

New Journal of Chemistry

Supporting Information for

Polyamine Dendritic Polymer–Copper Complex: A Reusable Catalyst for Additive-Free Amination of Aryl Bromides, and Iodides

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Kochi-682022, Kerala, India. Email: ksk@cusat.ac.in

Abstract

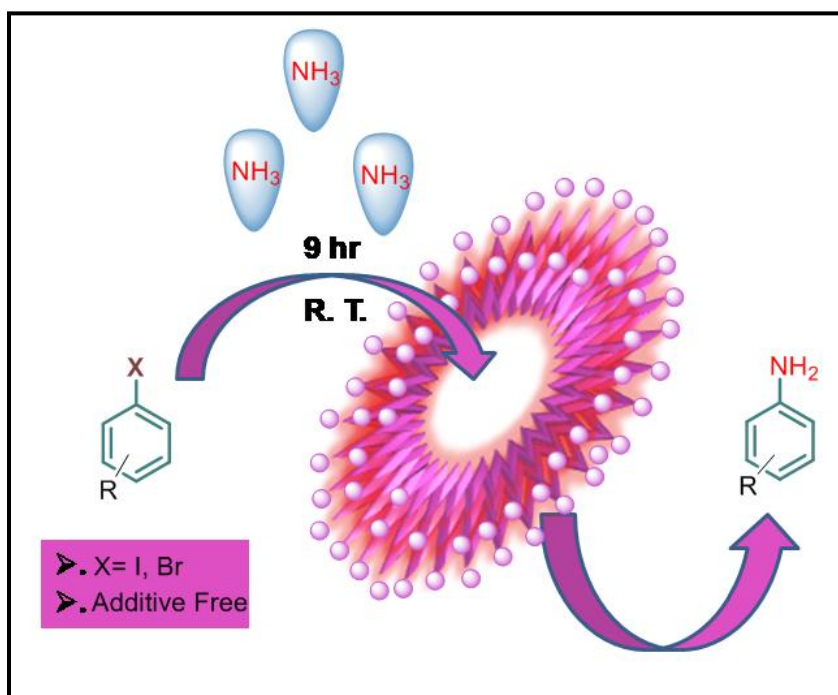
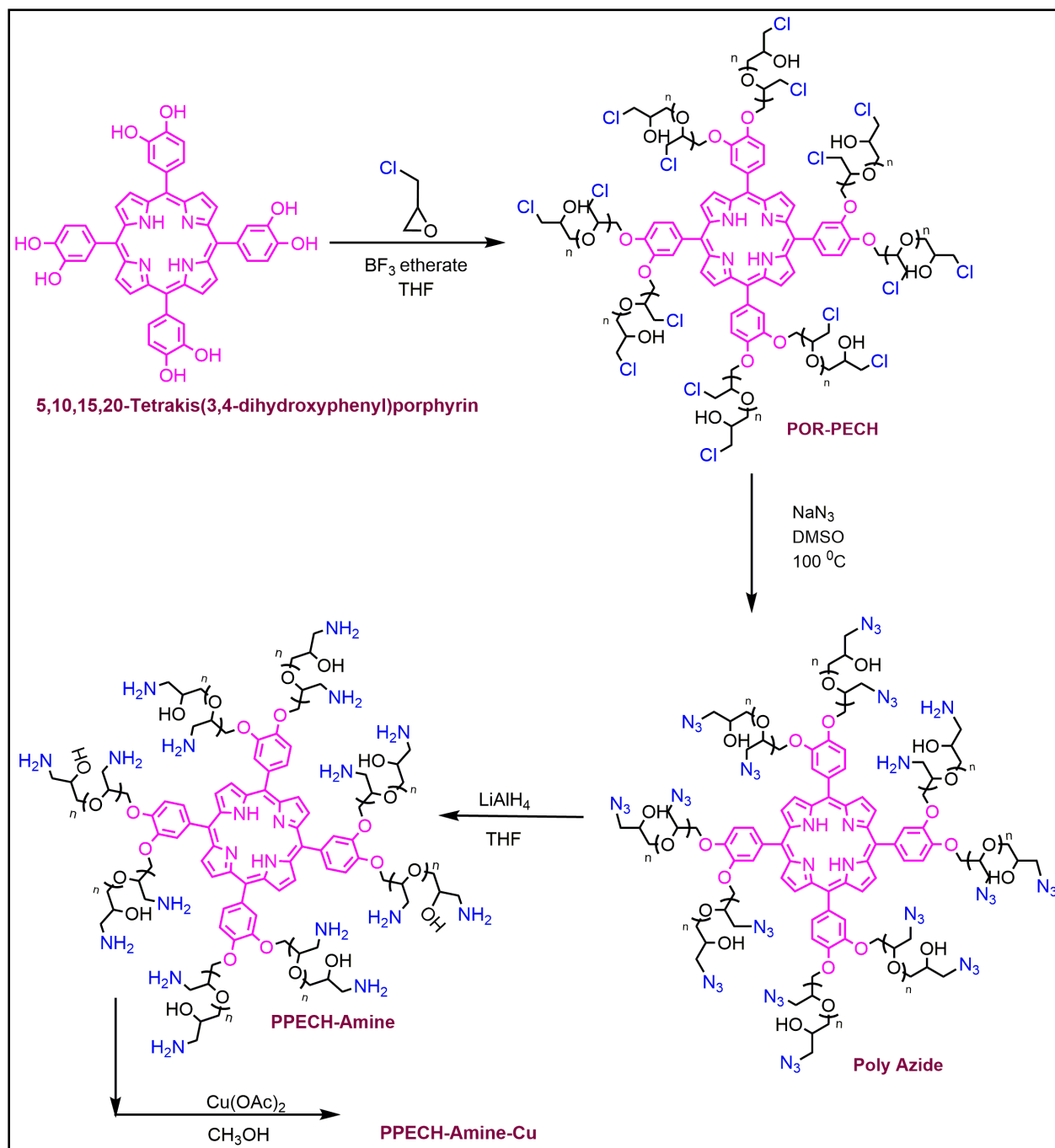
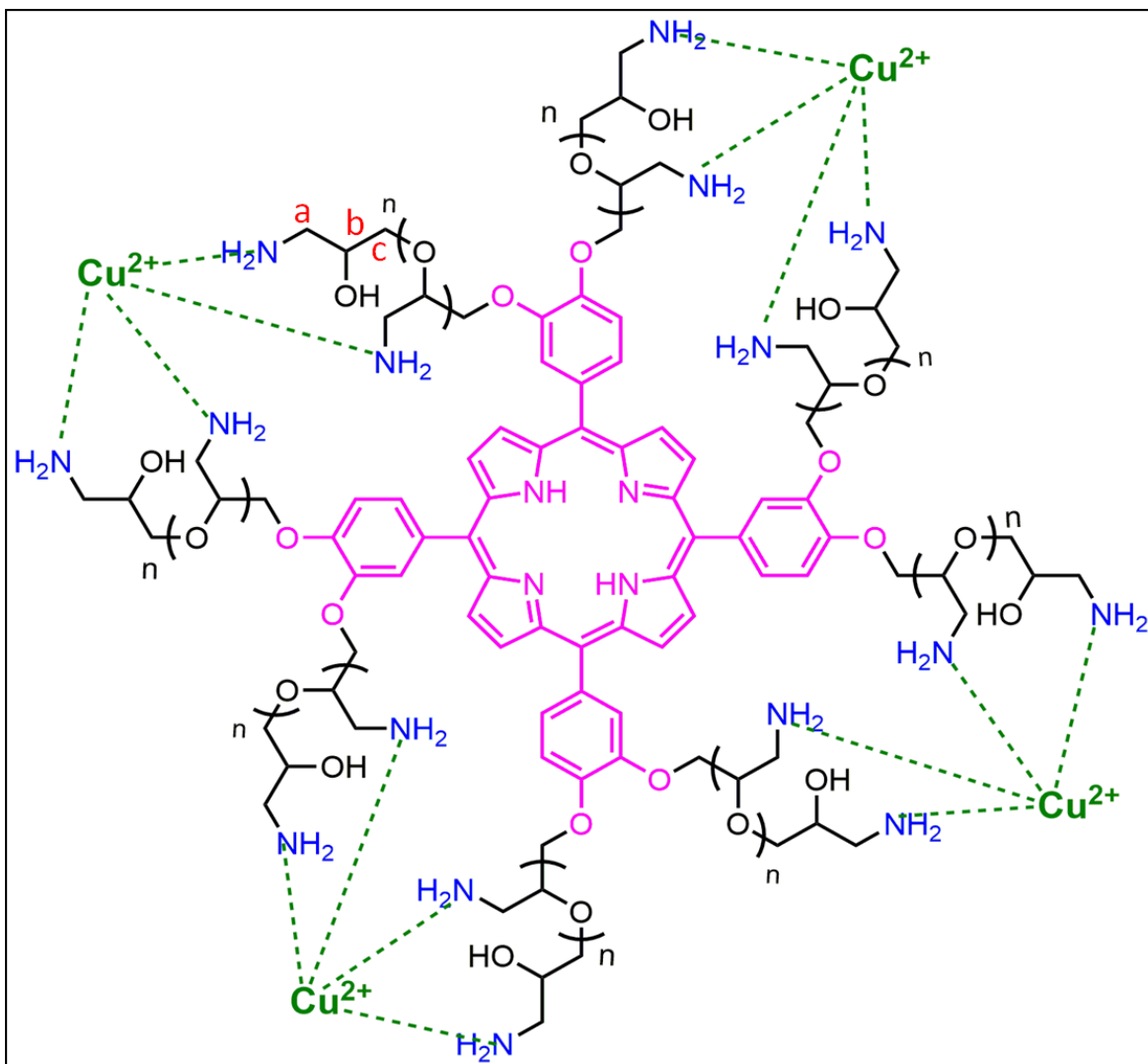


Figure No.	Content	Page No.
S1	Scheme for the synthesis of PPECH-Amine-Cu	3
S2	FT-IR spectrum and GPC Report of POR-PECH	5
S3	FT-IR spectrum of PPECH-Amine	7
S4	^1H and ^{13}C NMR spectrum of PPECH-Amine	8
S5	GPC Report of POR-PECH-amine	9
S6	FE- SEM image of PPECH-Amine	10
S7	UV-Vis spectrum of PPECH-Amine & spectrum of PPECH-Amine-Cu	11
S8	^1H NMR spectrum of PPECH-Amine-Cu	12
S9	^{13}C NMR and DEPT-135 spectrum of PPECH-Amine-Cu	13
S10	TG-DTA Trace of PPECH-Amine- Cu	14
S11	PXRD image of PPECH-Amine- Cu	15
S12	FE- SEM image of PPECH-Amine- Cu	15
S13	HR-TEM image of PPECH-Amine- Cu	16
S14	XPS Spectra of PPECH-Amine- Cu	17
S15	EDX image of PPECH-Amine- Cu	18
S16	^1H and ^{13}C NMR of selected Aromatic amines	19

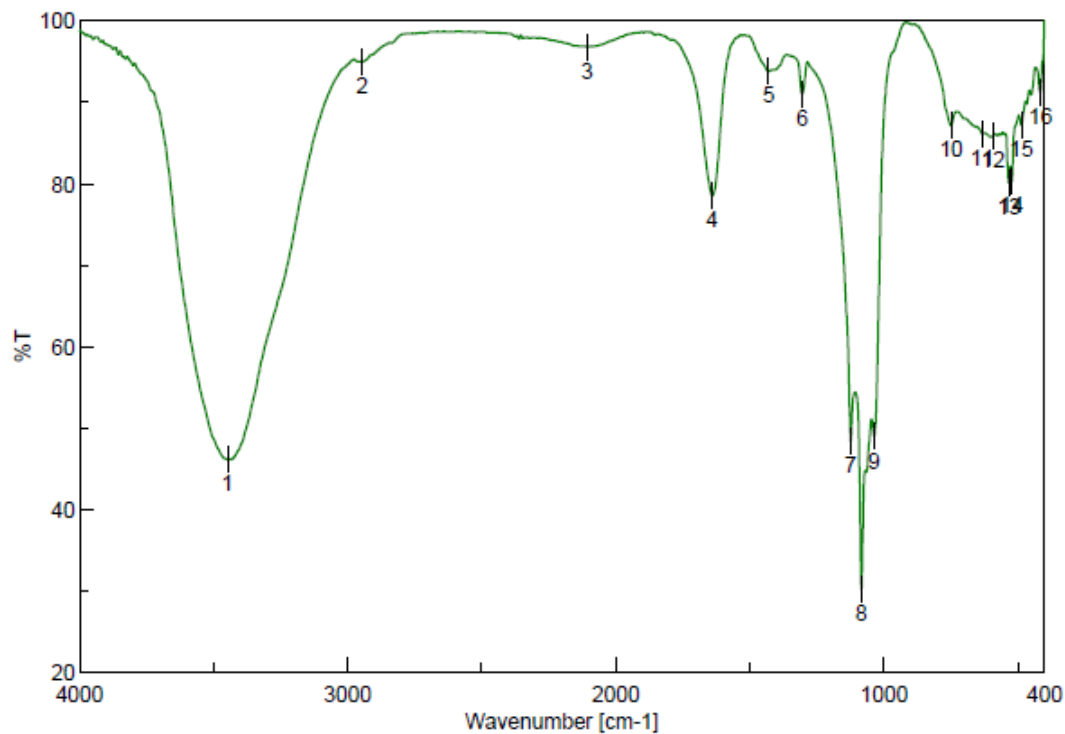
S1. Scheme for the synthesis of PPECH-Amine-Cu



Structure of PPECH-Amine-Cu



S2. FT-IR spectrum and GPC Report of POR-PECH



Result of Peak Picking

No.	Position	Intensity	No.	Position	Intensity
1	3448.1	46.0408	2	2946.7	94.9201
3	2106.85	96.787	4	1639.2	78.4645
5	1428.99	93.7592	6	1304.61	90.9546
7	1123.33	48.3097	8	1082.83	30.0692
9	1035.59	48.8874	10	749.209	87.0822
11	633.501	86.0612	12	592.039	85.8604
13	533.221	80.0705	14	522.615	80.2824
15	486.938	87.1023	16	416.549	91.2245

[Comment]

Sample Name
 Comment
 User
 Division
 Company inst

[Measurement Information]

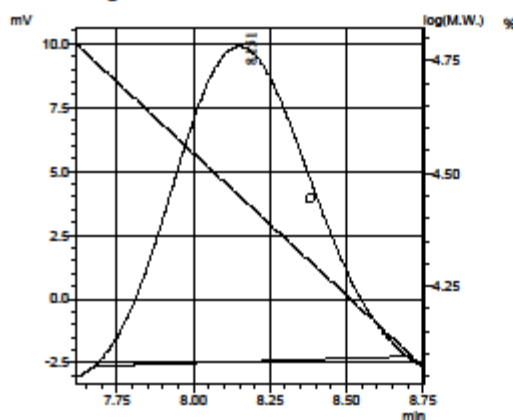
Model Name FT/IR-4100typeA
 Serial Number B053361016

Light Source Standard
 Detector TGS
 Accumulation 60
 Resolution 4 cm-1
 Zero Filling On
 Apodization Cosine
 Gain Auto (8)
 Aperture Auto (7.1 mm)
 Scanning Speed Auto (2 mm/sec)
 Filter Auto (30000 Hz)

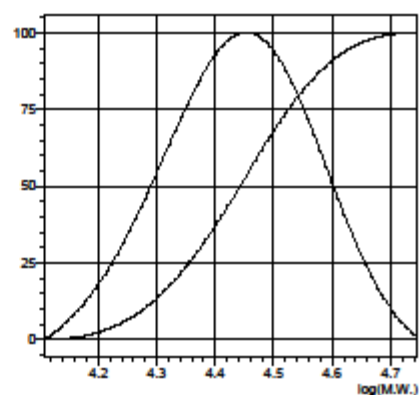
==== Shimadzu LabSolutions GPC Analysis Report ====

Acquired by : System Administrator
 Sample Name : por-pech
 Sample ID : POR-PECH
 Tray# : 1
 Vial# : 42
 Injection Volume : 10 uL
 Data Filename : AVP1
 Method Filename : GPC Polystyrene 07022018 C.lcm
 Batch Filename : QUE.lcb
 Report Filename : DEFAULT1sr
 Date Acquired : 3/5/2019 8:01:55 PM
 Date Processed : 7/2/2019 4:04:28 PM

Chromatogram & Calibration Curve



Molecular Weight Distribution Curve



GPC Calculation Results

Peak#:1 (Detector B Channel 1)

[Peak Information]

	Time(min)	Volume(mL)	Molecular Weight	Height
Start	8.625	8.625	14173	7989
Top	9.000	9.000	8236	1331
End	9.250	9.250	5733	7618

Area : 24557

Area% : 100.0000

[Average Molecular Weight]

Number Average Molecular Weight(Mn)	8288
Weight Average Molecular Weight(Mw)	8572
Z Average Molecular Weight(Mz)	8885
Z+1 Average Molecular Weight(Mz1)	9224
Mw/Mn	1.03423
Mv/Mn	0.00000
Mz/Mw	1.03655

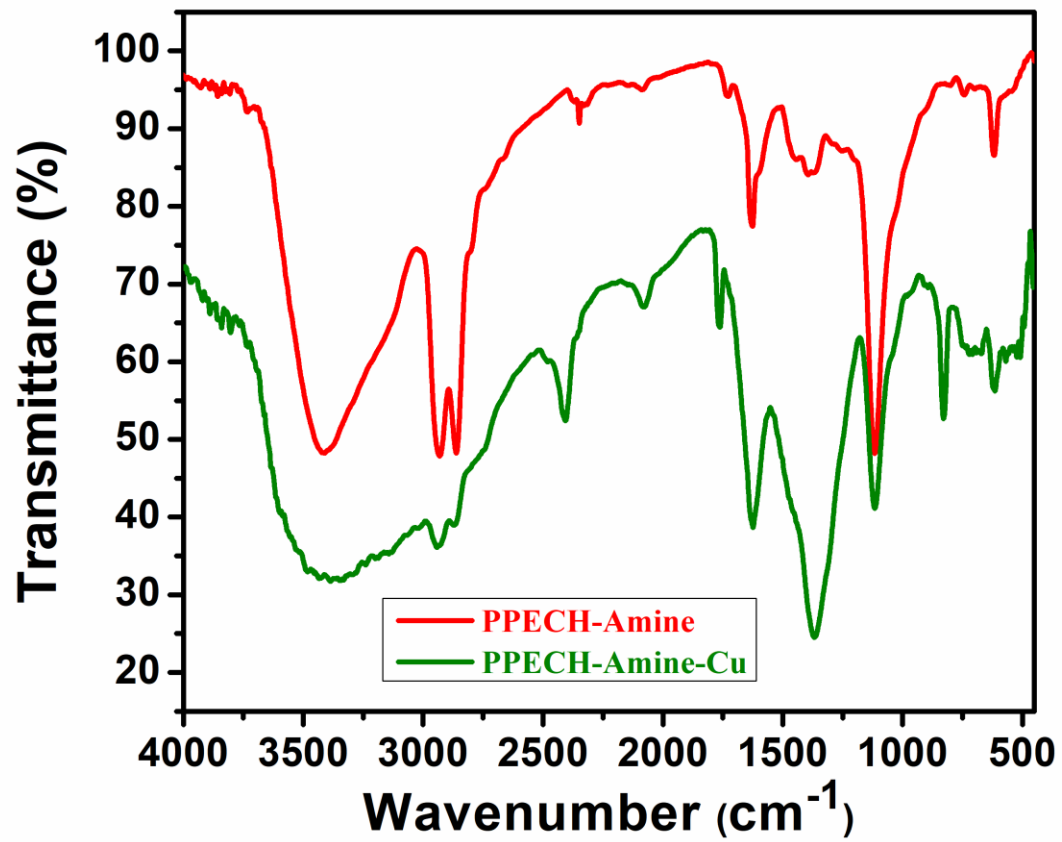
Detector B Channel 1

[Average Molecular Weight(Total)]

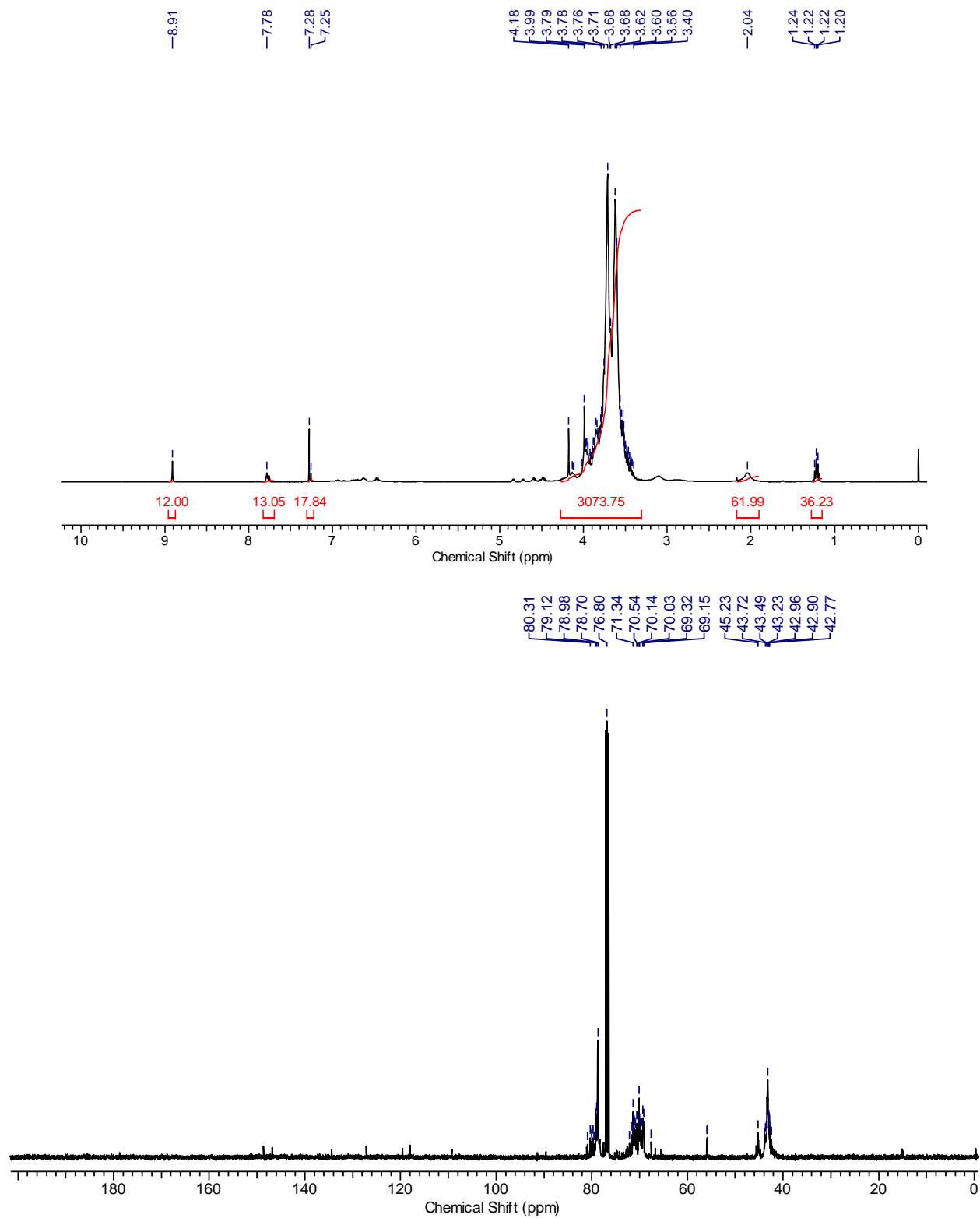
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Weight Average Molecular Weight(Mw)	8572
Z Average Molecular Weight(Mz)	8885
Z+1 Average Molecular Weight(Mz1)	9224
Mw/Mn	1.03423
Mv/Mn	0.00000
Mz/Mw	1.03655

E:\Data\2019\MARCH\WOT1.lcd

S3. FT-IR spectrum of PPECH-Amine and PPECH-Amine-Cu



S4. ^1H and ^{13}C NMR spectrum of PPECH-Amine



S5. GPC Report of POR-PECH-amine

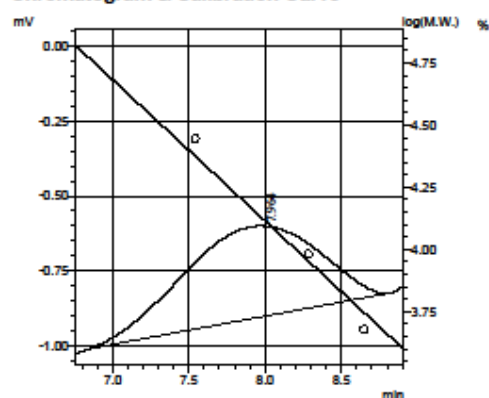
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==== Shimadzu LabSolutions GPC Analysis Report ====

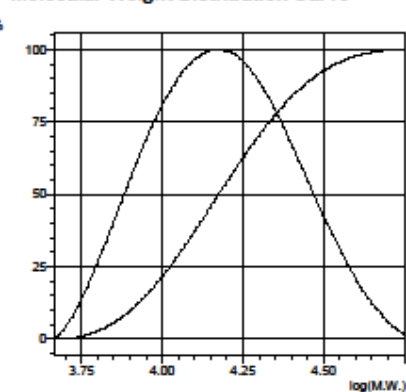
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Sample ID       : POR-PECH-AMINE
Tray#          : 1
Vial#         : 14
Injection Volume : 20 uL
Data Filename   : A4.lcd
Method Filename : GPC Polystyrene 07022018 C.lcm
Batch Filename  : LC_07022018/CL.lcb
Report Filename : DEFAULT.lsr
Date Acquired   : 2/8/2018 1:29:58 PM
Date Processed  : 2/8/2018 2:36:32 PM
    
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Chromatogram & Calibration Curve



Molecular Weight Distribution Curve



GPC Calculation Results

Peak# 1 (Detector B Channel 1)

[Peak Information]

	Time(min)	Volume(mL)	Molecular Weight	Height
Start	6.867	6.867	57434	-1009
Top	7.964	7.964	13650	306
End	8.800	8.800	4569	-827

Area : 19086

Area% : 100.0000

[Average Molecular Weight]

Number Average Molecular Weight(Mn)	13648
Weight Average Molecular Weight(Mw)	17260
Z Average Molecular Weight(Mz)	21724
Z+1 Average Molecular Weight(Mz1)	26495
Mw/Mn	1.26461
Mv/Mn	0.00000
Mz/Mw	1.25866

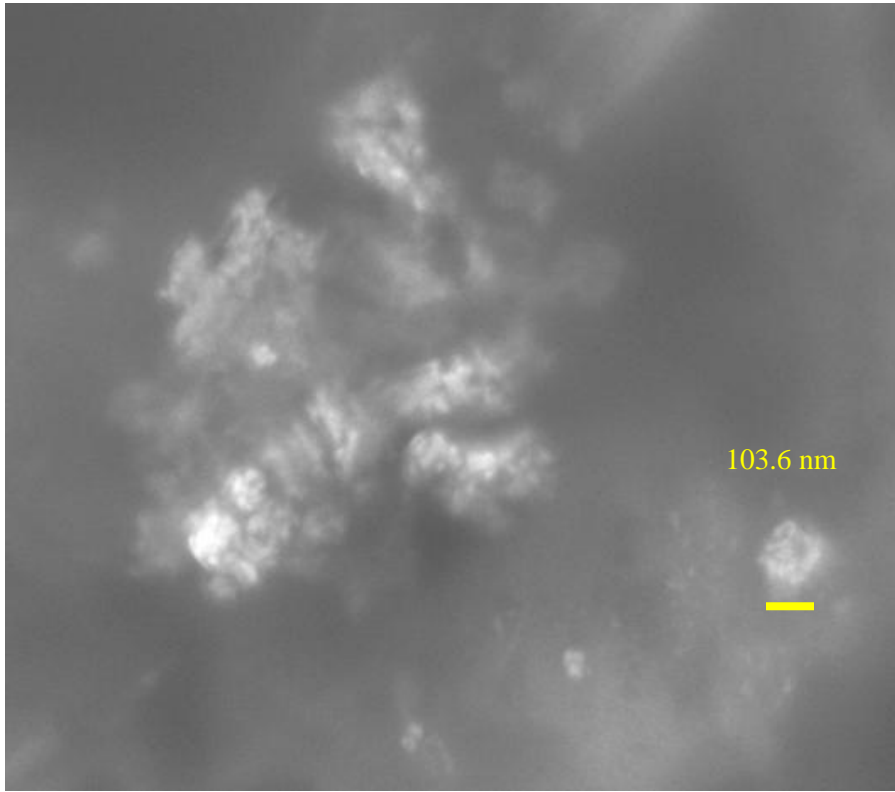
Detector B Channel 1

[Average Molecular Weight(Total)]

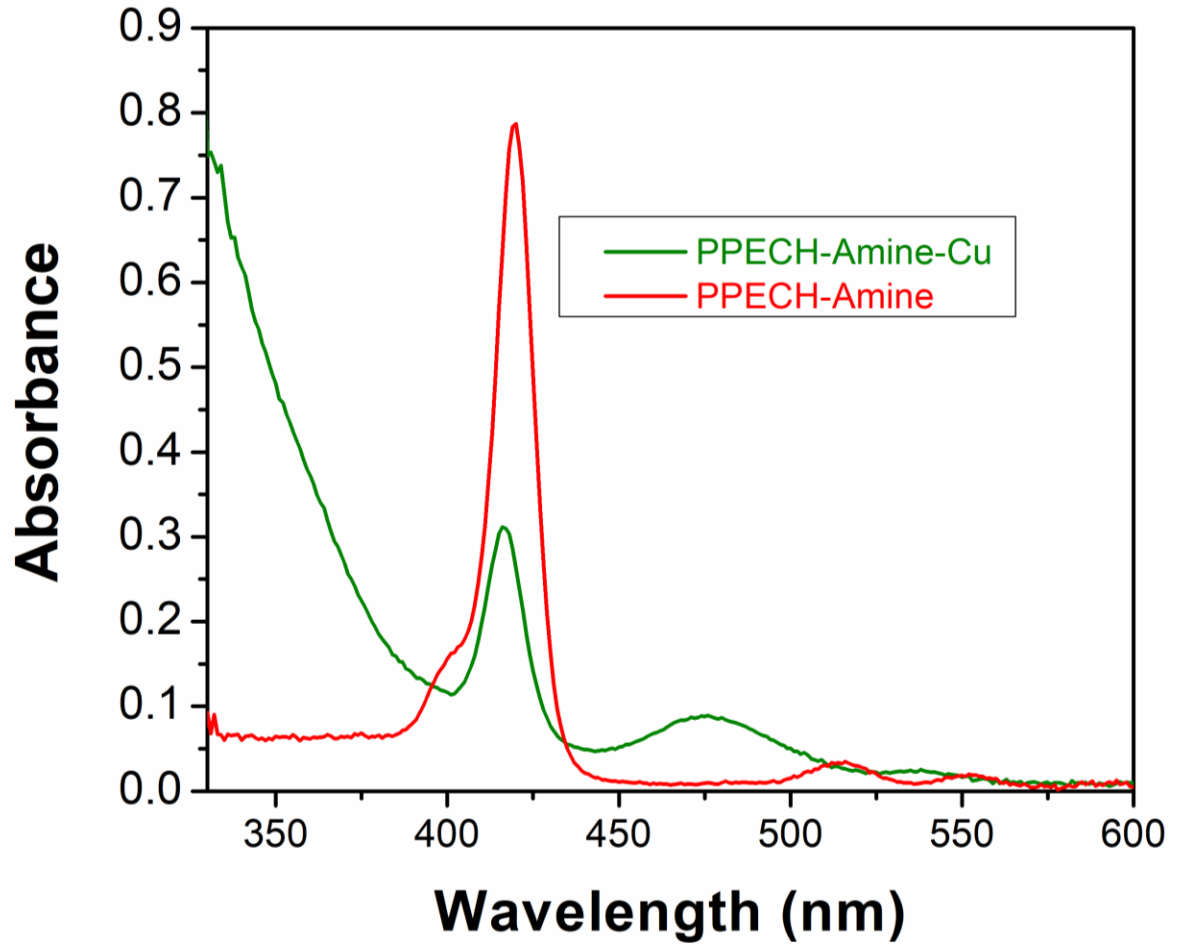
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Weight Average Molecular Weight(Mw)	17260
Z Average Molecular Weight(Mz)	21724
Z+1 Average Molecular Weight(Mz1)	26495
Mw/Mn	1.26461
Mv/Mn	0.00000
Mz/Mw	1.25866

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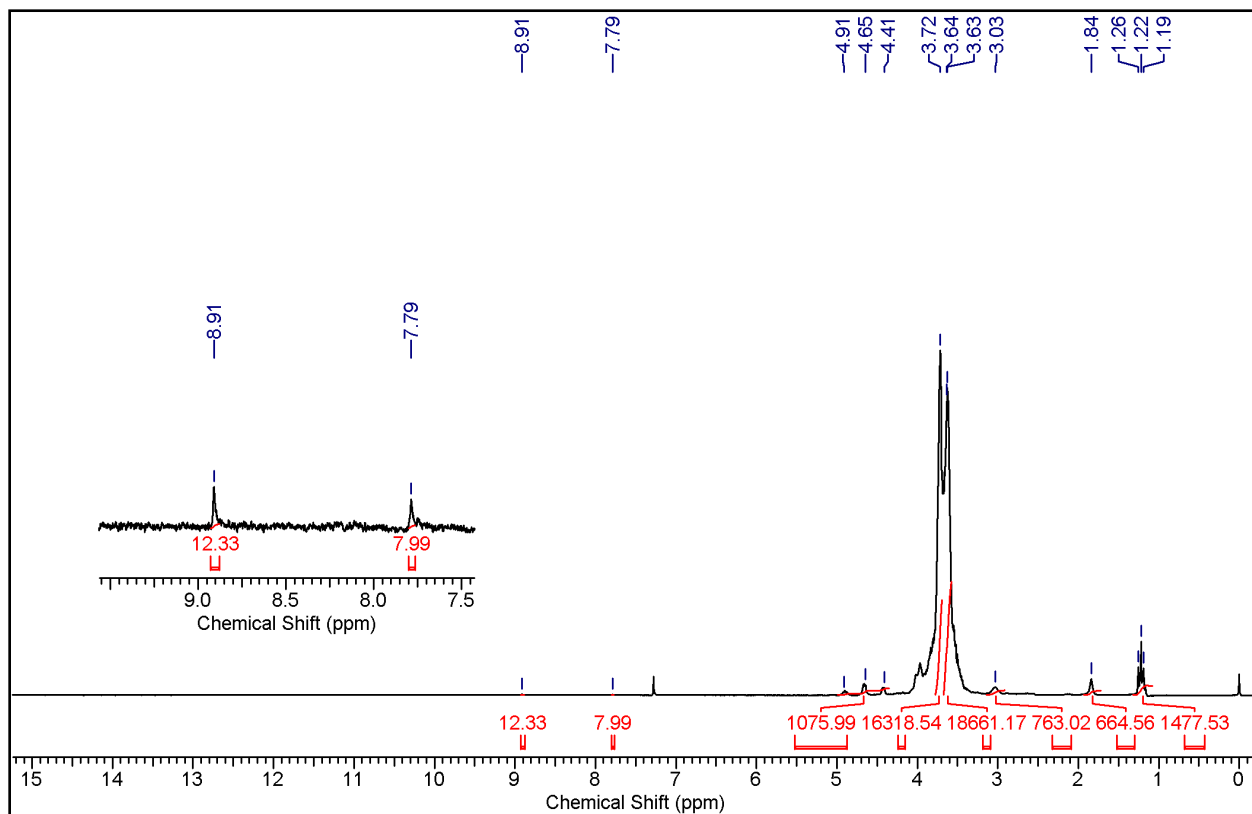
S6. FE- SEM image of PPECH-amine



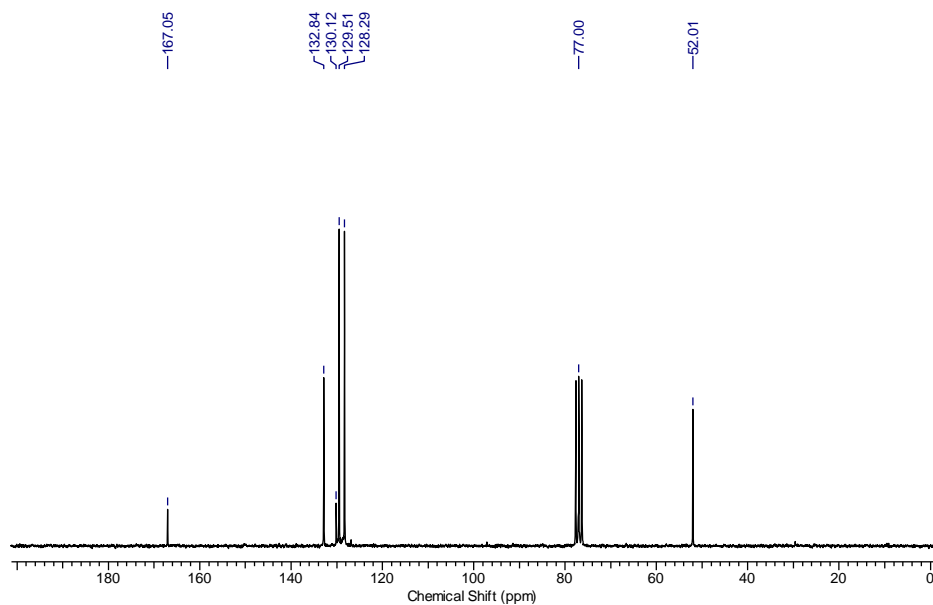
S7. UV-Vis spectrum of PPECH-Amine & spectrum of PPECH-Amine-Cu



S8. ^1H NMR spectrum of PPECH-Amine- Cu

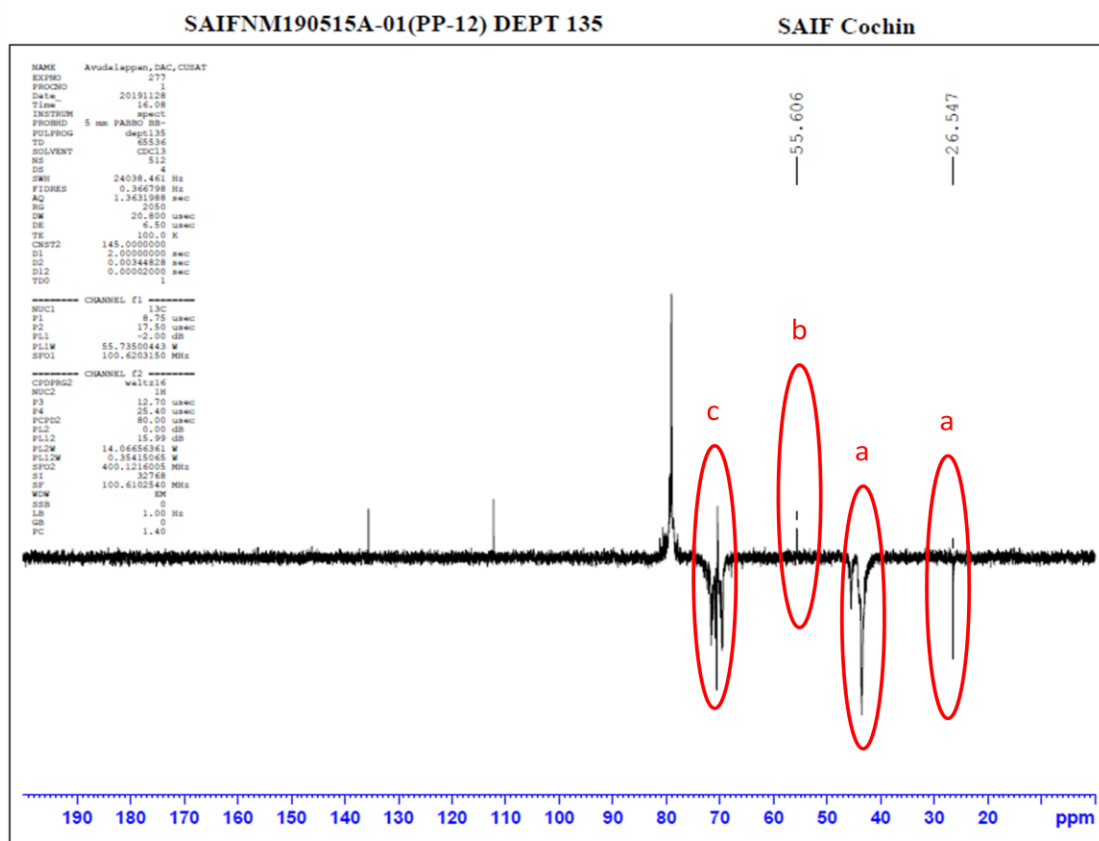


S9A. ¹³C NMR spectrum of PPECH-Amine- Cu

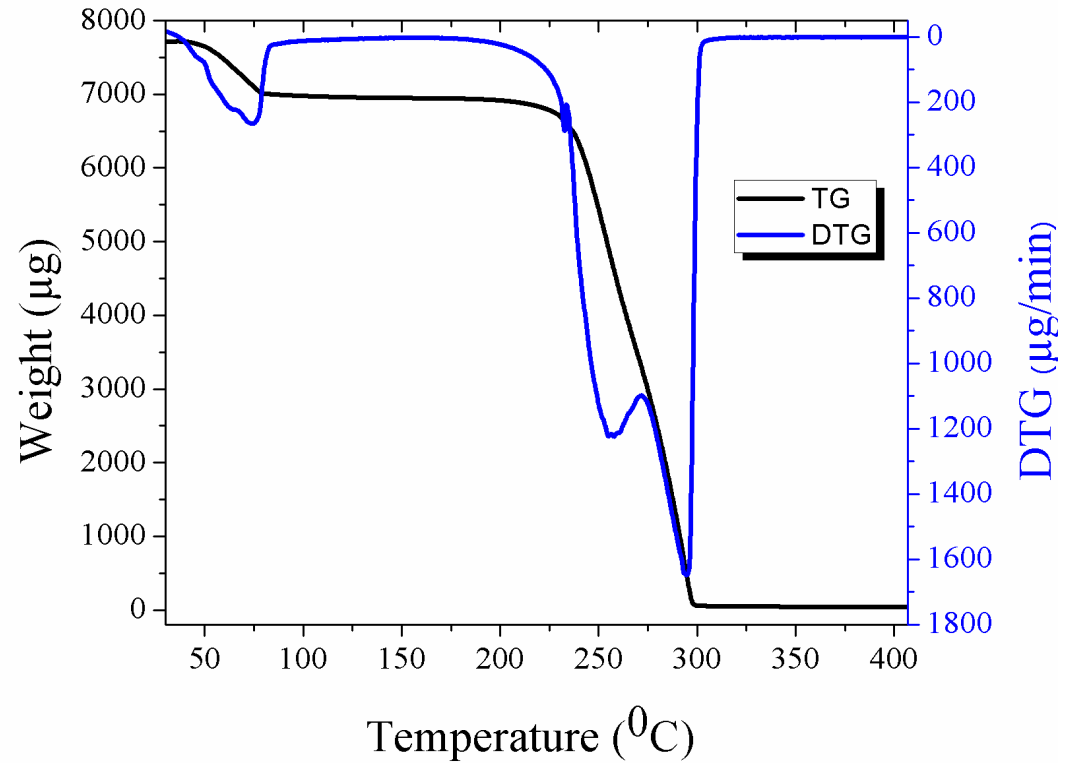


The NOE quench effect of paramagnetic species resulting in partial ¹³C NMR signals were not observable.

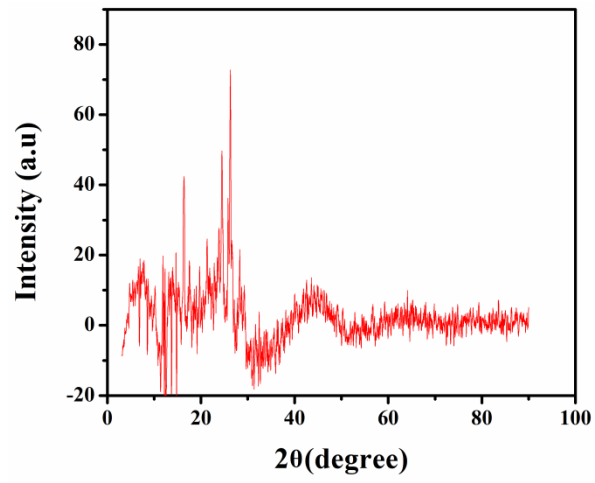
S9B. DEPT-135 spectrum of PPECH-Amine- Cu



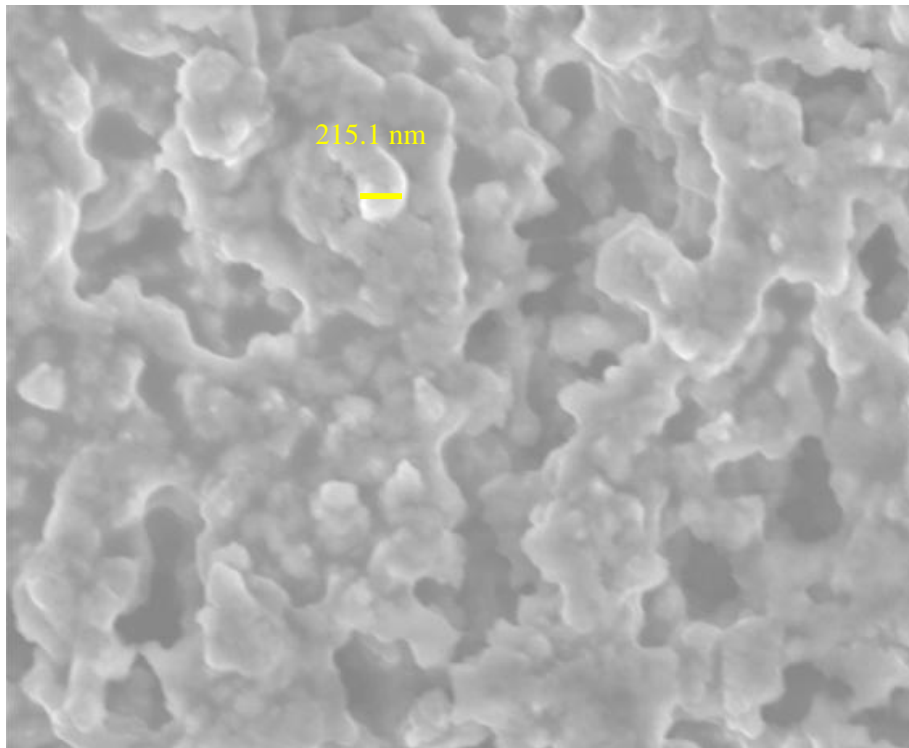
S10. TG-DTA Trace of PBCMO-amine-Cu



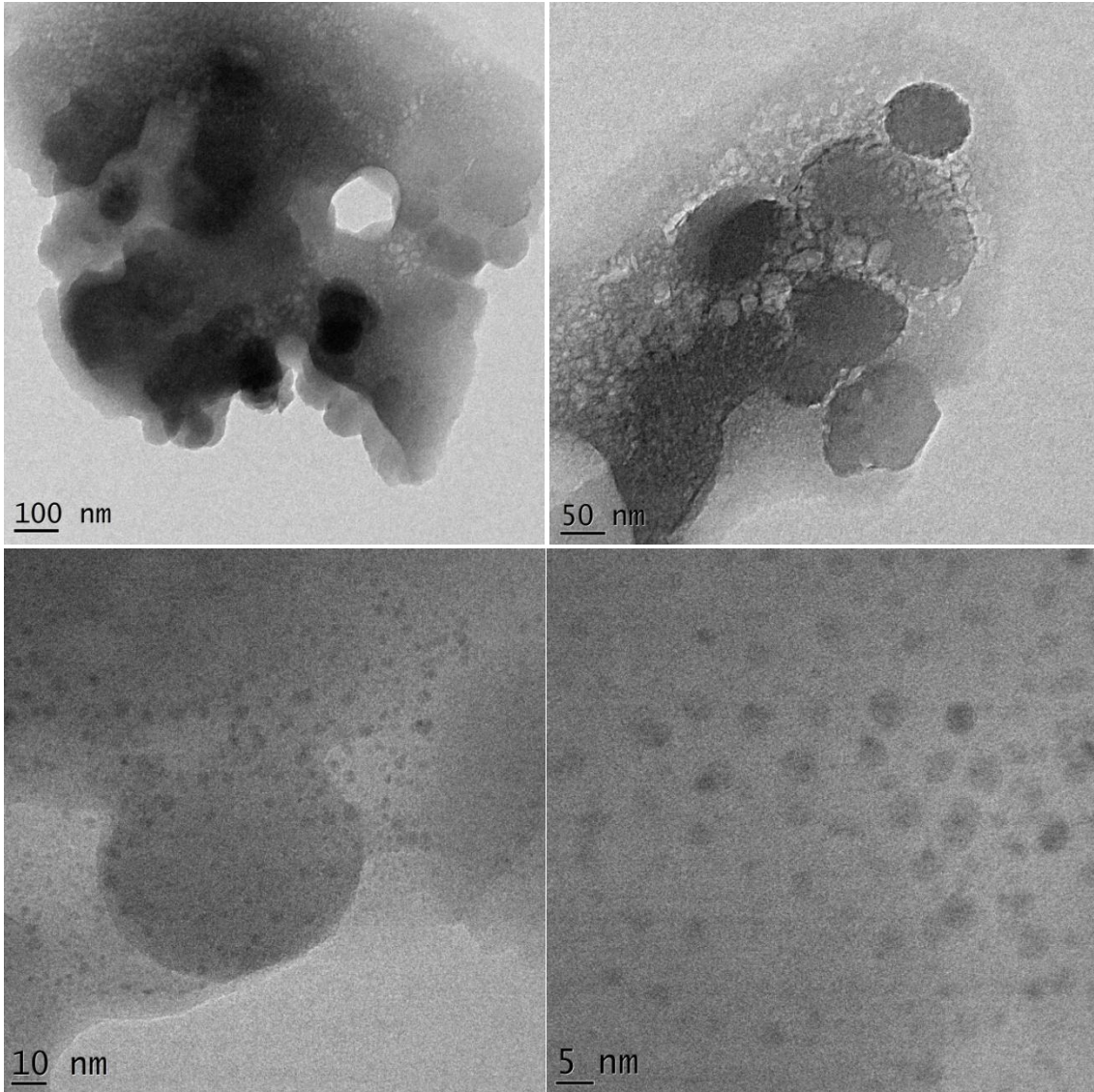
S11. PXRD image of PBCMO-amine-Cu



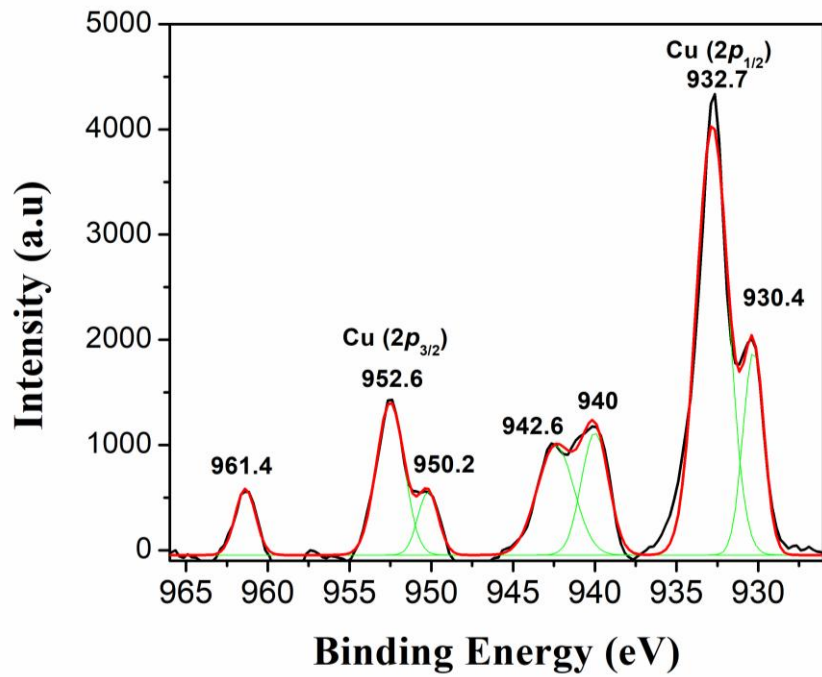
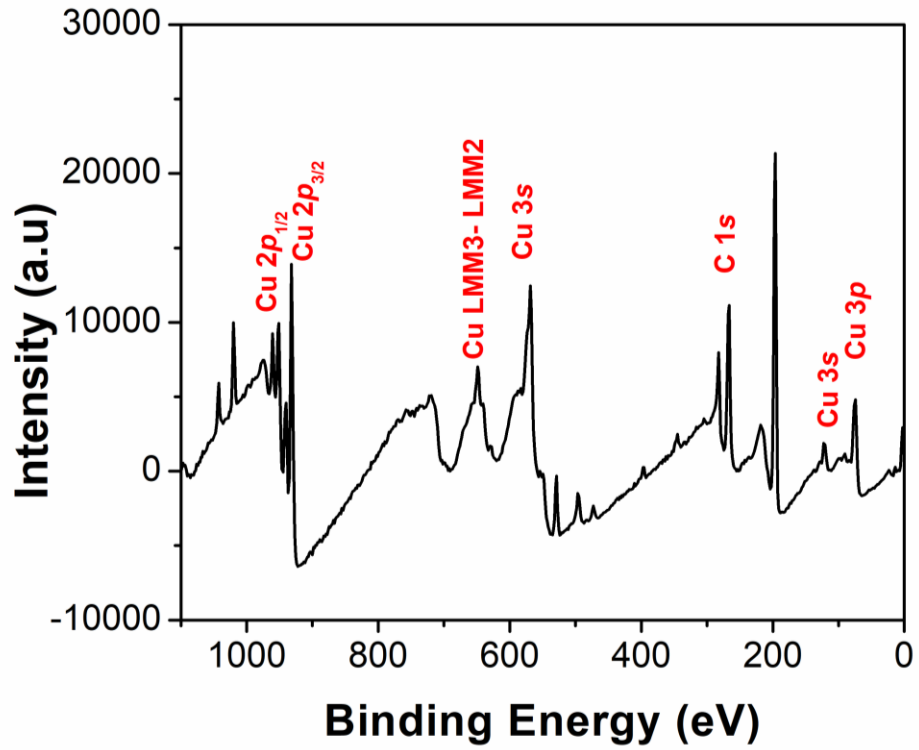
S12. FE- SEM image of POR-PBCMO-amine-Cu



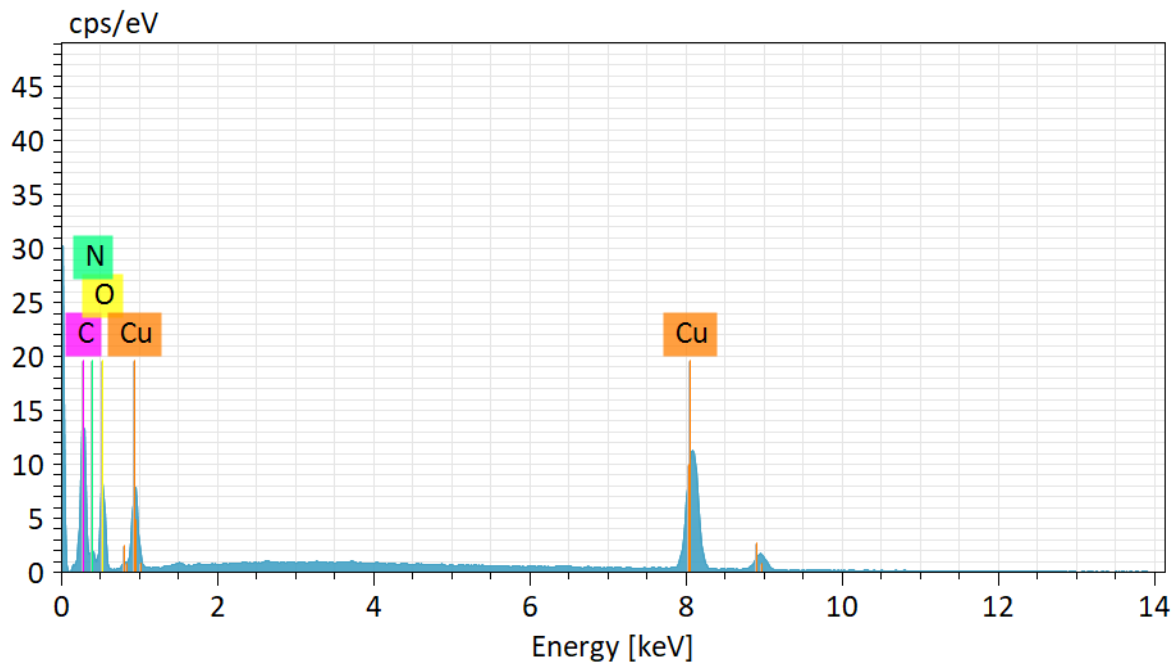
S13. HR-TEM image of PPECH-Amine- Cu



S14. XPS Spectra of PPECH-Amine- Cu



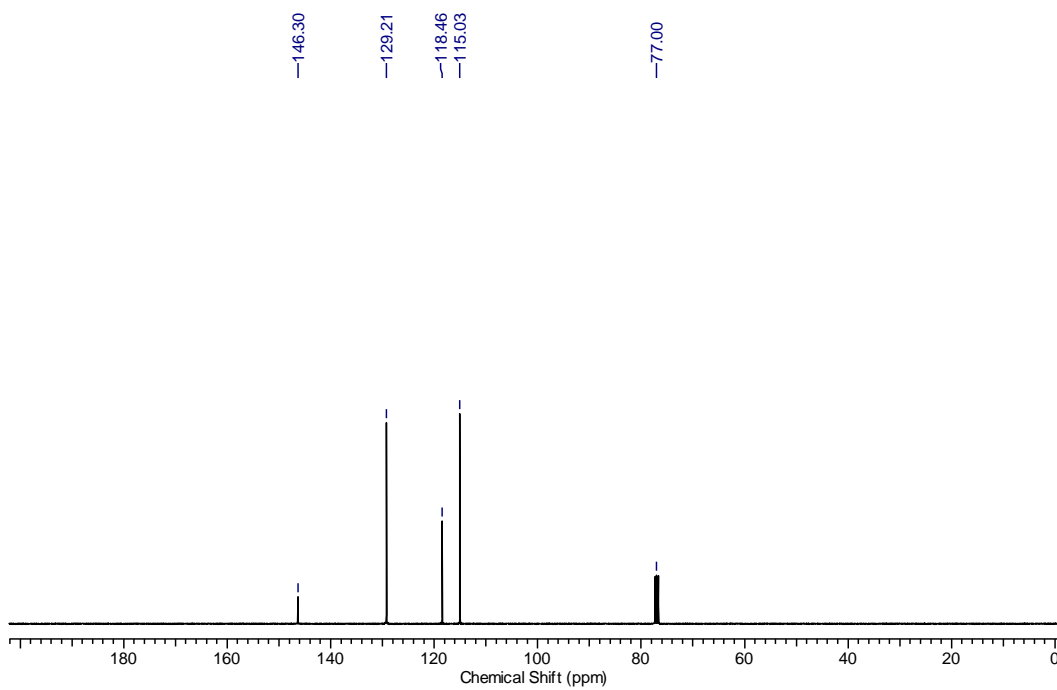
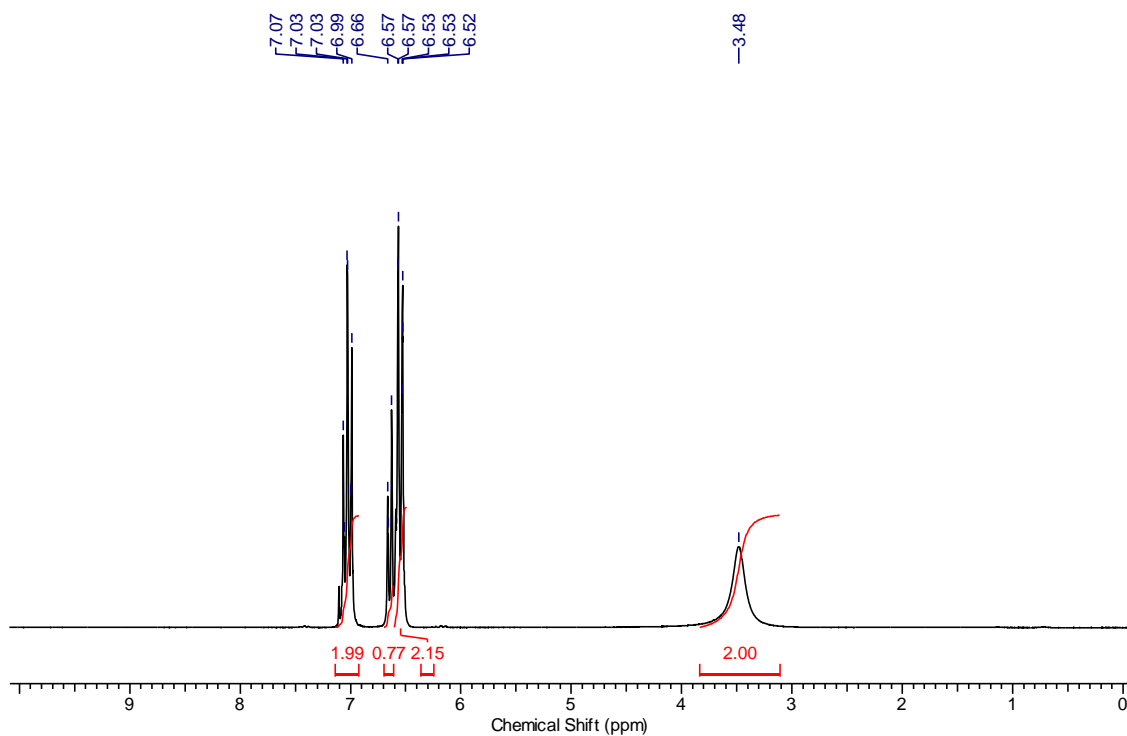
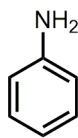
S15. EDX image of PPECH-Amine- Cu

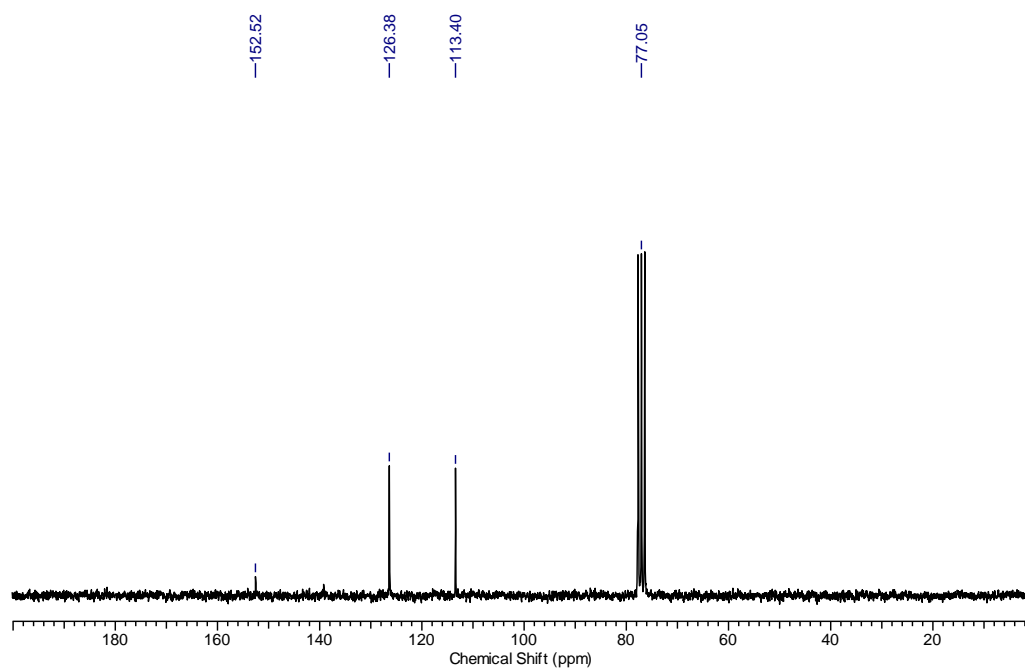
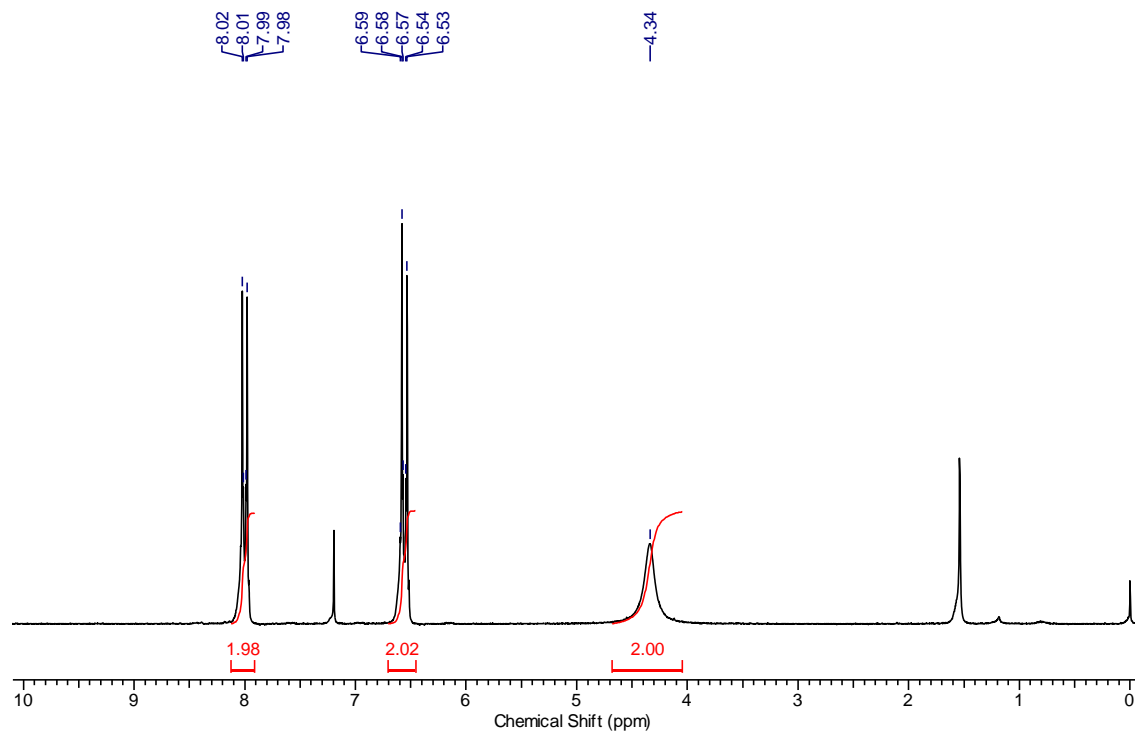
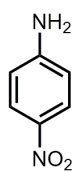


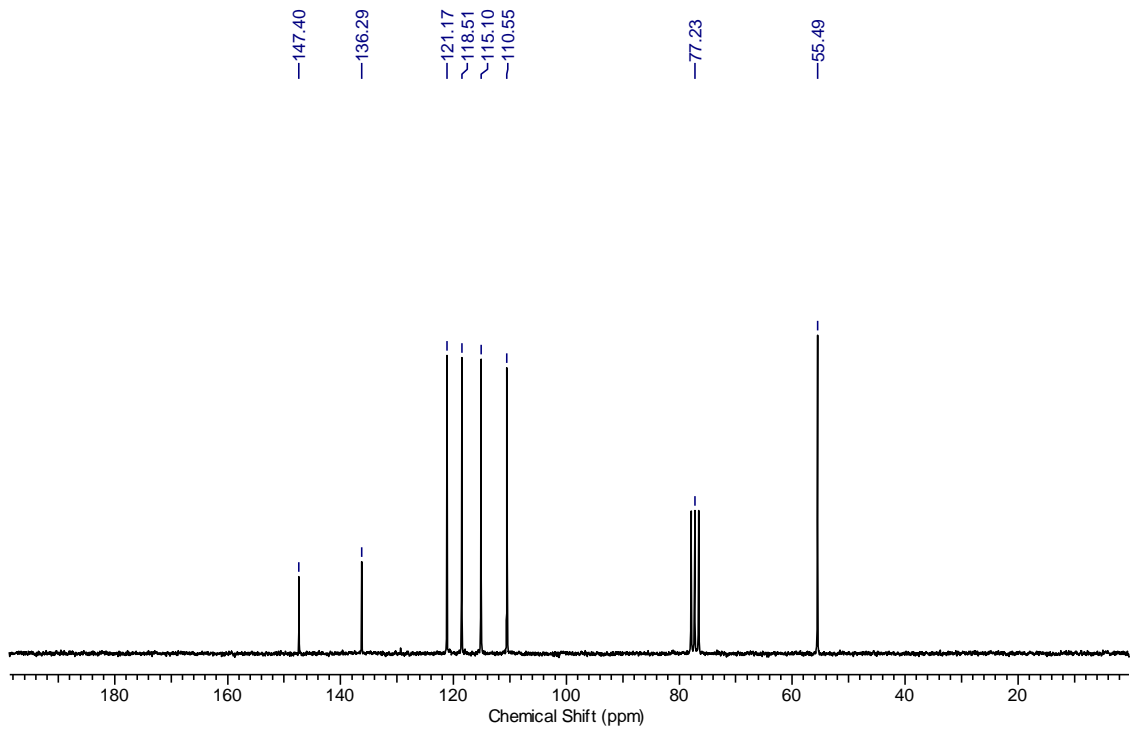
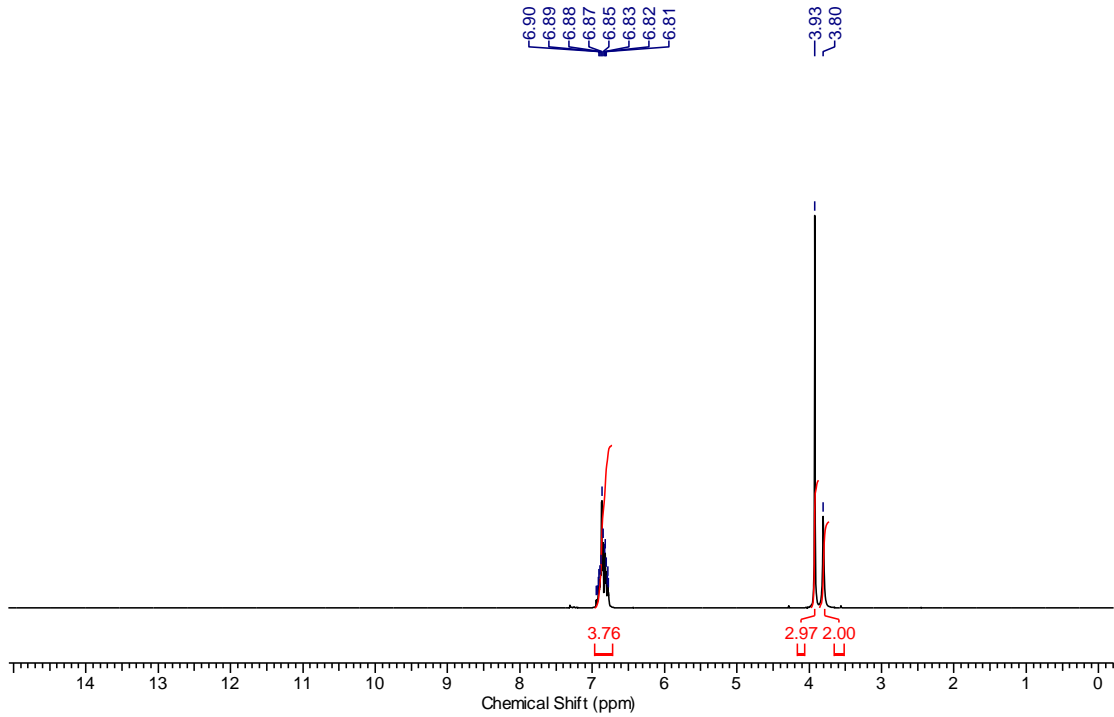
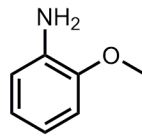
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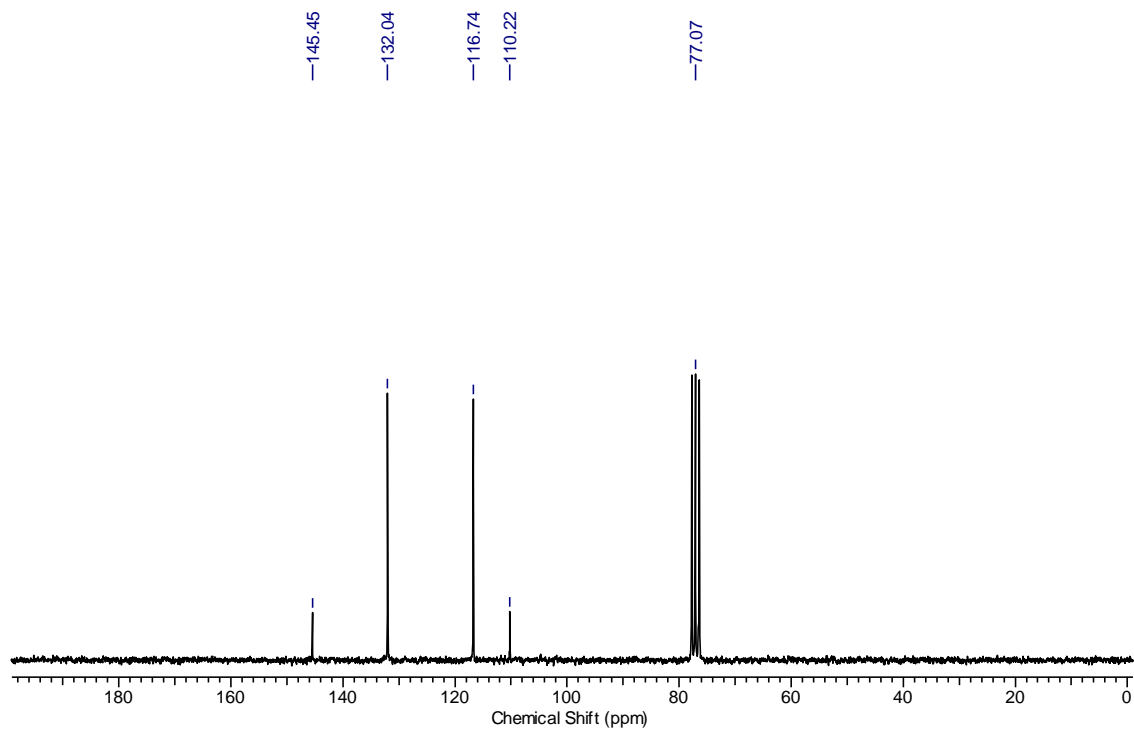
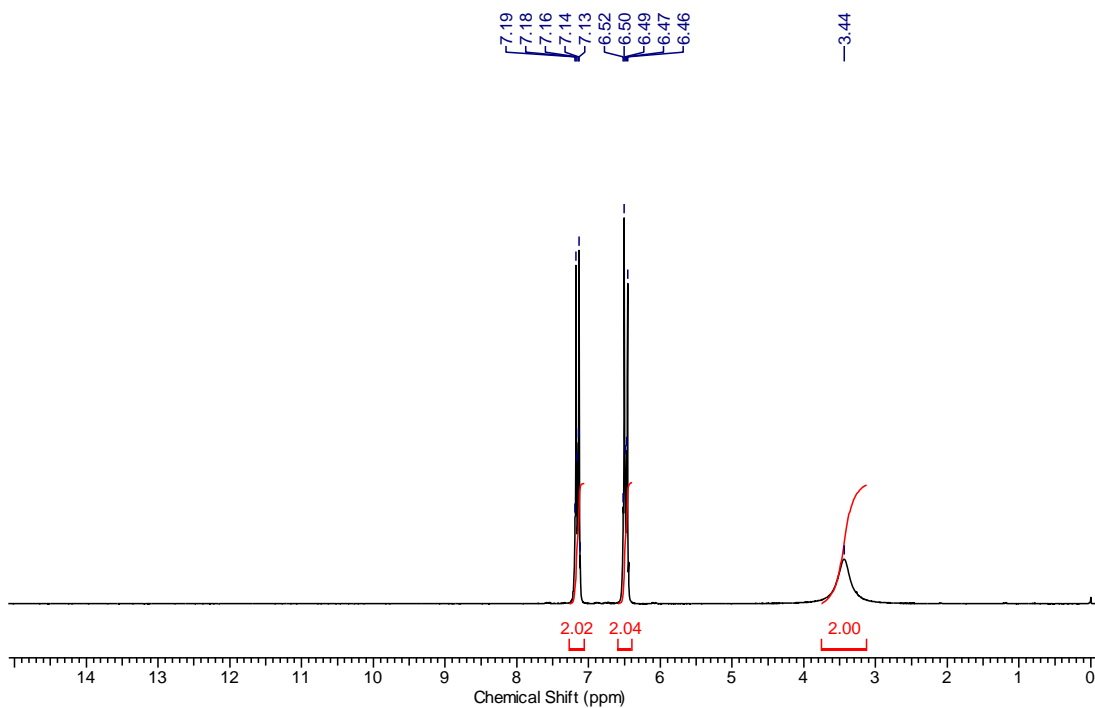
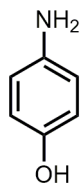
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Carbon	6	16673	9.42	34.88	52.19	1.26	13.36
Oxygen	8	11370	5.56	20.59	23.13	0.79	14.20
Copper	29	29316	8.76	32.46	9.18	0.27	3.04
Nitrogen	7	2847	3.26	12.07	15.49	0.60	18.26
		Sum	27.00	100.00	100.00		

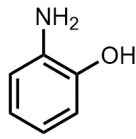
S16. ^1H and ^{13}C NMR of selected Aromatic amines





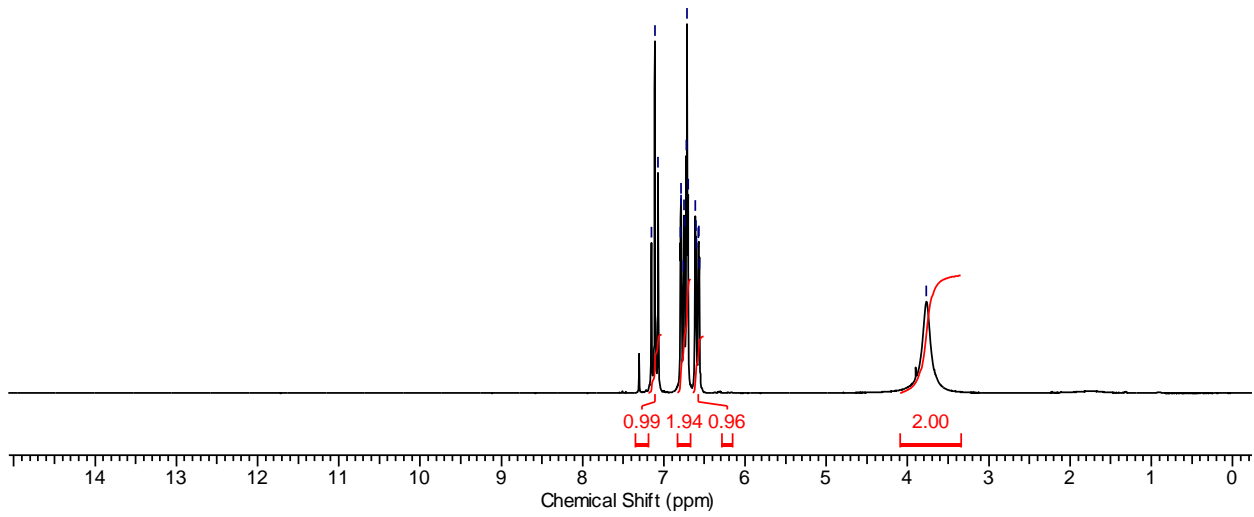






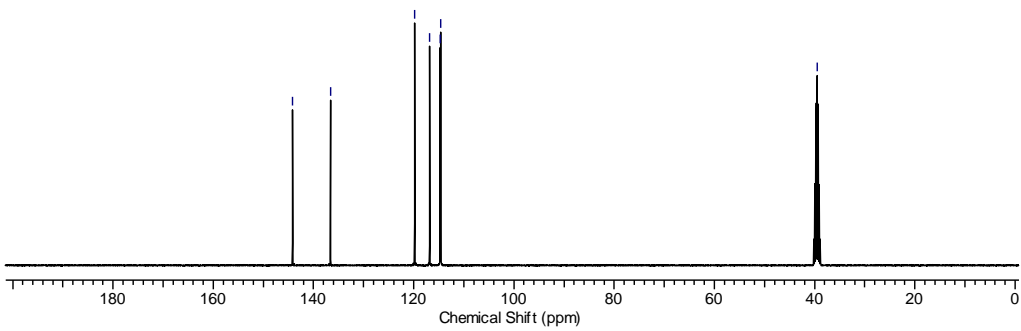
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6.57

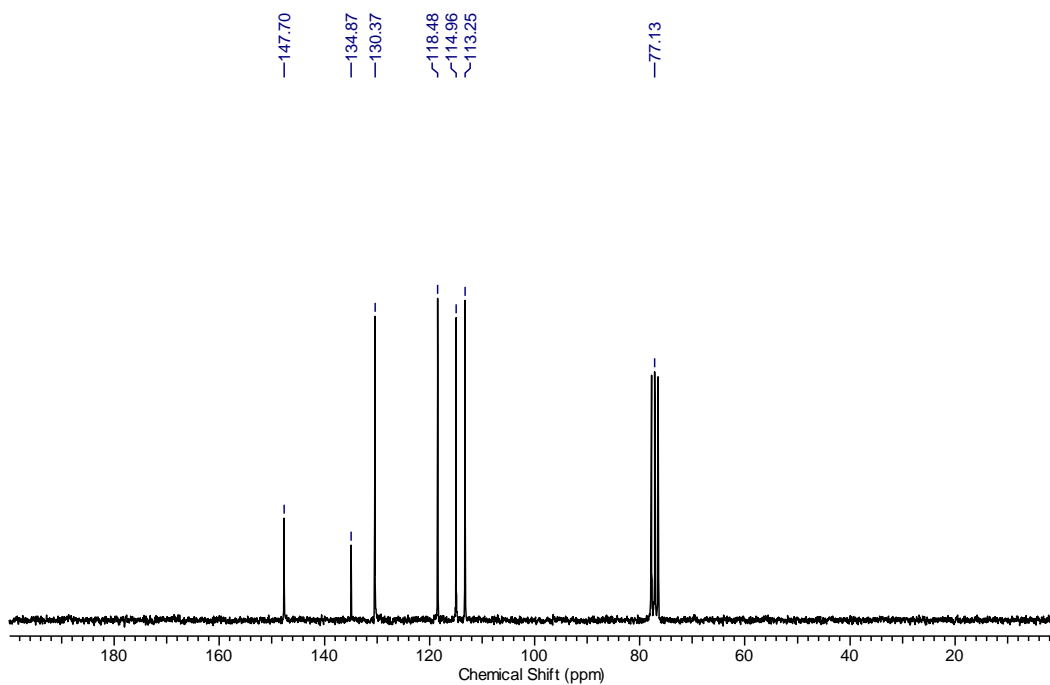
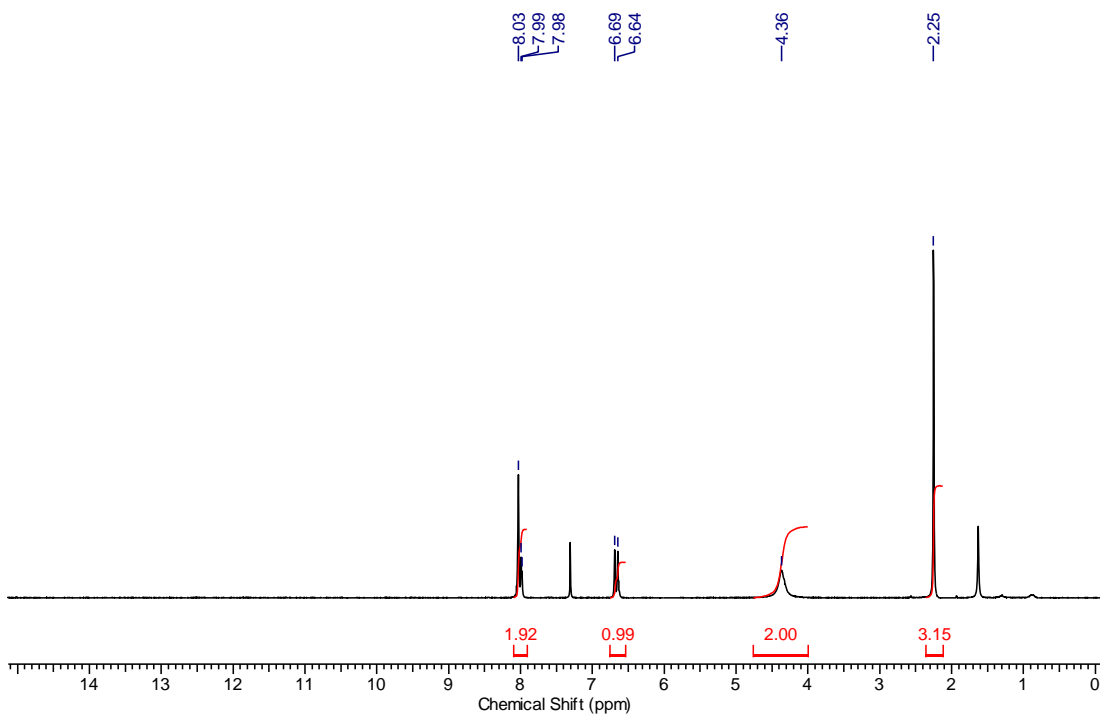
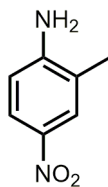
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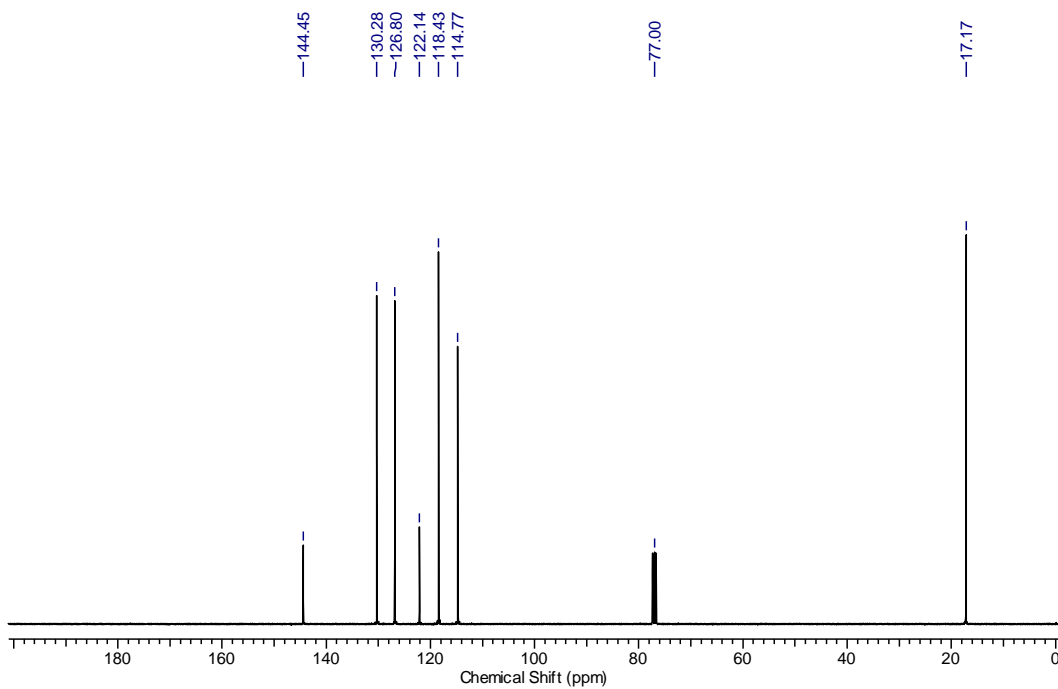
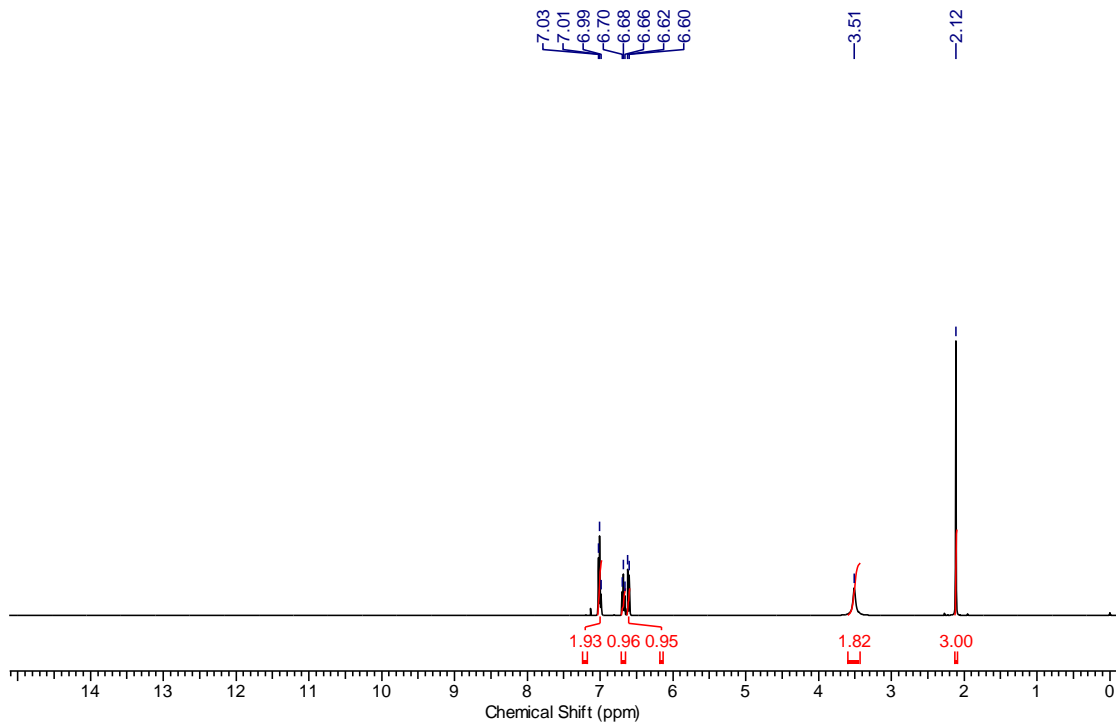
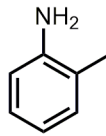


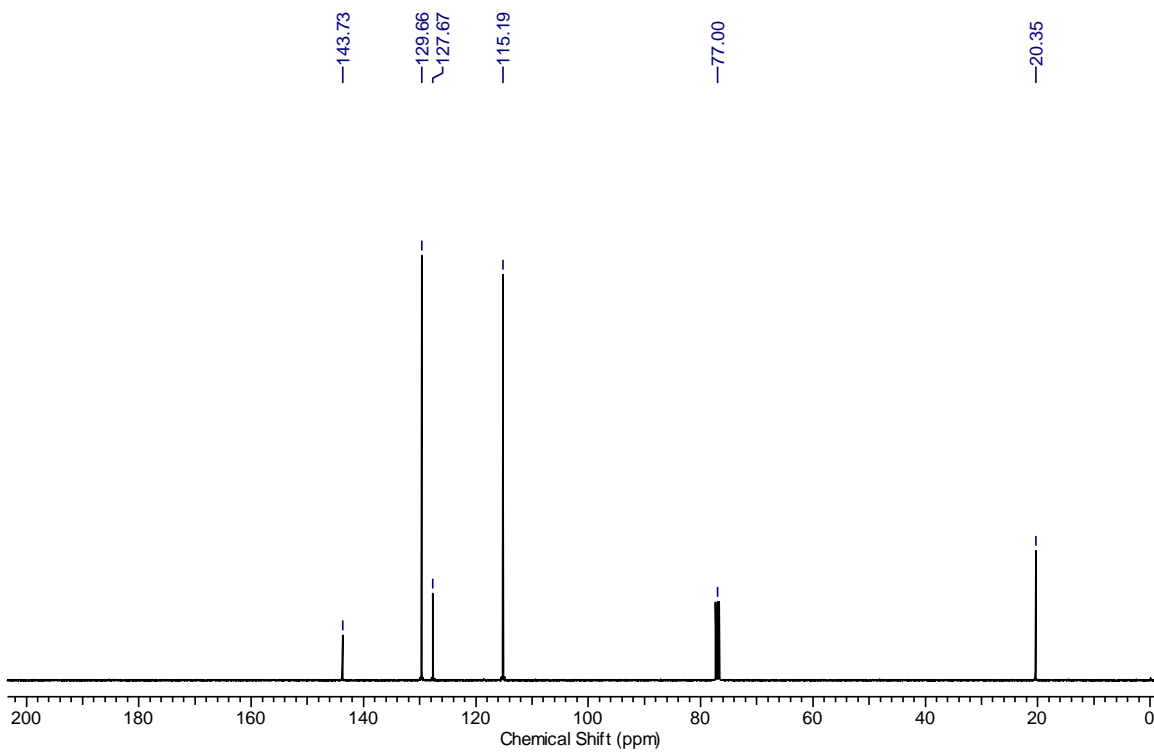
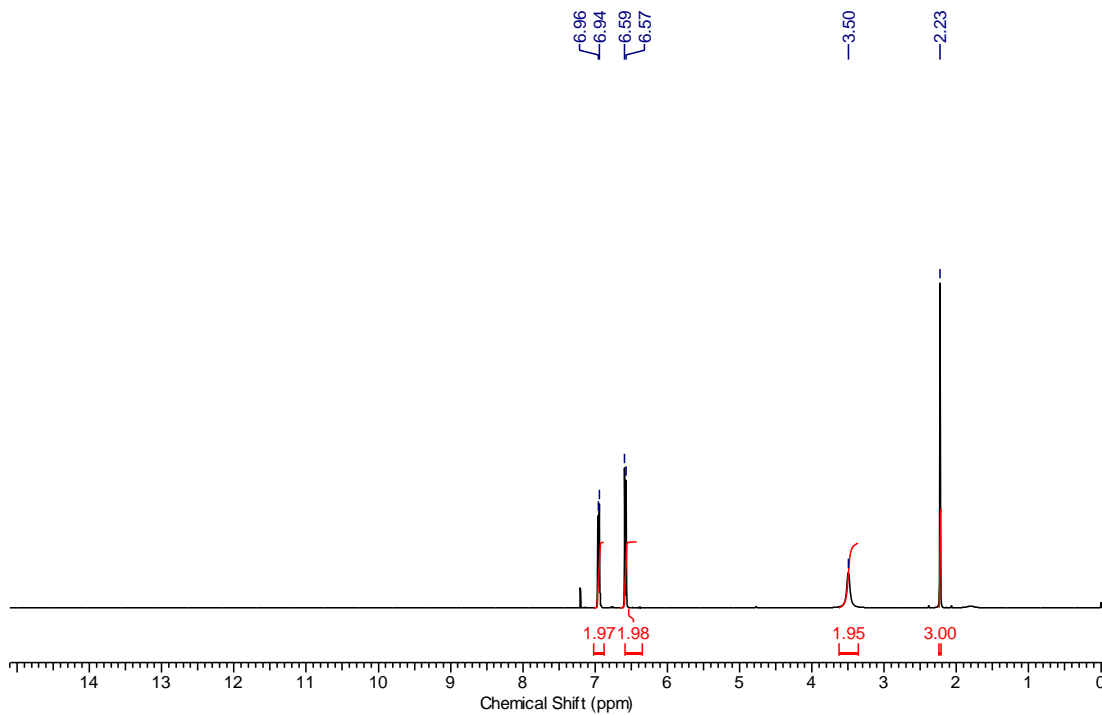
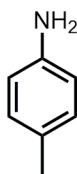
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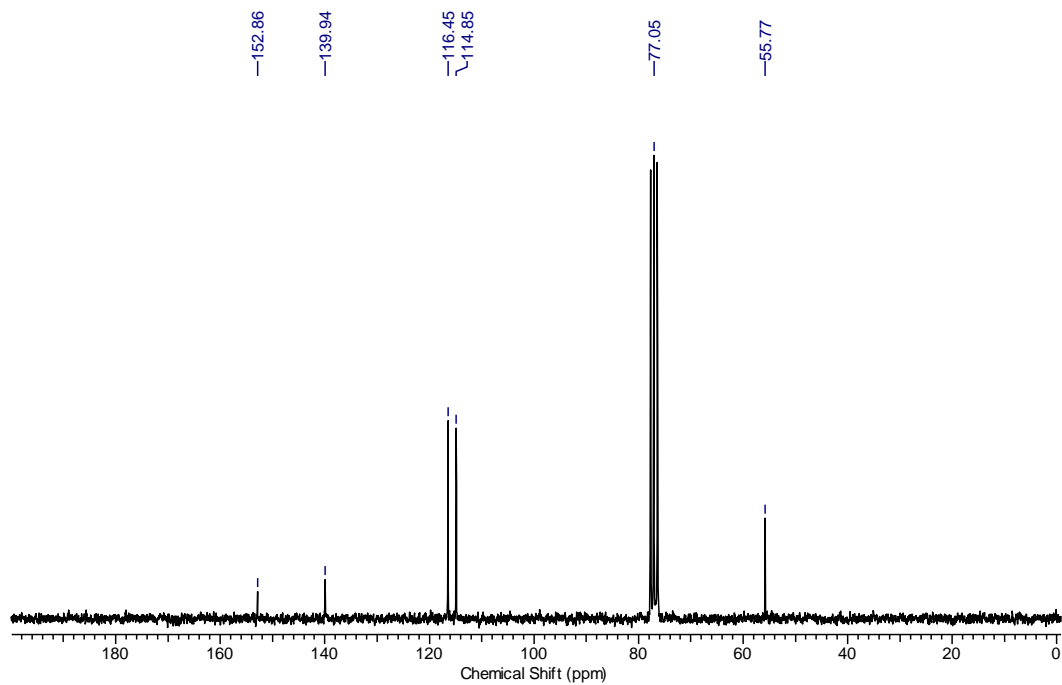
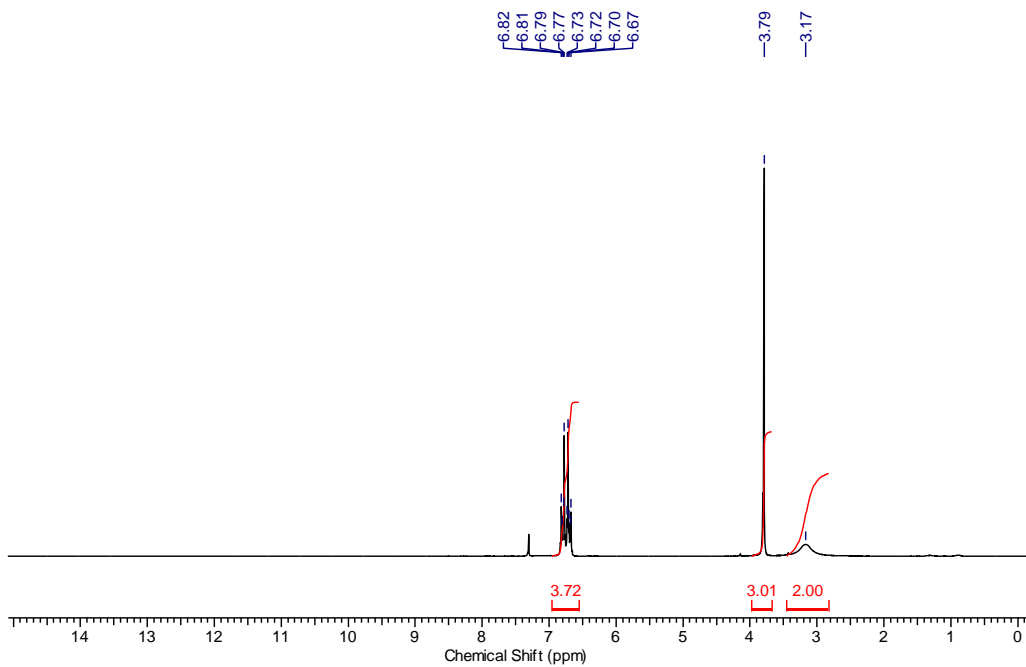
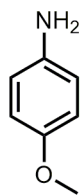
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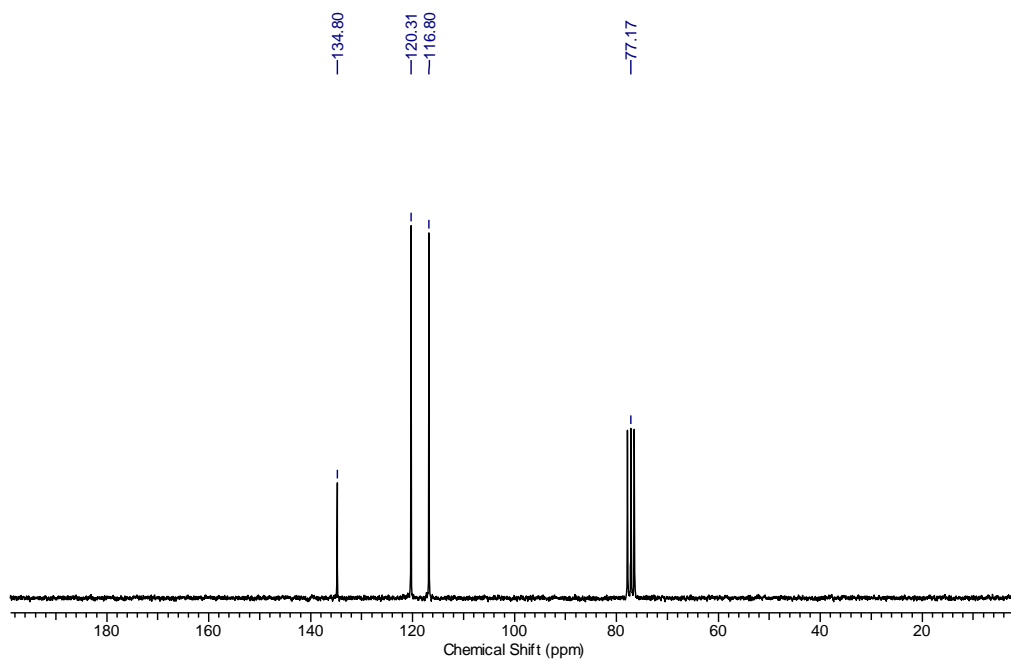
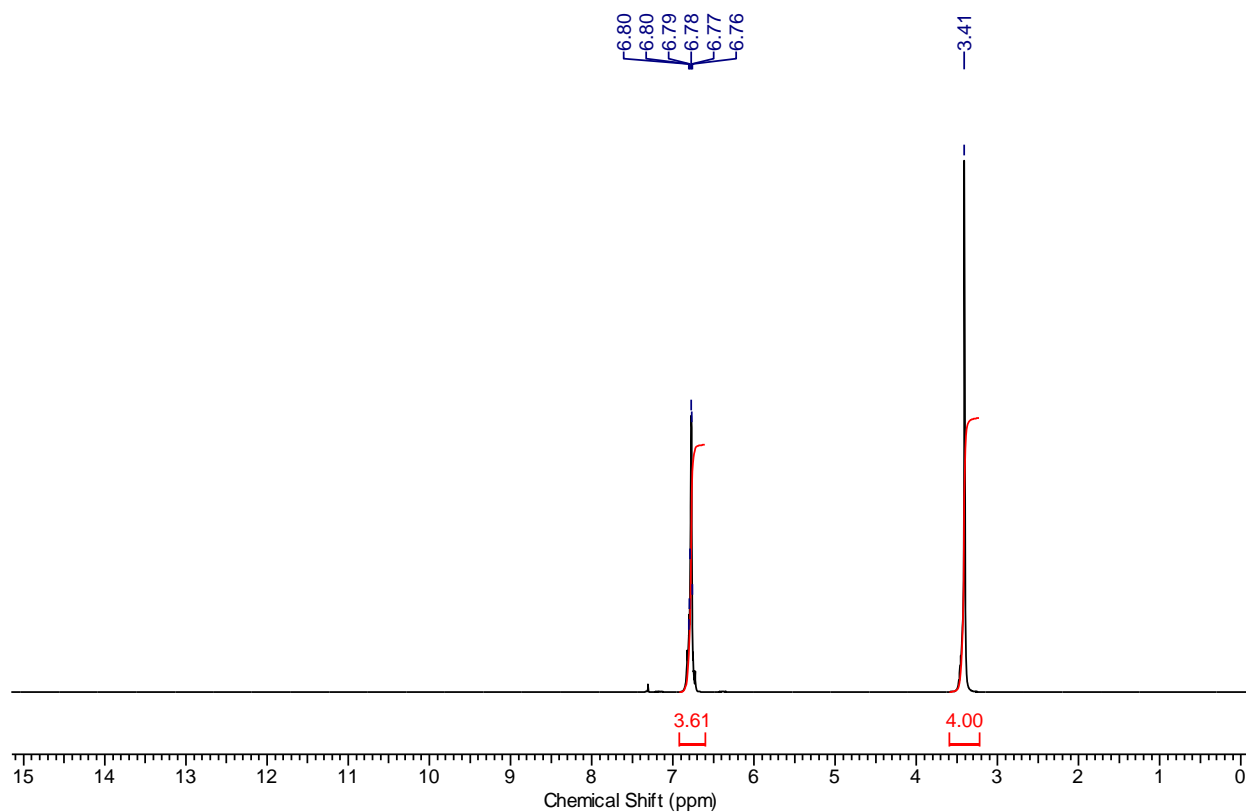
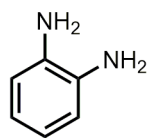


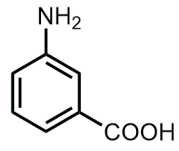




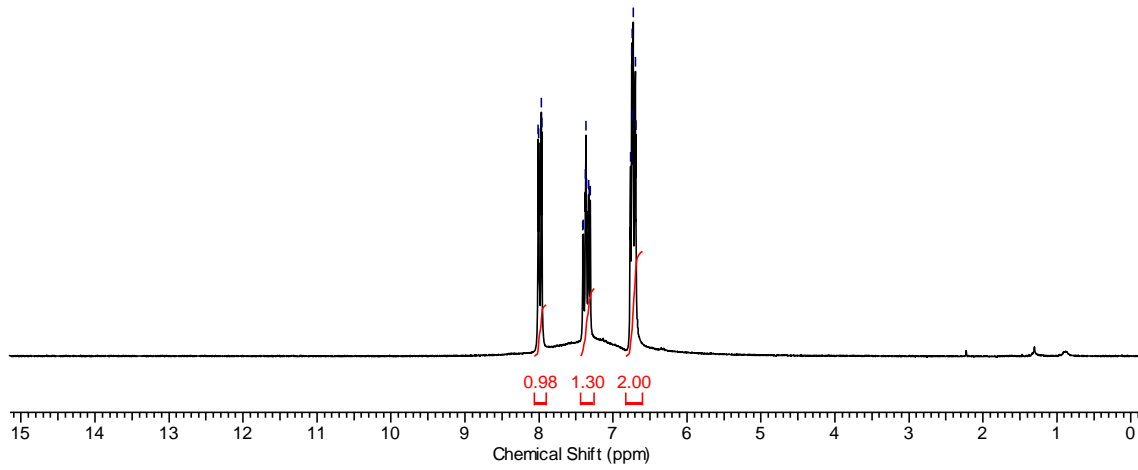




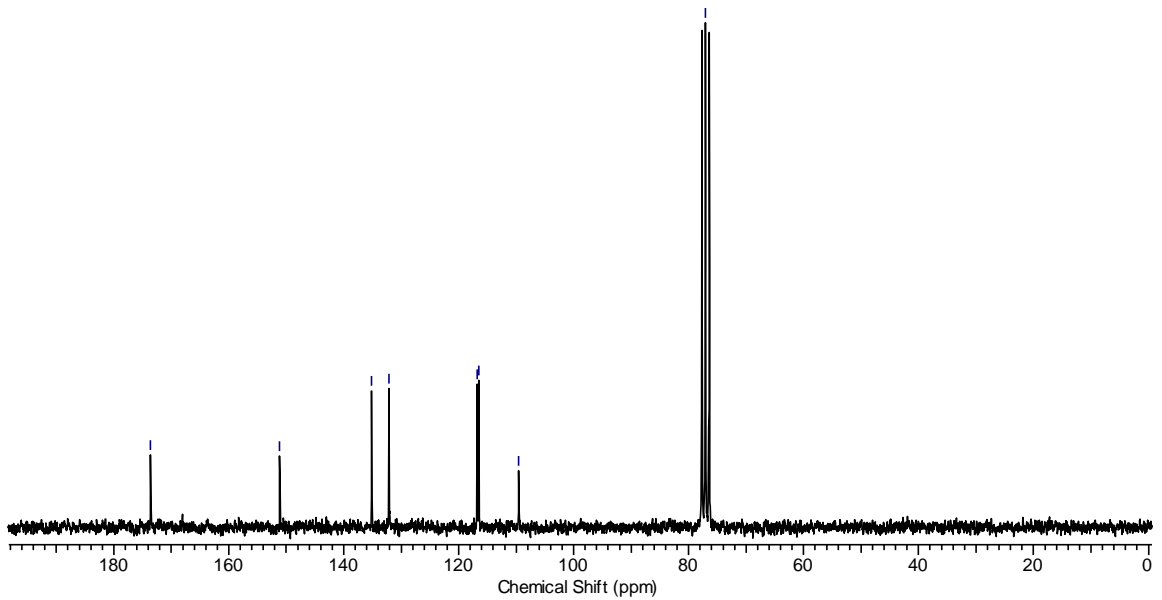


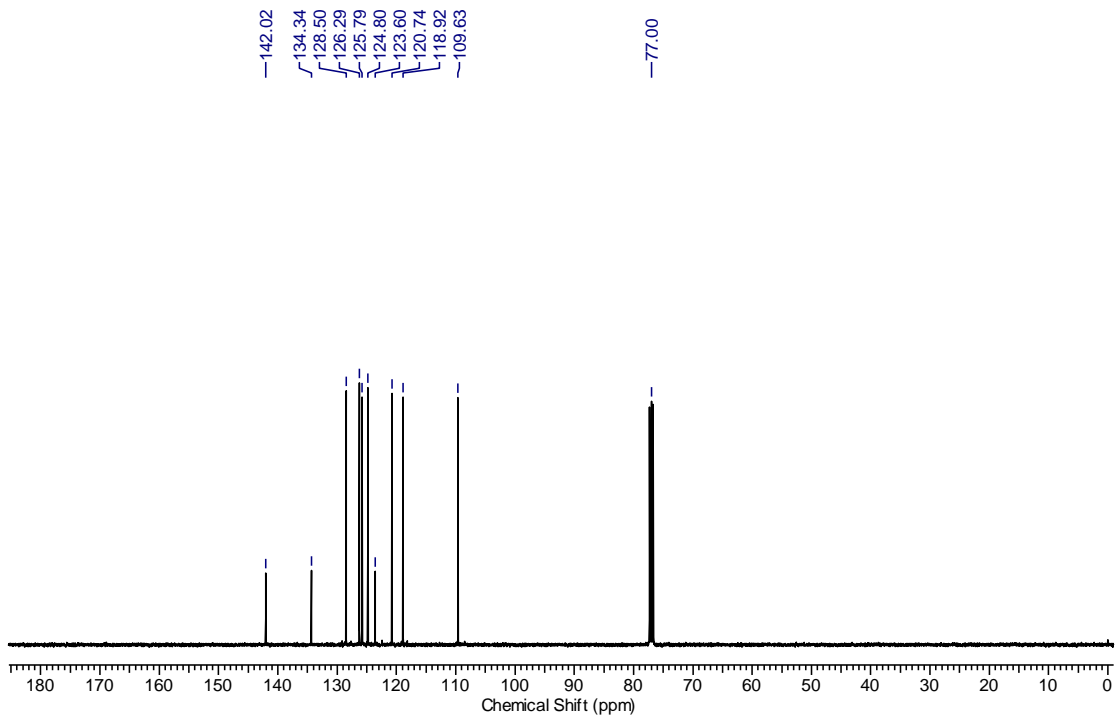
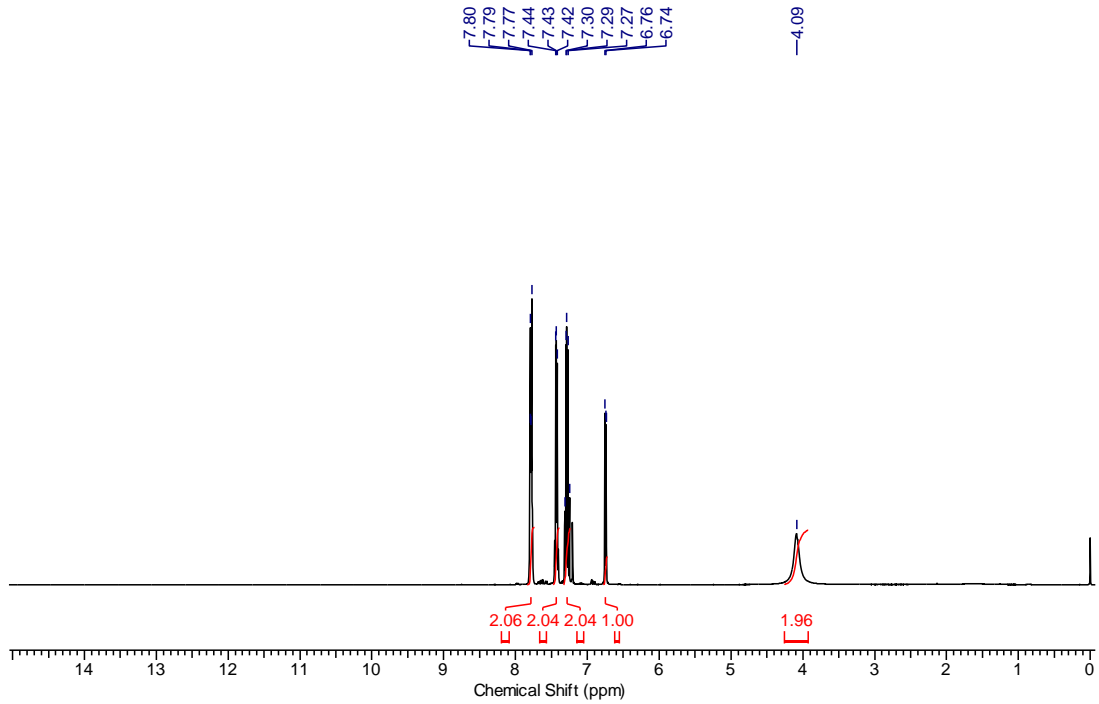
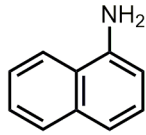


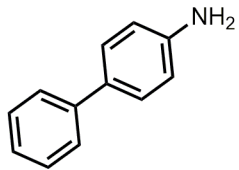
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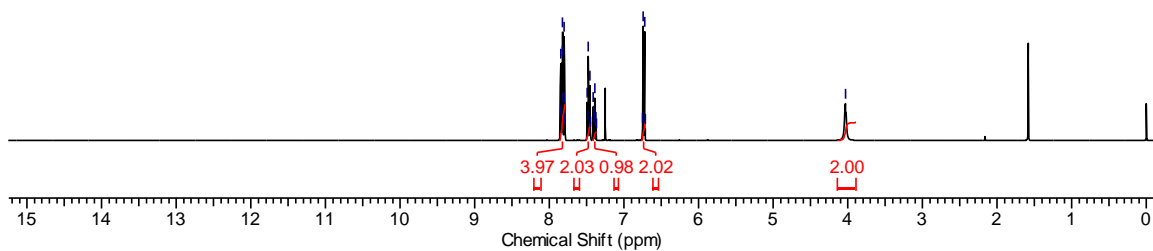






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7.82
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6.75
6.73

4.03



152.94
149.54
145.54

128.78
126.96
125.08
122.31

114.61

77.00

