

# Organocatalytic Asymmetric Michael Addition of $\alpha$ -Alkylidene Succinimides to Nitroalkenes

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Beijing 100081, People's Republic of China*

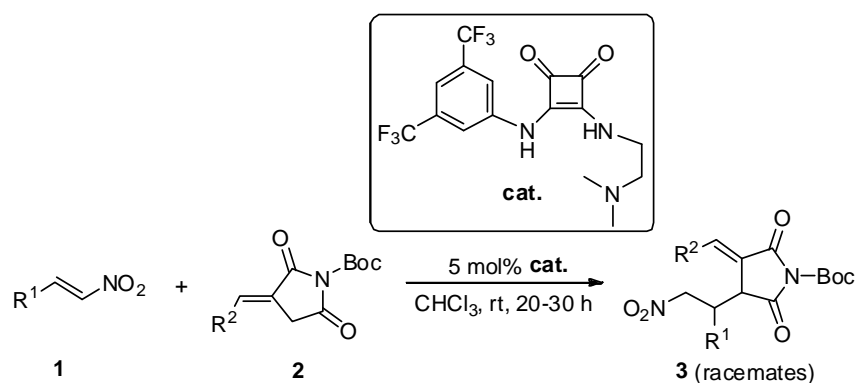
[dudm@bit.edu.cn](mailto:dudm@bit.edu.cn)

## *Supporting Information*

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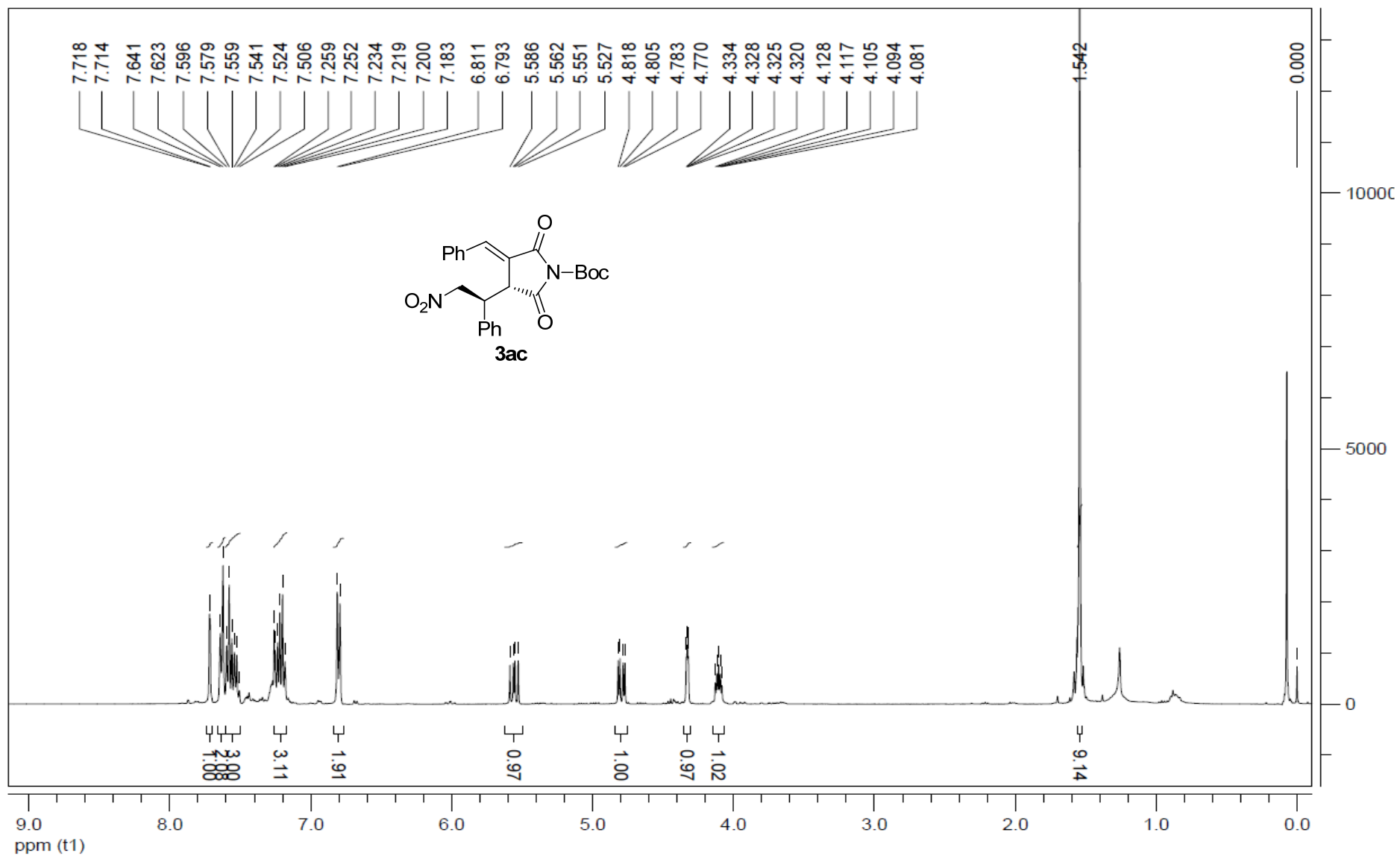
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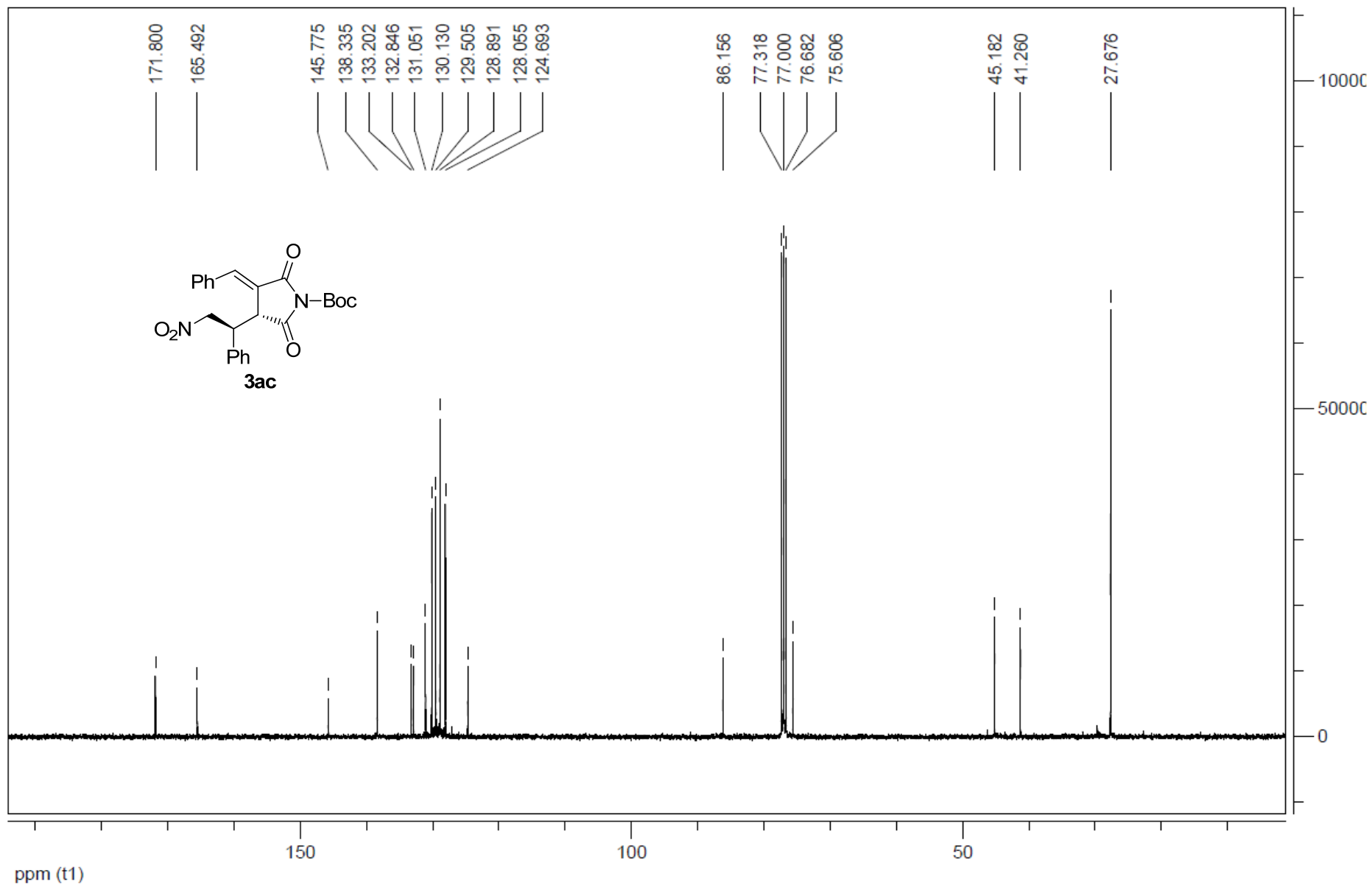
### General procedure for the synthesis of the racemates of product **3**



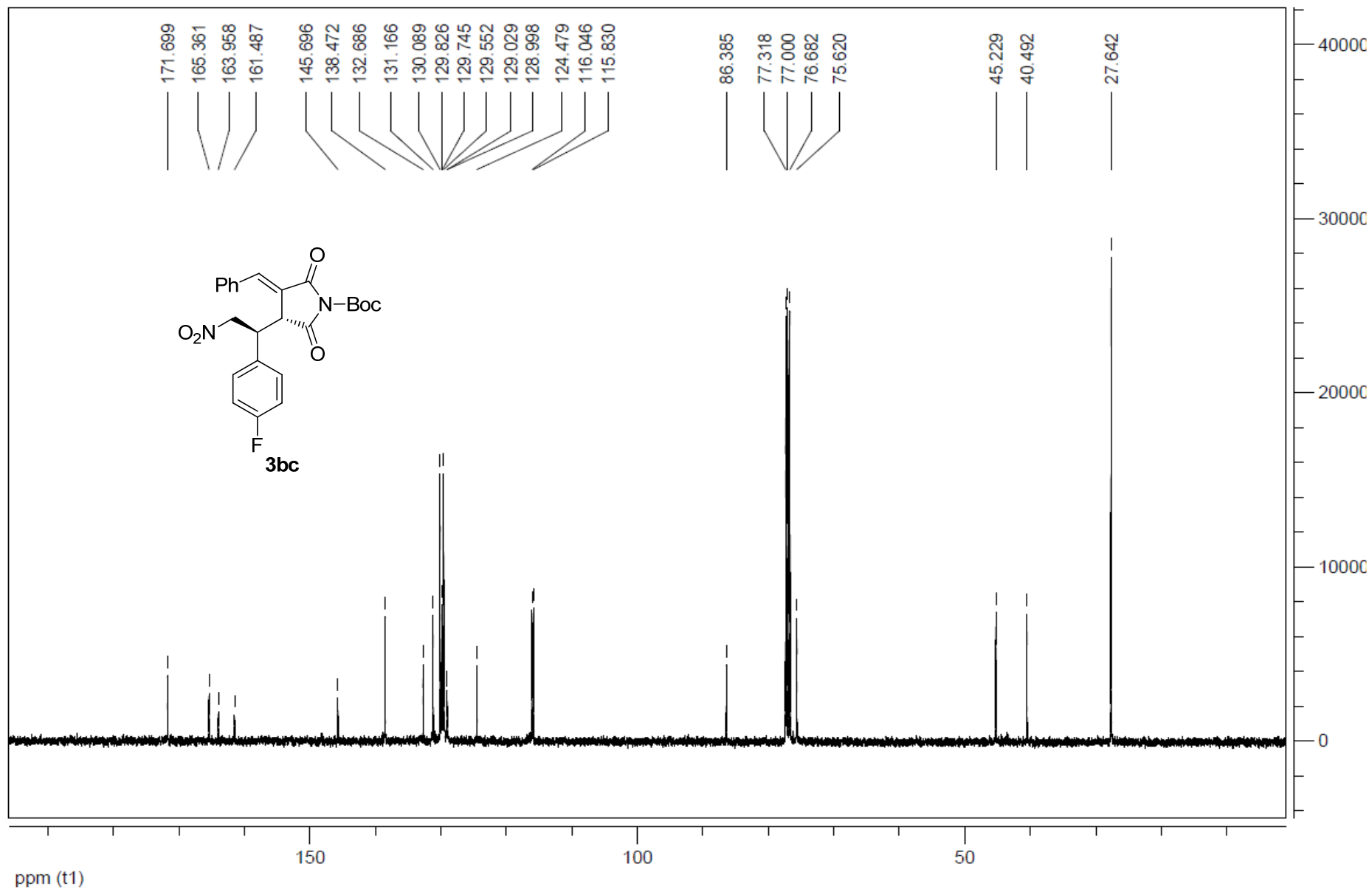
To a dried small bottle were added **2** (0.1 mmol), squaramide catalyst (2.0 mg, 0.005 mmol, 5 mol %) and  $\text{CHCl}_3$  (0.5 mL). The reaction mixture was stirred at room temperature for 15 min, and **1** was then added. After stirring at room temperature for 20–30 h, the reaction mixture was concentrated and directly purified by silica gel column chromatography to afford the racemates of **3**.

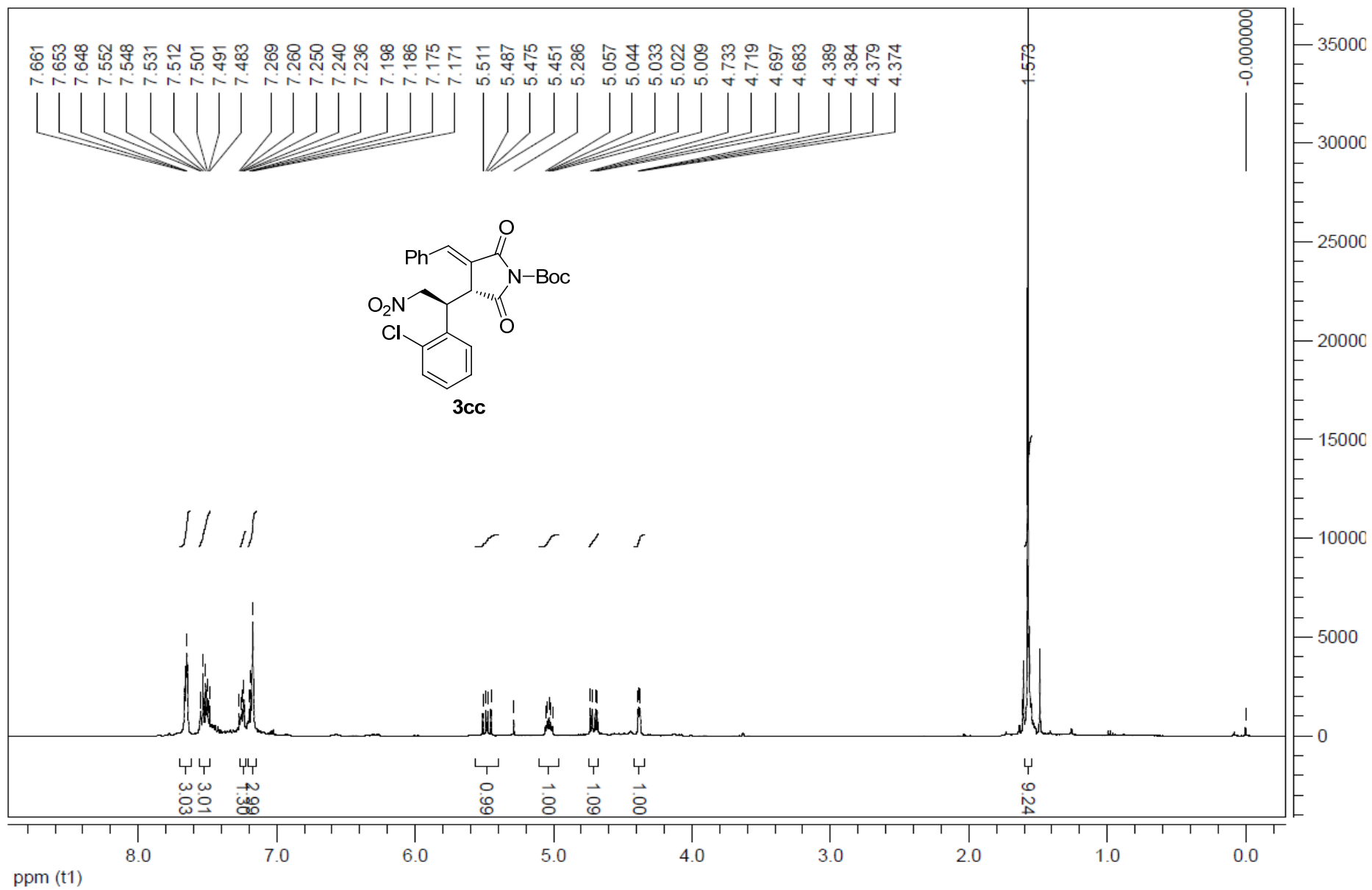
Copies of  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra of new compounds

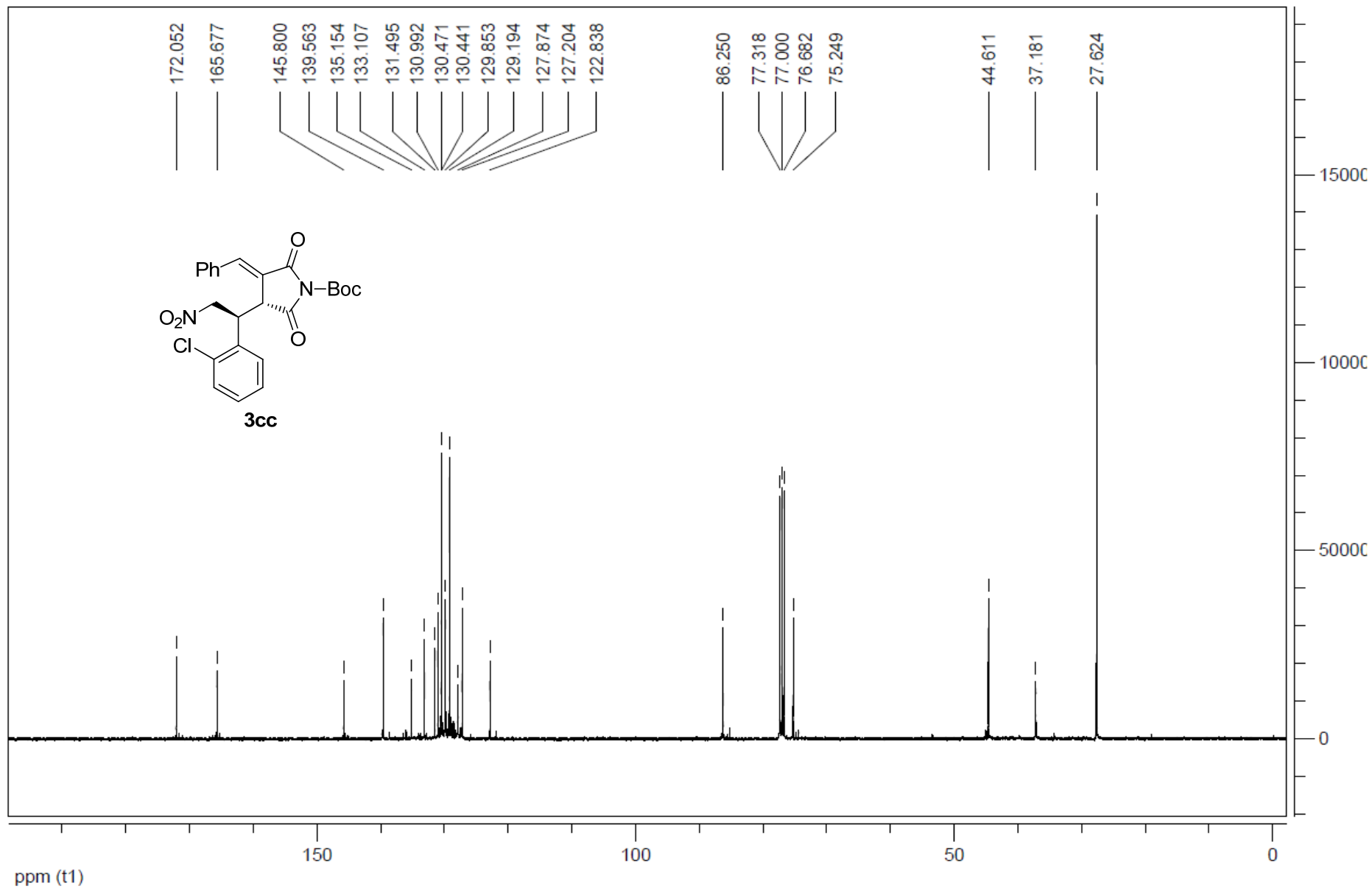




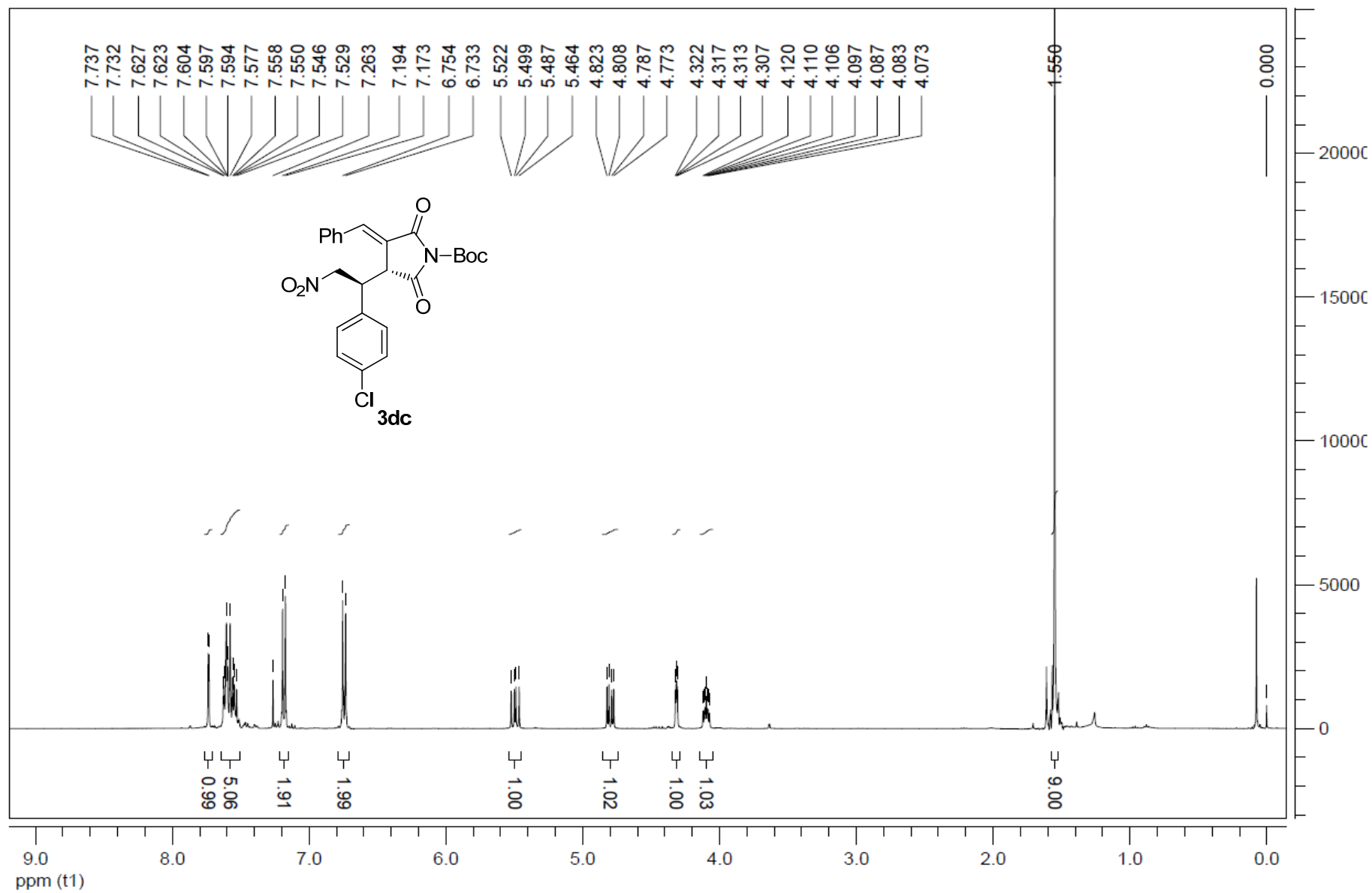


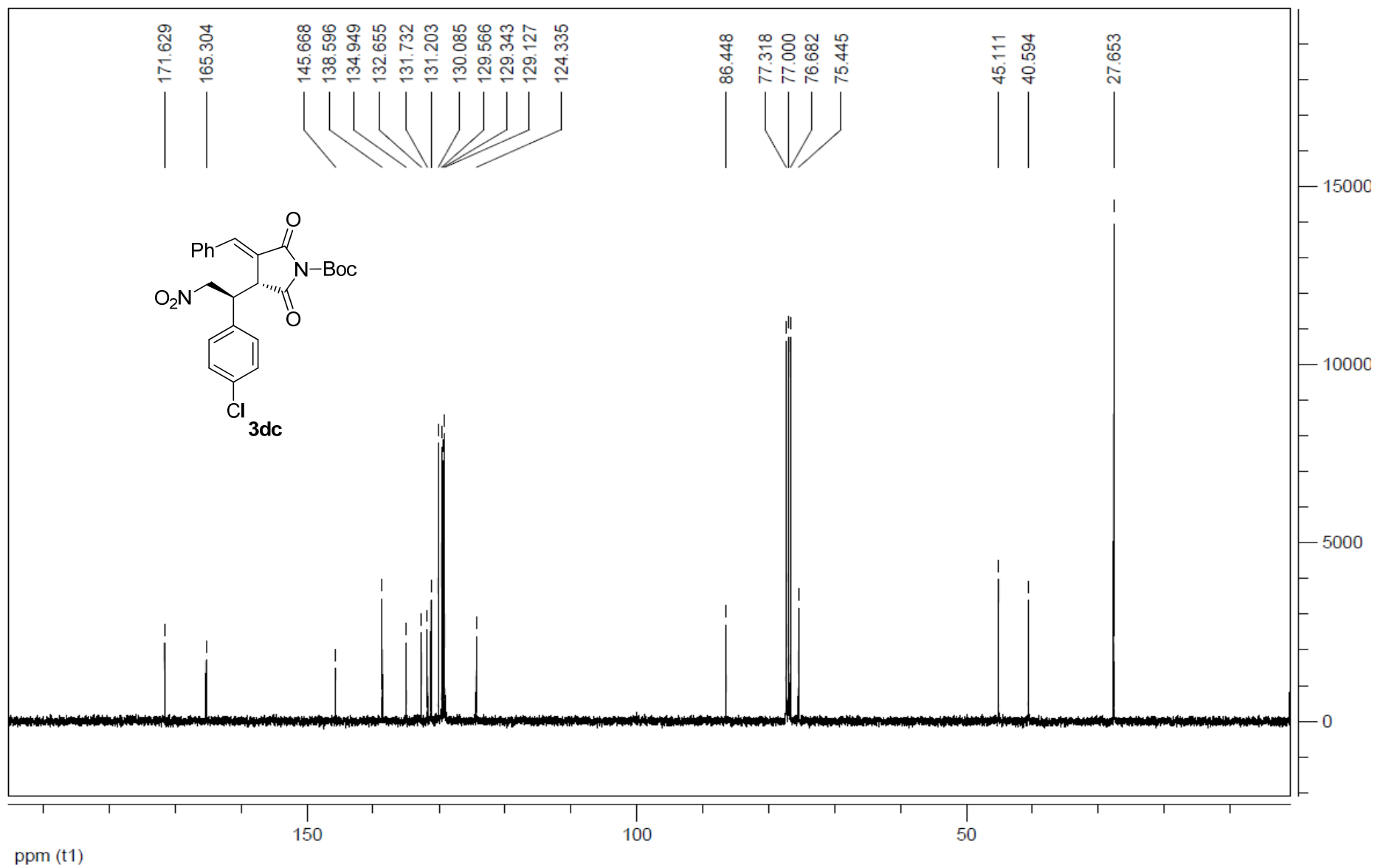


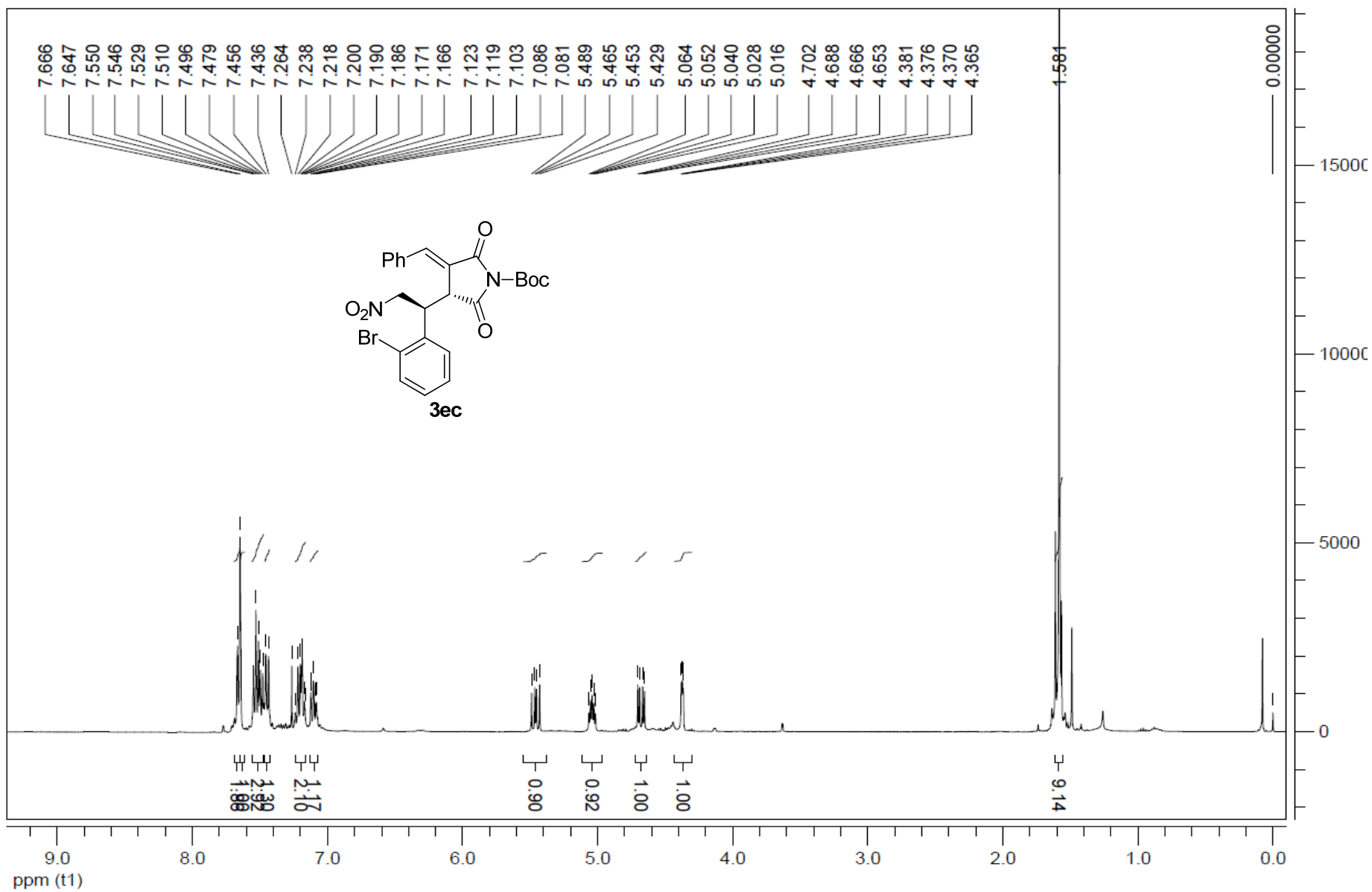


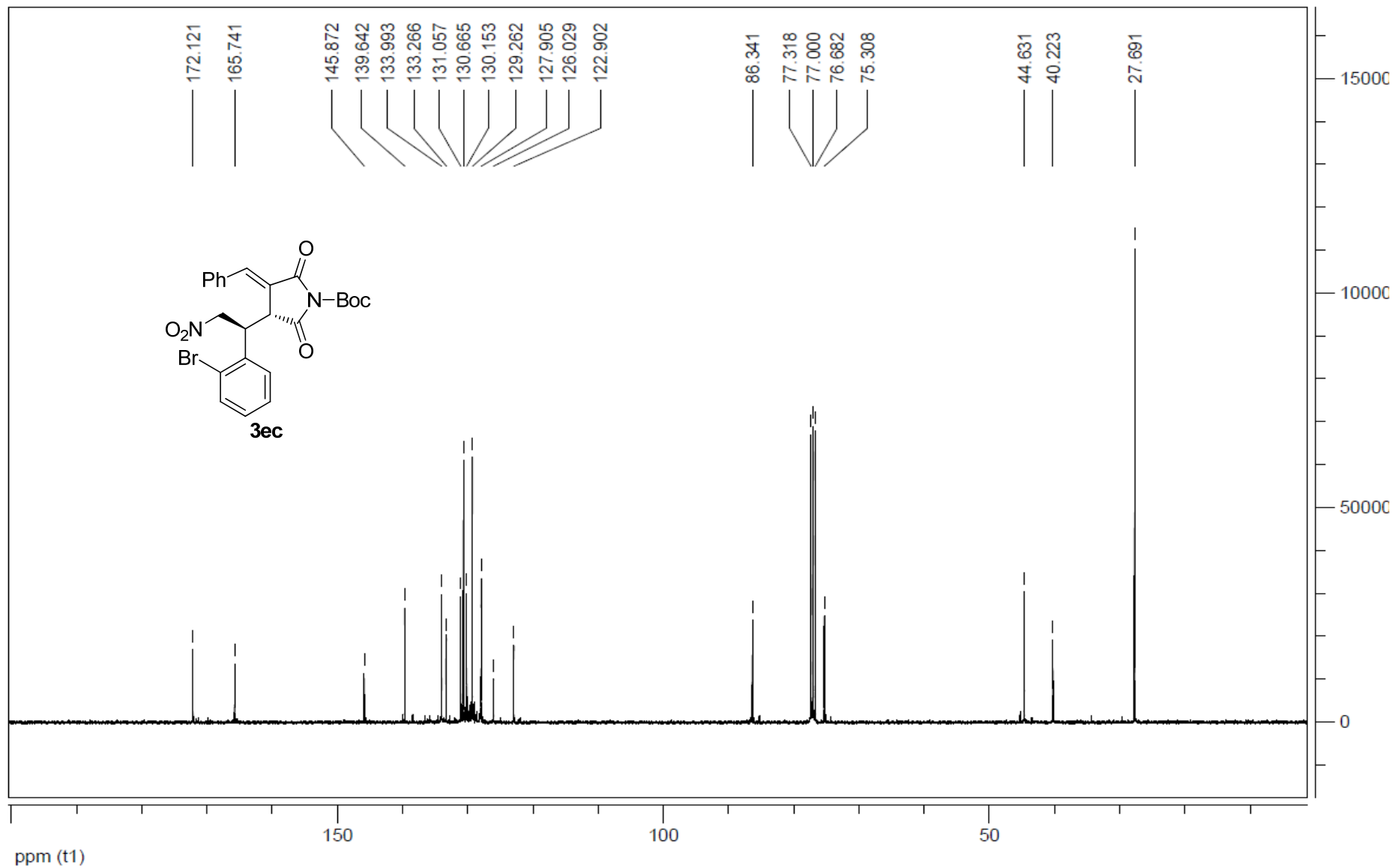


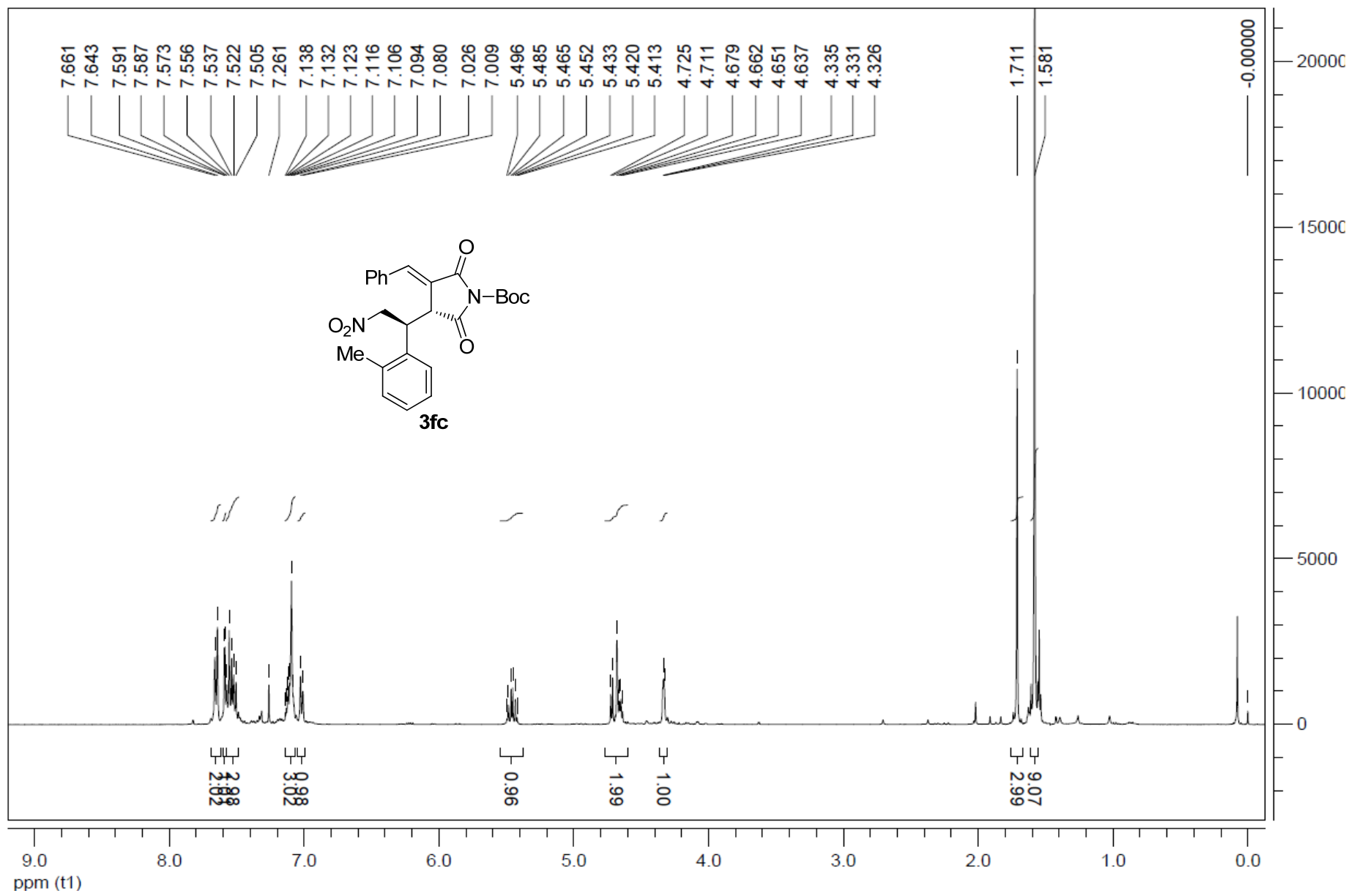


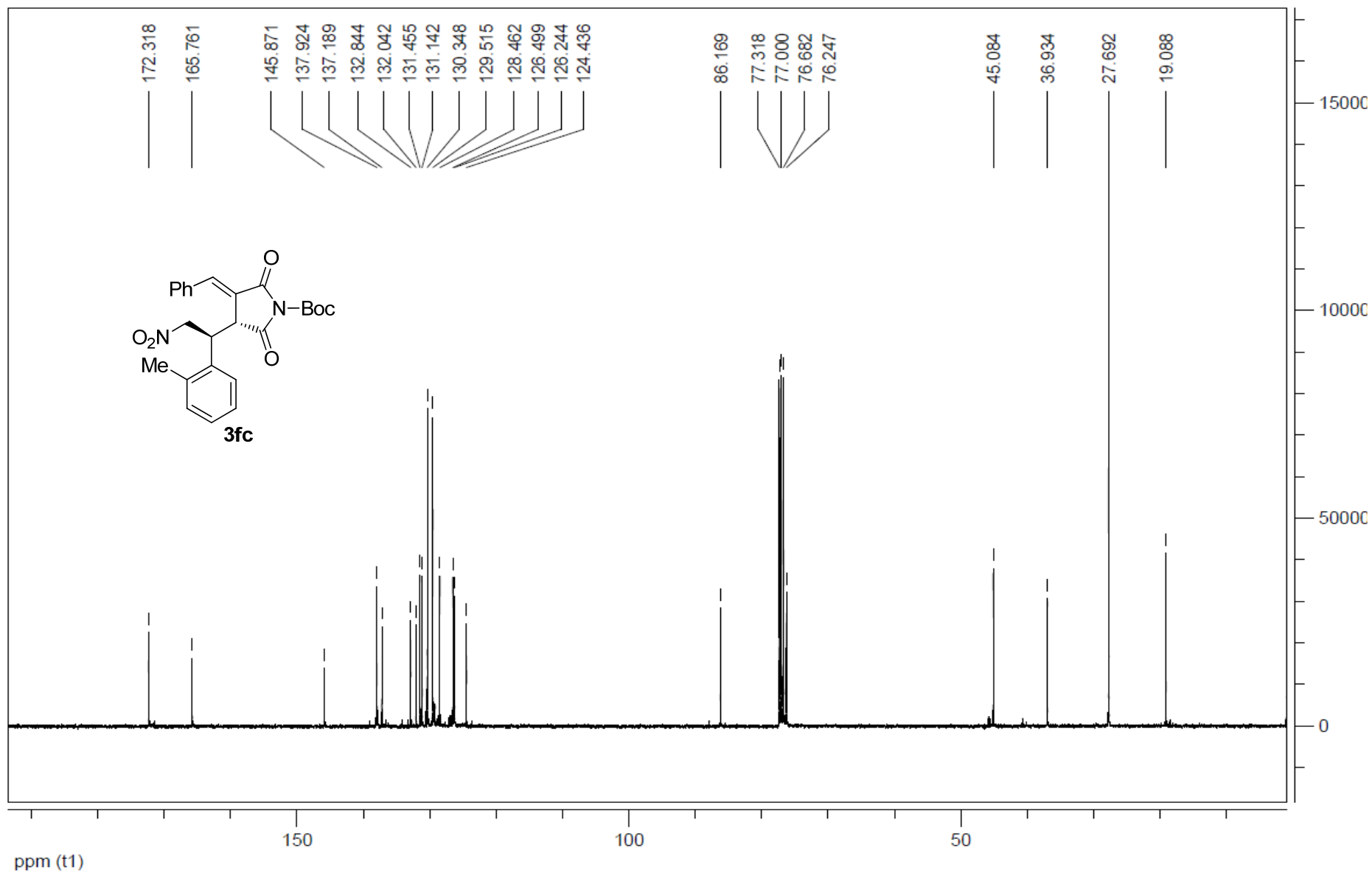


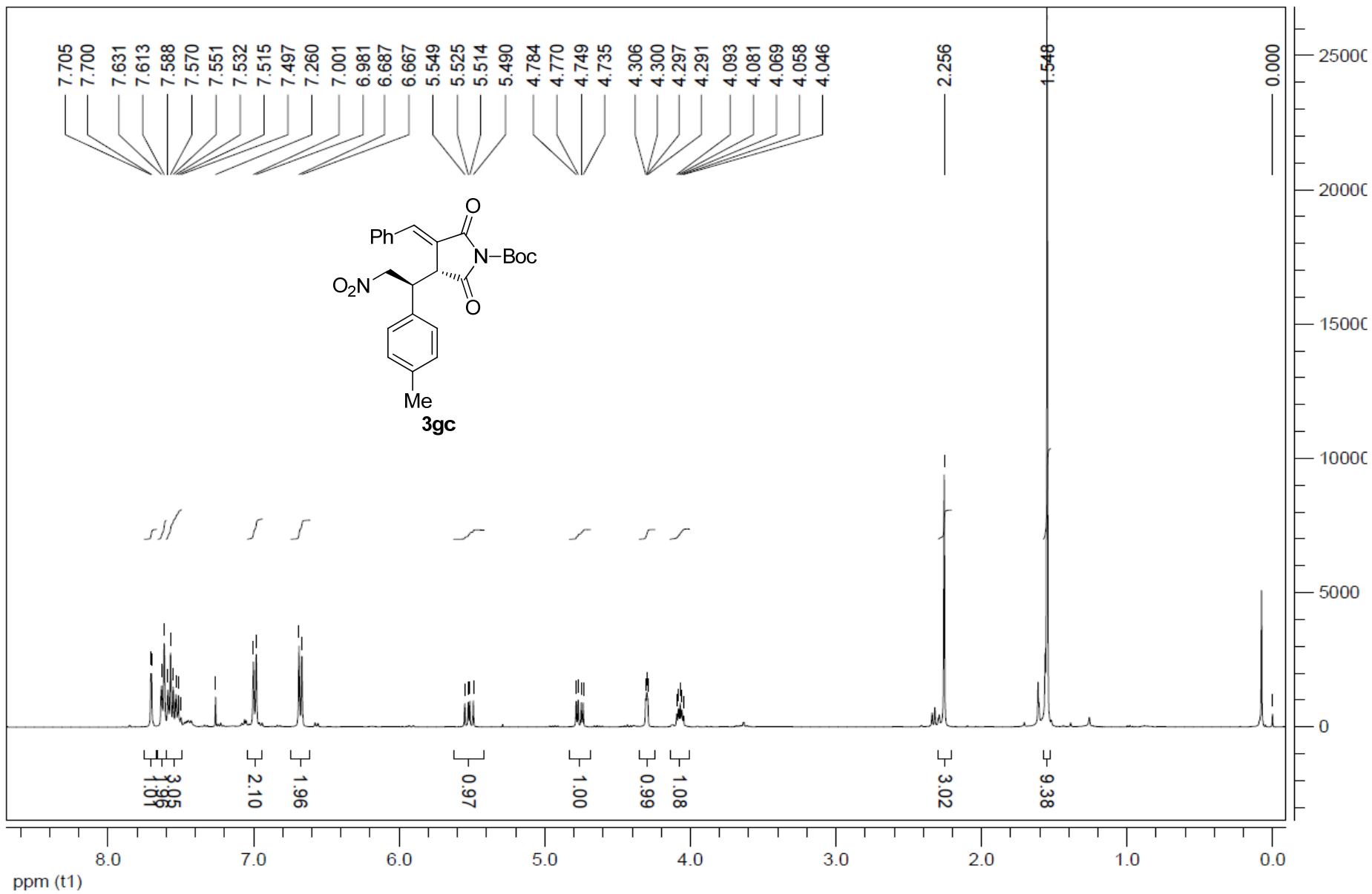


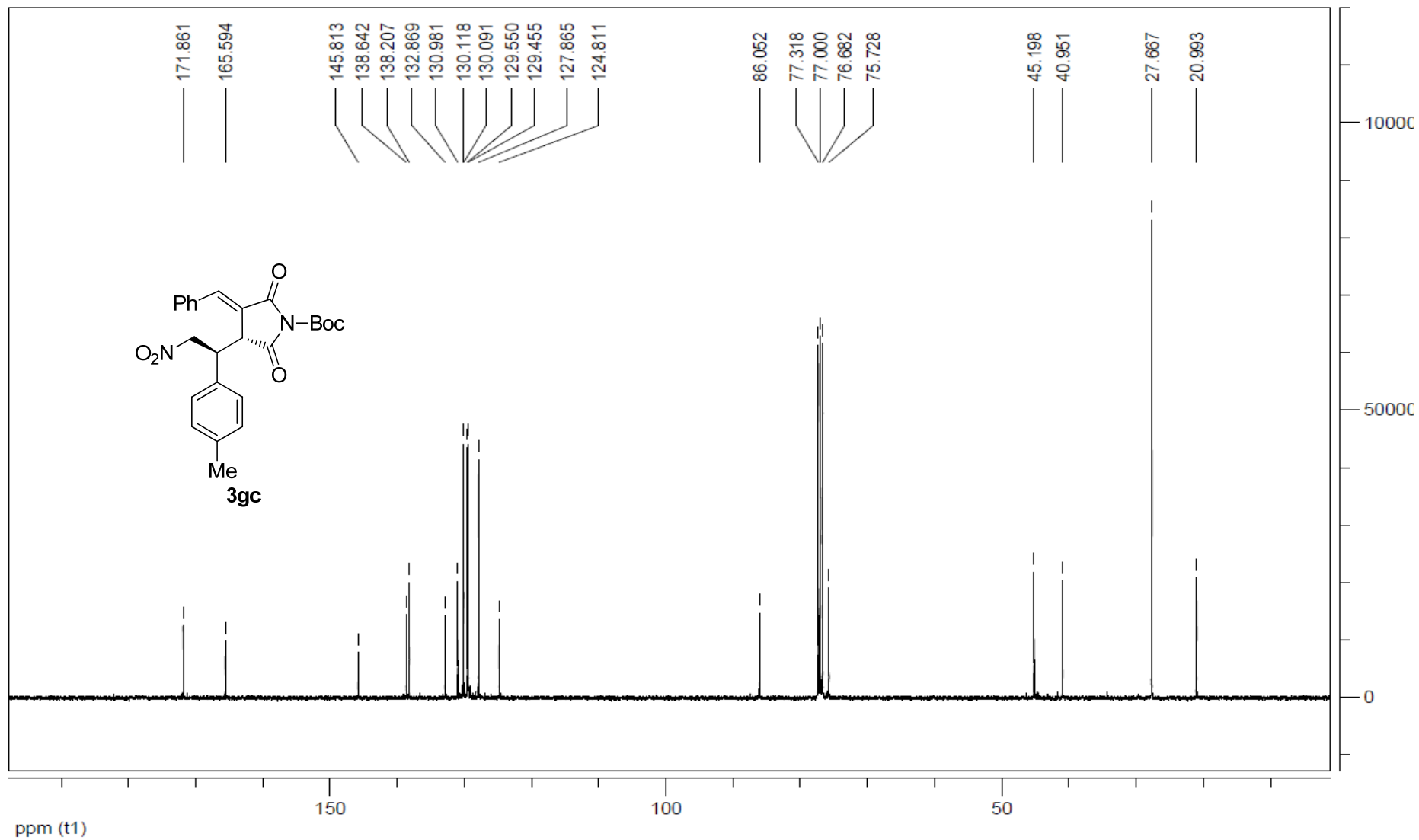




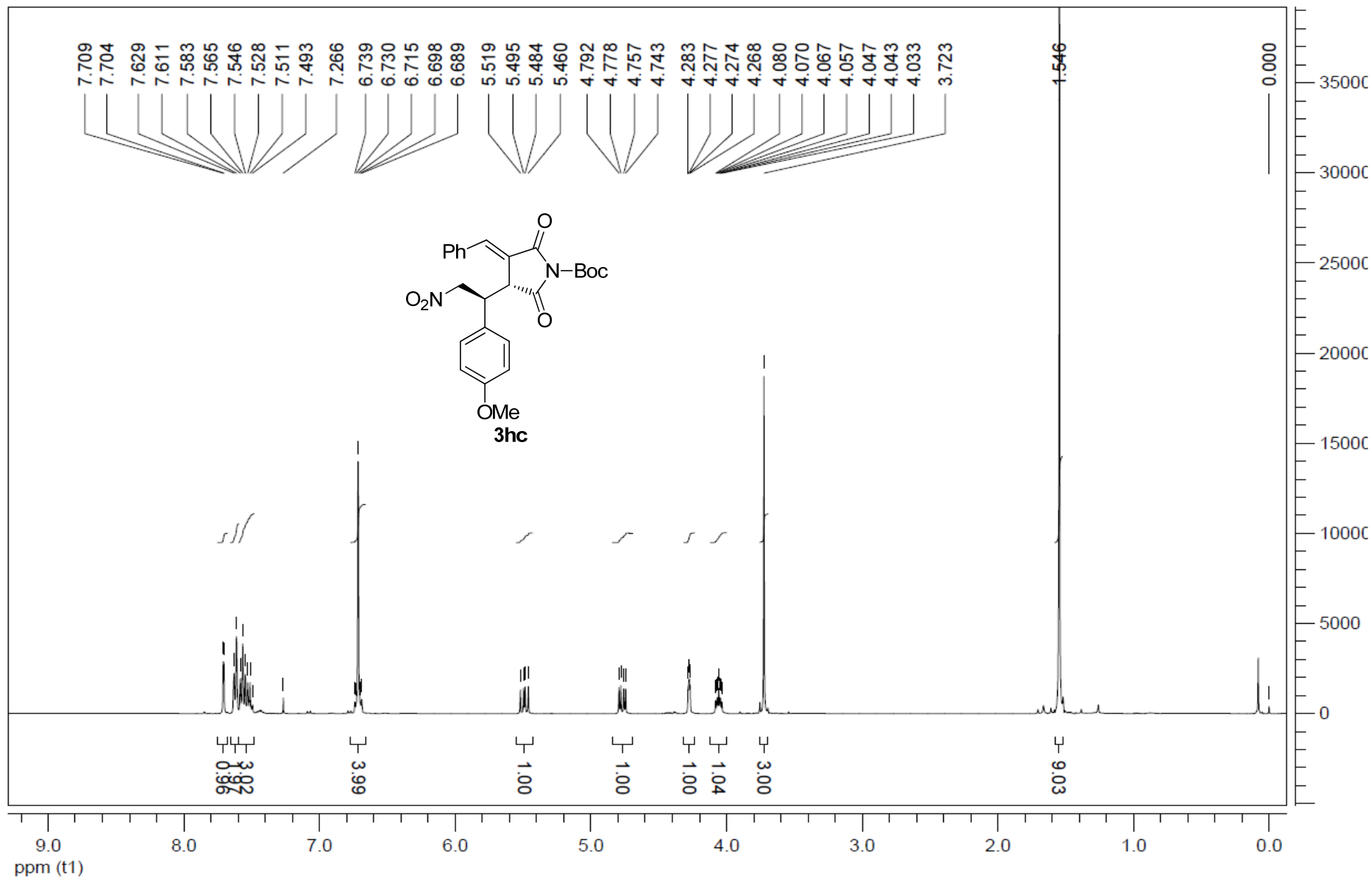


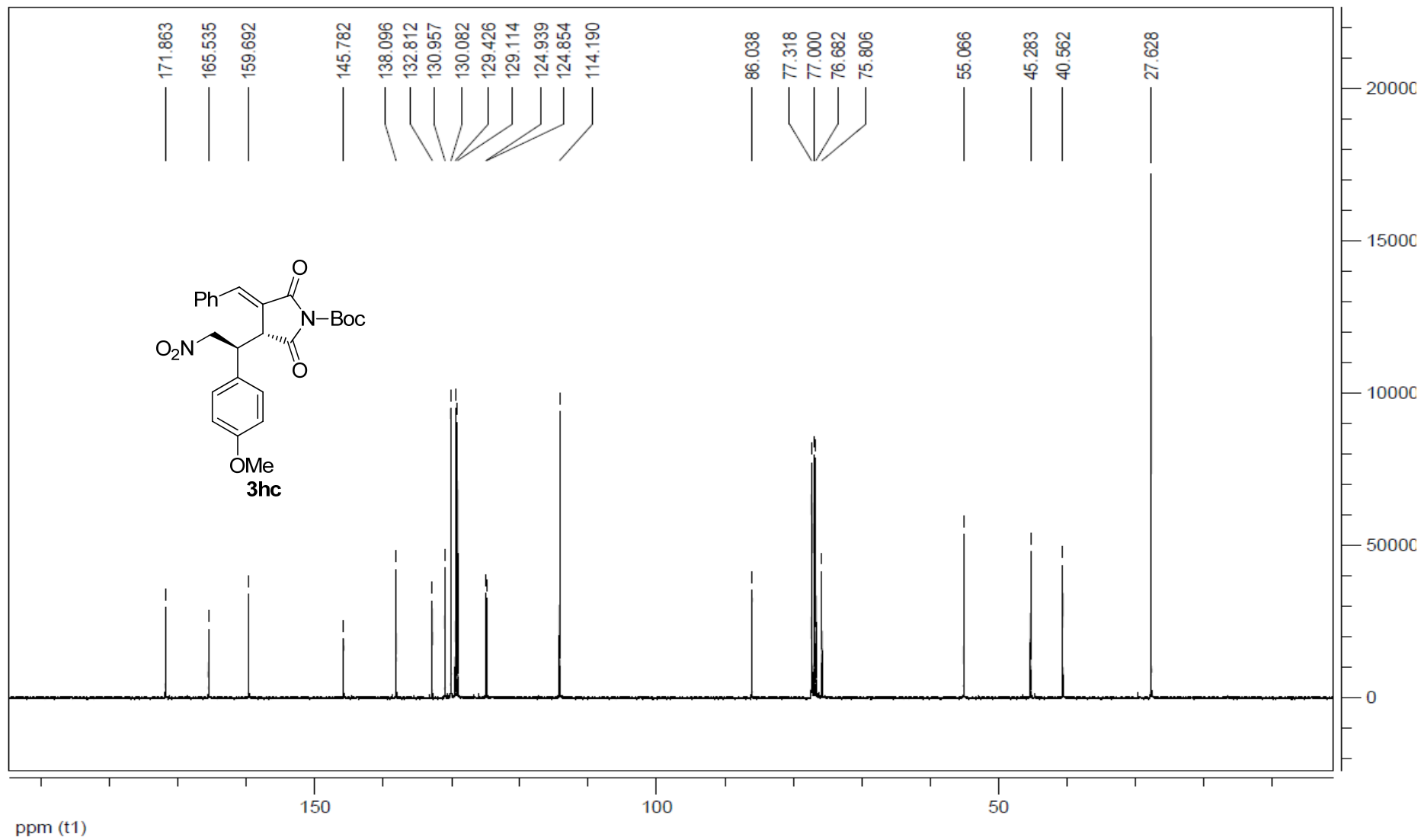


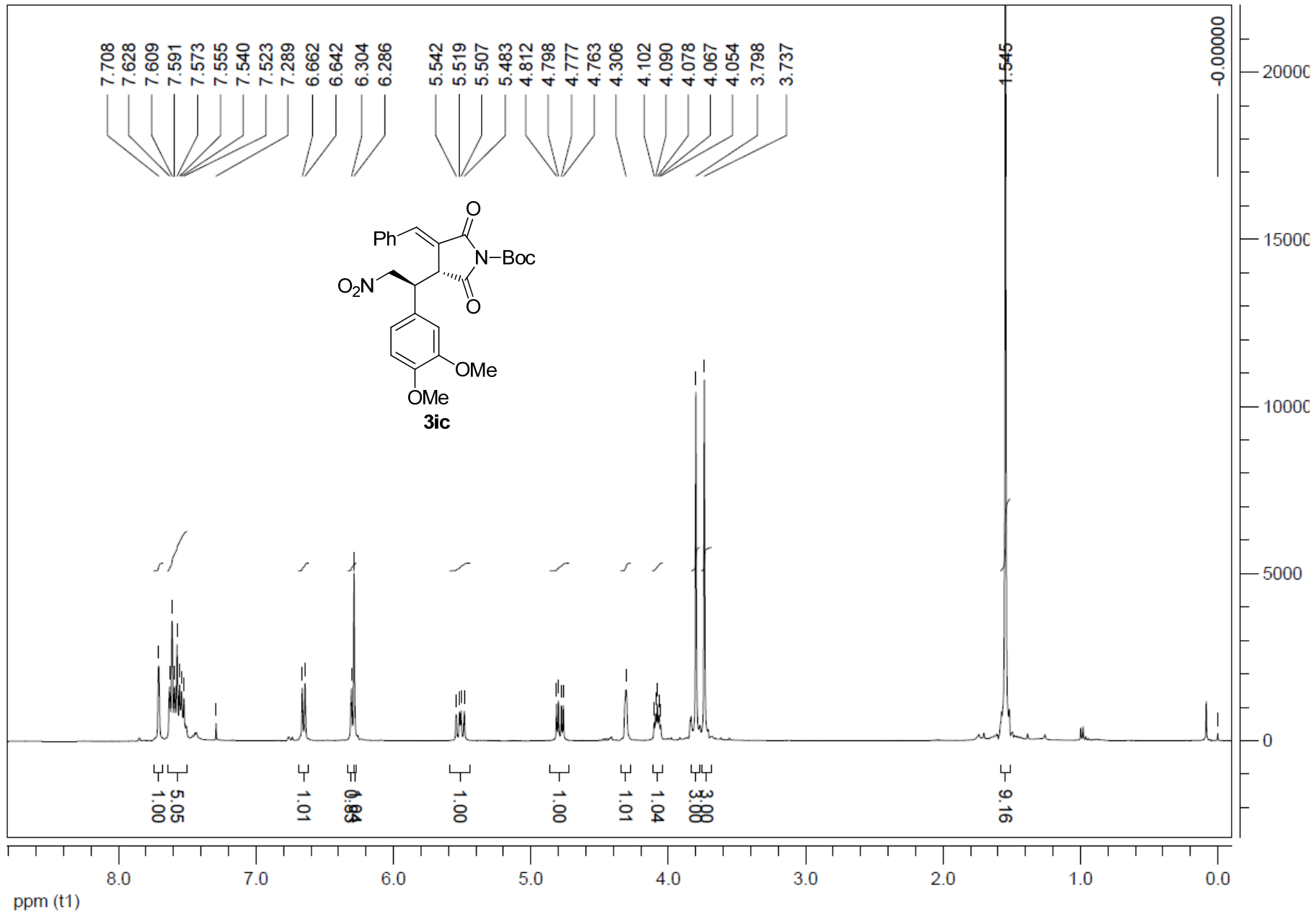


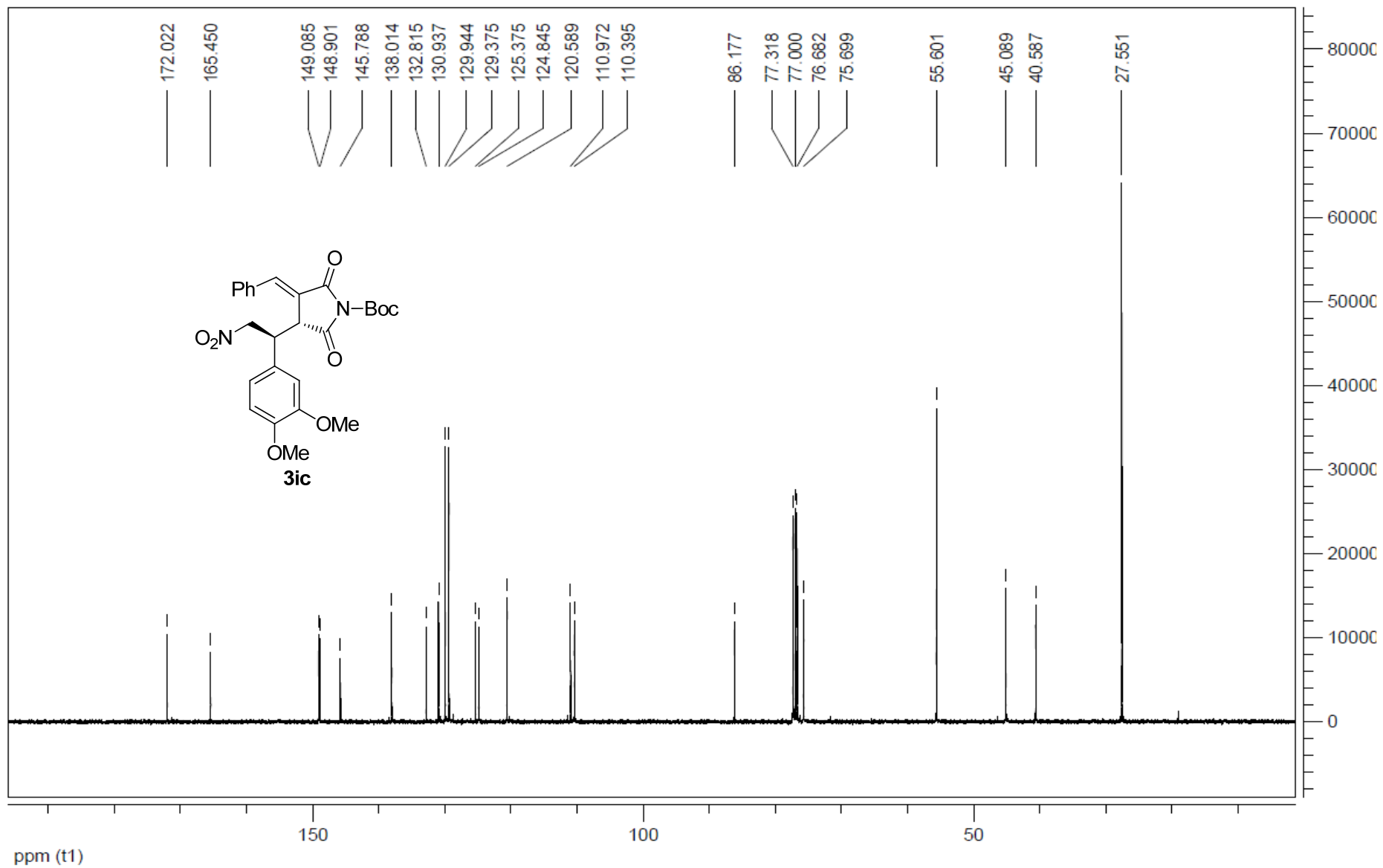


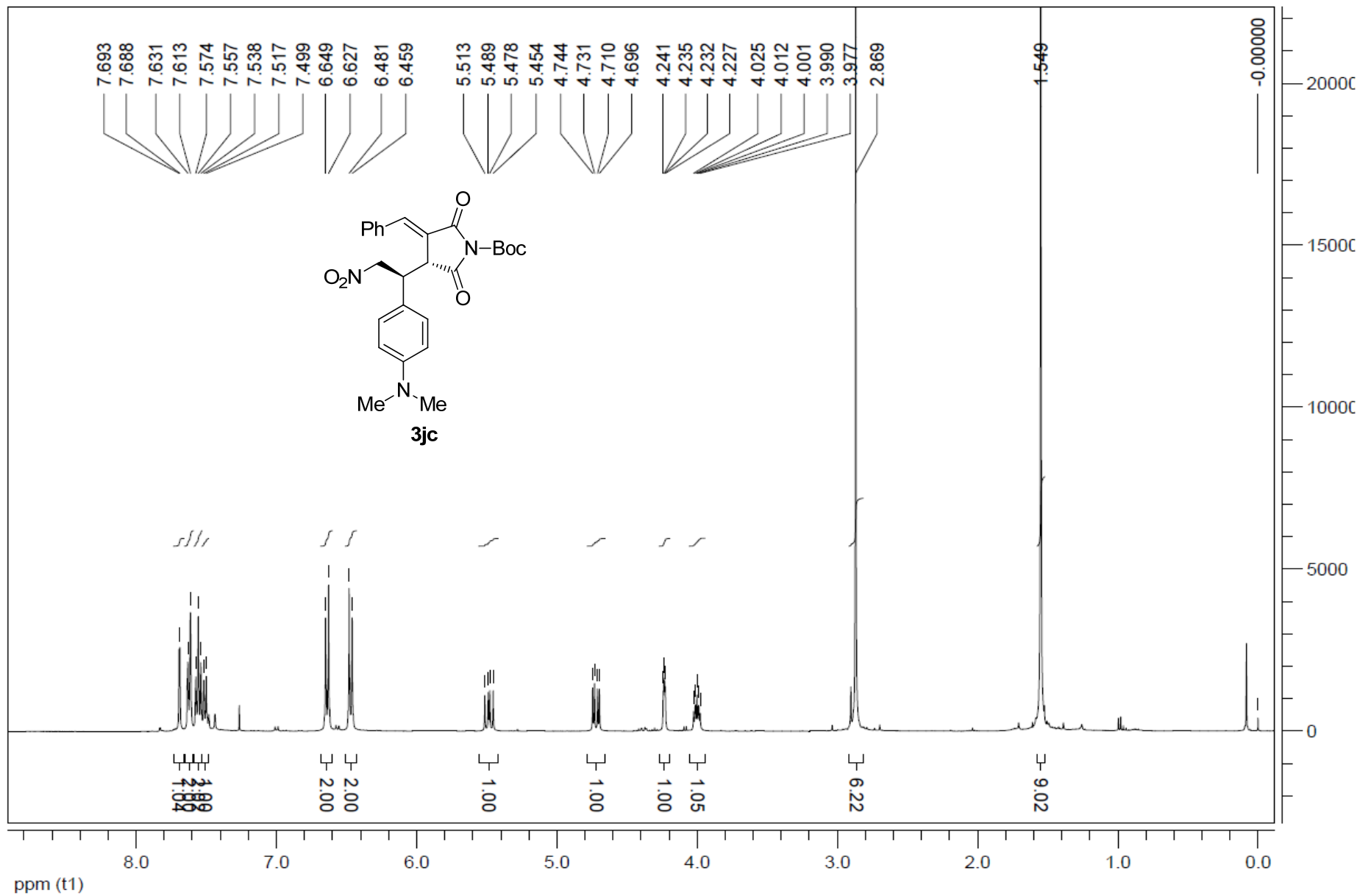


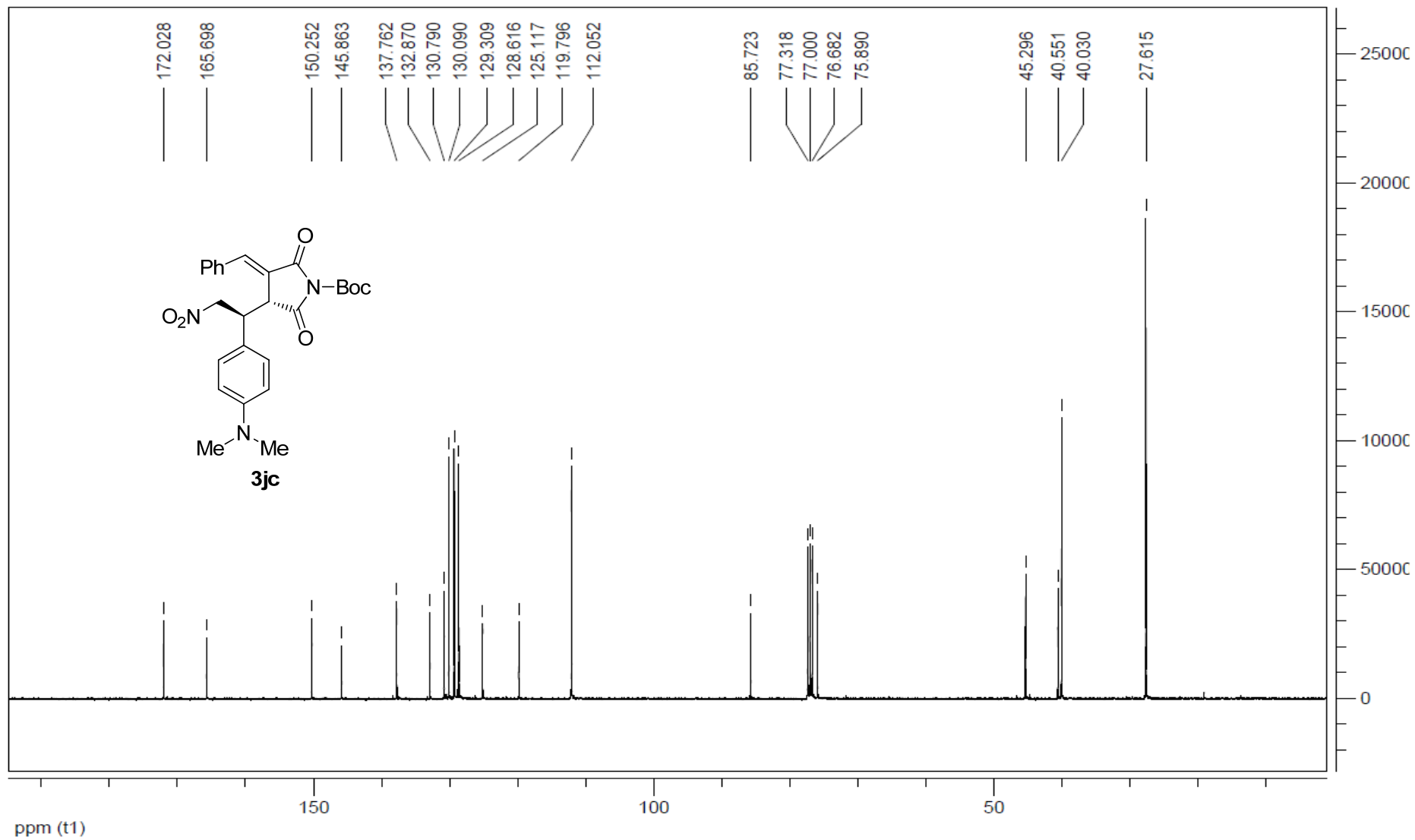


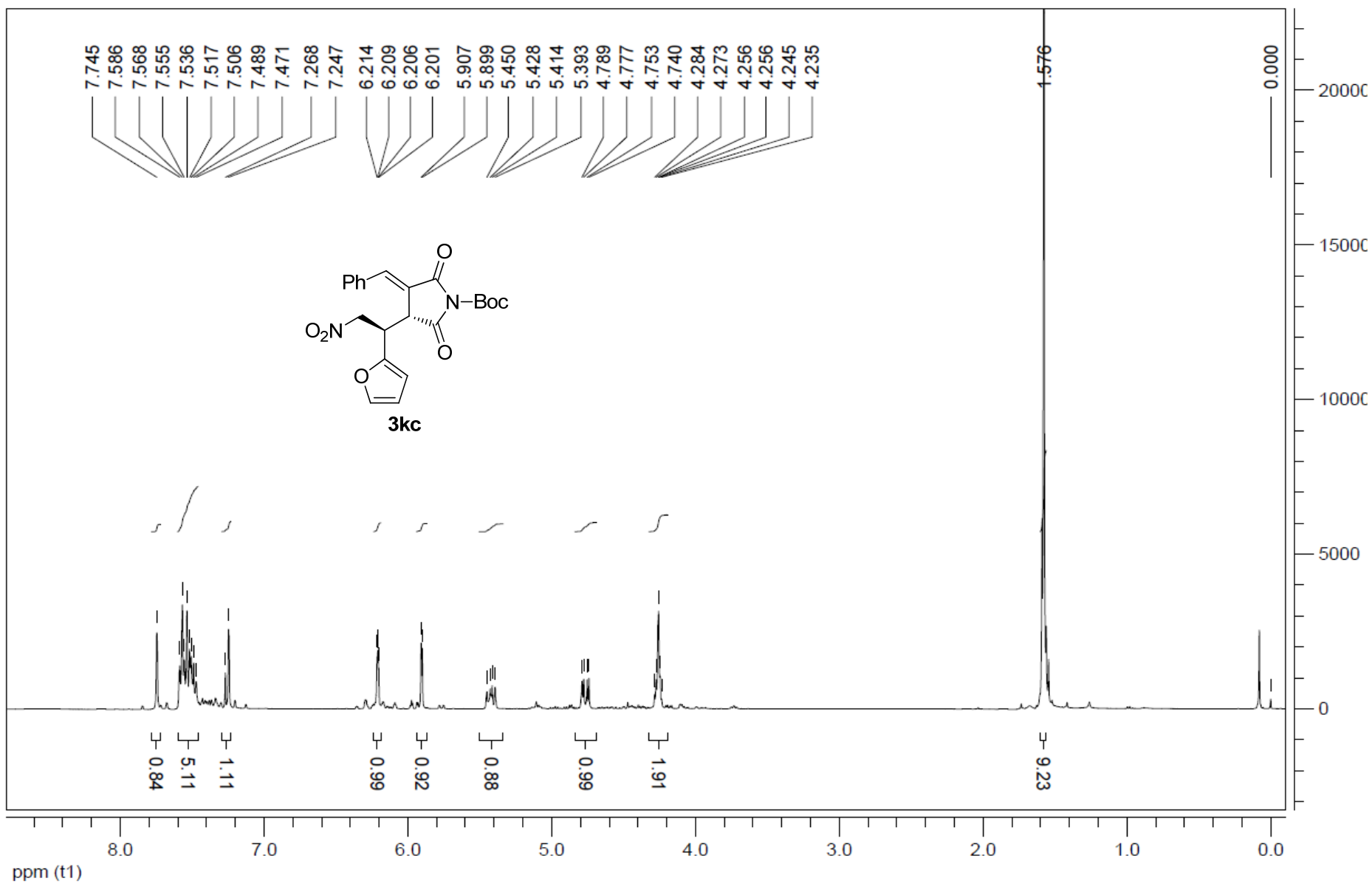


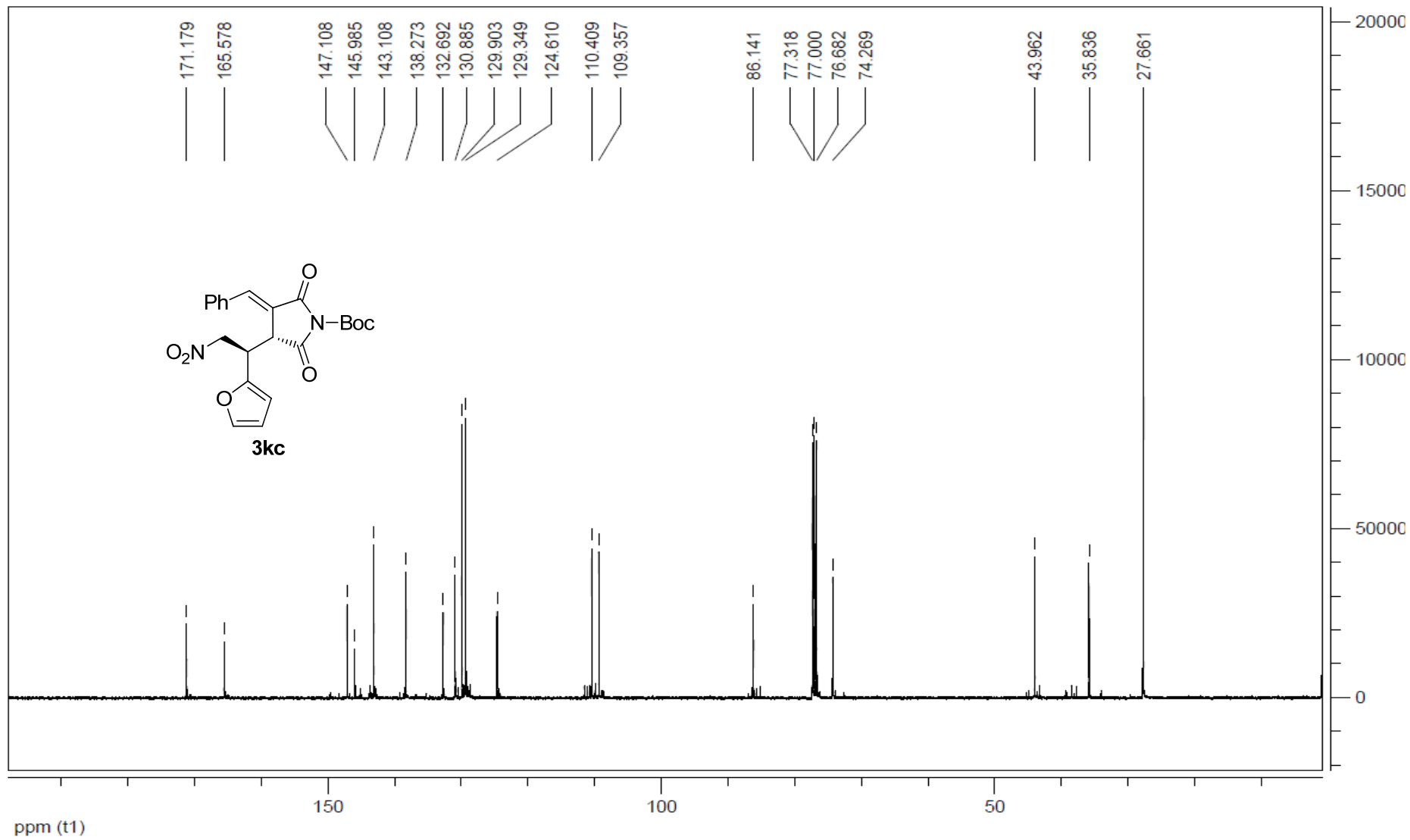




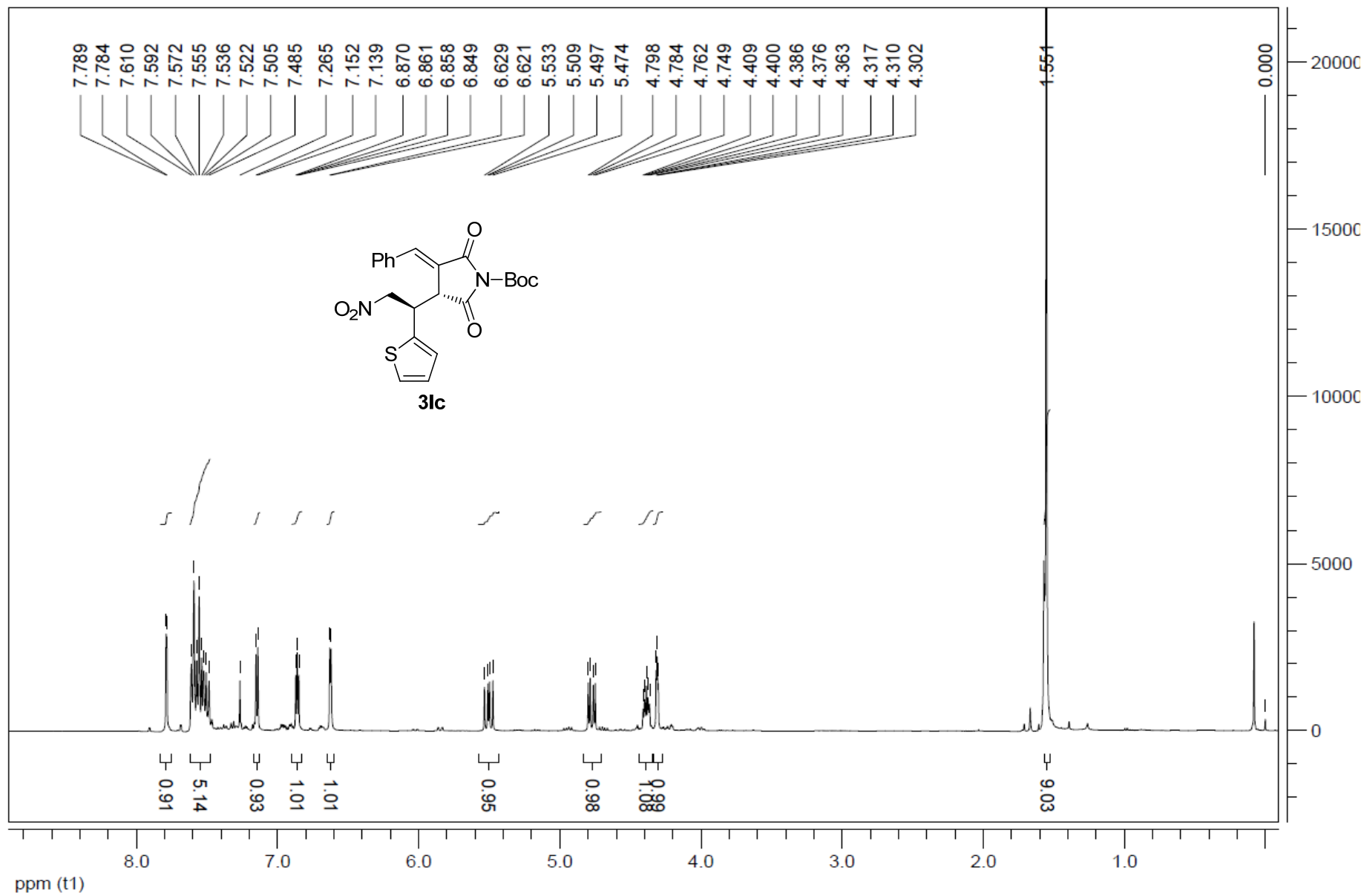


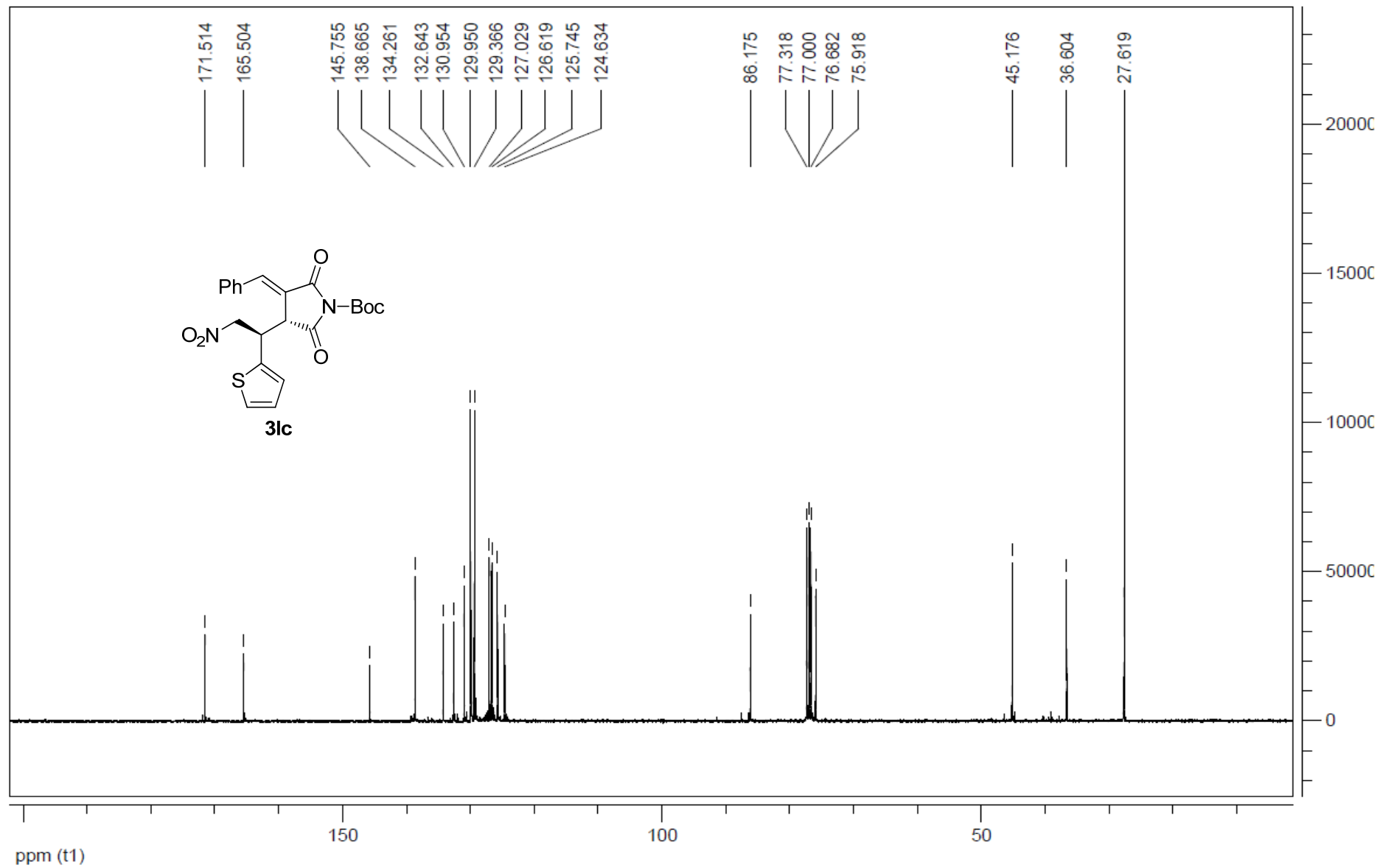


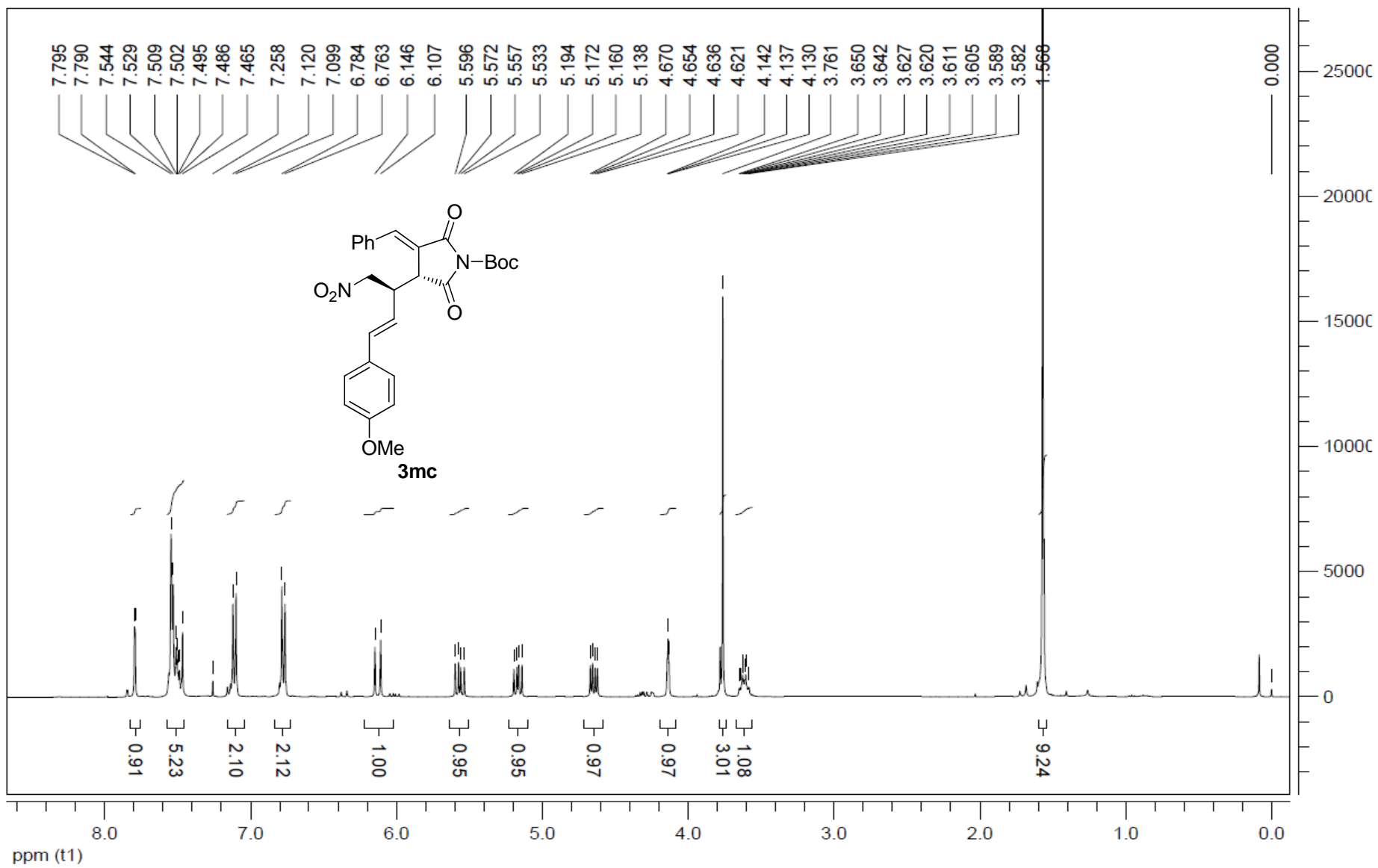


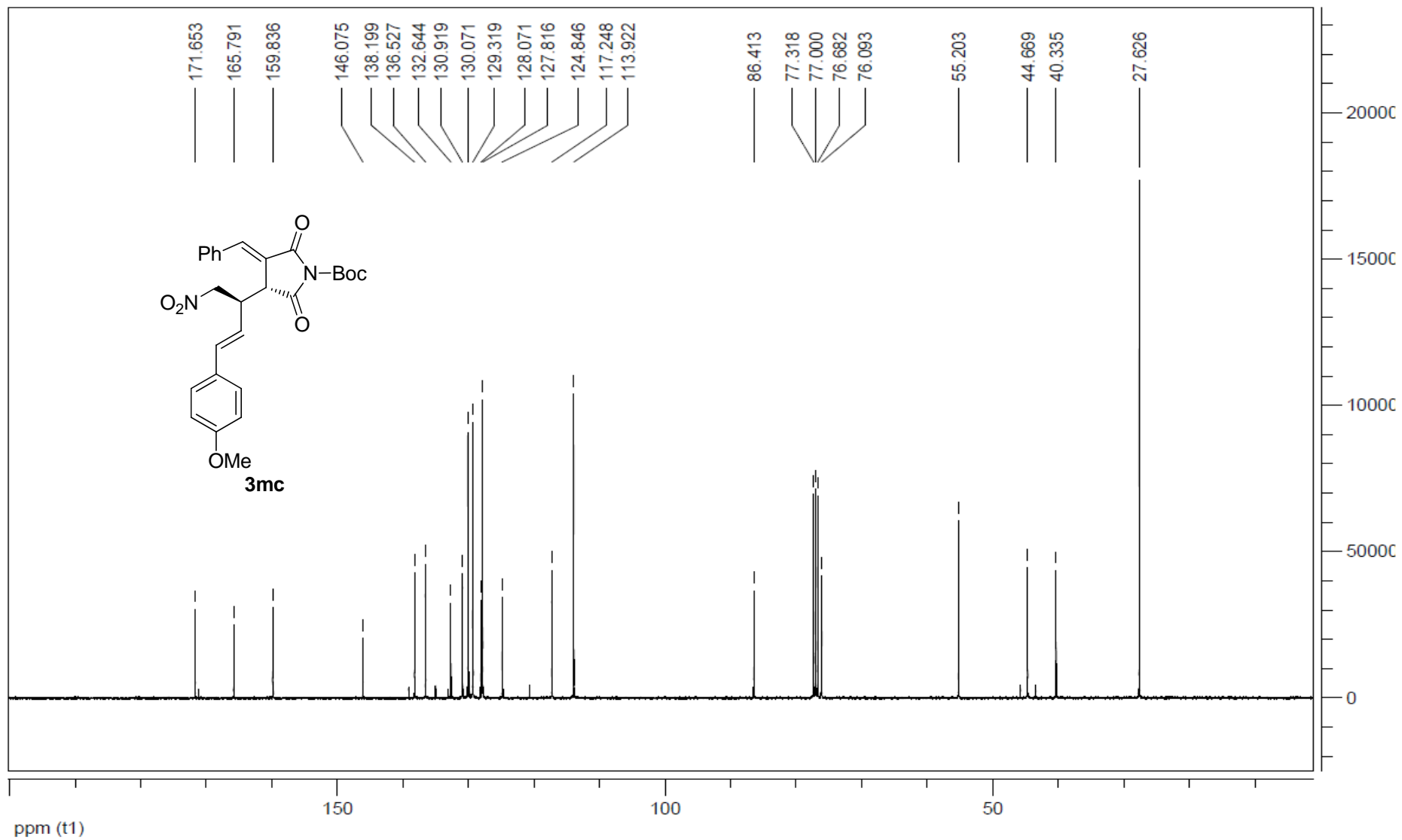


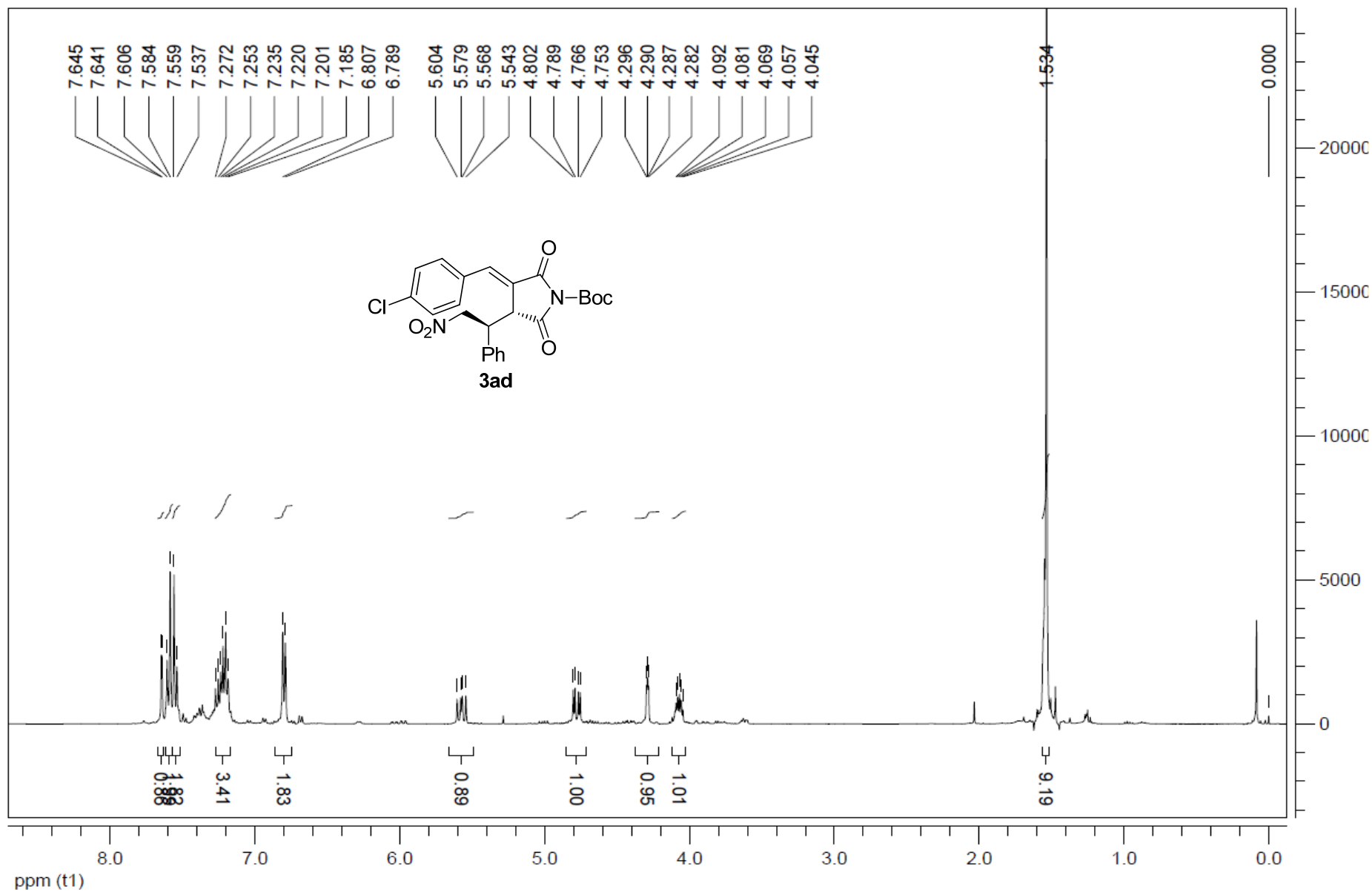


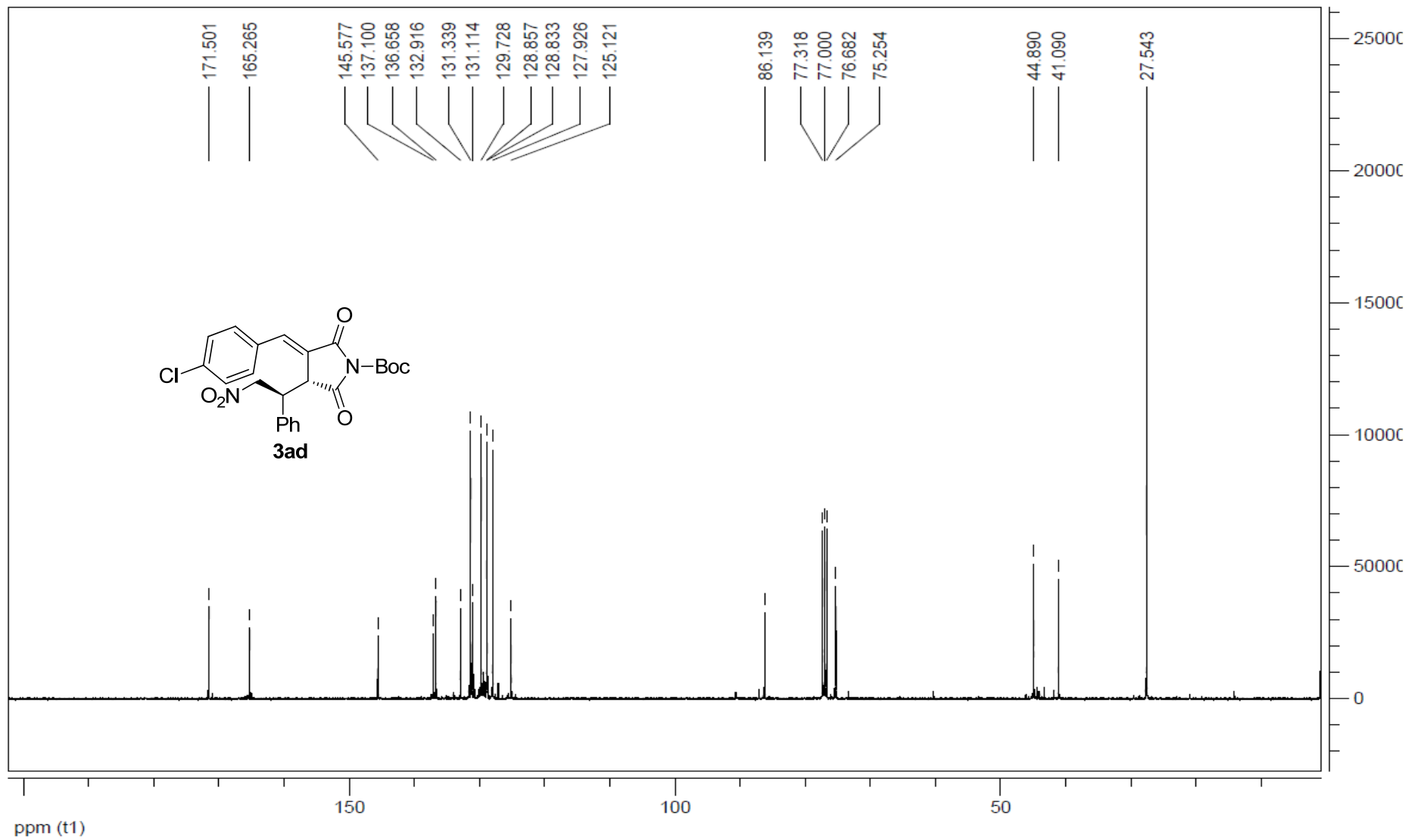


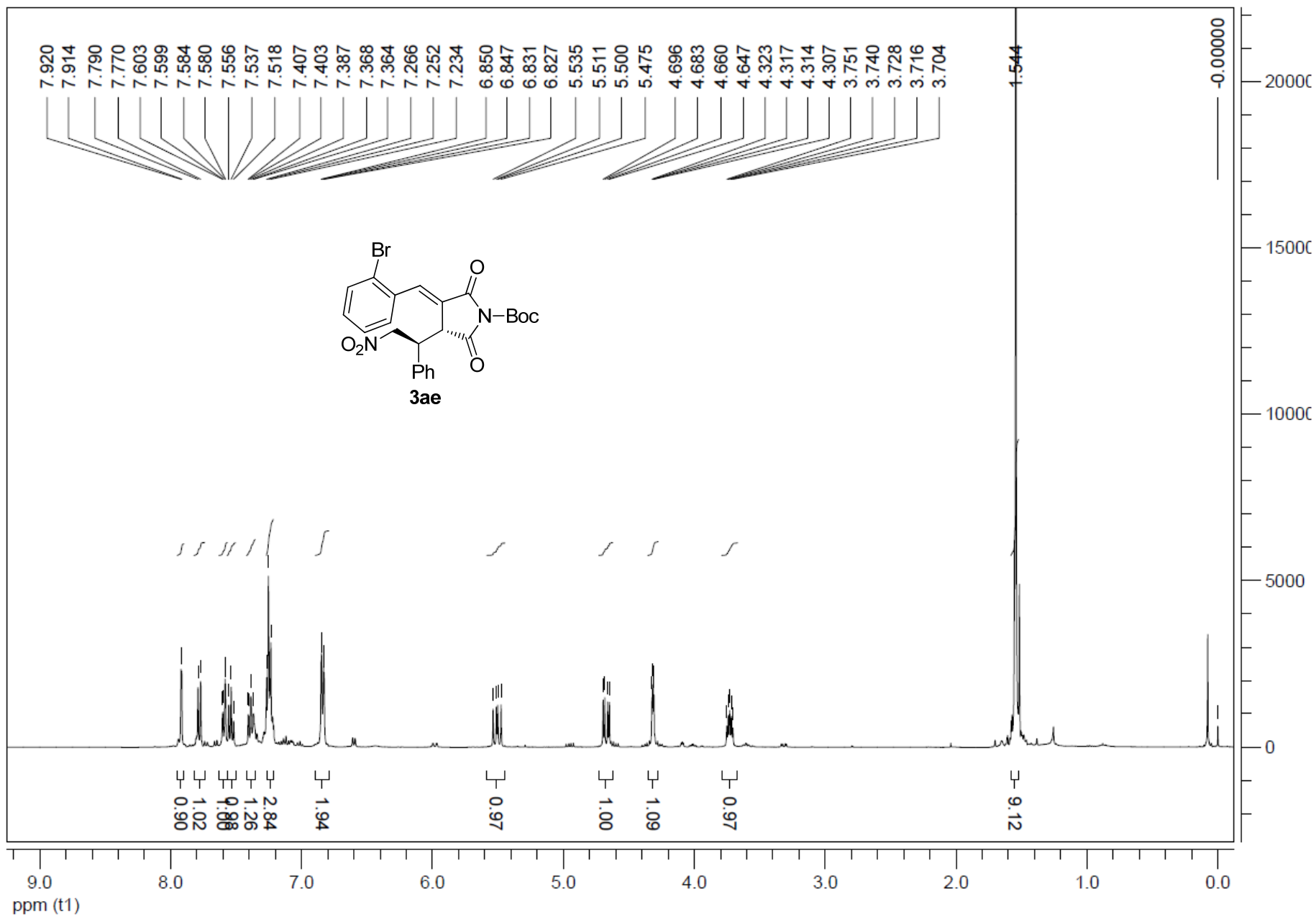


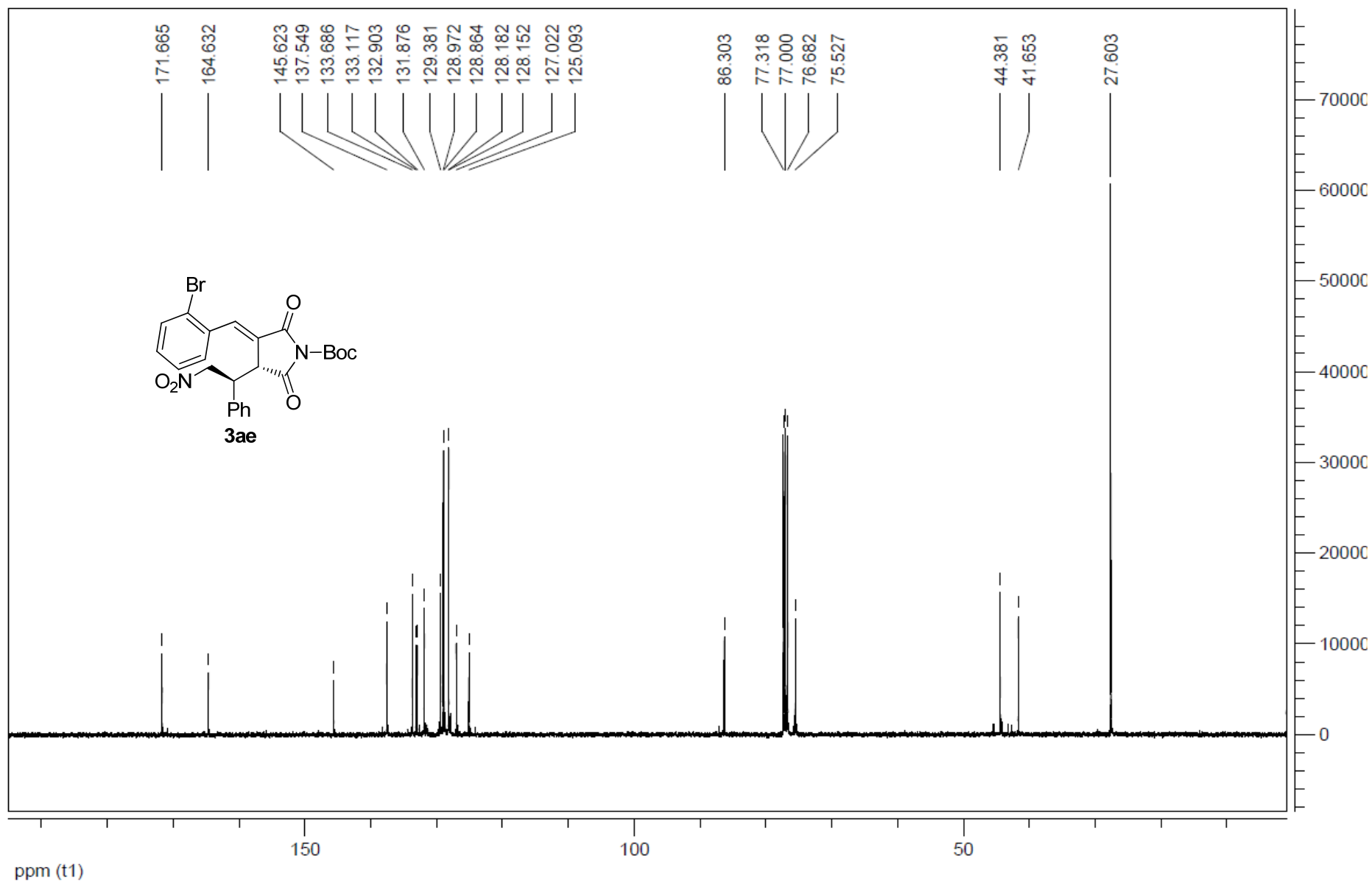




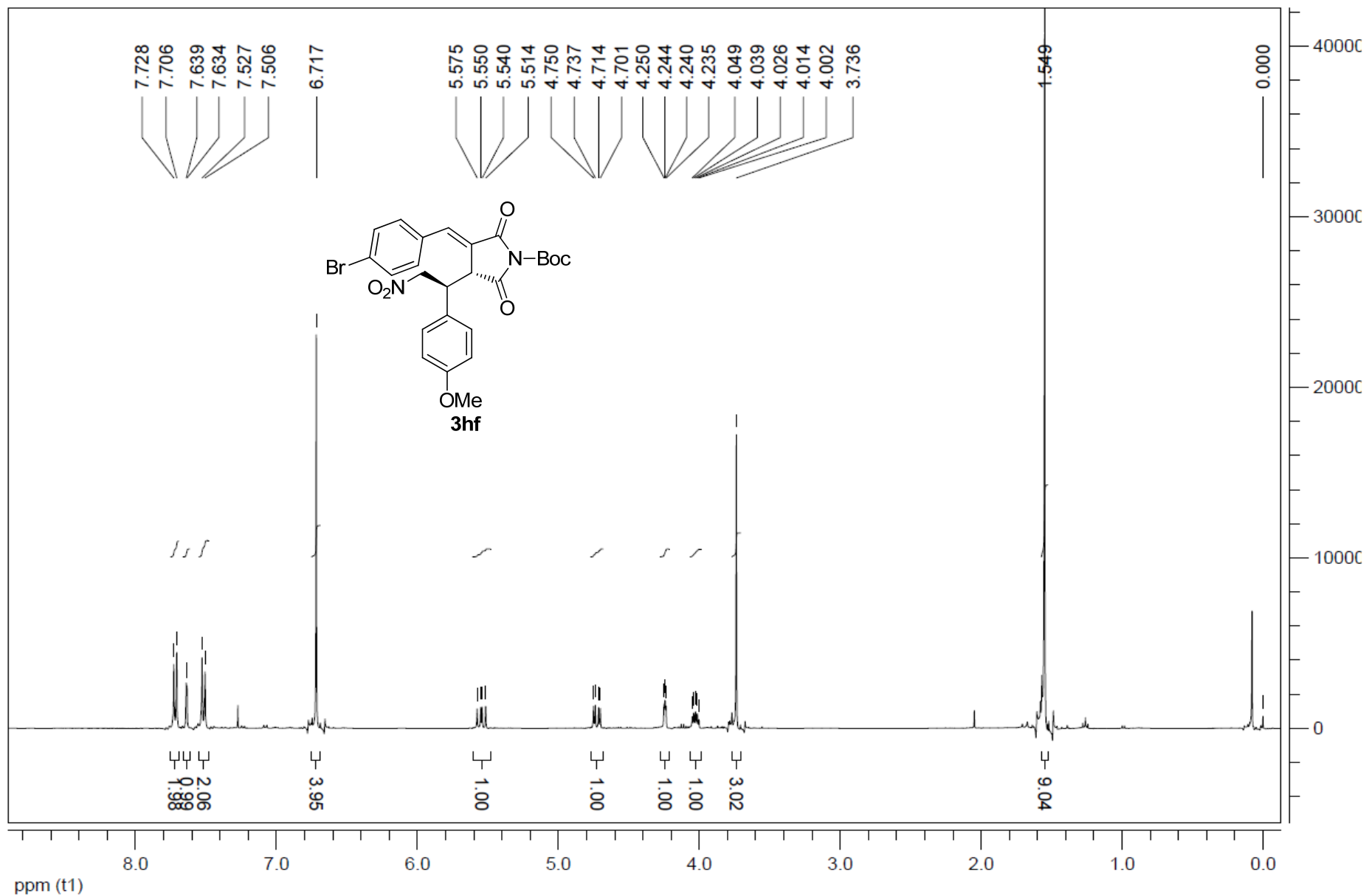


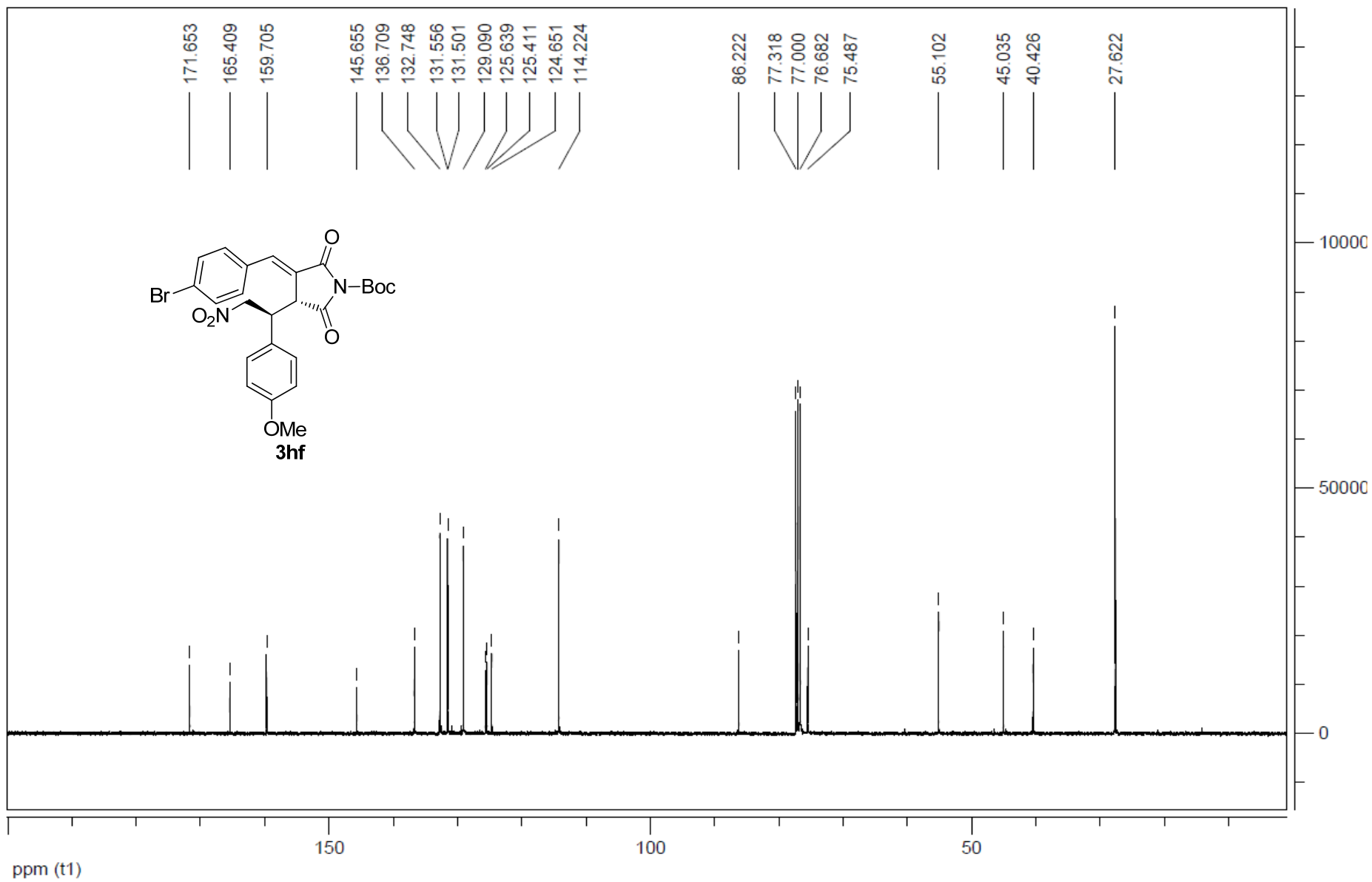


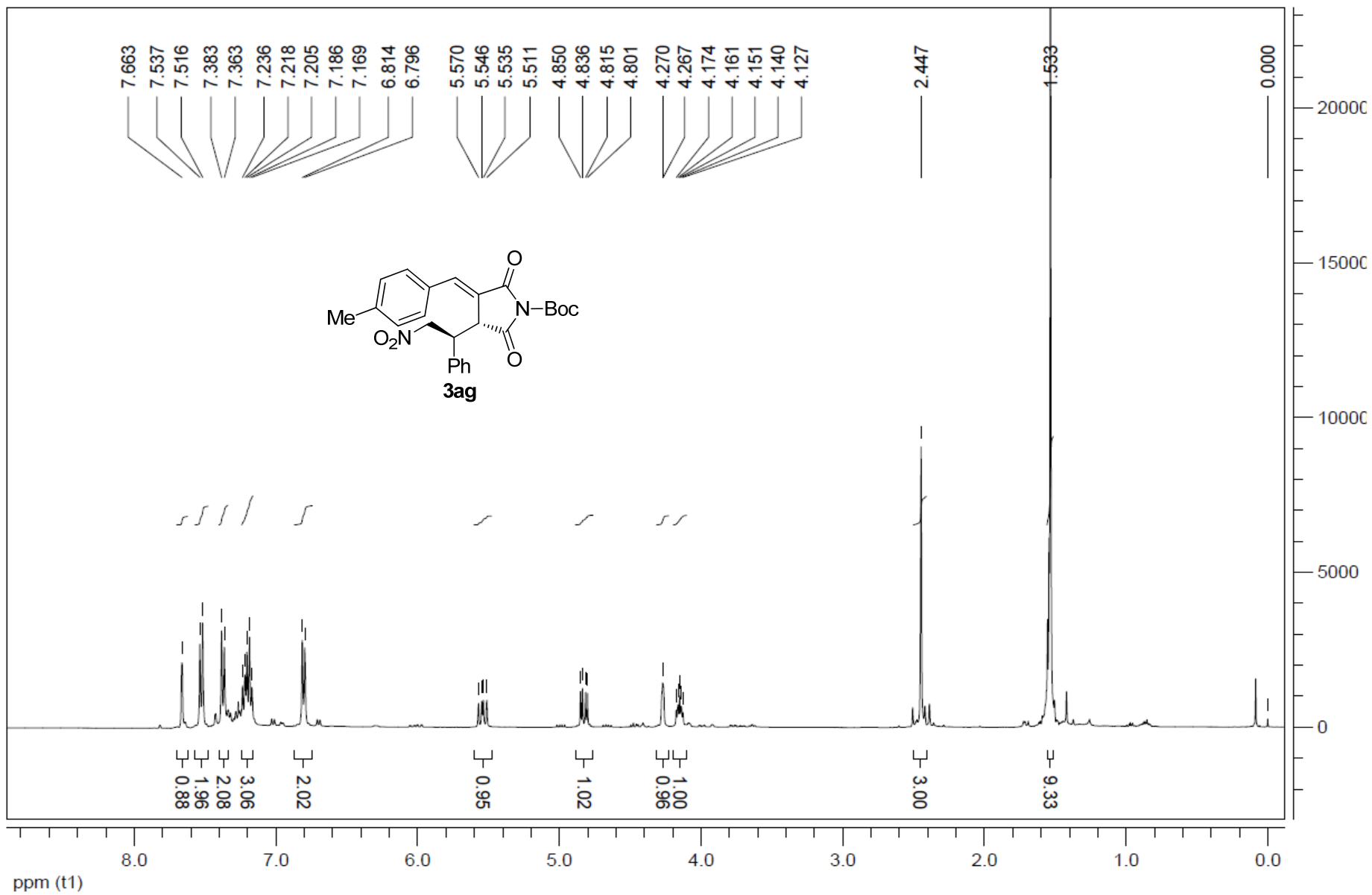


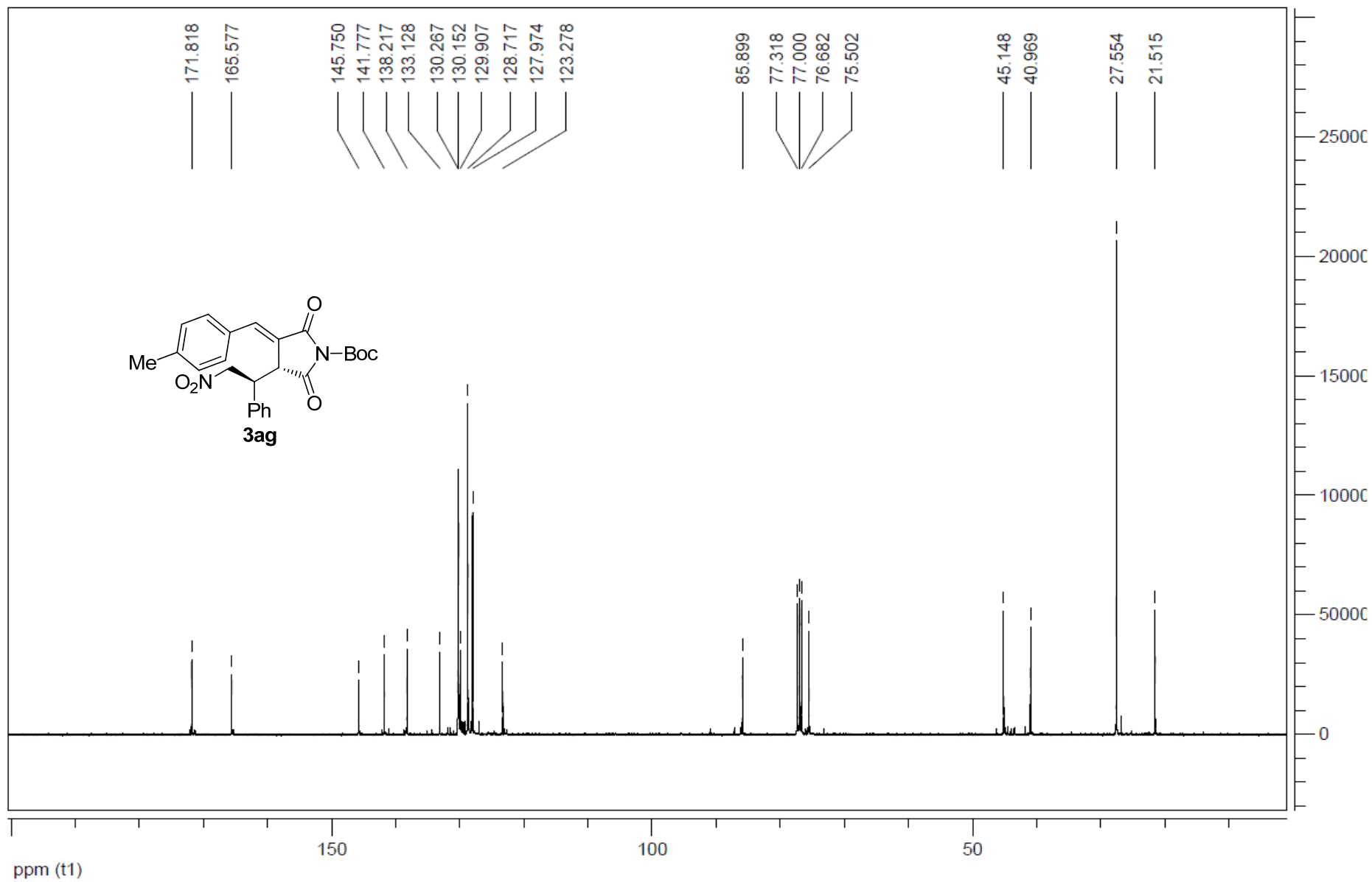


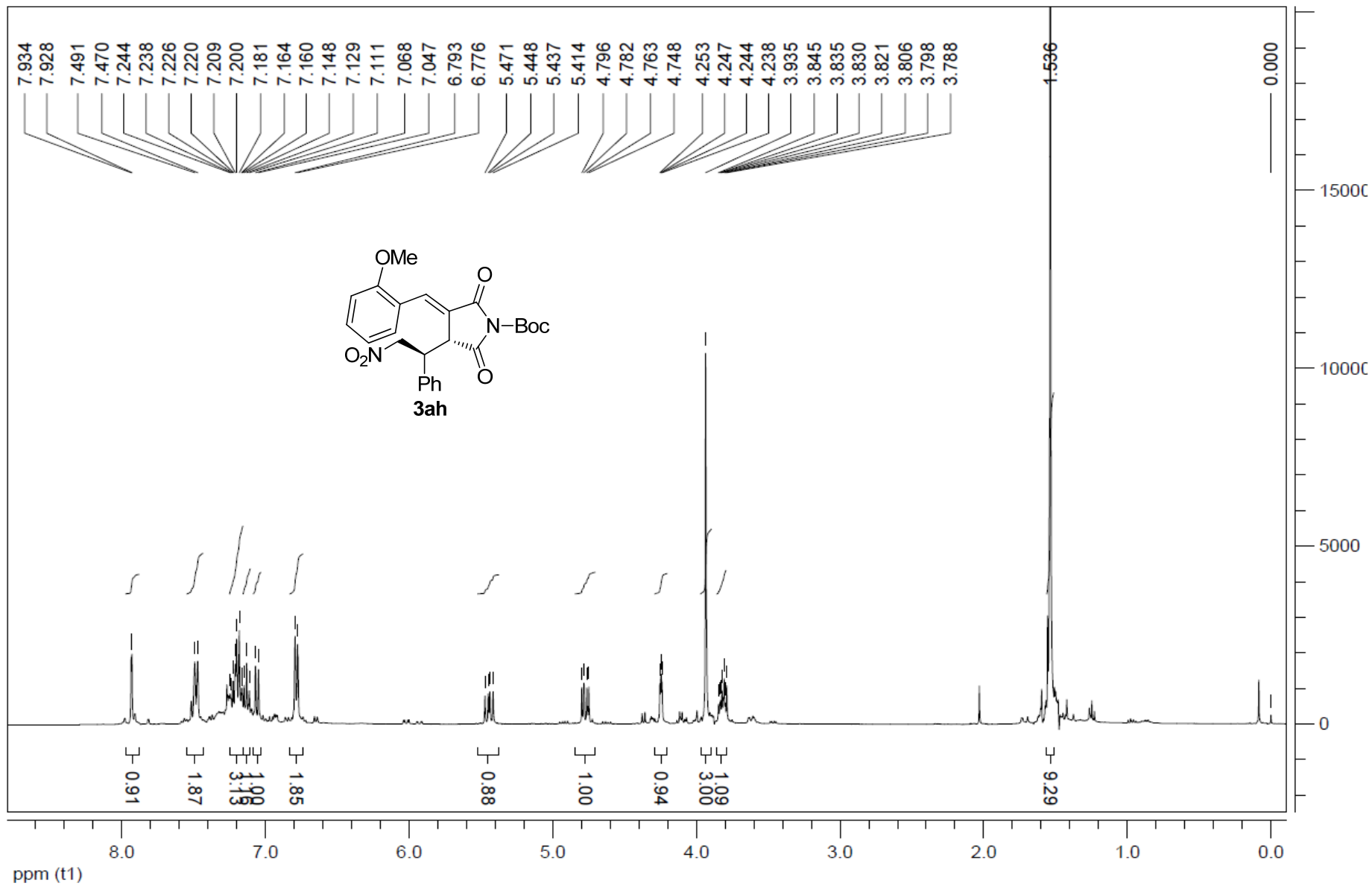


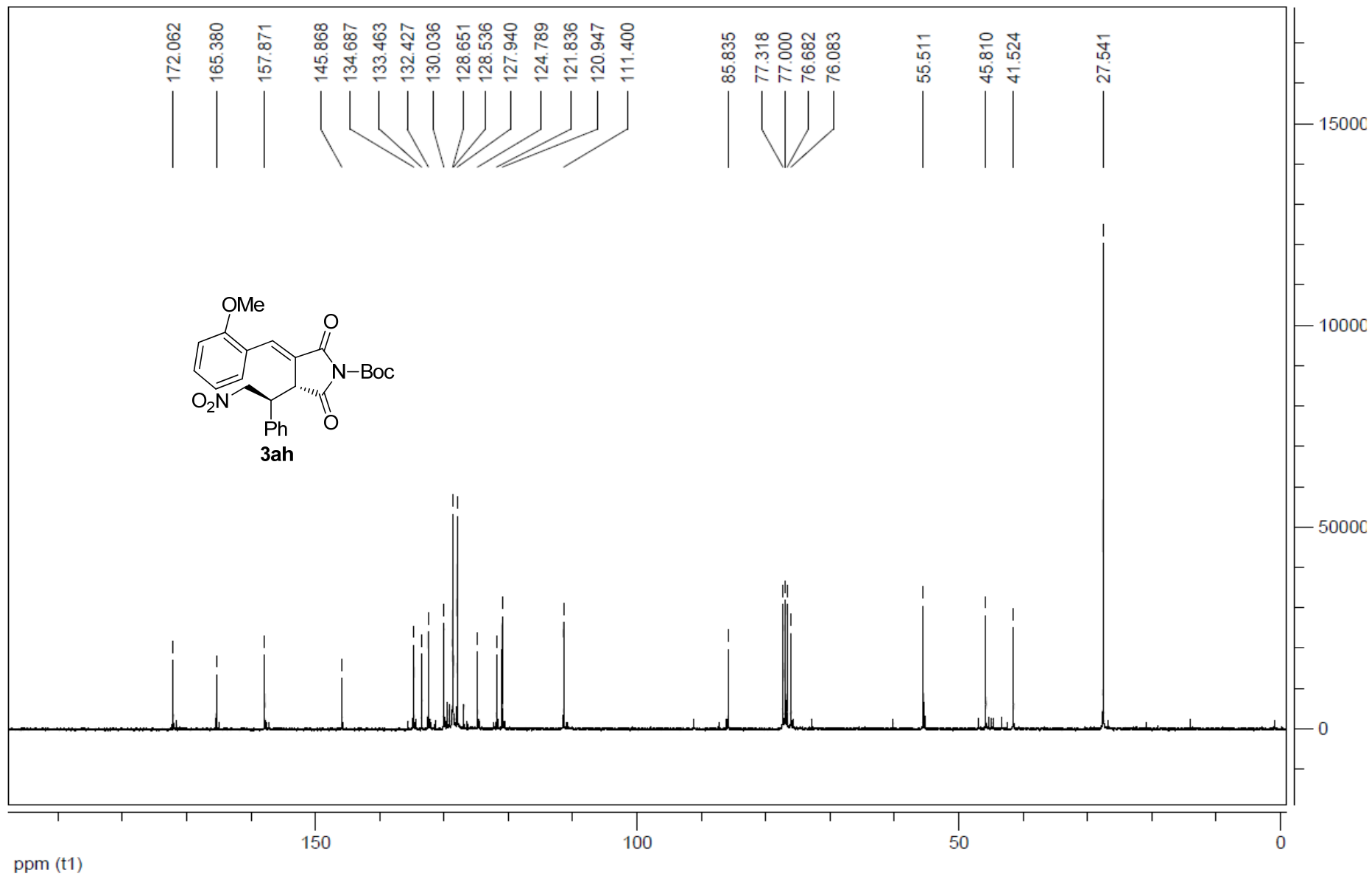


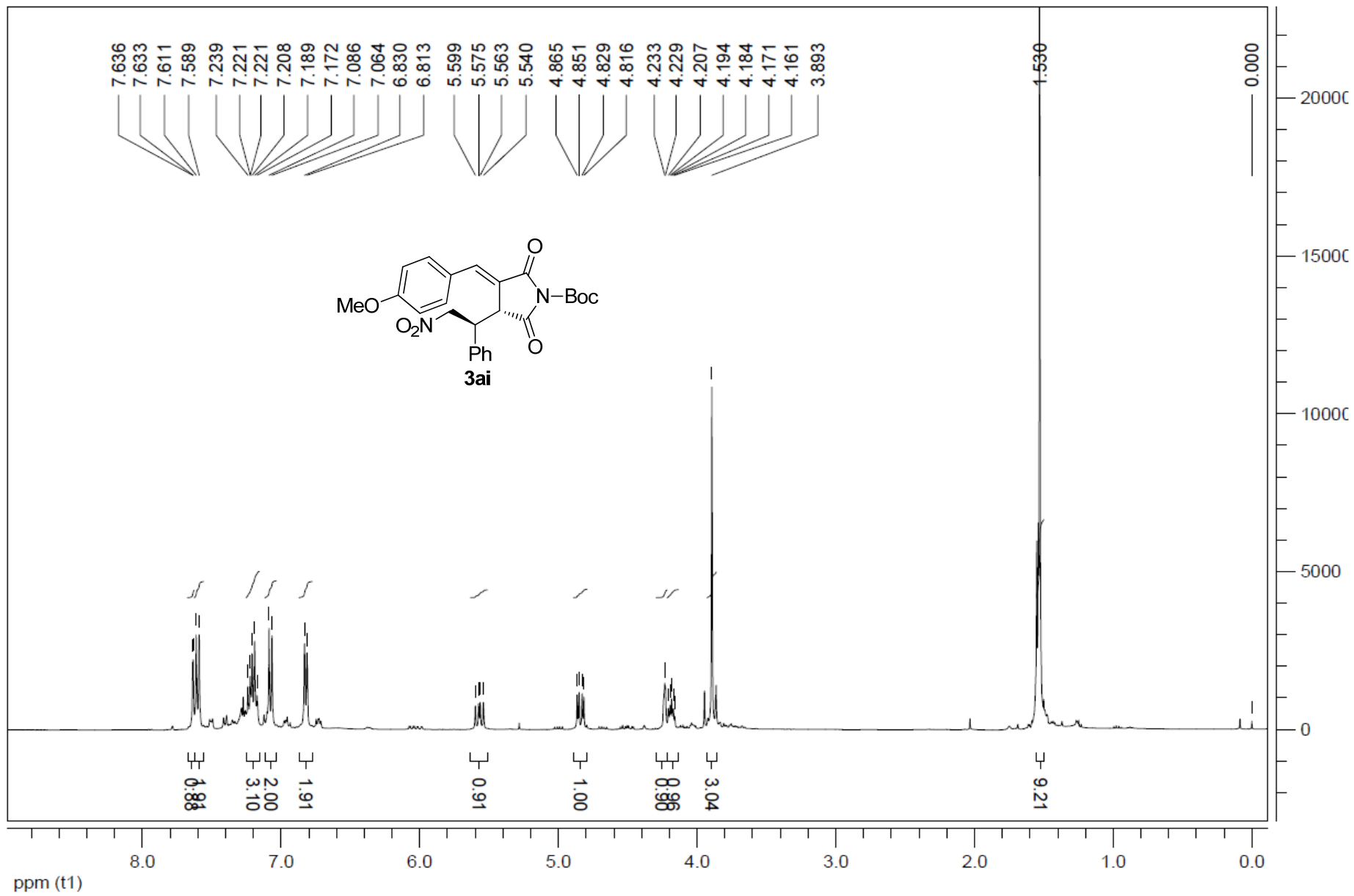


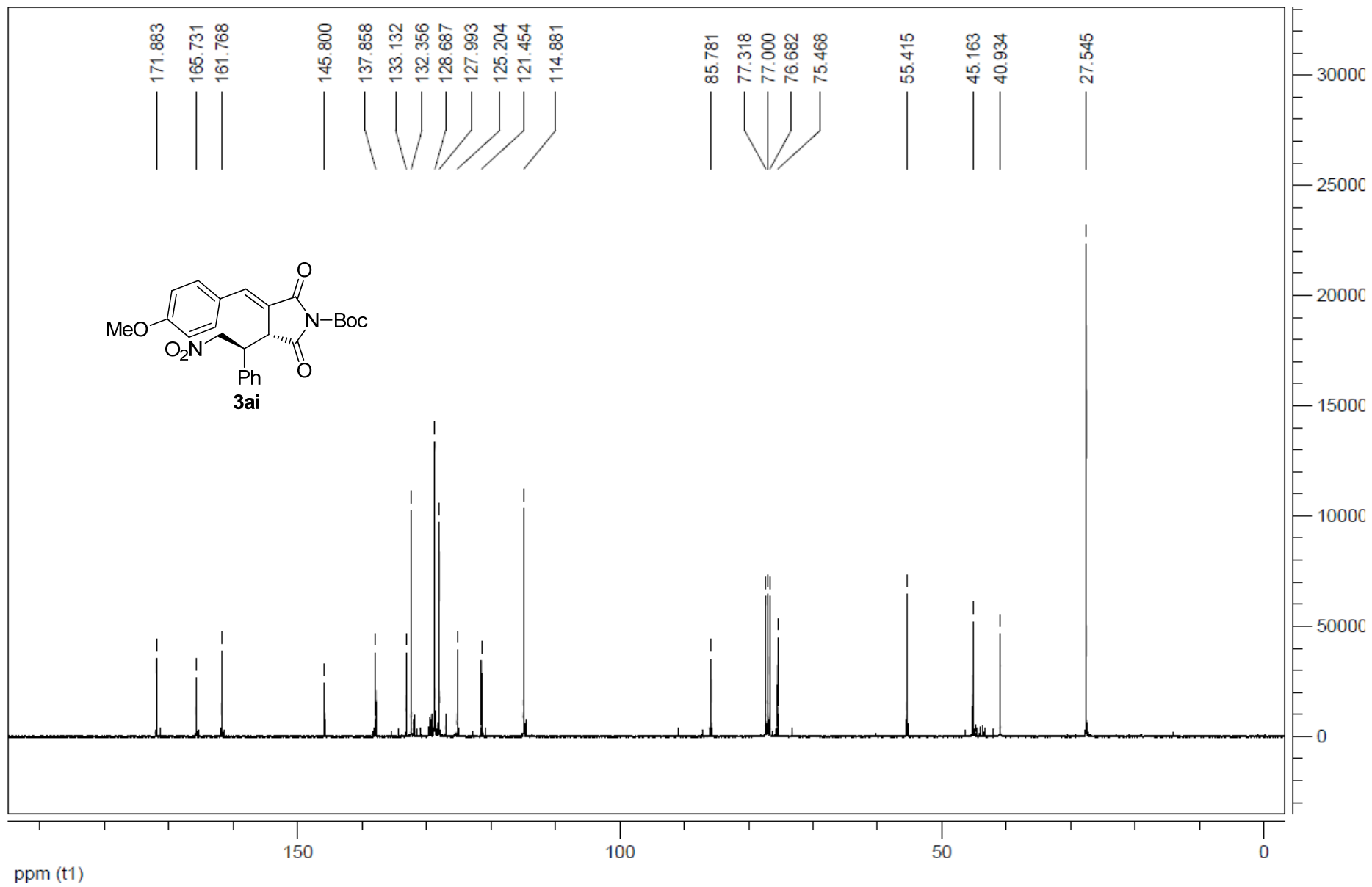




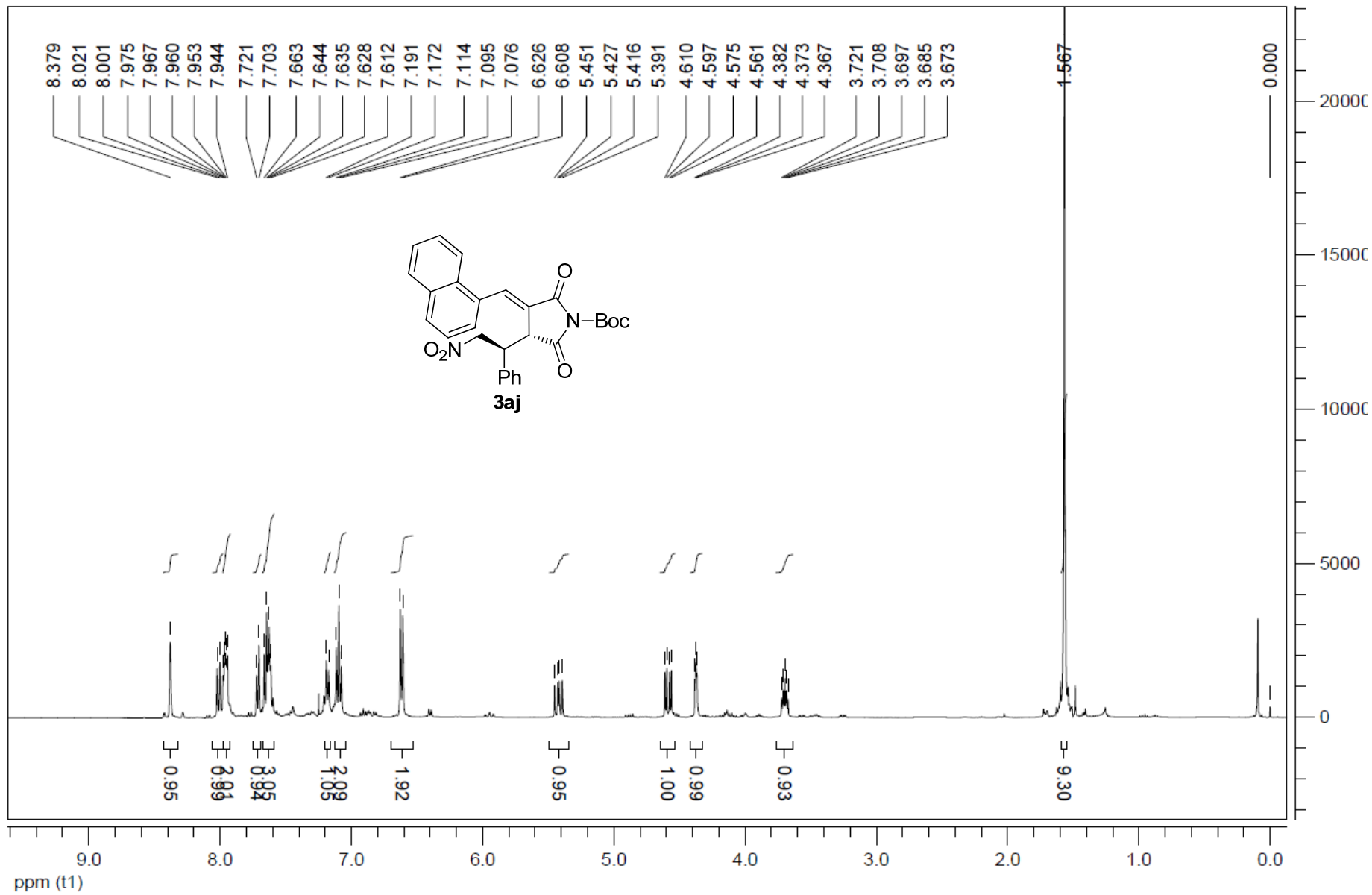


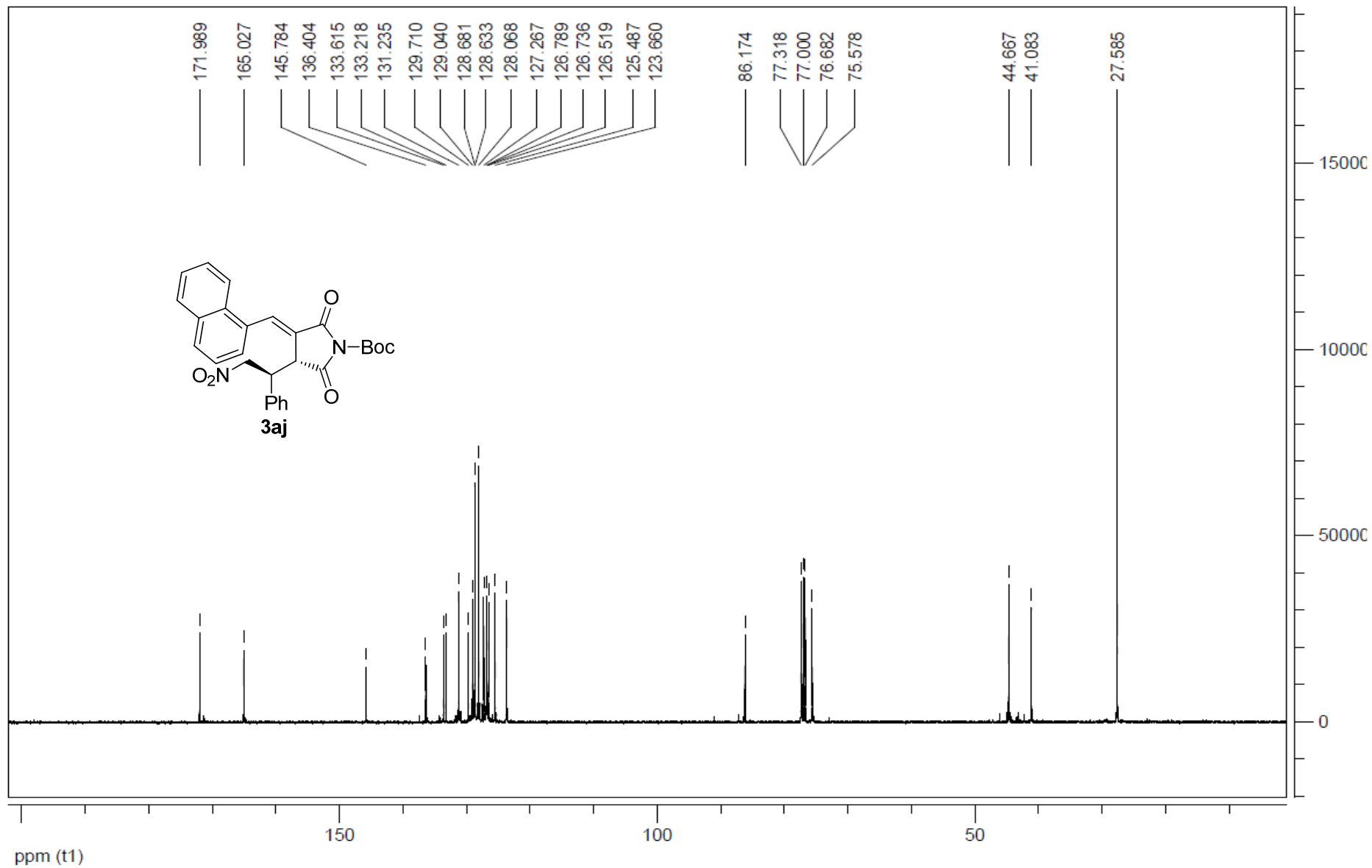


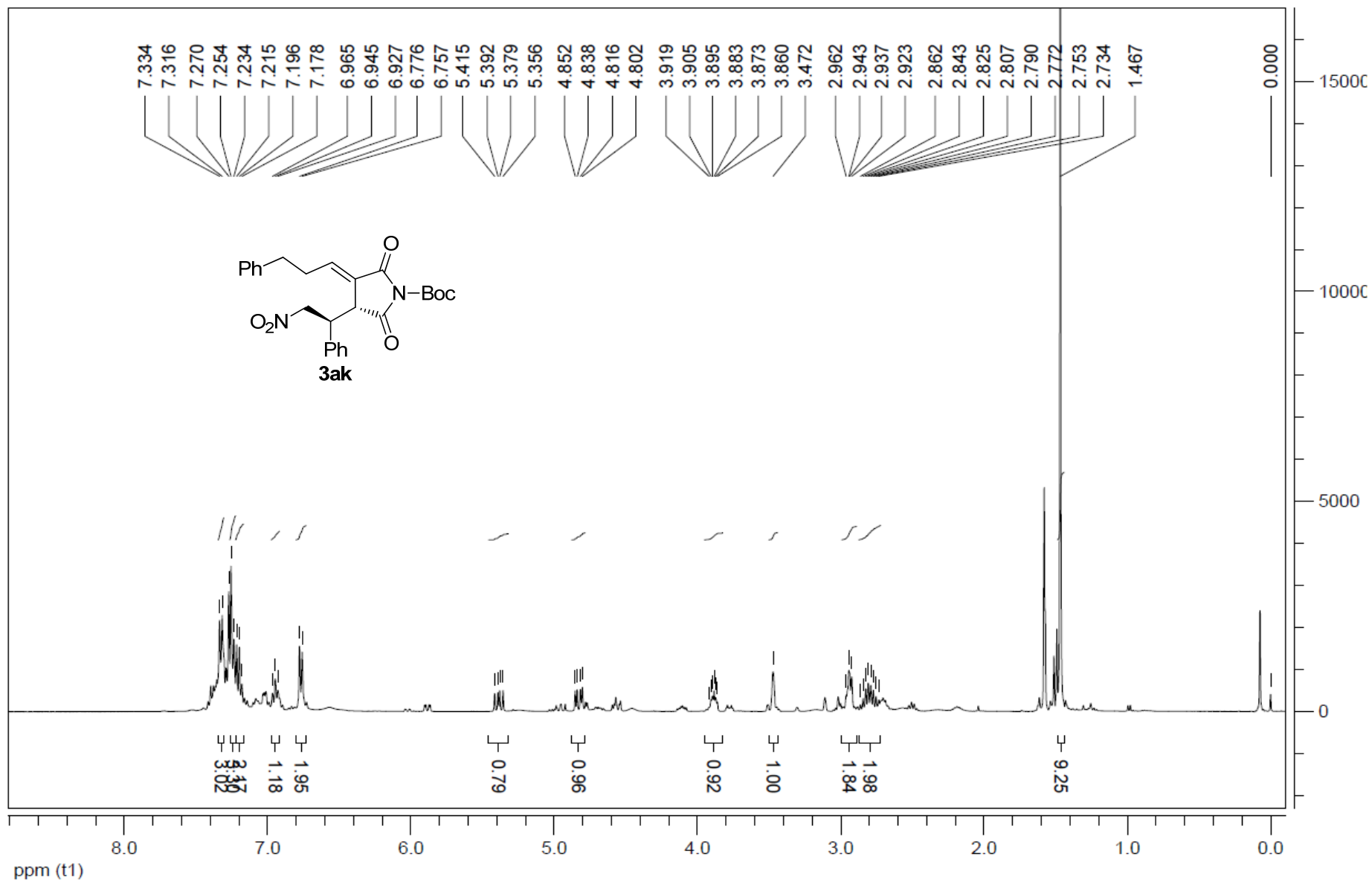


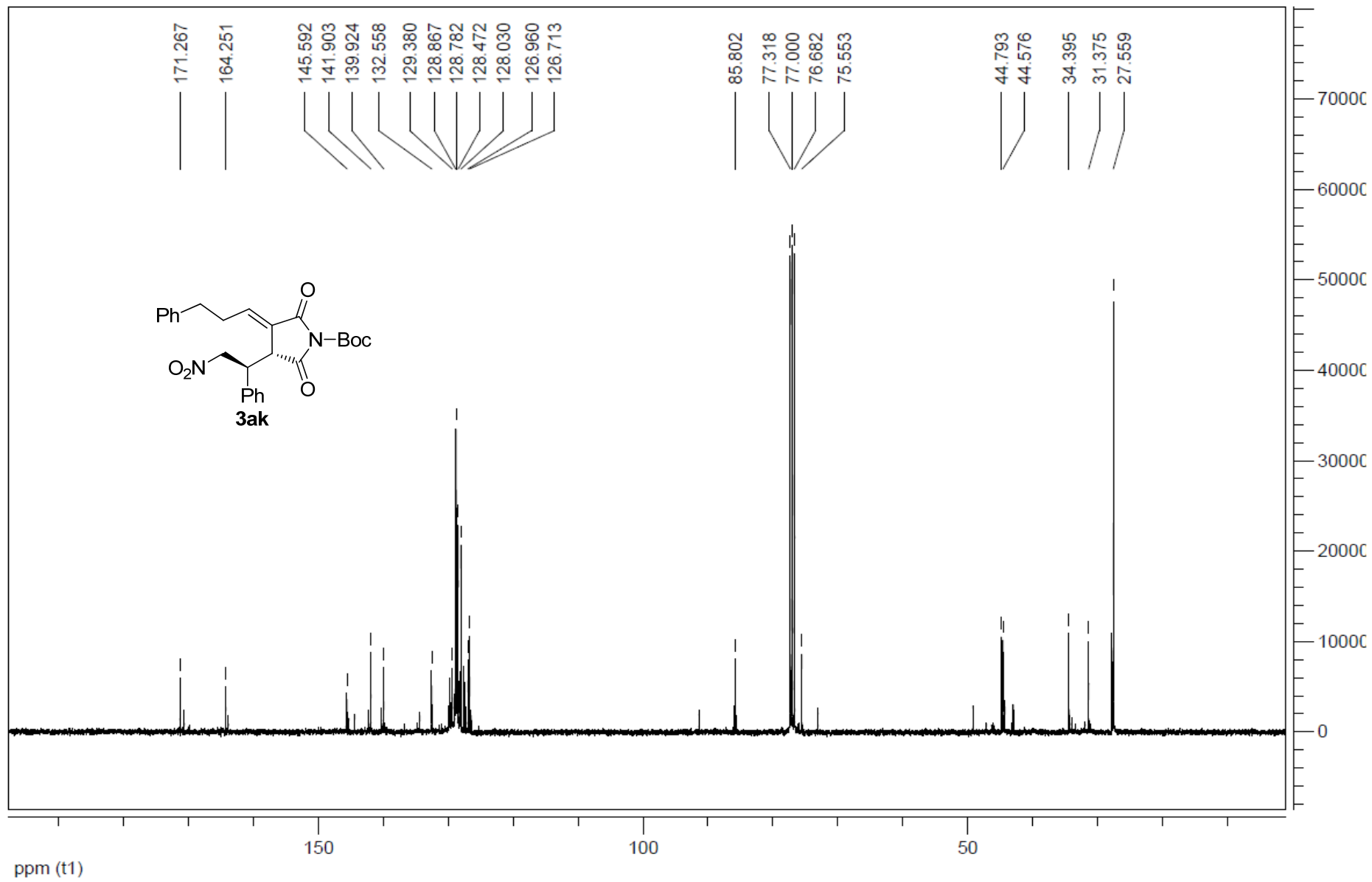




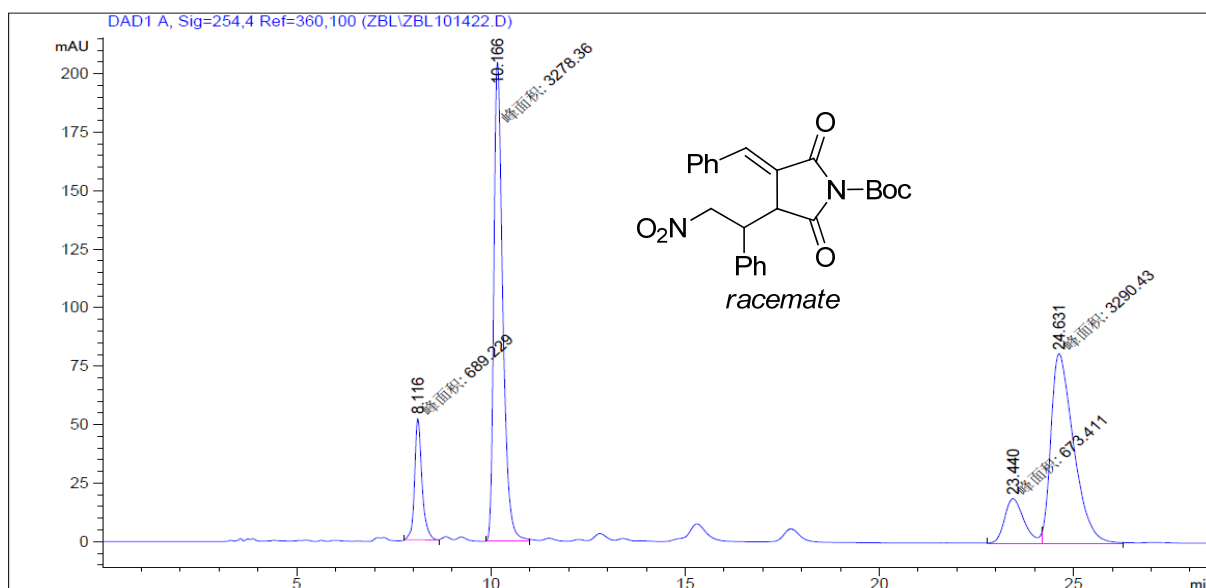




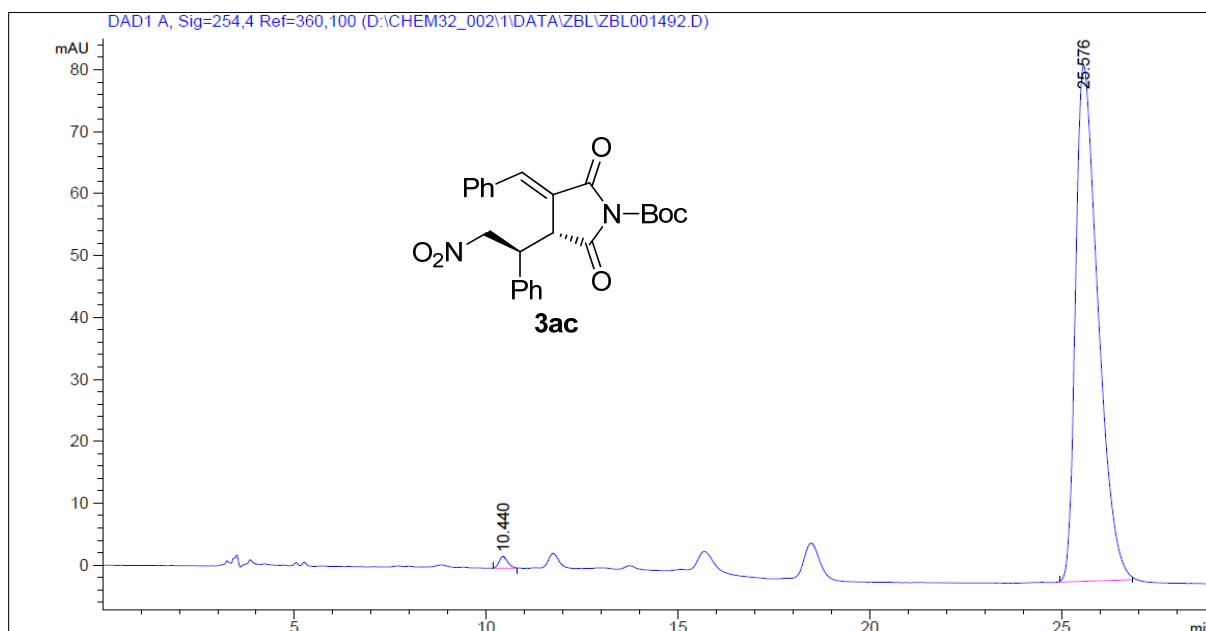




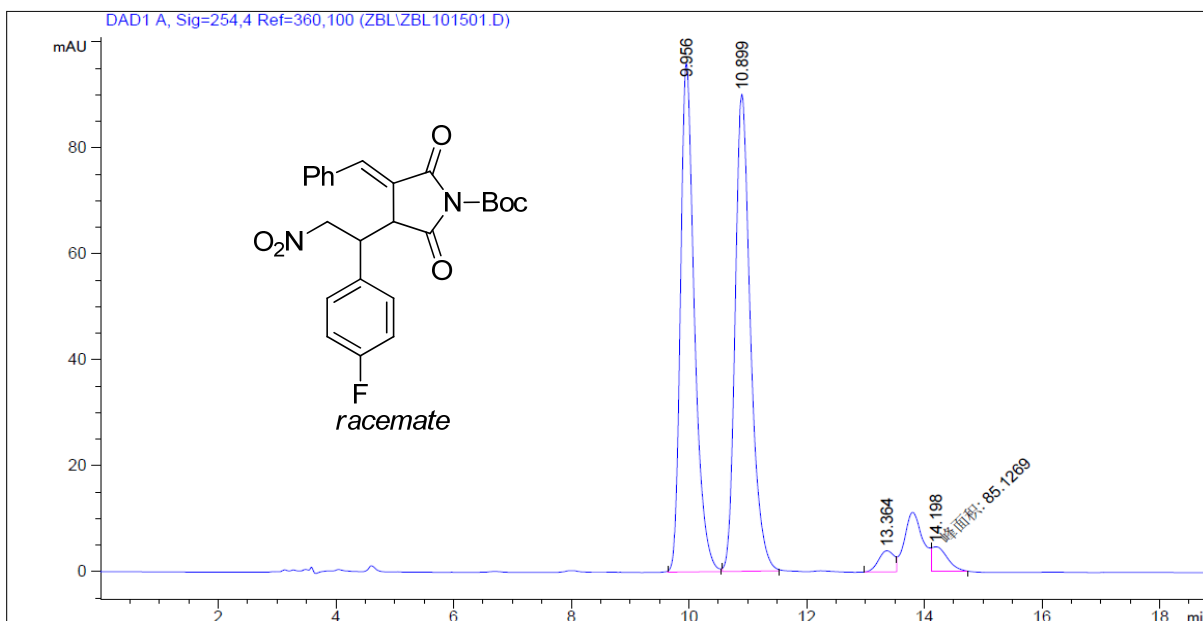
## Copies of HPLC chromatograms



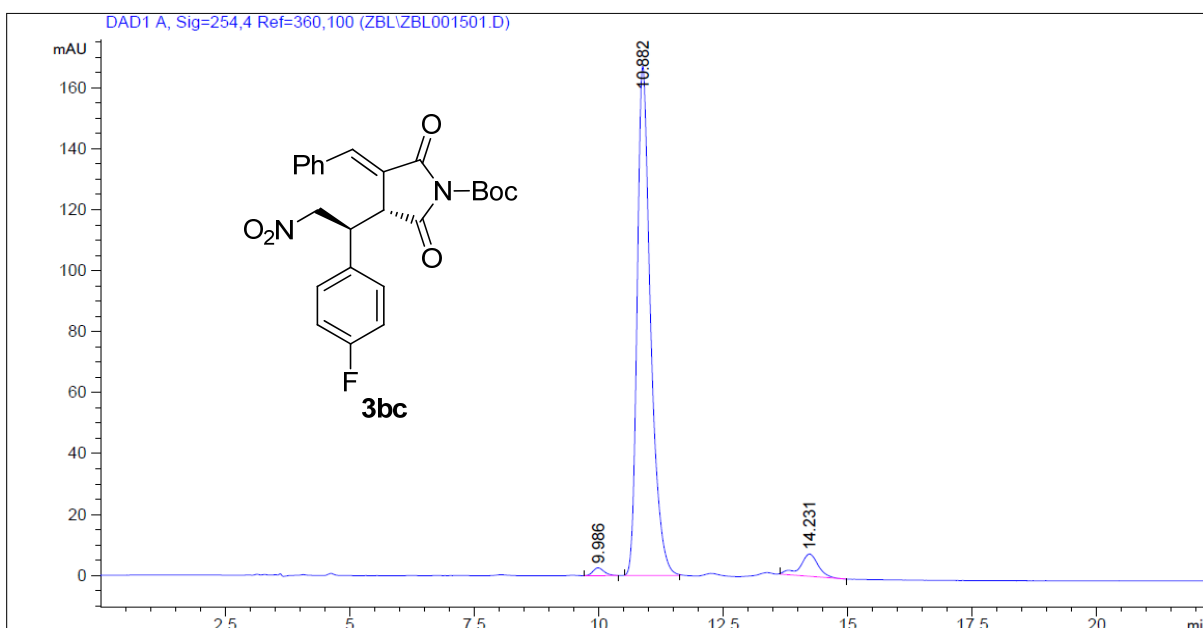
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2	10.166	MM	0.2670	3278.36060	204.65494	41.3338
3	23.440	MM	0.5876	673.41064	19.09912	8.4904
4	24.631	MM	0.6769	3290.42944	81.01297	41.4860



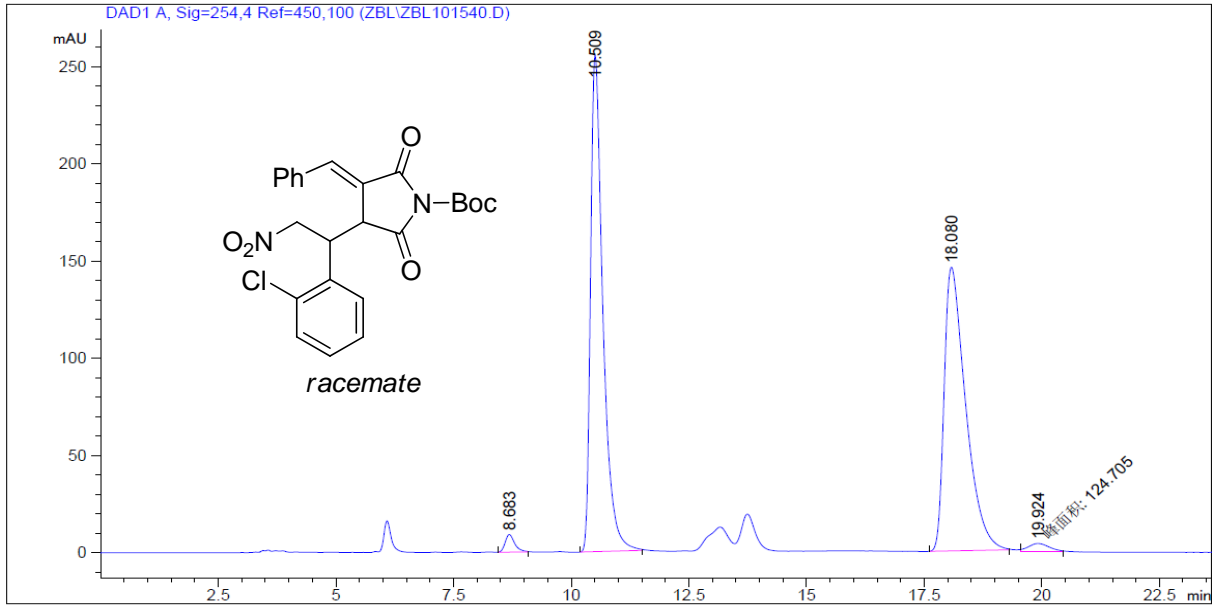
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2	25.576	BB	0.6144	3388.21680	83.33169	99.1370



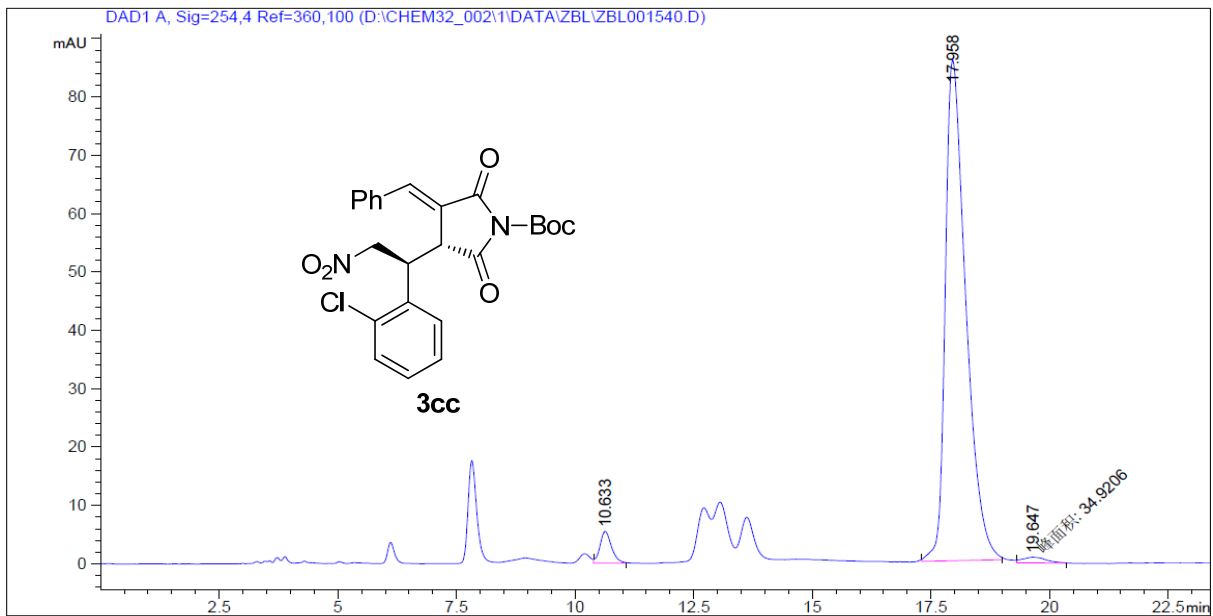
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1	9.956	BB	0.2485	1585.36255	96.06881	46.9618
2	10.899	BB	0.2733	1632.10388	90.10428	48.3464
3	13.364	BV	0.2760	73.26394	3.99497	2.1702
4	14.198	MM	0.3051	85.12688	4.65086	2.5216



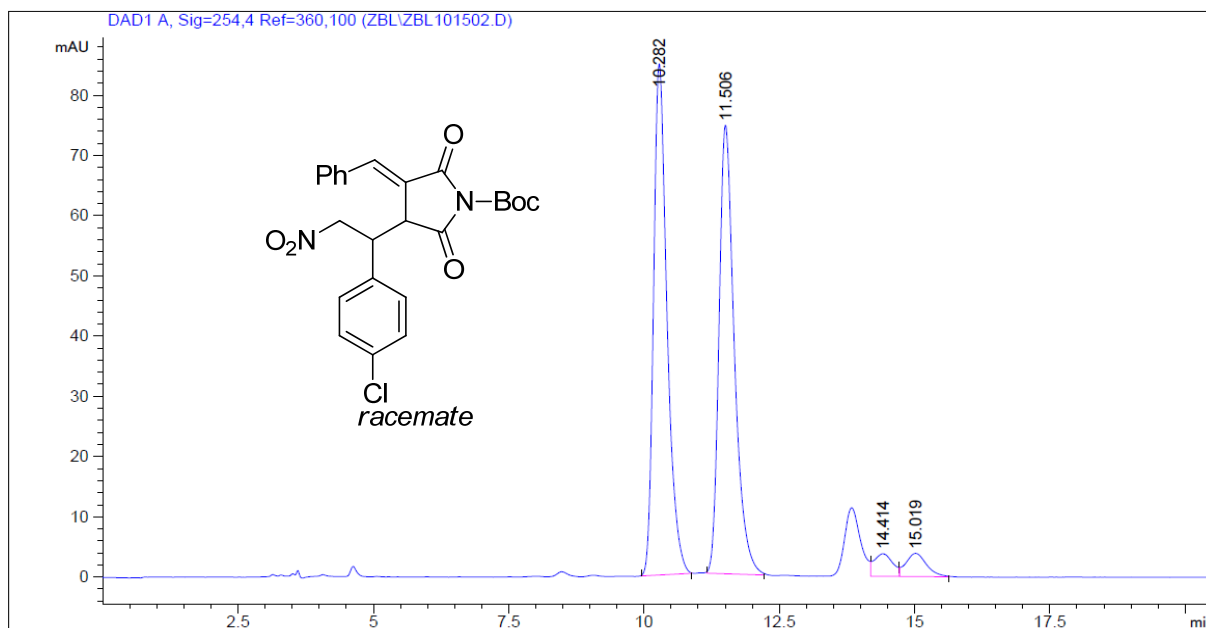
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1	9.986	BB	0.2379	40.21817	2.57933	1.1940
2	10.882	BB	0.2813	3143.86719	167.22809	93.3364
3	14.231	BB	0.3736	184.23434	7.32202	5.4696



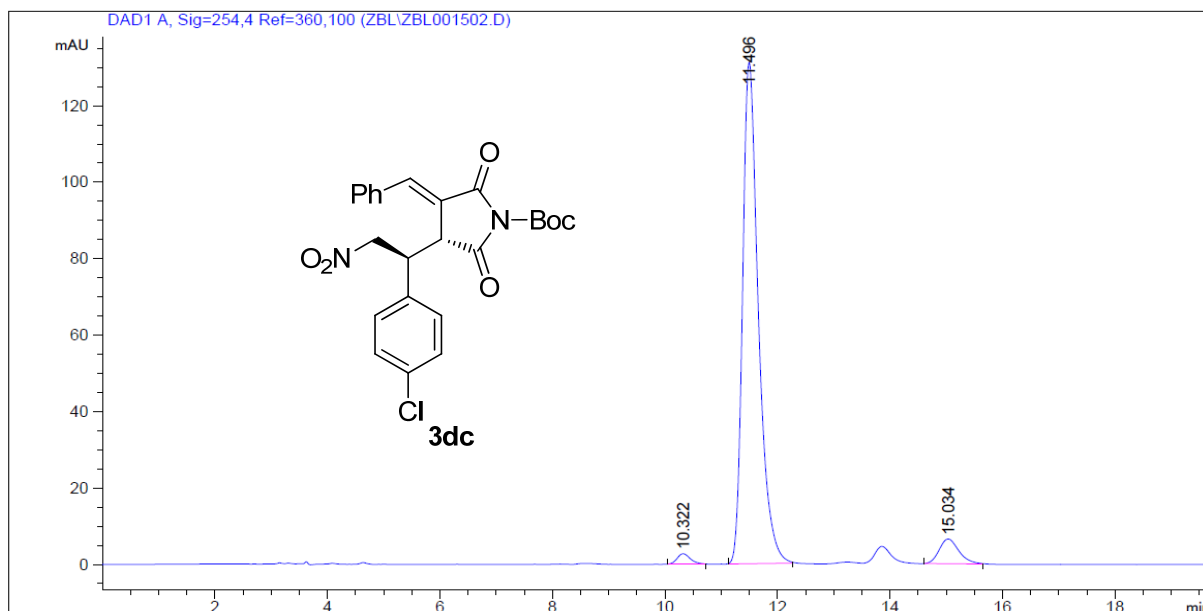
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2	10.509	BB	0.2724	4651.82471	255.55843	48.7555
3	18.080	BB	0.4766	4636.21191	145.96326	48.5919
4	19.924	MM	0.5085	124.70516	4.08721	1.3070



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.633	VB	0.2571	91.84529	5.43653	3.3896
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3	19.647	MM	0.5799	34.92059	1.00365	1.2888

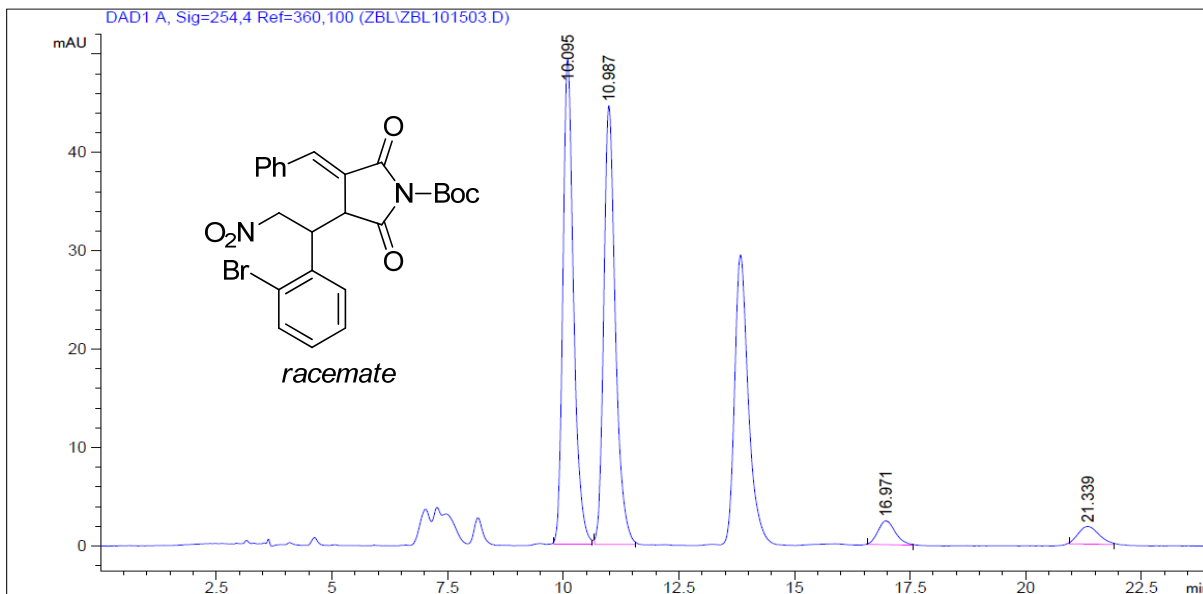


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2	11.506	BB	0.2975	1465.36340	74.49806	46.8677
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4	15.019	VB	0.3842	102.51240	3.85520	3.2787

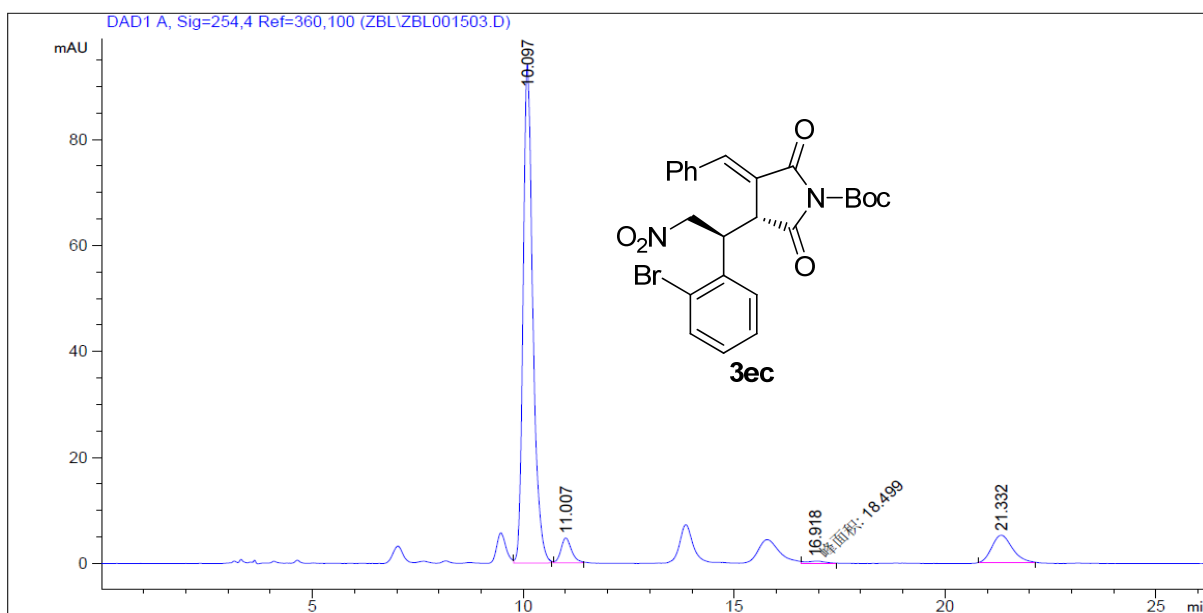


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2	11.496	BB	0.2937	2562.13452	131.27029	92.6490
3	15.034	BB	0.3669	158.29454	6.48314	5.7241

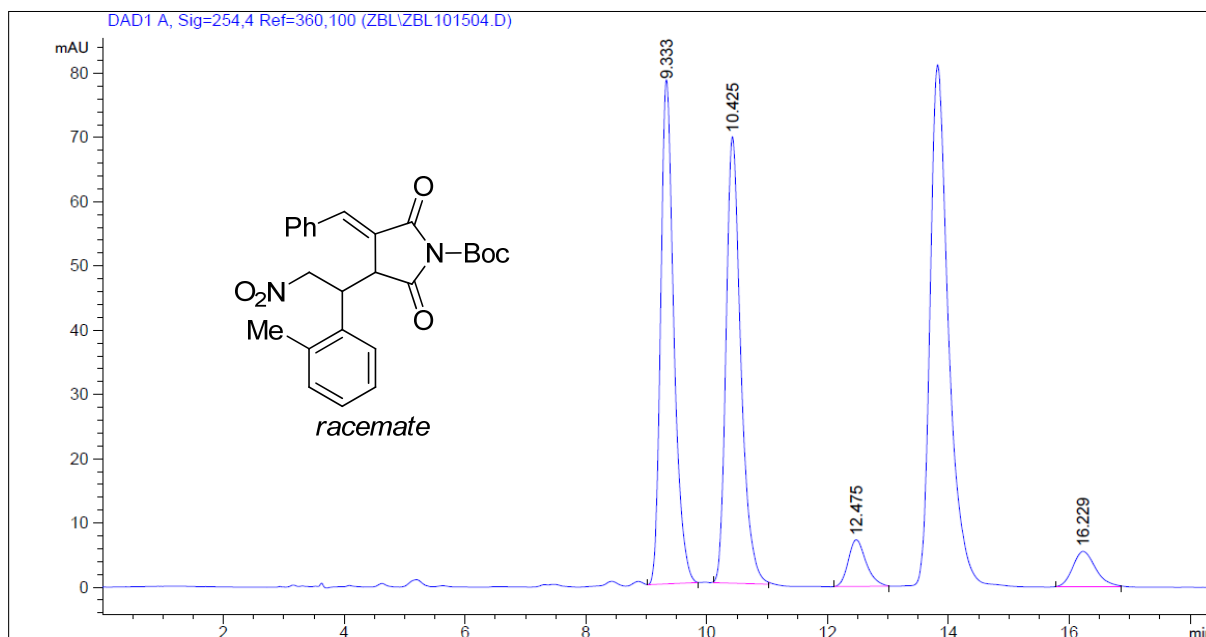




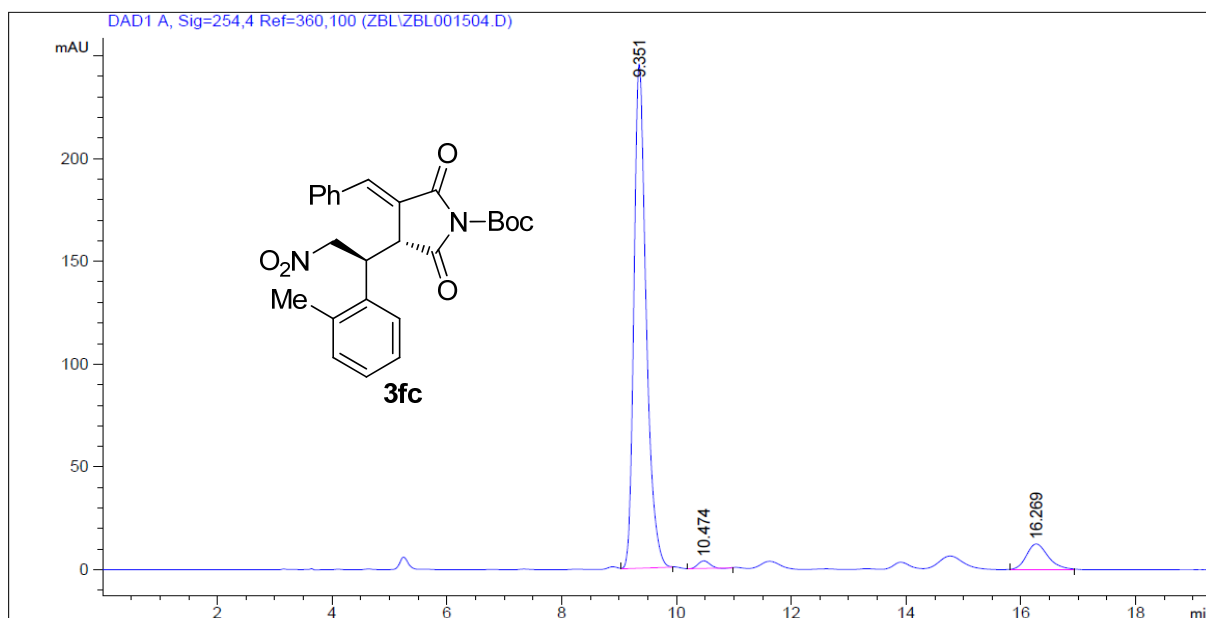
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1	10.095	BB	0.2434	792.62909	49.34098	46.7753
2	10.987	BB	0.2649	783.50098	44.60143	46.2366
3	16.971	BB	0.3710	62.77668	2.41737	3.7046
4	21.339	BB	0.3916	55.63958	1.79504	3.2835



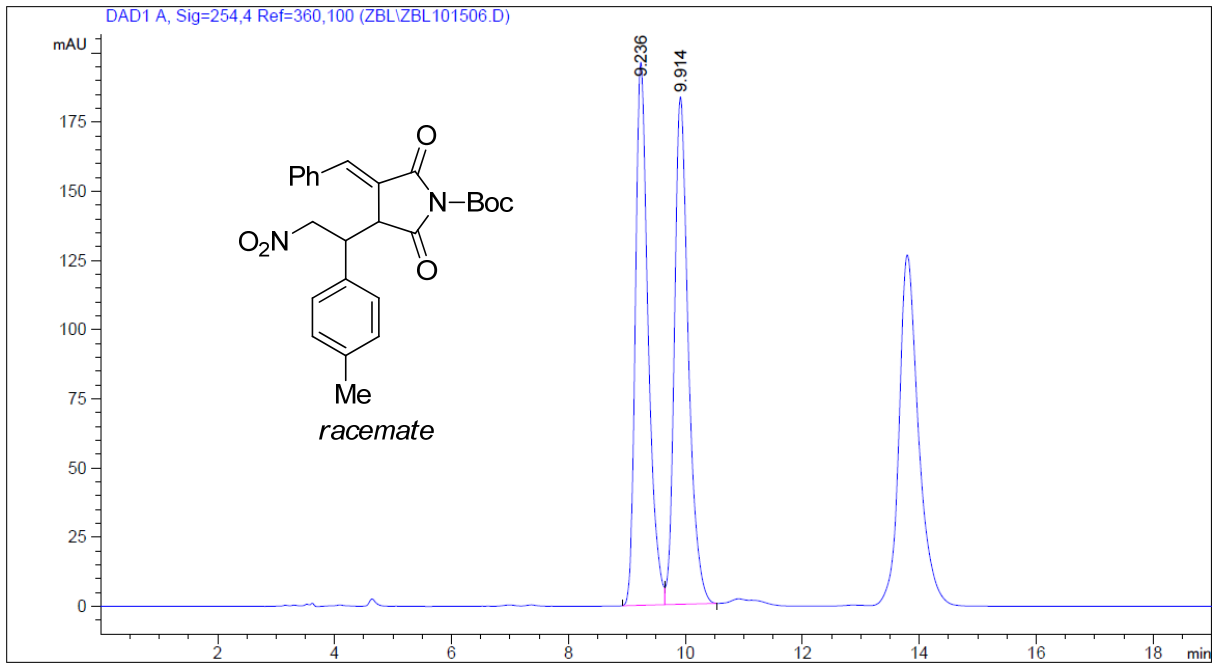
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1	10.097	VB	0.2432	1510.37170	94.14999	84.4600
2	11.007	BB	0.2576	81.03400	4.68874	4.5314
3	16.918	MM	0.5985	18.49899	5.15118e-1	1.0345
4	21.332	BB	0.4329	178.36305	5.21596	9.9741



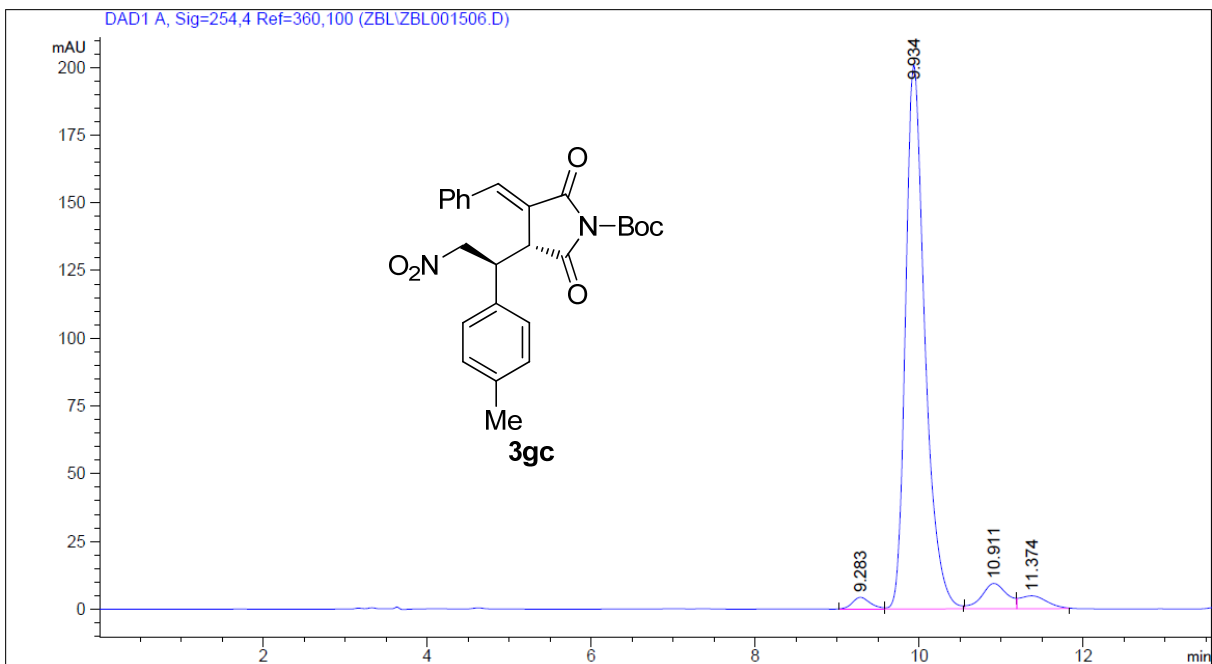
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1	9.333	VB	0.2307	1188.94861	78.50717	44.5744
2	10.425	BB	0.2569	1185.08093	69.50342	44.4294
3	12.475	BB	0.3073	148.92793	7.26021	5.5834
4	16.229	BB	0.3957	144.37941	5.51026	5.4129



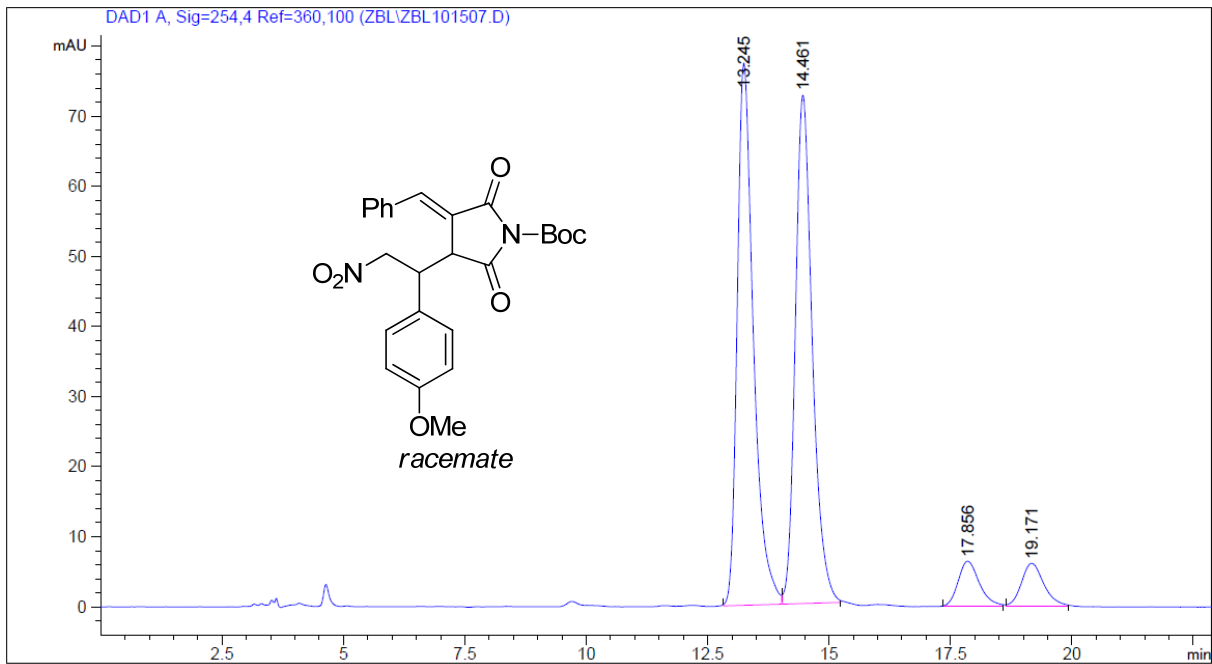
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1	9.351	VB	0.2252	3642.12769	245.26823	90.6048
2	10.474	BB	0.2207	51.05826	3.70689	1.2702
3	16.269	BB	0.3943	326.61035	12.43892	8.1250



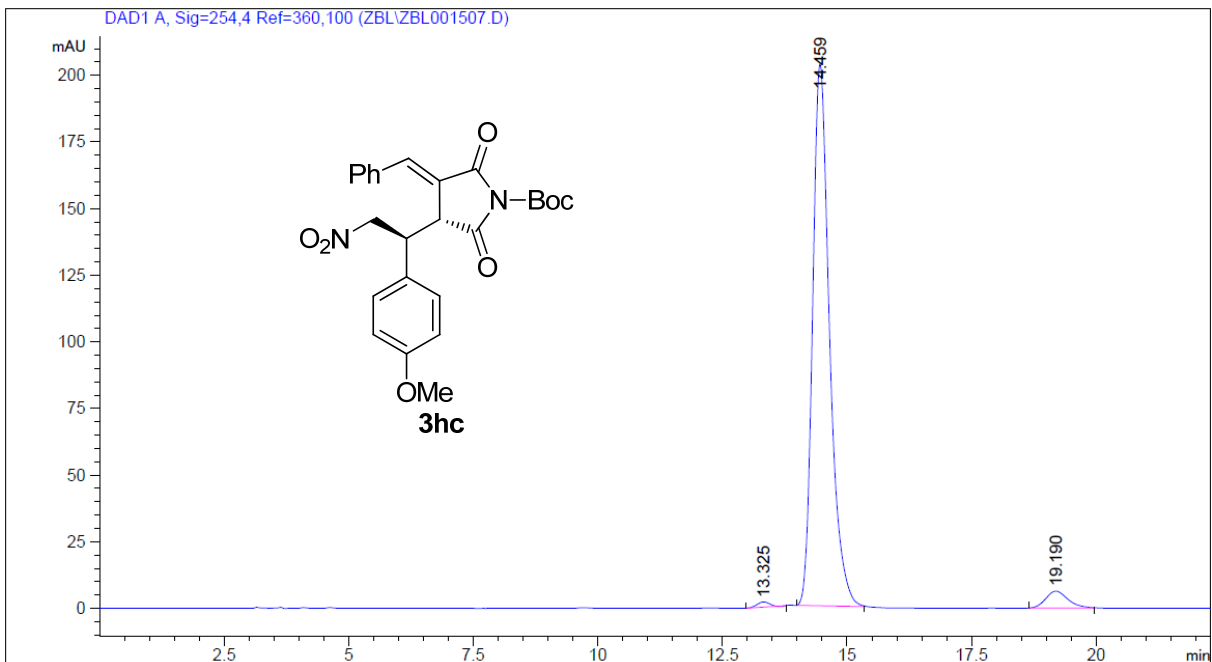
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1	9.236	BV	0.2299	2992.91333	196.32695	49.6218
2	9.914	VB	0.2493	3038.52930	183.34857	50.3782



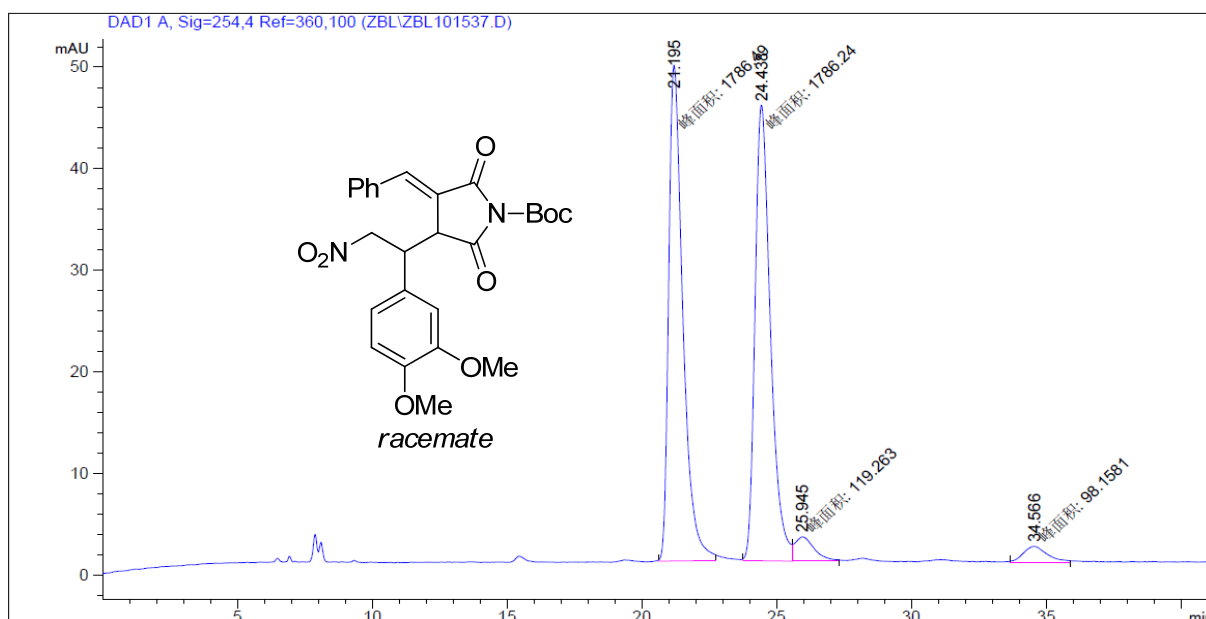
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1	9.283	BV	0.2279	64.03785	4.29580	1.7429
2	9.934	VB	0.2477	3300.18481	200.83203	89.8217
3	10.911	BV	0.3191	201.03455	9.33874	5.4716
4	11.374	VB	0.3361	108.89336	4.73830	2.9638



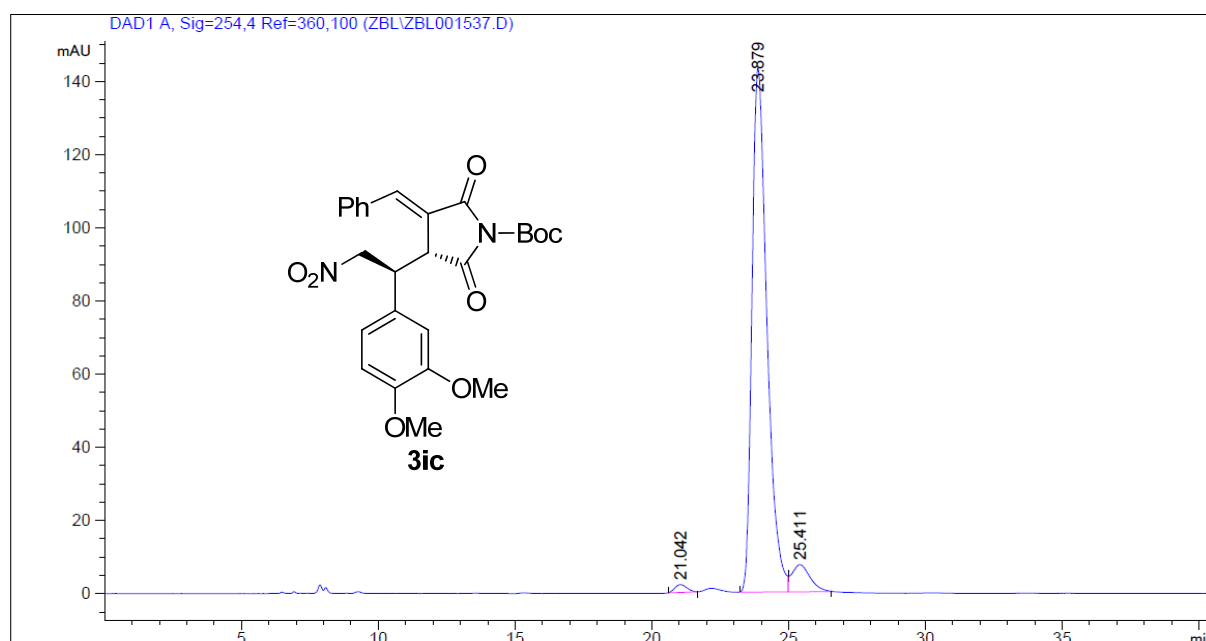
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1	13.245	BB	0.3488	1795.98474	77.36314	45.4954
2	14.461	BB	0.3699	1764.43591	72.51273	44.6962
3	17.856	BB	0.4434	193.14354	6.41271	4.8927
4	19.171	BB	0.4792	194.05678	6.09883	4.9158



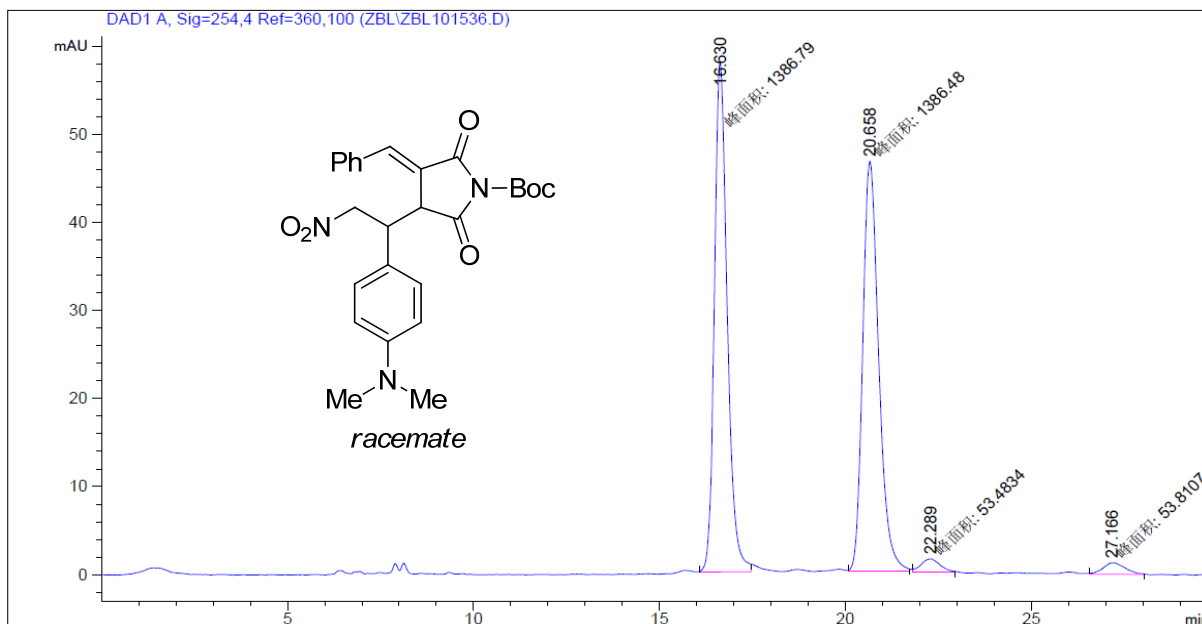
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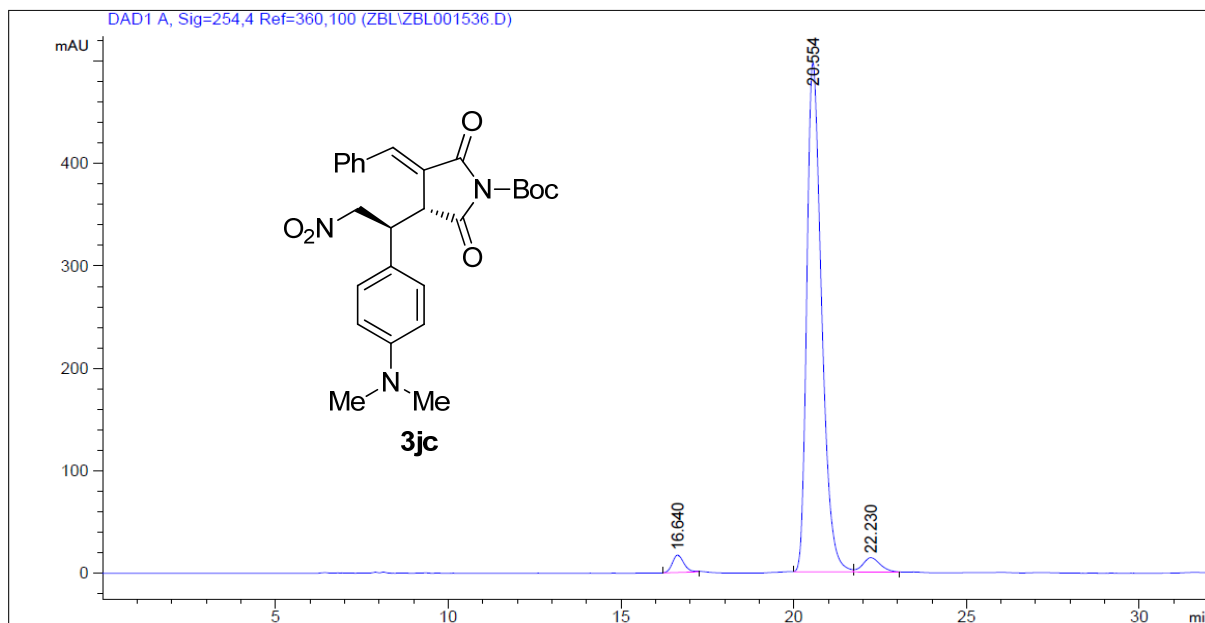
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1	21.195	MM	0.6099	1786.48975	48.81981	47.1351
2	24.438	MM	0.6637	1786.23779	44.85478	47.1284
3	25.945	MM	0.8282	119.26338	2.40000	3.1467
4	34.566	MM	1.0415	98.15815	1.57077	2.5898



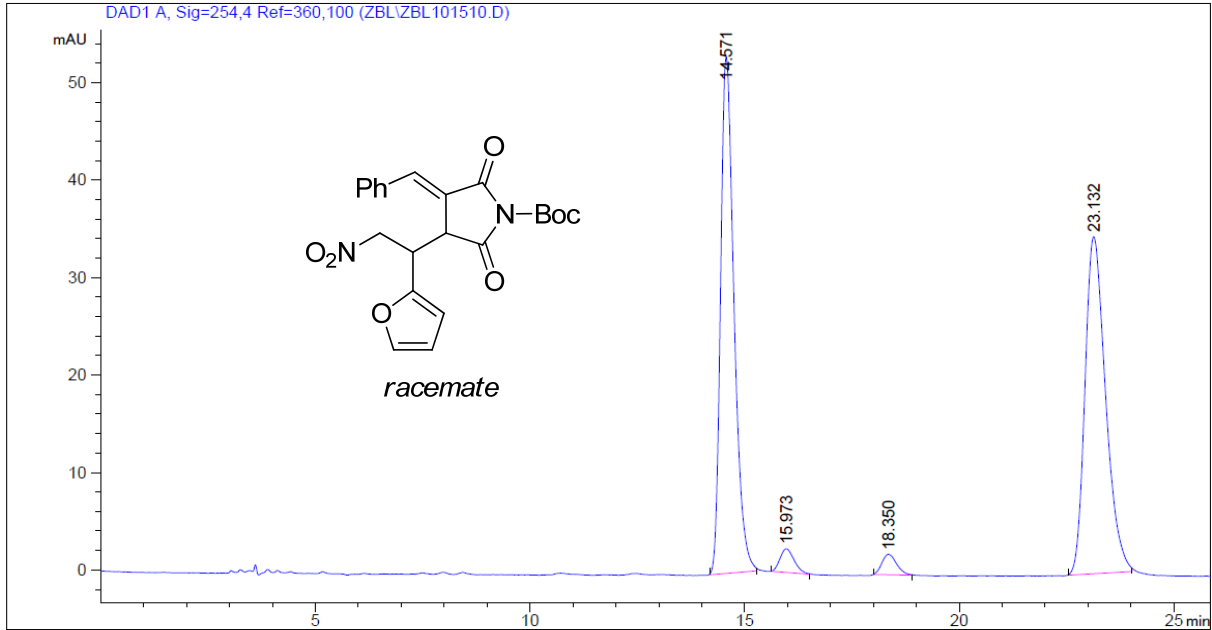
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1	21.042	BB	0.3849	65.25977	2.13342	1.1132
2	23.879	BB	0.5837	5448.54102	143.25677	92.9375
3	25.411	BB	0.6059	348.78741	7.45382	5.9494



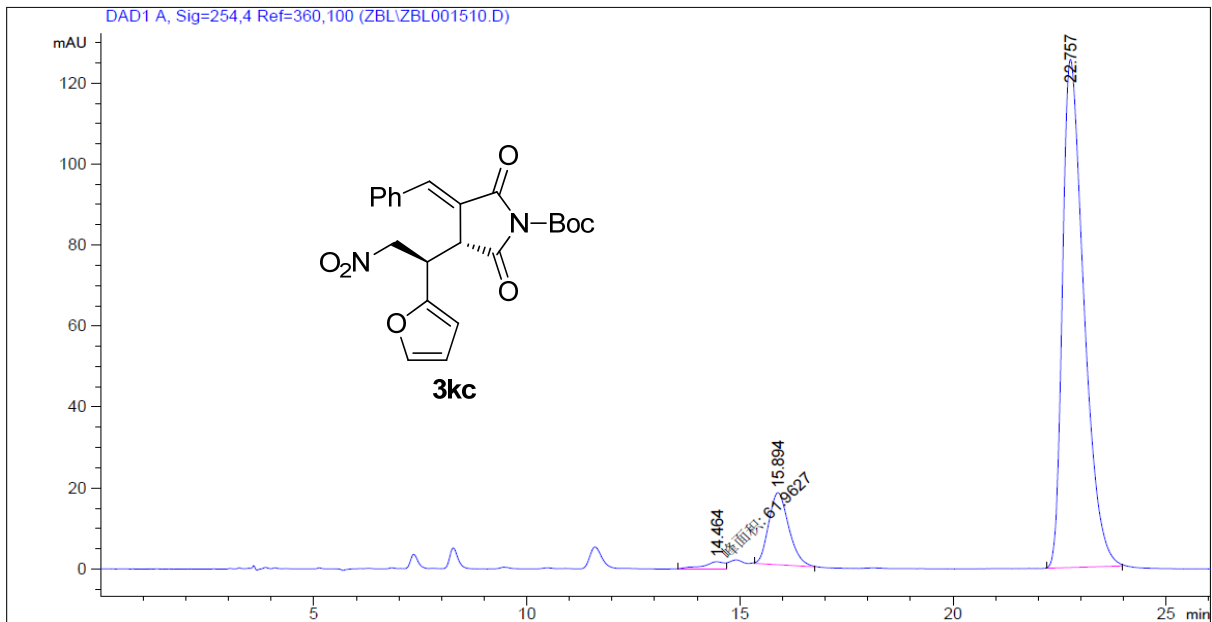
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.630	MM	0.3996	1386.79199	57.83700	48.1431
2	20.658	MM	0.4966	1386.47583	46.53016	48.1321
3	22.289	MM	0.5910	53.48343	1.50836	1.8567
4	27.166	MM	0.6830	53.81073	1.31310	1.8681



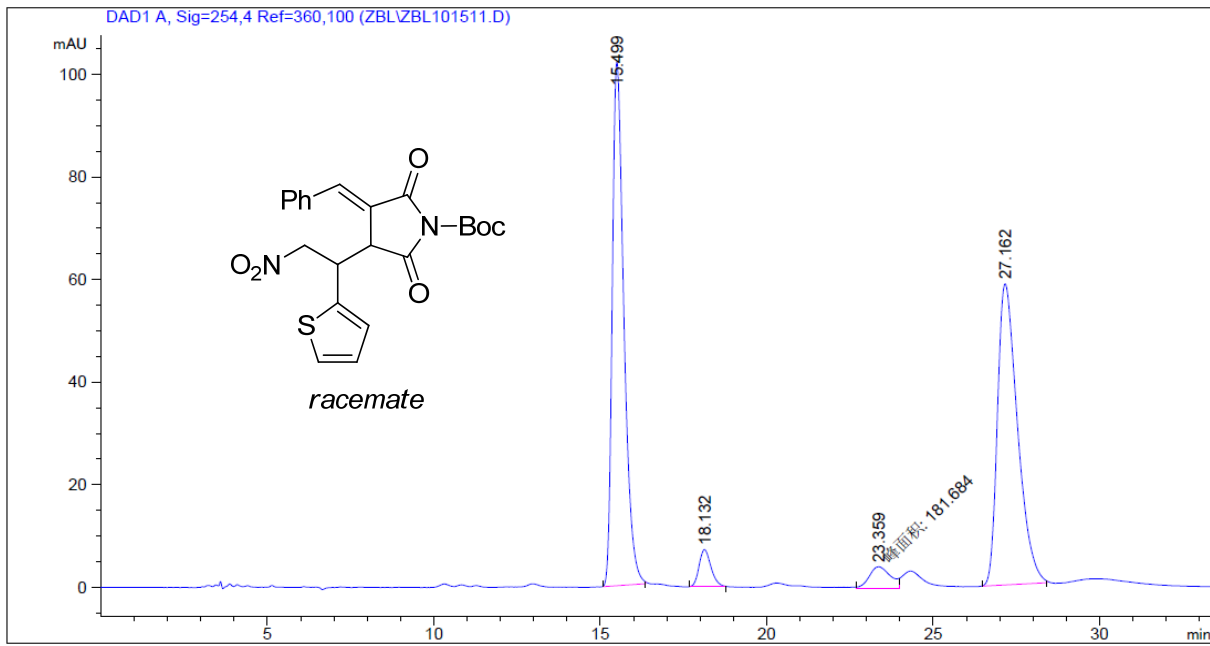
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.640	BB	0.3563	397.00647	17.01204	2.5274
2	20.554	BB	0.4594	1.48128e4	497.48376	94.3005
3	22.230	BB	0.5279	498.27512	14.11194	3.1721



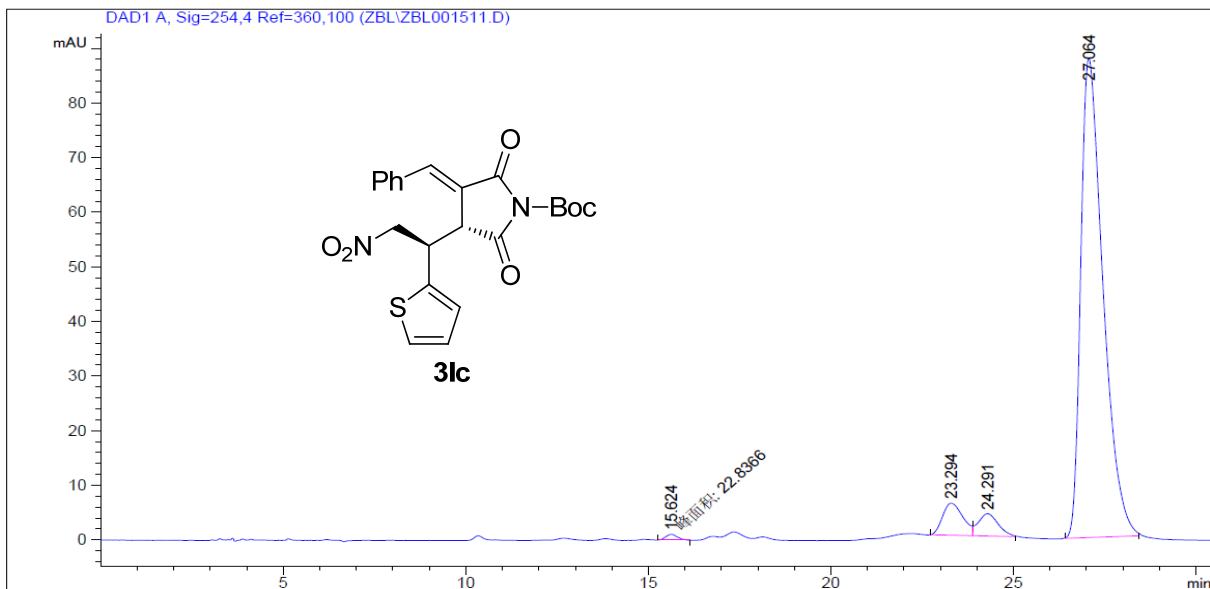
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.571	BB	0.3313	1152.19971	53.06300	47.7790
2	15.973	BB	0.3236	55.75045	2.43080	2.3118
3	18.350	BB	0.3247	49.94647	2.10588	2.0712
4	23.132	BB	0.5131	1153.62292	34.58816	47.8380



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.464	MM	0.5785	61.96268	1.78521	1.2309
2	15.894	BB	0.4890	581.96527	17.82087	11.5608
3	22.757	BB	0.5302	4390.03760	125.48440	87.2083

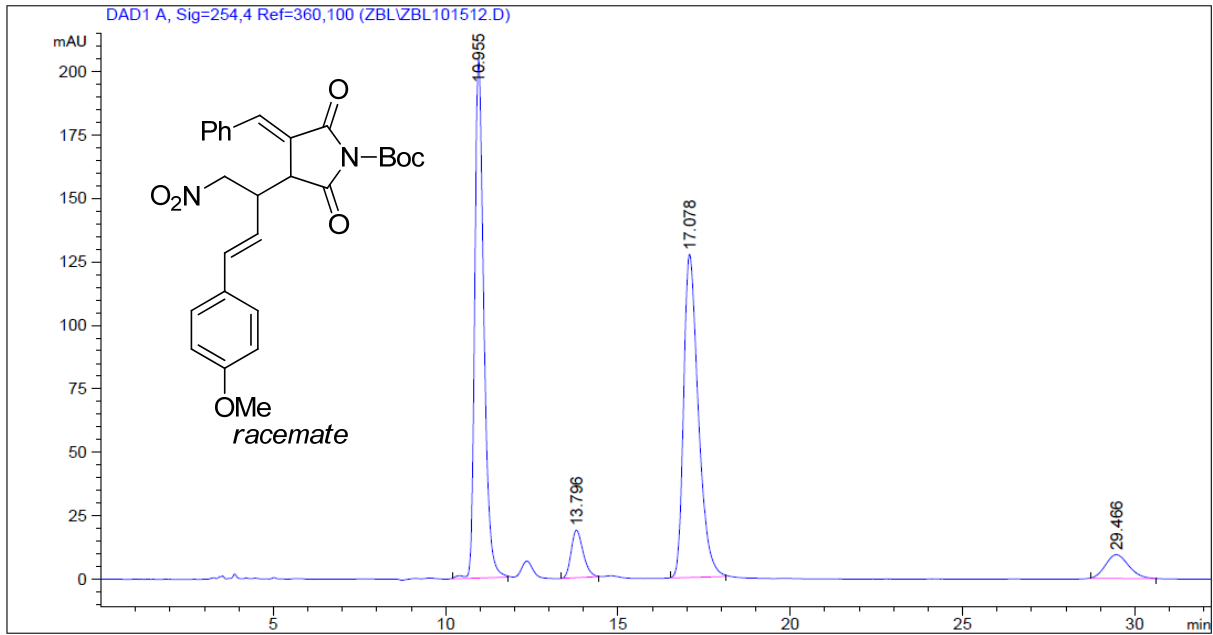


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.499	BB	0.3685	2473.88599	102.17088	46.7327
2	18.132	BB	0.3681	179.91498	7.23605	3.3987
3	23.359	MM	0.7313	181.68382	4.14074	3.4321
4	27.162	BB	0.6306	2458.20947	58.69219	46.4366

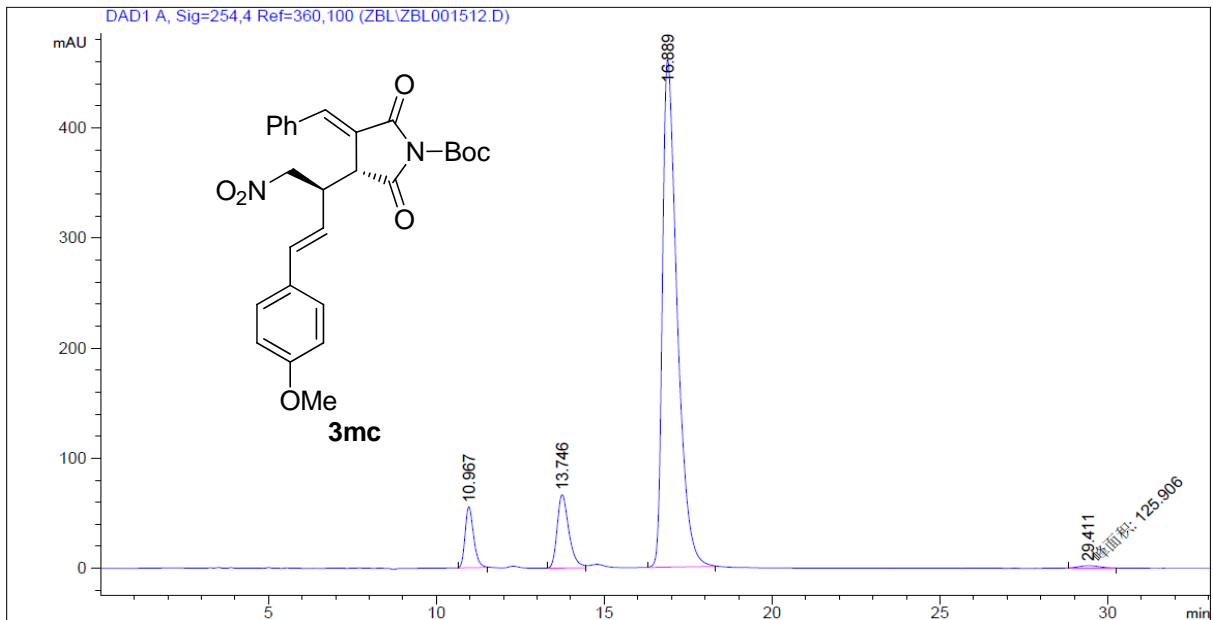


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.624	MM	0.3609	22.83657	1.05463	0.5547
2	23.294	BV	0.5015	227.25681	5.87209	5.5197
3	24.291	VB	0.4846	155.62320	4.08331	3.7798
4	27.064	BB	0.6374	3711.49463	87.75254	90.1458

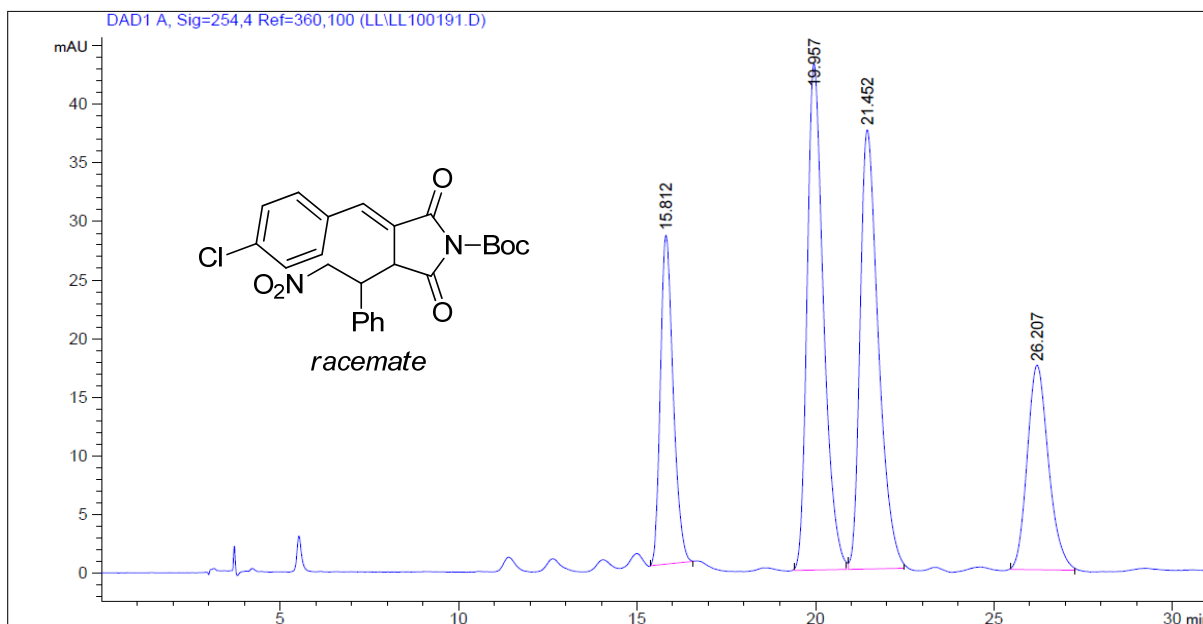




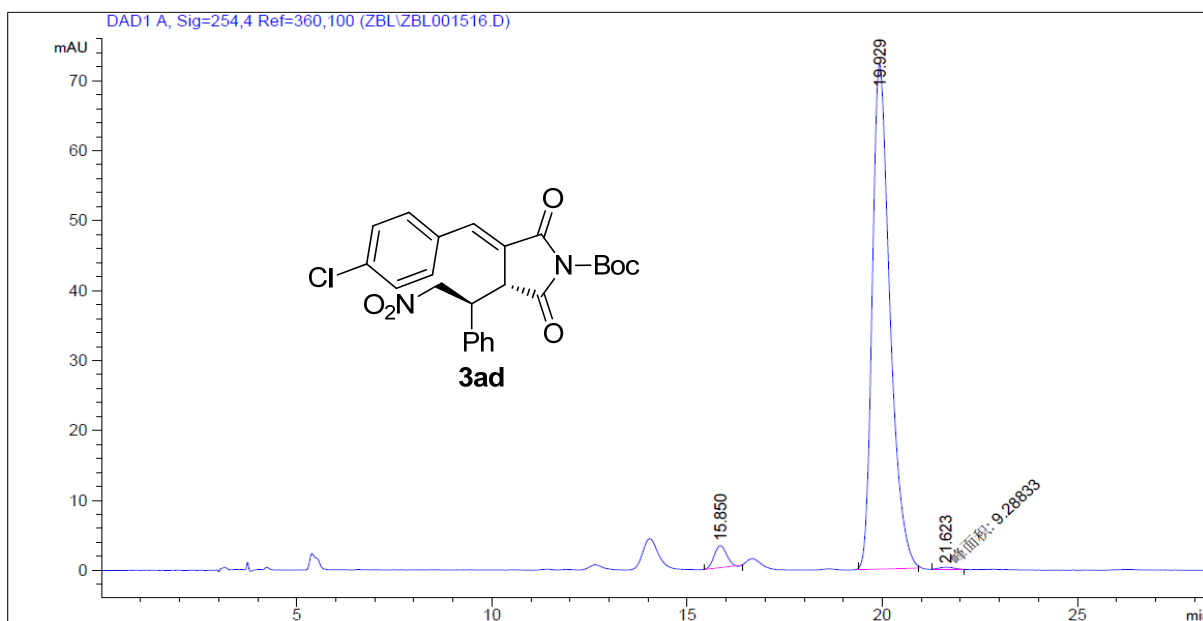
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.955	BB	0.2817	3782.07178	204.52385	44.7605
2	13.796	BB	0.3714	451.97433	18.73966	5.3491
3	17.078	BB	0.4519	3776.20581	127.37211	44.6911
4	29.466	BB	0.6787	439.31561	9.37544	5.1993



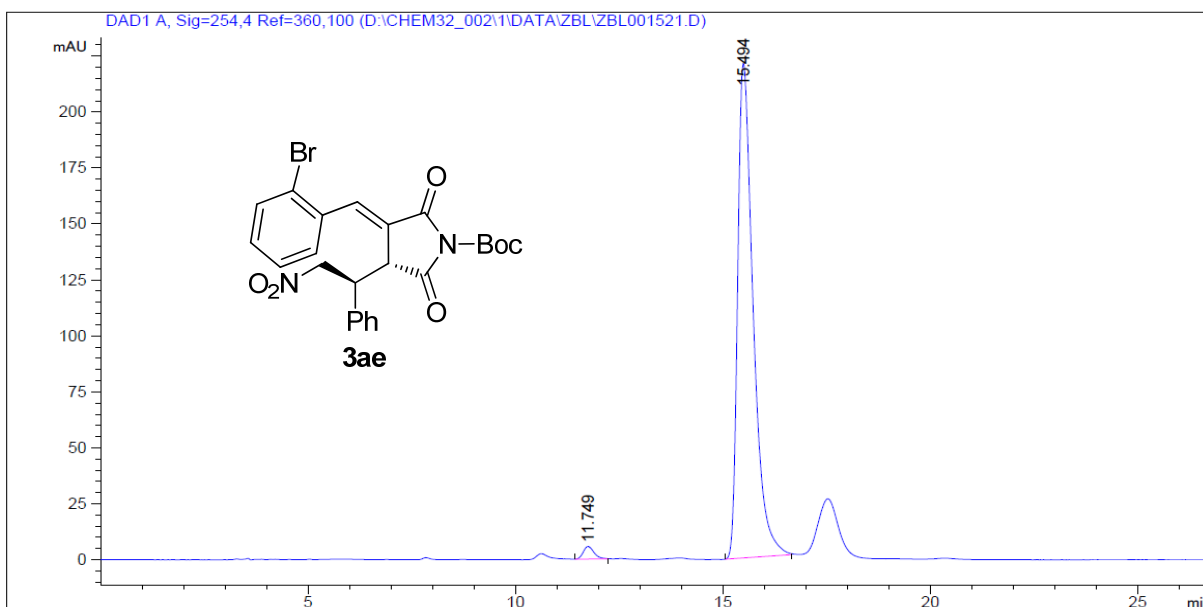
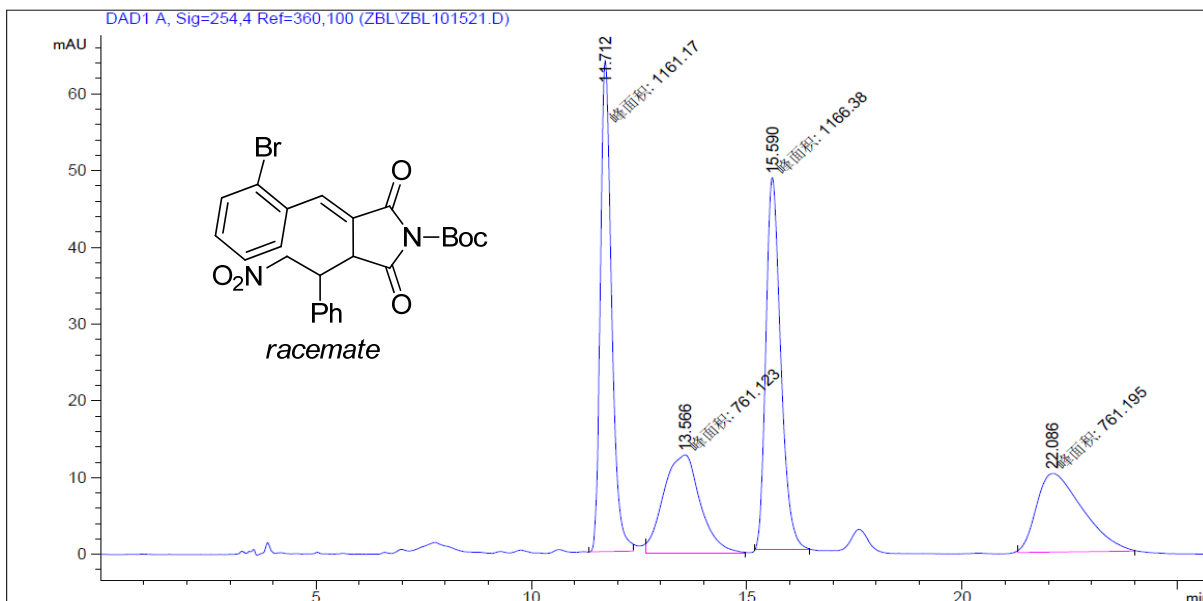
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.967	BB	0.2711	981.56384	55.30618	5.8537
2	13.746	BB	0.3672	1618.33105	66.67809	9.6512
3	16.889	BB	0.4592	1.40424e4	461.18542	83.7443
4	29.411	MM	0.8189	125.90567	2.56238	0.7509

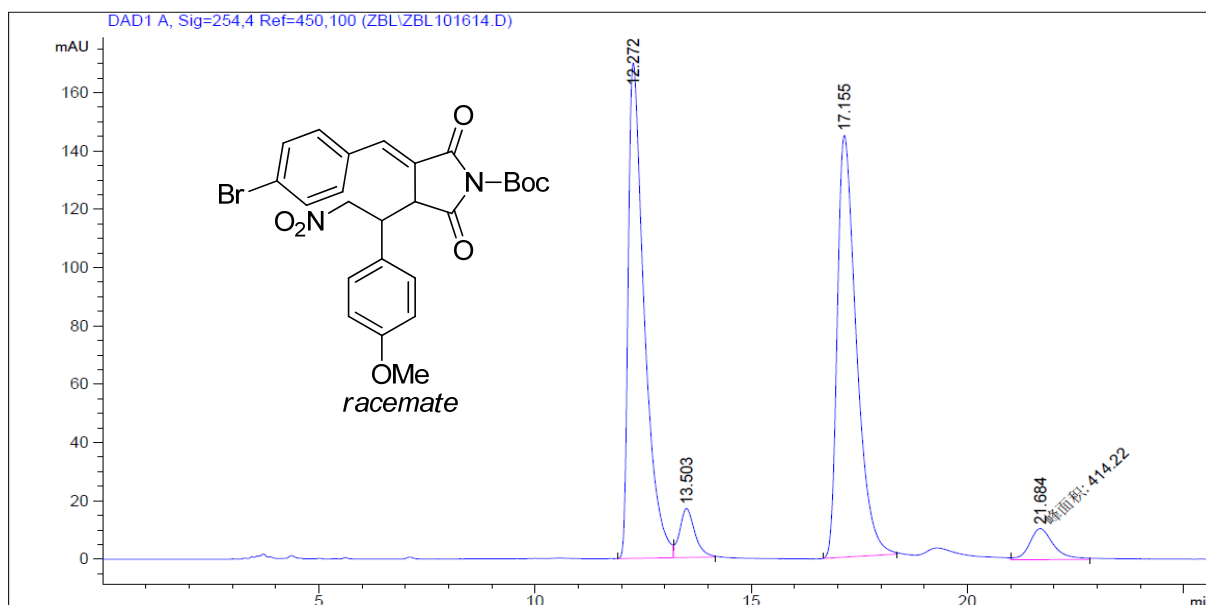


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.812	BB	0.3745	699.23291	28.08502	16.8597
2	19.957	BB	0.4882	1386.14807	43.22046	33.4225
3	21.452	BB	0.5342	1337.27173	37.48706	32.2440
4	26.207	BB	0.6161	724.69843	17.46672	17.4738

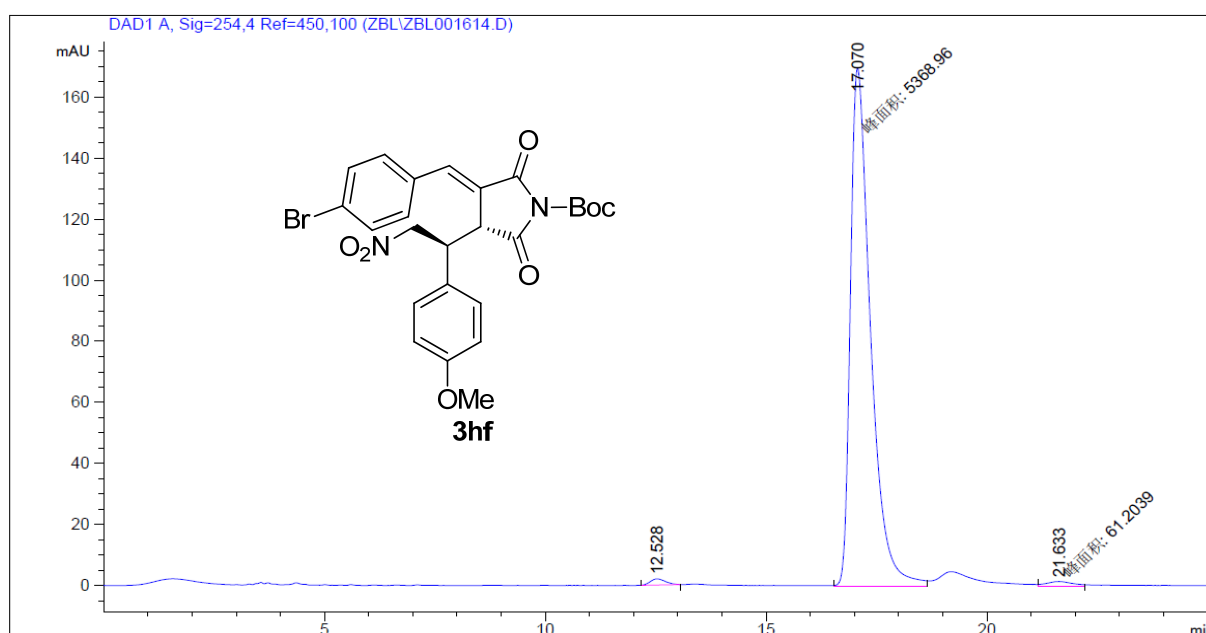


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.850	BB	0.3181	67.60826	3.12881	2.8625
2	19.929	BB	0.4811	2284.92871	72.21793	96.7442
3	21.623	MM	0.4625	9.28833	3.34744e-1	0.3933

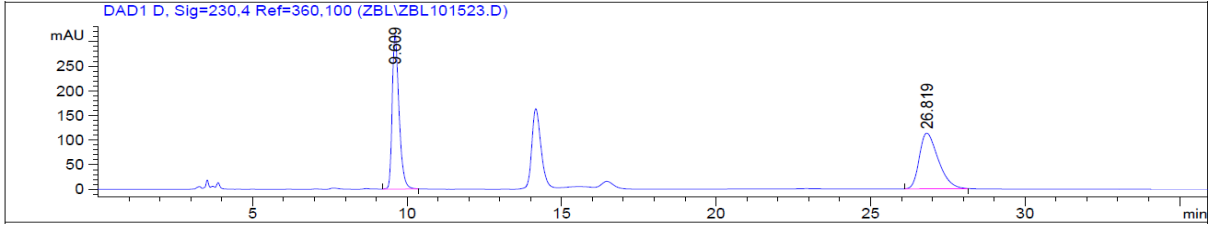
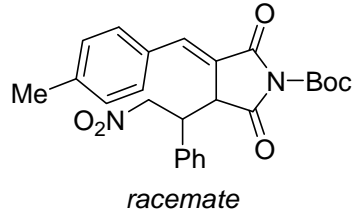




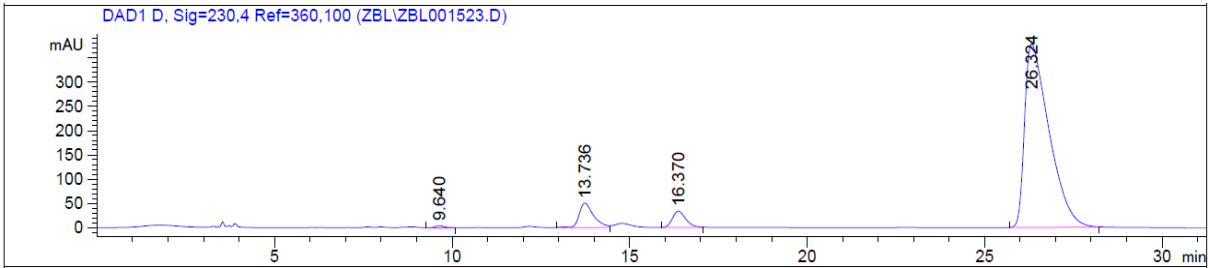
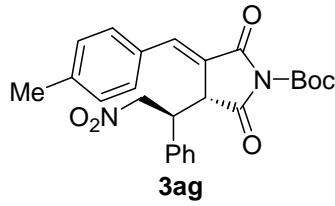
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.272	BV	0.3835	4390.82178	169.88310	45.4988
2	13.503	VB	0.3651	414.06360	16.82564	4.2906
3	17.155	BB	0.4613	4431.31250	144.67480	45.9183
4	21.684	MM	0.6475	414.21970	10.66220	4.2922



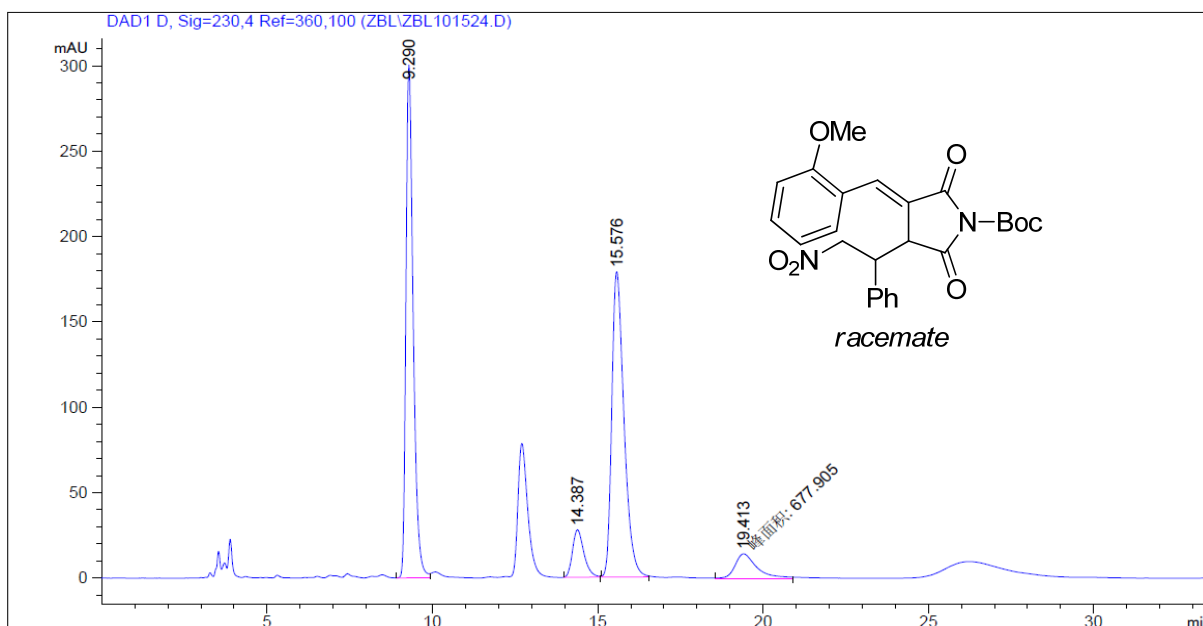
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.528	BB	0.3297	47.71120	2.00445	0.8710
2	17.070	MM	0.5273	5368.96045	169.69423	98.0117
3	21.633	MM	0.6826	61.20391	1.49433	1.1173



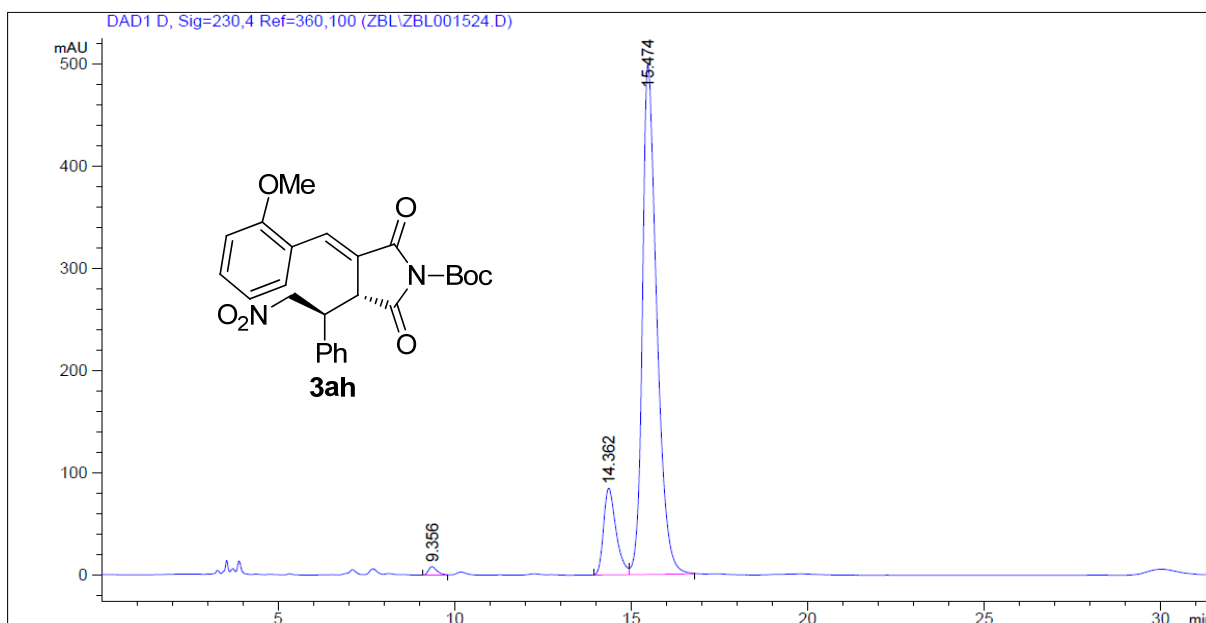
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.609	BB	0.2337	4833.29980	313.86353	50.0648
2	26.819	BB	0.6523	4820.79687	113.32423	49.9352



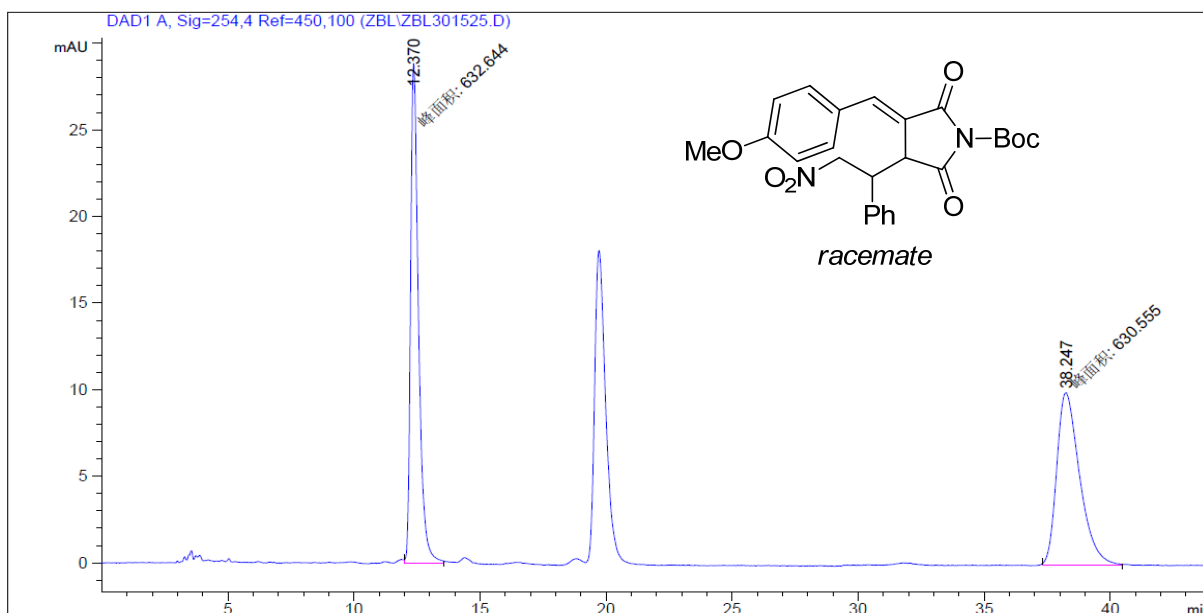
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.640	VB	0.2326	65.32833	4.26638	0.3189
2	13.736	BV	0.4244	1425.25916	50.31973	6.9575
3	16.370	BB	0.4002	871.13275	33.41497	4.2525
4	26.324	BB	0.7165	1.81235e4	378.56329	88.4711



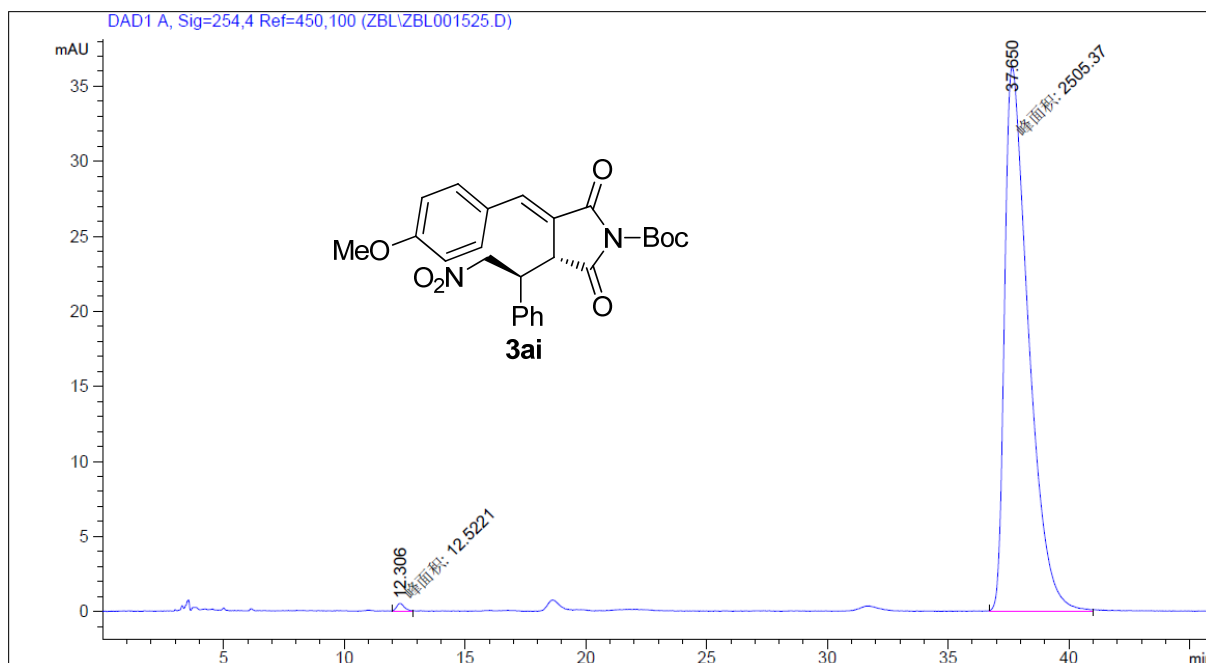
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.290	VB	0.2299	4583.59375	300.56076	43.5938
2	14.387	BB	0.3637	668.47162	27.88285	6.3577
3	15.576	BB	0.3890	4584.35352	178.84978	43.6010
4	19.413	MM	0.7758	677.90491	14.56275	6.4474



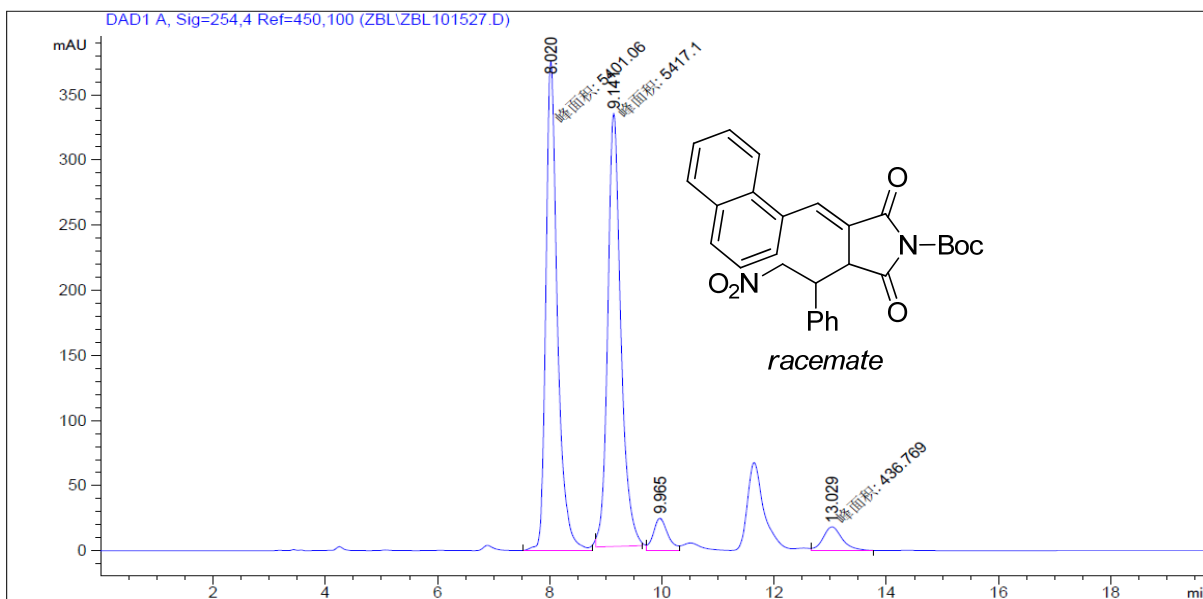
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.356	BB	0.2555	142.78436	8.34804	0.8715
2	14.362	BV	0.3727	2088.34399	84.98019	12.7458
3	15.474	VB	0.4245	1.41534e4	499.67642	86.3827



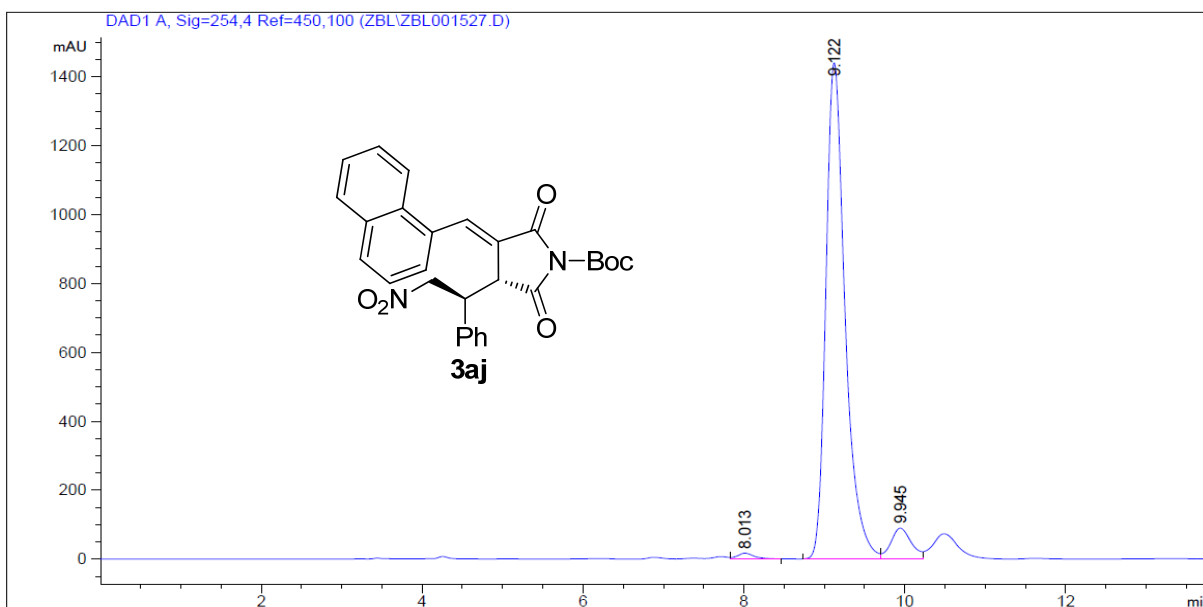
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.370	MM	0.3652	632.64392	28.87119	50.0827
2	38.247	MM	1.0560	630.55536	9.95201	49.9173



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.306	MM	0.3936	12.52206	5.30205e-1	0.4973
2	37.650	MM	1.1503	2505.37158	36.29874	99.5027

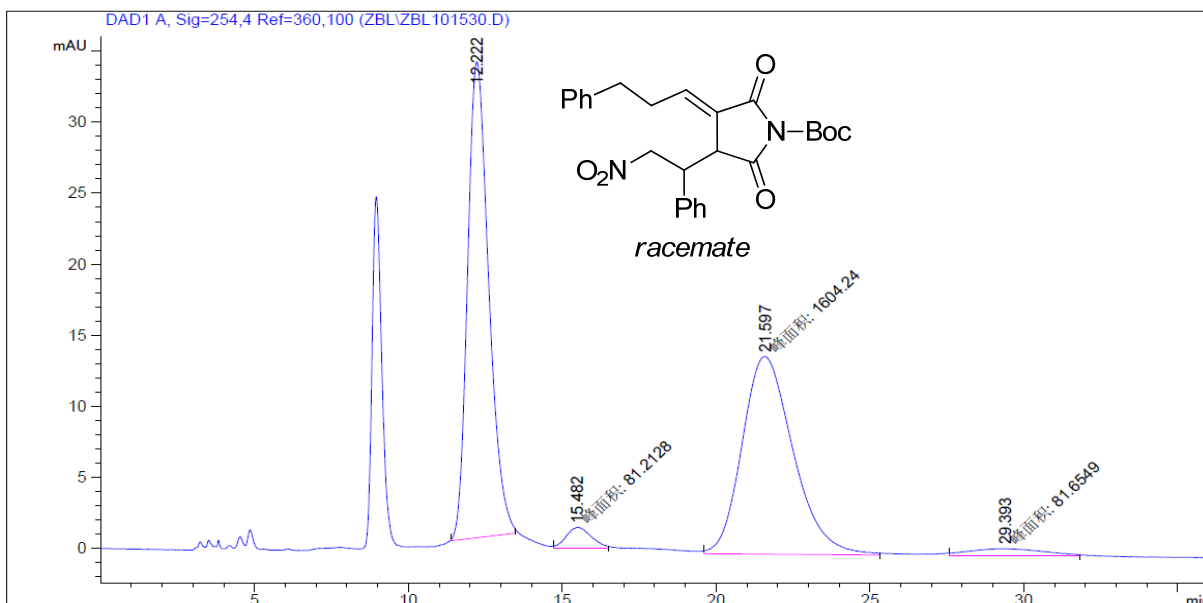


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.020	MM	0.2395	5401.06396	375.89597	46.1841
2	9.141	MM	0.2714	5417.09961	332.67834	46.3212
3	9.965	VV	0.2674	439.70566	24.72864	3.7599
4	13.029	MM	0.3979	436.76883	18.29449	3.7348

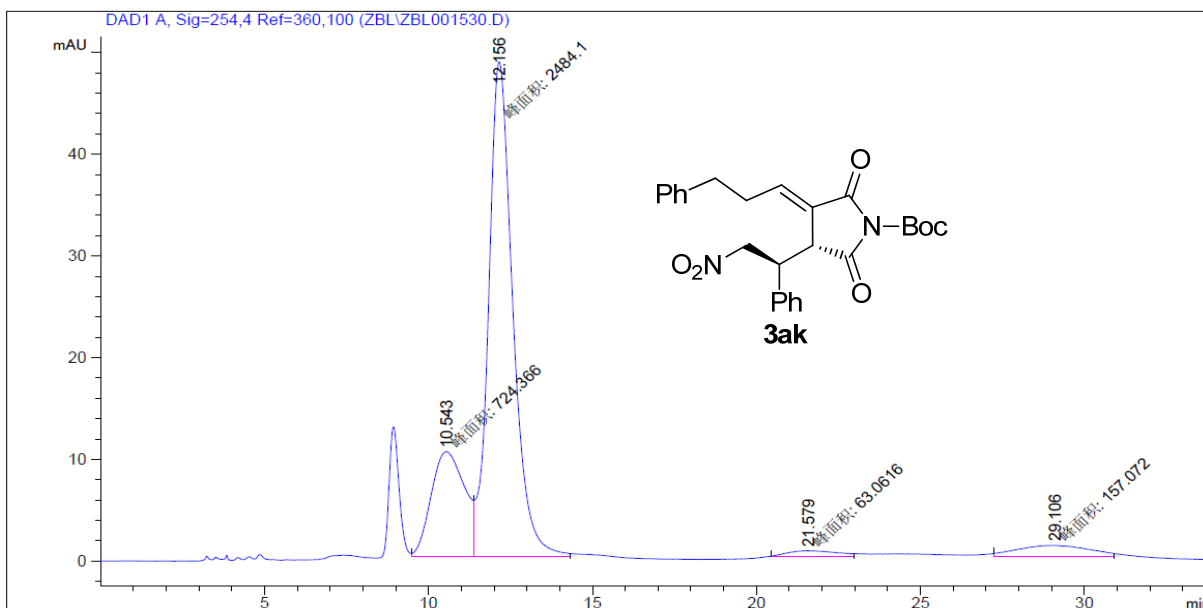


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.013	VB	0.2221	259.92325	17.22486	1.0078
2	9.122	BV	0.2519	2.39445e4	1440.95374	92.8400
3	9.945	VV	0.2656	1586.71729	90.04076	6.1522

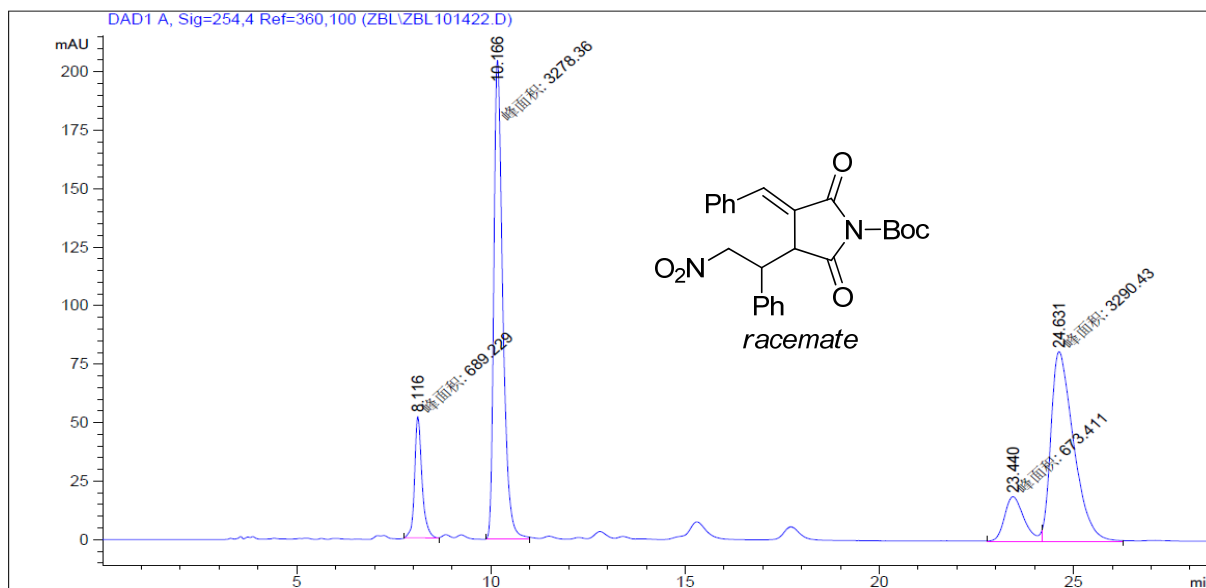




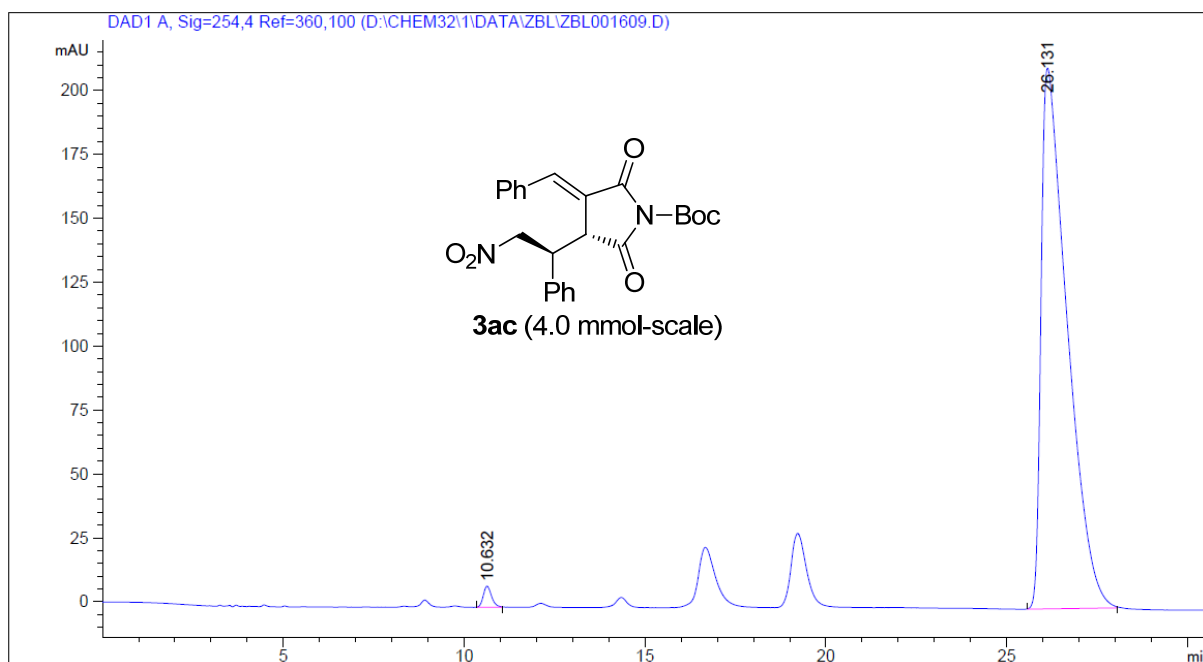
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.222	BB	0.7232	1599.94739	33.50122	47.5178
2	15.482	MM	0.9367	81.21283	1.44500	2.4120
3	21.597	MM	1.9220	1604.23694	13.91150	47.6451
4	29.393	MM	2.7349	81.65488	4.97617e-1	2.4251



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.543	MM	1.1752	724.36591	10.27259	21.1272
2	12.156	MM	0.8523	2484.10107	48.57589	72.4523
3	21.579	MM	1.7693	63.06158	5.94041e-1	1.8393
4	29.106	MM	2.5022	157.07245	1.04623	4.5812



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.116	MM	0.2216	689.22876	51.83558	8.6898
2	10.166	MM	0.2670	3278.36060	204.65494	41.3338
3	23.440	MM	0.5876	673.41064	19.09912	8.4904
4	24.631	MM	0.6769	3290.42944	81.01297	41.4860



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.632	BB	0.2432	130.88290	8.24389	1.2188
2	26.131	BB	0.7290	1.06081e4	211.56175	98.7812