

[2.2]Paracyclophane-based carbene-copper catalyst tuned by transannular
electronic effects for asymmetric boration

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252000, China.*

Electronic Supplementary Information

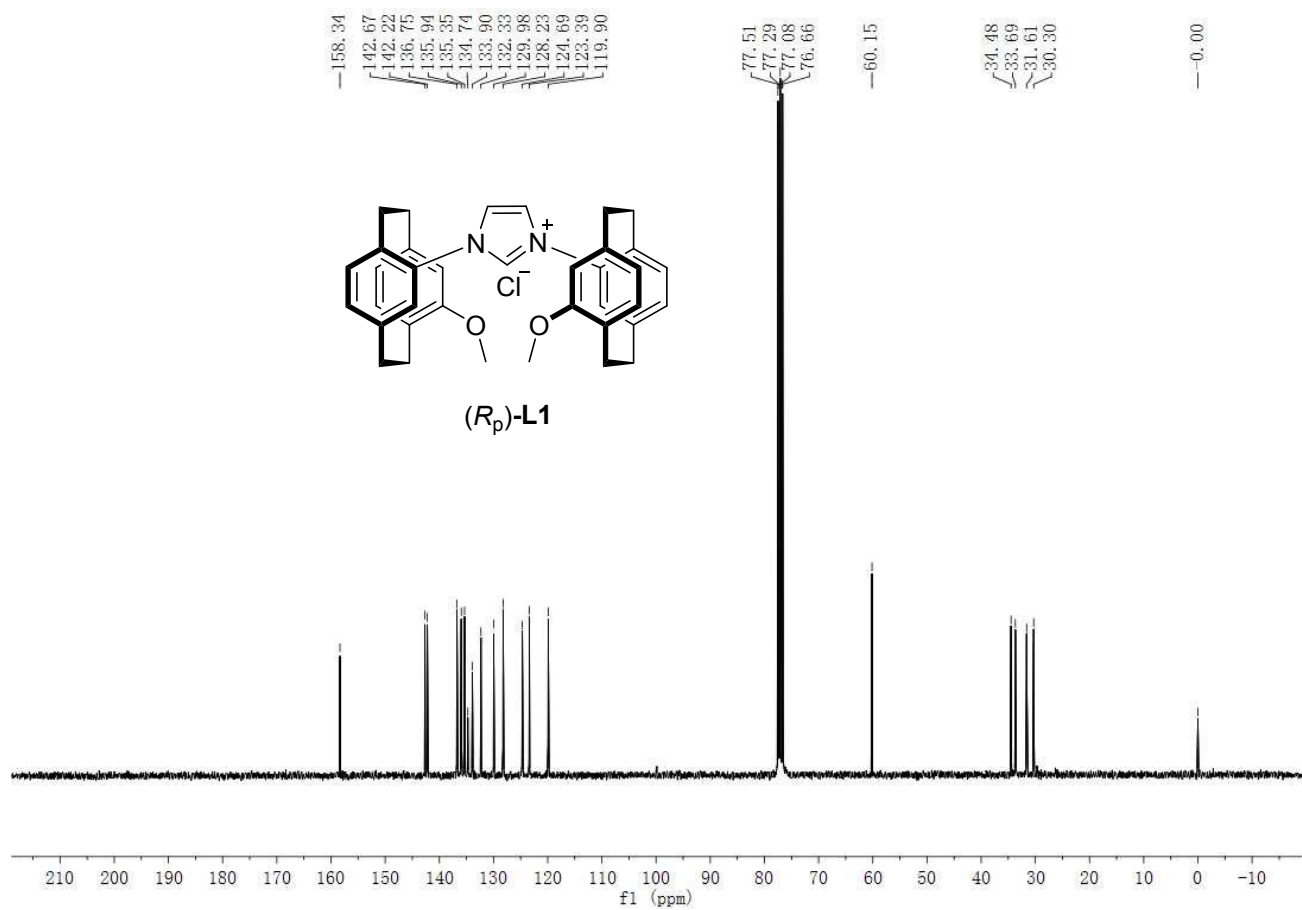
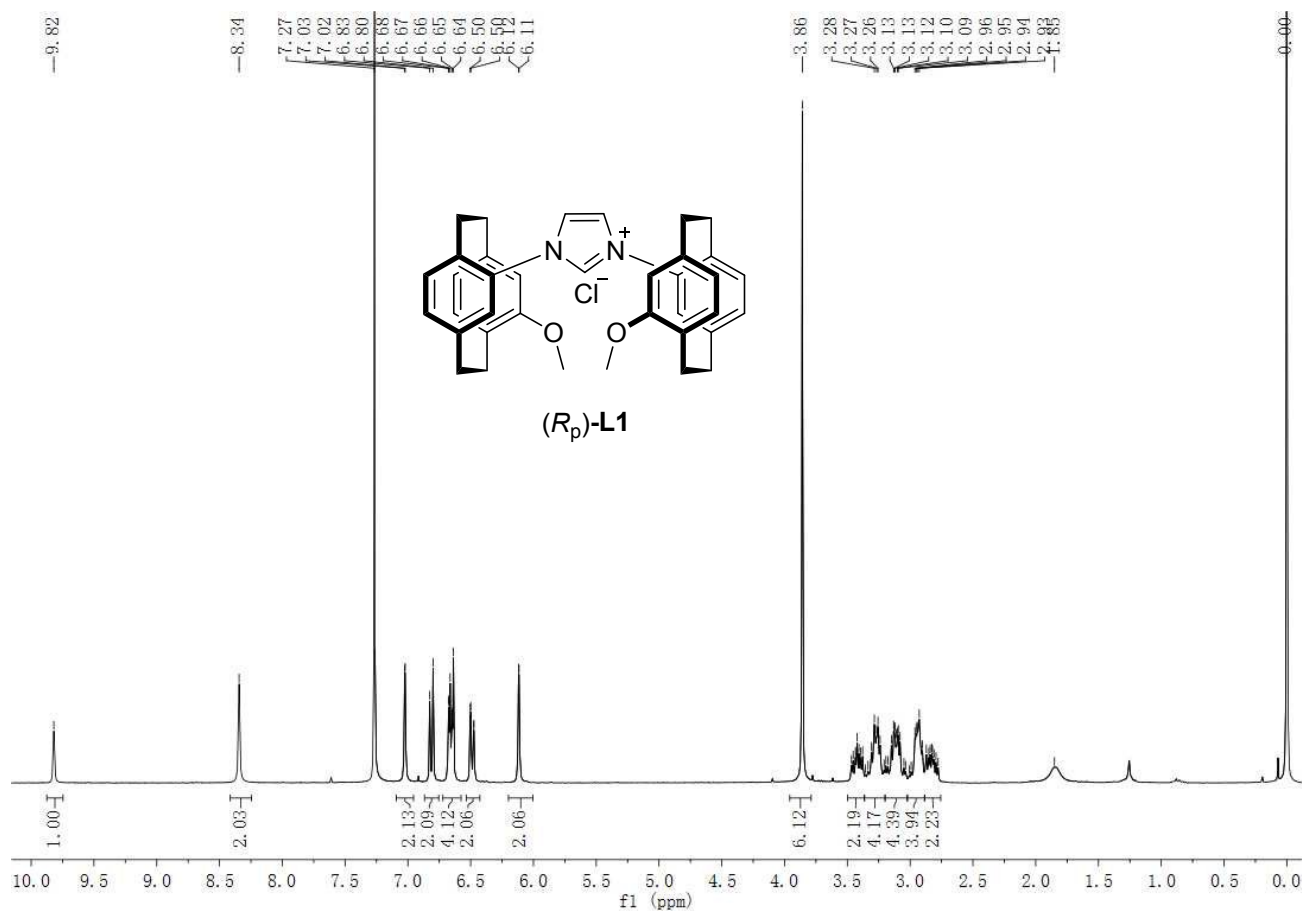
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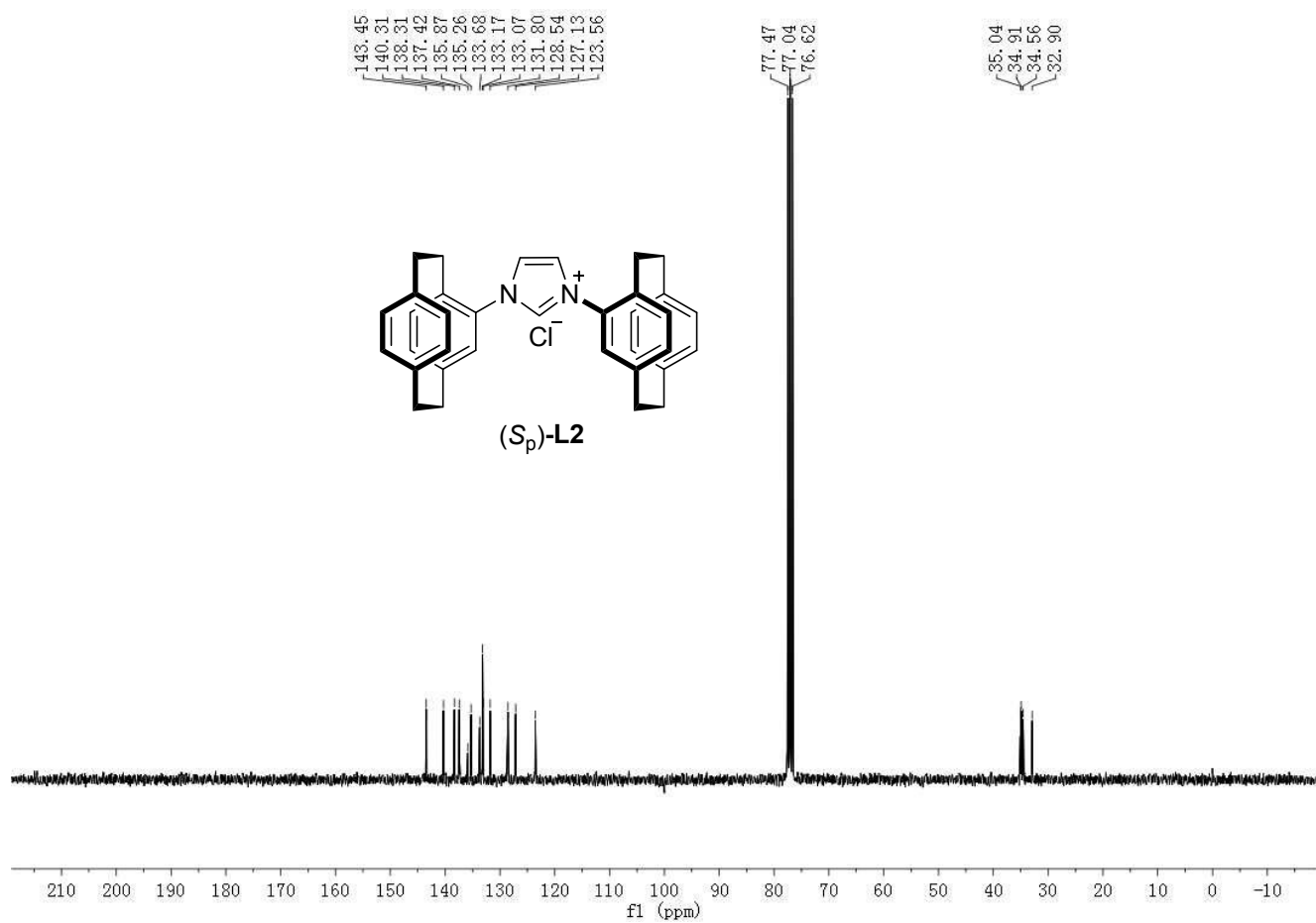
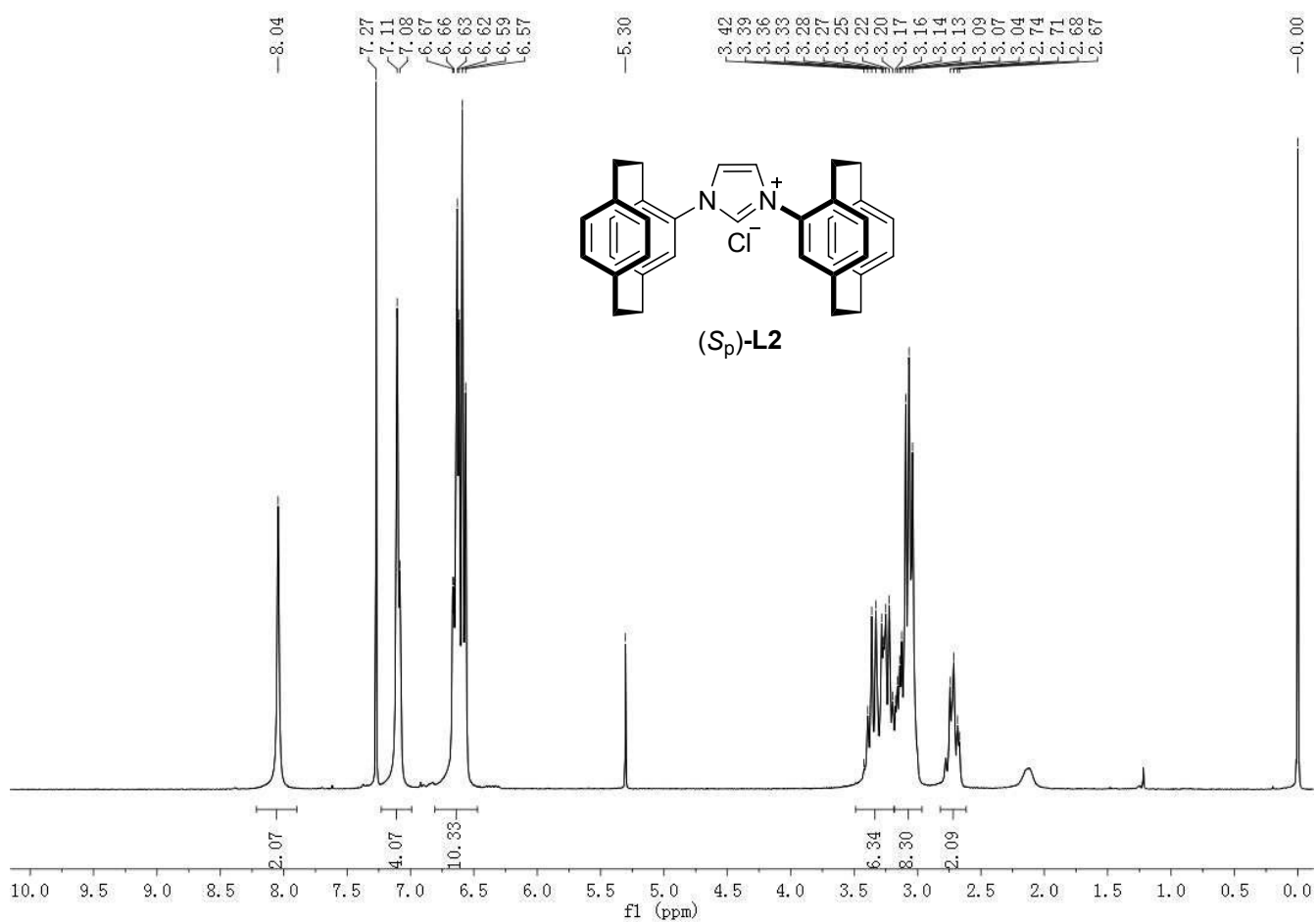
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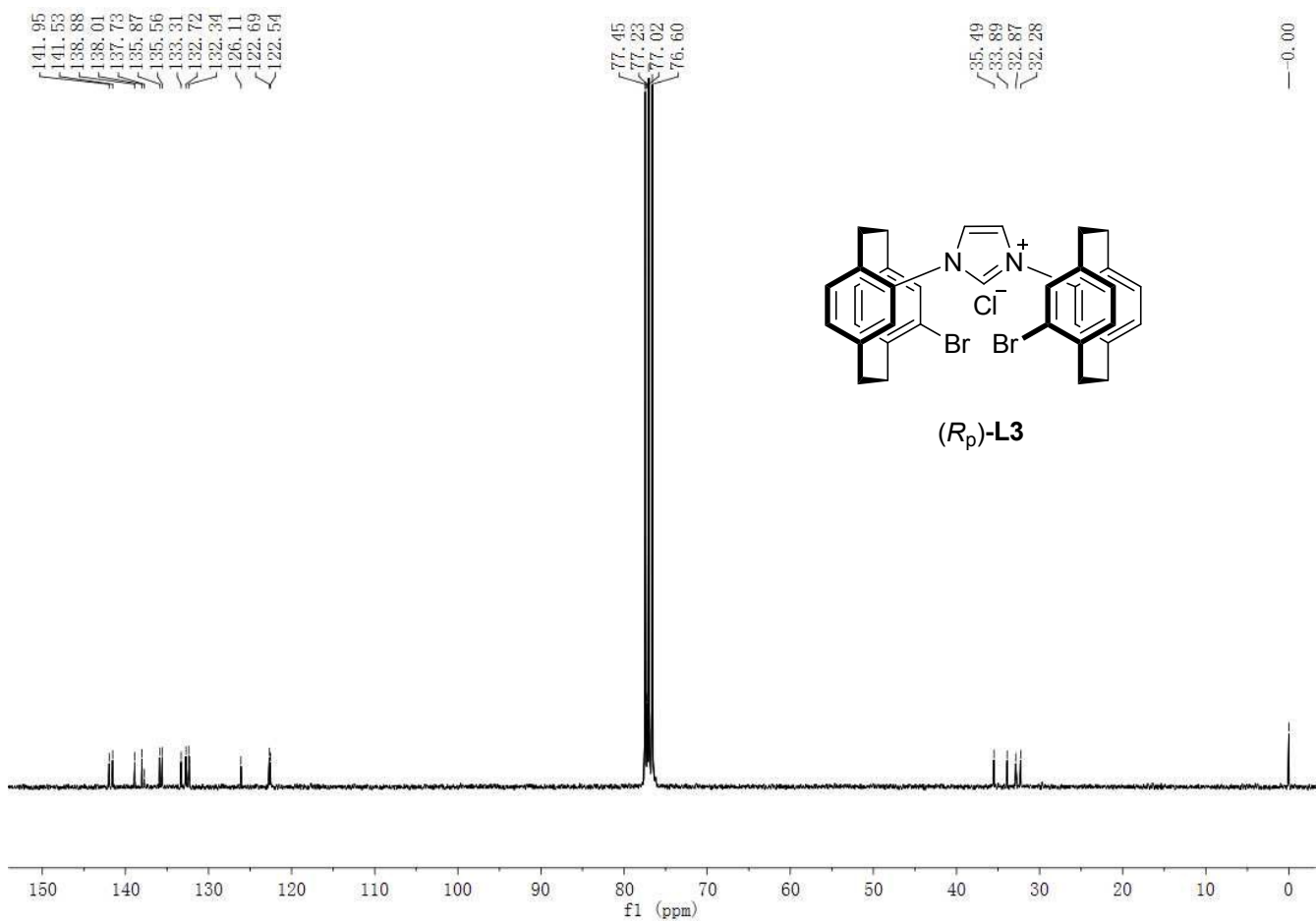
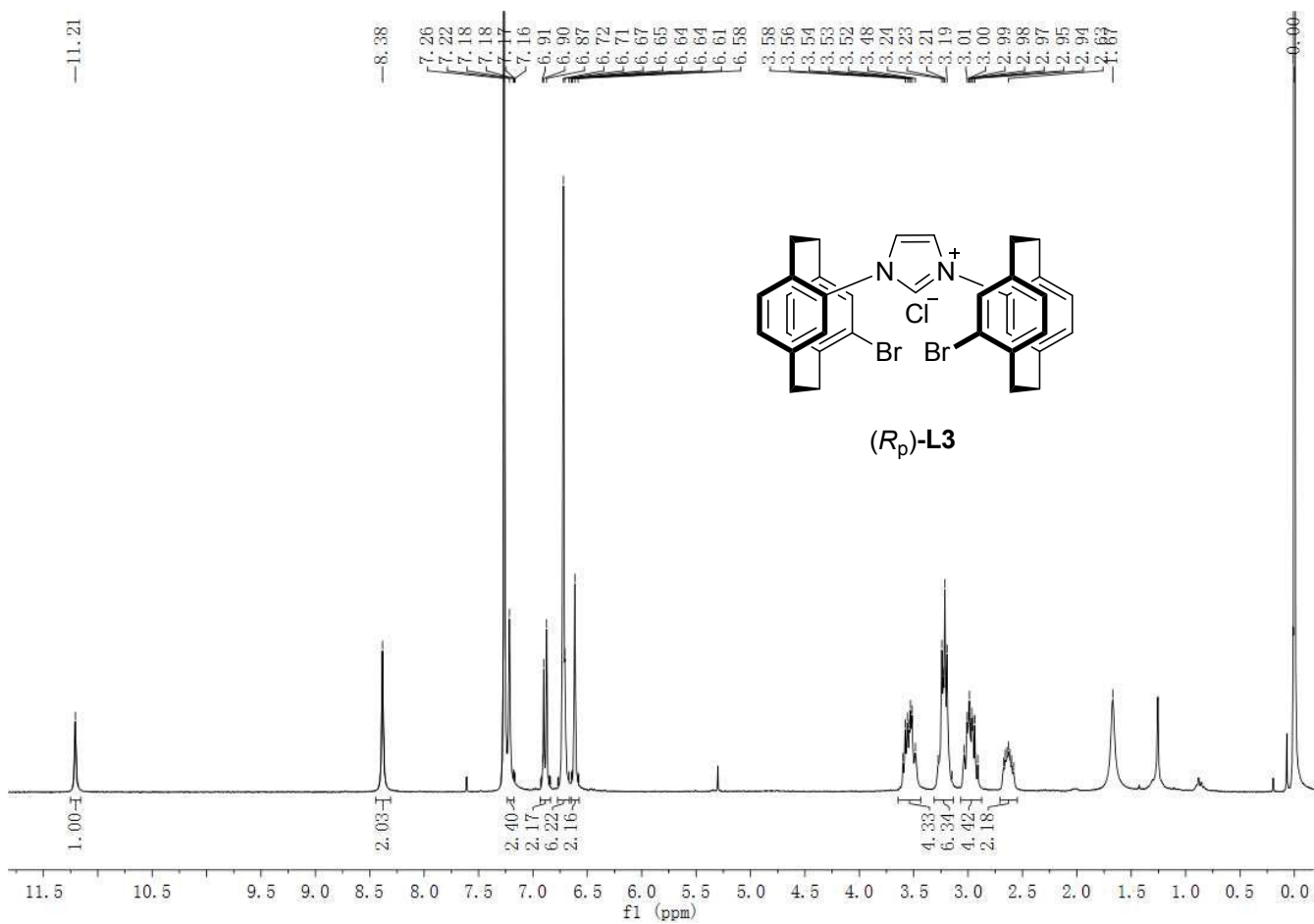
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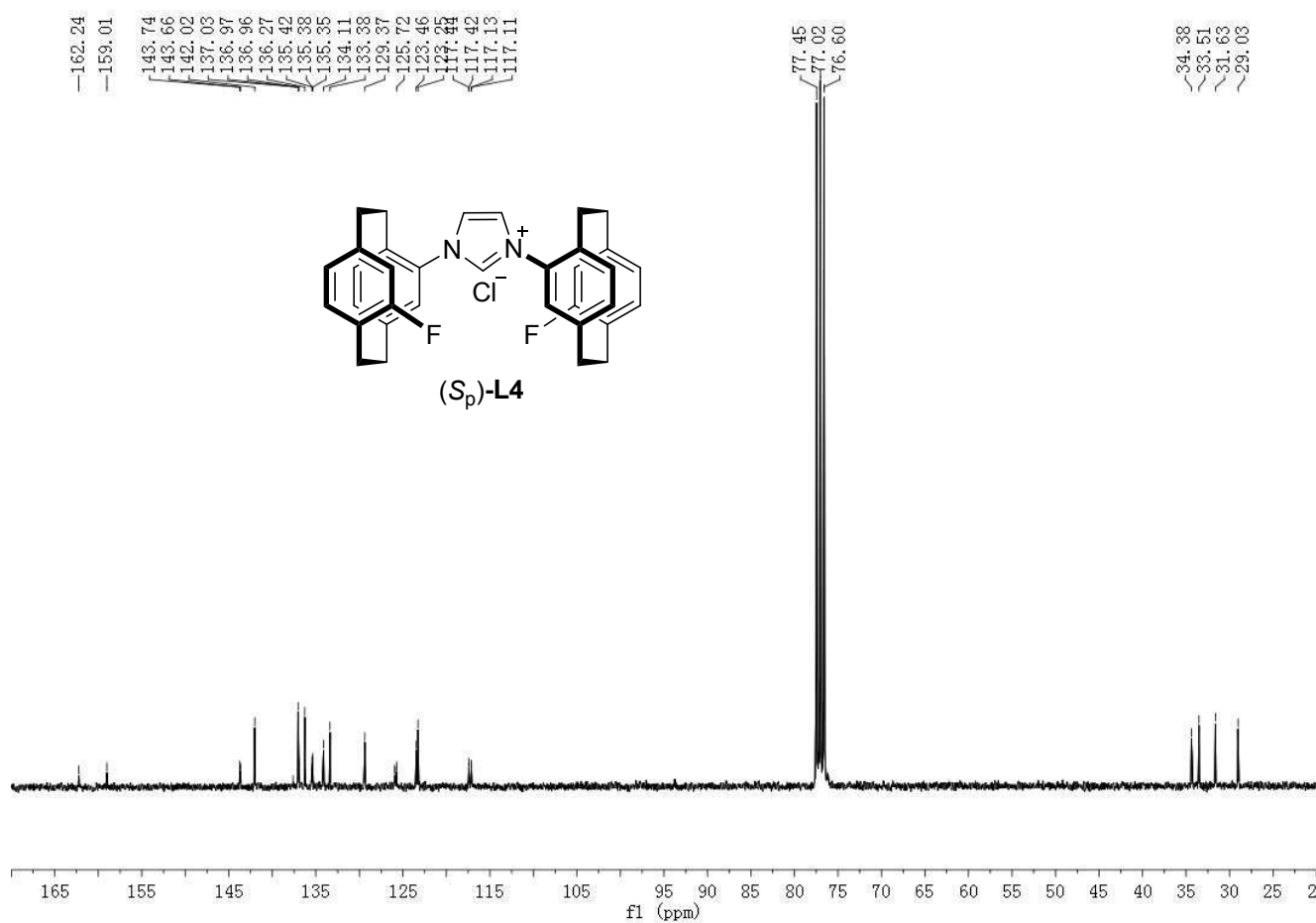
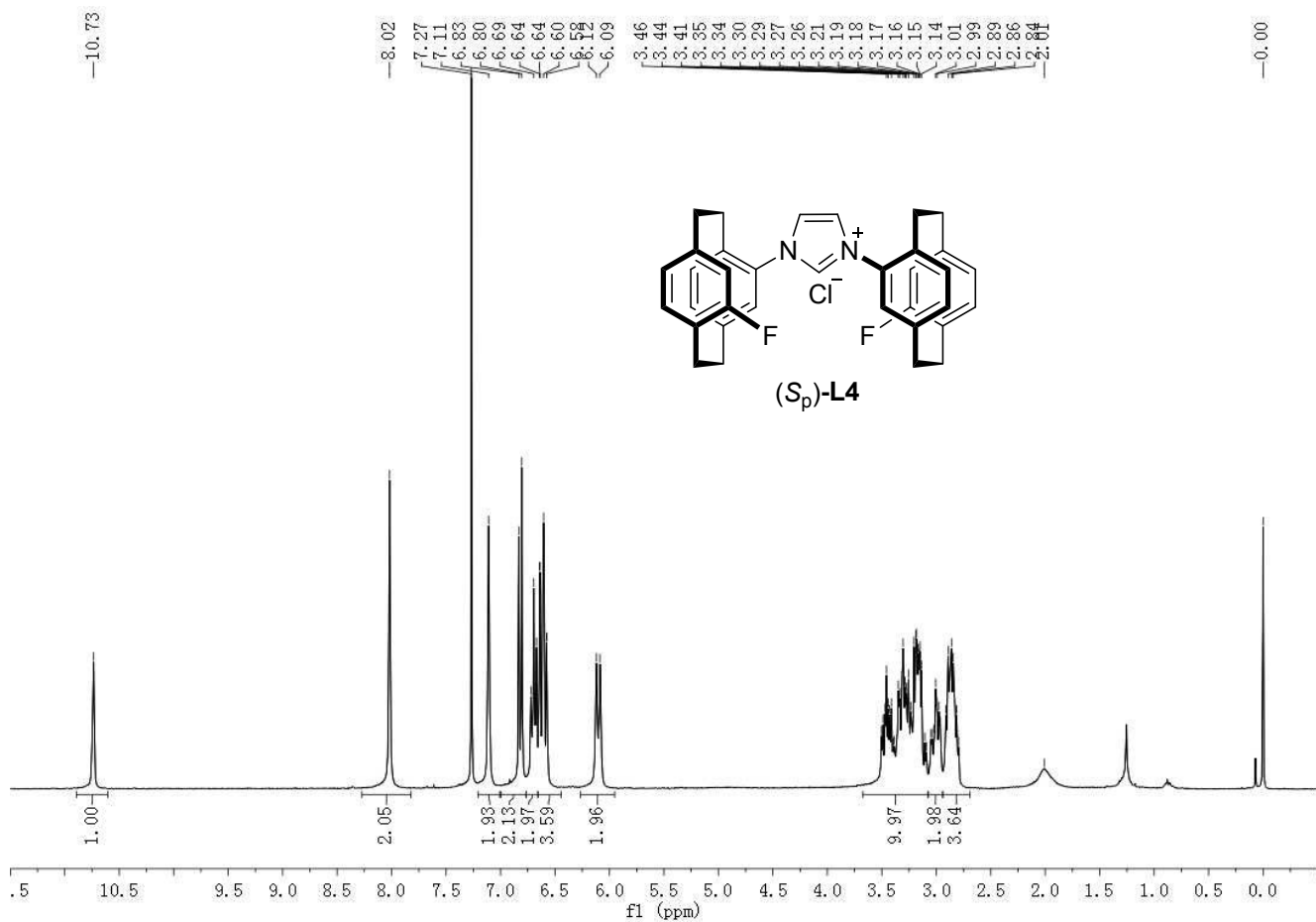
All manipulations of oxygen- and moisture-sensitive materials were conducted with a standard Schlenk technique under a purified argon atmosphere. Solvents were reagent grade and purified by standard techniques. ^1H and ^{13}C NMR spectra were recorded on a 300 MHz spectrometer. Chemical shifts were reported as δ values in ppm and referenced to using tetramethylsilane as an internal. Data are reported as (s = singlet, d = doublet, dd = doublet of doublet, ddd = doublet of doublet of doublet, t = triplet, dt = doublet of triplet, td = triplet of doublet, q = quartet, qd = quartet of doublet, m = multiplet, brs = broad singlet). All high resolution mass spectra were obtained on an Accurate-Mass LC-ESI-Q-TOF-MS. All reactions were monitored by TLC with silica gel-coated plates and visualized with a UV light at 254 nm. Optical rotations were reported as follows: $[\alpha]_{\text{D}}^{\text{T}}$ (c = g/100 mL, solvent).

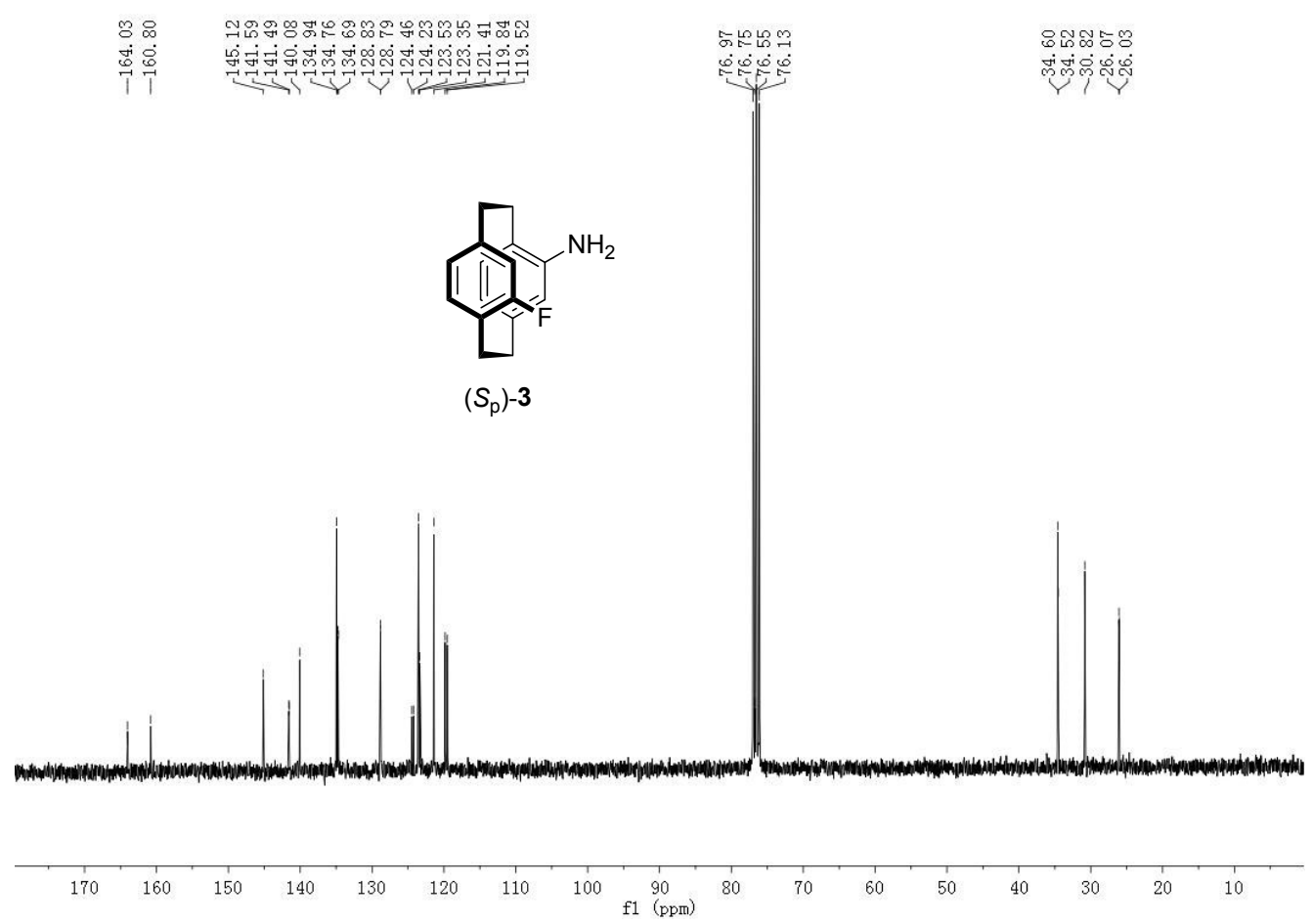
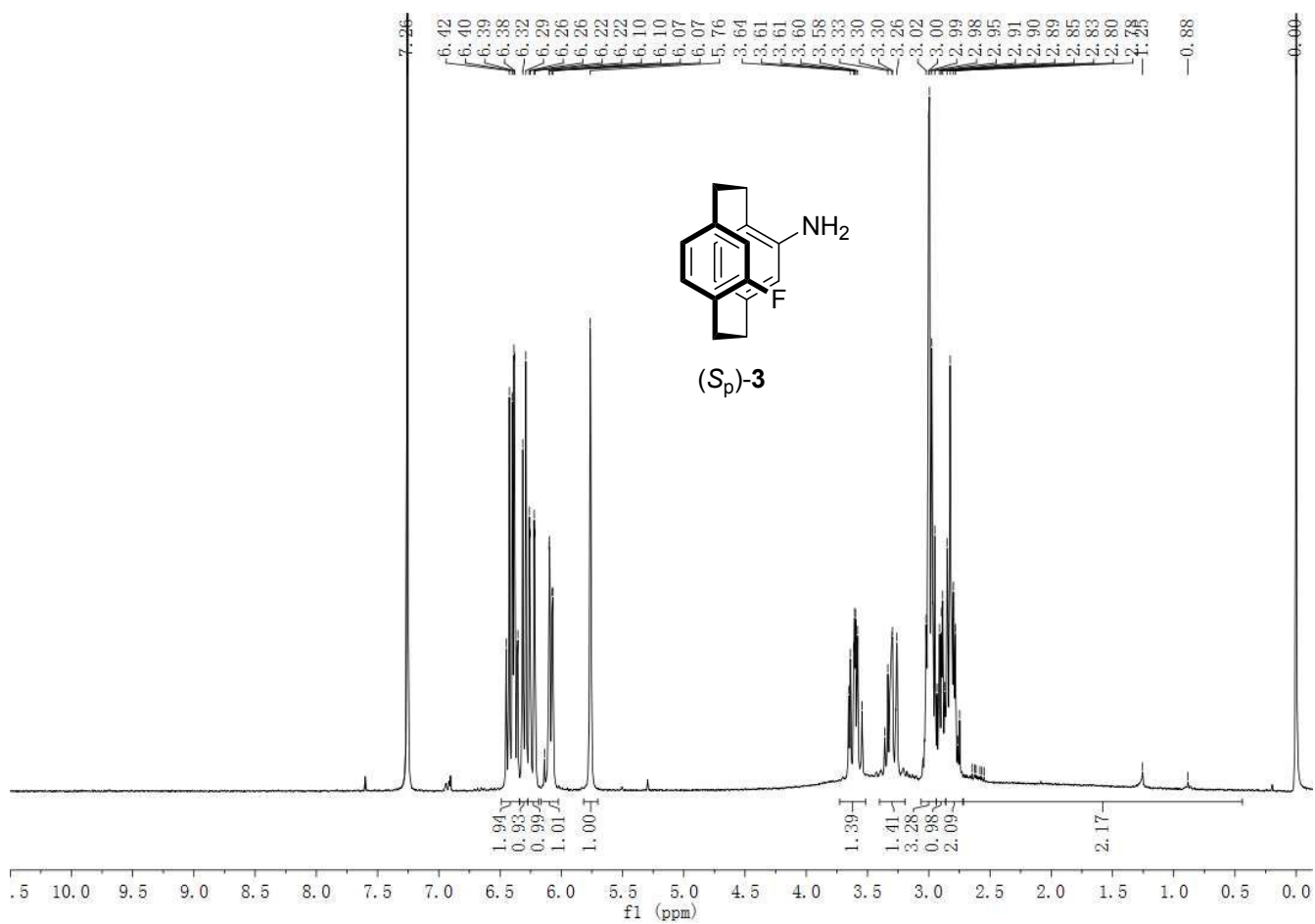
2. NMR spectras and HPLC chromatograms

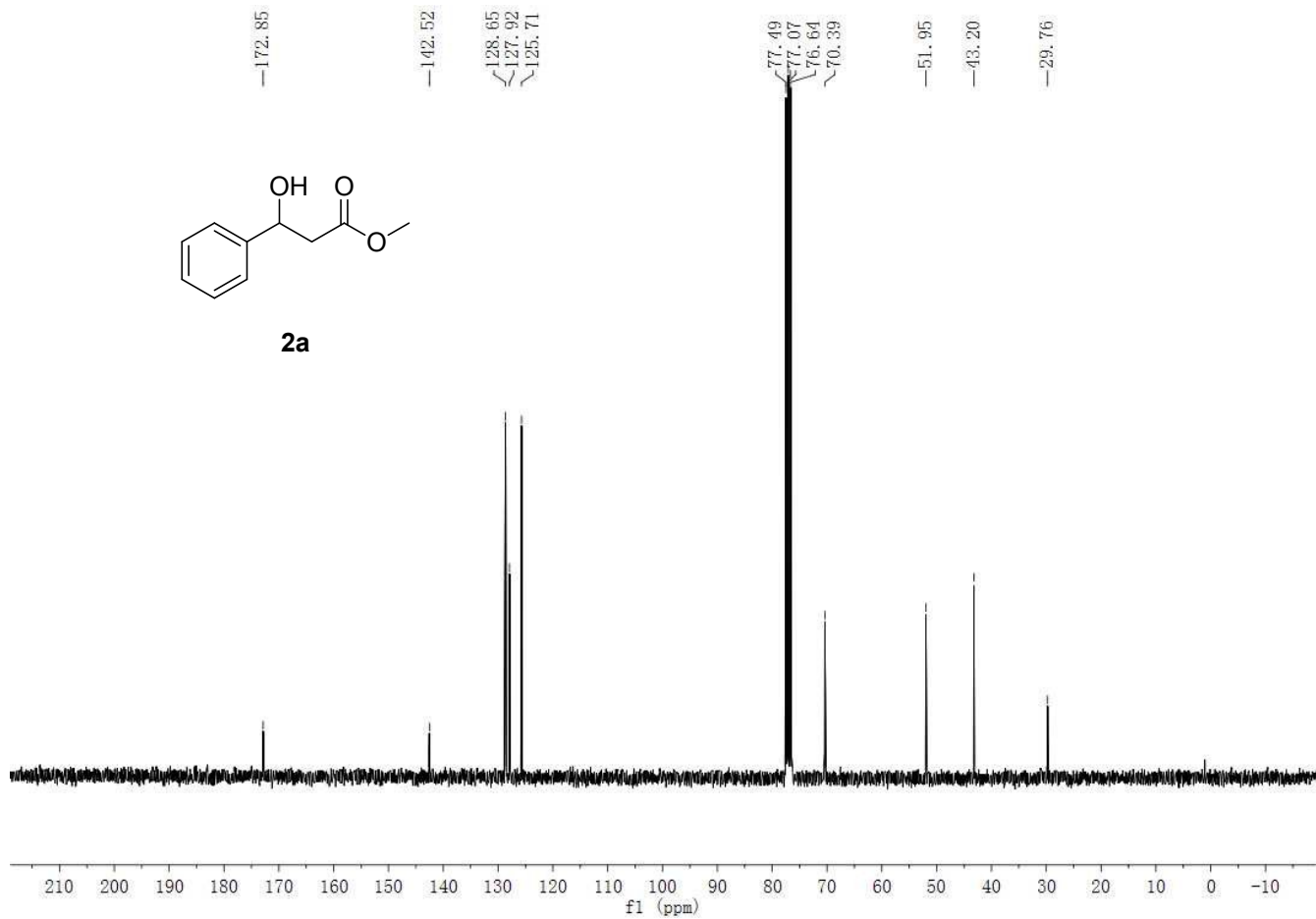
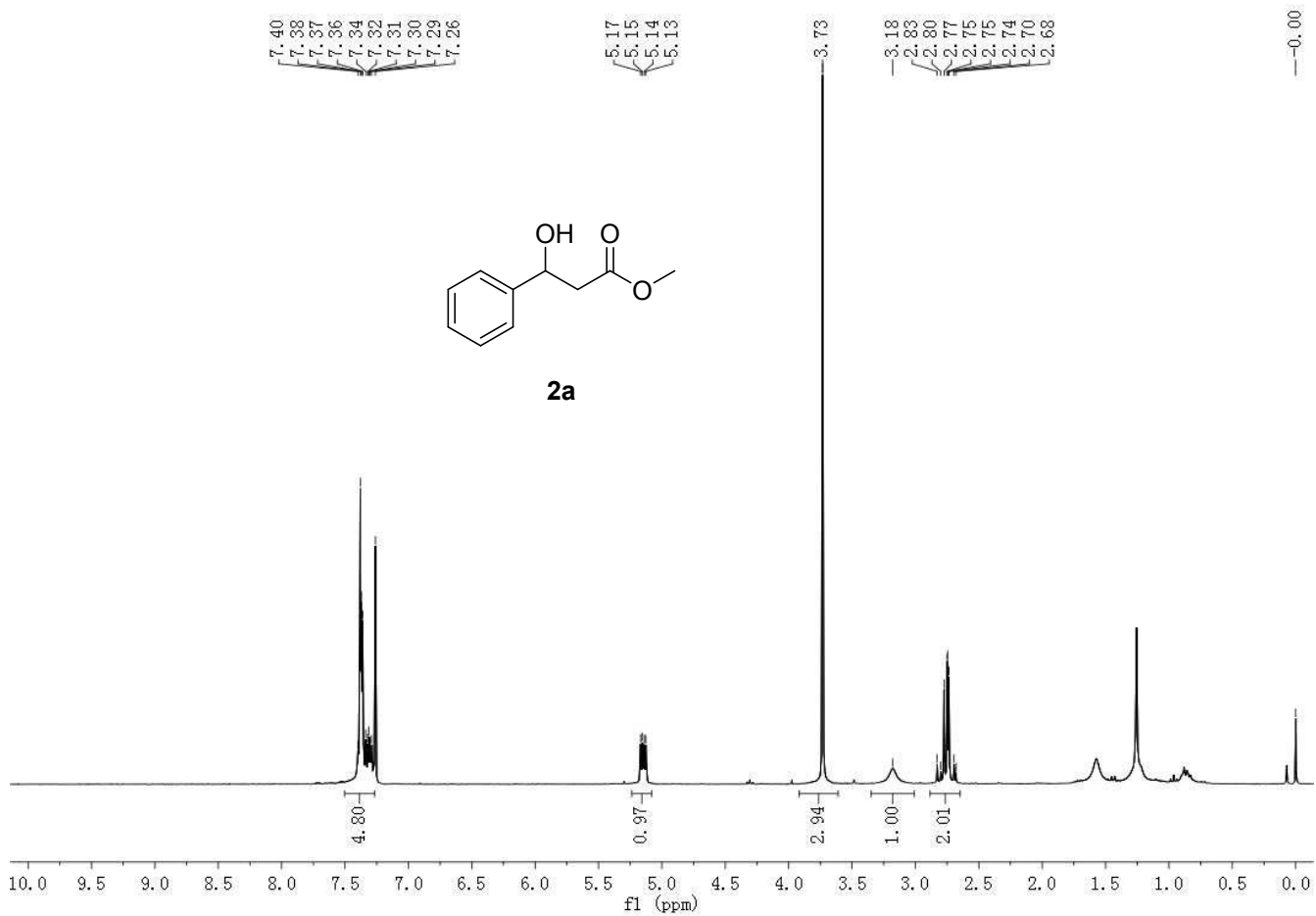


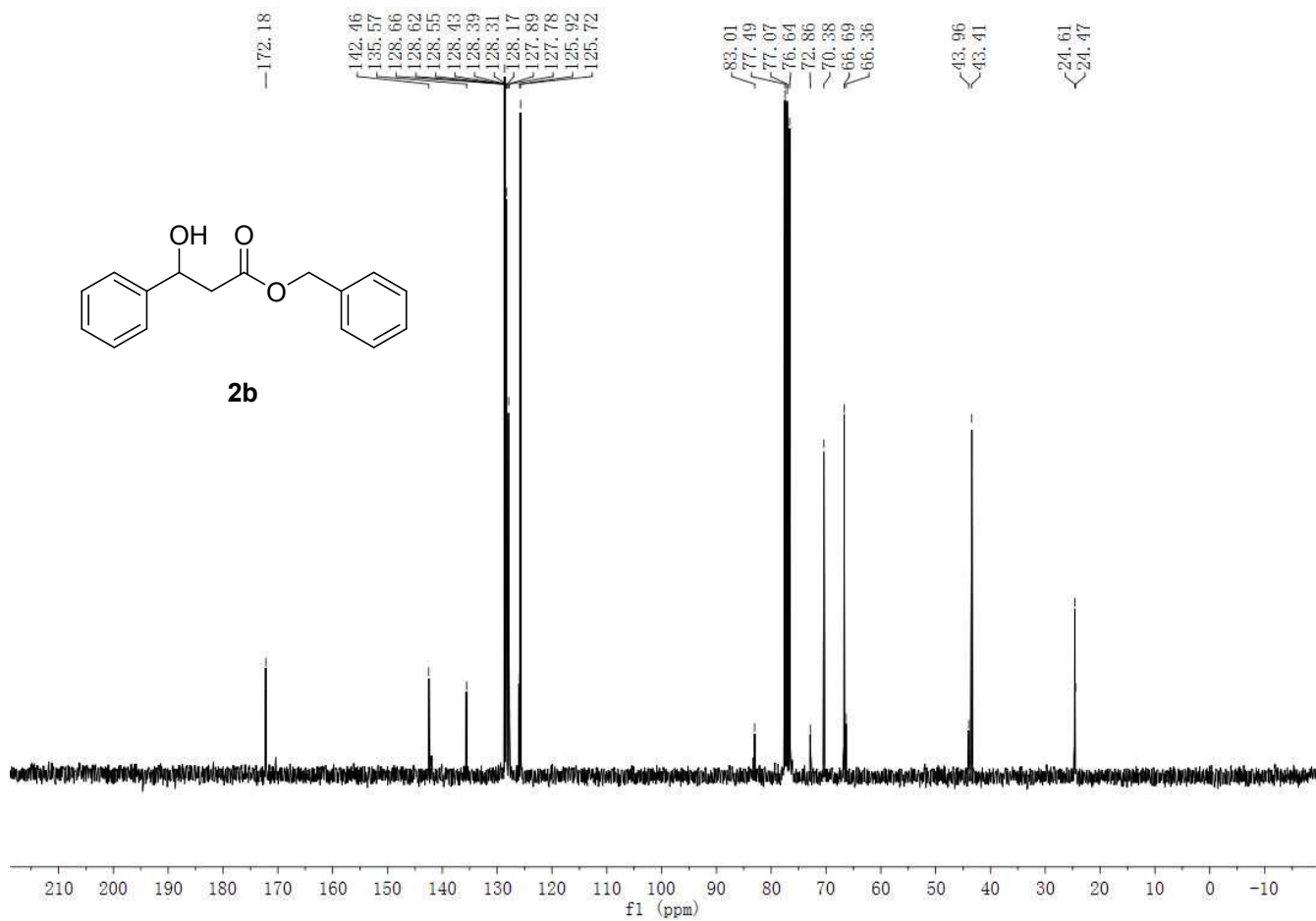
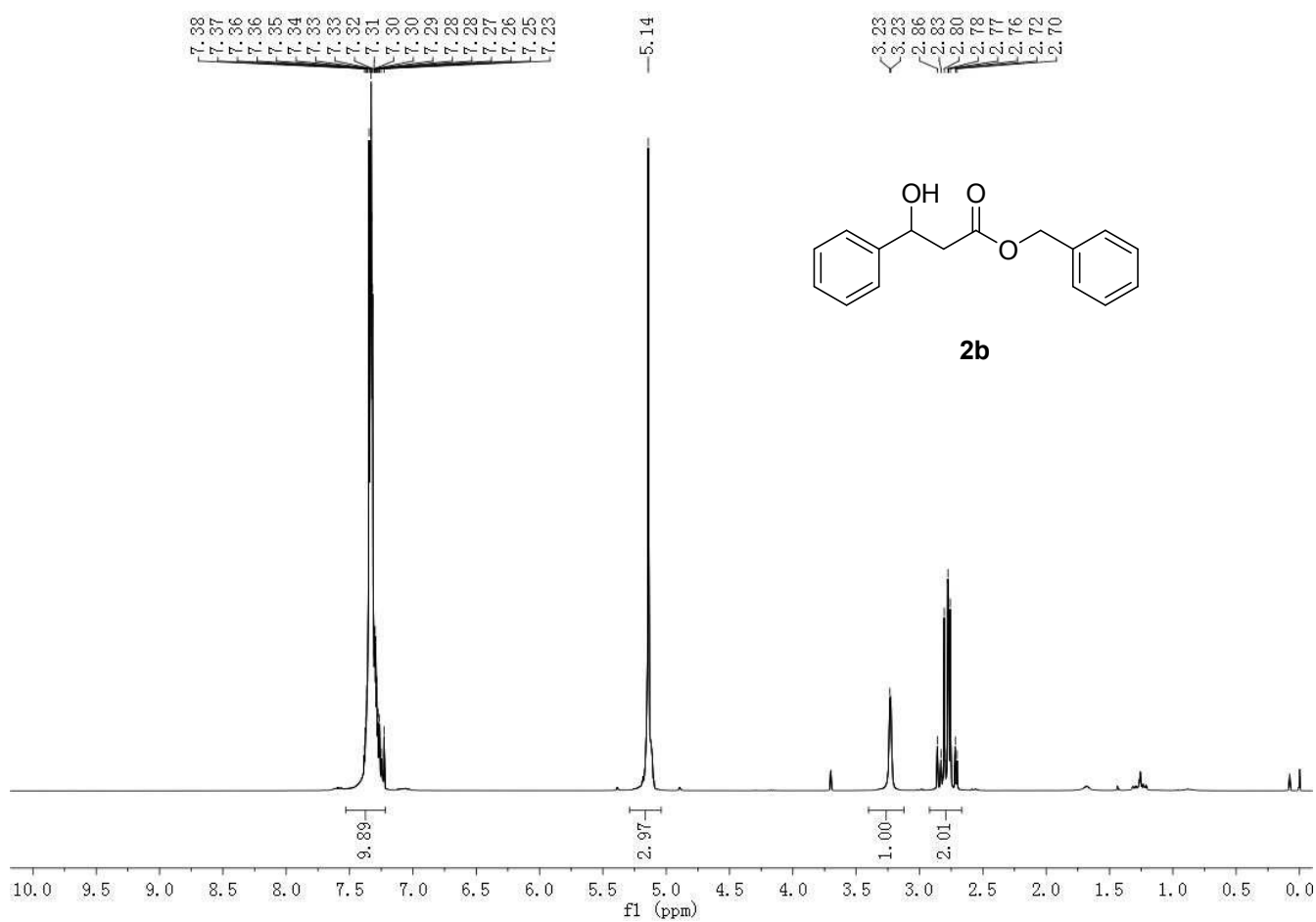


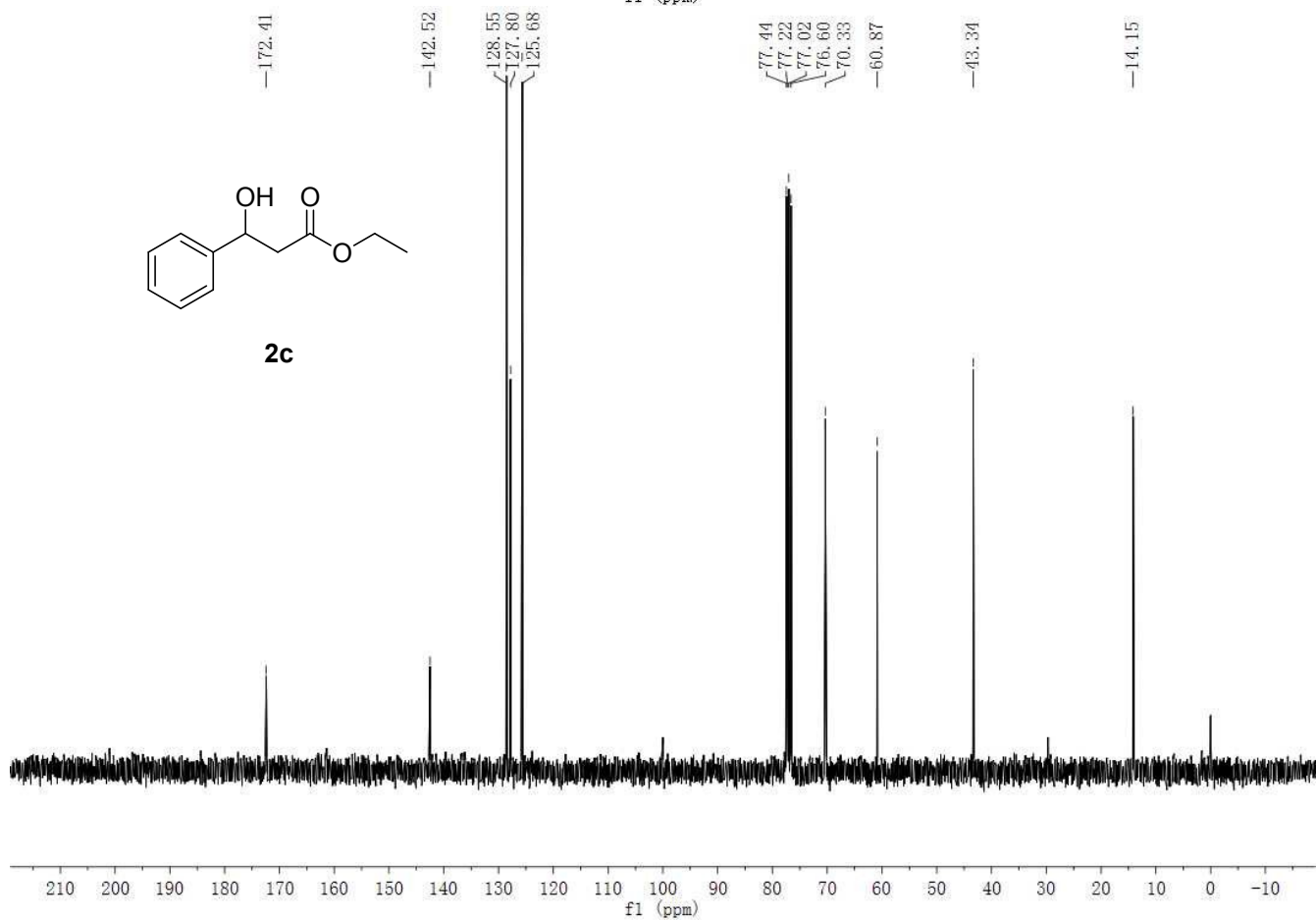
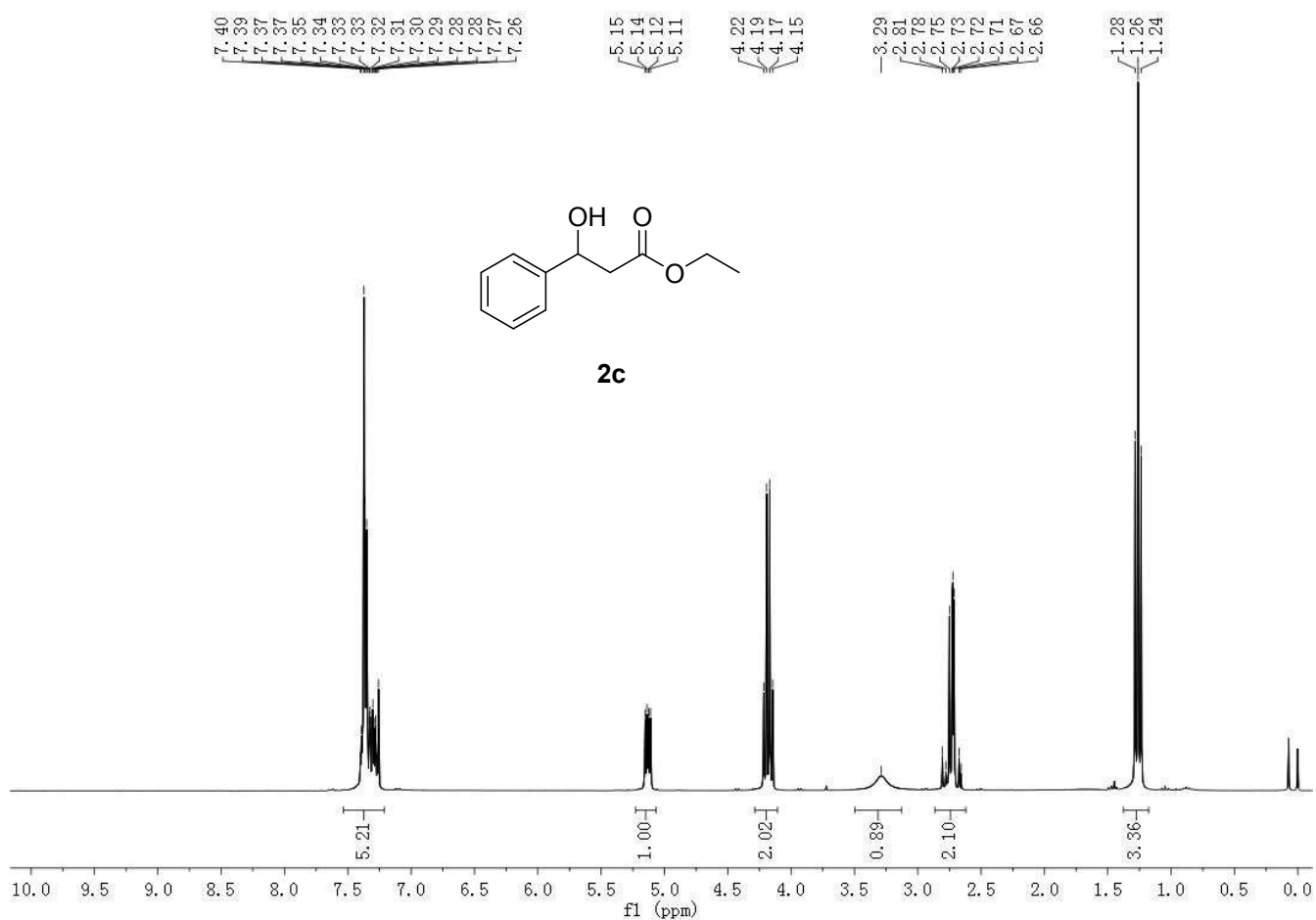


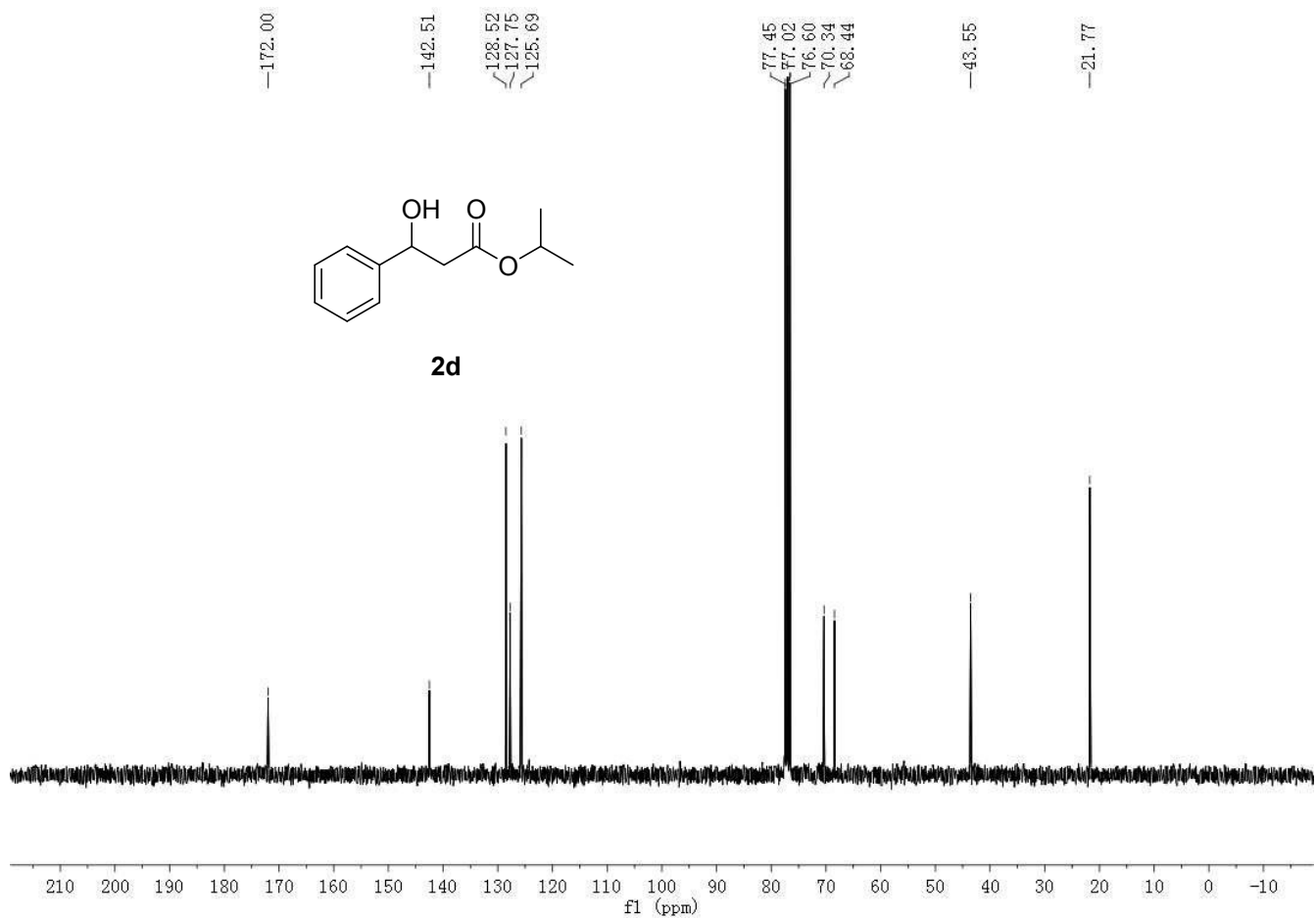
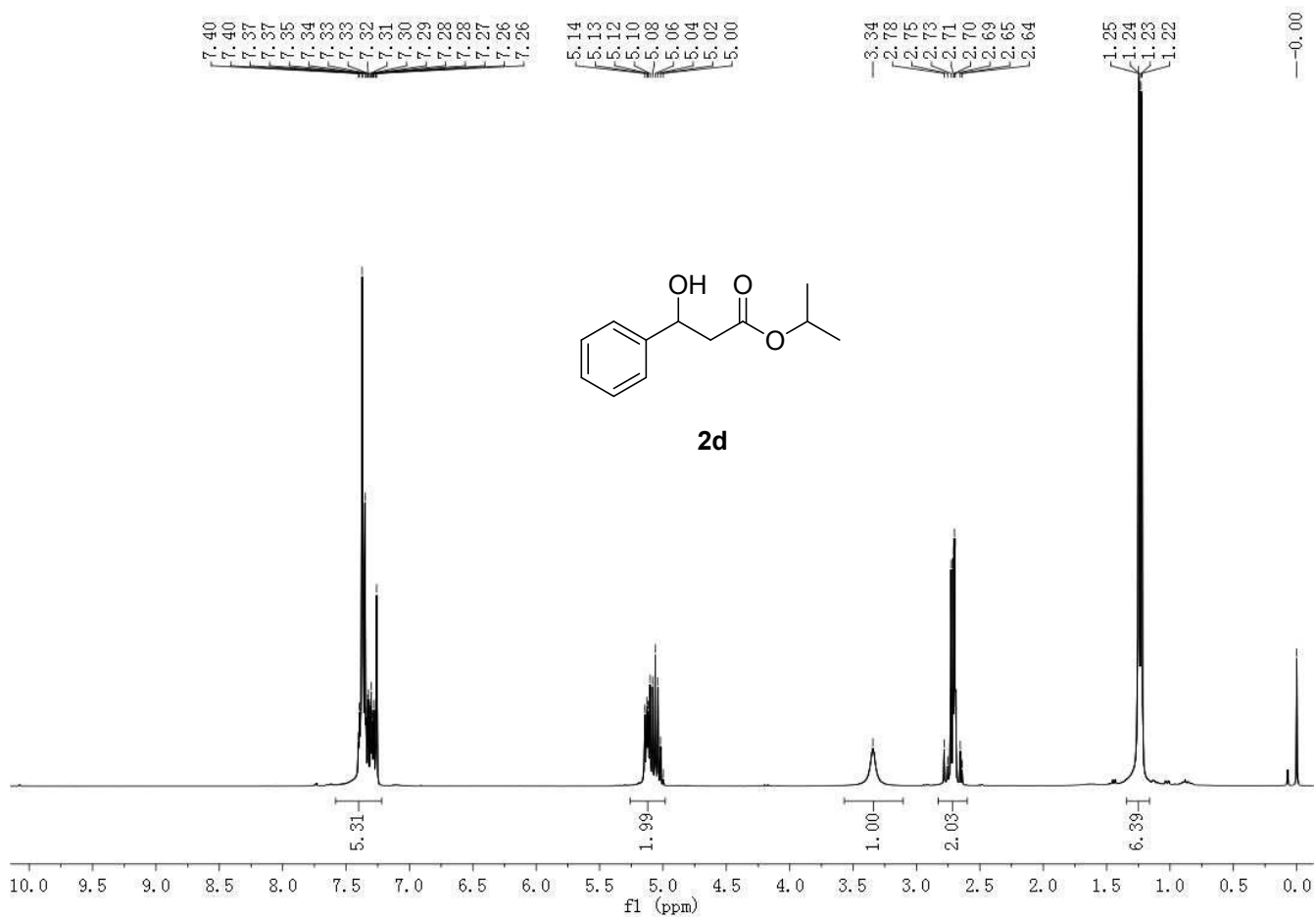


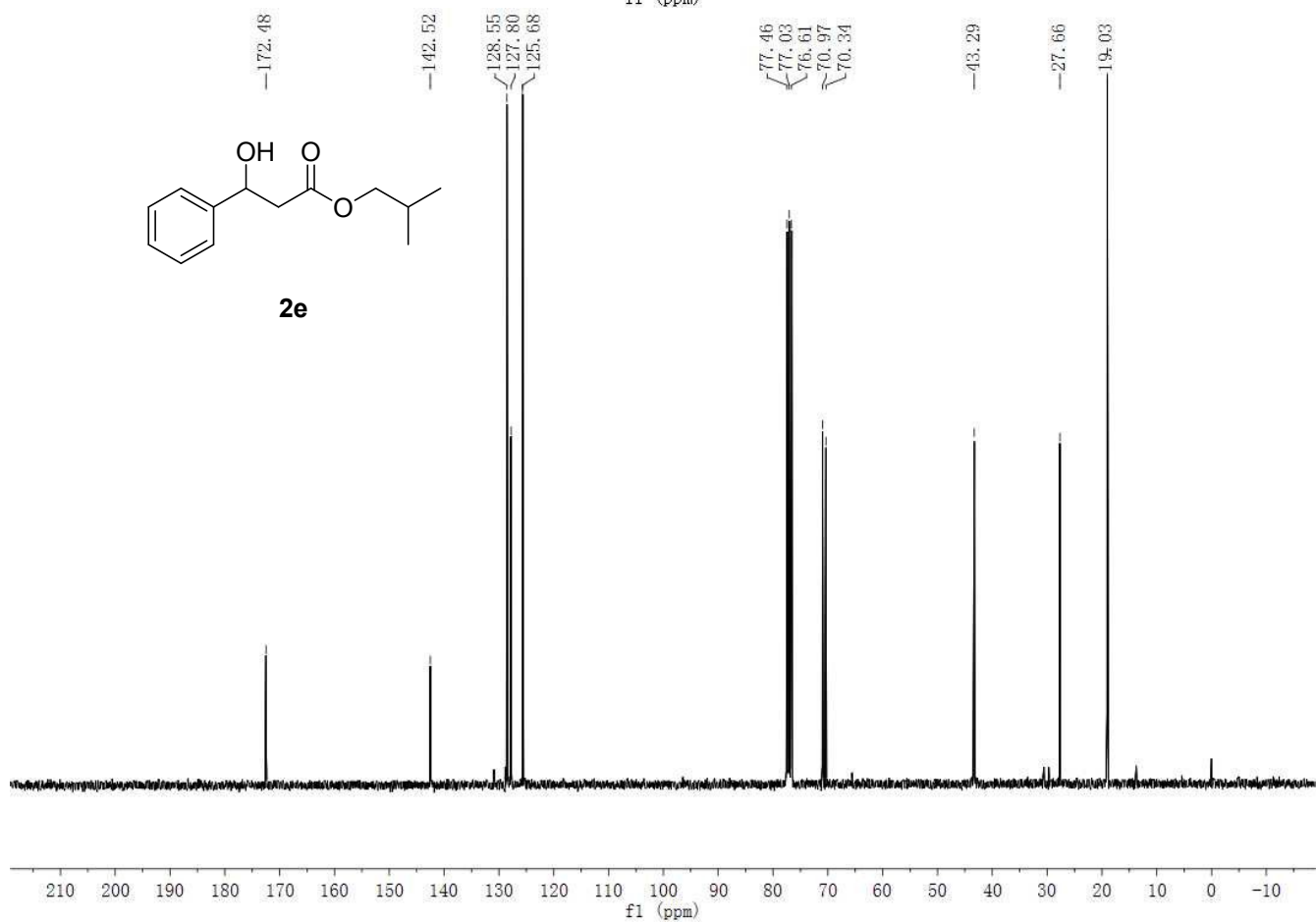
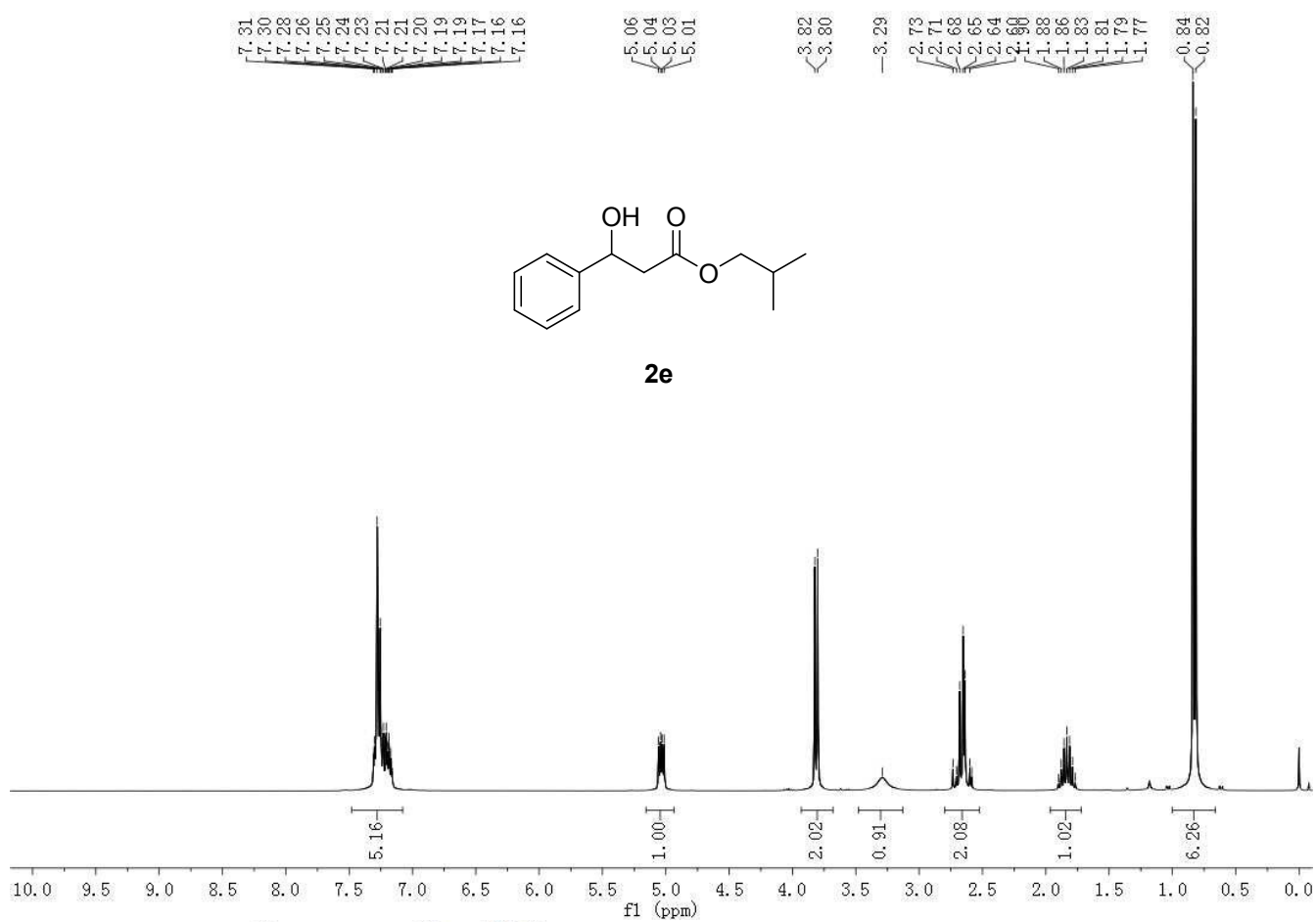


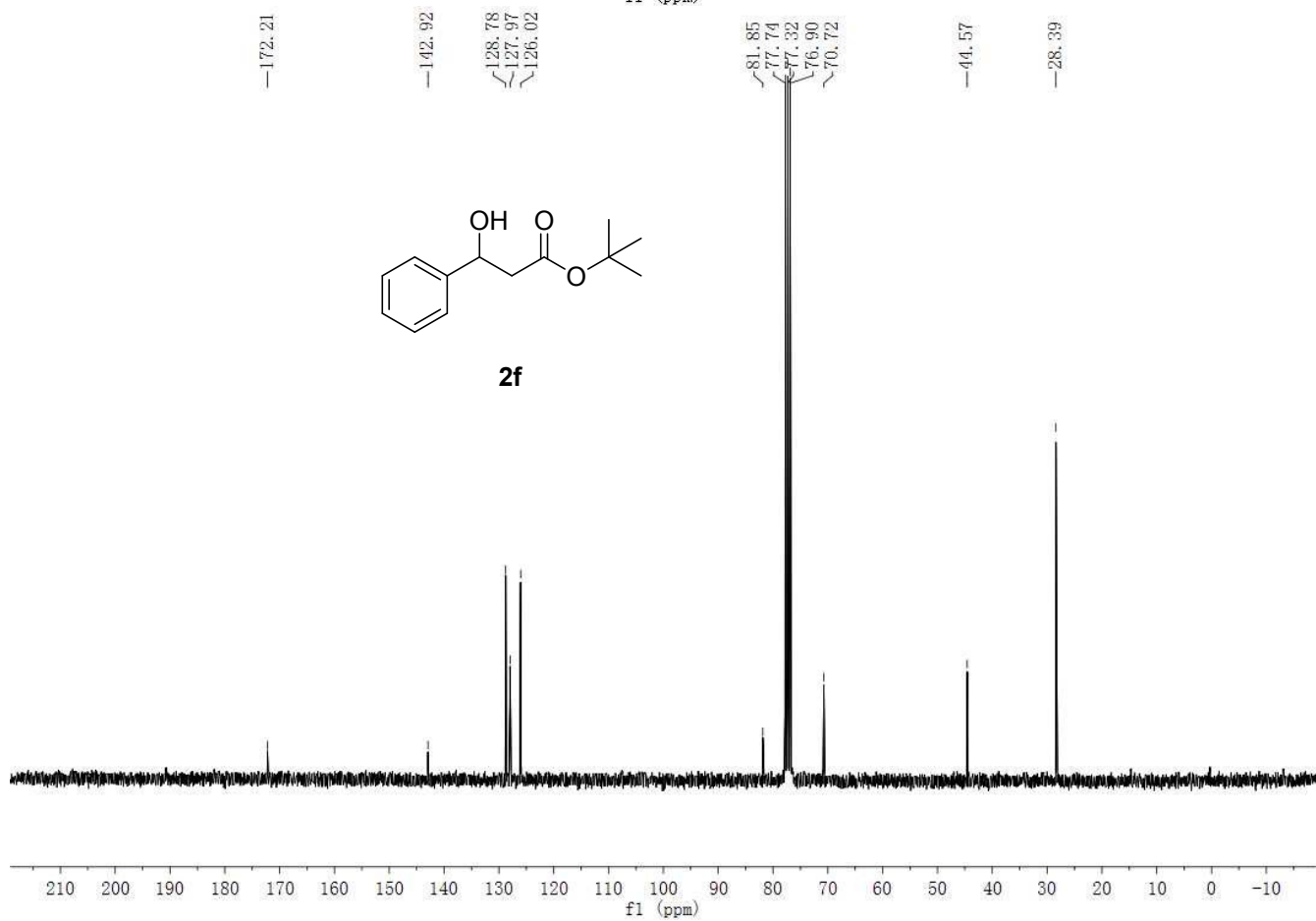
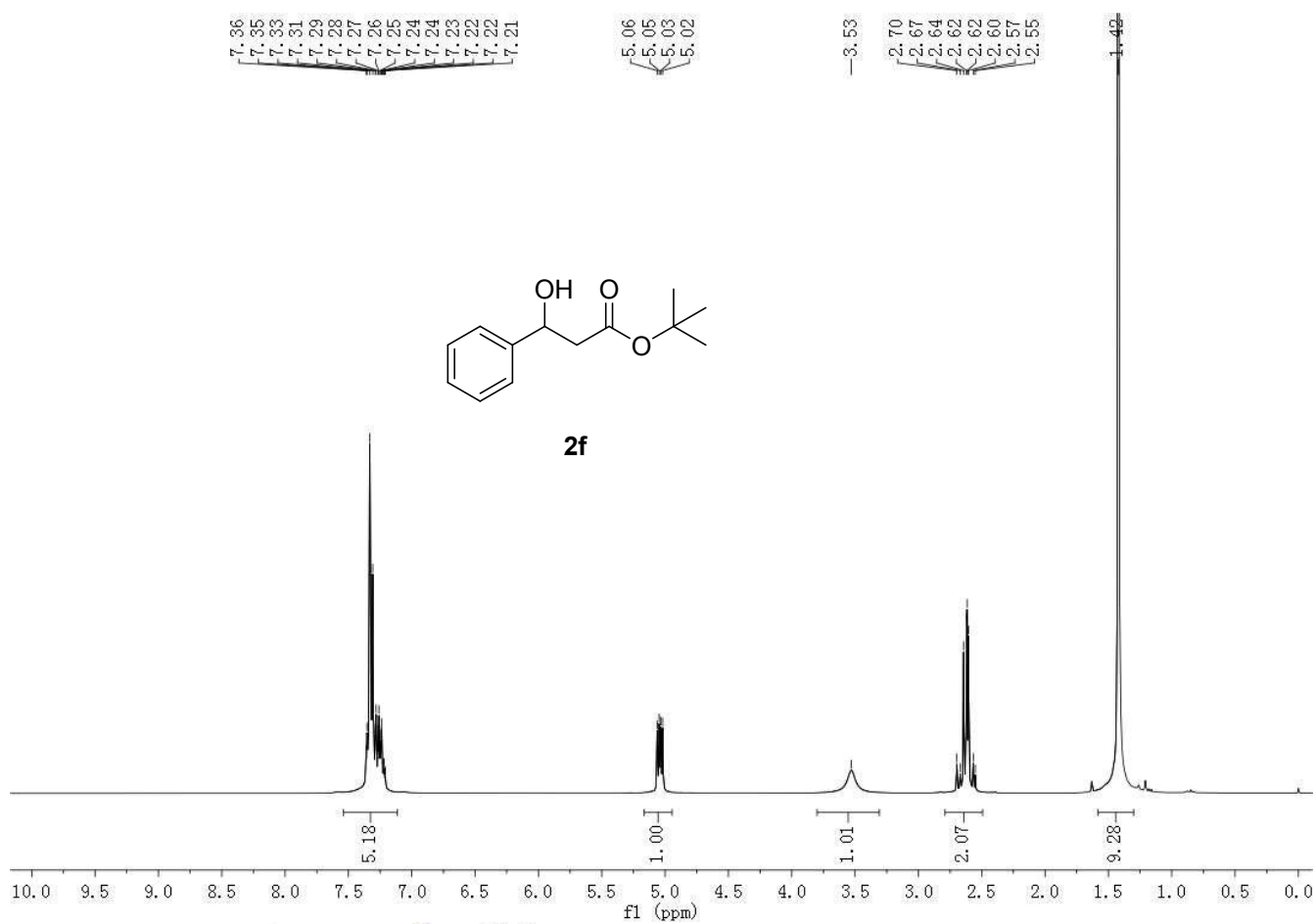


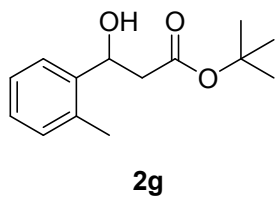
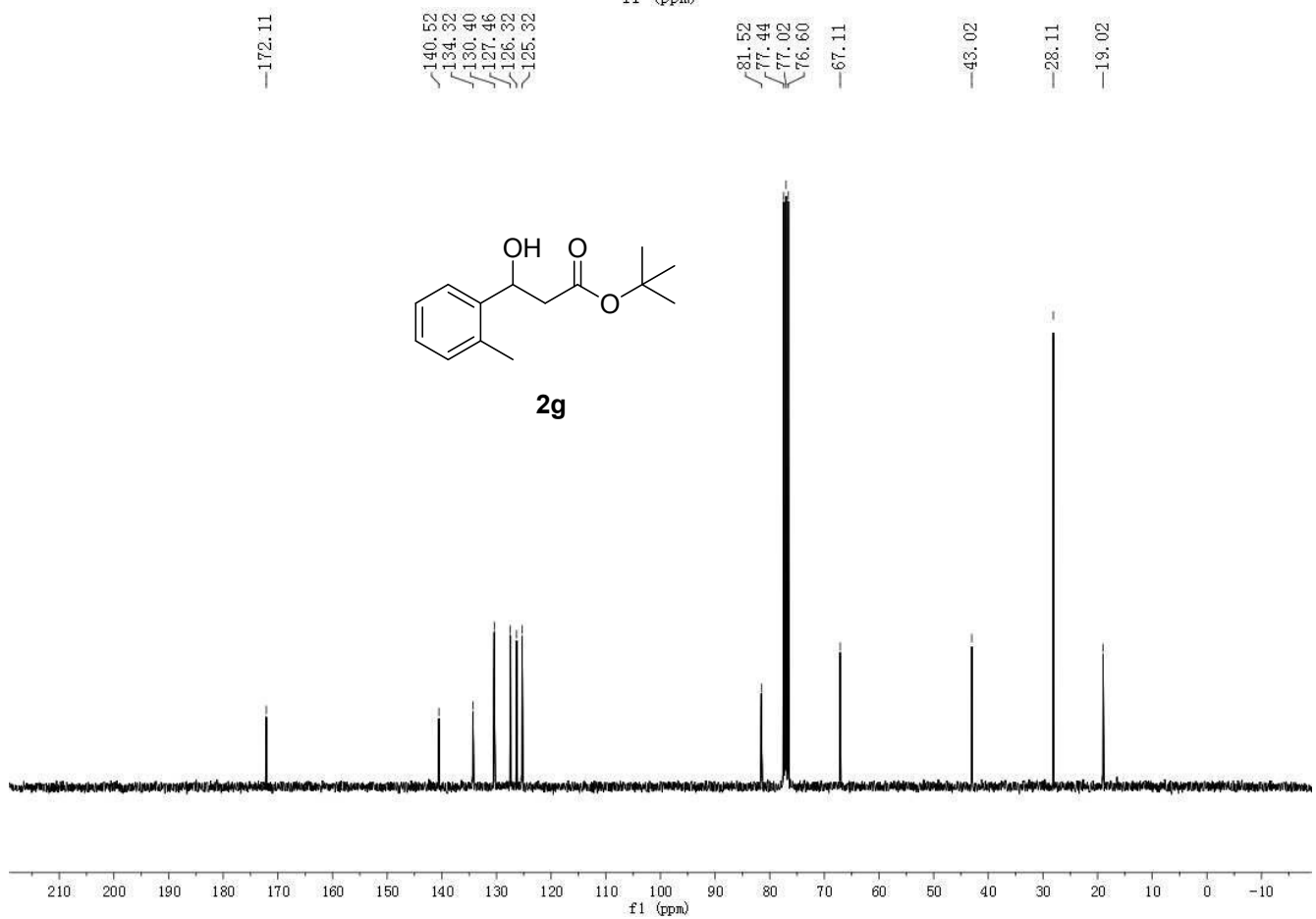
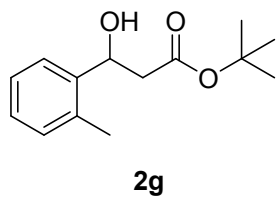
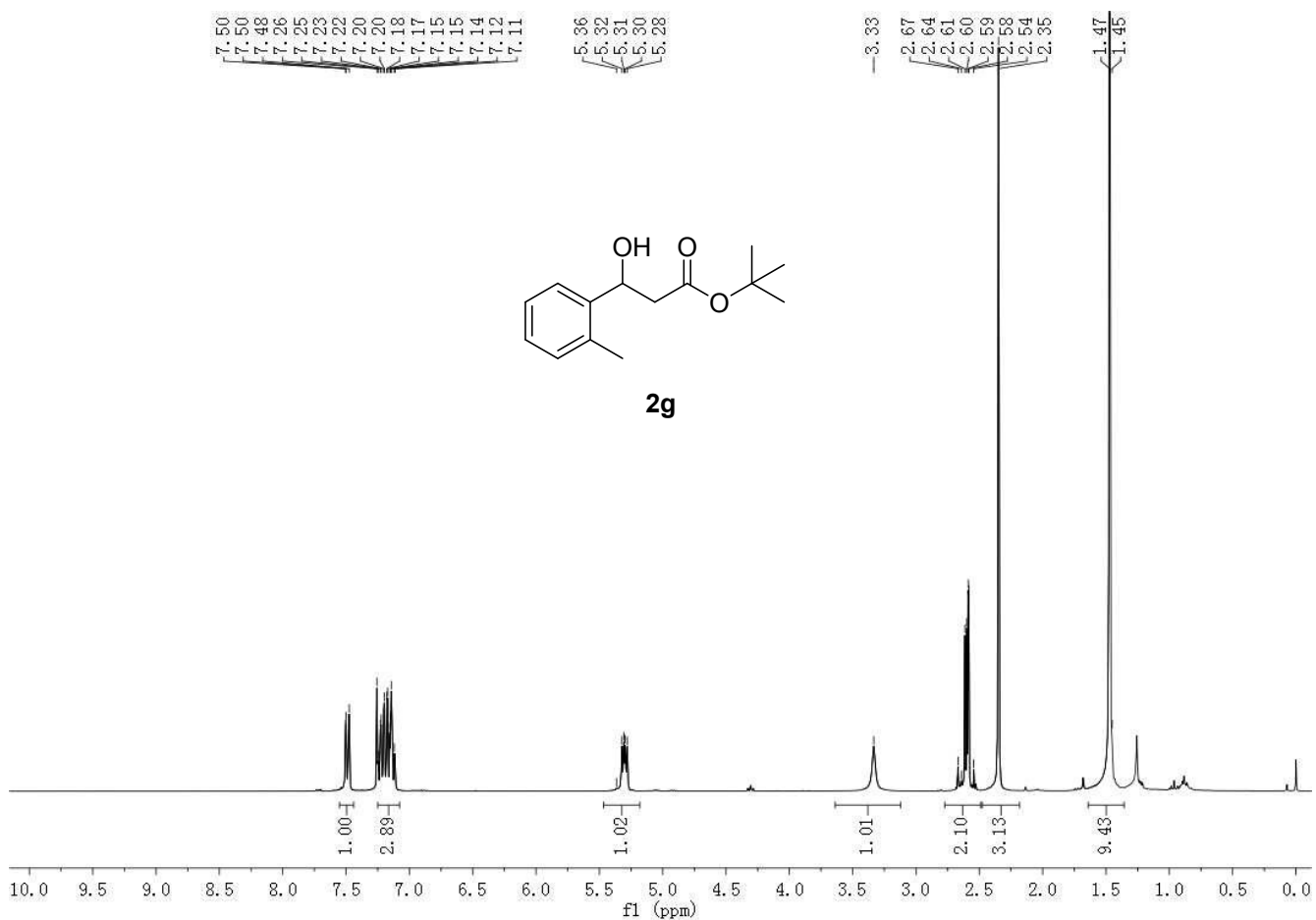


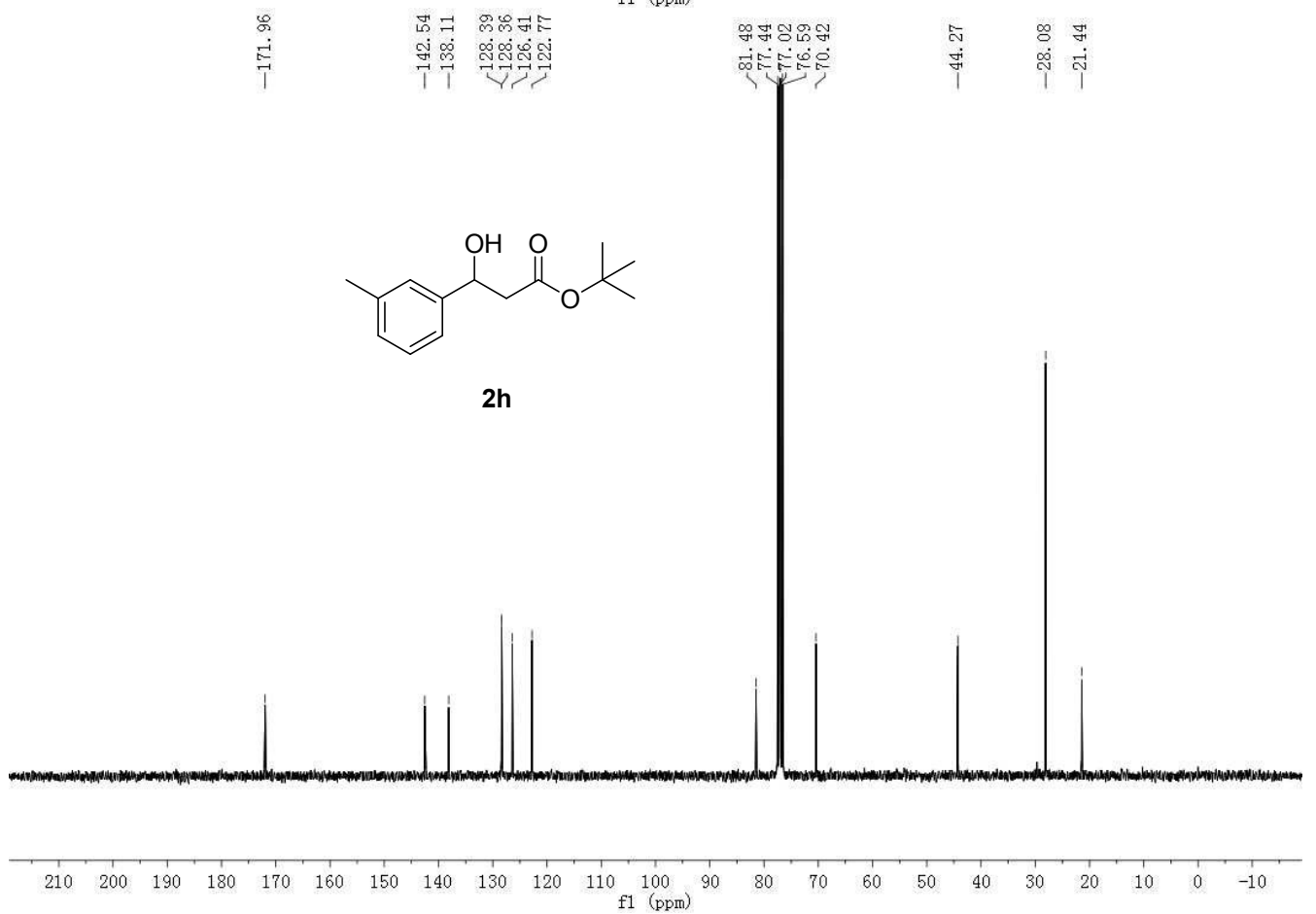
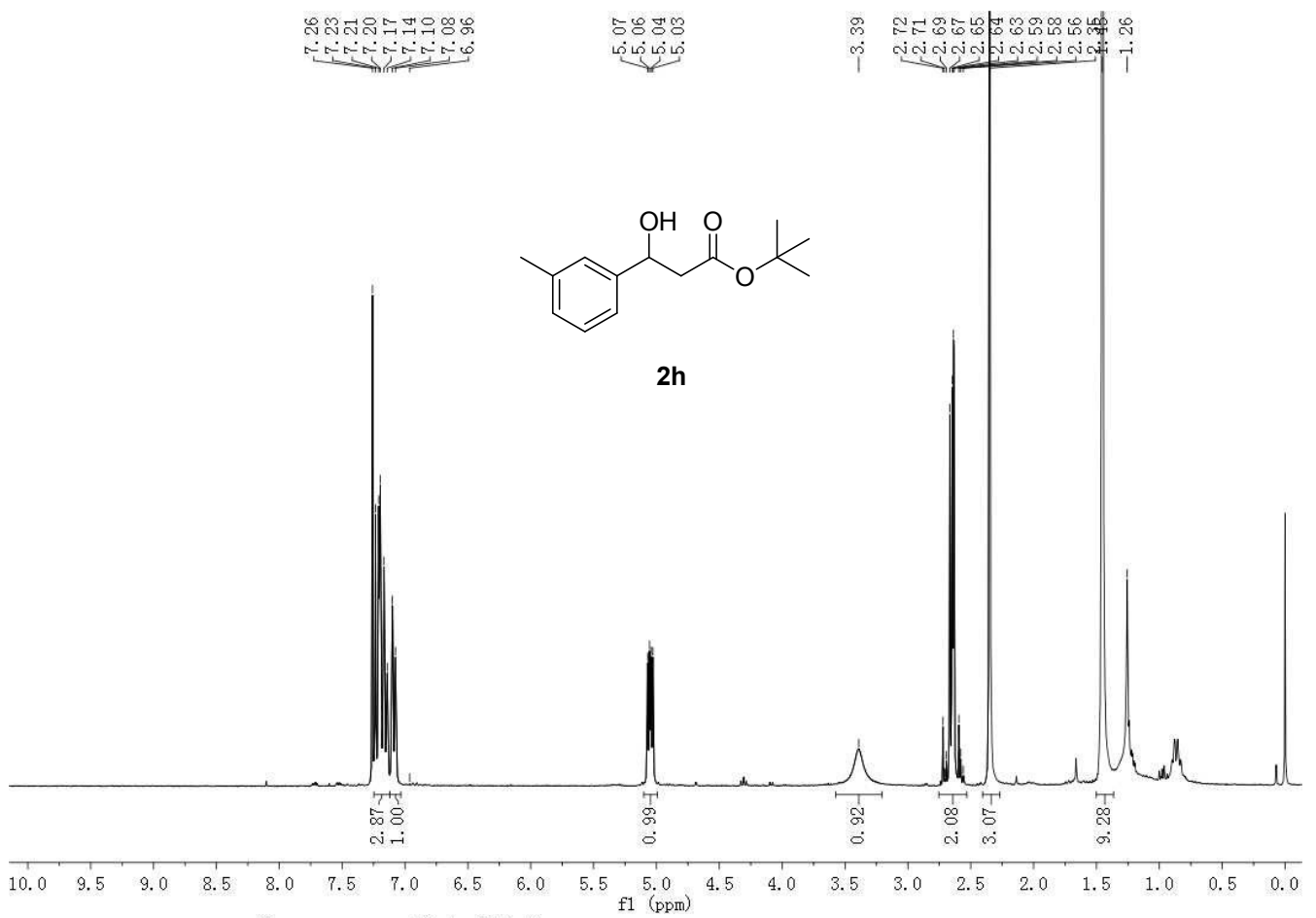


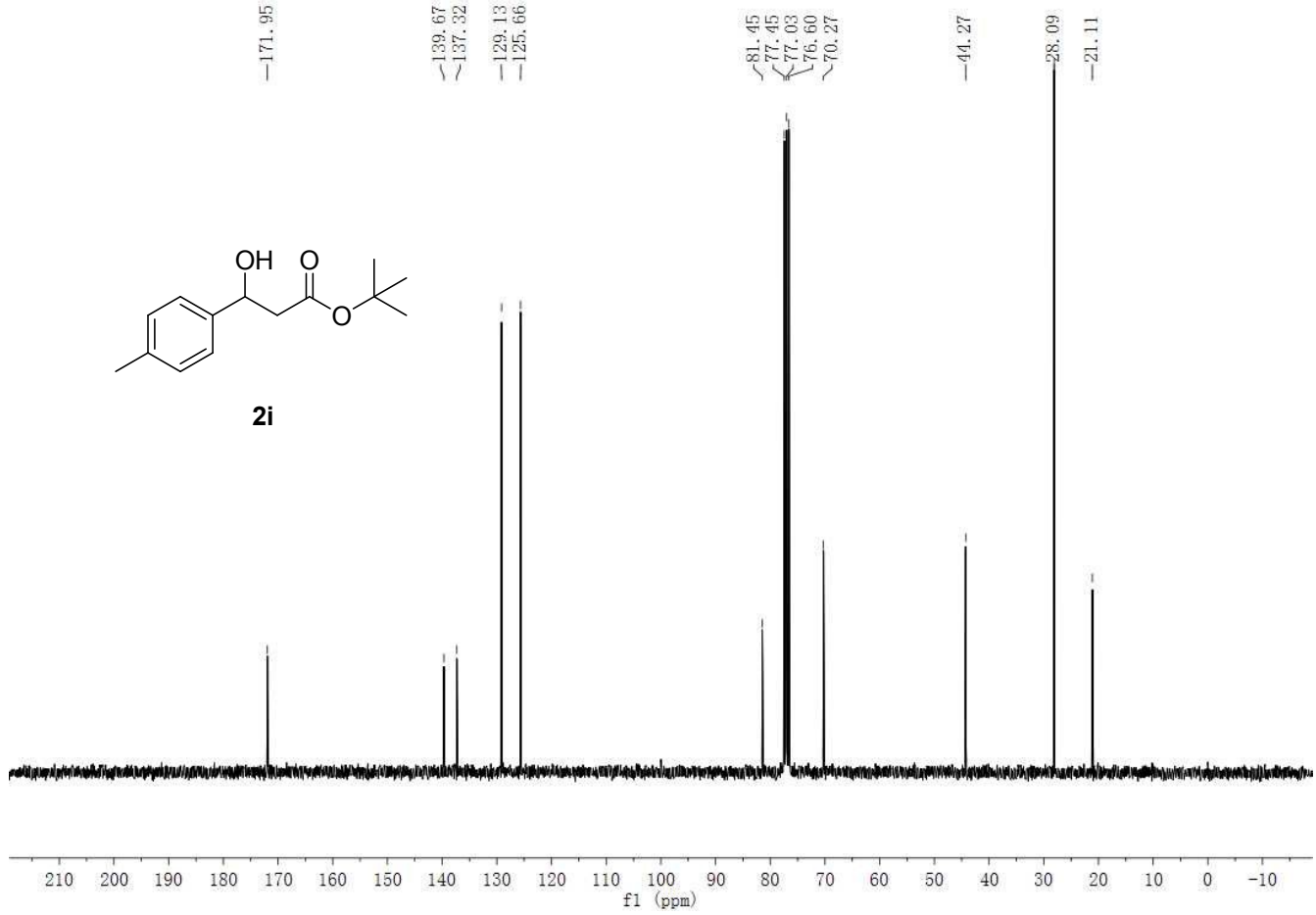
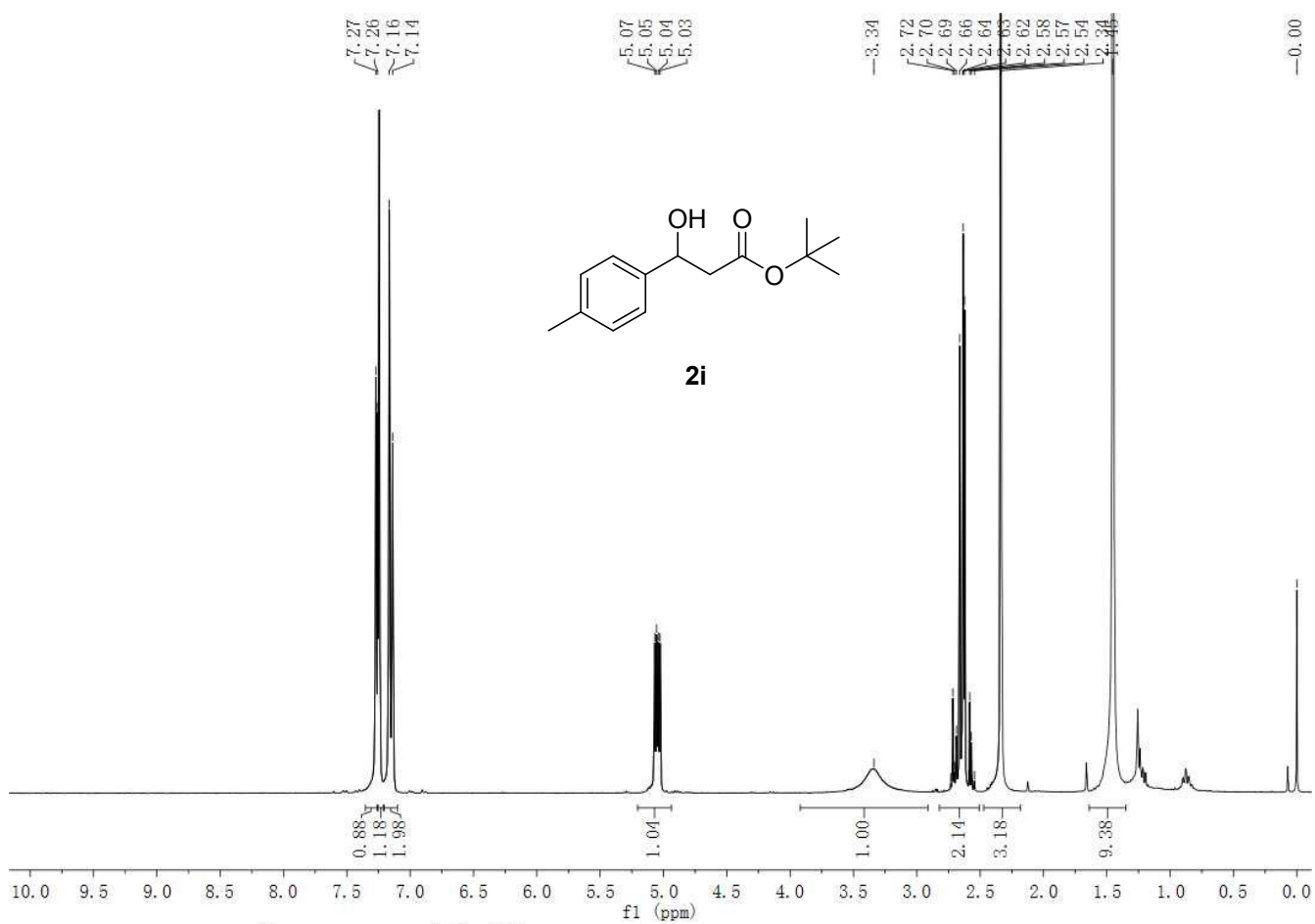


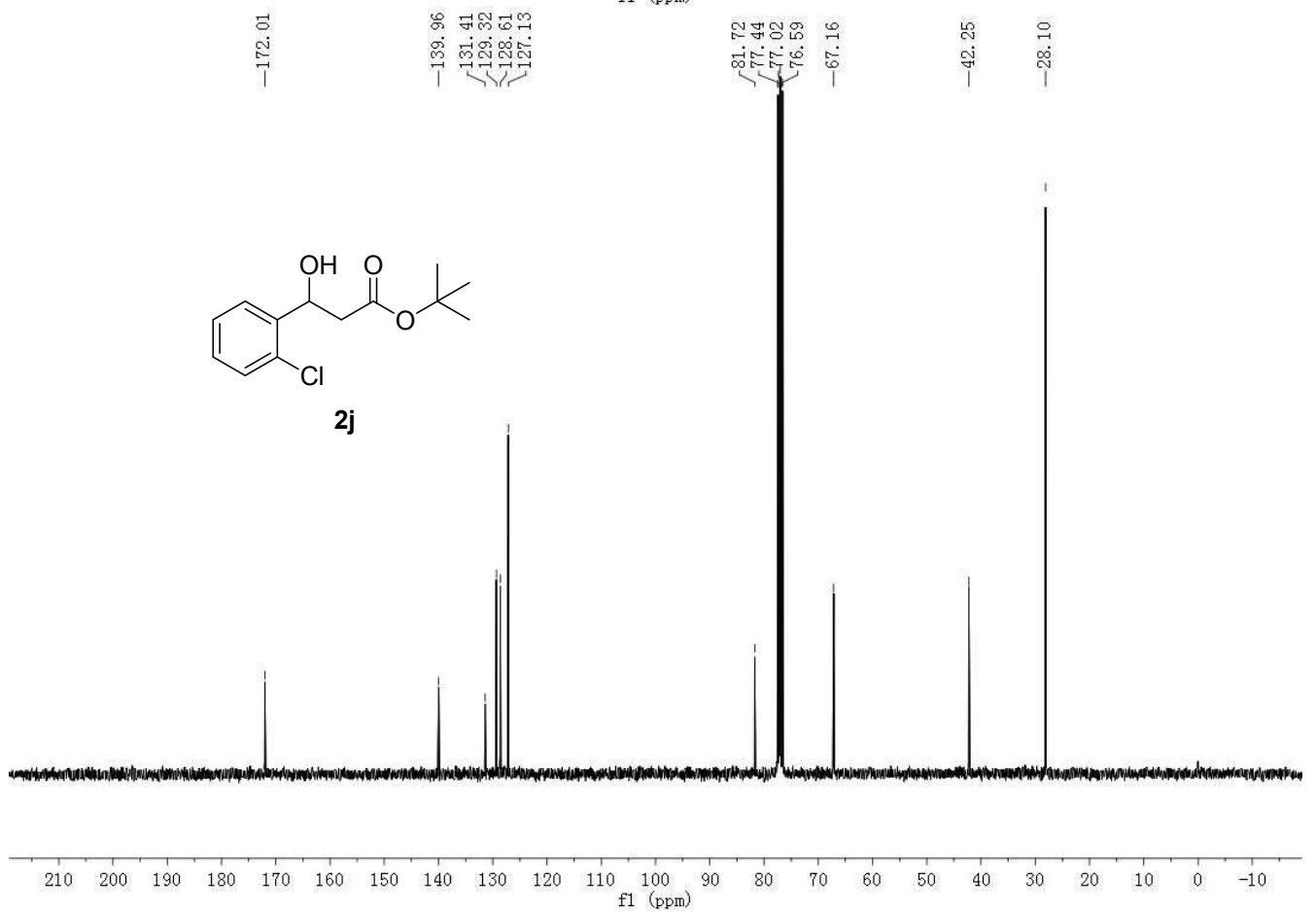
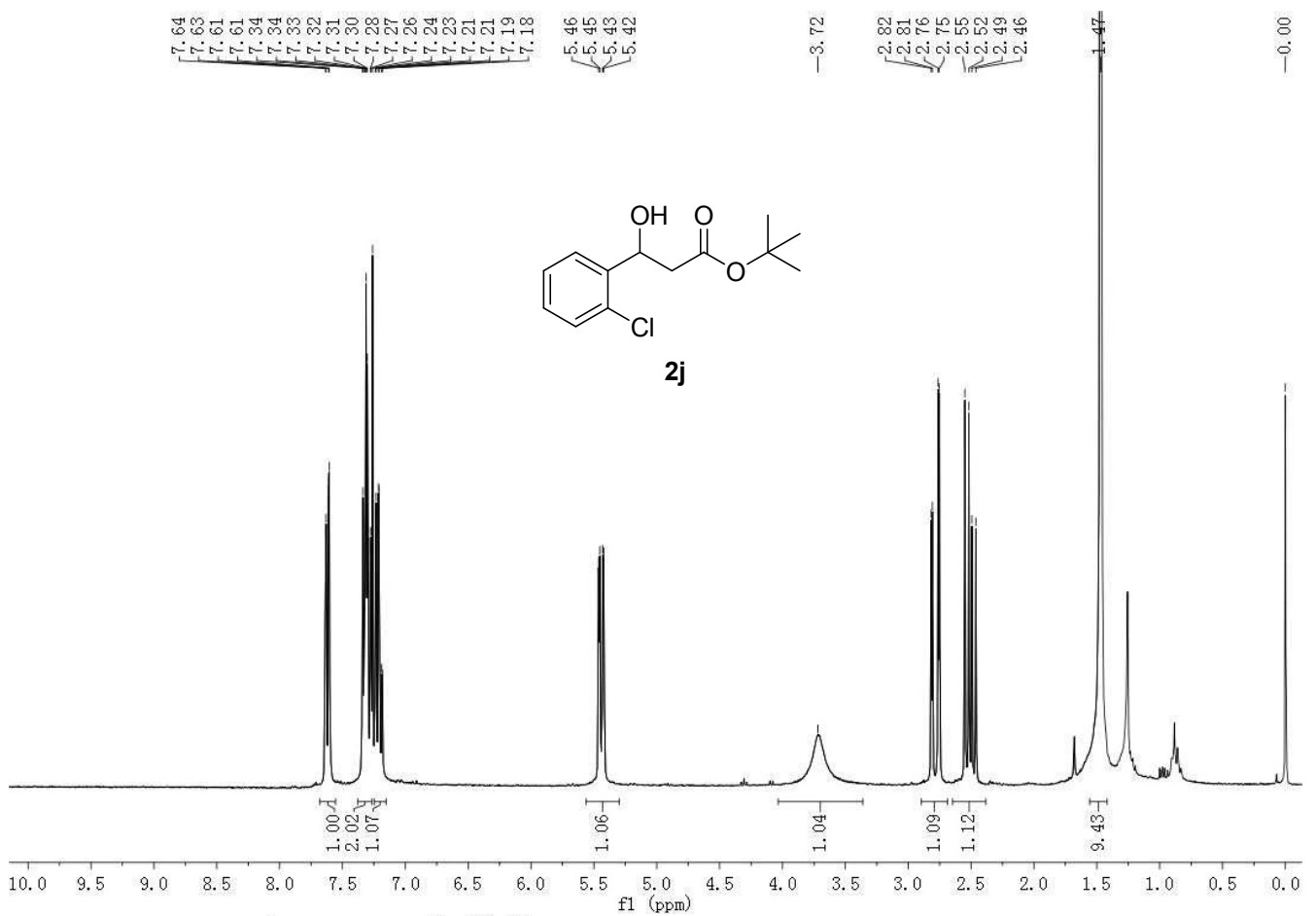


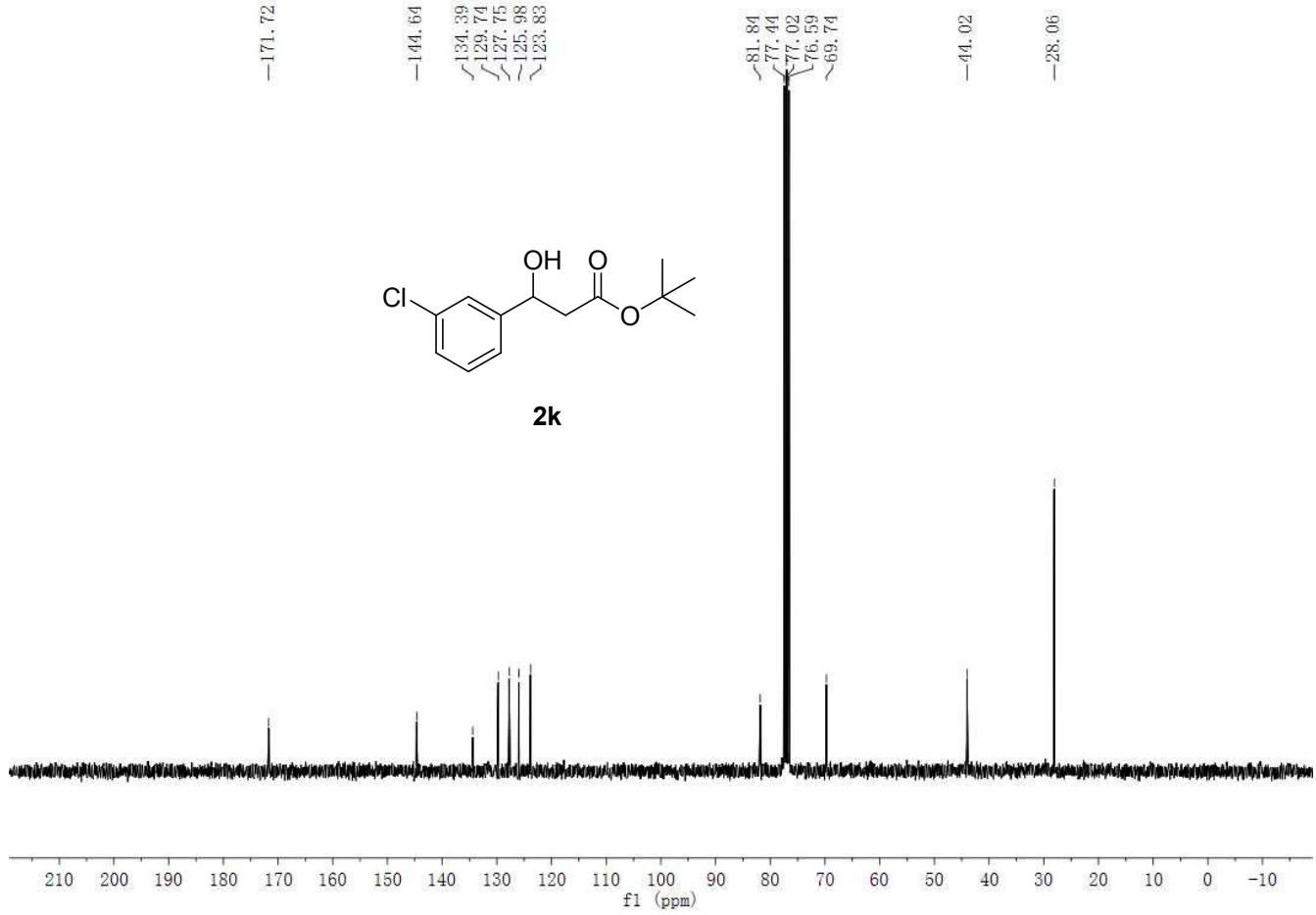
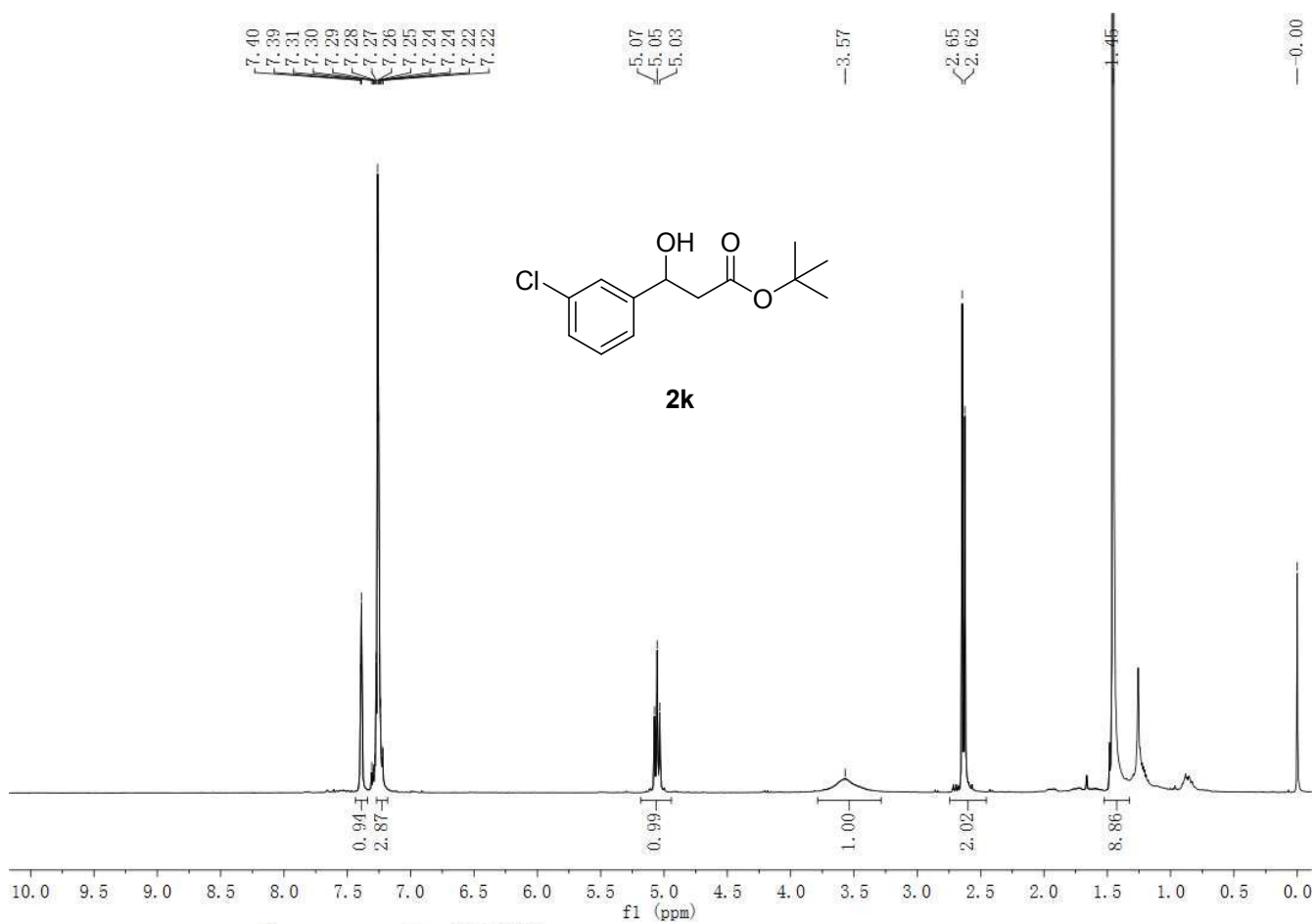


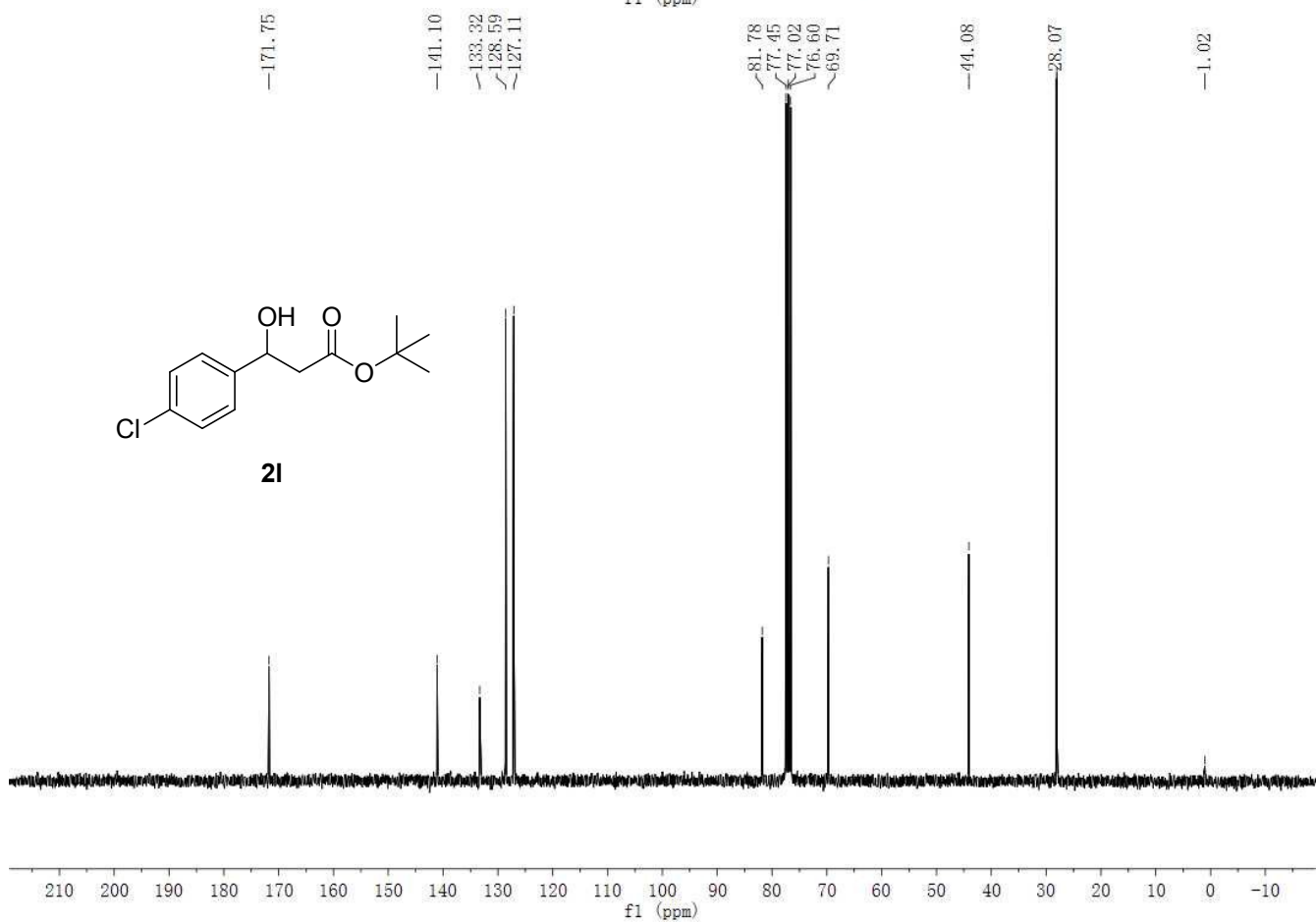
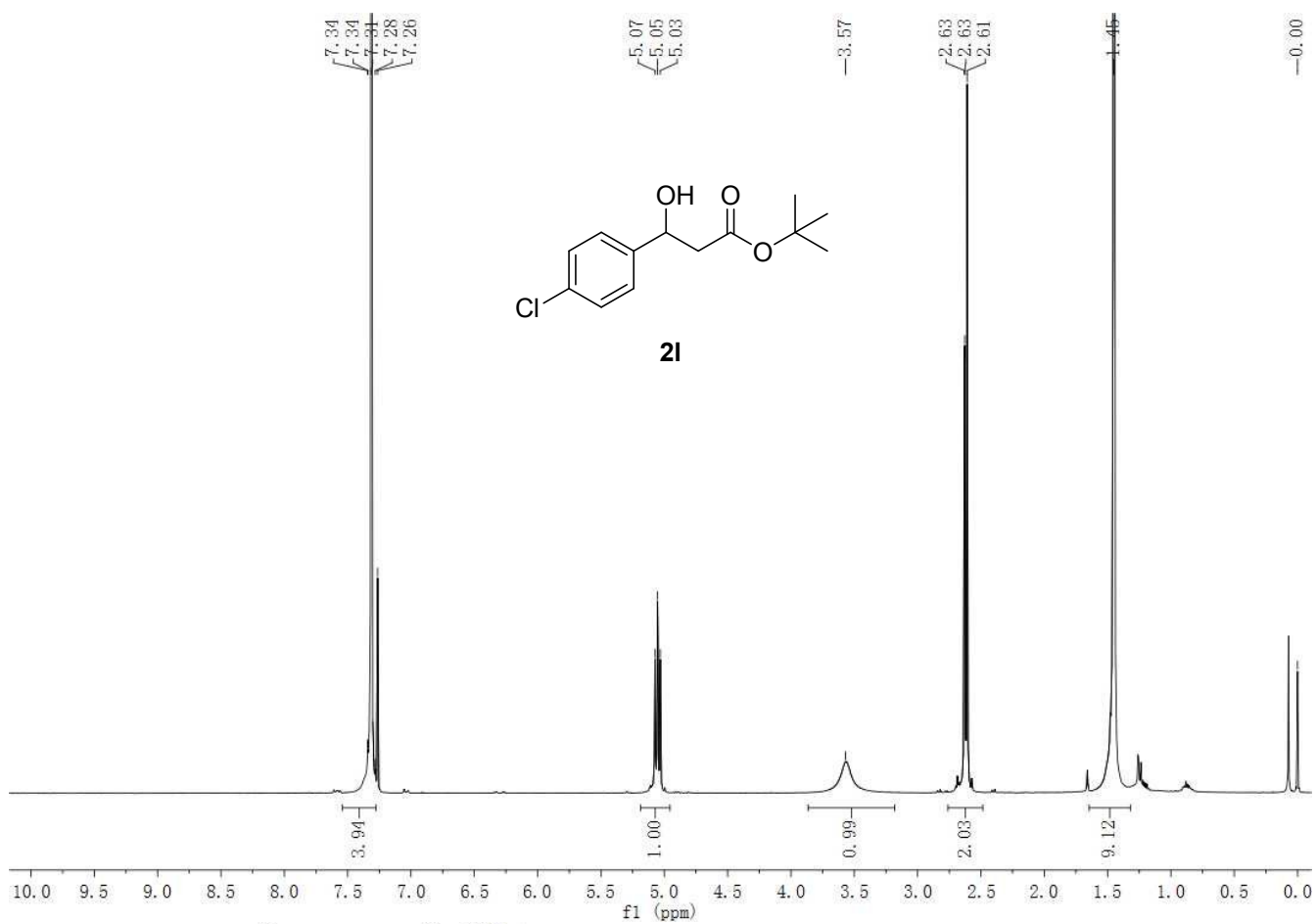


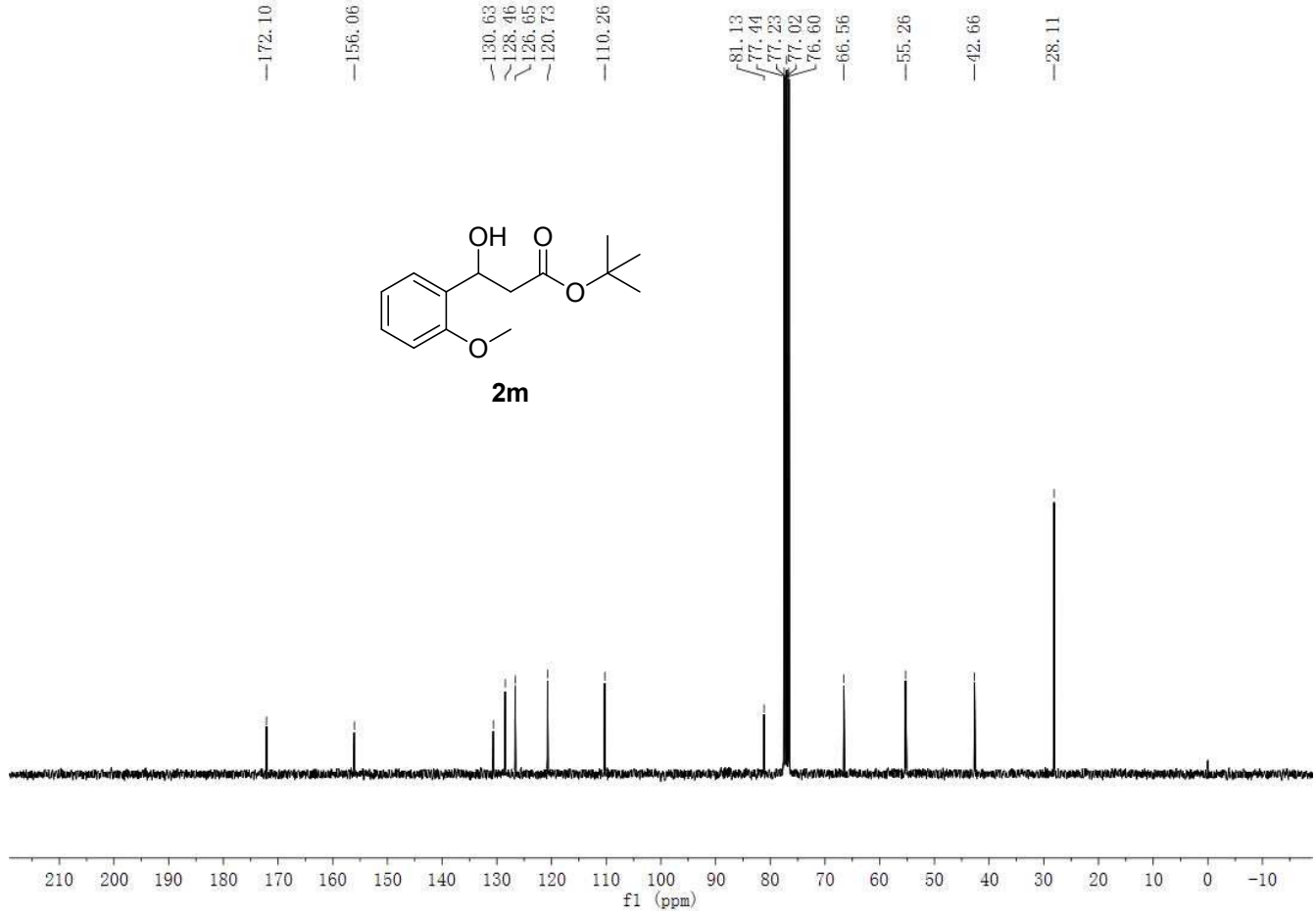
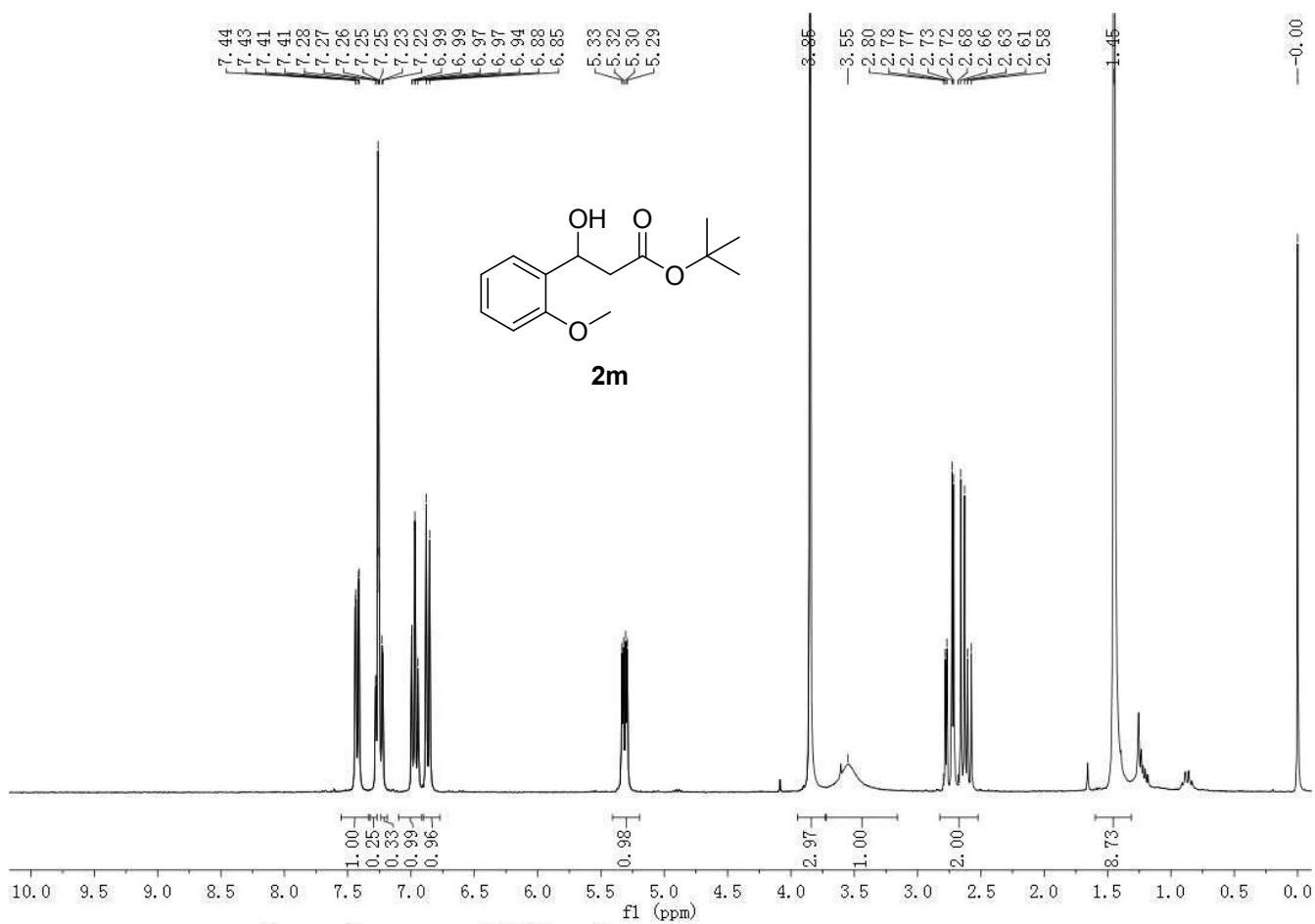


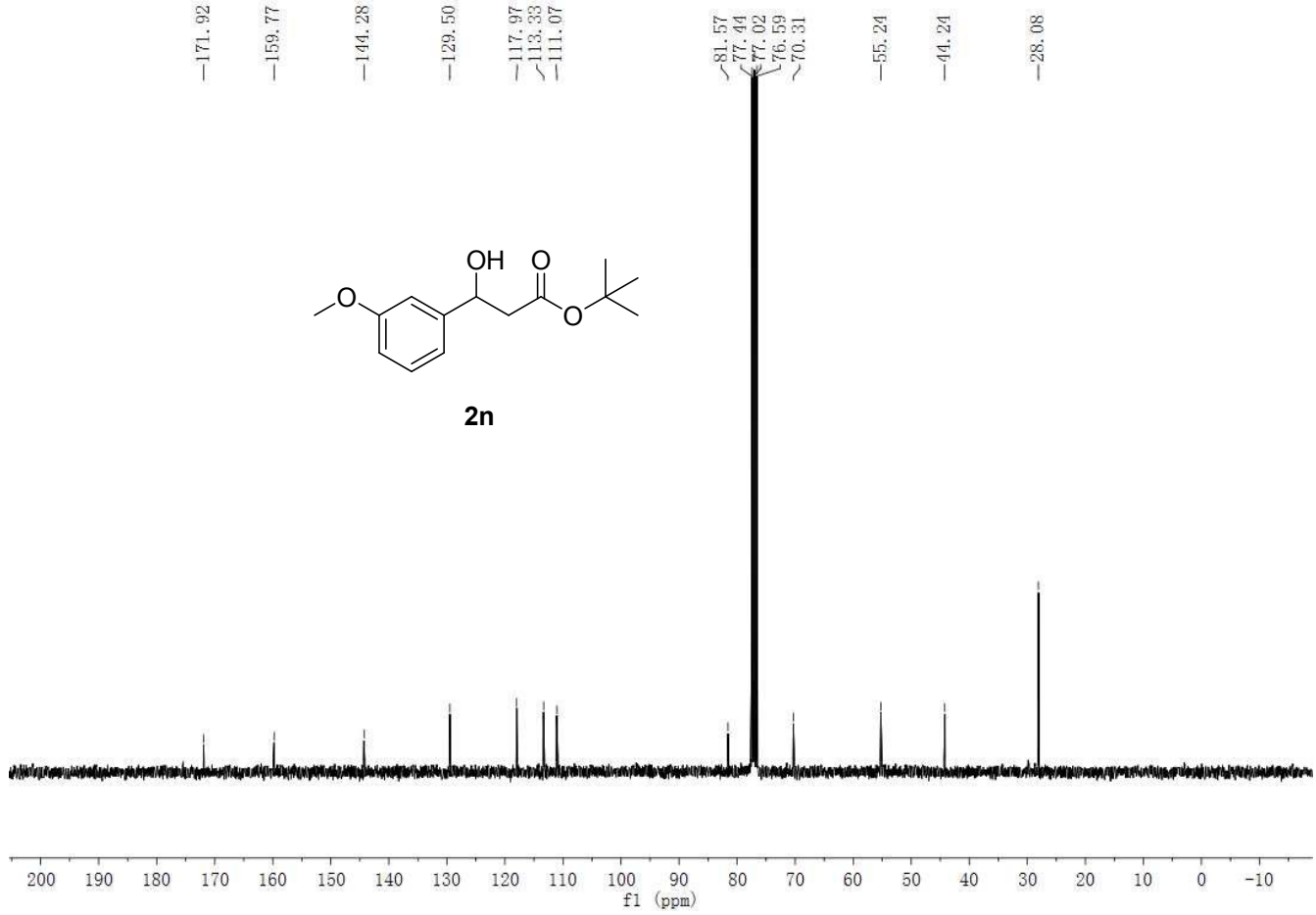
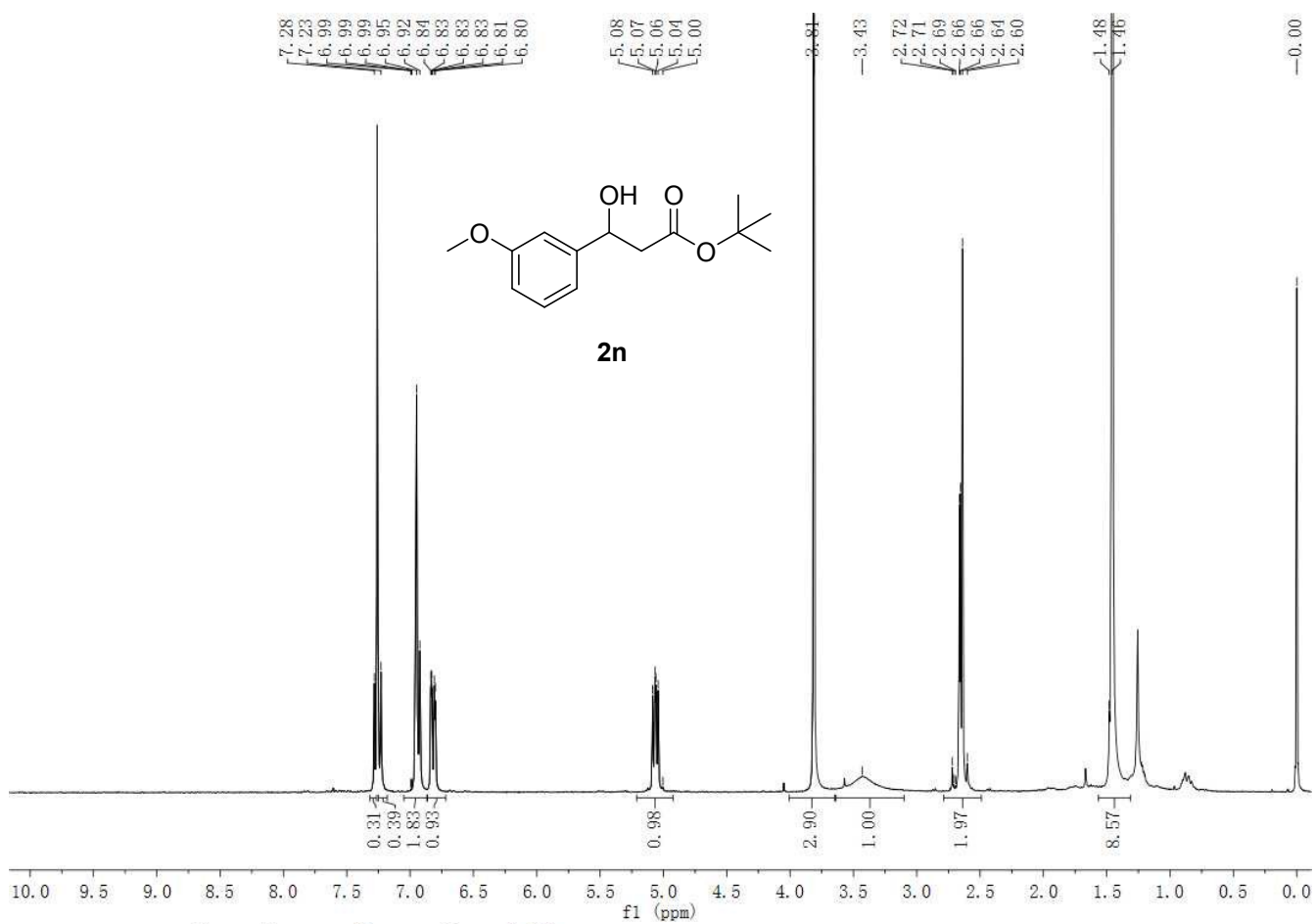


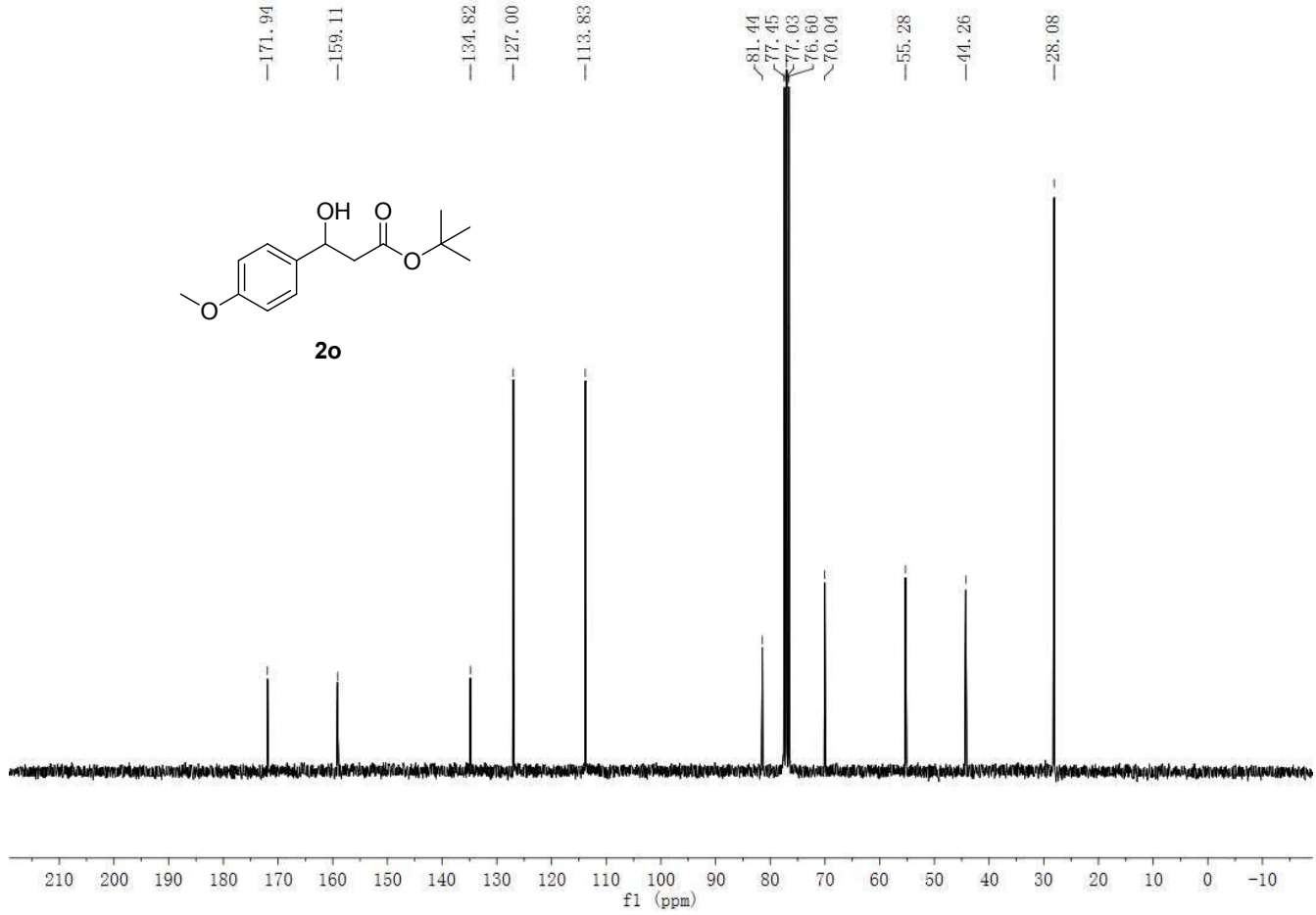
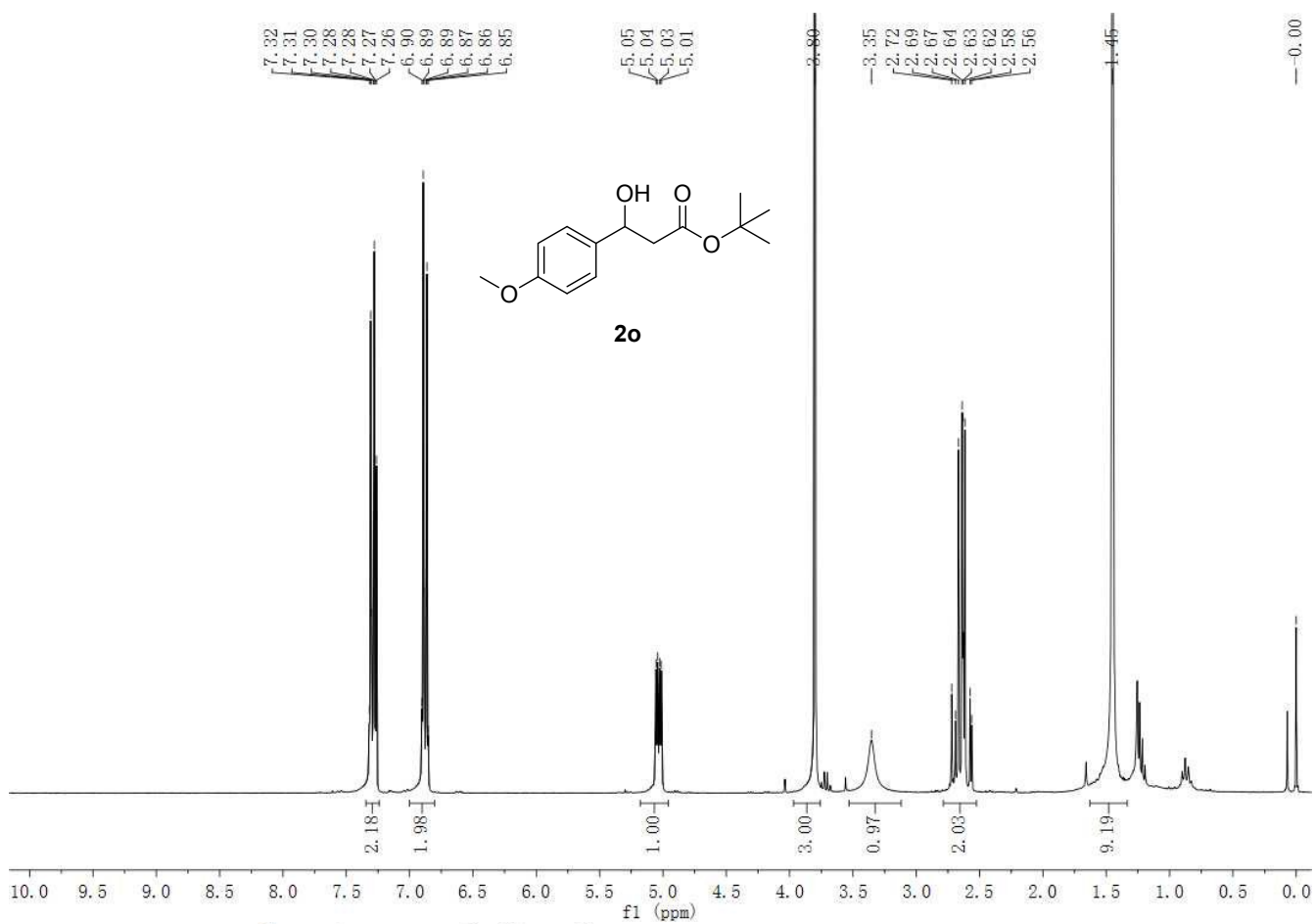


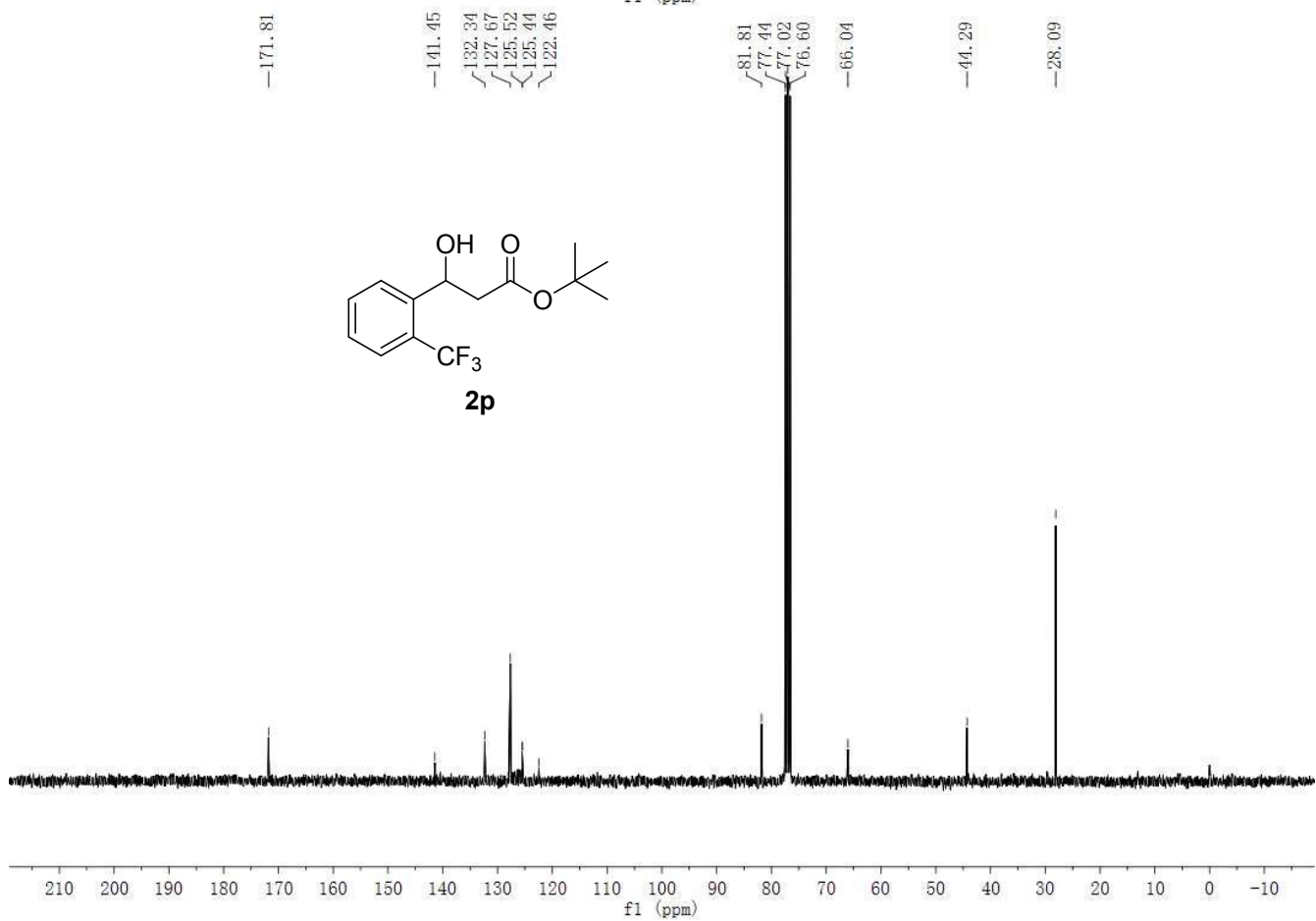
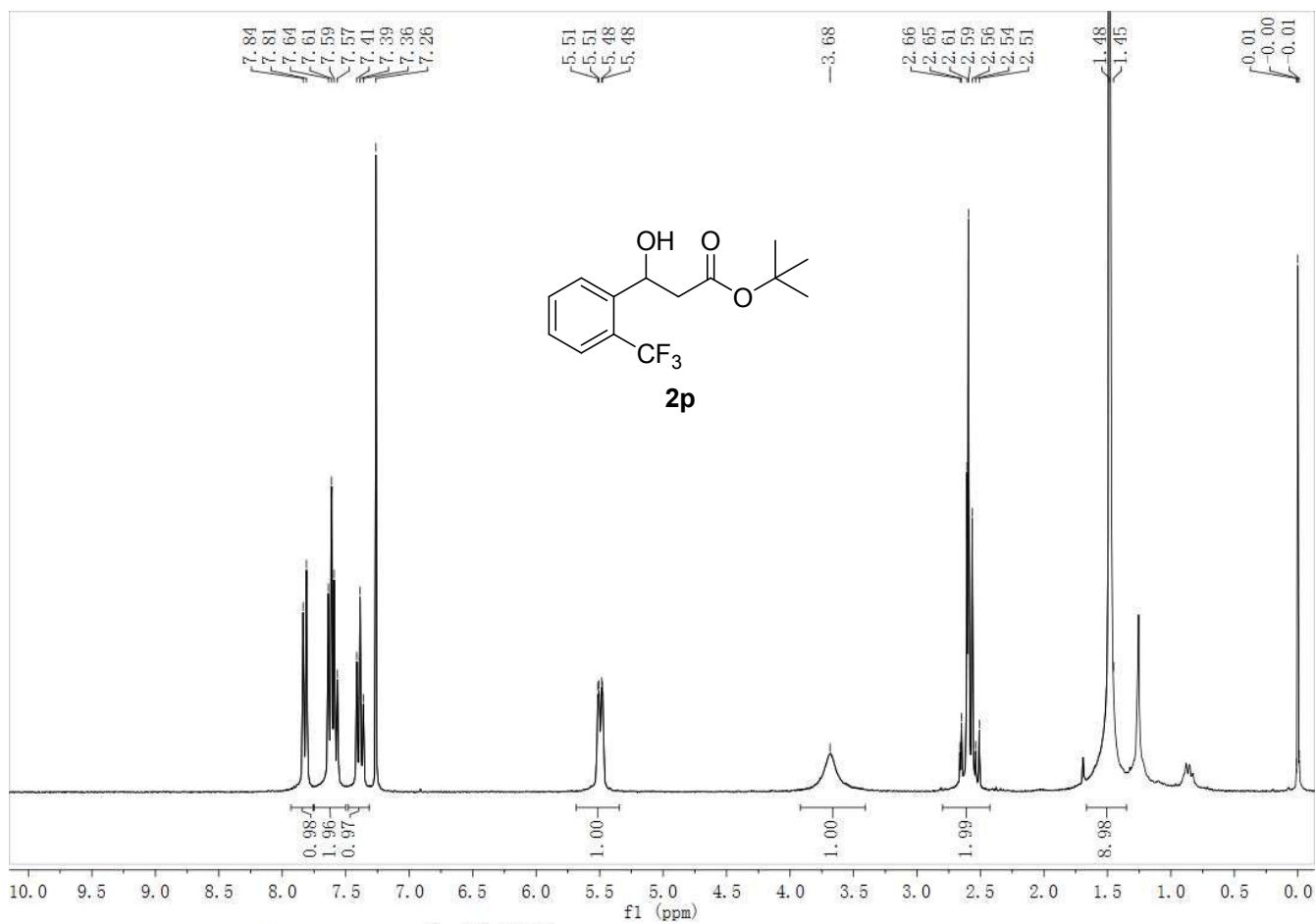


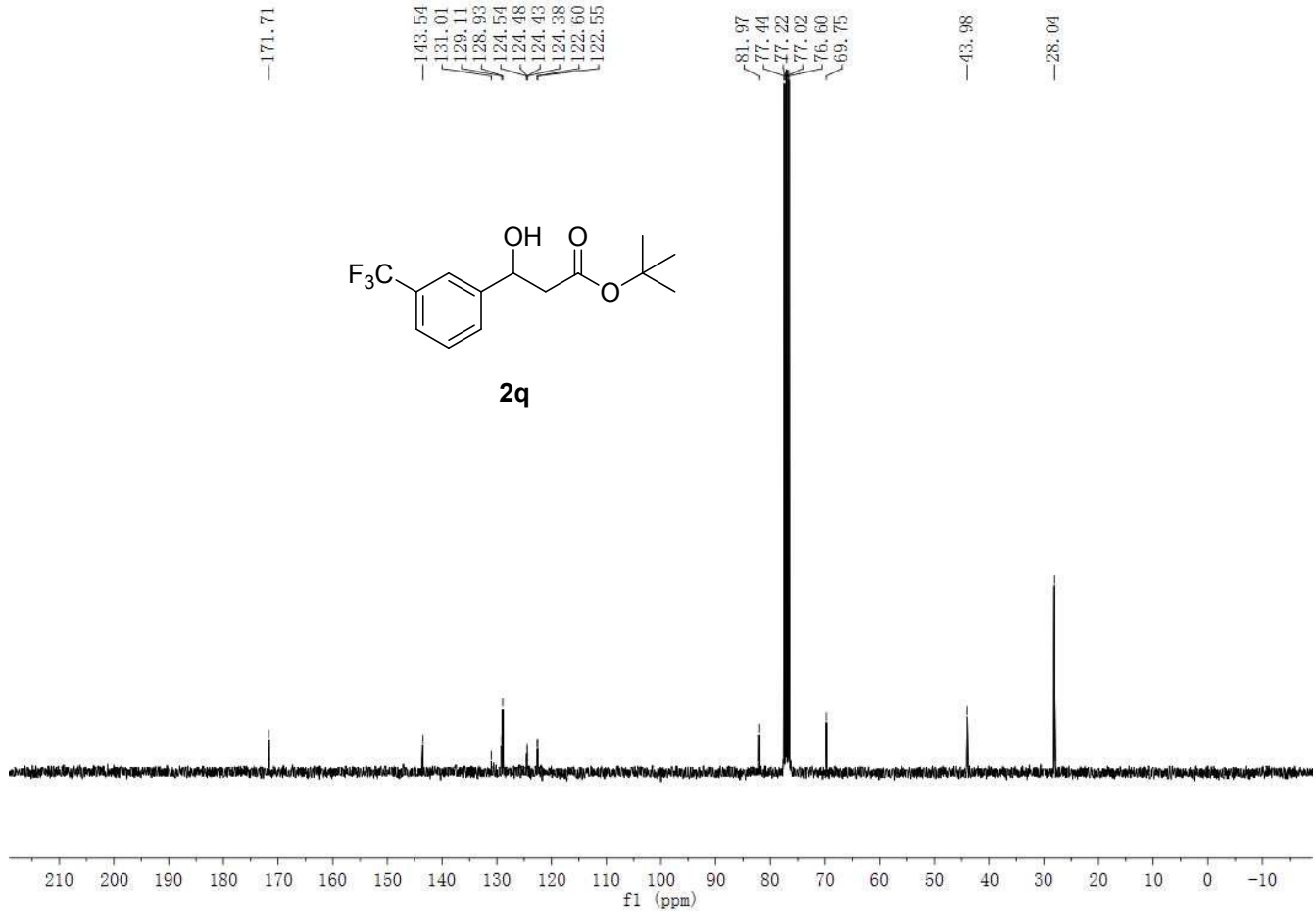
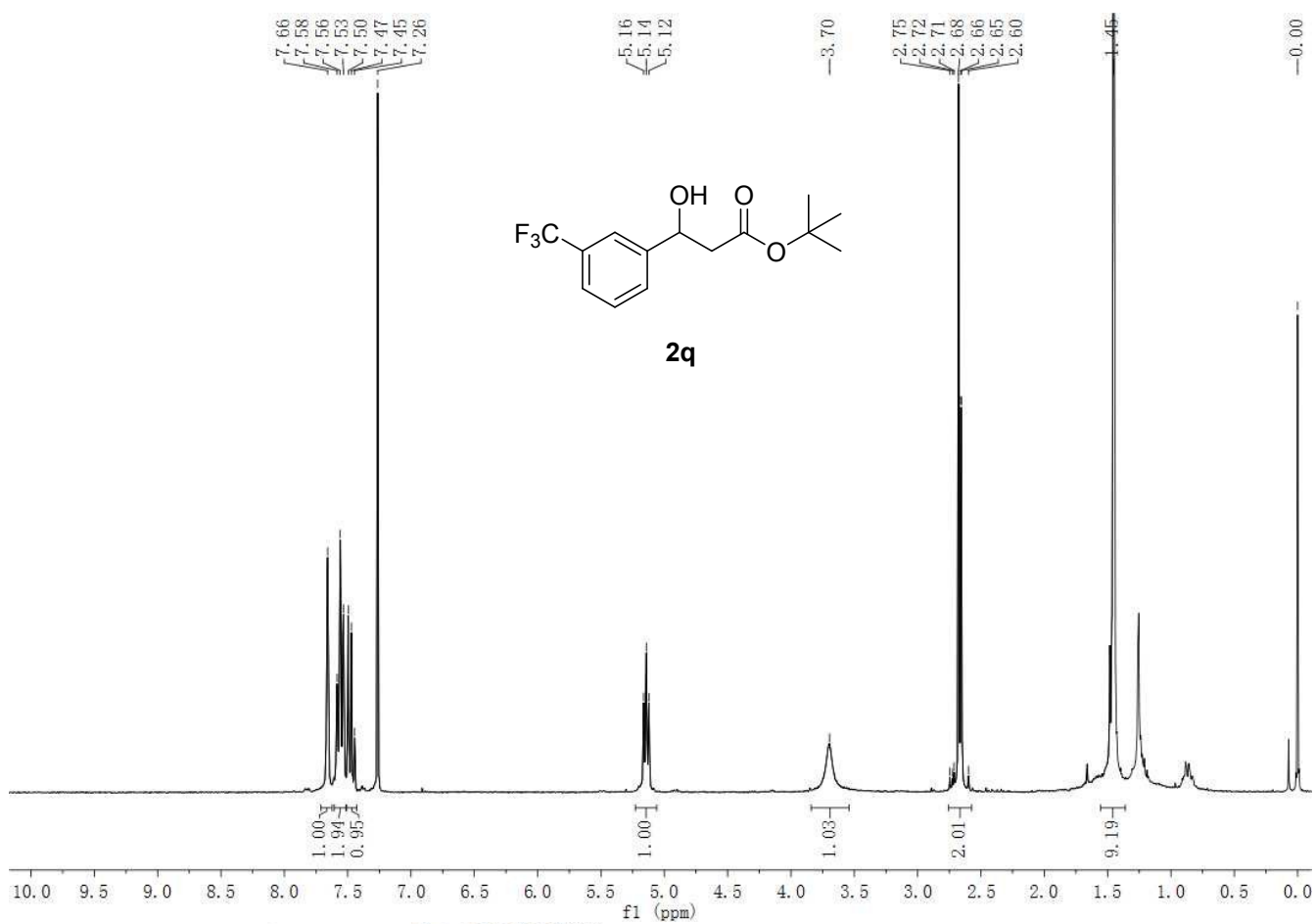


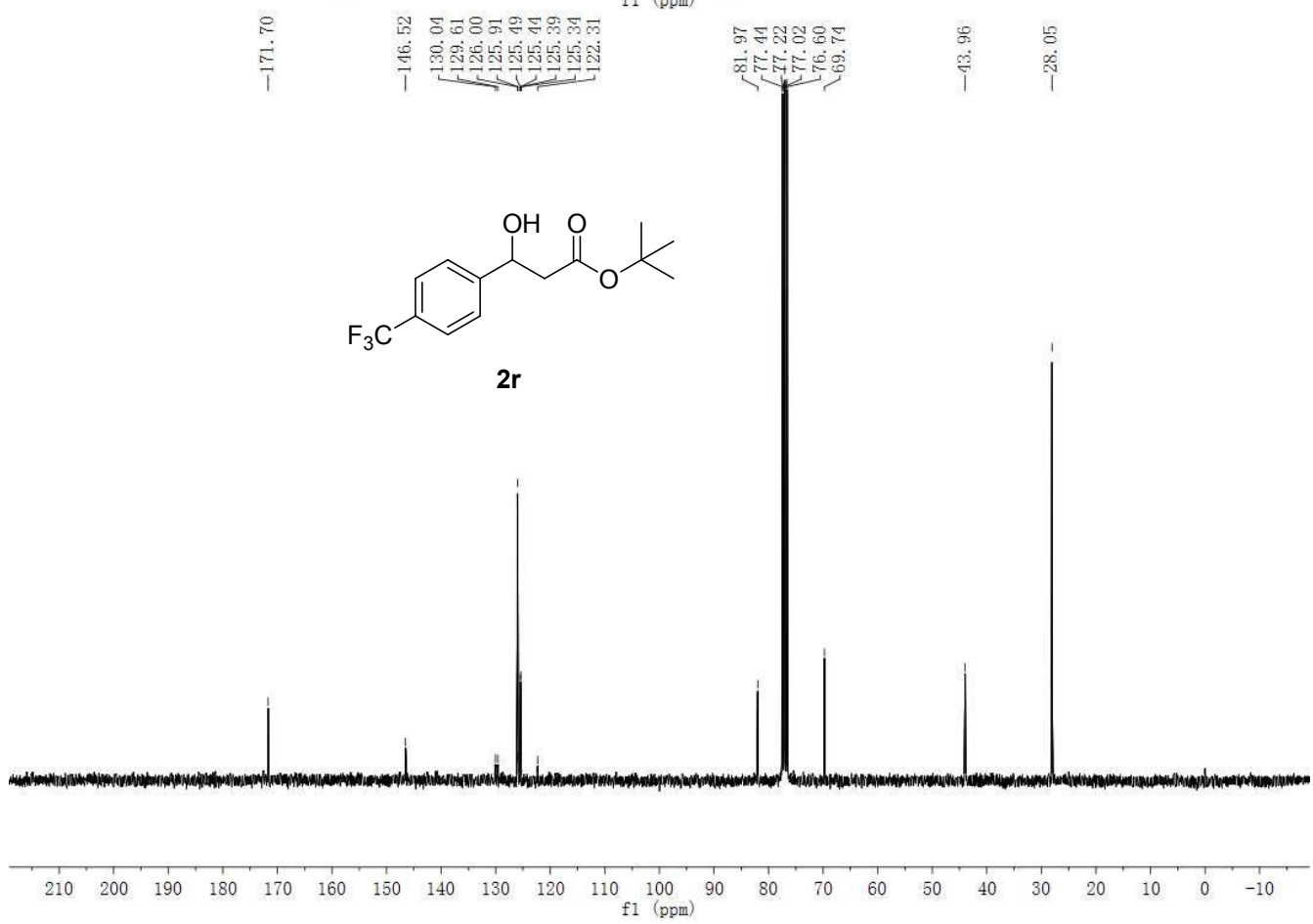
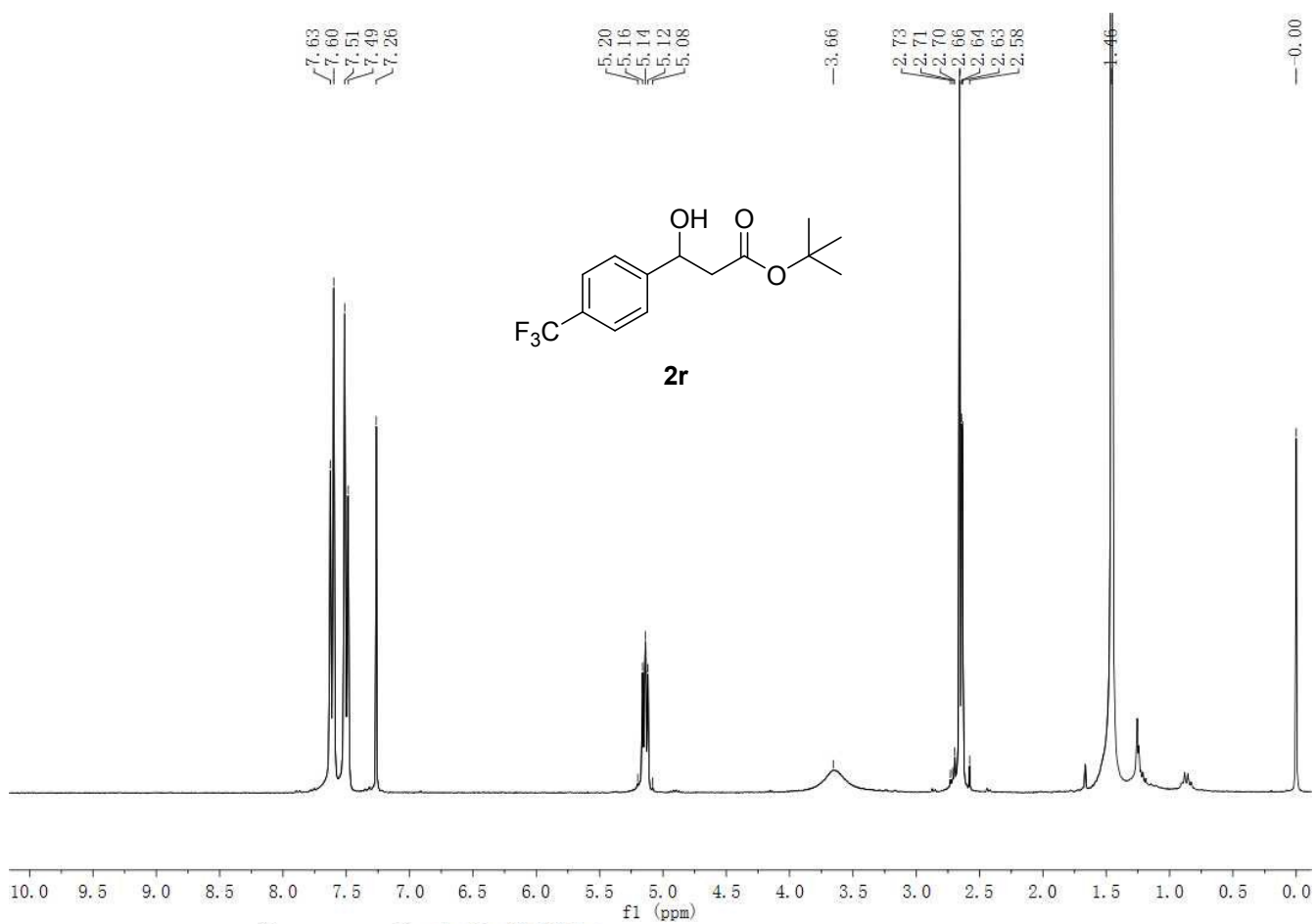


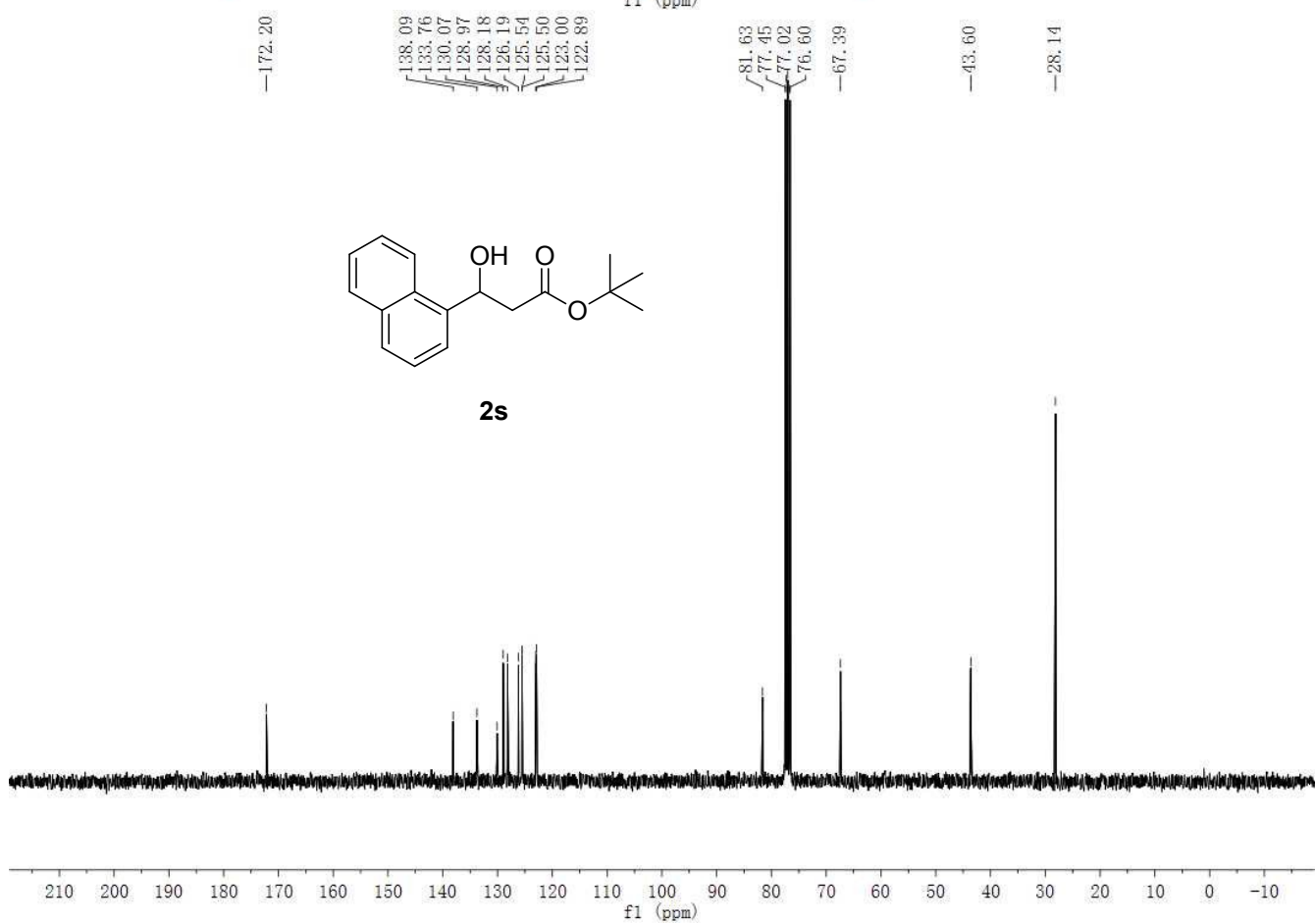
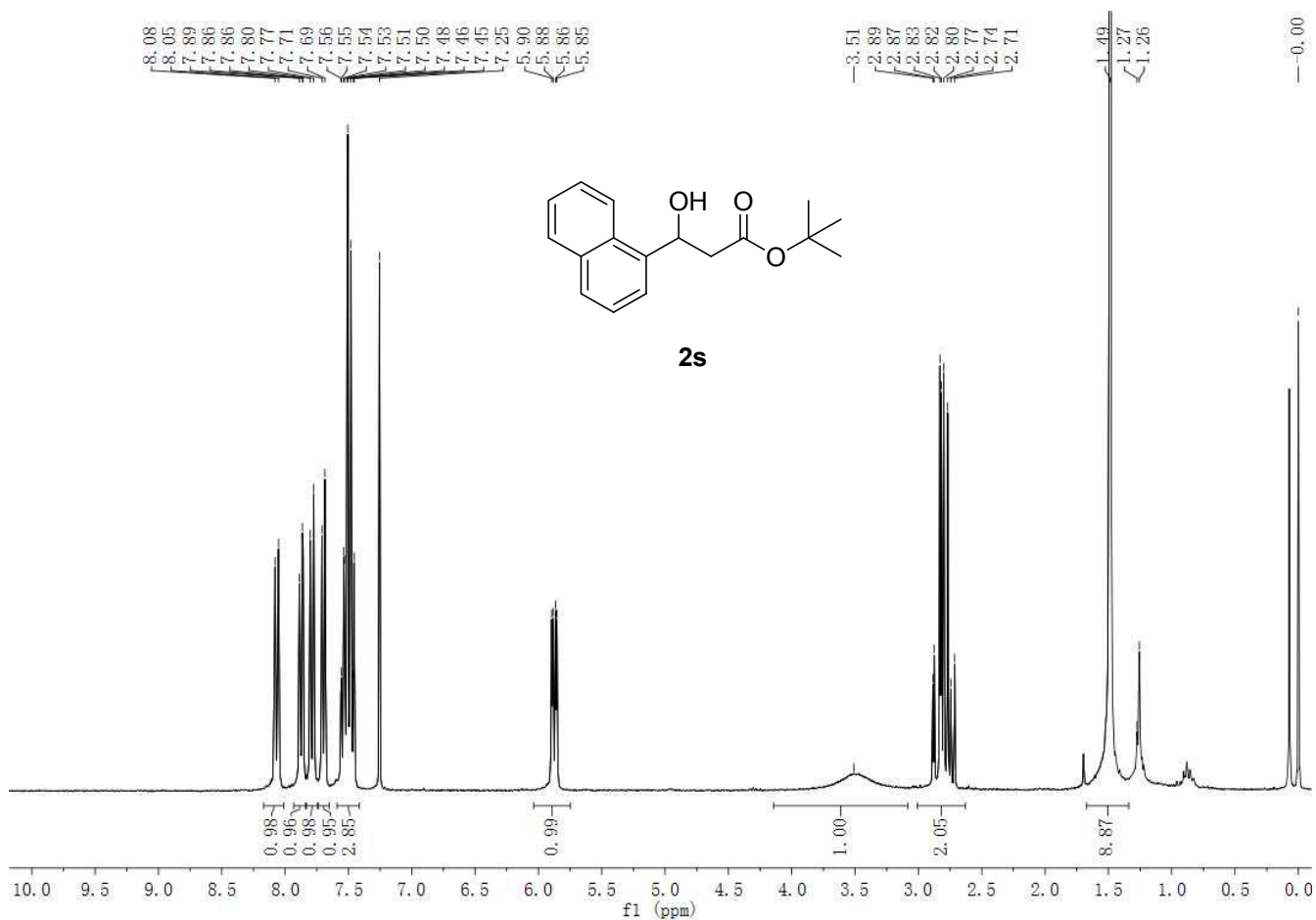


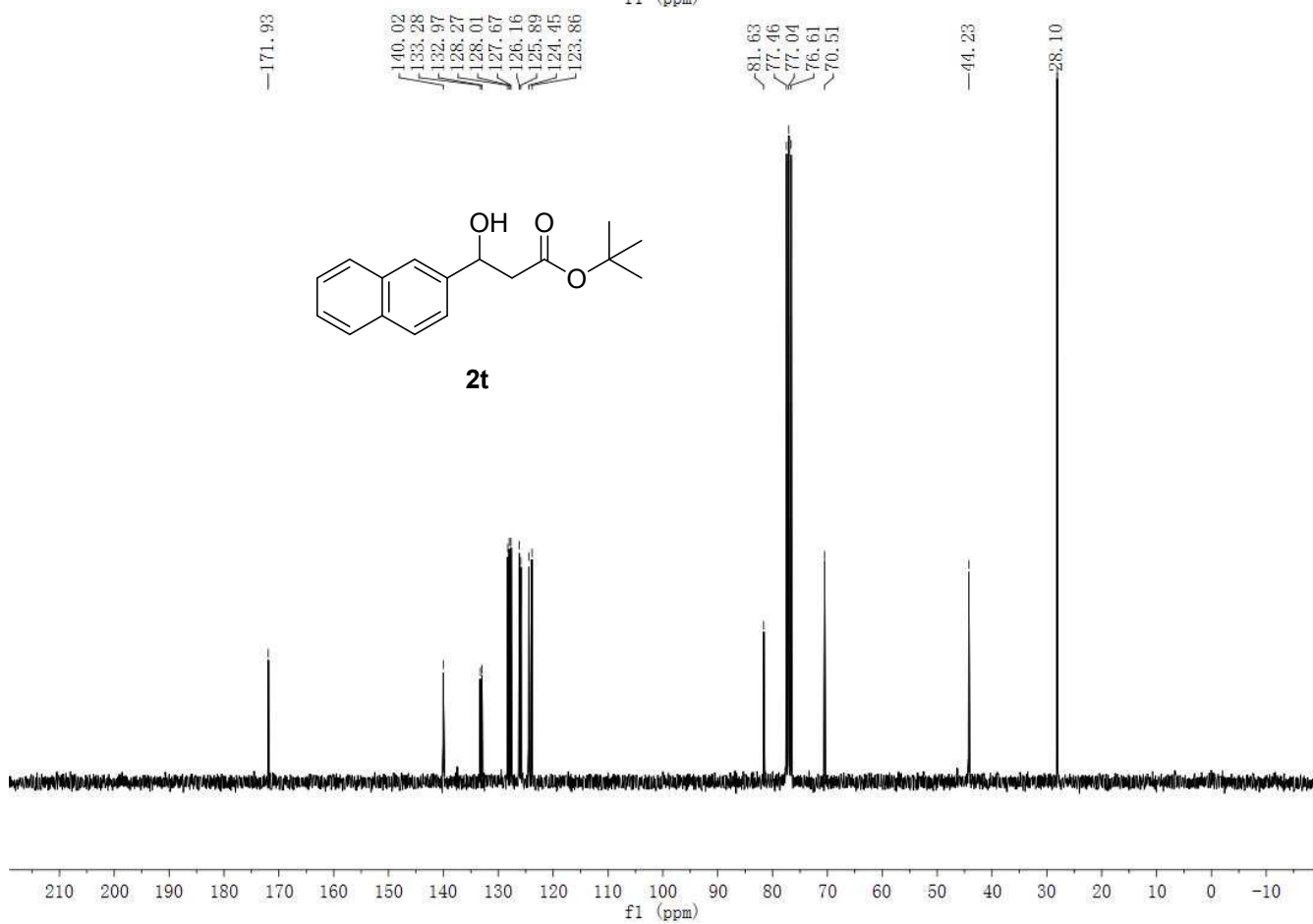
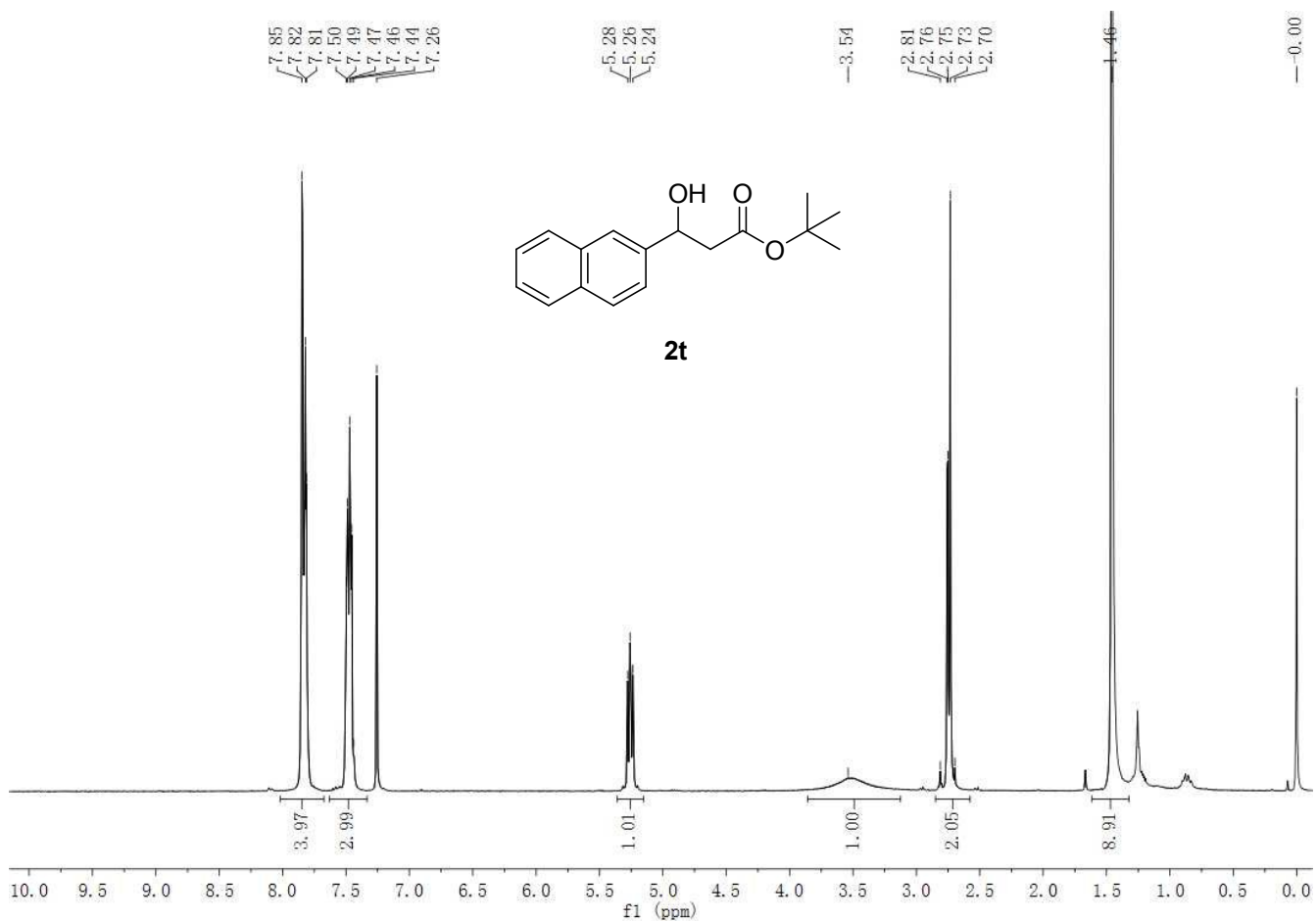


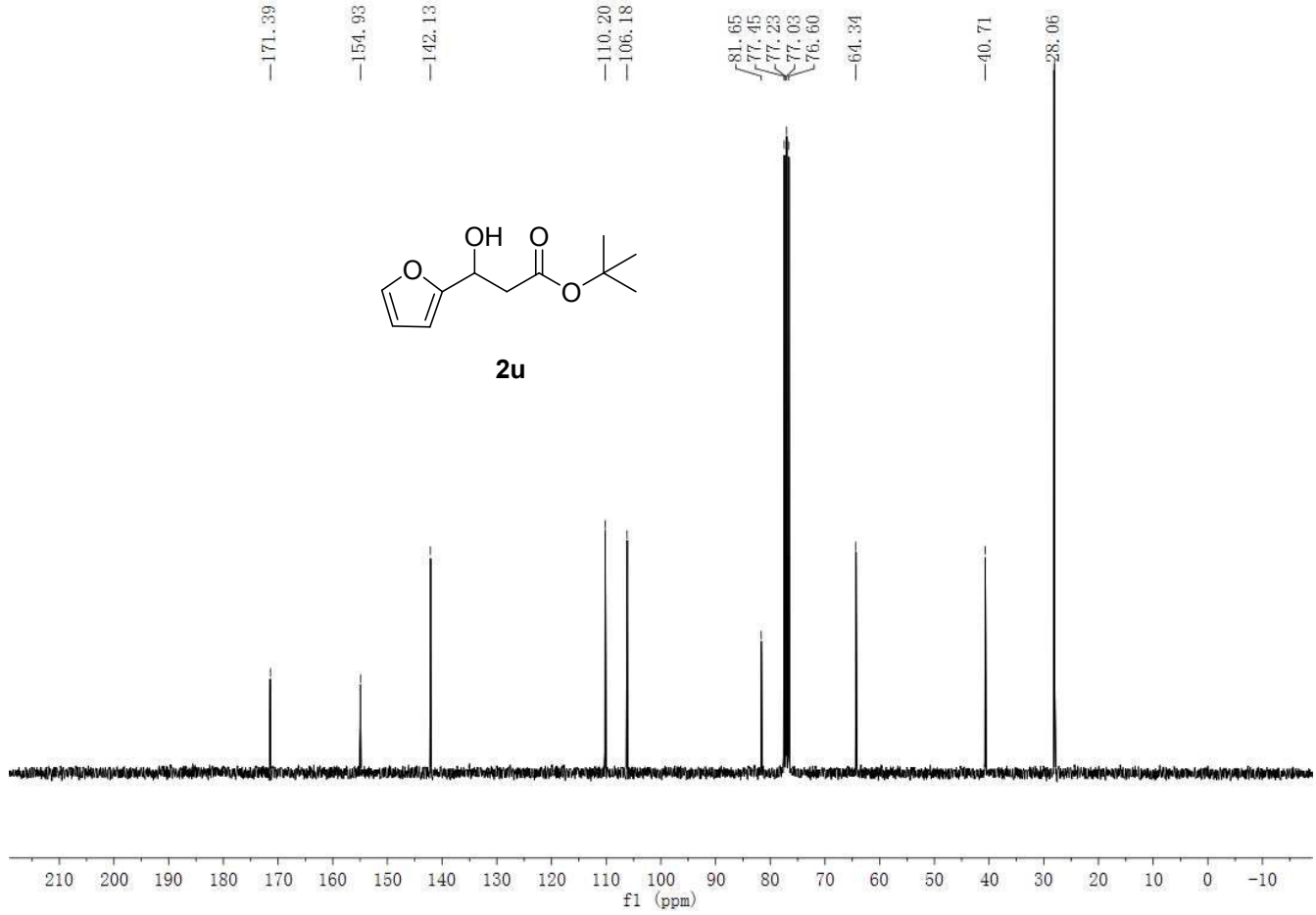
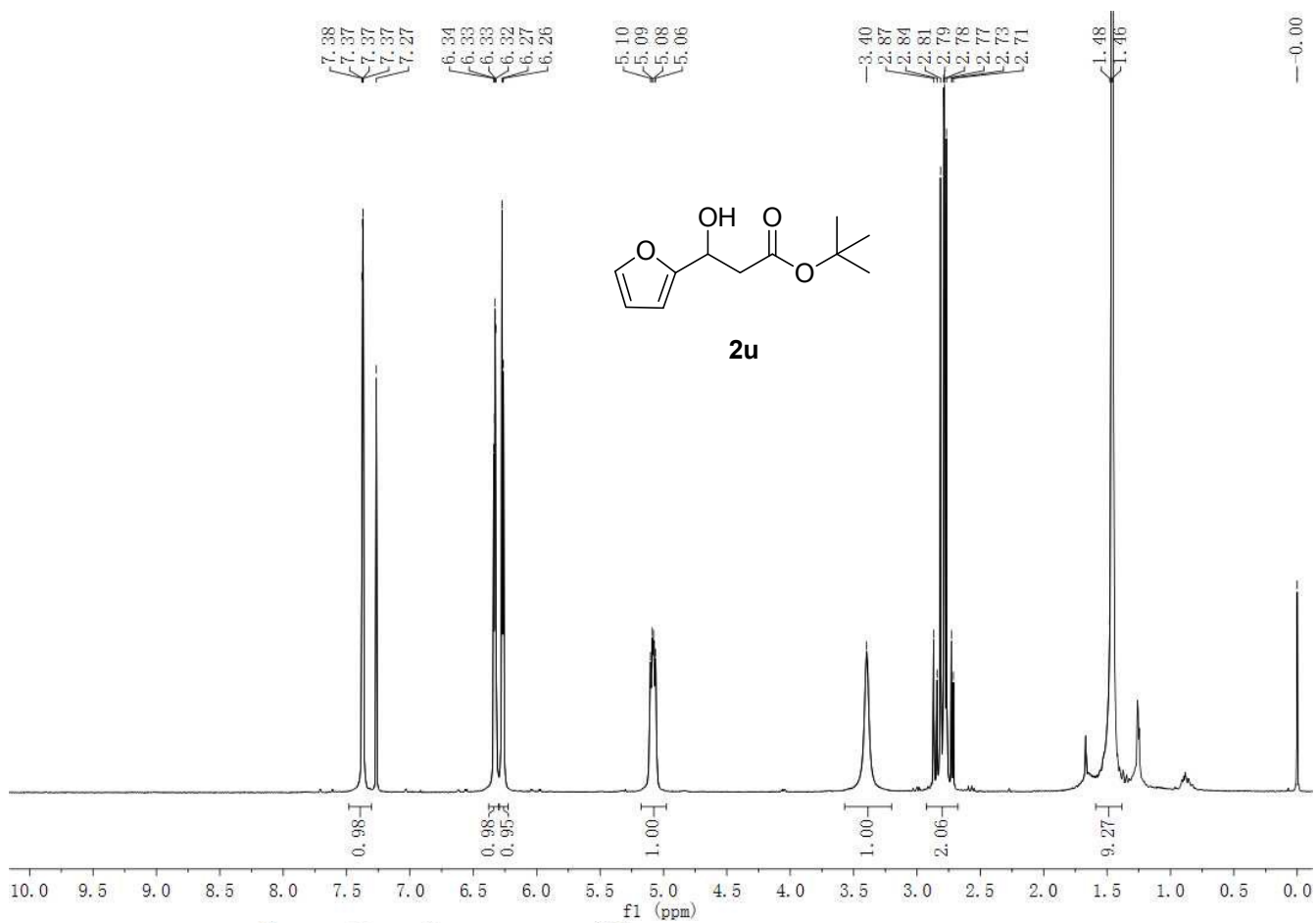


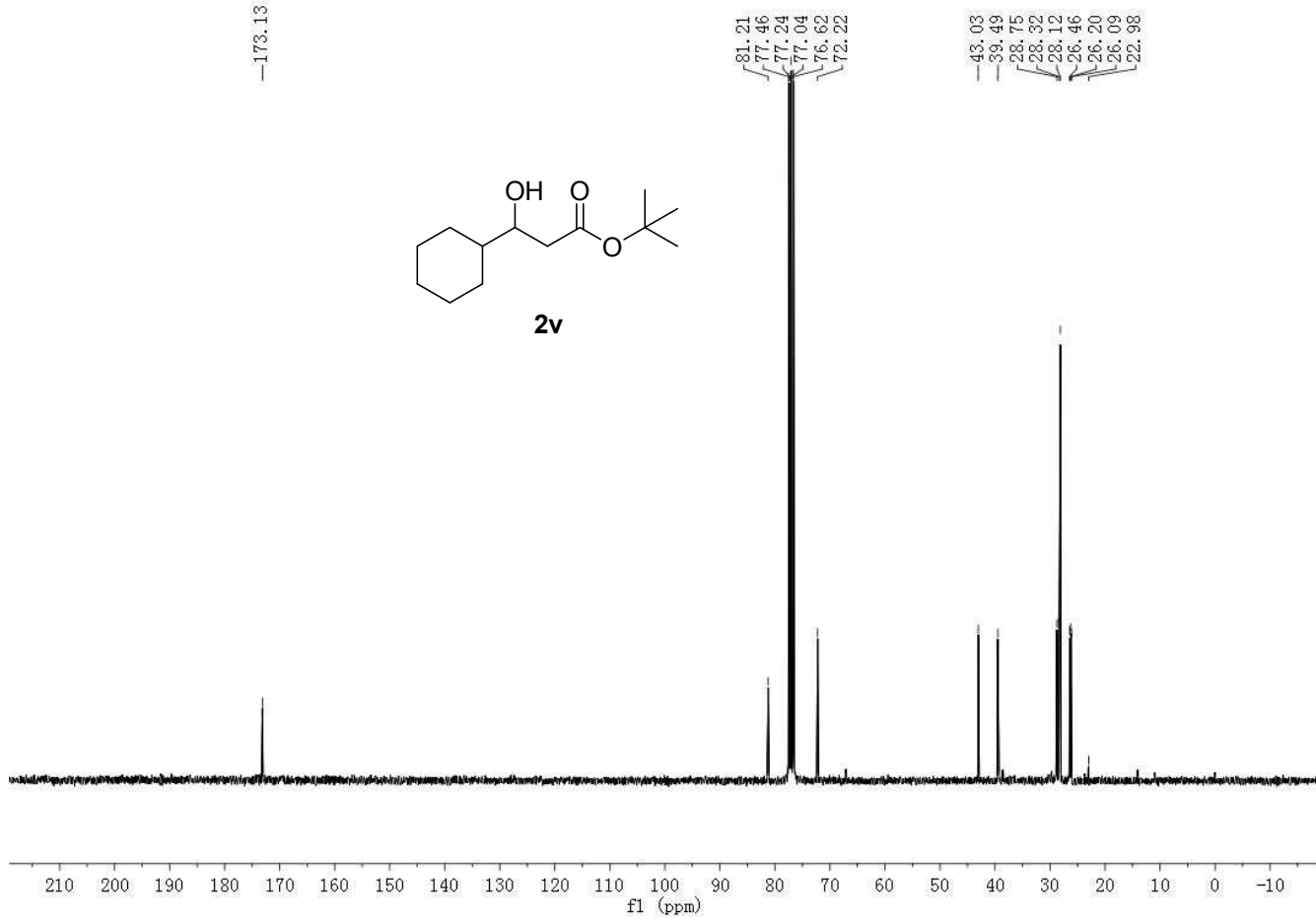
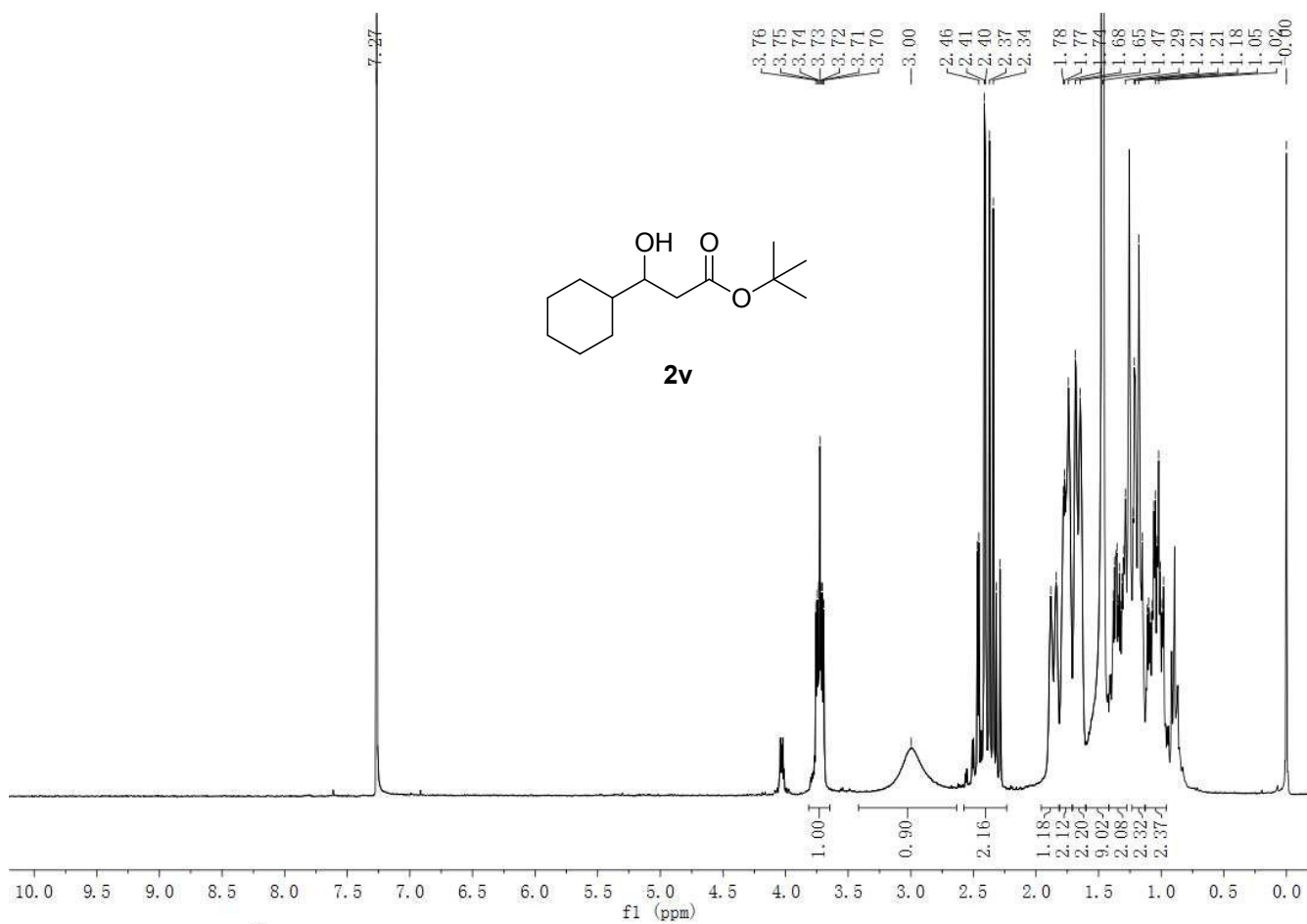


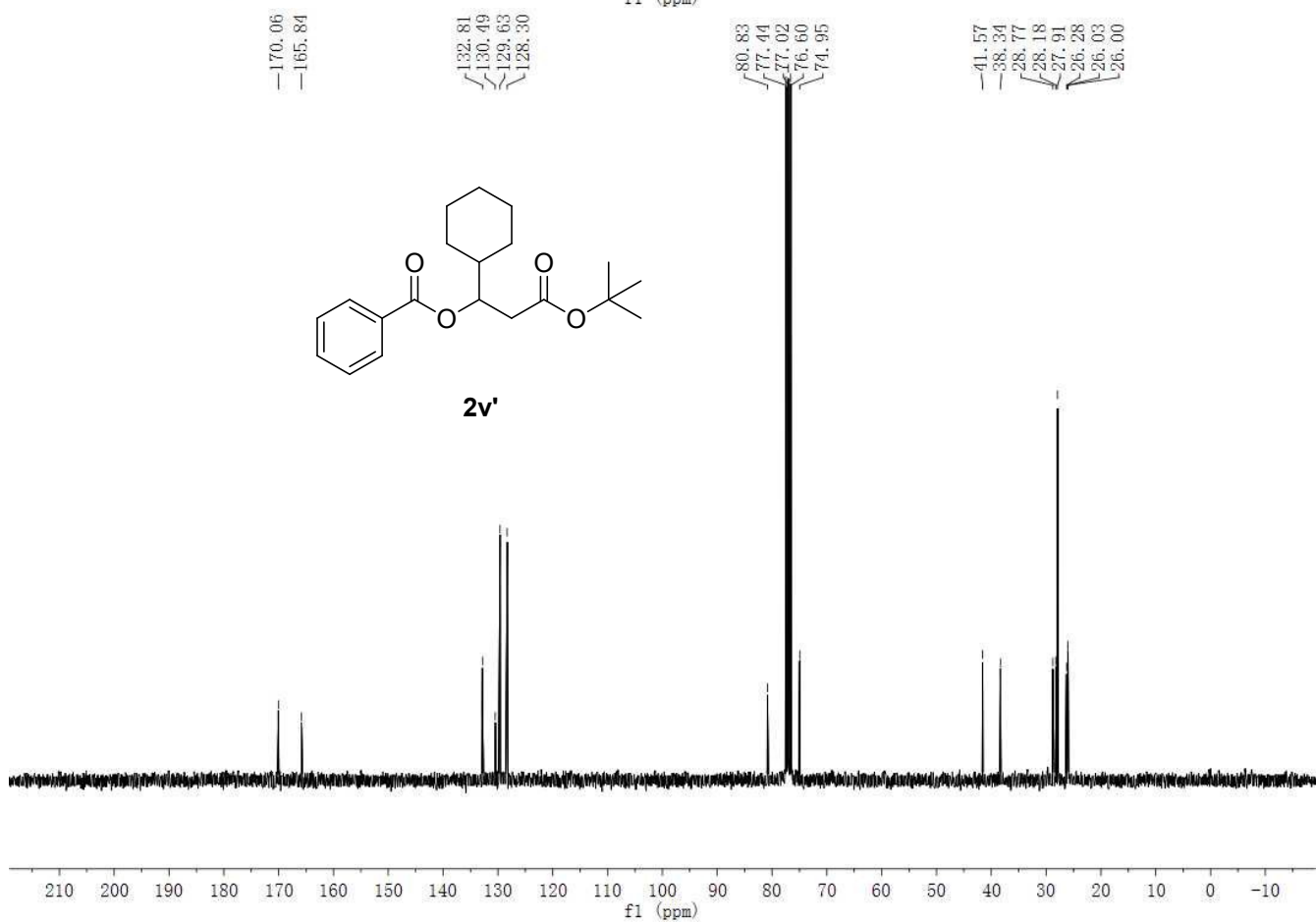
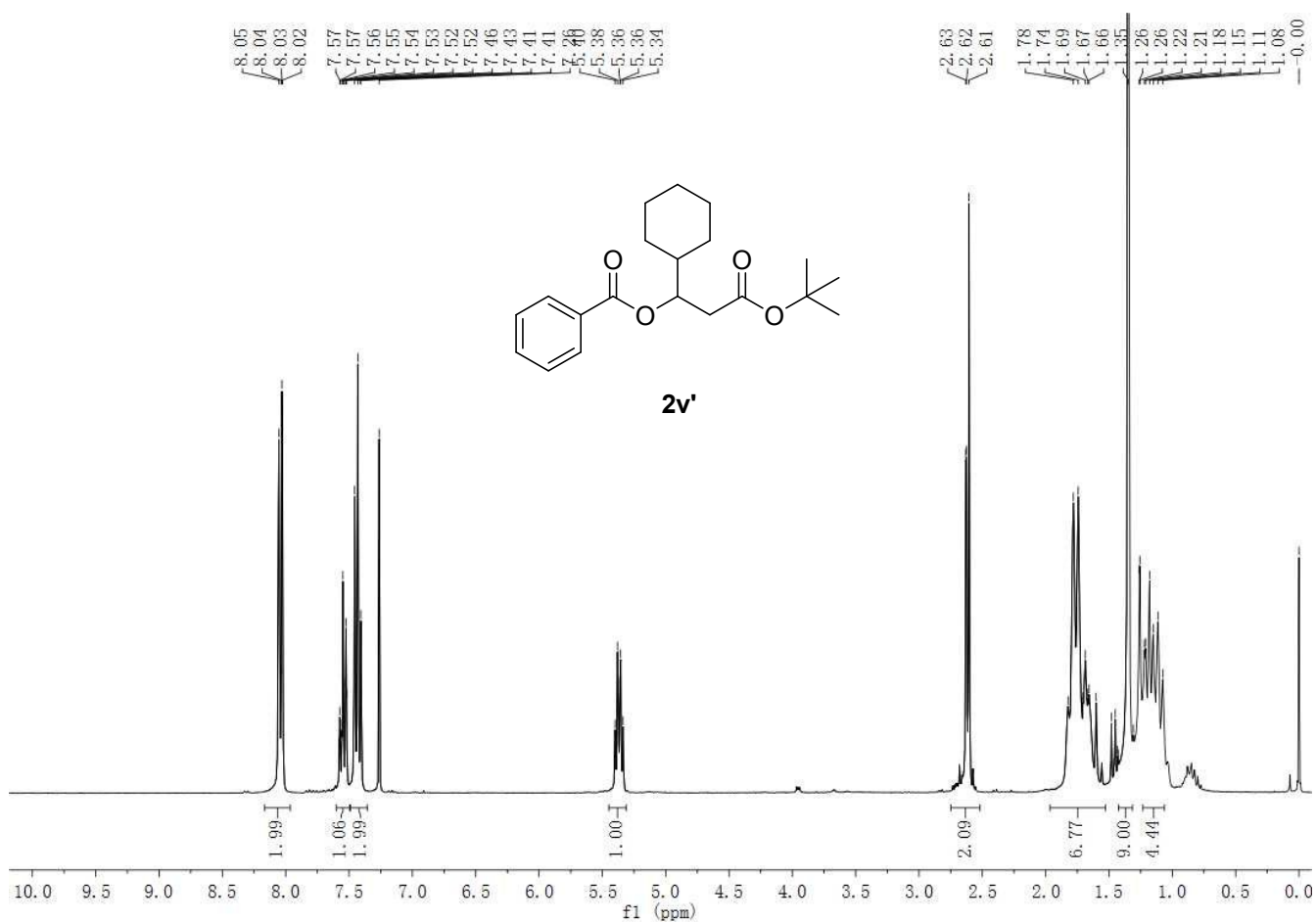


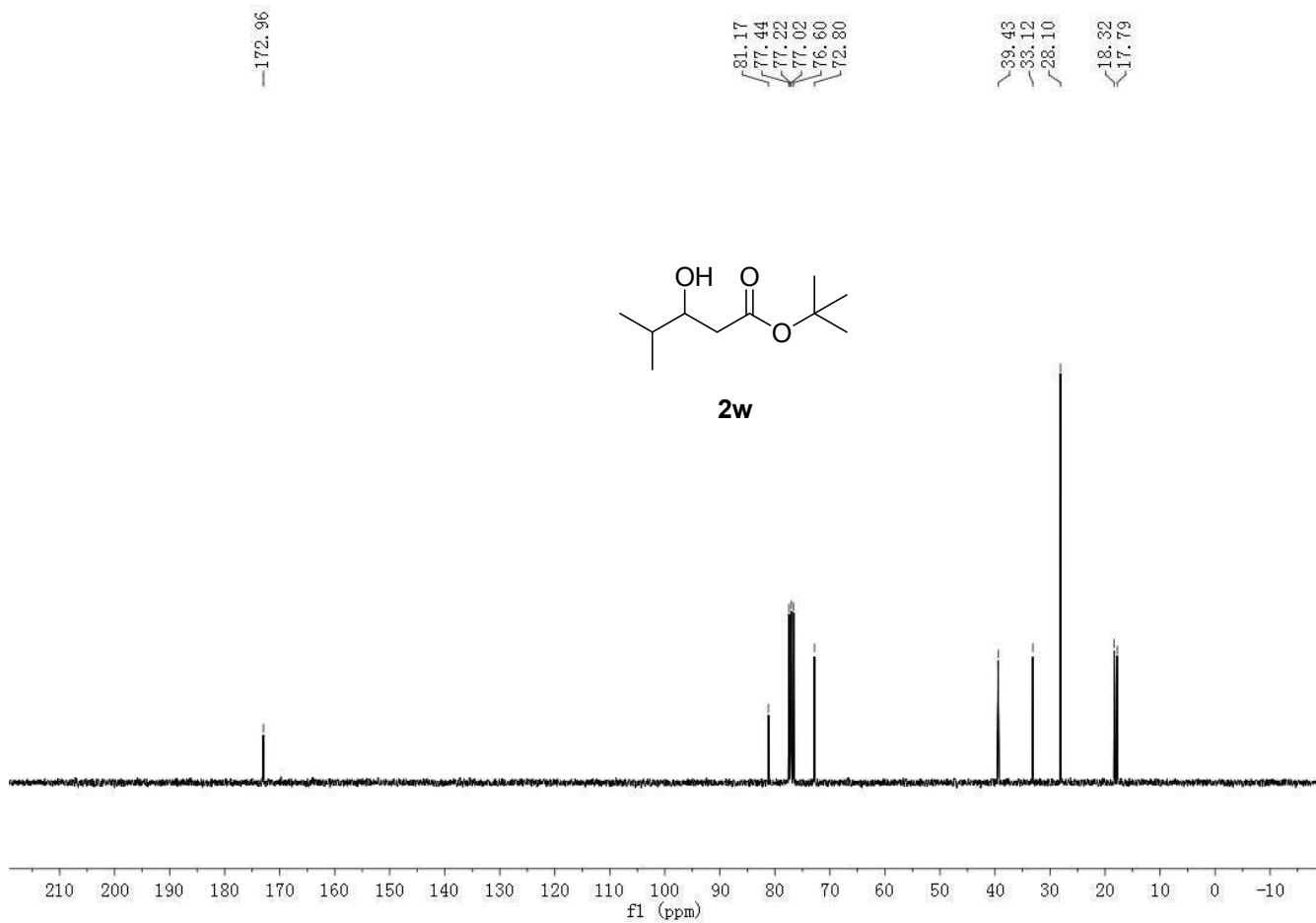
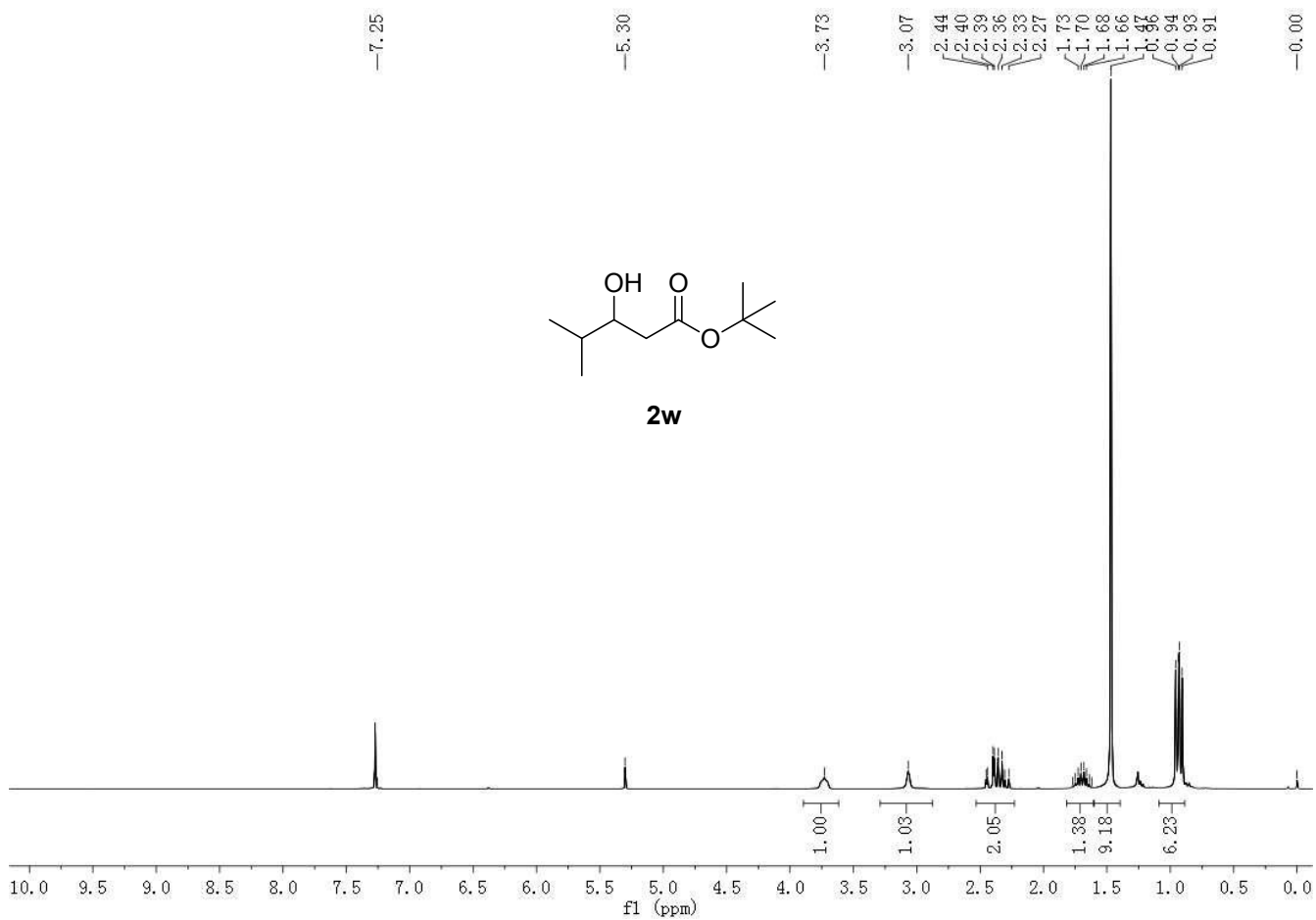


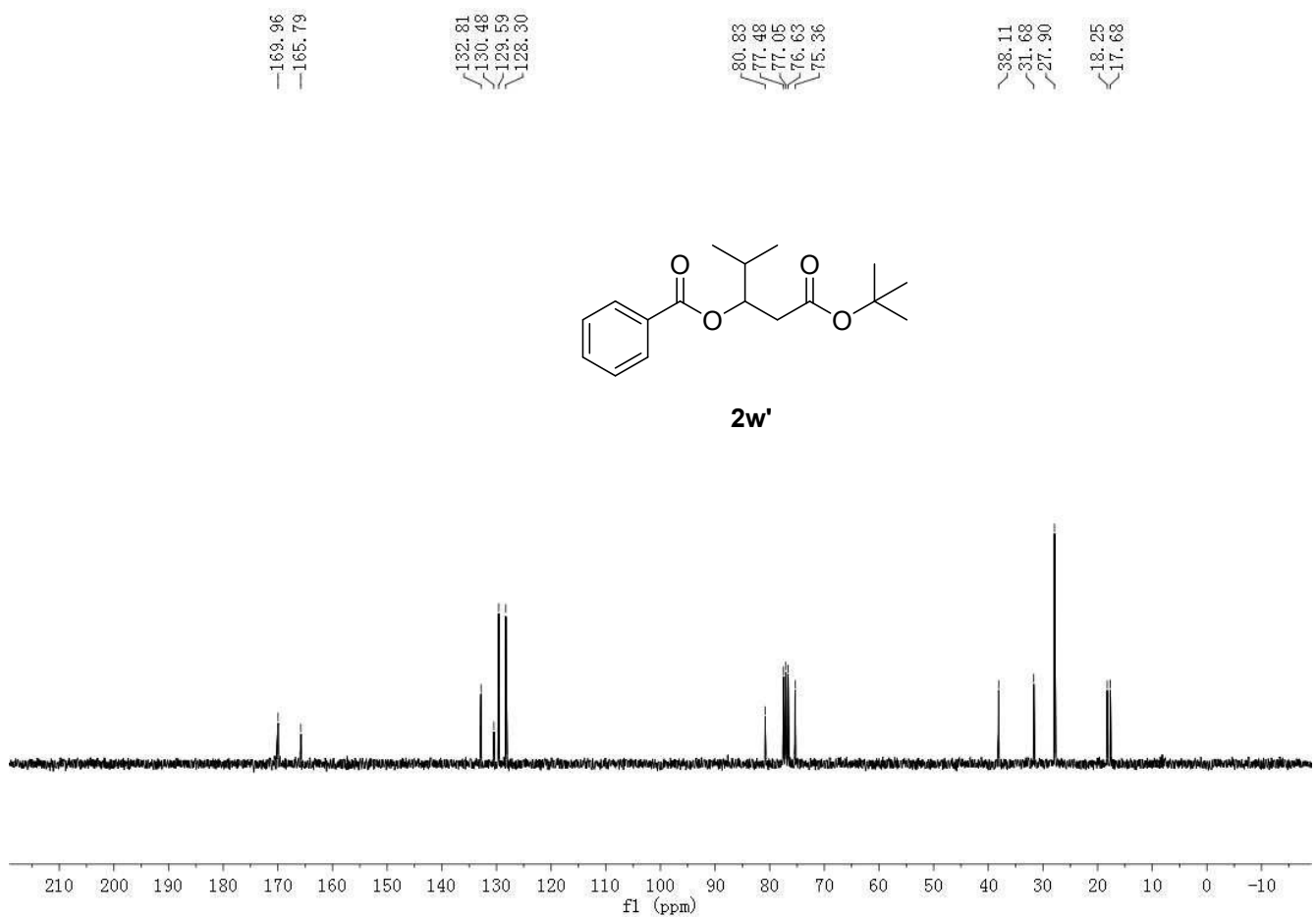
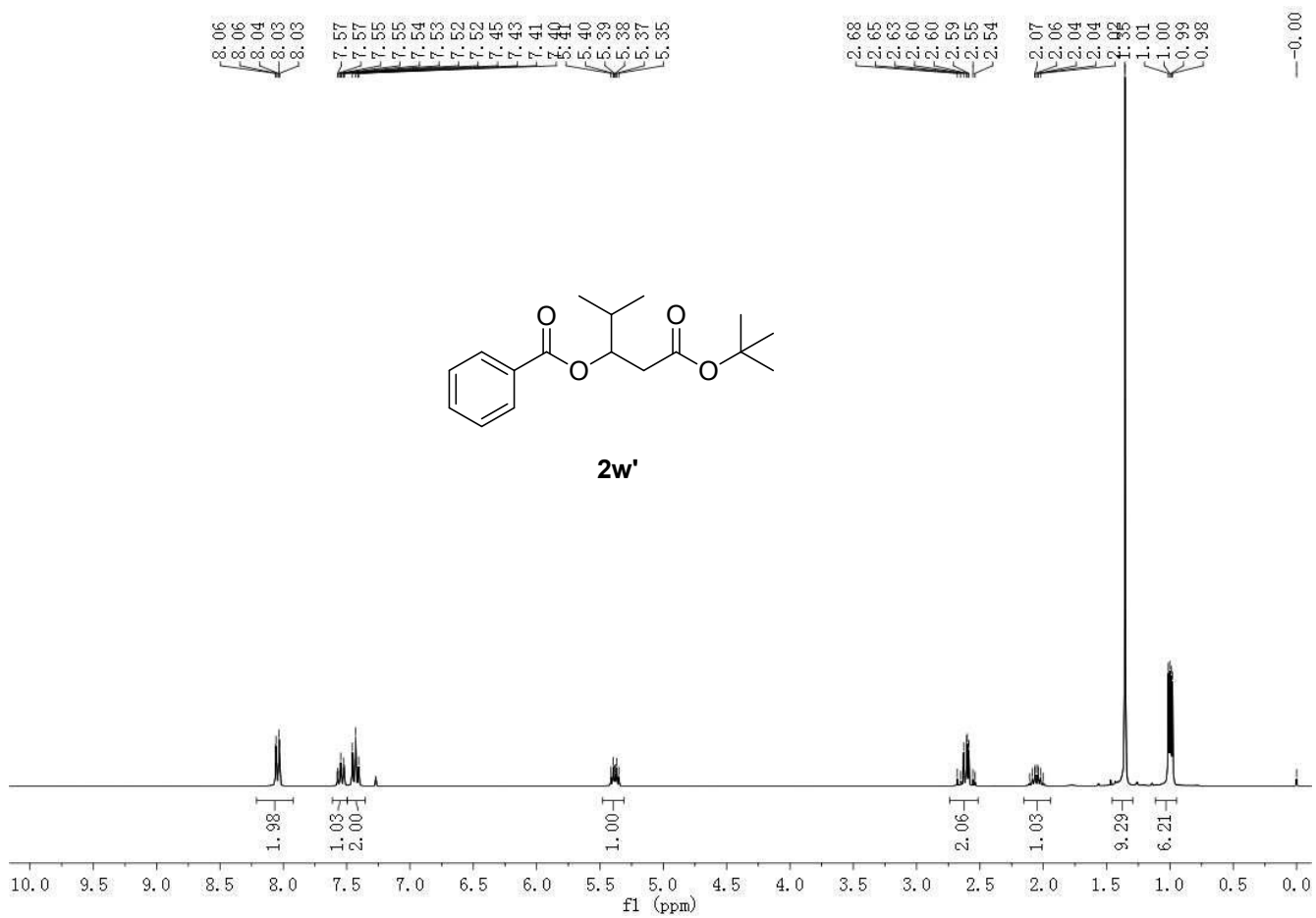


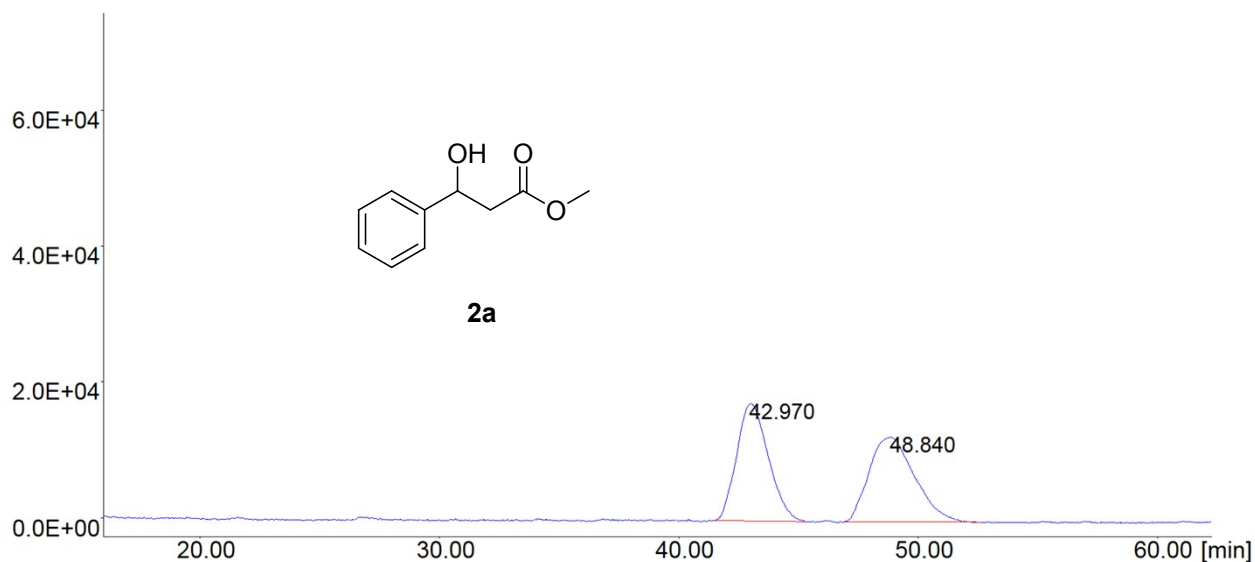




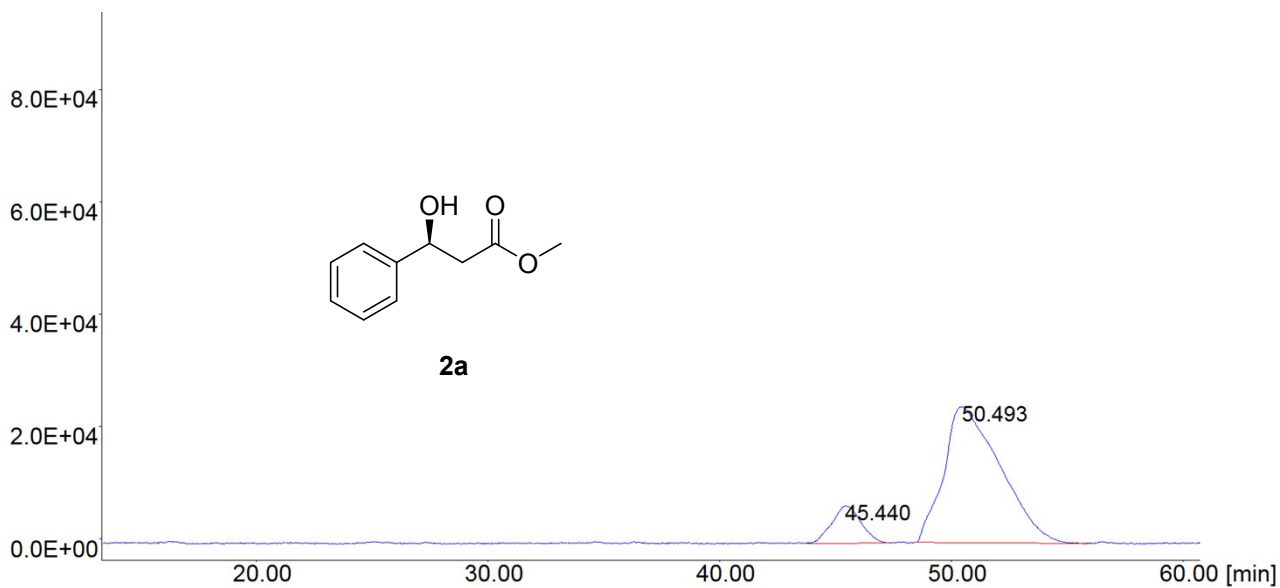




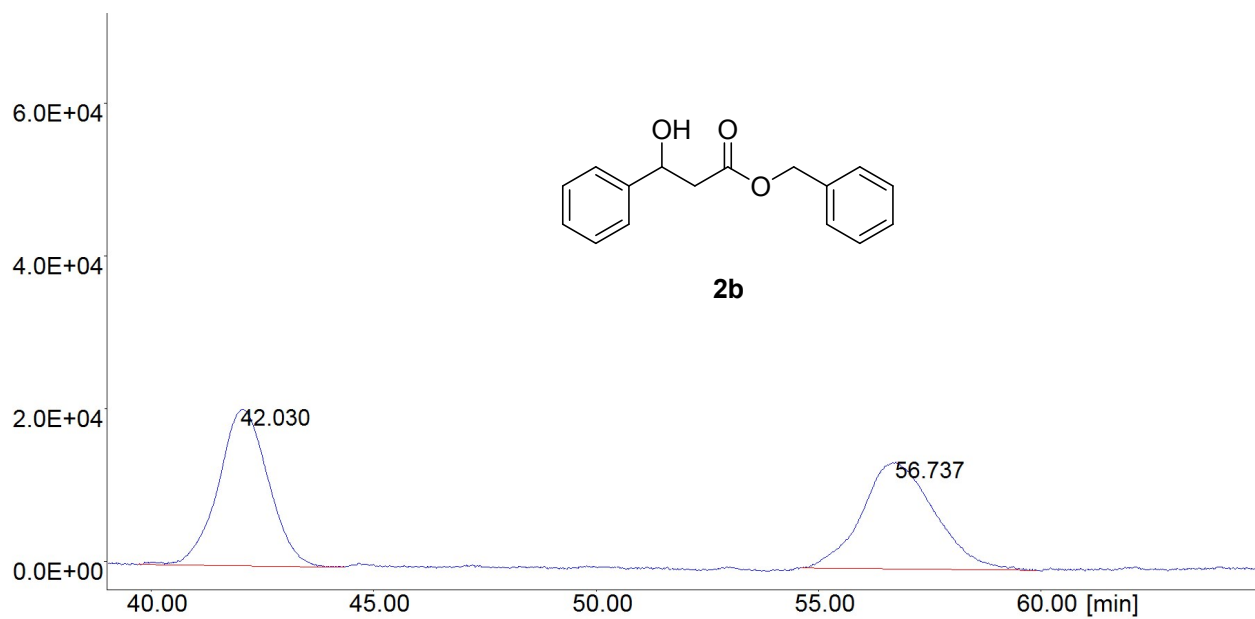




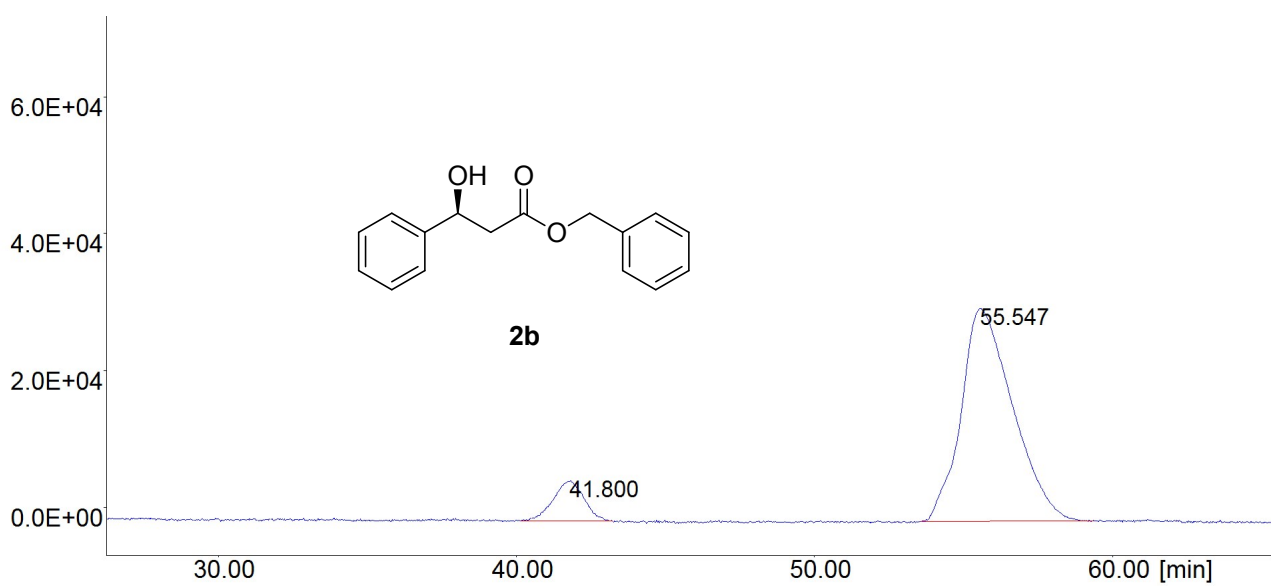
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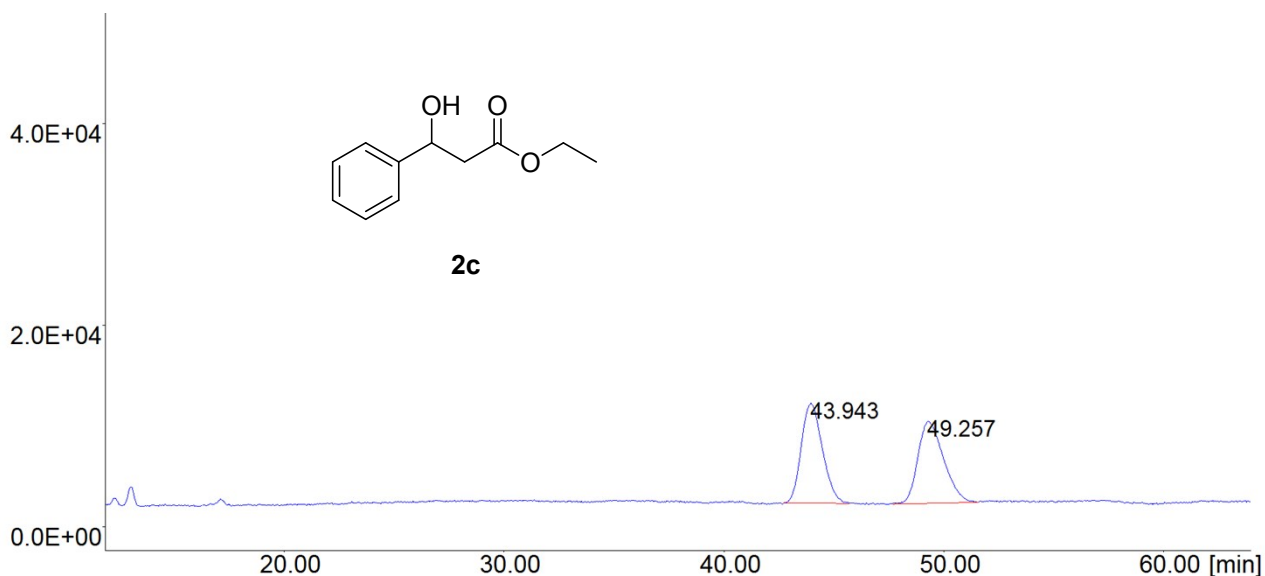
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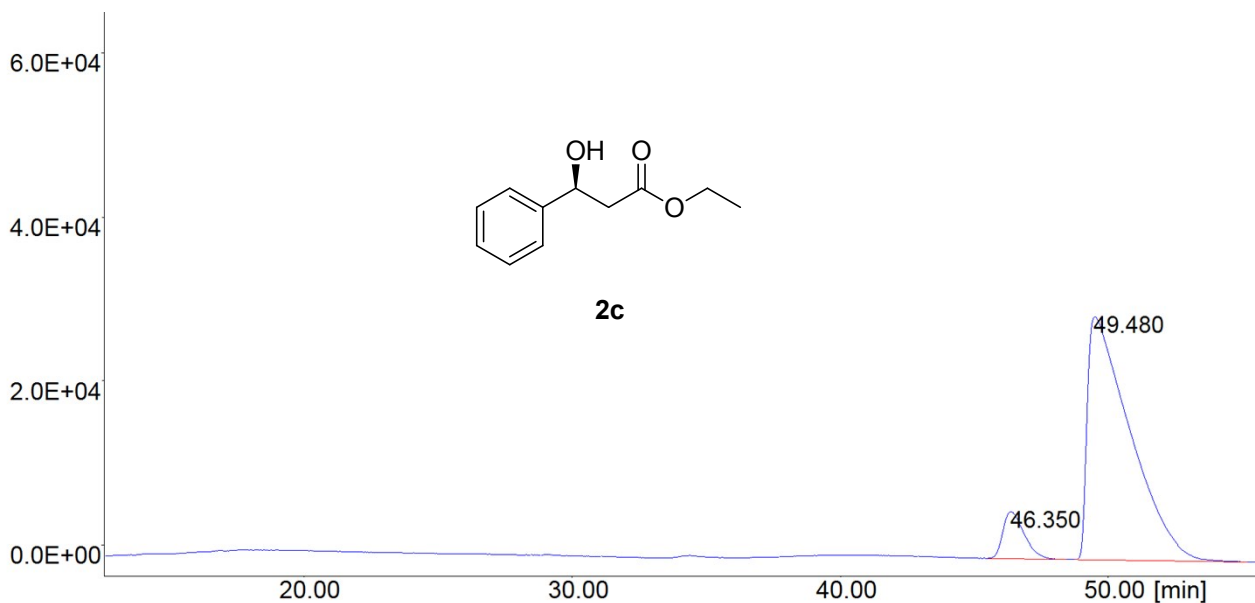
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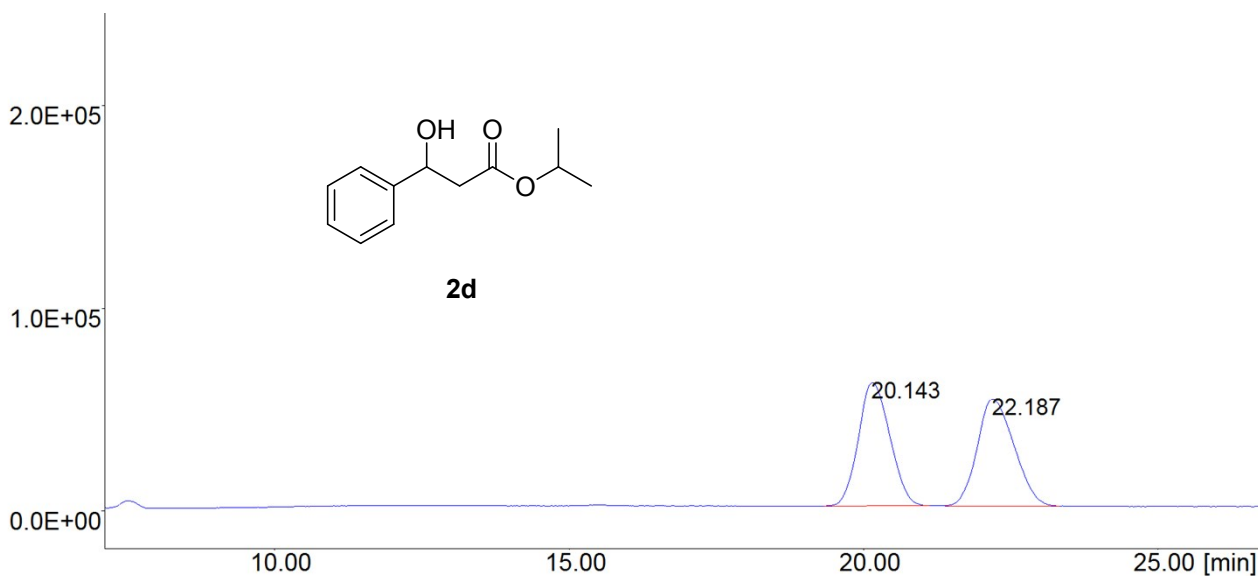
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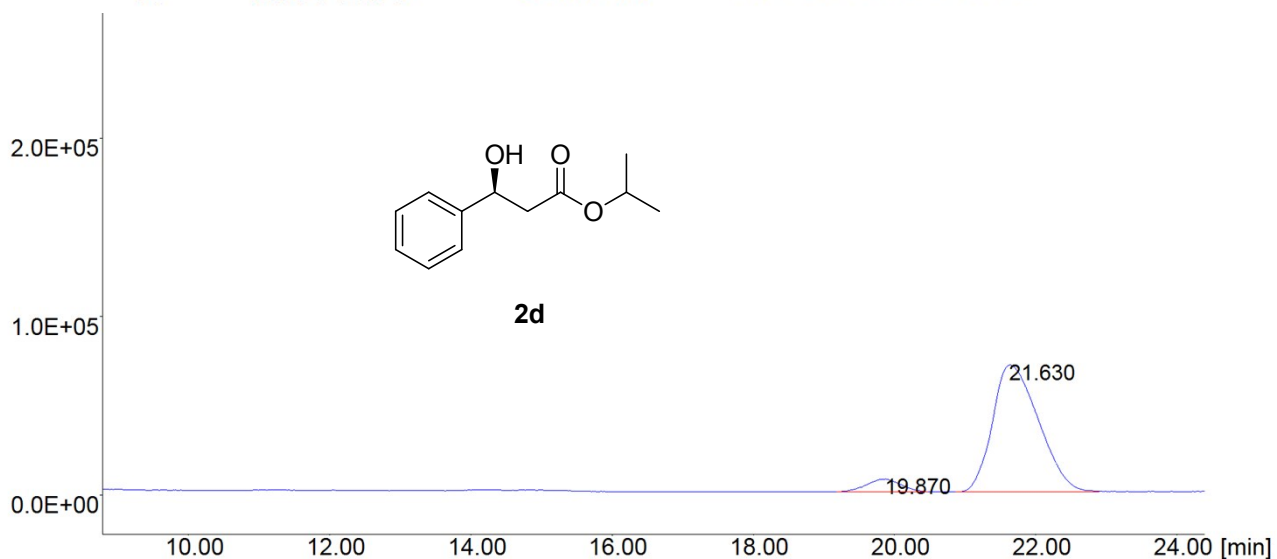
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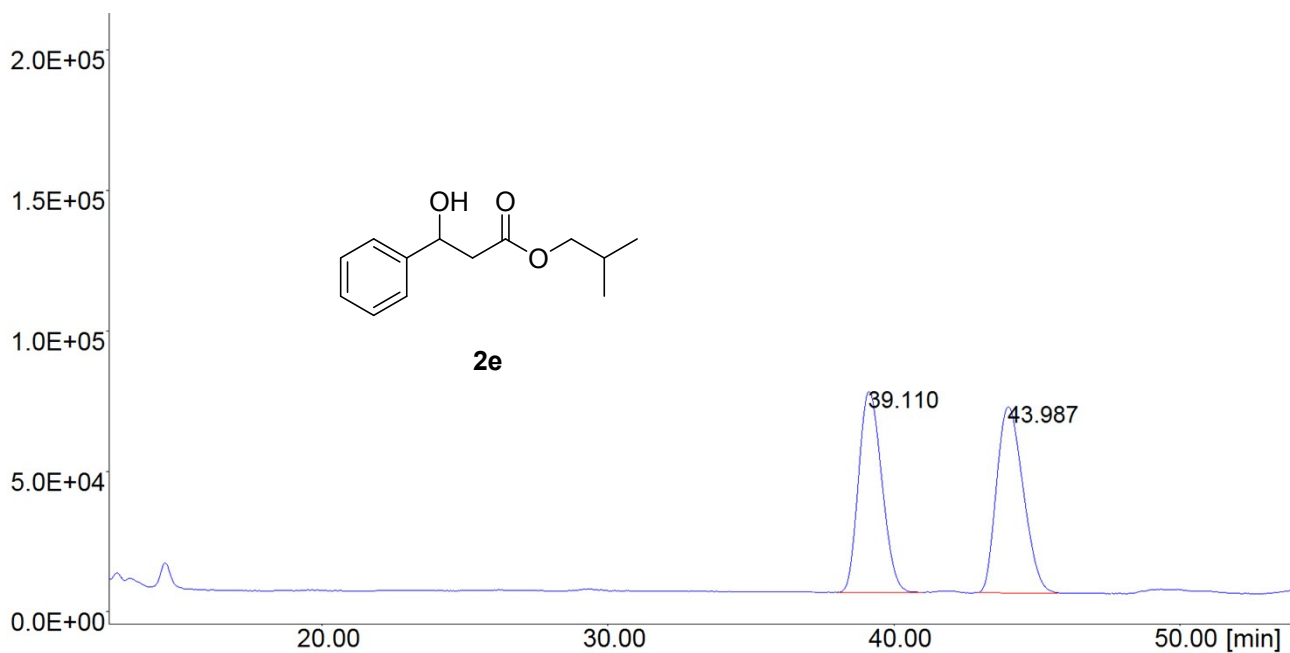
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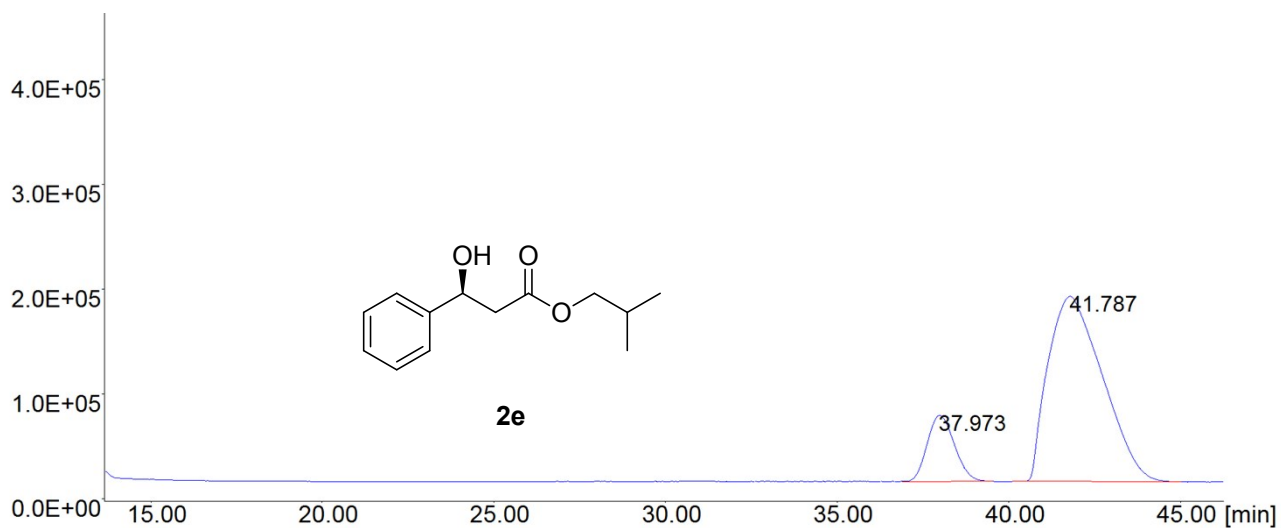
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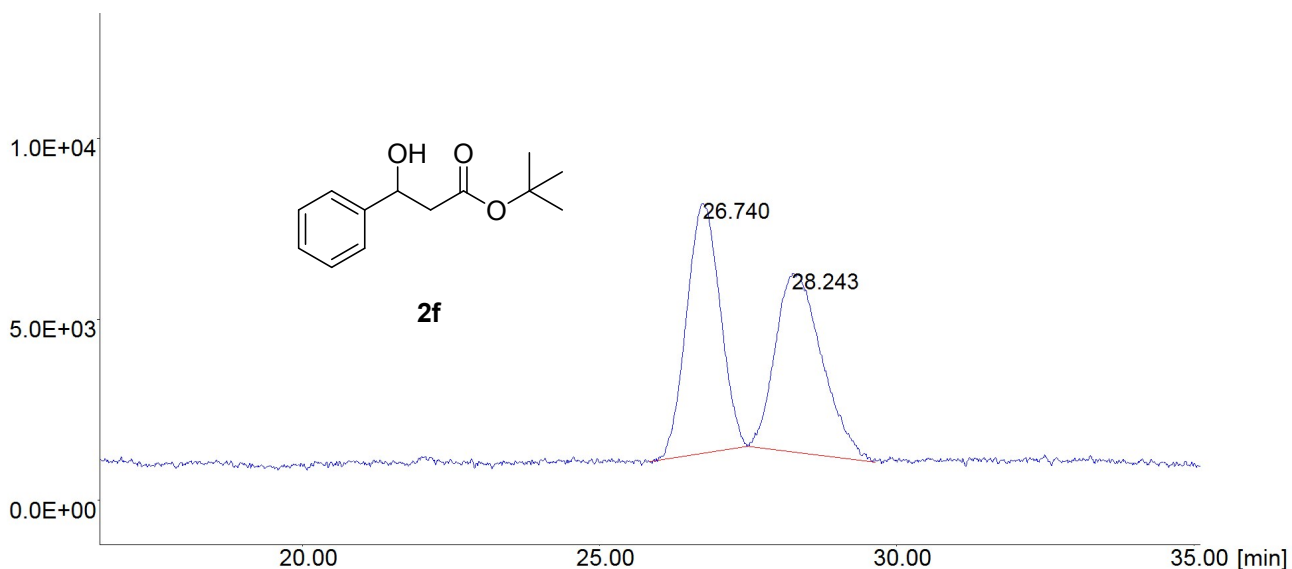
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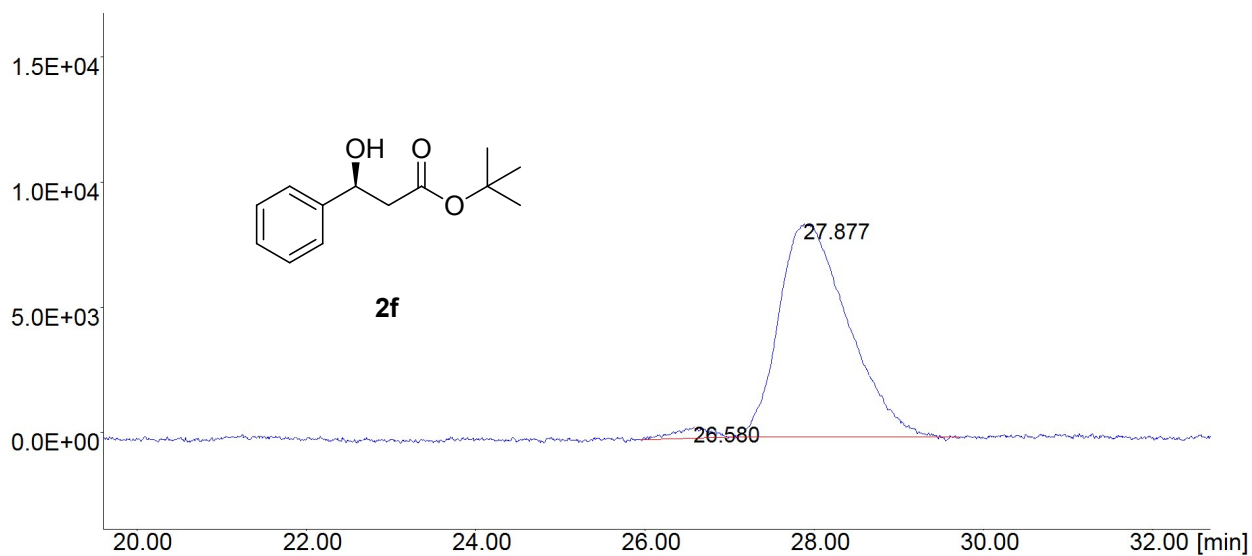
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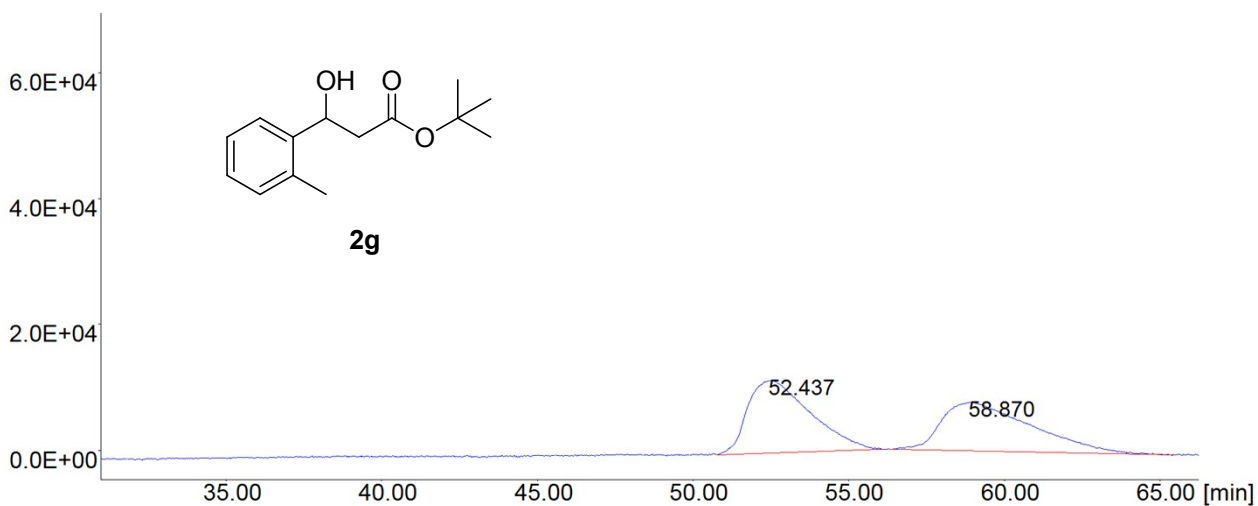
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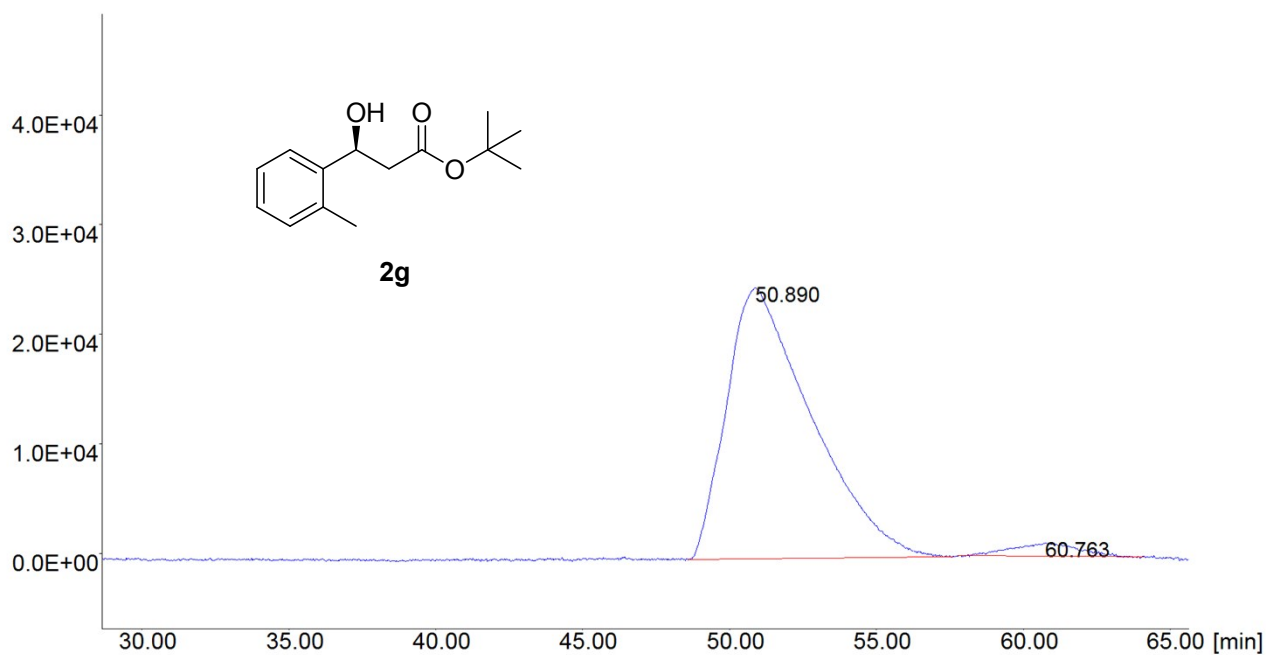
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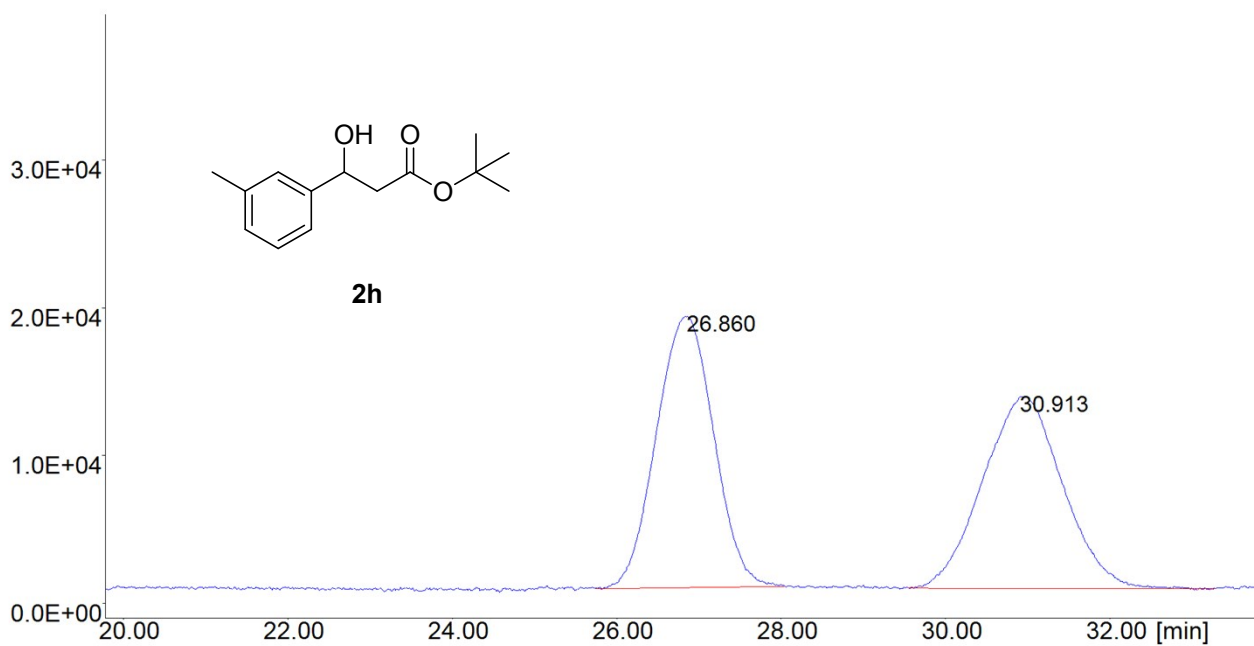
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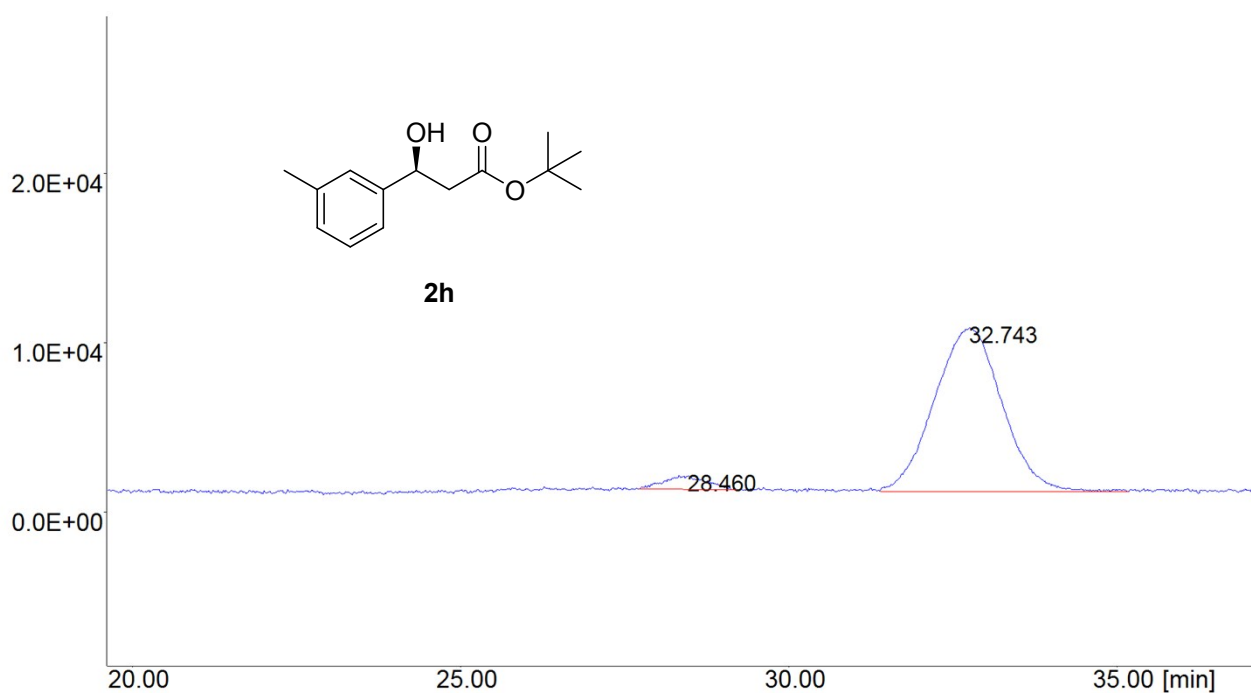
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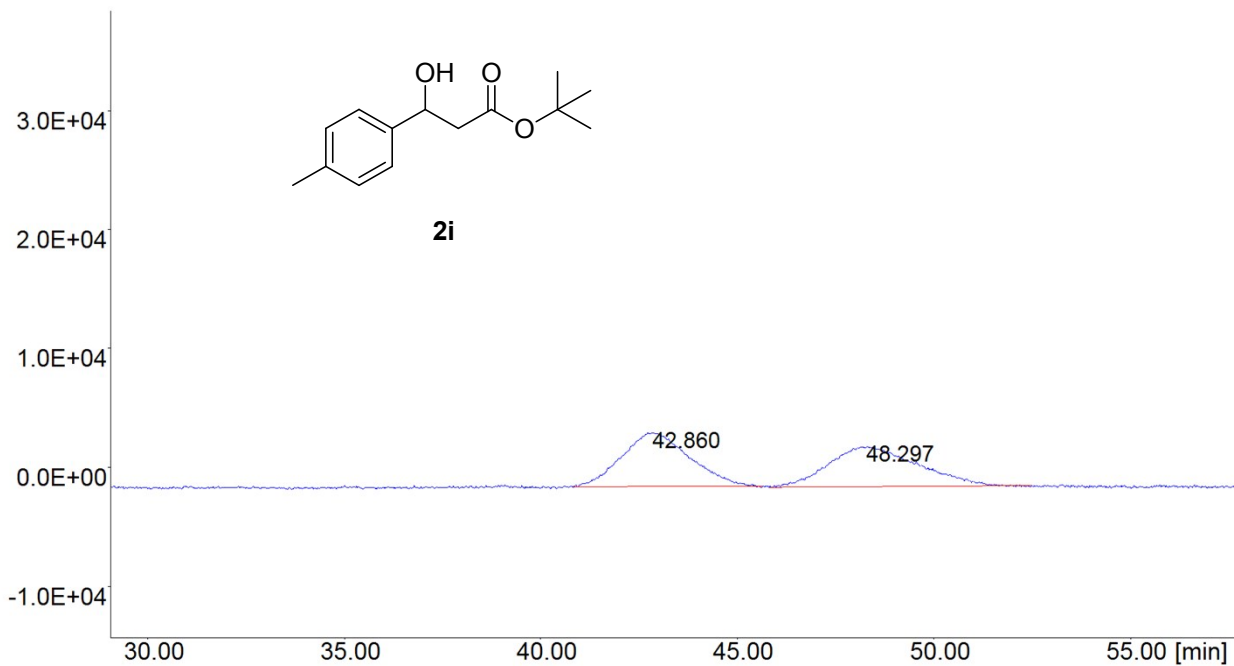
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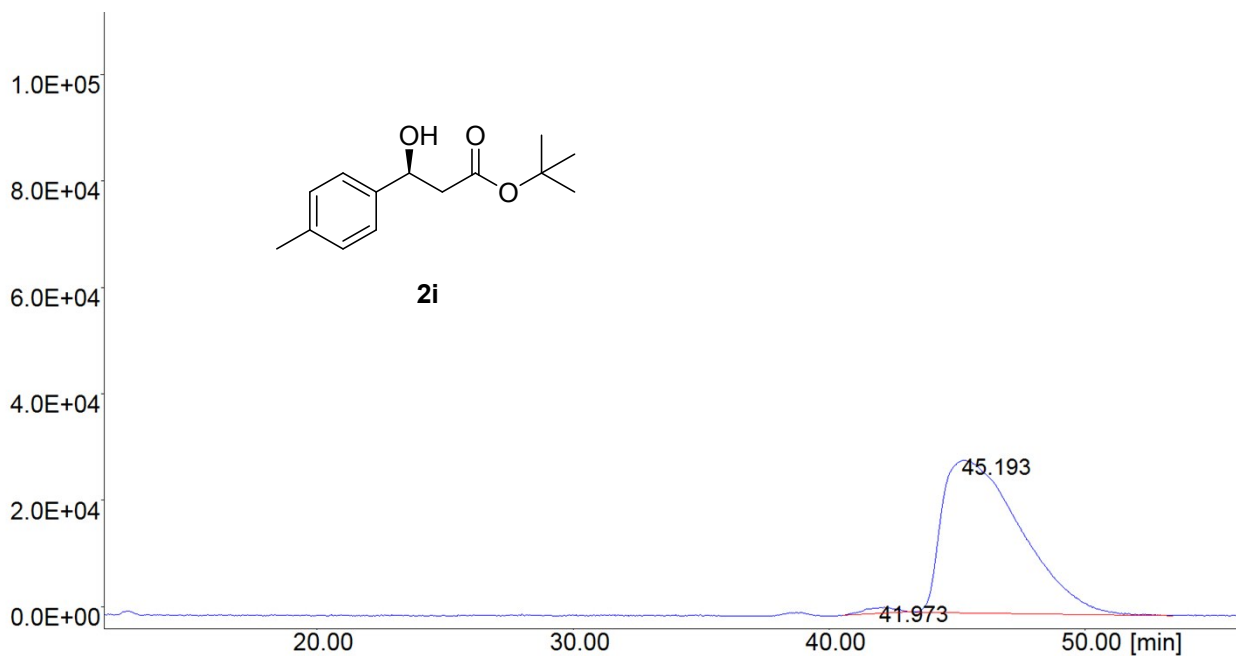
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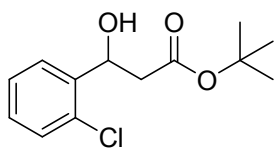
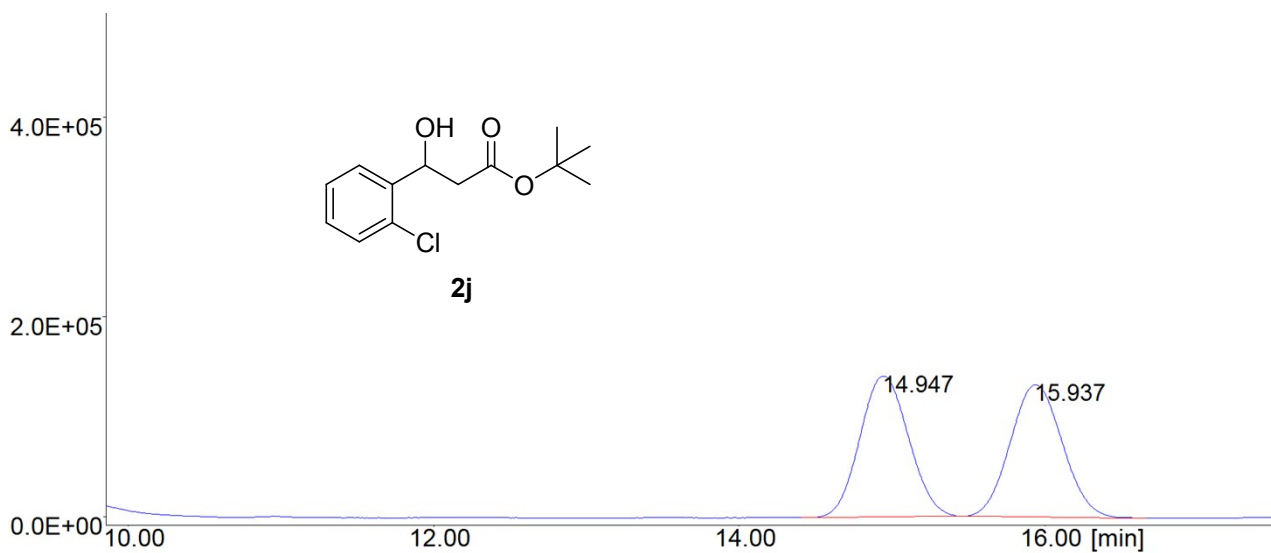
#	Name	RT	Height	Area	%Area
1		28.460	823	34734.184	4.796
2		32.743	9704	689555.470	95.204



#	Name	RT	Height	Area	%Area
1		42.860	4533	536592.655	50.689
2		48.297	3397	522010.967	49.311

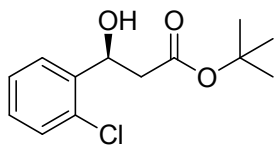
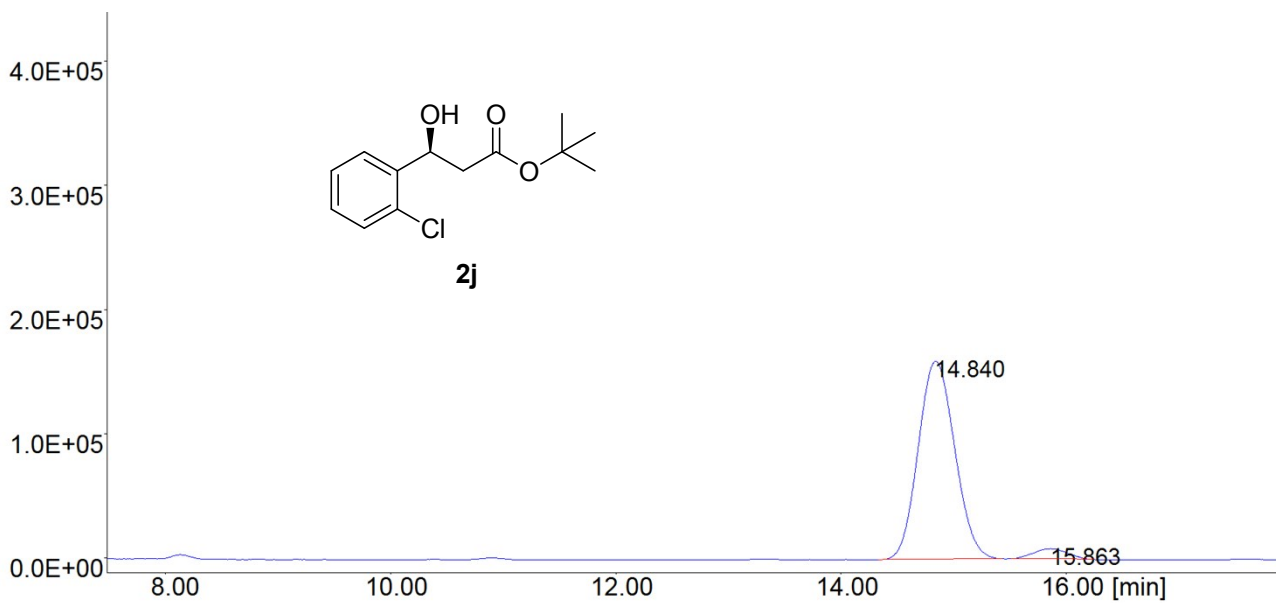


#	Name	RT	Height	Area	%Area
1		41.973	1185	92228.244	1.488
2		45.193	28703	6106451.726	98.512



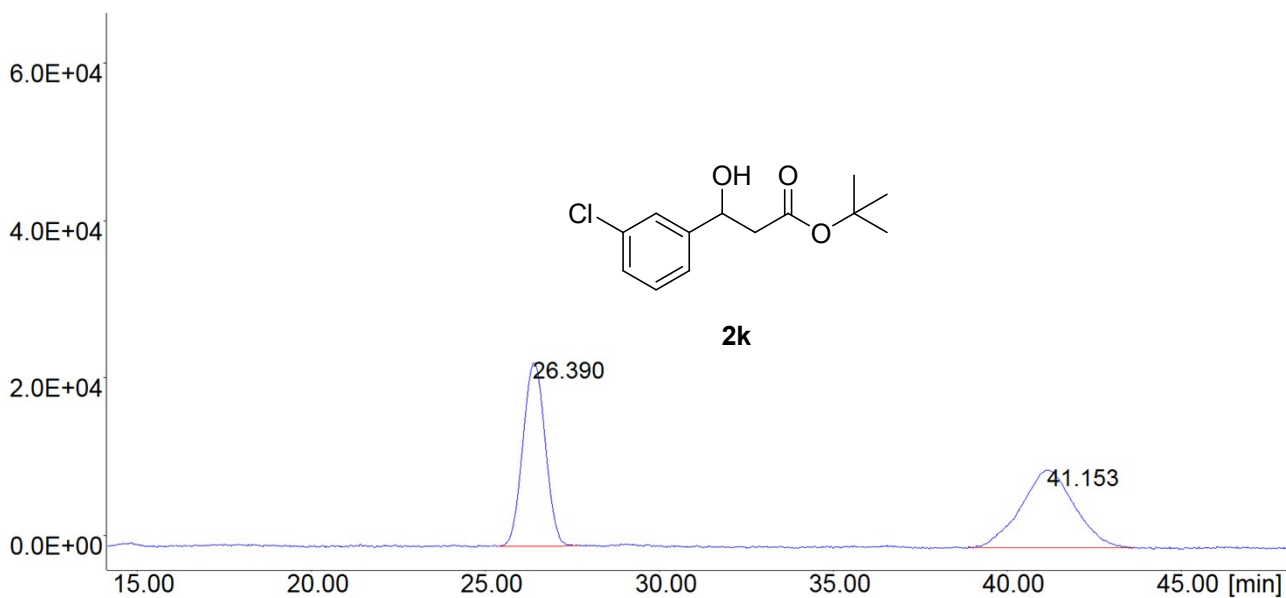
2j

#	Name	RT	Height	Area	%Area
1		14.947	141287	3097453.281	49.835
2		15.937	132524	3117998.231	50.165

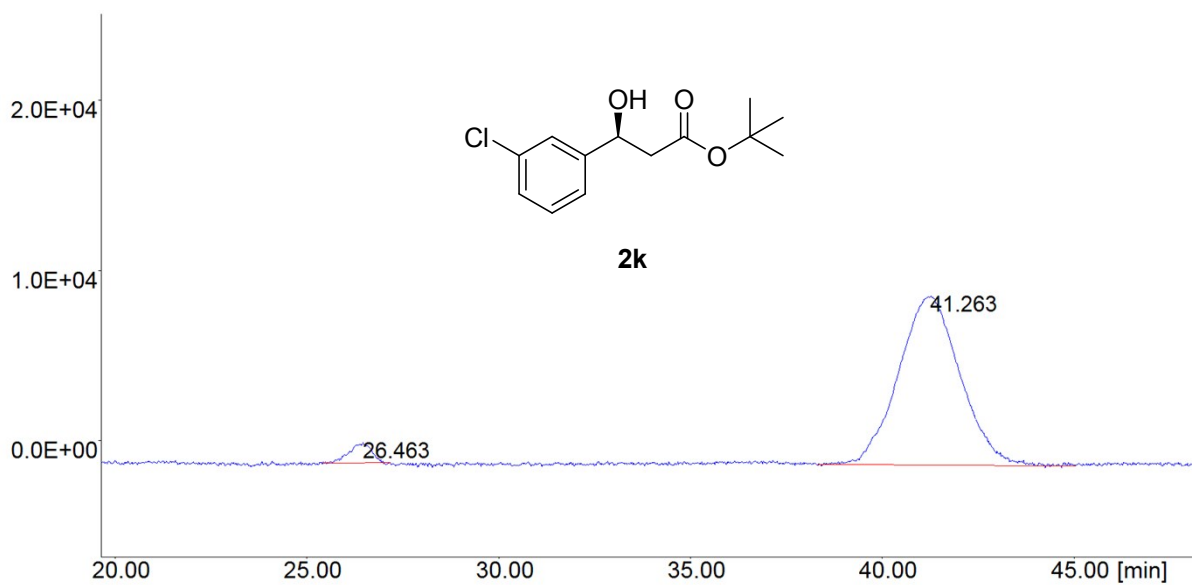


2j

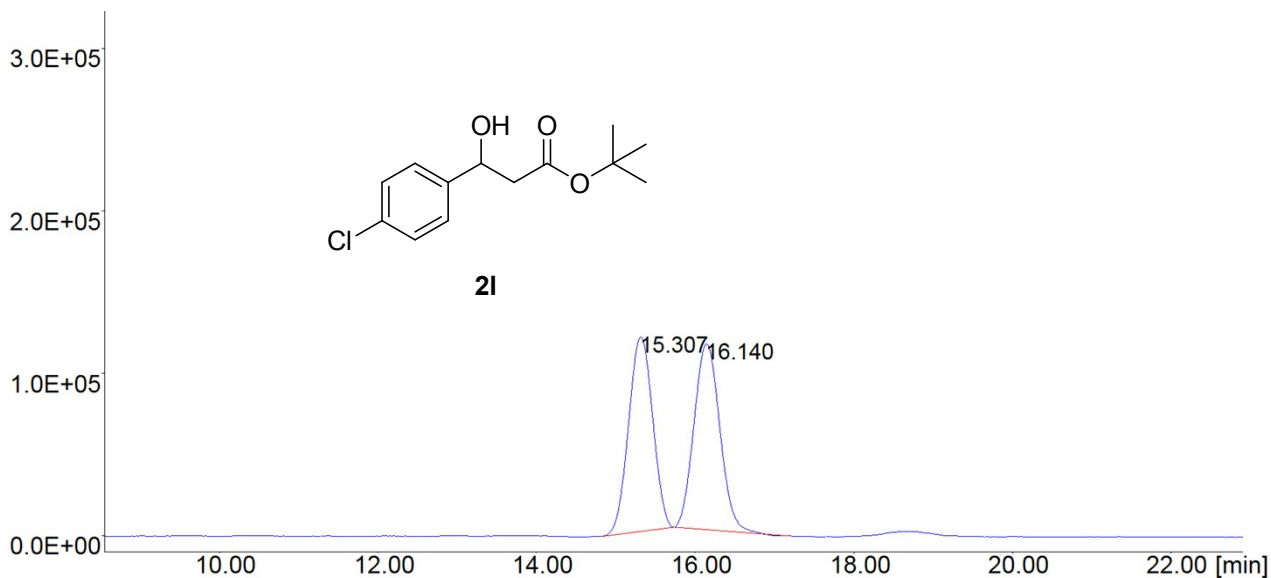
#	Name	RT	Height	Area	%Area
1		14.840	159370	3544655.435	95.457
2		15.863	8075	168695.700	4.543



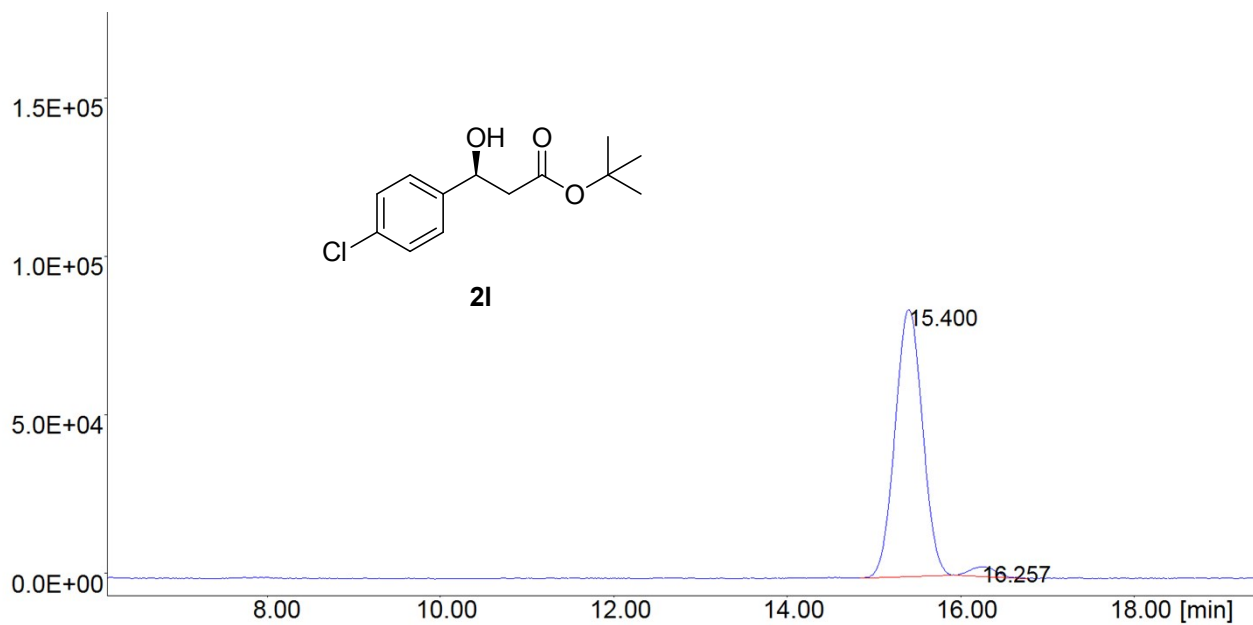
#	Name	RT	Height	Area	%Area
1		26.390	23325	1020897.243	49.586
2		41.153	9844	1037942.758	50.414



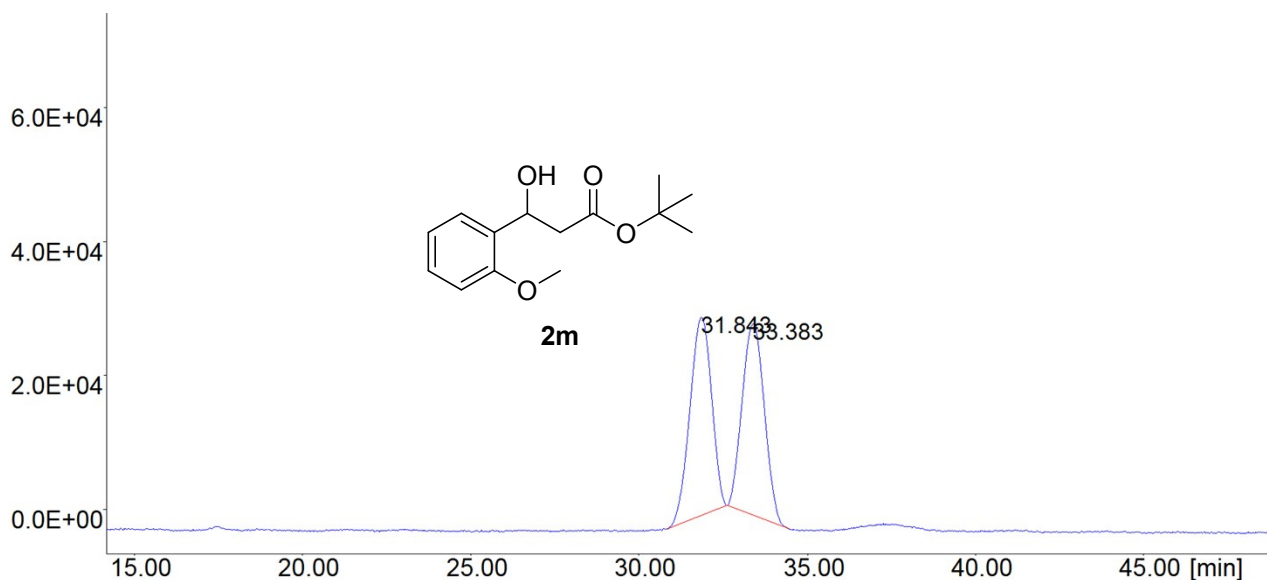
#	Name	RT	Height	Area	%Area
1		26.463	1206	47604.830	4.129
2		41.263	9927	1105406.156	95.871



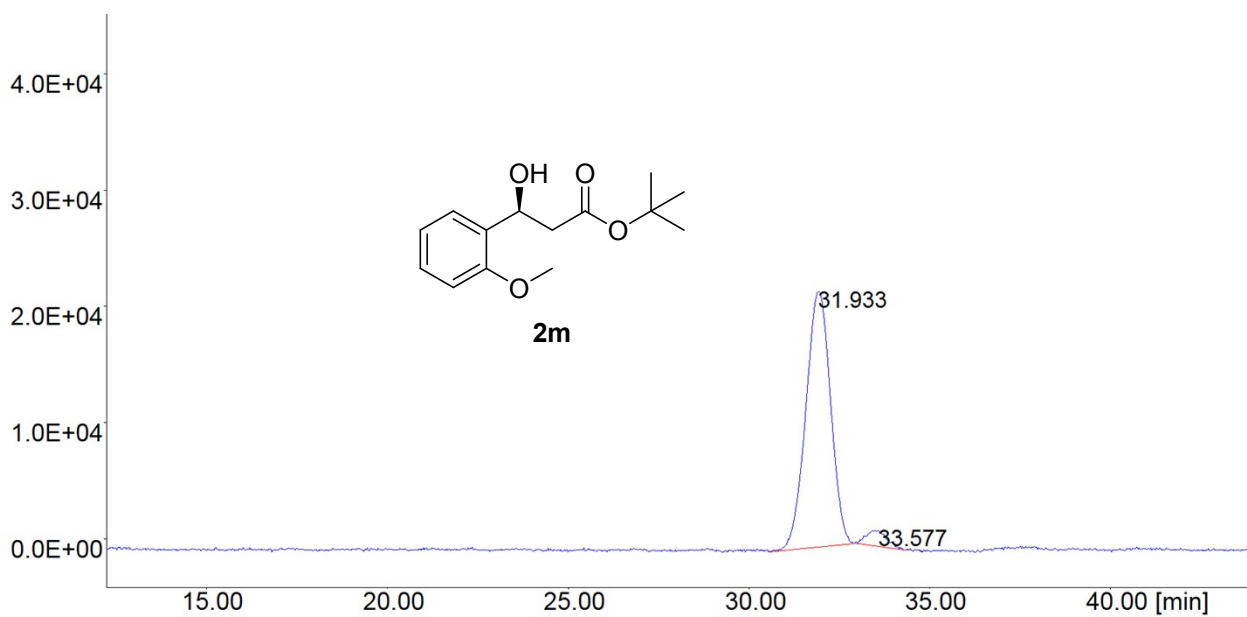
#	Name	RT	Height	Area	%Area
1		15.307	119709	2486585.649	49.308
2		16.140	114394	2556428.137	50.692



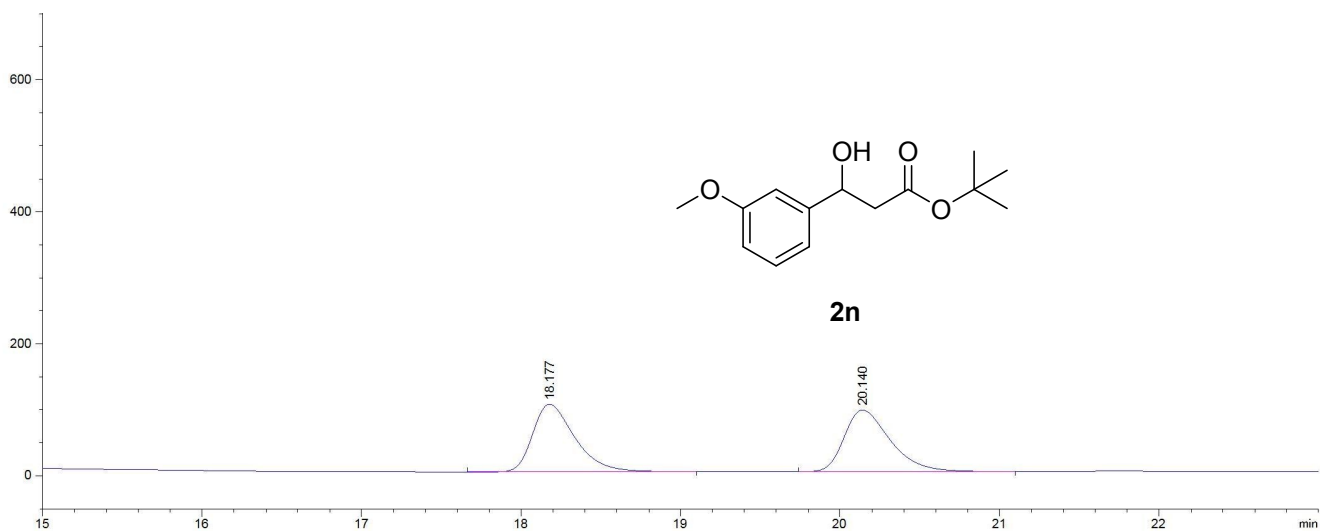
#	Name	RT	Height	Area	%Area
1		15.400	83932	1815855.871	96.646
2		16.257	3099	63008.224	3.354



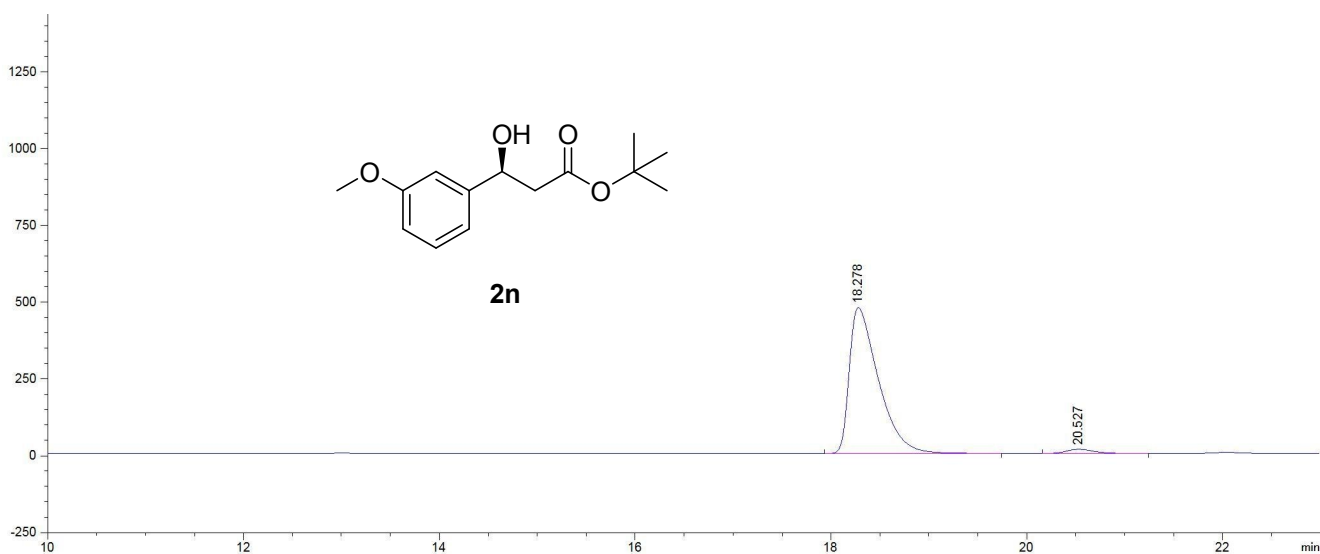
#	Name	RT	Height	Area	%Area
1		31.843	29630	1299067.076	50.222
2		33.383	28593	1287601.224	49.778



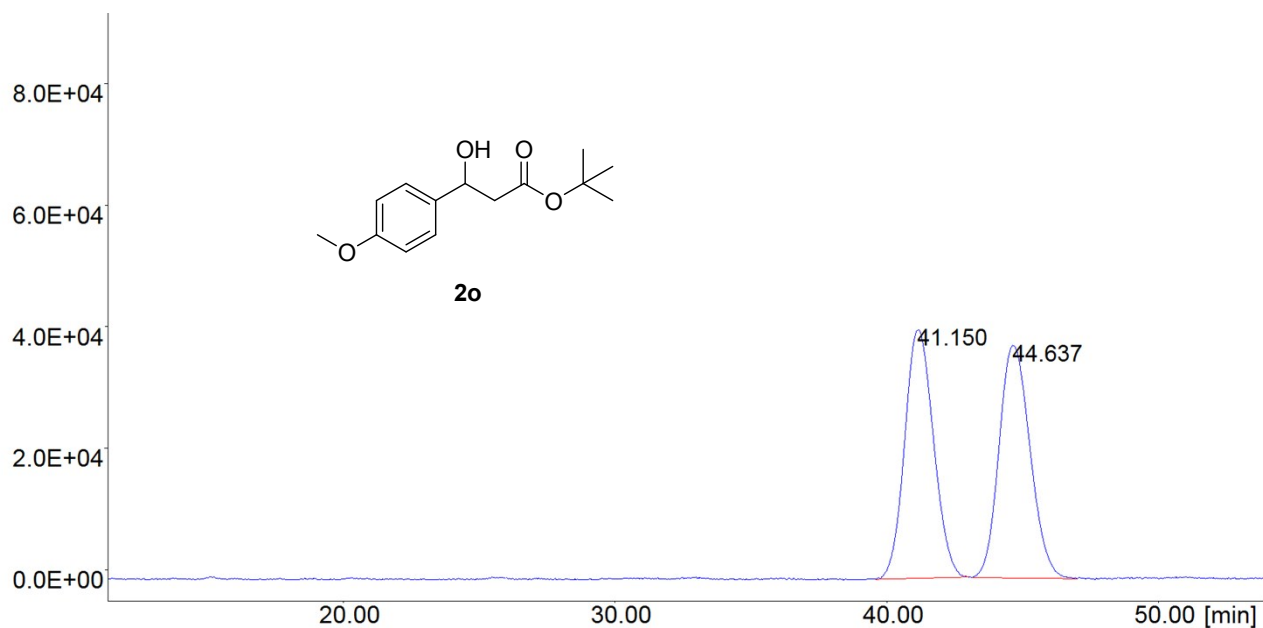
#	Name	RT	Height	Area	%Area
1		31.933	21976	1027699.719	95.080
2		33.577	1381	53183.528	4.920



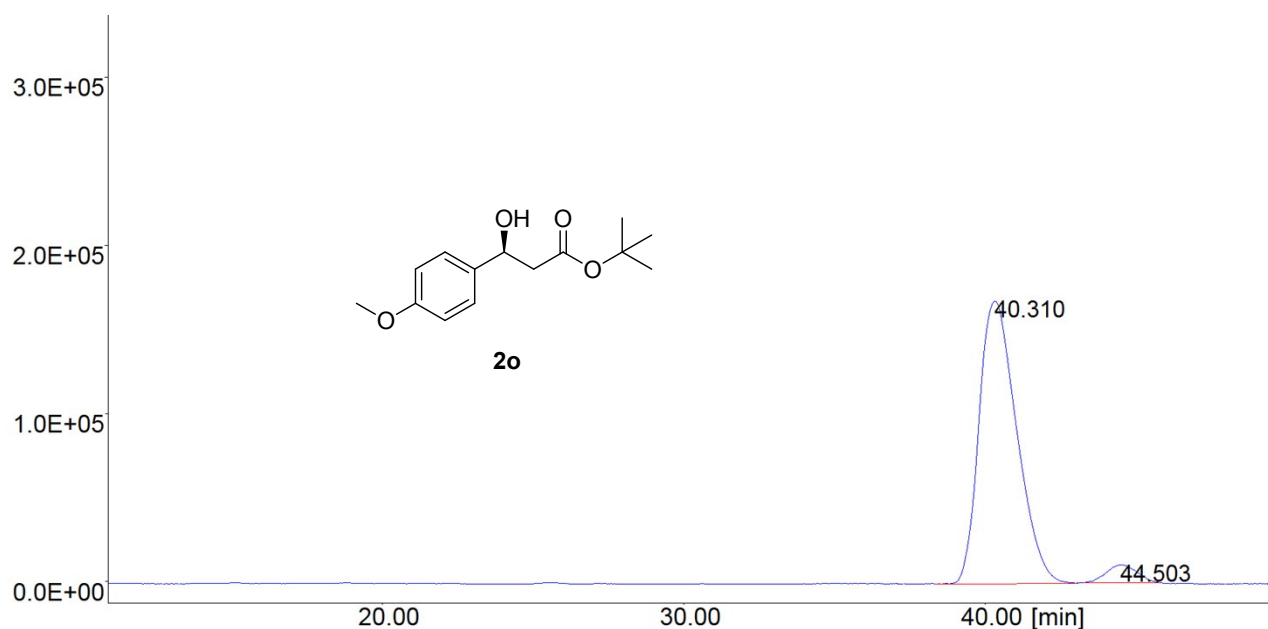
#	Name	RT	Height	Area	%Area
1		18.177	102.457	1890.410	50.135
2		20.140	93.501	1880.179	49.864



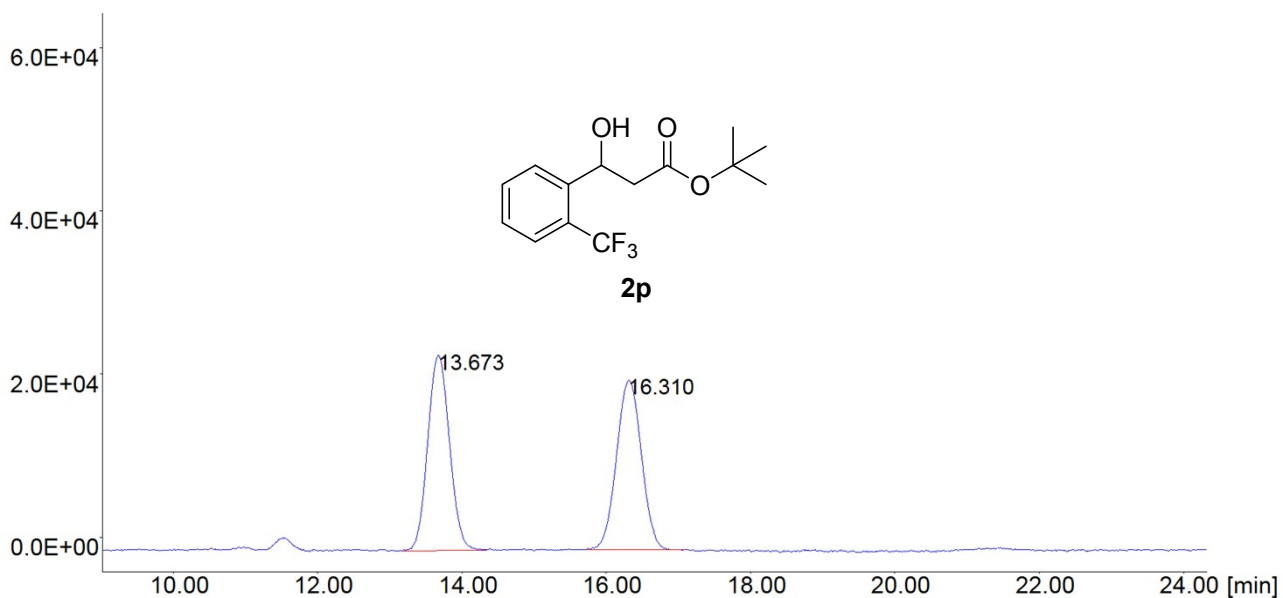
#	Name	RT	Height	Area	%Area
1		18.278	475.749	9842.300	97.2168
2		20.527	13.878	281.774	2.7832



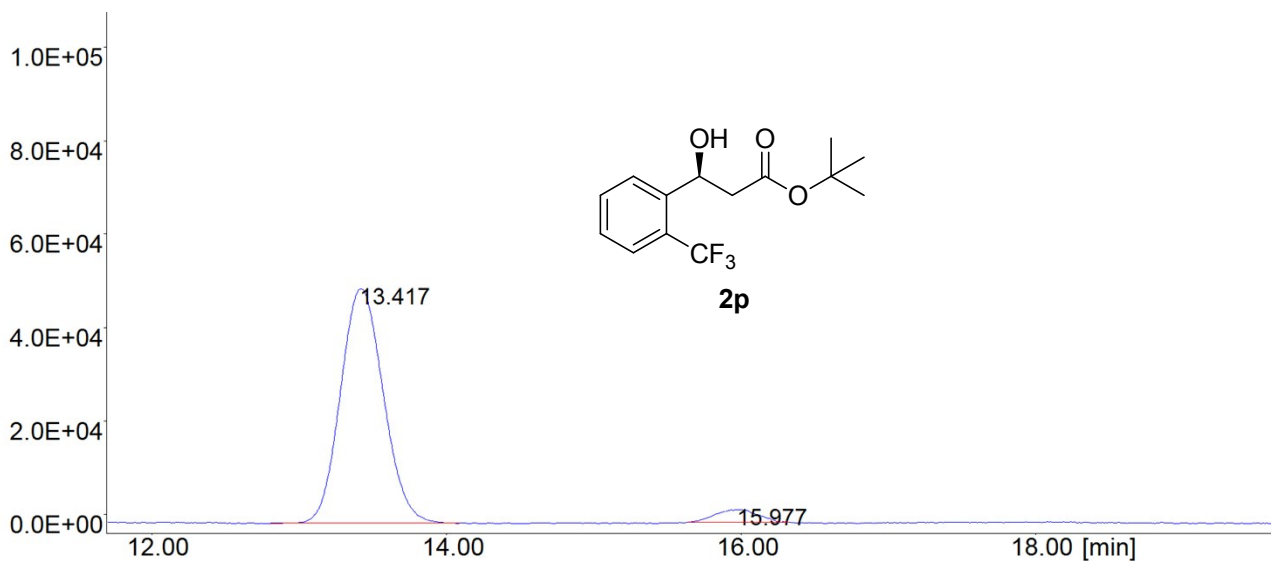
#	Name	RT	Height	Area	%Area
1		41.150	40895	2969893.936	49.893
2		44.637	38200	2982680.351	50.107



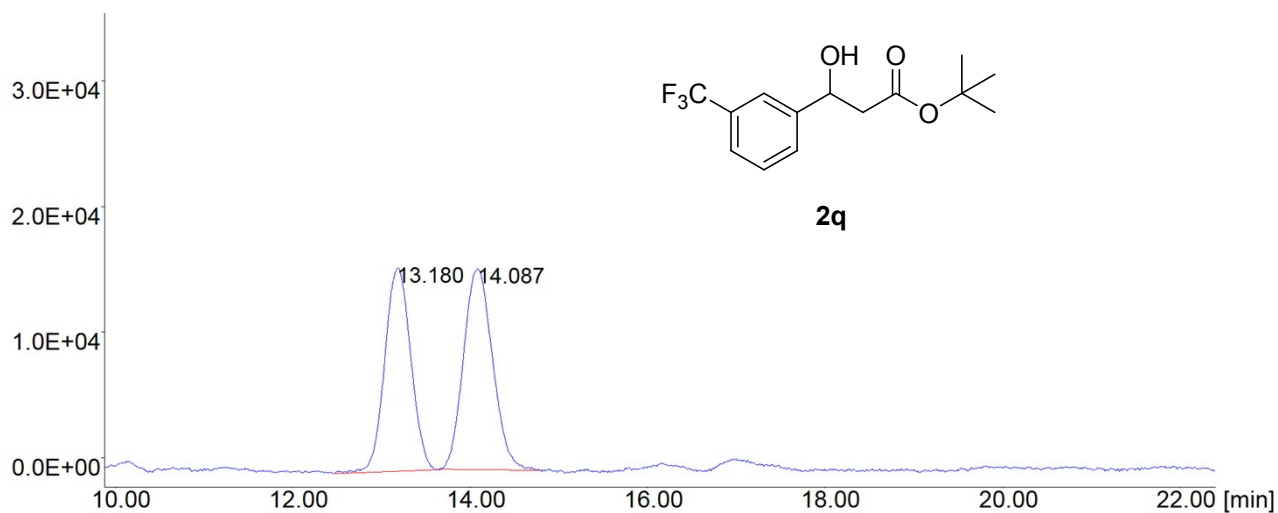
#	Name	RT	Height	Area	%Area
1		40.310	168016	14387046.731	95.042
2		44.503	10584	750512.269	4.958



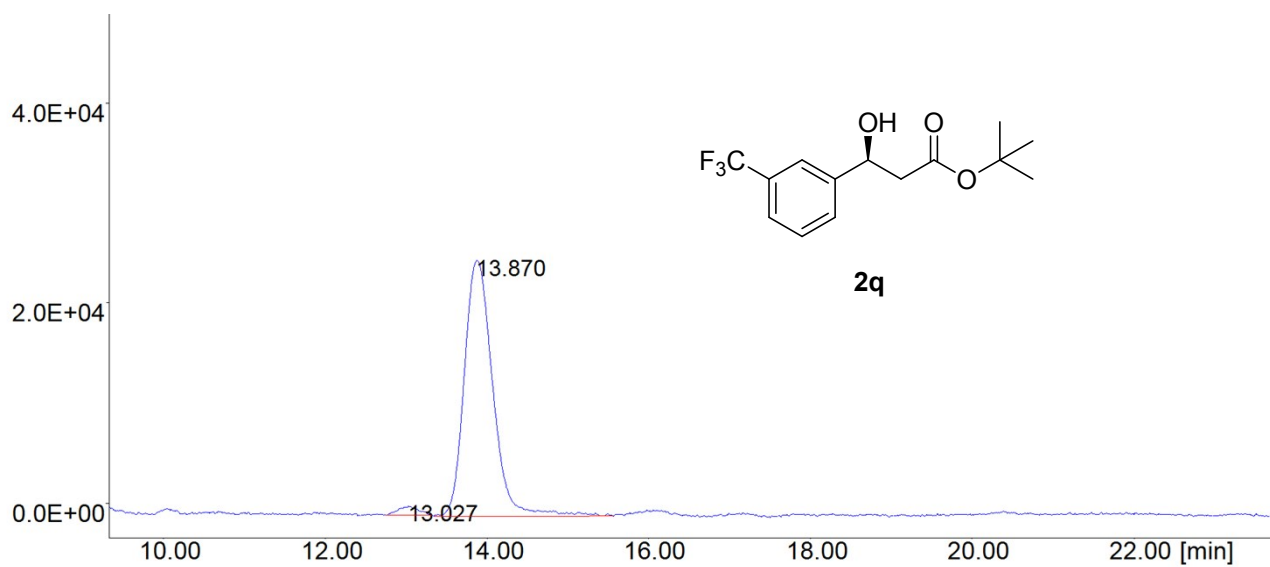
#	Name	RT	Height	Area	%Area
1		13.673	23853	491938.402	50.121
2		16.310	20795	489566.824	49.879



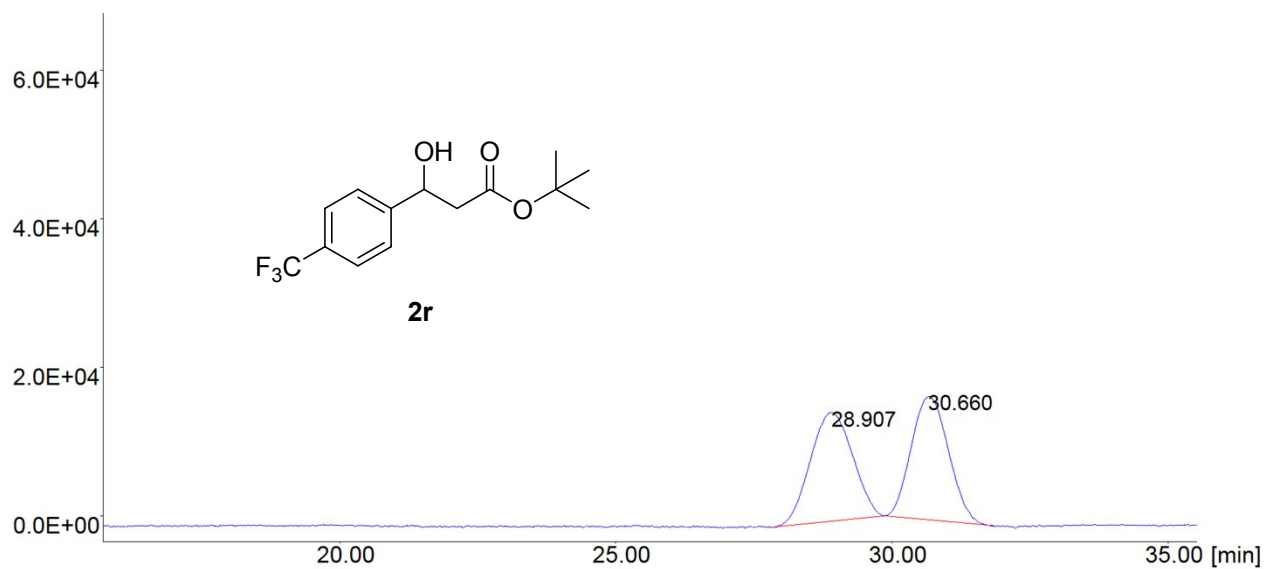
#	Name	RT	Height	Area	%Area
1		13.417	50153	1002682.633	94.981
2		15.977	2635	52980.627	5.019



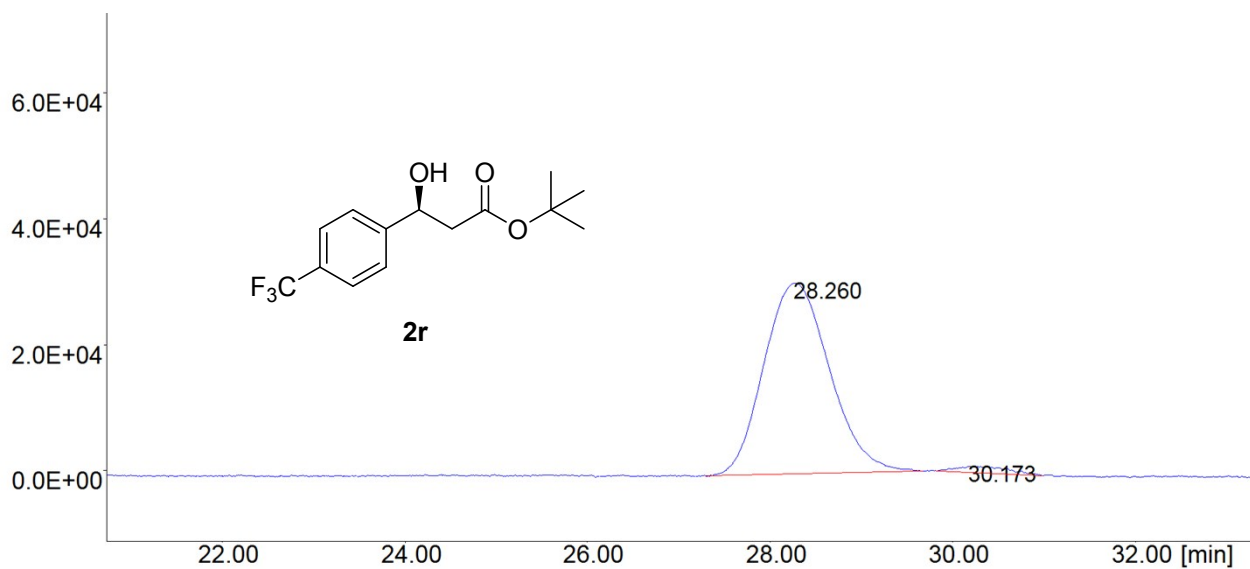
#	Name	RT	Height	Area	%Area
1		13.180	16200	325898.631	47.571
2		14.087	16008	359178.383	52.429



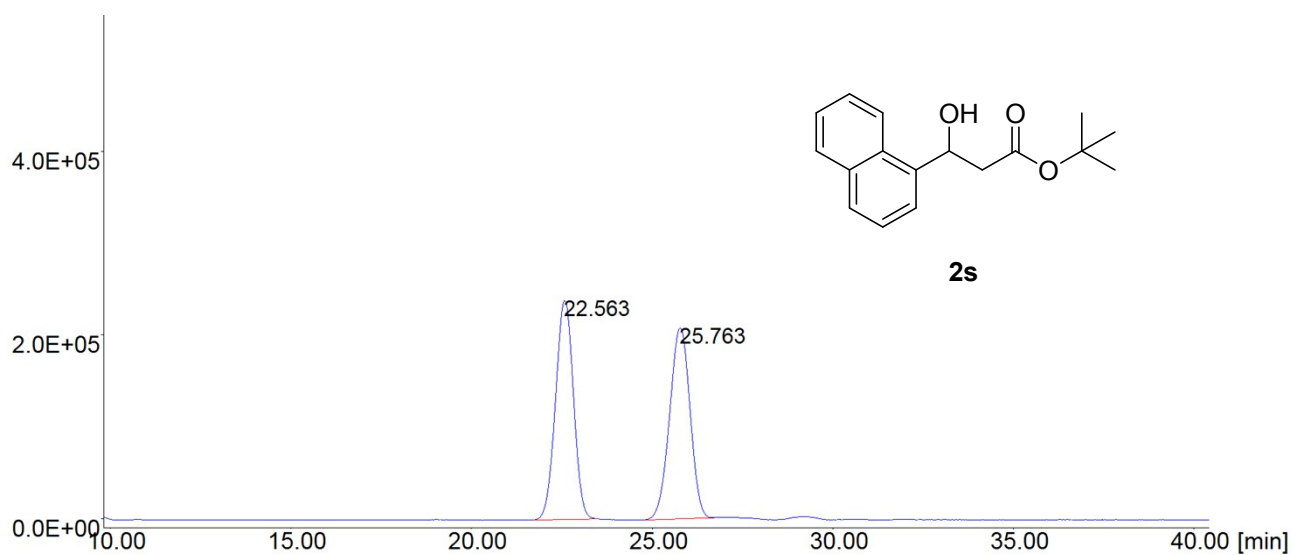
#	Name	RT	Height	Area	%Area
1		13.027	925	16017.600	2.530
2		13.870	25557	617033.115	97.470



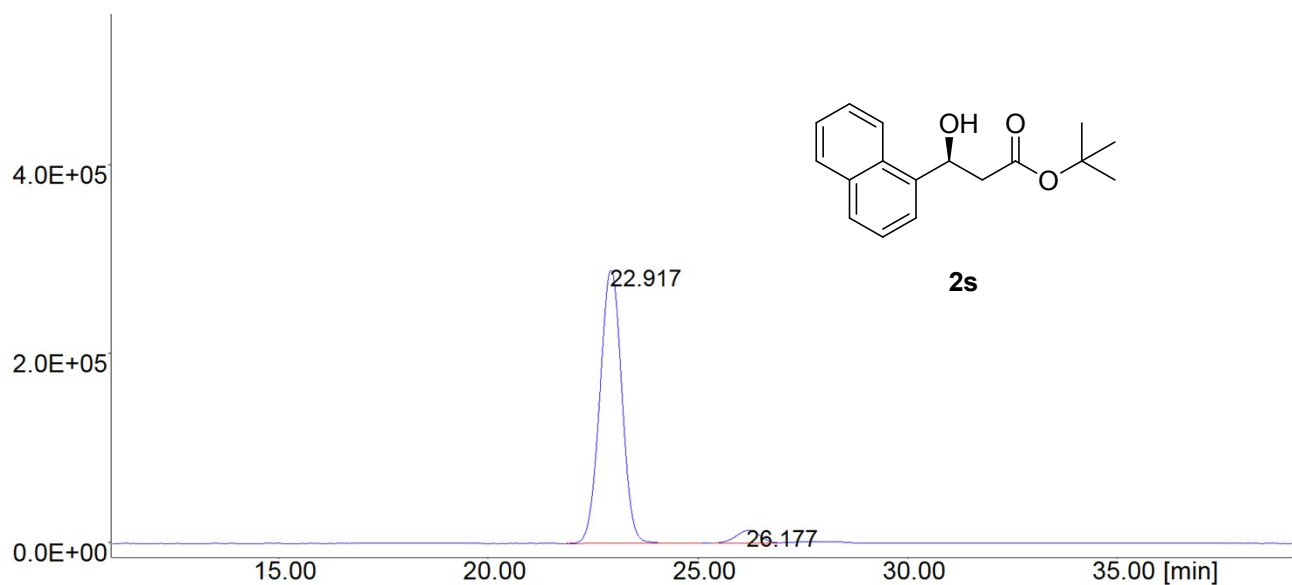
#	Name	RT	Height	Area	%Area
1		28.907	14609	773602.992	50.010
2		30.660	16647	773290.619	49.990



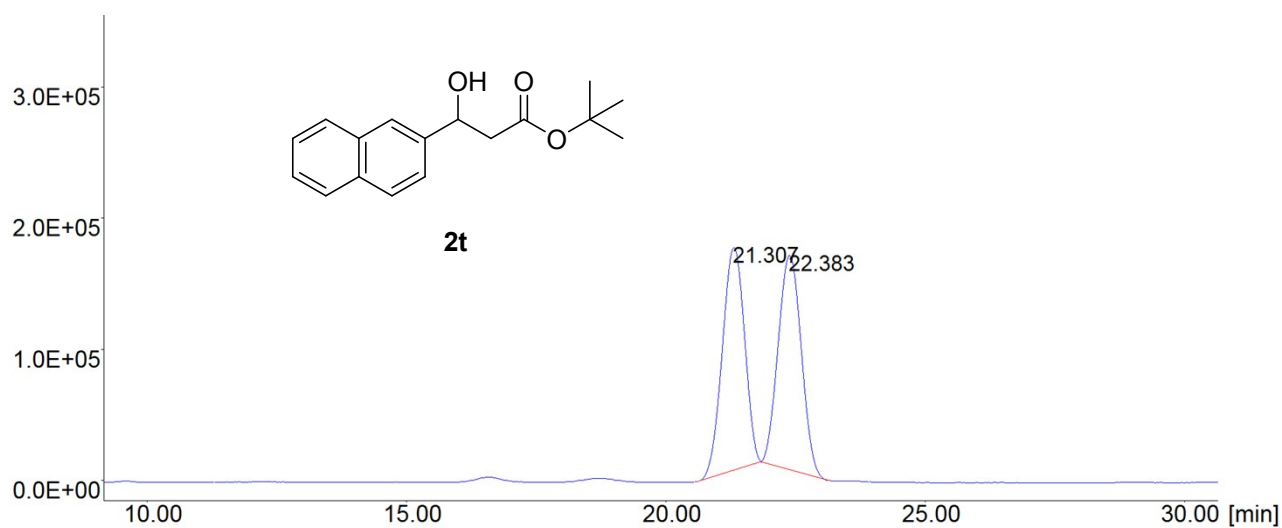
#	Name	RT	Height	Area	%Area
1		28.260	30360	1508978.620	97.540
2		30.173	909	38062.803	2.460



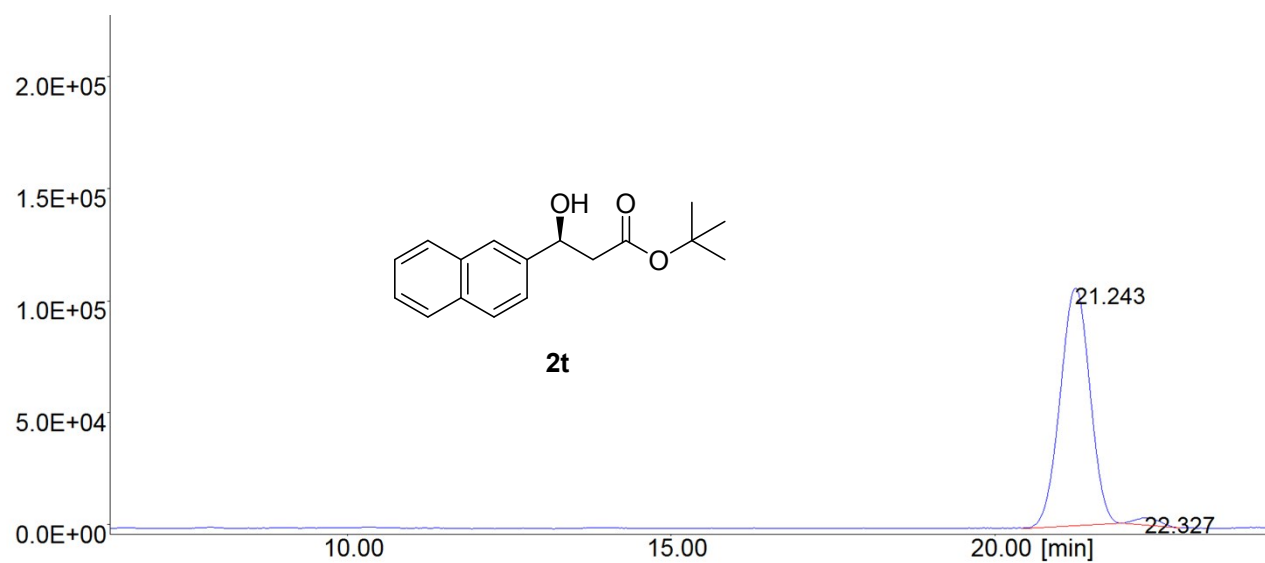
#	Name	RT	Height	Area	%Area
1		22.563	237956	8026585.110	50.133
2		25.763	207327	7984116.926	49.867



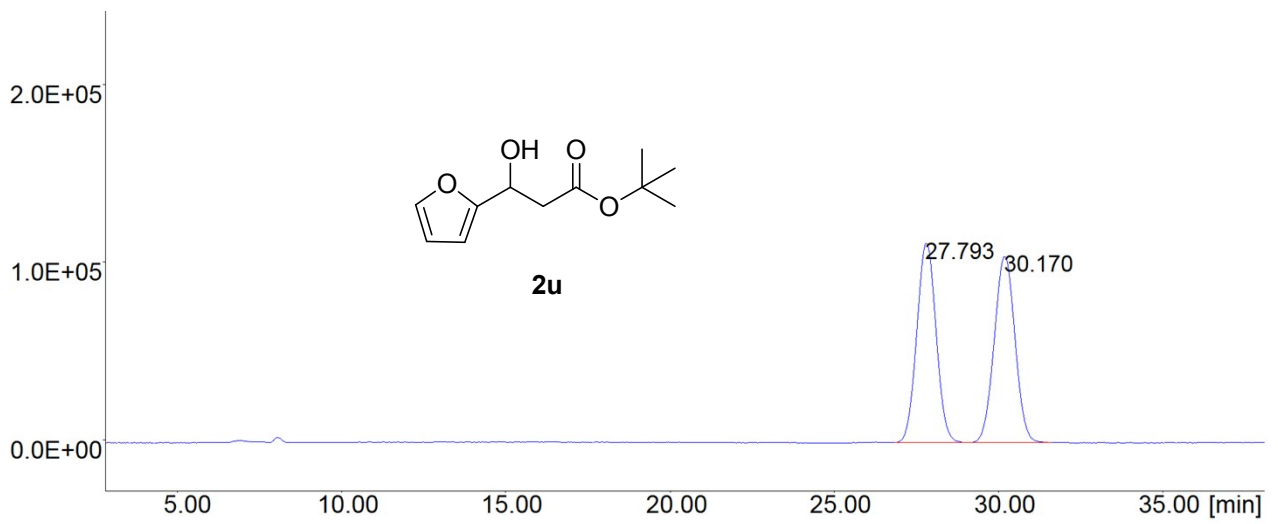
#	Name	RT	Height	Area	%Area
1		22.917	289009	10251062.372	95.303
2		26.177	12992	505210.209	4.697



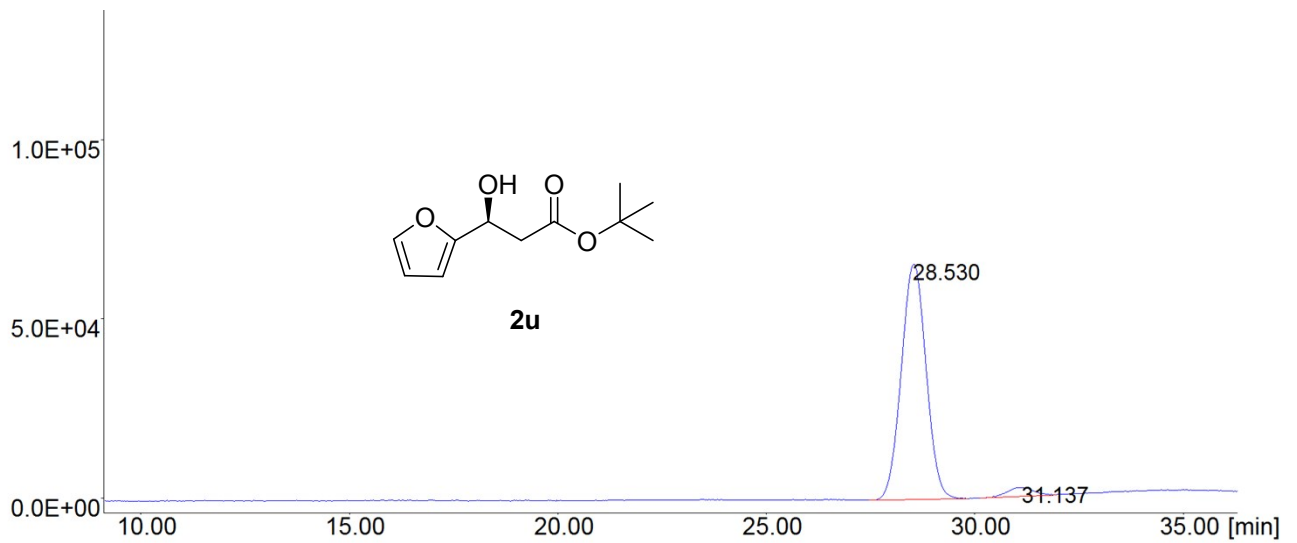
#	Name	RT	Height	Area	%Area
1		21.307	169552	4943624.924	49.941
2		22.383	162960	4955241.717	50.059



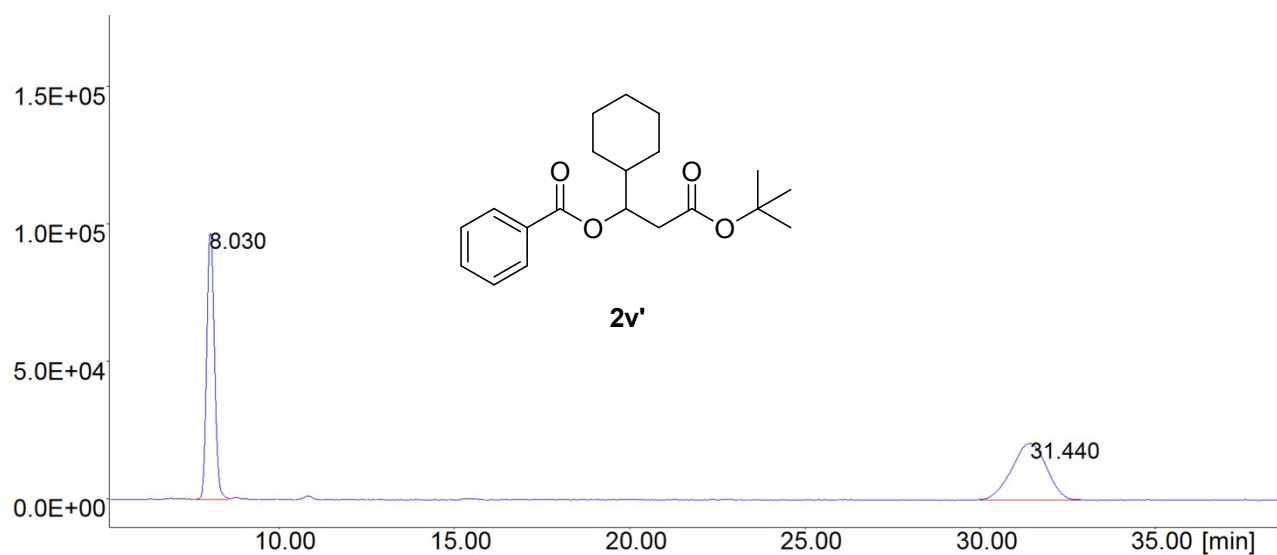
#	Name	RT	Height	Area	%Area
1		21.243	105957	3339287.760	97.417
2		22.327	3305	88557.600	2.583



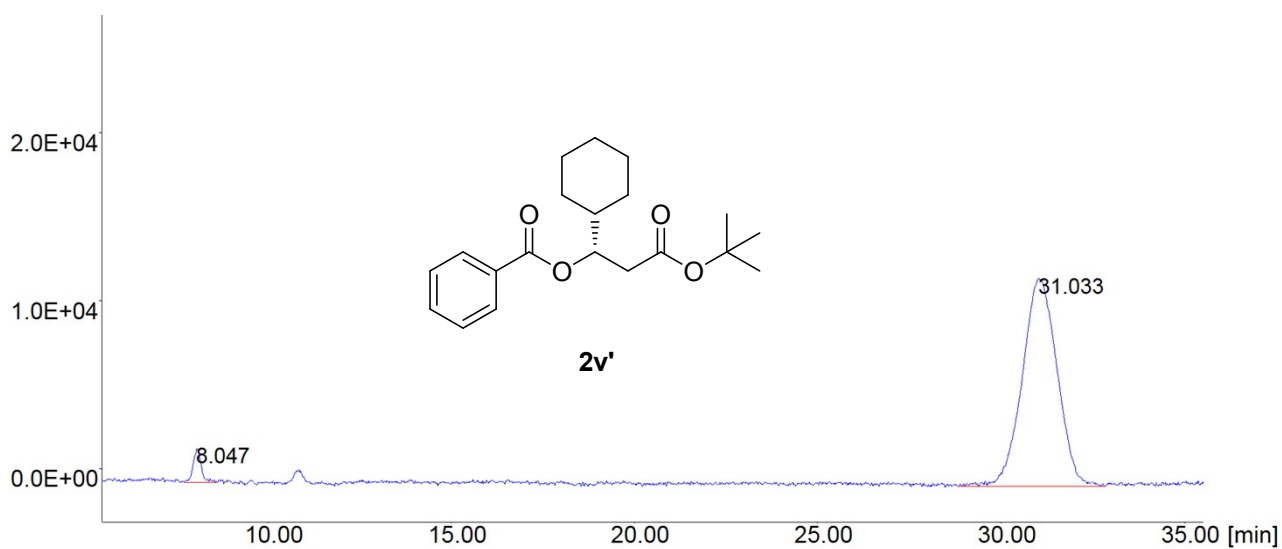
#	Name	RT	Height	Area	%Area
1		27.793	112155	4489836.300	49.895
2		30.170	104641	4508762.366	50.105



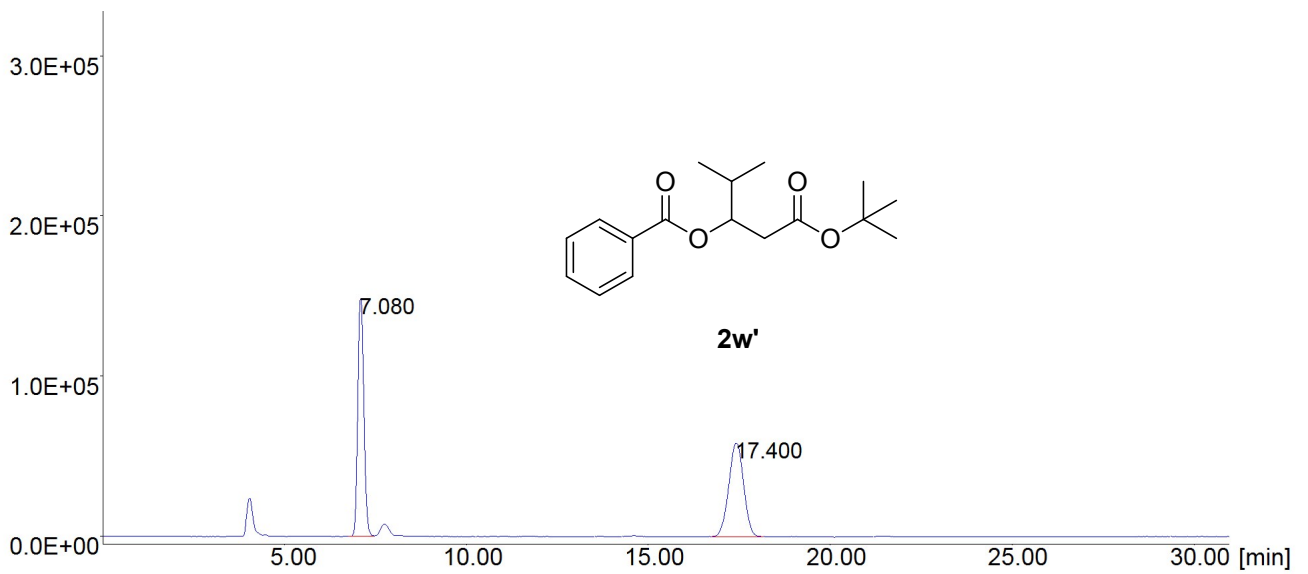
#	Name	RT	Height	Area	%Area
1		28.530	65639	2668621.954	96.022
2		31.137	2573	110555.213	3.978



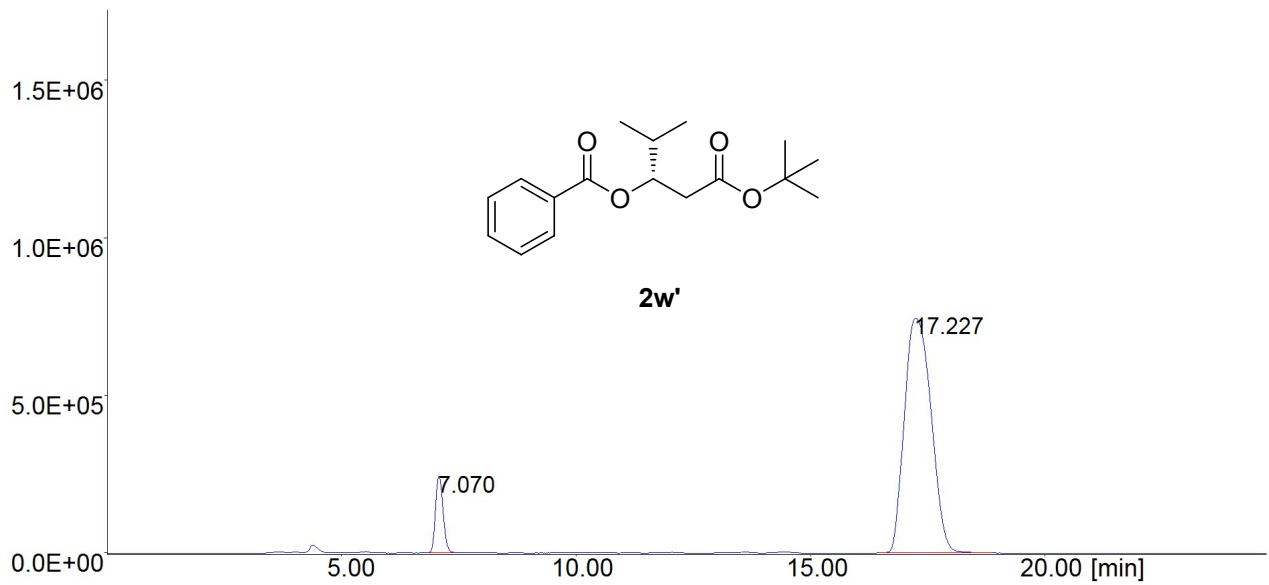
#	Name	RT	Height	Area	%Area
1		8.030	96843	1396628.600	49.911
2		31.440	20668	1401630.662	50.089



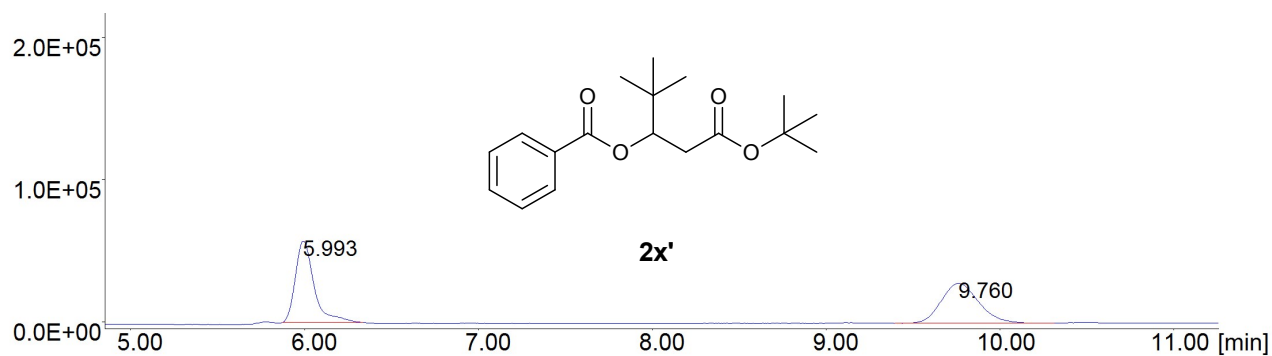
#	Name	RT	Height	Area	%Area
1		8.047	2040	30492.600	3.614
2		31.033	12361	813209.802	96.386



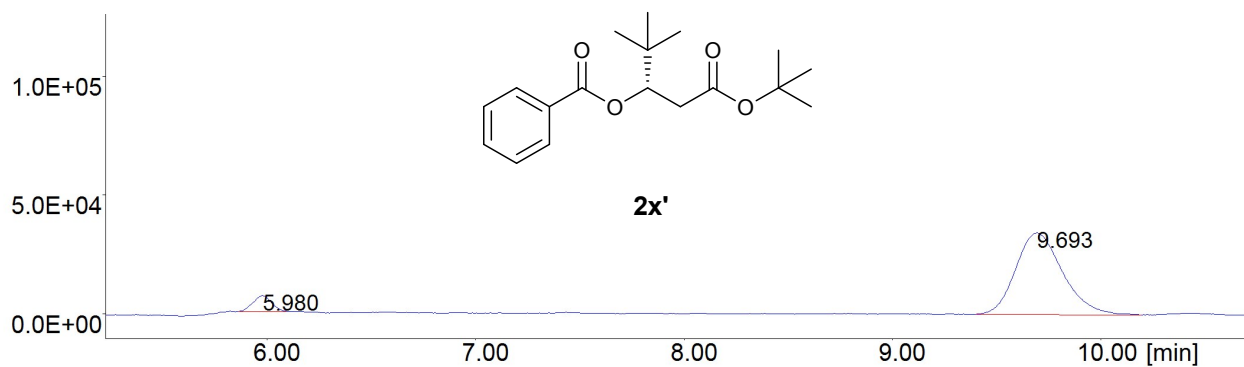
#	Name	RT	Height	Area	%Area
1		7.080	148264	1582437.743	49.476
2		17.400	58548	1615937.409	50.524



#	Name	RT	Height	Area	%Area
1		7.070	241031	2524249.000	8.022
2		17.227	743928	28941490.501	91.978



#	Name	RT	Height	Area	%Area
1		5.993	57157	423205.459	50.036
2		9.760	28182	422602.364	49.964



#	Name	RT	Height	Area	%Area
1		5.980	6645	40593.200	7.046
2		9.693	34302	535554.600	92.954

3. The comparative kinetic study of the ligands

