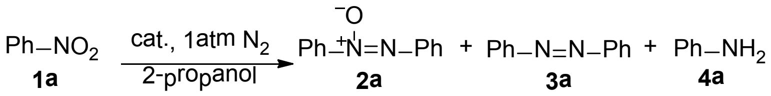
Supporting Information

Mild, Selective and Switchable Transfer Reduction of Nitroarenes Catalyzed by Supported Gold Nanoparticles

Xiang Liu, Sen Ye, Hai-Qian Li, Yong-Mei Liu, Yong Cao,* and Kang-Nian Fan

Department of Chemistry, Shanghai Key Laboratory of Molecular Catalysis and Innovative Materials, Fudan University, Shanghai 200433, P. R. China.

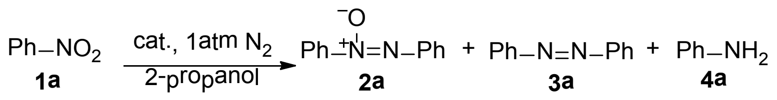
A. ***Table S1.*** Transfer reduction of nitrobenzene using different catalysts.[a]



Entry	Catalyst	Conv. (%)[b]	Sel. (%)[b]		
			2a	**3a**	**4a**
1	Au/meso-CeO_2	100	>99	<1	-
2	Au/CeO_2-50	81	89	7	2
3	Au/ ZrO_2	26	74	25	1
4	Au/TiO_2	60	65	34	<1
5	Au/Fe_2O_3	21	41	59	-
6	Au/Al_2O_3	36	53	46	1
7	Au/ZnO	30	58	41	<1
8	Pt/meso-CeO_2	20	46	41	12
9	meso-CeO_2	-	-	-	-

[a] Reaction conditions: 1 mmol nitrobenzene, catalyst (metal: 1.0 mol%), 0.5 mmol KOH, 5.0 mL 2-propanol, 1.0 mL water, 1 atm N_2, 30 °C, 5 h. [b] Conversion and selectivity based on **1a** consumption. Determined by GC using *n*-dodecane as the internal standard.

B. ***Table S2.*** Transfer reduction of nitrobenzene in the presence of different bases.[a]

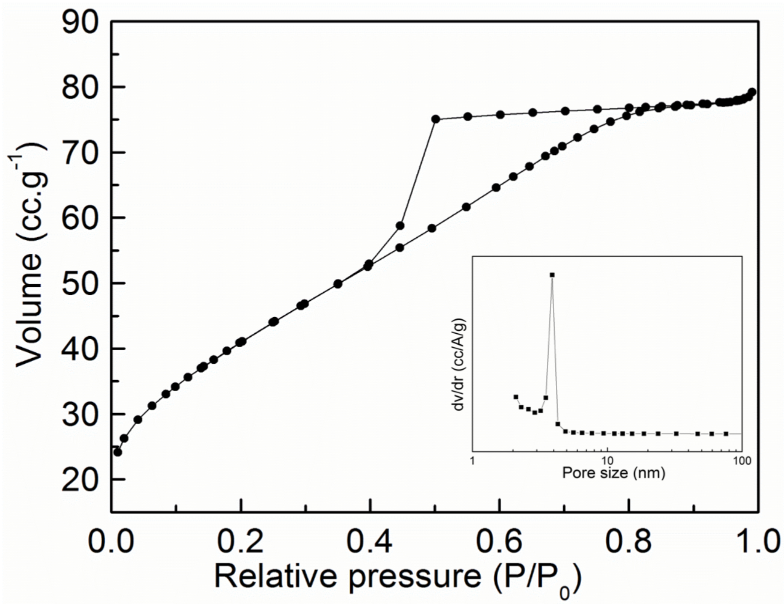


$$\underset{\textbf{1a}}{Ph{-}NO_2} \xrightarrow[\text{2-propanol}]{\text{cat., 1atm } N_2} \underset{\textbf{2a}}{Ph{-}\overset{O^-}{\overset{|}{N^+}}{=}N{-}Ph} + \underset{\textbf{3a}}{Ph{-}N{=}N{-}Ph} + \underset{\textbf{4a}}{Ph{-}NH_2}$$

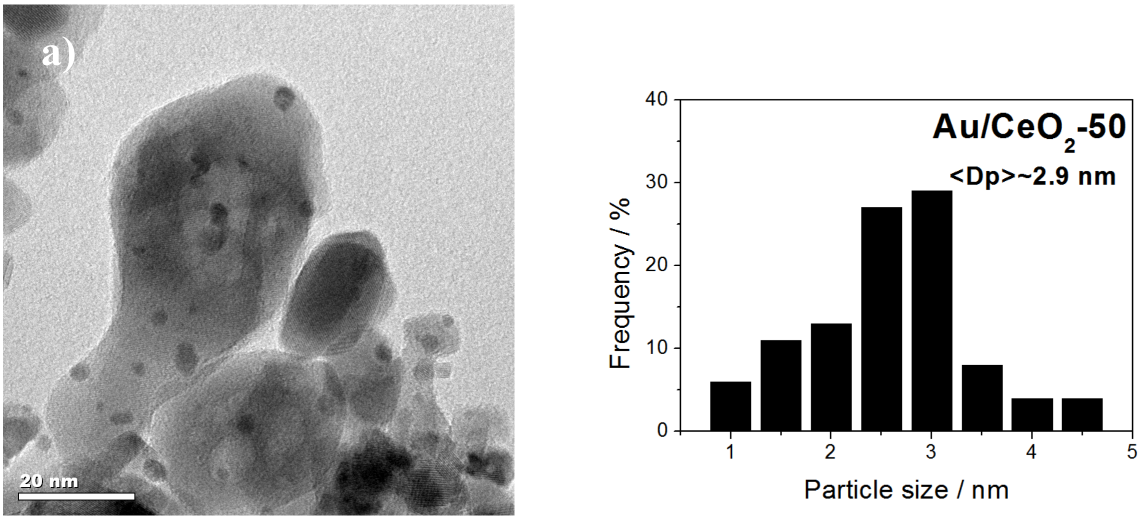
Entry	Base(equiv.)	t/h	Conv. (%)[b]	Sel. (%)[b]		
				2a	**3a**	**4a**
1	-	8	86	-	4	96
2	NaOH (0.5)	8	93	69	22	10
3	Na_2CO_3(0.5)	8	45	40	23	37
4	Cs_2CO_3(0.5)	8	89	11	81	8
5	KOH(0.25)	8	100	81	15	4
6	KOH(0.5)	5	100	>99	<1	-
7	KOH(1.0)	5	100	84	14	2
8	KOH(2.0)	5	100	69	29	2

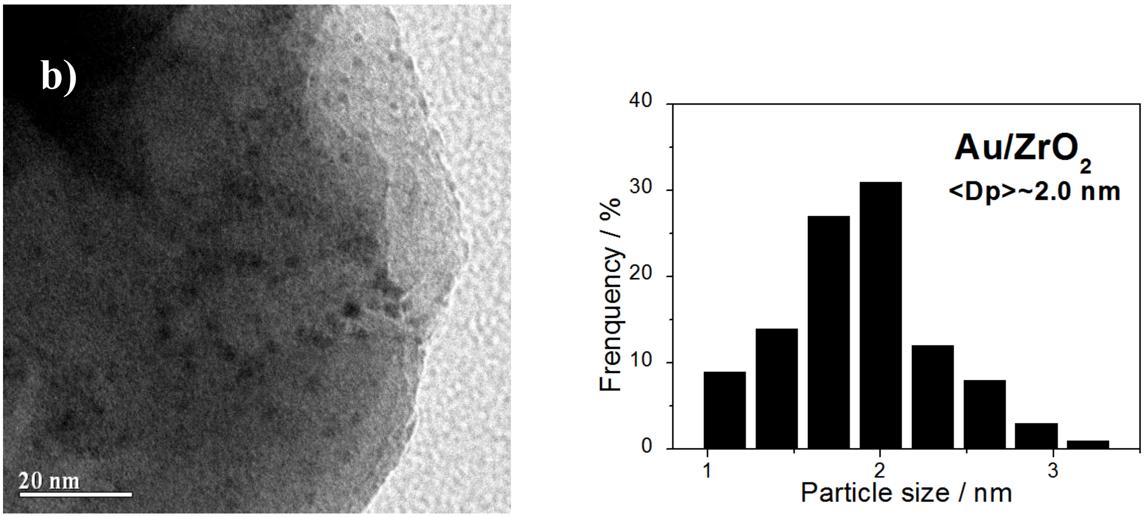
[a] Reaction conditions: 1 mmol nitrobenzene, Au/meso-CeO_2 (Au: 1.0 mol%), 5.0 mL 2-propanol, 1.0 mL water, 1 atm N_2, 30 °C. [b] Conversion and selectivity based on **1a** consumption. Determined by GC using *n*-dodecane as the internal standard.

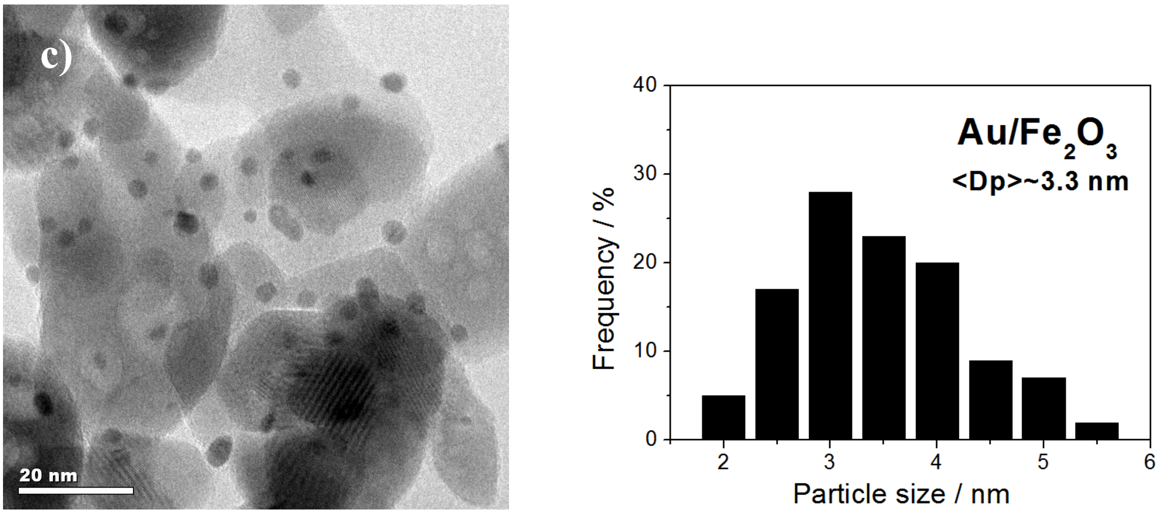
C. ***Figure S1.*** Nitrogen adsorption-desorption isotherms of the meso-CeO_2.



D. TEM images


a)
20 nm
Au/CeO$_2$-50
<Dp>~2.9 nm
Frequency / %
0
10
20
30
40
1
2
3
4
5
Particle size / nm


b)
20 nm
Au/ZrO$_2$
<Dp>~2.0 nm
Frenquency / %
0
10
20
30
40
1
2
3
Particle size / nm


c)
20 nm
Au/Fe$_2$O$_3$
<Dp>~3.3 nm
Frequency / %
0
10
20
30
40
2
3
4
5
6
Particle size / nm

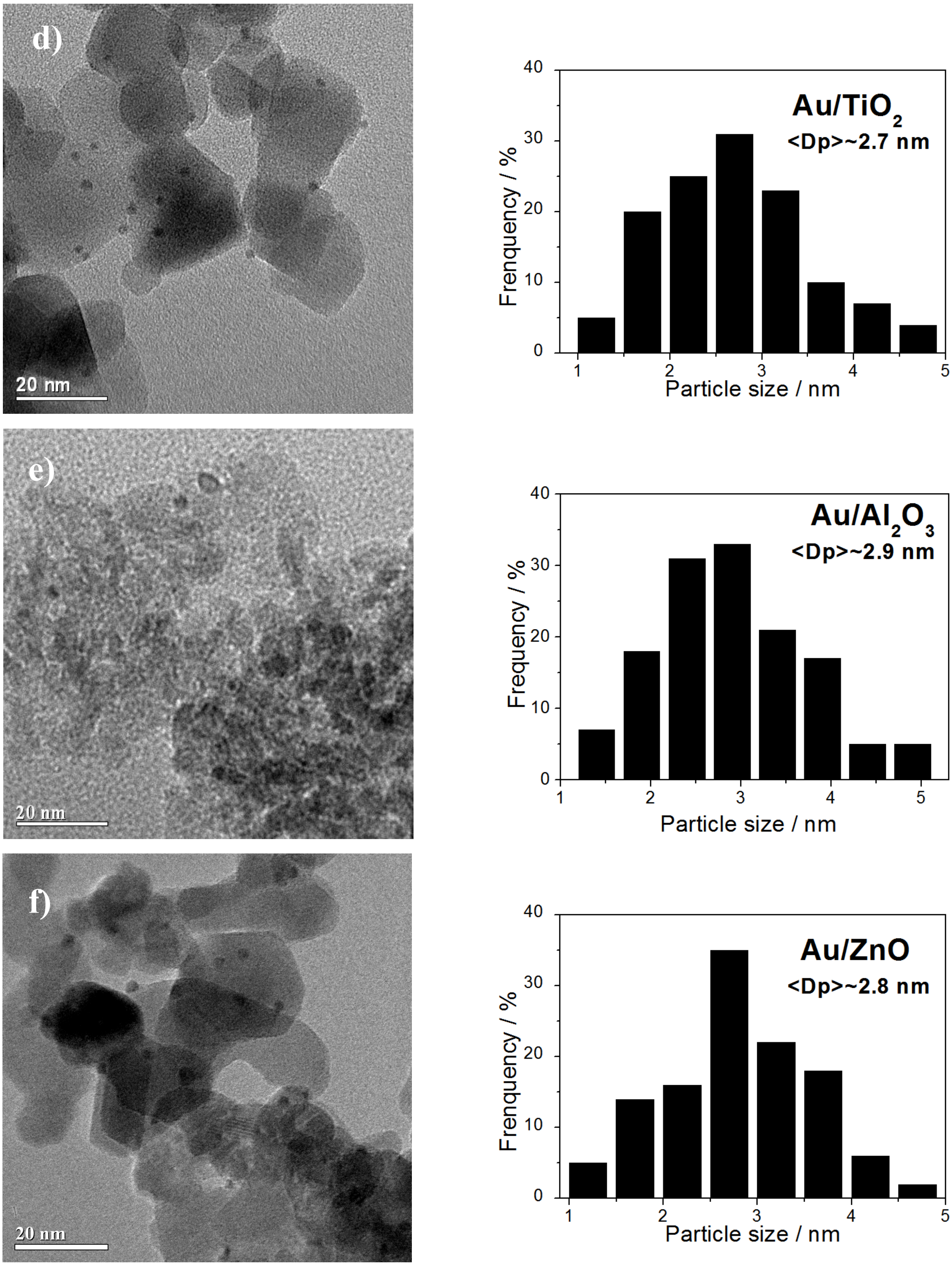


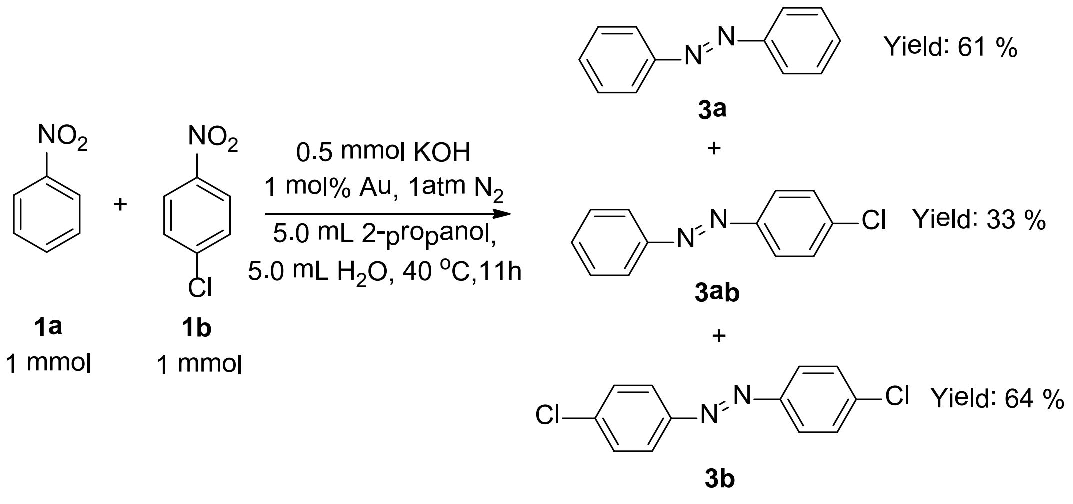
Figure S2. TEM images and gold particle size distribution of (a) 0.49 wt% Au/CeO_2-50; (b) 0.8 wt% Au/ZrO_2, (c) 4.50 wt% Au/Fe_2O_3; (d) 1.0 wt% Au/TiO_2; (e) 1.0 wt% Au/Al_2O_3; (f) 1.0 wt% Au/ZnO。

E. ***Table S3.*** Catalyst characterazition by XRD, TEM, XPS, and nitrogen adsorption.

Sample	S_{BET} (m^2/g)	Crystallite size(nm)[a]	Crystallite size(nm)[b]	Surface n_{Au}/n_{Ce}[c]
meso-CeO_2	150	7.3	n.m.[d]	-
Fresh Au/meso-CeO_2	148	7.5	4.8	0.015
Used Au/meso-CeO_2	147	7.5	4.8	0.014

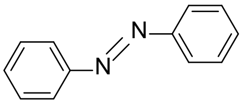
[a] Determined by XRD. [b] Determined by HRTEM. [c] The XPS lines used to calculate the atomic ratios were Au ($4f_{7/2}$) and Ce ($3d_{5/2}$). Surface n_{Au}/n_{Ce} = $(A_{Au}/S_{Au})/(A_{Ce}/S_{Ce})$, A is peak area, atomic sensitivity factors S were taken from reference [S1]. [d] n.m. means not measured. Note that the surface Au/Ce atomic ratio unambiguously demonstrate that the gold dispersion in the Au/meso-CeO_2.

F. Cross-coupling reaction between nitrobenzene and 4-chloronitrobenzene

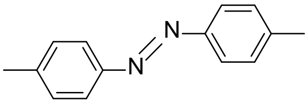


Scheme S1. Transfer reductive cross-coupling between equimolar amount of nitrobenzene and 4-chloronitrobenzene. The yield was determined by GC. The yield of **3a** and **3ab** was calculated based on **1a**, and the yield of **3b** was calculated based on **1b**. Note that aniline (5 % yield based on **1a**) and azoxybenzene (1 % yield based on **1a**) were also detected as by-products in the resultant mixture.

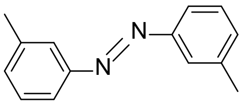
G. Characterization of Products



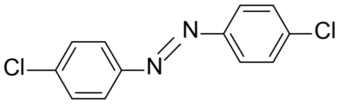
(Table 3, entry 1). [S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.93-7.91 (t, 4H), 7.54-7.46 (m, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 152.7, 131.0, 129.1, 122.8.



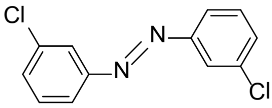
(Table 3, entry 2). [S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.82- 7.80 (d, 4H), 7.31-7.29 (d, 4H), 2.43 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 150.9, 141.2, 129.7, 122.7, 21.5.



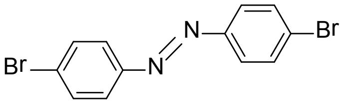
(Table 3, entry 3). [S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.72 (s, 4H), 7.42-7.38 (t, 2H), 7.29-7.28 (d, 2H), 2.46 (s, 6 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 152.8, 139.0, 131.7, 128.9, 122.9, 120.4, 21.4.



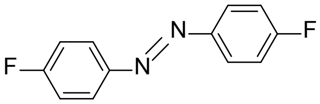
(Table 3, entry 4). [S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.87-7.86 (d, 4H), 7.50-7.48 (d, 4H).^{13}C NMR ($CDCl_3$, 125 MHz): δ 150.9, 137.3, 129.4, 124.2.



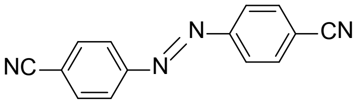
(Table 3, entry 5). [S3] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ7.90-7.85 (t, 2 H), 7.84-7.83 (t, 2 H), 7.50-7.47 (m, 4 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 153.2, 139.9, 131.2, 130.2, 122.6, 121.9.



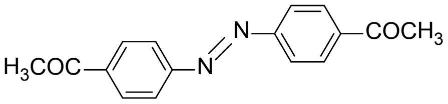
(Table 3, entry 6). [S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.80-7.79 (d, 4 H), 7.66-7.64 (d, 4 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 151.2, 139.9, 132.4, 125.7, 124.4.



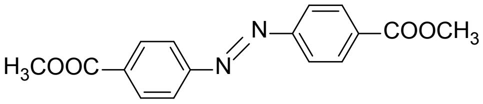
(Table 3, entry 7). [S4] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.92- 7.90 (m, 4 H), 7.24-7.16 (m, 4 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 165.4, 163.4, 149.0, 124.9, 124.8, 116.2, 116.0.



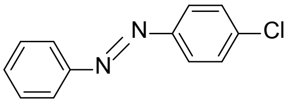
(Table 3, entry 1).[S3] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.04-8.03 (d, 4H), 7.86-7.84 (d, 4H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 154.0, 133.4, 123.7, 118.1, 115.2.



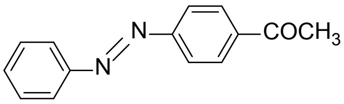
(Table 3, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.14-8.12 (d, 4 H), 8.02-8.01 (d, 4 H), 2.68 (s, 6 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ197.3, 154.9, 139.0, 129.4, 123.2, 26.9.



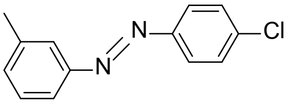
(Table 3, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.22-8.20 (d, 4H), 8.00-7.98 (d, 4H), 3.97 (s, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 166.4, 155.0, 132.5, 130.7, 52.4.



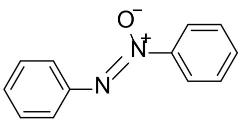
(Scheme 1).[S4] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.93-7.87 (m, 4 H), 7.53-7.48 (m, 5 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 152.5, 151.0, 136.9, 131.3, 129.3, 129.1, 124.1, 122.9.



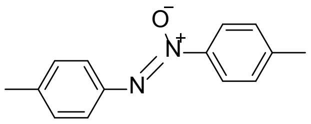
(Scheme 1).[S5] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.12-8.10 (d, 2H), 7.98-7.94 (m, 4H), 7.54-7.52 (d, 3H), 2.67 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 197.4, 152.6, 131.8, 131.4, 129.4, 129.2, 123.2, 122.9, 29.7.



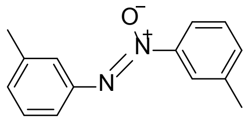
(Scheme 1).[S4] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 7.87-7.85 (d, 2H), 7.72-7.71 (d, 2H), 7.49-7.47 (d, 2H), 7.42-7.39 (t, 1H), 7.31-7.29 (d, 1H), 2.46 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): 152.6, 151.1, 139.1, 136.8, 132.1, 129.3, 129.0, 124.1, 123.0, 120.5, 21.4.



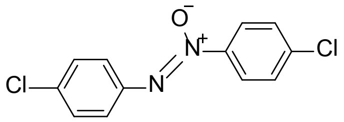
(Table 4, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.32-8.30 (m, 2H), 8.17-8.16(d, 2H), 7.58-7.26 (m, 6H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ148.4, 144.1, 131.6, 129.6, 128.8, 128.7, 125.5, 122.4.



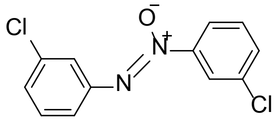
(Table 4, entry 2).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.19-8.17 (d, 2H), 8.12-8.10 (d, 2H), 7.29-7.25 (t, 4H), 2.44 (s, 3H), 2.41 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 146.3, 141.9, 140.0, 129.3, 125.7, 122.2, 21.5, 21.3.



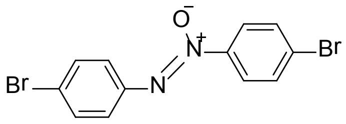
(Table 4, entry 3).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.10-8.07 (t, 2H), 7.98-7.96 (d, 2H), 7.40-7.35 (m, 3H), 7.21-7.20 (d, 1H), 2.47 (s, 3H) 2.43 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 148.4, 144.1, 139.0, 138.4, 132.3, 130.3, 128.6, 128.5, 126.0, 122.8, 122.5, 119.5, 21.5, 21.4.



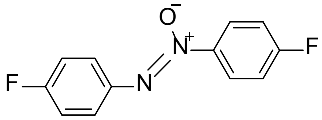
(Table 4, entry 4).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.26-8.24 (d, 2H), 8.16-8.15 (d, 2H), 7.49-7.44 (m, 4H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 146.6, 144.3, 138.1, 135.3, 129.0, 129.0, 127.1, 123.7.



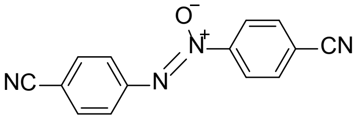
(Table 4, entry 5).[S3] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.32-8.20 (m, 3H), 8.01-8.00 (d, 1H), 7.57-7.56 (d, 1H), 7.50-7.39 (m, 4 H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 144.5, 134.9, 134.5, 132.0, 129.9, 129.9, 129.7, 125.4, 124.0, 122.9, 120.6.



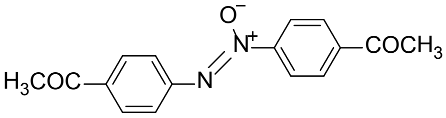
(Table 4, entry 6).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.19-8.17 (d, 2H), 8.09-8.07 (d, 2H), 7.66-7.60 (m, 4H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 147.1, 142.7, 132.1, 131.9, 127.2, 126.5, 123.9, 123.6.



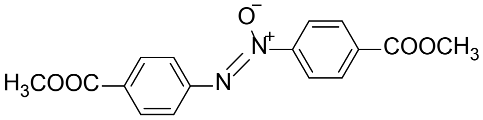
(Table 4, entry 7).[S6] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.34-8.31 (m, 2H), 8.27-8.24 (m, 2H), 7.20-7.15 (m, 4H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 165.5, 163.6, 163.5, 161.6, 140.3, 128.0, 127.9, 124.6, 124.5, 115.8, 115.8, 115.6, 115.5.



(Table 4, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.47-8.45 (d, 2H), 8.24-8.22 (d, 2H), 7.88-7.86 (d, 2H), 7.80-8.79(d, 2H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 146.3, 139.9, 139.8, 133.1, 132.8, 126.0, 123.4, 118.2, 117.3, 116.2, 113.2.



(Table 4, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): 8.41-8.40 (d, 2H), 8.22-8.20 (d, 2H), 8.11-8.07 (m, 4H), 2.68 (s, 3H), 2.65 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 197.0, 196.7, 150.8, 147.0, 139.8, 139.6, 137.4, 129.0, 129.0, 125.5, 122.8, 26.9, 26.7.



(Table 4, entry 1).[S2] ^{1}H-NMR ($CDCl_3$, 500 MHz): δ 8.40-8.38 (d, 2H), 8.21-8.17 (m, 6H), 3.98 (s, 3H), 3.95 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz): δ 166.2, 165.8, 150.9, 147.0, 133.3, 130.7, 130.4, 130.2, 125.3, 122.6, 52.6, 52.3.

References

[S1] J. H. Scofield, *J. Electron. Spectrosc. Relat. Phenom.*, 1976, **8**, 129.

[S2] N. Sakai, K. Fujii, S. Nabeshima, R. Ikeda, T. Konakahara, *Chem. Commun.*, 2010, **46**, 3173.

[S3] R. Thorwirth, F. Bernhardt, A. Stolle, B. Pndruschka, J. Asghri, *Chem. Eur. J.*, 2010, **16**, 13242.

[S4] S. Cai, H. Rong, X. Yu, X. Liu, D. Wang, W. He, Y. Li, *ACS Catal.*, 2013, **3**, 486.

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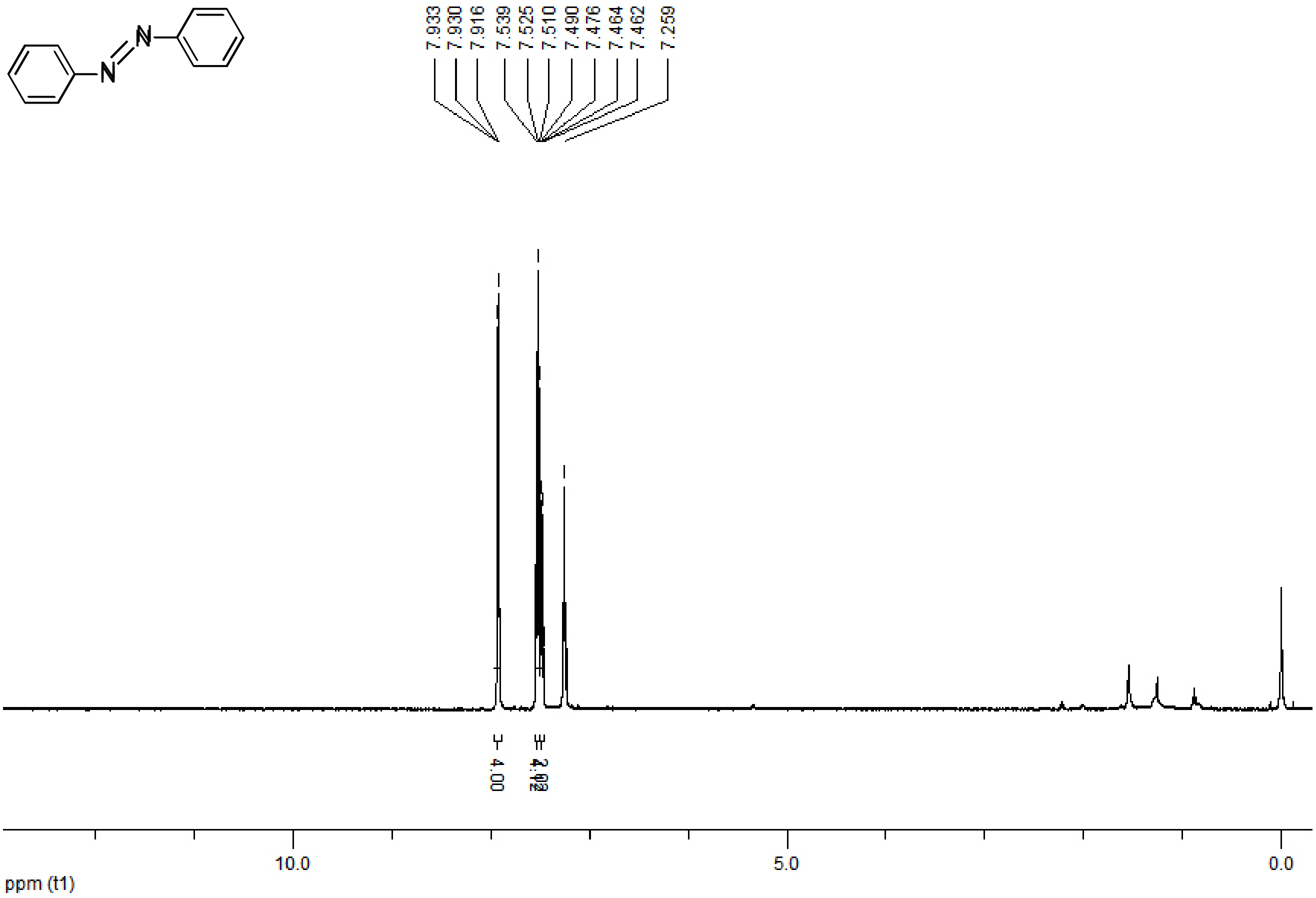
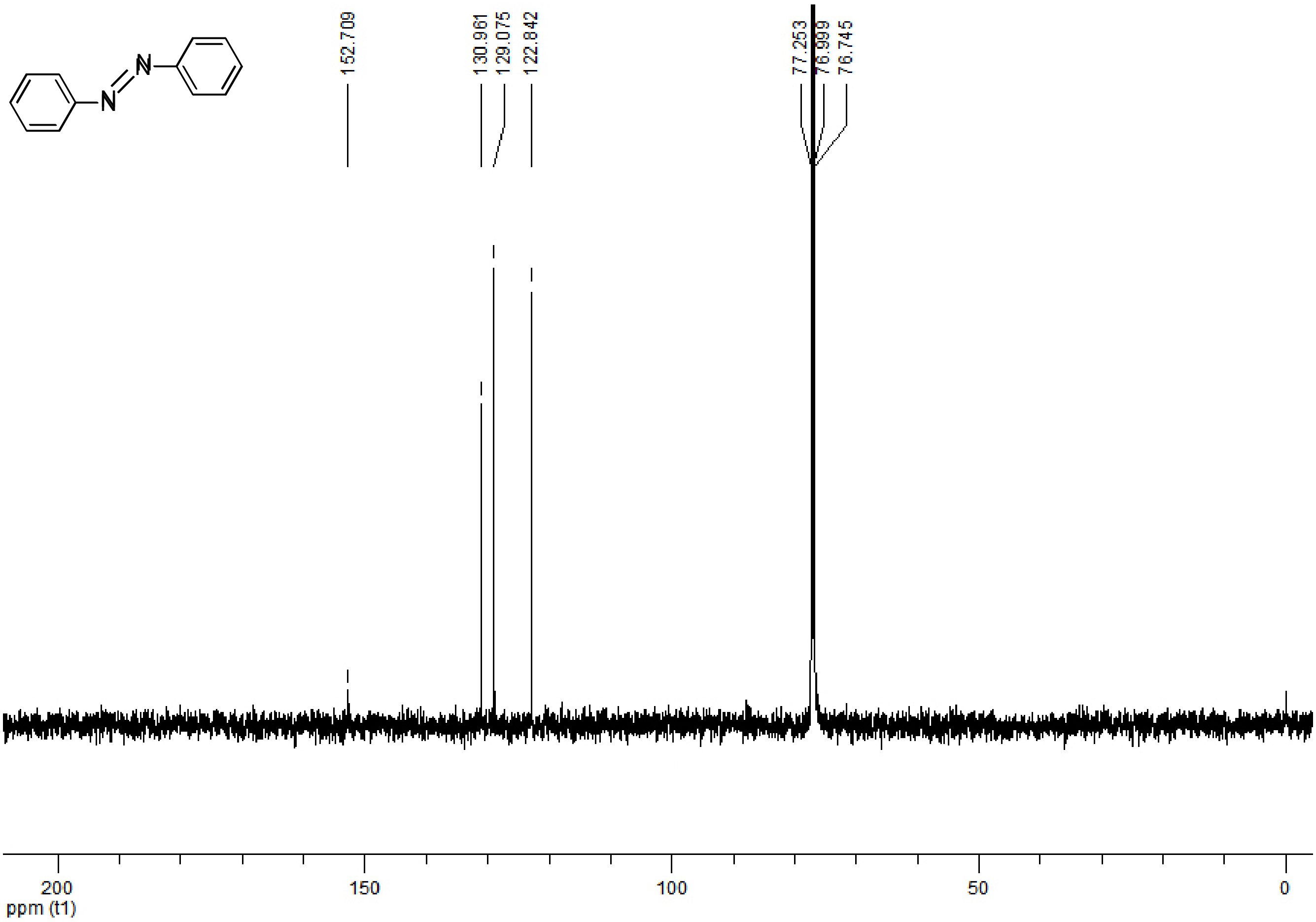
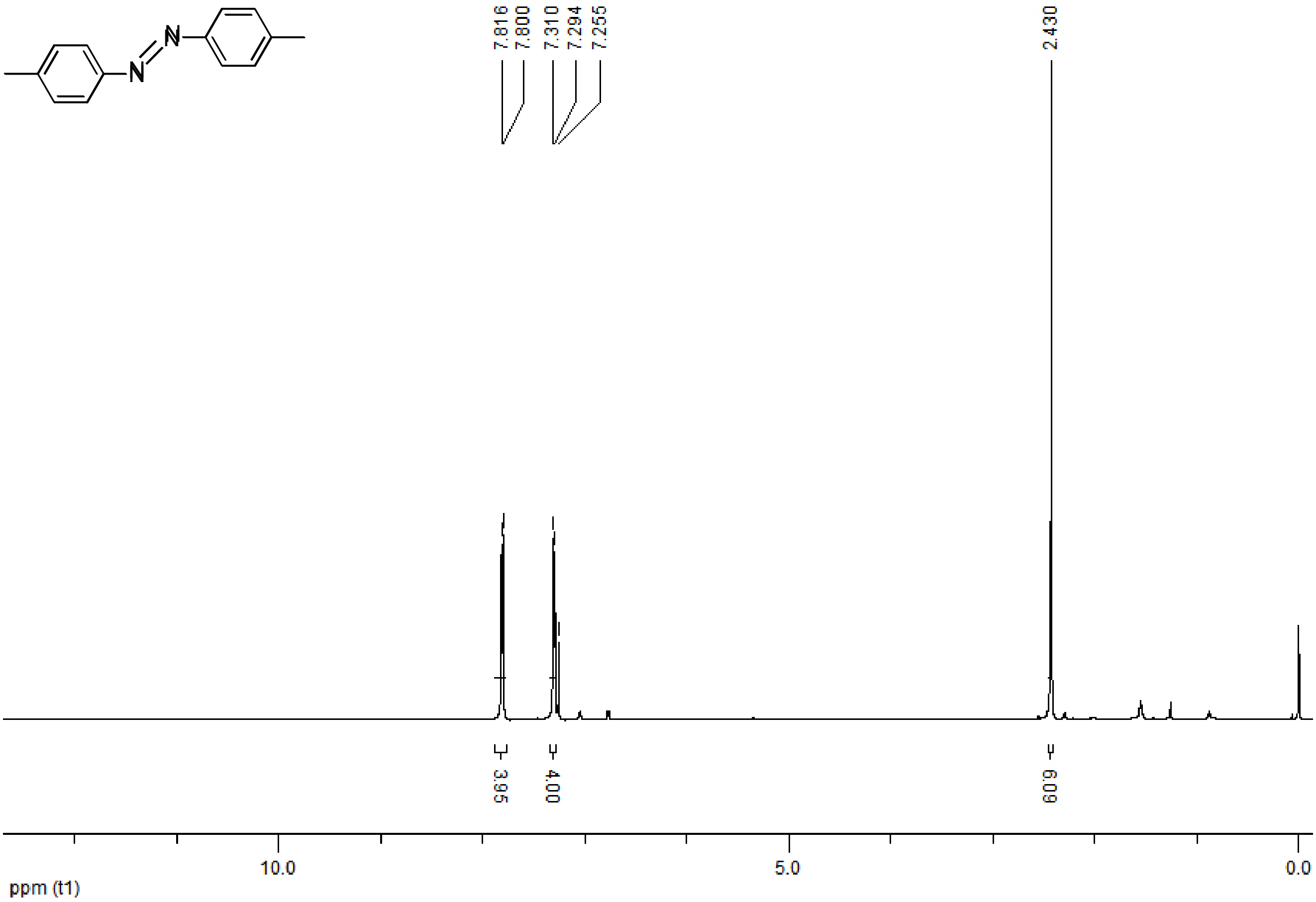
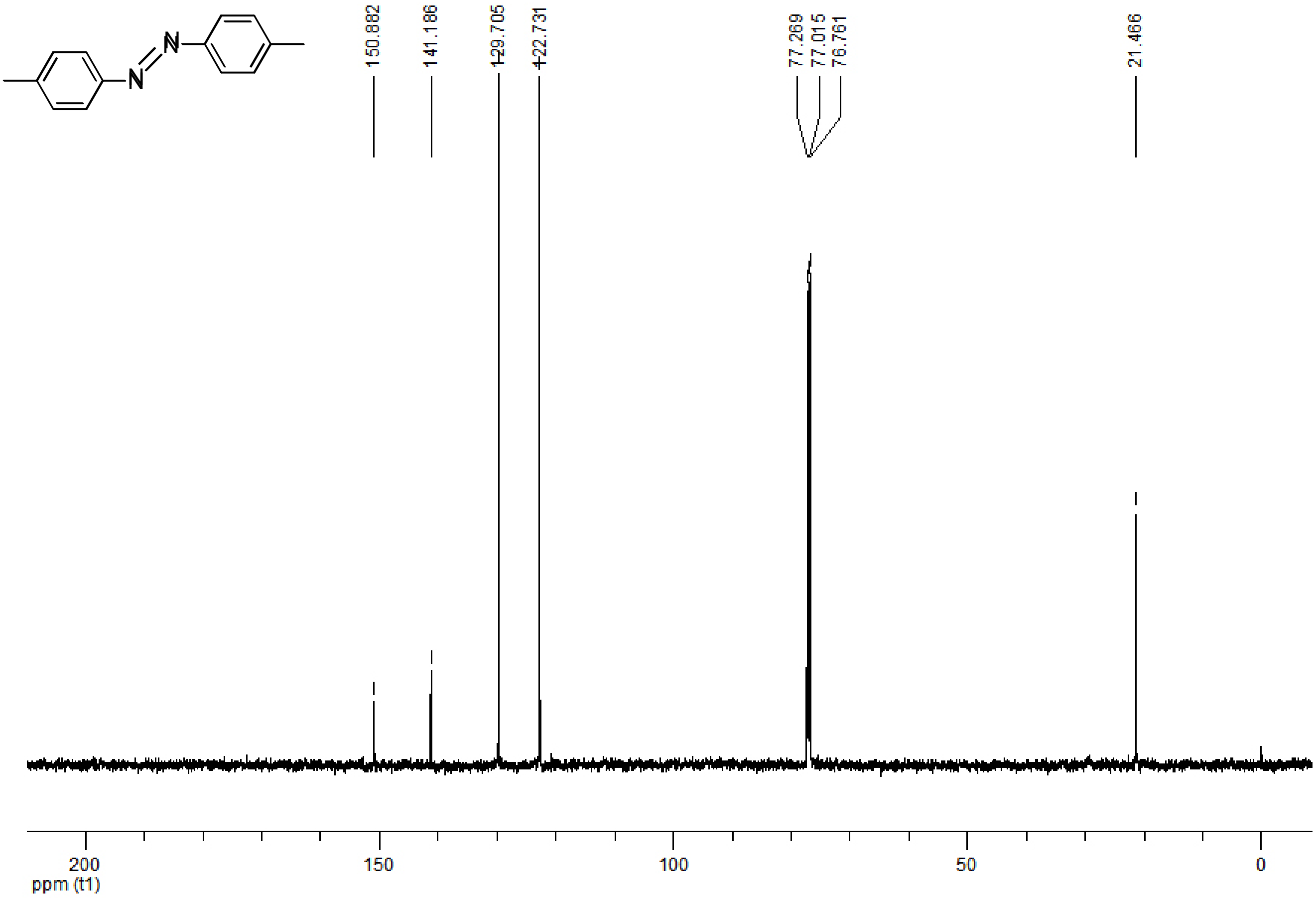
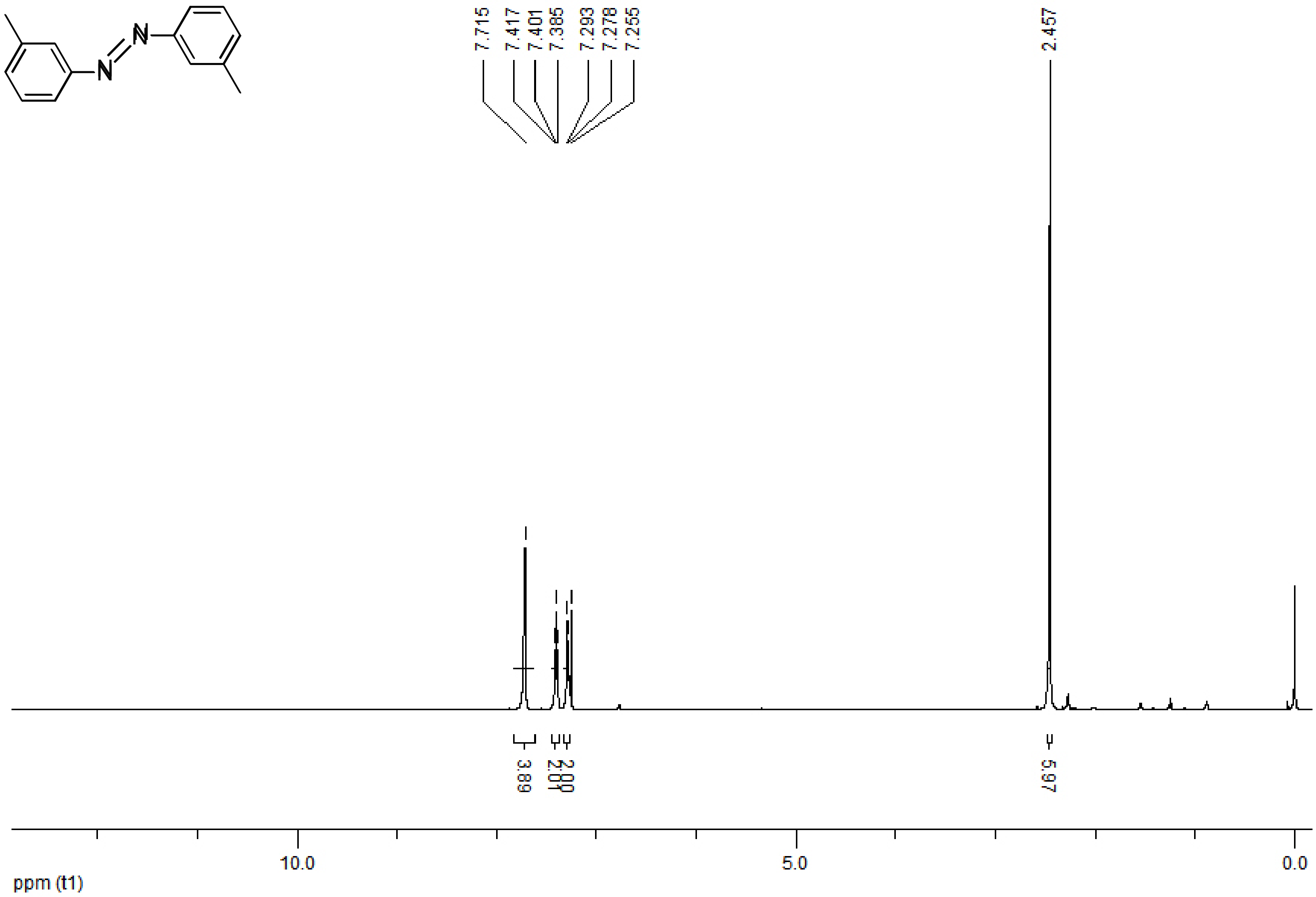
[S6] S. P. Annen, H. Grützmacher, *Dalton Trans.*, 2012, **41**, 14137.

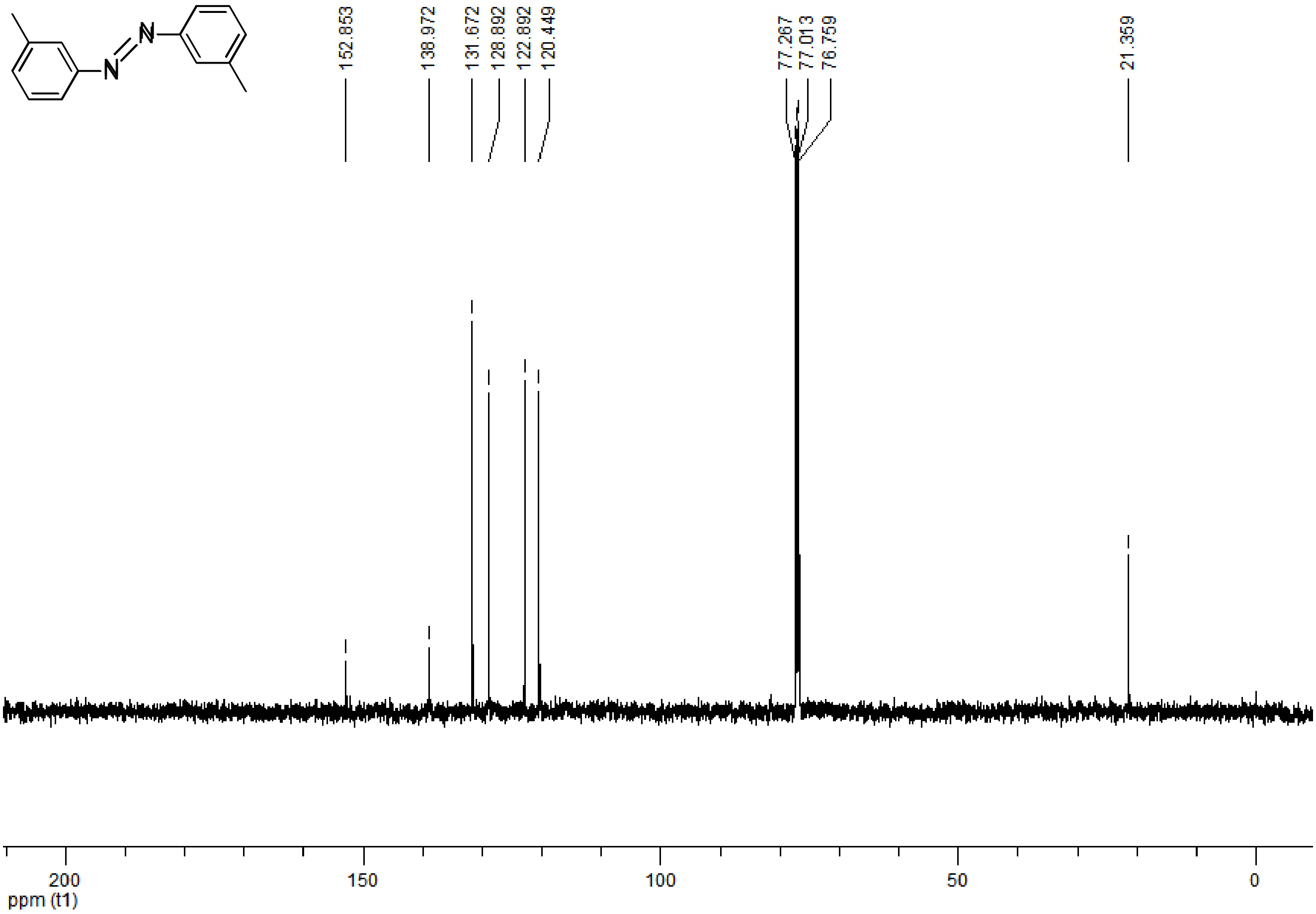

N
N
7.933
7.930
7.916
7.539
7.525
7.510
7.490
7.476
7.464
7.462
7.259
4.00
4.02
2.12
10.0
5.0
0.0
ppm (t1)

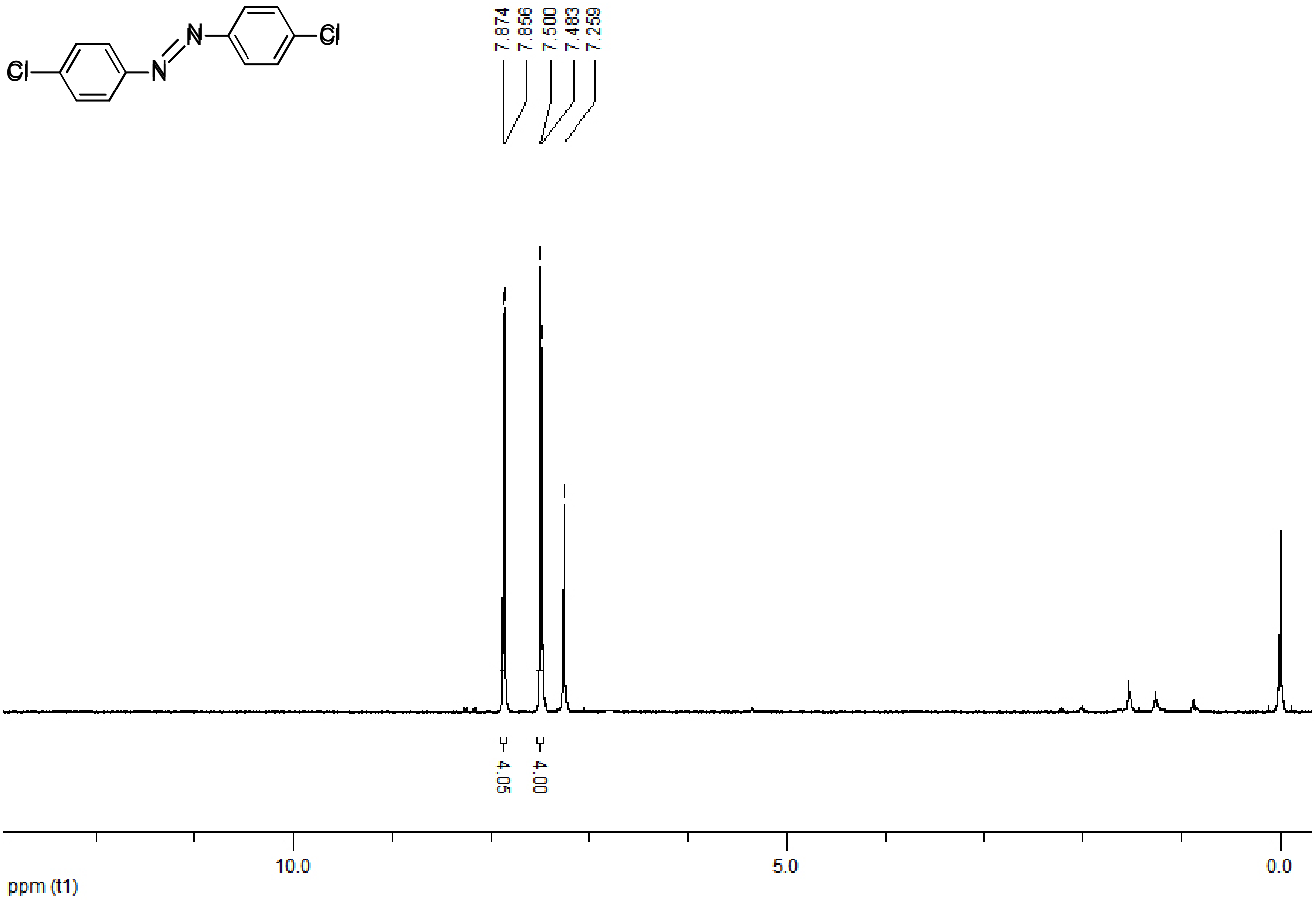

N
N
152.709
130.961
129.075
122.842
77.253
76.999
76.745
200
150
100
50
0
ppm (t1)

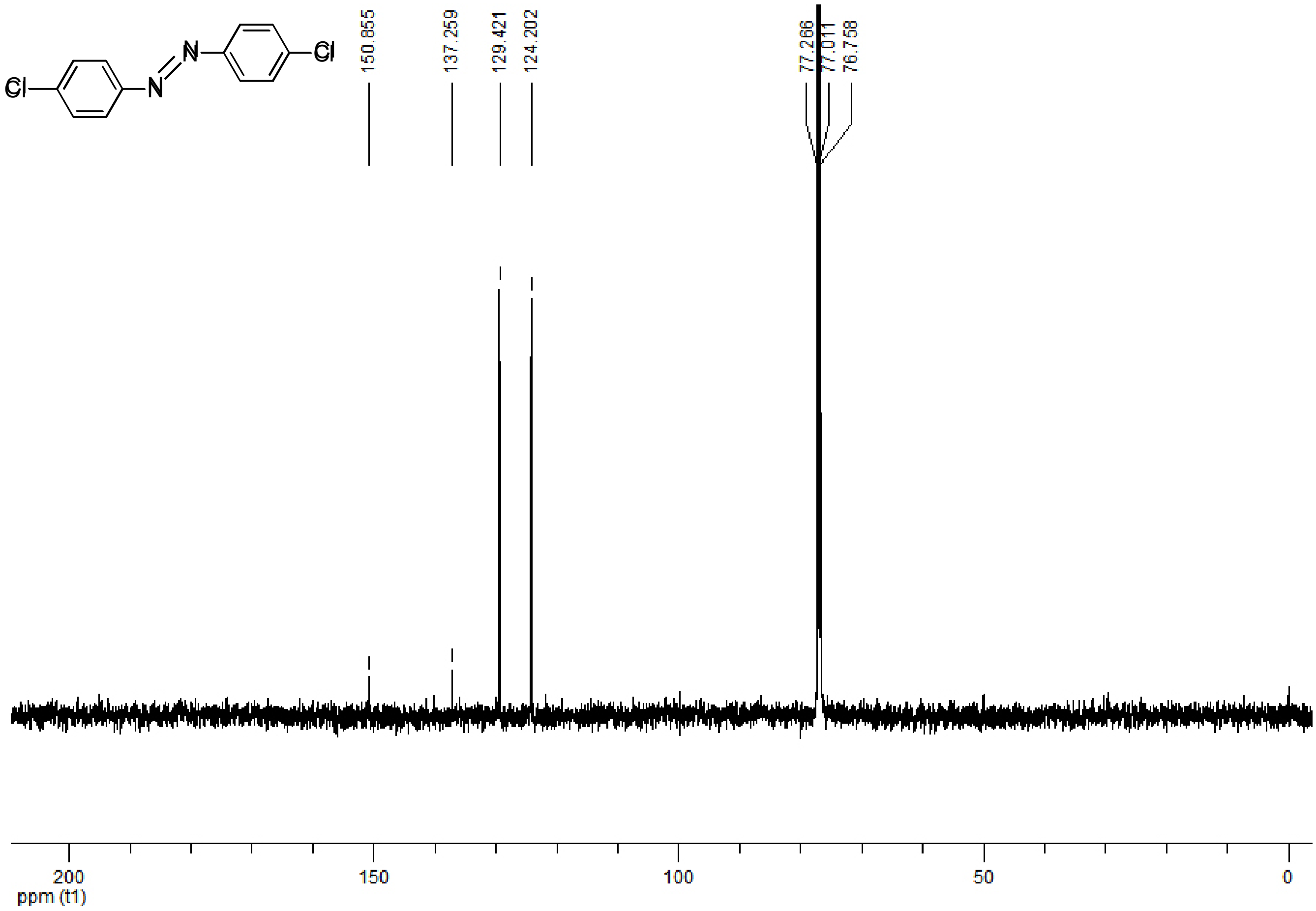

N
N
7.816
7.800
7.310
7.294
7.255
2.430
3.95
4.00
6.09
10.0
5.0
0.0
ppm (t1)

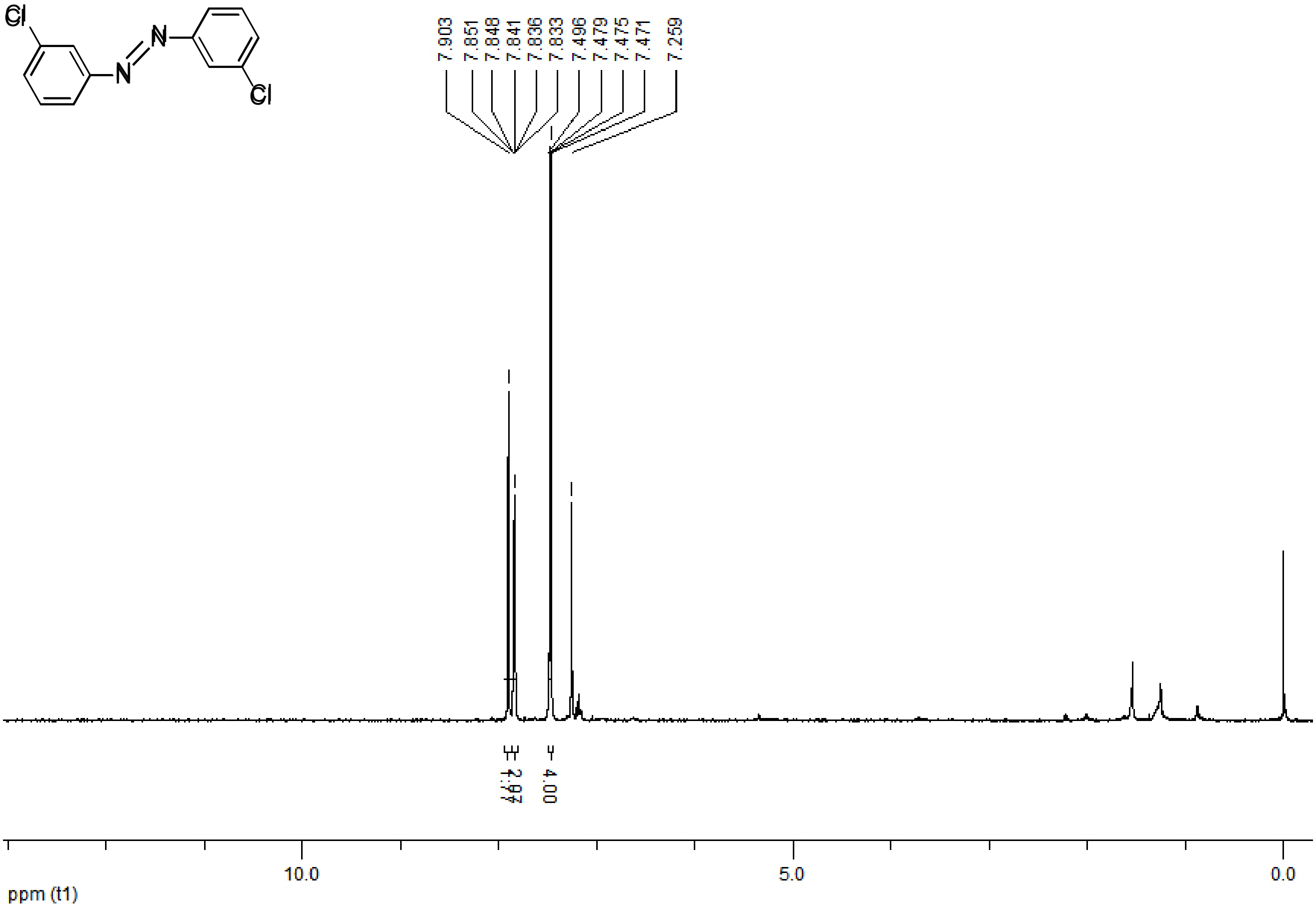

N
N
150.882
141.186
129.705
122.731
77.269
77.015
76.761
21.466
200
150
100
50
0
ppm (t1)

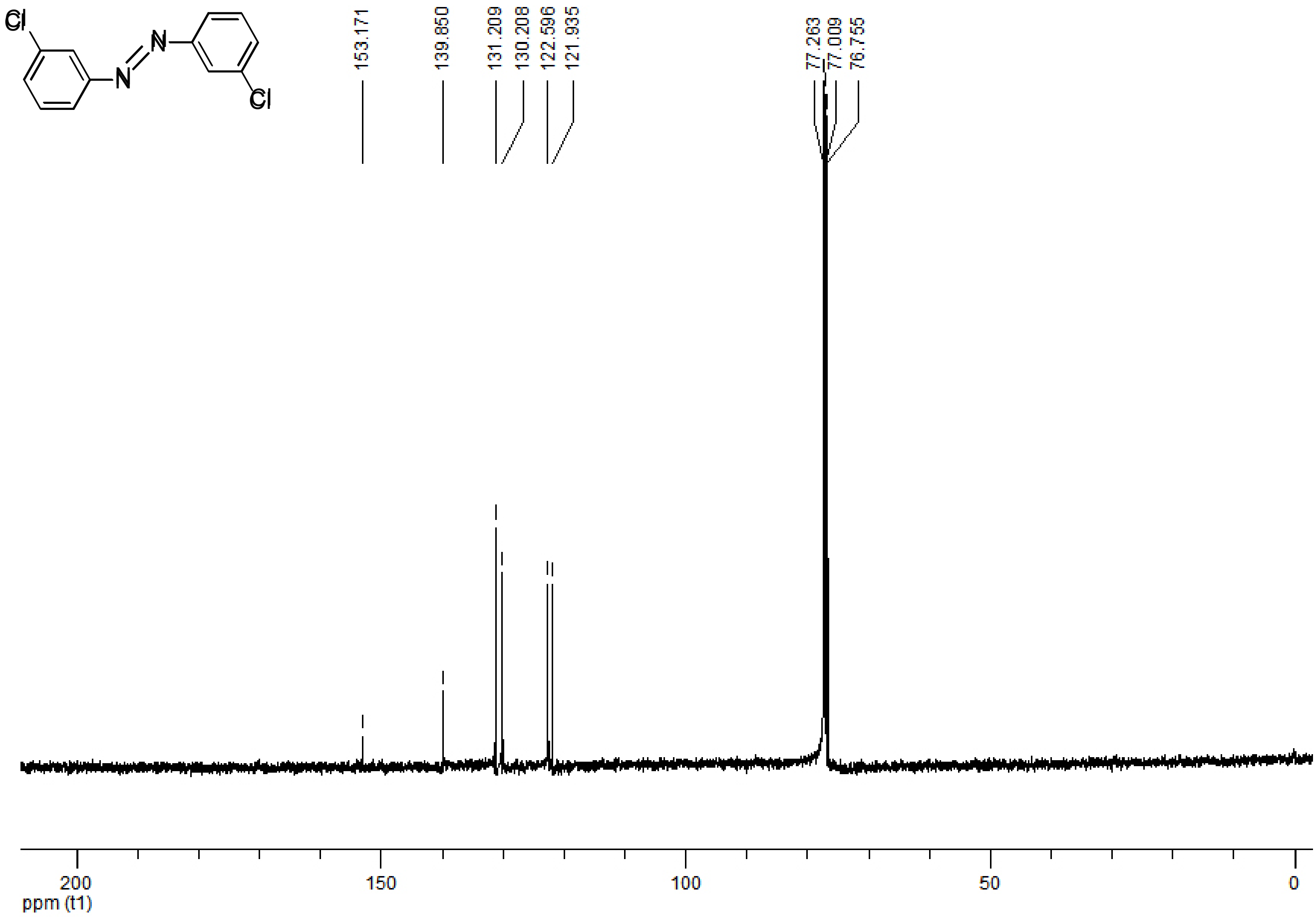

7.715
7.417
7.401
7.385
7.293
7.278
7.255
2.457
3.89
2.01
2.00
5.97
10.0
5.0
0.0
ppm (t1)

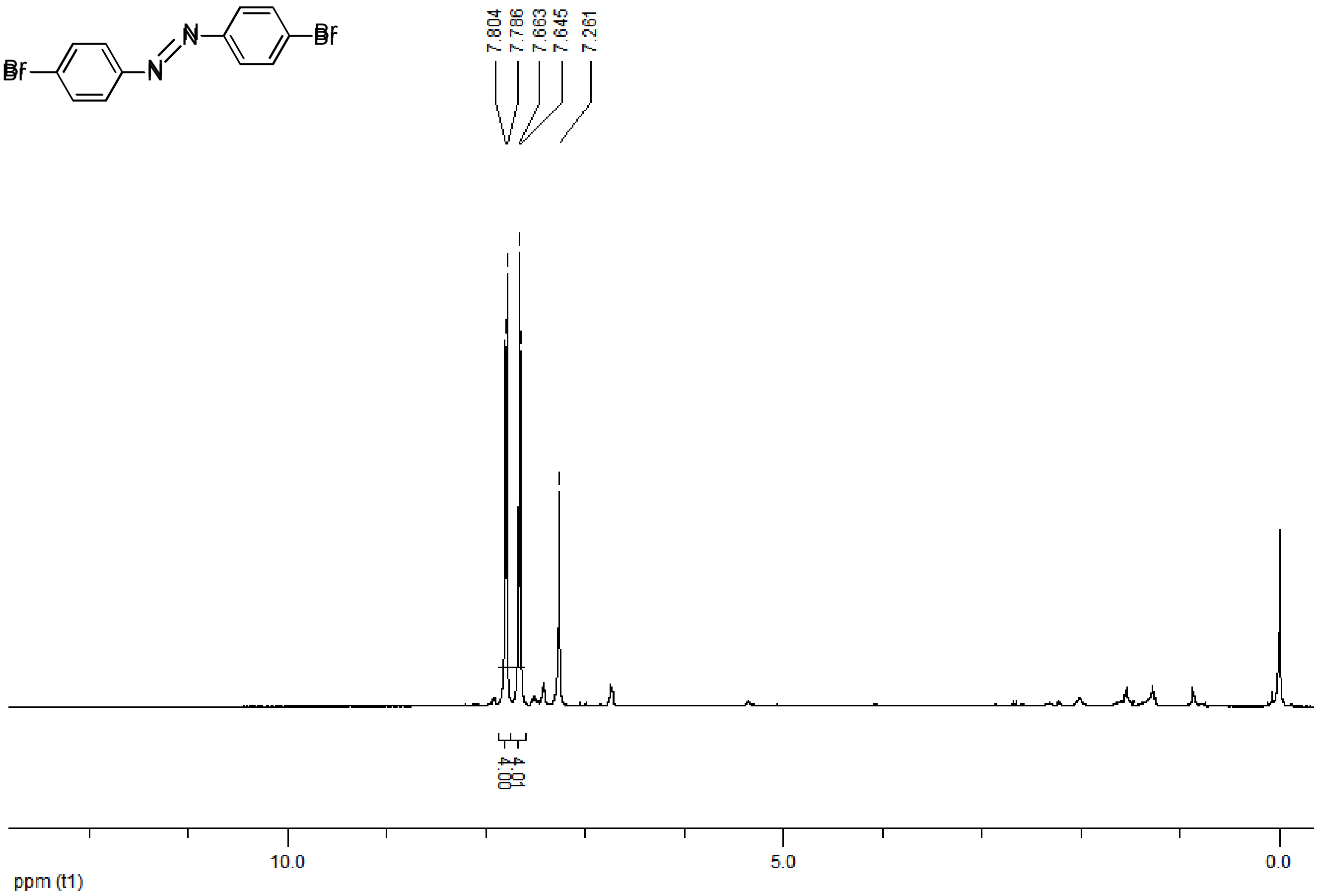

152.853
138.972
131.672
128.892
122.892
120.449
77.267
77.013
76.759
21.359
200
150
100
50
0
ppm (t1)

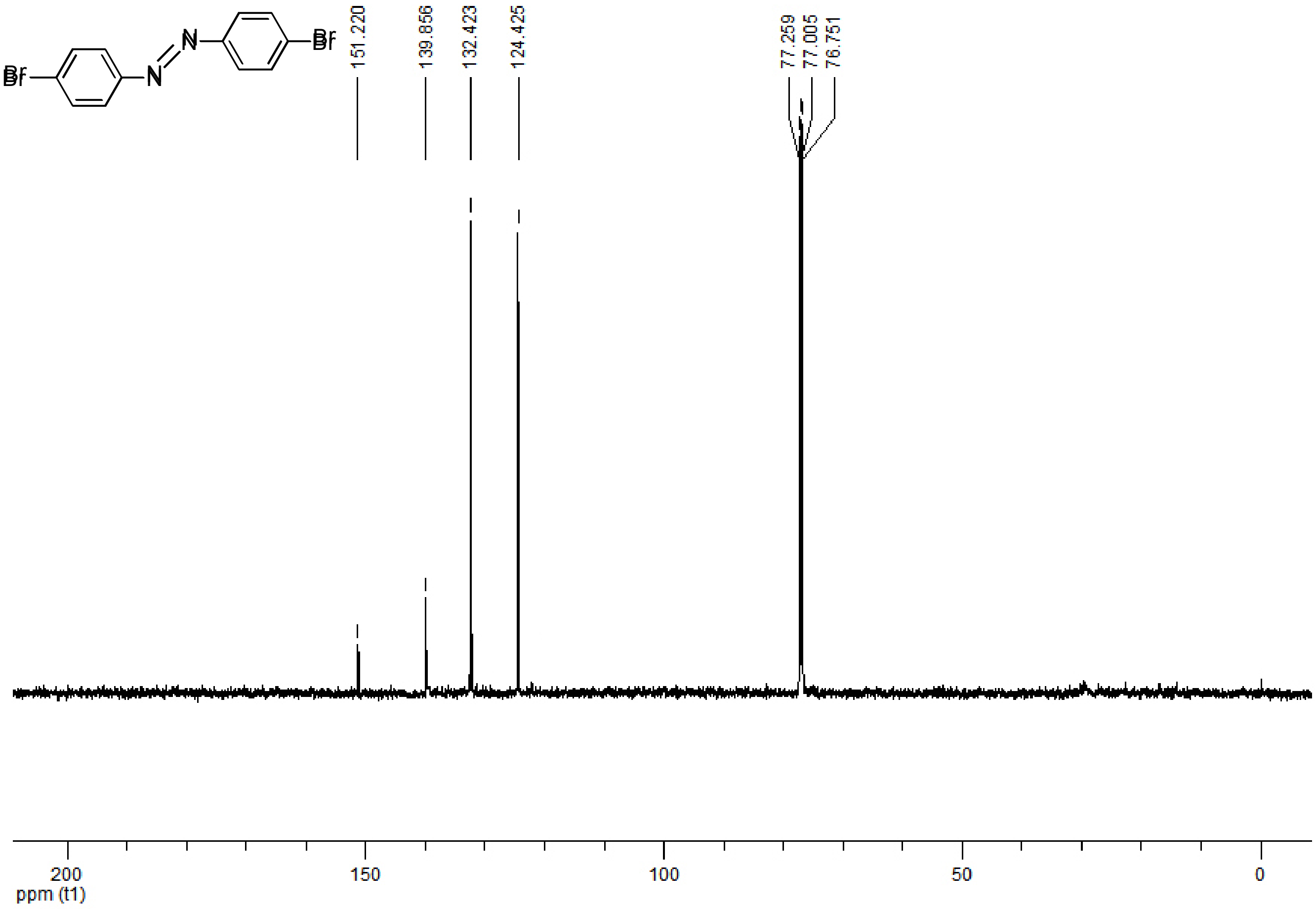

Cl
N
N
Cl
7.874
7.856
7.500
7.483
7.259
4.05
4.00
10.0
5.0
0.0
ppm (t1)

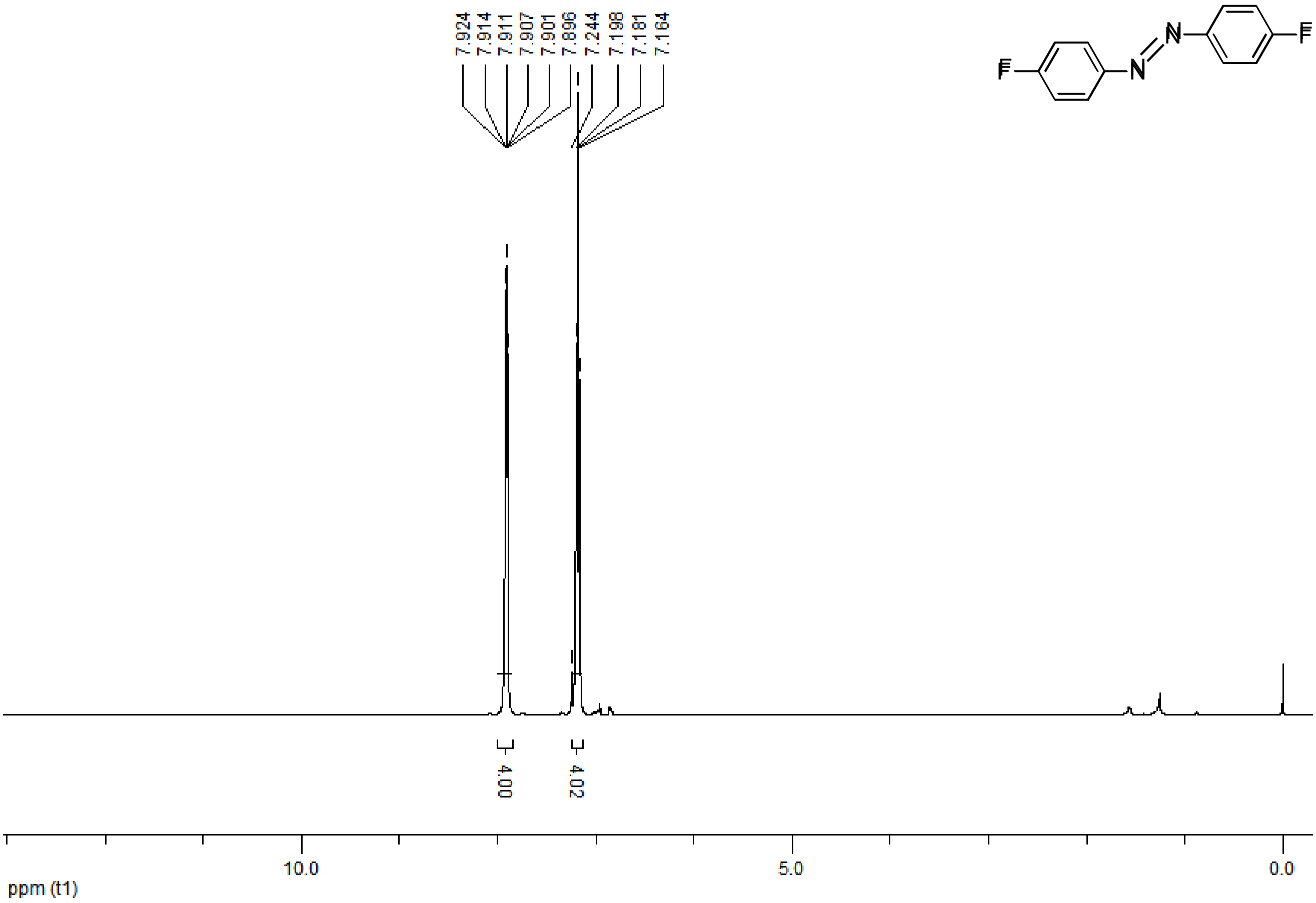

Cl
N
N
Cl
150.855
137.259
129.421
124.202
77.266
77.011
76.758
200
150
100
50
0
ppm (t1)

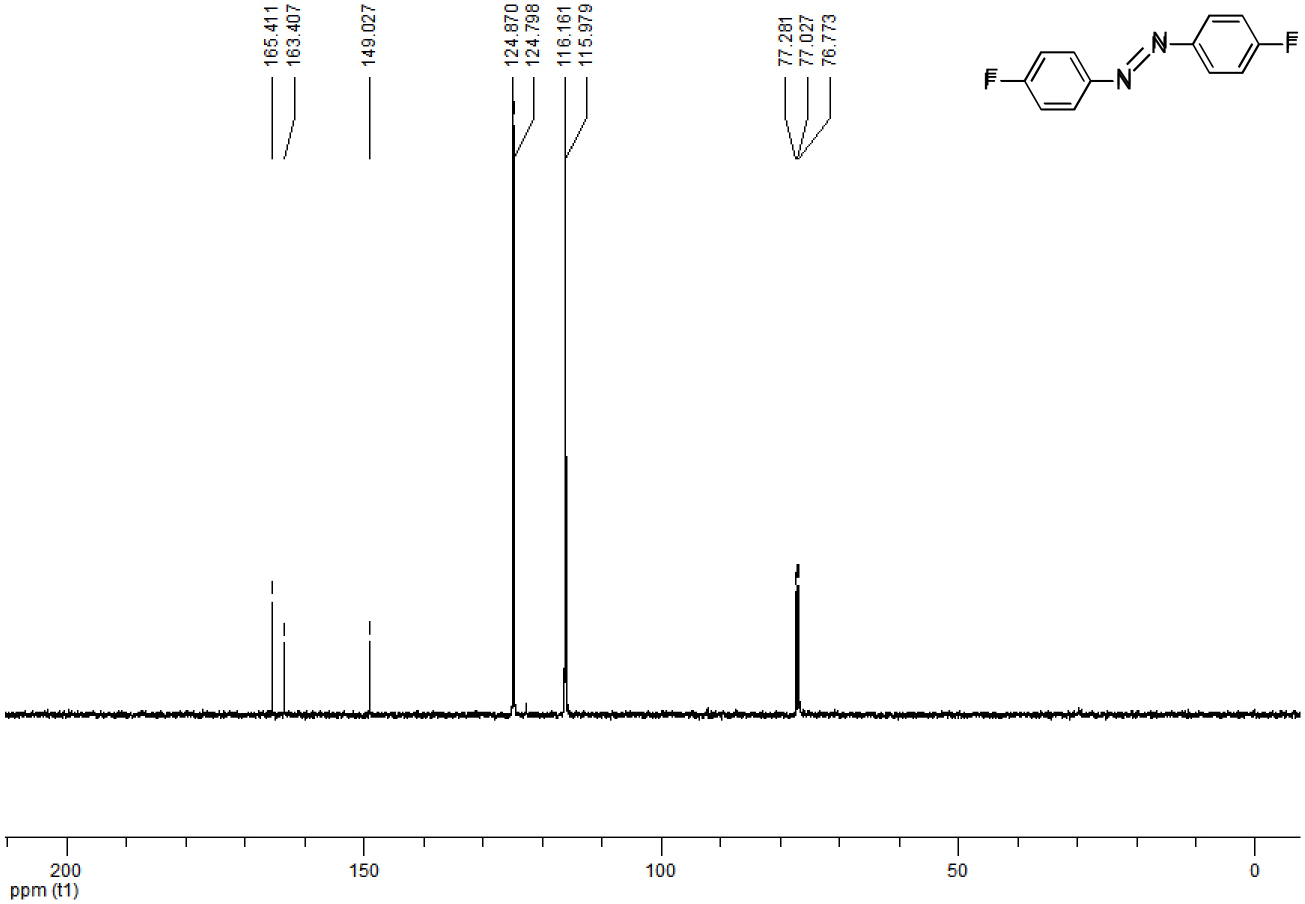

Cl
N
N
Cl
7.903
7.851
7.848
7.841
7.836
7.833
7.496
7.479
7.475
7.471
7.259
1.97
2.07
4.00
10.0
5.0
0.0
ppm (t1)

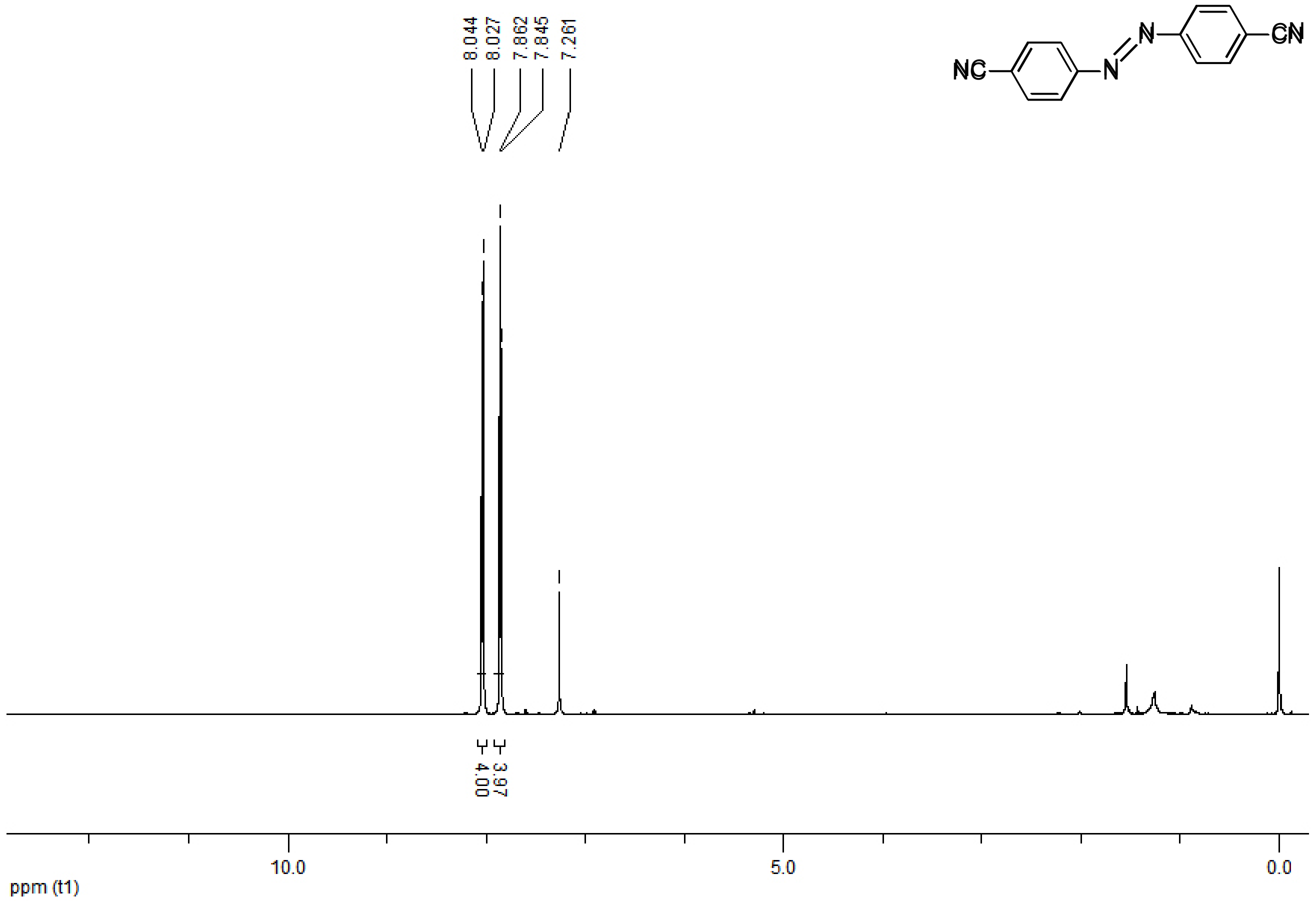

Cl
N
N
Cl
153.171
139.850
131.209
130.208
122.596
121.935
77.263
77.009
76.755
200
150
100
50
0
ppm (t1)

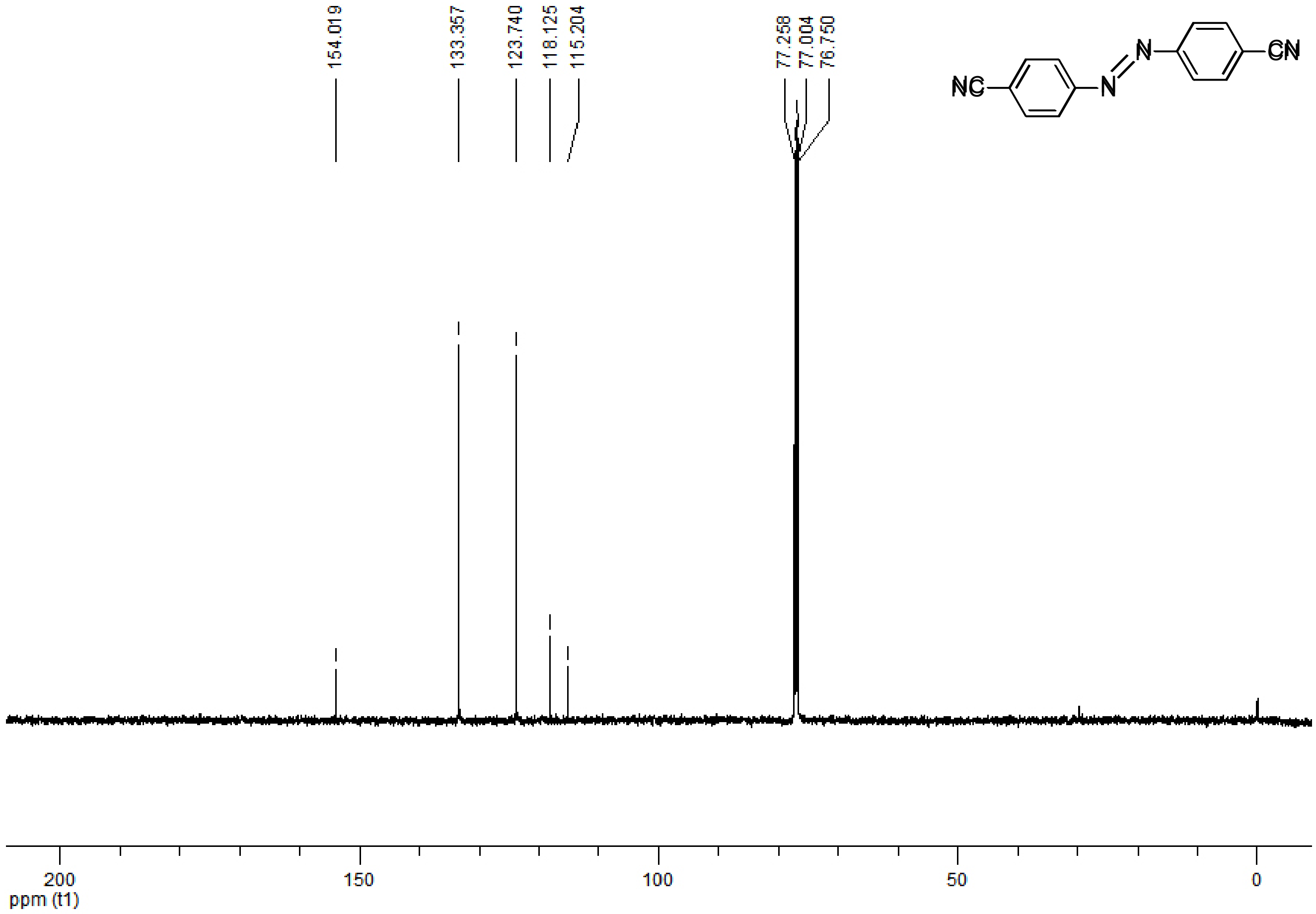

Br
N
N
Br
7.804
7.786
7.663
7.645
7.261
4.00
4.01
10.0
5.0
0.0
ppm (t1)

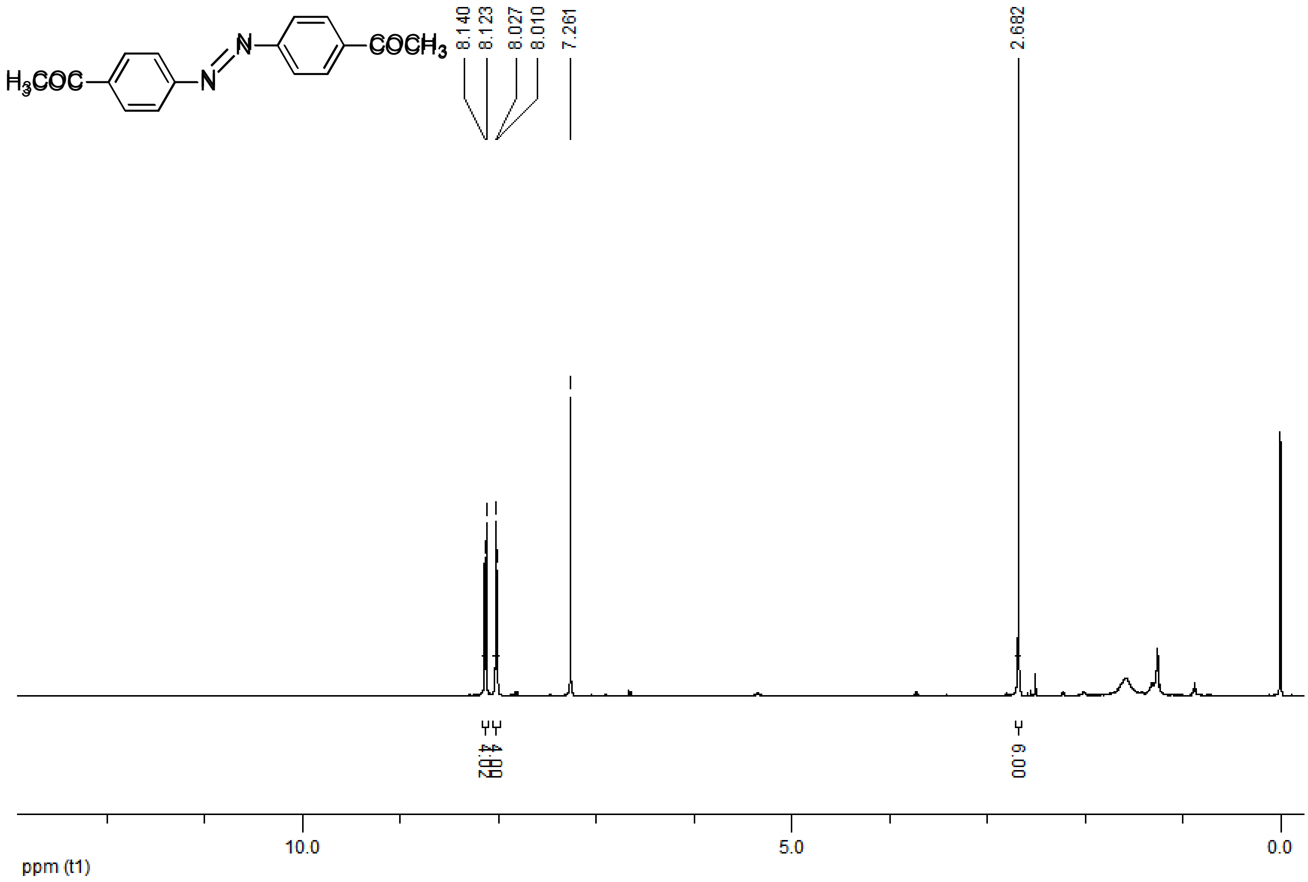

Br
N
N
Br
151.220
139.856
132.423
124.425
77.259
77.005
76.751
200
150
100
50
0
ppm (t1)

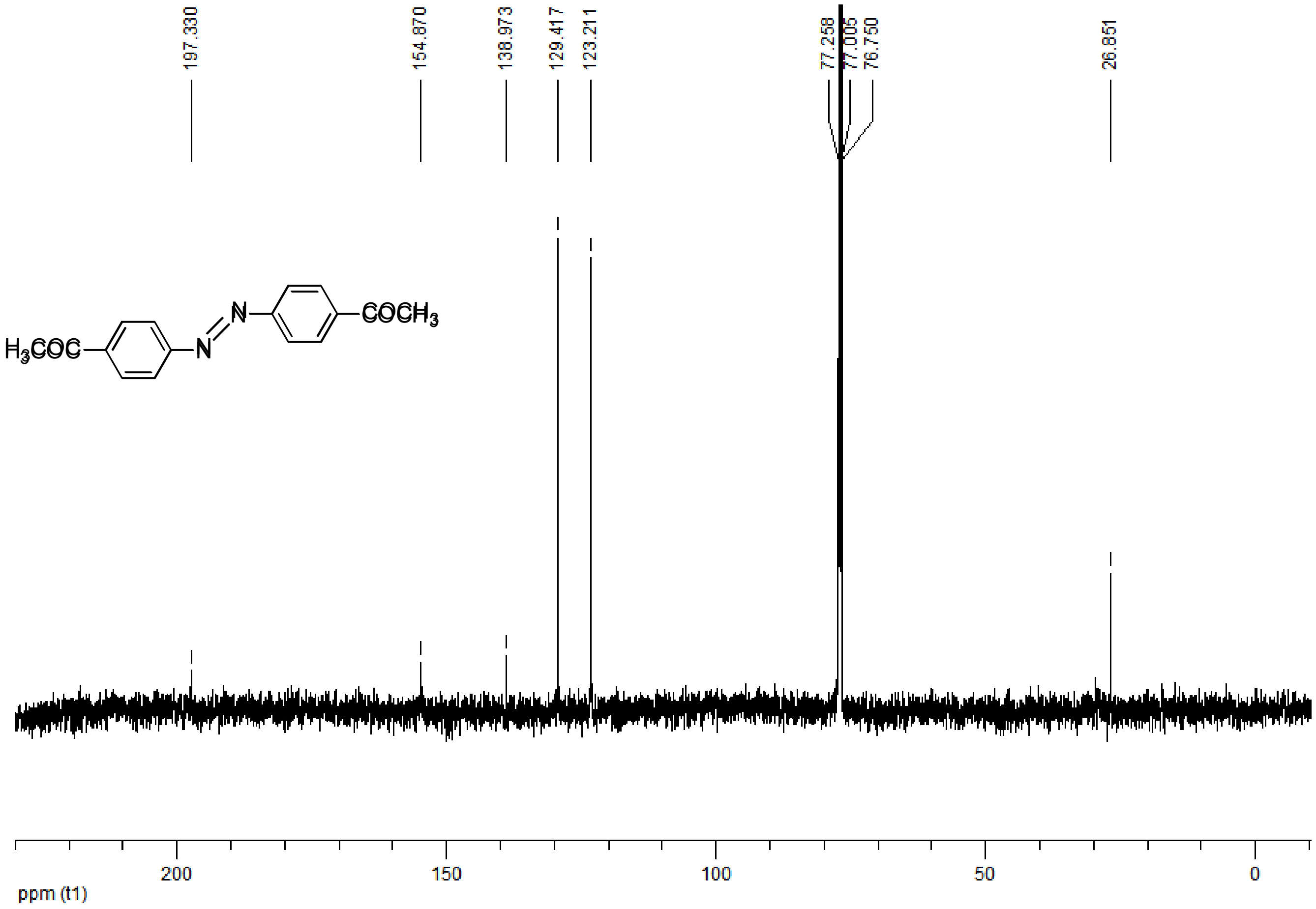

7.924
7.914
7.911
7.907
7.901
7.896
7.244
7.198
7.181
7.164
F
N
N
F
4.00
4.02
10.0
5.0
0.0
ppm (t1)

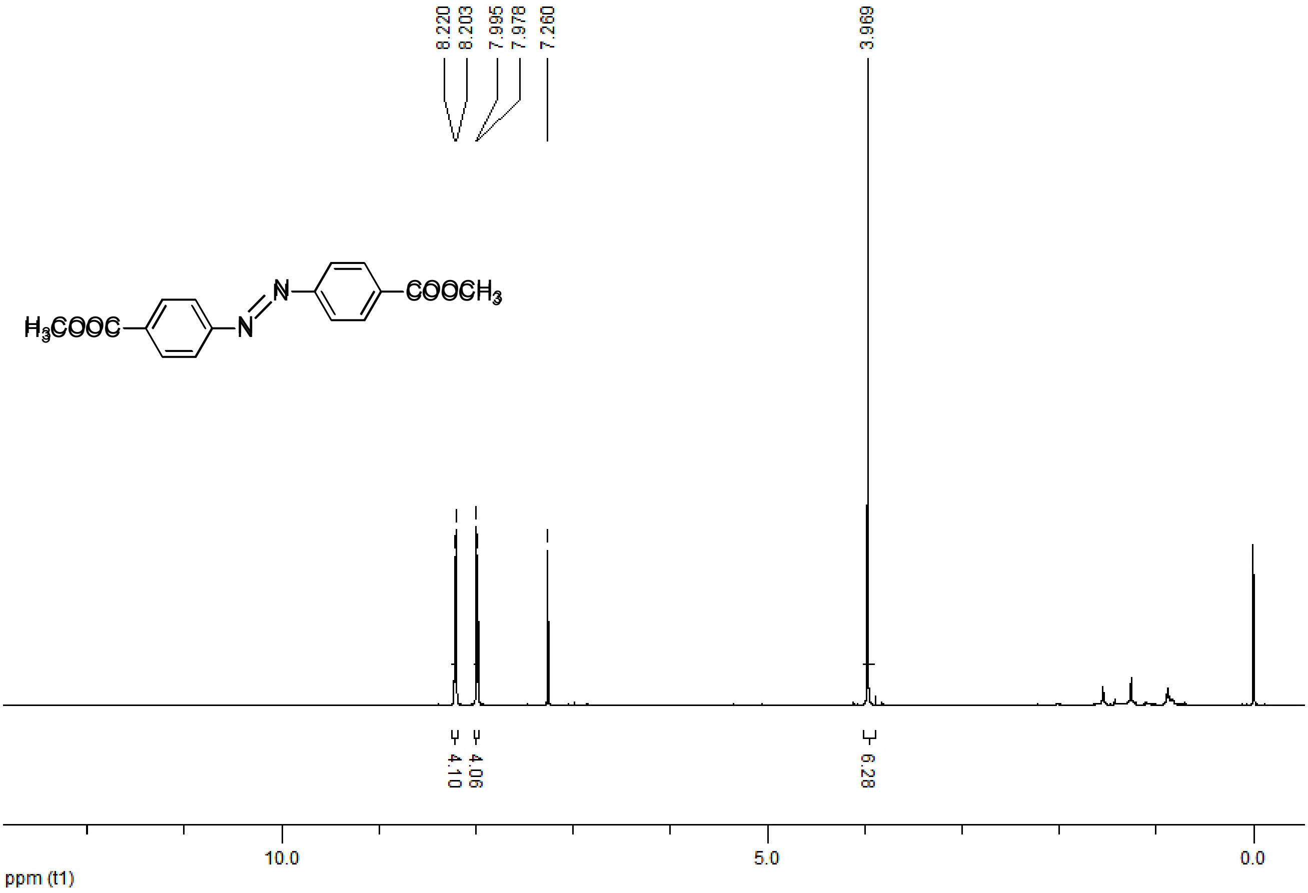

165.411
163.407
149.027
124.870
124.798
116.161
115.979
77.281
77.027
76.773
F
N
N
F
200
150
100
50
0
ppm (t1)

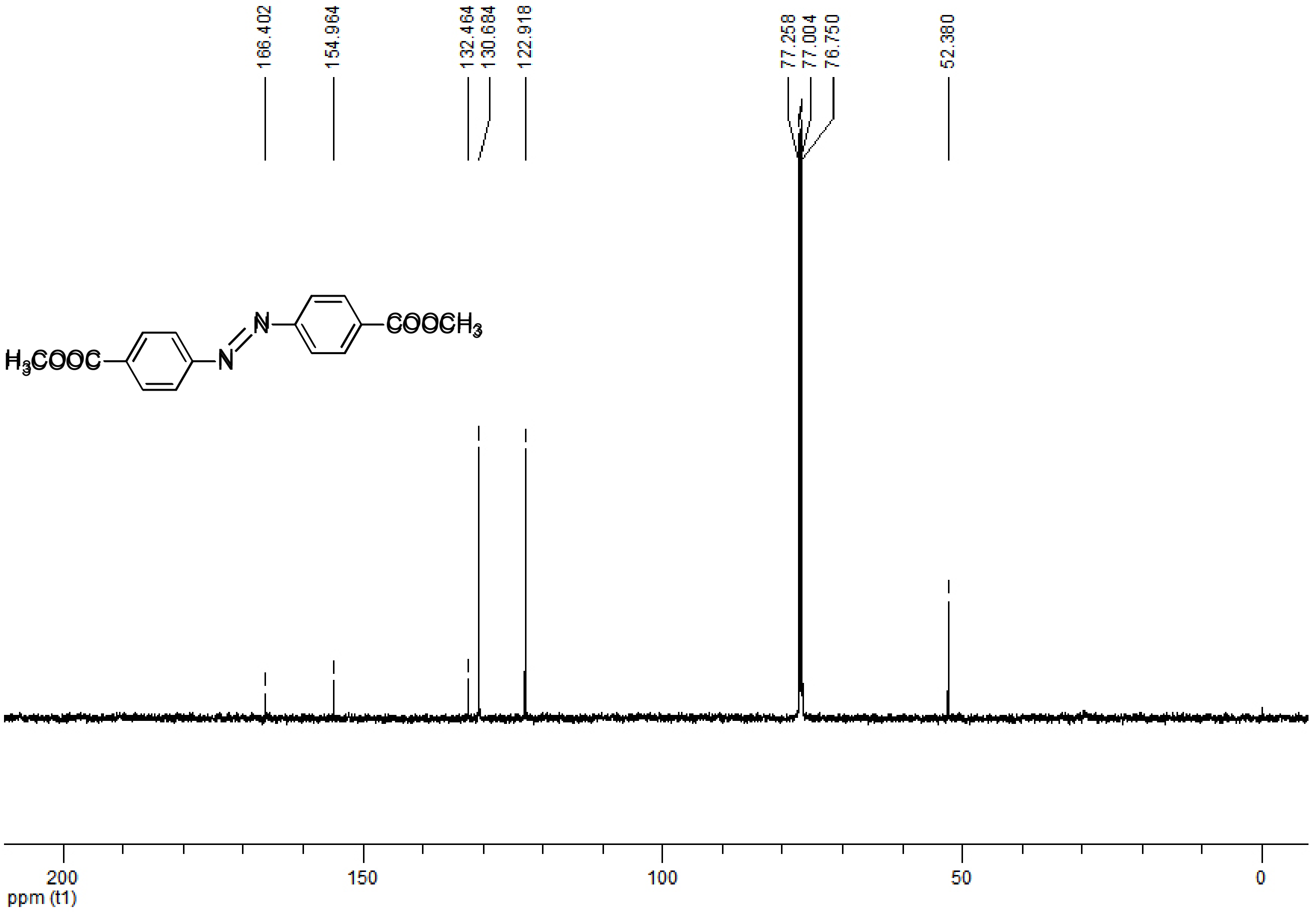

8.044
8.027
7.862
7.845
7.261
NC
N
N
CN
4.00
3.97
10.0
5.0
0.0
ppm (t1)

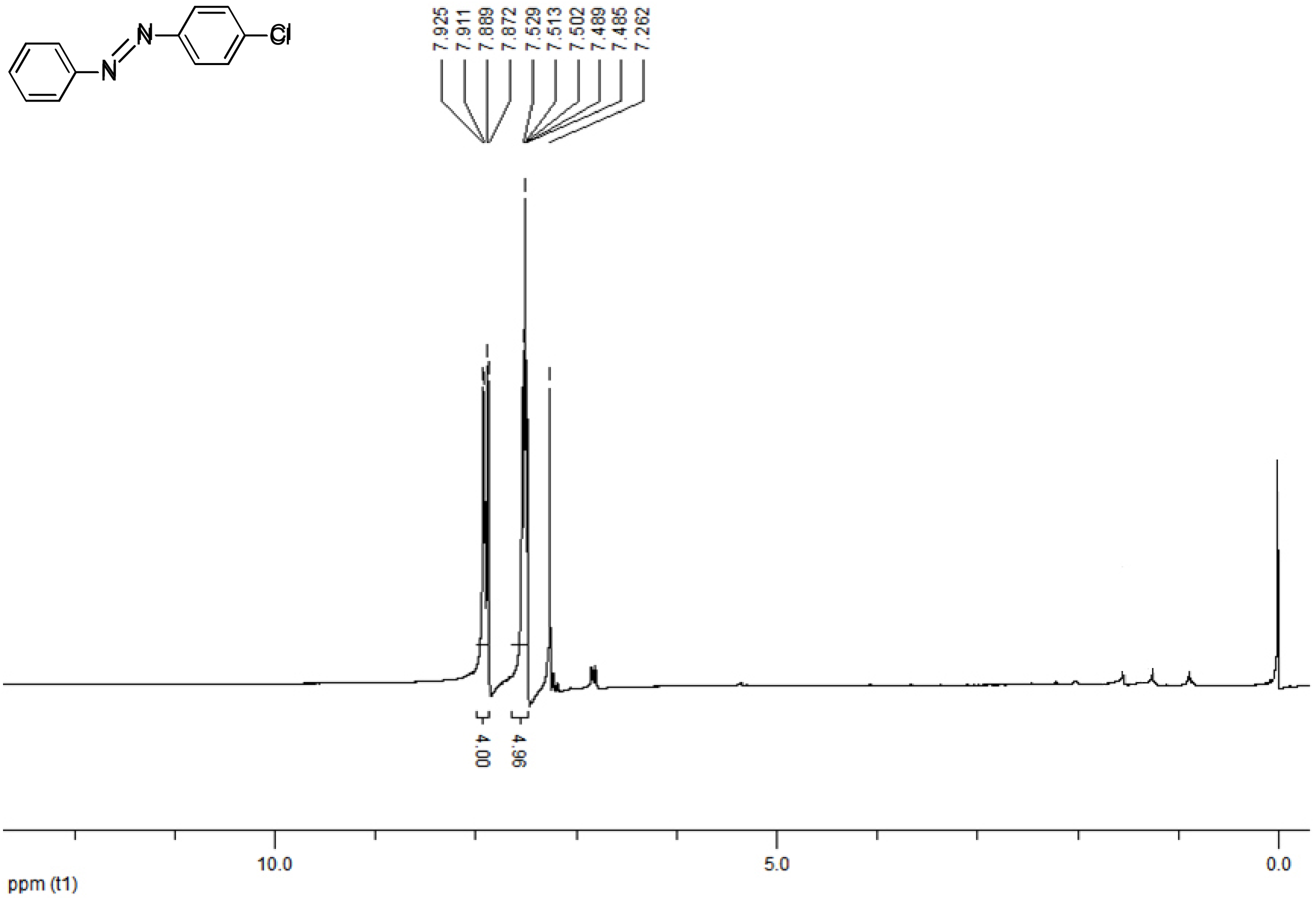

154.019
133.357
123.740
118.125
115.204
77.258
77.004
76.750
NC
N
N
CN
200
150
100
50
0
ppm (t1)

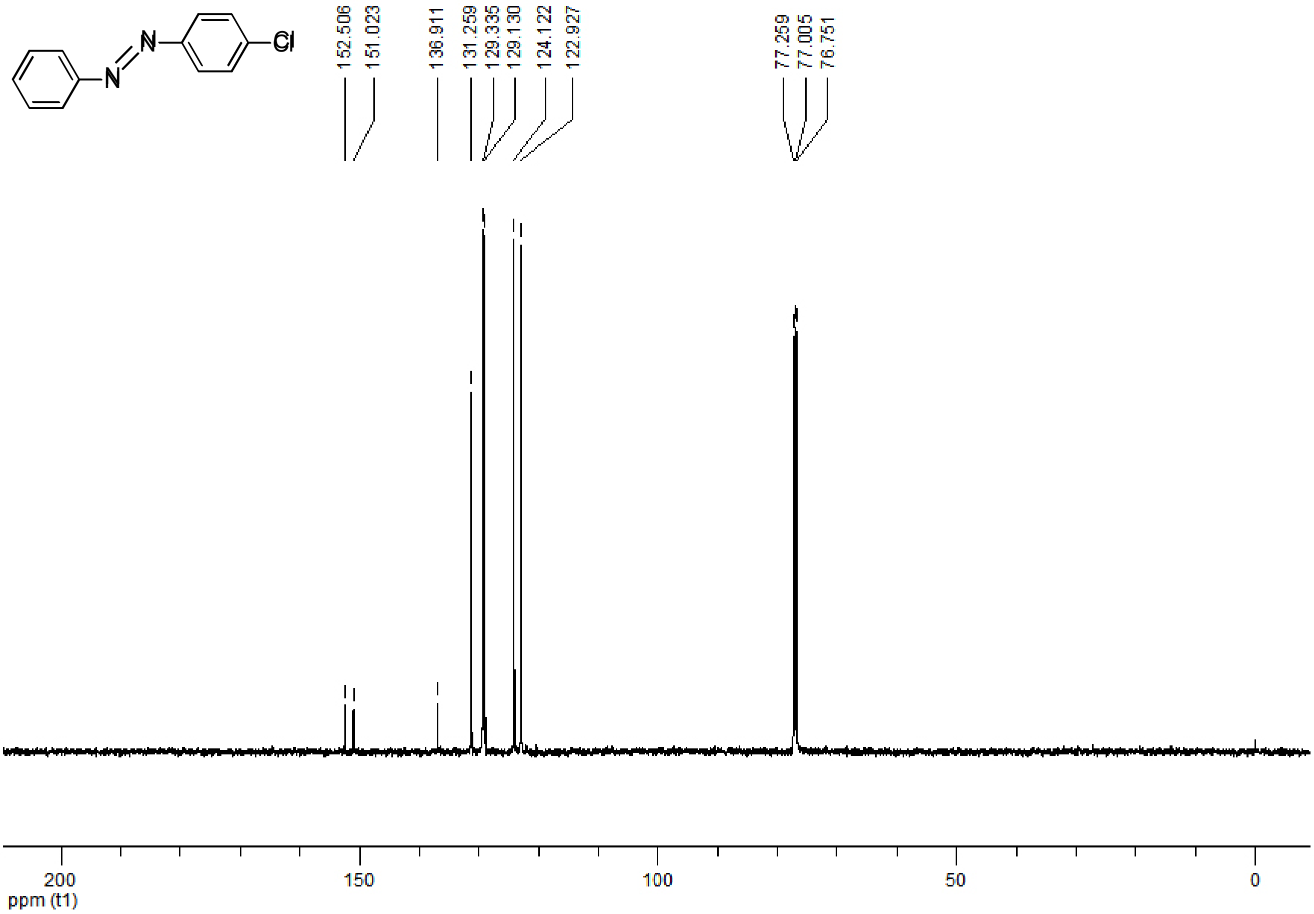

H3COC
N
N
COCH3
8.140
8.123
8.027
8.010
7.261
2.682
4.00
4.02
6.00
10.0
5.0
0.0
ppm (t1)

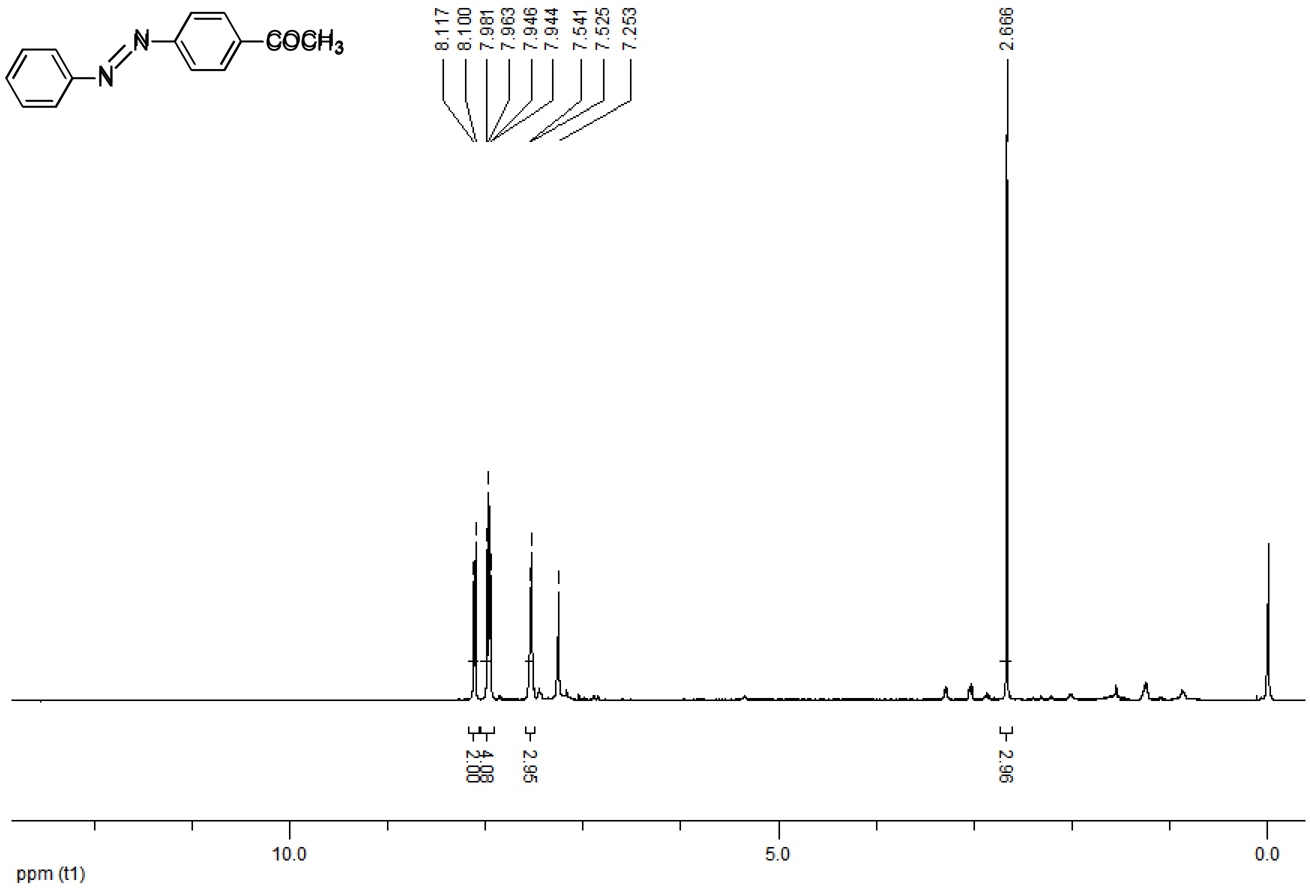

197.330
154.870
138.973
129.417
123.211
77.258
77.005
76.750
26.851
H3COC
N
N
COCH3
200
150
100
50
0
ppm (t1)

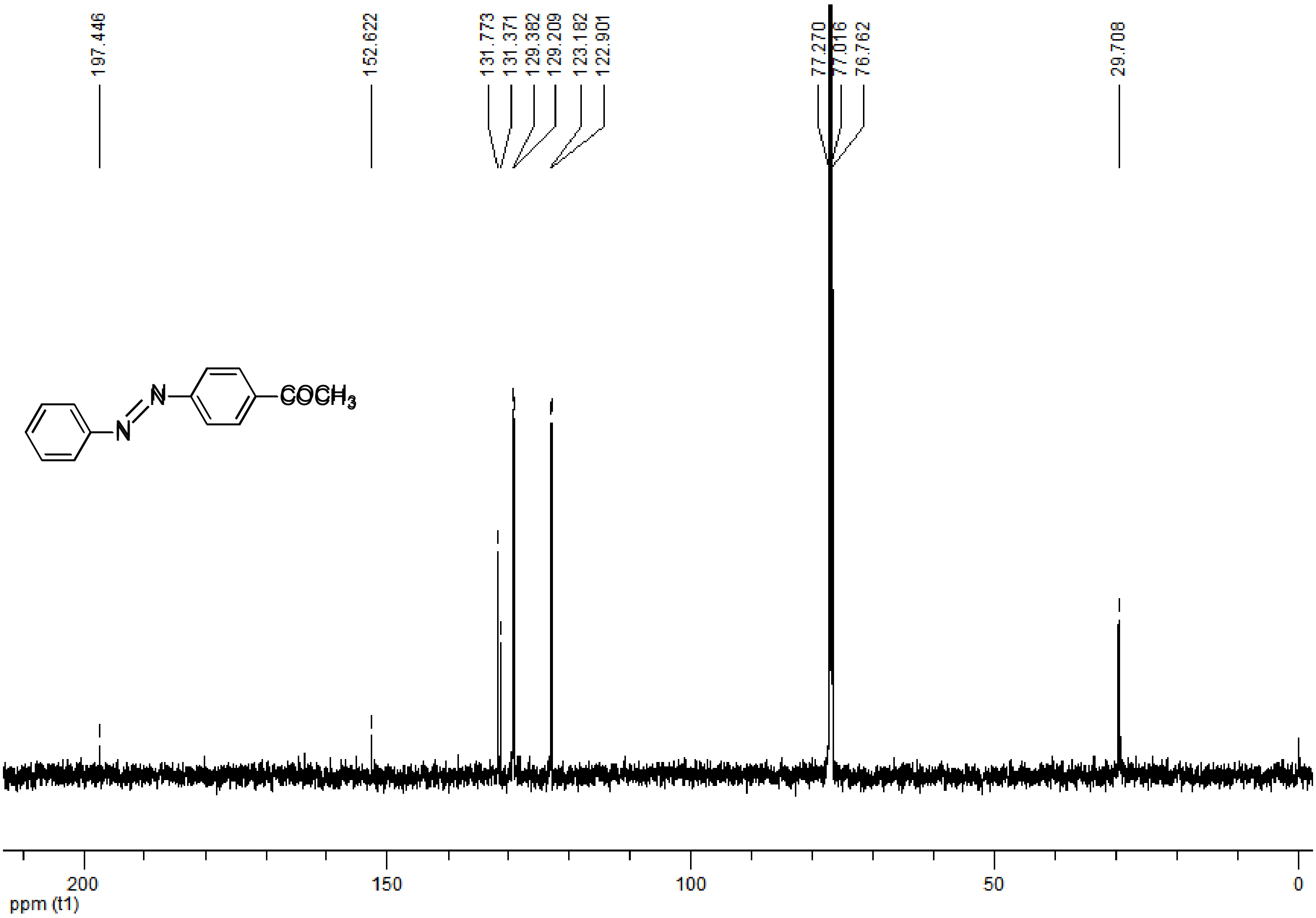

8.220
8.203
7.995
7.978
7.260
3.969
H3COOC
N
N
COOCH3
4.10
4.06
6.28
10.0
5.0
0.0
ppm (t1)

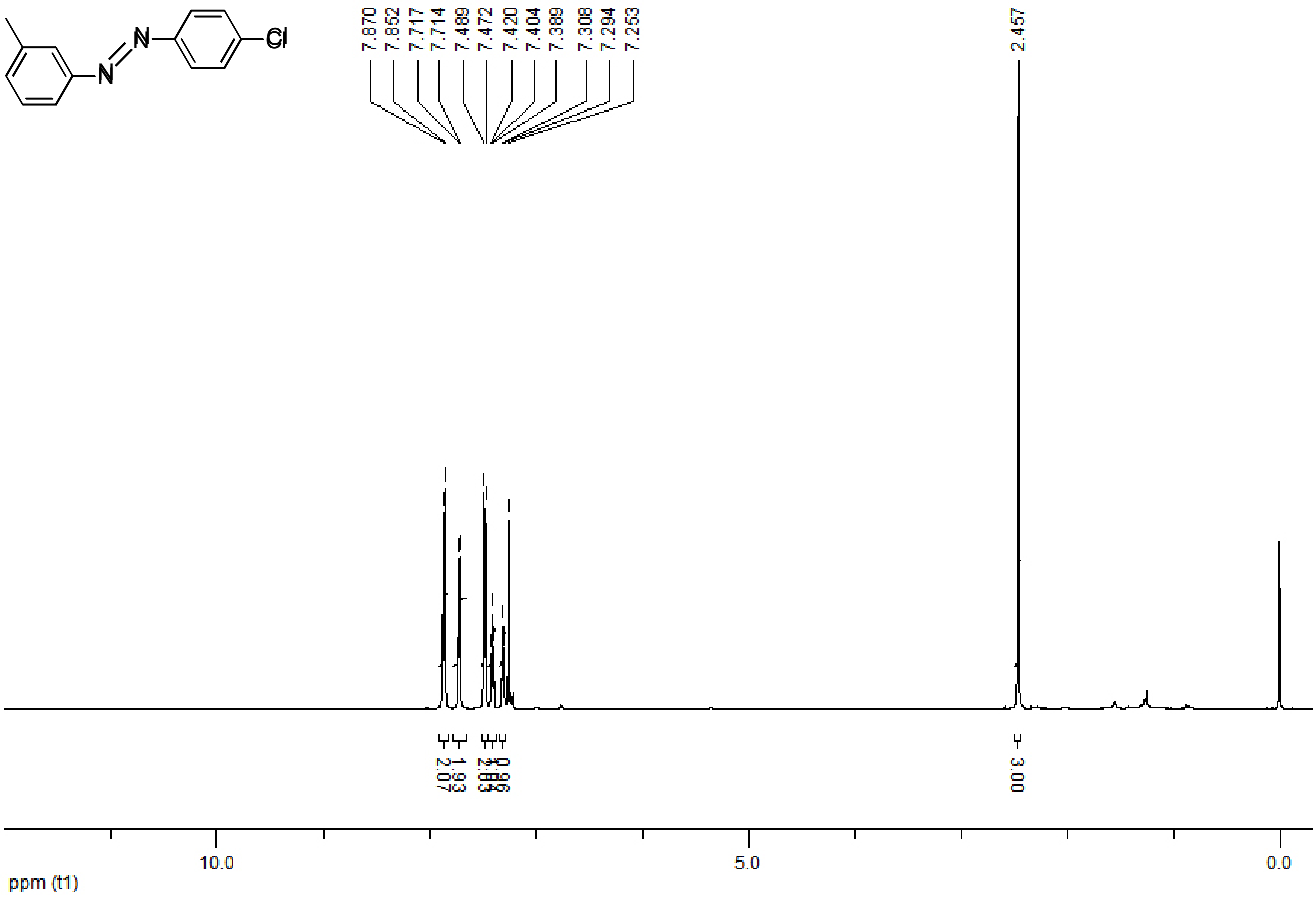

166.402
154.964
132.464
130.684
122.918
77.258
77.004
76.750
52.380
H3COOC
N
N
COOCH3
200
150
100
50
0
ppm (t1)

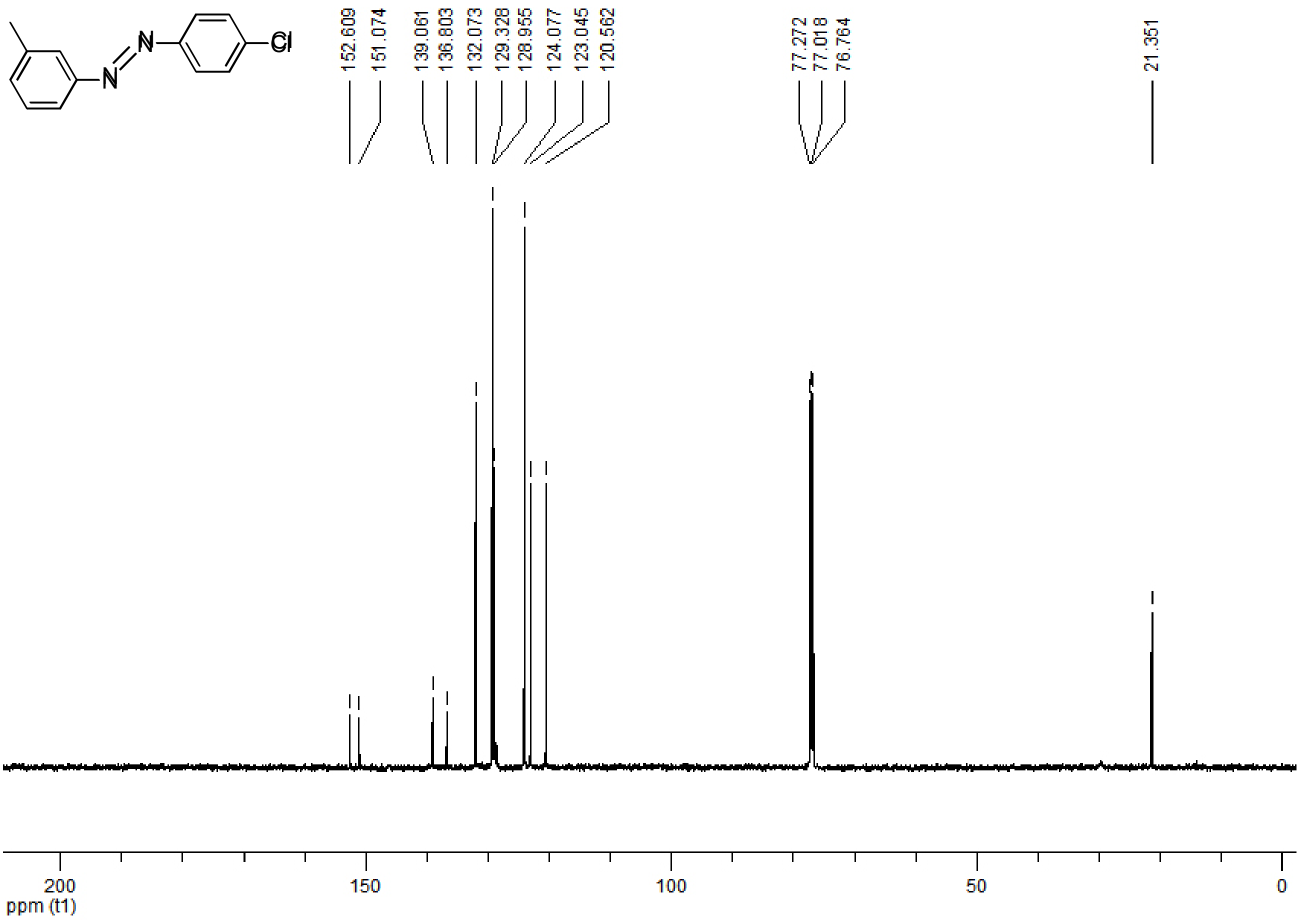

N
N
Cl
7.925
7.911
7.889
7.872
7.529
7.513
7.502
7.489
7.485
7.262
4.00
4.96
10.0
5.0
0.0
ppm (t1)

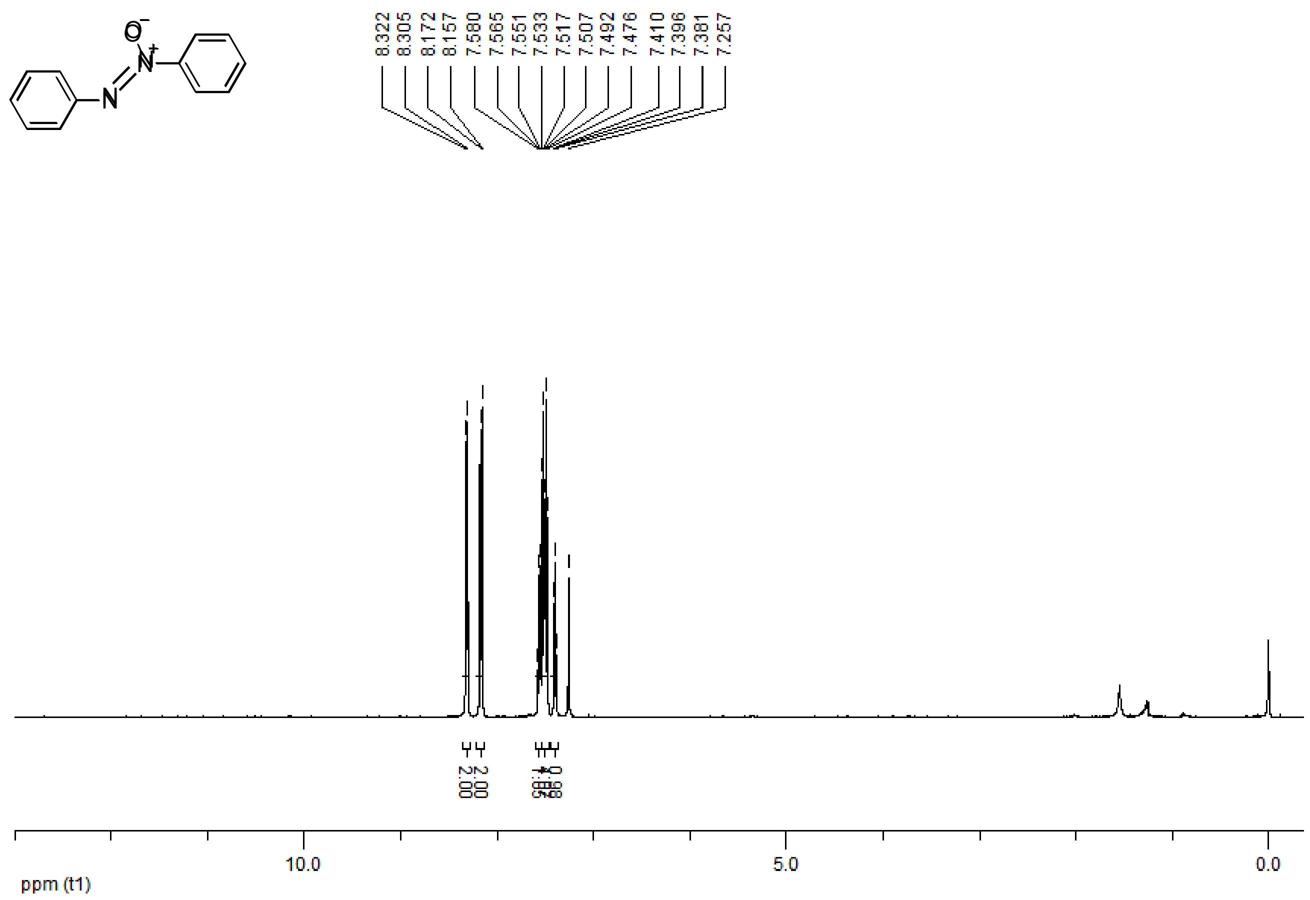

N
N
Cl
152.506
151.023
136.911
131.259
129.335
129.130
124.122
122.927
77.259
77.005
76.751
200
150
100
50
0
ppm (t1)

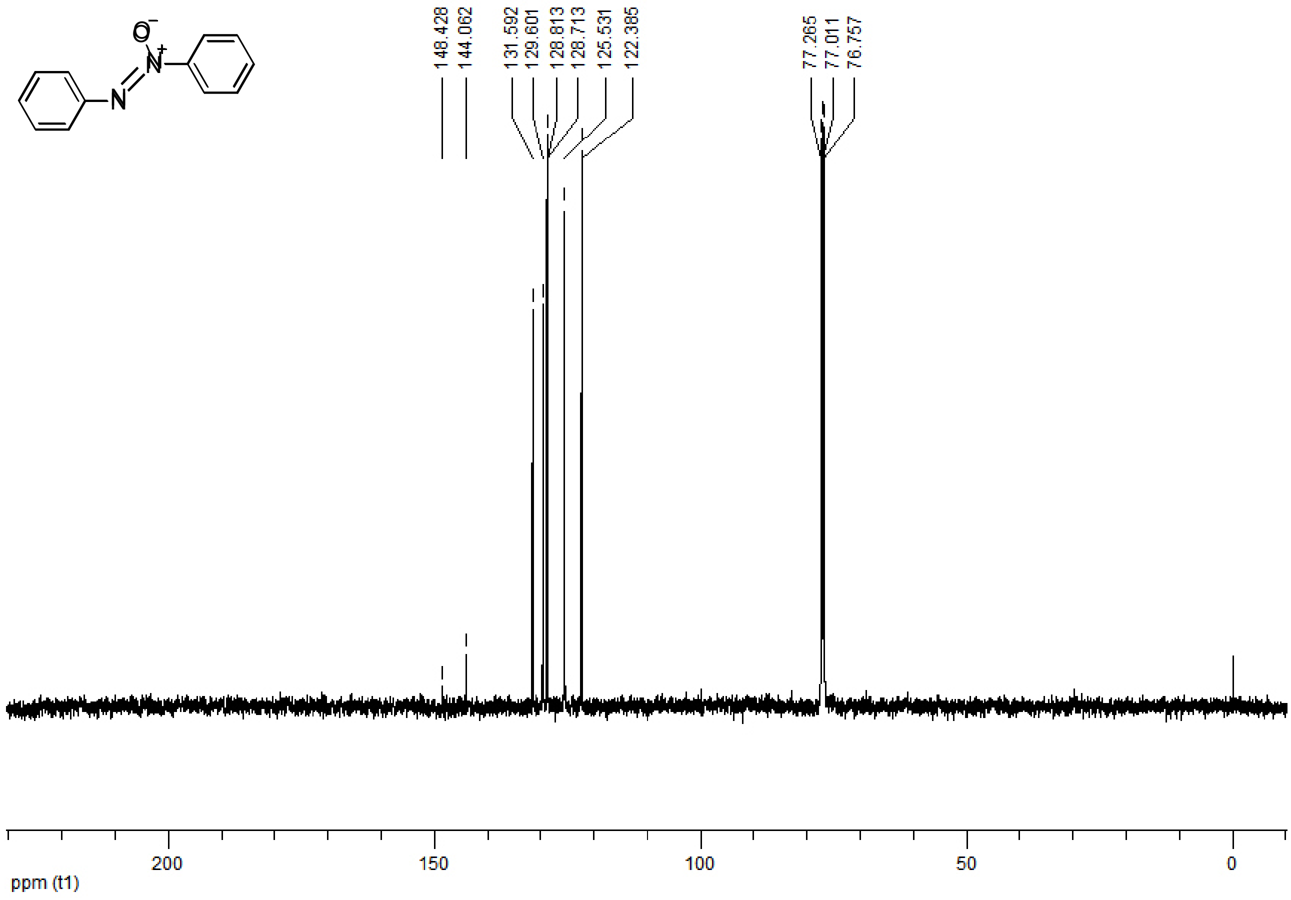

COCH3
N
N
8.117
8.100
7.981
7.963
7.946
7.944
7.541
7.525
7.253
2.666
2.00
4.08
2.95
2.96
10.0
5.0
0.0
ppm (t1)

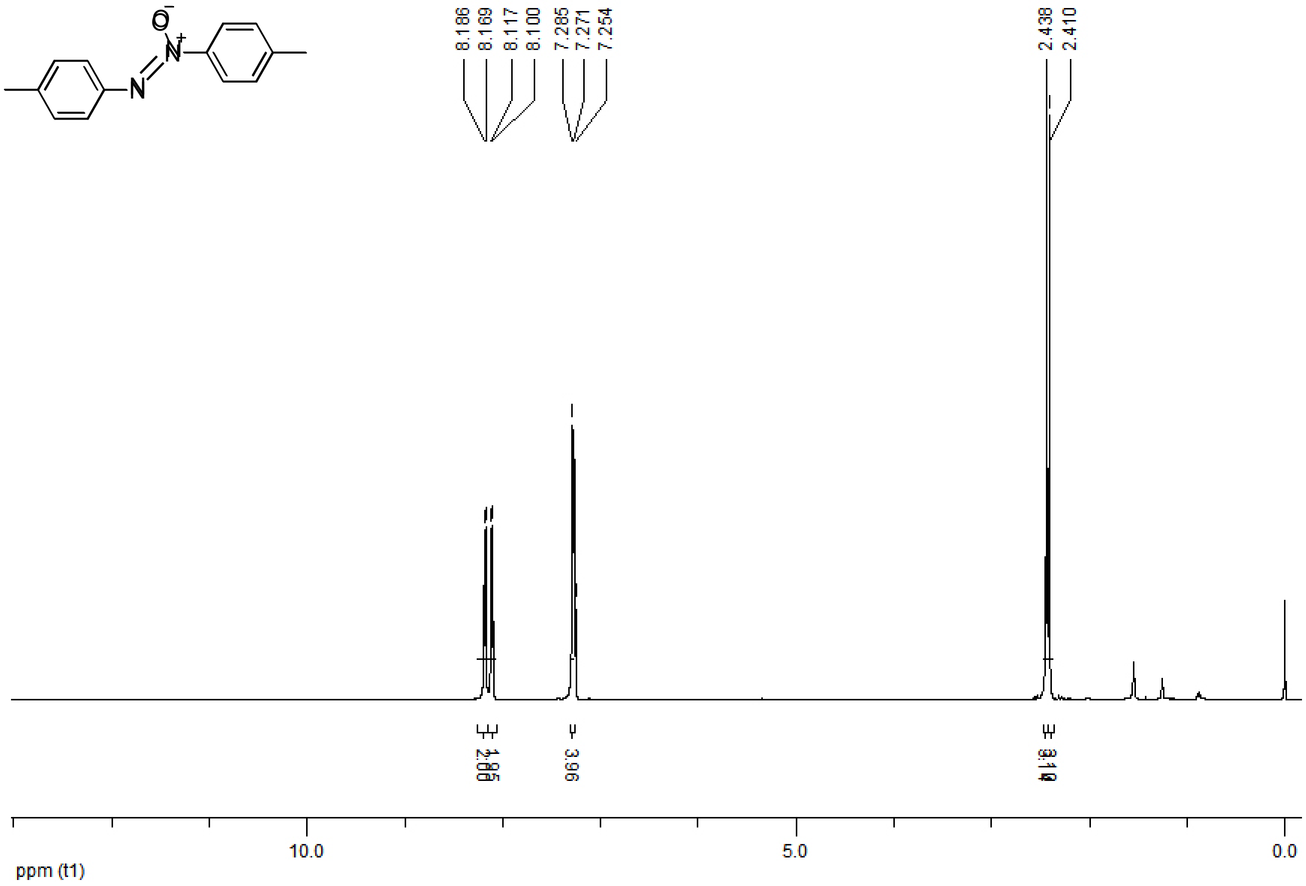

197.446
152.622
131.773
131.371
129.382
129.209
123.182
122.901
77.270
77.016
76.762
29.708
COCH3
N
N
200
150
100
50
0
ppm (t1)

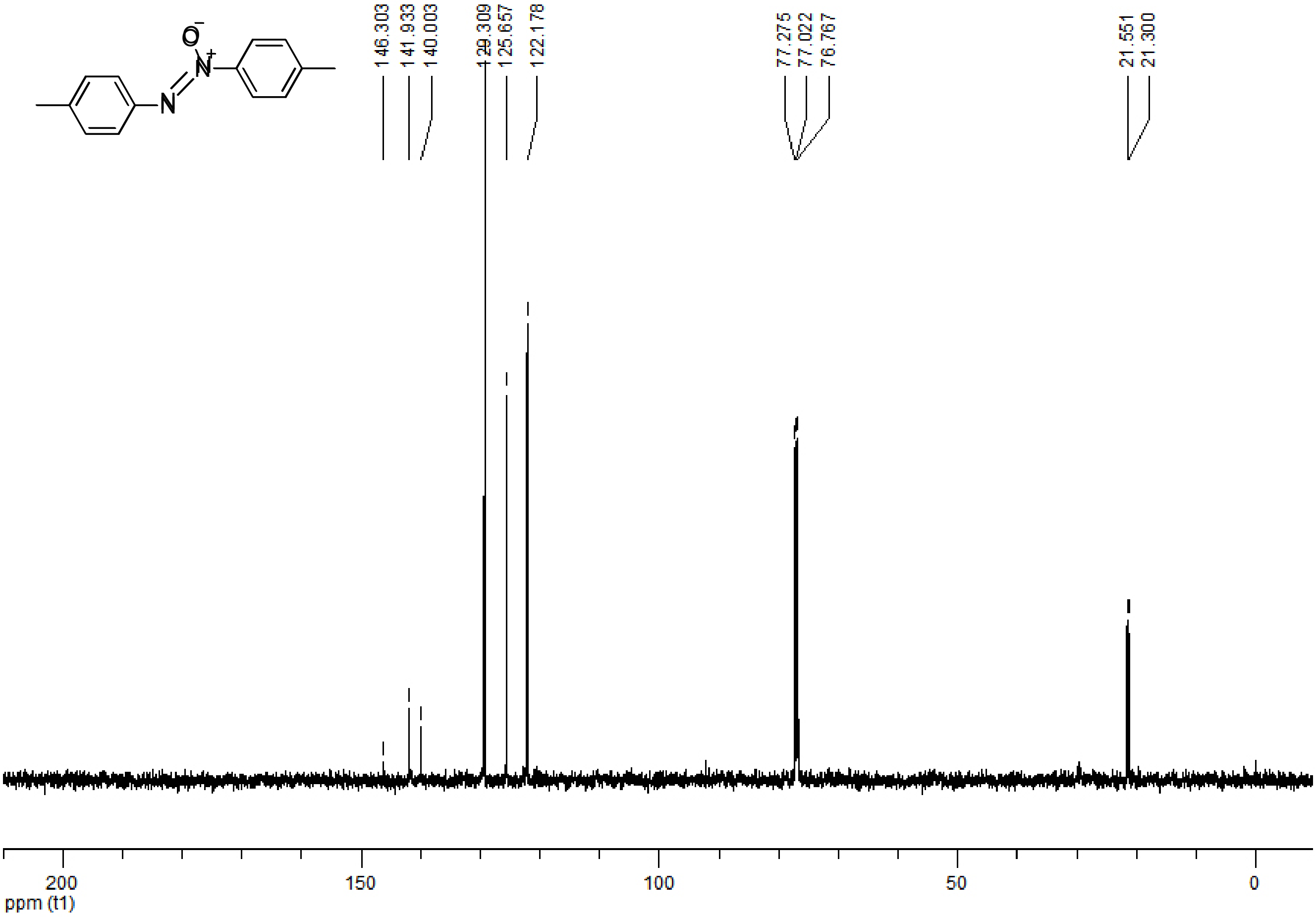

Cl
N
N
7.870
7.852
7.717
7.714
7.489
7.472
7.420
7.404
7.389
7.308
7.294
7.253
2.457
2.07
1.93
0.96
3.00
10.0
5.0
0.0
ppm (t1)

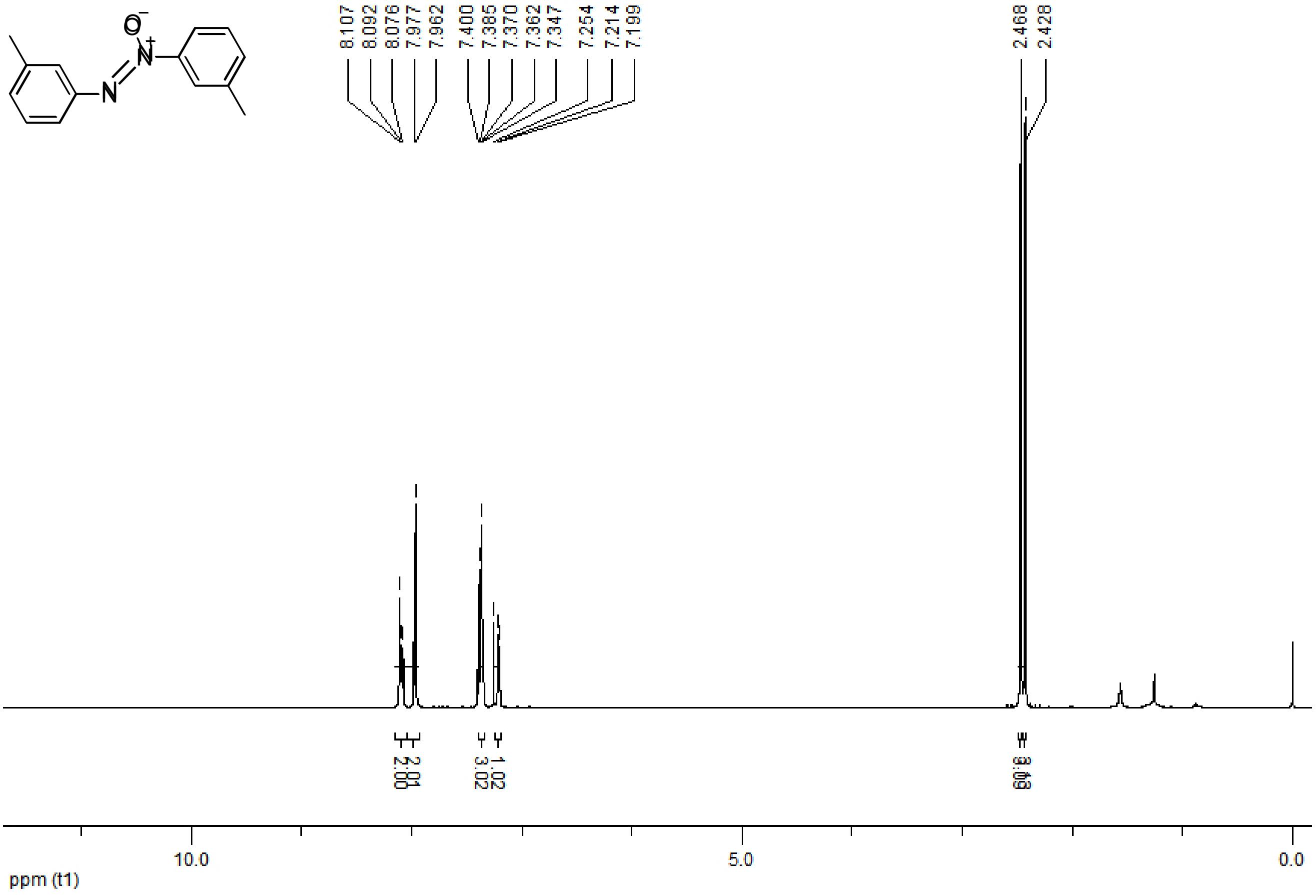

Cl
N
N
152.609
151.074
139.061
136.803
132.073
129.328
128.955
124.077
123.045
120.562
77.272
77.018
76.764
21.351
200
150
100
50
0
ppm (t1)

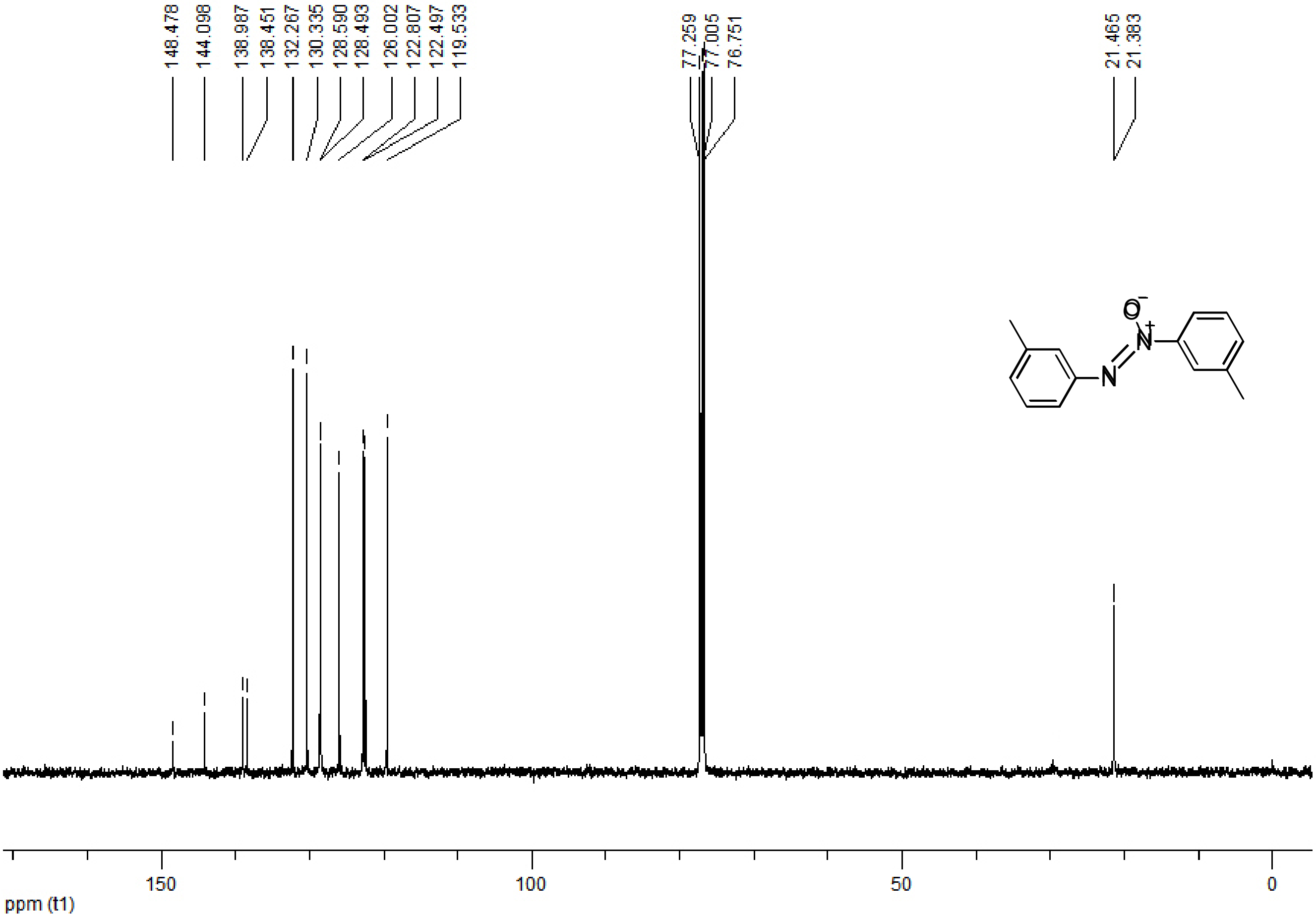

O⁻
N⁺
N
8.322
8.305
8.172
8.157
7.580
7.565
7.551
7.533
7.517
7.507
7.492
7.476
7.410
7.396
7.381
7.257
2.00
2.00
0.98
10.0
5.0
0.0
ppm (t1)

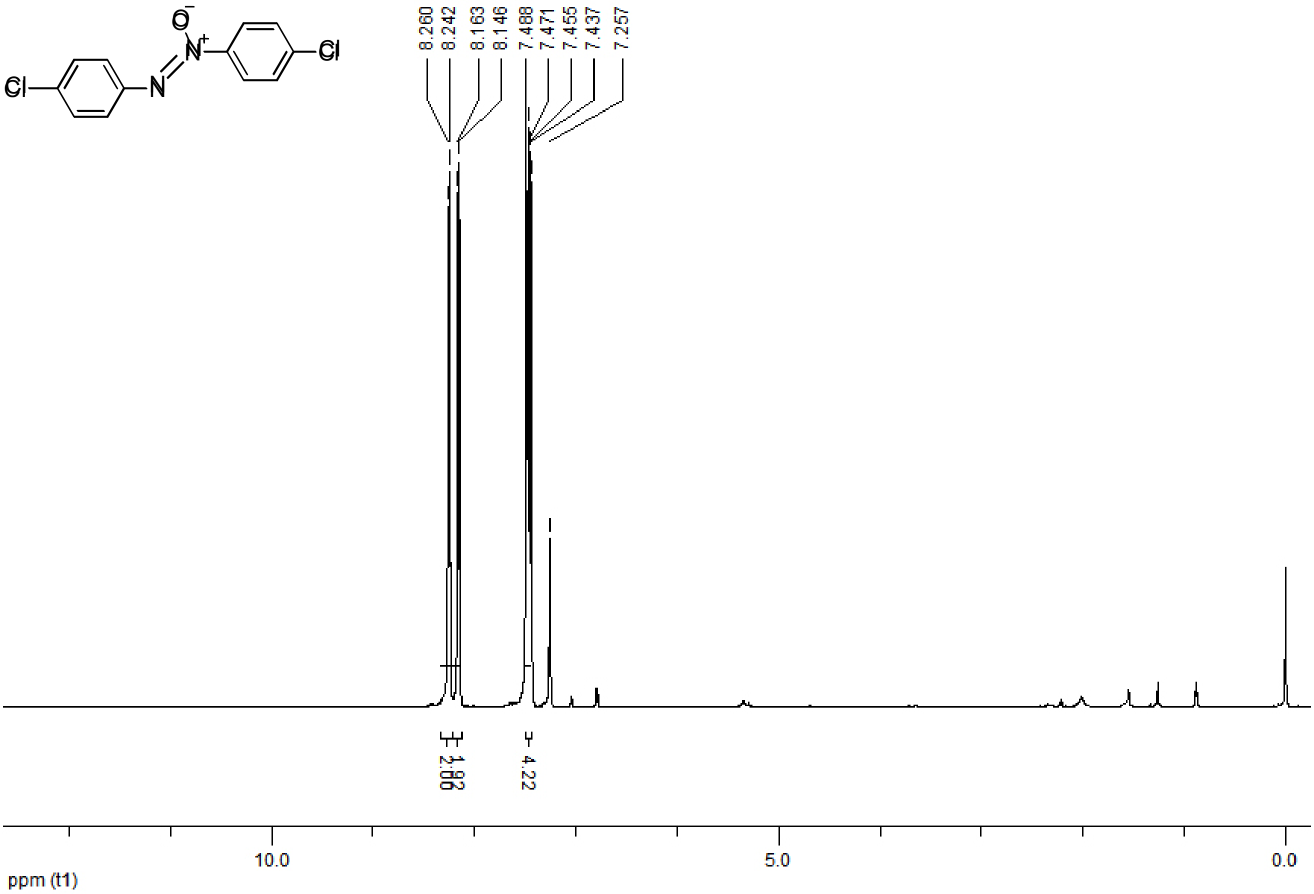

O⁻
N⁺
N
148.428
144.062
131.592
129.601
128.813
128.713
125.531
122.385
77.265
77.011
76.757
200
150
100
50
0
ppm (t1)

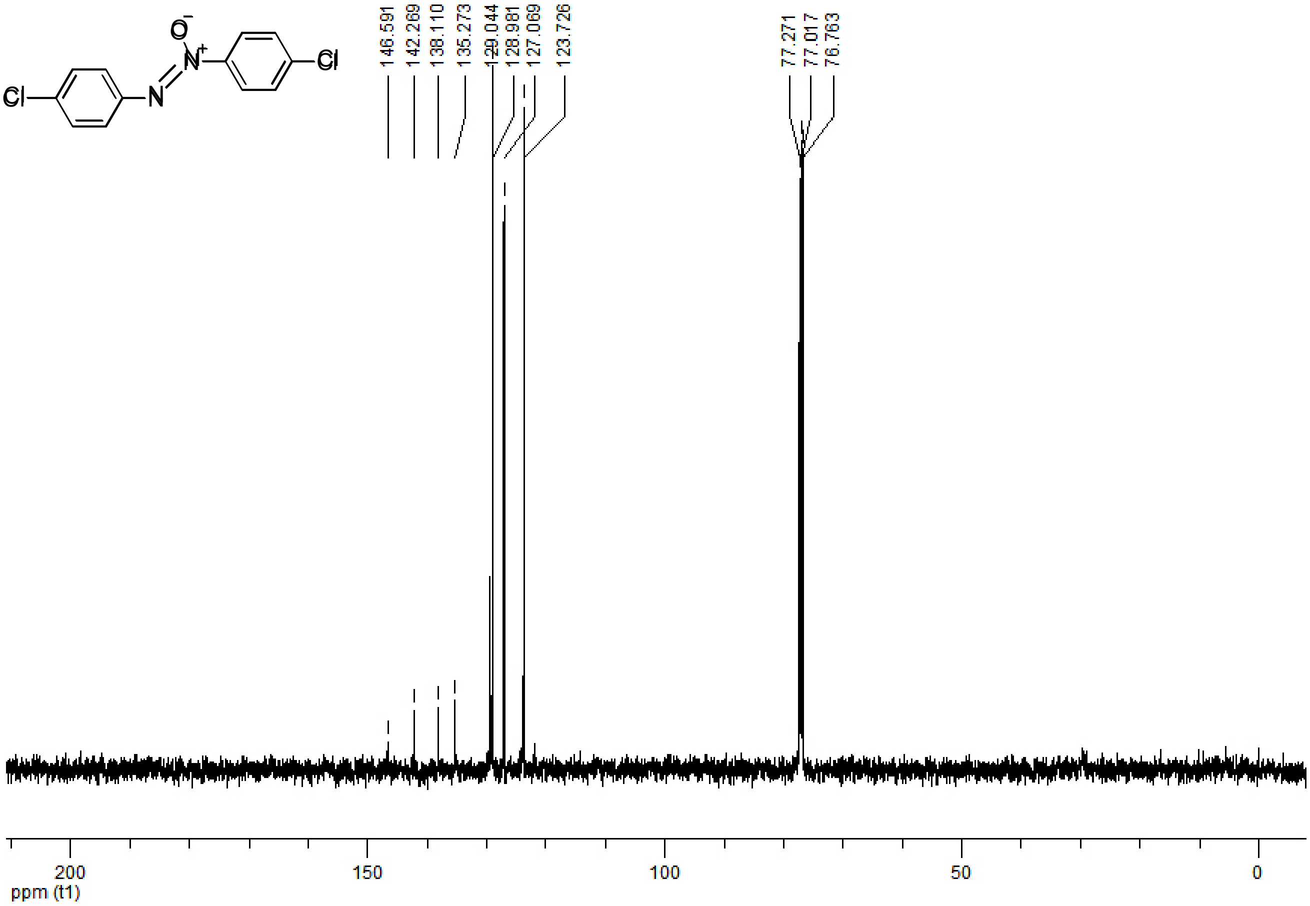

O
N
N
8.186
8.169
8.117
8.100
7.285
7.271
7.254
2.438
2.410
2.00
1.95
3.96
10.0
5.0
0.0
ppm (t1)

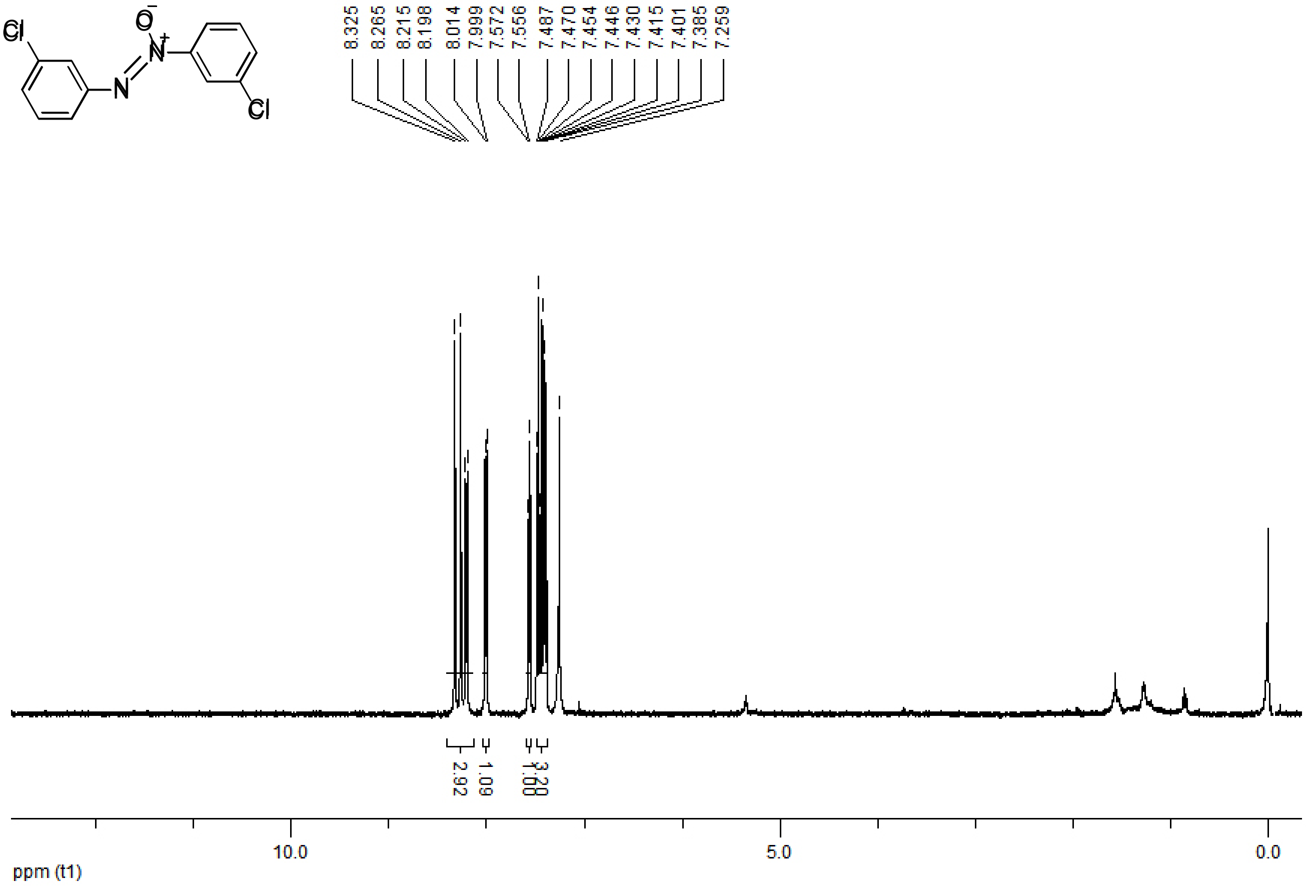

O
N
N
146.303
141.933
140.003
129.309
125.657
122.178
77.275
77.022
76.767
21.551
21.300
200
150
100
50
0
ppm (t1)

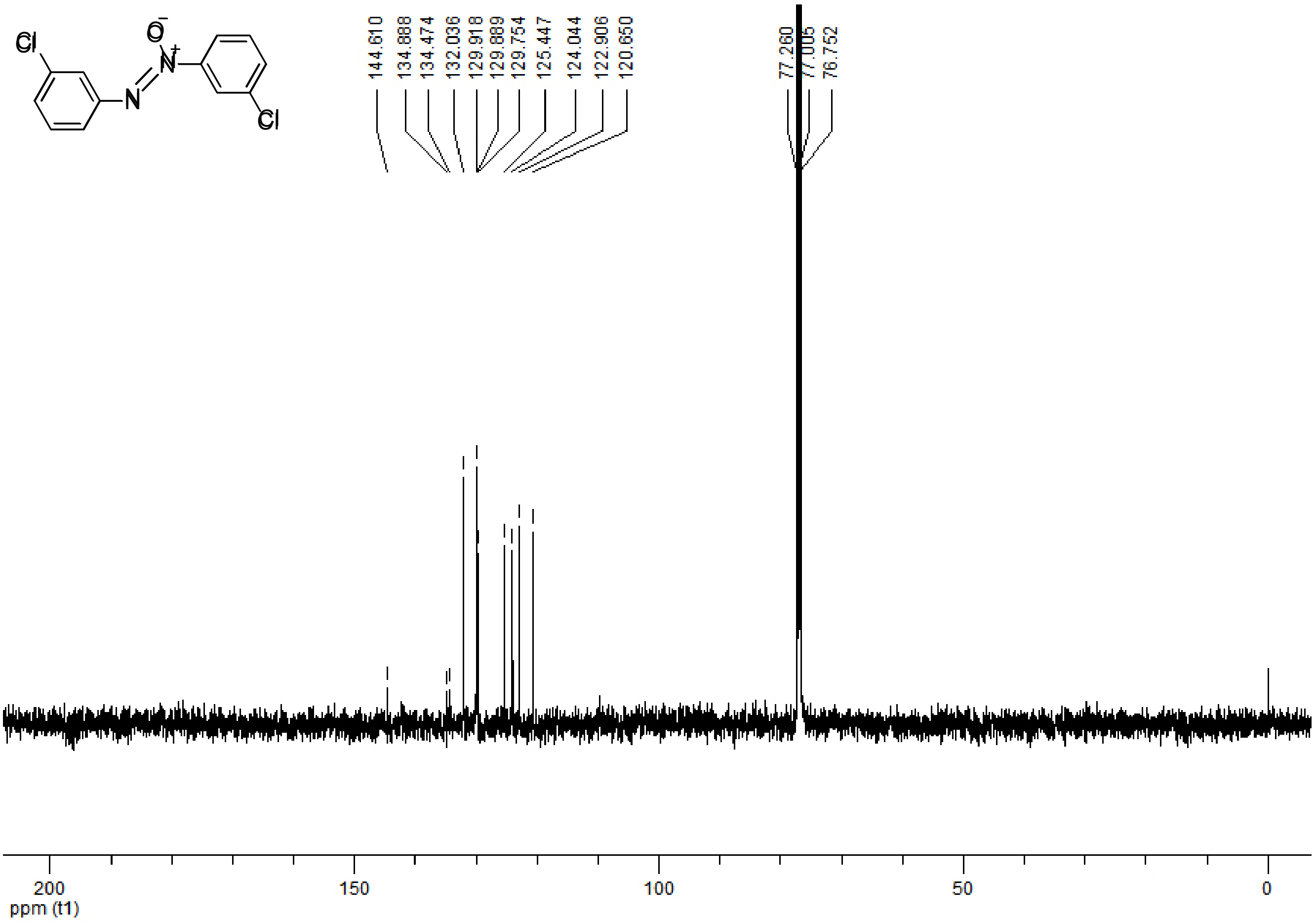

8.107
8.092
8.076
7.977
7.962
7.400
7.385
7.370
7.362
7.347
7.254
7.214
7.199
2.468
2.428
2.00
2.01
3.02
1.02
10.0
5.0
0.0
ppm (t1)
O
N
N

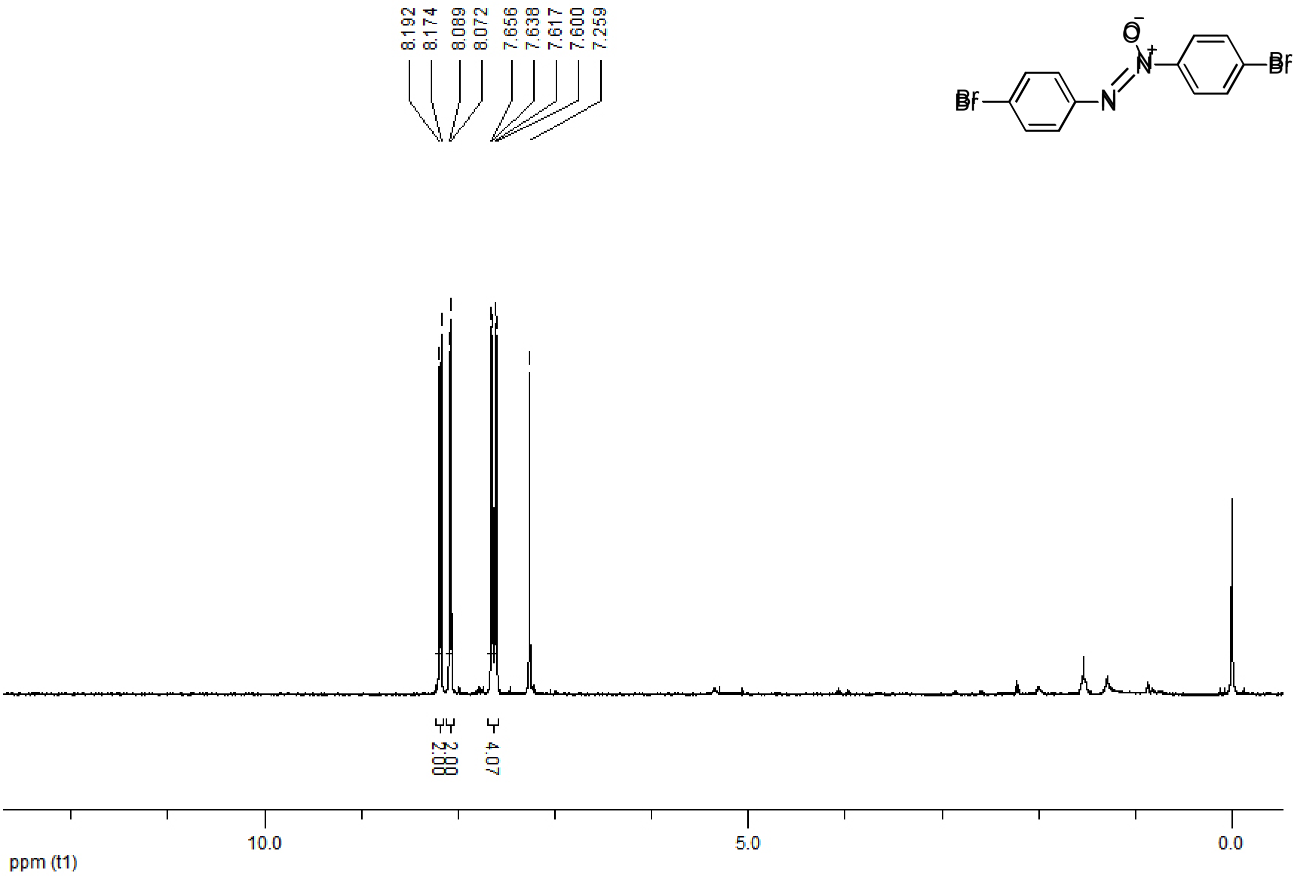

148.478
144.098
138.987
138.451
132.267
130.335
128.590
128.493
126.002
122.807
122.497
119.533
77.259
77.005
76.751
21.465
21.383
150
100
50
0
ppm (t1)
O
N
N

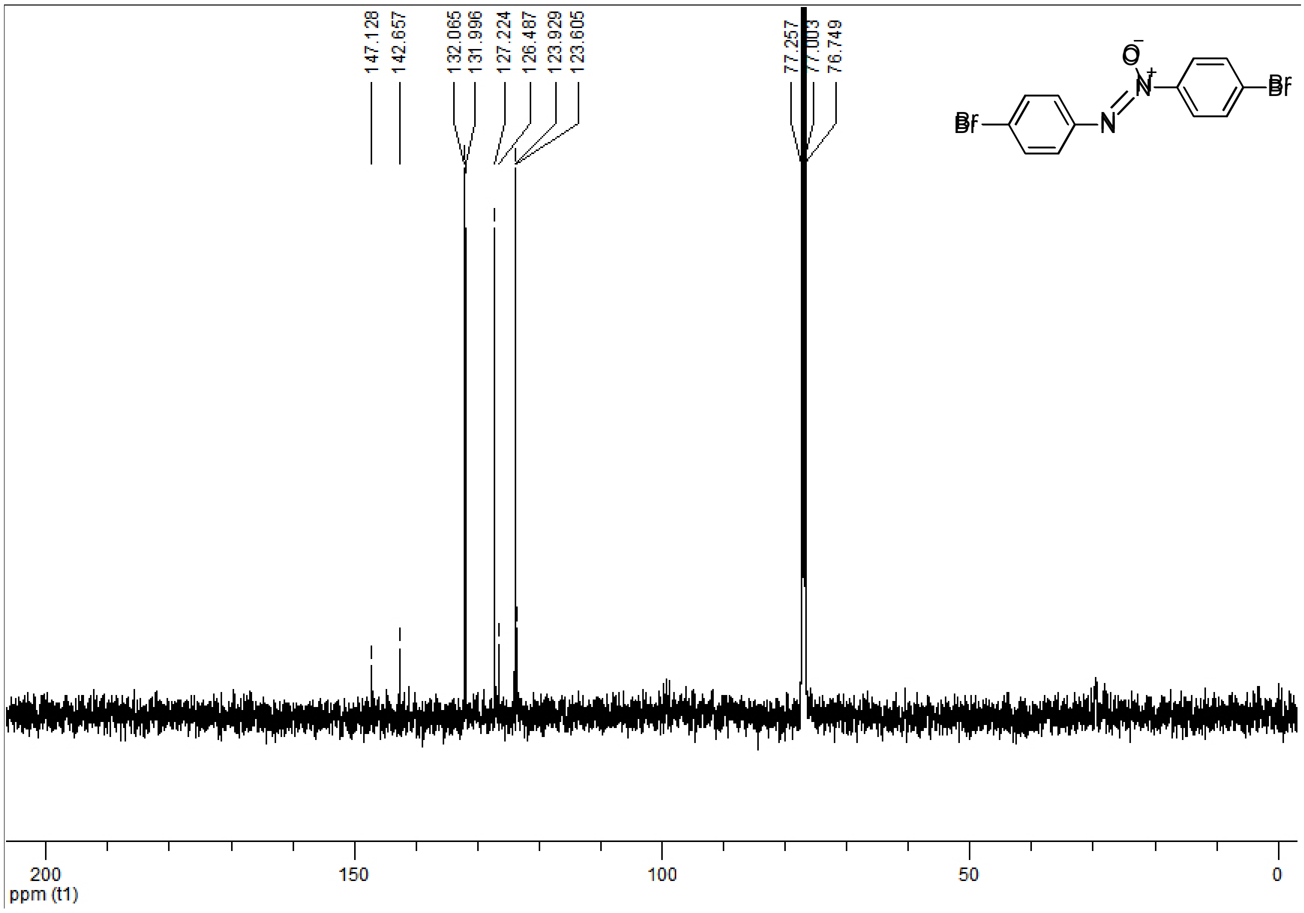

Cl
N
N+
O−
Cl
8.260
8.242
8.163
8.146
7.488
7.471
7.455
7.437
7.257
2.06
1.92
4.22
10.0
5.0
0.0
ppm (t1)

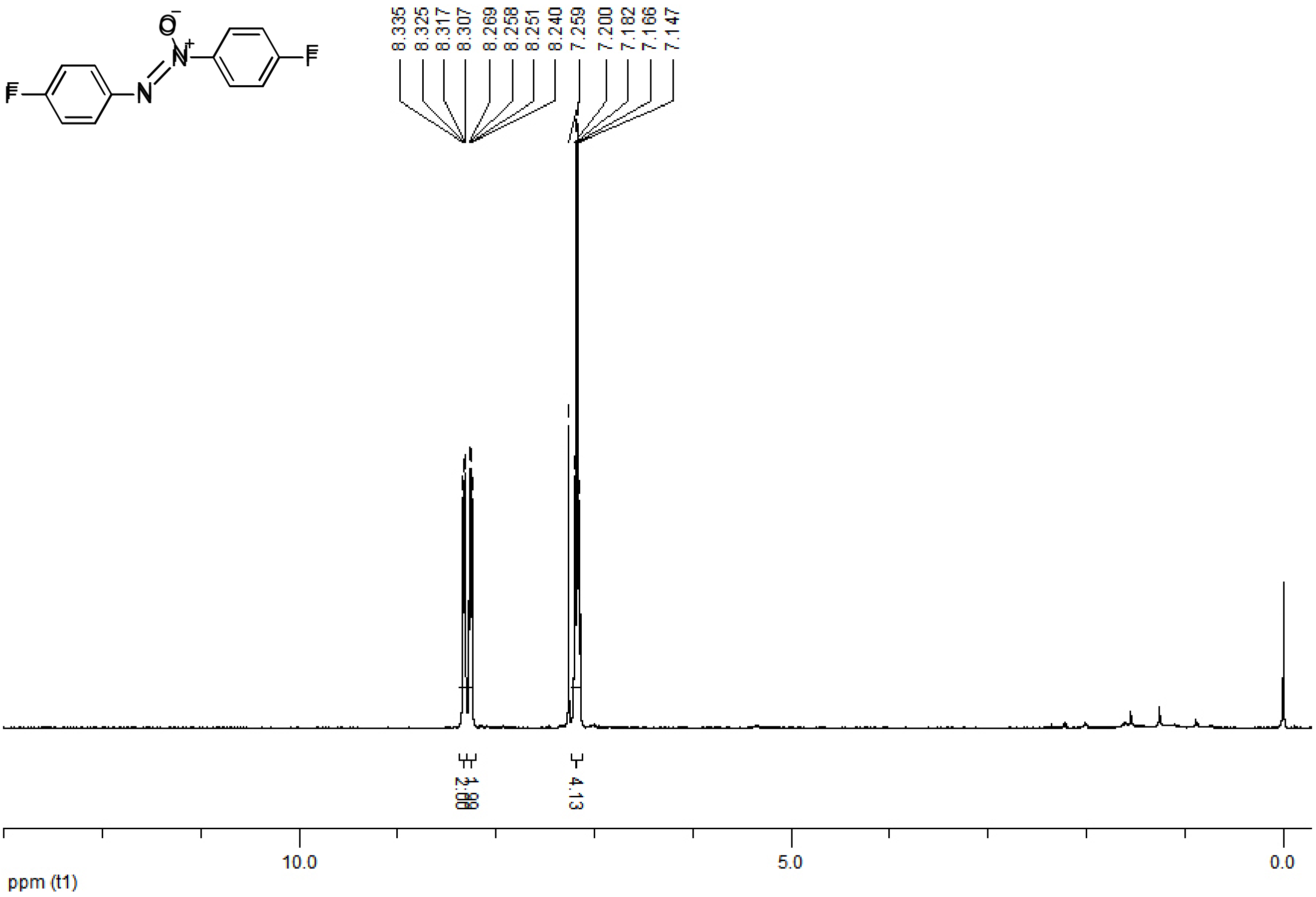

Cl
N
N+
O−
Cl
146.591
142.269
138.110
135.273
129.044
128.981
127.069
123.726
77.271
77.017
76.763
200
150
100
50
0
ppm (t1)

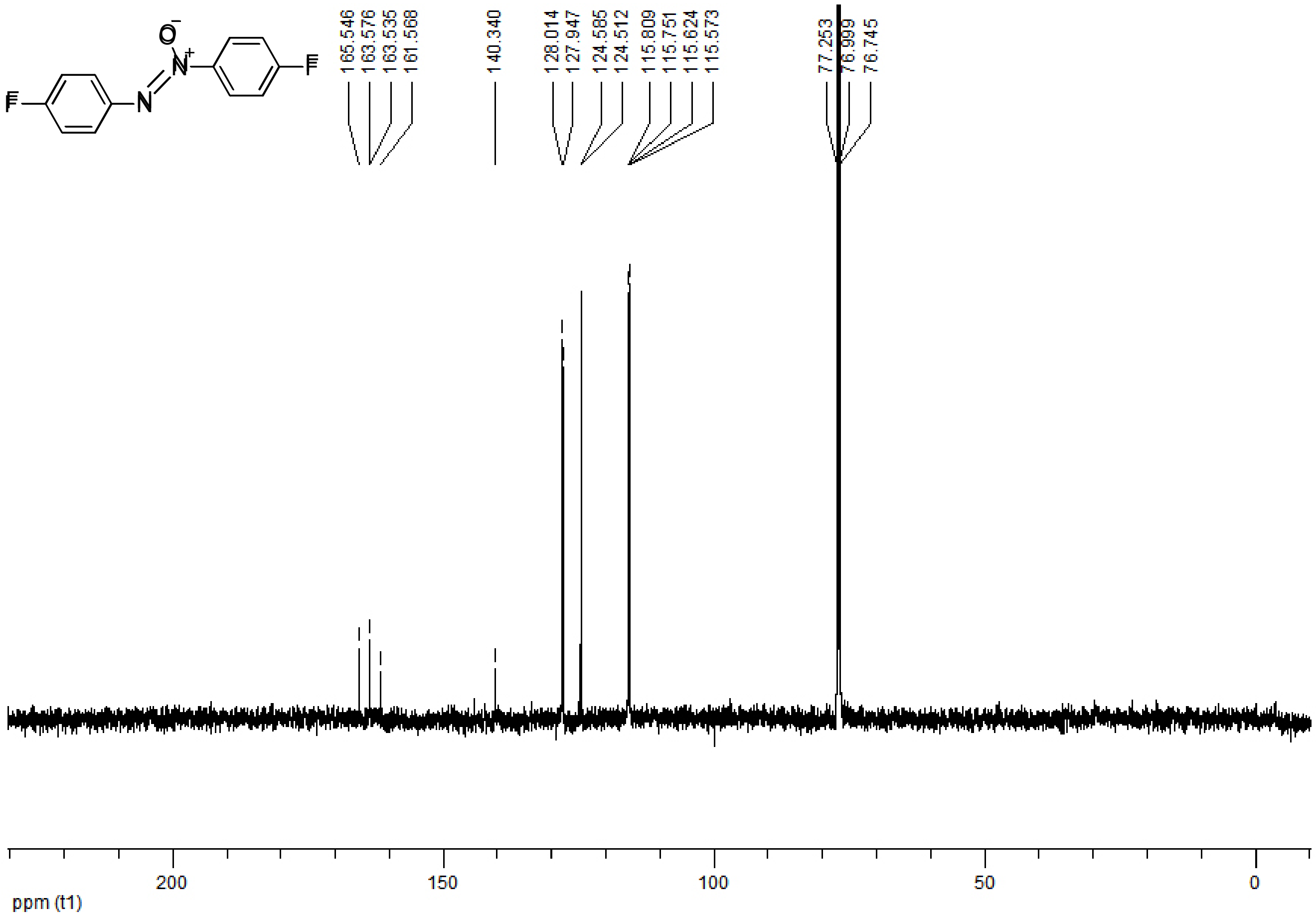

Cl
O
N
+
N
Cl
8.325
8.265
8.215
8.198
8.014
7.999
7.572
7.556
7.487
7.470
7.454
7.446
7.430
7.415
7.401
7.385
7.259
2.92
1.09
1.00
3.28
10.0
5.0
0.0
ppm (t1)

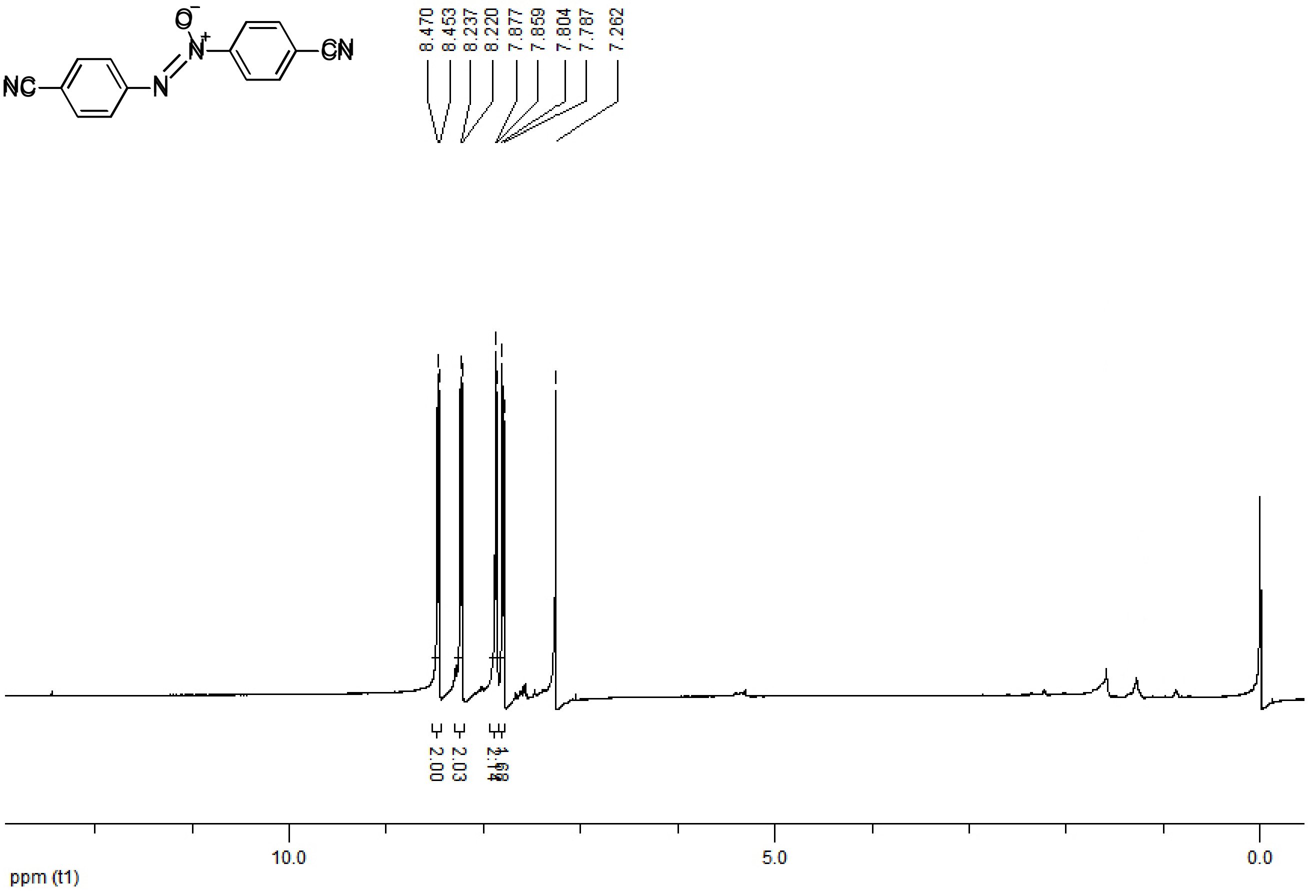

Cl
O
N
+
N
Cl
144.610
134.888
134.474
132.036
129.918
129.889
129.754
125.447
124.044
122.906
120.650
77.260
77.005
76.752
200
150
100
50
0
ppm (t1)

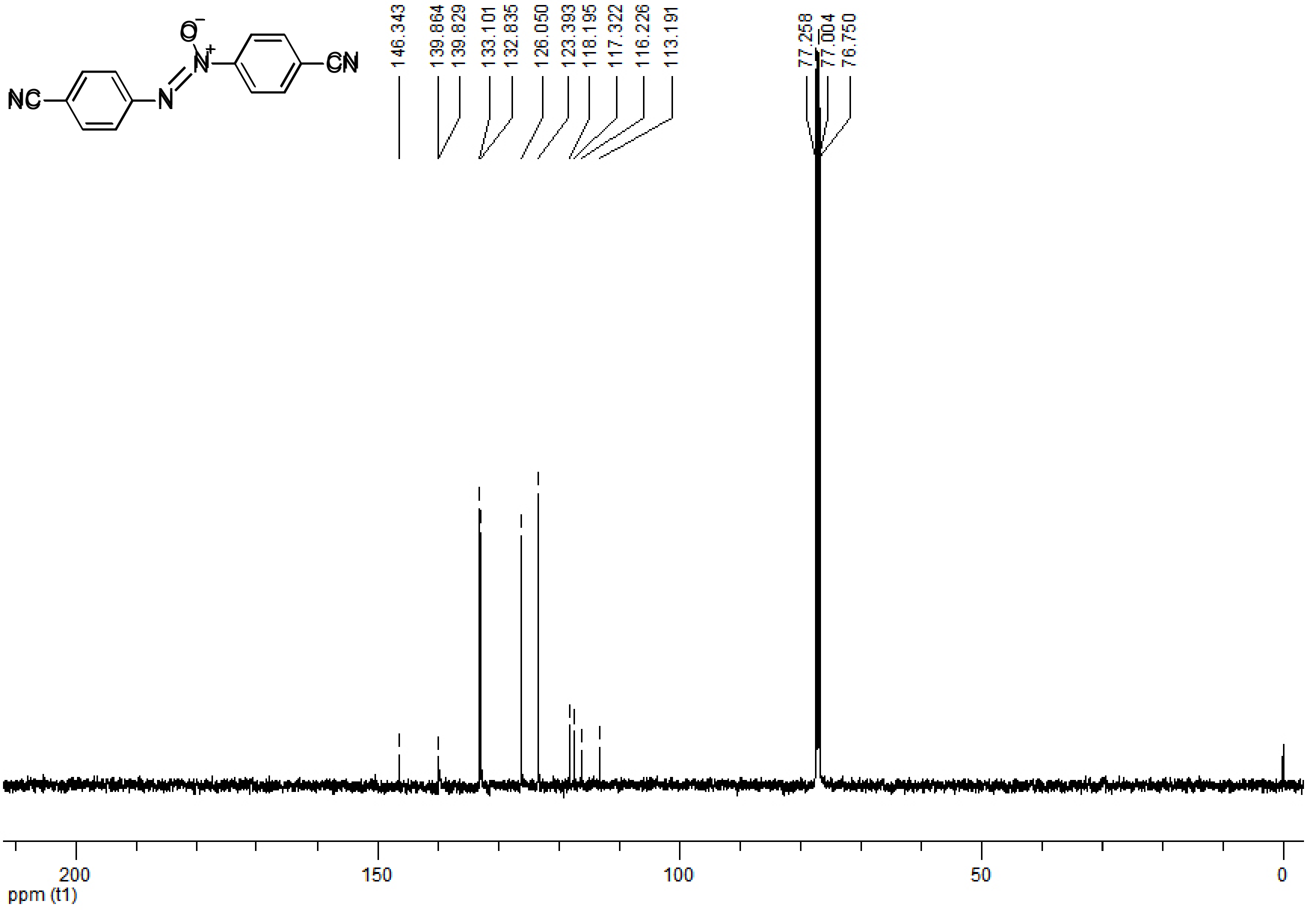

8.192
8.174
8.089
8.072
7.656
7.638
7.617
7.600
7.259
Br
N
N
O
+
−
Br
2.00
4.07
10.0
5.0
0.0
ppm (t1)

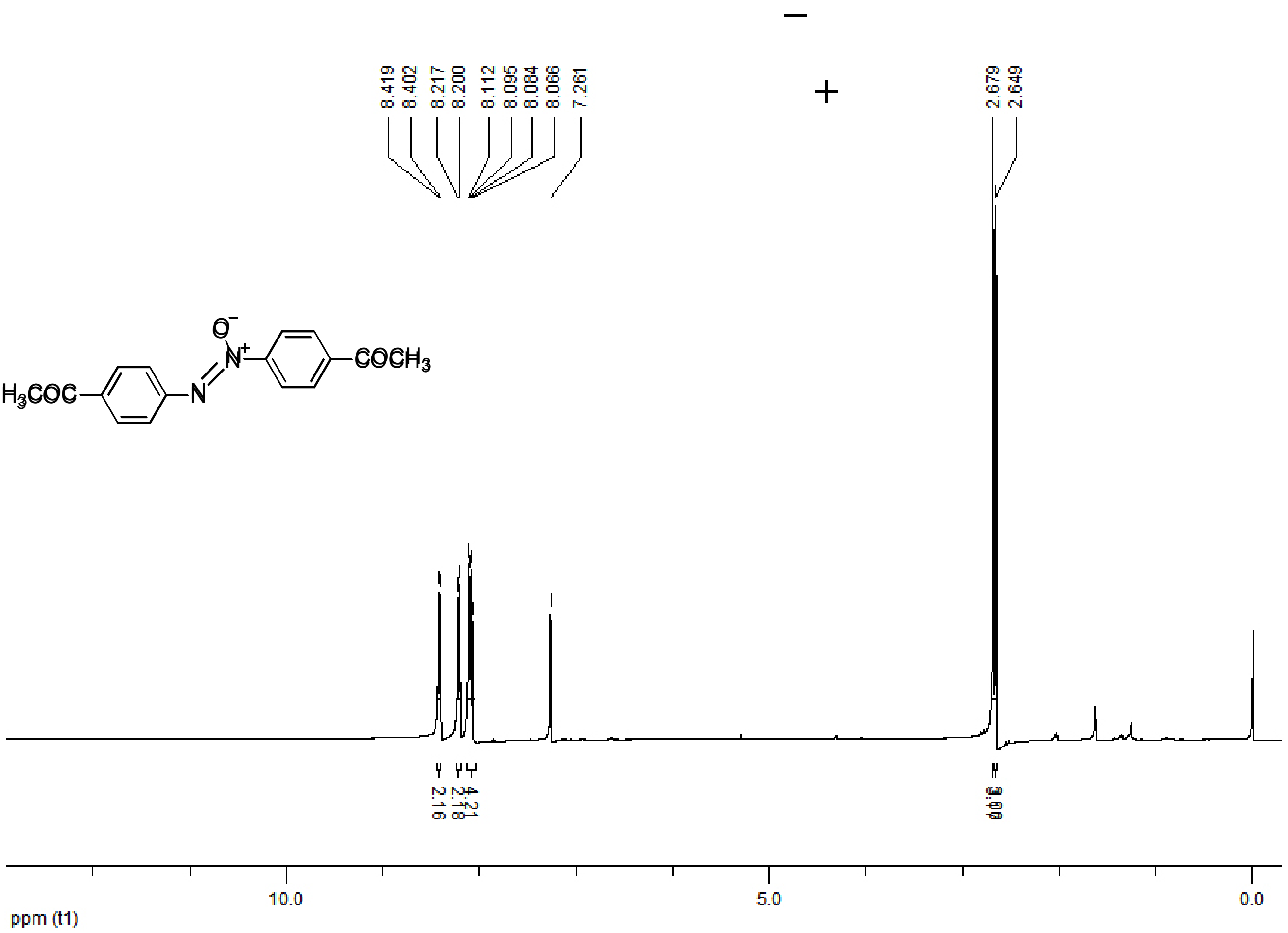

147.128
142.657
132.065
131.996
127.224
126.487
123.929
123.605
77.257
77.003
76.749
Br
N
N
O
+
−
Br
200
150
100
50
0
ppm (t1)

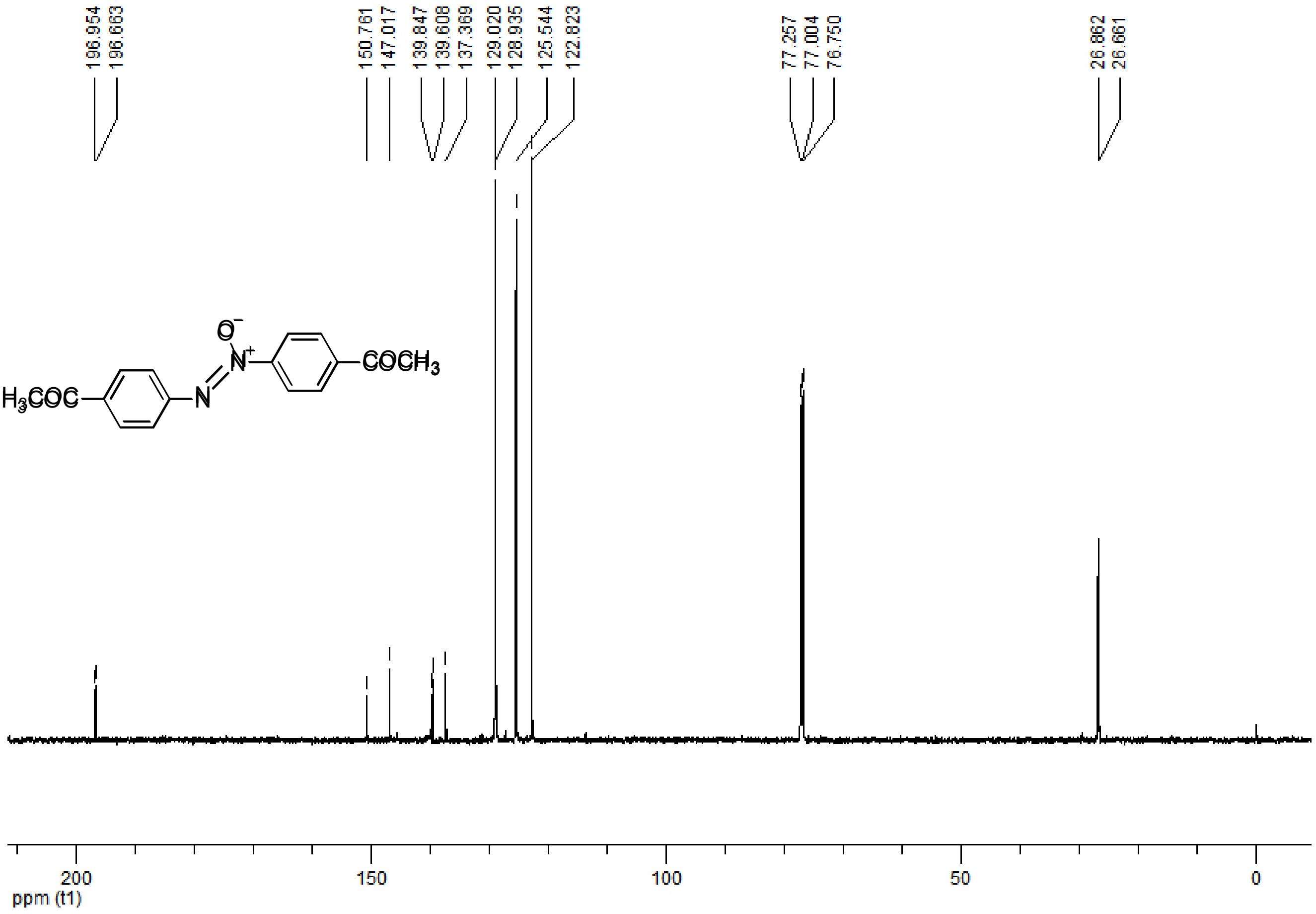

F
N
N
O
+
F
8.335
8.325
8.317
8.307
8.269
8.258
8.251
8.240
7.259
7.200
7.182
7.166
7.147
1.88
2.00
4.13
10.0
5.0
0.0
ppm (t1)

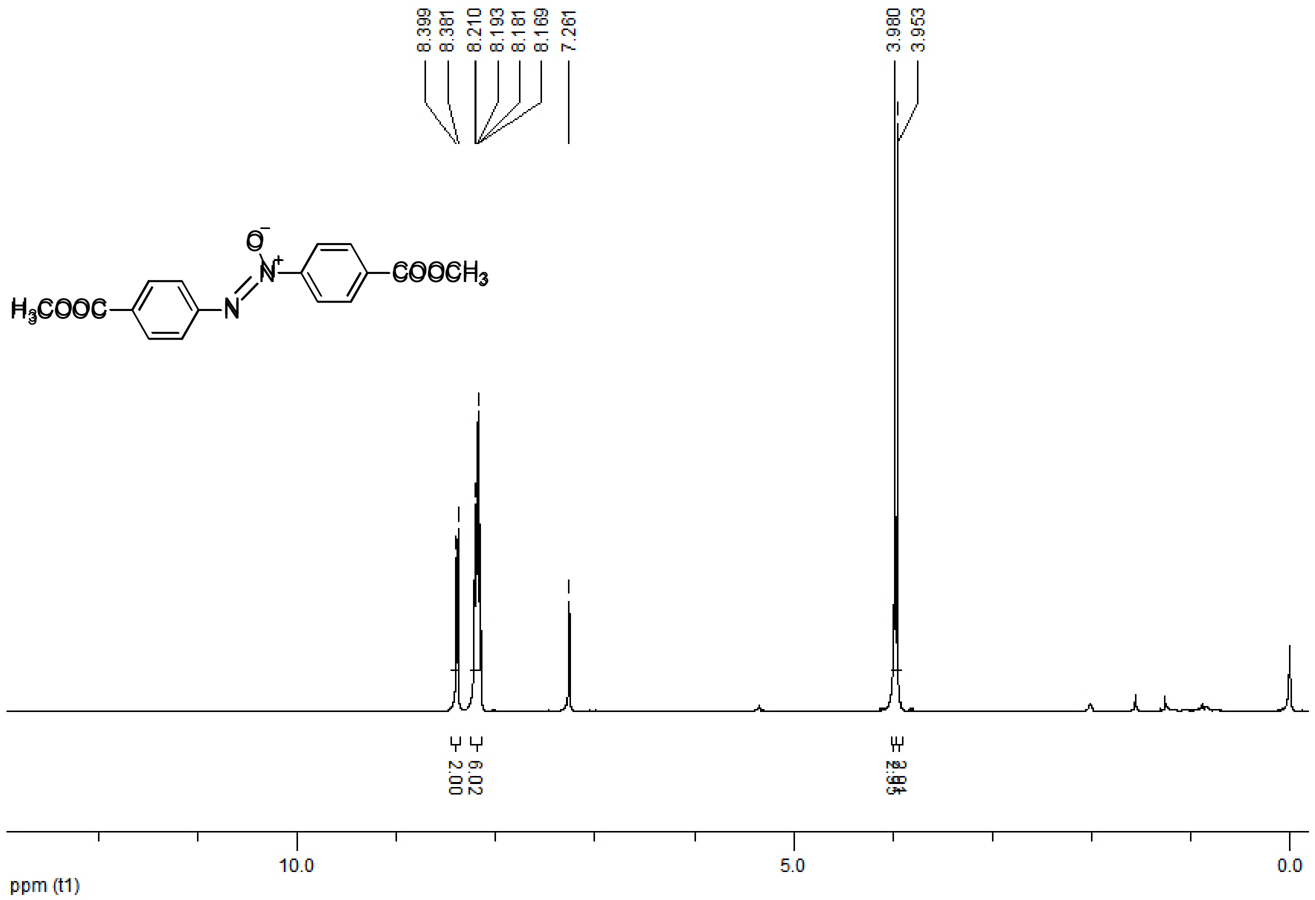

F
N
N
O
+
F
165.546
163.576
163.535
161.568
140.340
128.014
127.947
124.585
124.512
115.809
115.751
115.624
115.573
77.253
76.999
76.745
200
150
100
50
0
ppm (t1)

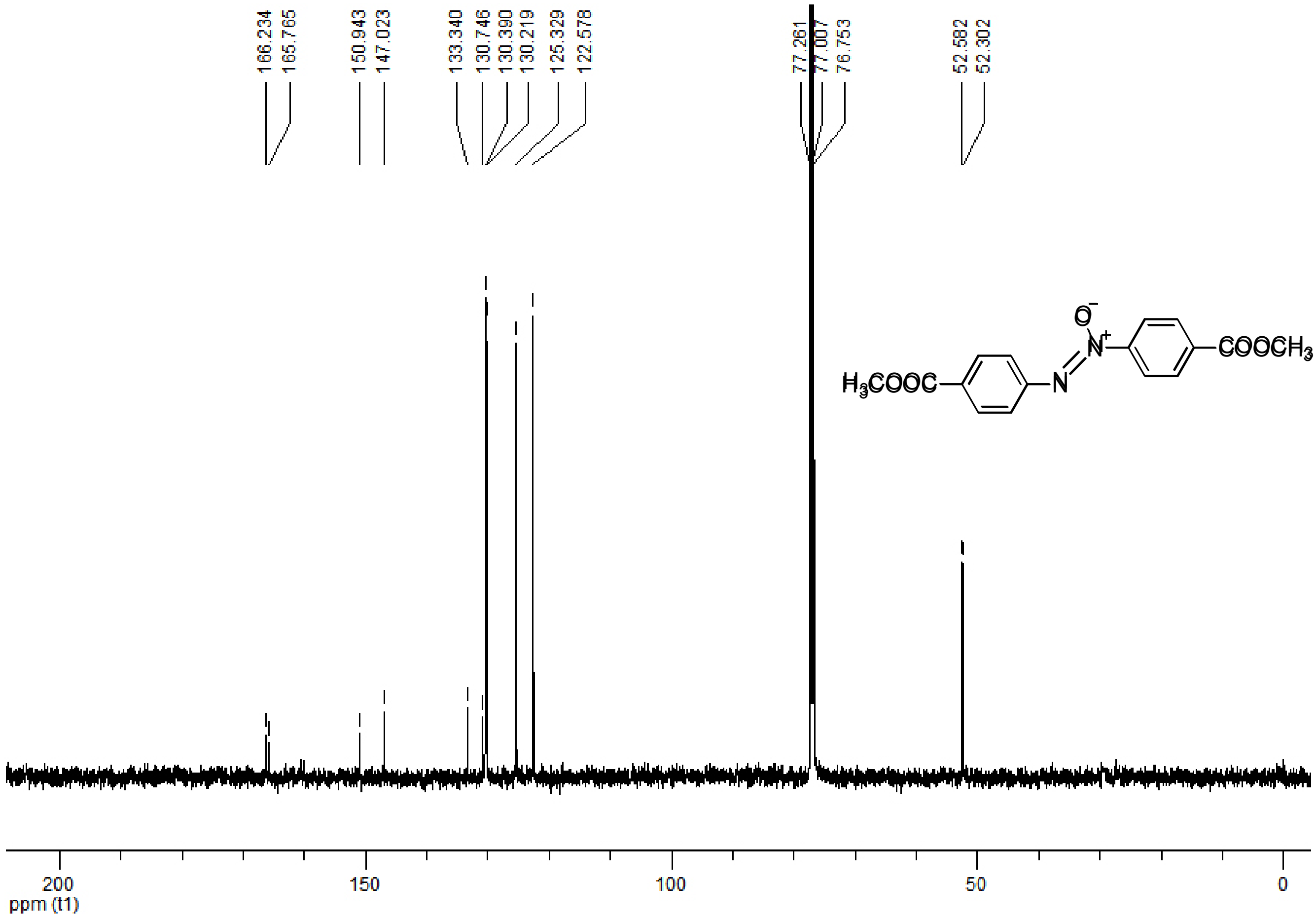

NC
N
N
O
+
−
CN
8.470
8.453
8.237
8.220
7.877
7.859
7.804
7.787
7.262
2.00
2.03
2.14
1.68
10.0
5.0
0.0
ppm (t1)


NC
N
N
O
+
−
CN
146.343
139.864
139.829
133.101
132.835
126.050
123.393
118.195
117.322
116.226
113.191
77.258
77.004
76.750
200
150
100
50
0
ppm (t1)


8.419
8.402
8.217
8.200
8.112
8.095
8.084
8.066
7.261
2.679
2.649
H3COC
N
N+
O−
COCH3
2.16
2.18
4.21
3.00
10.0
5.0
0.0
ppm (t1)


196.954
196.663
150.761
147.017
139.847
139.608
137.369
129.020
128.935
125.544
122.823
77.257
77.004
76.750
26.862
26.661
H3COC
N
N+
O−
COCH3
200
150
100
50
0
ppm (t1)


8.399
8.381
8.210
8.193
8.181
8.169
7.261
3.980
3.953
H3COOC
N
N+
O−
COOCH3
2.00
6.02
10.0
5.0
0.0
ppm (t1)


166.234
165.765
150.943
147.023
133.340
130.746
130.390
130.219
125.329
122.578
77.261
77.007
76.753
52.582
52.302
H3COOC
N
N+
O−
COOCH3
200
150
100
50
0
ppm (t1)