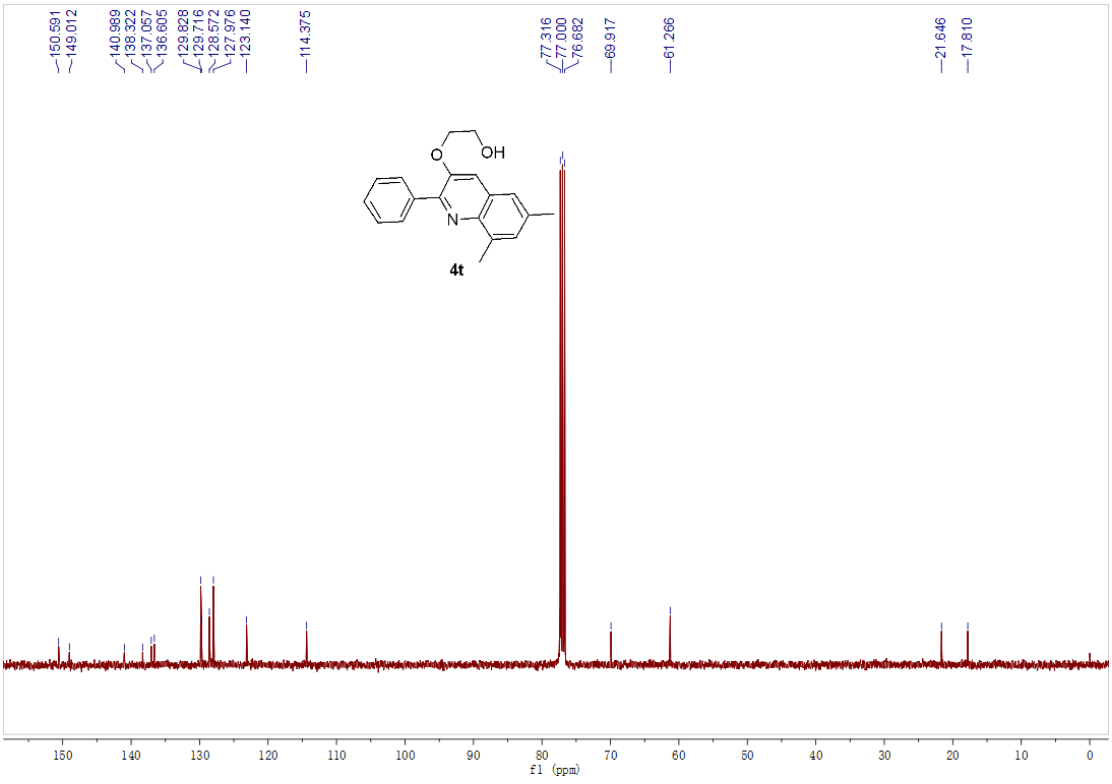
7.468
7.446
7.428
7.415
7.346
7.279
7.259
4.231
4.220
4.208
4.010
3.999
3.989
2.793
2.487
0.000
OH
O
N
4t
2.00
4.03
1.00
1.09
2.02
2.01
3.01
3.00
f1 (ppm)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140.989
138.322
137.057
136.605
129.828
129.716
128.572
127.976
123.140
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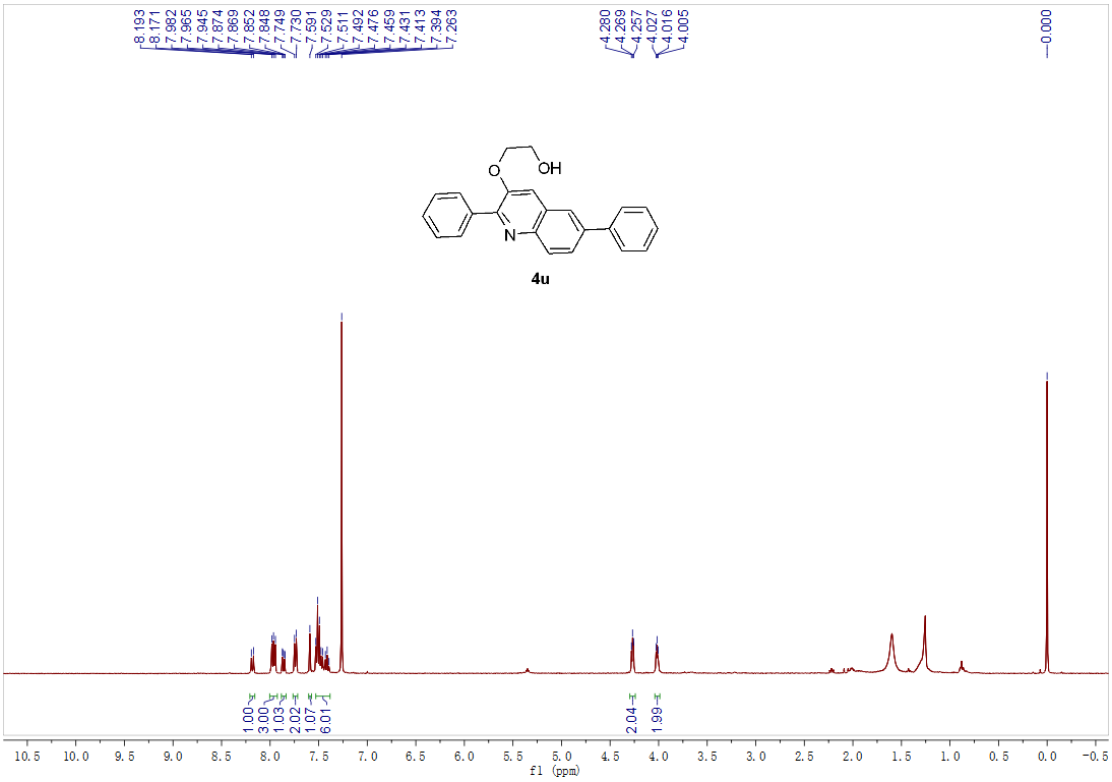
77.316
77.000
76.682
69.917
61.266
21.646
17.810
OH
O
N
4t
f1 (ppm)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7.869
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7.848
7.749
7.730
7.591
7.529
7.511
7.492
7.476
7.459
7.431
7.413
7.394
7.263
4.280
4.269
4.257
4.027
4.016
4.005
0.000
OH
O
N
4u
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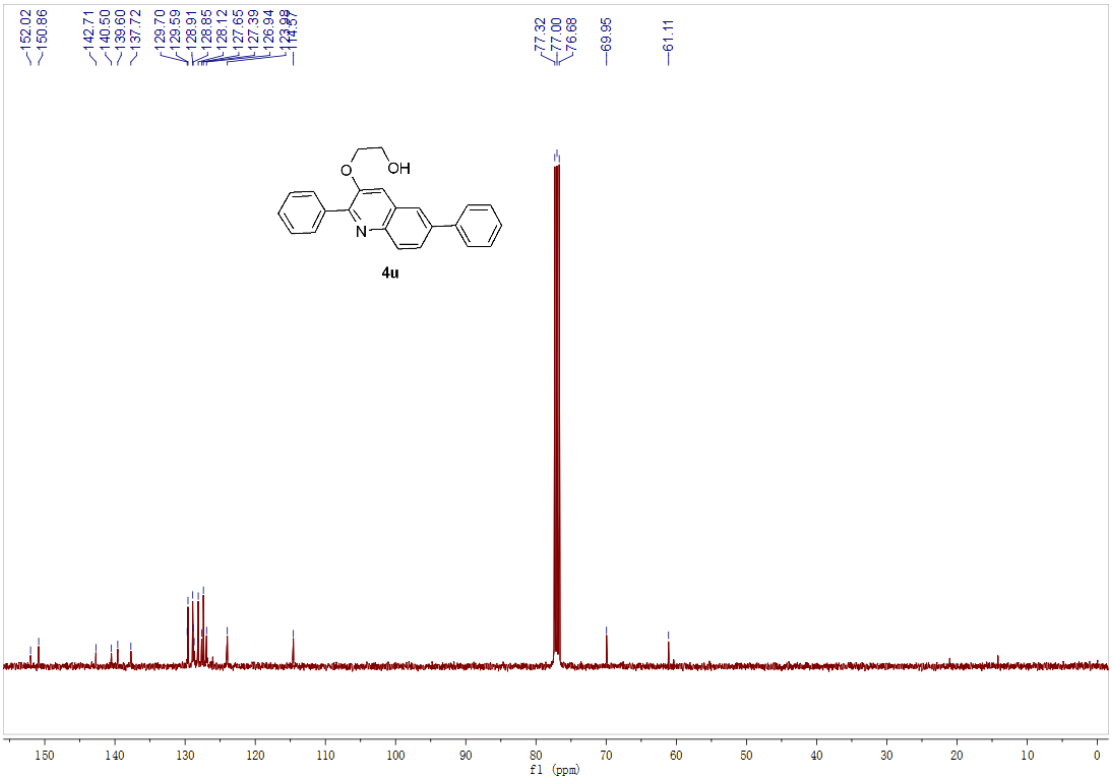
3.00
1.03
2.02
1.07
6.01
2.04
1.99
f1 (ppm)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128.12
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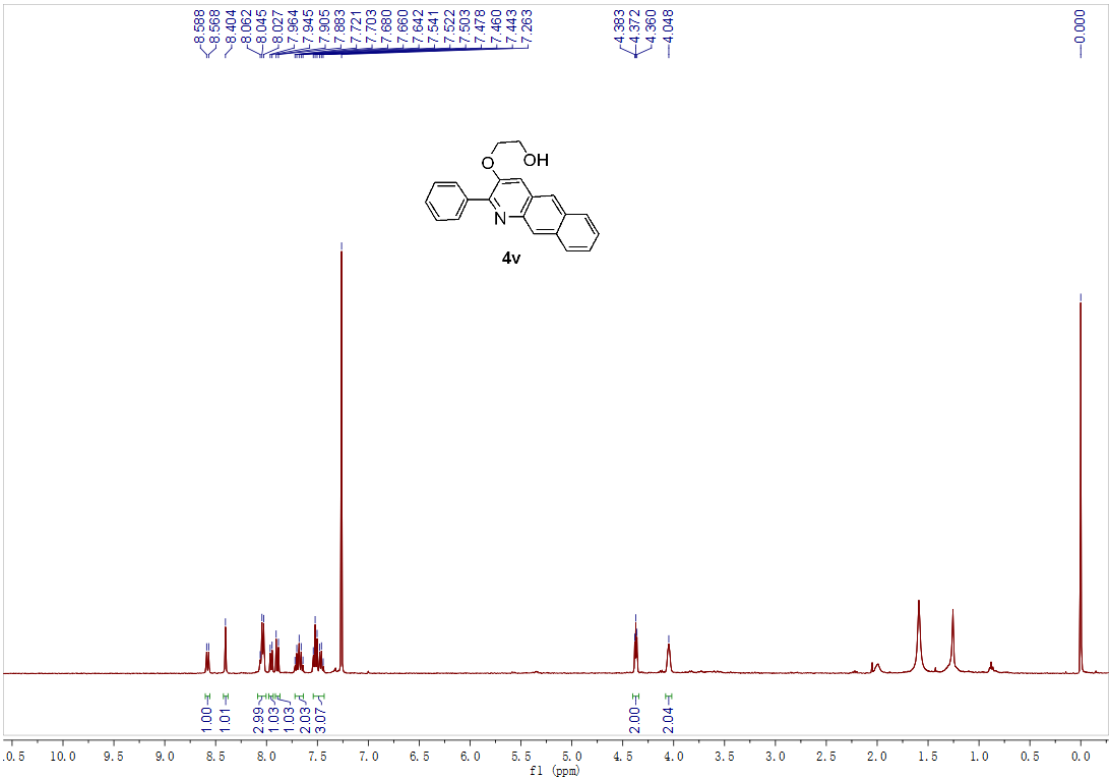
77.32
77.00
76.68
69.95
61.11
OH
O
N
4u
f1 (ppm)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7.945
7.905
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7.721
7.703
7.680
7.660
7.642
7.541
7.522
7.503
7.478
7.460
7.443
7.263
4.383
4.372
4.360
4.048
0.000
OH
O
N
4v
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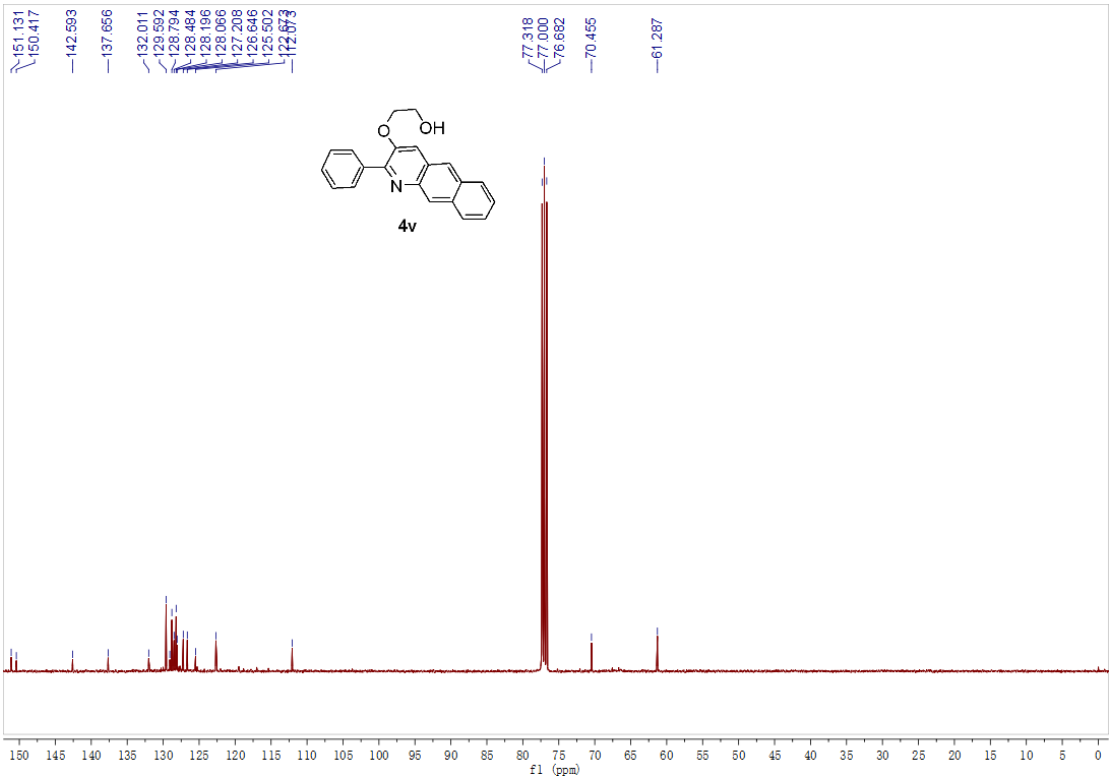
1.01
2.99
1.03
1.03
2.03
3.07
2.00
2.04
f1 (ppm)


151.131
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142.593
137.656
132.011
129.592
128.794
128.484
128.196
128.066
127.208
126.646
125.502
77.318
77.000
76.682
70.455
61.287
OH
O
N
4v
f1 (ppm)