

Electronic Supplementary Information for

Chiral amine/chiral acid as excellent organocatalytic system

for the enantioselective tandem oxa-Michael-aldol reaction

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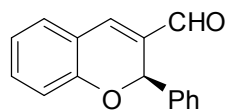
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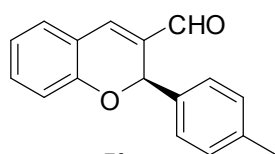
Proton and carbon NMR spectra of 5a-5m	S2
HPLC analysis spectra	S19



5a

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.63 (s, 1H), 7.39 (s, 1H), 7.35-7.34 (m, 2H), 7.28-7.23 (m, 5H), 6.95-6.92 (t, $J=7.5$ Hz, 1H), 6.87-6.85 (d, $J=8.5$ Hz, 1H), 6.33 (s, 1H).

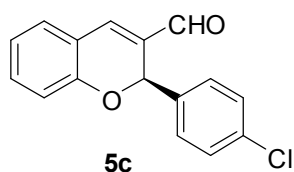
^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 190.0, 154.9, 140.8, 139.1, 133.8, 133.7, 129.4, 128.7, 128.6, 126.8, 121.8, 120.0, 117.2, 74.3.



5b

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.62 (s, 1H), 7.39 (s, 1H), 7.27-7.22 (m, 4H), 7.08-7.06 (d, $J=8.5$ Hz, 2H), 6.94-6.91 (t, $J=8.5$ Hz, 1H), 6.85-6.83 (d, $J=8.5$ Hz, 1H), 6.29 (s, 1H), 2.27 (s, 3H).

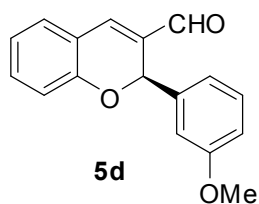
^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 190.0, 154.9, 140.6, 138.5, 136.1, 133.9, 133.6, 129.3, 129.2, 126.8, 121.7, 120.0, 117.2, 74.2, 21.1.



5c

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.63 (s, 1H), 7.41 (s, 1H), 7.31-7.27 (m, 3H), 7.25-7.22 (m, 3H), 6.97-6.94 (t, $J=9.0$ Hz, 1H), 6.87-6.85 (d, $J=8.5$ Hz, 1H), 6.29 (s, 1H).

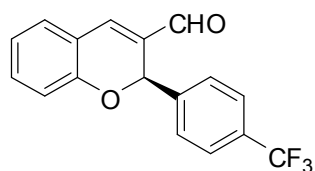
^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 189.9, 154.6, 140.9, 137.6, 134.5, 133.9, 133.4, 129.4, 128.7, 128.2, 122.0, 119.8, 117.2, 73.5.



5d

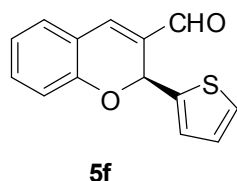
^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.63 (s, 1H), 7.38 (s, 1H), 7.30-7.26 (m, 1H), 7.25-7.22 (m, 1H), 7.19-7.16 (t, $J=8.0$ Hz, 1H), 6.95-6.91 (m, 3H), 6.88-6.87 (d, $J=8.5$ Hz, 1H), 6.80-6.78 (dd, $J_1=8.5$ Hz, $J_2=3.0$ Hz, 1H), 6.31 (s, 1H), 3.72 (s, 3H).

^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 190.0, 159.7, 154.9, 140.8, 140.6, 133.7, 129.6, 129.4, 121.8, 120.0, 119.0, 117.1, 113.9, 112.7, 74.0, 55.2.



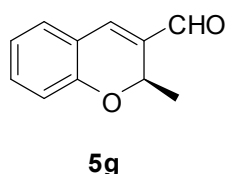
^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.66 (s, 1H), 7.54-7.52 (m, 2H), 7.48-7.46 (m, 2H), 7.44 (s, 1H), 7.35-7.31 (m, 1H), 7.27-7.26 (m, 1H), 6.99-6.96 (t, $J=8.5$ Hz, 1H), 6.92-6.90 (d, $J=8.5$ Hz, 1H), 6.38 (s, 1H).

^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 189.9, 154.6, 143.1, 141.2, 134.0, 133.2, 130.8, 129.6, 127.0, 125.6, 125.5, 122.2, 119.8, 117.4, 73.4.



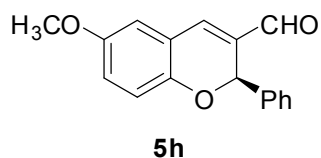
^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.64 (s, 1H), 7.41 (s, 1H), 7.29-7.27 (m, 2H), 7.17-7.16 (dd, $J_1=5.0$ Hz, $J_2=1.5$ Hz, 1H), 6.99-6.96 (m, 2H), 6.89-6.86 (m, 2H), 6.54 (s, 1H).

^{13}C NMR (125 MHz, $\text{DMSO}-d_6$, δ ppm): 190.0, 160.3, 152.8, 141.0, 140.3, 133.1, 132.7, 129.3, 126.4, 121.8, 119.8, 119.0, 116.6, 67.9.



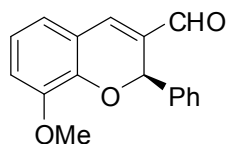
^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.55 (s, 1H), 7.32-7.29 (m, 1H), 7.21-7.19 (m, 2H), 6.96-6.93 (t, $J=7.0$ Hz, 1H), 6.88-6.87 (d, $J=8.0$ Hz, 1H), 5.44-5.40 (q, $J=6.5$ Hz, 1H), 1.37-1.36 (d, $J=6.5$ Hz, 3H).

^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 190.0, 154.5, 140.2, 136.3, 133.4, 129.2, 121.6, 120.0, 117.4, 69.9, 19.9.



^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.64 (s, 1H), 7.35 (s, 1H), 7.34-7.32 (m, 2H), 7.26-7.25 (m, 3H), 6.87-6.85 (dd, $J_1=9.0$ Hz, $J_2=3.0$ Hz, 1H), 6.81-6.79 (m, 1H), 6.77-6.76 (d, $J=3.0$ Hz, 1H), 6.29 (s, 1H), 3.76 (s, 3H).

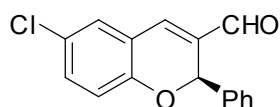
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5i

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.66 (s, 1H), 7.39-7.36 (m, 3H), 7.26-7.25 (m, 3H), 6.93-6.87 (m, 3H), 6.43 (s, 1H), 3.83 (s, 3H).

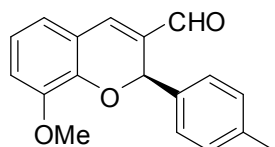
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5j

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.64 (s, 1H), 7.32-7.31 (m, 3H), 7.28-7.27 (m, 3H), 7.22-7.20 (m, 2H), 6.81-6.79 (d, $J=8.0$ Hz, 1H), 6.32 (s, 1H).

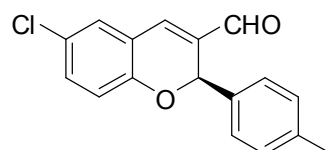
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5k

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.64 (s, 1H), 7.38 (s, 1H), 7.26-7.24 (d, $J=9.0$ Hz, 2H), 7.06-7.05 (m, 2H), 6.90-6.87 (m, 3H), 6.39 (s, 1H), 3.81 (s, 3H), 2.26 (s, 3H).

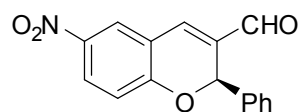
^{13}C NMR (125 MHz, CDCl_3 , δ ppm): 190.0, 148.5, 144.1, 140.7, 138.4, 135.9, 134.0, 129.1, 126.6, 124.5, 121.4, 119.5, 116.1, 74.0, 56.3, 21.1.



5l

^1H NMR (500 MHz, CDCl_3 , δ ppm): 9.64 (s, 1H), 7.33 (s, 1H), 7.23-7.19 (m, 4H), 7.09-7.07 (m, 2H), 6.79-6.77 (d, $J=8.5$ Hz, 1H), 6.28 (s, 1H), 2.28 (s, 3H).

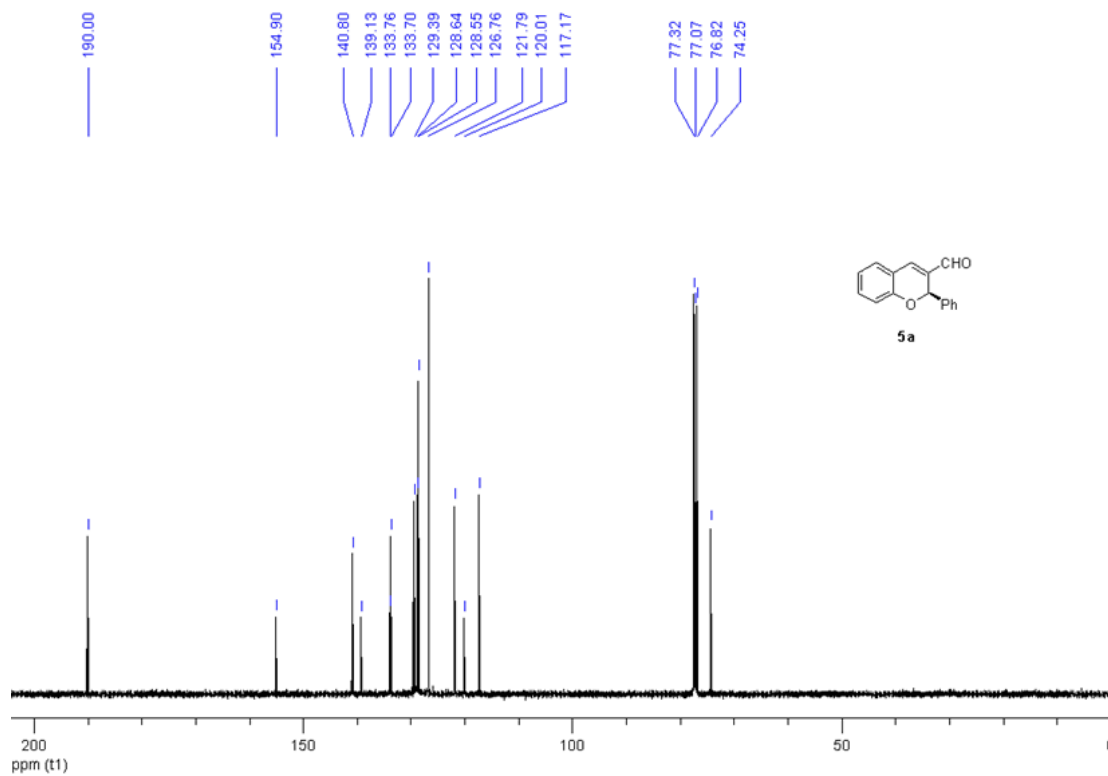
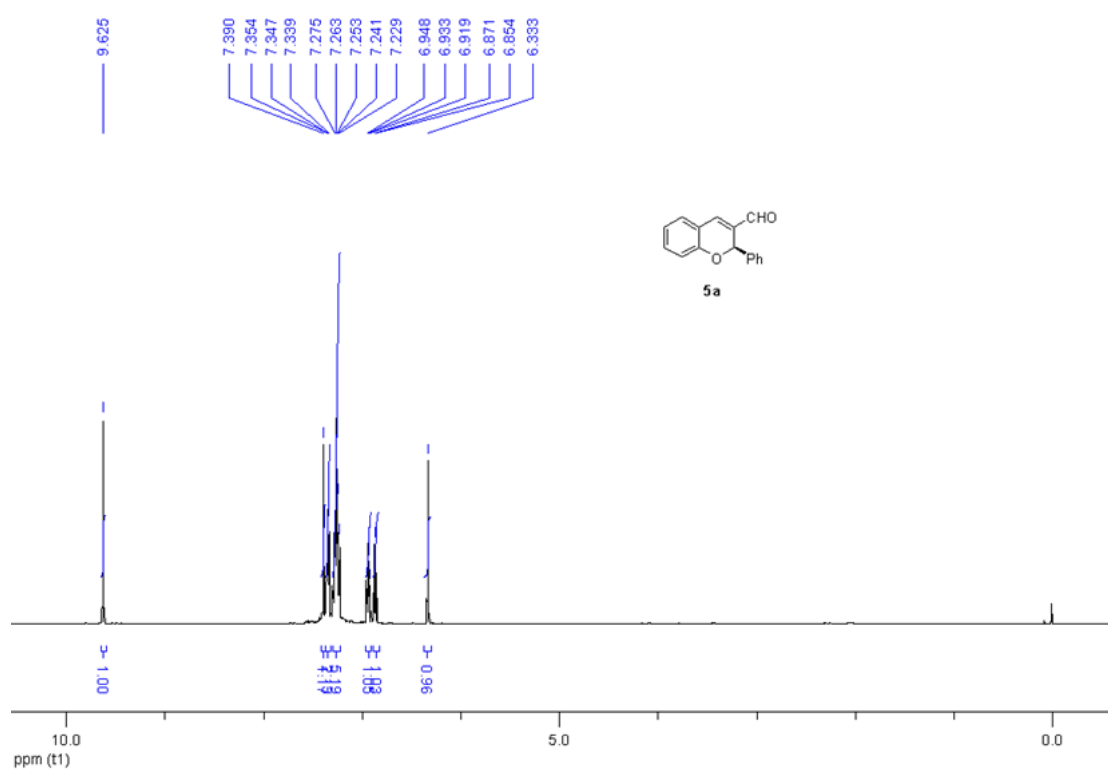
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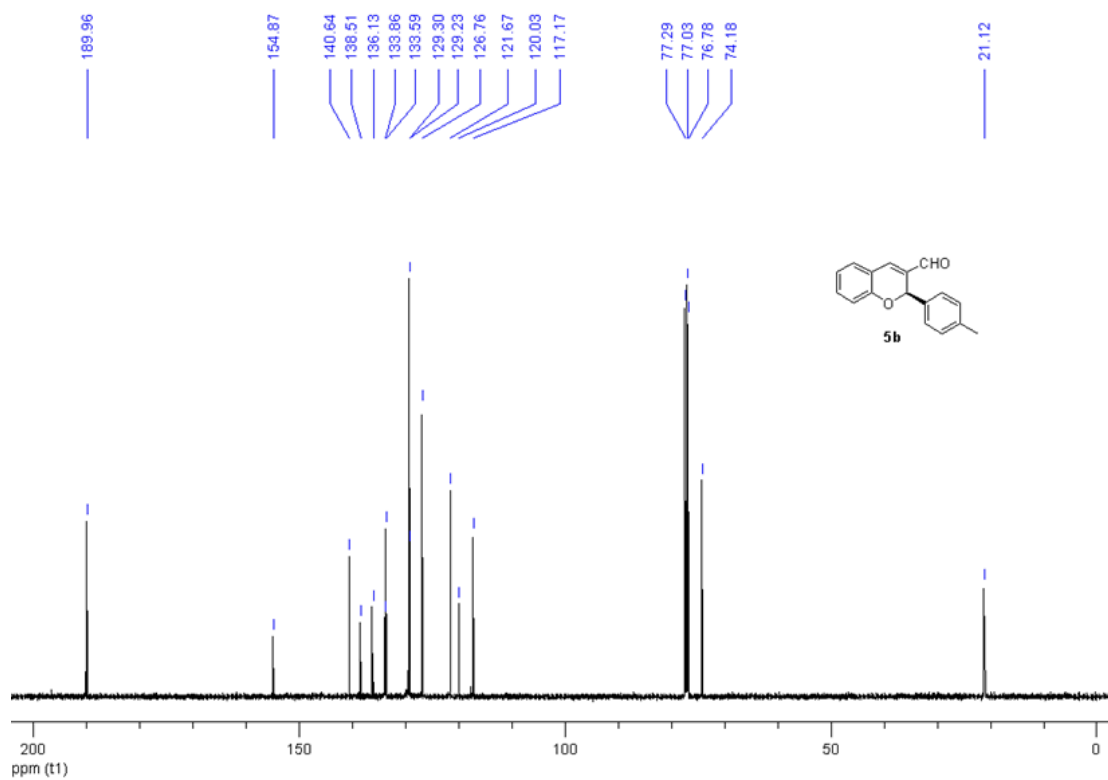
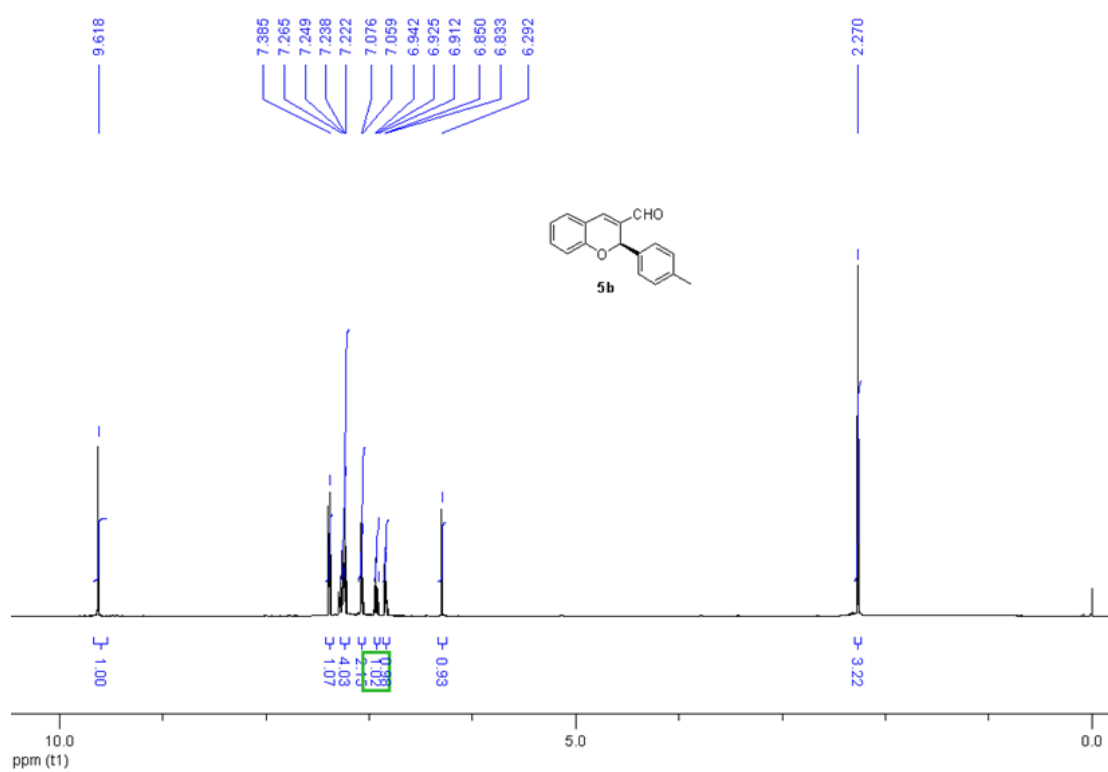


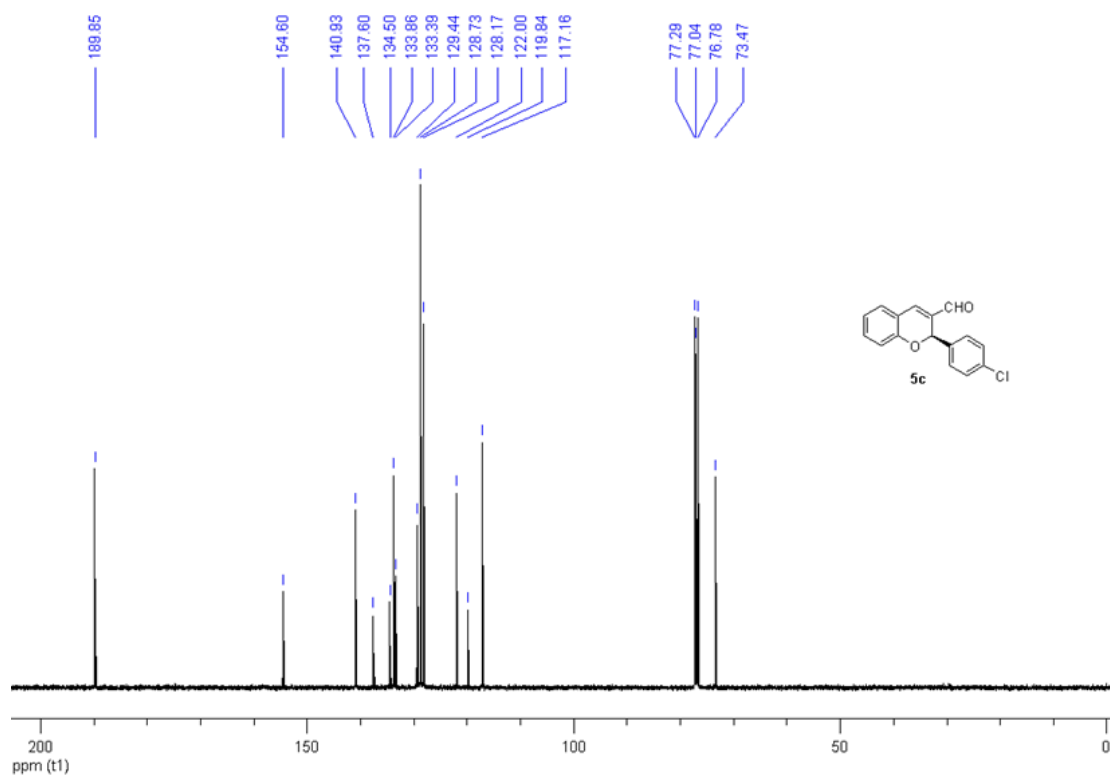
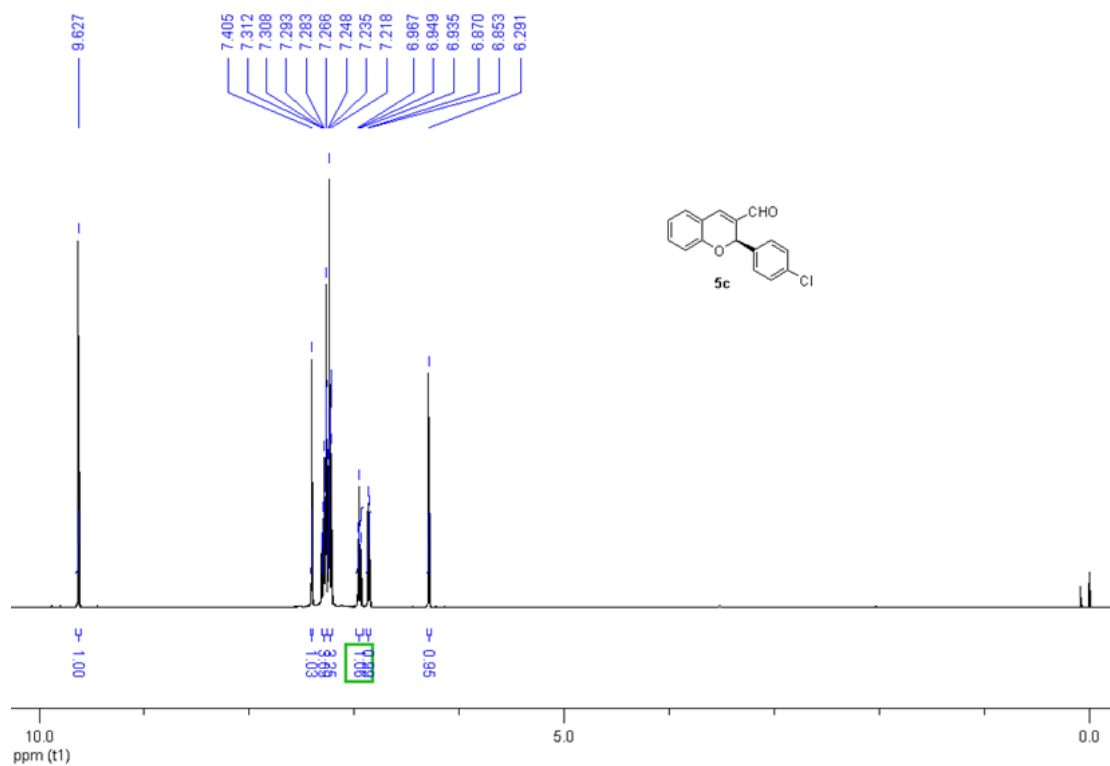
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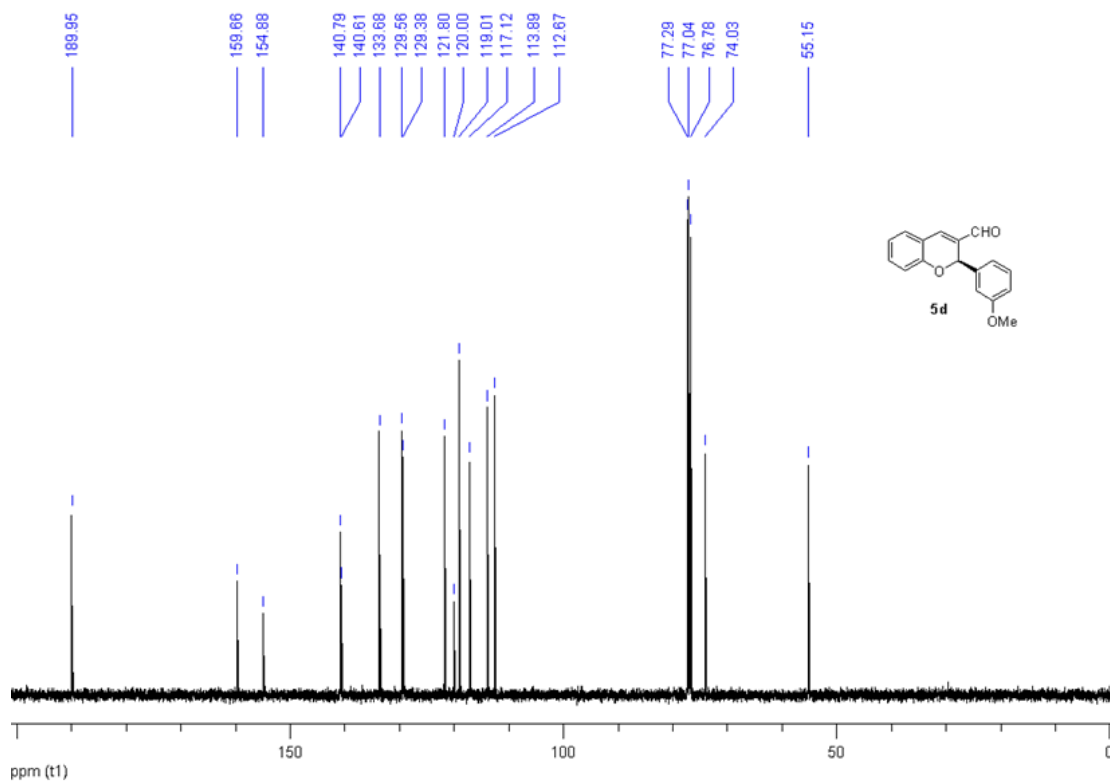
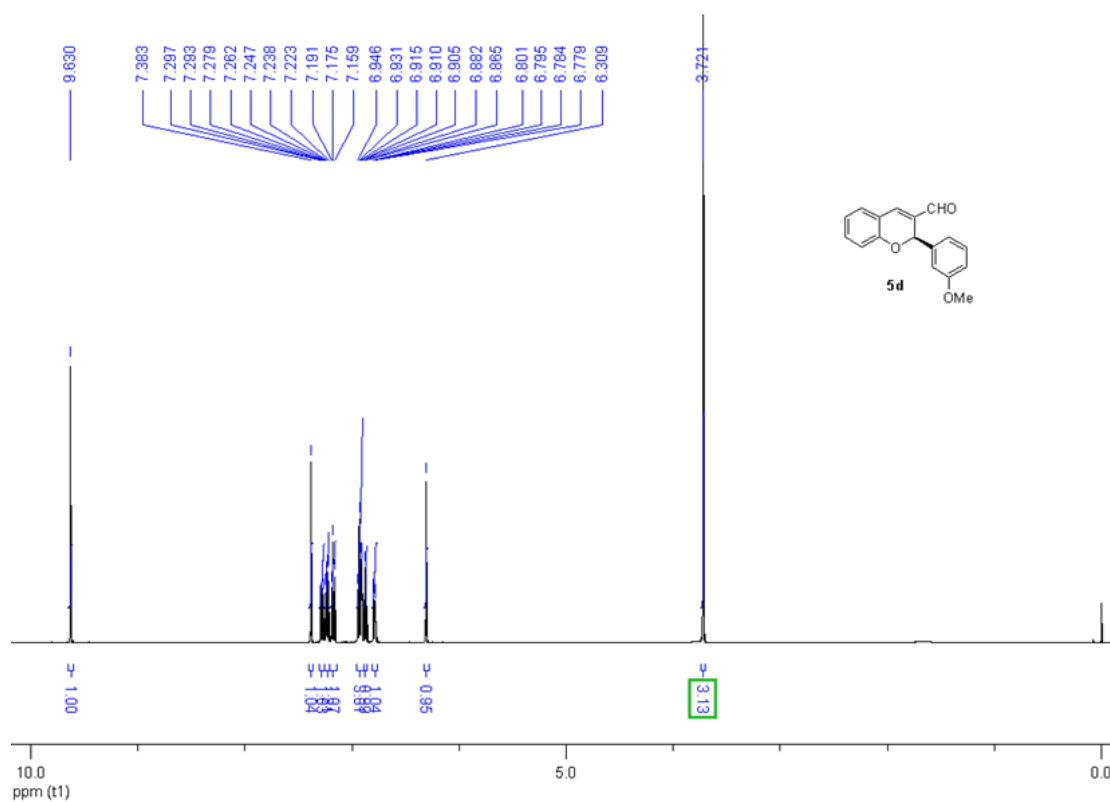
^1H NMR (500 MHz, $\text{DMSO}-d_6$, δ ppm): 9.69 (s, 1H), 8.48-8.47 (d, $J=2.5$ Hz, 1H), 8.20-8.17 (dd,

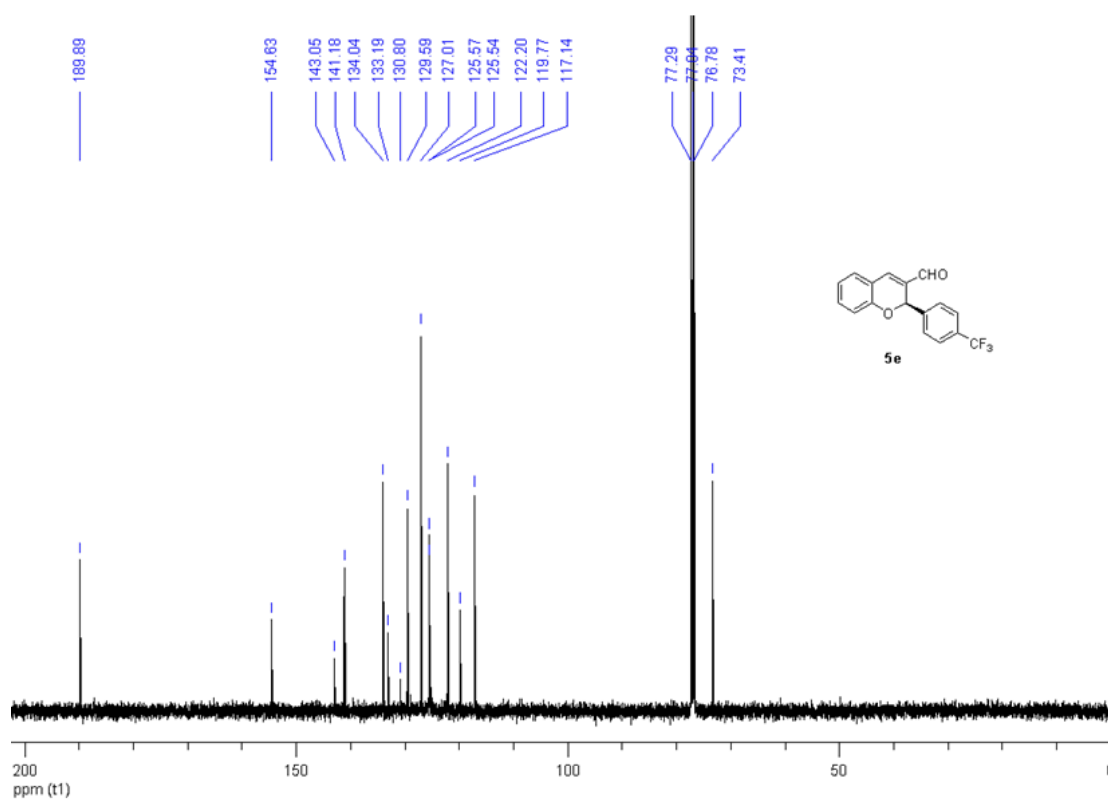
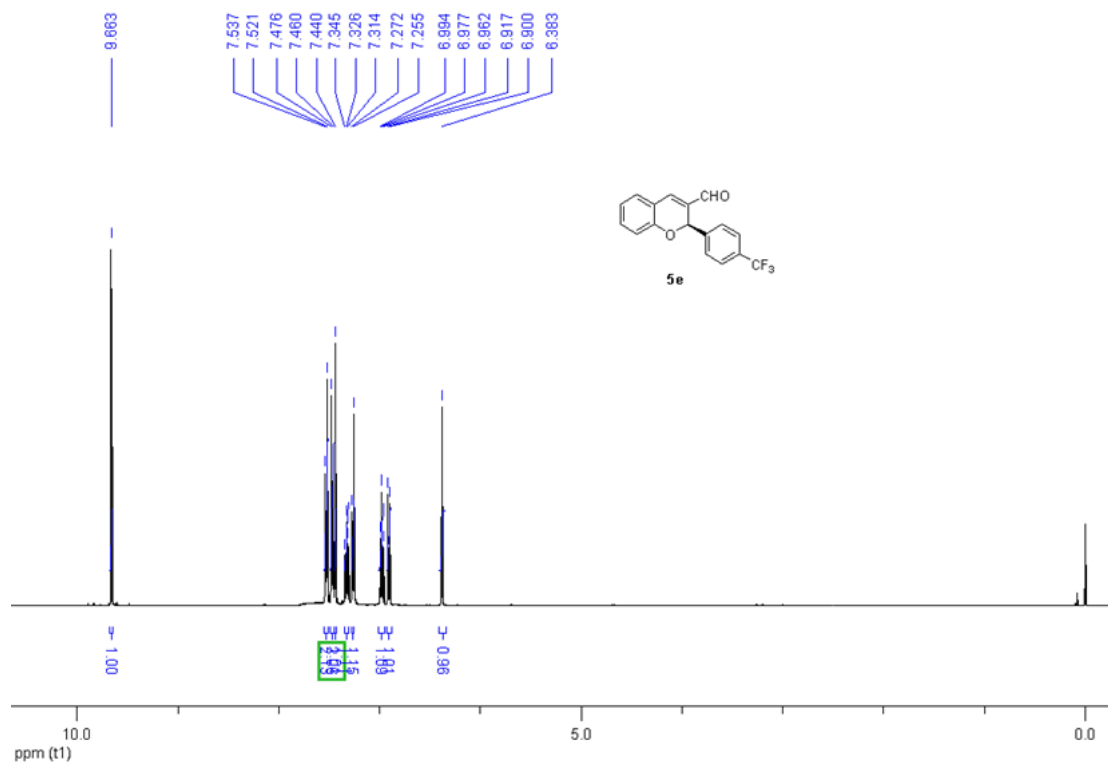
$J_1=9.0$ Hz, $J_2=3.0$ Hz, 1H), 8.04 (s, 1H), 7.35 (s, 5H), 7.08-7.06 (d, $J=7.5$ Hz, 1H), 6.45 (s, 1H).
 ^{13}C NMR (125 MHz, DMSO- d_6 , δ ppm): 190.8, 158.8, 141.7, 138.8, 137.9, 133.9, 129.2, 128.8, 128.6, 127.0, 125.3, 120.0, 117.5, 75.1.

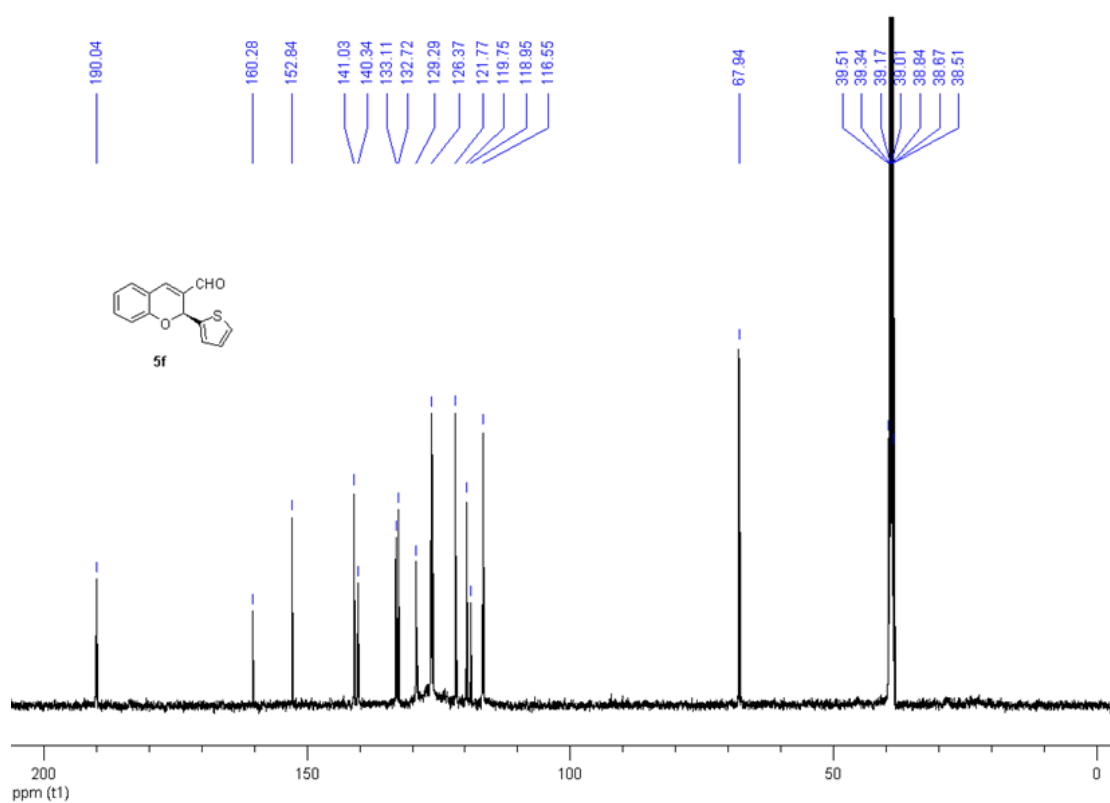
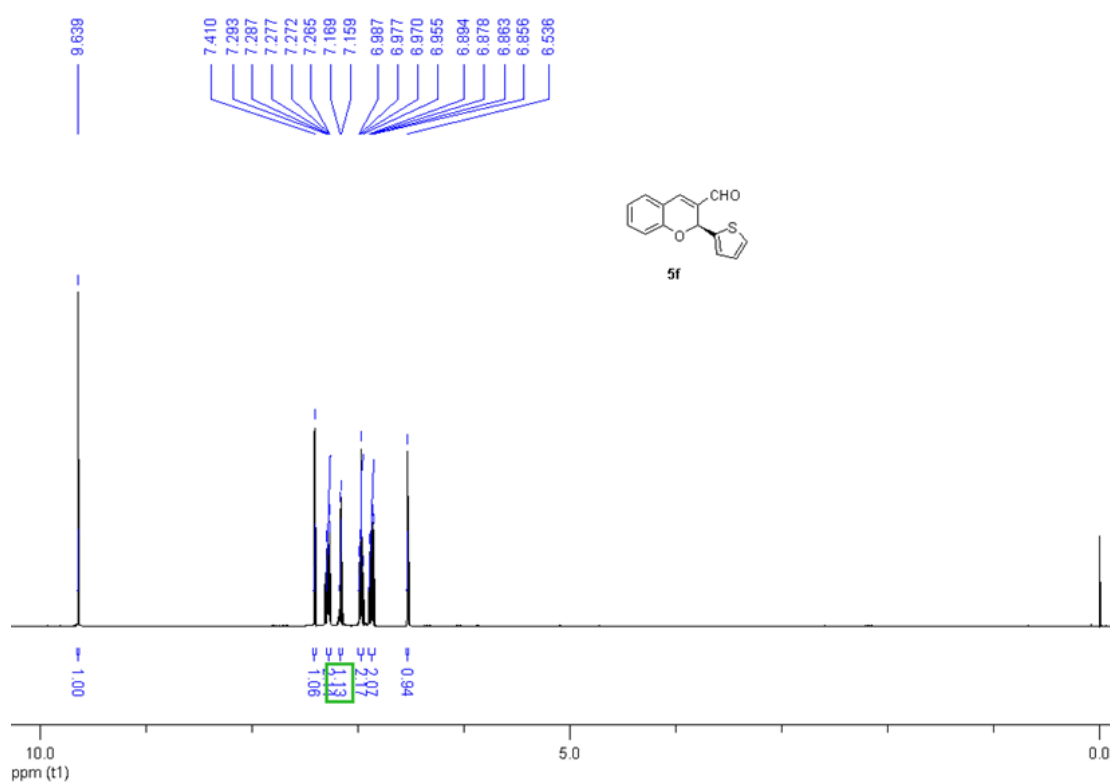


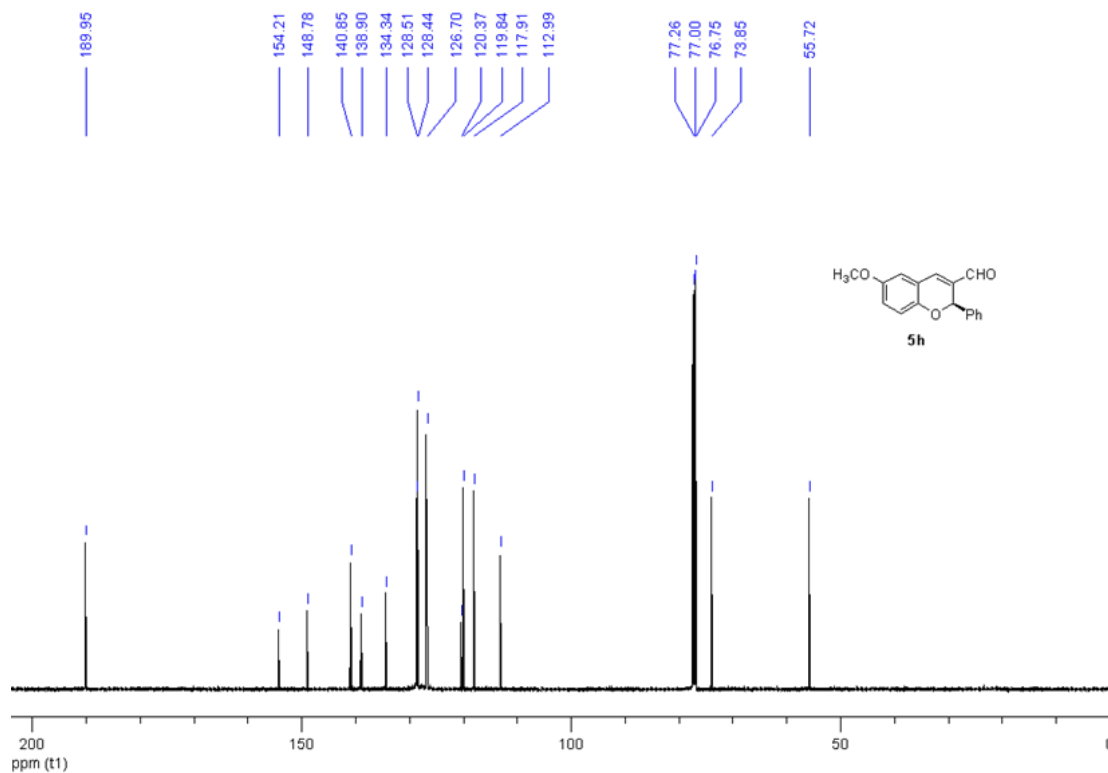
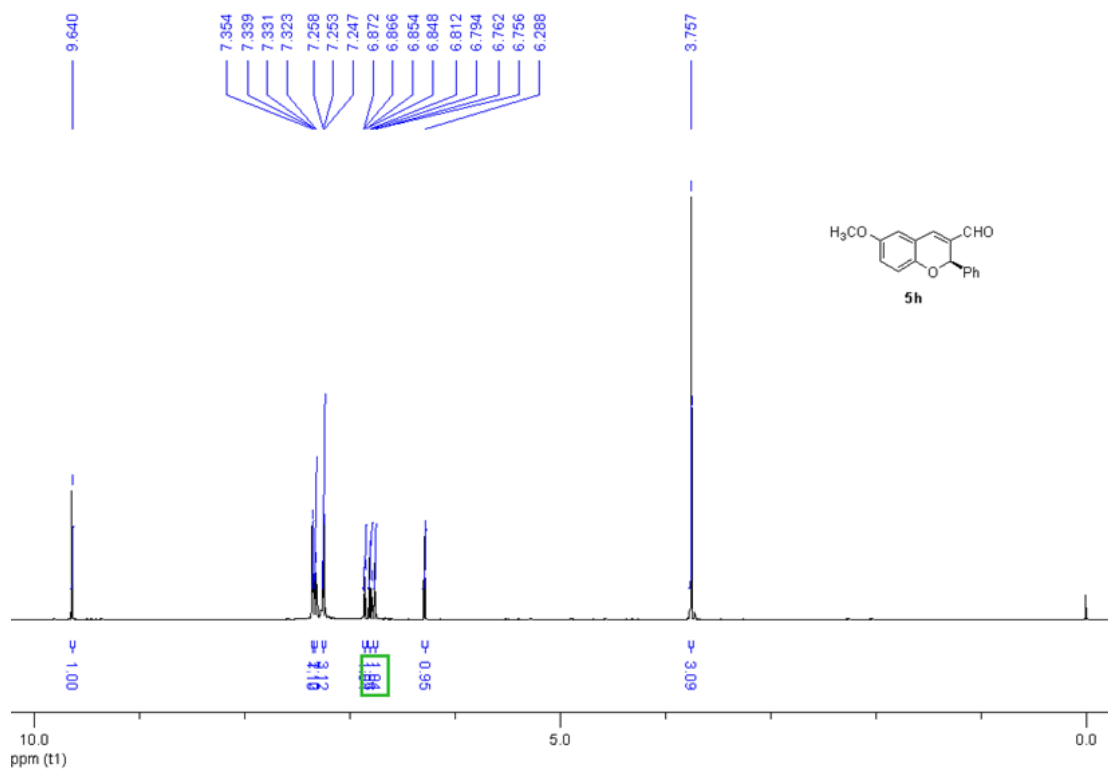


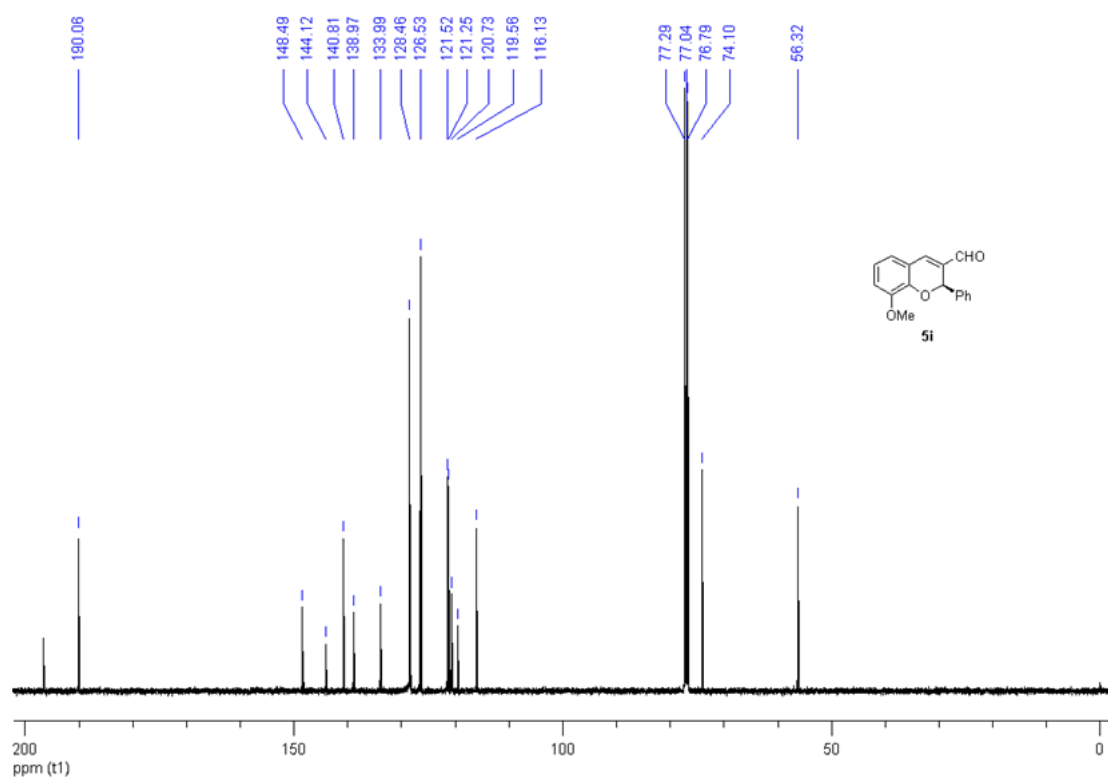
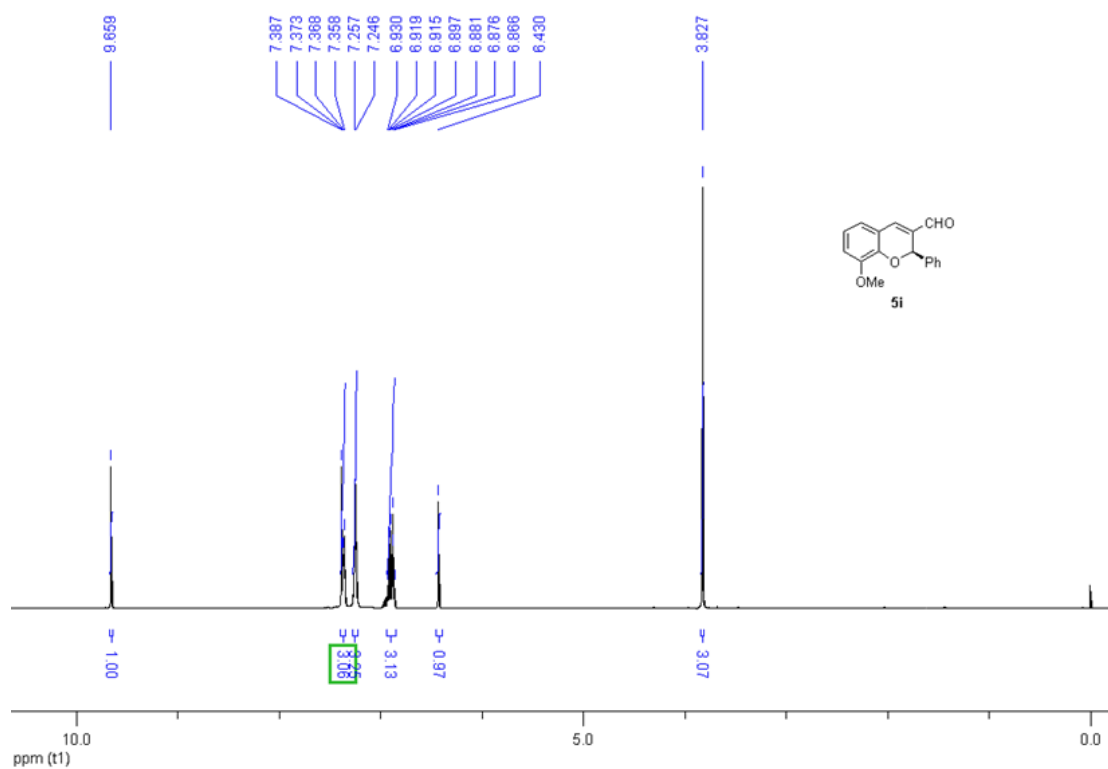


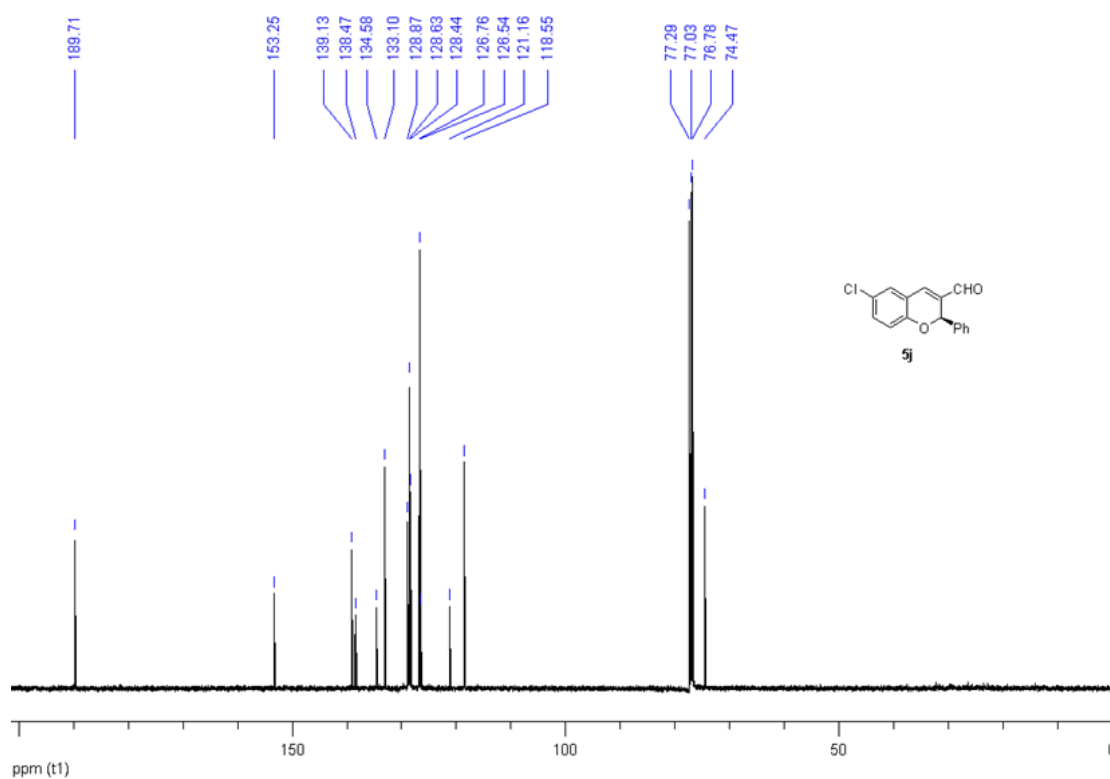
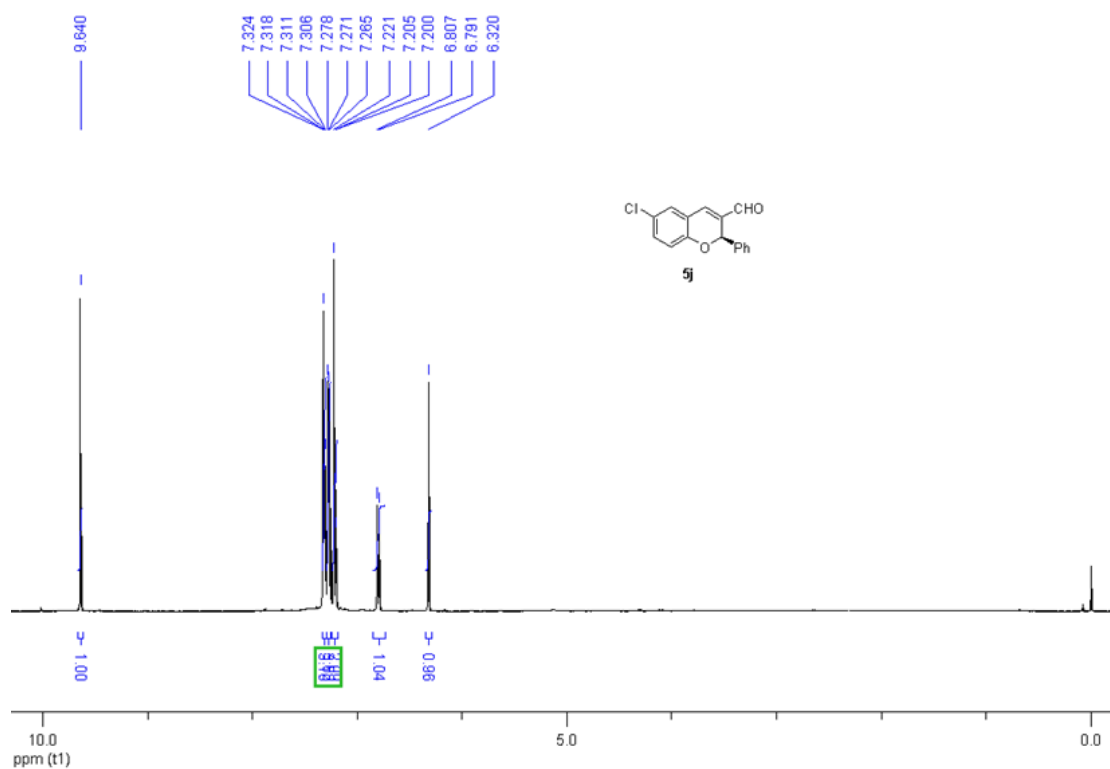


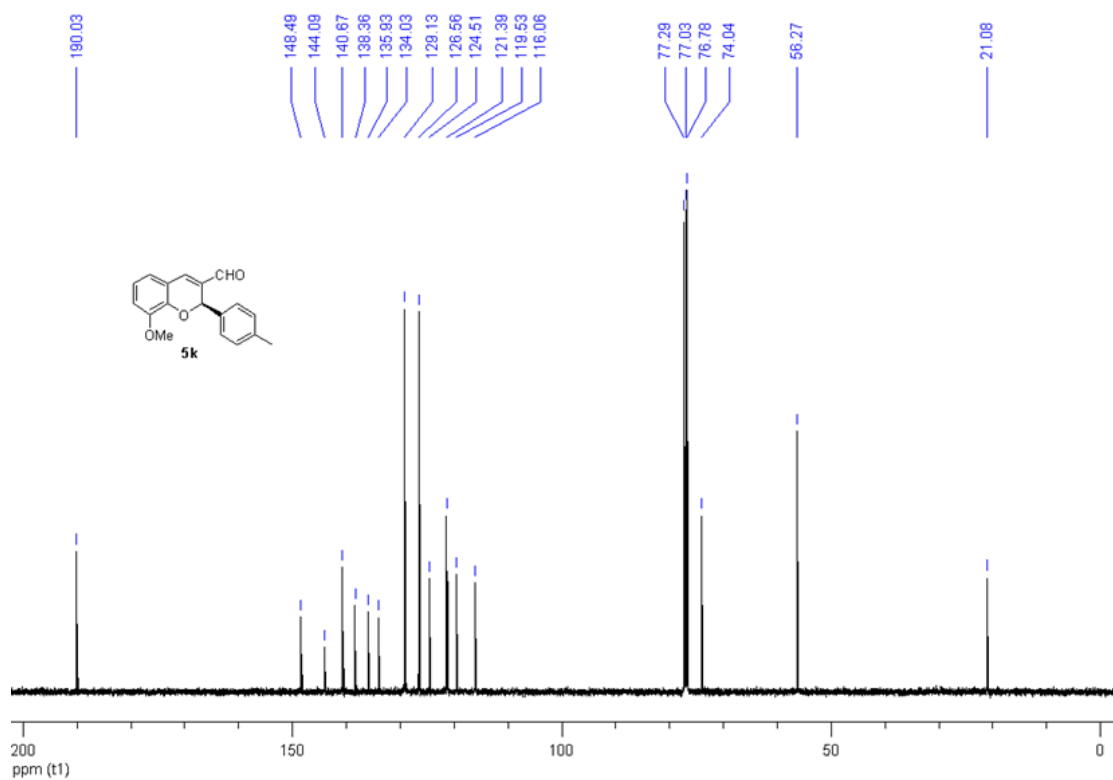
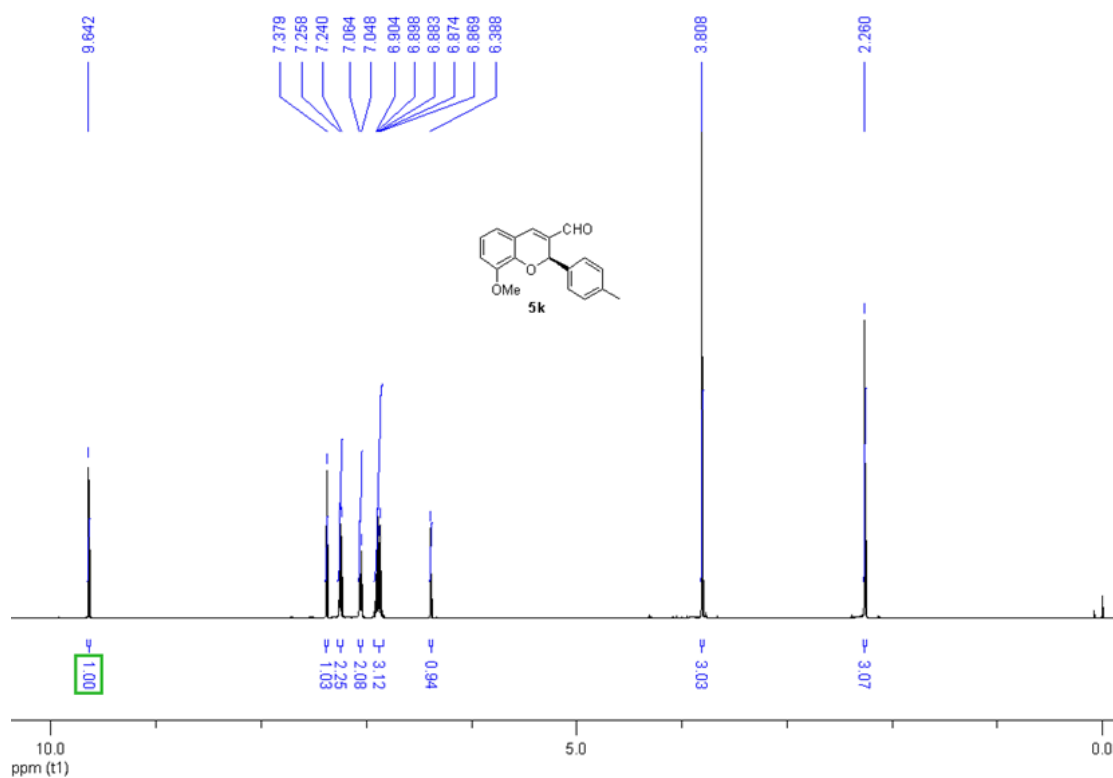


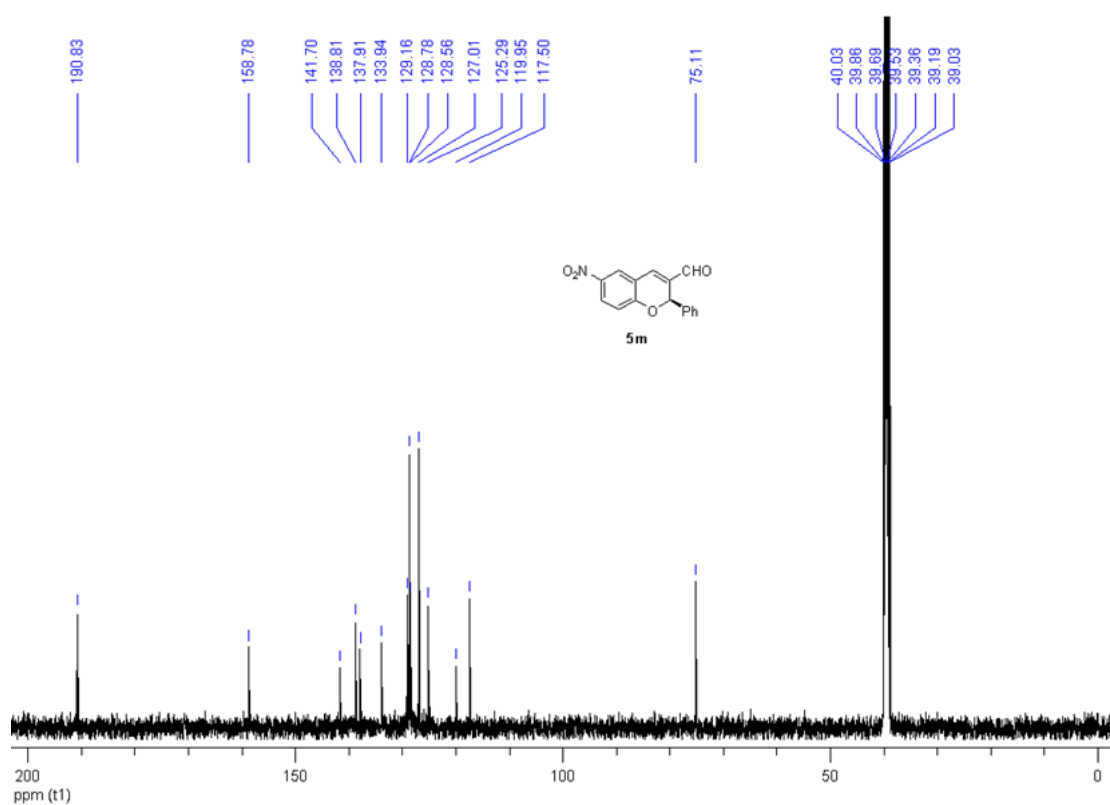
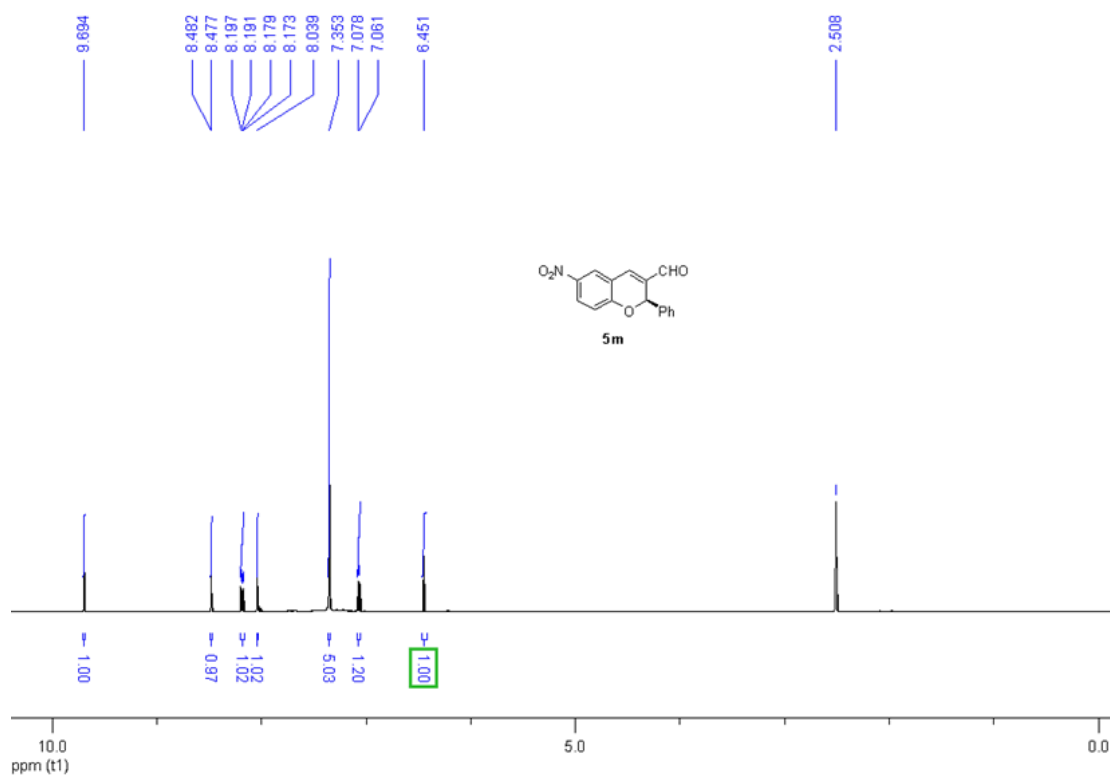


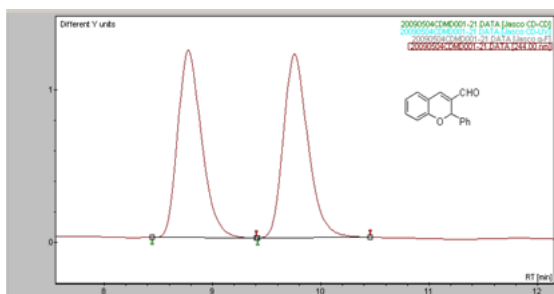




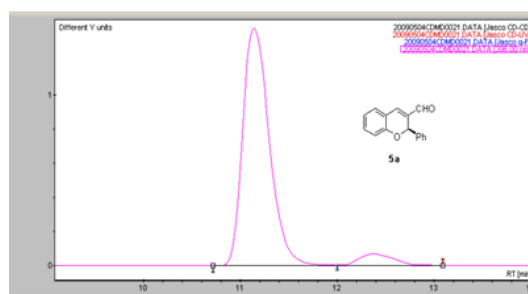




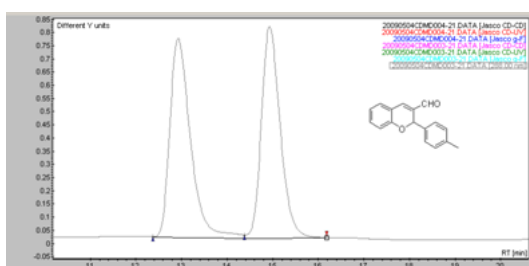




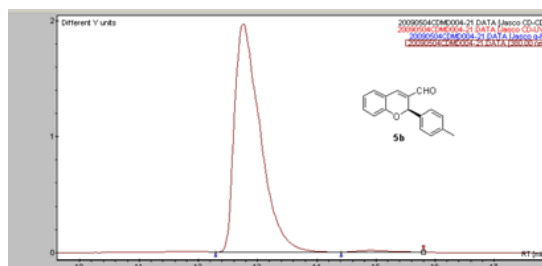
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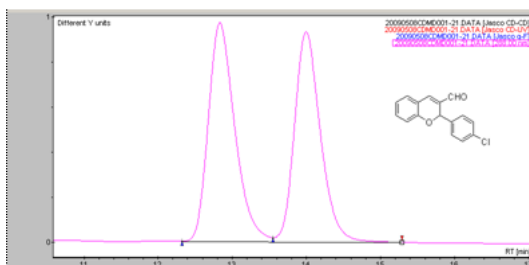
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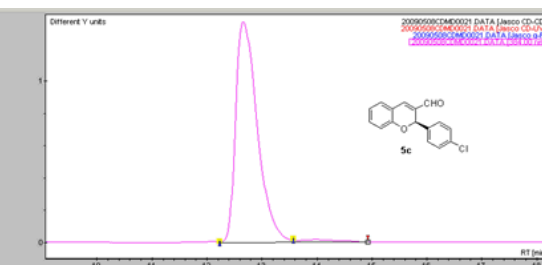
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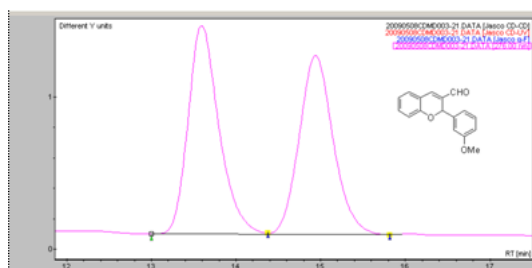
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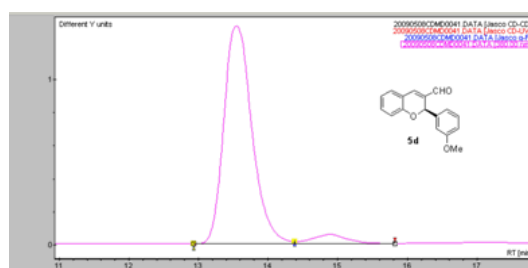
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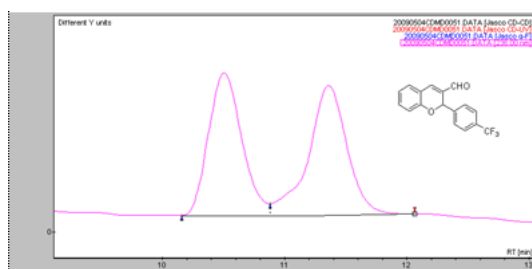
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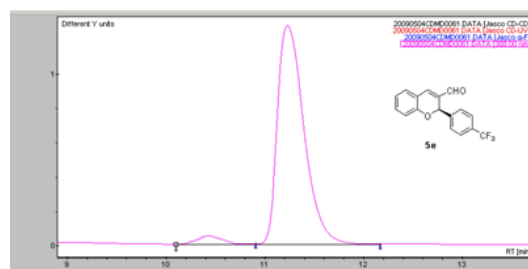
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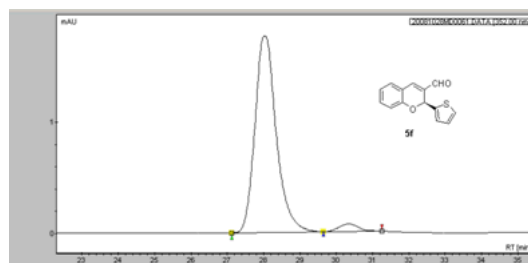
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Total				100.000



#	Start[min]	Time[min]	End[min]	Area[%]
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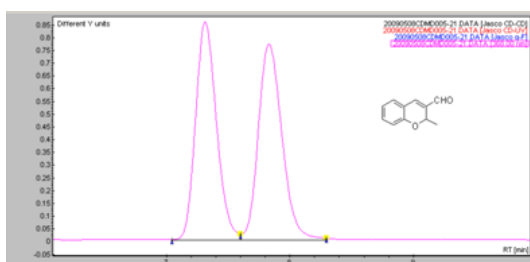


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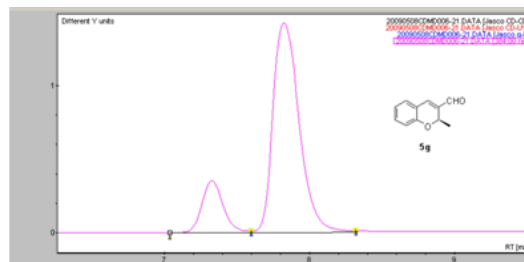


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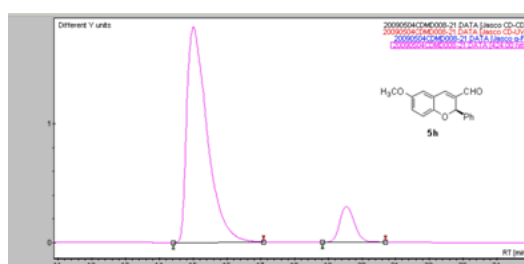


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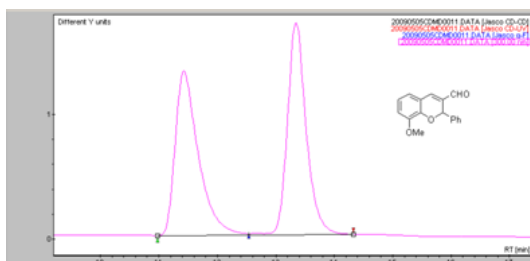


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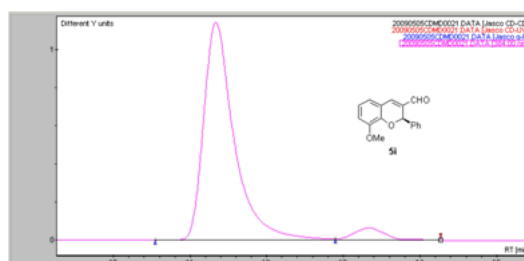
#	Start[min]	Time[min]	End[min]	Area[%]
1	14.932	15.599	16.865	49.879
2	19.225	19.959	21.412	50.121
Total				100.000



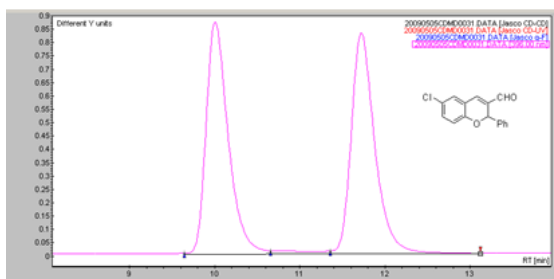
#	Start[min]	Time[min]	End[min]	Area[%]
1	14.412	15.012	17.092	91.085
2	18.825	19.532	20.692	8.915
Total				100.000



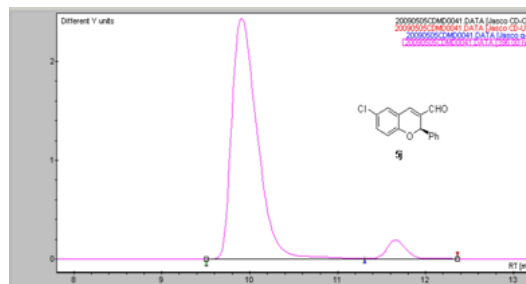
#	Start[min]	Time[min]	End[min]	Area[%]
1	10.973	11.426	12.532	48.994
2	12.532	13.346	14.332	51.006
Total				100.000



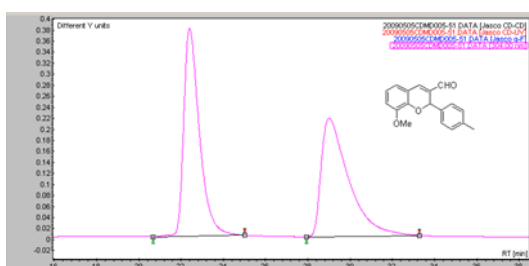
#	Start[min]	Time[min]	End[min]	Area[%]
1	10.546	11.333	12.892	95.222
2	12.892	13.332	14.266	4.778
Total				100.000



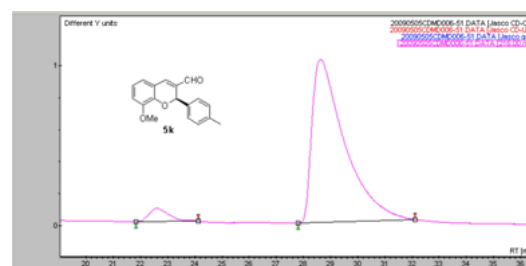
#	Start[min]	Time[min]	End[min]	Area[%]
1	9.639	9.999	10.653	49.682
2	11.359	11.719	13.119	50.318
Total				100.000



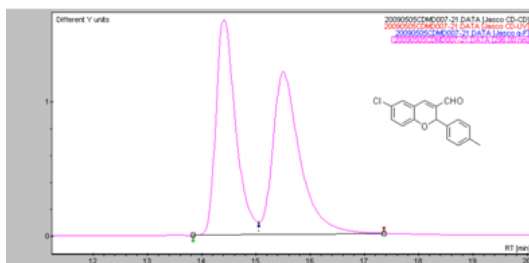
#	Start[min]	Time[min]	End[min]	Area[%]
1	9.507	9.893	11.307	95.231
2	11.307	11.653	12.360	4.769
Total				100.000



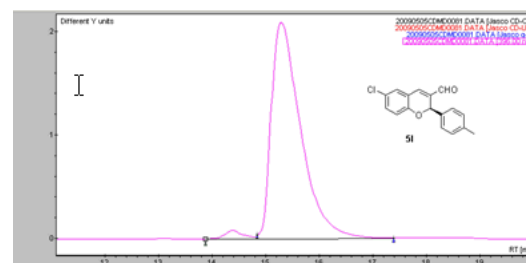
#	Start[min]	Time[min]	End[min]	Area[%]
1	20.679	22.398	25.025	50.137
2	27.931	28.998	33.291	49.863
Total				100.000



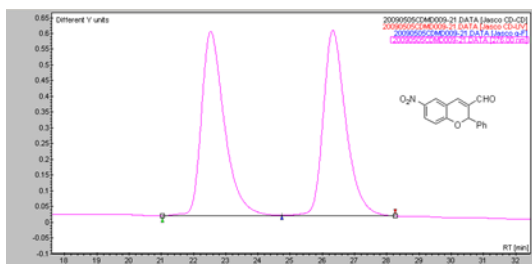
#	Start[min]	Time[min]	End[min]	Area[%]
1	21.838	22.598	24.118	5.164
2	27.798	28.611	32.118	94.836
Total				100.000



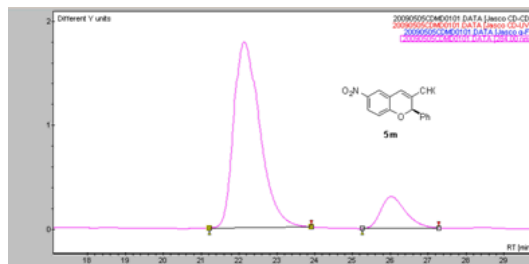
#	Start[min]	Time[min]	End[min]	Area[%]
1	13.839	14.412	15.052	49.056
2	15.052	15.506	17.359	50.944
Total				100.000



#	Start[min]	Time[min]	End[min]	Area[%]
1	13.879	14.346	14.839	2.928
2	14.839	15.292	17.385	97.072
Total				100.000



#	Start[min]	Time[min]	End[min]	Area[%]
1	21.038	22.532	24.732	50.254
2	24.732	26.331	28.251	49.746
Total				100.000



#	Start[min]	Time[min]	End[min]	Area[%]
1	21.212	22.145	23.918	88.373
2	25.252	26.025	27.278	11.627
Total				100.000