

Electronic Supporting Information for

Enantioselective Organocatalytic Phospha-Michael Reaction of α,β -Unsaturated Aldehydes

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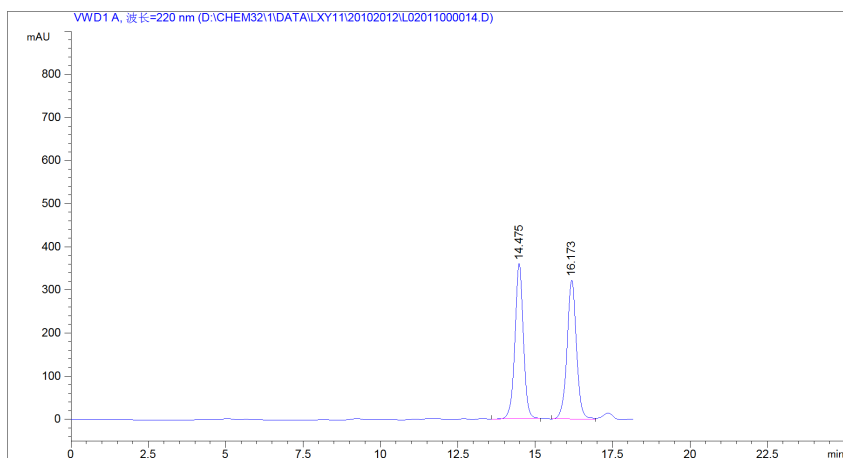
A: HPLC Analysis of Products

S2

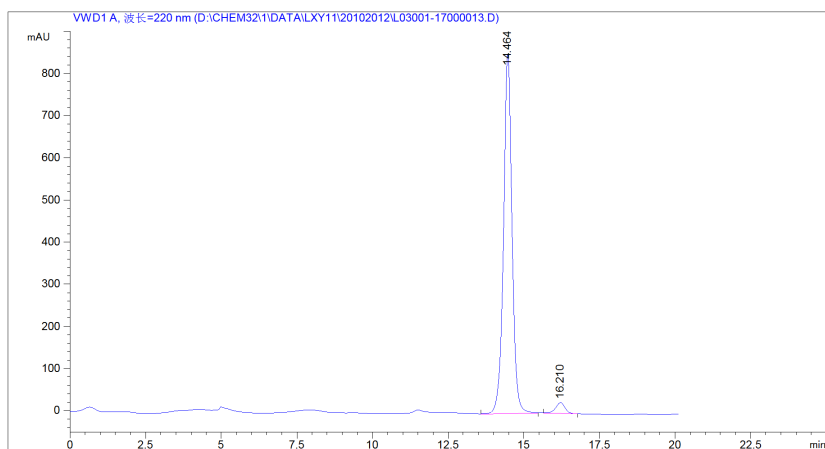
B: NMR Analysis of Products

S21

A: HPLC Analysis of Michael Addition Products
(*S*)-3-(diphenylphosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 1)

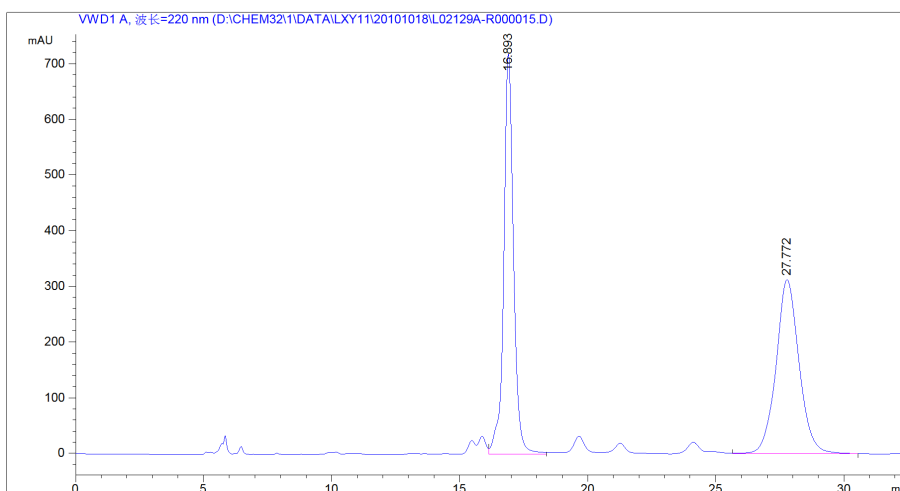


#	Time (min)	Width	Area	Height	Area %
1	14.475	0.2862	6809.10059	359.95547	49.8197
2	16.173	0.3225	6858.38574	322.38452	50.1803

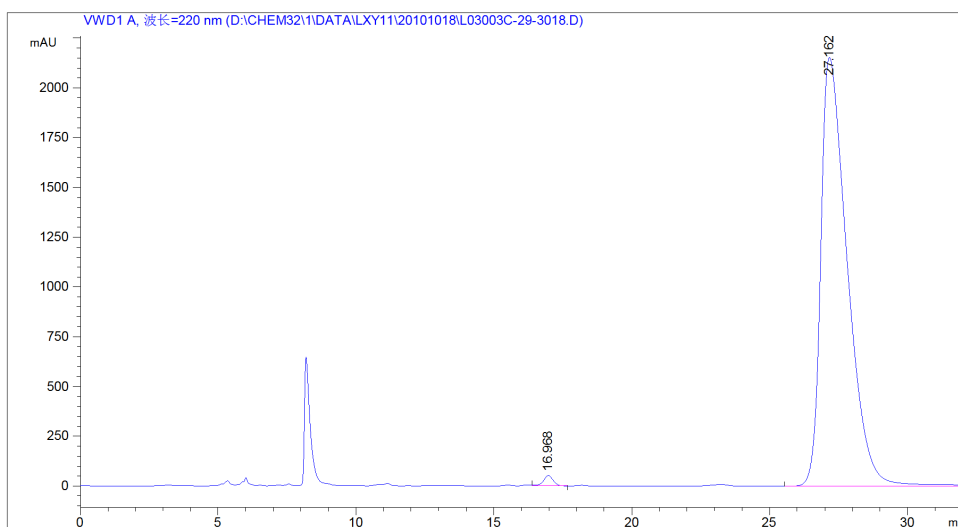


#	Time (min)	Width	Area	Height	Area %
1	14.464	0.2991	1.67467e4	853.32233	96.7524
2	16.210	0.3610	562.12708	25.94903	3.2476

(S)-3-(bis(2,6-dimethylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 2)

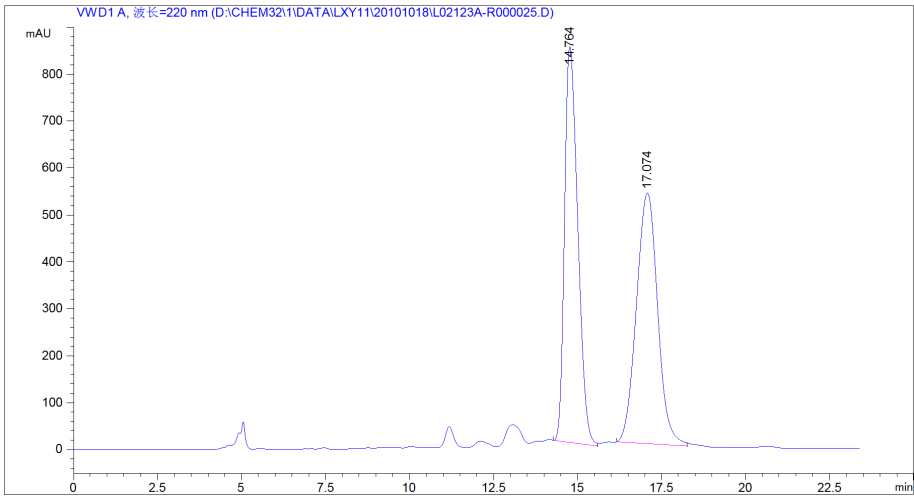


#	Time (min)	Width	Area	Height	Area %
1	16.893	0.3976	1.91055e4	718.57294	49.4066
2	27.772	0.9353	1.95644e4	312.67905	50.5934

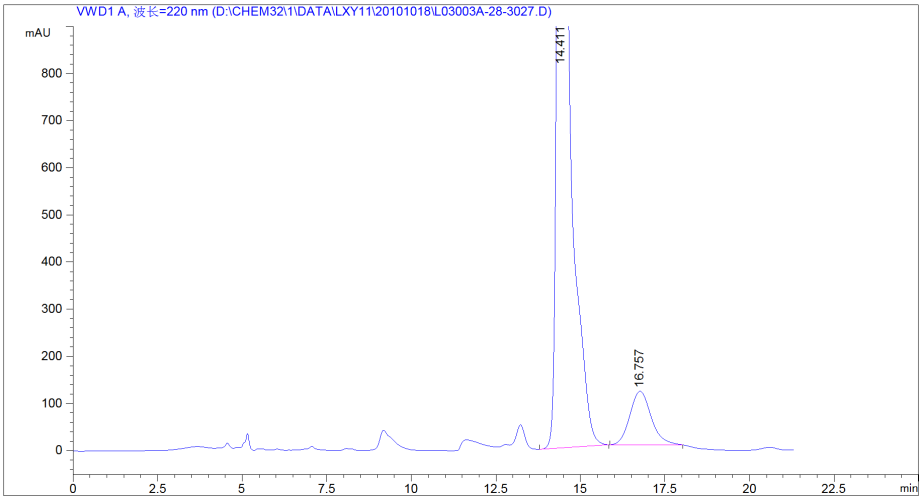


#	Time (min)	Width	Area	Height	Area %
1	16.968	0.3799	1309.56714	52.22726	0.9026
2	27.162	1.0105	1.43783e5	2153.32959	99.0974

(S)-3-(bis(3,5-dimethylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 3)

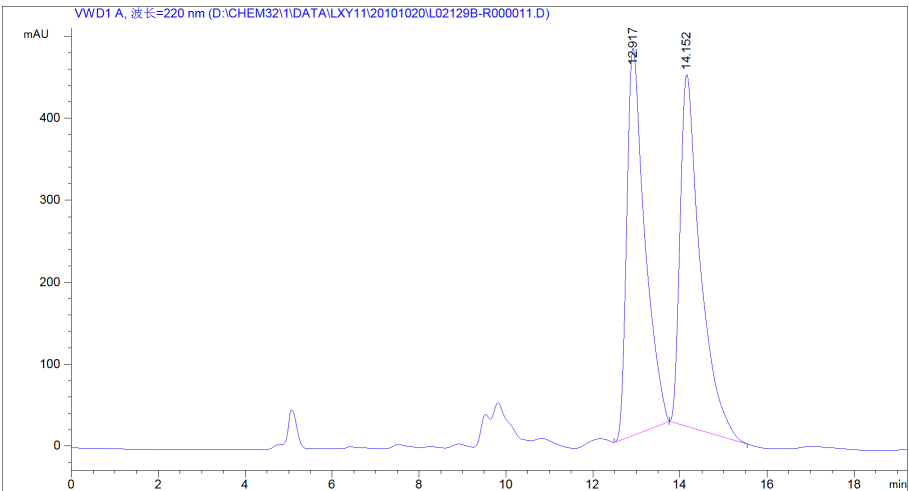


#	Time (min)	Width	Area	Height	Area %
1	14.764	0.4203	2.31017e4	844.21185	49.6187
2	17.074	0.6845	2.34567e4	534.39557	50.3813

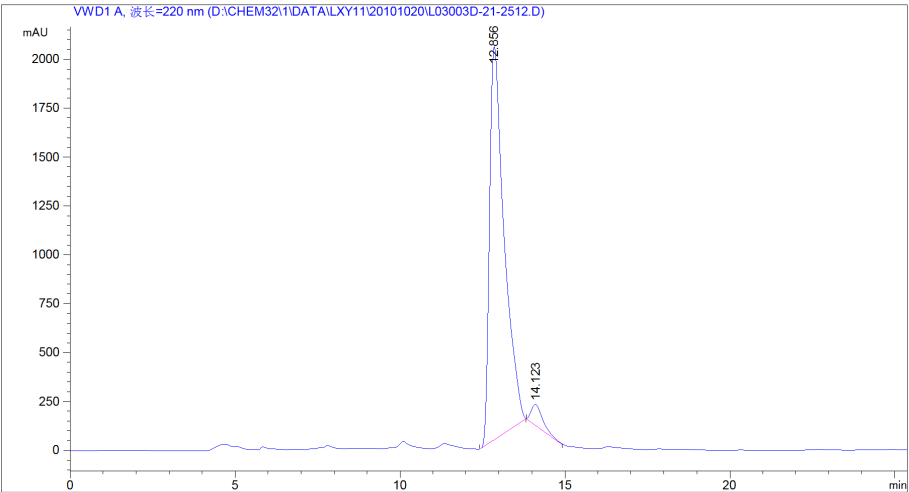


#	Time (min)	Width	Area	Height	Area %
1	14.411	0.2689	6.54964e4	3142.42676	92.8648
2	16.757	0.5924	5032.35938	113.99905	7.1352

(S)-3-(bis(3,5-diisopropylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 4)

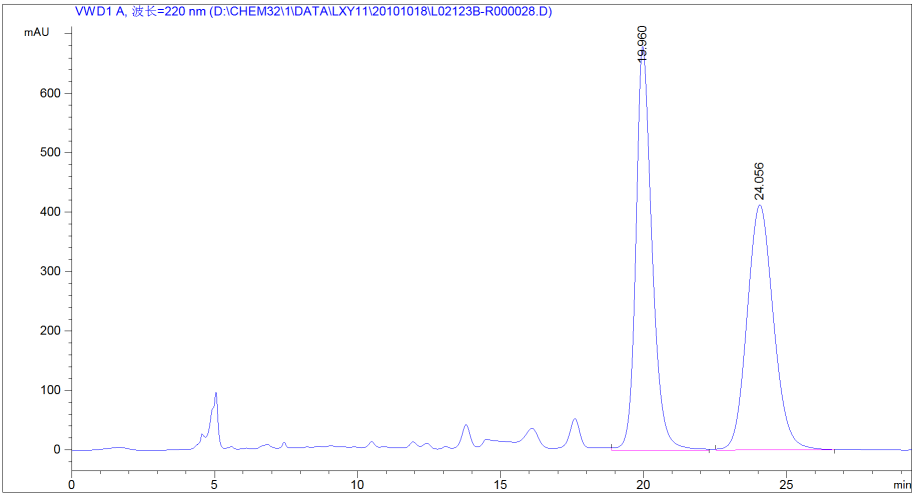


#	Time (min)	Width	Area	Height	Area %
1	12.917	0.4224	1.36391e4	473.02588	49.6292
2	14.152	0.4815	1.38429e4	429.54950	50.3708

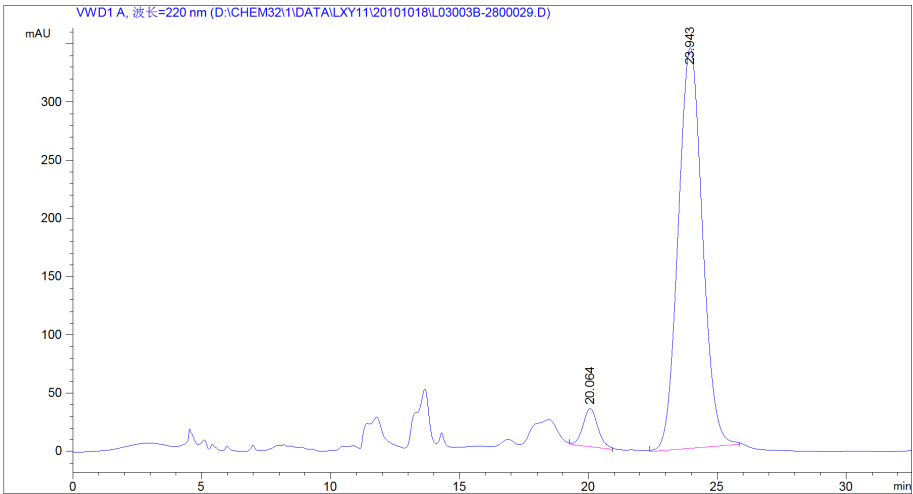


#	Time (min)	Width	Area	Height	Area %
1	12.856	0.3668	6.21401e4	2012.33118	95.8606
2	14.123	0.4113	2683.30615	108.72403	4.1394

(S)-3-(bis(4-tert-butylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 5)

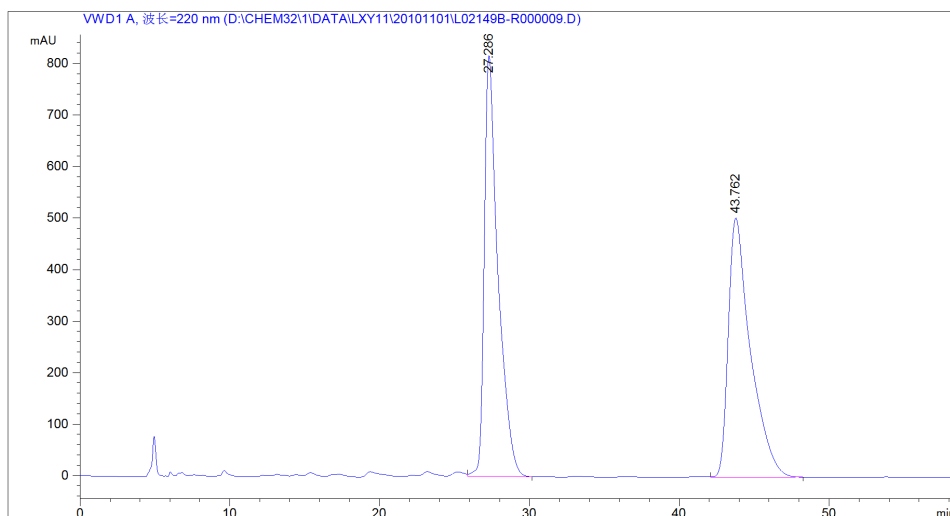


#	Time (min)	Width	Area	Height	Area %
1	19.960	0.5842	2.67433e4	679.73022	50.2055
2	24.056	0.9969	2.65243e4	412.95731	49.7945

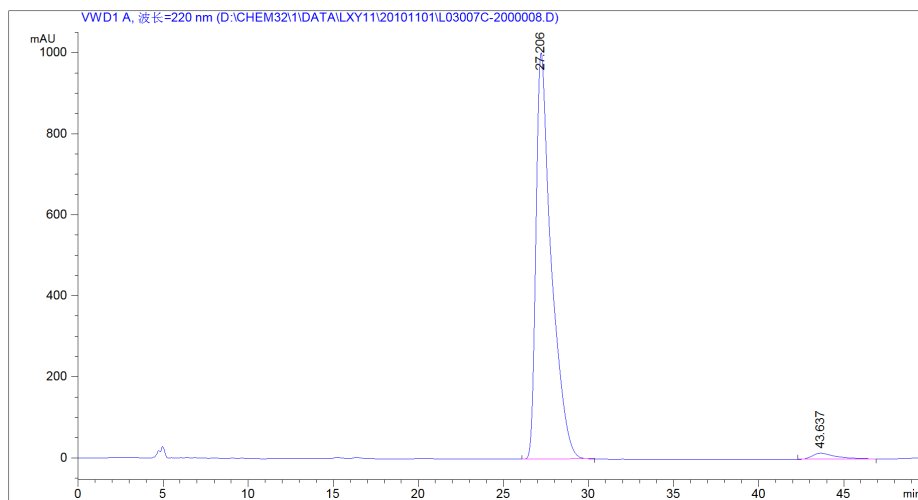


#	Time (min)	Width	Area	Height	Area %
1	20.064	0.6717	1325.78149	32.89719	5.5674
2	23.943	0.9579	2.24873e4	344.38480	94.4326

(S)-3-(2-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 1)

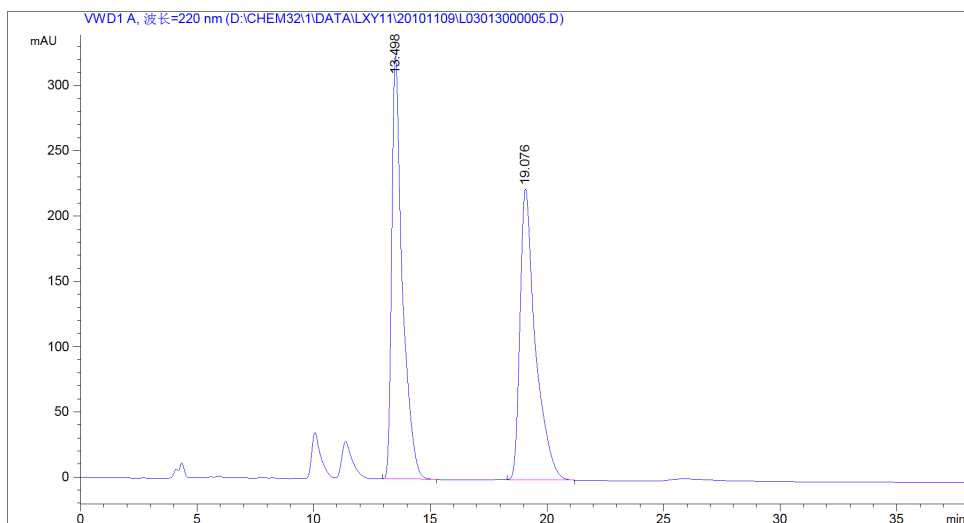


#	Time (min)	Width	Area	Height	Area %
1	27.286	0.9128	5.20216e4	817.50720	50.0913
2	43.762	1.4810	5.18318e4	503.33212	49.9087

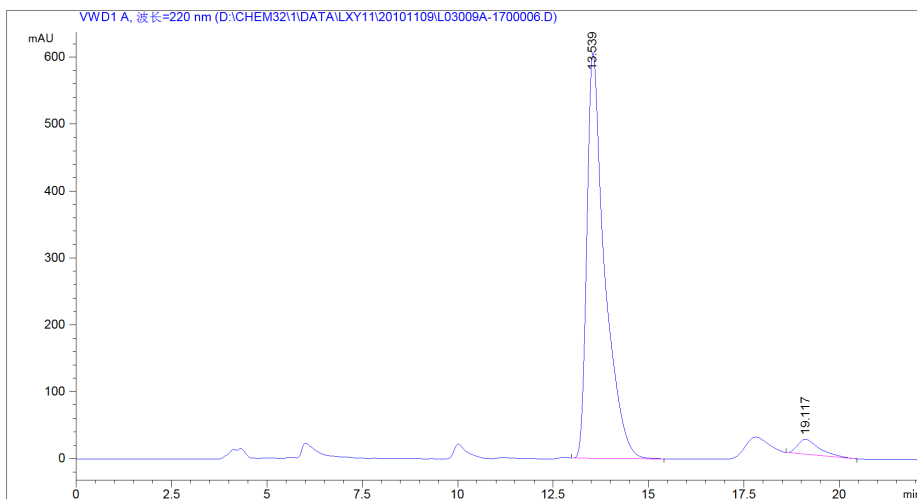


#	Time (min)	Width	Area	Height	Area %
1	27.206	0.8998	6.28293e4	1002.90308	97.6427
2	43.637	1.4287	1516.84094	15.07456	2.3573

(S)-3-(3-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 2)

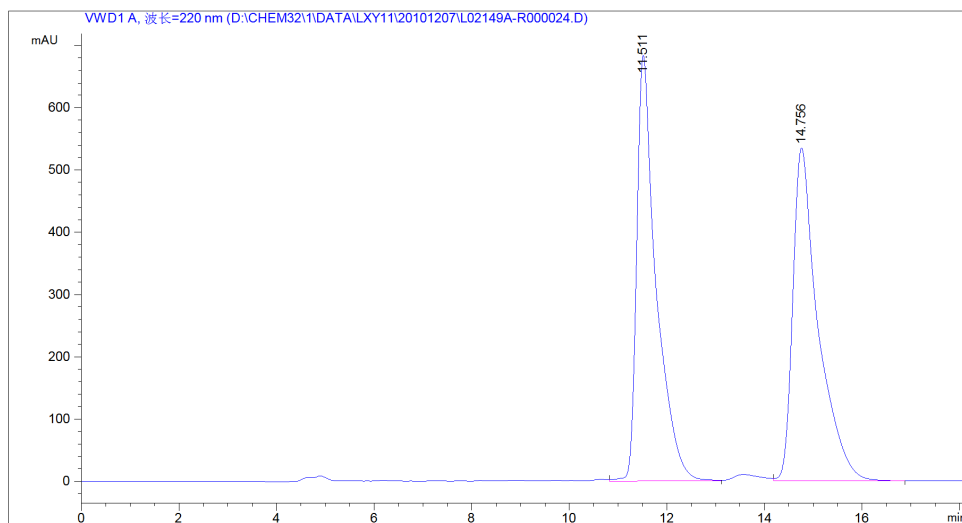


#	Time (min)	Width	Area	Height	Area %
1	13.498	0.4556	1.02740e4	324.17981	50.0877
2	19.076	0.6620	1.02381e4	223.12923	49.9123

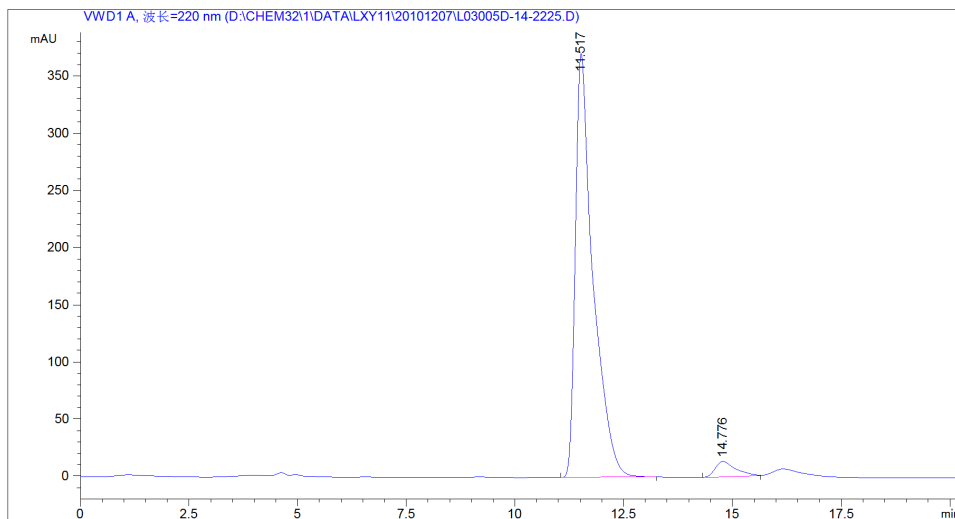


#	Time (min)	Width	Area	Height	Area %
1	13.539	0.5391	1.96371e4	607.07227	95.5446
2	19.117	0.6703	915.70795	22.76859	4.4554

(S)-3-(4-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 3)

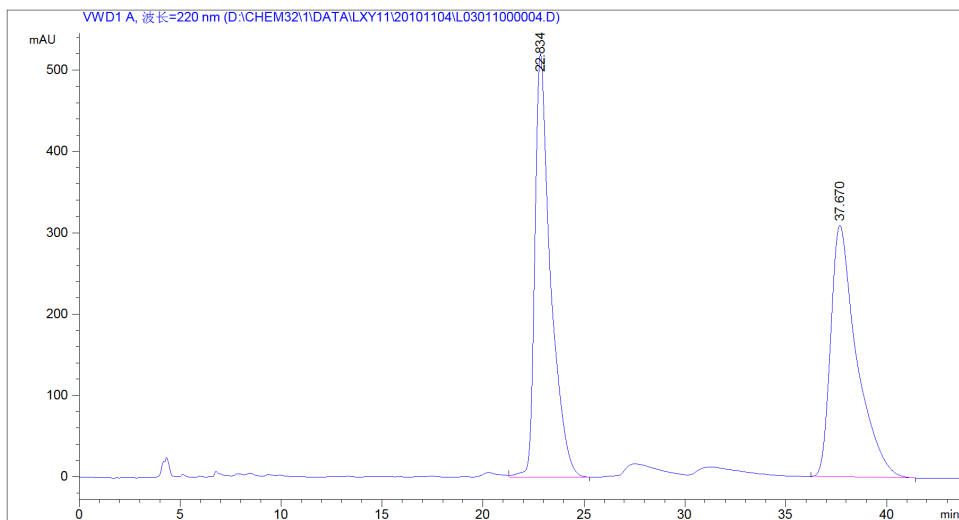


#	Time (min)	Width	Area	Height	Area %
1	11.511	0.3938	1.89224e4	684.59564	49.5460
2	14.756	0.5161	1.92692e4	535.21283	50.4540

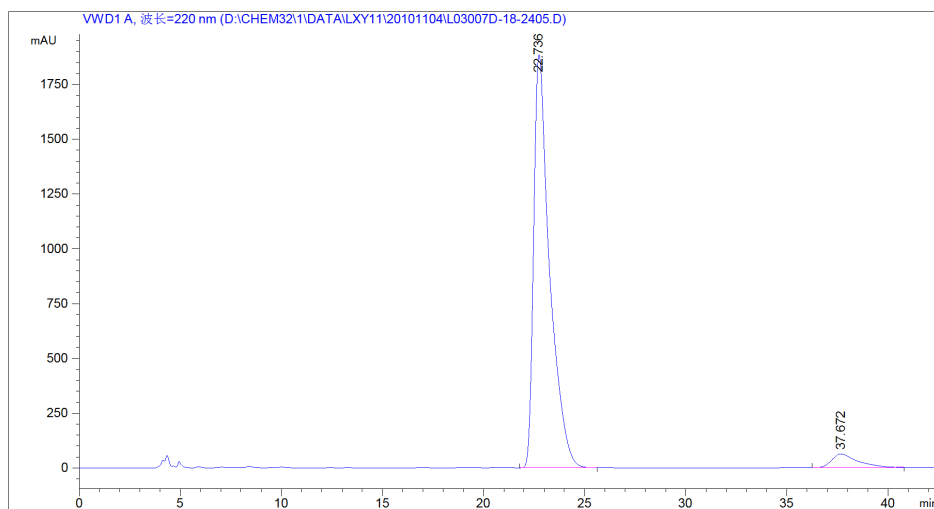


#	Time (min)	Width	Area	Height	Area %
1	11.517	0.3999	1.04461e4	370.87991	95.8275
2	14.776	0.5534	454.83951	13.69792	4.1725

(S)-3-(2-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 4)

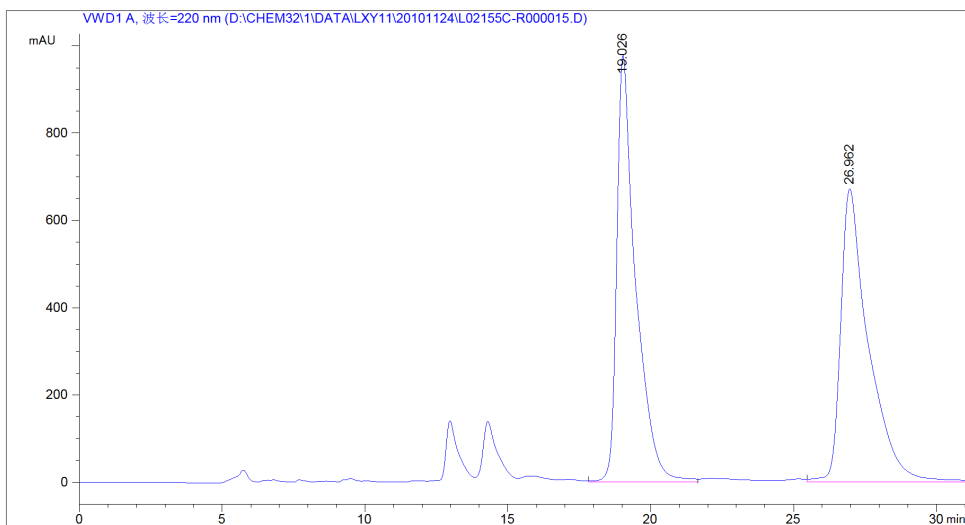


#	Time (min)	Width	Area	Height	Area %
1	22.834	0.7793	2.81185e4	520.09277	50.4418
2	37.670	1.2941	2.76259e4	309.23993	49.5582

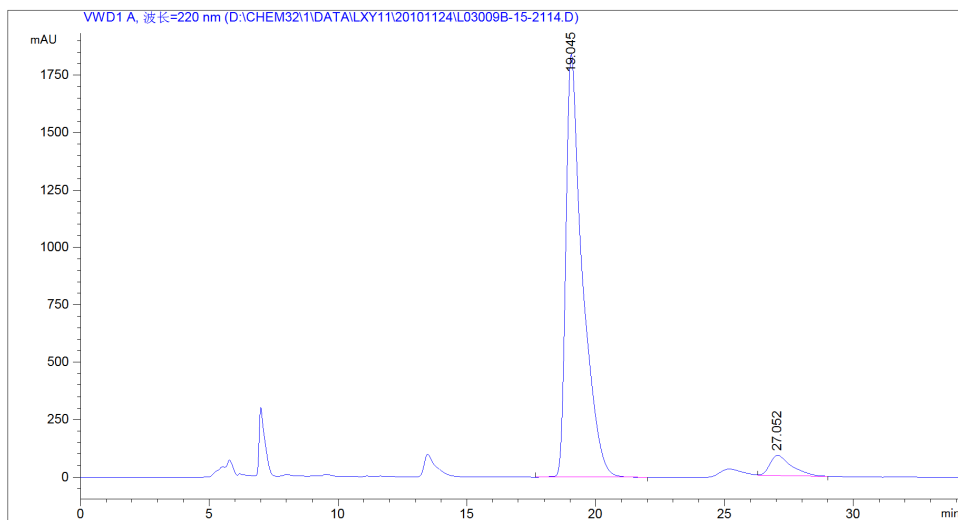


#	Time (min)	Width	Area	Height	Area %
1	22.736	0.7943	1.03225e5	1886.05542	94.9063
2	37.672	1.2818	5540.18701	62.49033	5.0937

(S)-3-(3-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 5)

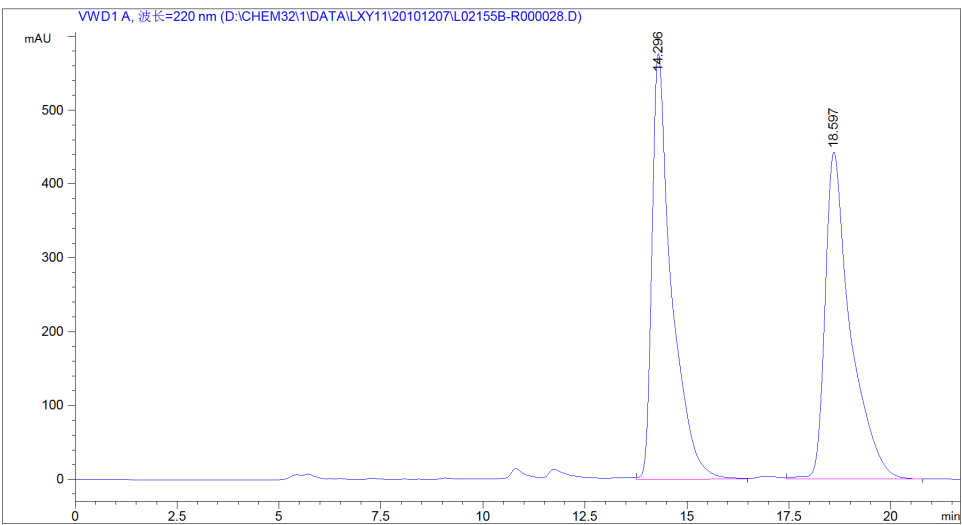


#	Time (min)	Width	Area	Height	Area %
1	19.026	0.6513	4.50656e4	977.73059	49.7068
2	26.962	0.9597	4.55973e4	671.47864	50.2932

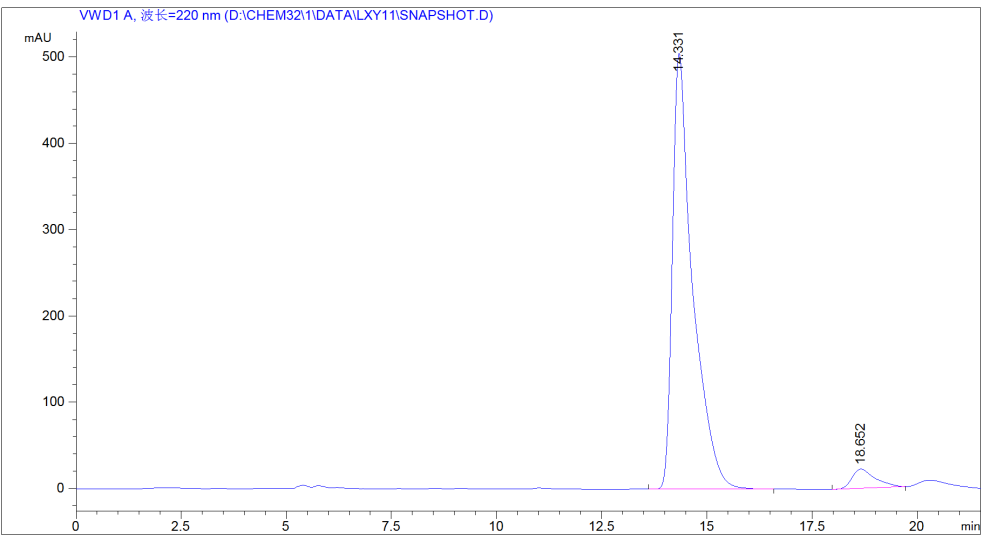


#	Time (min)	Width	Area	Height	Area %
1	19.045	0.6400	8.24523e4	1842.45642	93.9494
2	27.052	0.9886	5310.12842	89.52396	6.0506

(S)-3-(4-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 6)

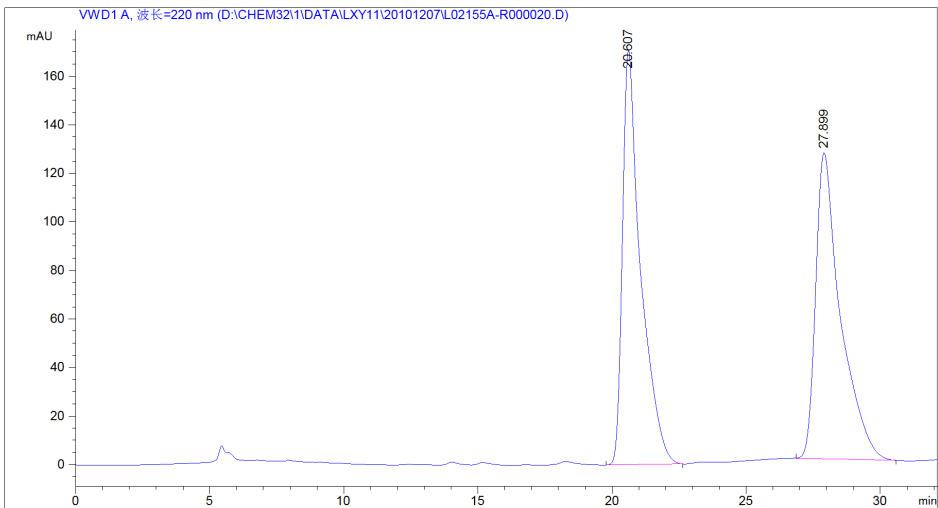


#	Time (min)	Width	Area	Height	Area %
1	14.296	0.4722	1.92542e4	577.12268	50.1763
2	18.597	0.6171	1.91189e4	442.96234	49.8237

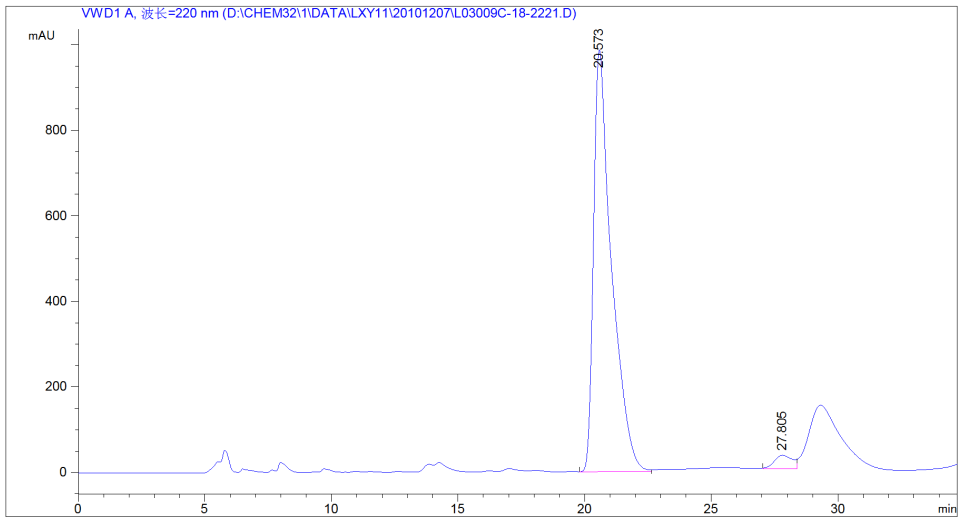


#	Time (min)	Width	Area	Height	Area %
1	14.331	0.4539	1.68963e4	505.43008	95.1251
2	18.652	0.5901	865.87915	22.45368	4.8749

(S)-3-(4-fluorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 7)

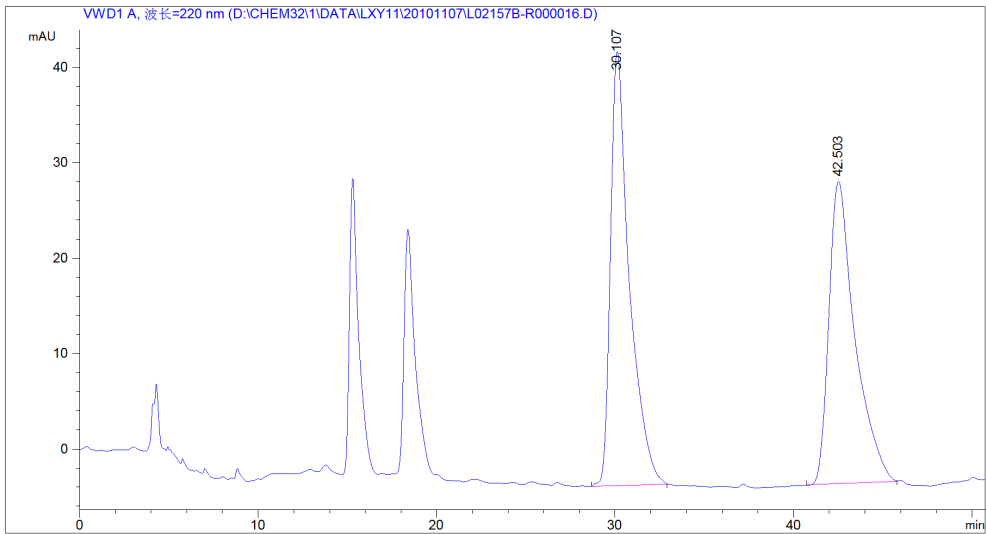


#	Time (min)	Width	Area	Height	Area %
1	20.607	0.6724	8062.87305	170.54068	49.8327
2	27.899	0.9199	8117.00977	126.09936	50.1673

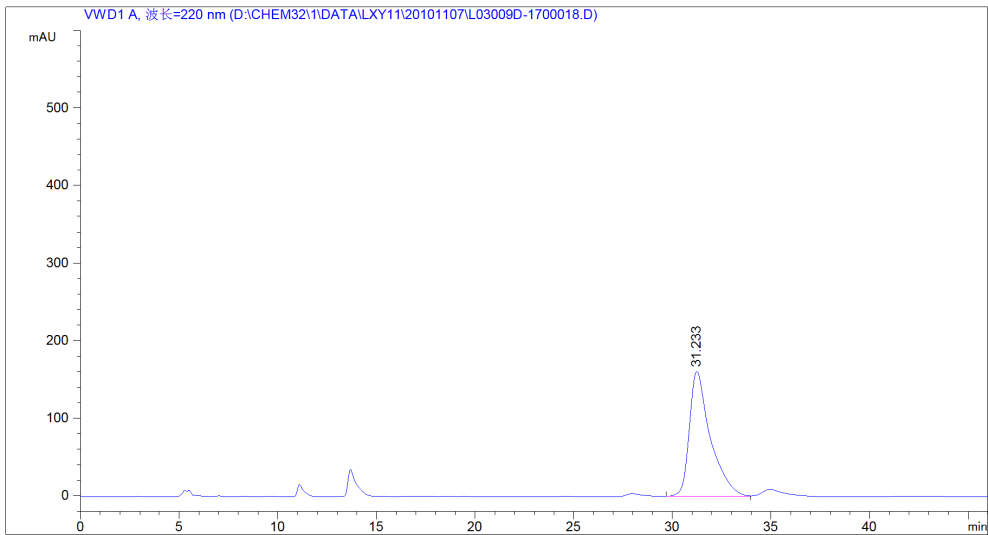


#	Time (min)	Width	Area	Height	Area %
1	20.573	0.7025	4.87696e4	985.63409	96.7770
2	27.805	0.8510	1624.19653	31.81003	3.2230

(S)-3-(4-nitrophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 8)

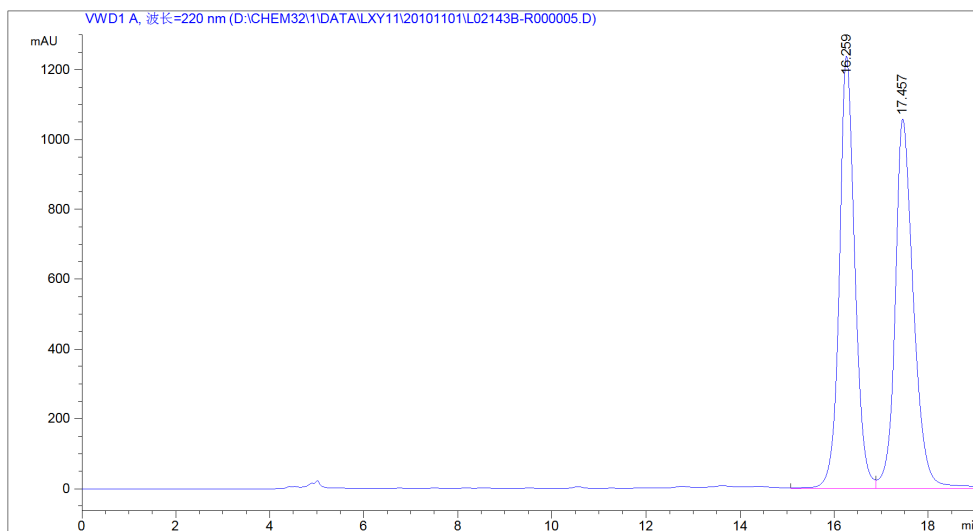


#	Time (min)	Width	Area	Height	Area %
1	30.107	1.0641	3344.69312	45.51279	50.9698
2	42.503	1.6915	3217.41626	31.70246	49.0302

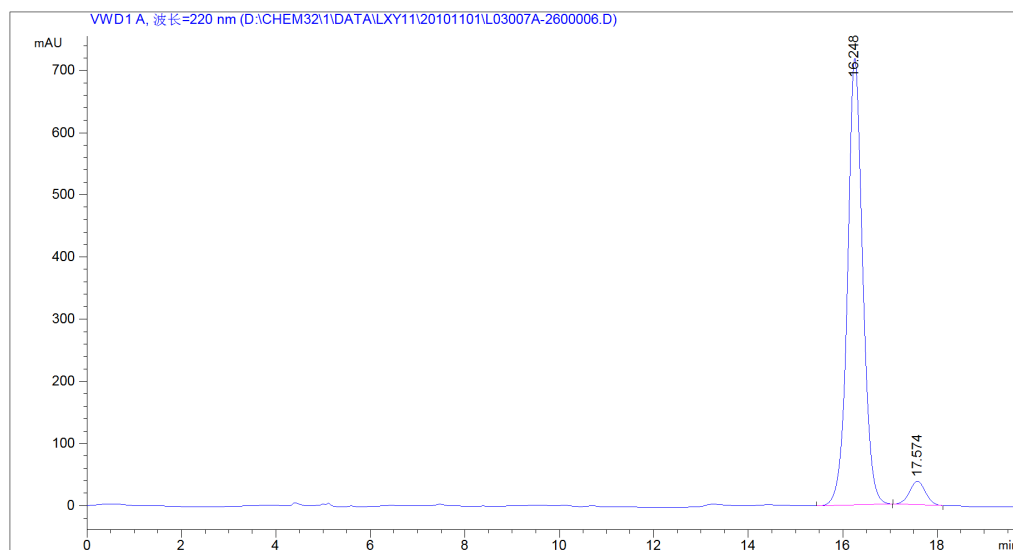


#	Time (min)	Width	Area	Height	Area %
1	31.233	1.0659	1.19742e4	161.22728	100.000

(S)-3-(3-methylphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 9)

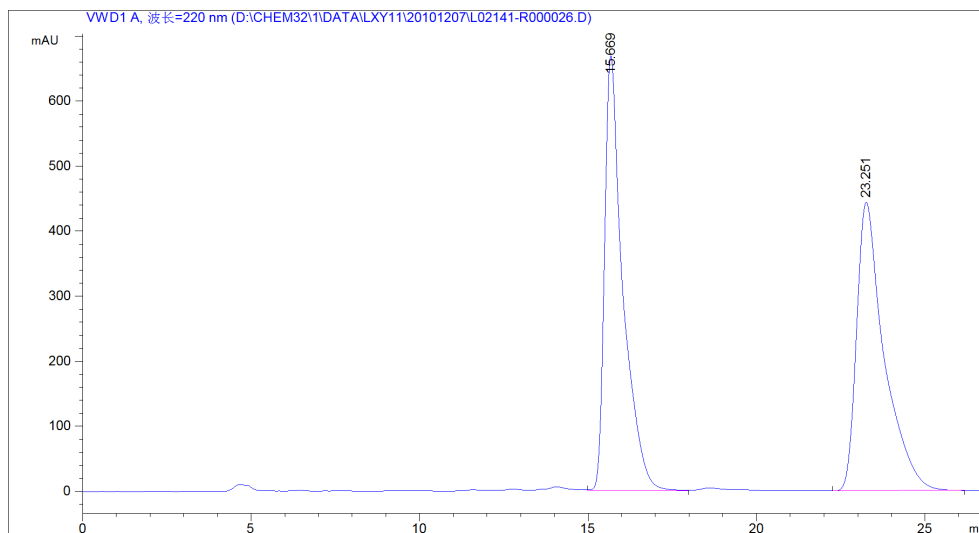


#	Time (min)	Width	Area	Height	Area %
1	16.259	0.3443	2.83732e4	1239.07422	49.6861
2	17.457	0.4055	2.87316e4	1058.49768	50.3139

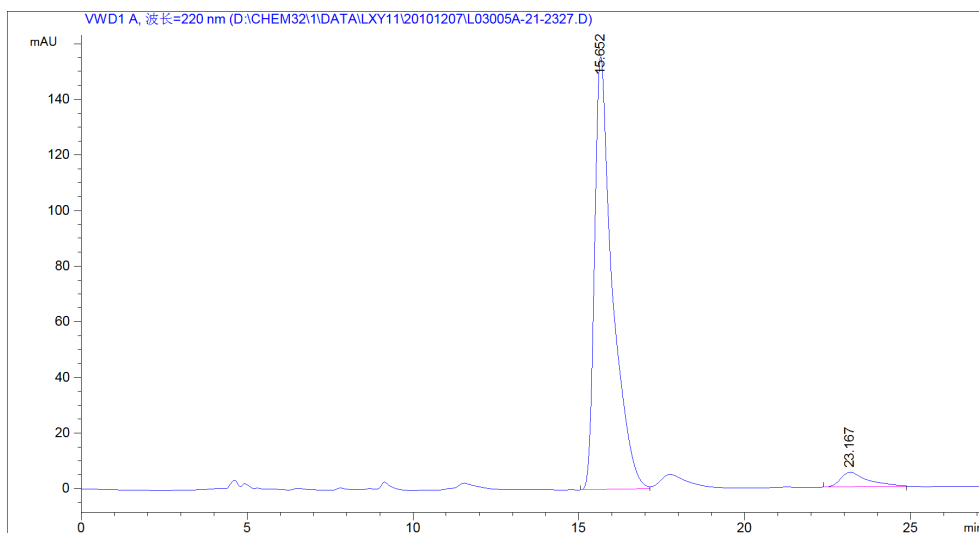


#	Time (min)	Width	Area	Height	Area %
1	16.248	0.3137	1.60916e4	718.64282	94.7273
2	17.574	0.3150	895.68872	38.06295	5.2727

(S)-3-(4-methylphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 10)

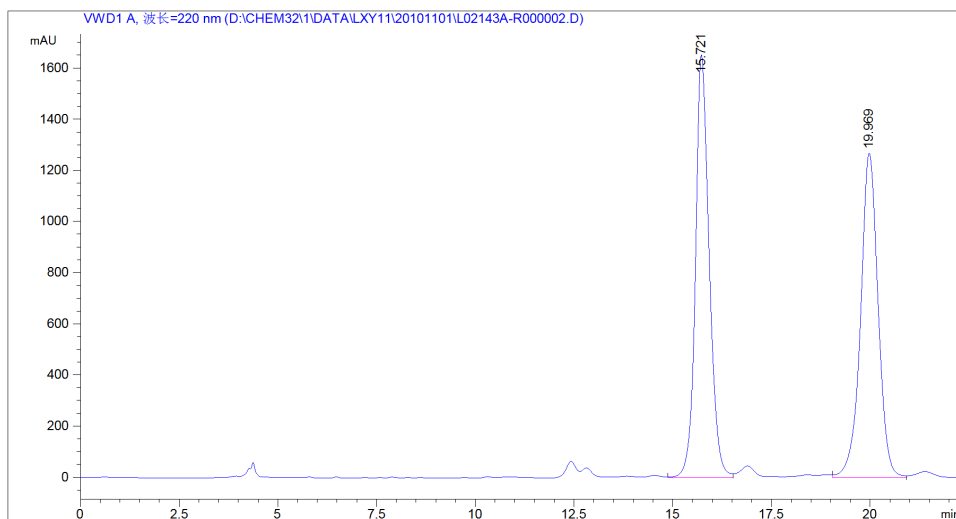


#	Time (min)	Width	Area	Height	Area %
1	15.669	0.5434	2.53387e4	669.55591	50.0927
2	23.251	0.8208	2.52449e4	443.88312	49.9073

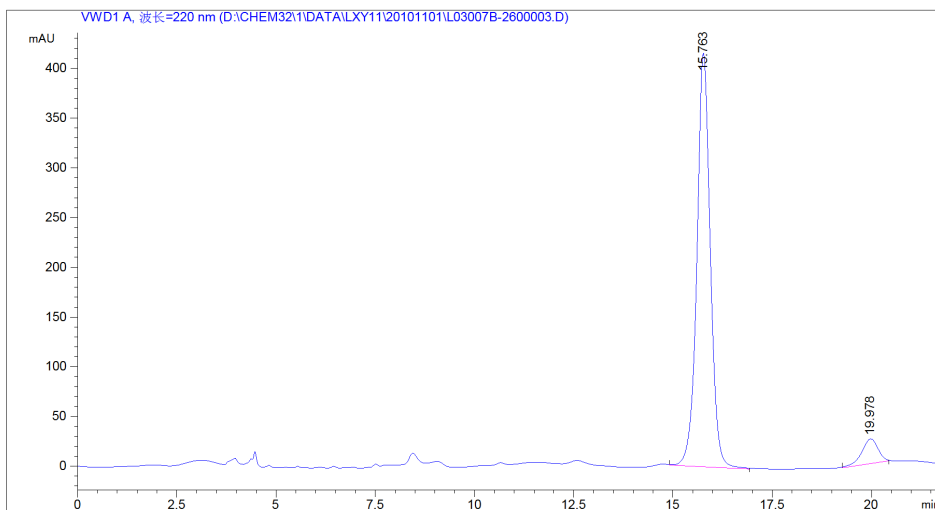


#	Time (min)	Width	Area	Height	Area %
1	15.652	0.5365	5821.37988	155.76198	95.1291
2	23.167	0.7900	298.07370	5.25426	4.8709

(S)-3-(2-methoxyphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 11)

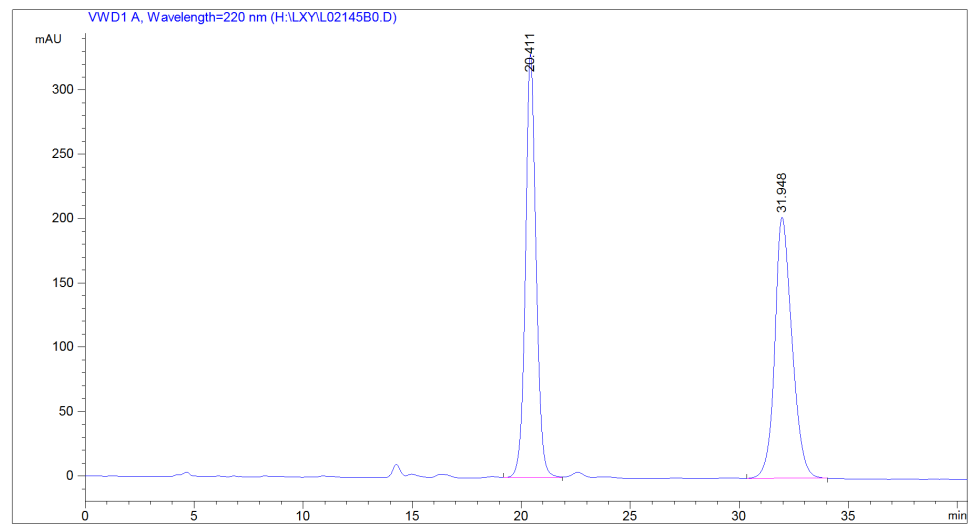


#	Time (min)	Width	Area	Height	Area %
1	15.721	0.3611	4.00212e4	1653.00061	50.4941
2	19.969	0.4656	3.92380e4	1268.83350	49.5059

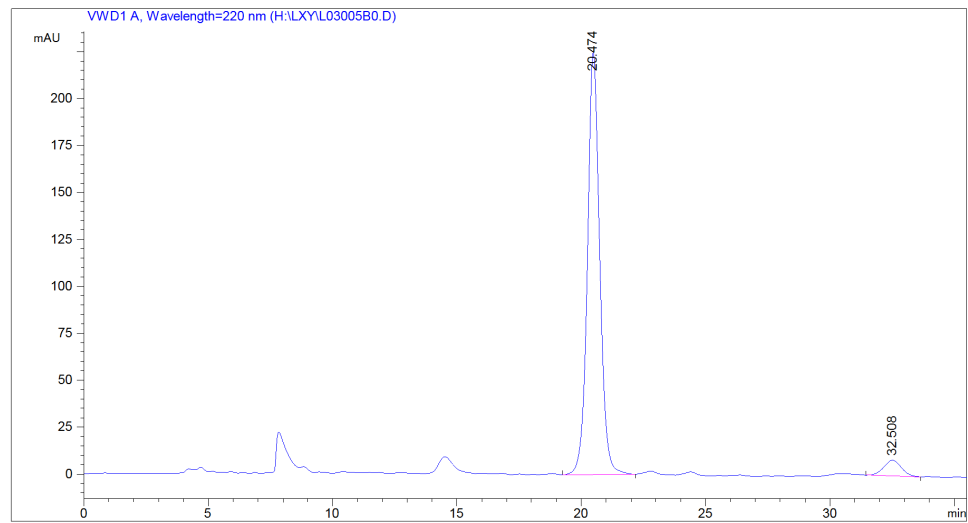


#	Time (min)	Width	Area	Height	Area %
1	15.763	0.3910	9755.88281	415.88449	93.1253
2	19.978	0.4804	720.19519	24.98556	6.8747

(S)-3-(4-methoxyphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 12)

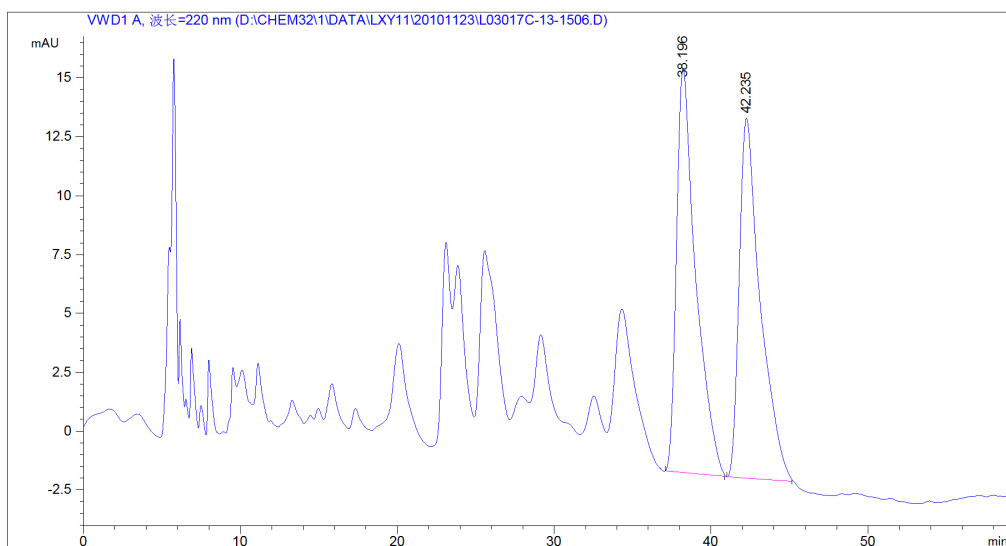


#	Time (min)	Width	Area	Height	Area %
1	20.411	0.5091	1.11209e4	329.21030	49.8871
2	31.948	0.8283	1.11713e4	203.02072	50.1129

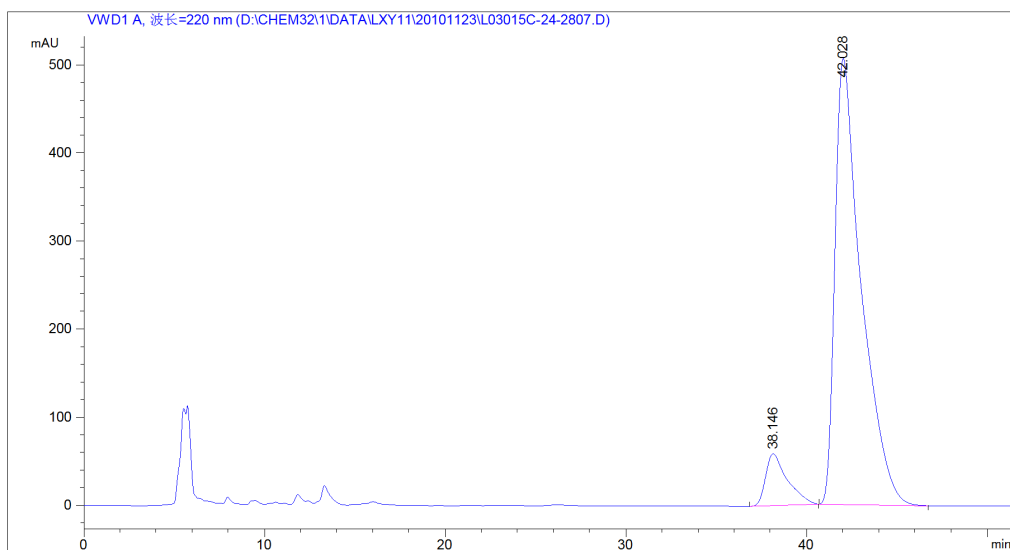


#	Time (min)	Width	Area	Height	Area %
1	20.474	0.5121	7733.06543	224.73132	94.9043
2	32.508	0.8223	415.21371	8.41602	5.0957

(R)-3-(diphenylphosphoryl)hexan-1-ol (Table 3, Entry 13)

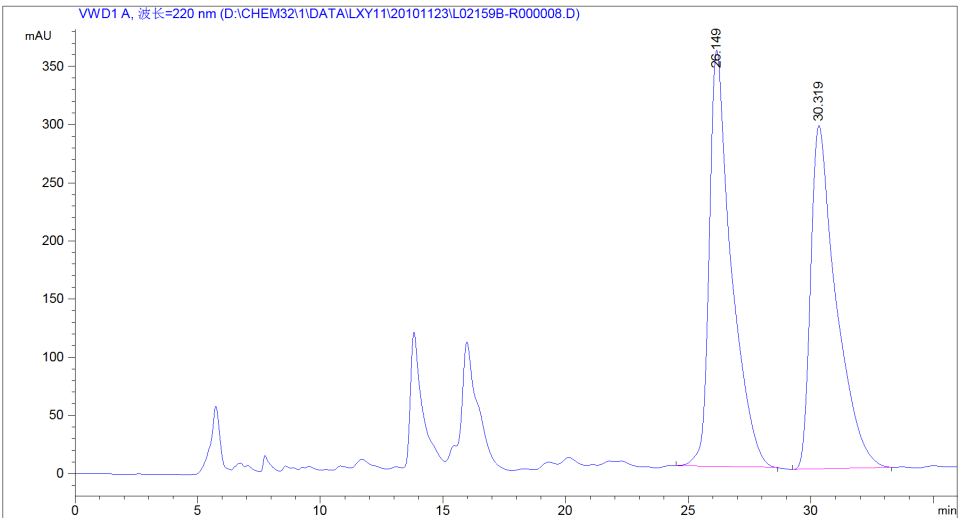


#	Time (min)	Width	Area	Height	Area %
1	38.196	1.1953	1462.58496	17.18494	50.6044
2	42.235	1.3056	1427.64893	15.27970	49.3956

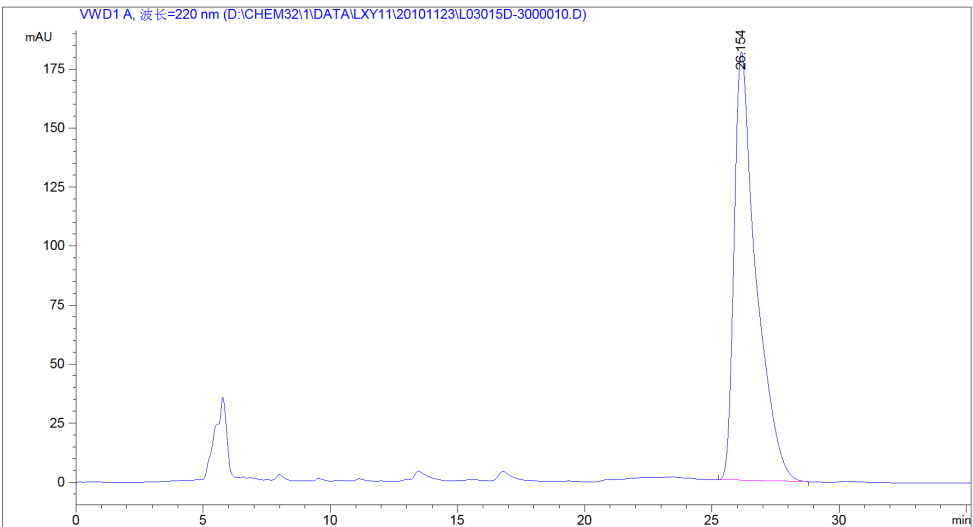


#	Time (min)	Width	Area	Height	Area %
1	38.146	1.2759	5019.06982	59.36153	8.9283
2	42.028	1.3167	5.11963e4	506.62628	91.0717

(S)-3-(diphenylphosphoryl)-4-methylpentan-1-ol (Table 3, Entry 14)

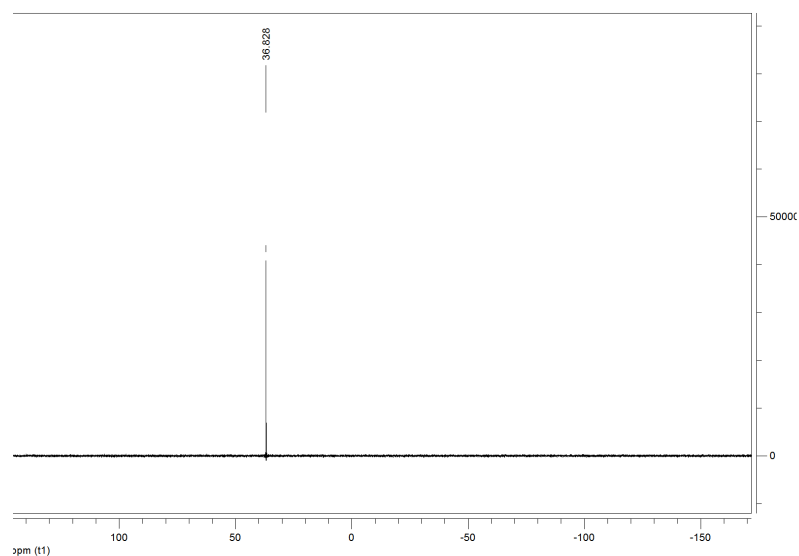
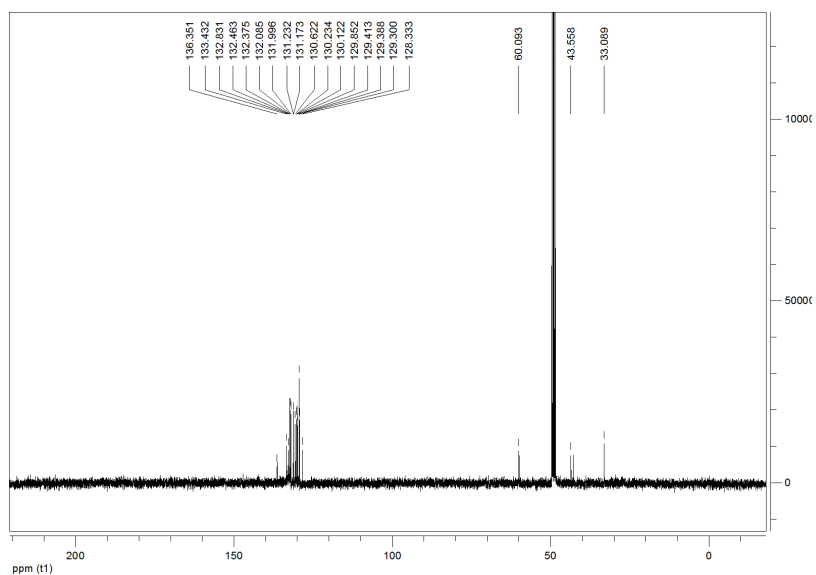
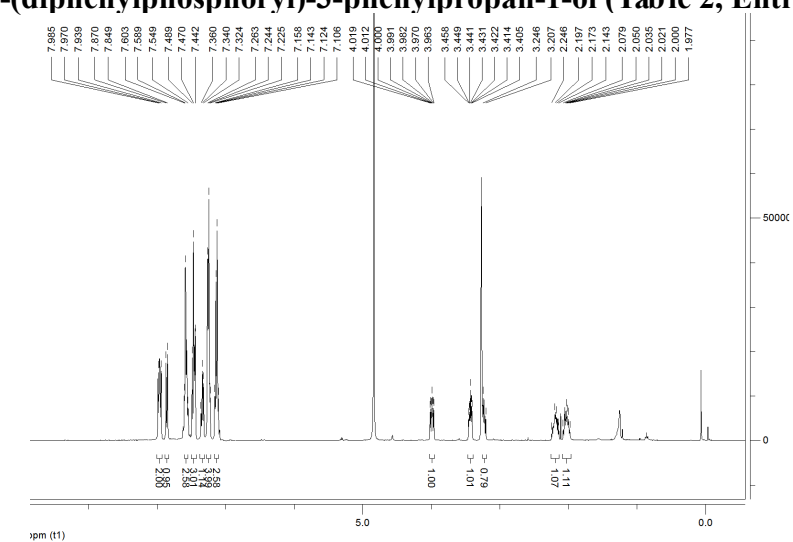


#	Time (min)	Width	Area	Height	Area %
1	26.149	0.8403	2.23711e4	357.56033	51.1926
2	30.319	1.0375	2.13287e4	294.87793	48.8074

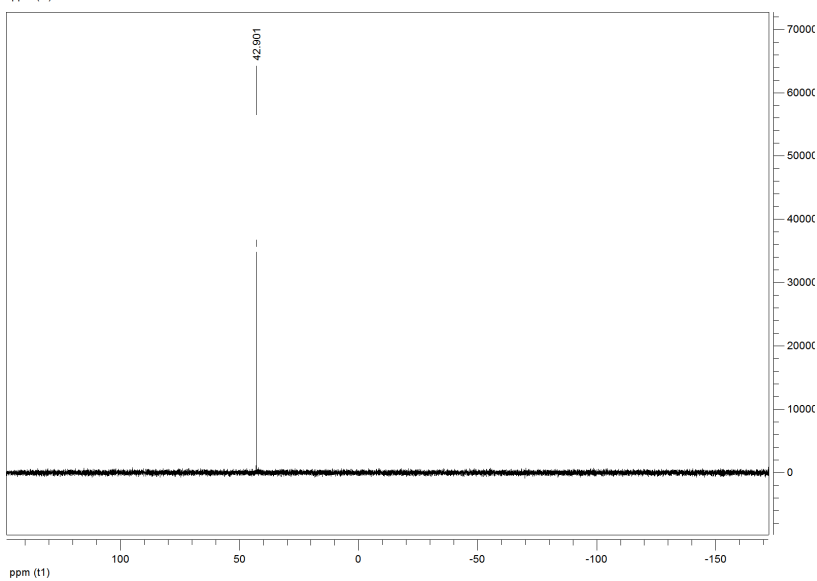
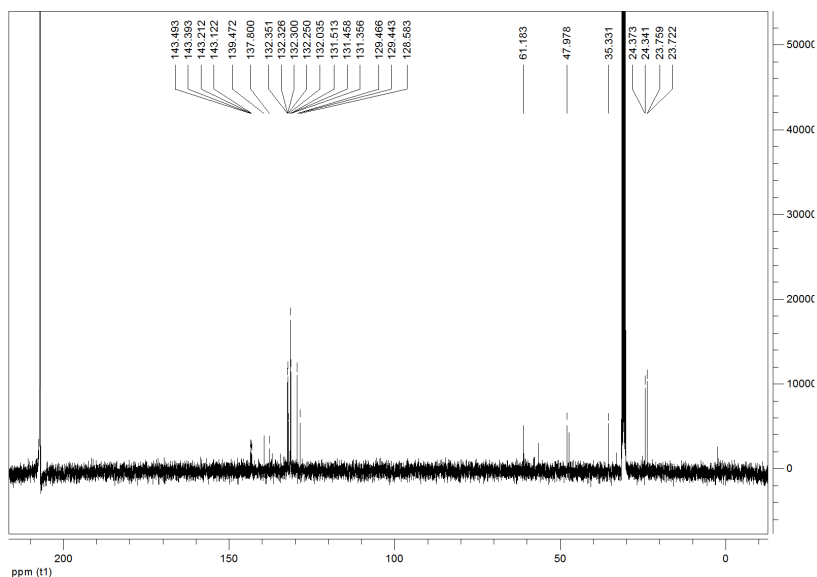
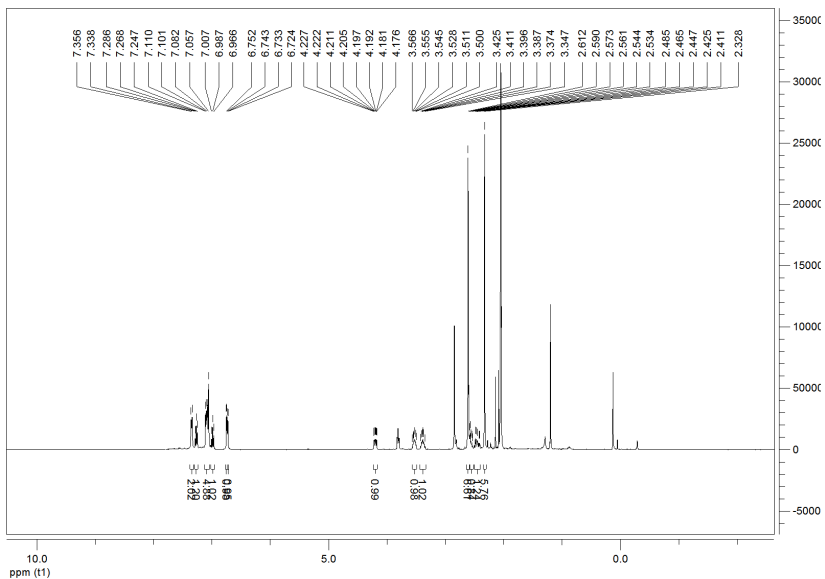


#	Time (min)	Width	Area	Height	Area %
1	26.154	0.8564	1.08724e4	181.42764	100.0000

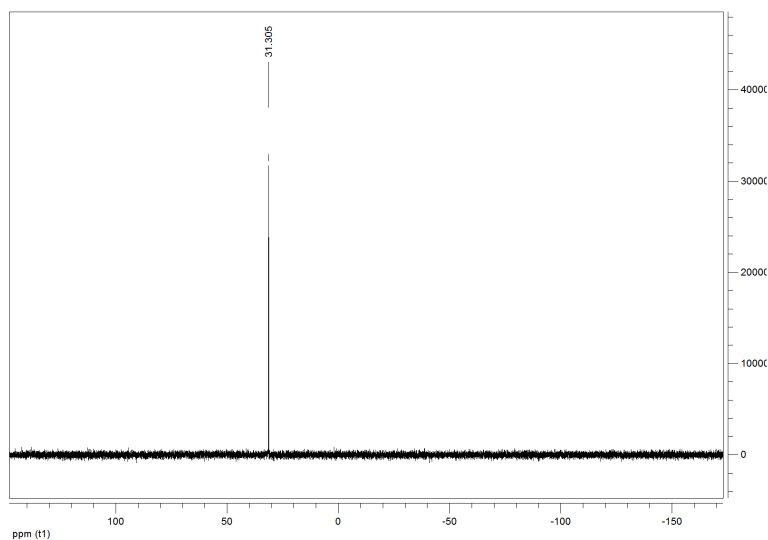
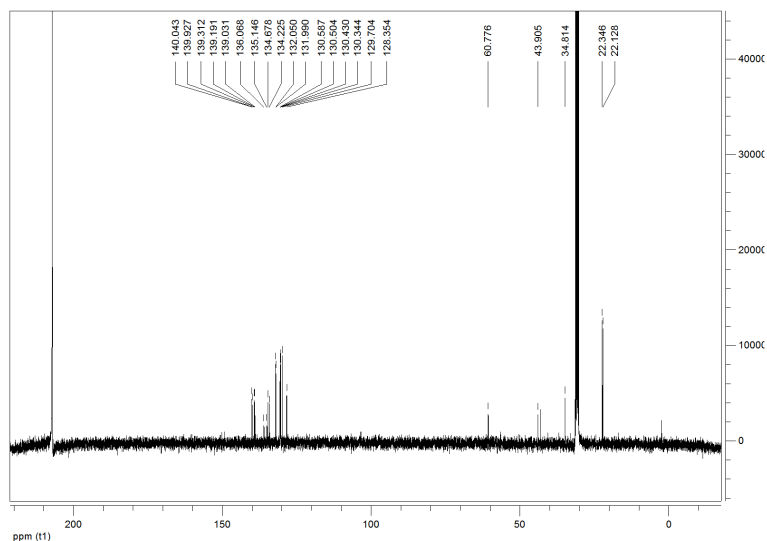
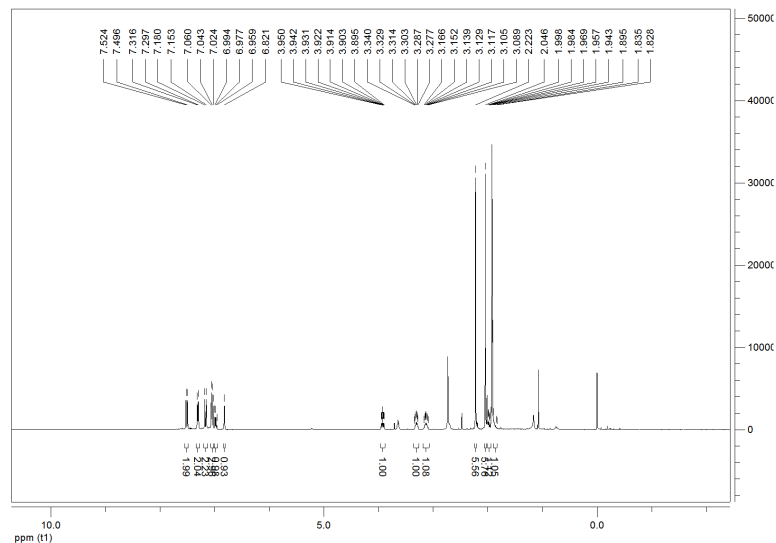
D: NMR Analysis of Michael Addition Products
(S)-3-(diphenylphosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 1)



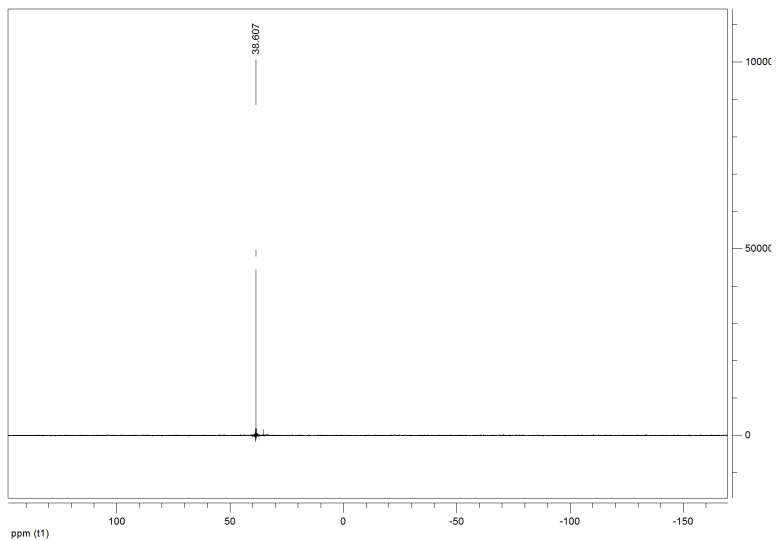
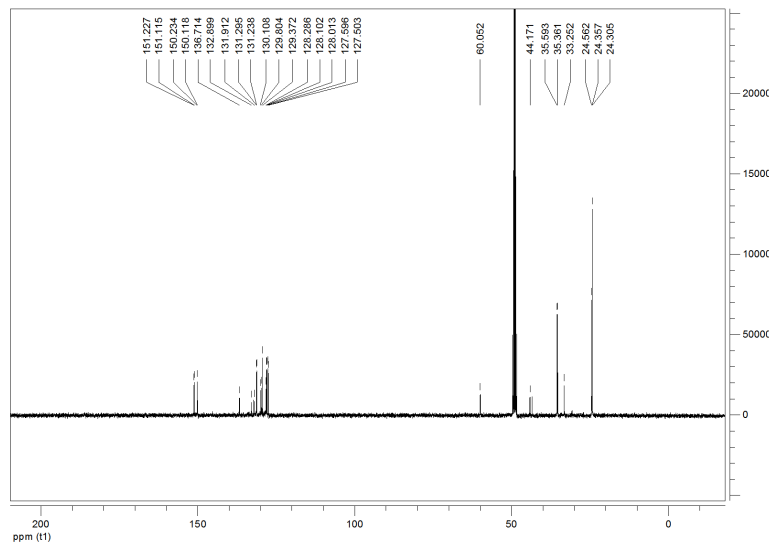
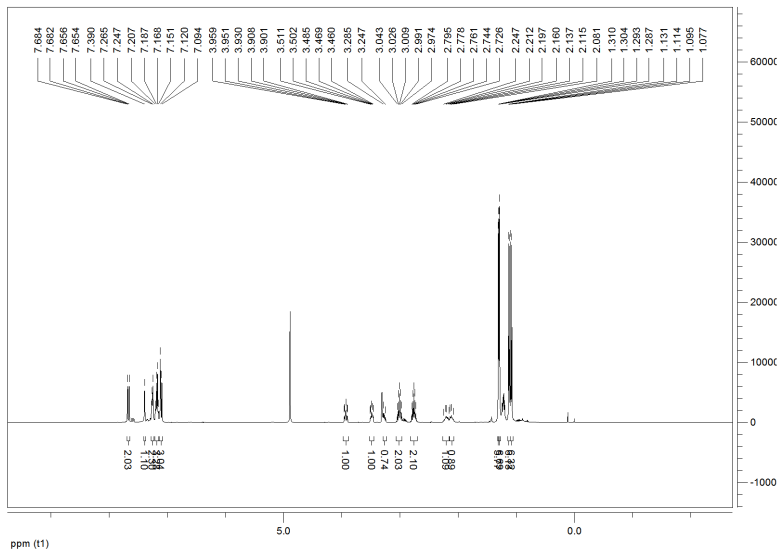
(S)-3-(bis(2,6-dimethylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 2)



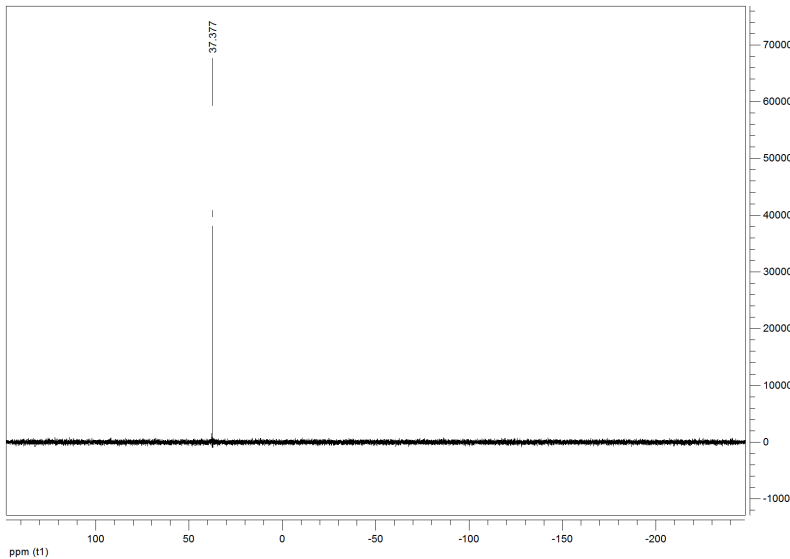
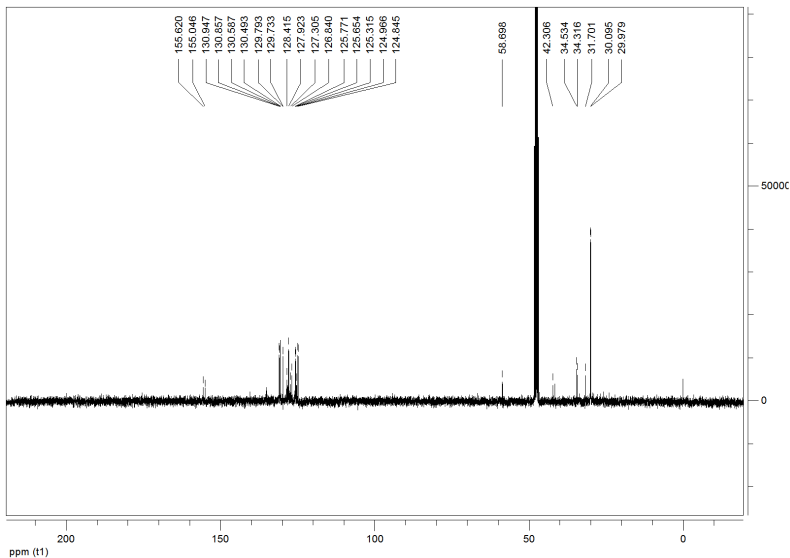
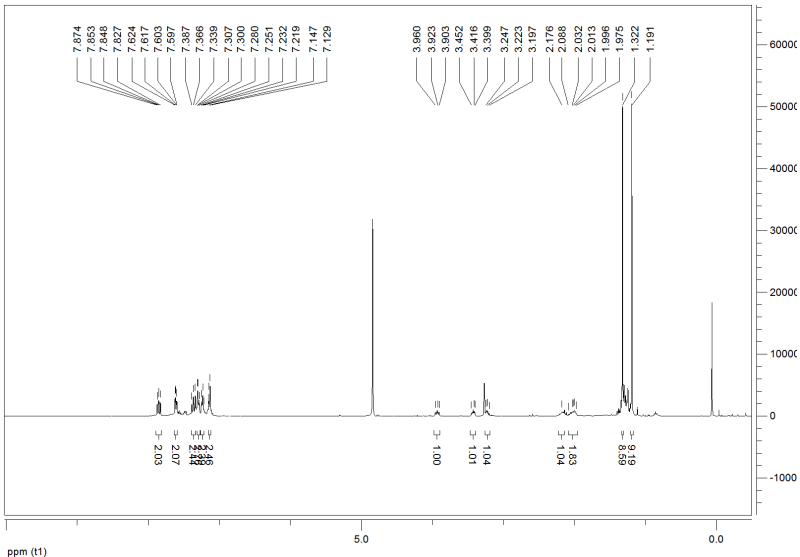
(S)-3-(bis(3,5-dimethylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 3)



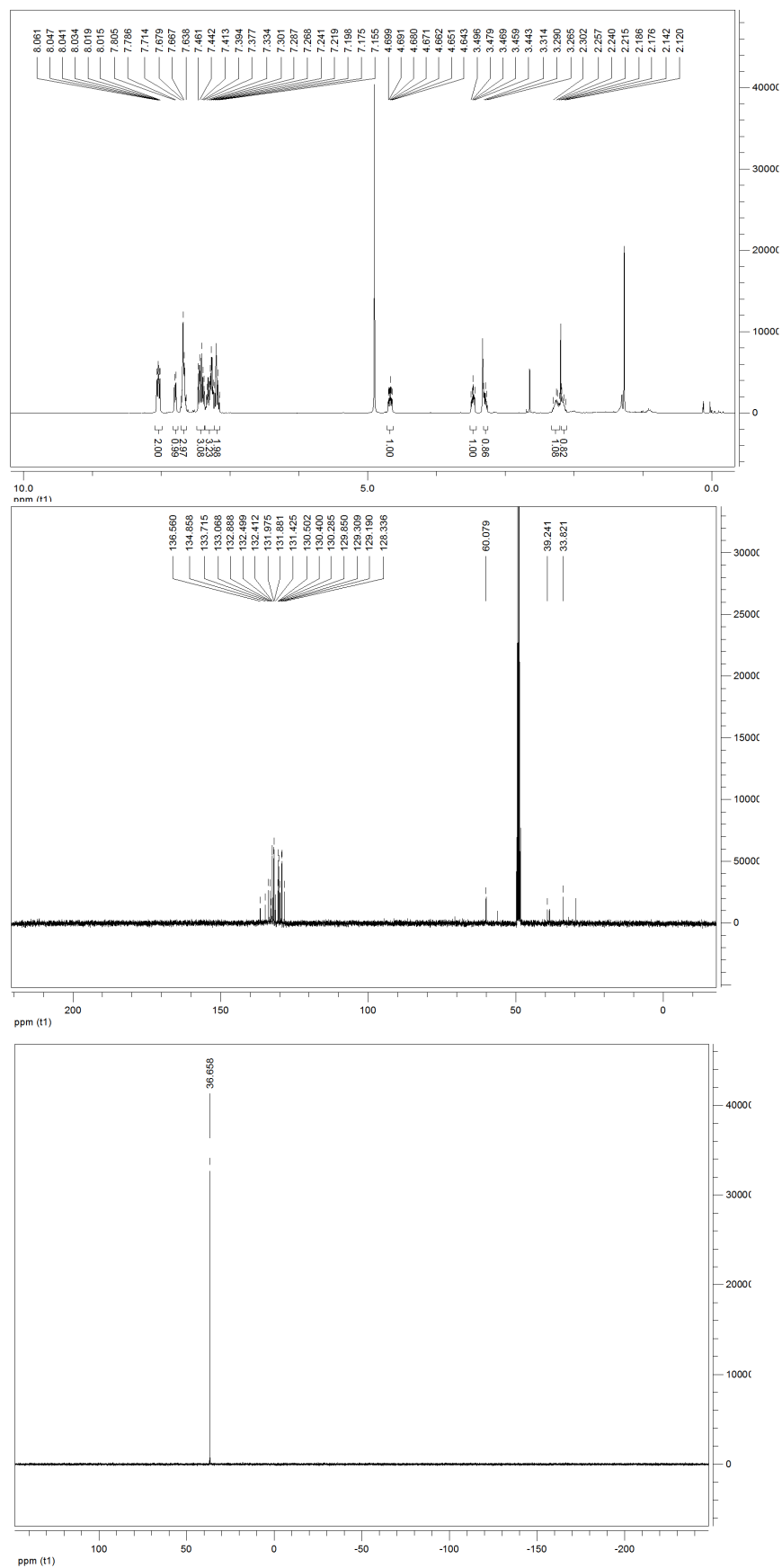
(S)-3-(bis(3,5-diisopropylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 4)



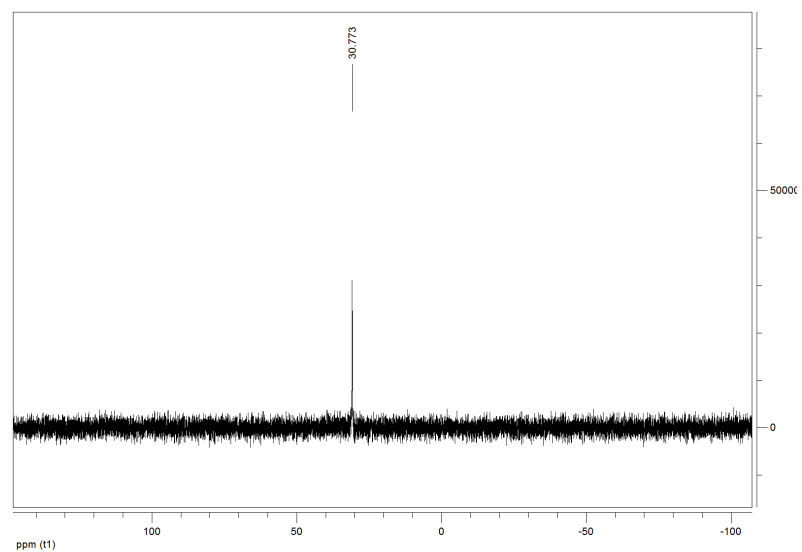
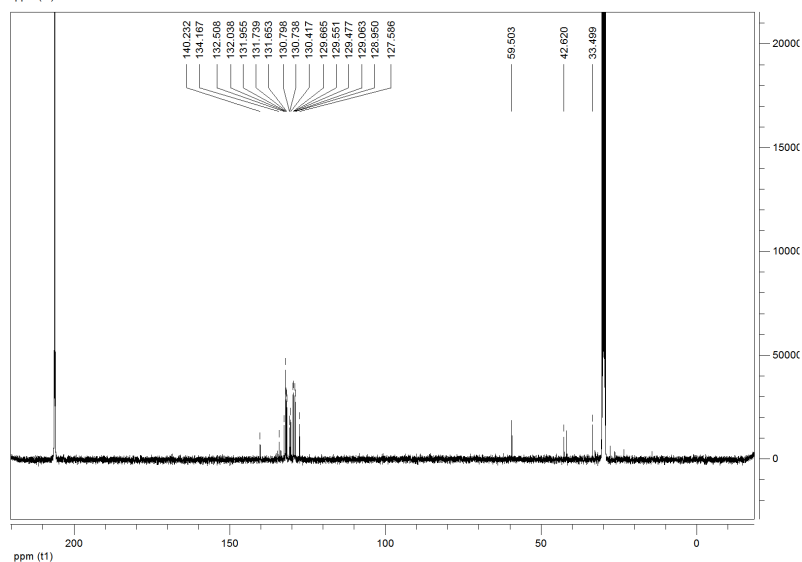
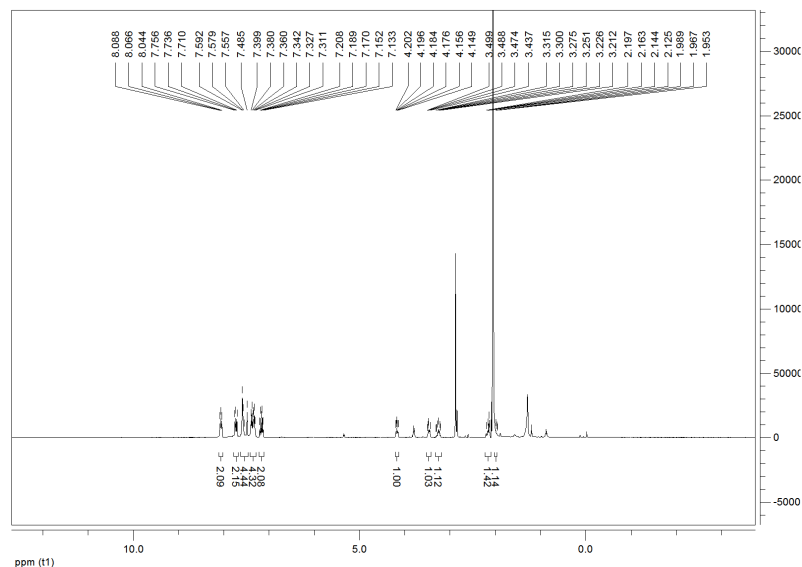
(S)-3-(bis(4-tert-butylphenyl)phosphoryl)-3-phenylpropan-1-ol (Table 2, Entry 5)



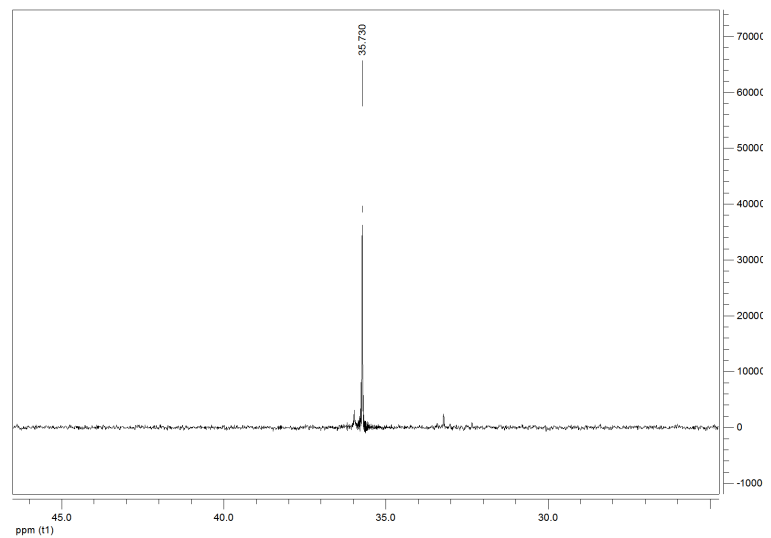
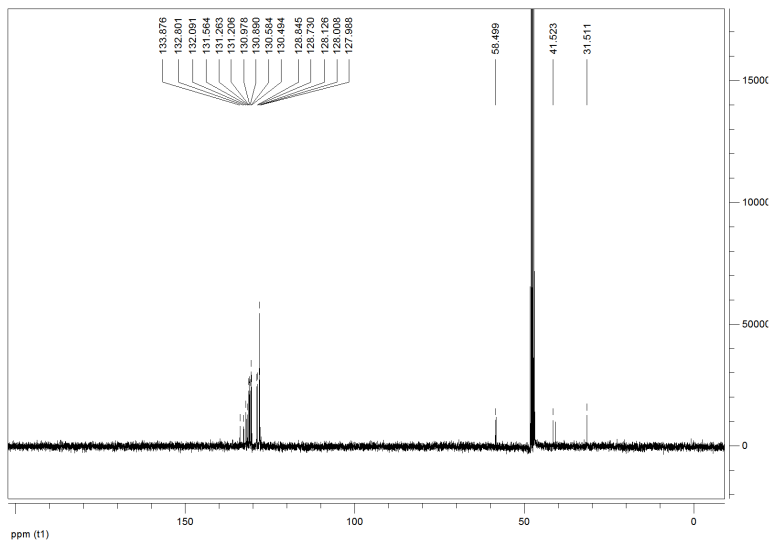
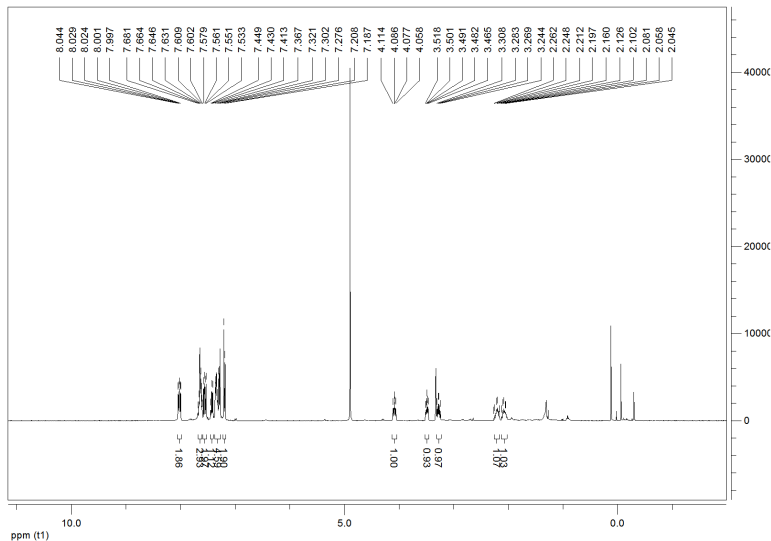
(S)-3-(2-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 1)



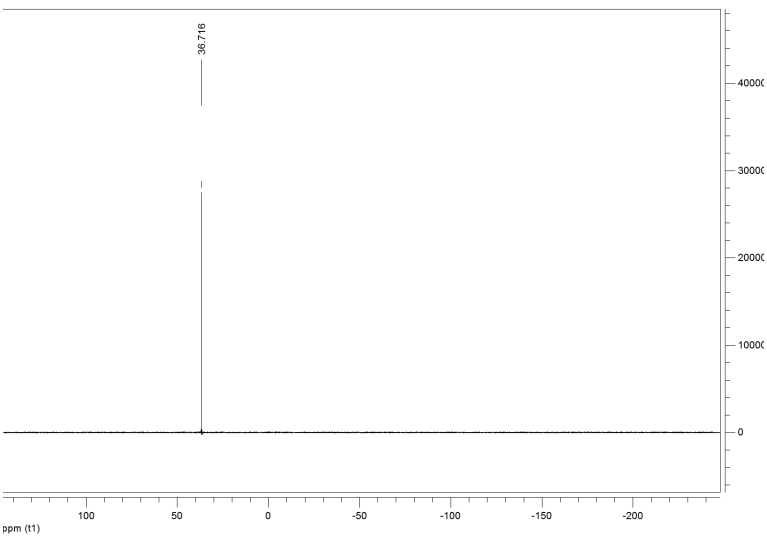
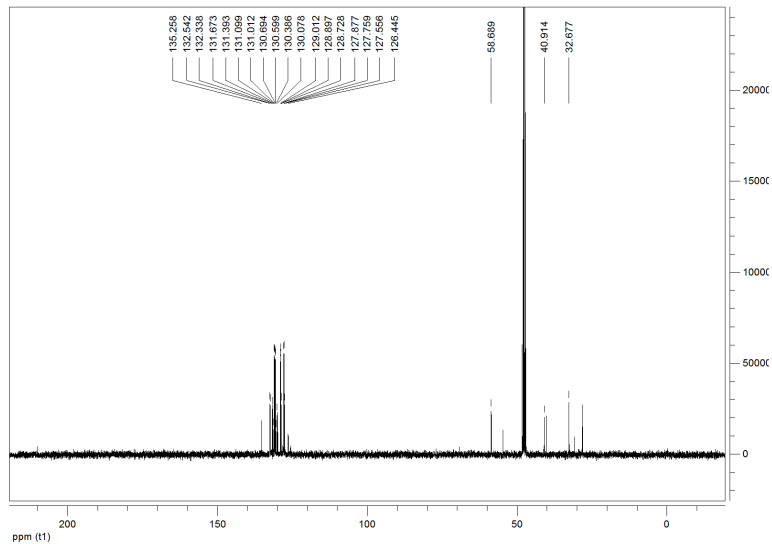
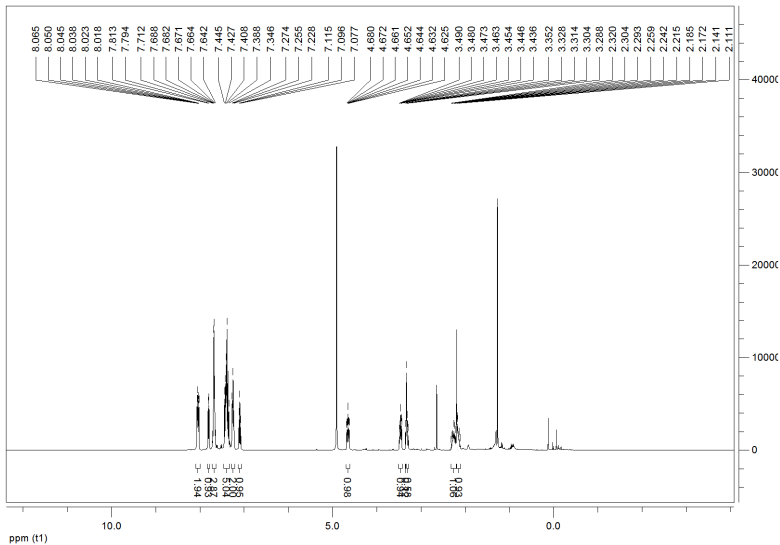
(S)-3-(3-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 2)



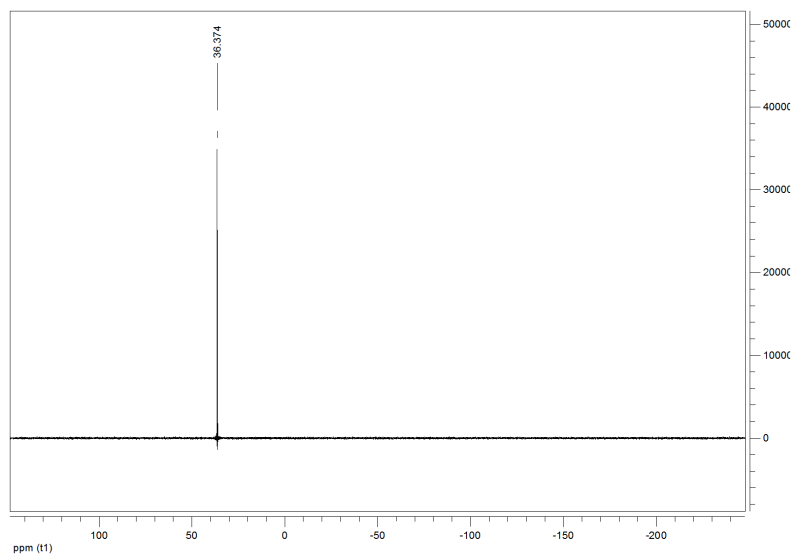
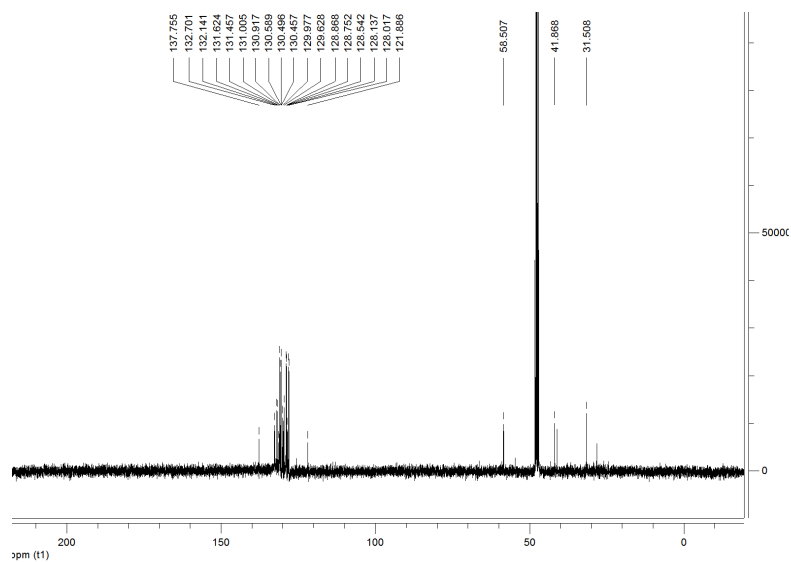
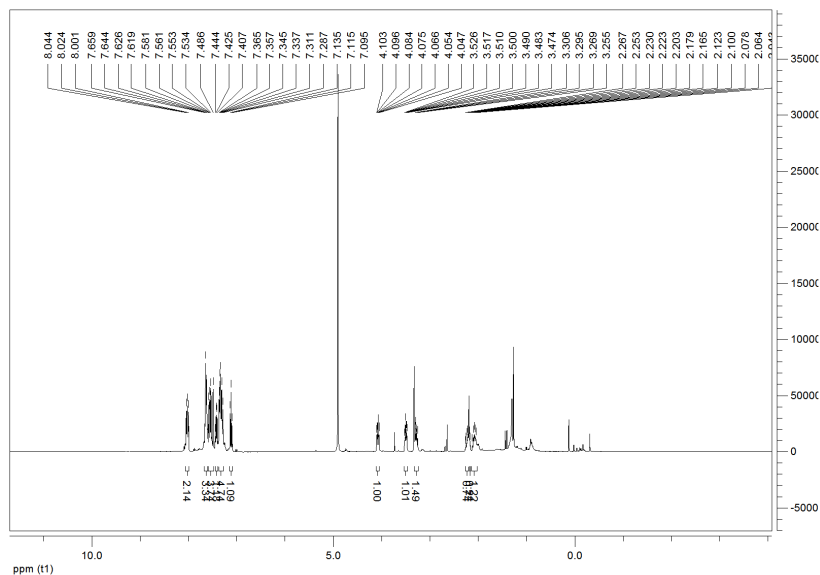
(S)-3-(4-chlorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 3)



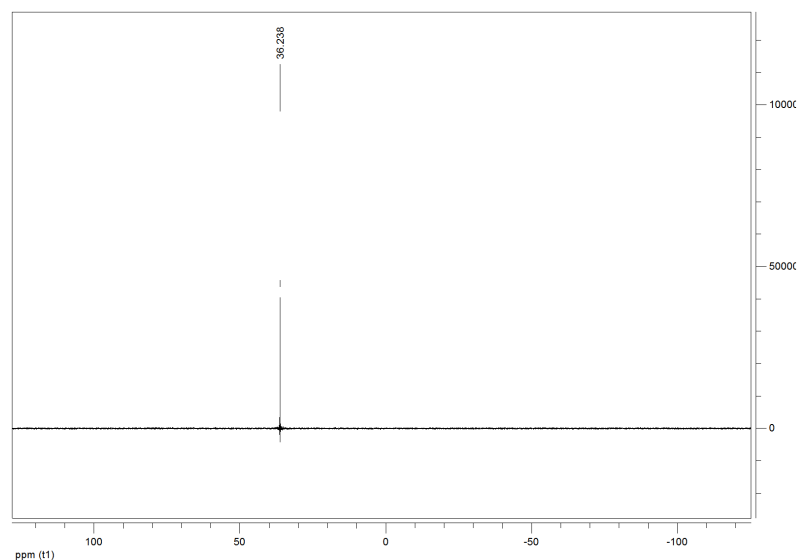
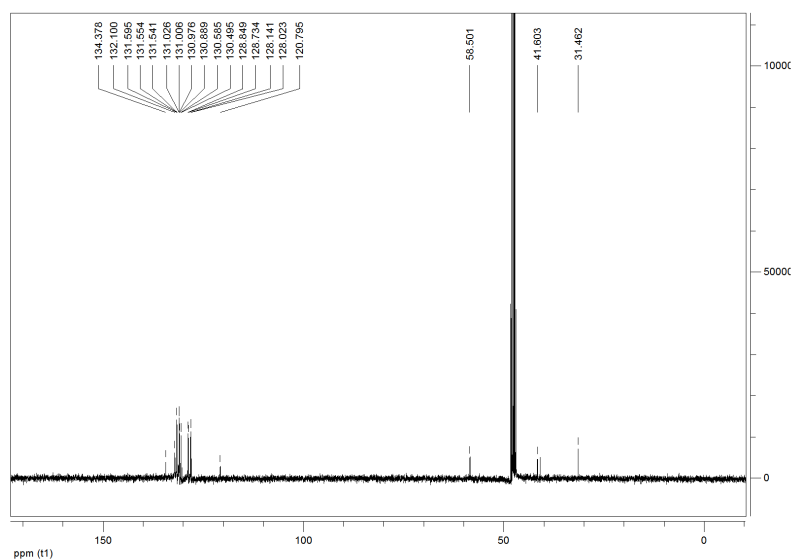
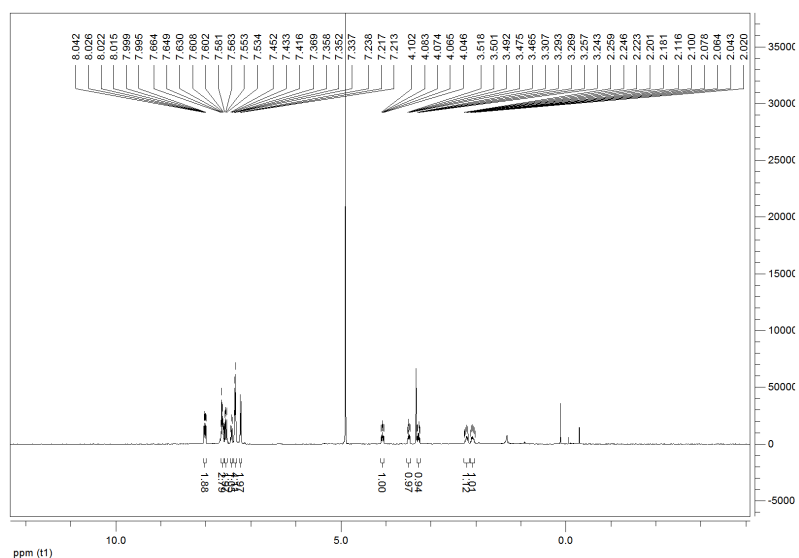
(S)-3-(2-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 4)



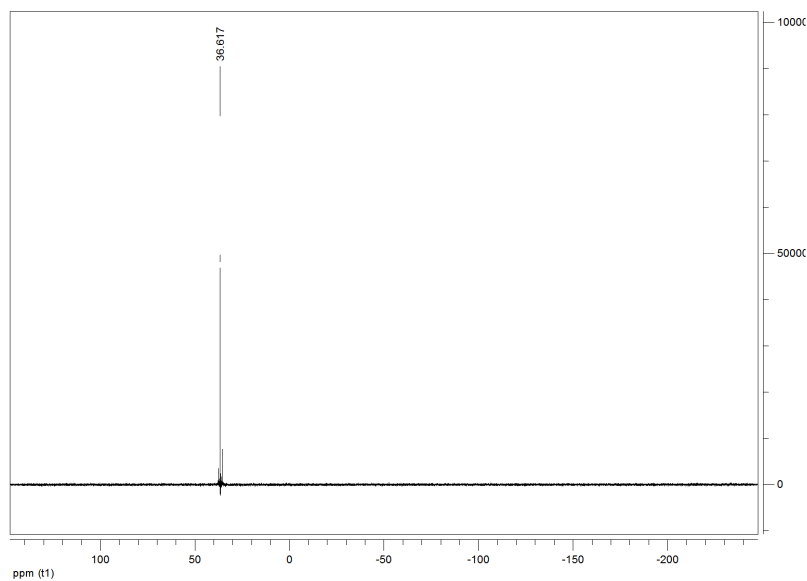
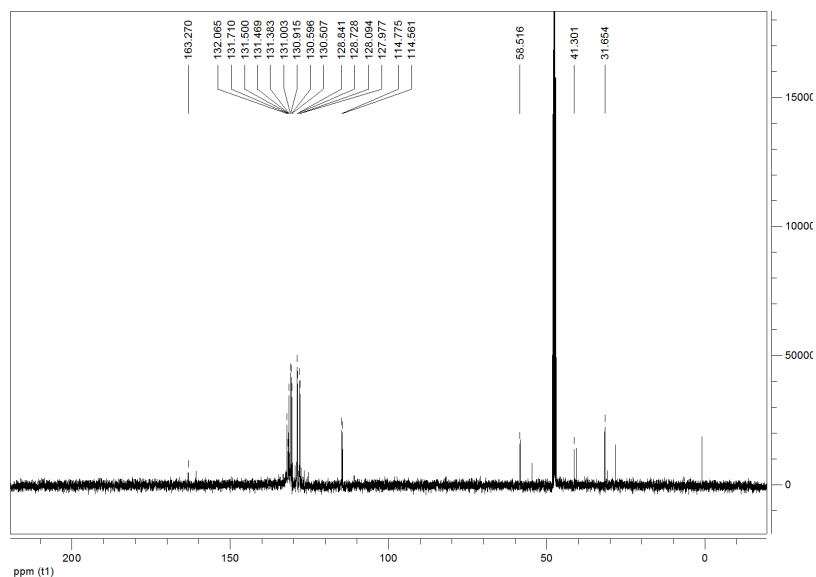
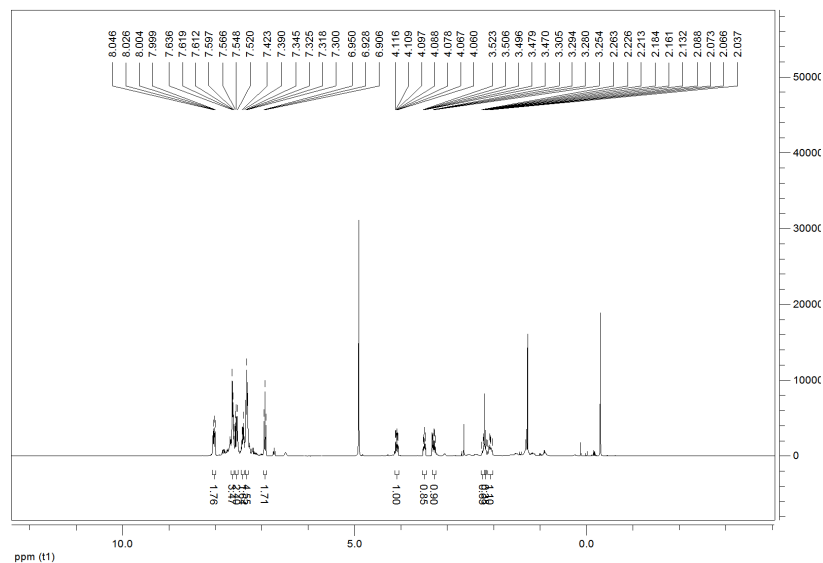
(S)-3-(3-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 5)



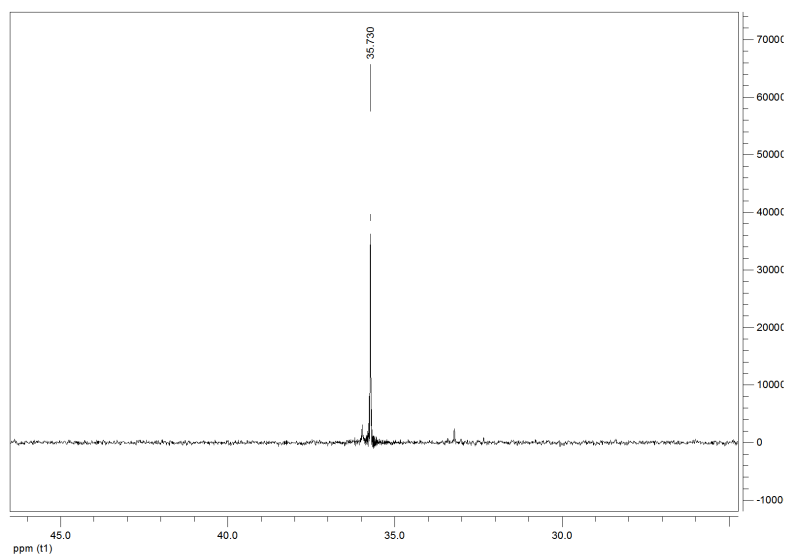
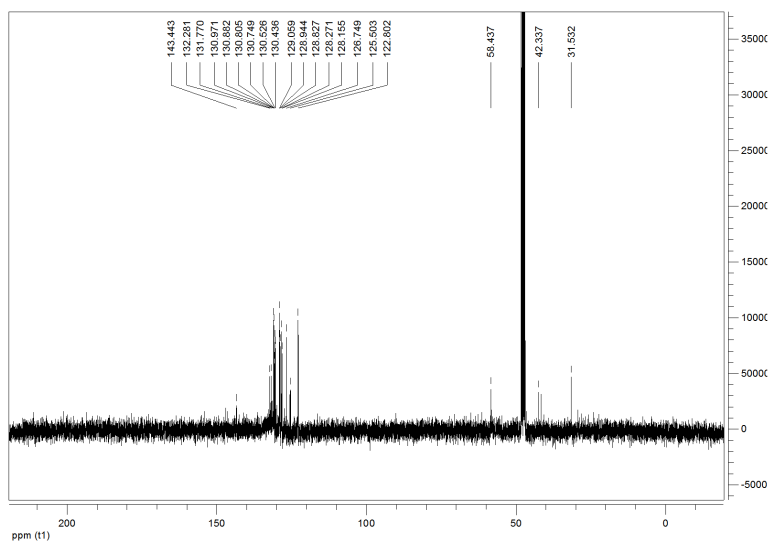
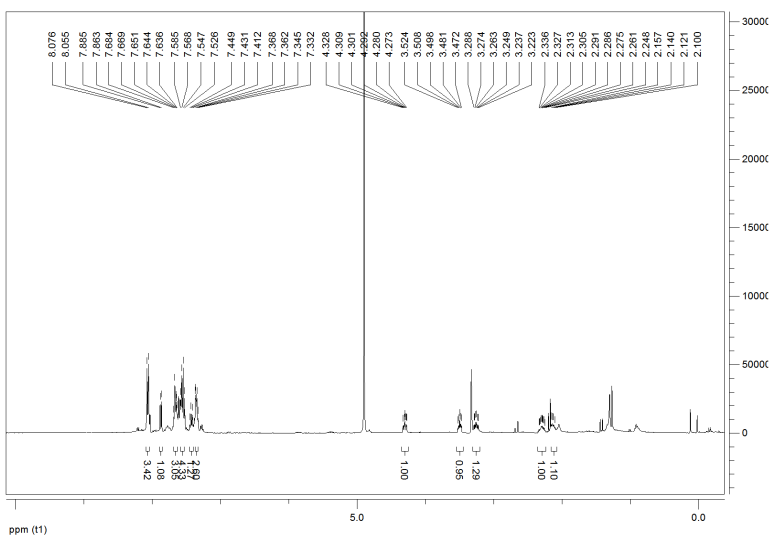
(S)-3-(4-bromophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 6)



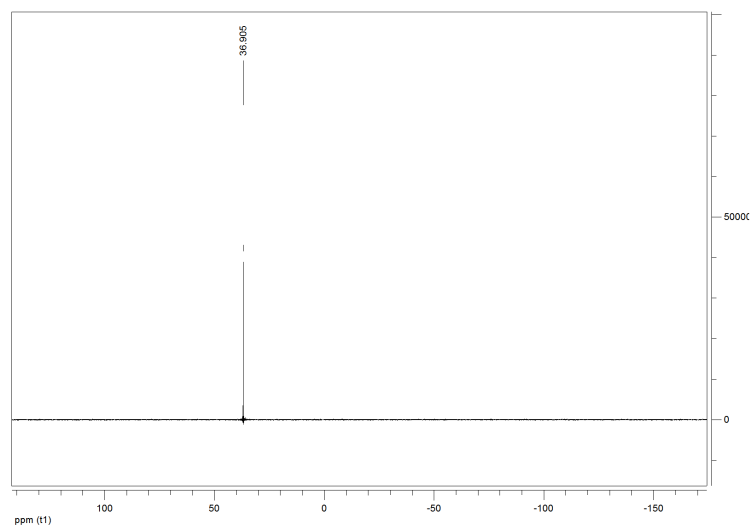
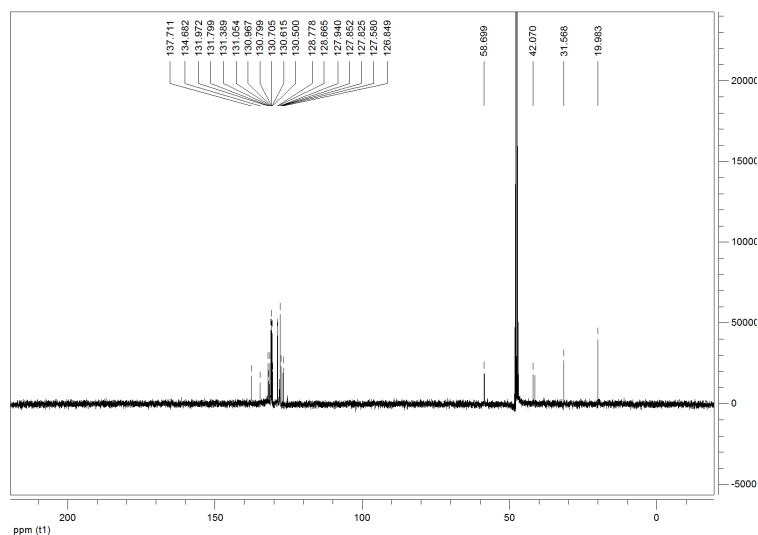
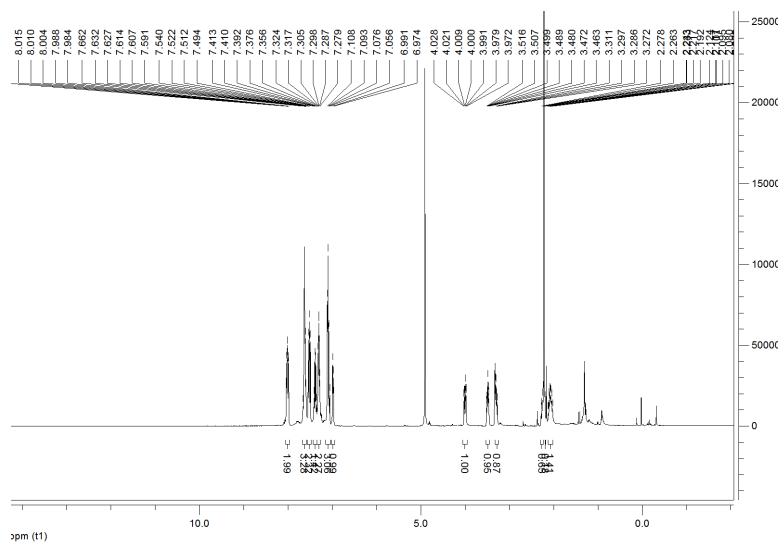
(S)-3-(4-fluorophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 7)



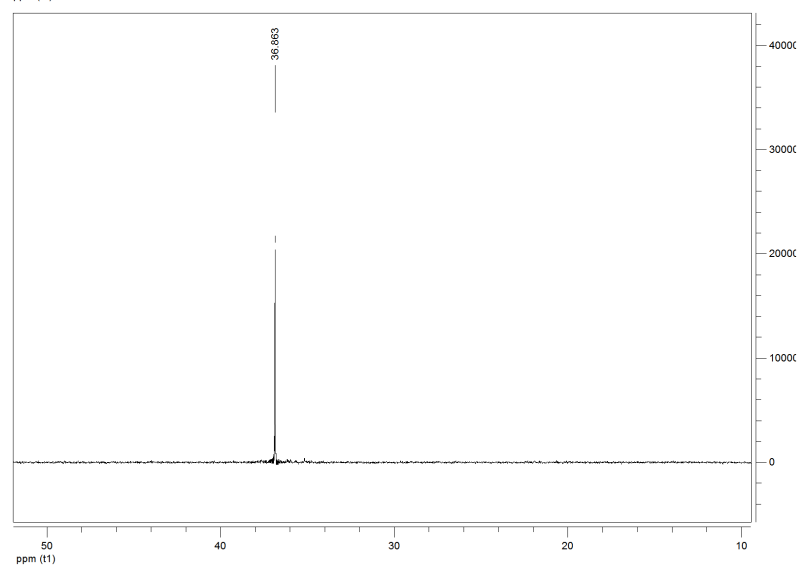
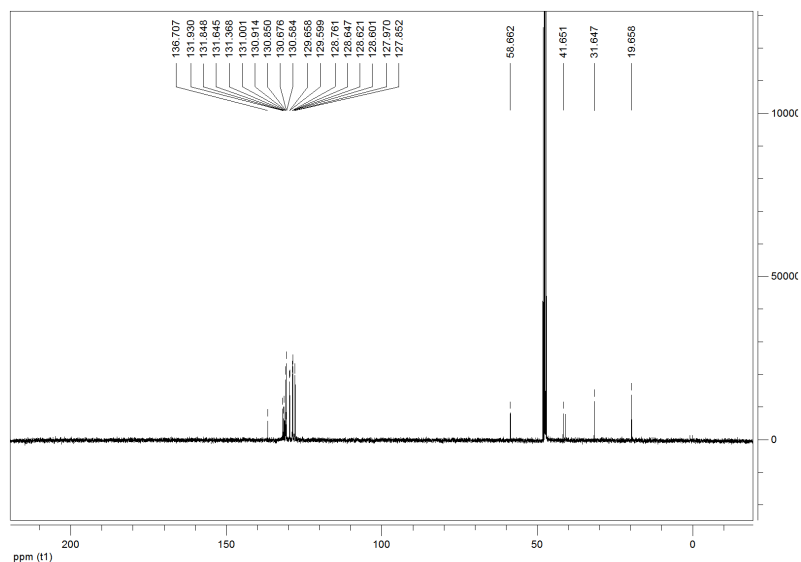
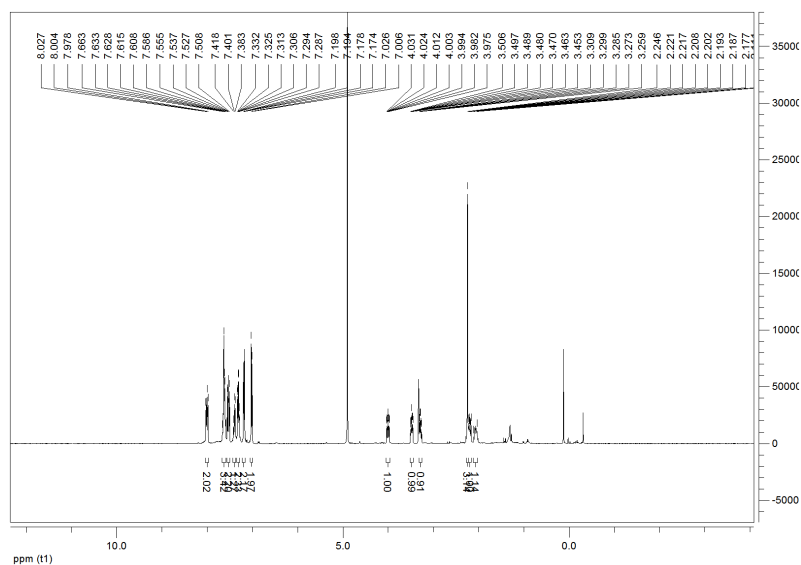
(S)-3-(4-nitrophenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 8)



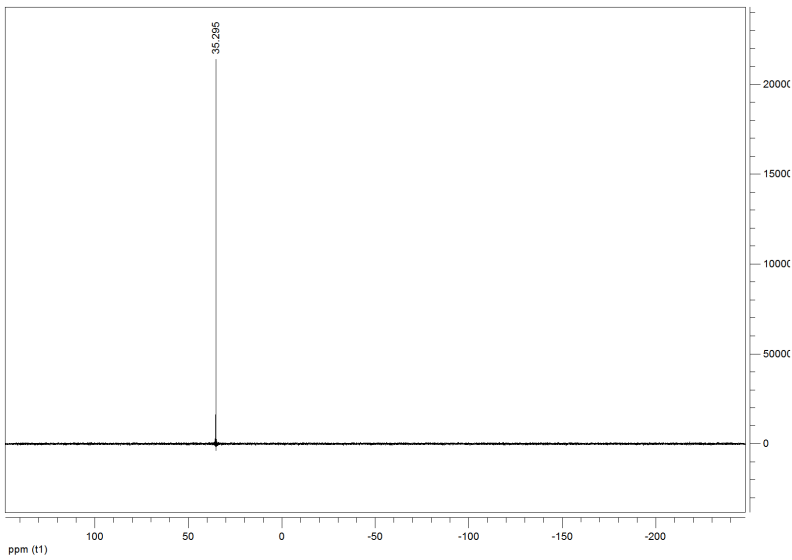
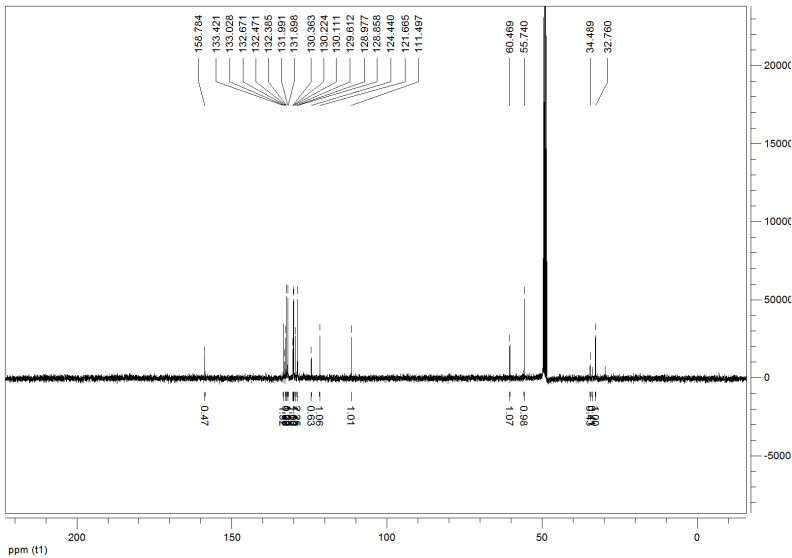
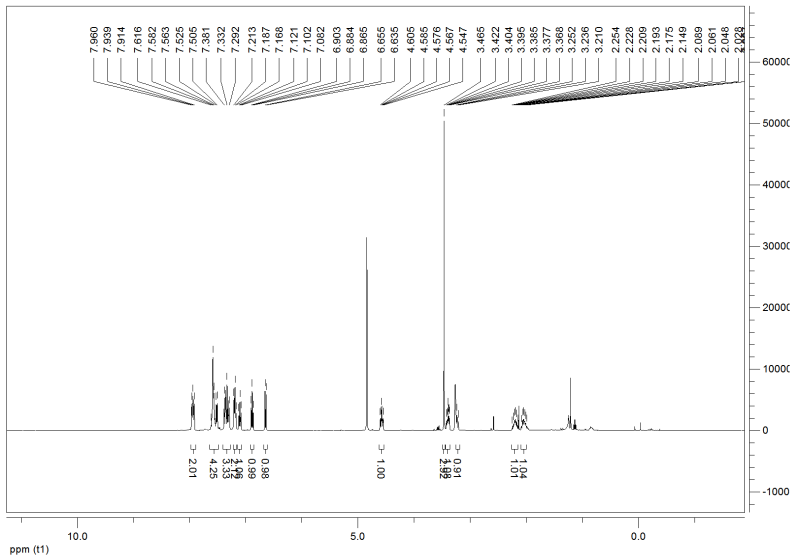
(S)-3-(3-methylphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 9)



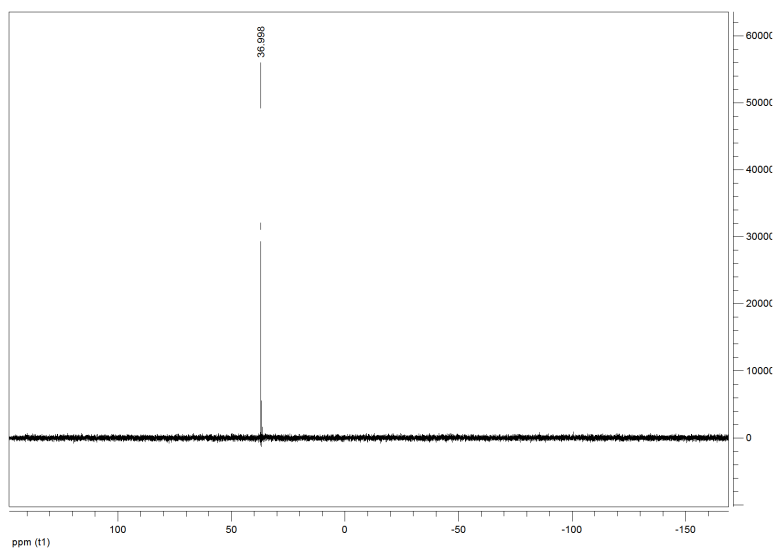
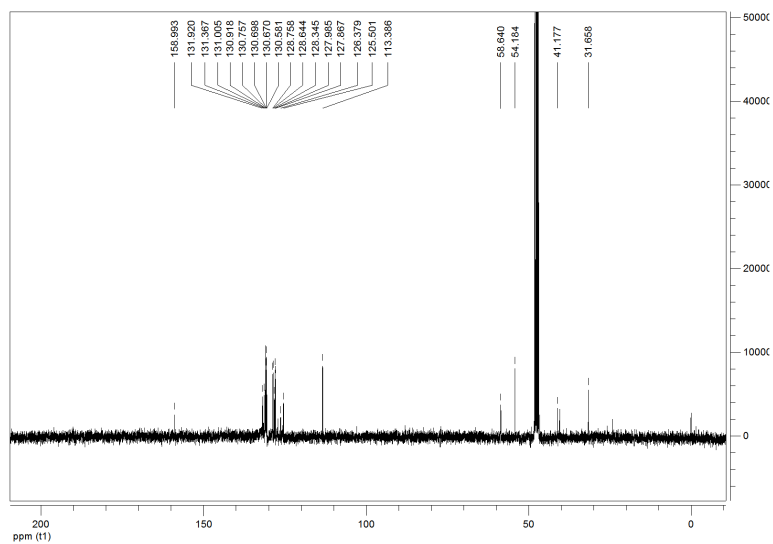
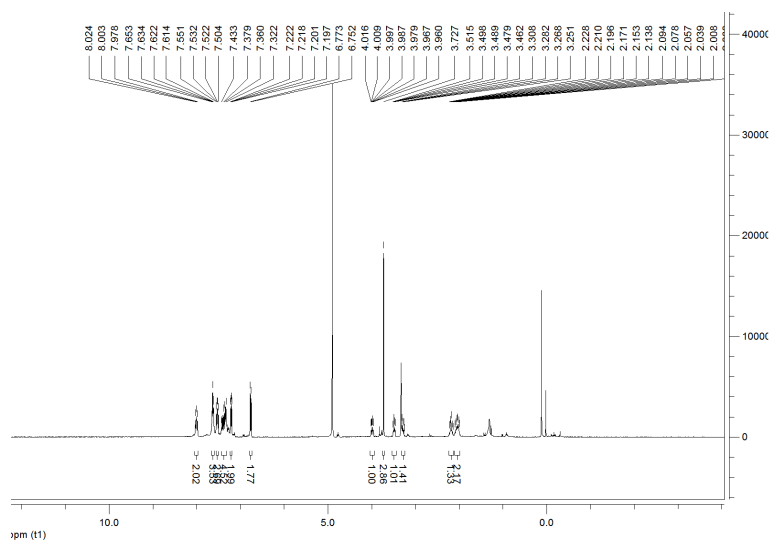
(S)-3-(4-methylphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 10)



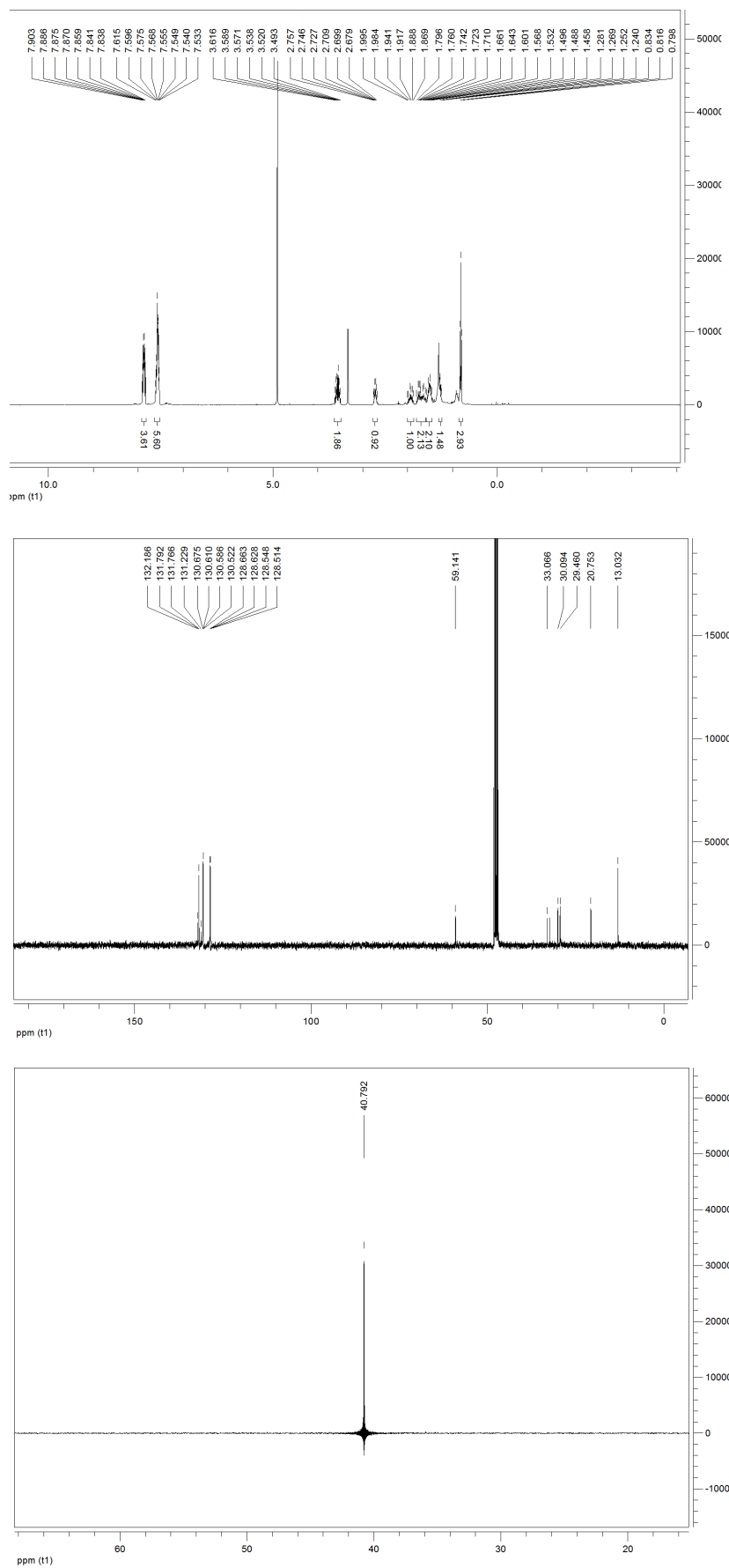
(S)-3-(2-methoxyphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 11)



(S)-3-(4-methoxyphenyl)-3-(diphenylphosphoryl)propan-1-ol (Table 3, Entry 12)



(*R*)-3-(diphenylphosphoryl)hexan-1-ol (Table 3, Entry 13)



(S)-3-(diphenylphosphoryl)-4-methylpentan-1-ol (Table 3, Entry 14)

