

Highly Enantioselective Michael Addition of Cyclic β -Diones to α,β -Unsaturated Enones Catalyzed by Quinine-based Organocatalysts

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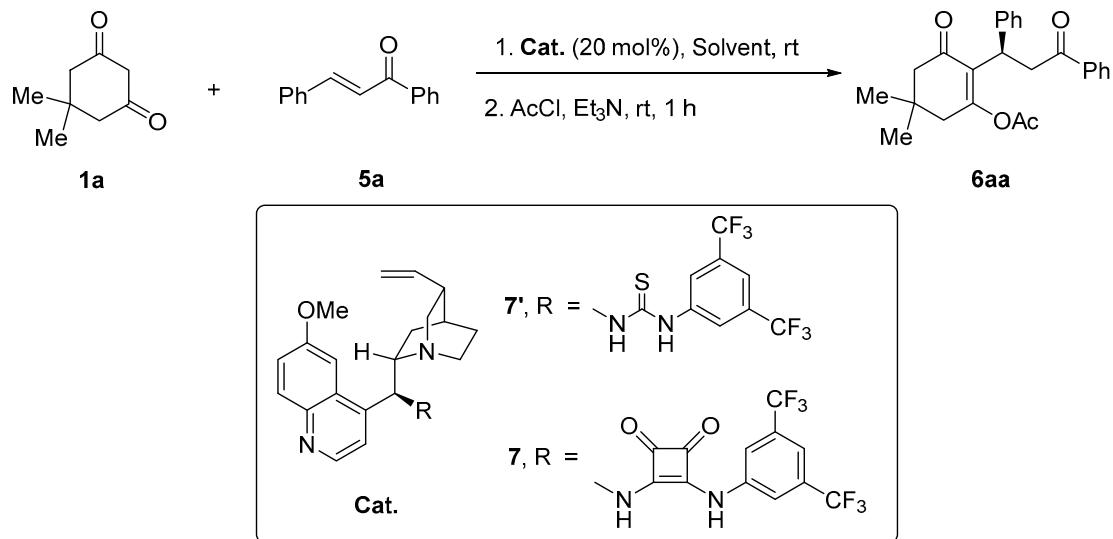
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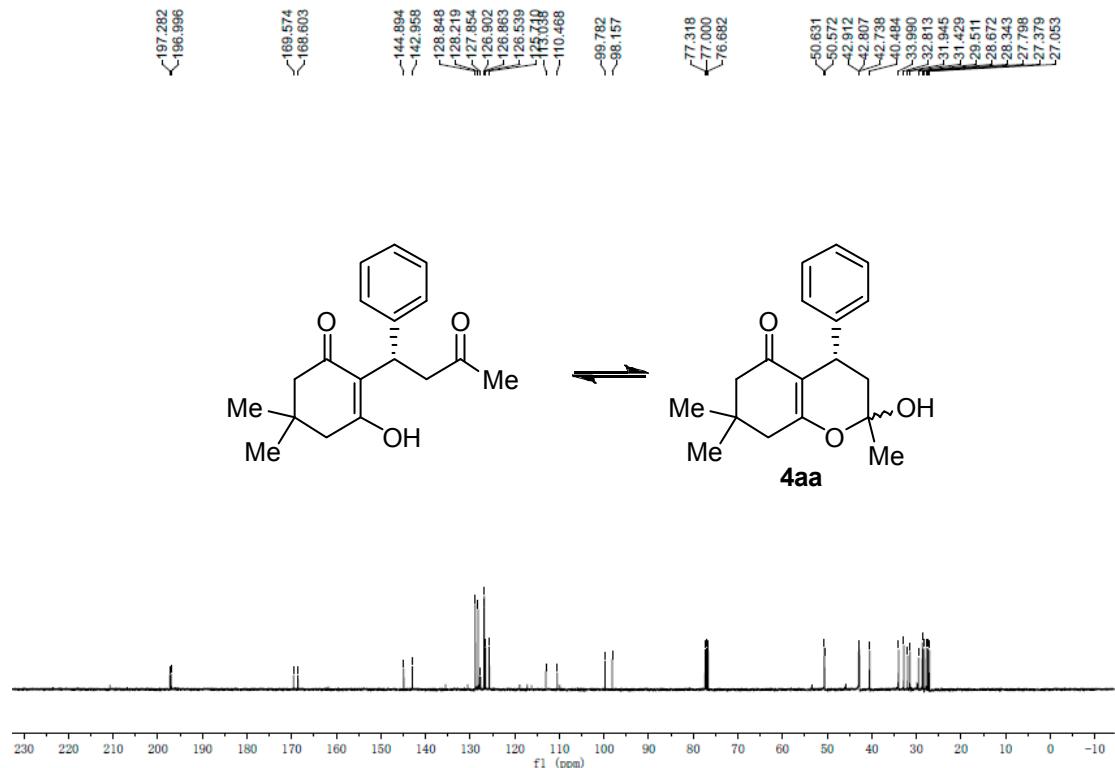
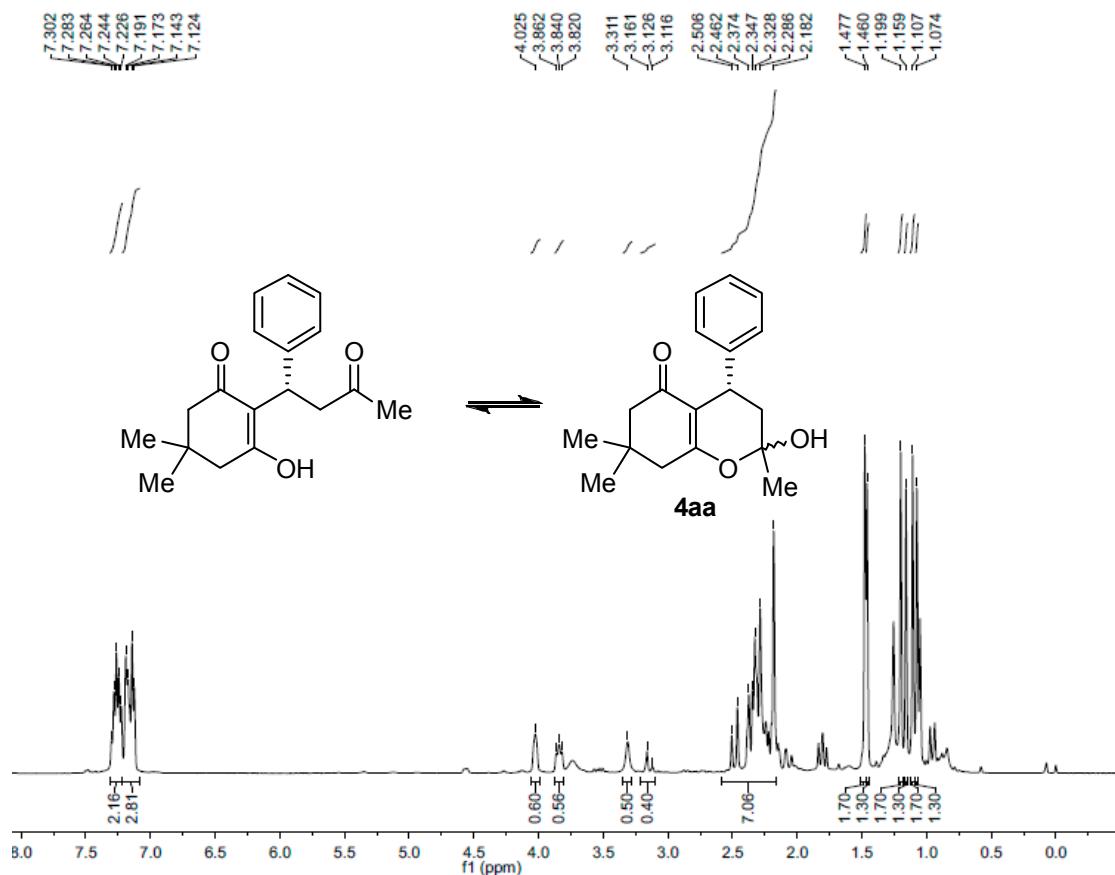
Table 1. Optimization of reaction conditions for Michael addition of dimedone **1a** to chalcone **5a**.^a

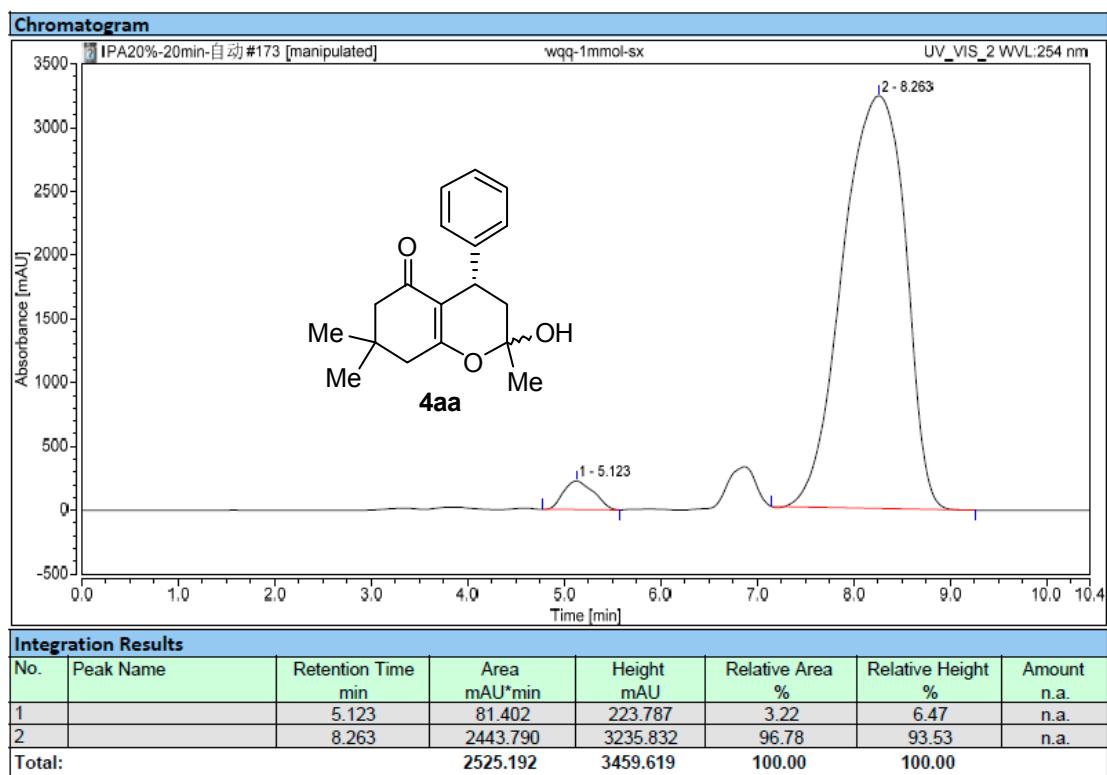
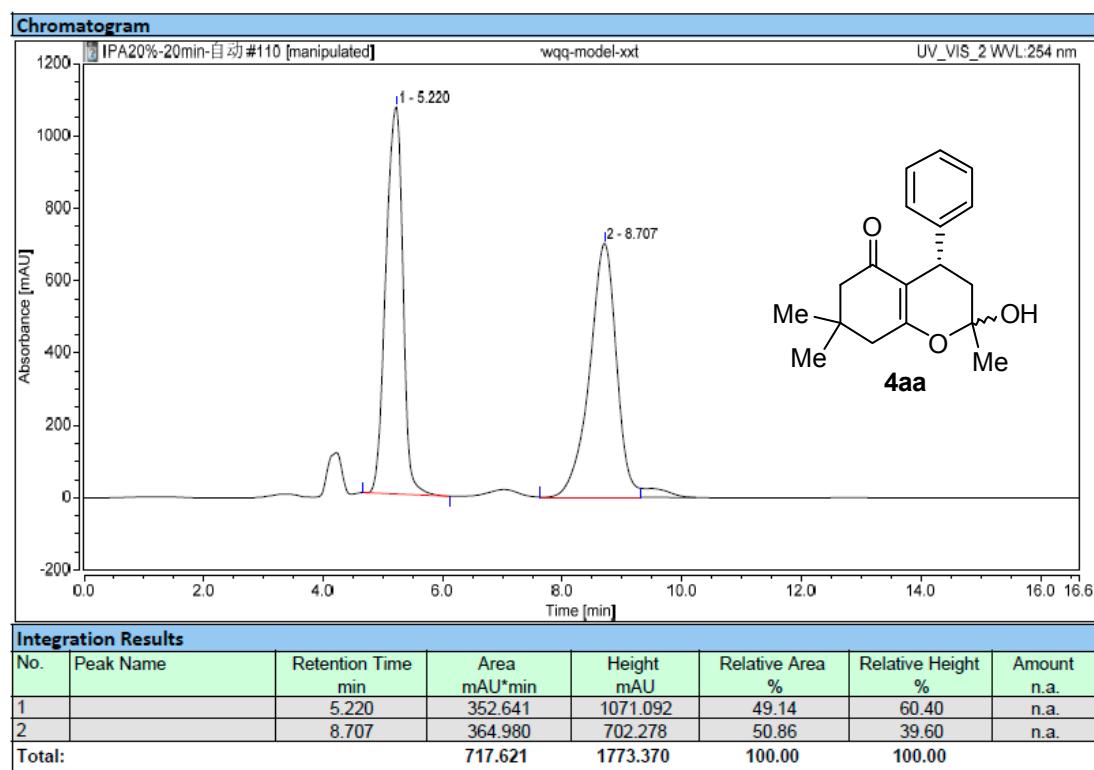


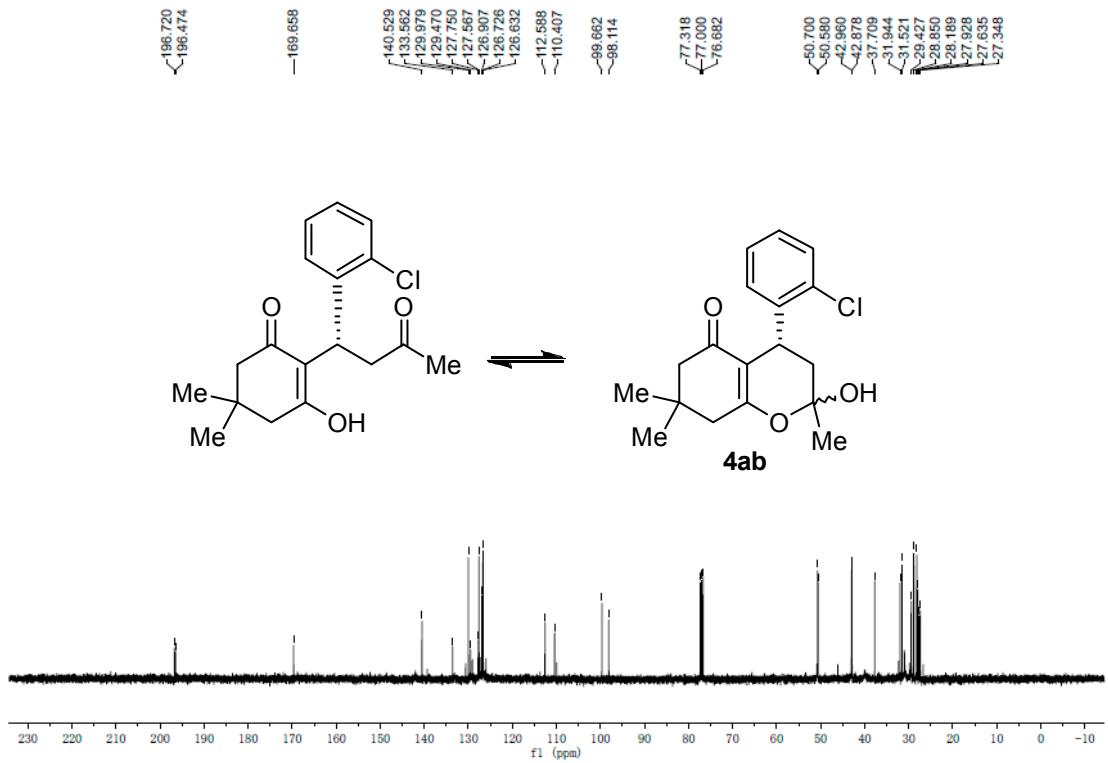
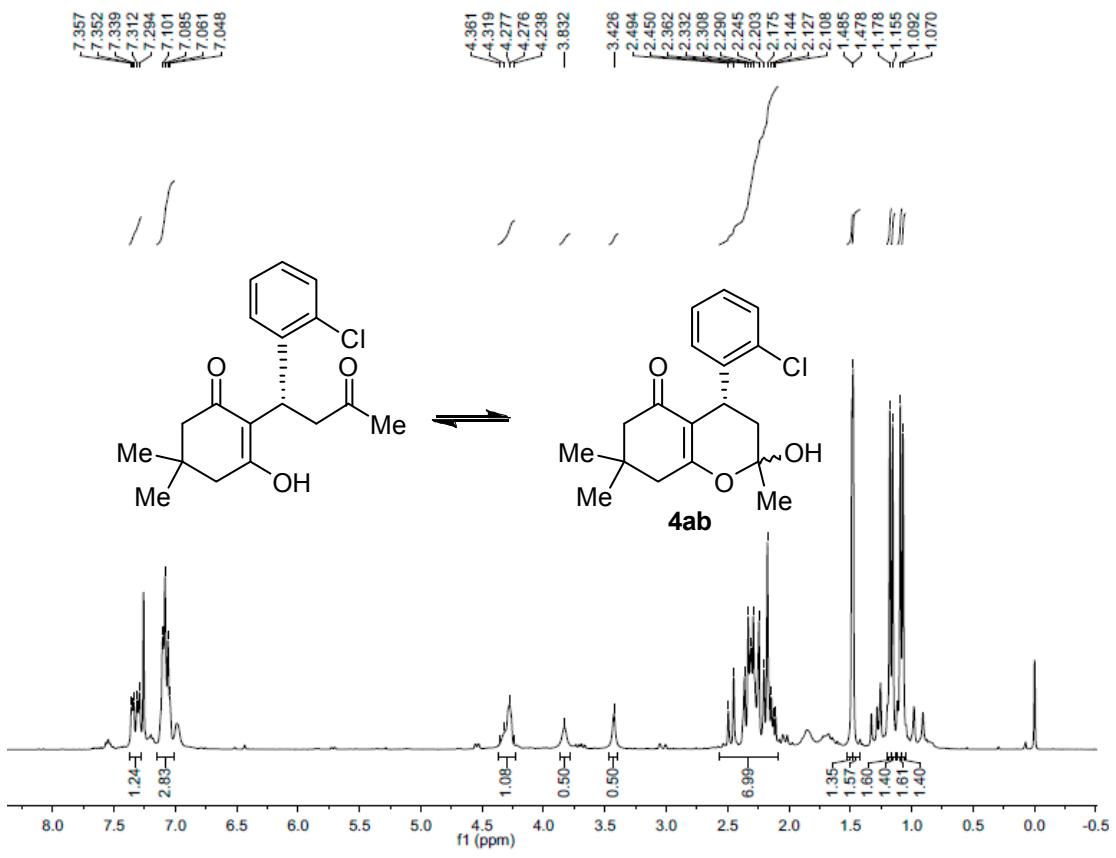
Entry	Cat.	Solvent	Time (h)	Yield (%) ^b	ee (%) ^c
1	7'	toluene	96	96	75
2	7	toluene	96	99	90
3	7	PhCF ₃	168	76	88
4	7	DCM	120	99	92
5	7	DCE	120	92	92
6	7	CHCl ₃	120	95	93
7	7	EtOAc	168	87	90

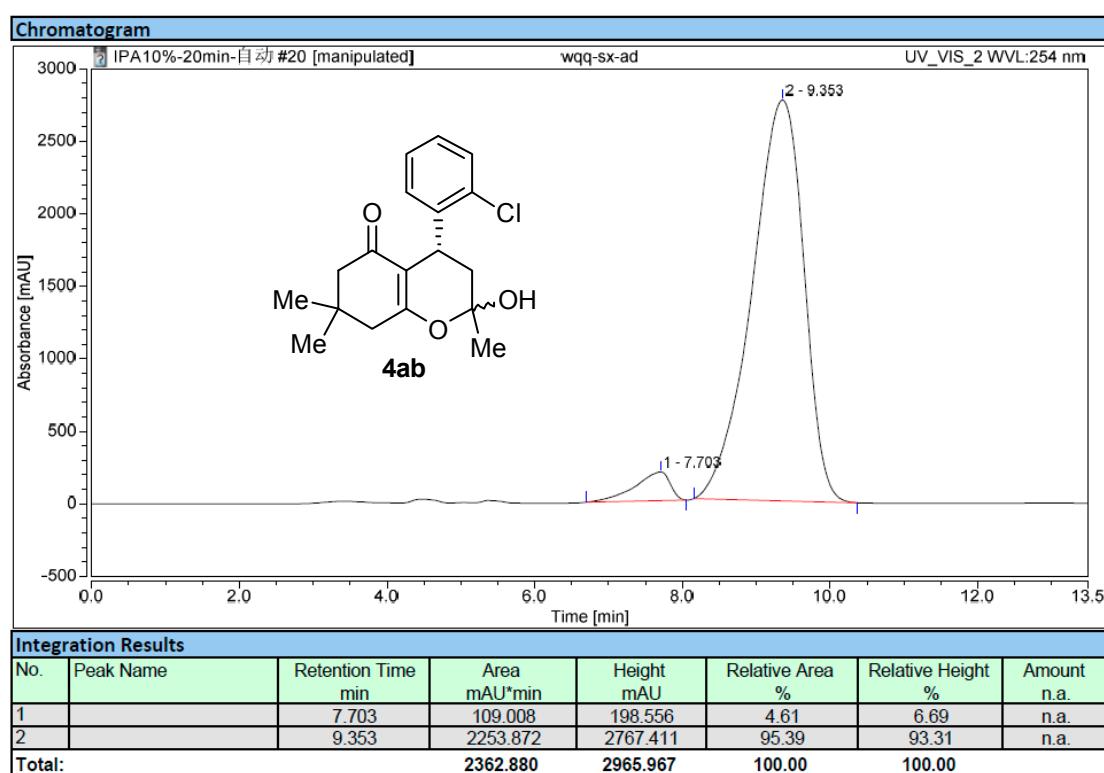
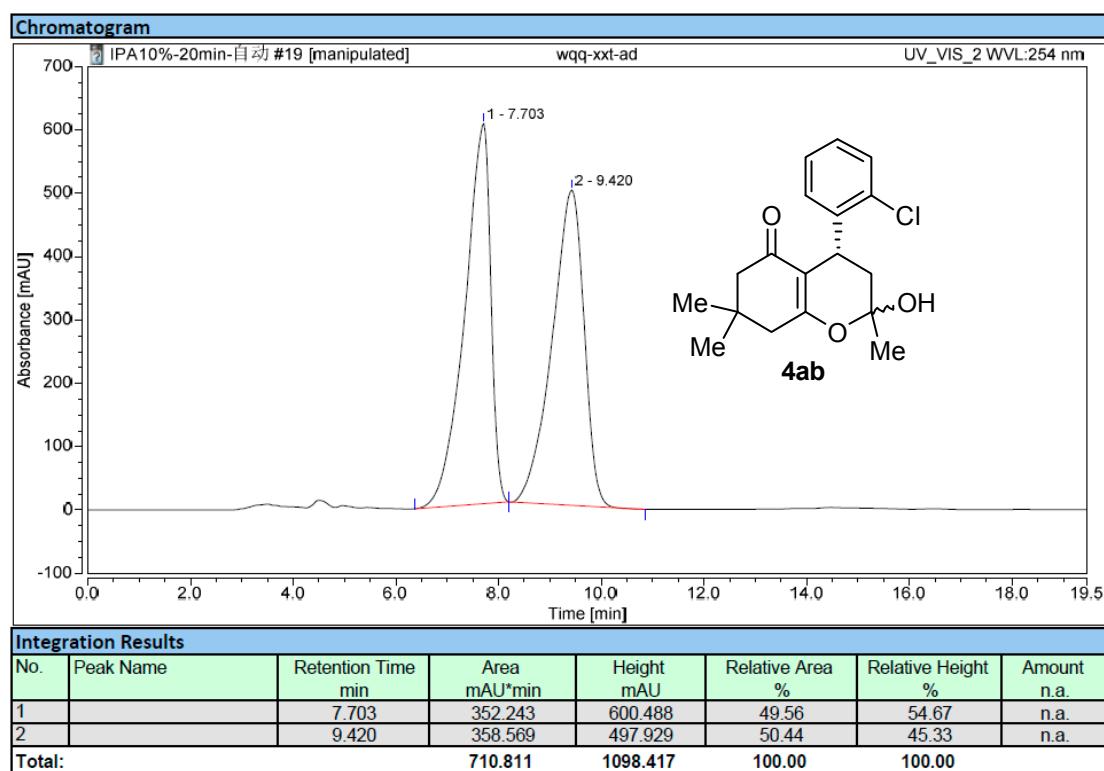
^a Unless otherwise noted, the Michael addition was performed with 0.1 mmol of **1a**, 0.12 mmol of **5a**, 20 mol% of catalyst in 1 mL of solvent at rt. ^b Isolated yield after flash chromatography on silica gel. ^c Determined by HPLC analysis on a chiral stationary phase.

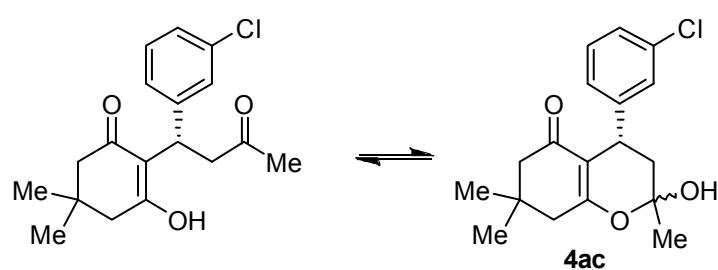
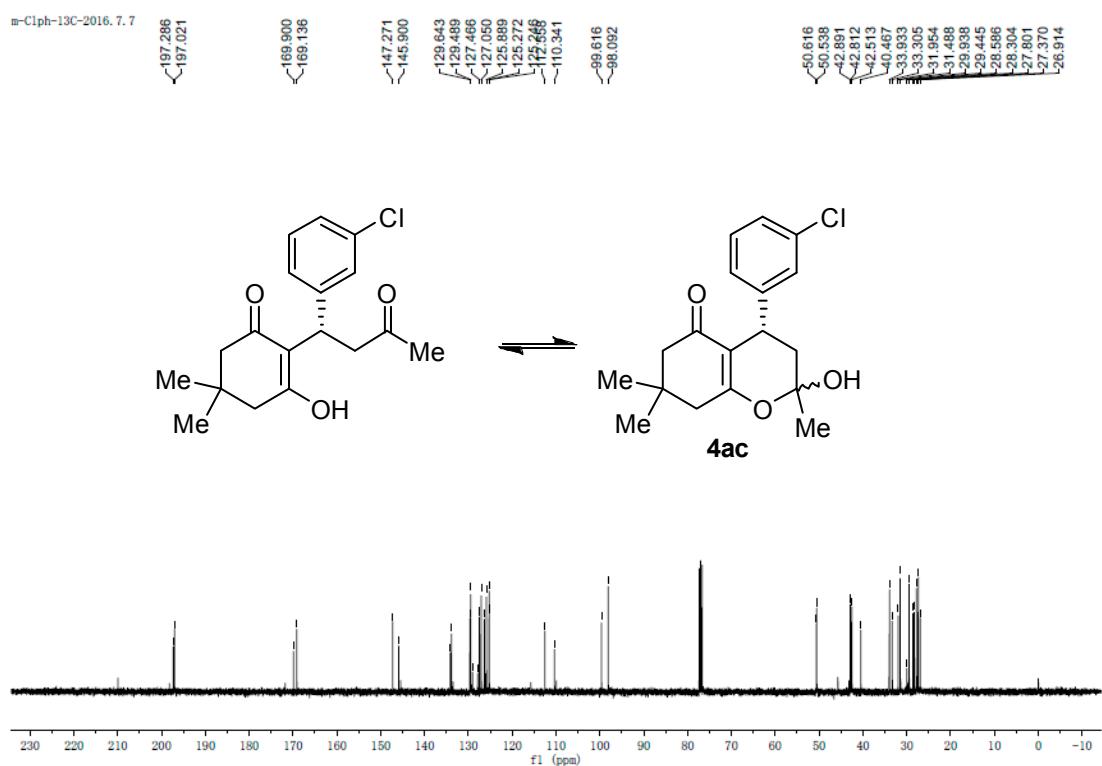
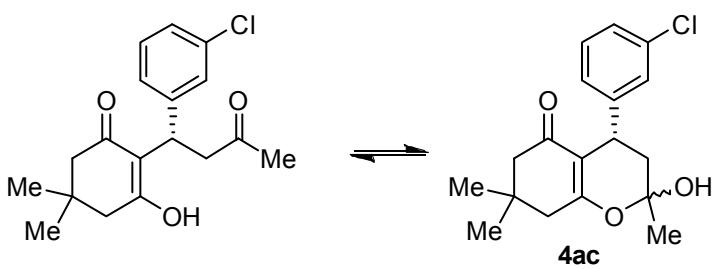
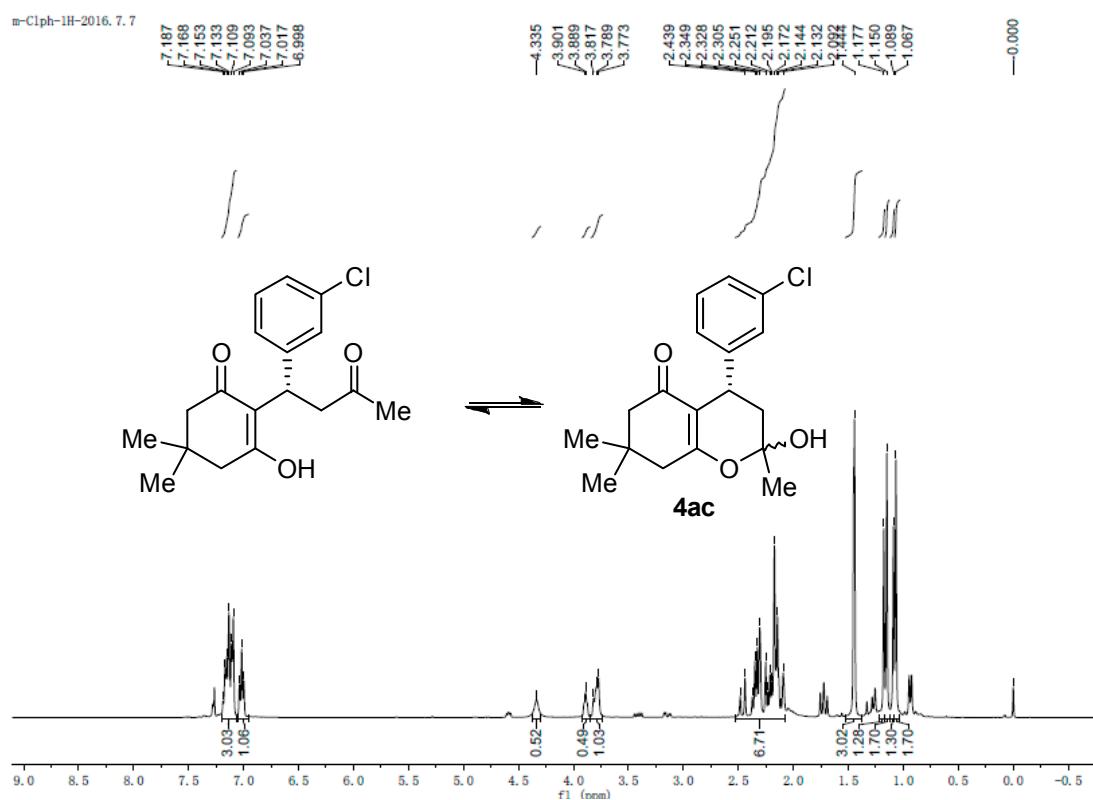
NMR spectra and HPLC chromatograms of products

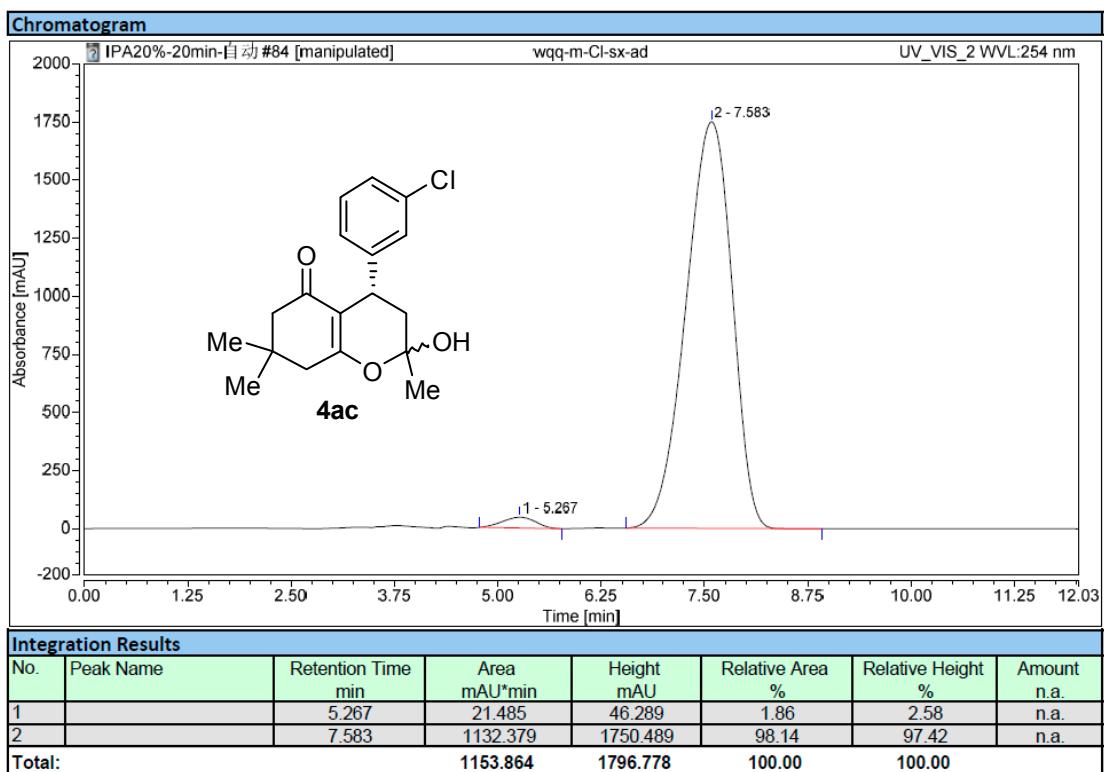
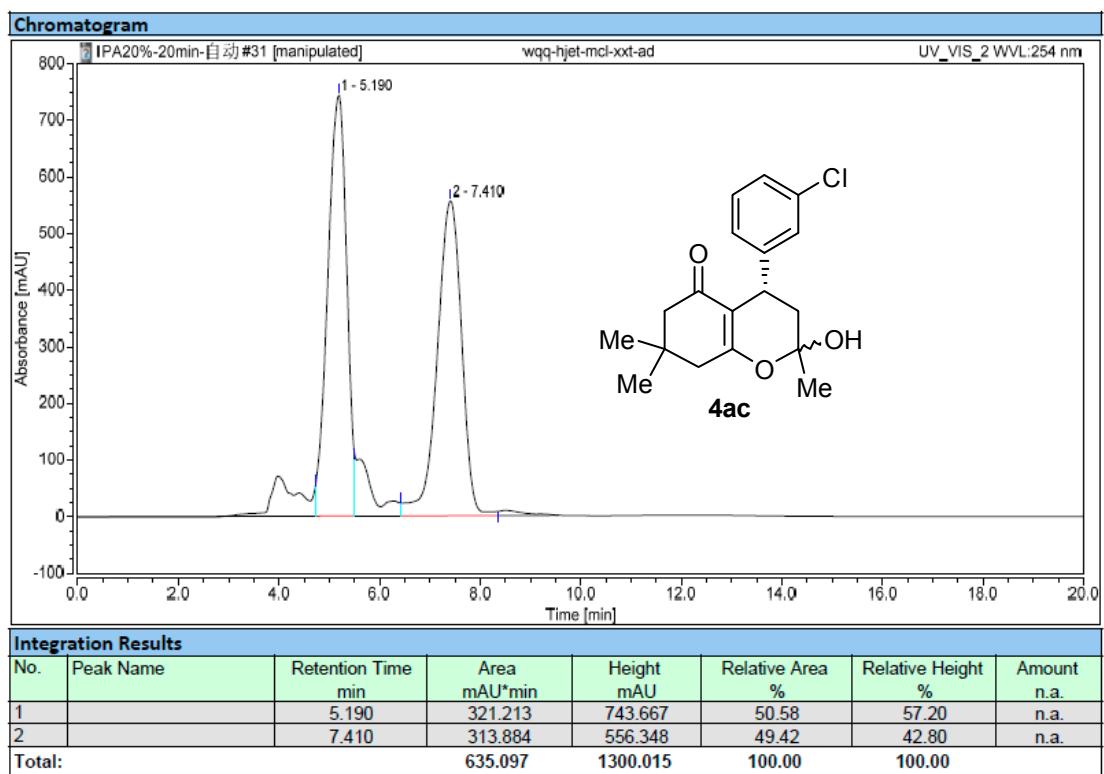


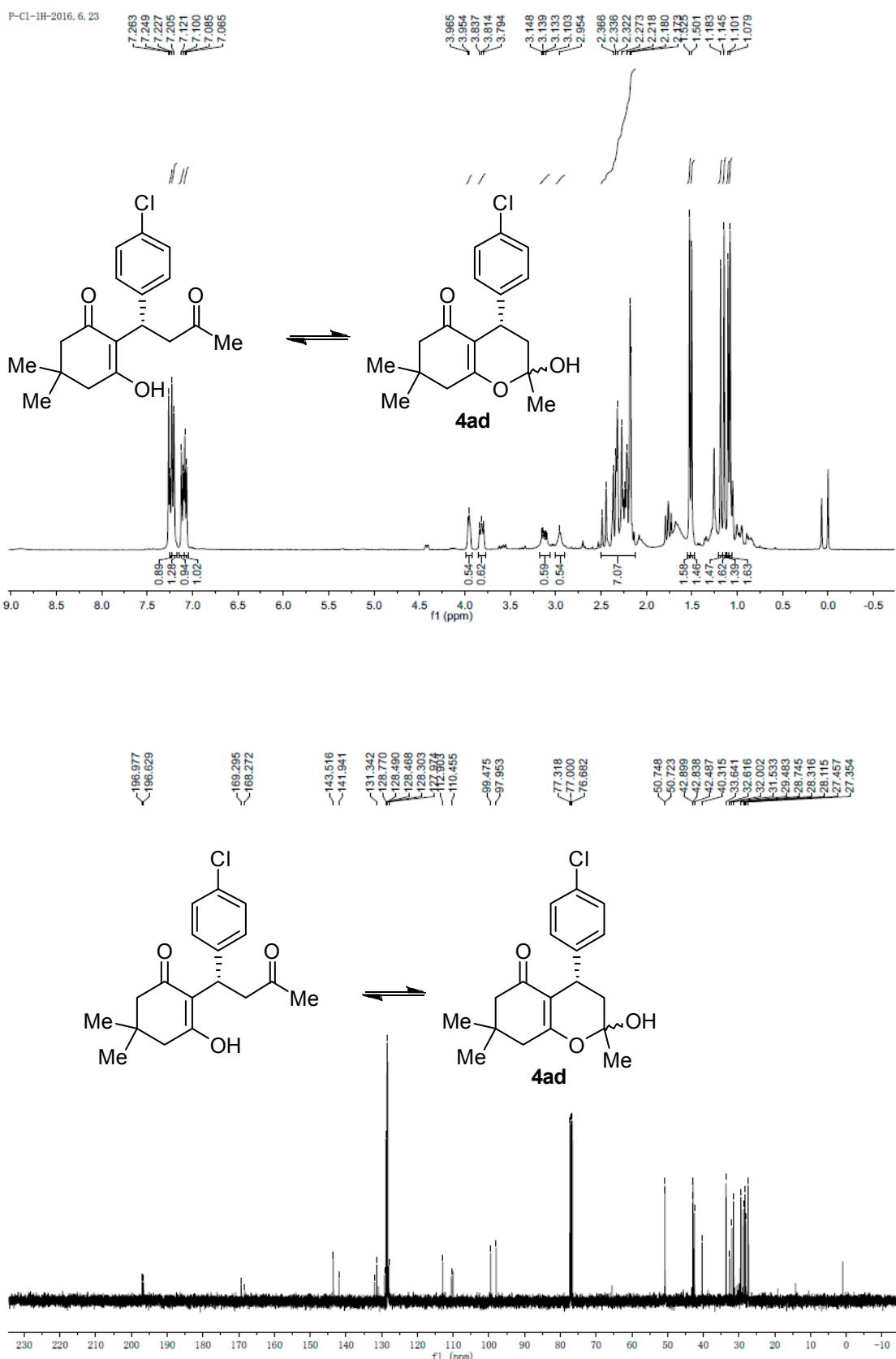


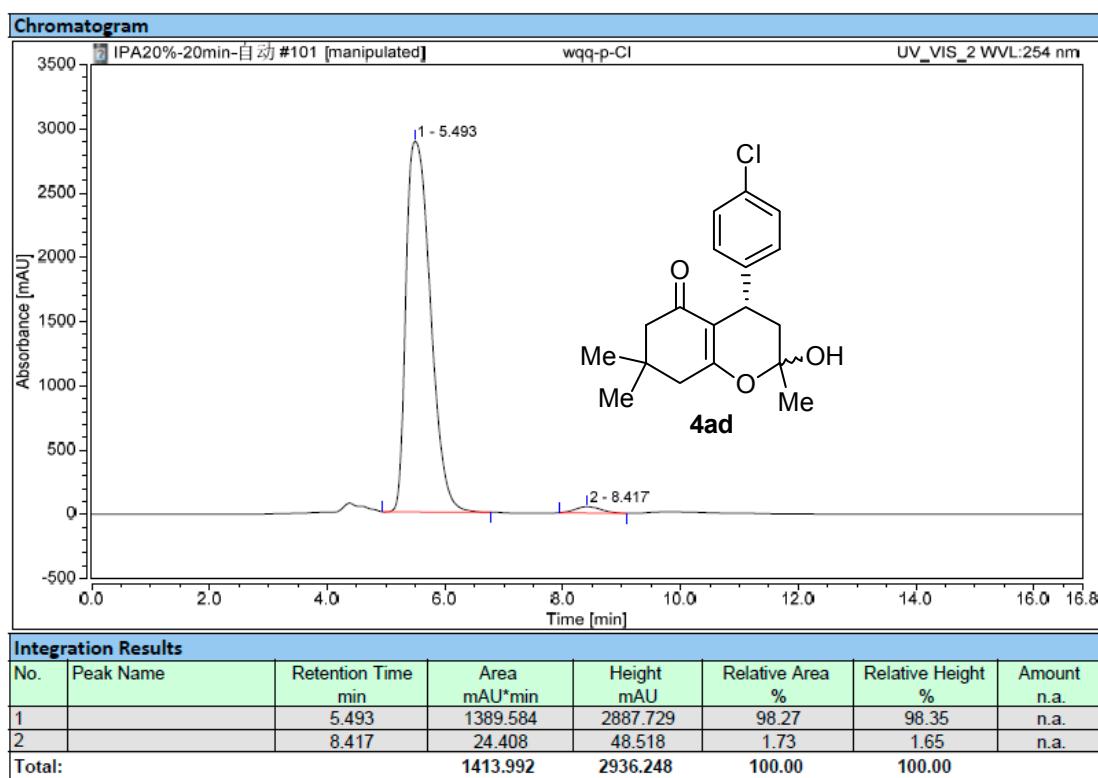
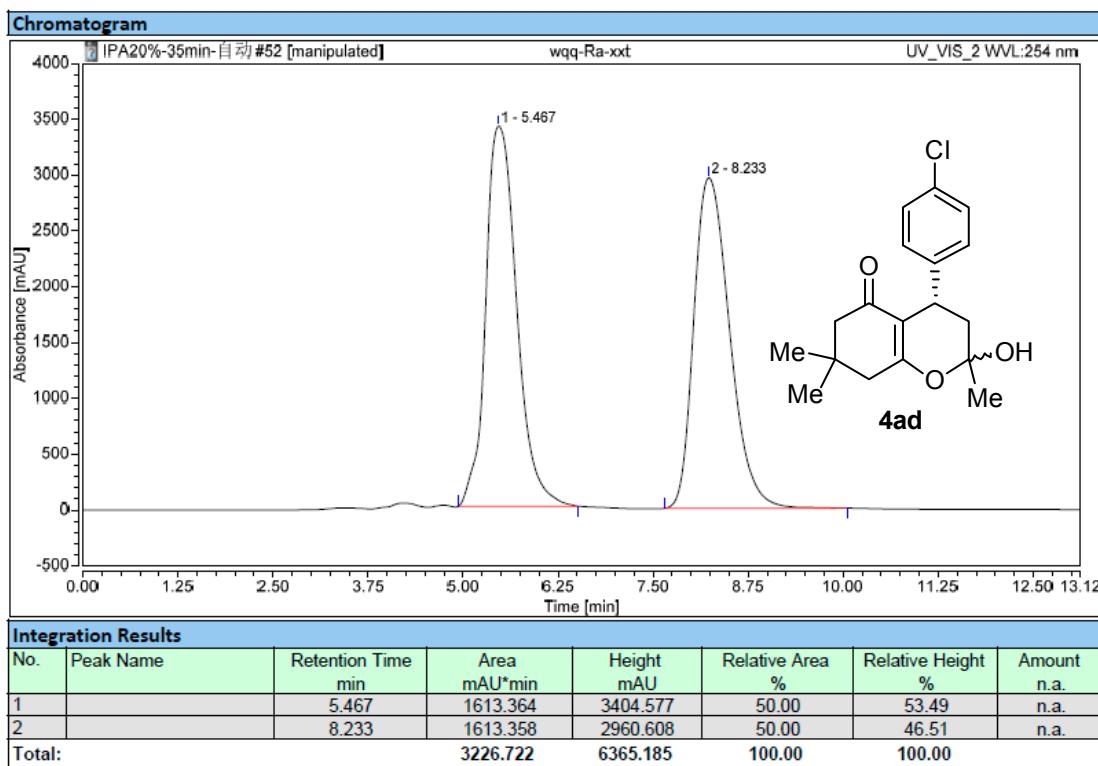


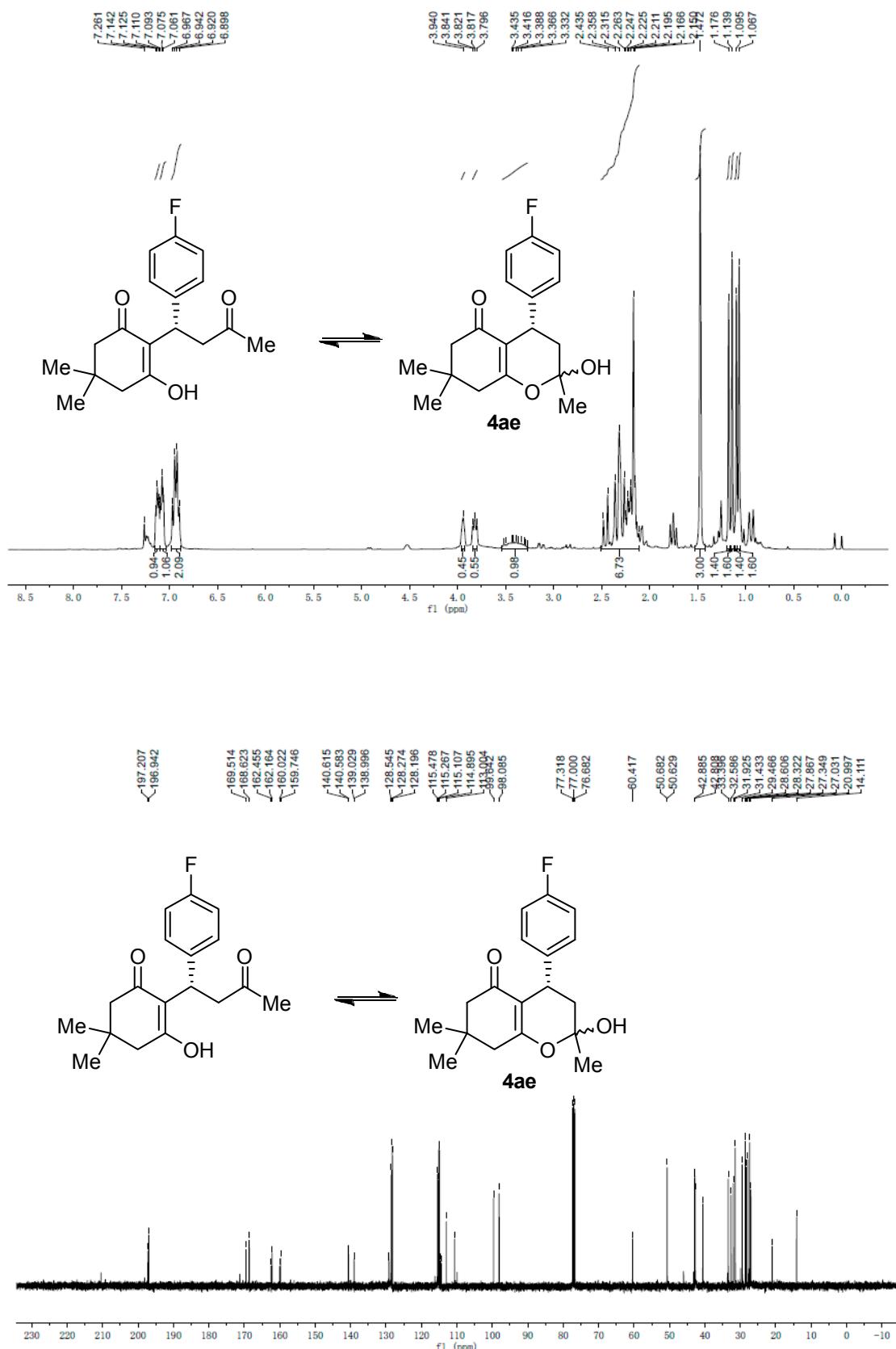


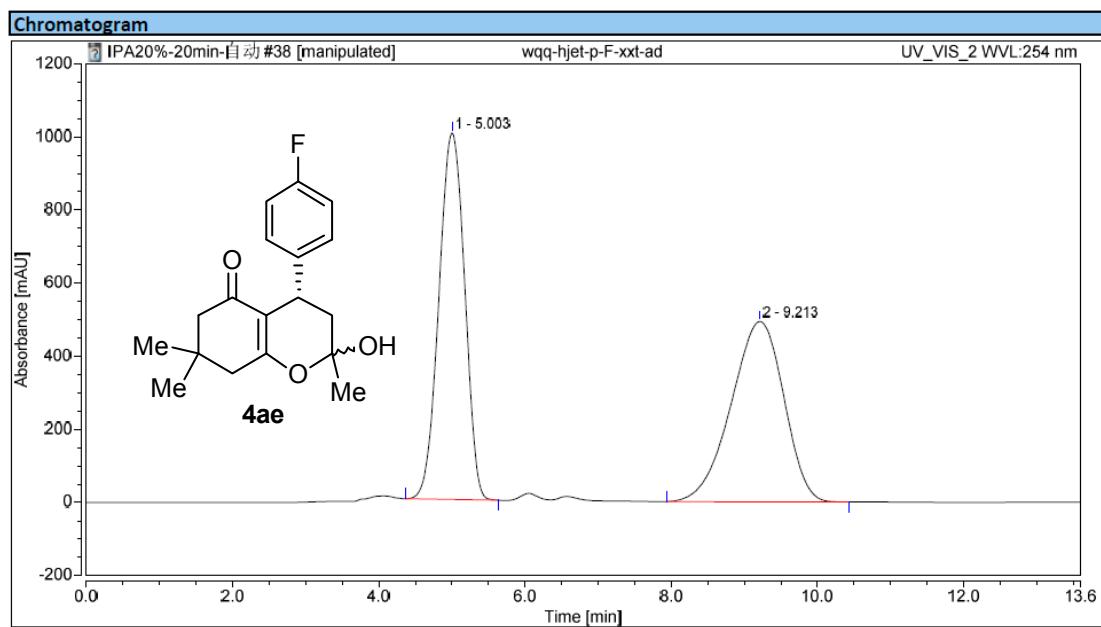






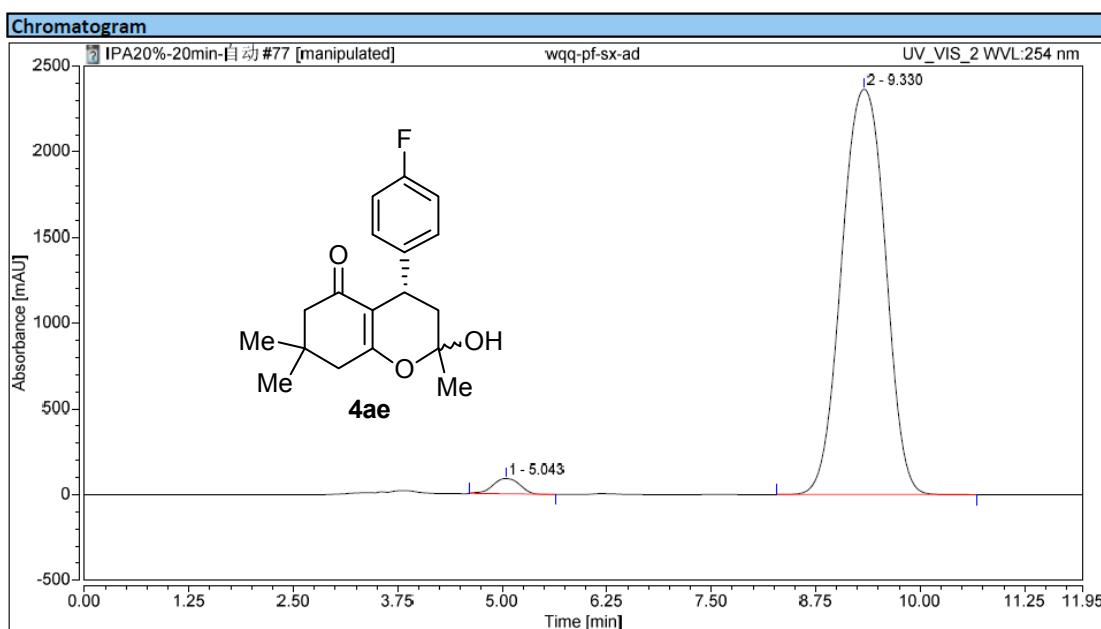






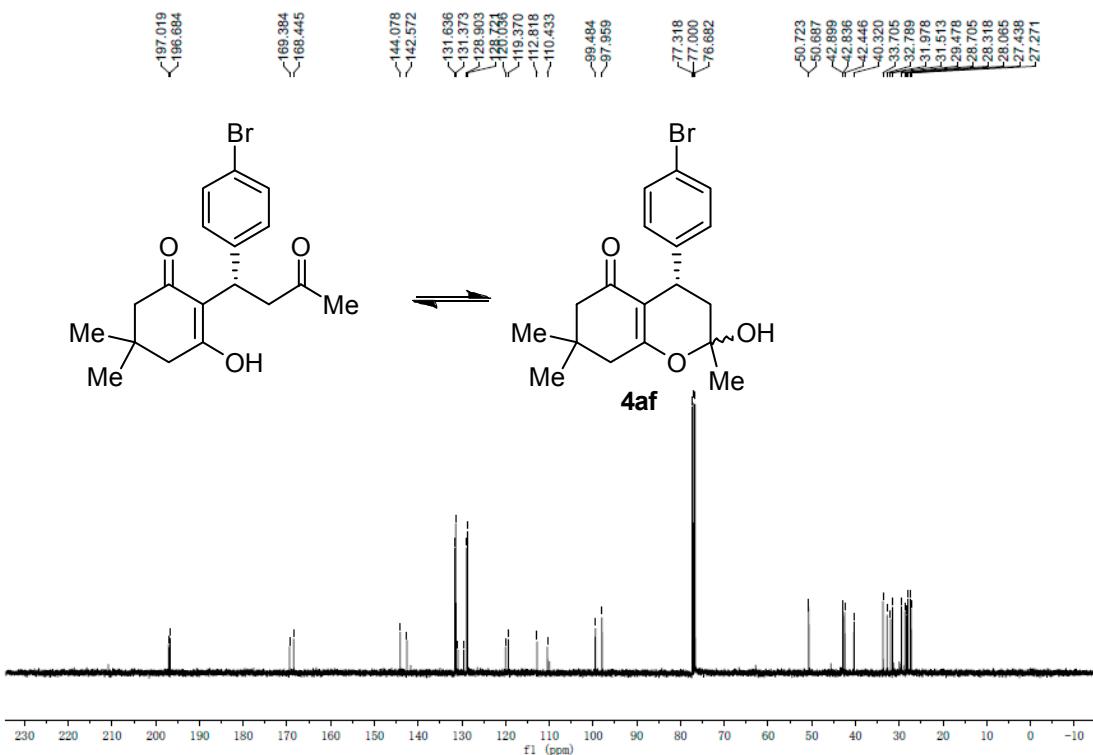
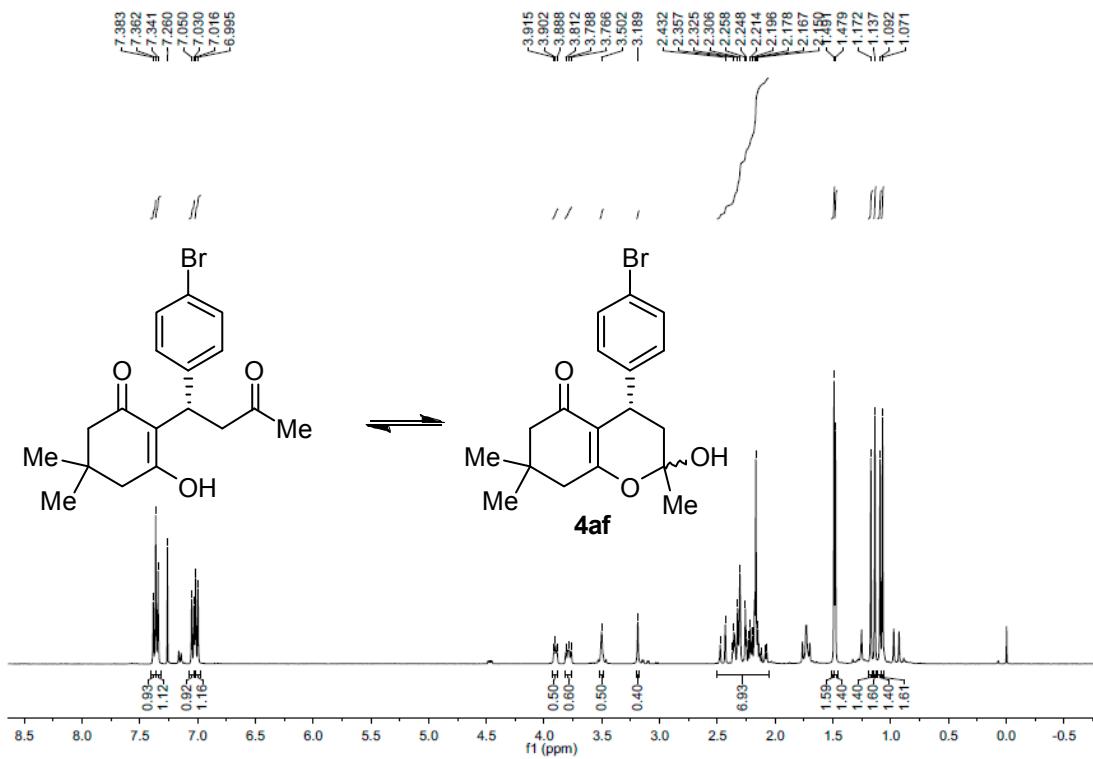
Integration Results

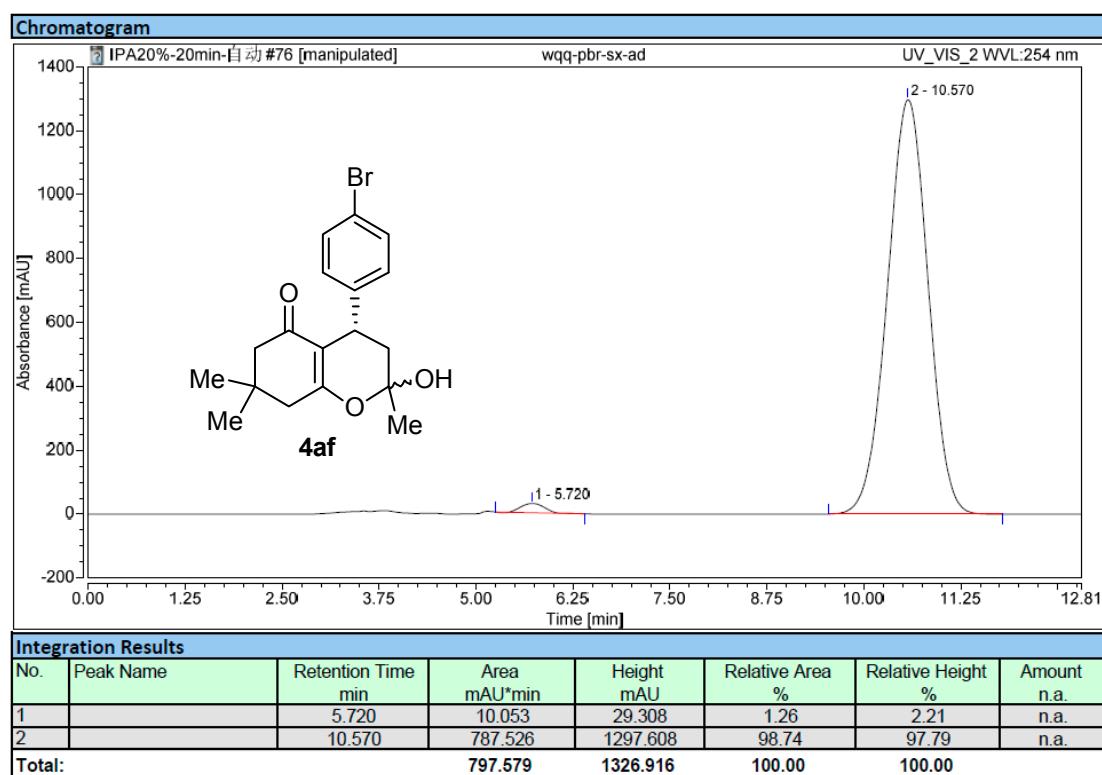
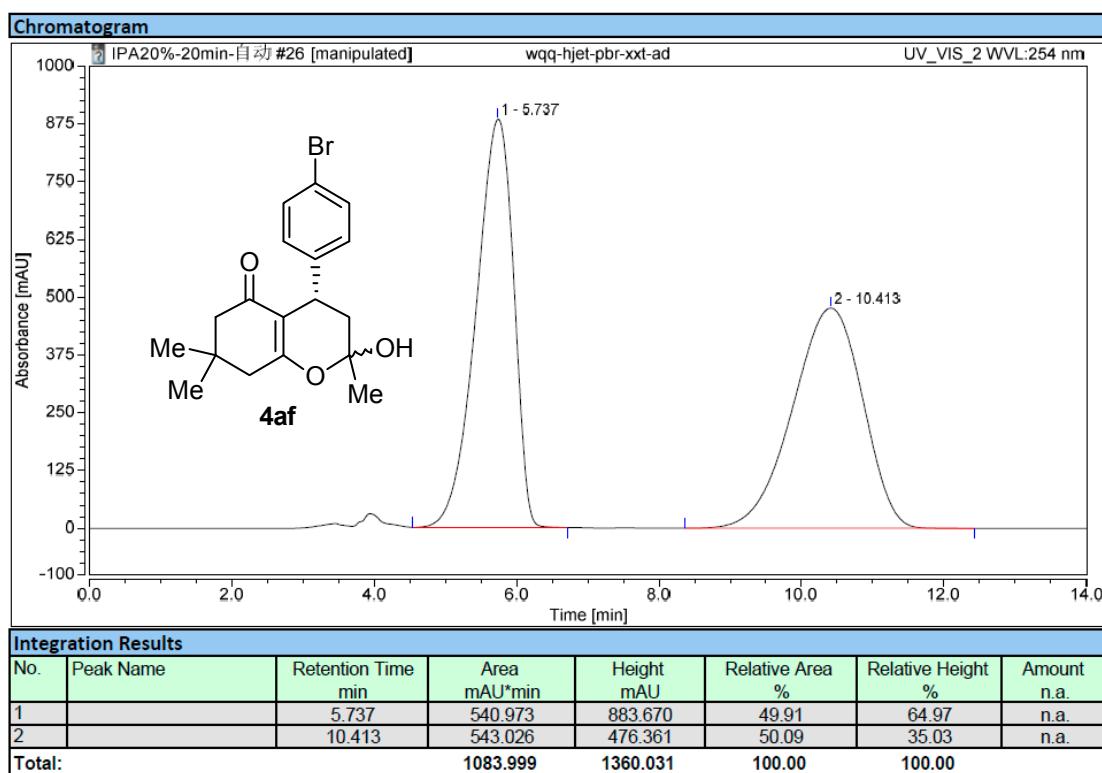
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.003	409.288	1003.007	49.83	67.03	n.a.
2		9.213	412.096	493.402	50.17	32.97	n.a.
Total:			821.384	1496.409	100.00	100.00	

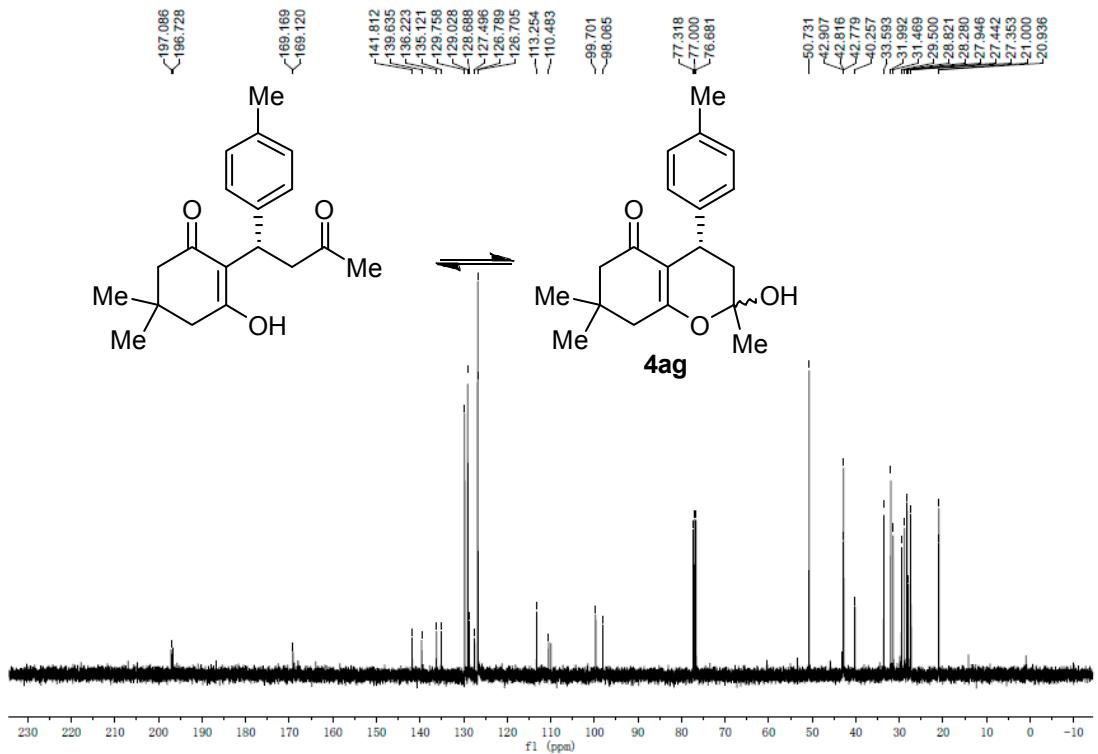
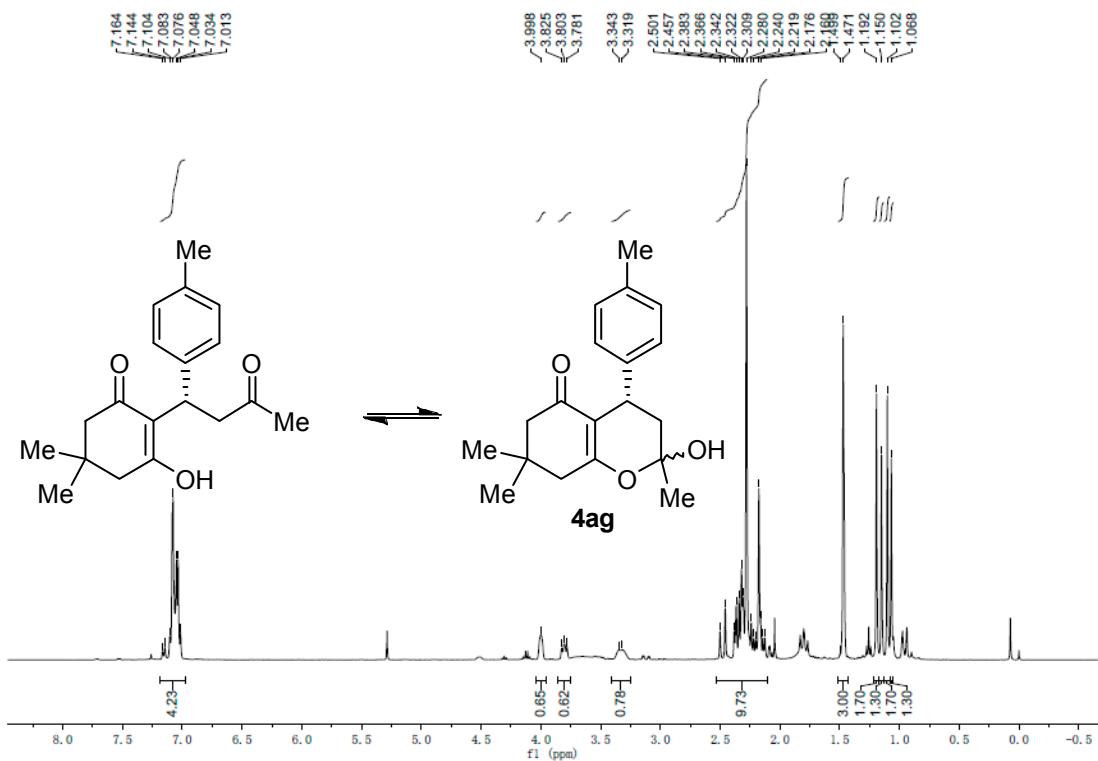


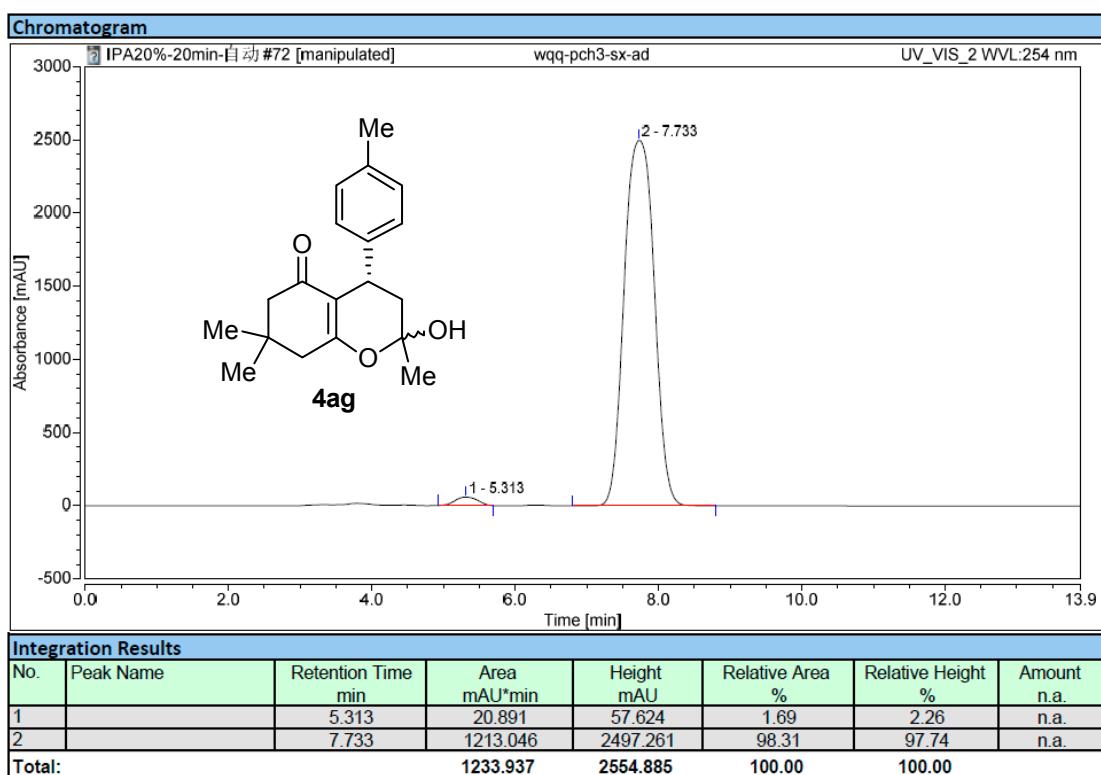
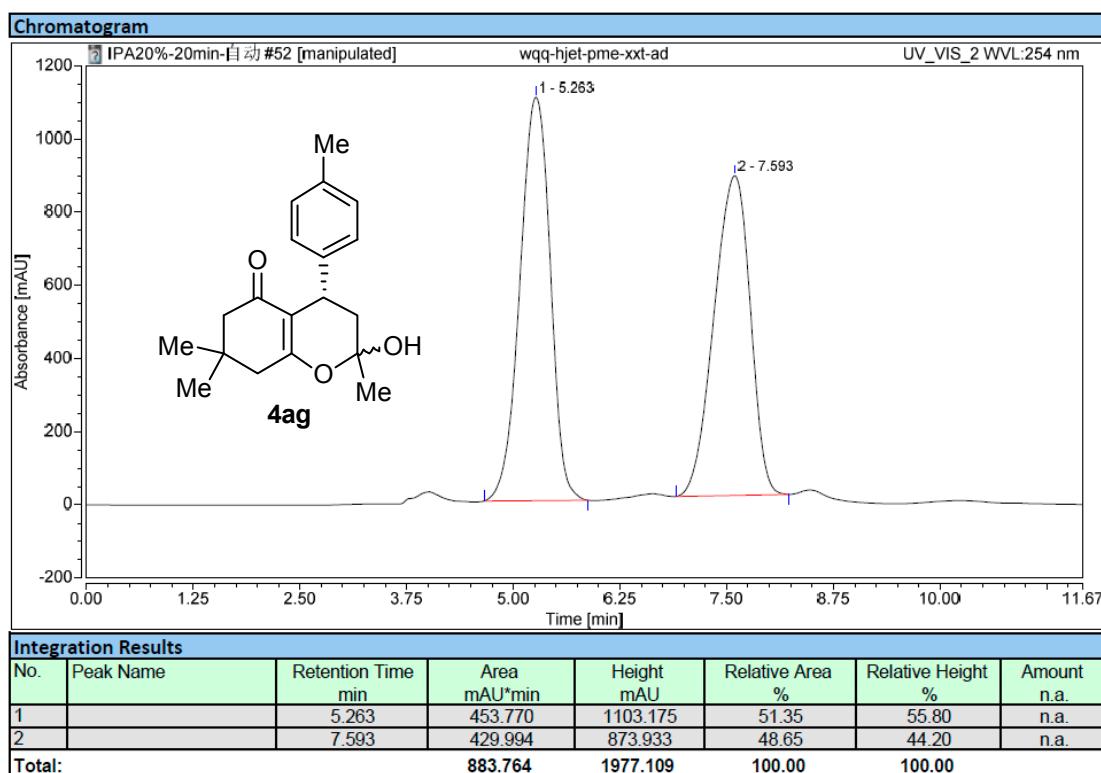
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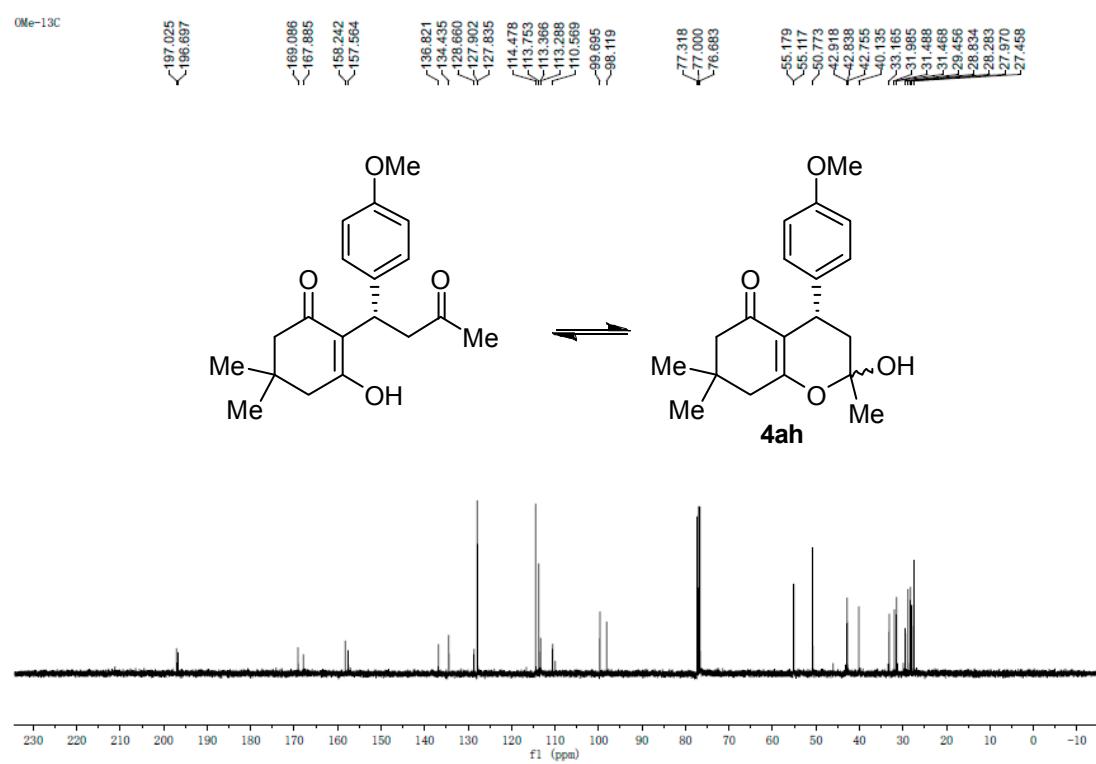
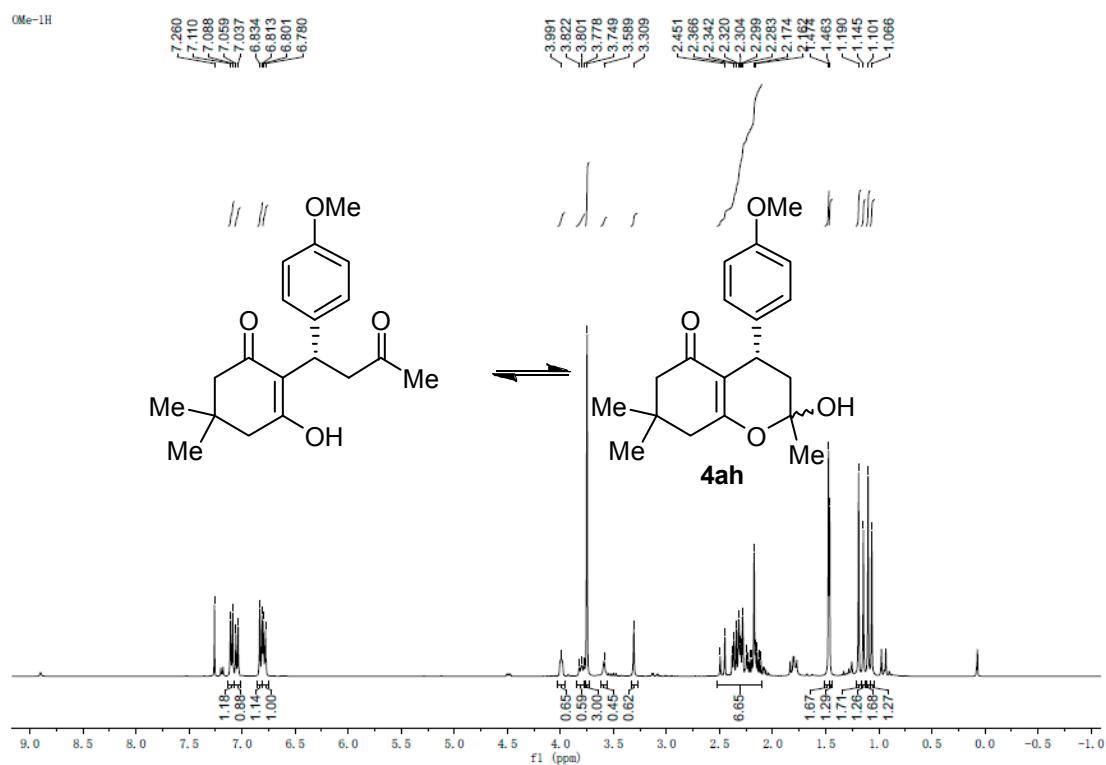
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.043	32.869	89.146	2.24	3.63	n.a.
2		9.330	1434.374	2364.527	97.76	96.37	n.a.
Total:			1467.243	2453.673	100.00	100.00	

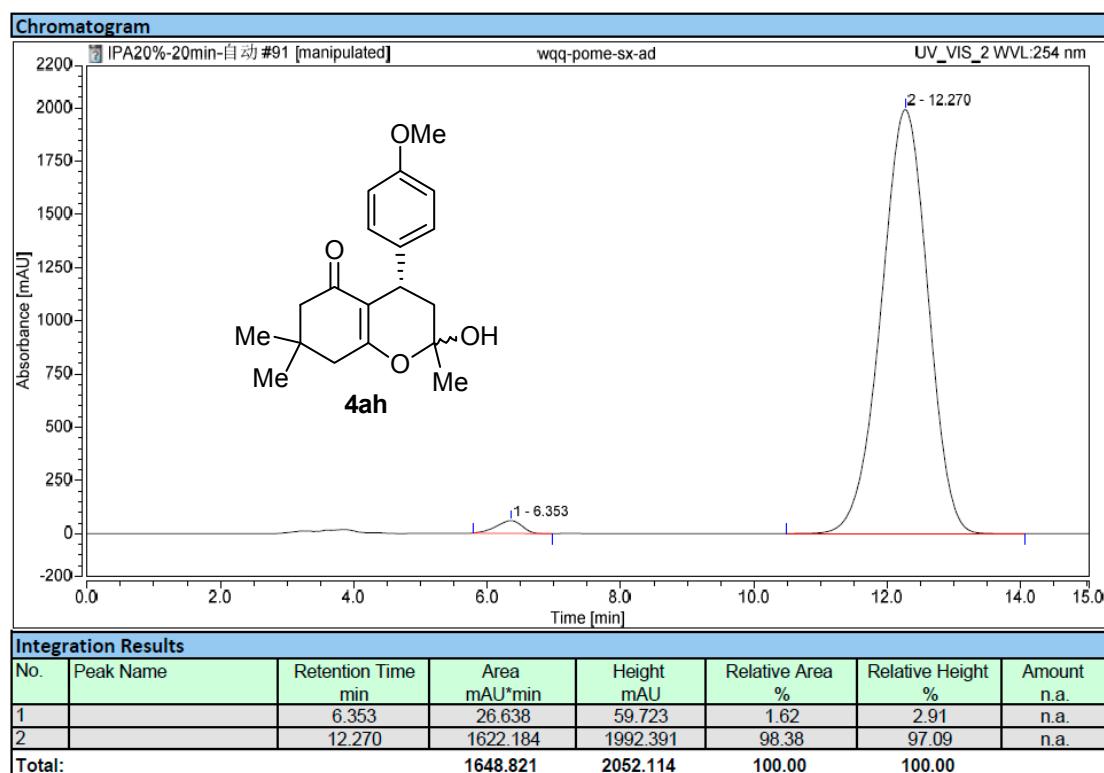
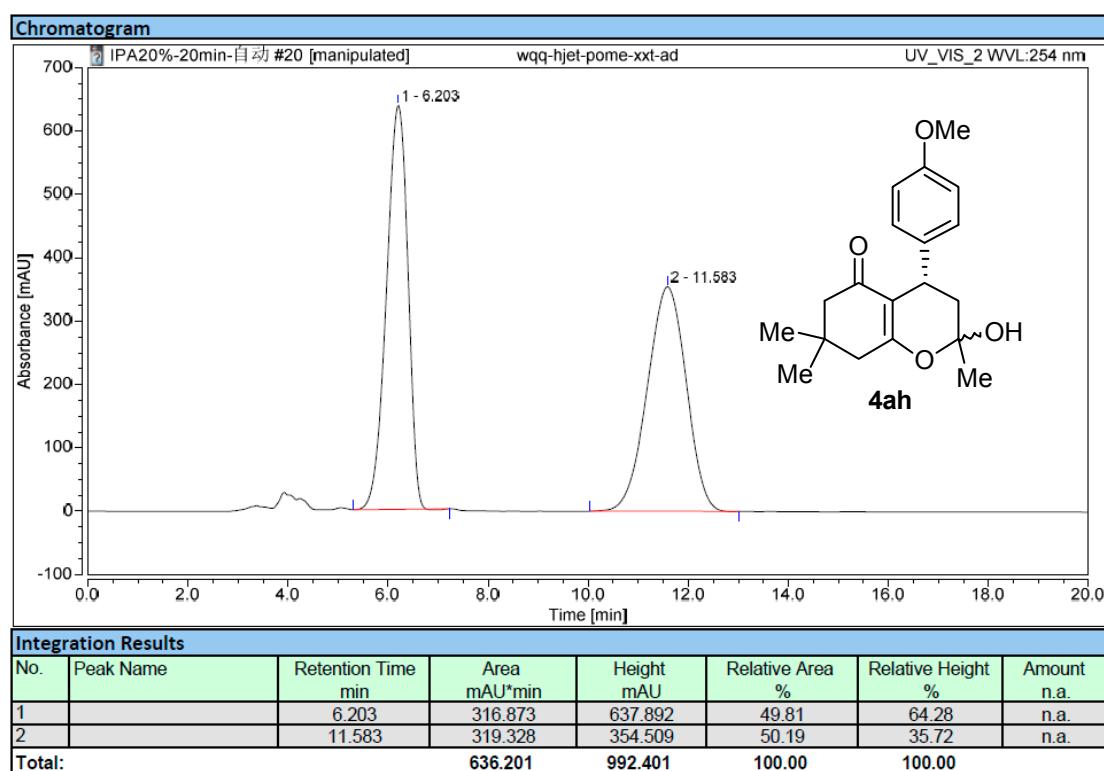


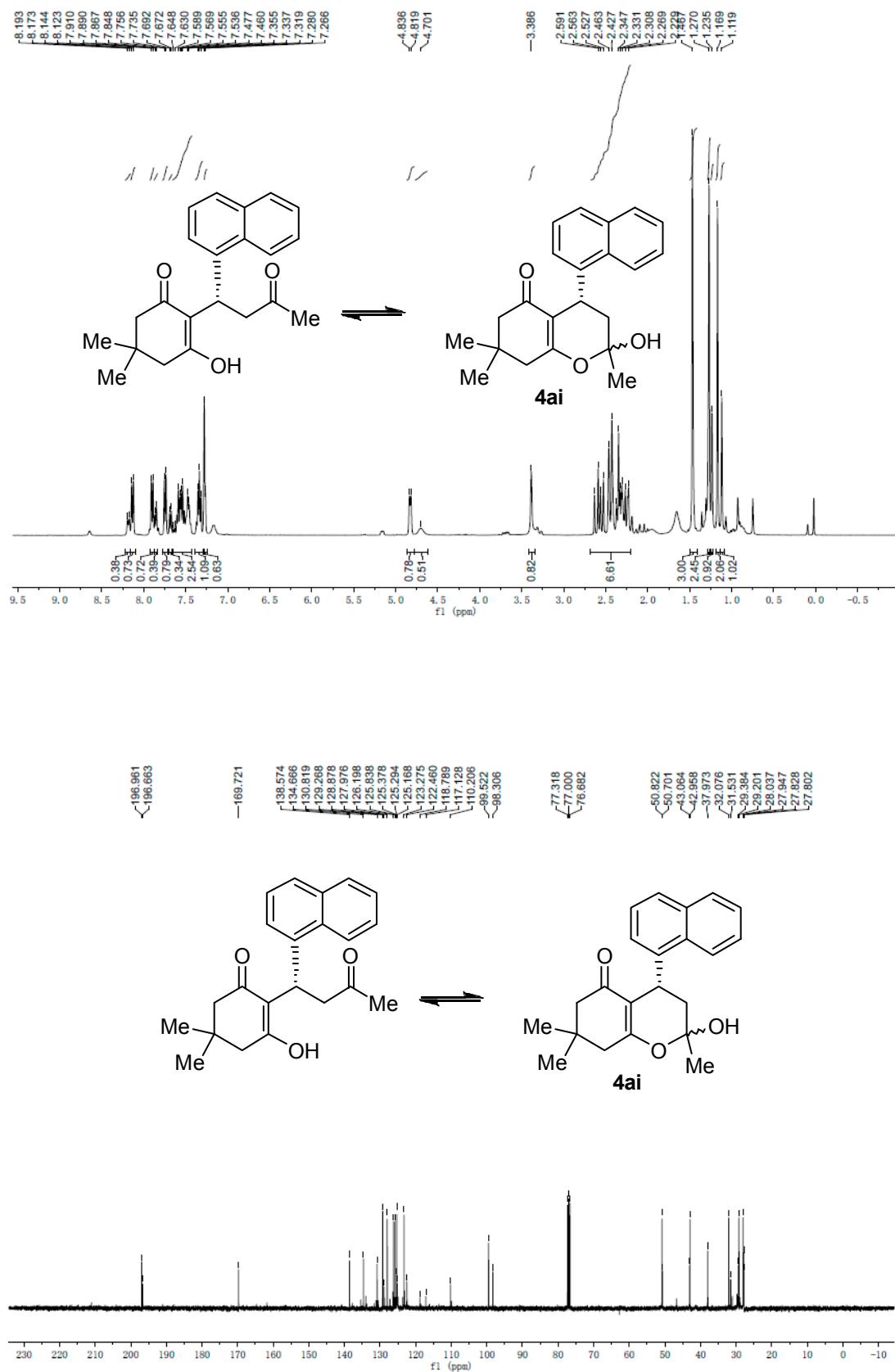


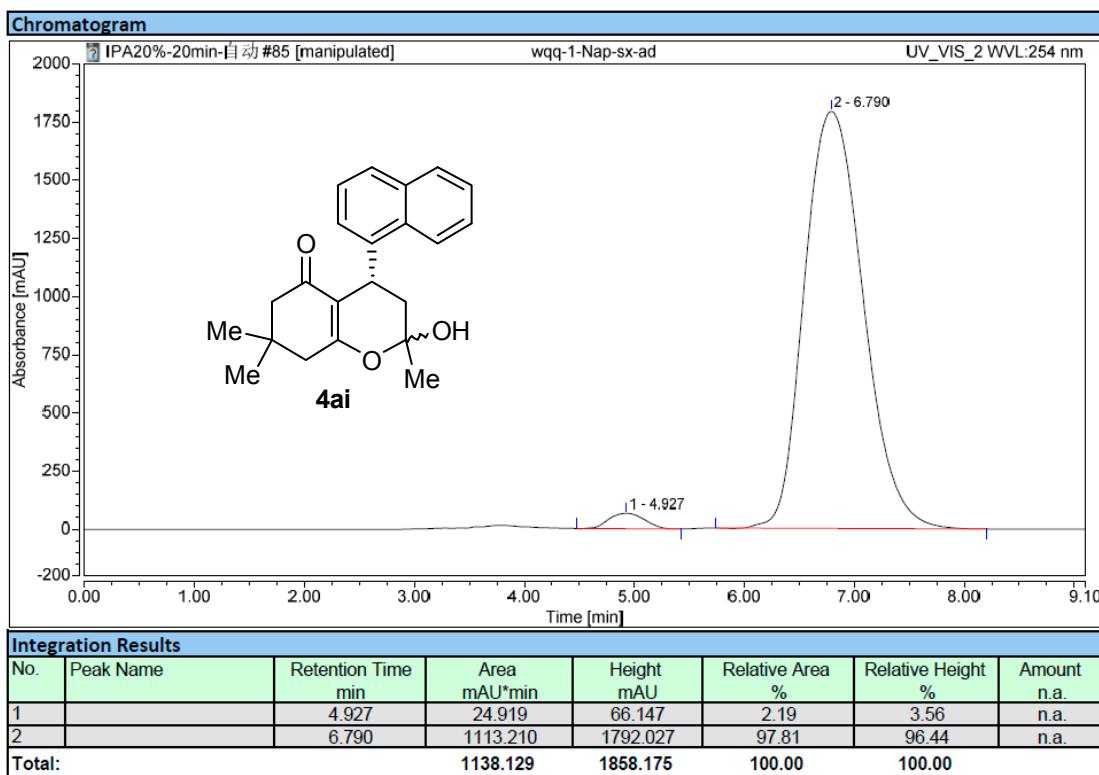
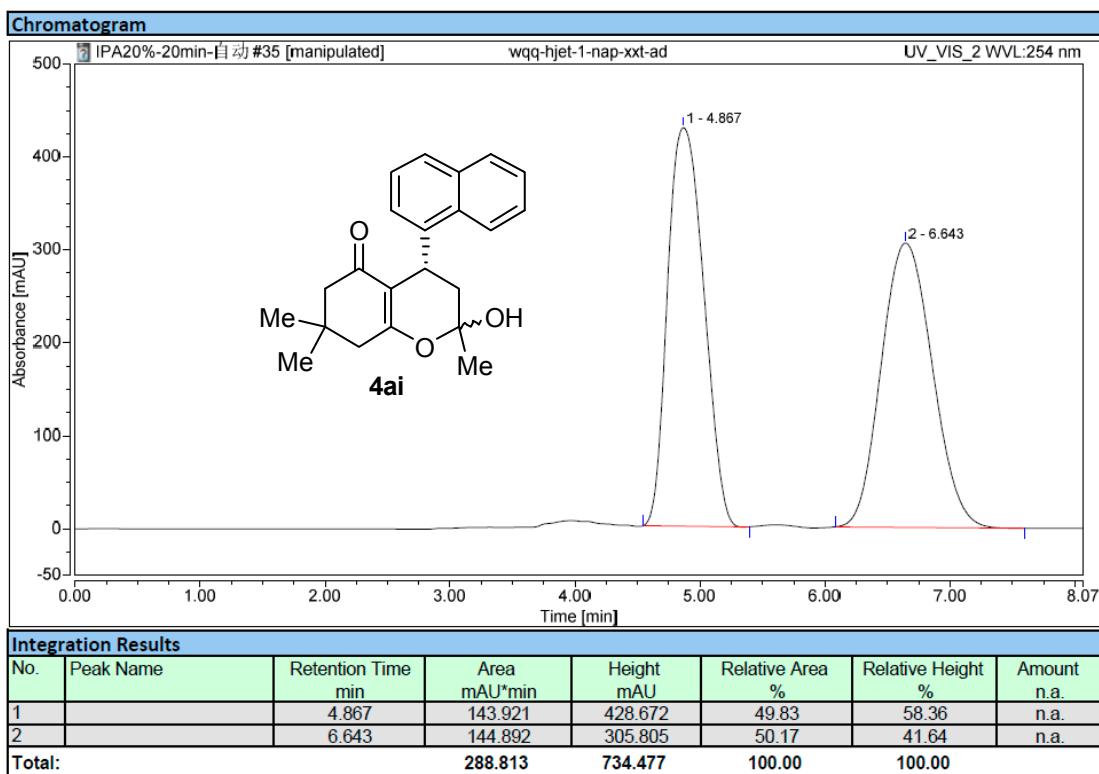


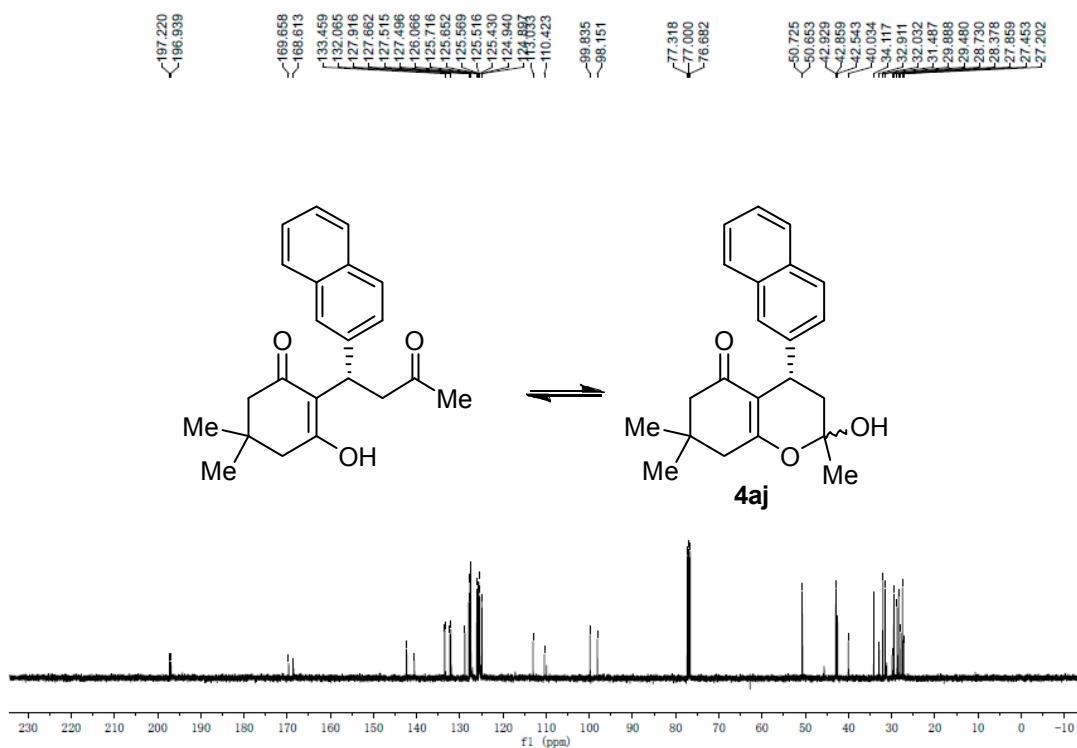
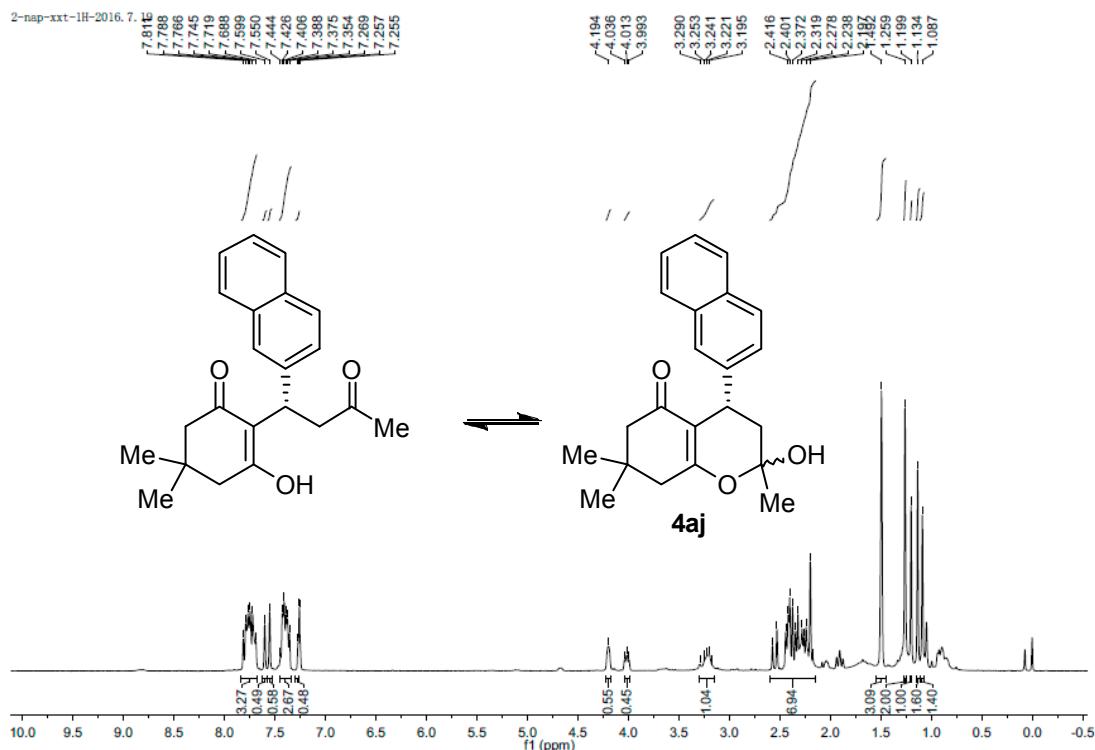


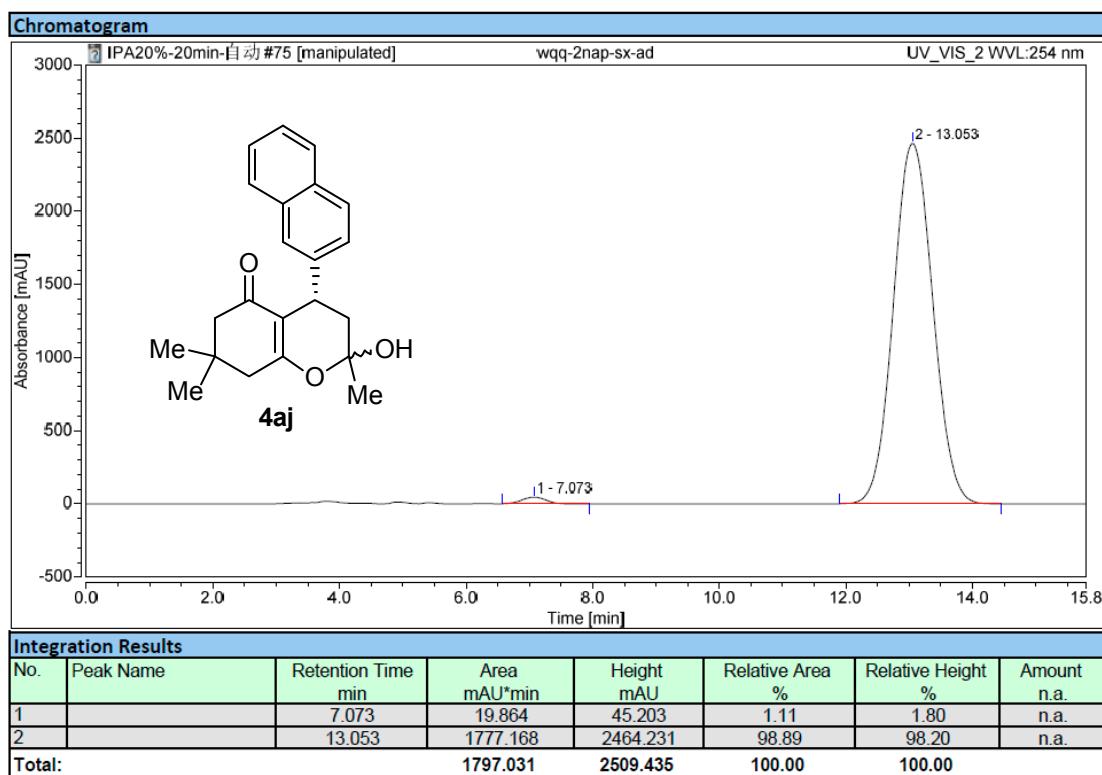
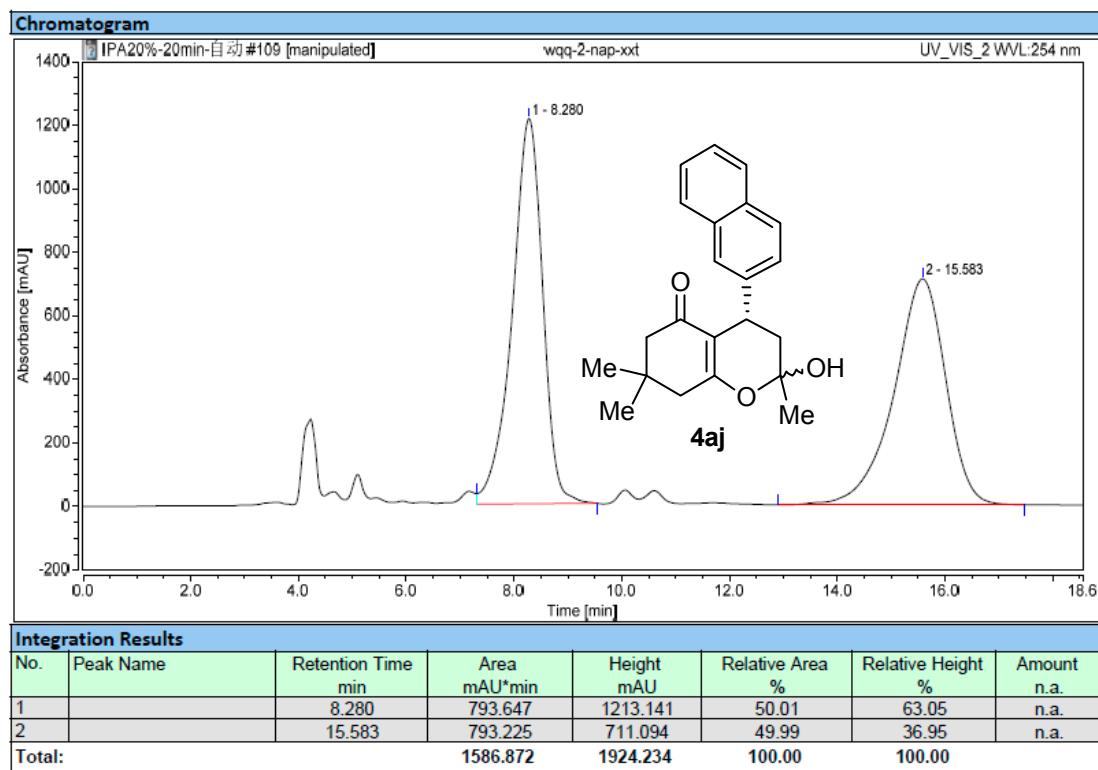


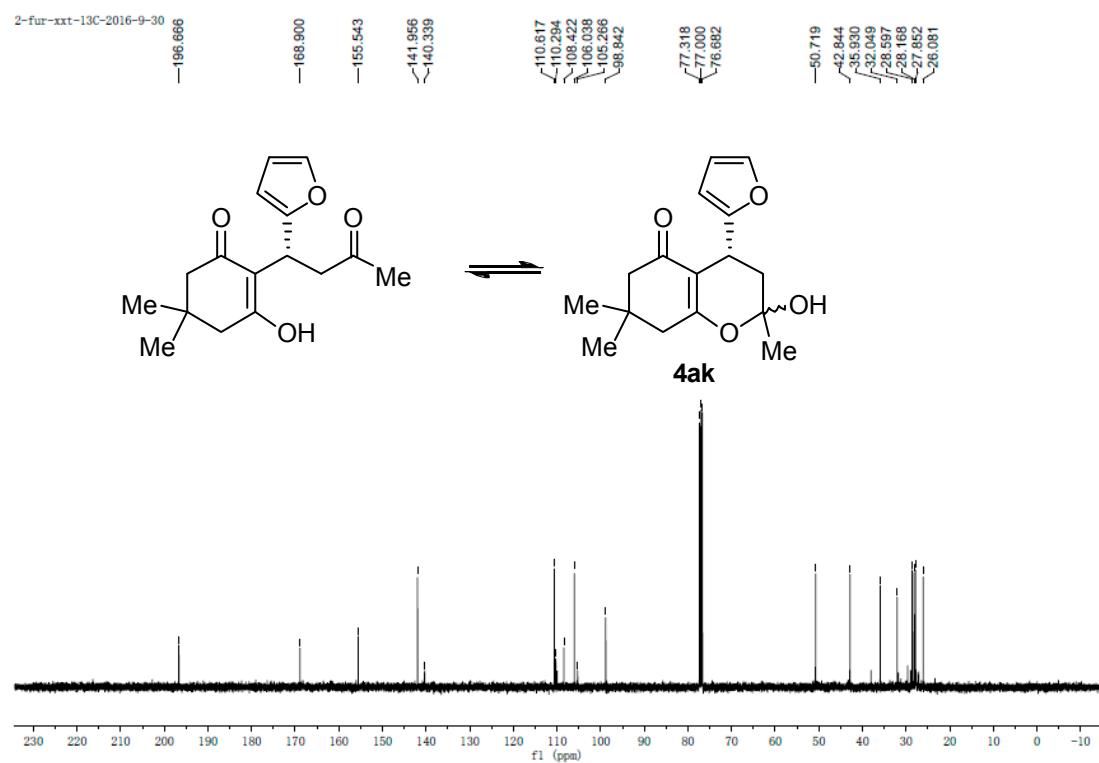
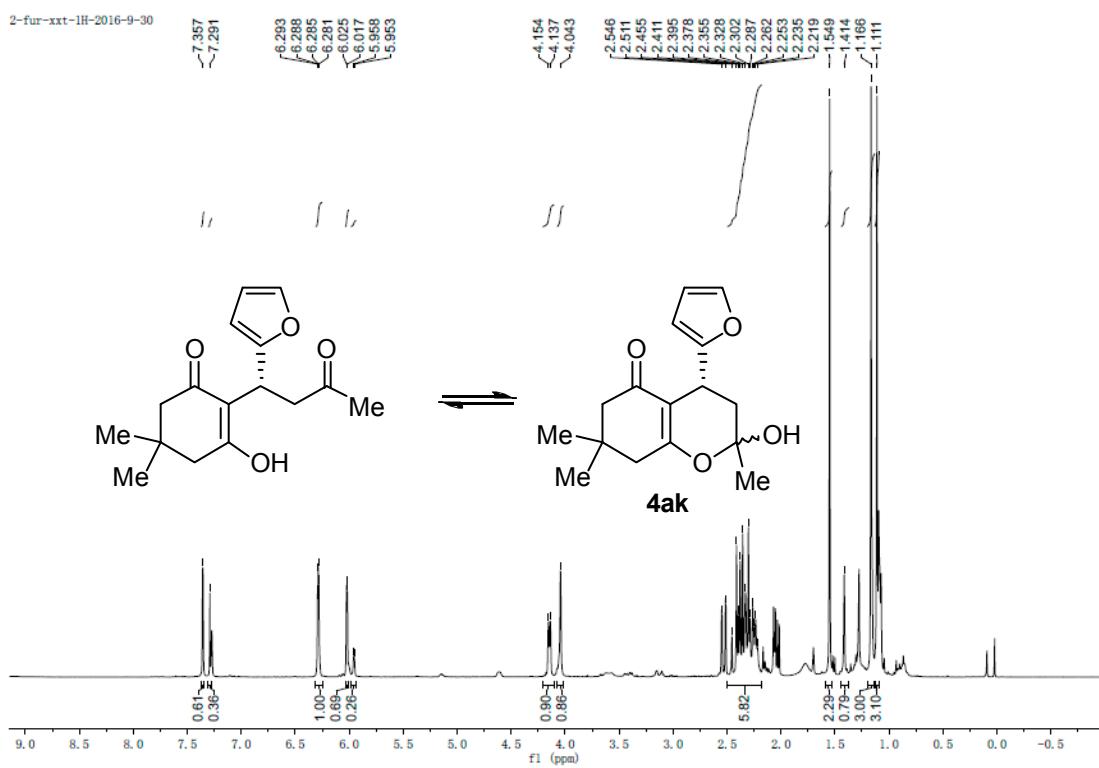


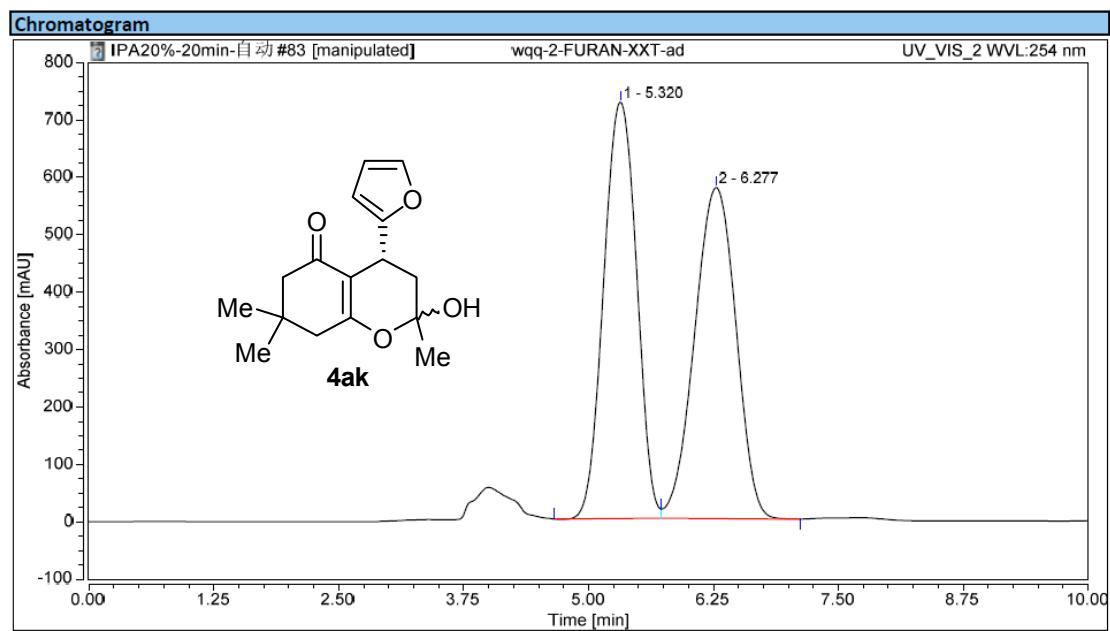




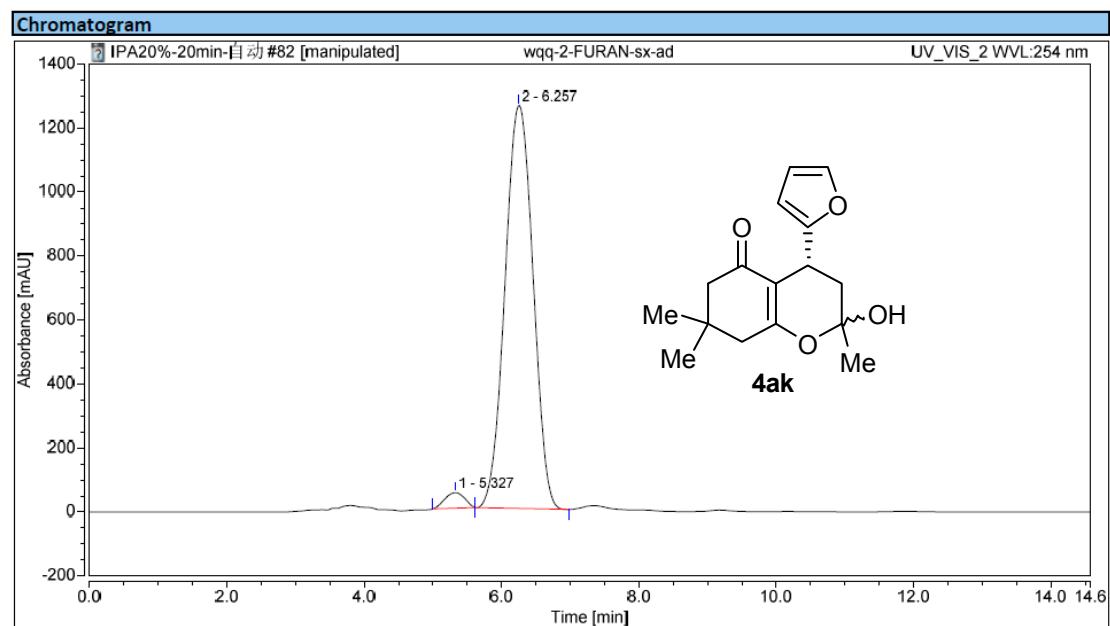






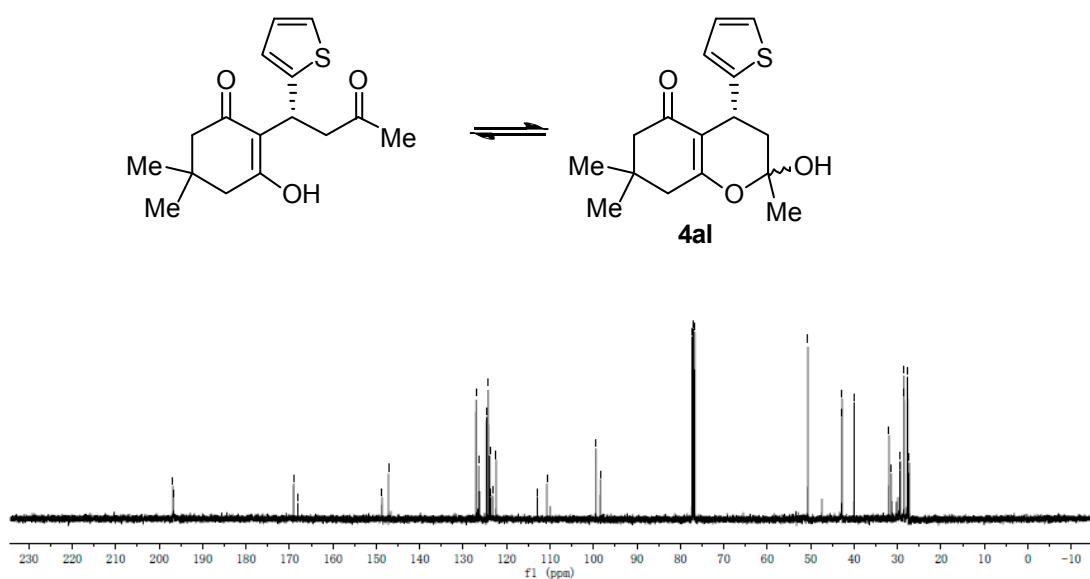
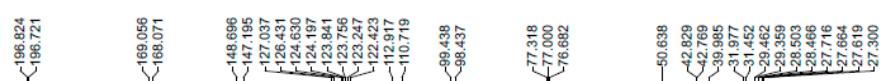
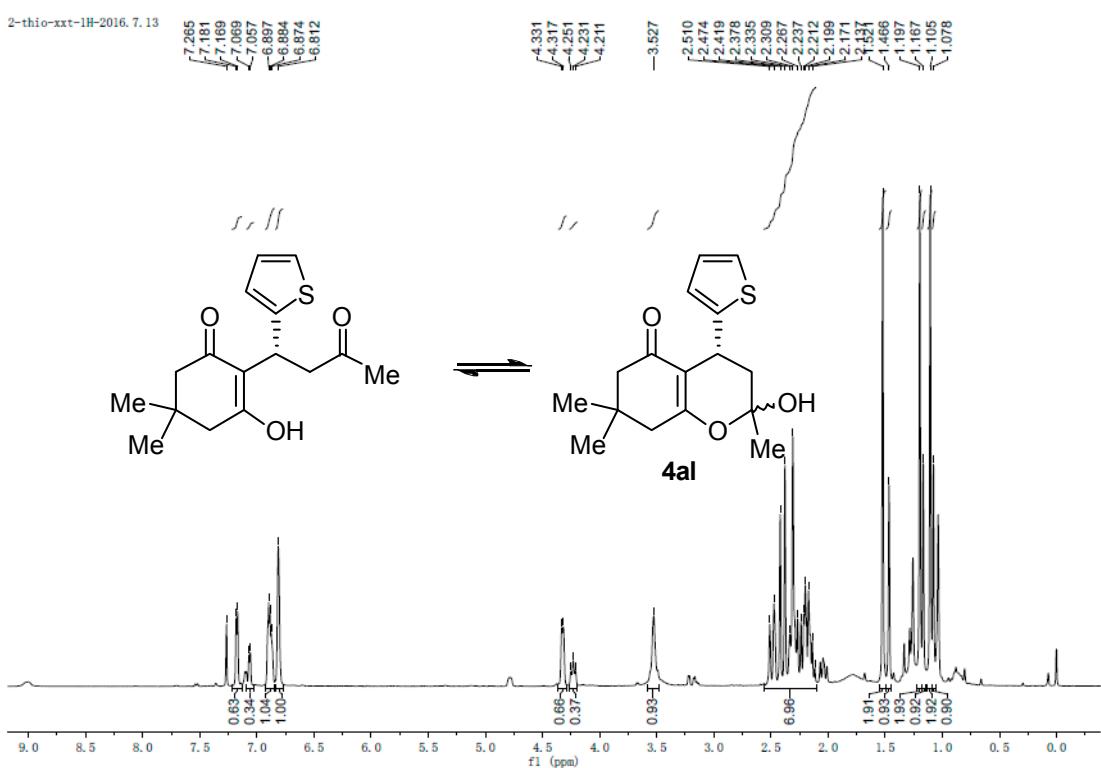


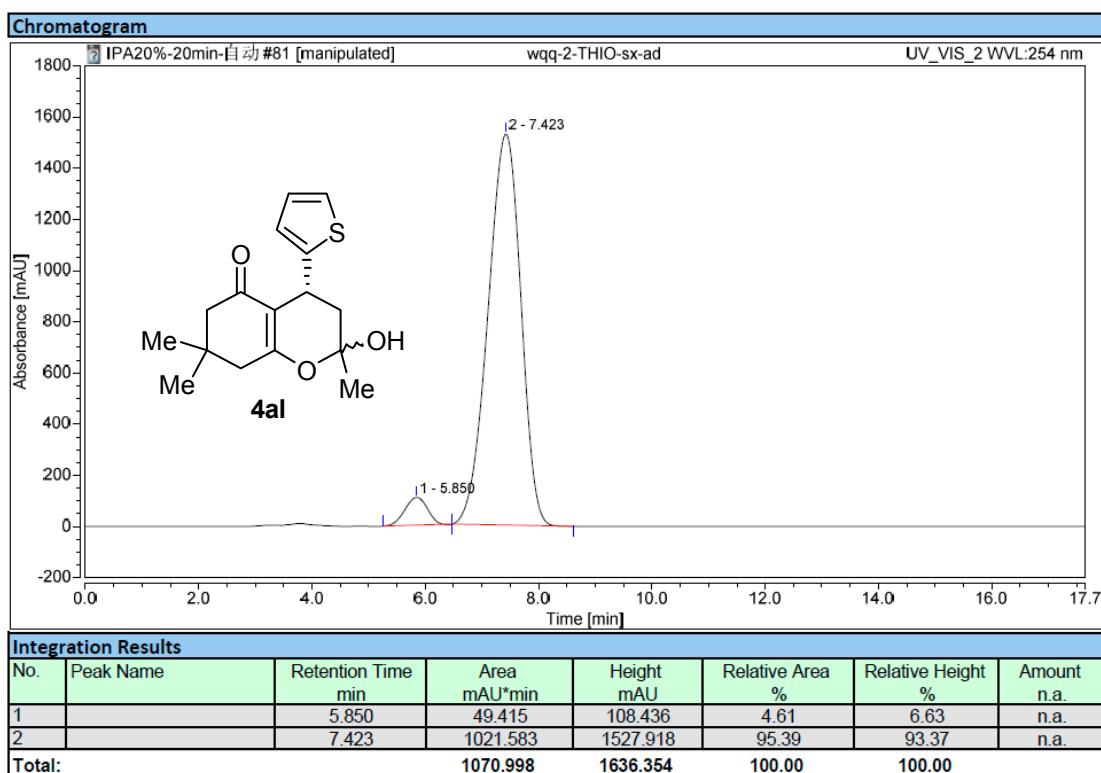
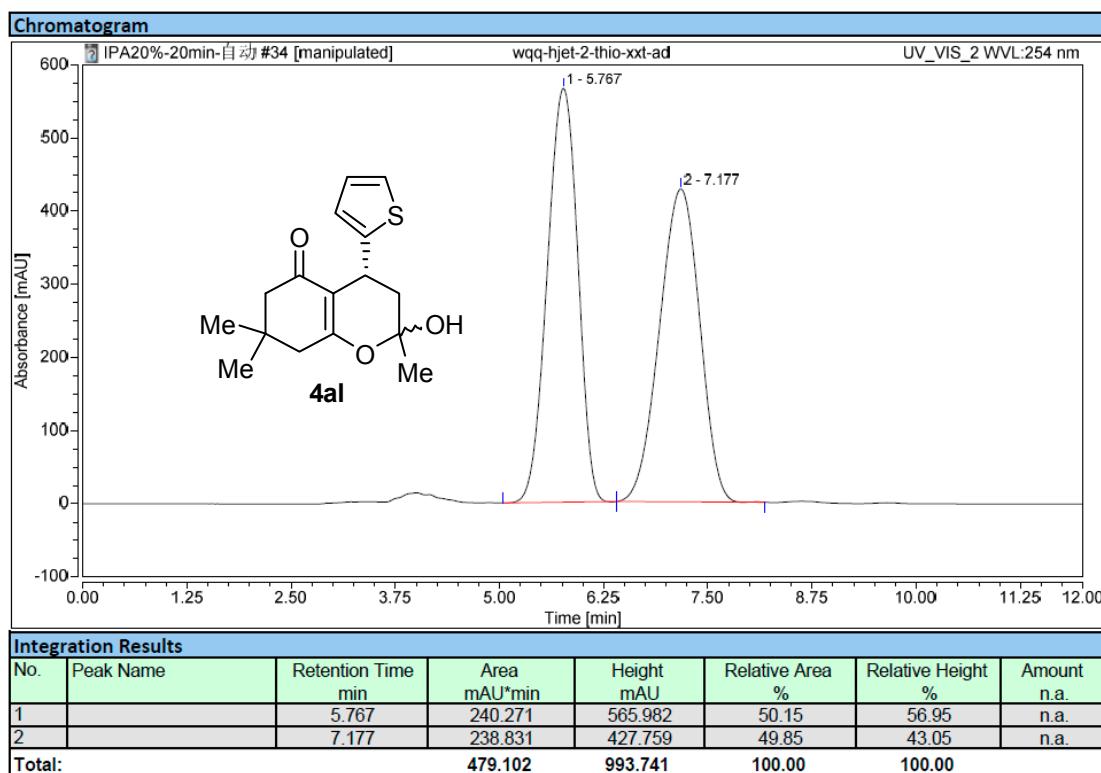
Integration Results							
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.320	276.320	725.621	50.01	55.71	n.a.
2		6.277	276.219	576.859	49.99	44.29	n.a.
Total:			552.539	1302.480	100.00	100.00	

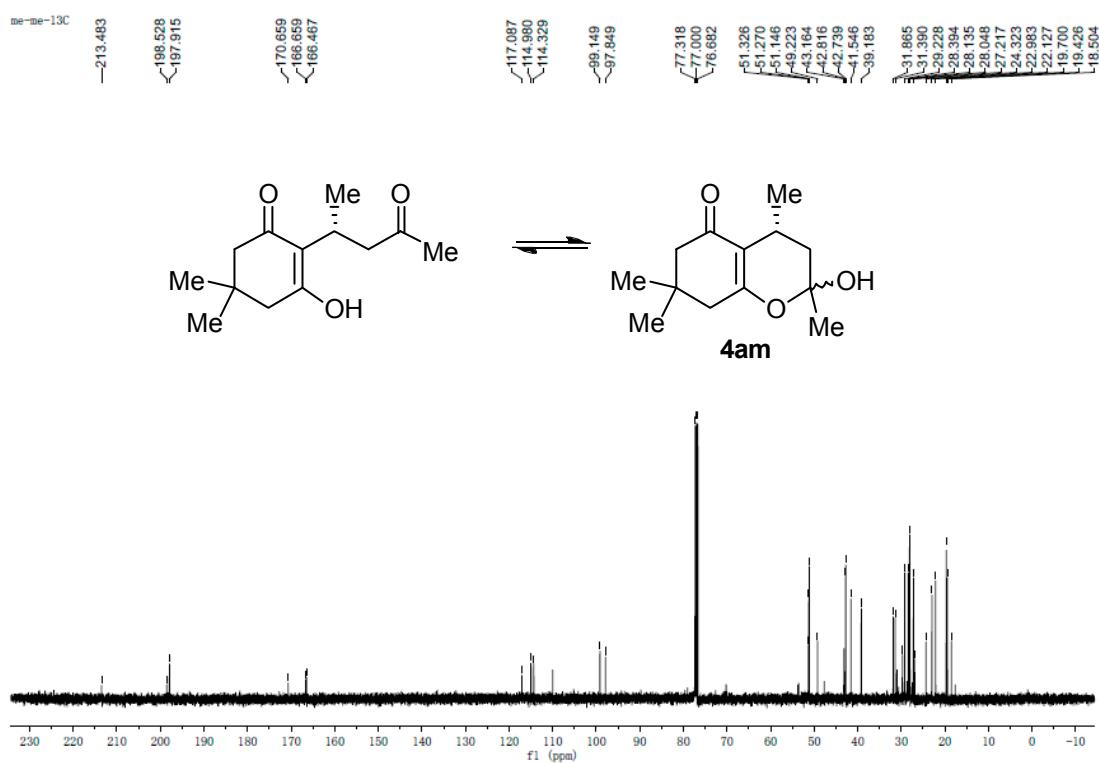
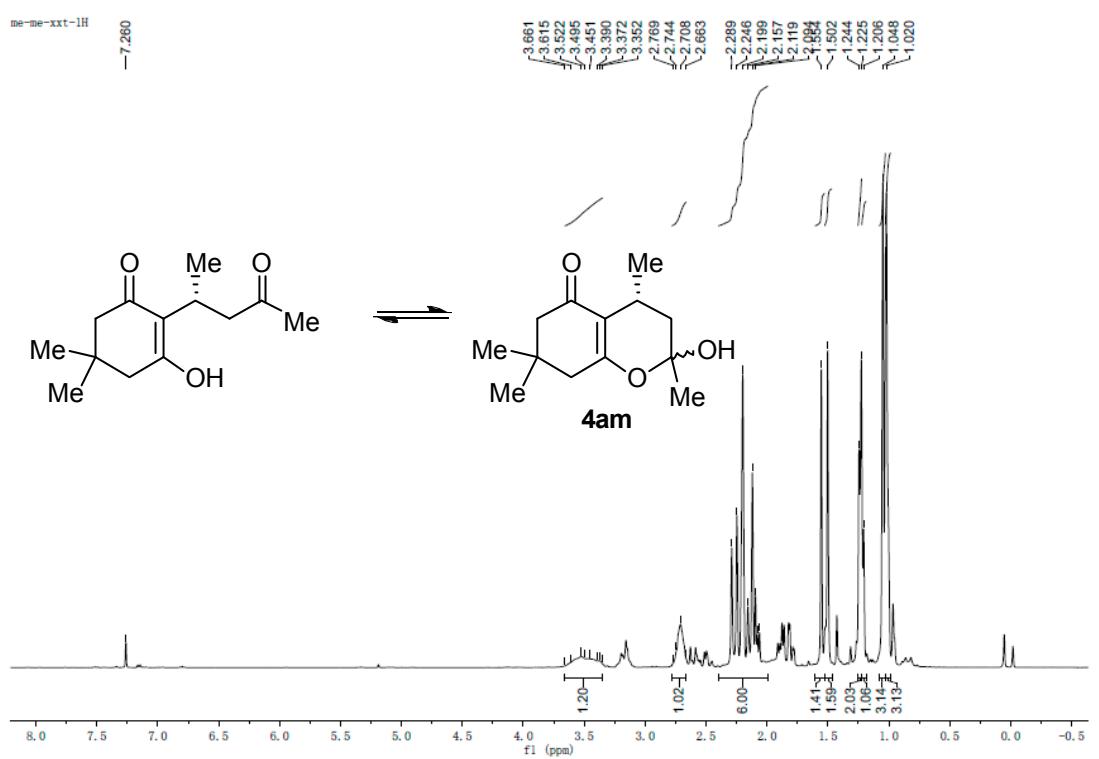


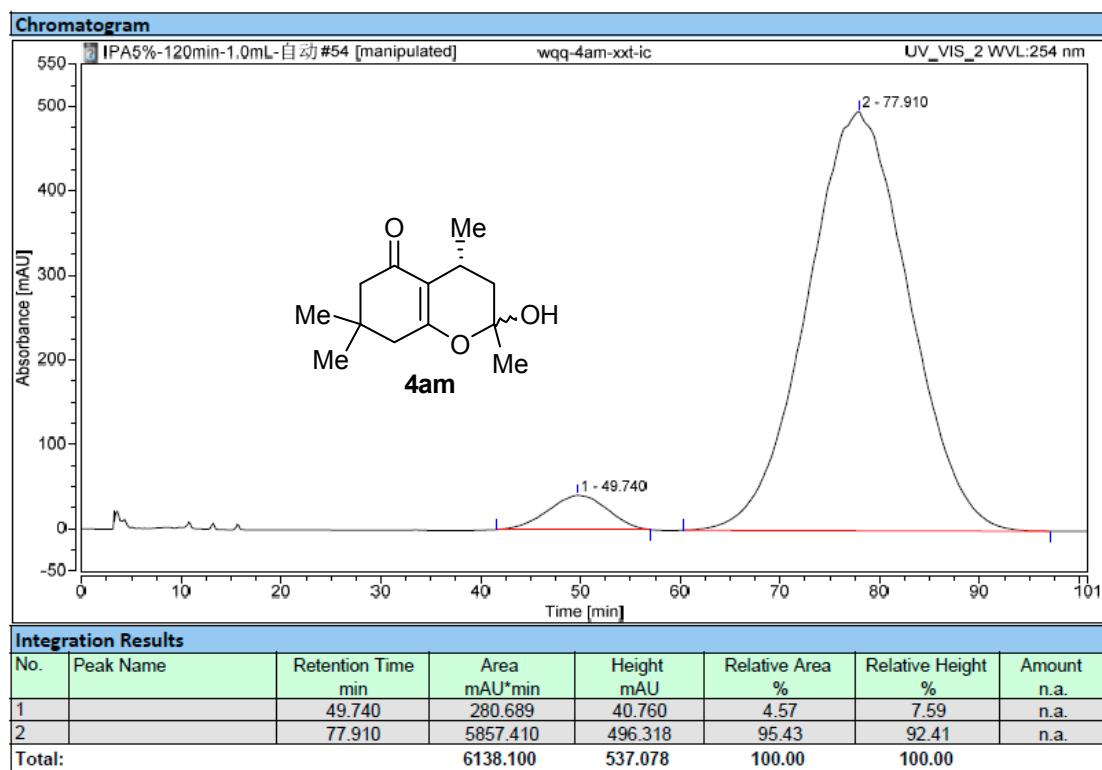
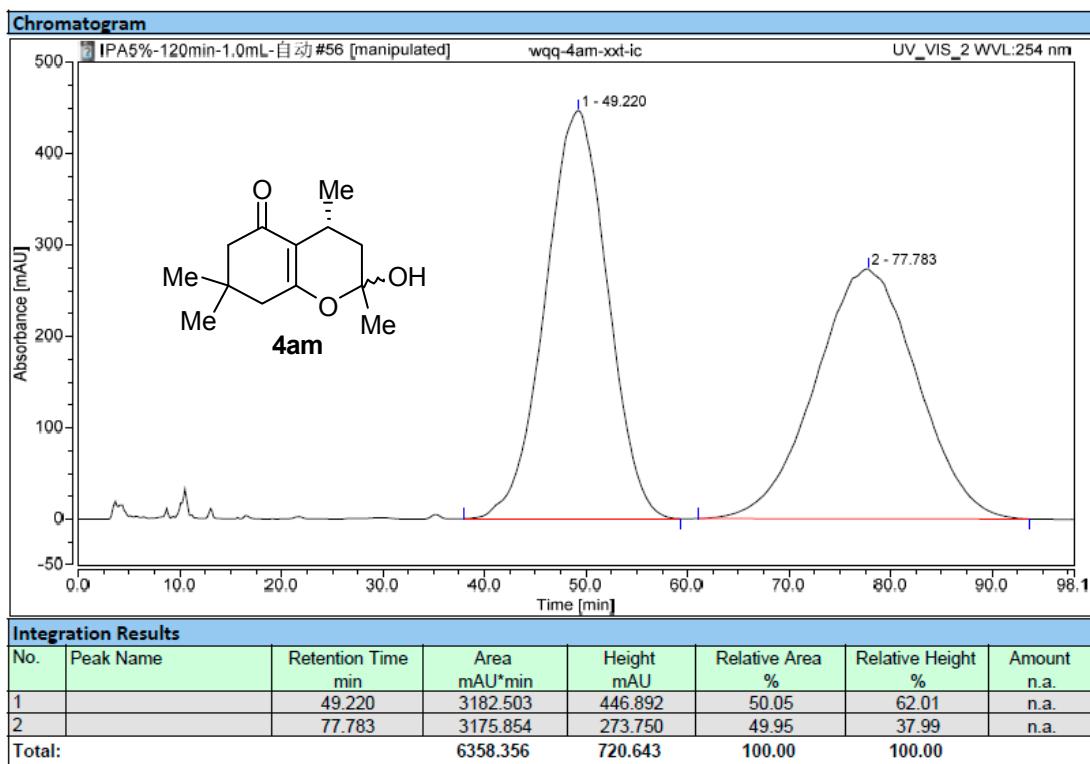
Integration Results							
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.327	16.196	48.459	2.65	3.70	n.a.
2		6.257	595.956	1259.864	97.35	96.30	n.a.
Total:			612.152	1308.323	100.00	100.00	

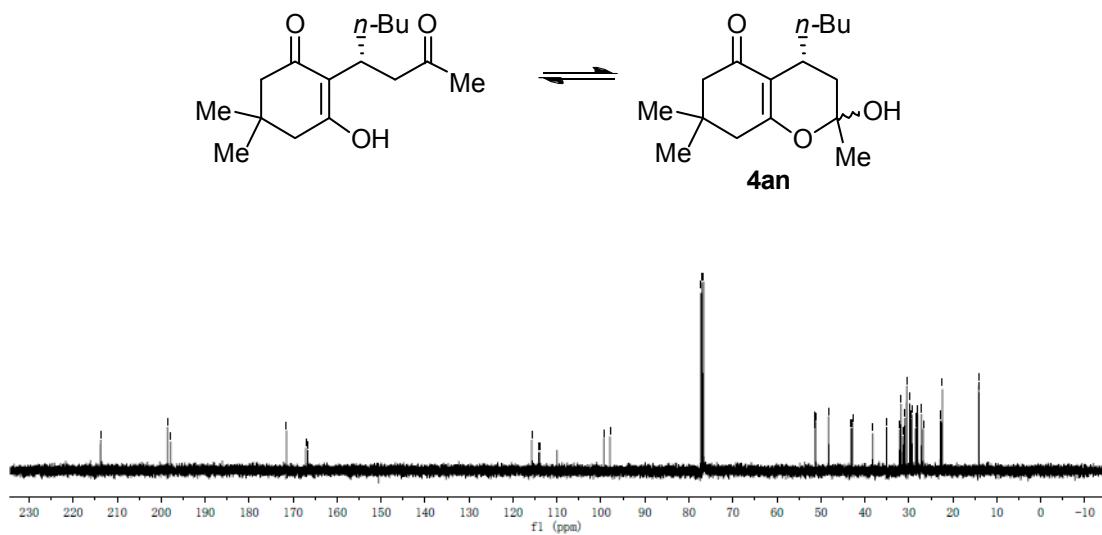
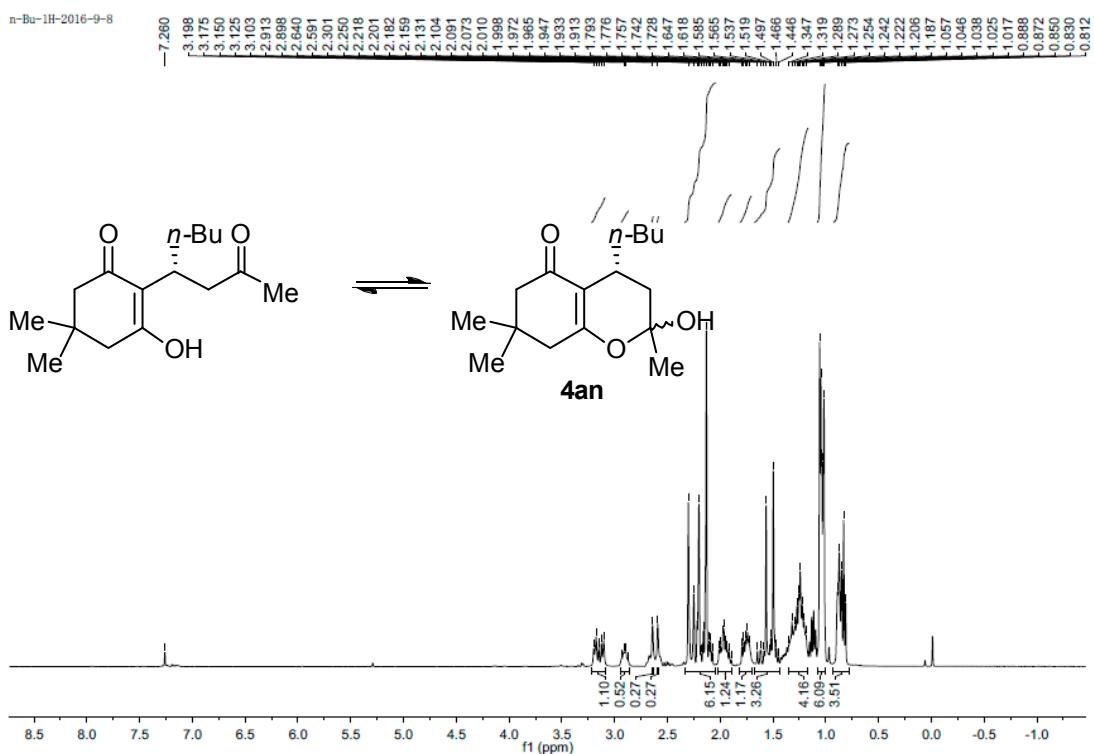
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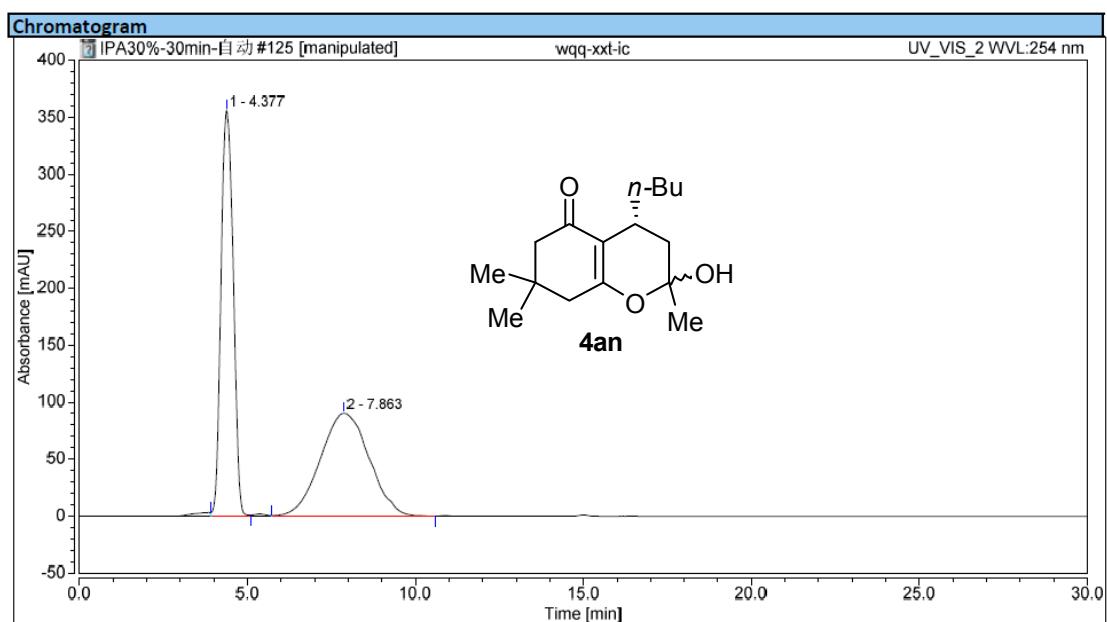






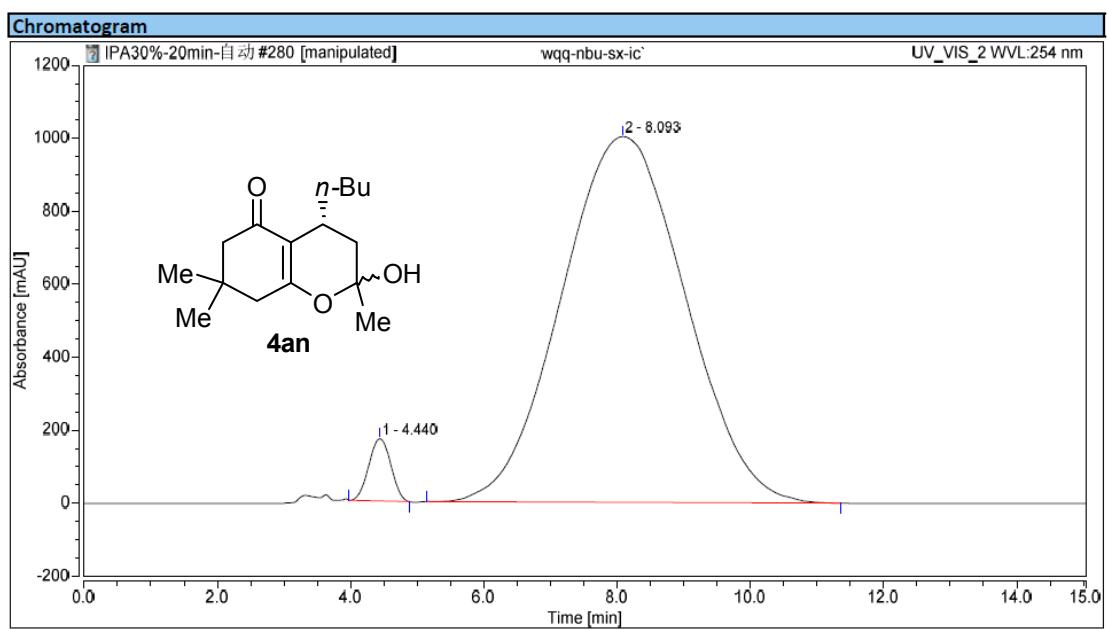






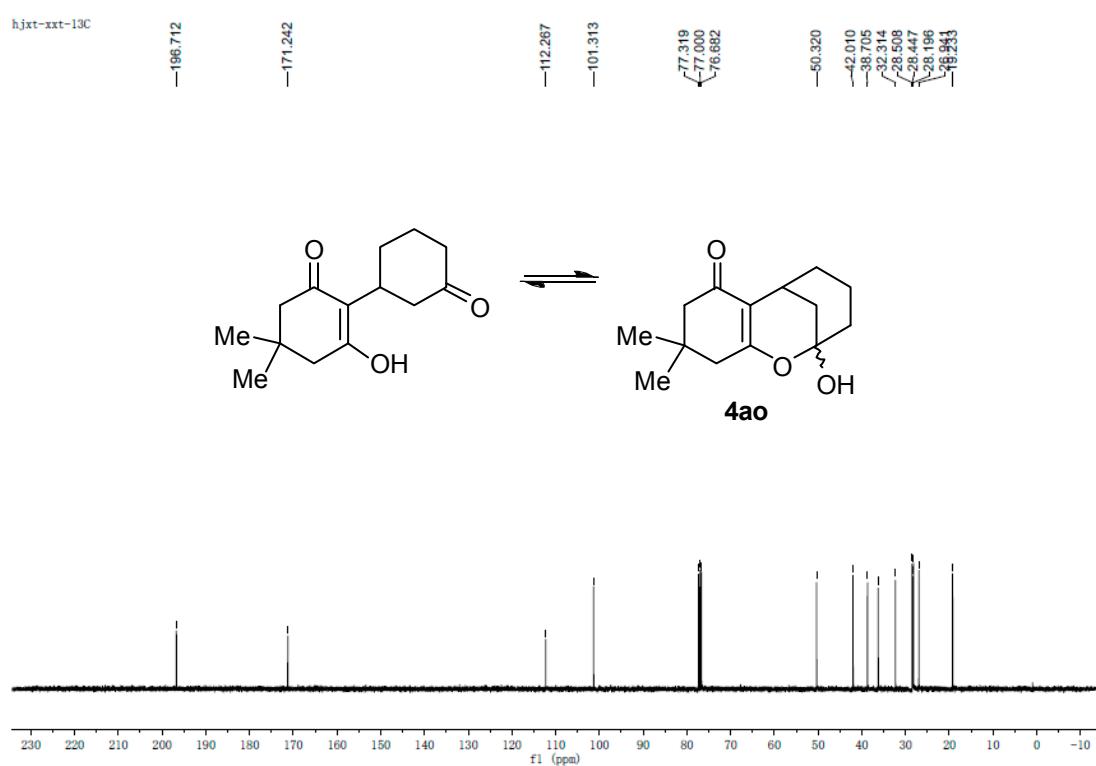
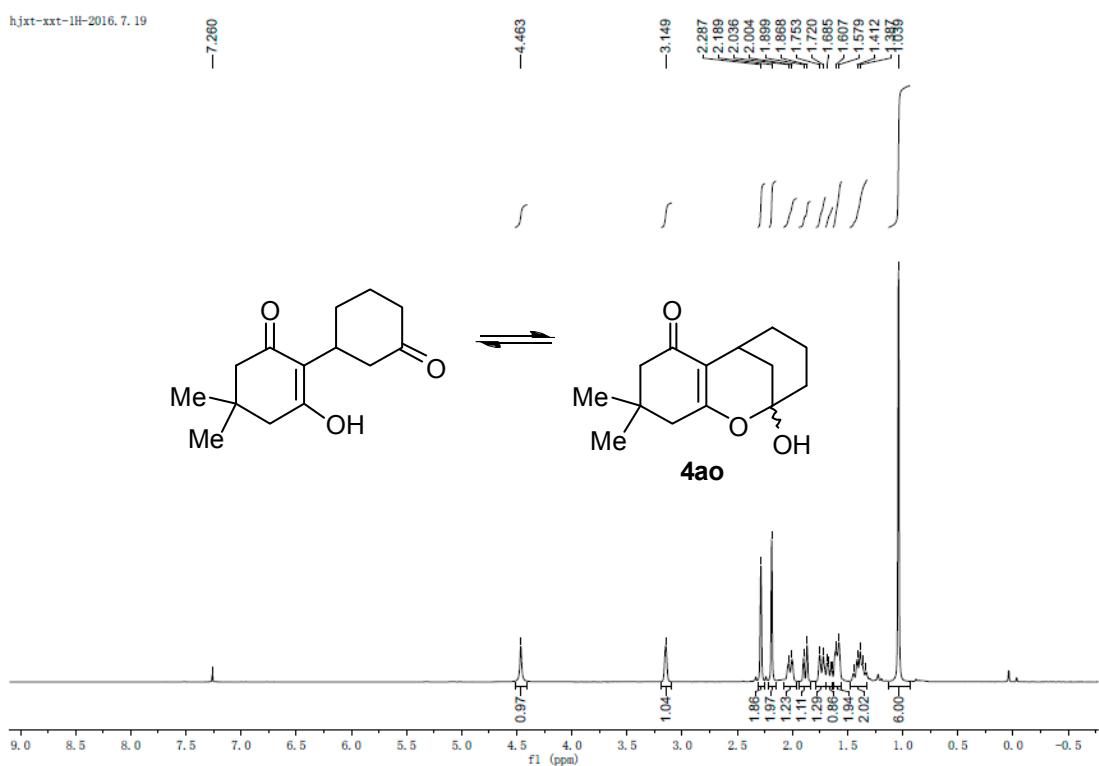
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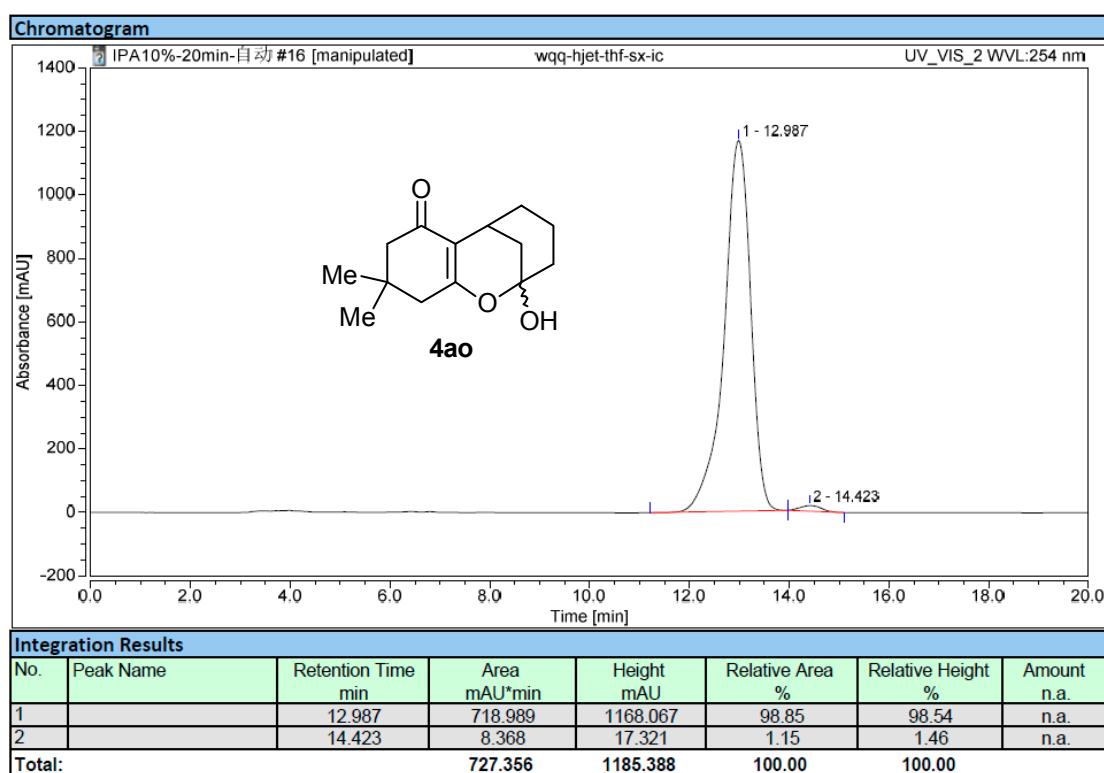
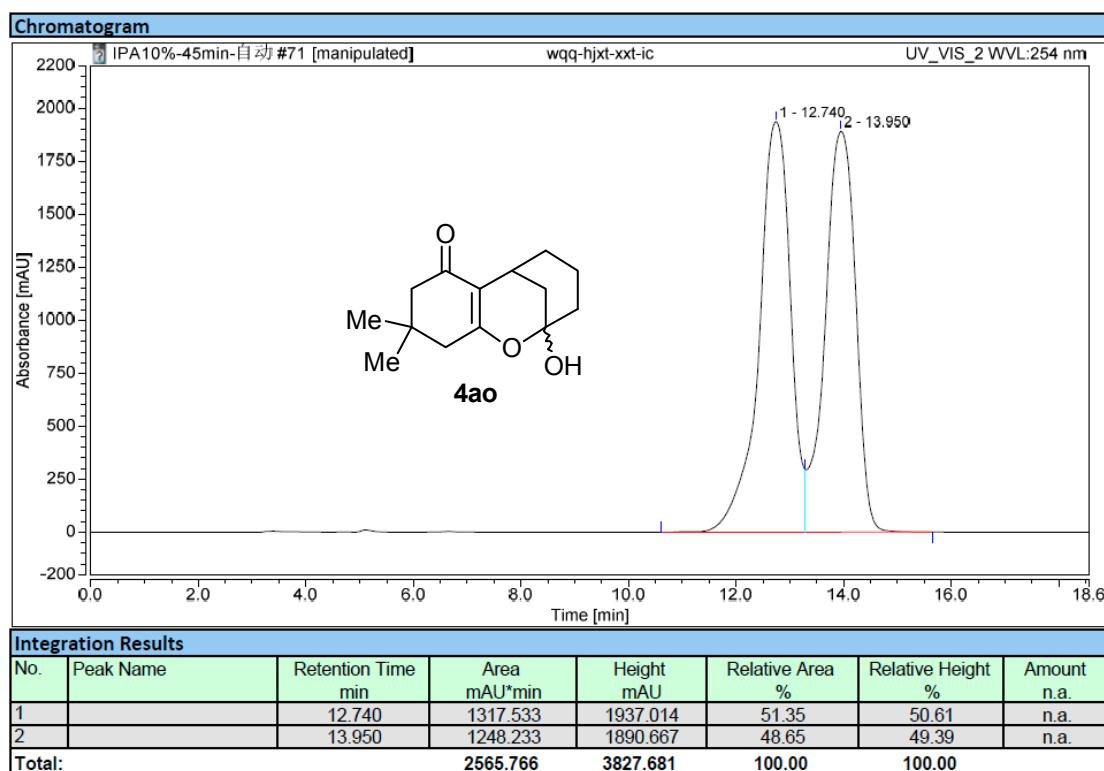
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		4.377	150.702	356.188	49.75	79.77	n.a.
2		7.863	152.209	90.305	50.25	20.23	n.a.
Total:			302.910	446.493	100.00	100.00	

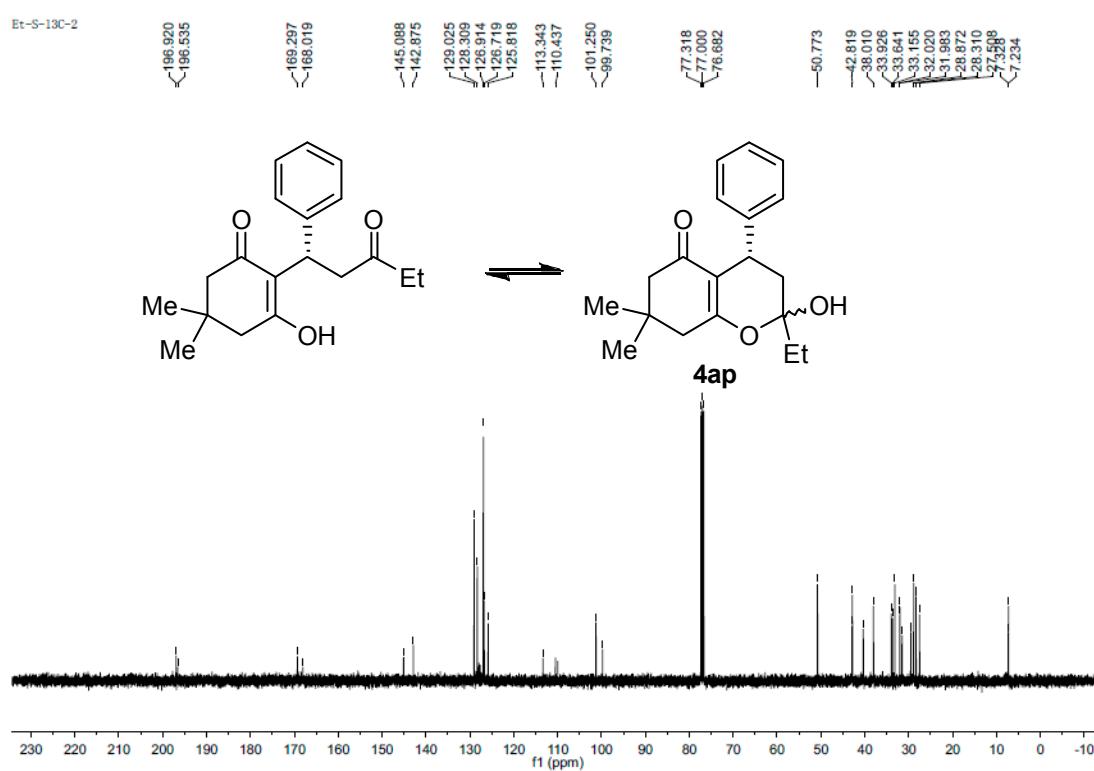
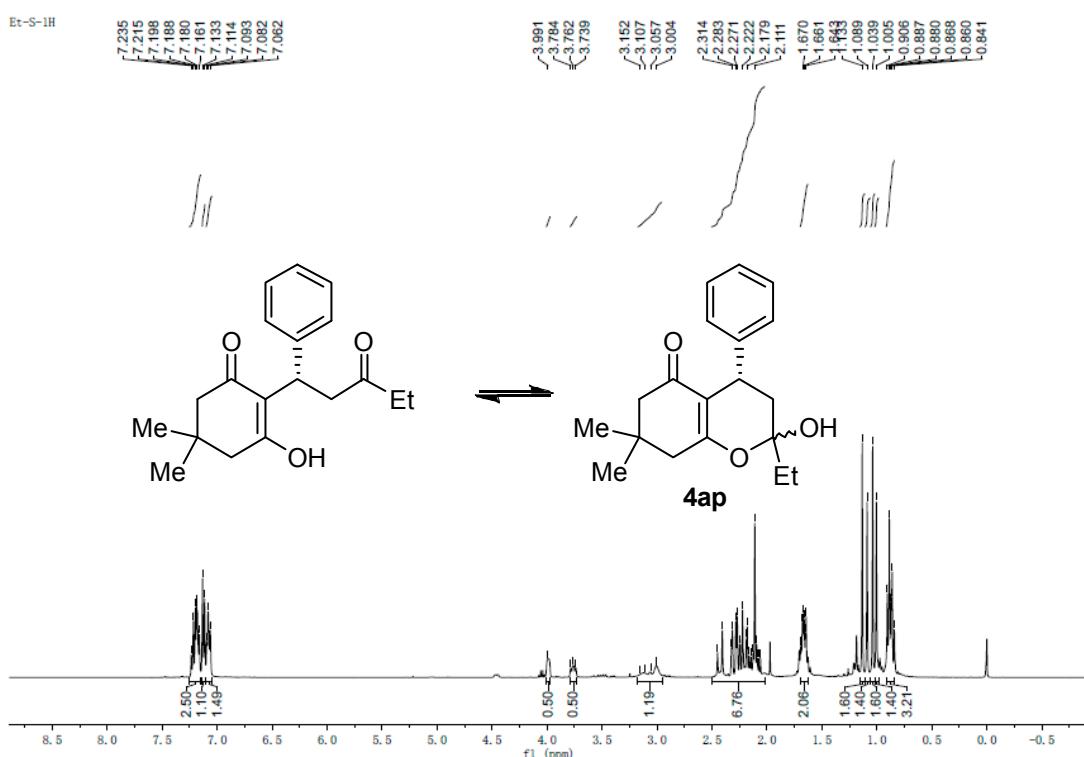


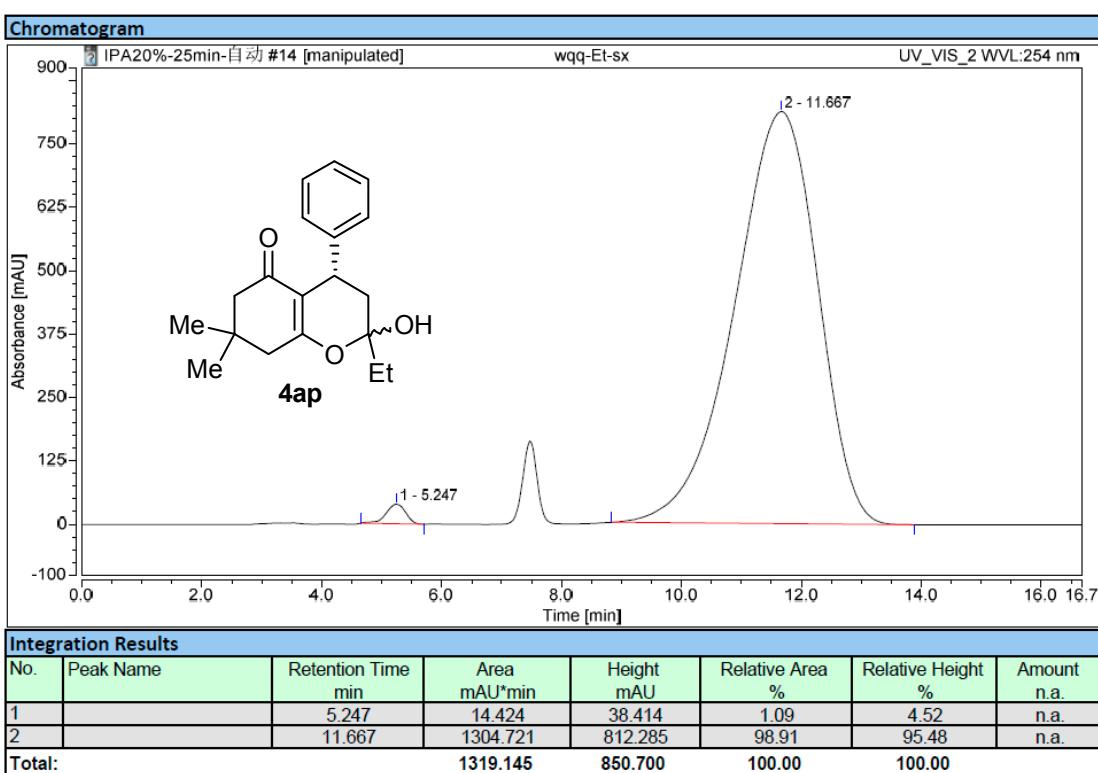
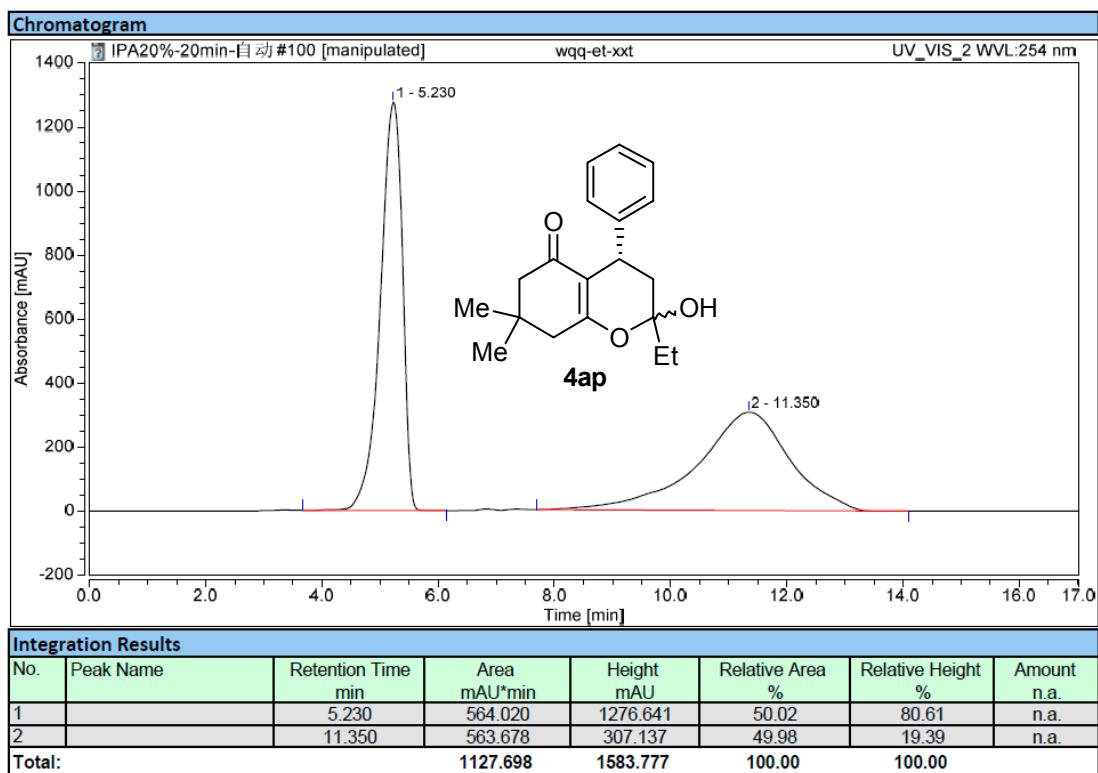
Integration Results

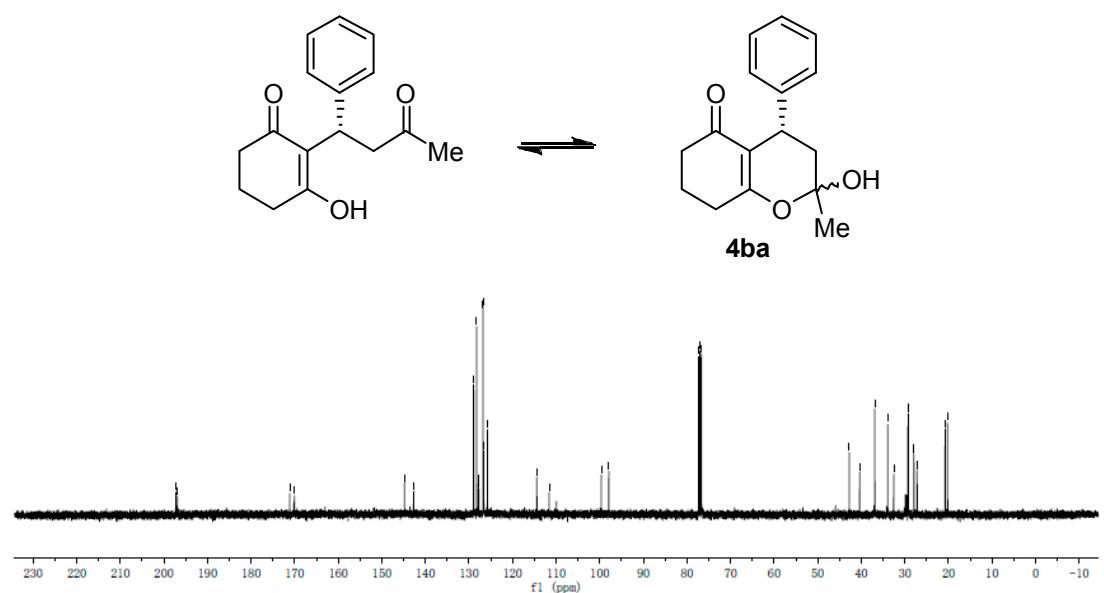
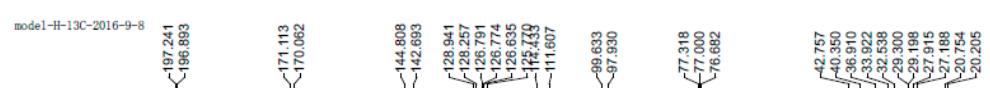
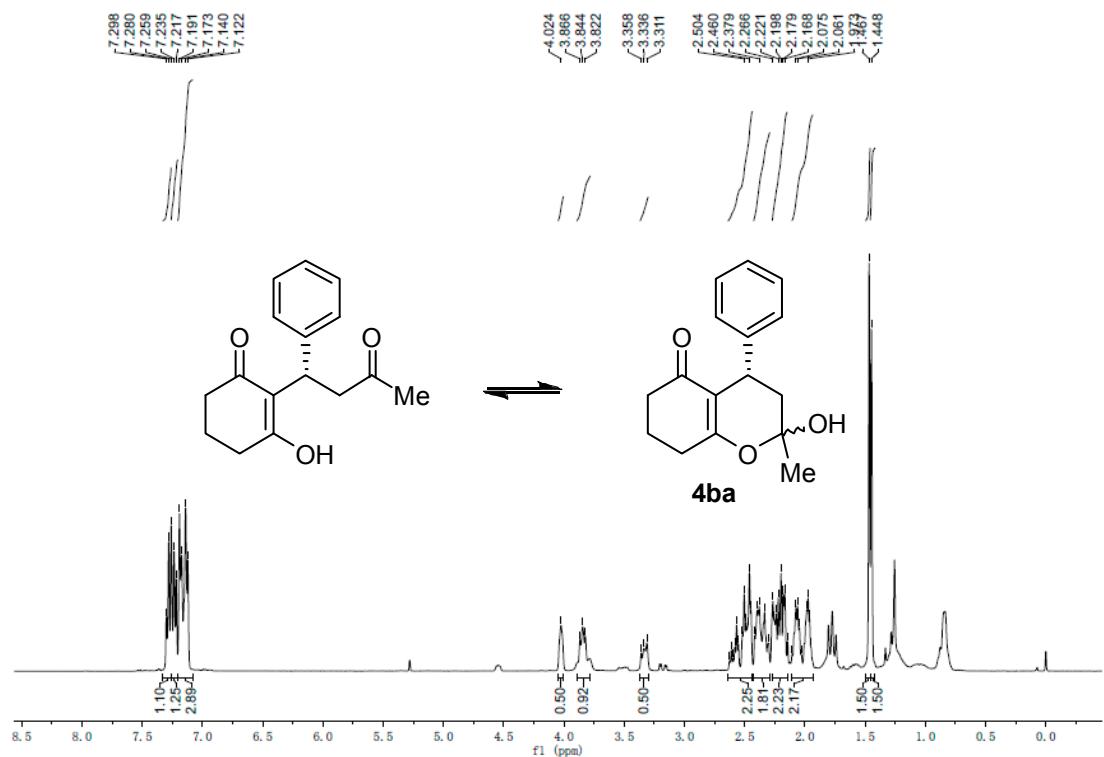
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		4.440	65.412	170.567	2.94	14.54	n.a.
2		8.093	2155.779	1002.202	97.06	85.46	n.a.
Total:			2221.191	1172.769	100.00	100.00	

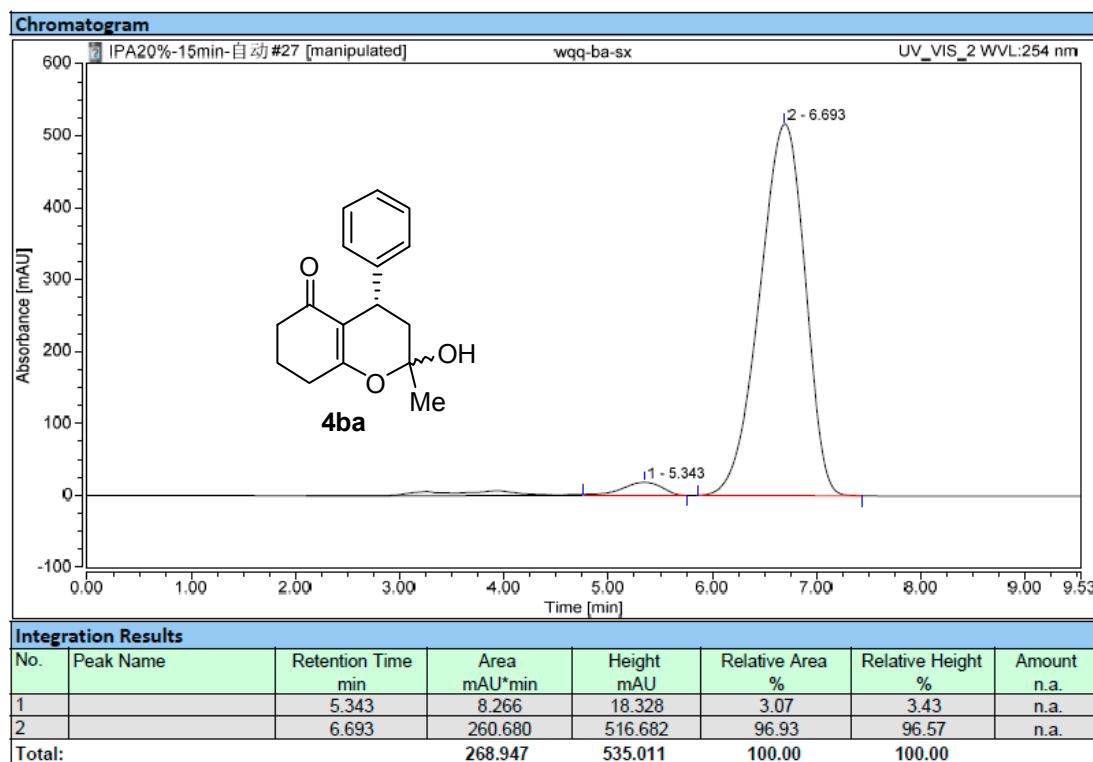
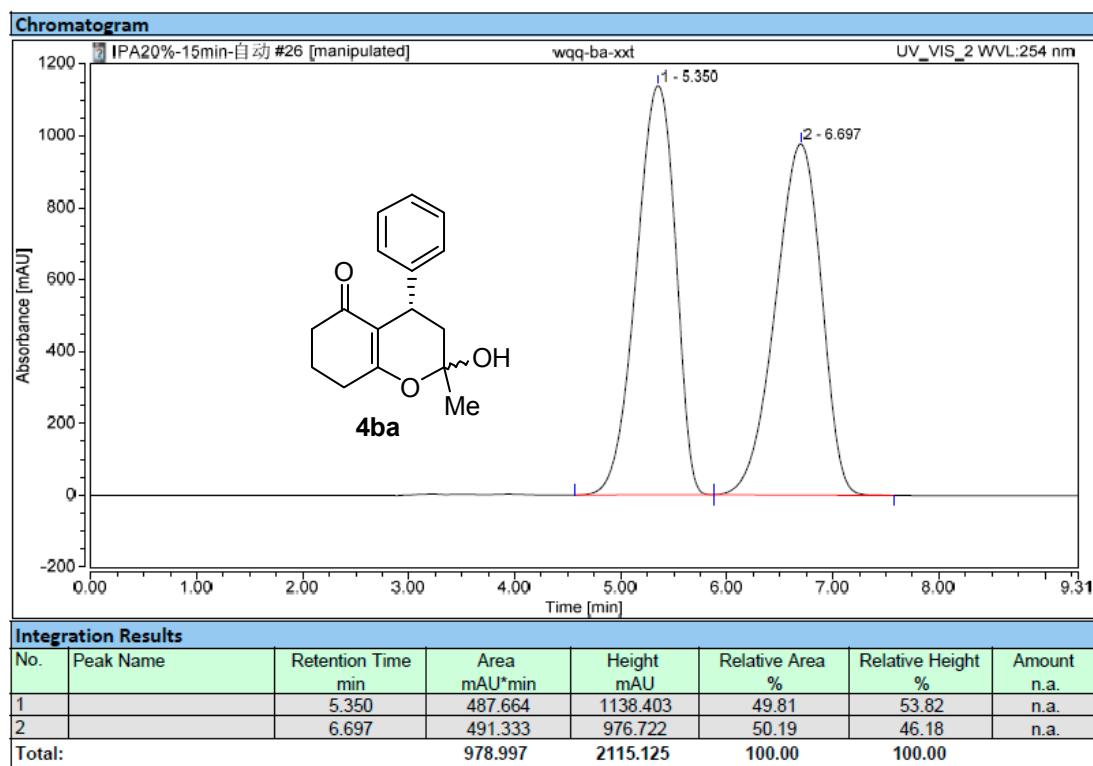


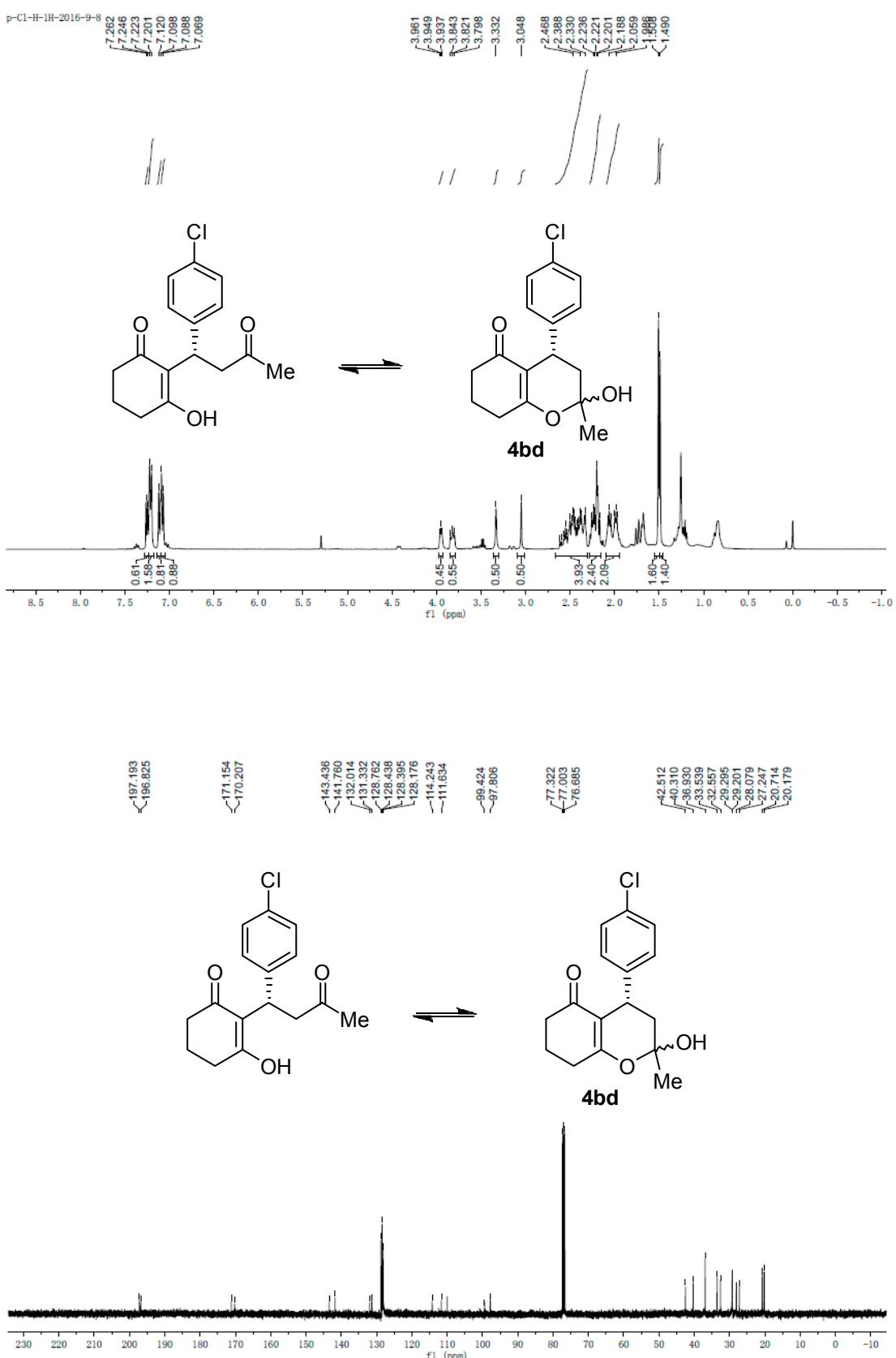


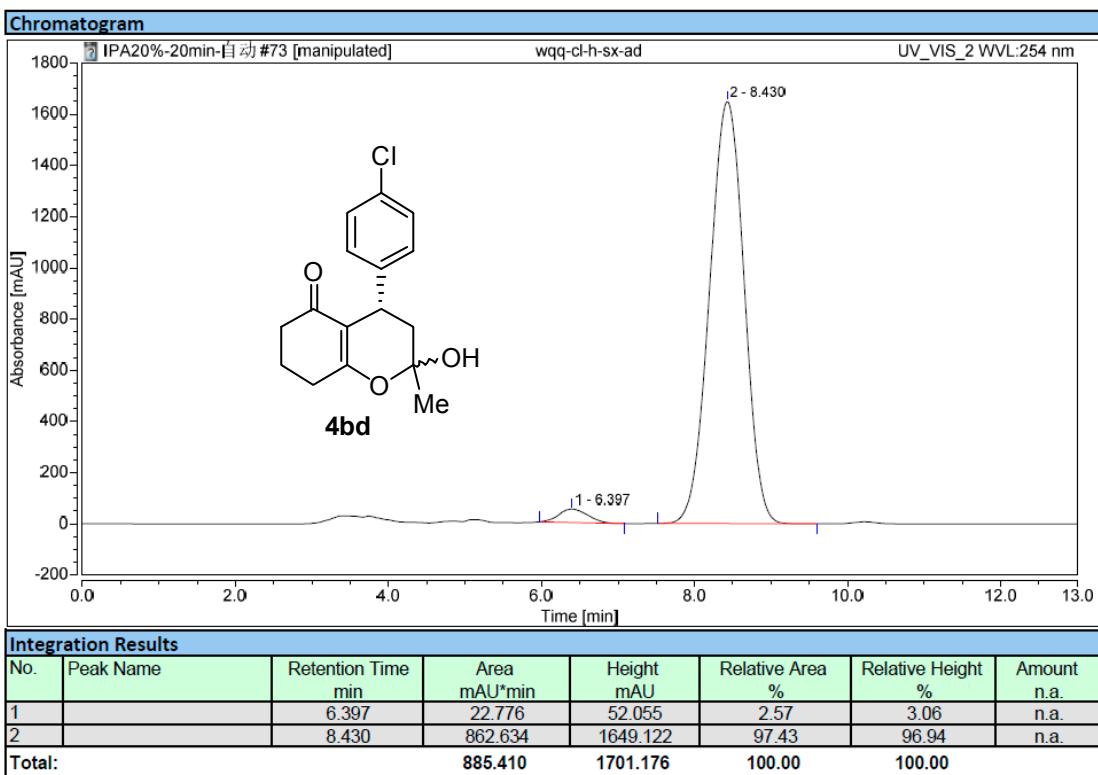
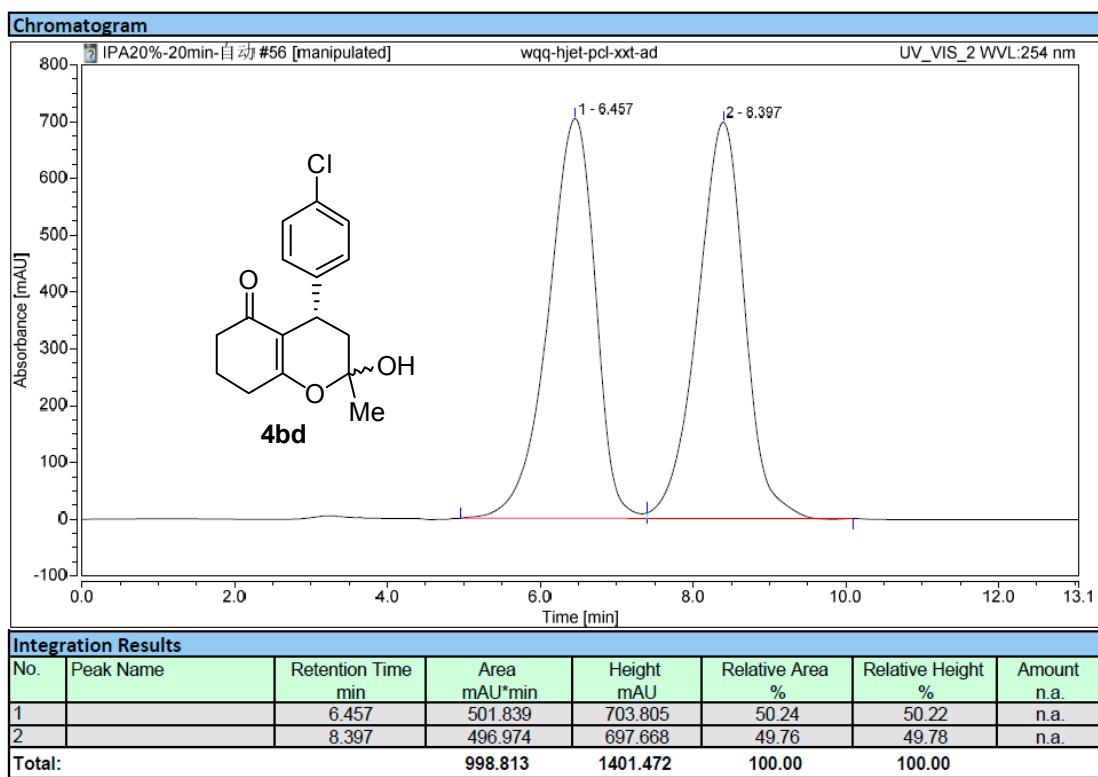


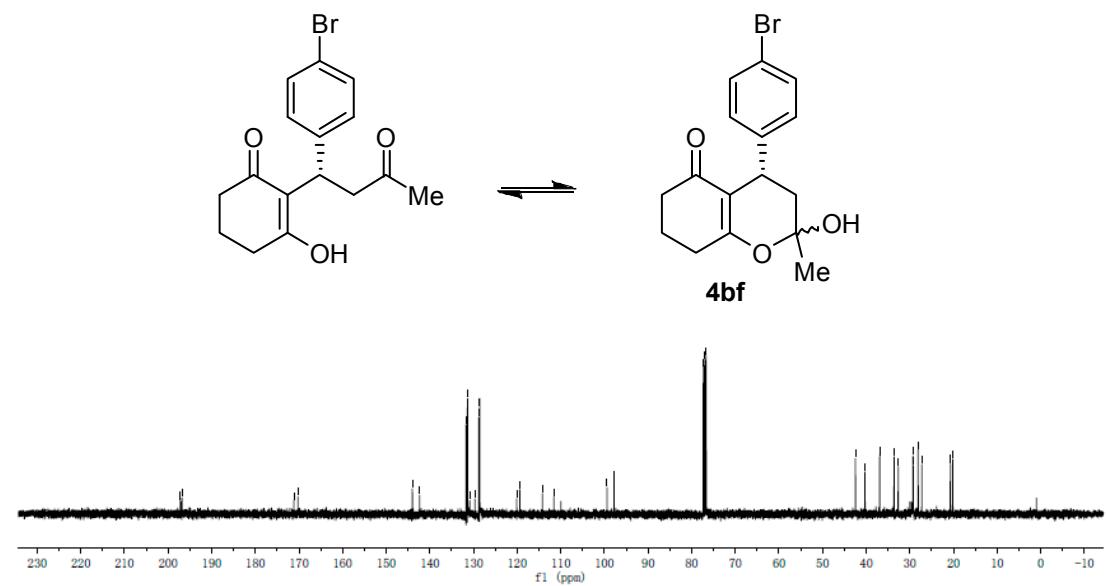
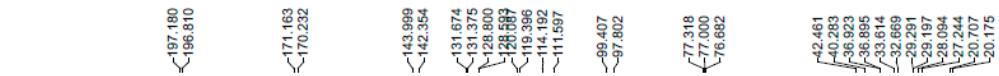
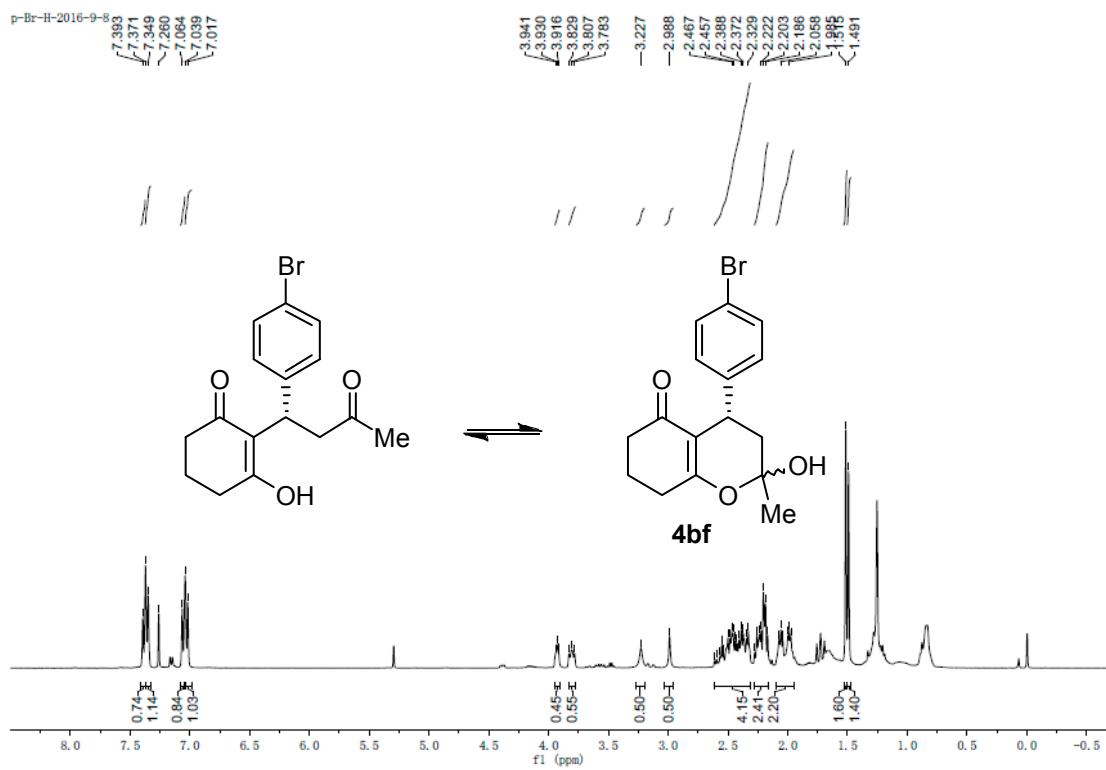


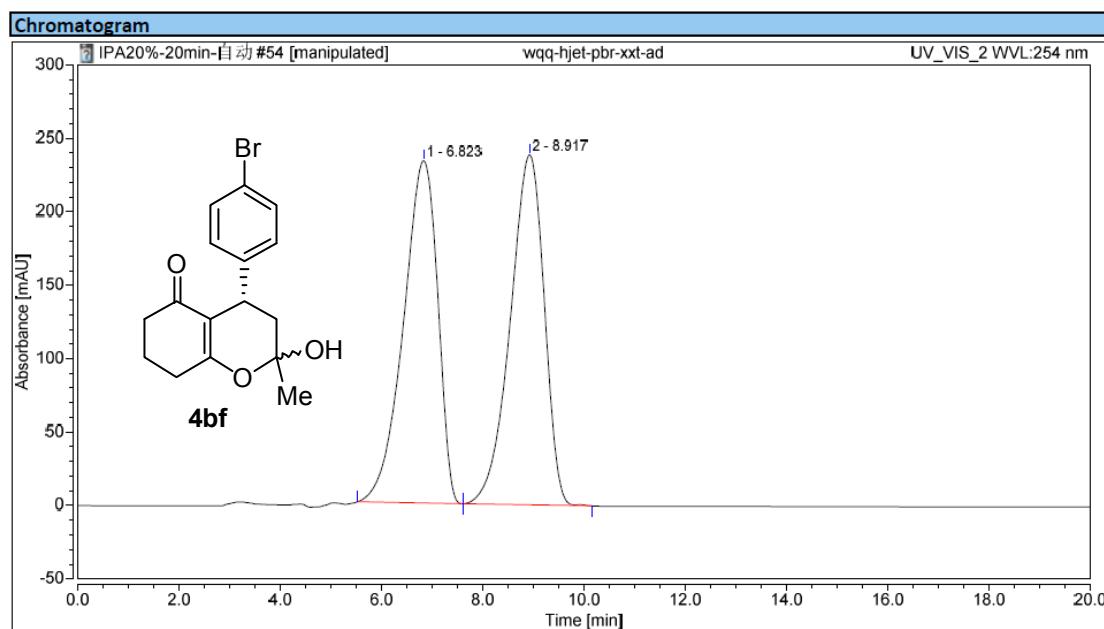






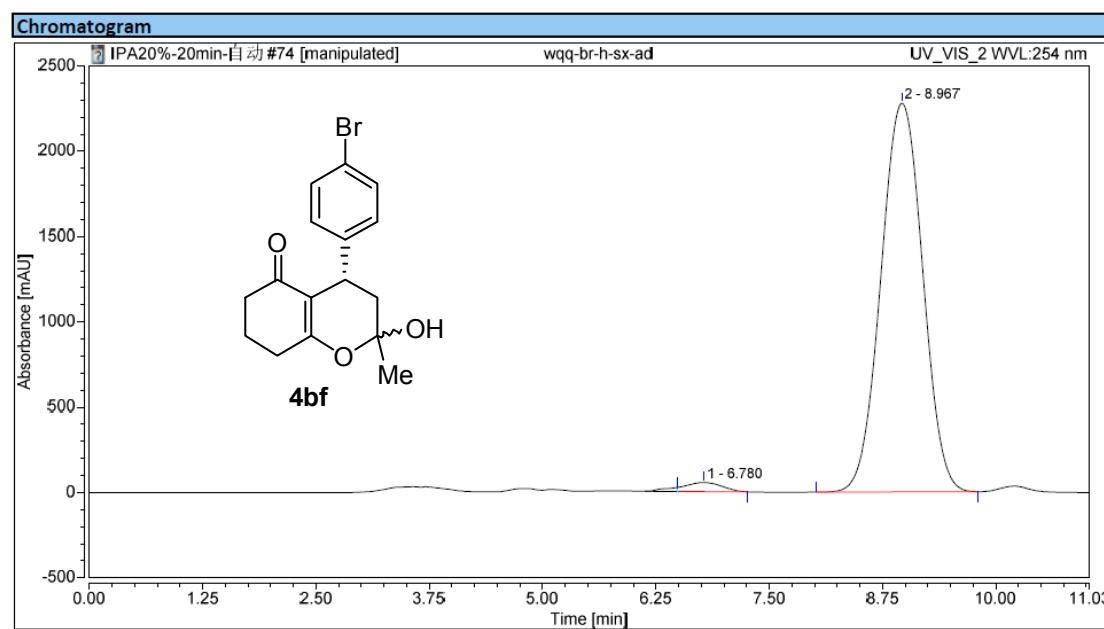






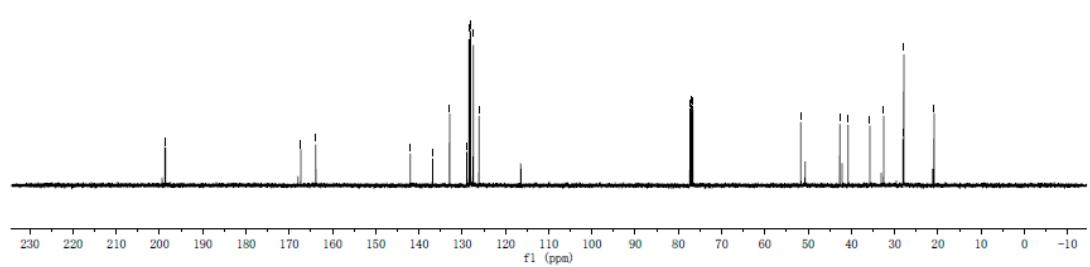
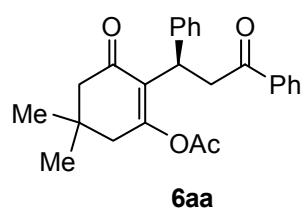
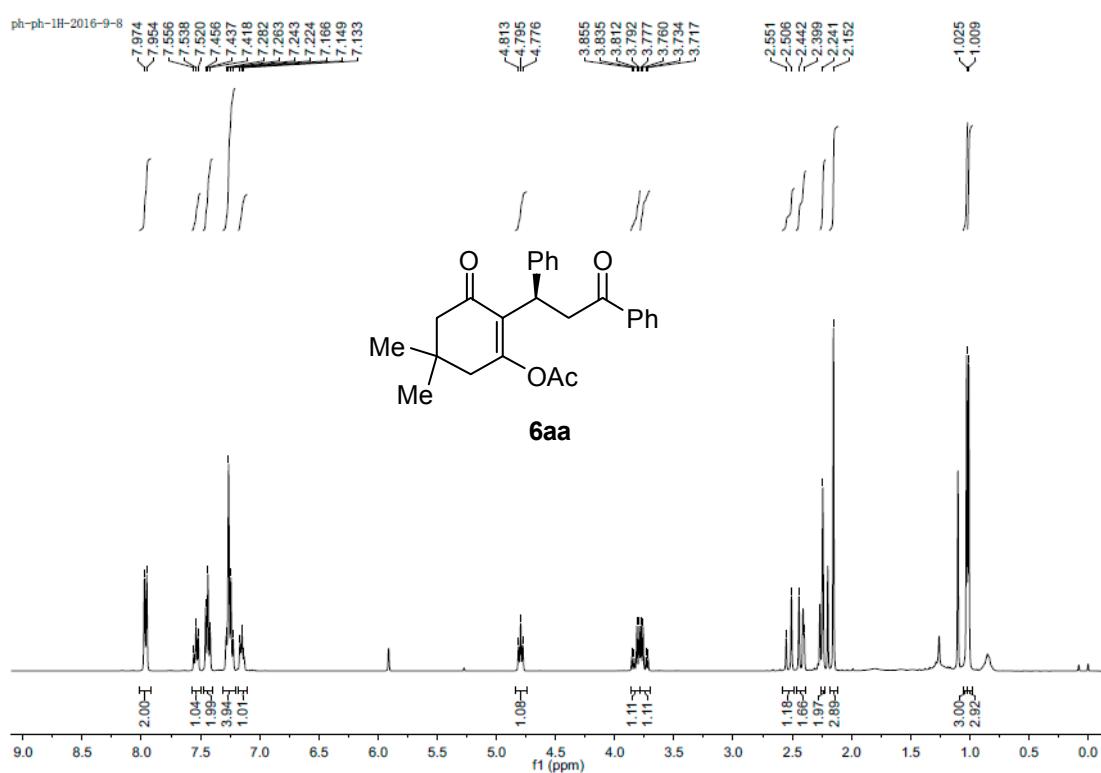
Integration Results

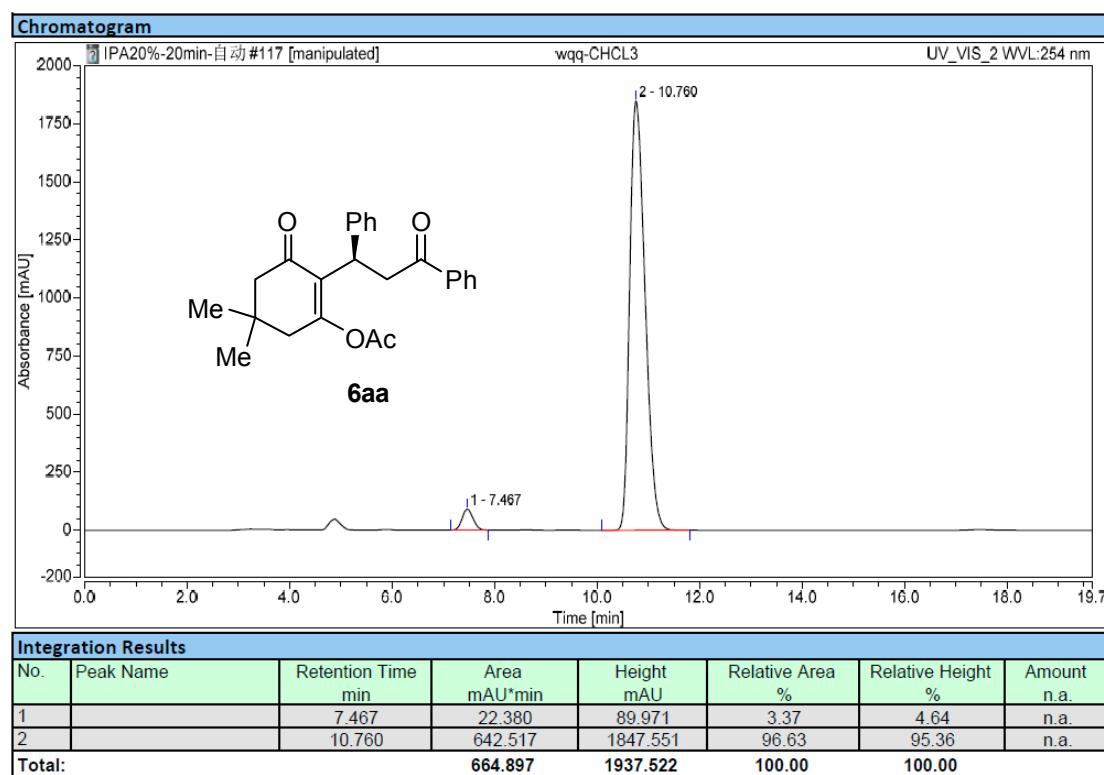
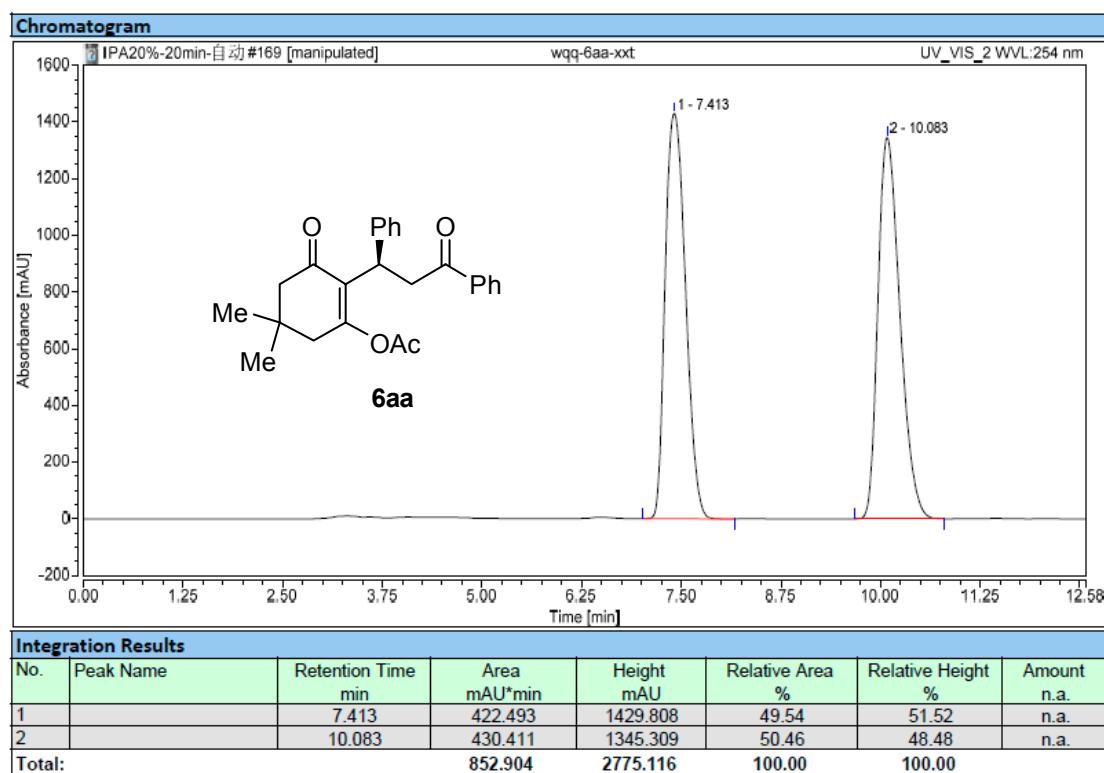
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.823	182.779	233.155	49.70	49.44	n.a.
2		8.917	184.960	238.416	50.30	50.56	n.a.
Total:			367.740	471.571	100.00	100.00	

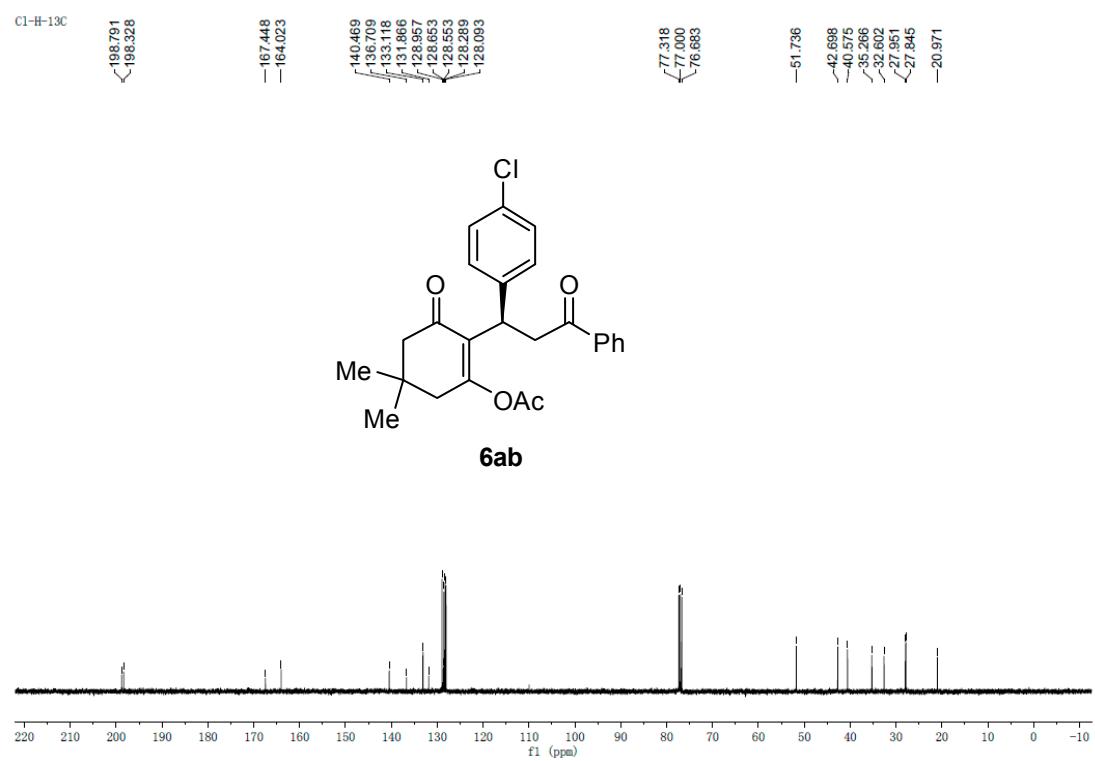
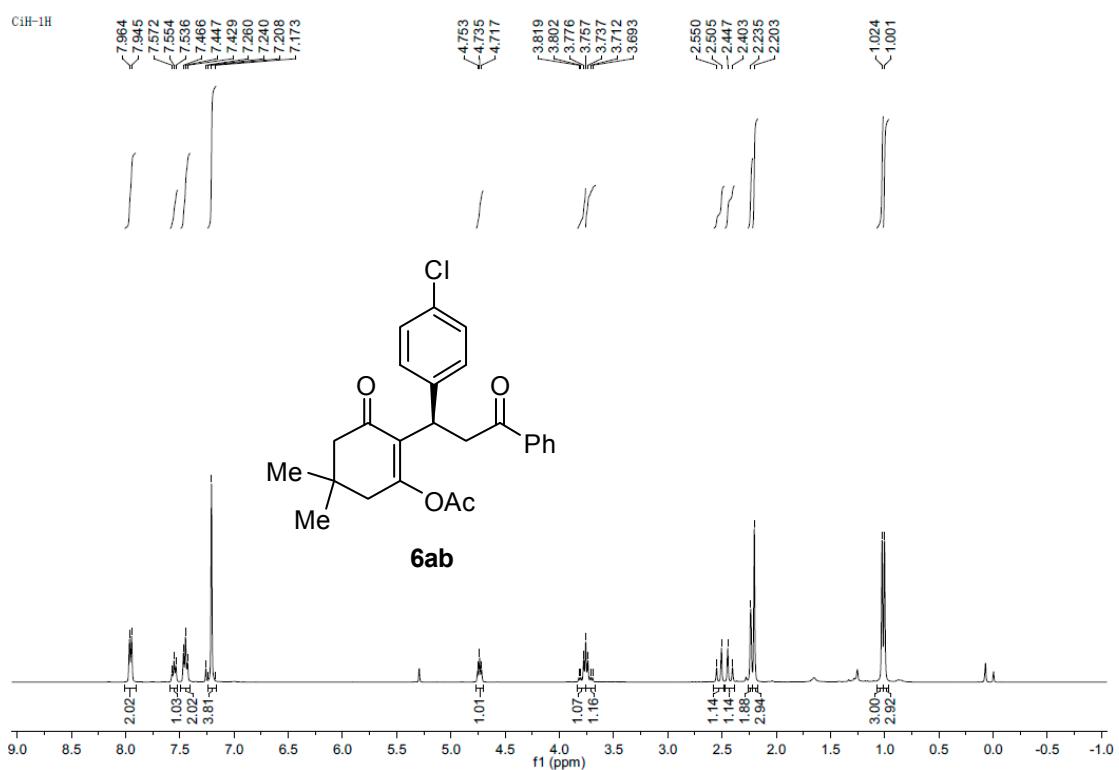


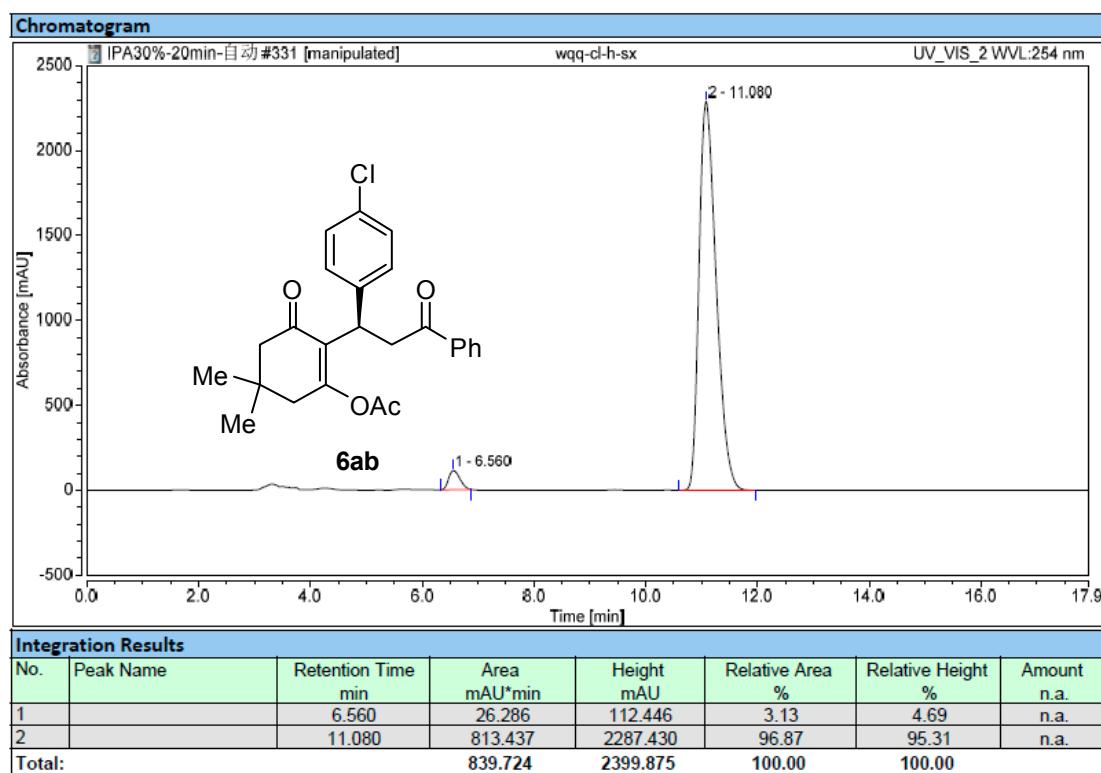
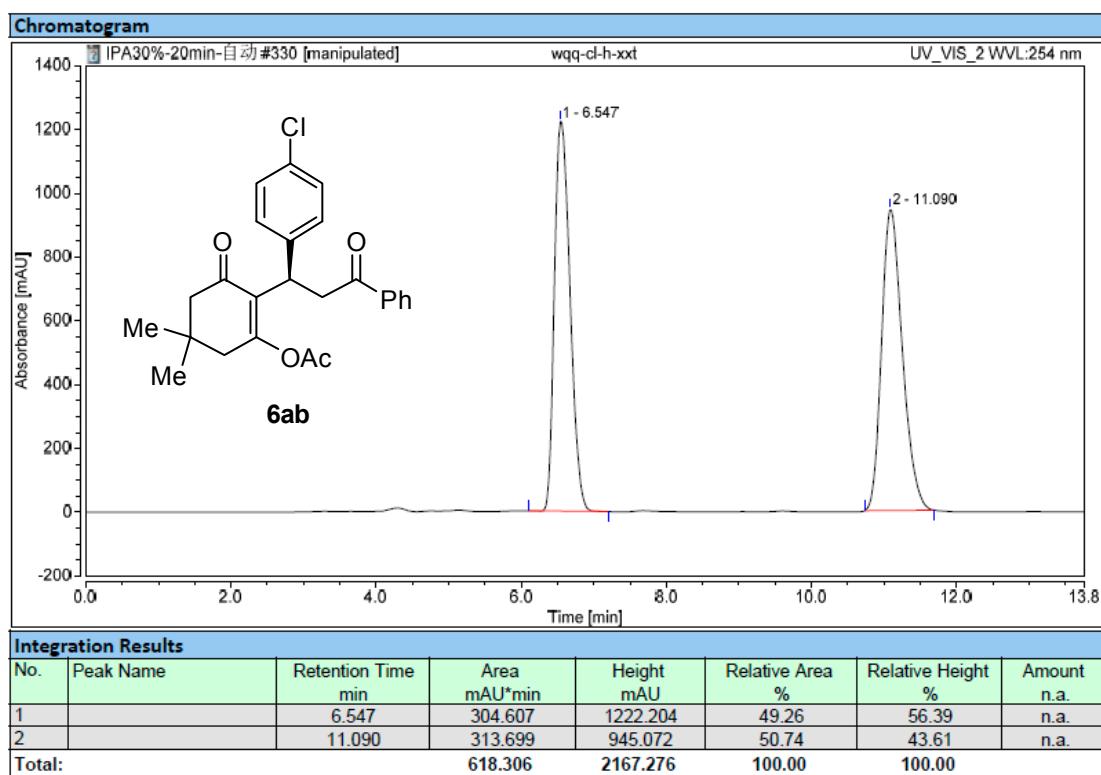
Integration Results

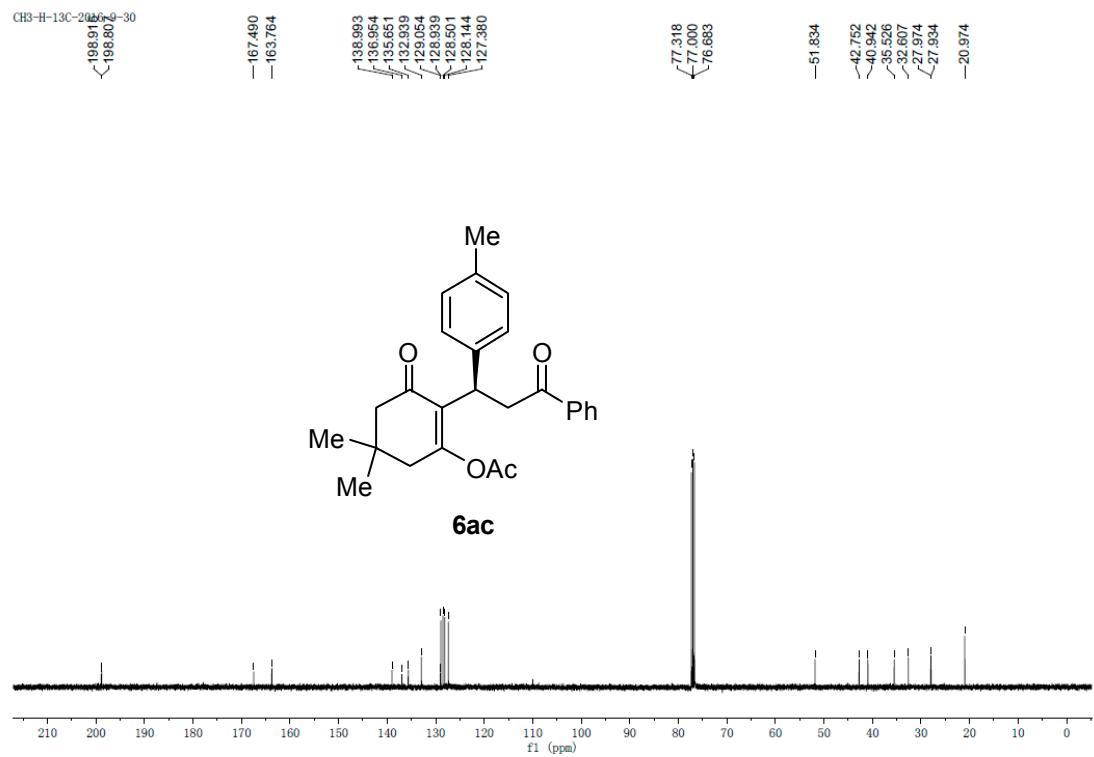
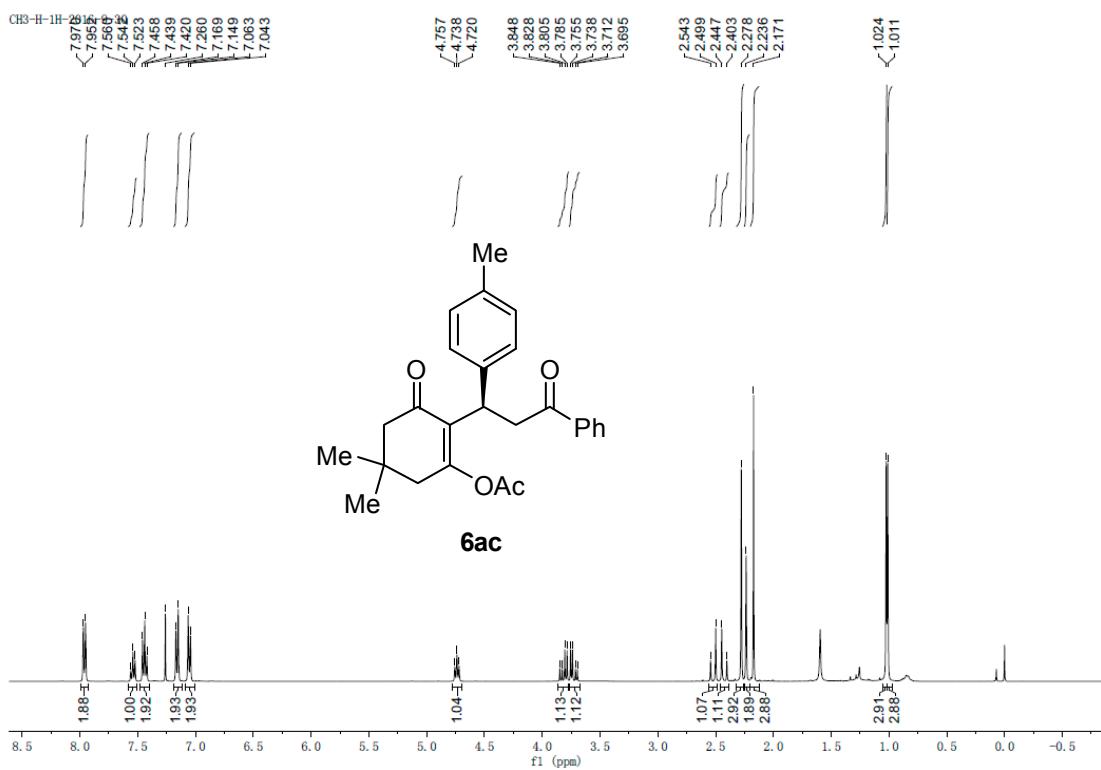
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.780	24.403	53.278	1.97	2.29	n.a.
2		8.967	1214.027	2277.581	98.03	97.71	n.a.
Total:			1238.429	2330.859	100.00	100.00	

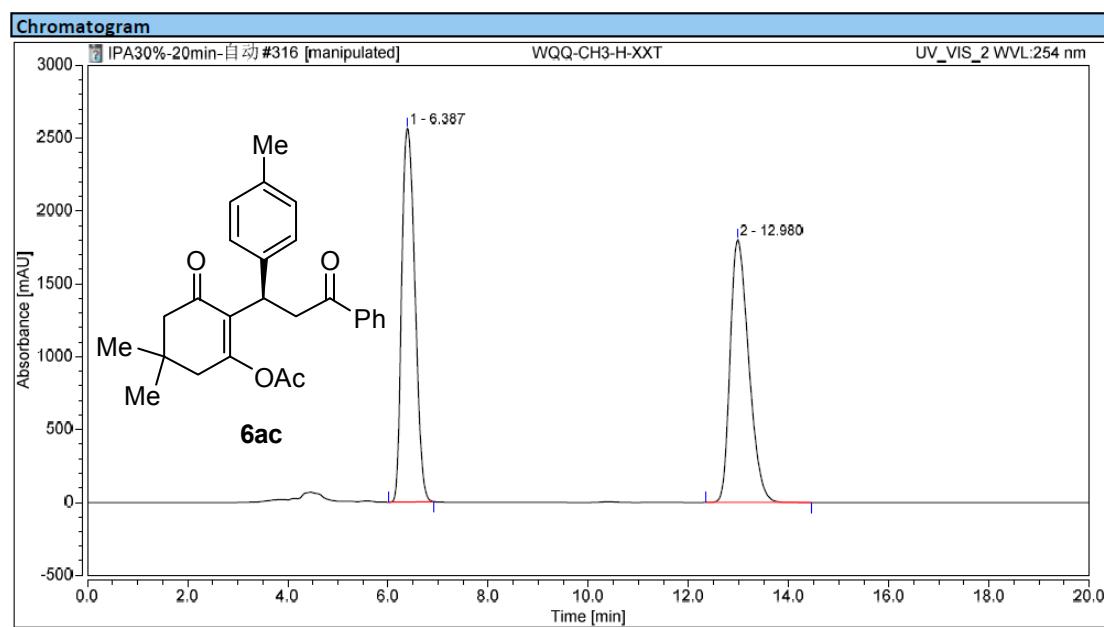






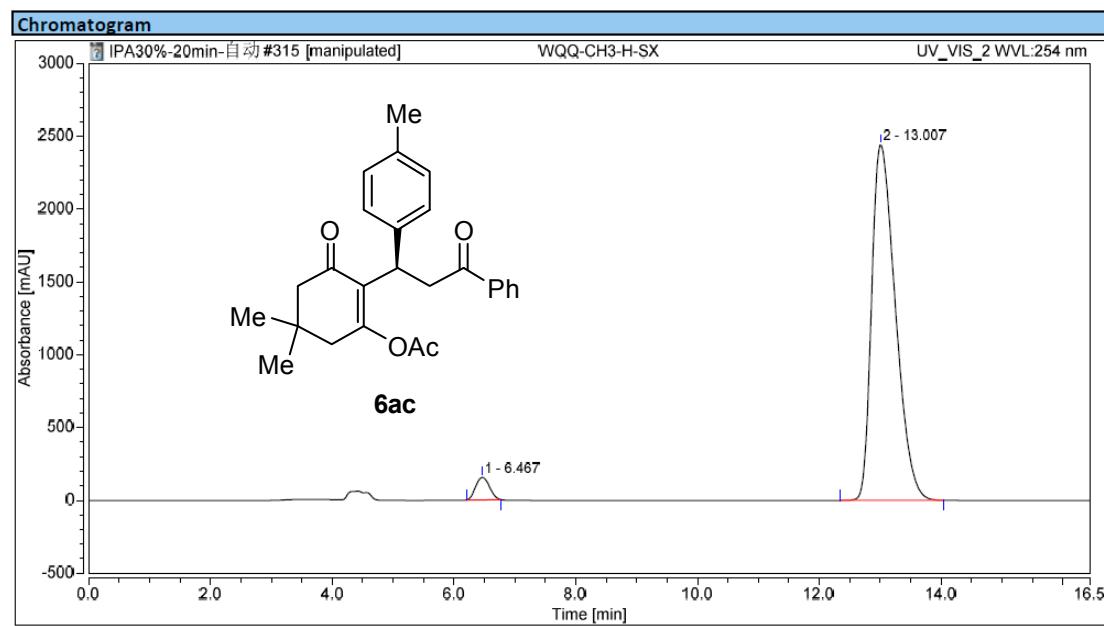






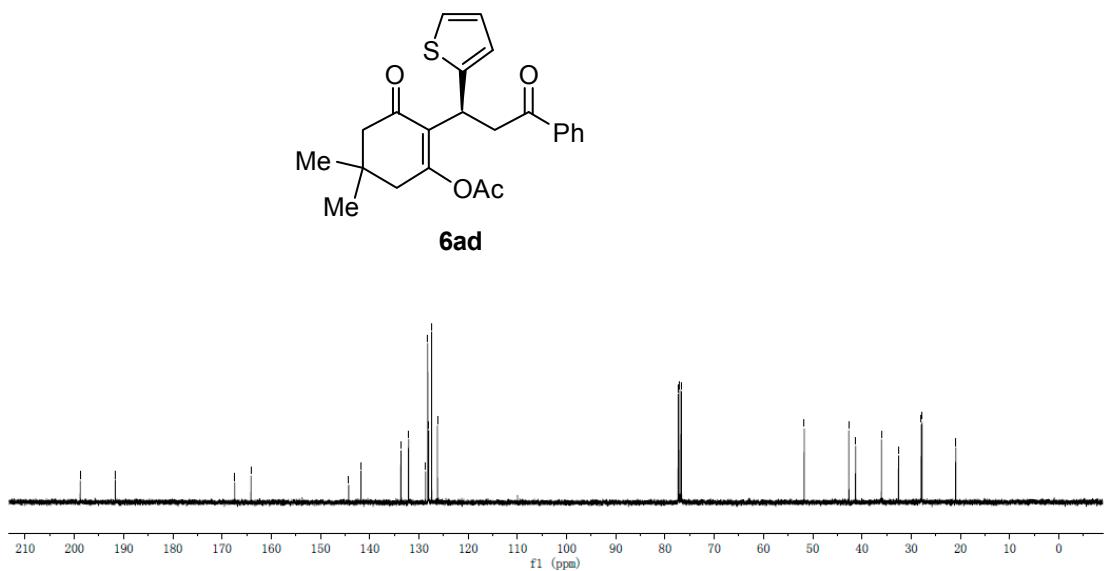
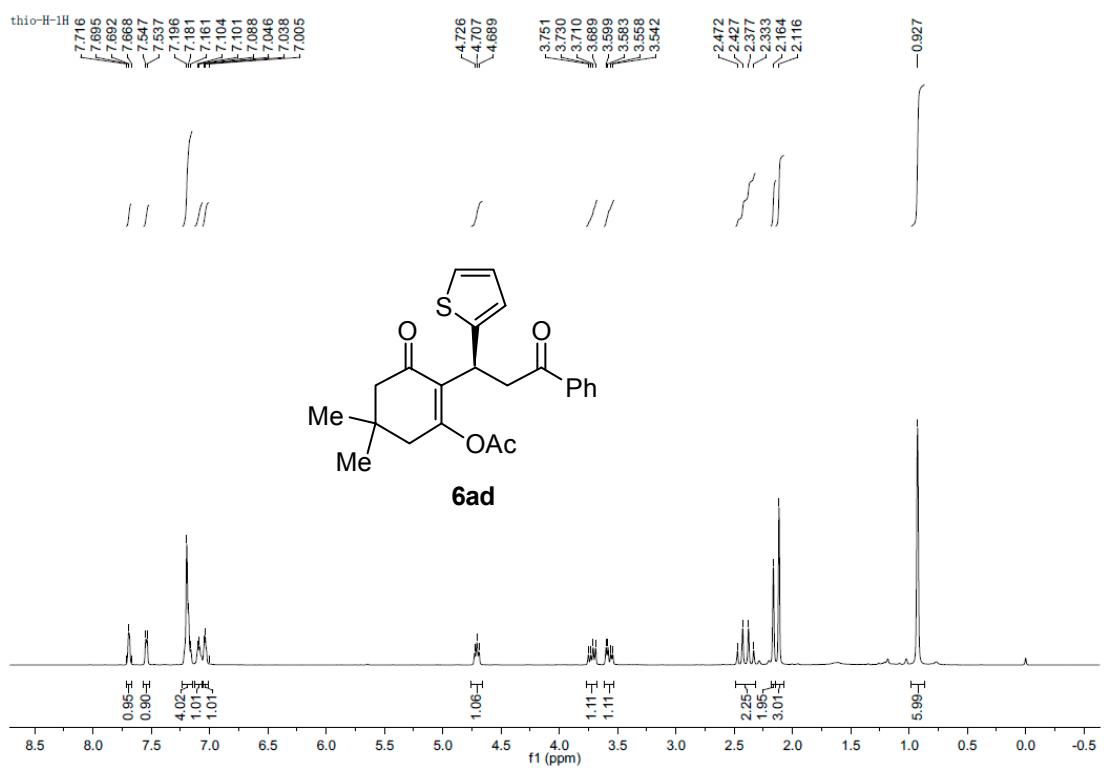
Integration Results

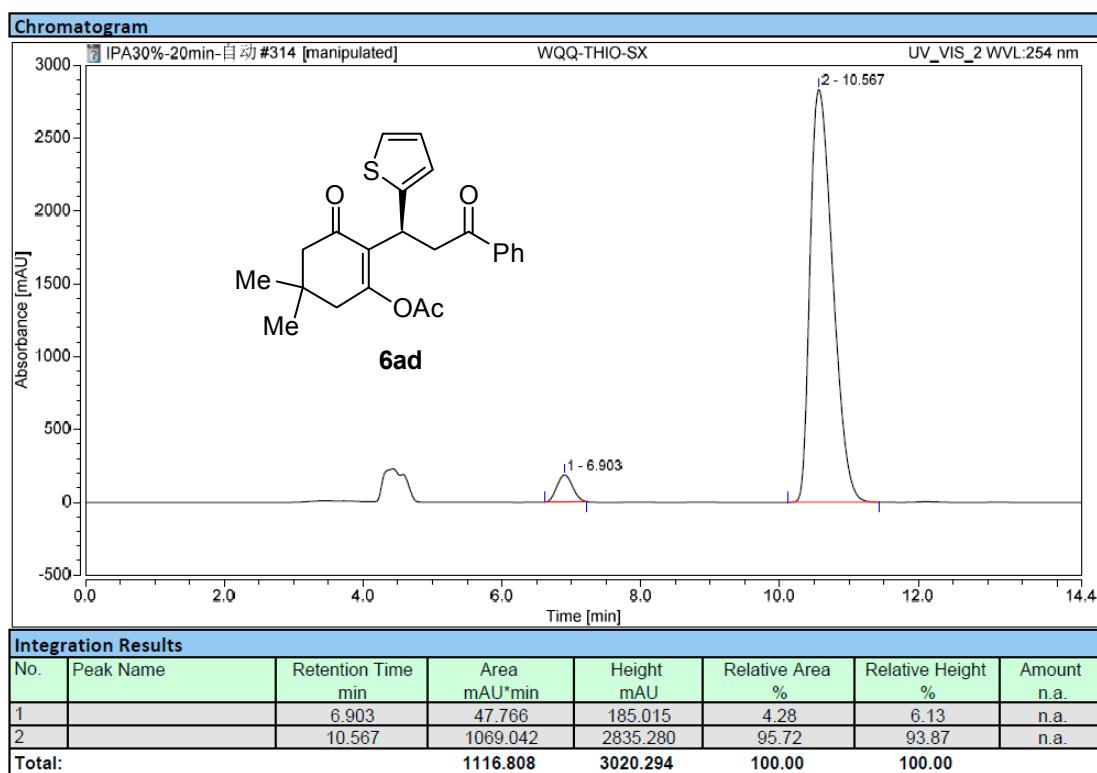
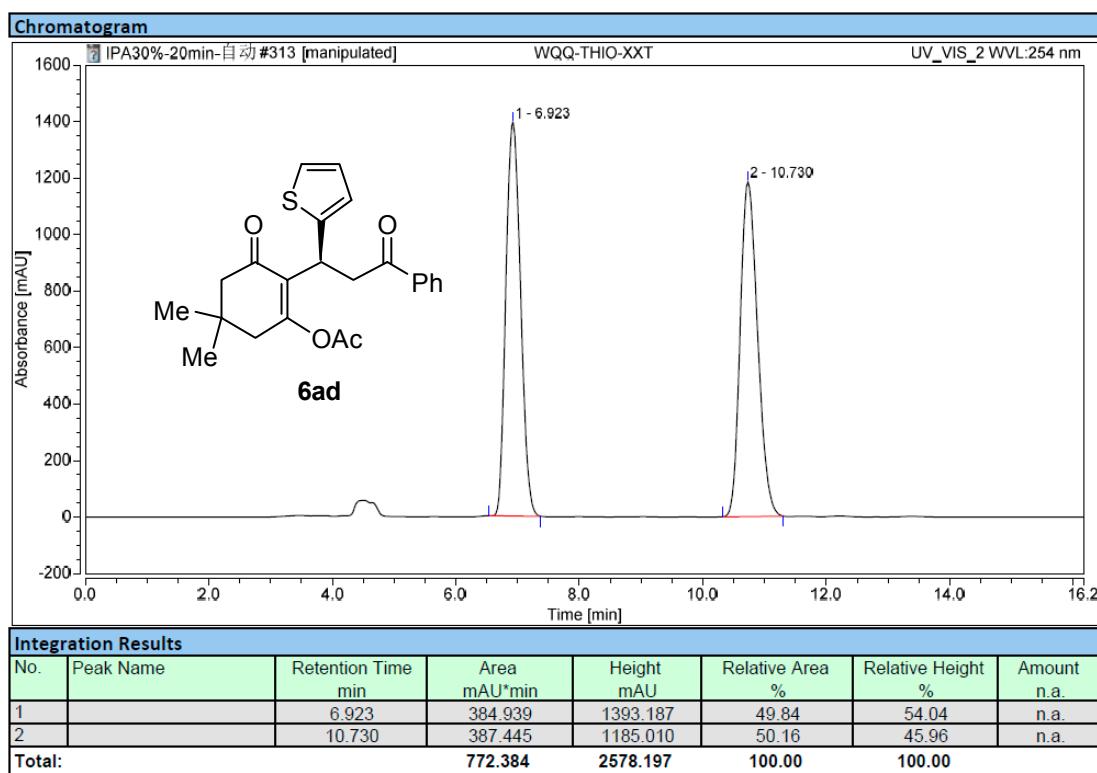
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.387	781.505	2564.376	50.25	58.72	n.a.
2		12.980	773.582	1802.842	49.75	41.28	n.a.
Total:			1555.088	4367.218	100.00	100.00	

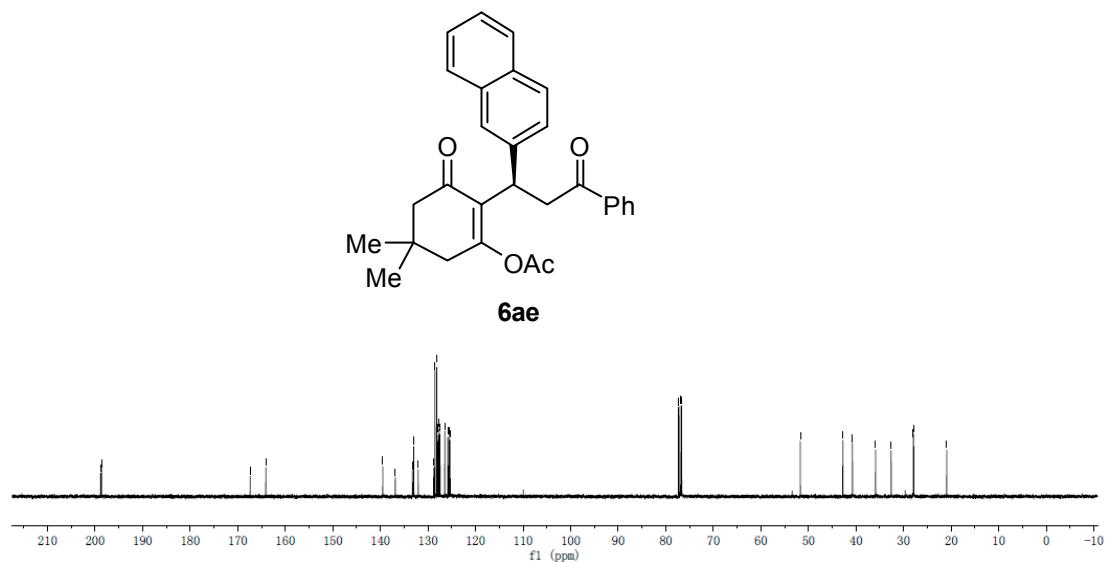
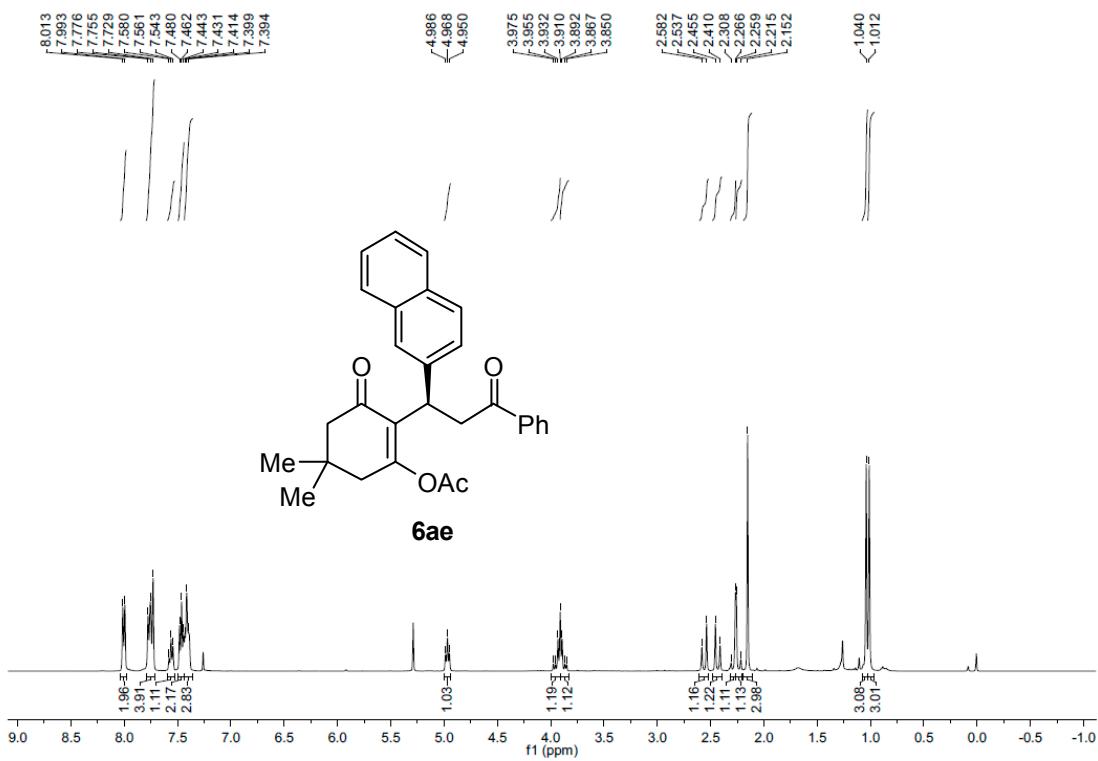


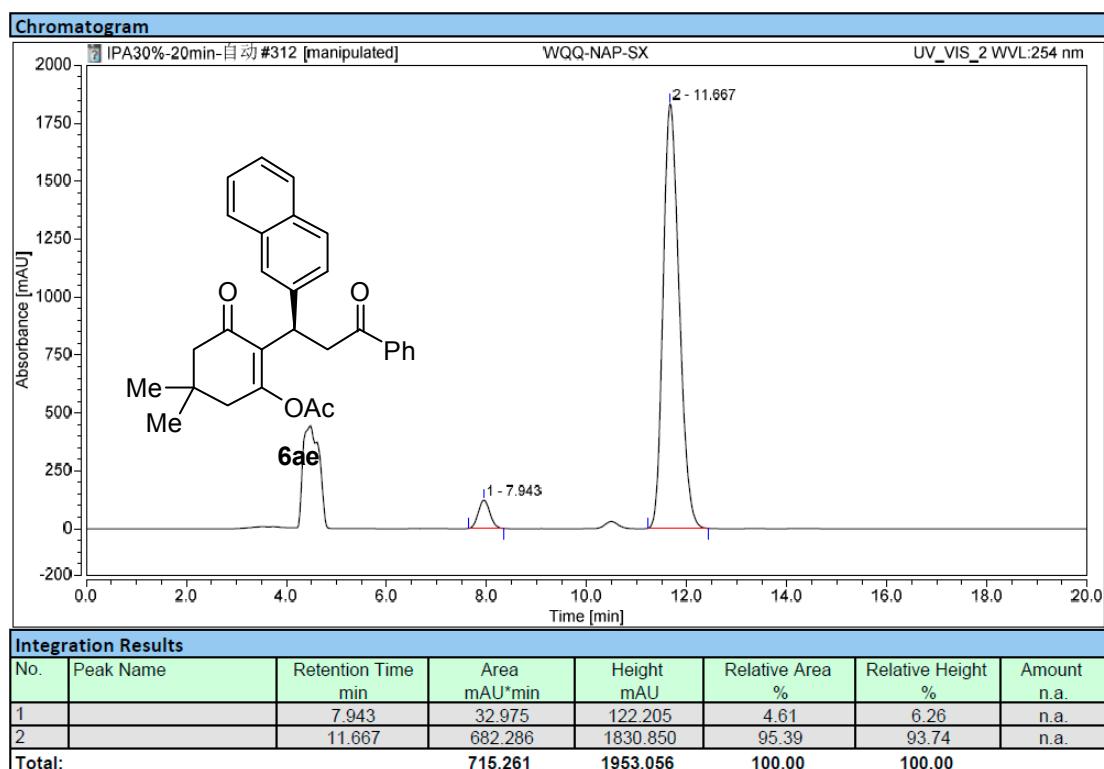
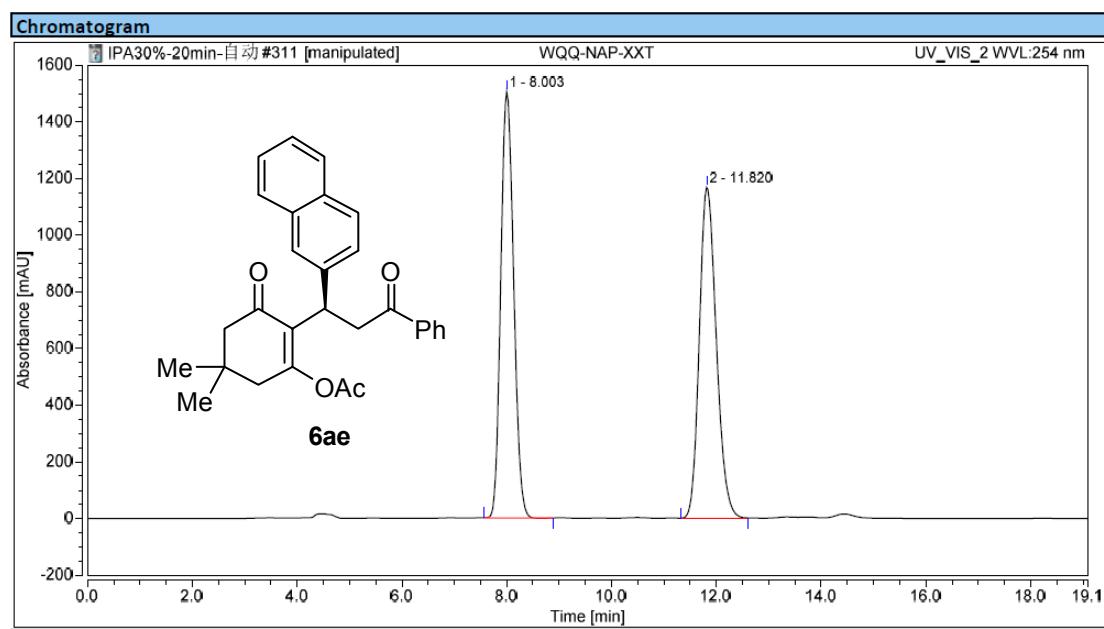
Integration Results

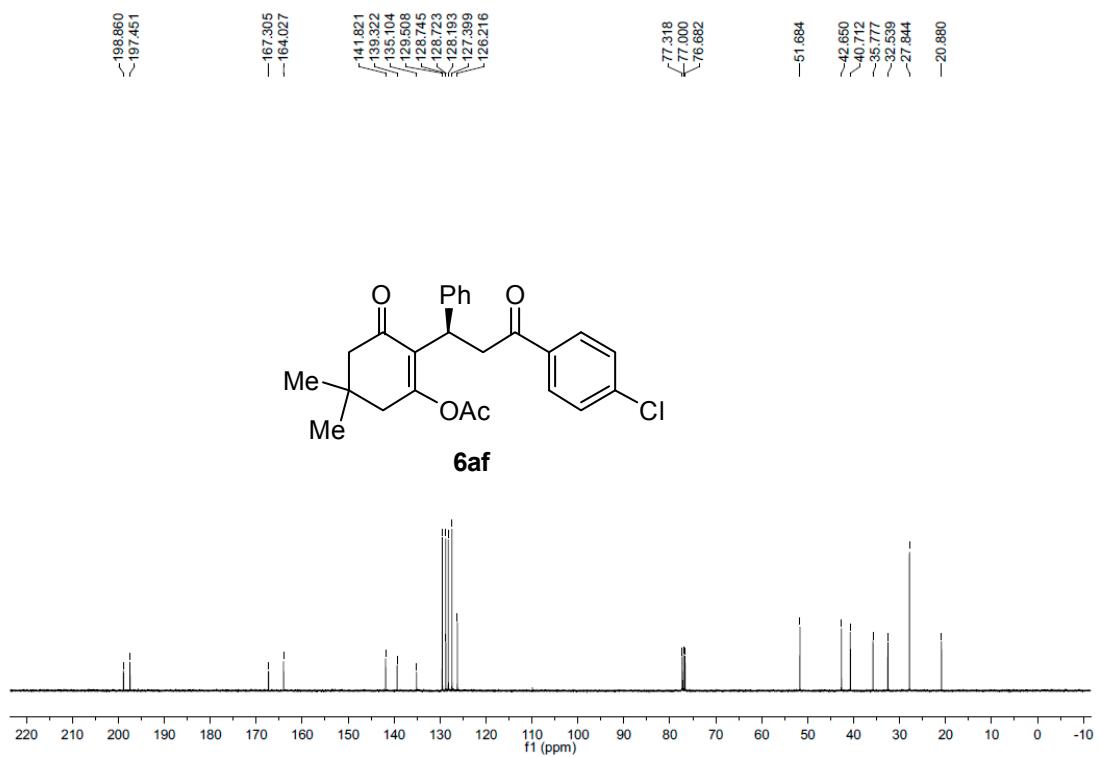
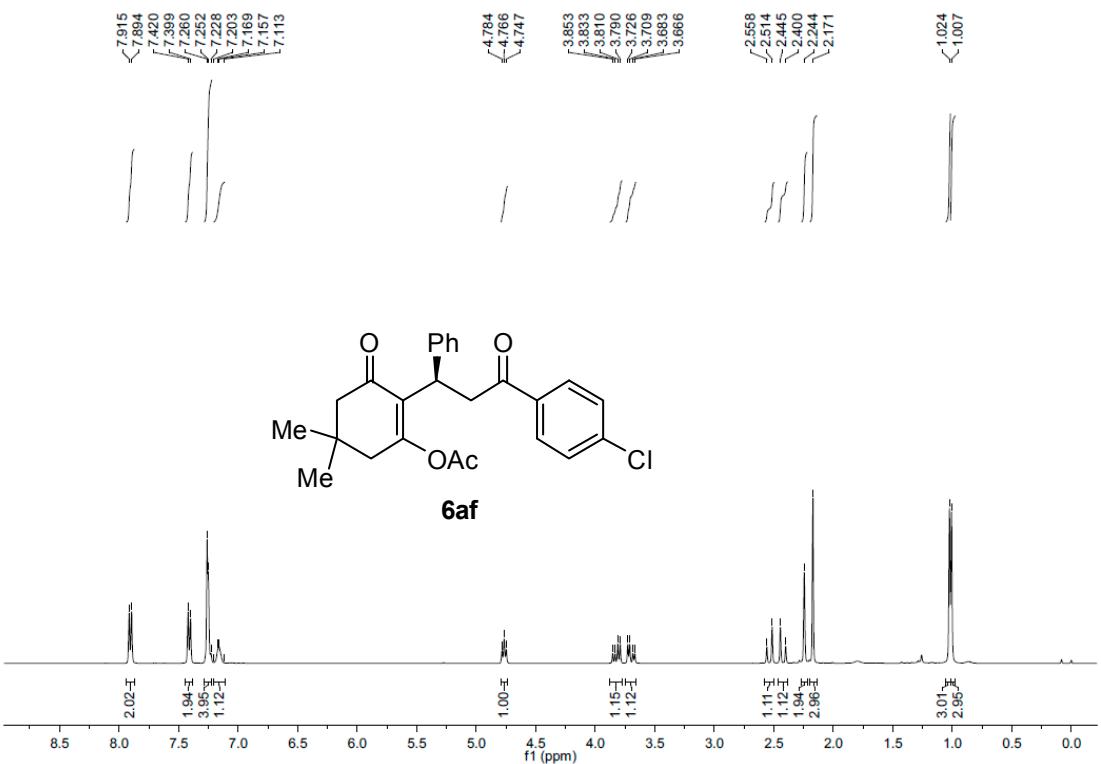
No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.467	40.762	154.775	3.57	5.96	n.a.
2		13.007	1102.012	2442.184	96.43	94.04	n.a.
Total:			1142.774	2596.959	100.00	100.00	

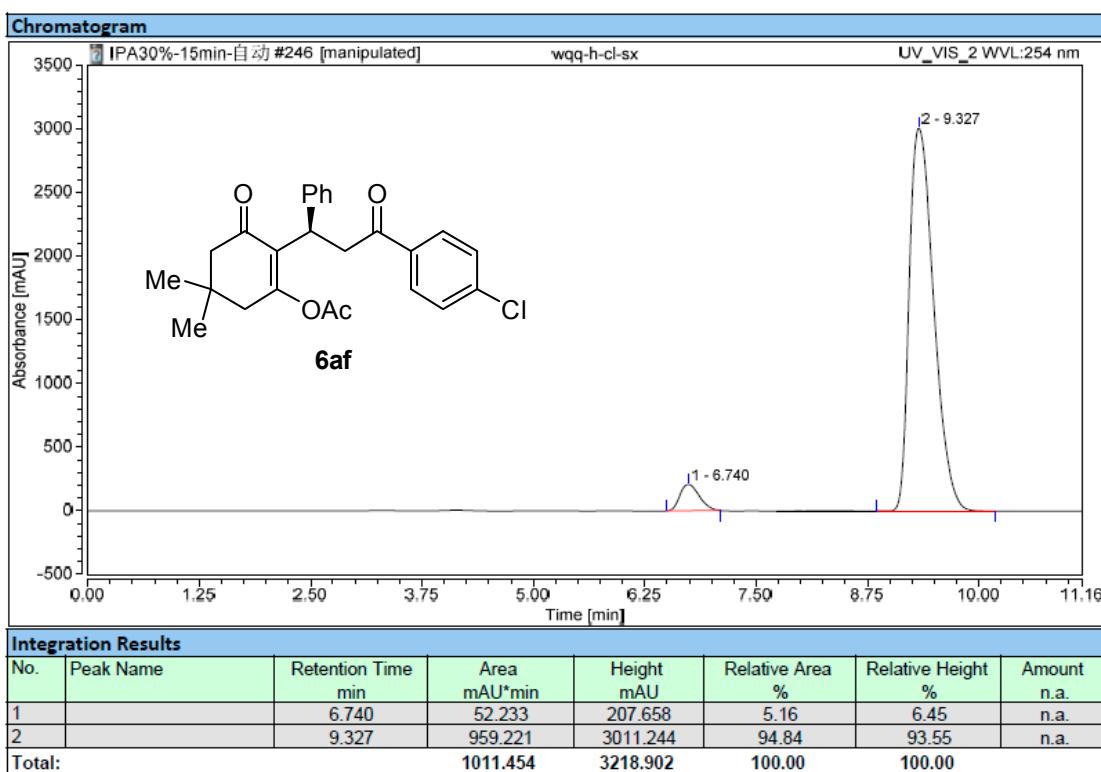
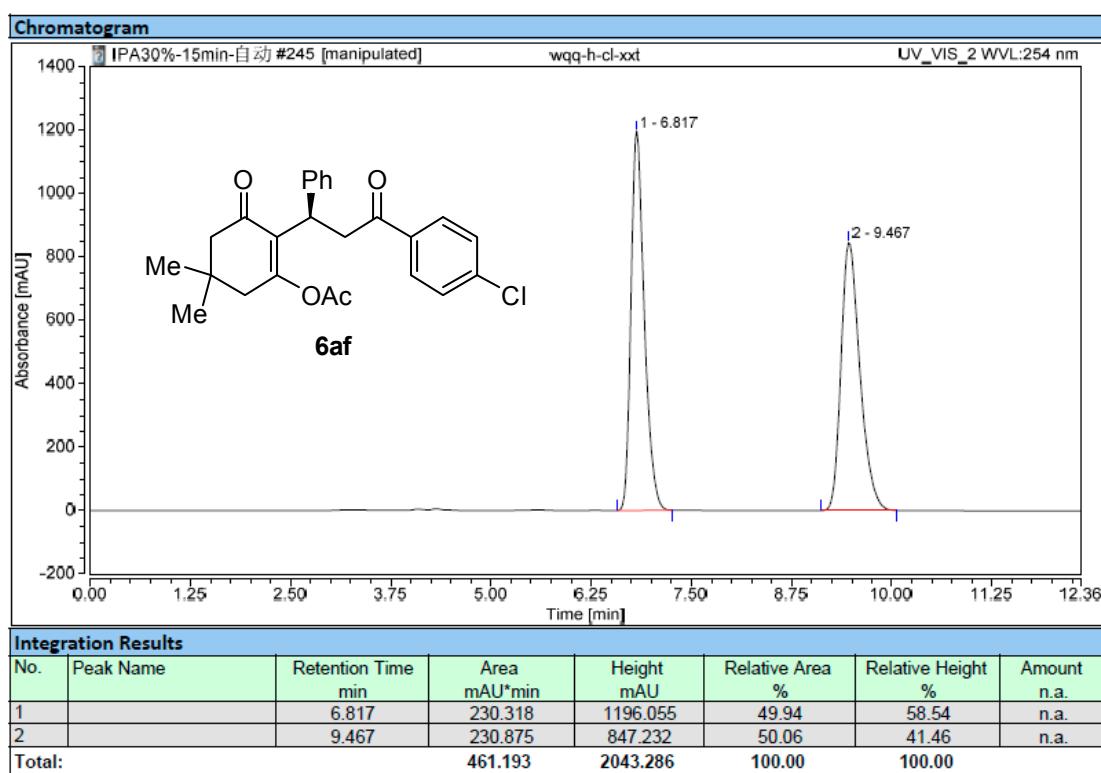


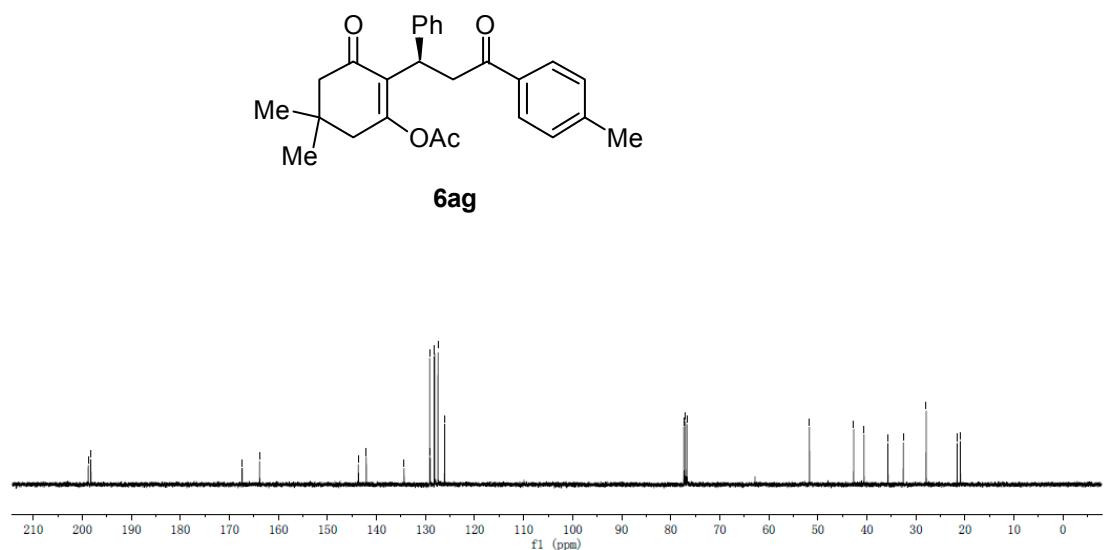
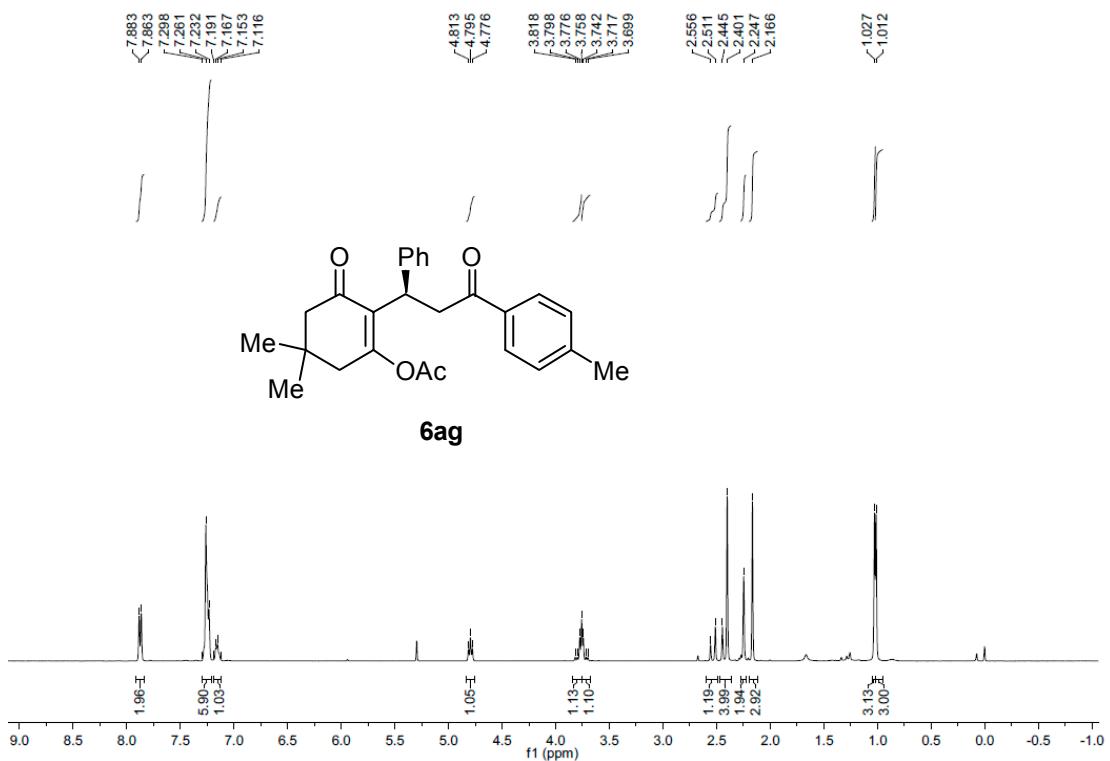


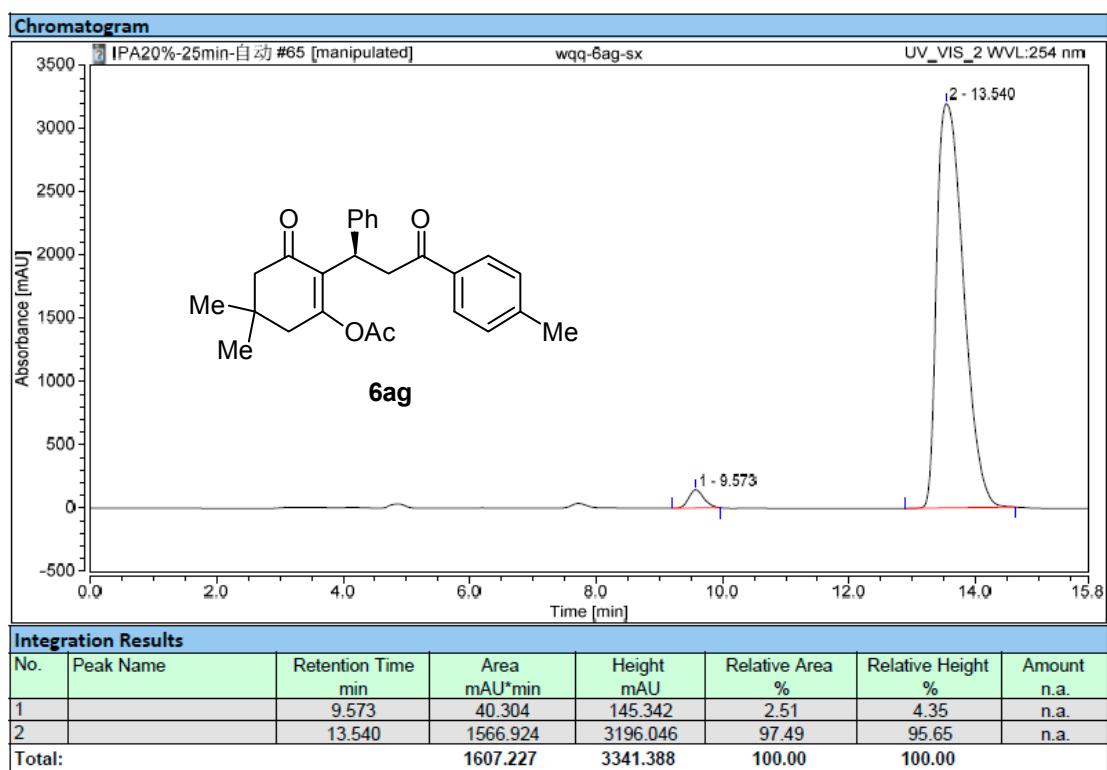
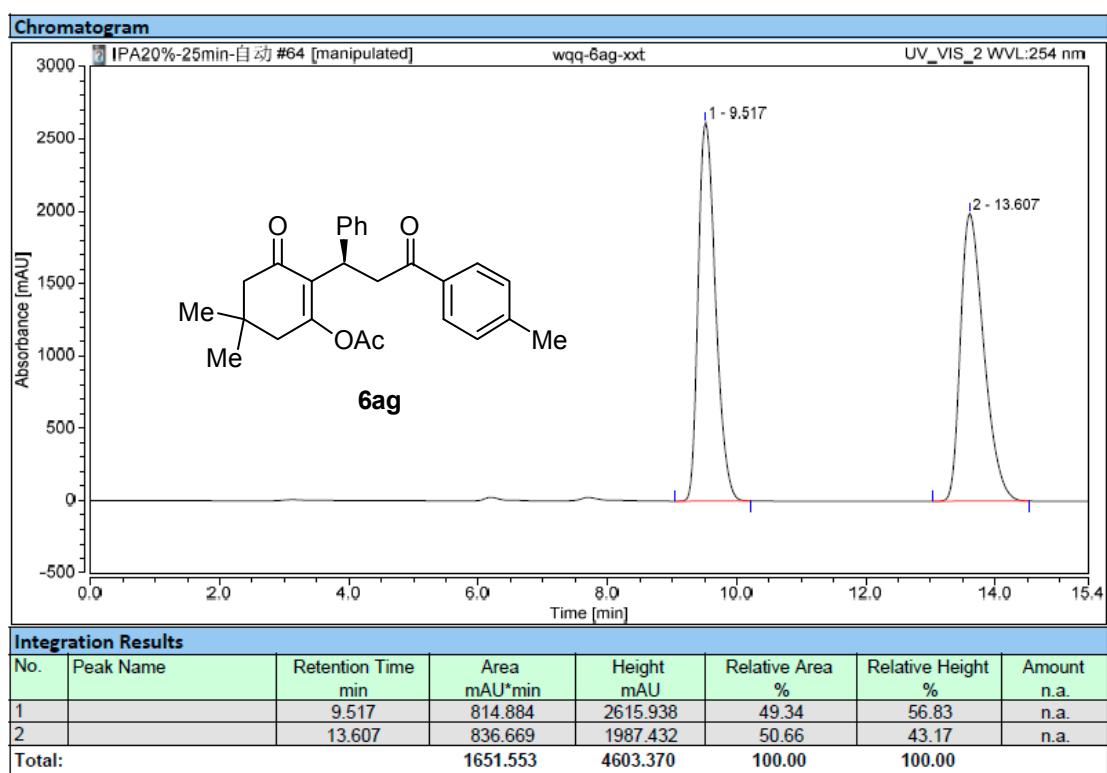


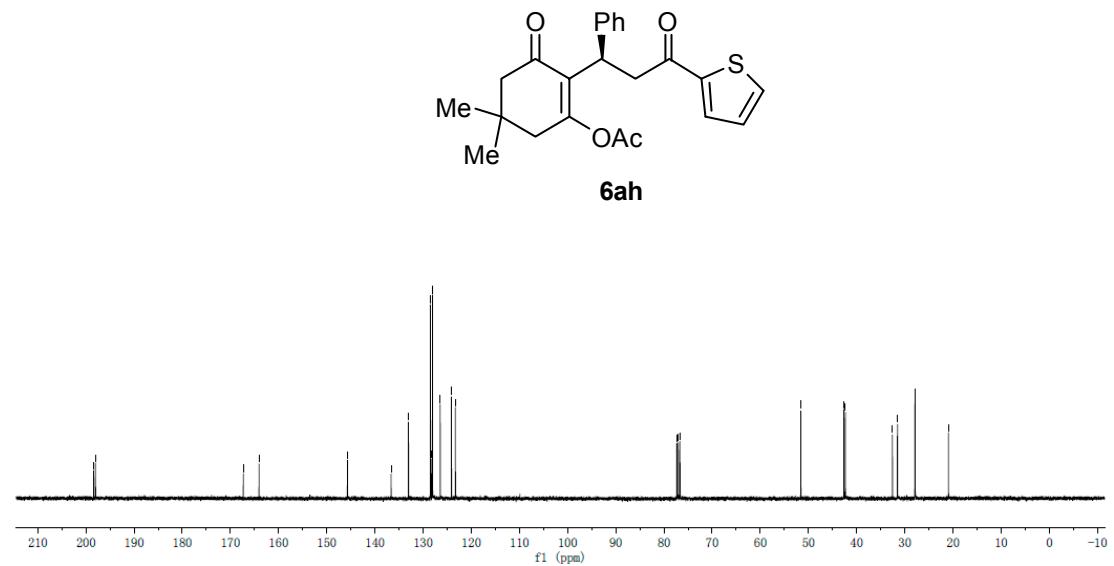
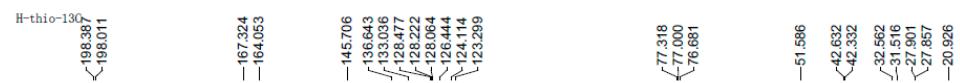
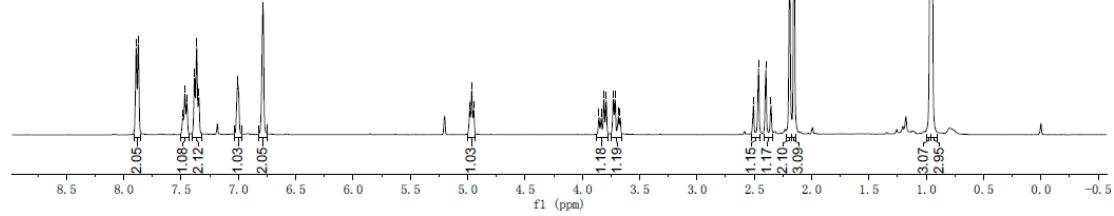
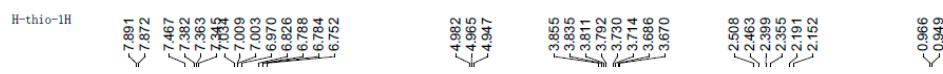


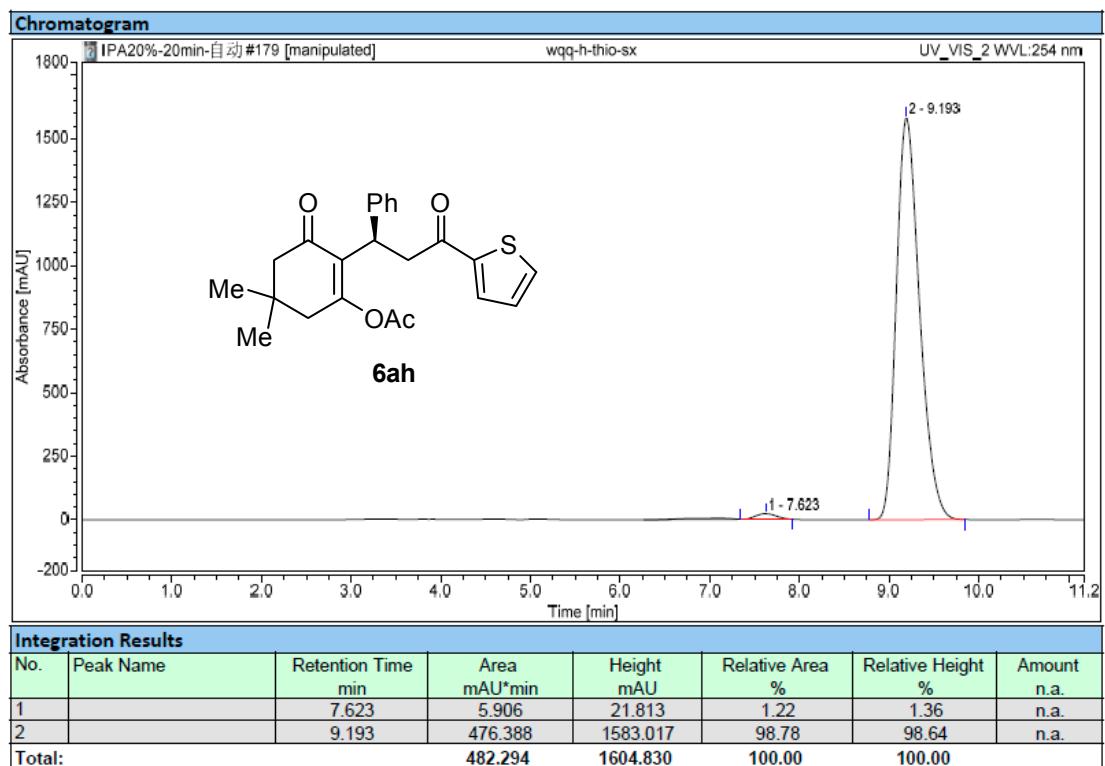
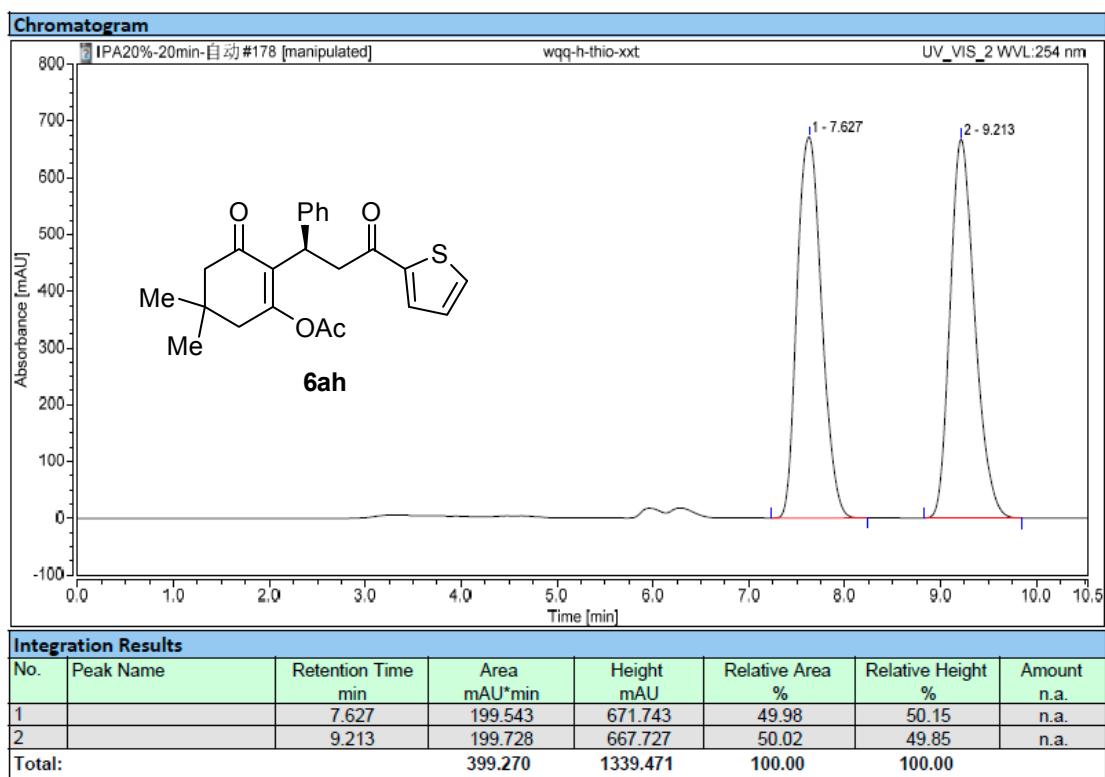


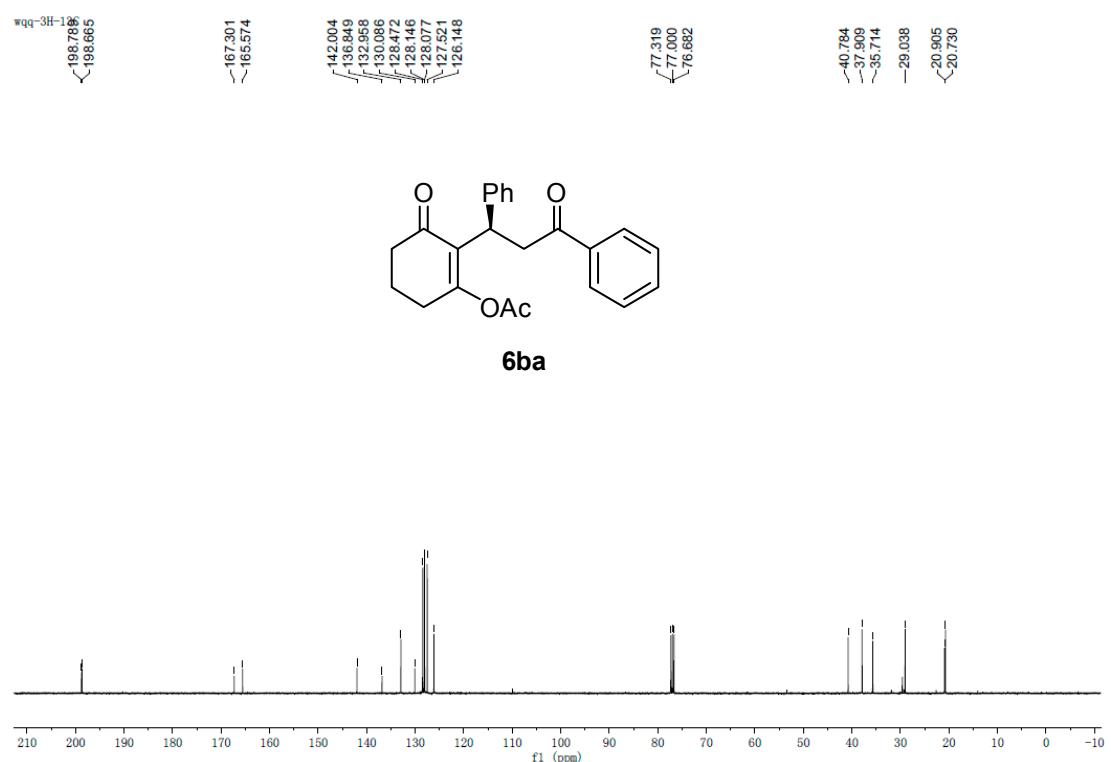
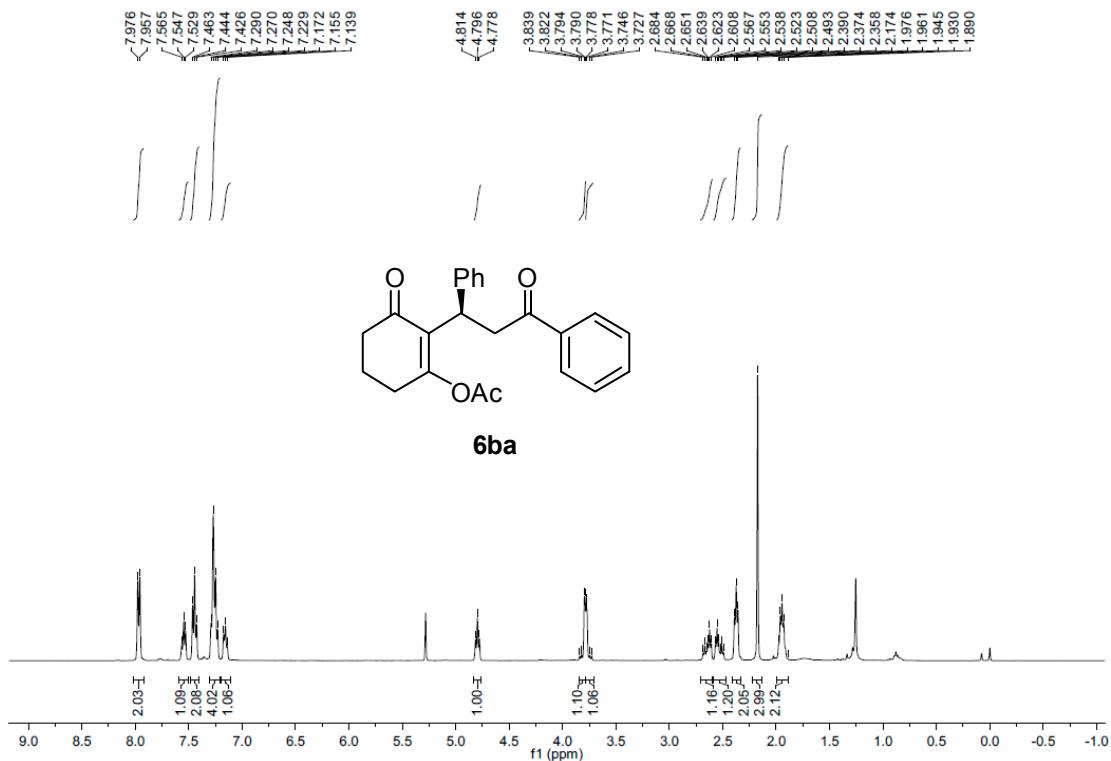


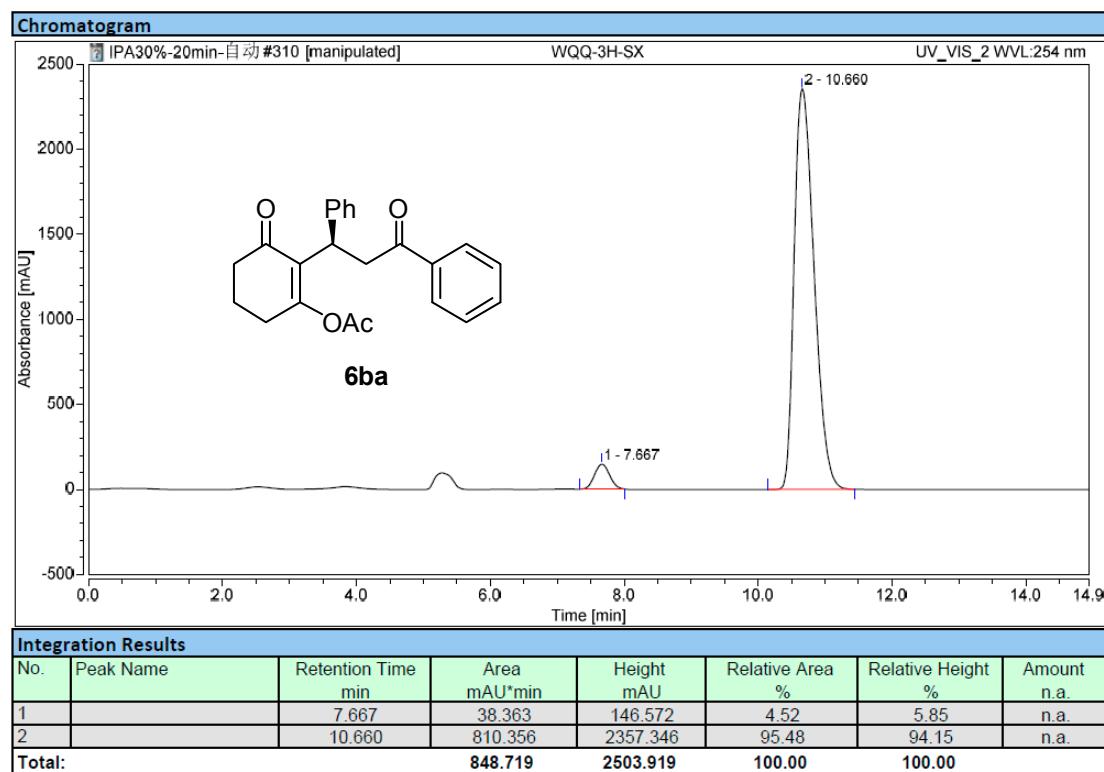
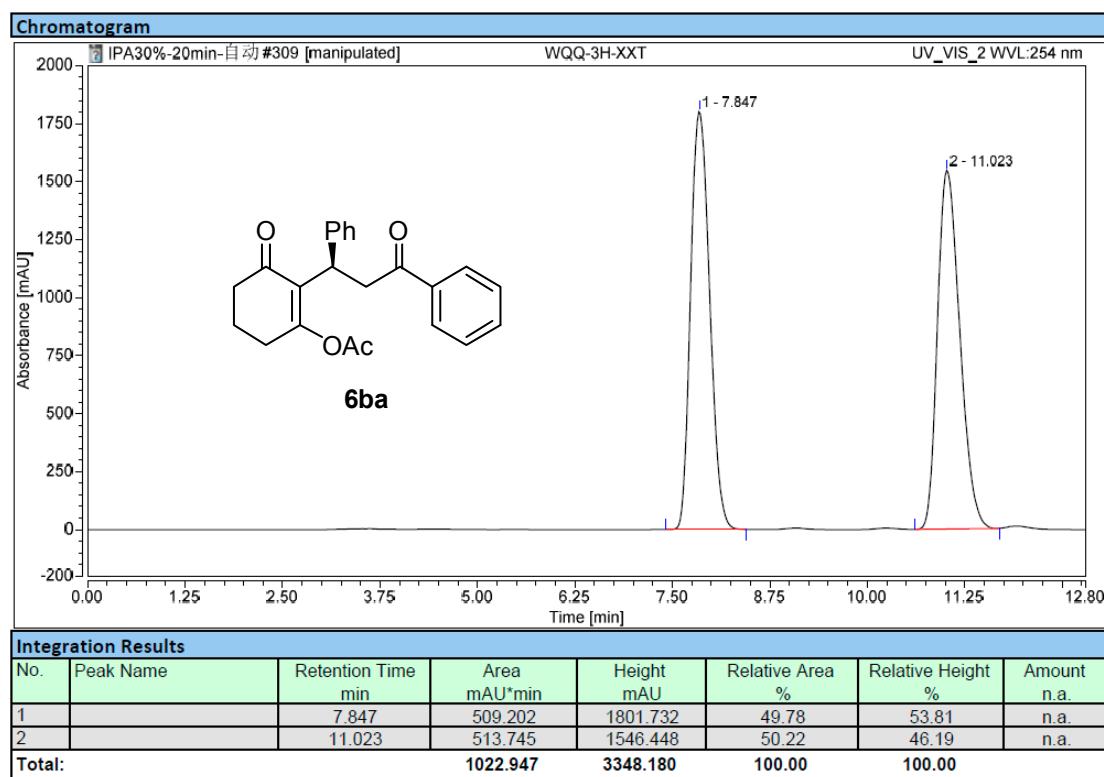


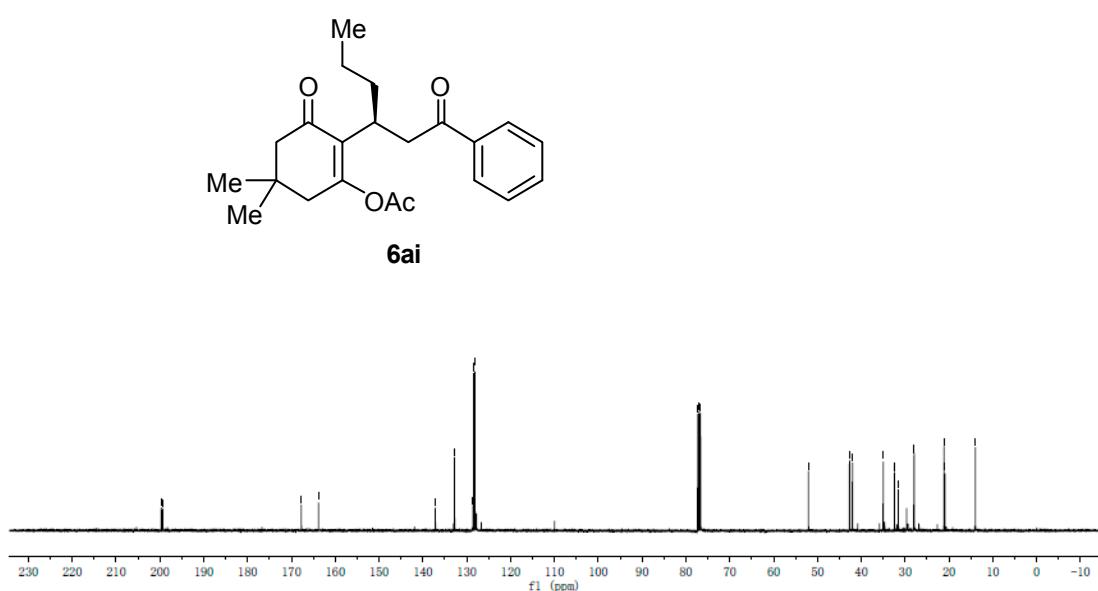
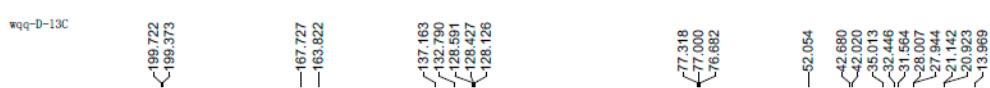
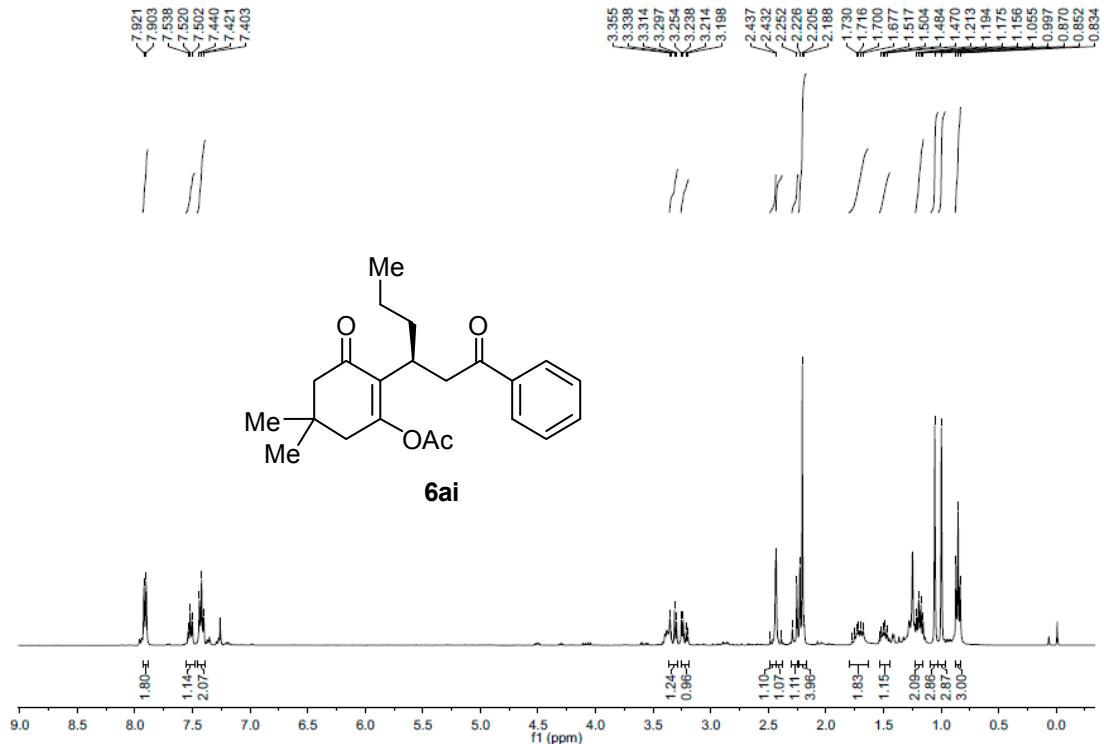


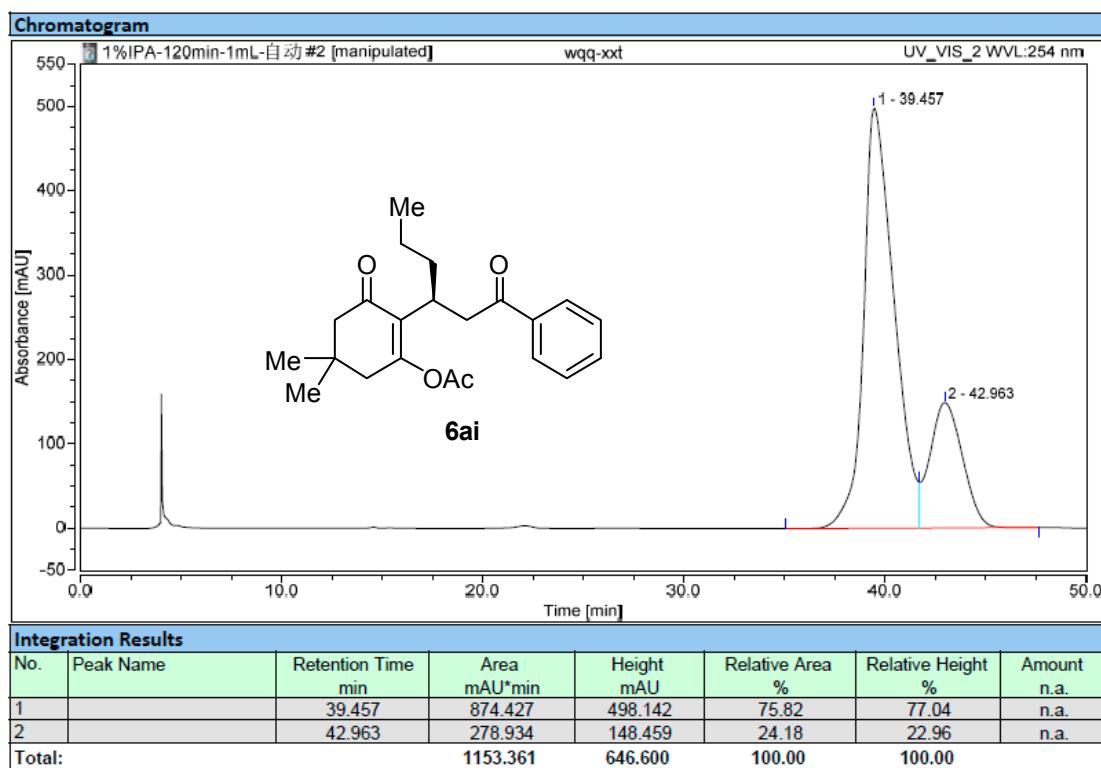
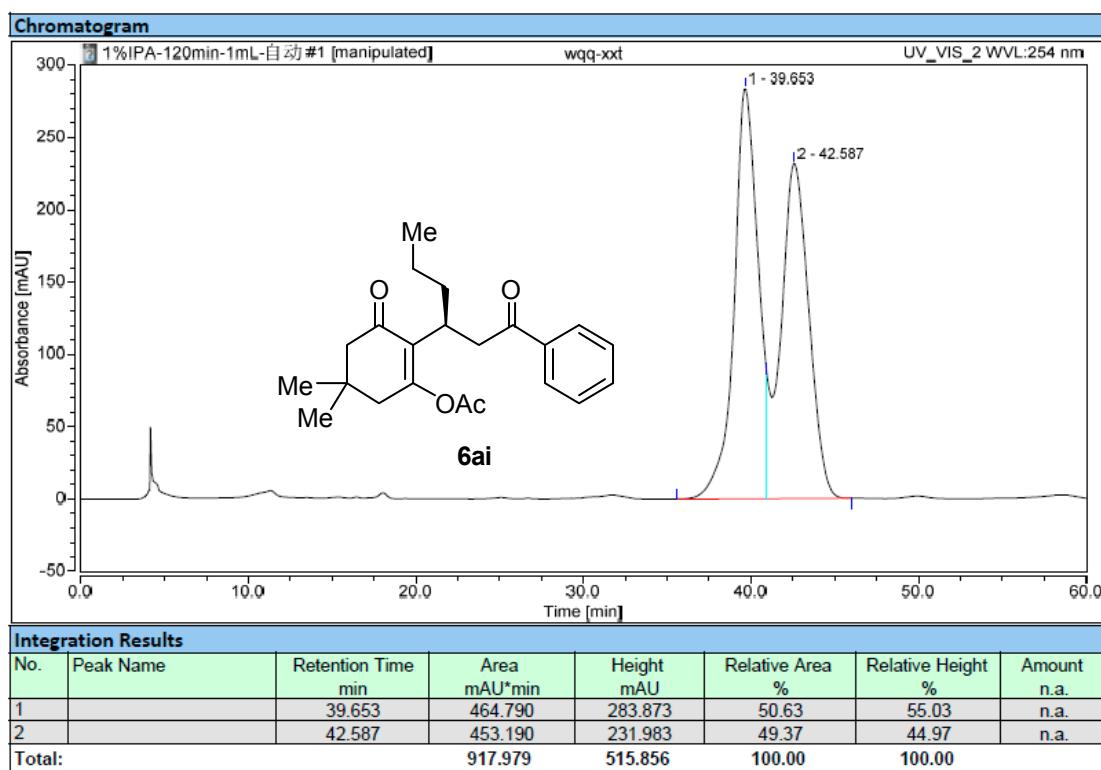


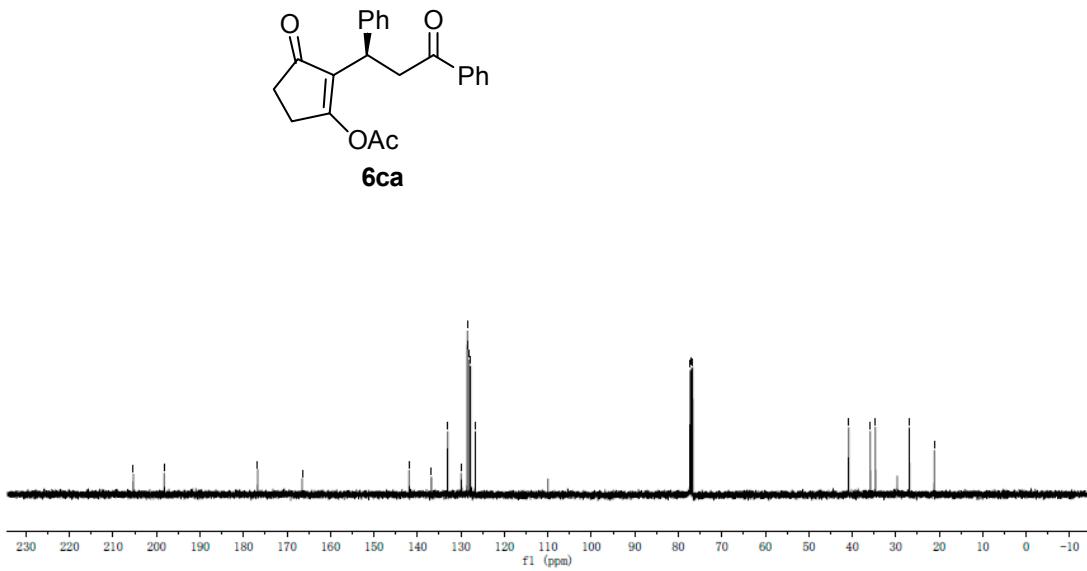
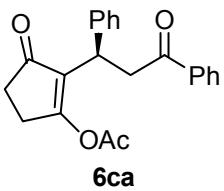
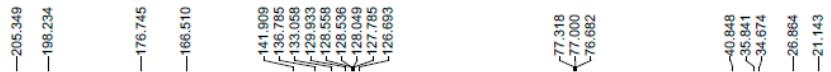
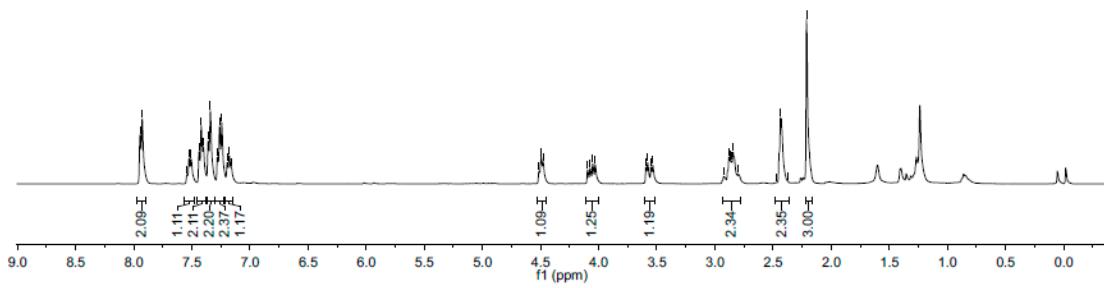
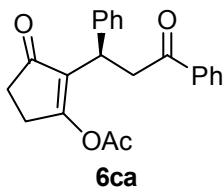


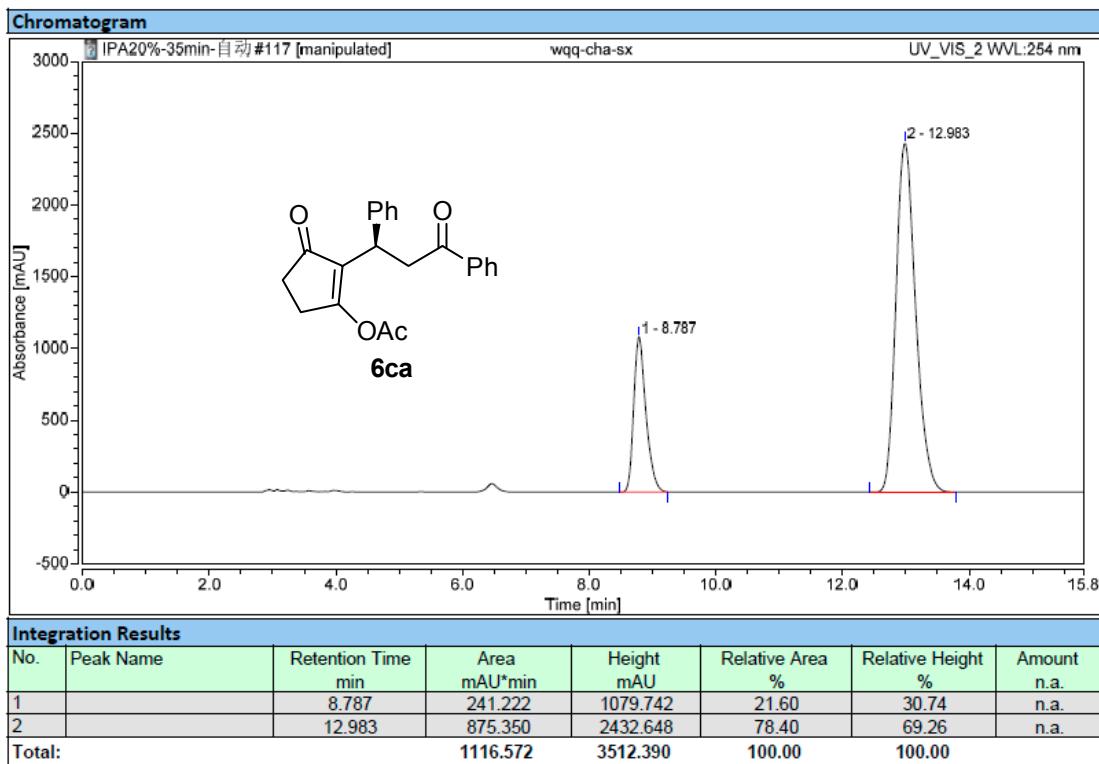
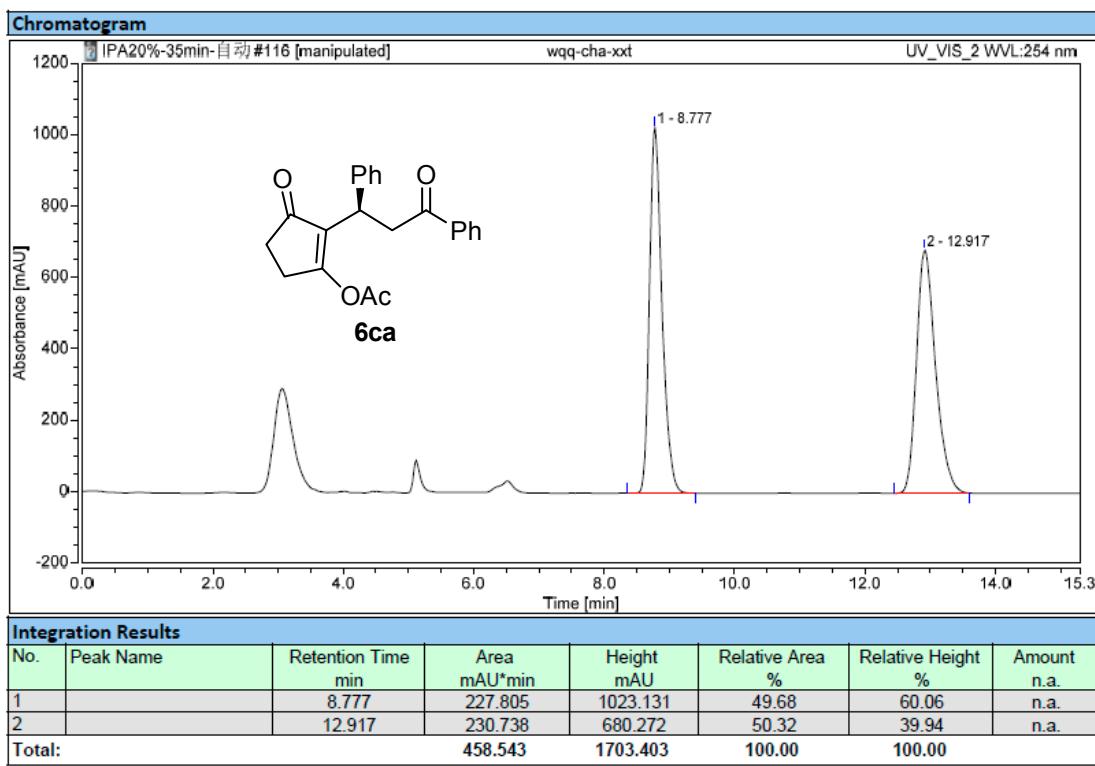


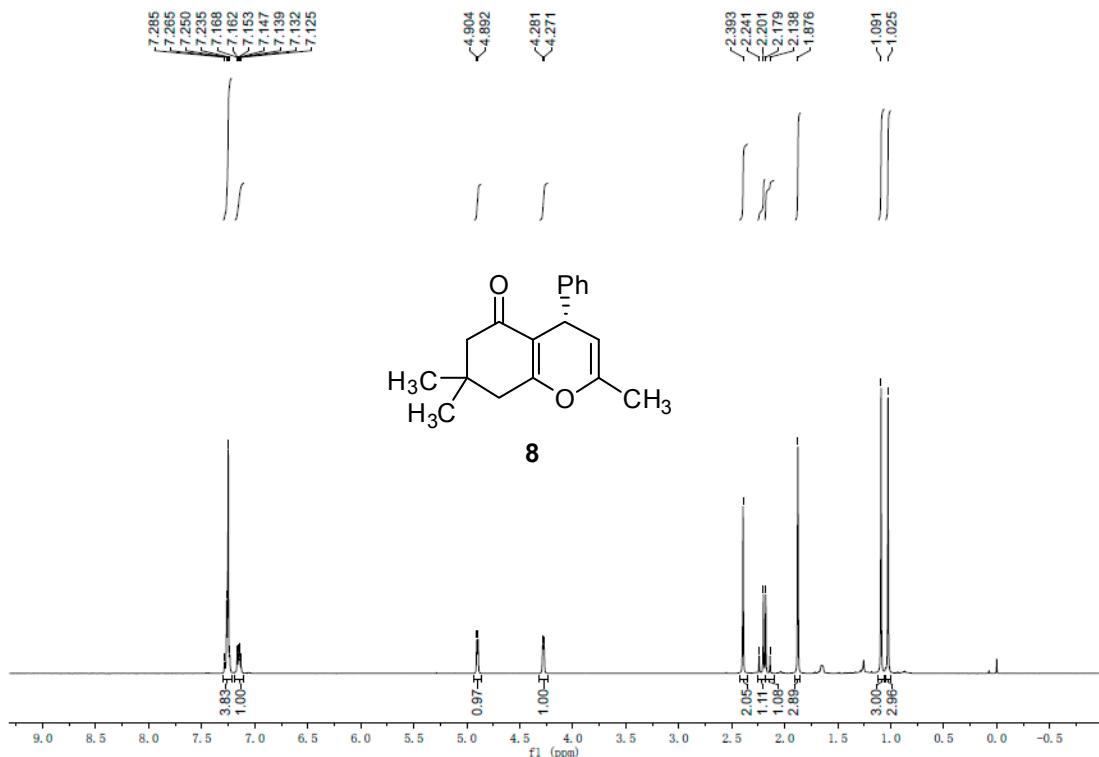




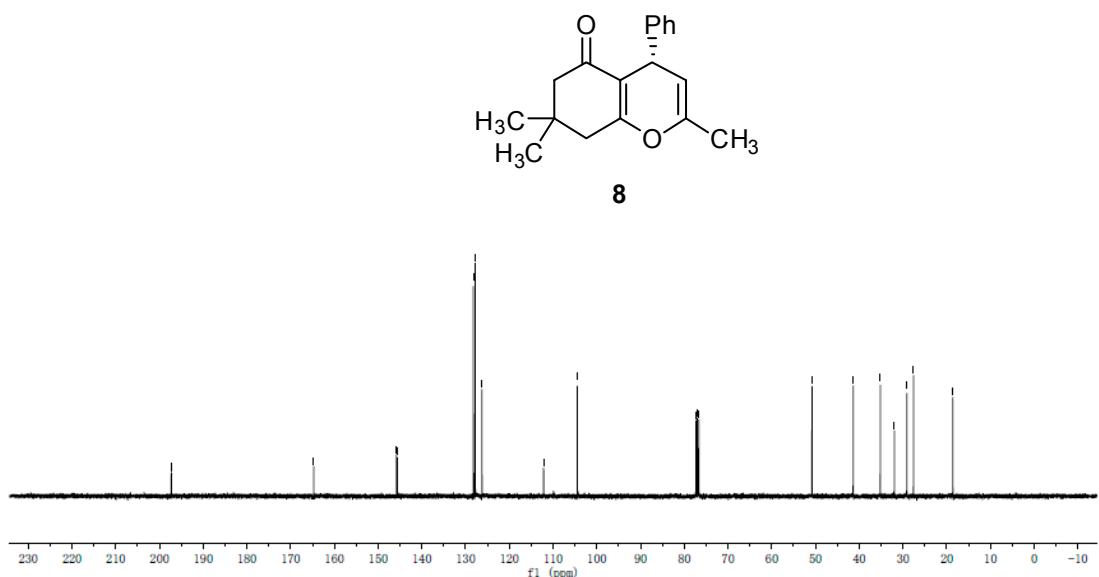


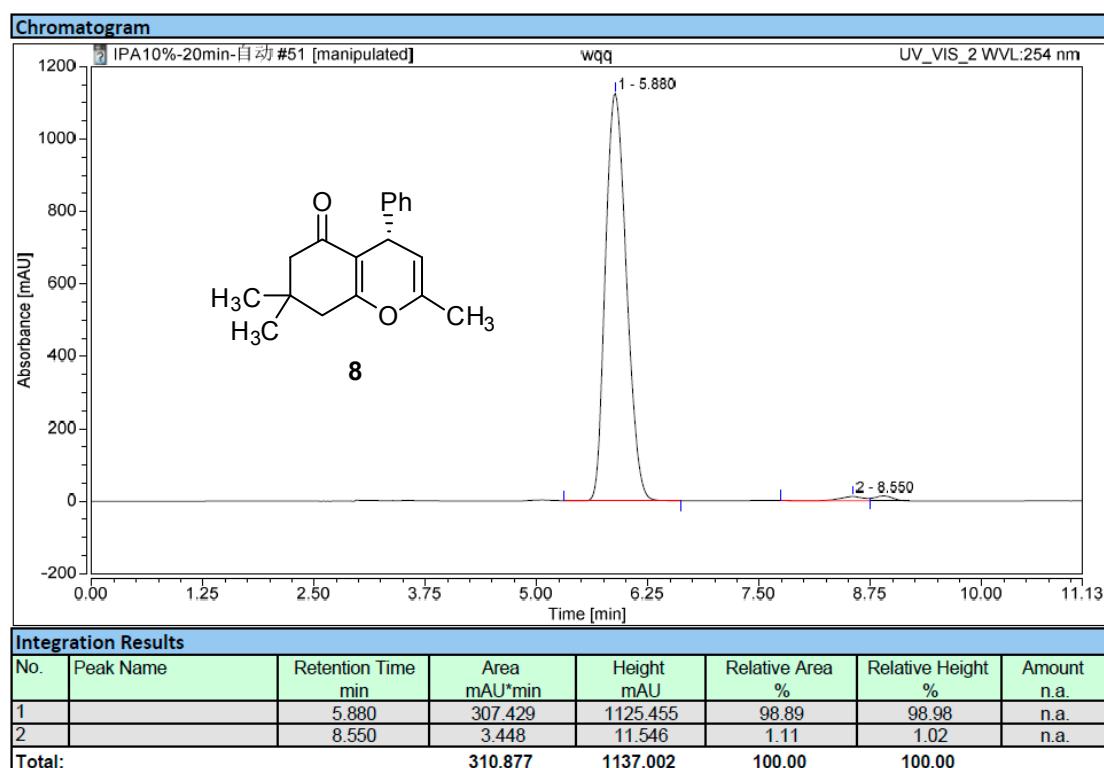
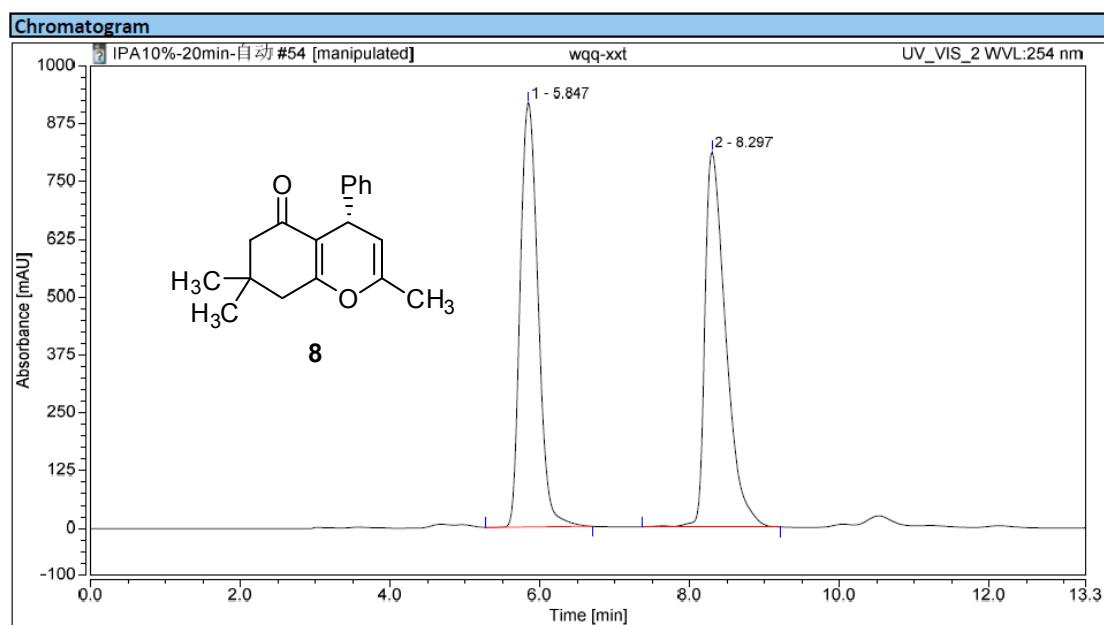


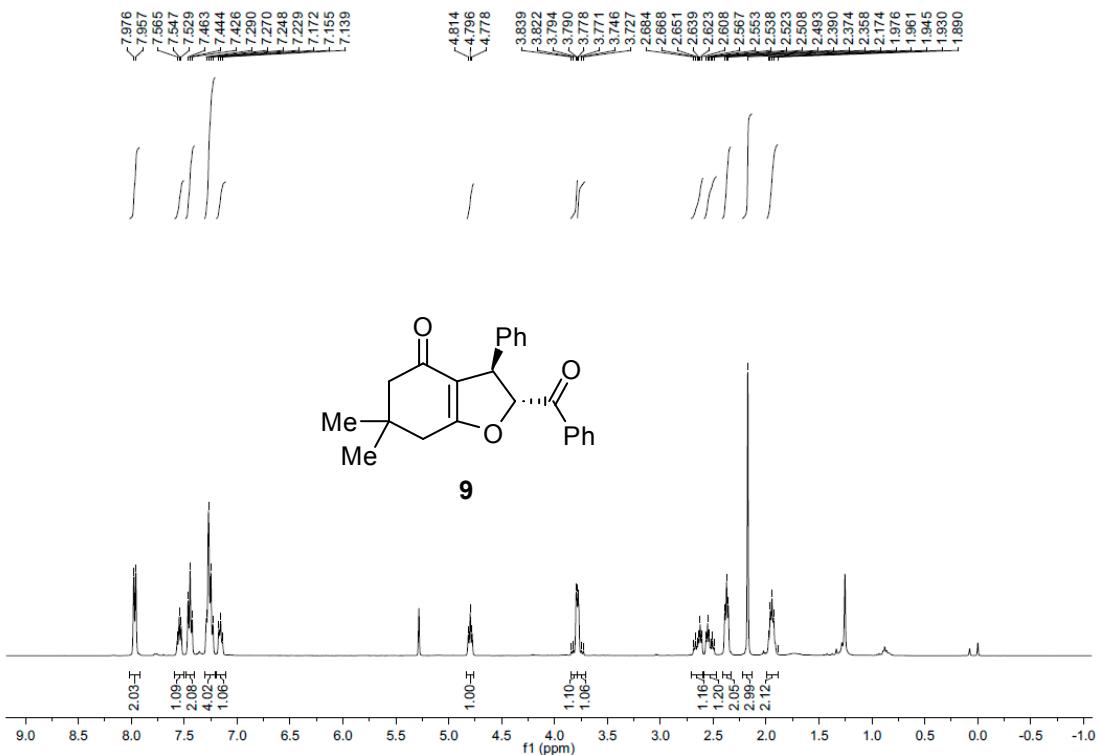




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