Supporting Information

Selective Cleavage of Inert Aryl C-O Bonds to Arenes

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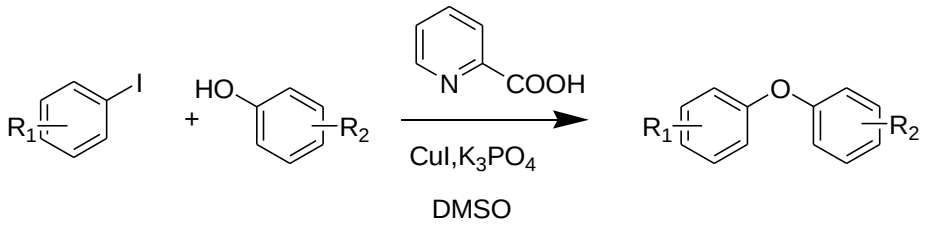
1. General experimental details

1.1 Materials

Toluene (A.R. grade) was purchased from Xilong Chemical CO., LTD, and used as received. $LiAlH_4$ (>98%, gray powder) was purchased from TCI, and KO*t*Bu(99%) from Across. Phenol, anisole, dodecane, tetradecane were from Across. Diphenyl ether, 4-ethylanisole, 4-tert-butylanisole, 2-naphthol, 1,2,3,4-tetrahydronaphthalene, biphenyl, 4-hydroxydiphenyl 1,4-diphenoxybenzene were purchased from Alfa Aesar. 4-Ethylphenol, 2-ethylanisole, tert-butylbezene was purchased from TCI. Benzene, dibenzofuran, benzofuran, 2-methoxynaphthalene, 2-ethylphenol, 4-ethylguaiacol, 2-hydroxydiphenyl, 2-methoxybiphenyl, 4-methoxybiphenyl, 1,2-dimethoxybenzene, 1,3-dimethoxybenzene, pyrocatechol, 1,2,3,4-tetrahydro-1-naphthol, sodium hydride, sodium ethoxide, sodium tert-butoxide, lithium t-butoxidediisobutyl aluminum hydride (1M solution in toluene), triethylsilane, sodium borohydride, potassium borohydride, potassium hydroxide, 1,8-diazabicyclo[5.4.0]undec-7-ene were purchased from J&K. Anhydrous copper iodide, pyridine-2-carboxylic acid (picolinic acid), anhydrous K_3PO_4, phenols were also from J&K. Di-2-methoxyphenyl ether, di-4-tert-butylphenyl ether, di-4-ethylphenylether, 2-phenoxy-1-phenethanol, 2-(2-methoxyphenoxy)-1-phenylethanol, and 2-phenoxy-1-phenylpropane-1, 3-diol were synthesized by ourselves as follows.

1) Synthesis of diarylethers

General procedure for the synthesis of diarylethers was based on a reported route (S1).



Typically, a 100 mL round bottom flask was charged with copper (I) iodide (1mmol), picolinic acid (pyridine-2-carboxylic acid, 2 mmol), aryl iodide (10 mmol), phenol (12 mmol), potassium phosphate (20 mmol), DMSO (30ml) and a magnetic stir bar. The reaction flask was sealed with a septum in an argon atmosphere and the reaction mixture was stirred at 100 ℃ until complete reaction. The reaction mixture was cooled and diluted with a saturated aqueous solution of ammonium chloride (100 ml) and water (100 ml). The crude product was extracted with methylene chloride (2 × 100 ml). The combined organic extracts were successively washed with a 5% aqueous solution of potassium hydroxide (100 ml), brine (100 ml) and dried over anhydrous sodium sulfate.

The crude product was purified by flash column chromatography.

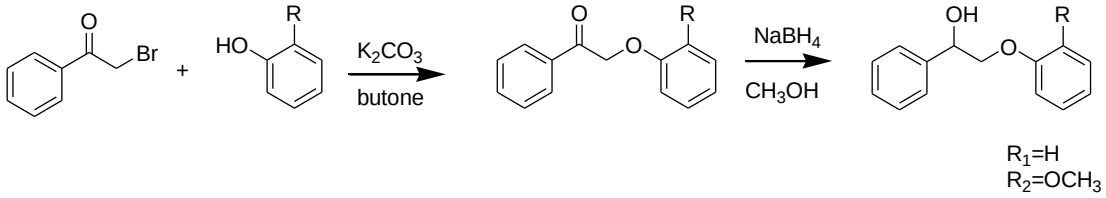
Di-2-methoxyphenyl ether was synthesized according to the general procedure using 2-iodoanisole (2.34 g, 10 mmol), guaiacol (2-methoxyphenol, 1.49 g, 12 mmol), potassium phosphate (4.24 g, 20 mmol), copper (I) iodide (190 mg, 1 mmol), pyridine-2-carboxylic acid (246 mg, 2 mmol) and DMSO (30 ml). The crude product was purified by flash column chromatography (eluent: petro to petro acetate, 10:1) to give di-2-methoxyphenyl ether as a white solid in 65% yield.^{1}H NMR (400MHz, $CDCl_3$): δ 7.03-7.07 (m, 2H), 6.96-6.98 (m, 2H), 6.81-6.87 (m, 4H), 3.85 (s, 6H). ^{13}C {^{1}H} NMR (100 MHz, $CDCl_3$): δ 150.6 (C), 146.1 (C), 123.9 (CH), 120.9 (CH), 118.9 (CH), 112.6 (CH), 56.2 (CH_3).

Di-4-tert-butylphenyl ether was synthesized using the similar procedure as above.^{1}H NMR (400 MHz, $CDCl_3$): δ 7.32 (d, J = 8 Hz, 4H), 6.93 (d, J = 8 Hz, 4H), 1.31 (s, 18H). ^{13}C {^{1}H} NMR (100 MHz, $CDCl_3$): δ 155.6 (C), 146.2 (C), 126.9 (CH), 118.7 (CH), 34.7 (C), 31.9 (CH_3).

Di-4-ethylphenyl ether was synthesized using the similar procedure as above.^{1}H NMR (400 MHz, $CDCl_3$): δ 7.13 (d, J = 8 Hz, 4H), 6.91 (d, J = 8 Hz, 4H), 2.61(q, J=8 Hz, 2H), 1.22 (t, J=8 Hz, 3H). ^{13}C {^{1}H} NMR (100 MHz, CDCl3): δ 155.6 (C), 138.9 (C), 129.1 (CH), 118.7 (CH), 28.3 (CH_2), 15.8(CH_3).

2) Synthesis of β-O-4 lignin-type dimers

General procedure for the synthesis of β-O-4 lignin-type dimmers was similar to a reported procedure (S2).



Typically, bromoacetophenone (5 mmol) and phenols (6 mmol) were dissolved in 50 ml butone, mixed with K_2CO_3 (7.5 mmol) and stirred overnight with a reflux condenser. The reaction mixture was cooled and diluted with water (100 ml). The crude product was extracted with methylene chloride (2×100 ml). The combined organic extracts were washed with brine (100 ml) and dried over anhydrous sodium sulfate. The crude product was resolved in methanol, and treated with small portions of sodium borohydride (5.5 mmol) and stirred for 2 h. A saturated solution of ammonium sulfate (l00 ml) followed by methylene chloride (2 × 100 ml) was added to the reaction mixture. The organic layer was separated, washed with water (2 × 100 ml) and dried over anhydrous sodium sulfate. The crude product was purified by flash column chromatography.

2-phenoxy-1-phenylethanol was synthesized using the similar procedure as above. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46-6.97(m, 7H), 6.95-6.80 (m, 3H), 5.10 (dd, J = 12, 4 Hz, 1H), 4.10 (dd, J = 12, 4 Hz, 1 H), 4.00 (t, J=12 Hz, 1H), 2.85(br.s, 1H). ^{13}C {1H} NMR (100 MHz, $CDCl_3$) δ 159.1 (C), 140.4 (C), 130.2 (CH), 129.2 (CH),

128.8(CH), 126.9(CH), 122.0(CH), 121.2(CH), 116.0(C), 115.3(CH), 74.9 (CH), 73.3(CH).

2-(2-methoxyphenoxy)-1- phenylethanol was synthesized using the similar procedure as above. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43-7.28(m, 5H), 6.96-6.87(m, 3H), 5.09 (dd, J = 12, 4 Hz, 1H), 4.15 (dd, J = 12, 4 Hz, 1 H), 3.98 (t, J=12 Hz, 1H), 2.0(br.s, 1H). ^{13}C {^{1}H} NMR (100 MHz, $CDCl_3$) δ 159.1 (C), 140.4 (C), 130.2(CH), 129.2 (CH), 128.8(CH), 126.9(CH), 122.0(CH), 121.2 (CH), 116.0(C), 115.3(CH), 74.9 (CH), 73.3(CH).

3) Synthesis of 2-phenoxy-1-phenylpropane-1, 3-diol

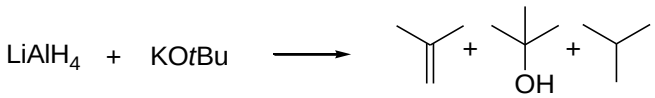
2-Phenoxy-1-phenylpropane-1, 3-diol was synthesized based on a reported procedure (S3). ^{1}H NMR and ^{13}C NMR spectra are as follows.^{1}H NMR (400 MHz, $CDCl_3$): δ 7.41-7.20(m, 7H), 6.98-6.86(m, 3H), 5.02 (dd, J = 12, 4 Hz, 1H), 4.39(m, 1 H), 3.91 (m, 1H), 3.52(dd, J=12,4Hz, 1H). ^{13}C {^{1}H} NMR (100 MHz, $CDCl_3$) major diastereomer: δ 158.5(C), 140.2(C), 130.1(CH), 129.0(CH), 128.6(CH), 127.3(CH), 122.4(CH), 116.9(CH), 83.3(CH),74.2(CHOH), 61.5(CH_2OH); minor diastereomer:158.0(C),140.8(C), 130.0(CH), 128.9(CH), 128.3(CH), 126.7(CH), 122.3(CH), 117.1(CH), 82.3(CH), 74.4(CHOH), 61.6(CH_2OH).

1.2 General procedures for deoxygenation of aryl C-O containing compounds

The water- and O_2-sensitive manipulations were conducted under an argon atmosphere in a glovebox. The deoxygenation reactions were conducted in a 35 mL vial with Teflon-lined screw cap (supplied by Synthware Company) and Teflon-coated magnetic stir bar. In a glovebox, a 35 mL screw cap vial was loaded with the corresponding substrate (1 mmol, 1 equiv.), base (2.5-5 equiv.) and a magnetic stirring bar, followed by syringe addition of 5 mL (or 8 mL) of toluene and hydride source (2.5-5 equiv.). The reaction vial was sealed with the Teflon-lined screw cap and heated at a desired temperature and time. After cooling to room temperature, n-dodecane or n-tetradecane (internal standard for GC) was added to the reaction solution, and the liquid was separated. Toluene (3 × 2.5 mL) was used to clean the tube. The combined substrate was centrifuged and then subjected to GC/FID, GC/MS for qualitative and quantitative identification.

In order to isolate the products, ethyl acetate (3 × 2.5 mL) was used to clean the tube. The combined mixture were centrifuged and then the solvent was removed under vacuum. The crude product was purified by flash column chromatography (the eluent was petro).

1.3 Reaction of KO*t*Bu and $LiAlH_4$ in toluene



In a glovebox, KO*t*Bu (2.5 mmol), $LiAlH_4$ (5 mmol.) and toluene (5 mL) were loaded in a 35 mL vial with a

magnetic stirring bar. Then the vial was sealed with a Teflon-lined screw cap and heated at 180 °C for 24h. After cooling to room temperature, n-dodecane (internal standard for GC analysis) was added to the reaction solution, and the liquid solution was separated via centrifugation for GC/FID and GC/MS identification. It was demonstrated that 2-methylpropane, 2-methylprop-1-ene and 2-butanol were detected in the liquid solution, indicating that 2-methylpropane, 2-methylprop-1-ene and 2-butanol in the following reaction solutions were from the reaction of KO*t*Bu and $LiAlH_4$.

1.4 Characterization

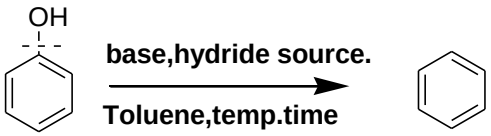
The liquid products were analyzed by GC on an Agilent 6890/7890B gas chromatography equipped with an HP-5 25 m x 0.20 mm ID x 0.33 μm capillary column (Agilent) or an HP-INNOWAX 19091N-133 (30 m x 0.25 mm ID x 0.25 μm) capillary column (Agilent) and an FID detector. The following GC temperature program was used: 50 ℃ hold for 2 min, ramp 20 ℃/min to a final temperature of 260 ℃, and hold for 8 min. Nitrogen was used as a carrier gas. The injector temperature was held at 250 ℃.

The gas products were analyzed by GC on an Agilent 4890D Gas Chromatography equipped with a carbon sieves packing column and TCD detector for CO, O_2, H_2 and hydrocarbons. Argon was used as the carrier gas. The following GC temperature program was used: 80 ℃ hold for 4 min, ramp 20 ℃/min to a final temperature of 180 ℃, and hold for 3 min. The injector temperature was held at 250 ℃.

GC-MS analyses were performed on a Shimadzu QP-2010 gas chromatography equipped with a DB-5 30 m × 0.25 mm × 0.25 μm capillary column (Agilent). The GC was directly interfaced to an Agilent 5973 mass selective detector (EI, 70 eV). The following GC temperature program was used: 50 ℃ hold for 2 min, ramp 20 ℃/min to a final temperature of 250 ℃, and hold for 20 min. Nitrogen was used as a carrier gas. The injector temperature was held constant at 250 ℃.

^{1}H-NMR spectra were acquired on a 400 MHz Varian Unity instrument. ^{13}C-NMR spectra were acquired on a 100 MHz Varian Unity instrument. Chemical shifts were reported in ppm relative to a peak of a residual $CHCl_3$ ($CDCl_3$, δ 7.26 ppm for ^{1}H and 77 ppm for ^{13}C).

2. Table S1. Reductive cleavage of C-O bond in phenol under different conditions



Entry	Hydride source(equiv.)	Base(equiv.)	Temp.(^{o}C)	Time(h)	Yield (%)
1	$NaBH_4$(5)	KO*t*Bu (2.5)	180	24	0
2	NaH (5)	KO*t*Bu (2.5)	180	24	<1
3	DIBAL (5)	KO*t*Bu (2.5)	180	24	5
4	Et_3SiH (5)	KO*t*Bu (2.5)	180	24	0
5	KBH_4 (5)	KO*t*Bu (2.5)	180	24	0
6	$LiAlH_4$ (5)	DBU (2.5)	180	24	0
7	$LiAlH_4$ (5)	KOH (2.5)	180	24	67
8	$LiAlH_4$ (5)	NaOEt (2.5)	180	24	51
9	$LiAlH_4$ (5)	NaO*t*Bu (2.5)	180	24	56
10	$LiAlH_4$ (5)	LiO*t*Bu (2.5)	180	24	4
11	$LiAlH_4$ (5)	KO*t*Bu (2.5)	180	24	80
12	$LiAlH_4$ (2.5)	KO*t*Bu (2.5)	180	24	65
13	$LiAlH_4$ (2.5)	KO*t*Bu (5)	180	24	50
14	$LiAlH_4$ (5)	KO*t*Bu (2.5)	140	24	11
15	$LiAlH_4$ (5)	KO*t*Bu (2.5)	140	32	14
16	$LiAlH_4$ (5)	KO*t*Bu (2.5)	160	24	25
17	$LiAlH_4$ (5)	KO*t*Bu (2.5)	180	32	82

3. Dependence of the unreacted phenol amount and benzene yield on reaction time

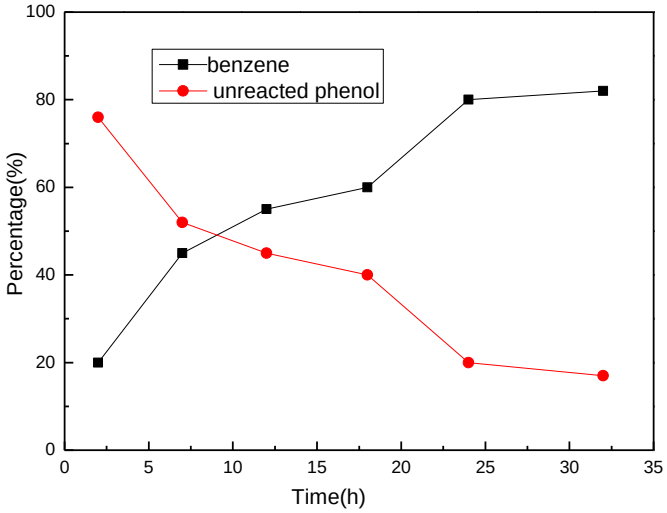


Figure S1 Dependence of the unreacted phenol amount and benzene yield on reaction time.

4. GC spectra of CH_4+H_2 mixture and the gas phase of the anisole reduction.

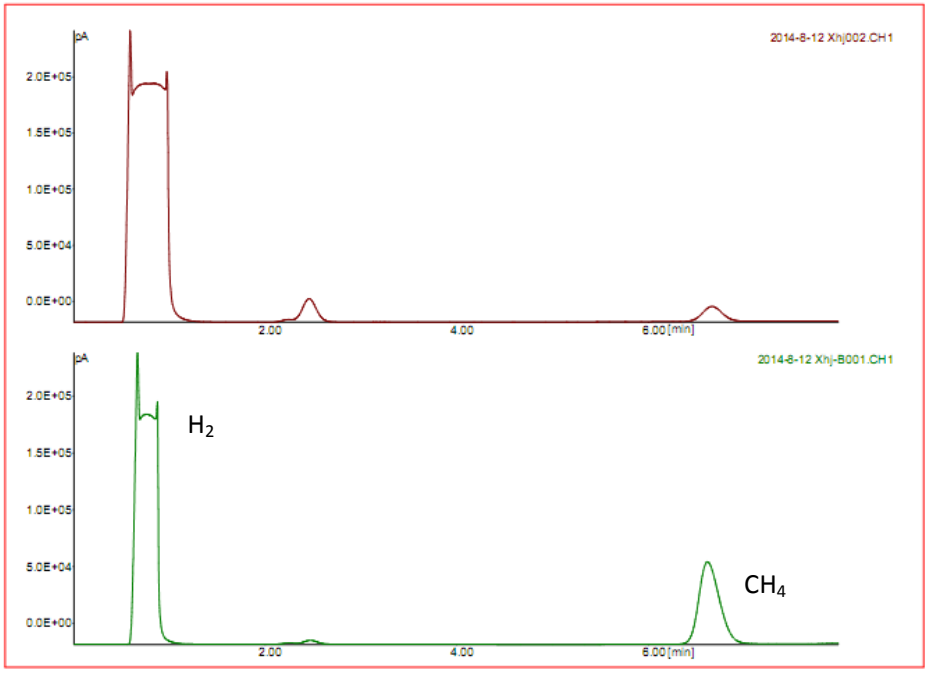


Figure S2 GC spectra of CH_4+H_2 mixture (bottom) and the gas phase of the anisole reduction (top).

5. EPR spectra of the reaction solution

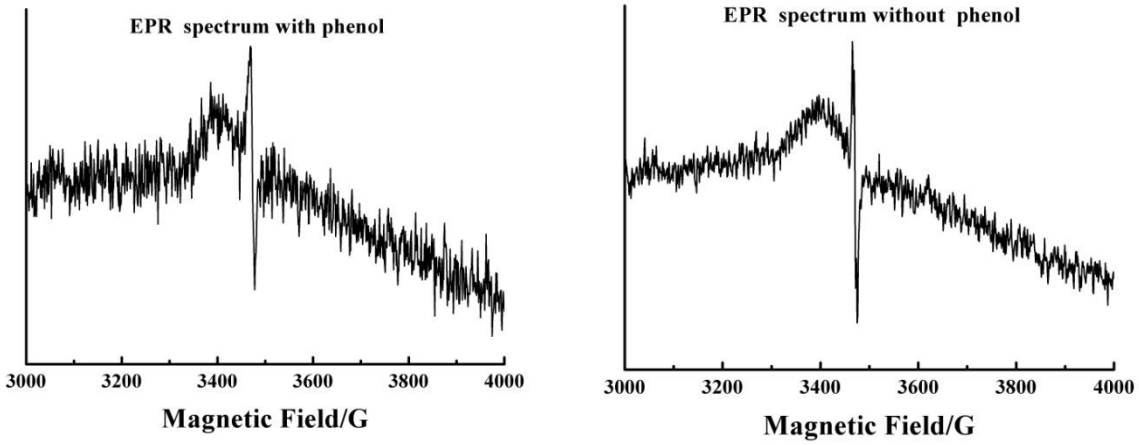
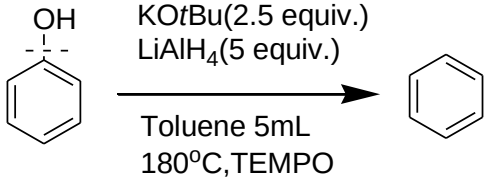


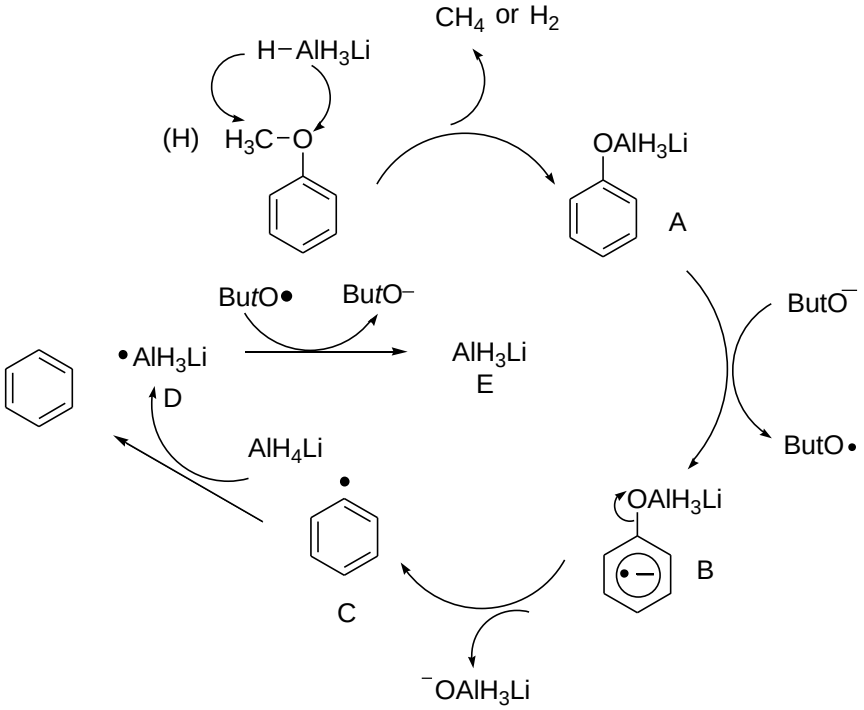
Figure S3. EPR spectra of:(left) reaction solution of phenol reduced by$LiAlH_4$ in the presence of KO*t*Bu in toluene at 180°C for 4h; (right)reaction solution of $LiAlH_4$/KO*t*Bu in toluene at 180°C for 4h.

6. **Table S2**. Effect of radical scavenger TEMPO on the reduction of phenol.



TEMPO/ equiv.	Benzene yield/%
0	80
1	3.2
2.5	0

7. Scheme S1. Tentative mechanism for the $LiAlH_4$ and KO*t*Bu-catalyzed deoxygenation



Scheme S1. Tentative mechanism for the $LiAlH_4$ and KO*t*Bu-reduced deoxygenation of phenols and aryl ethers.

8. NMR spectra of the as-synthesized starting materials in experimental section

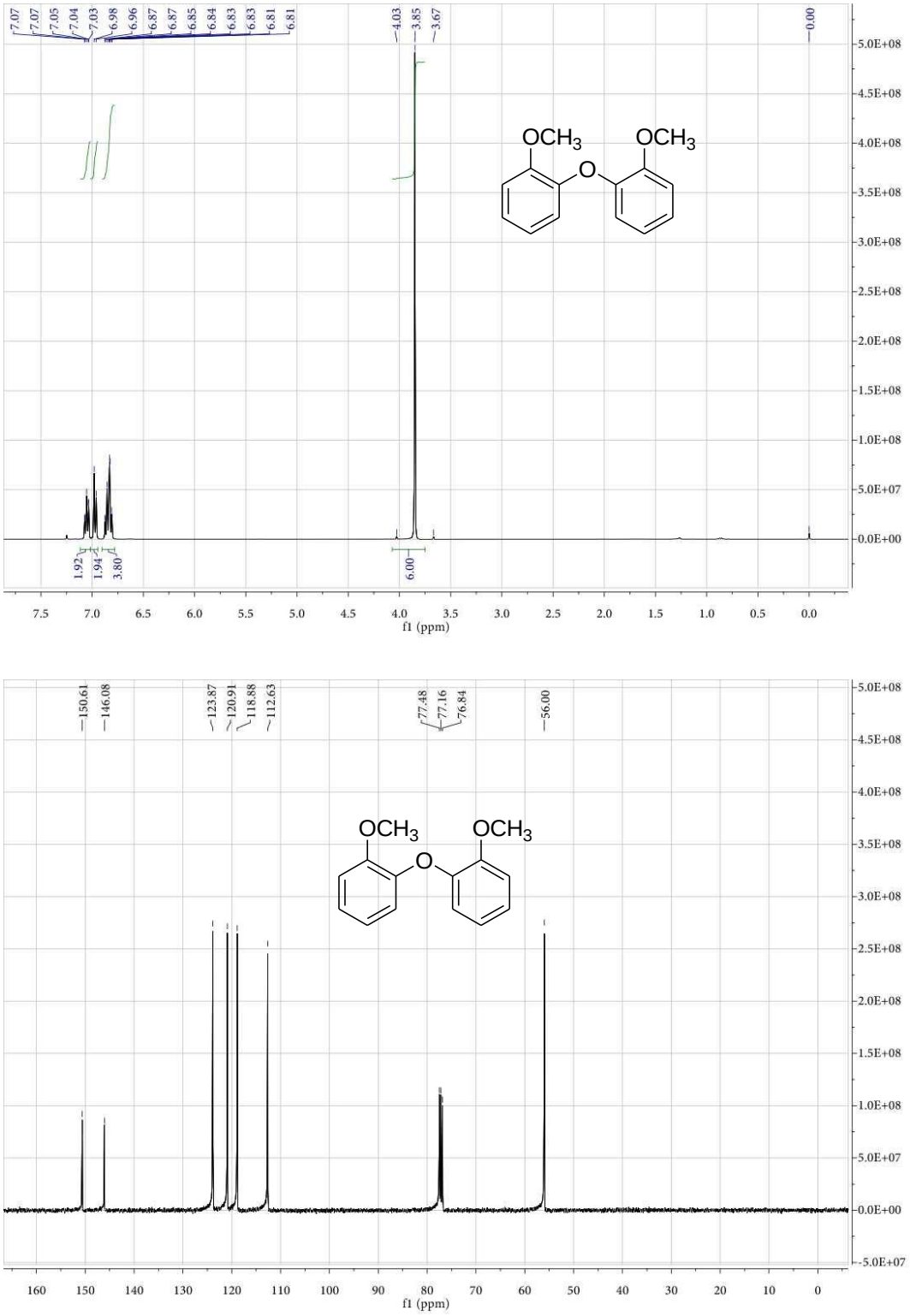


Figure S4. ^{1}H (top) and ^{13}C (bottom) NMR spectra of di-2-methoxyphenyl ether.

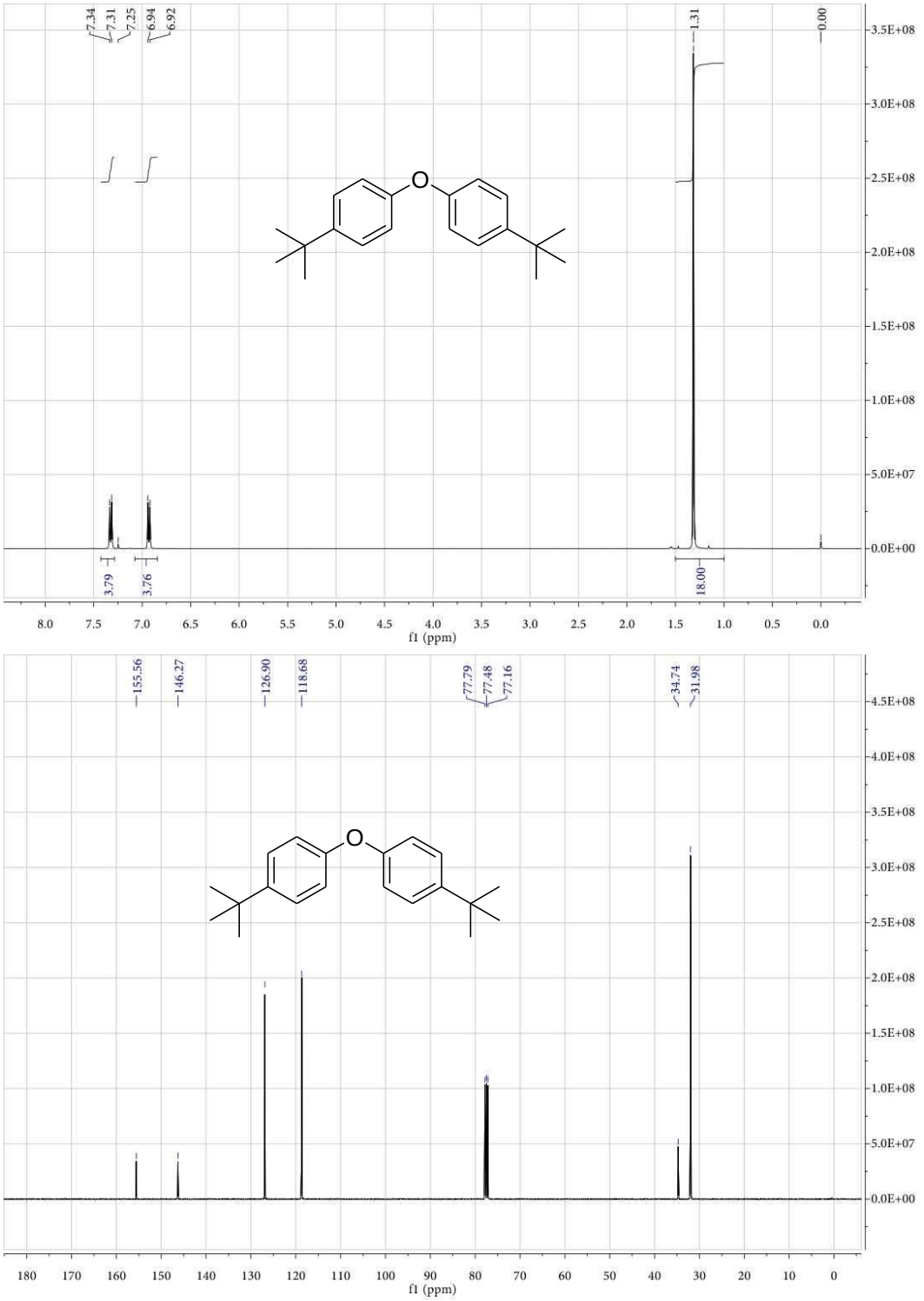


Figure S5. ^{1}H (top) and ^{13}C (bottom) NMR spectra of di-4-tert-butylphenyl ether.

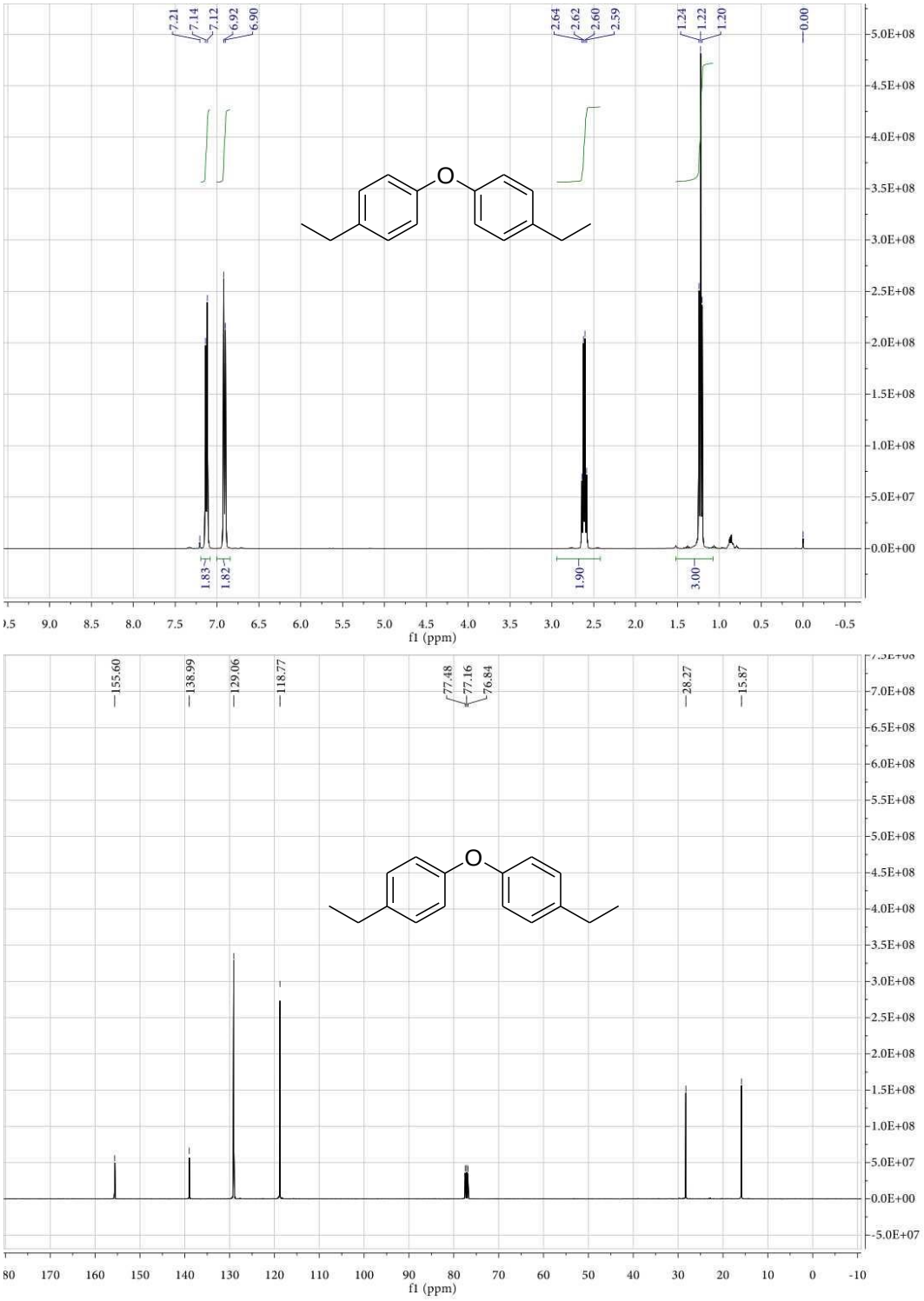


Figure S6. ^{1}H (top) and ^{13}C (bottom) NMR spectra of di-4-ethylphenyl ether

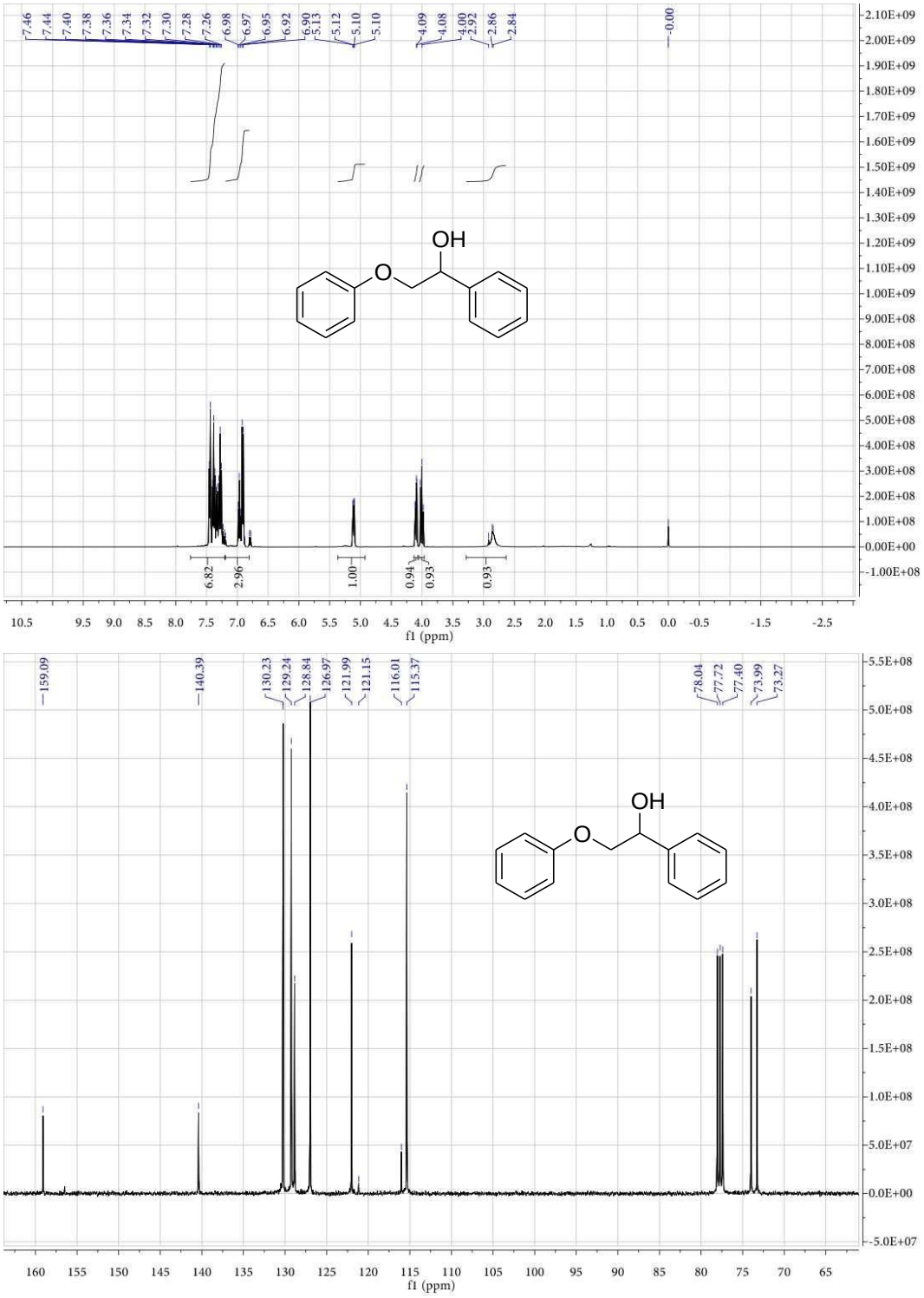


Figure S7. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-phenoxy-1-phenethanol.

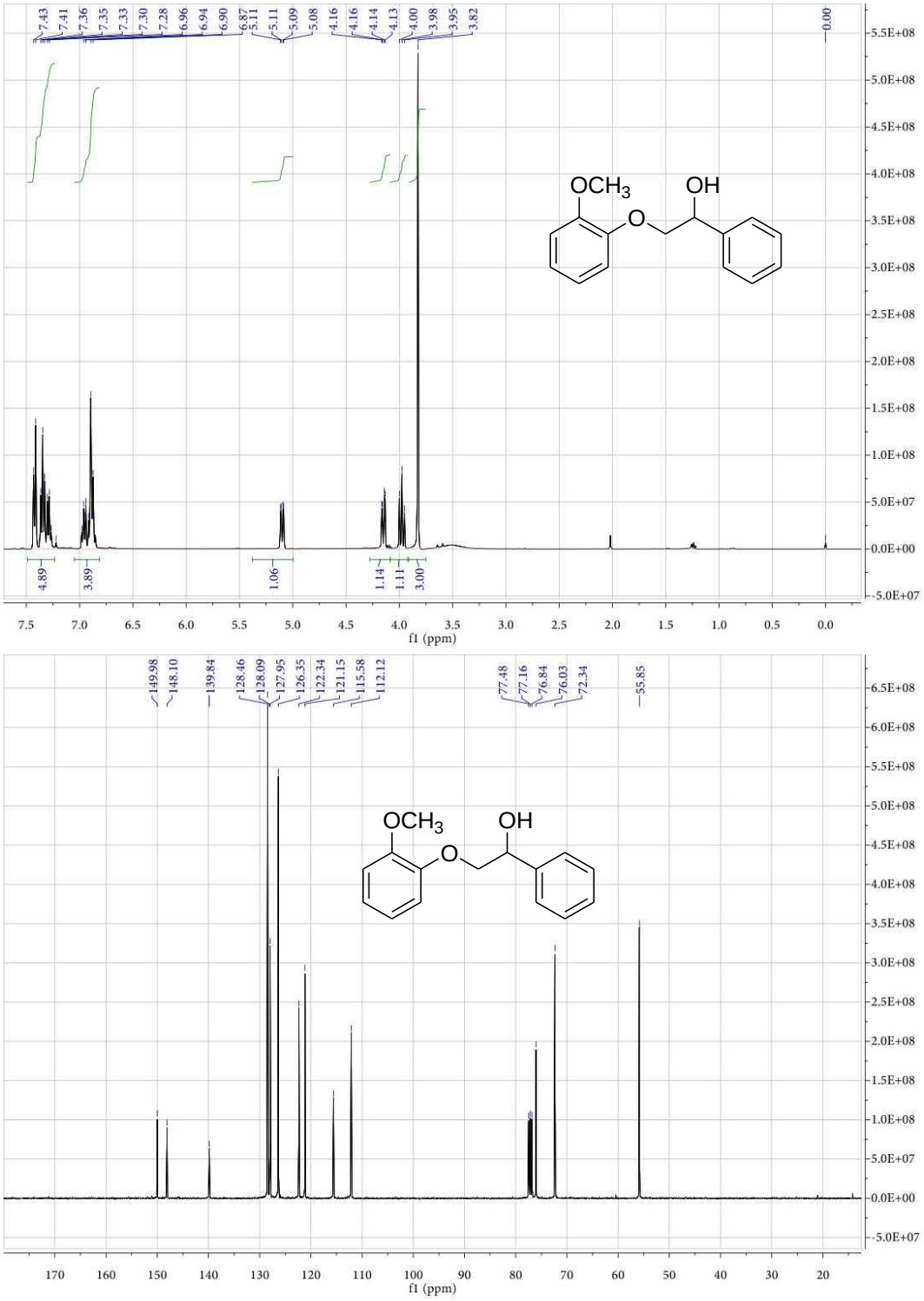


Figure S8. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-methoxyphenoxy)-1- phenylethanol.

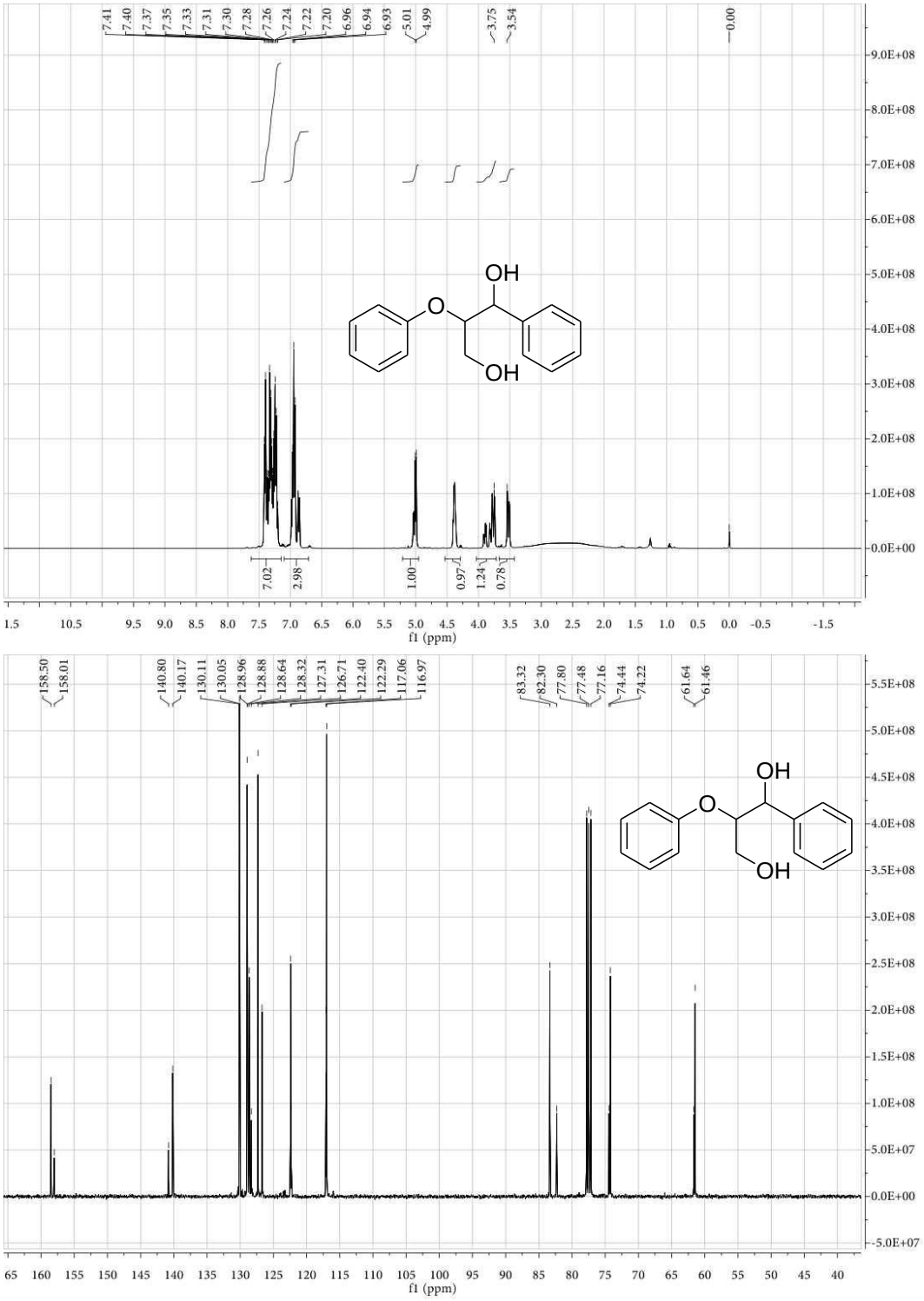
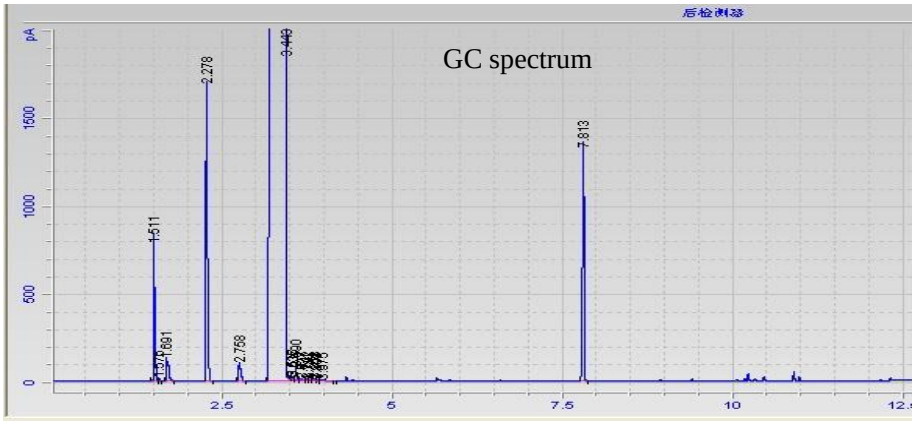
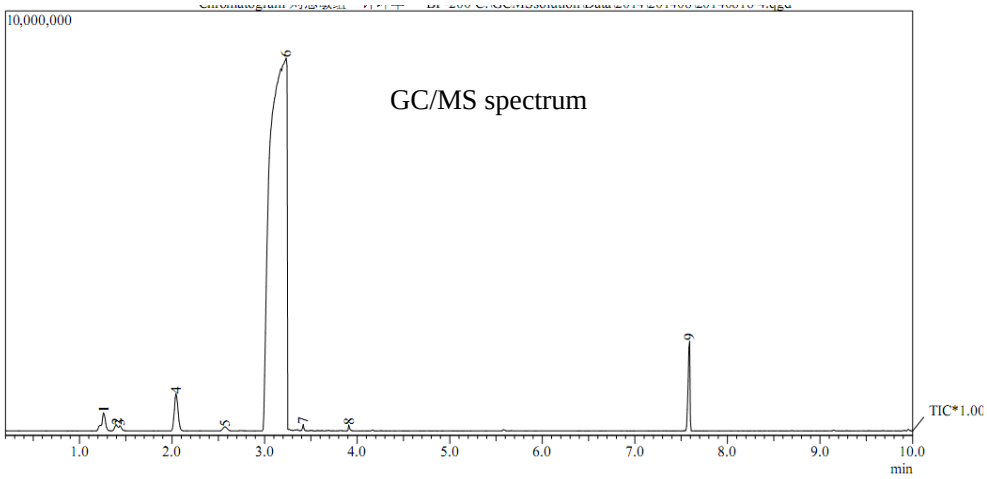


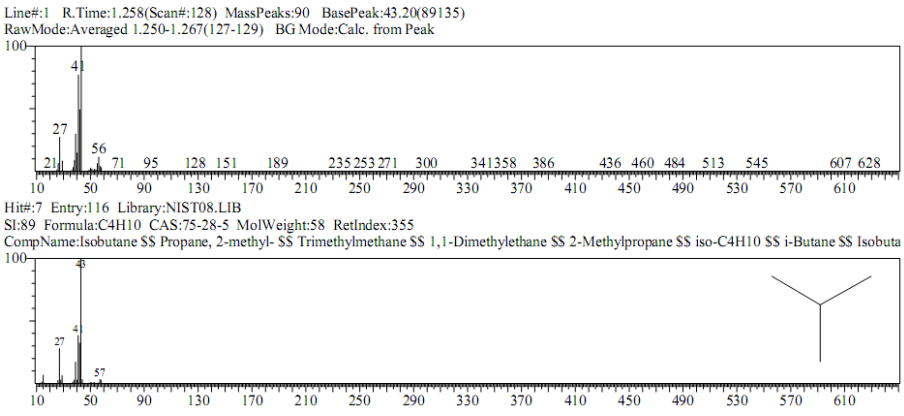
Figure S9. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-phenoxy-1-phenylpropane-1, 3-diol.

9. GC and GC-MS spectra of the reaction solutions.





1. Isobutane, 2. Acetone (from syringe cleaning solvent), 3. tert-butanol, 4. Benzene, 5. Methylcylohexane (from toluene solvent), 6. Toluene, 7. n-octane(impurity from internal standard), 8. Diactonealchol (from syringe cleaning solvent) 9. n-dodecane (internal standard).



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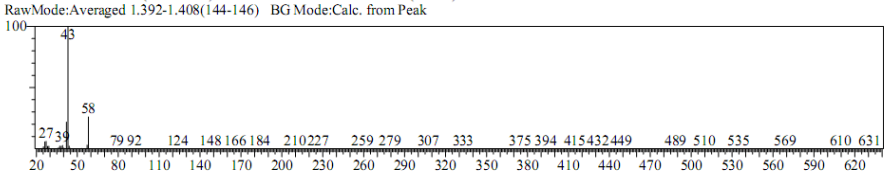

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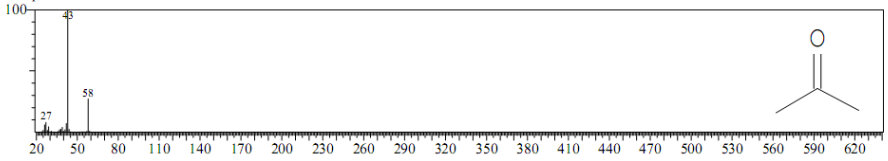

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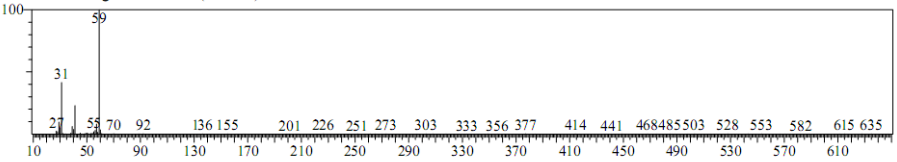

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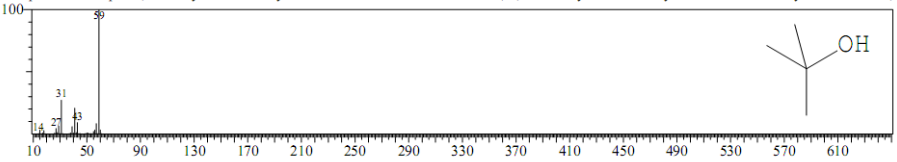

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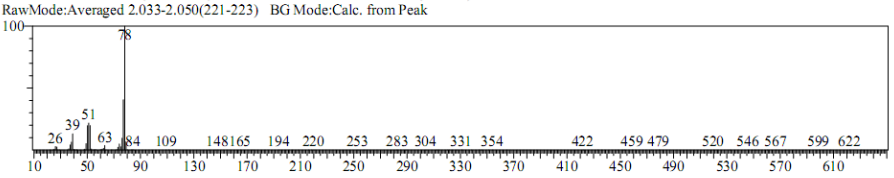

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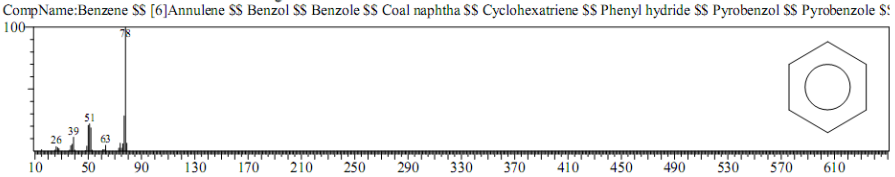

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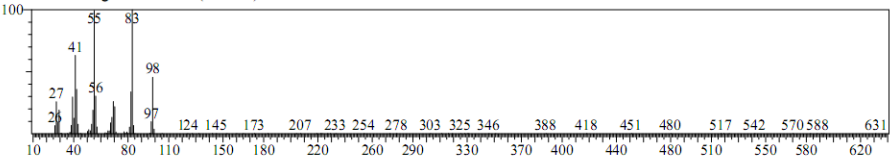

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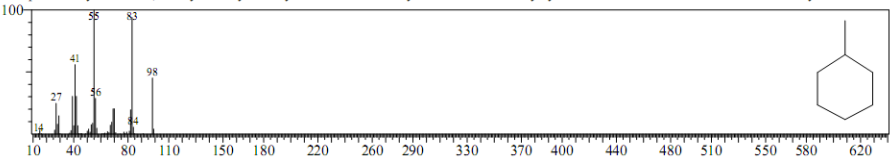


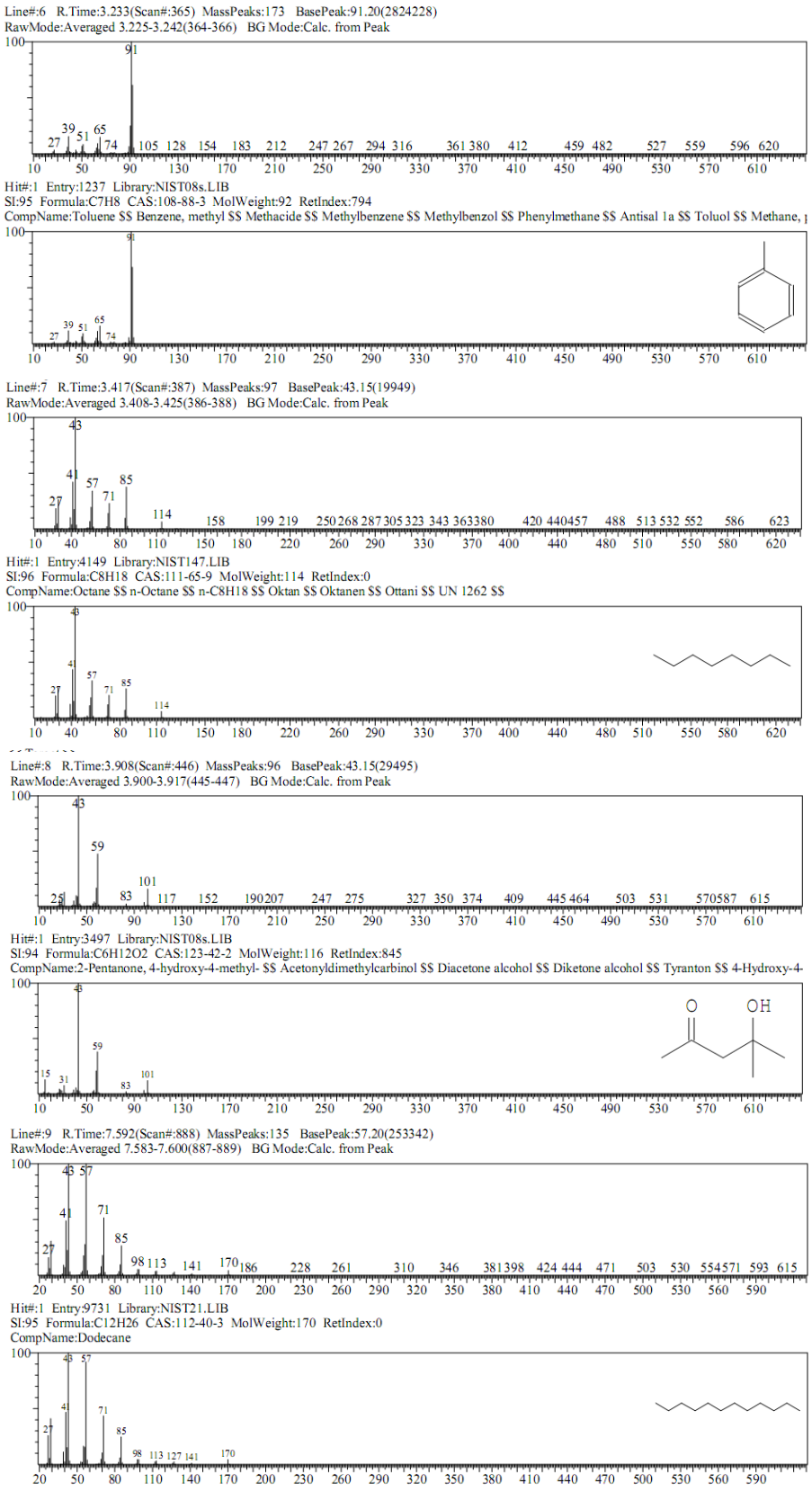


Figure S10. GC and GC/MS spectra of the reaction solution of phenol reduction.

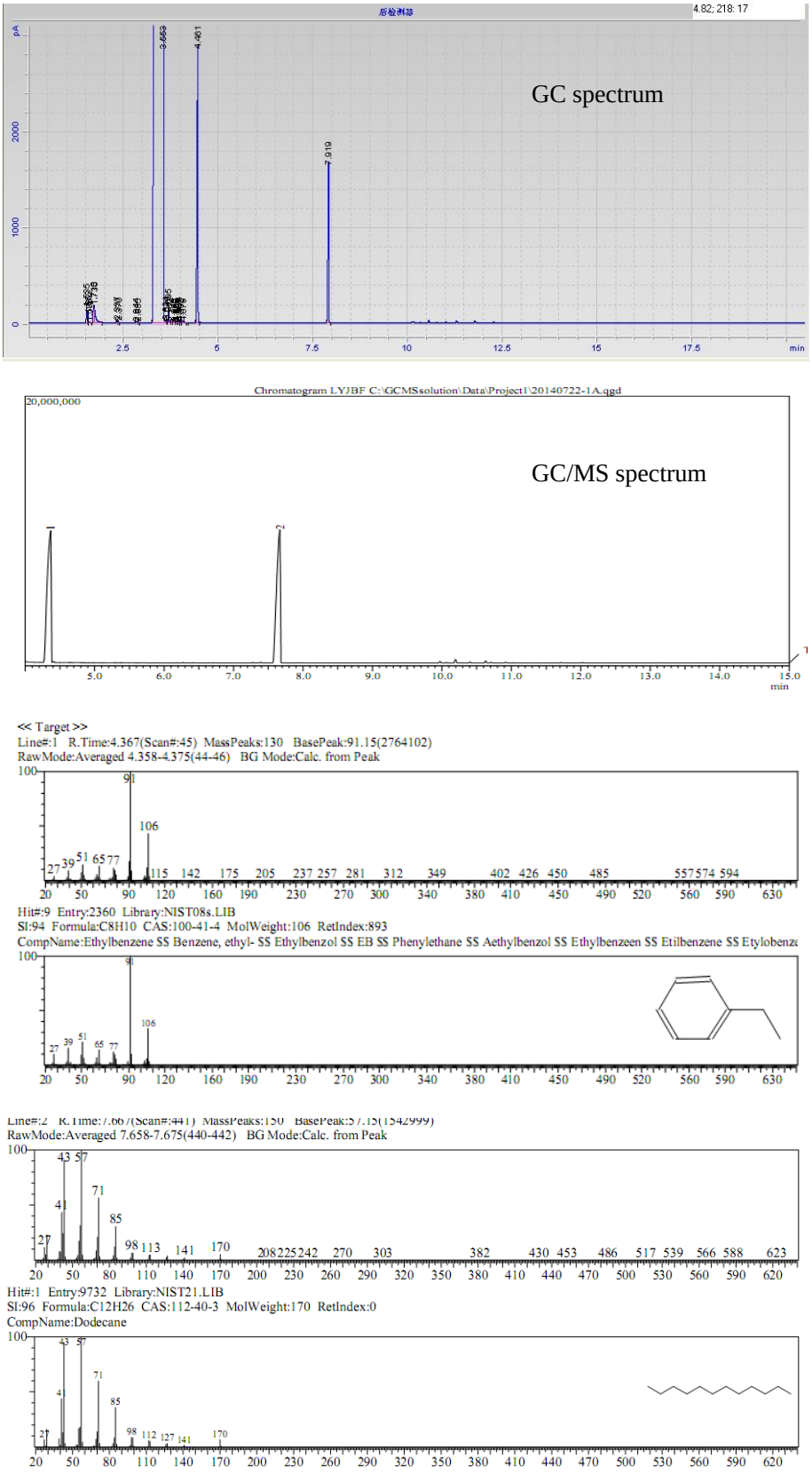


Figure S11. GC and GC/MS spectra of the reaction solution of 2-ethylphenol reduction.

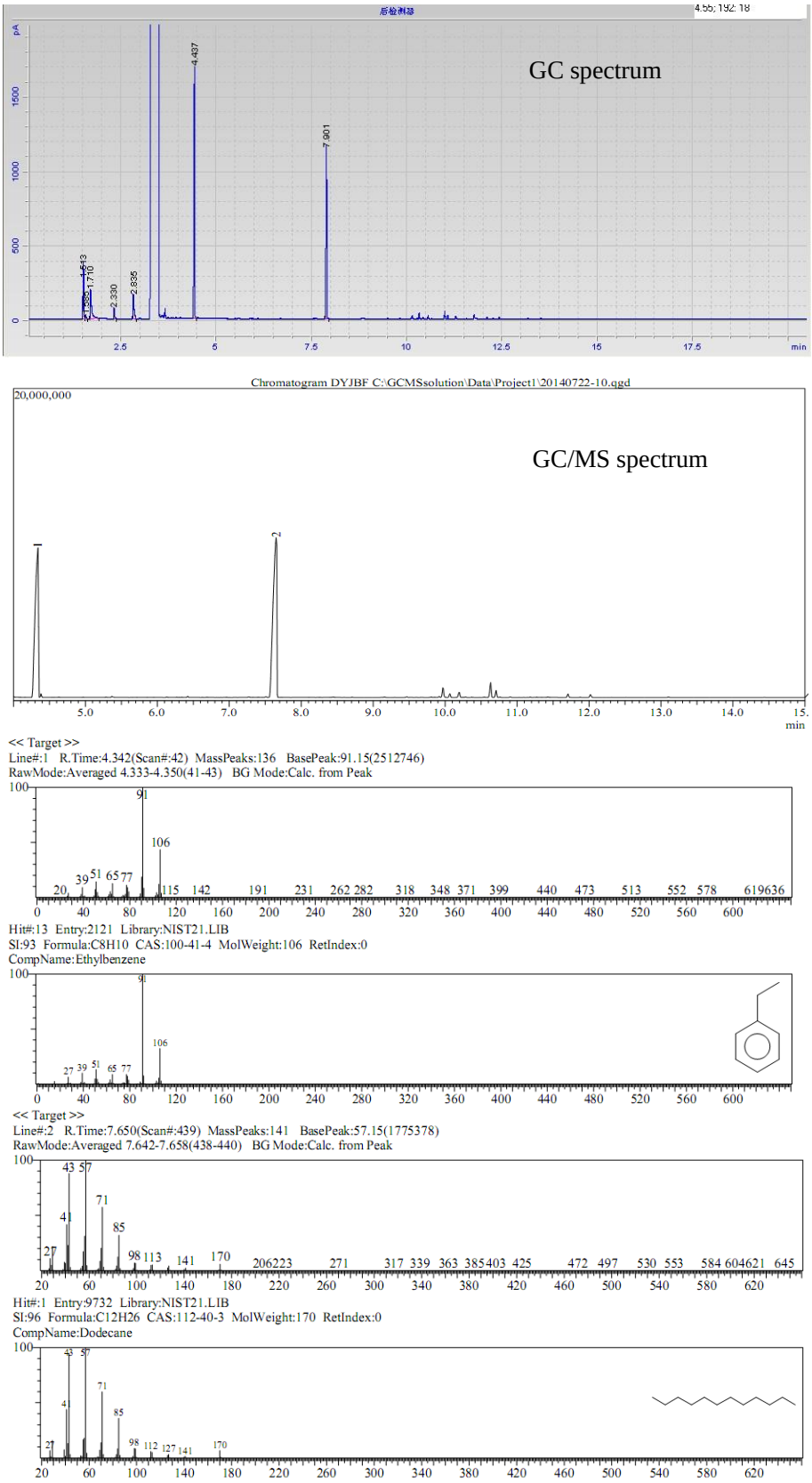


Figure S12. GC and GC/MS spectra of the reaction solution of 4-ethylphenol reduction.

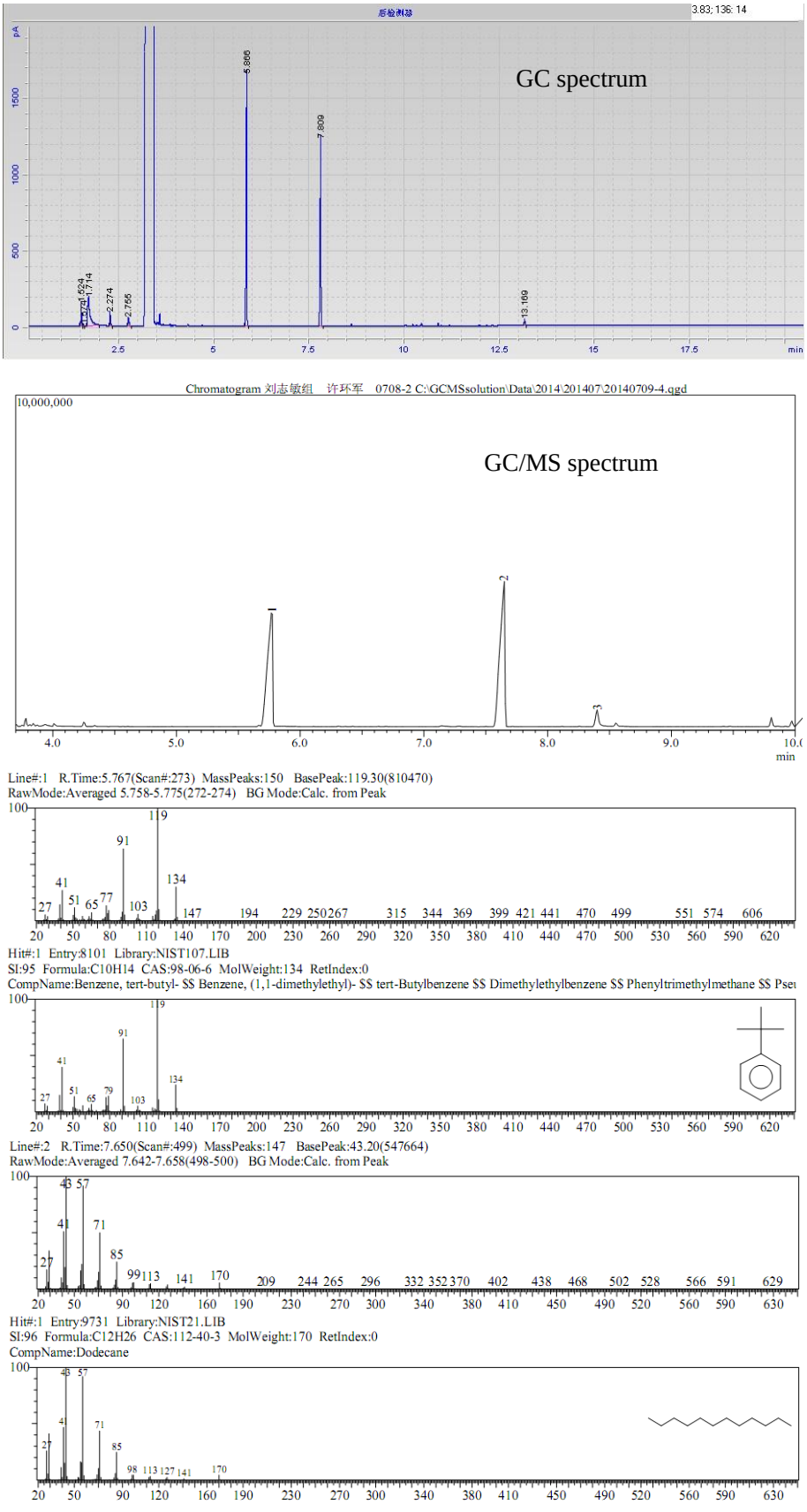


Figure S13. GC and GC/MS spectra of the reaction solution of 4-tert-butylphenol reduction.

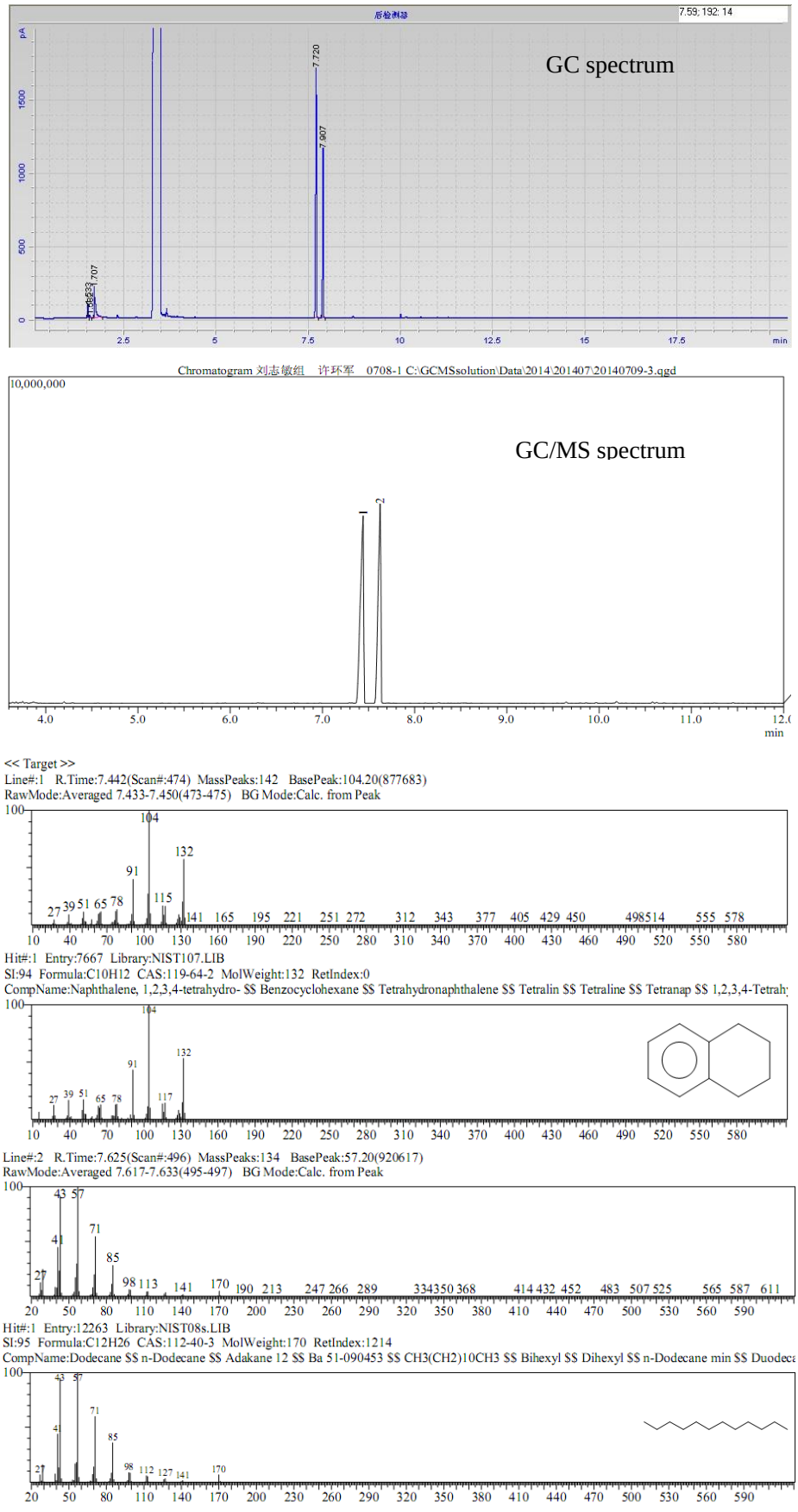
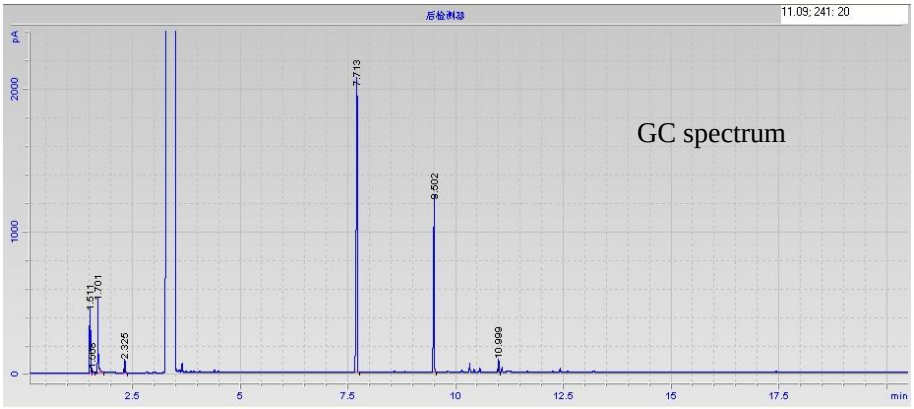
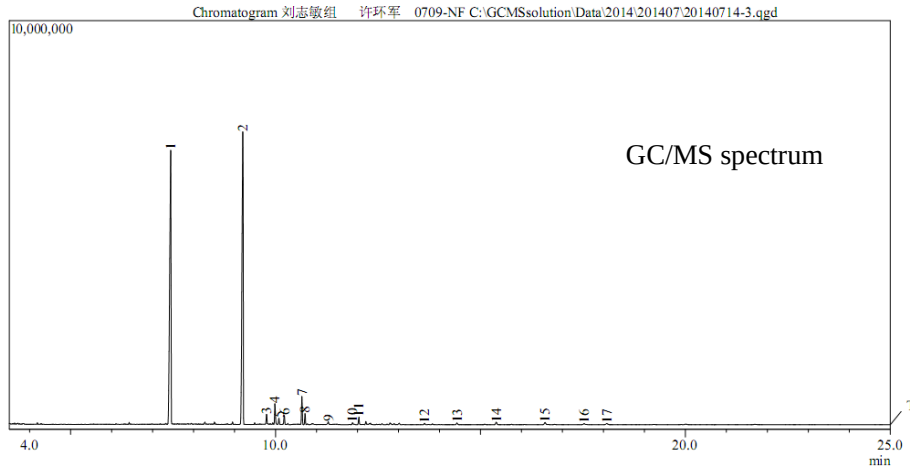
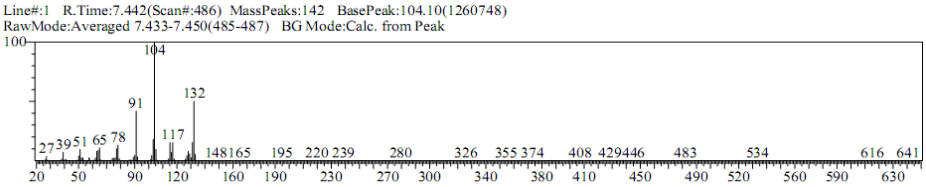
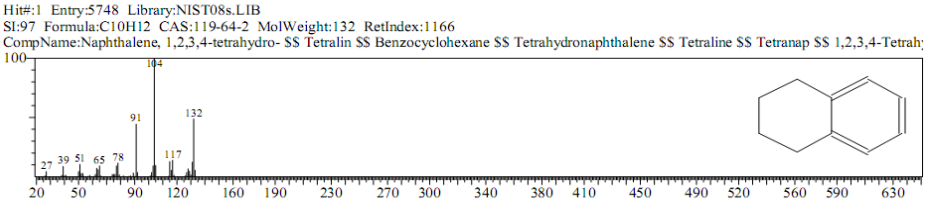


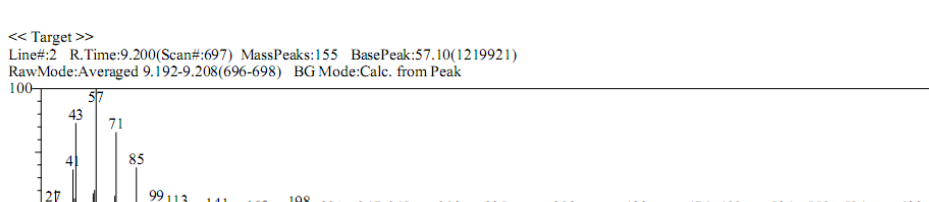
Figure S14. GC and GC/MS spectra of the reaction solution of 1,2,3,4-tetrahydro-1-naphthol reduction.

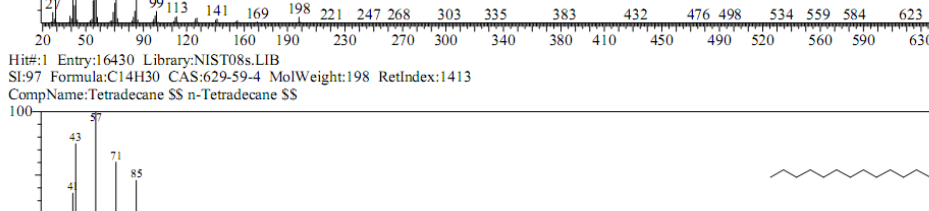












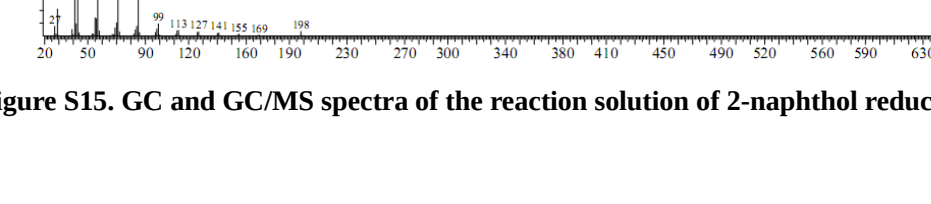


Figure S15. GC and GC/MS spectra of the reaction solution of 2-naphthol reduction.

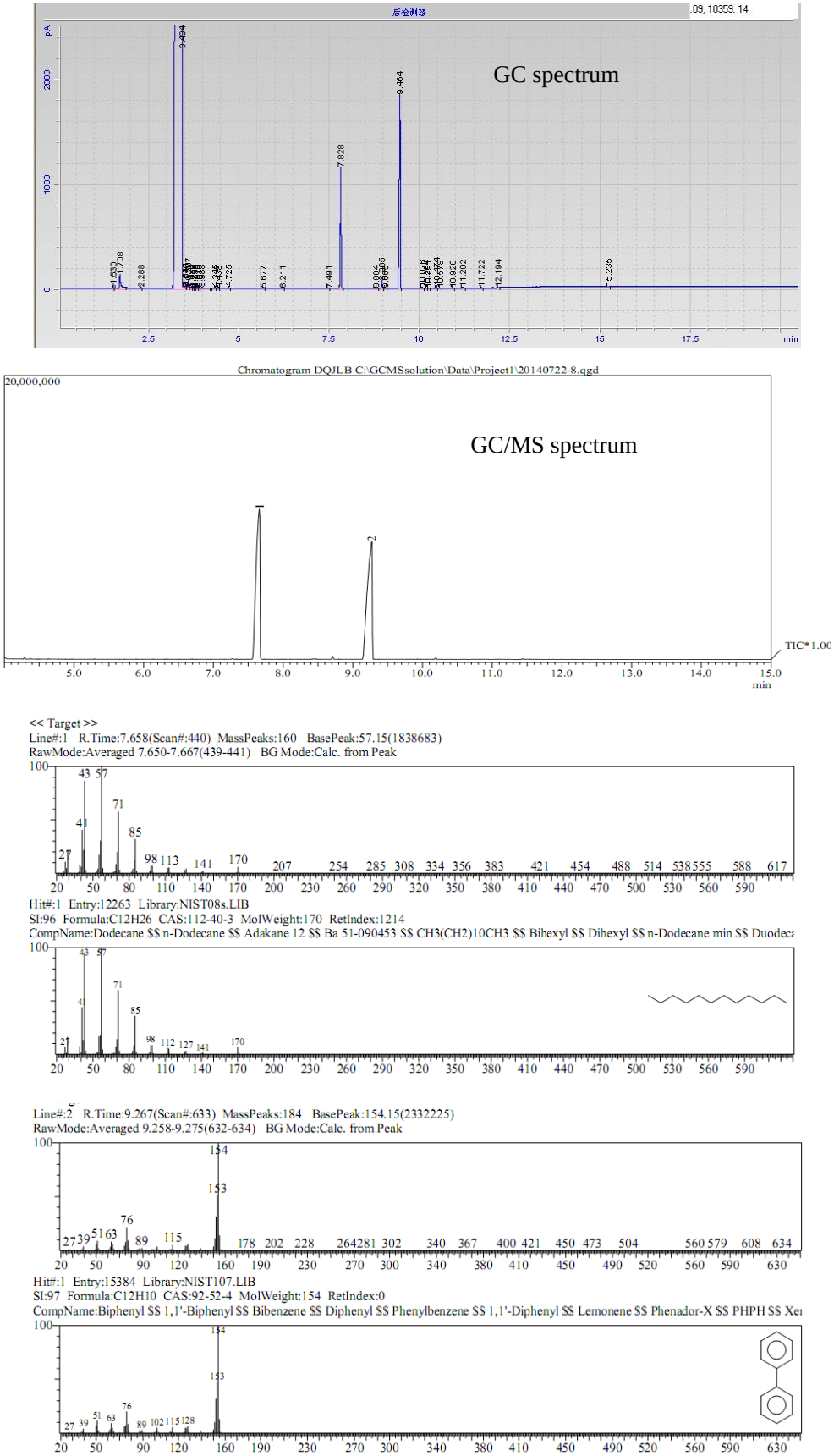
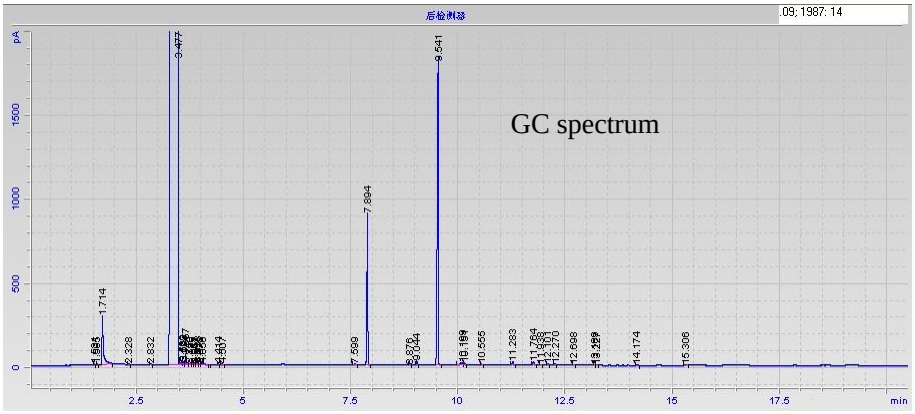
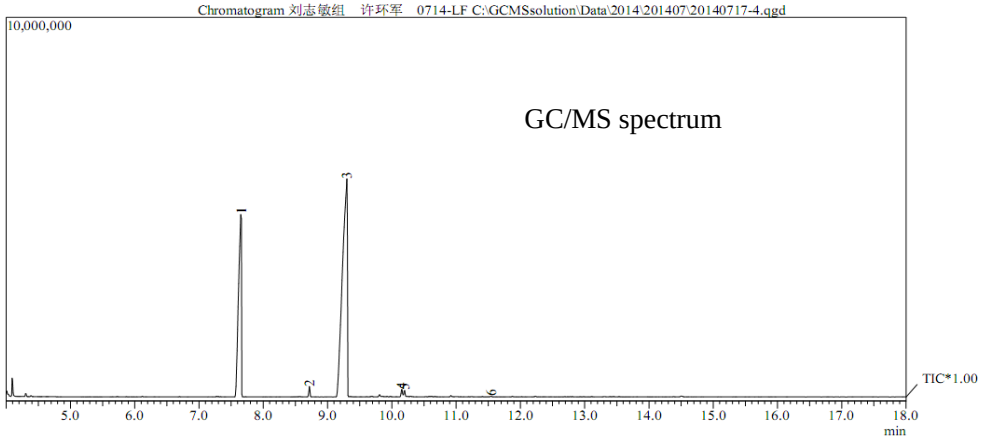


Figure S16. GC and GC/MS spectra of the reaction solution of 4-hydroxydiphenyl reduction.





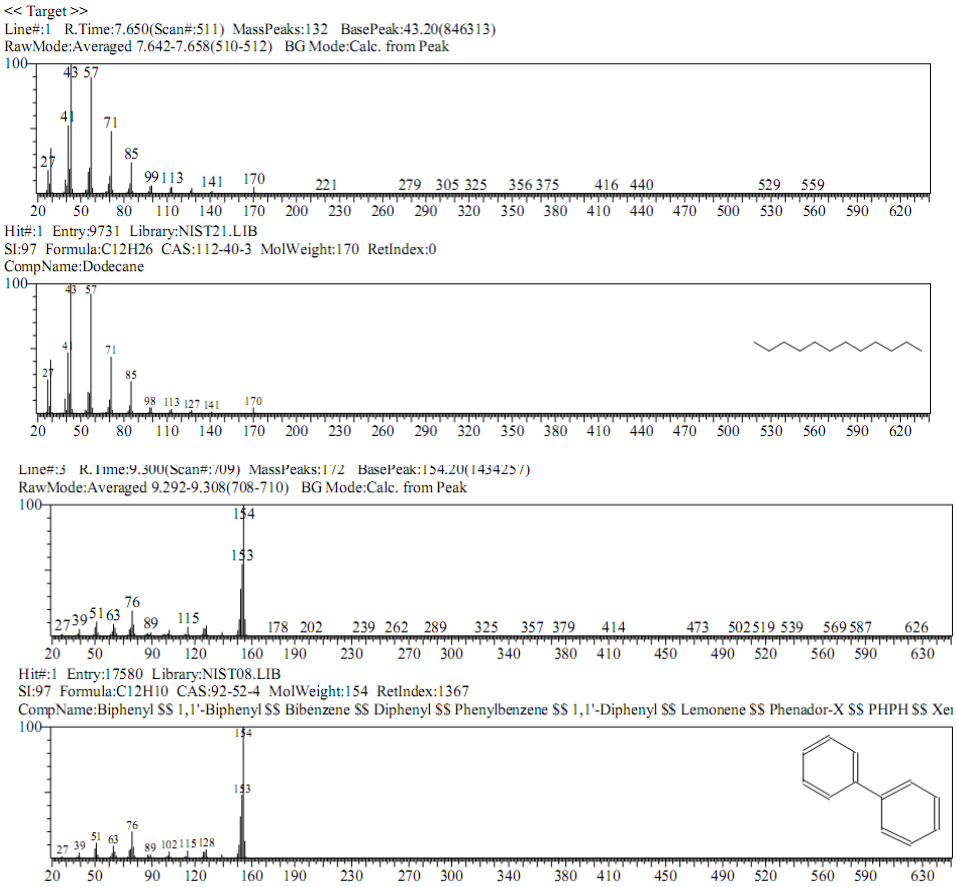


Figure S17. GC and GC/MS spectra of the reaction solution of 2-hydroxydiphenyl reduction.

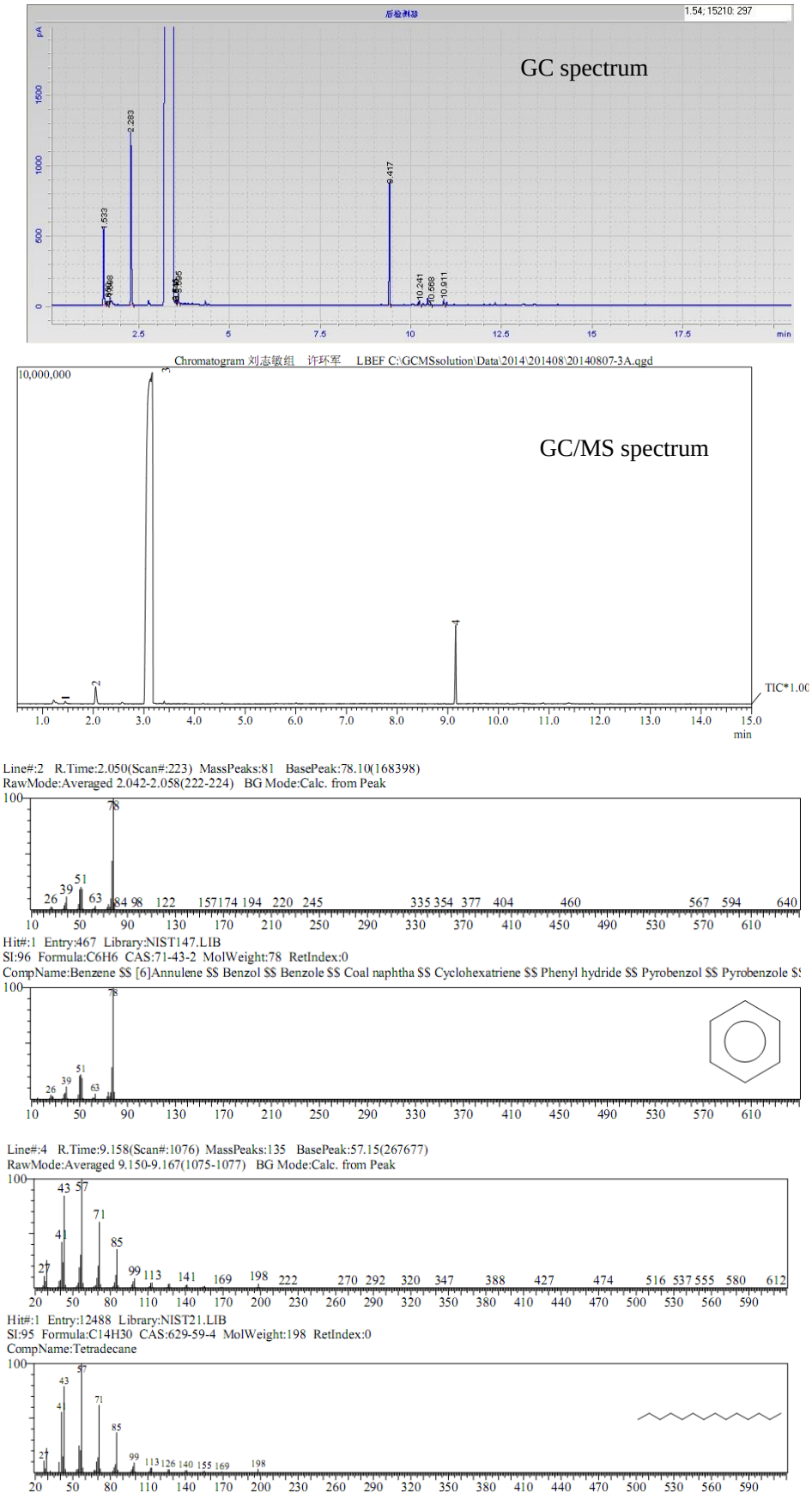


Figure S18. GC and GC/MS spectra of the reaction solution of catechol reduction.

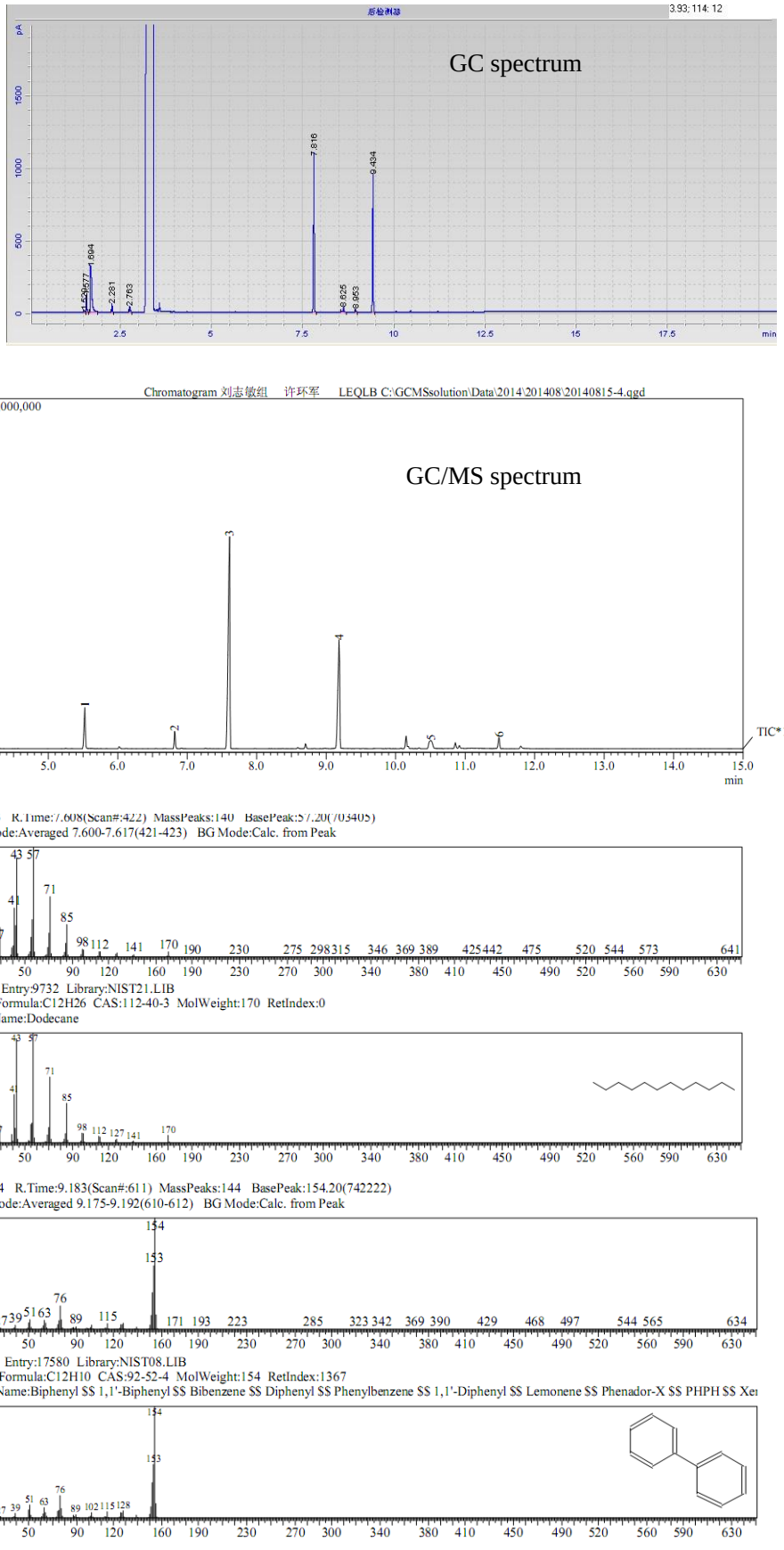
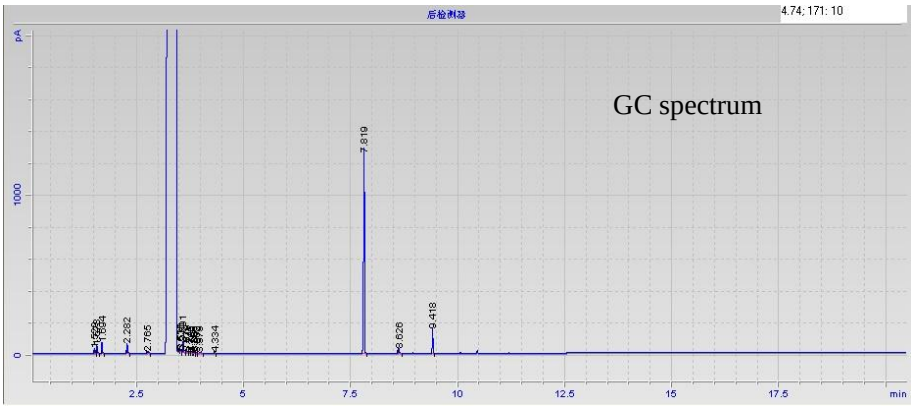
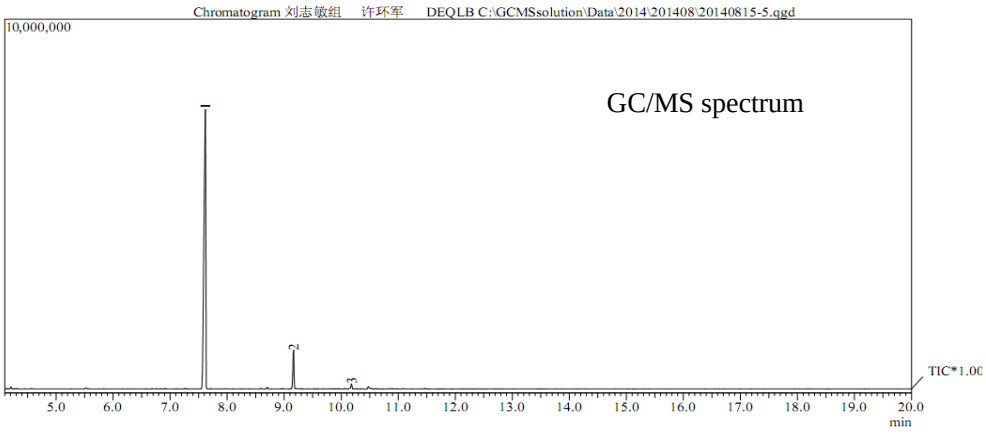


Figure S19. GC and GC/MS spectra of the reaction solution of 2,2'-bisphenol reduction.





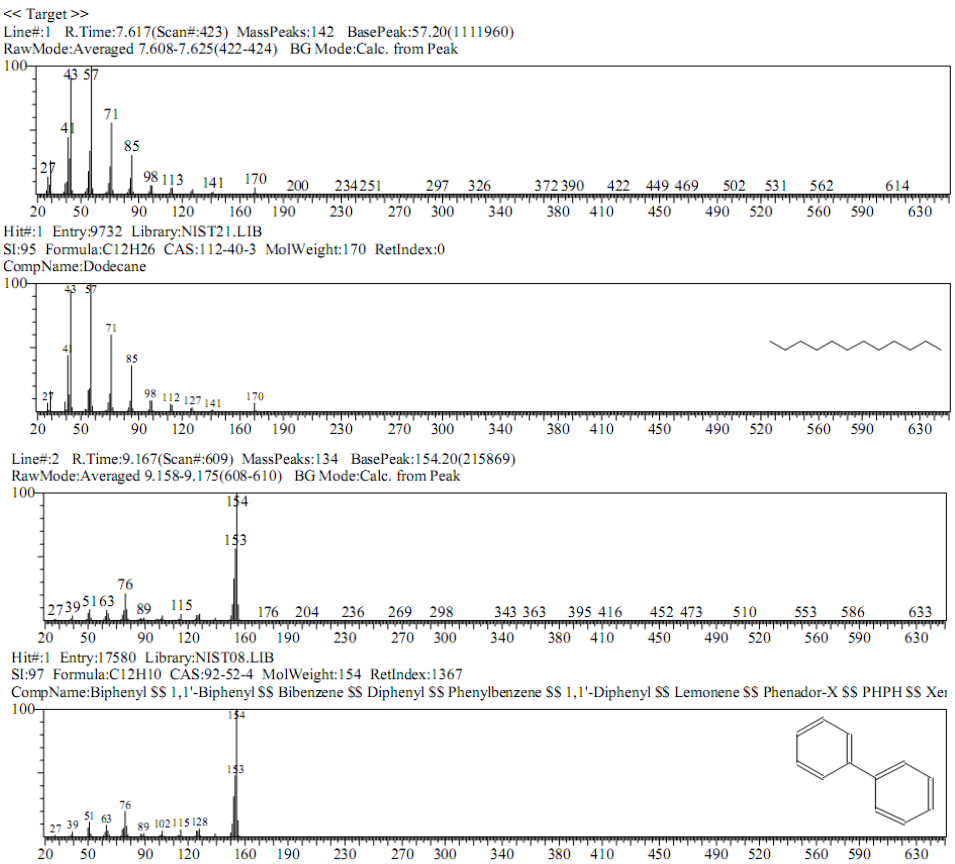
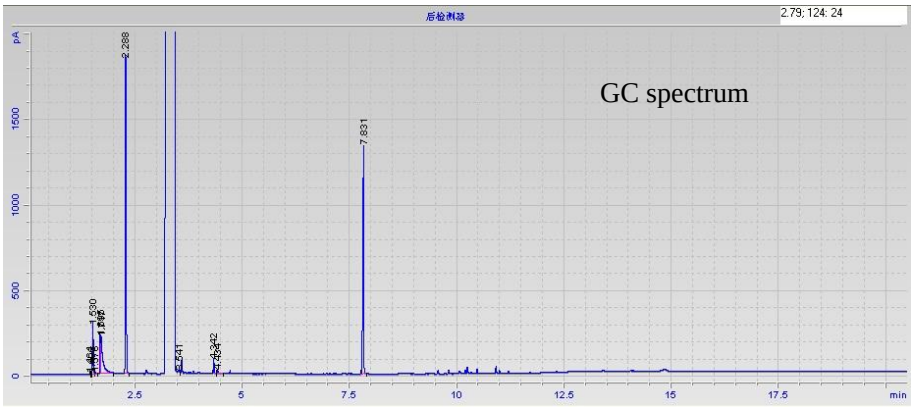
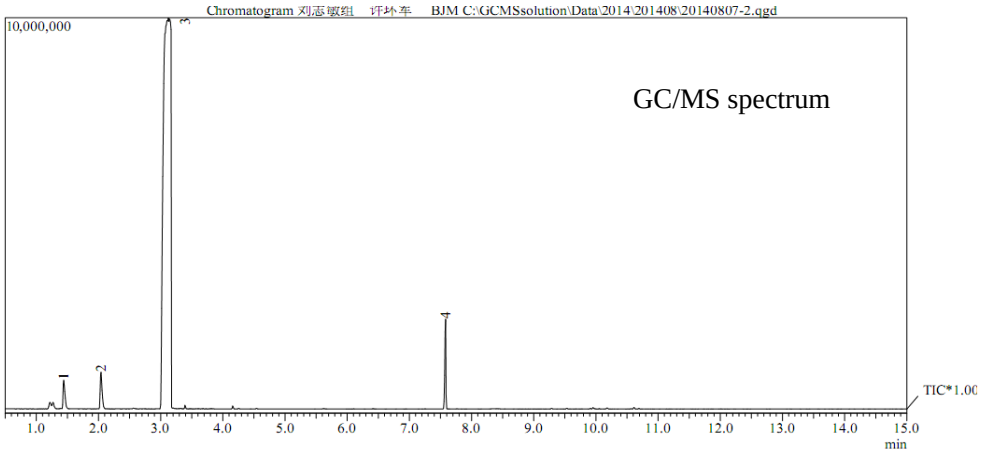


Figure S20. GC and GC/MS spectra of the reaction solution of 4,4'-bisphenol reduction.





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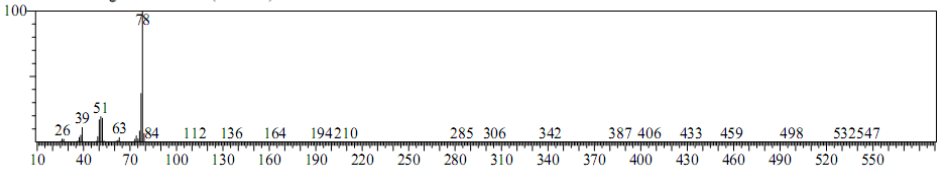

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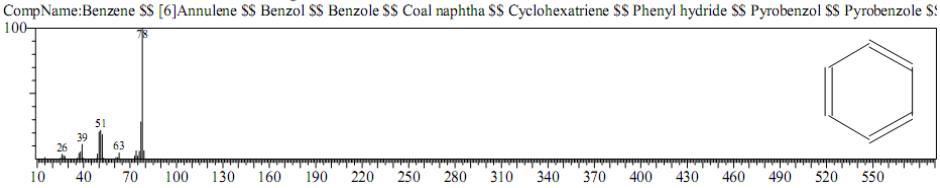
SI:97 Formula:C6H6 CAS:71-43-2 MolWeight:78 RetIndex:680
CompName:Benzene $$ [6]Annulene $$ Benzol $$ Benzole $$ Coal naphtha $$ Cyclohexatriene $$ Phenyl hydride $$ Pyrobenzol $$ Pyrobenzole $$



Line#:4 R.Time:7.583(Scan#:887) MassPeaks:109 BasePeak:57.15(282076)
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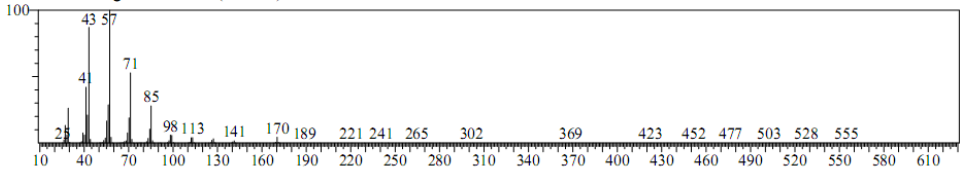

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SI:95 Formula:C12H26 CAS:112-40-3 MolWeight:170 RetIndex:0
CompName:Dodecane $$ n-Dodecane $$ Adakane 12 $$ Ba 51-090453 $$ CH3(CH2)10CH3 $$ Bihexyl $$ Dihexyl $$ n-Dodecane min $$ Duodeca

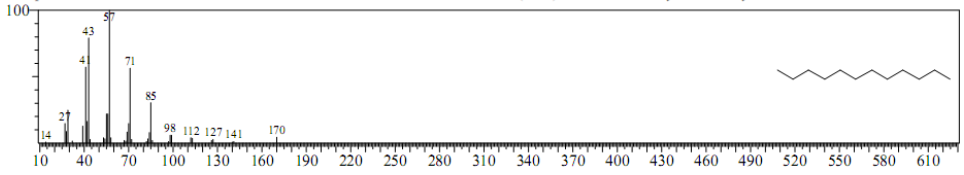
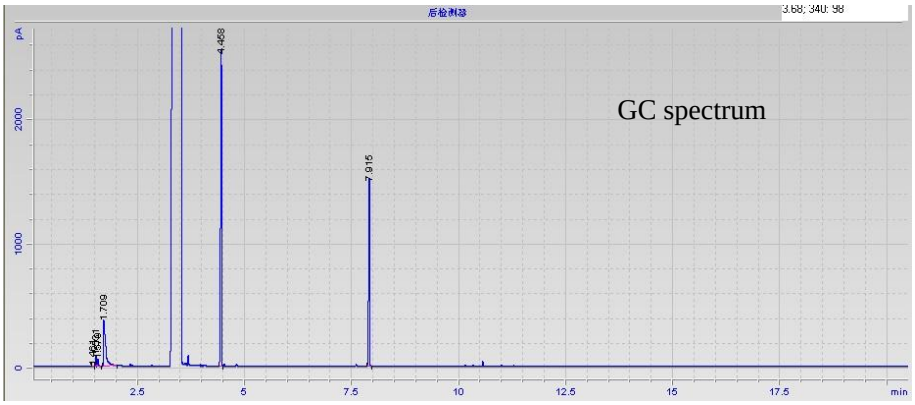
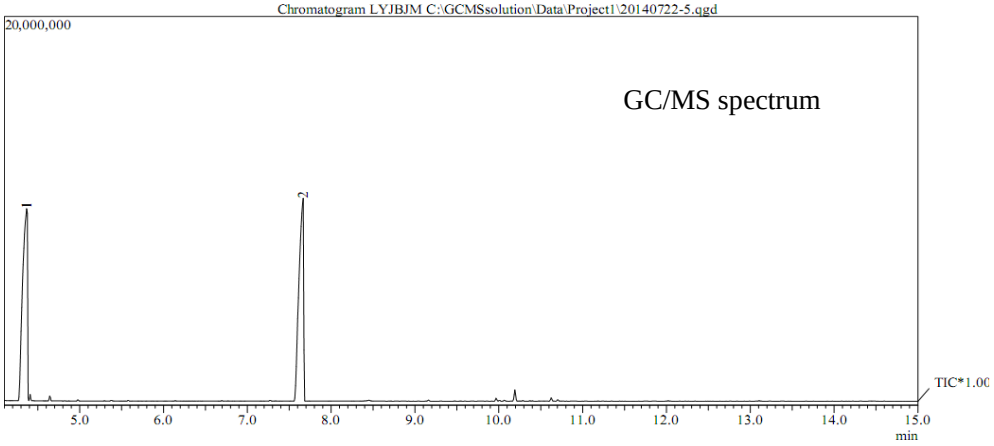
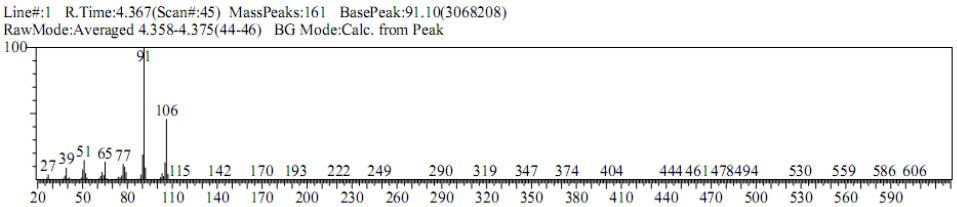
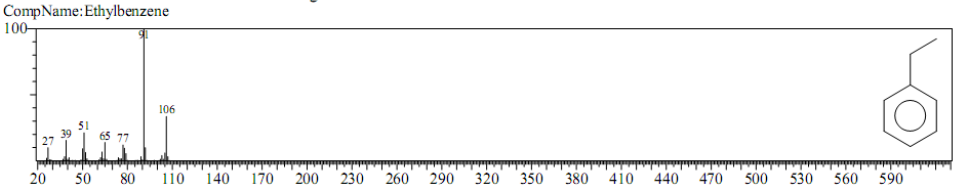


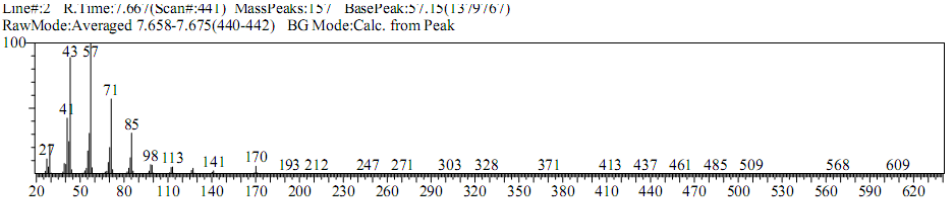
Figure S21. GC and GC/MS spectra of the reaction solution of anisole reduction.











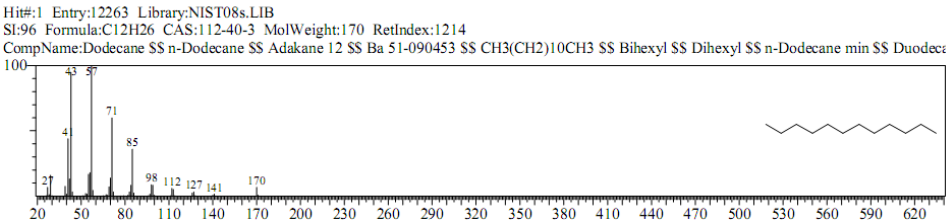


Figure S22. GC and GC/MS spectra of the reaction solution of 2-ethylanisole reduction.

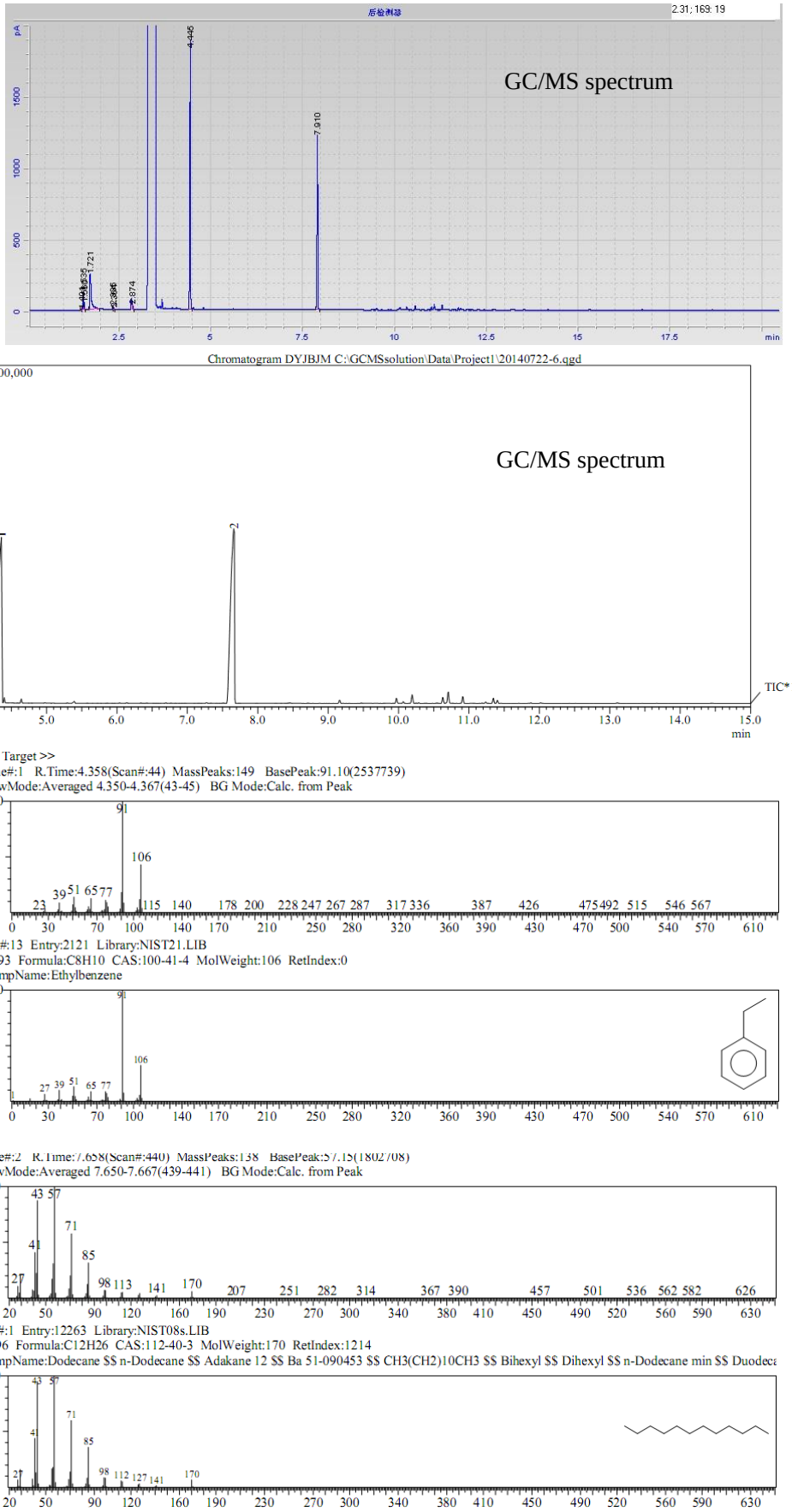
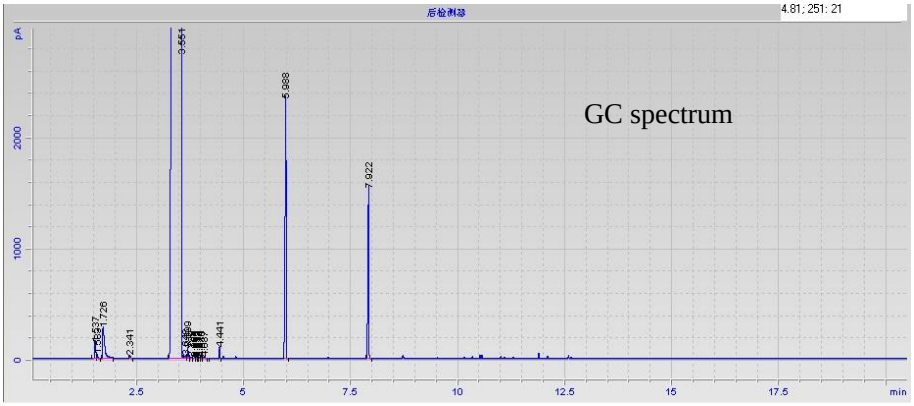


Figure S23. GC and GC/MS spectra of the reaction solution of 4-ethylanisole reduction.



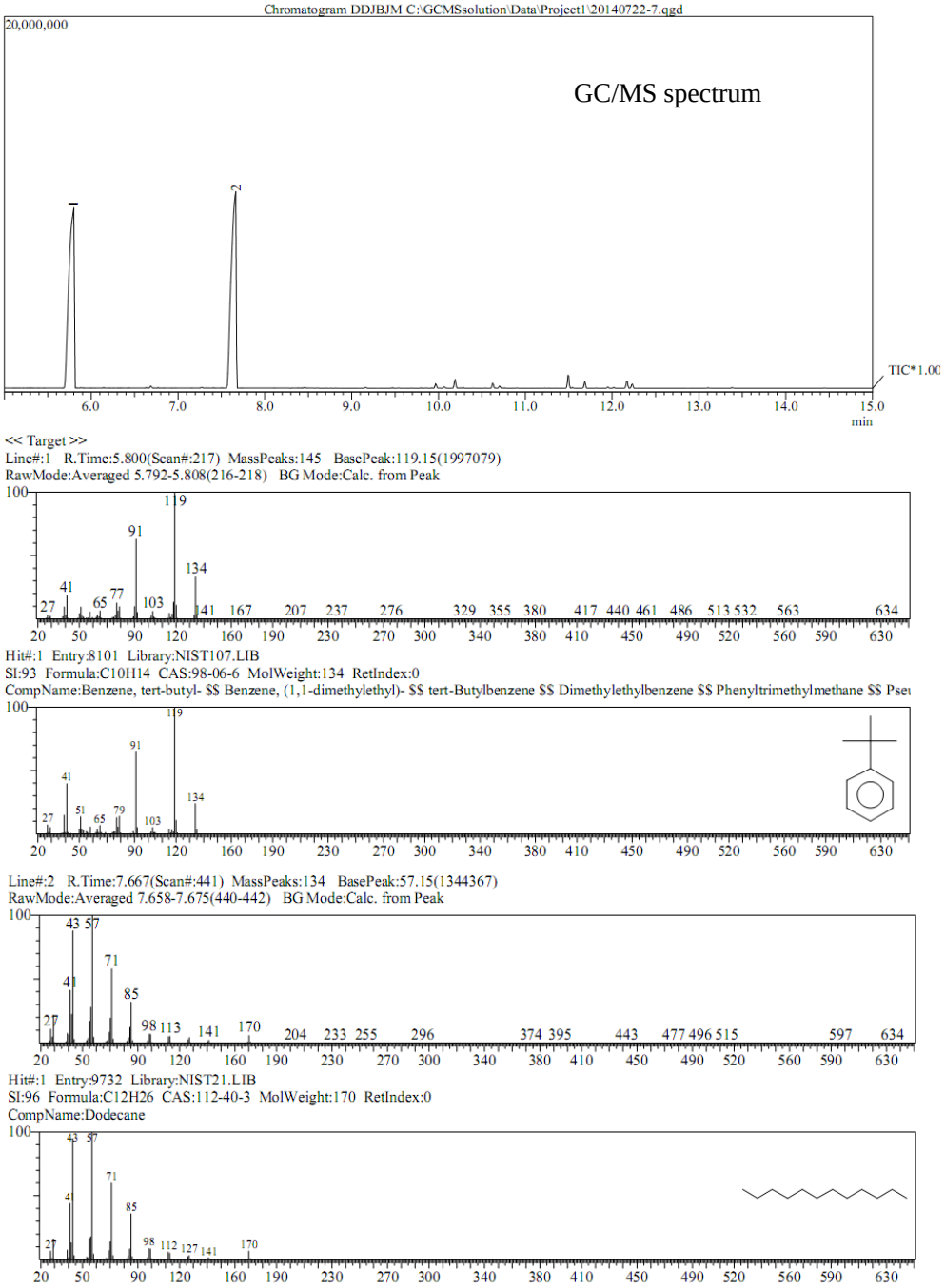


Figure S24. GC and GC/MS spectra of the reaction solution of 4-tert-butylanisole reduction.

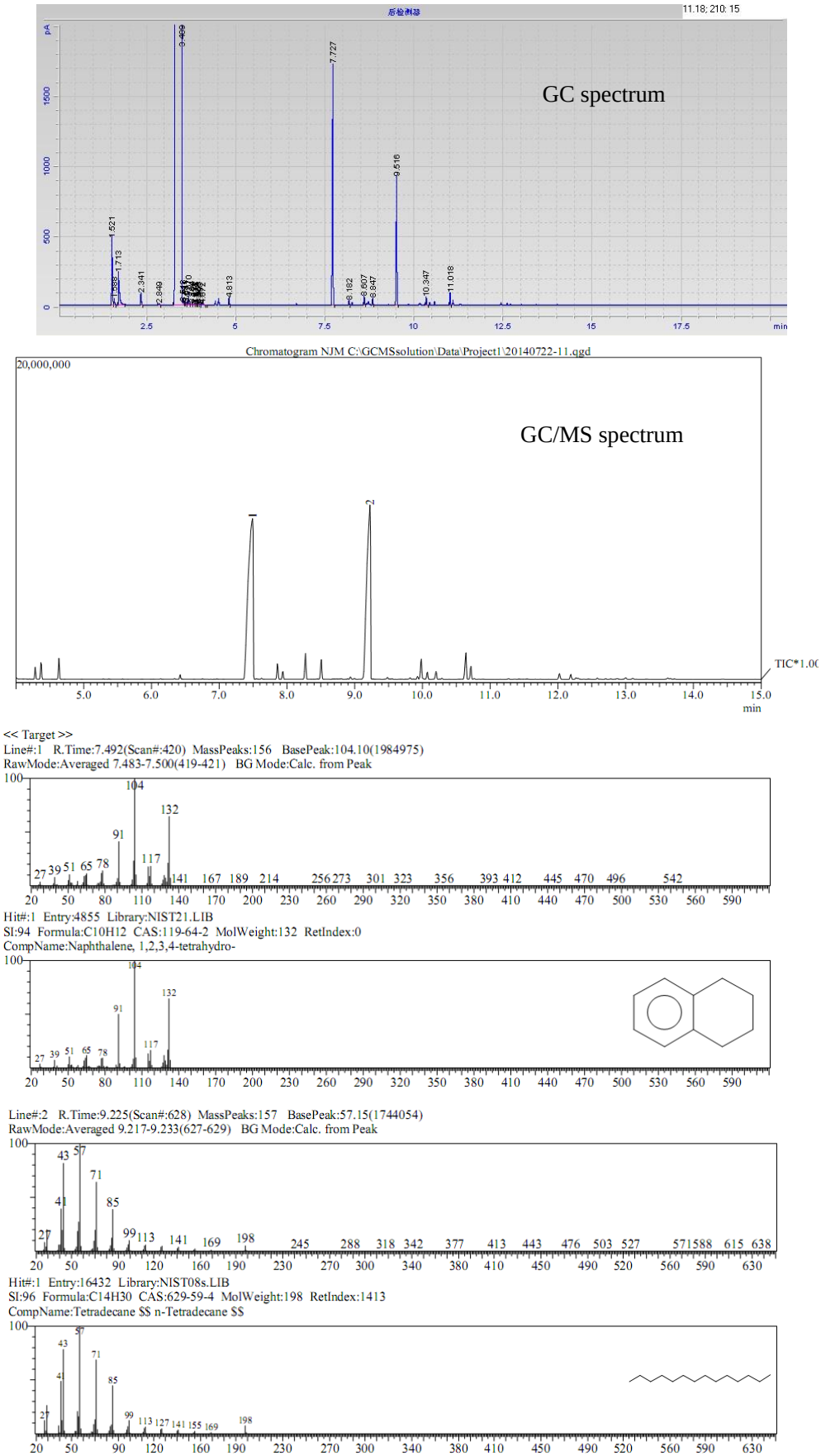
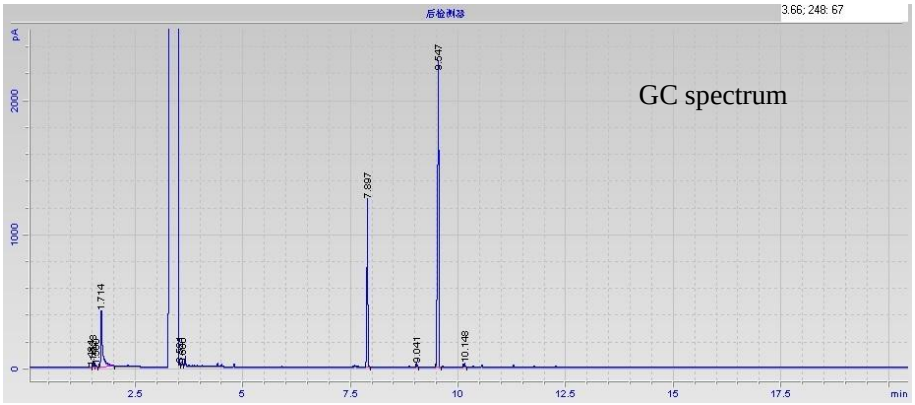
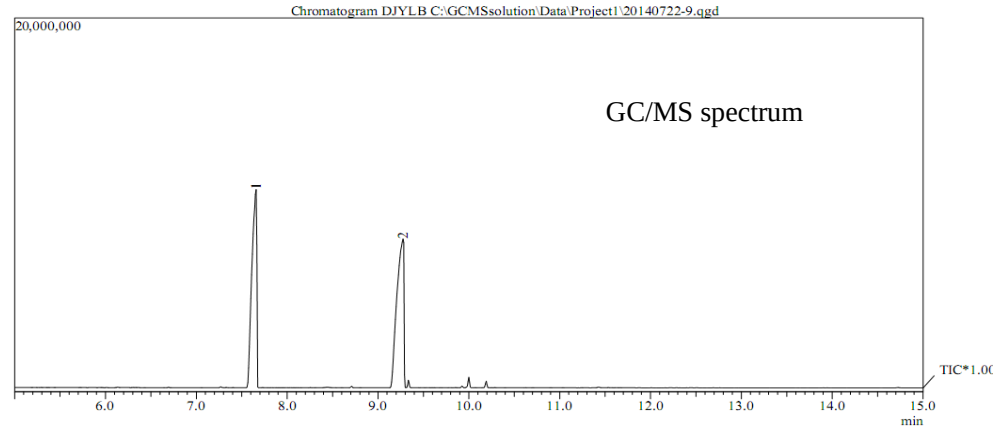


Figure S25. GC and GC/MS spectra of the reaction solution of 2-methoxynaphthalene reduction.





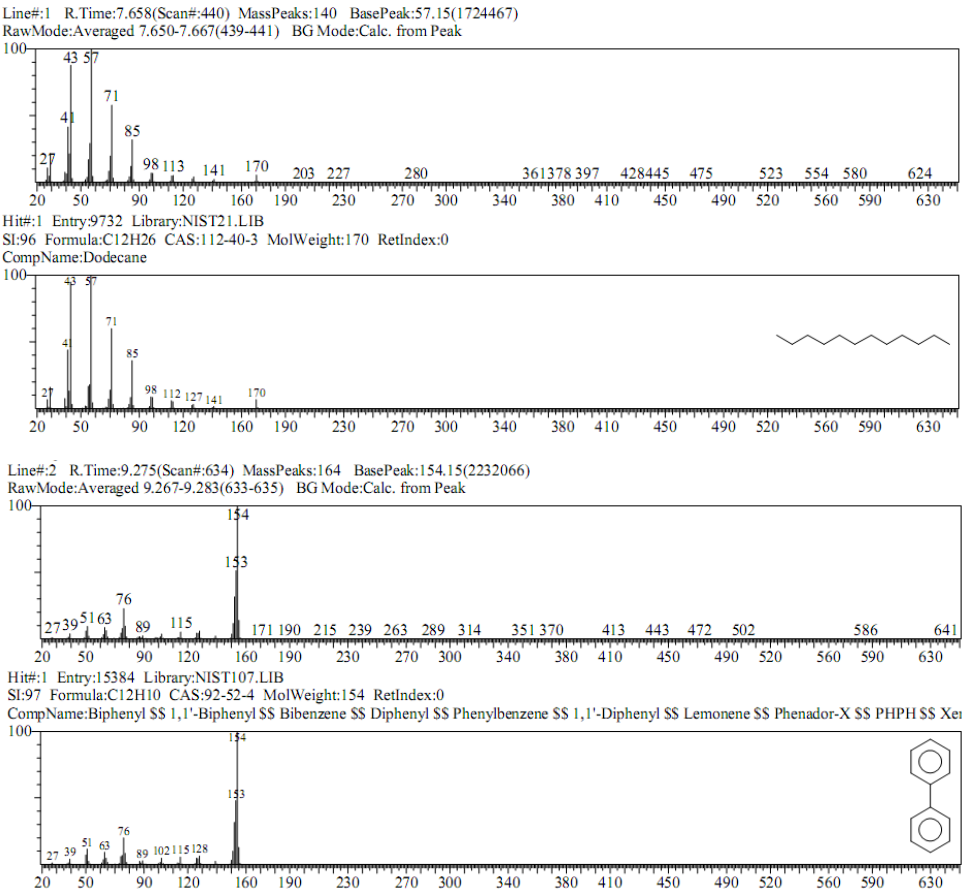
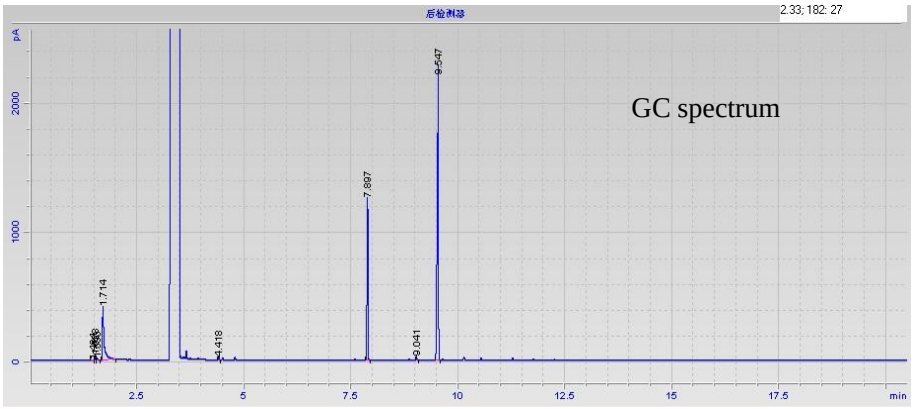


Figure S26. GC and GC/MS spectra of the reaction solution of 4-methoxybiphenyl reduction.



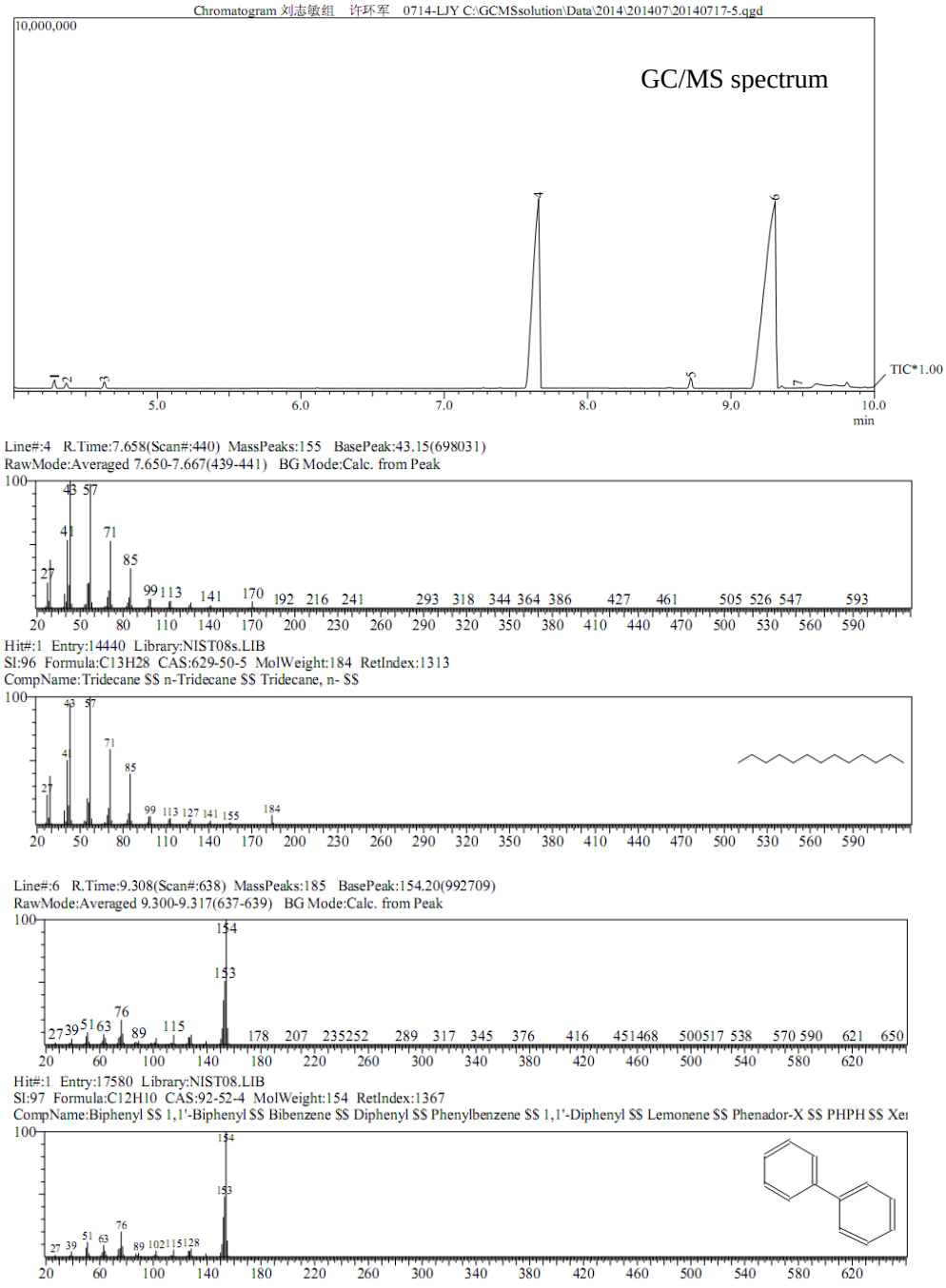


Figure S27. GC and GC/MS spectra of the reaction solution of 2-Methoxybiphenyl reduction.

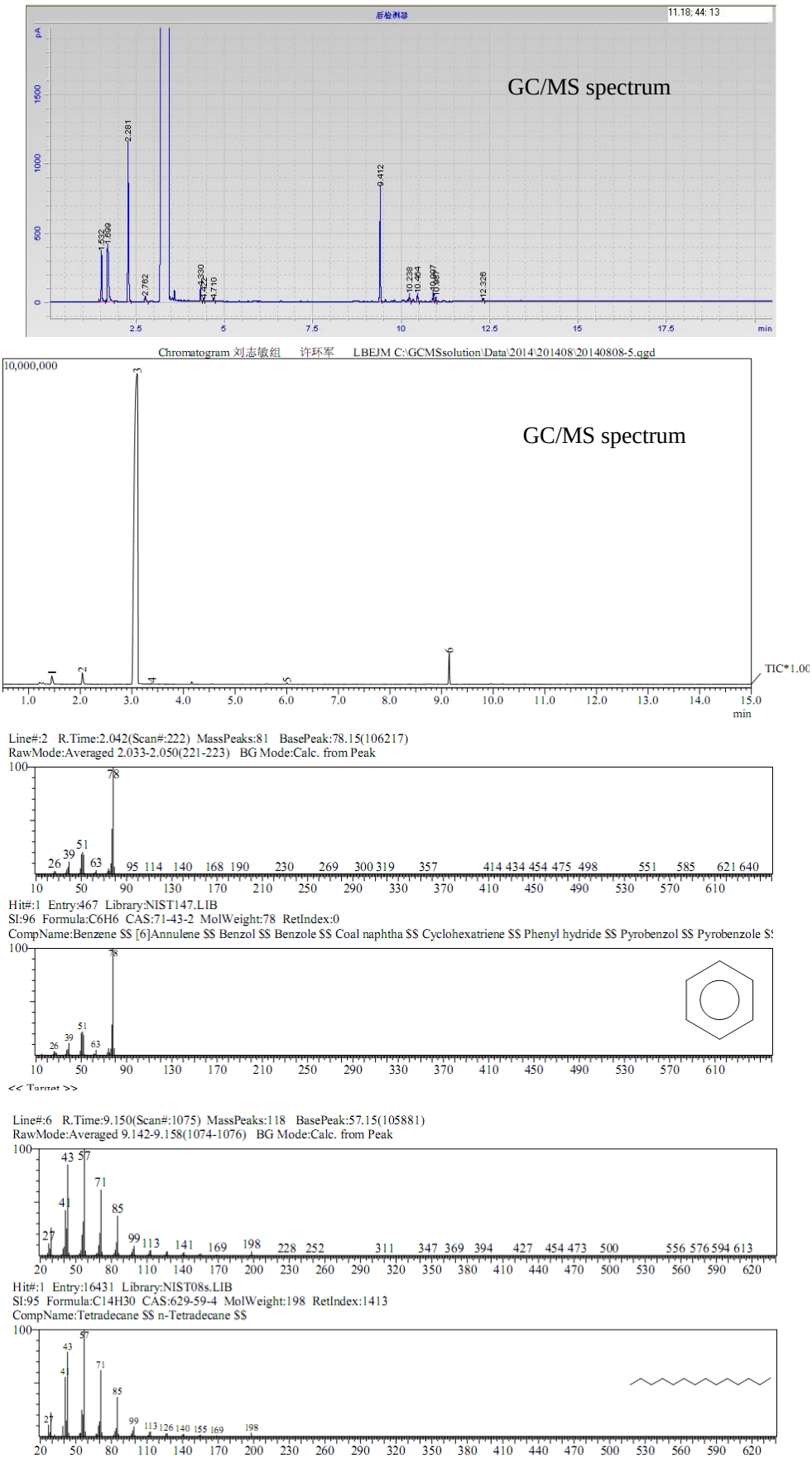
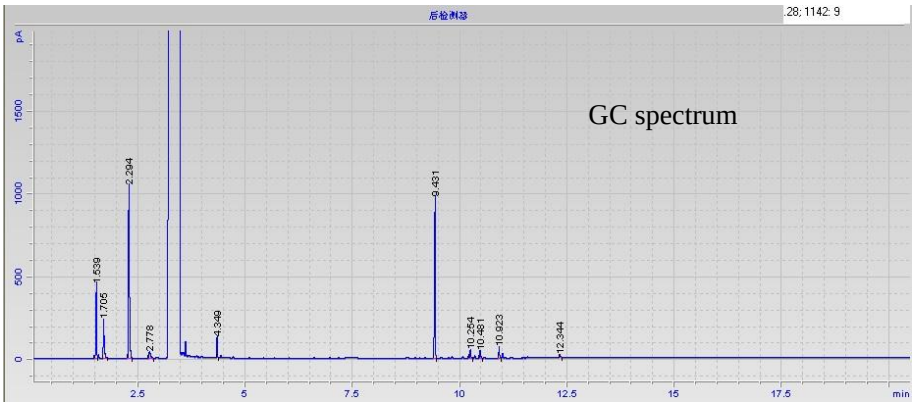
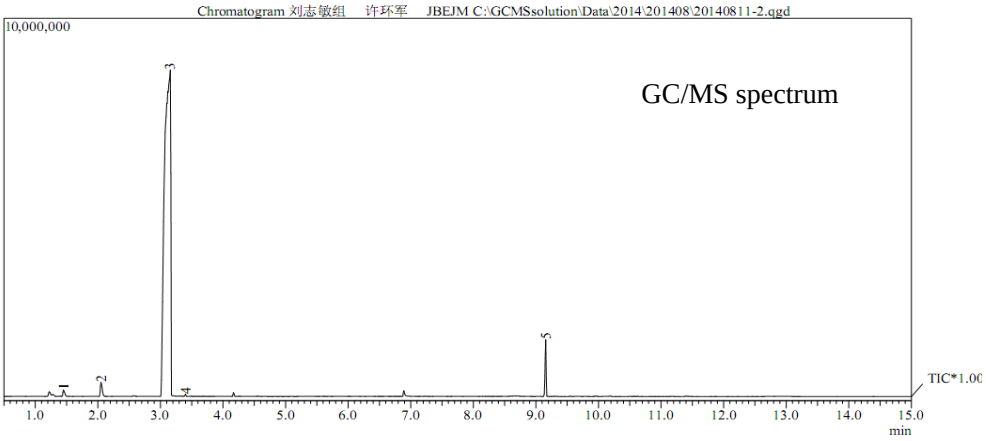
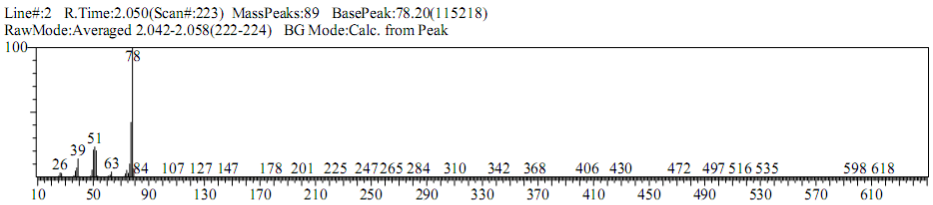
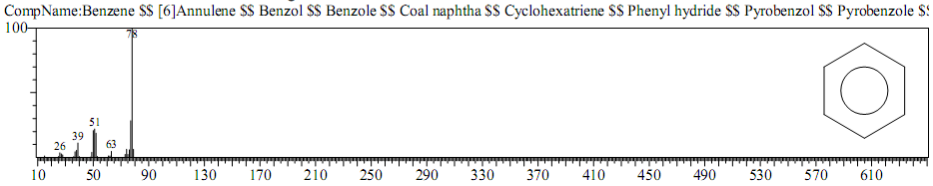


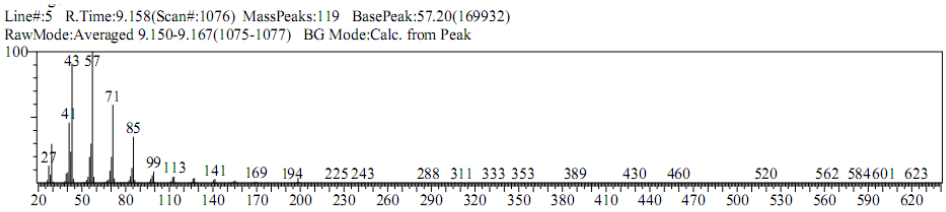
Figure S28. GC and GC/MS spectra of the reaction solution of 1,2-Dimethoxybenzene reduction.











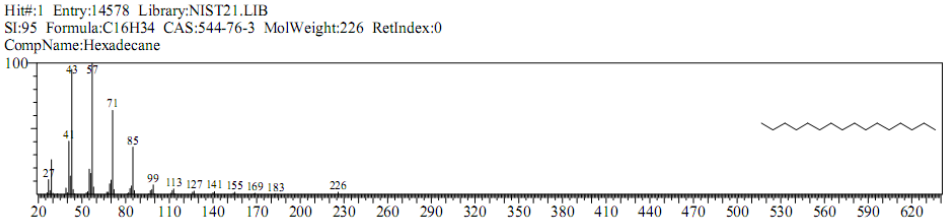


Figure S29. GC and GC/MS spectra of the reaction solution of 1, 3-dimethoxybenzene reduction.

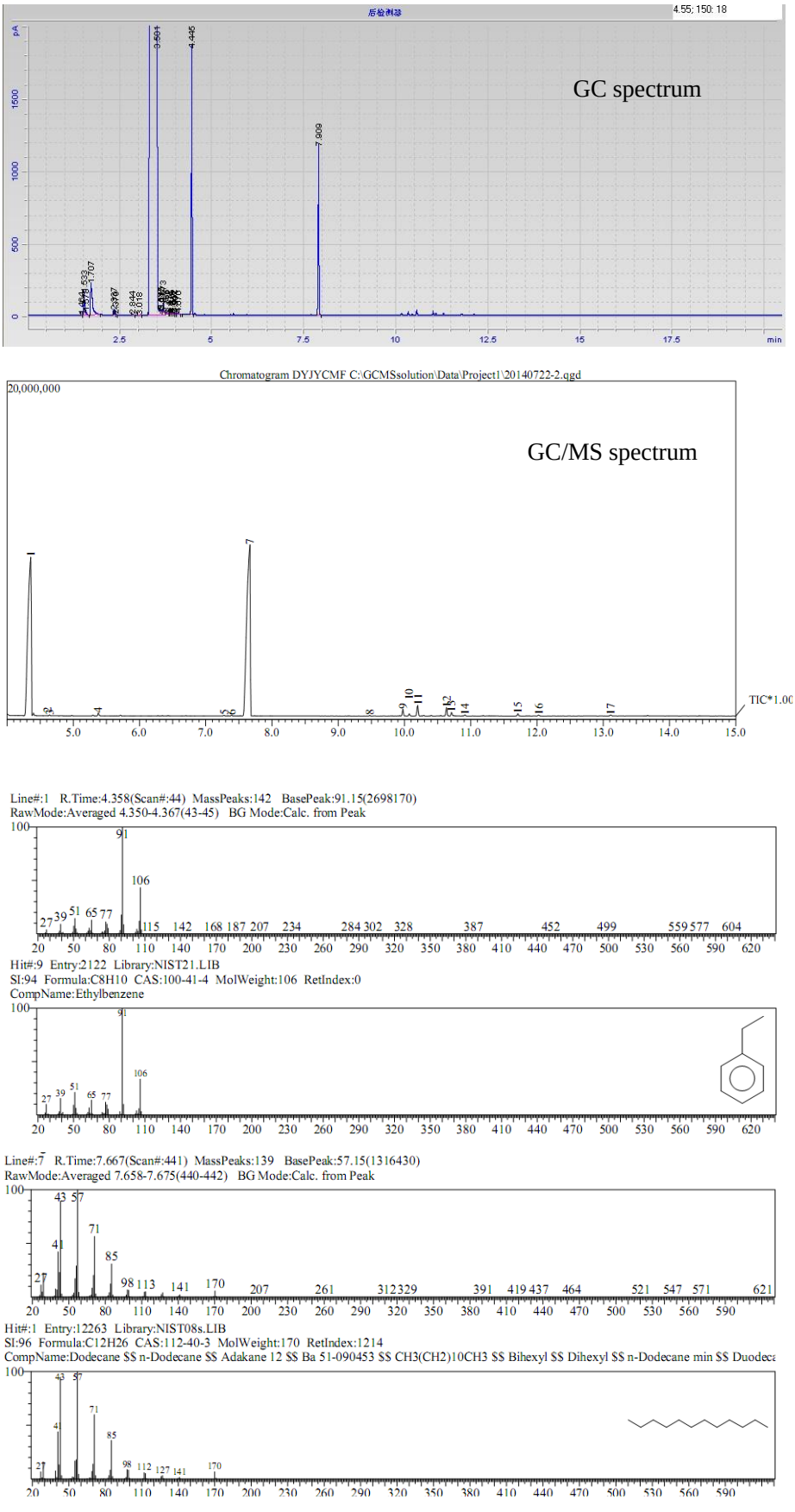


Figure S30. GC and GC/MS spectra of the reaction solution of 4-ethylguaiacol reduction.

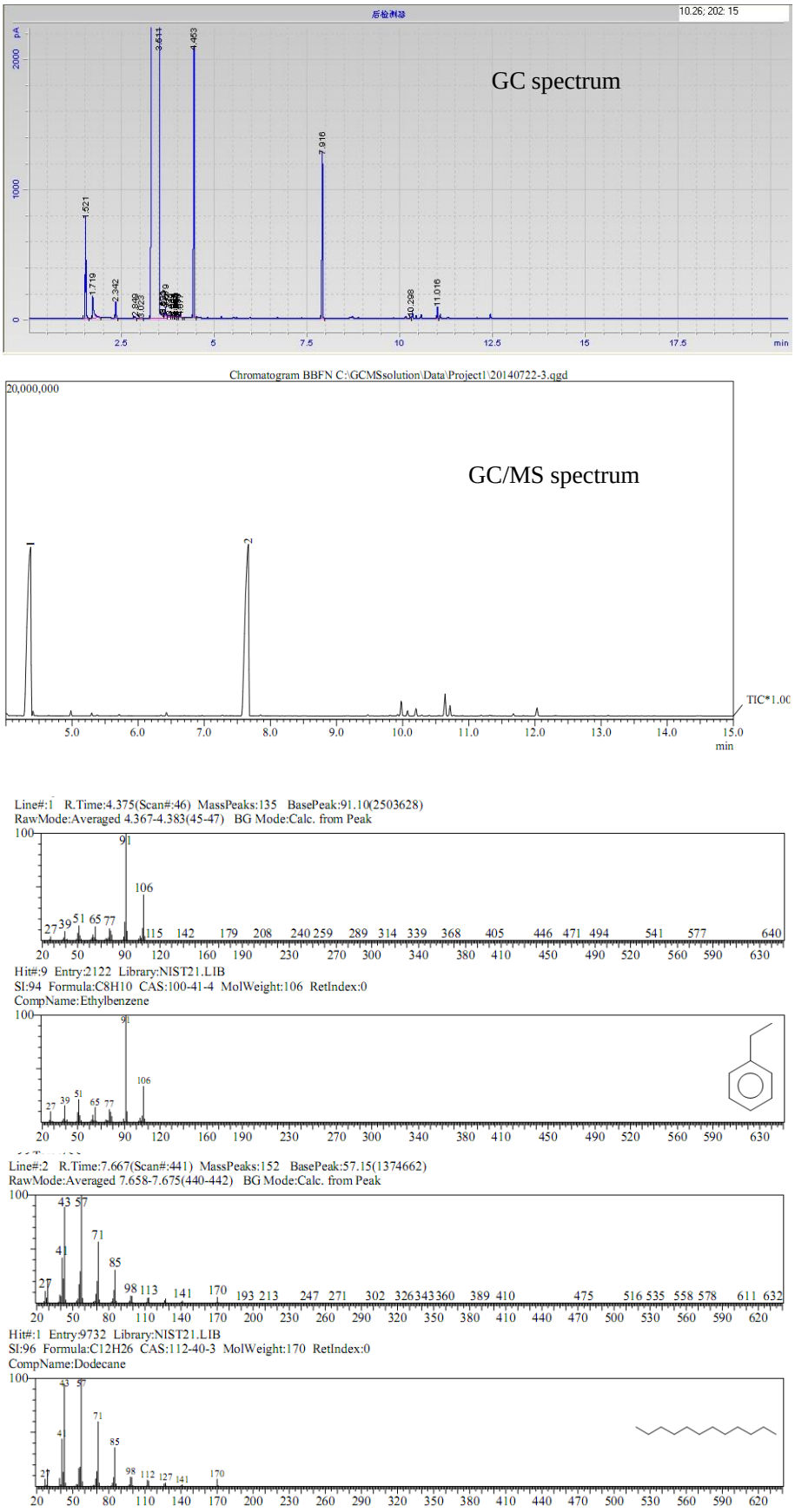


Figure S31. GC and GC/MS spectra of the reaction solution of benzofuran reduction.

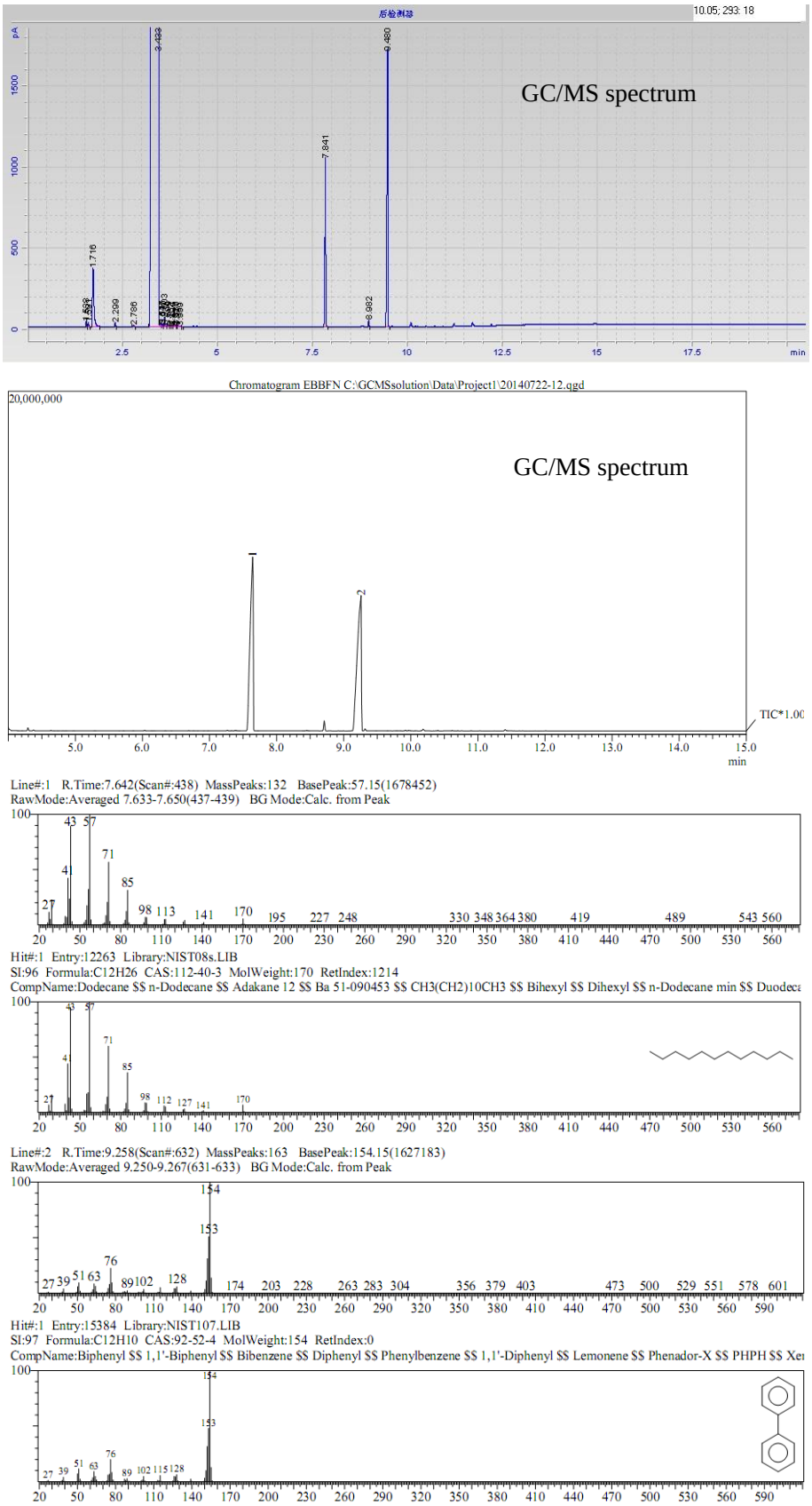


Figure S32. GC and GC/MS spectra of the reaction solution of Dibenzofuran reduction.

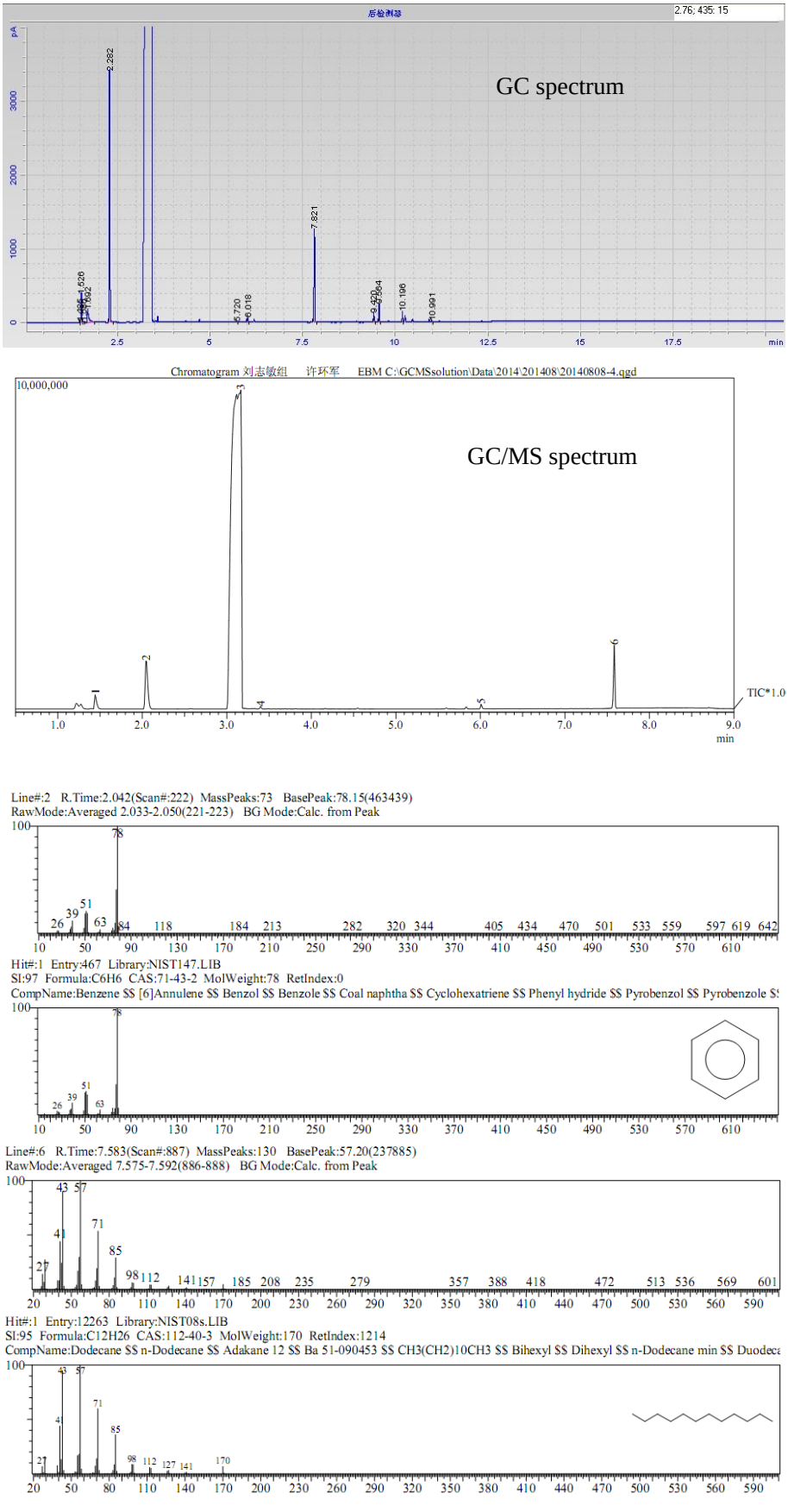


Figure S33. GC and GC/MS spectra of the reaction solution of Diphenyl ether reduction.

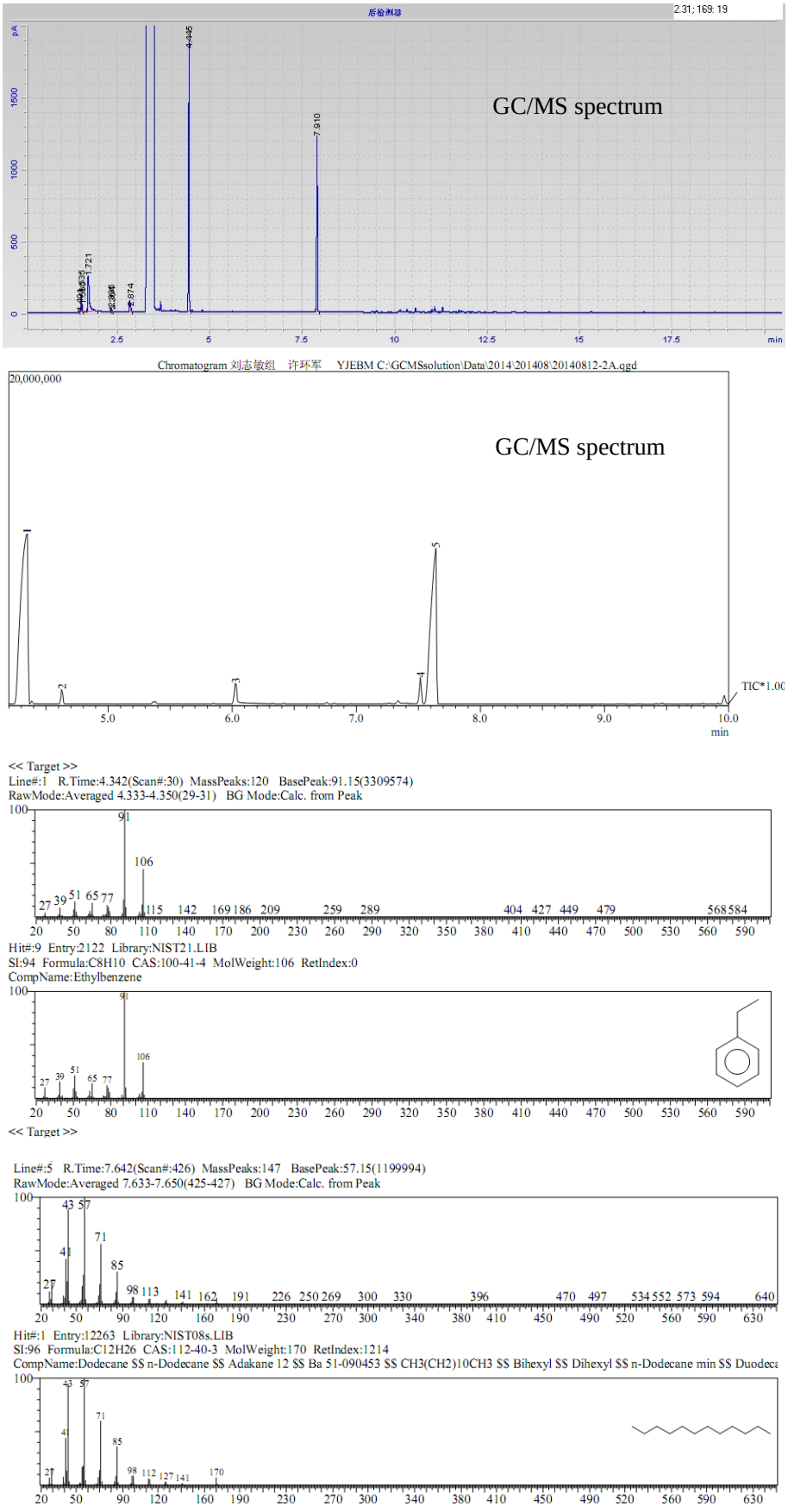


Figure S34. GC and GC/MS spectra of the reaction solution of Di-4-ethylphenyl ether reduction.

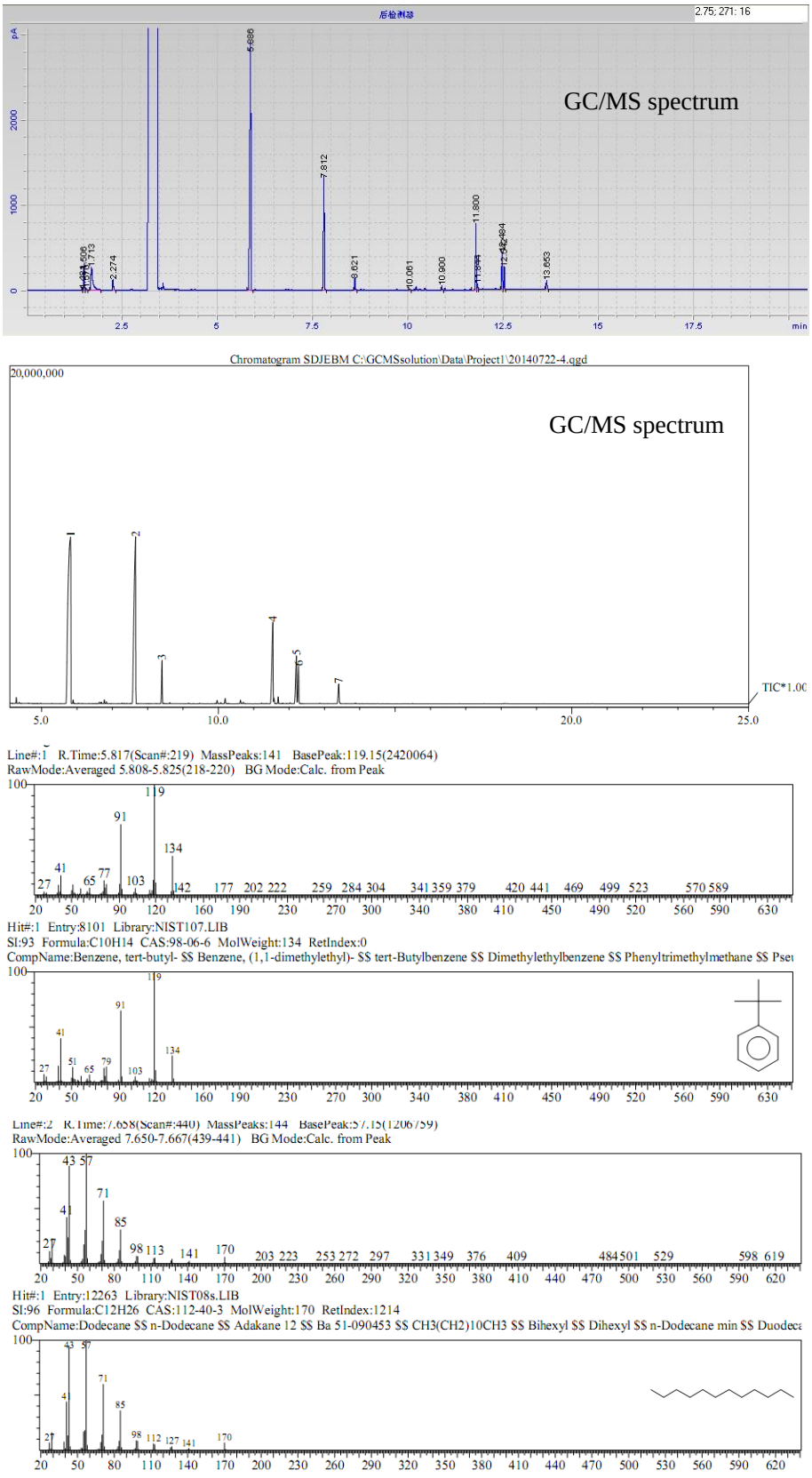


Figure S35. GC and GC/MS spectra of the reaction solution of Di-4-tert-butylphenyl ether reduction.

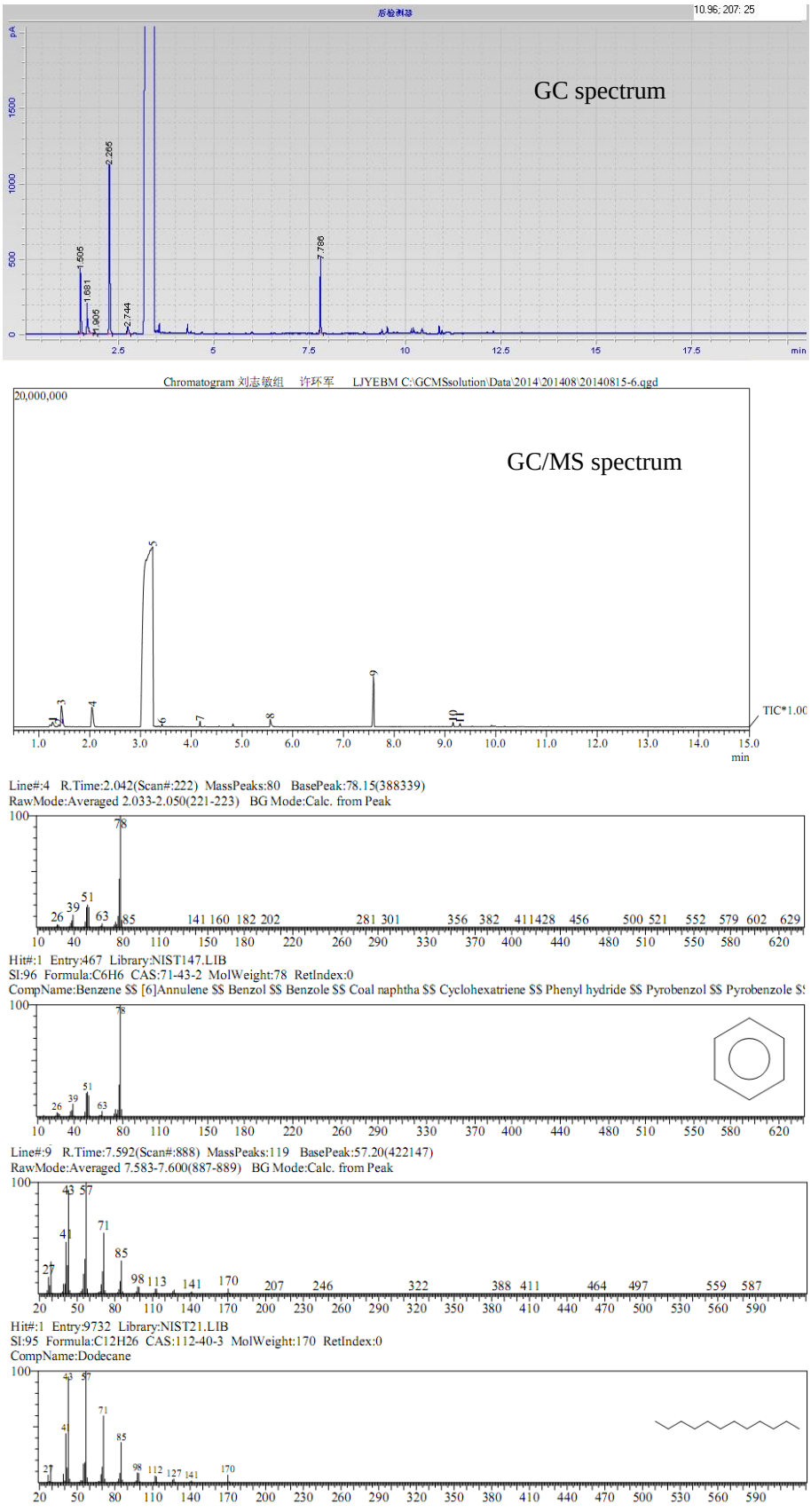


Figure S36. GC and GC/MS spectra of the reaction solution of Di-2-methoxyphenyl ether reduction.

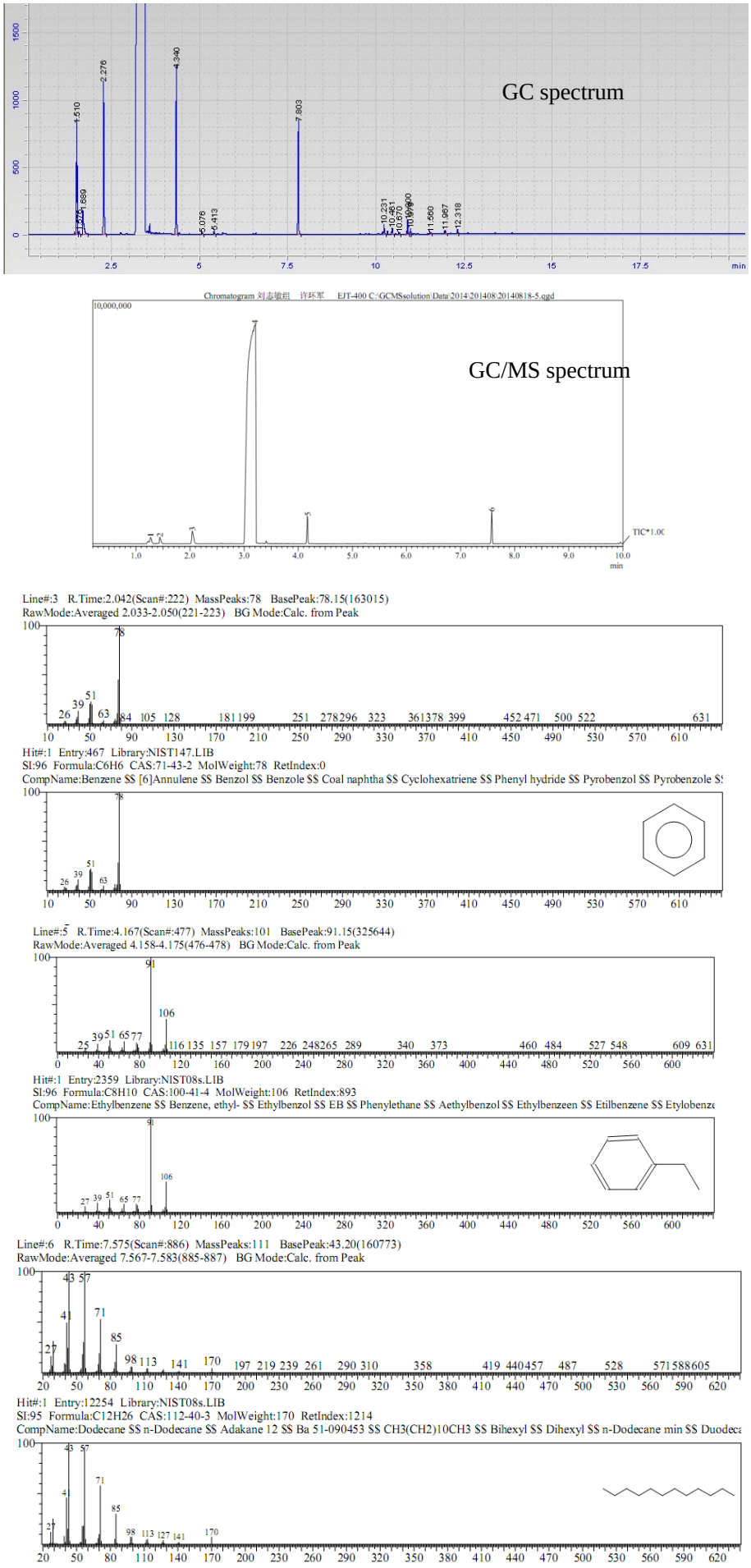


Figure S37. GC and GC/MS spectra of the reaction solution of 2-phenoxy-1-phenethanol reduction.

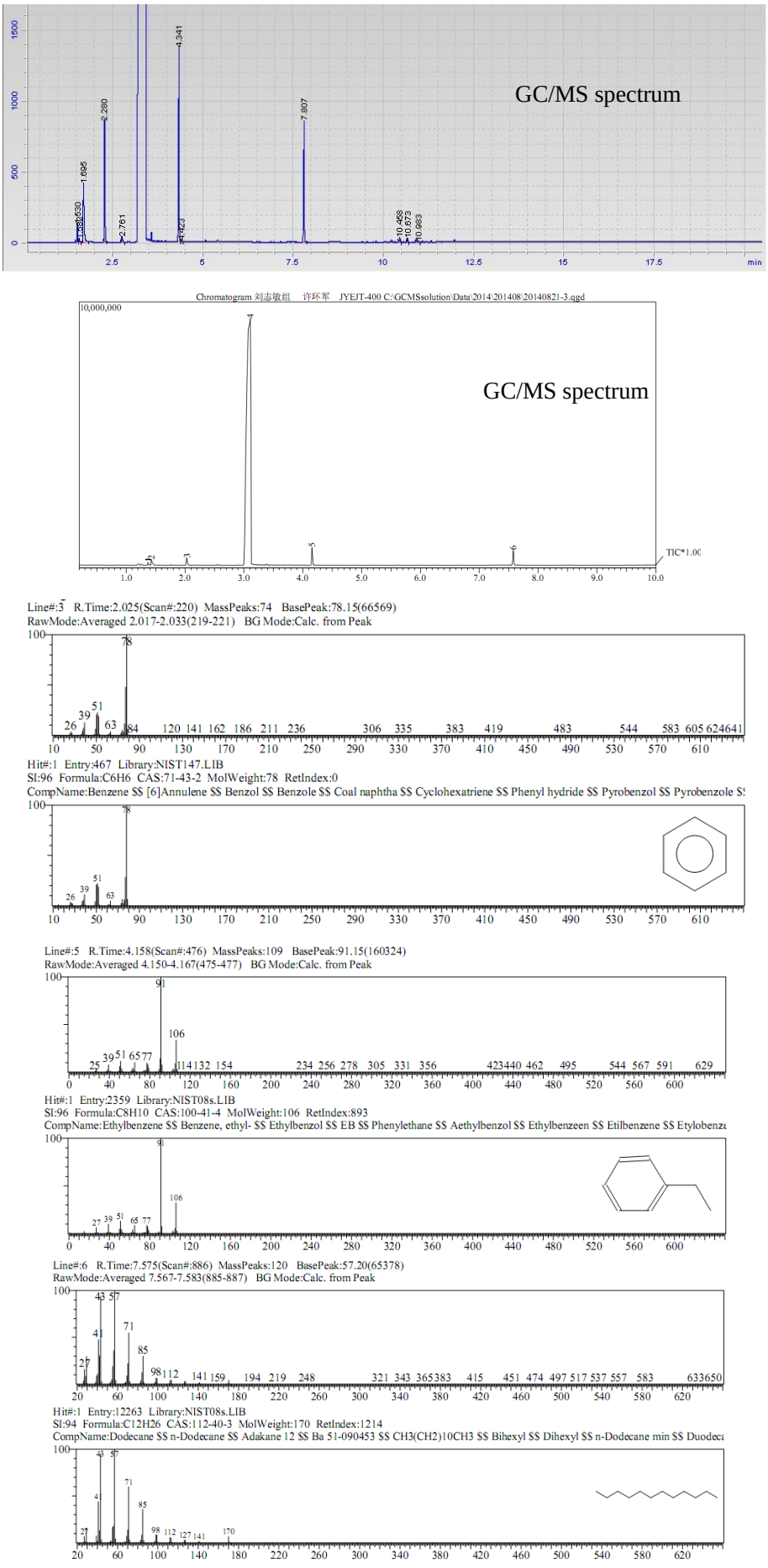
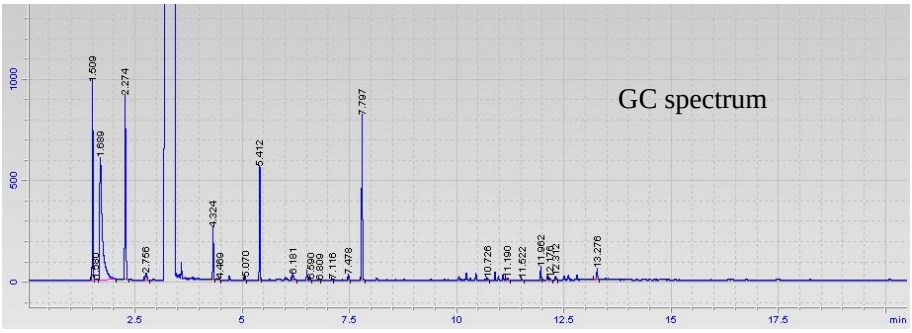
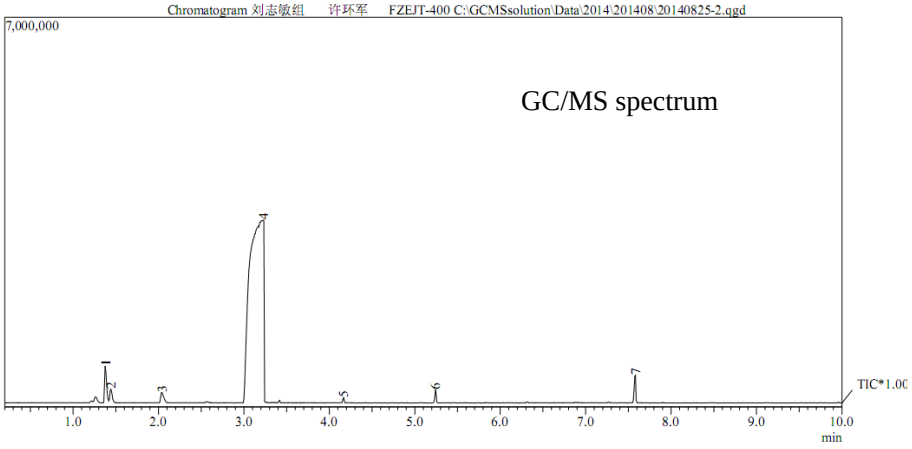


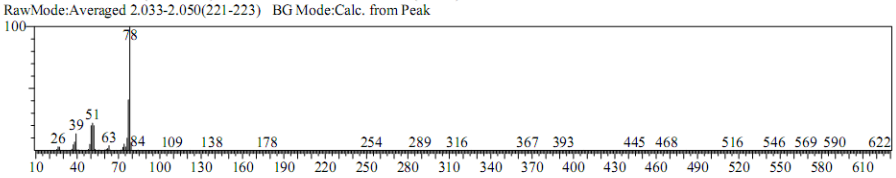
Figure S38. GC and GC/MS spectra of the reaction solution of 2-(2-methoxyphenoxy)-1-phenylethanol reduction.



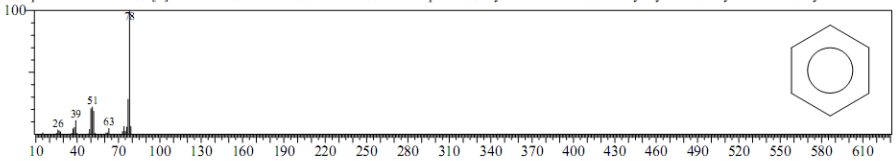
Chromatogram 刘志敏组　　许环军　　FZEJT-400 C:\GCMSsolution\Data\2014\201408\20140825-2.qgd



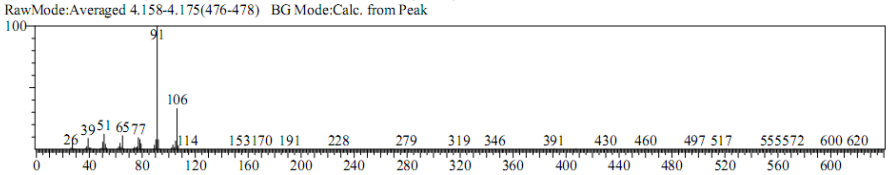
Line#:3　R.Time:2.042(Scan#:222)　MassPeaks:82　BasePeak:78.15(61513)
RawMode:Averaged 2.033-2.050(221-223)　BG Mode:Calc. from Peak



Hit#:1　Entry:467　Library:NIST147.LIB
SI:97　Formula:C6H6　CAS:71-43-2　MolWeight:78　RetIndex:0
CompName:Benzene $$ [6]Annulene $$ Benzol $$ Benzole $$ Coal naphtha $$ Cyclohexatriene $$ Phenyl hydride $$ Pyrobenzol $$ Pyrobenzole $$



Line#:5　R.Time:4.167(Scan#:477)　MassPeaks:89　BasePeak:91.20(24422)
RawMode:Averaged 4.158-4.175(476-478)　BG Mode:Calc. from Peak



Hit#:1　Entry:2121　Library:NIST21.LIB
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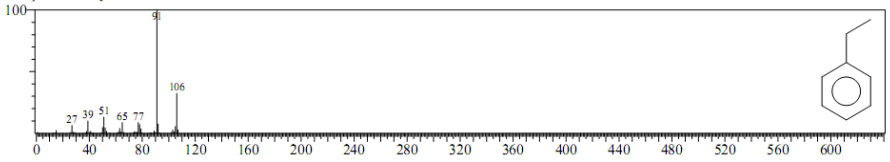
CompName:Ethylbenzene



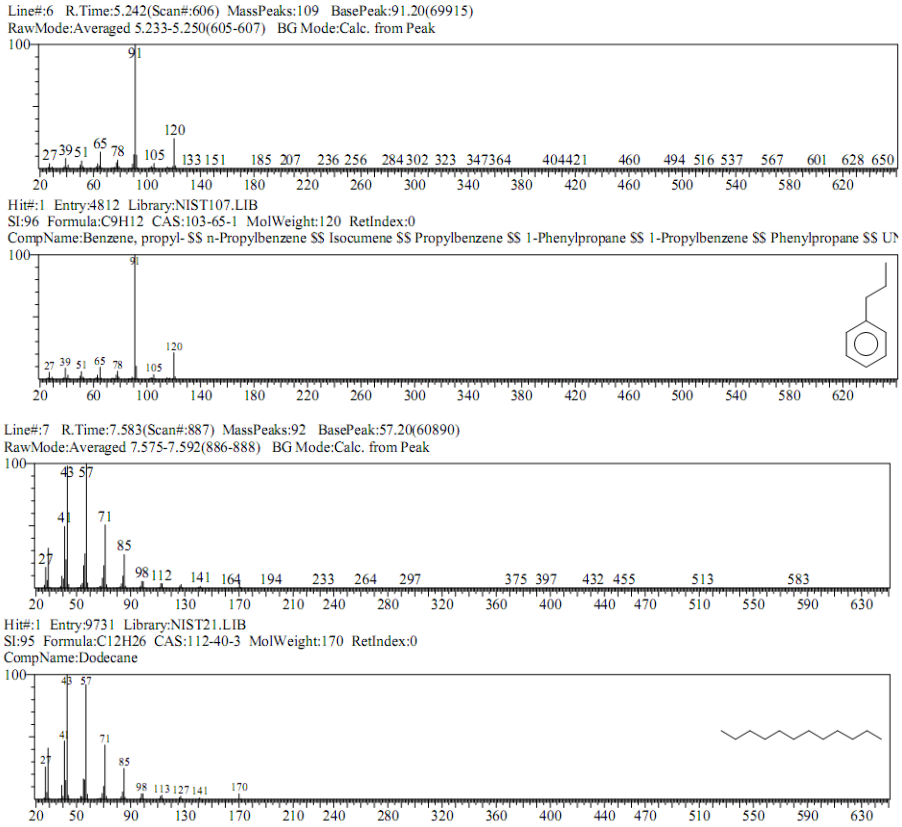


Figure S39. GC and GC/MS spectra of the reaction solution of2-phenoxy-1-phenylpropane-1, 3-diol reduction.

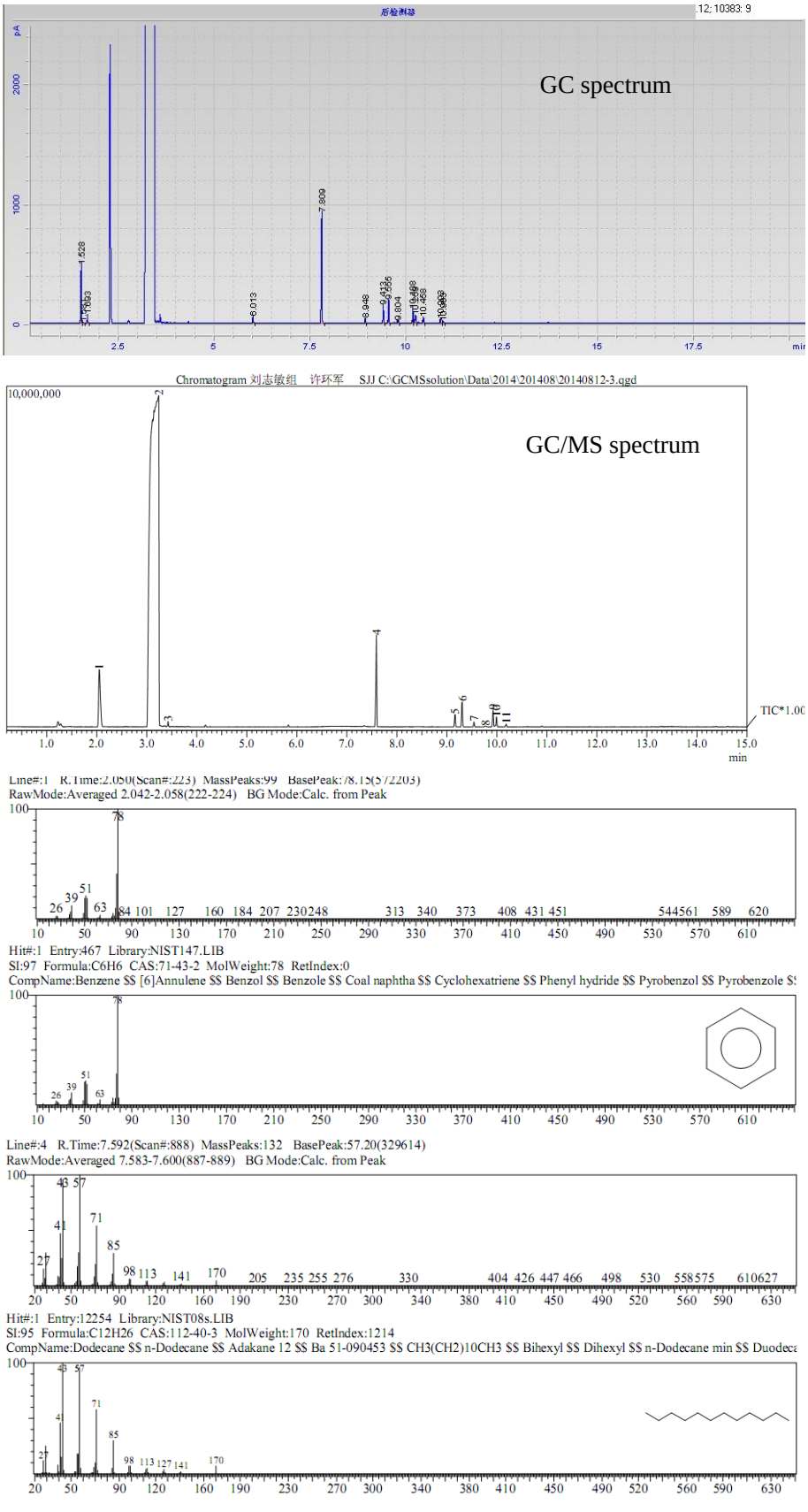


Figure S40. GC and GC/MS spectra of the reaction solution of 1,4-diphenoxybenzene reduction.

10. ^{1}H NMR and ^{13}C NMR spectra of the isolated products from the reduction of 2-hydroxydiphenyl, 4-hydroxydiphenyl, and 1,2,3,4-tetrahydro-1-naphthol.

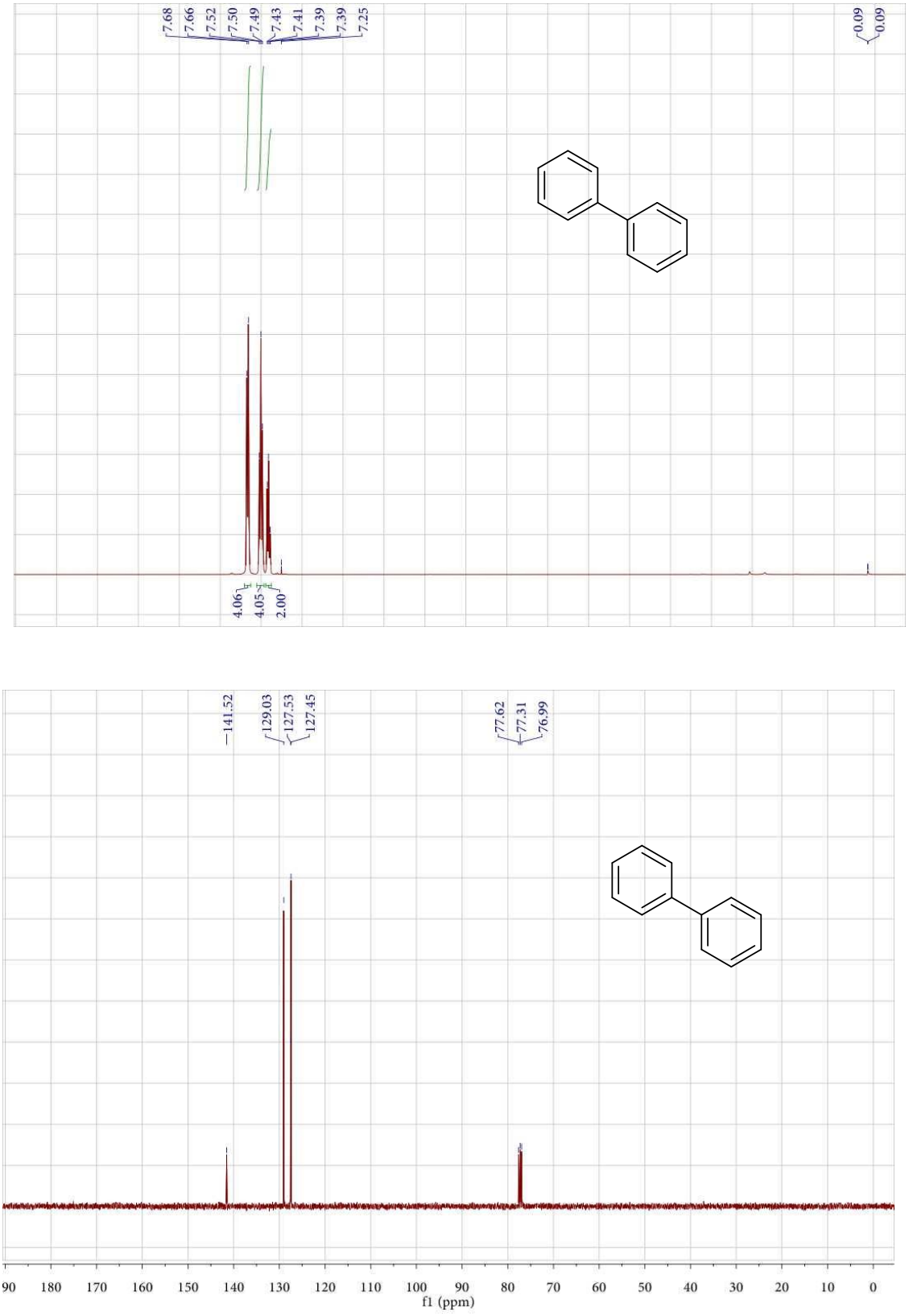


Figure S41 ^{1}H (top) and ^{13}C (bottom) NMR spectra of the isolated product of 2-hydroxydiphenyl reduction

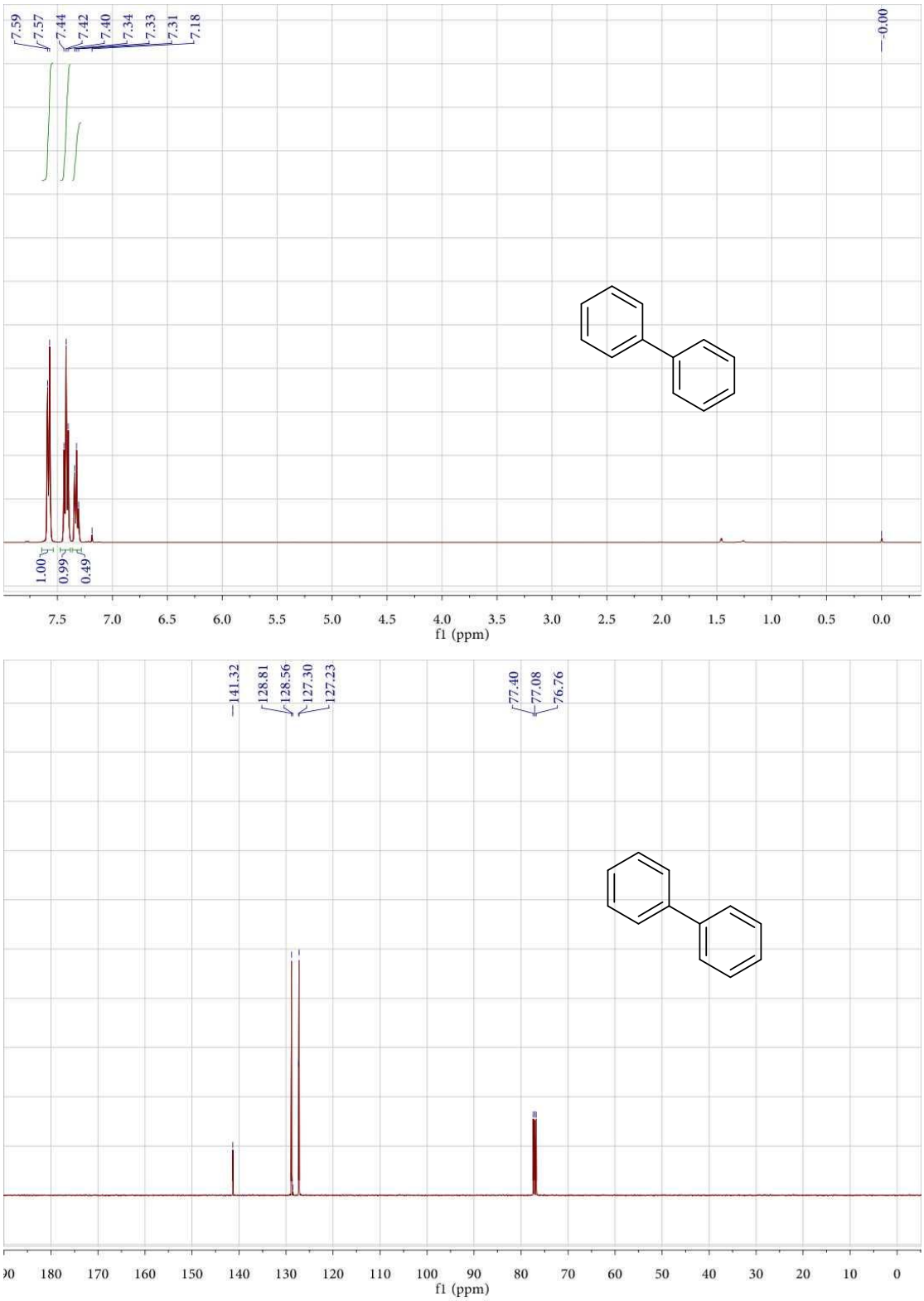


Figure S42 ^{1}H (top) and ^{13}C (bottom) NMR spectra of the isolated product of 4-hydroxydiphenyl reduction

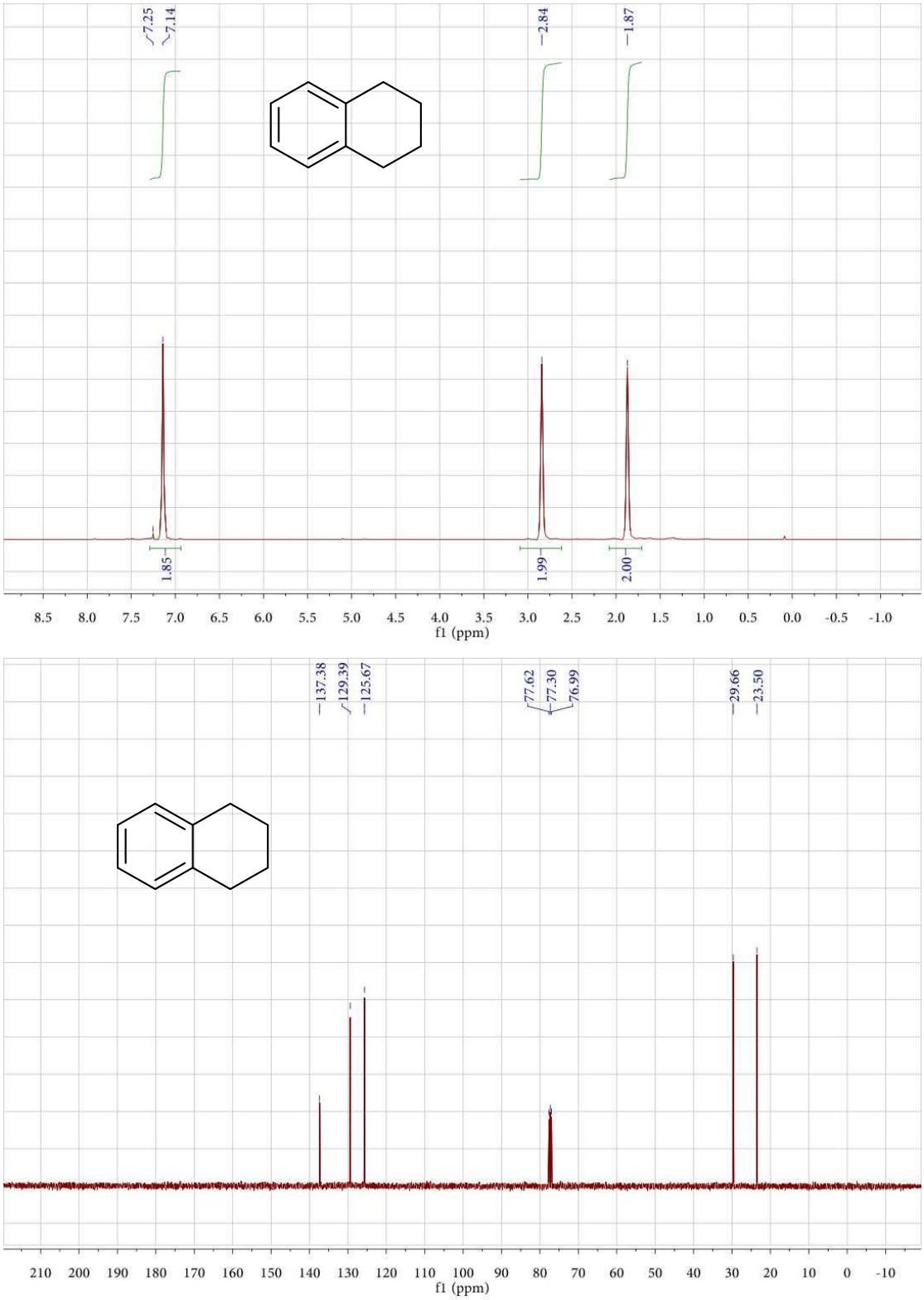


Figure S43 ^{1}H (top) and ^{13}C (bottom) NMR spectra of the isolated product of 1,2,3,4-tetrahydro-1-naphthol reduction

11. References:

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S2. Z.Strassberger, A. H. Alberts, M. J. Louwerse, S. Tanase, G. Rothenberg, *Green Chem.*, 2013, 15, 768.

S3. Q. Song, F. Wang, J. Xu, *Chem. Commun.*, 2012, 48, 7019.