Supporting Information

Domino *N*-/*C*- or *N*-/*N*-/*C*-Arylation of Imidazoles to Yield Polyaryl Imidazolium Salts via Atom-Economical Use of Diaryliodonium Salts

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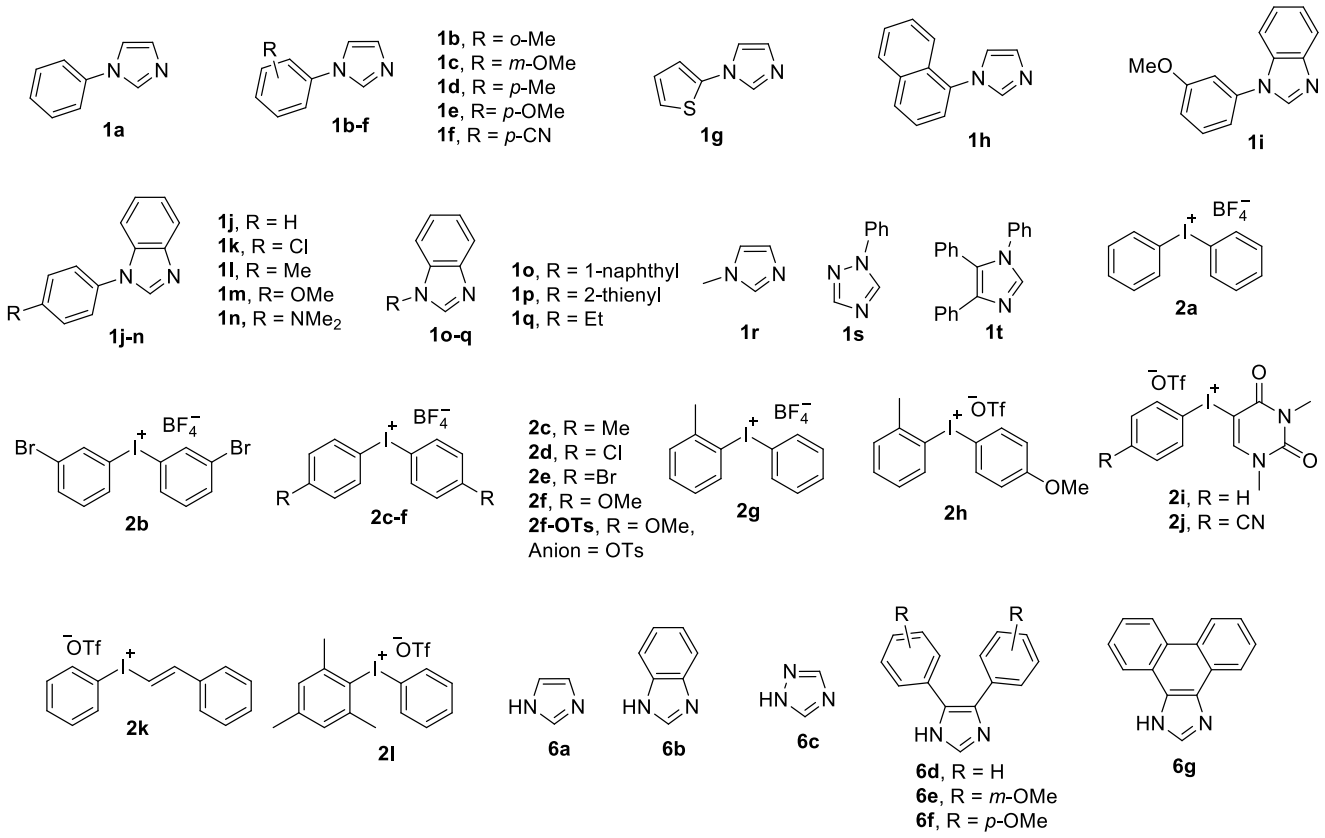
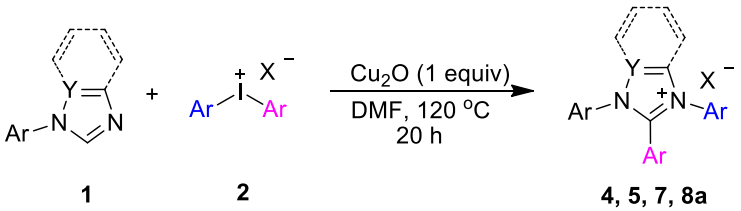
I. General remarks

NMR spectra were obtained on a BRUKER Ascend400 and Ascend500. The ^{1}H NMR (400 and 500 MHz) chemical shifts were measured relative to $CDCl_3$ or DMSO-d_6 as the internal reference ($CDCl_3$: δ = 7.26 ppm; DMSO-d_6: δ = 2.50 ppm). The ^{13}C NMR (101 and 126MHz) chemical shifts were given using $CDCl_3$ or DMSO-d_6 the internal standard ($CDCl_3$: δ = 77.16 ppm; DMSO-d_6: δ = 39.52 ppm). High-resolution mass spectra (HR-MS) were obtained with a BRUKER solanX 70 FT-MS (ESI^+). Melting points were determined with SGW® X-4 and are uncorrected.

Unless otherwise noted, all reagents were obtained from commercial suppliers and used without further purification. Azoles **6a-d**, N-methyl imidazole **1q** and Cu_2O (purity of 99%) were were purchased from Beijing Innochem Chemical Engineering Reagent (China) Co., Ltd. Boron trifluoride diethyl etherate, *m*-CPBA (purity of 75%), triflic acid, sodium tetrafluoroborate, uracil, aryl iodides and arylboronic acids were purchased from Adamas-beta Ltd. The N-aryl(benzo)imidazoles **1a-p**,[1] 1-phenyl-1,2,4-triazole **1s**,[2] 1,4,5-triphenylimidazole **1t**[3], diaryliodonium tetrafluoroborate **2a-g**,[4] bis(4- methoxyphenyl)iodonium tosylates **2f-OTs**,[5] (*2*-tolyl)-(4-methoxyphenyl) iodonium triflate **2h** and (phenyl)(mesityl) iodonium triflate **2l**,[6] aryl-uracil iodonium triflate **2i** and **2j**,[7] styryl-phenyl iodonium triflate **2k**,[8] 4,5-bisaryl-1*H*-imidazole **6e** and **6f**[9] and 1*H*-phenanthro[9,10-d]imidazole **6g**[10] were prepared according to the literature procedures.



II. General procedure A for the domino diarylation



1 **2** **4, 5, 7, 8a**

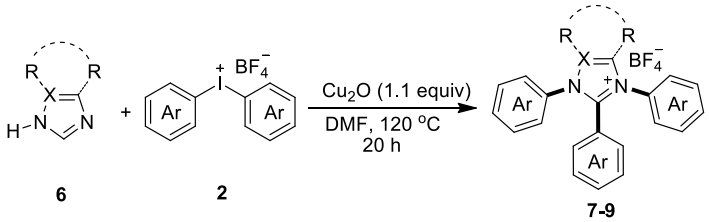
To a dry Schlenck tube containing a magnetic stir bar was added an *N*-aryl azole **1** (0.2 mmol, 1.0 equiv), diaryliodonium salt **2** (0.2 mmol, 1 equiv), Cu_2O (28 mg, 1.0 equiv) and DMF (1 mL). The mixture was stirred at 120 ℃ for 20 h under an N_2 atmosphere. The mixture was cooled down to room temperature before DMF was removed under reduced pressure. The residue was purified by a silica (100-200 meshes) gel column (dichloromethane/methanol = 100/1→30/1, v/v) to afford products **4**, **5**, **7** and **8a**.

Table S1. Screening of the catalyst and reaction time[a]

Entry	Metal/mol%	Time/h	Yield[b] **3a**:**4a**
1	Cu_2O/10	20	90:trace
2	Cu_2O/20	20	62:18
3	Cu_2O/50	20	35:44
4	Cu_2O/70	20	10:66
5	Cu_2O/100	2	81:trace
6	Cu_2O/100	5	59:23
7	Cu_2O/100	10	43:41
8	Cu_2O/100	15	15:65
9	Cu_2O/100	18	8:72
10	$Pd(OAc)_2$/10	20	n.d. : n.d.
11	$Pd(OAc)_2$/100	20	n.d. : n.d.
12	$PdCl_2$/10	20	8 : n.d.
13	$PdCl_2$/100	20	n.d. : n.d.
14	Ag_2O/10	20	10 : n.d.
15	Ag_2O/10	20	n.d. : n.d.

[a] Reaction conditions: **1a** (0.2 mmol), **2a** (0.24 mmol) and catalyst (x mol%) in DMF (1 mL) at 120 ℃ for y hours under a N_2 atmosphere. [b] Isolated yield. n.d. = not detected.

III. General procedure B for the domino triarylation

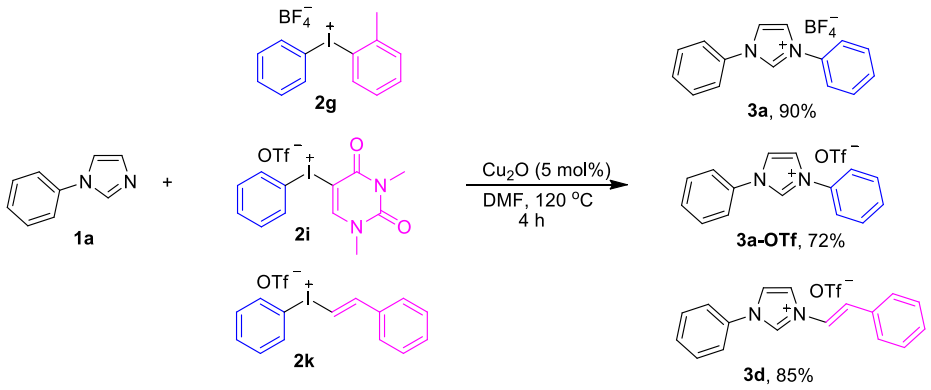


6 **2** **7-9**

To a dry Schlenck tube containing a magnetic stir bar was added an azole **6** (0.2 mmol, 1.0 equiv), diaryliodonium salt **2** (0.4 mmol, 2 equiv), Cu_2O (31 mg, 1.1 equiv) and DMF (1.5 mL). The mixture was stirred at 120 ℃ for 20 h under an N_2 atmosphere. The mixture was cooled down to room

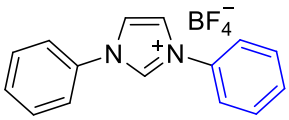
temperature before DMF was removed under reduced pressure. The residue was purified by a silica (100-200 meshes) gel column, eluting with dichloromethane/methanol (100/1→50/1, v/v) or dichloromethane/ethyl acetate (10/1→1/1, v/v) to afford corresponding products.

IV. Selectivity of *N*-quaternization with unsymmetrical iodonium salts



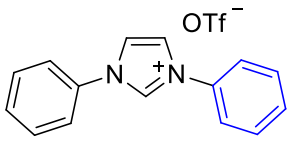
To a dry Schlenck tube with a magnetic stir bar was added an *N*-phenyl imidazole **1a** (0.2 mmol, 1.0 equiv), diarylliodonium salt **2g**/**2i**/**2k** (0.2 mmol, 1 equiv), Cu_2O (1.4 mg, 5 mol%) and DMF (1 mL). The mixture was stirred at 120 ℃ for 4 h under an N_2 atmosphere and cooled down before DMF was removed under reduced pressure. The residue was purified by a silica (100-200 meshes) gel column (dichloromethane/methanol = 50/1→20/1, v/v) to afford product **3a**/**3a-OTf**/**3d**.

1,3-Diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (3a)



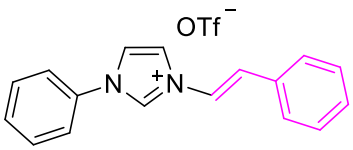
A white solid (56 mg, 90% yield). ^{1}H NMR (400 MHz, DMSO-d_6): δ = 10.34 (s, 1H), 8.58 (s, 2H), 7.92 (d, J = 7.6 Hz, 4H), 7.72 (t, J = 7.6 Hz, 4H), 7.64 (t, J = 7.2 Hz, 2H) ppm. The result was in accordance with the literature.[11]

1,3-Diphenyl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (3a-OTf)



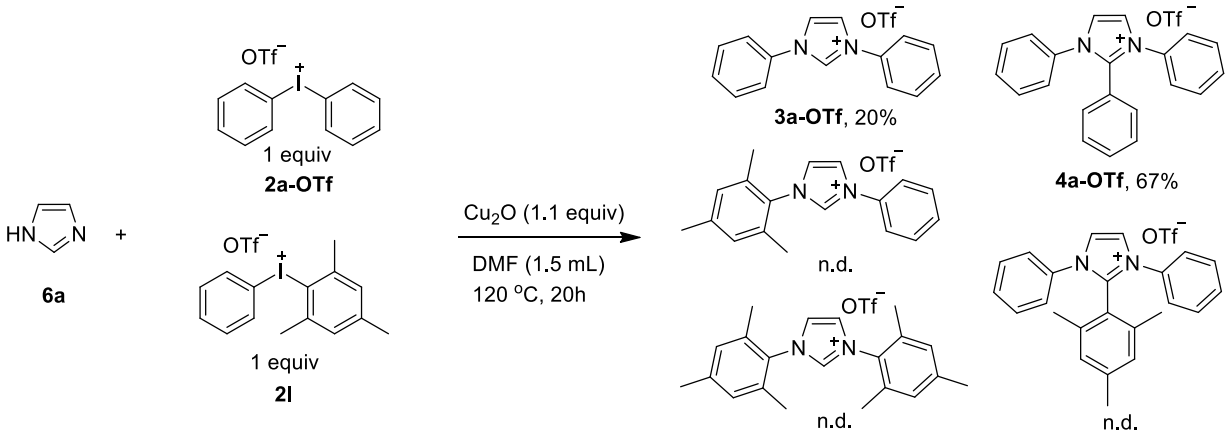
A white solid (53 mg, 72% yield). ^{1}H NMR (500 MHz, DMSO-d_6): δ = 10.34 (s, 1H), 8.58 (s, 2H), 7.93 (d, J = 7.5 Hz, 4H), 7.72 (t, J = 7.5 Hz, 4H), 7.64 (t, J = 7.0 Hz, 2H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): δ = 135.2, 135.0, 130.6, 130.5, 122.6, 122.4 ppm. The result was in accordance with the literature.[11]

(*E*)-1-Phenyl-3-styryl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (3d)



A gray solid (50 mg, 85% yield). ^{1}H NMR (400 MHz, DMSO-d_6): δ = 10.12 (s, 1H), 8.48 (s, 1H), 8.42 (s, 1H), 7.93 (d, J = 14.4 Hz, 1H), 7.85 (d, J = 7.6 Hz, 2H), 7.71 (t, J = 7.6 Hz, 2H), 7.65–7.60 (m, 3H), 7.56 (d, J = 14.8 Hz, 1H), 7.49 (t, J = 7.6 Hz, 2H), 7.42 (t, J = 7.6 Hz, 1H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 134.6, 134.1, 132. 9, 130.2, 130.0, 129.3, 129.2, 126.9, 125.1, 122.0, 121.92, 121.88, 120.8 ppm. HRMS (ESI) *m/z*: calcd for $C_{17}H_{15}N_2^+$ ([M−OTf$^-$]$^+$) 247.1235, found 247.1233.

V. Selectivity of triarylation reaction with 6a, 2a-OTf and 2l



Scheme S1. The reaction of **6a** with two different iodonium salts (**2a-OTf** and **2l**). n.d. = not detected.

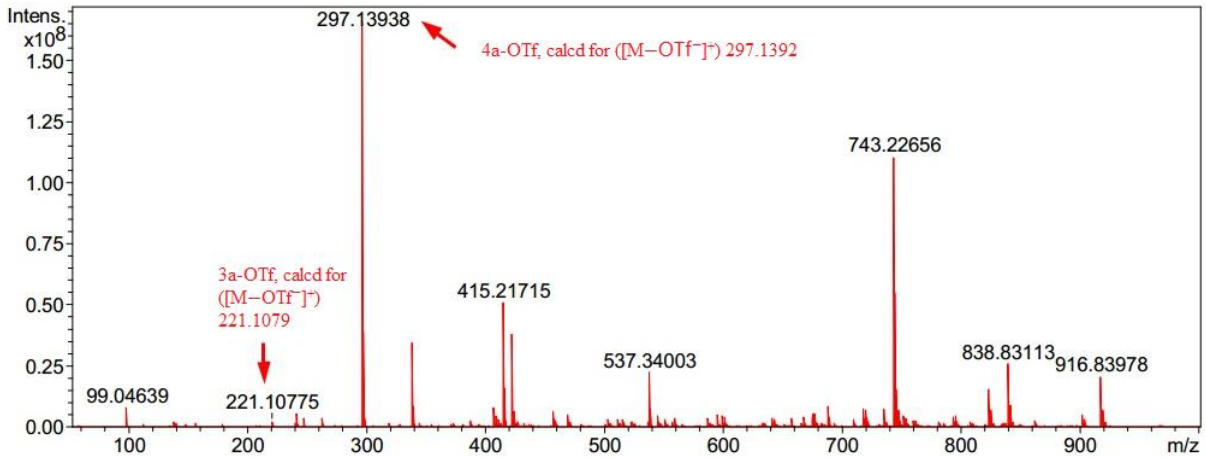


Figure S1. HRMS spectrum of the reaction mixture of **6a**, **2a-OTf** and **2l** after filtering through a celite pad.

VI. AE values in the diarylation reaction

Table S2. AE values of the compounds for diarylation[a,b].

Compound	AE/%	Compound	AE/%	Compound	AE/%	Compound	AE/%
4a	65	**4h**	48	**4p**	67	**5h**	52
4a-OTf	61	**4i**	58	**5a**	41	**5i**	48
4b	61	**4j**	66	**5b**	46	**5j**	36
4c	55	**4k**	62	**5c**	60	**5k**	26
4d	62	**4l**	55	**5d**	52	**5k′**	47
4e	65	**4m**	58	**5e**	46	**5l**	56
4f	43	**4n**	45	**5f**	52	**7d**	31[b]
4g	49	**4o**	51	**5g**	47	**8a**	62[b]

[a] The calculation formula of AE:

$$AE = \frac{\text{molecular mass of the desired reaction product}}{\text{molecular mass of all reactants}} \times 100\%$$

[b] The AE values of **7d** and **8a** are calculated besed on the diarylation.

VII. Proposed mechanism of the di-/triarylation

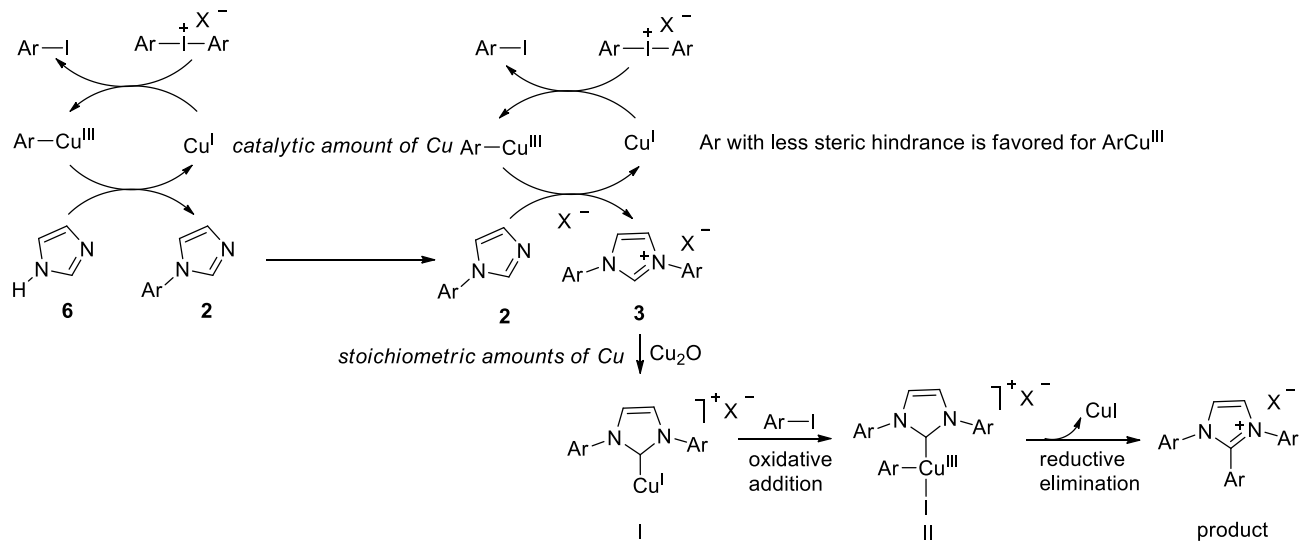
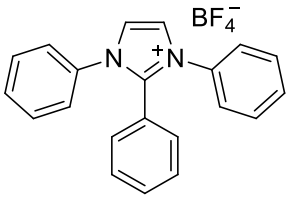


Figure S2. Proposed mechanism.

VIII. Experimental data for the described substances

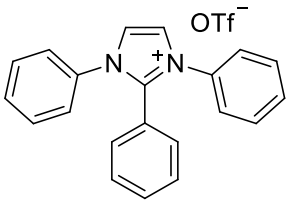
1,2,3-Triphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (4a or 7a)[12]



Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4a** as a white solid (66 mg, 86% yield, AE = 65%).

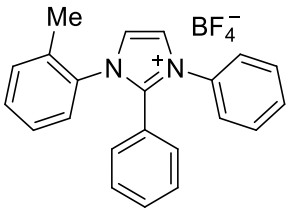
Following the general procedure B, the reaction of imidazole **6a** (13.6 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) afforded **7a** as a white solid (55 mg, 71%). ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.42 (s, 2H), 7.54–7.48 (m, 10H), 7.43–7.40 (m, 3H), 7.33 (t, J = 7.6 Hz, 2H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 144.5, 135.0, 131.8, 131.2, 130.3, 129.7, 128.6, 126.4, 124.0, 121. 6 ppm. ^{19}F NMR (376 MHz, DMSO-d_6): δ = -148.27 (s), -148.32 (s) ppm.

1,2,3-Triphenyl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (4a-OTf)



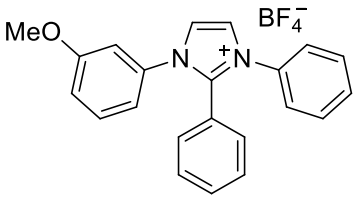
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and diphenyliodonium triflate **2a-OTf** (86.0 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4a-OTf** as a white solid (71 mg, 80% yield, AE = 61%). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.42 (s, 2H), 7.52 (br, 10H), 7.43–7.41 (m, 3H), 7.33 (t, J = 7.6 Hz, 2H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6)): δ = 144.5, 135.0, 131.7, 131.2, 130.3, 129.6, 128.5, 126.3, 124.0, 121.5 ppm. ^{19}F NMR (376 MHz, DMSO-d_6): δ = -77.75 (s) ppm. HRMS (ESI) *m/z*: calcd for $C_{21}H_{17}N_2^+$ ([M−OTf$^-$]$^+$) 297.1392, found 297.1394.

2,3-Diphenyl-1-(*o*-tolyl)-1*H*-imidazol-3-ium Tetrafluoroborate (4b)



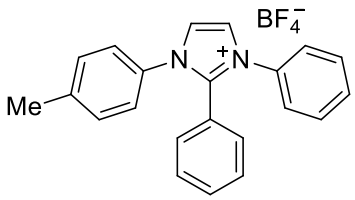
Following the general procedure A, 1-(*o*-tolyl)-1*H*-imidazole **1b** (31.6 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4b** as a white solid (64 mg, 80% yield, AE = 61%). M.p.: 193–195 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.77 (s, 1H), 7.71 (d, *J* = 7.6 Hz, 1H), 7.58 (s, 1H), 7.52 (d, *J* = 7.6 Hz, 2H), 7.43–7.33 (m, 5H), 7.29–7.27 (m, 1H), 7.24–7.21 (m, 5H), 2.07 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 144.8, 135.1, 134.2, 133.9, 132.1, 131.5, 131.2, 130.8, 130.5, 130.1, 129.1, 128.5, 127.8, 126.4, 124.5, 124.3, 121.2, 17.6 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{19}N_2^+$ ([M−BF_4^-]$^+$) 311.1548, found 311.1550.

1-(3-Methoxyphenyl)-2,3-diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (4c)



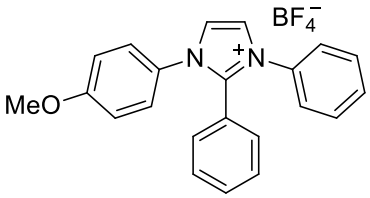
Following the general procedure A, 1-(3-methoxyphenyl)-1*H*-imidazole **1c** (34.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4c** as a white solid (60 mg, 72% yield, AE = 55%). M.p.: 192–194 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.68 (s, 1H), 7.66 (s, 1H), 7.46 (d, *J* = 7.2 Hz, 2H), 7.43–7.35 (m, 4H), 7.30 (d, *J* = 7.2 Hz, 2H), 7.26–7.21 (m, 3H), 7.13 (s, 1H), 6.95–6.92 (m, 2H), 3.72 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 160.7, 144.7, 136.0, 135.1, 133.7, 132.0, 131.2, 130.6, 130.0, 129.1, 126.5, 124.2, 124.1, 121.3, 118.1, 117.5, 111.7, 55.9 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{19}N_2O^+$ ([M−BF_4^-]$^+$) 327.1497, found 327.1502.

2,3-Diphenyl-1-(*p*-tolyl)-1*H*-imidazol-3-ium Tetrafluoroborate (4d)



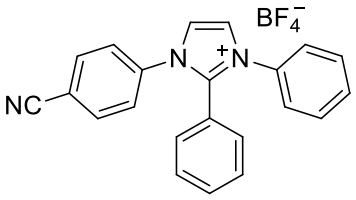
Following the general procedure A, 1-(*p*-tolyl)-1*H*-imidazole **1d** (31.6 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4d** a white solid (65 mg, 81% yield, AE = 62%). M.p.: 234–236 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.65 (s , 1H), 7.64 (s, 1H), 7.45 (d, *J* = 6.8 Hz, 2H), 7.41–7.32 (m, 6H), 7.28–7.21 (m, 4H), 7.15 (d, *J* = 8.0 Hz, 2H), 2.33 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 144.5, 140.9, 135.1, 132.6, 132.0, 131.2, 130.6, 130.5, 130.0, 129.1, 126.5, 126.2, 124.3, 124.1, 121.3, 21.3 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{19}N_2^+$ ([M−BF_4^-]$^+$) 311.1548, found 311.1554.

1-(4-Methoxyphenyl)-2,3-diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (4e)



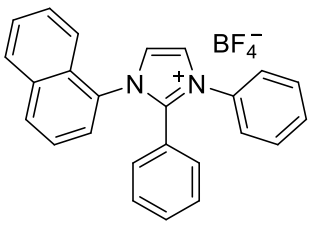
Following the general procedure A, 1-(4-methoxyphenyl)-1*H*-imidazole **1e** (34.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4e** as a gray solid (73 mg, 88% yield, AE = 65%). M.p.: 170–172 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.64 (d, *J* = 1.6 Hz, 2H), 7.47–7.45 (m, 2H), 7.43–7.36 (m, 6H), 7.27–7.25 (m, 4H), 6.86 (d, *J* = 9.2 Hz, 2H), 3.78 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 160.9, 144.8, 135.2, 132.0, 131.3, 130.6, 130.1, 129.1, 127.8, 127.7, 126.5, 124.5, 124.0, 121.4, 115.1, 55.7 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{19}N_2O^+$ ([M−BF_4^-]$^+$) 327.1497, found 327.1505.

1-(4-Cyanophenyl)-2,3-diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (4f)



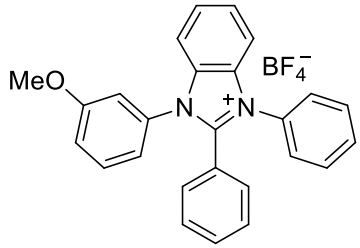
Following the general procedure A, 4-(1*H*-imidazol-1-yl)benzonitrile **1f** (33.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4f** as a yellow solid (46 mg, 56% yield, AE = 43%). M.p.: 203–205 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.83 (d, *J* = 2.0 Hz, 1H), 7.74 (d, *J* = 8.8 Hz, 2H), 7.69–7.65 (m, 3H), 7.51 (d, *J* = 7.6 Hz, 2H), 7.47–7.36 (m, 6H), 7.29–7.25 (m, 2H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 144.9, 138.5, 134.8, 133.8, 132.5, 131.4, 130.9, 130.1, 129.3, 127.9, 126.5, 124.7, 124.0, 120.7, 117.3, 114.7 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{16}N_3^+$ ([M−BF_4^-]$^+$) 322.1344, found 322.1345.

1-(Naphthalen-1-yl)-2,3-diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (4g)



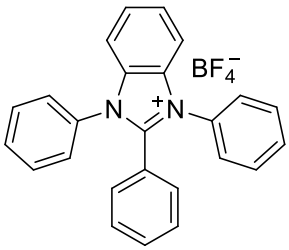
Following the general procedure A, 1-(naphthalen-1-yl)-1*H*-imidazole **1h** (38.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→30/1, v/v) afforded **4g** as a white solid (55 mg, 63% yield, AE = 49%). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 8.56 (d, *J* = 2.0 Hz, 1H), 8.48 (d, *J* = 2.0 Hz, 1H), 8.16 (d, *J* = 8.5 Hz, 1H), 8.09–8.07 (m, 1H), 7.93 (d, *J* = 7.5 Hz, 1H), 7.89 (d, *J* = 7.5 Hz, 1H), 7.70–7.64 (m, 5H), 7.58–7.54 (m, 3H), 7.38 (d, *J* = 7.5 Hz, 2H), 7.30 (t, *J* = 7.5 Hz, 1H), 7.20 (t, *J* = 7.5 Hz, 2H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 145.4, 135.1, 133.4, 131.8, 131.2, 131.0, 130.6, 130.3, 129.6, 128.4, 128.4, 128.3, 128.3, 127.4, 126.6, 126.4, 125.3, 125.0, 124.4, 122.0, 121.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{25}H_{19}N_2^+$ ([M−BF_4^-]$^+$) 347.1548, found 347.1557.

1-(3-Methoxyphenyl)-2,3-diphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4h)



Following the general procedure A, 1-(3-methoxyphenyl)-1*H*-benzo[d]imidazole **1i** (44.9 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4h** as a pale yellow solid (57 mg, 61% yield, AE = 48%). M.p.: 217–219 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.63 (br, 1H), 7.58–7.53 (m, 2H), 7.47–7.39 (m, 7H), 7.35–7.30 (m, 3H), 7.21–7.18 (m, 3H), 7.09 (d, *J* = 8.0 Hz, 1H), 6.99 (dd, *J* = 8.0 Hz, 2.0 Hz, 1H), 3.70 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 161.1, 150.2, 133.7, 133.0, 132.8, 132.5, 131.6, 131.0, 130.8, 130.4, 129.0, 128.03, 128.00, 121.1, 119.4, 118.0, 113.8, 113.7, 113.0, 56.2 ppm. HRMS (ESI) *m/z*: calcd for $C_{26}H_{21}N_2O^+$ ([M−BF_4^-]$^+$) 377.1654, found 377.1611.

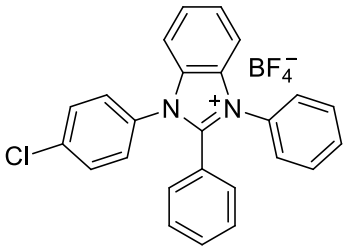
1,2,3-Triphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4i or 7c)



Following the general procedure A, 1-phenylbenzimidazole **1j** (38.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4i** as a white solid (65 mg, 75% yield, AE = 58%).

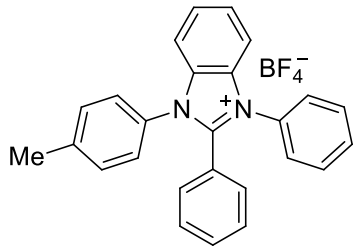
Following the general procedure B, the reaction of benzimidazole **6b** (23.6 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) afforded **7c** as a white solid (45 mg, 52%). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 7.81–7.79 (m, 2H), 7.65 (br, 12H), 7.55 (d, *J* = 7.5 Hz, 2H), 7.46 (t, *J* = 7.5 Hz, 1H), 7.36 (t, *J* = 7.5 Hz, 2H). ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 150.7, 132.5, 132.3, 131.2, 130.9, 130.3, 128.5, 127.8, 127.5, 121.4, 113.4 ppm. HRMS (ESI) *m/z*: calcd for $C_{25}H_{19}N_2^+$ ([M−BF_4^-]$^+$) 347.1548, found 347.1559.

1-(4-Chlorophenyl)-2,3-diphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4j)



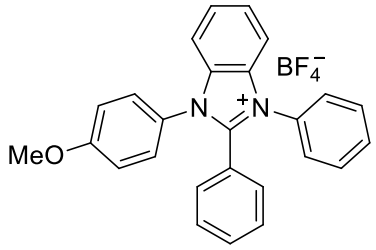
Following the general procedure A, 1-(4-chlorophenyl)-1*H*-benzo[d]imidazole **1k** (45.7 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4j** as a white solid (78 mg, 83% yield, AE = 66%). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.63–7.58 (m, 6H), 7.53–7.43 (m, 9H), 7.39 (t, *J* = 7.5 Hz, 1H), 7.26–7.23 (m, 2H). ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 150.4, 137.2, 133.0, 132.9, 132.7, 132.6, 131.5, 131.3, 131.0, 130. 7, 130.4, 129.4, 129.1, 128.1, 128.0, 127.9, 120.9, 113.7, 113.4 ppm. HRMS (ESI) *m/z*: calcd for $C_{25}H_{18}ClN_2^+$ ([M−BF_4^-]$^+$) 381.1159, found 381.1168.

2,3-Diphenyl-1-(*p*-tolyl)-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4k)



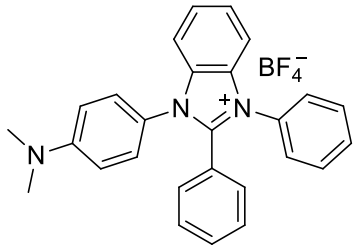
Following the general procedure A, 1-(*p*-tolyl)-1*H*-benzo[d]imidazole **1l** (41.7 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4k** as a pale yellow solid (71 mg, 79% yield, AE = 62%). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.65–7.63 (m, 2H), 7.61–7.57 (m, 2H), 7.52–7.45 (m, 9H), 7.37 (t, *J* = 7.4 Hz, 1H), 7.28–7.22 (m, 4H), 2.39 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 150.2, 1413, 133.1, 133.0, 132.8, 132.4, 131.5, 131.0, 130.9, 130.4, 130.1, 129.0, 127.9, 127.6, 121.1, 113.7, 113.6, 21.4 ppm. HRMS (ESI) *m/z*: calcd for $C_{26}H_{21}N_2^+$ ([M−BF_4^-]$^+$) 361.1705, found 361.1711.

1-(4-Methoxyphenyl)-2,3-diphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4l)



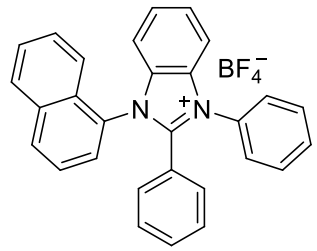
Following the general procedure A, 1-(4-methoxyphenyl)-1*H*-benzo[d]imidazole **1m** (44.9 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4l** as a white solid (65 mg, 70% yield, AE = 55%). M.p.: 224–226 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 7.79–7.77 (m, 2H), 7.67–7.63 (m, 7H), 7.58–7.54 (m, 4H), 7.46 (t, *J* = 7.5 Hz, 1H), 7.37 (t, *J* = 7.5 Hz, 2H), 7.16 (d, *J* = 9.0 Hz, 2H), 3.82 (s, 3H). ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 160.5, 150.9, 132.8, 132.5, 132.4, 132.2, 131.1, 130.9, 130.3, 128.9, 128.6, 127.70, 127.69, 127.5, 124.8, 121.5, 115.3, 113.5, 113.3, 55.6 ppm. HRMS (ESI) *m/z*: calcd for $C_{26}H_{21}N_2O^+$ ([M−BF_4^-]$^+$) 377.1654, found 377.1611.

1-(4-(Dimethylamino)phenyl)-2,3-diphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4m)



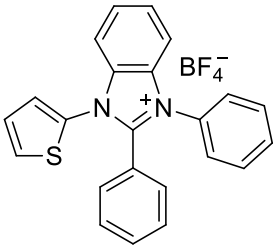
Following the general procedure A, 4-(1*H*-benzo[d]imidazol-1-yl)-*N*,*N*-dimethylaniline **1n** (47.5 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4m** as a yellow solid (70 mg, 74% yield, AE = 58%). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.63–7.57 (m, 4H), 7.51–7.49 (m, 4H), 7.47–7.35 (m, 6H), 7.27–7.25 (m, 2H), 6.67 (d, *J* = 8.8 Hz, 2H), 2.98 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 151.4, 150.3, 133. 6, 132.9, 132.8, 132.3, 131.5, 130.8, 130.4, 129.0, 128.3, 127.9, 127.8, 127.7, 121.4, 120.2, 114.0, 113.4, 112.5, 40.3 ppm. HRMS (ESI) *m/z*: calcd for $C_{27}H_{24}N_3^+$ ([M−BF_4^-]$^+$) 390.1970, found 390.1981.

1-(Naphthalen-1-yl)-2,3-diphenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4n)



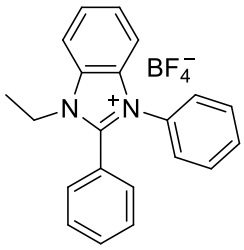
Following the general procedure A, 1-(naphthalen-1-yl)-1*H*-benzo[d]imidazole **1o** (48.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4n** as a white solid (55 mg, 57% yield, AE = 45%). M.p.: 143–145 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 8.26 (d, *J* = 8.5 Hz, 1H), 8.15 (d, *J* = 8.0 Hz, 1H), 8.01–8.00 (m, 2H), 7.83–7.63 (m, 11H), 7.50 (br, 2H), 7.35 (d, *J* = 8.0 Hz, 2H), 7.25 (t, *J* = 7.5 Hz, 2H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 151.2, 133.7, 133.0, 132.8, 132.6, 132.4, 131.7, 130.9, 130.4, 130.2, 128.7, 128.5, 128.3, 127.9, 127.7, 127.5, 125.8, 122.1, 121.3, 113.7, 113.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{29}H_{21}N_2^+$ ([M−BF_4^-]$^+$) 397.1705, found 397.1711.

2,3-Diphenyl-1-(thiophen-2-yl)-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (4o)



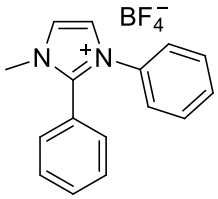
Following the general procedure A, 1-(thiophen-2-yl)-1*H*-benzo[d]imidazole **1p** (40.1 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **4o** as a white solid (58 mg, 66% yield, AE = 51%). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 7.85–7.76 (m, 4H), 7.65–7.64 (m, 8H), 7.51–7.49 (m, 2H), 7.43–7.40 (m, 2H), 7.20 (t, *J* = 9.5 Hz, 1H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 152.1, 133.3, 132.5, 132.4, 132.3, 131.0, 131.0, 130.8, 130.3, 129.6, 129.4, 128.5, 128.1, 127.9, 127.4, 126.6, 121.2, 113.5, 113.3 ppm. HRMS (ESI) *m/z*: calcd for $C_{23}H_{17}N_2S^+$ ([M−BF_4^-]$^+$) 353.1112, found 353.1120.

3-Ethyl-1,2-diphenyl-1*H*-benzo[*d*]imidazol-3-ium Tetrafluoroborate (4p)



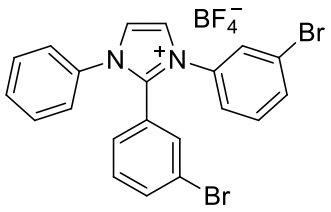
Following the general procedure A, 1-ethyl-1*H*-benzo[d]imidazole **1q** (29.2 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 50/1→30/1, v/v) afforded **4p** as a white solid (69 mg, 94% yield, AE = 67%). M.p.: 156–158 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.32 (d, *J* = 8.0 Hz, 1H), 7.84–7.70 (m, 4H), 7.66–7.52 (m, 9H), 4.44 (q, *J* = 7.2 Hz, 2H), 1.44 (t, *J* = 7.2 Hz, 3H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): *δ* = 150.9, 133.2, 133.1, 131.12, 131.07, 130.5, 129.6, 128.1, 127.9, 127.5, 121.9, 114.4, 113.7, 42.1, 14.8 ppm. HRMS (ESI) *m/z*: calcd for $C_{16}H_{15}N_2^+$ ([M−BF_4^-]$^+$) 235.1235, found 235.1234.

1-Methyl-2,3-diphenyl-1H-imidazol-3-ium Tetrafluoroborate (4q)



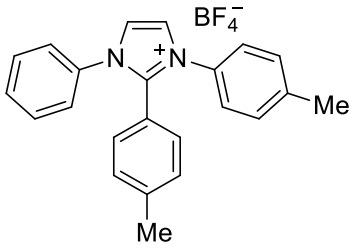
Following the general procedure A, 1-methyl-1*H*-imidazole **1r** (16.4 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 50/1→30/1, v/v) afforded **4q** as a light yellow semisolid (60 mg, 94% yield, AE = 67%). M.p.: 43–45 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.76 (s, 1H), 7.52 (t, *J* = 6.4 Hz, 2H), 7.48–7.42 (m, 4H), 7.40–7.34 (m, 3H), 7.30 (d, *J* = 7.6 Hz, 2H), 3.89 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 144.8, 135.1, 132.4, 130.9, 130.40, 130.039, 129.6, 126.1, 124.6, 123.2, 121.2, 36.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{16}H_{15}N_2^+$ ($[M-BF_4^-]^+$) 235.1235, found 235.1234.

2,3-Bis(3-Bromophenyl)-1-phenyl-1*H*-imidazol-3-ium Tetrafluoroborate (5a)



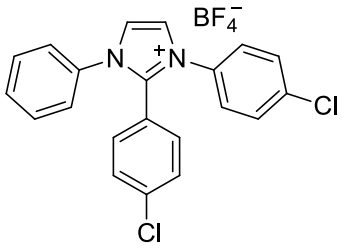
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and bis(3-bromophenyl)iodonium tetrafluoroborate **2b** (105.1 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5a** as a yellow solid (55 mg, 51% yield, AE = 41%). M.p.: 190–192 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 8.10–7.99 (m, 4H), 7.95–7.70 (m, 10H), 7.50–7.44 (m, 1H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 143.2, 135.8, 135.5, 134.7, 134.1, 133.8, 131.4, 130. 9, 130.7, 130.1, 129.5, 126.7, 126.6, 126.0, 124.6, 124.3, 123.1, 122.8, 122.7 ppm. HRMS (ESI) *m/z*: calcd for $C_{21}H_{15}Br_2N_2^+$ ($[M-BF_4^-]^+$) 454.9582, found 454.9581.

1-Phenyl-2,3-di-*p*-tolyl-1*H*-imidazol-3-ium Tetrafluoroborate (5b)



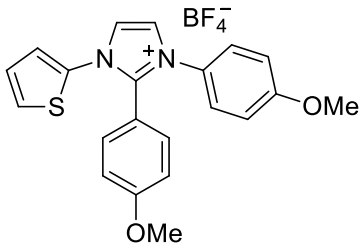
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and di-*p*-tolyliodonium tetrafluoroborate **2c** (79.2 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5b** as a yellow solid (50 mg, 61% yield, AE = 46%). M.p.: 192–194 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.66 (d, *J* = 6.5 Hz, 2H), 7.49 (d, *J* = 8.5 Hz, 2H), 7.42–7.35 (m, 5H), 7.17–7.15 (m, 4H), 7.01 (d, *J* = 10.0 Hz, 2H), 2.33 (s, 3H), 2.25 (s, 3H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 144.7, 142.7, 140.8, 135.2, 132.6, 131.1, 130.6, 130.5, 130.0, 129.8, 126.6, 126.2, 124.3, 124.1, 118.1, 21.6, 21.3 ppm. HRMS (ESI) *m/z*: calcd for $C_{23}H_{21}N_2^+$ ($[M-BF_4^-]^+$) 325.1705, found 325.1715.

2,3-Bis(4-chlorophenyl)-1-phenyl-1*H*-imidazol-3-ium Tetrafluoroborate (5c)



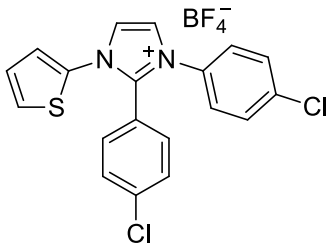
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and bis(4-chlorophenyl)iodonium tetrafluoroborate **2d** (83.4 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5c** as a white solid (67 mg, 74% yield, AE = 60%). M.p.: 217–219 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.64 (d, *J* = 1.6 Hz, 1H), 7.60 (d, *J* = 1.6 Hz, 1H), 7.47–7.42 (m, 5H), 7.39–7.31 (m, 4H), 7.28–7.26 (m, 2H), 7.21 (d, *J* = 8.4 Hz, 2H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): *δ* = 143.9, 138.9, 137.0, 134.9, 133.4, 132.8, 130.8, 130.3, 130.1, 129.6, 128.1, 126.6, 124.4, 124.3, 119.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{21}H_{15}Cl_2N_2^+$ ([M−BF_4^-]$^+$) 365.0612, found 365.0615.

2,3-Bis(4-methoxyphenyl)-1-(thiophen-2-yl)-1*H*-imidazol-3-ium Tetrafluoroborate (5d)



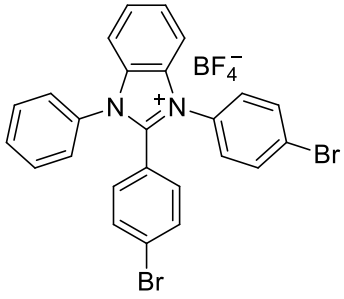
Following the general procedure A, 1-(thiophen-2-yl)-1*H*-imidazole **1g** (30.0 mg, 0.2 mmol) and bis(4-methoxyphenyl)iodonium tetrafluoroborate **2f** (85.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5d** as a white solid (60 mg, 67% yield, AE = 52%). M.p.: 66–68 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.39 (d, *J* = 2.0 Hz, 1H), 8.28 (d, *J* = 2.4 Hz, 1H), 7.64 (dd, *J* = 5.6 Hz, 1.2 Hz, 1H), 7.42 (d, *J* = 8.8 Hz, 4H), 7.37 (dd, *J* = 3.6 Hz, 1.2 Hz, 1H), 7.09–7.05 (m, 3H), 6.94 (d, *J* = 8.8 Hz, 2H), 3.77 (s, 3H), 3.73 (s, 3H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): *δ* = 161.7, 160.2, 146.0, 134.5, 133.0, 128.0, 127.8, 127.7, 127.1, 126.1, 124.6, 124.1, 114.7, 114.2, 112.9, 55.6, 55.4 ppm. HRMS (ESI) *m/z*: calcd for $C_{21}H_{19}N_2O_2S^+$ ([M−BF_4^-]$^+$) 363.1167, found 363.1168.

2,3-Bis(4-chlorophenyl)-1-(thiophen-2-yl)-1*H*-imidazol-3-ium Tetrafluoroborate (5e)



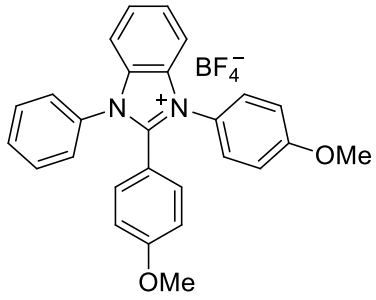
Following the general procedure A, 1-(thiophen-2-yl)-1*H*-imidazole **1g** (30.0 mg, 0.2 mmol) and bis(4-chlorophenyl)iodonium tetrafluoroborate **2d** (83.4 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5e** as a white solid (52 mg, 57% yield, AE = 46%). M.p.: 82–84 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.49 (d, *J* = 2.4 Hz, 1H), 8.42 (d, *J* = 2.0 Hz, 1H), 7.68–7.64 (m, 3H), 7.54–7.50 (m, 6H), 7.37 (dd, *J* = 3.6 Hz, 1.2 Hz, 1H), 7.10–7.08 (m, 1H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): *δ* = 144.8, 137.4, 135.3, 133.77, 133.6, 133.2, 129.9, 129.1, 128.4, 128.2, 127.5, 126.2, 125.4, 124.1, 120.0 ppm. HRMS (ESI) *m/z*: calcd for $C_{19}H_{13}Cl_3N_2S^+$ ([M−BF_4^-]$^+$) 371.0176, found 371.0175.

2,3-Bis(4-bromophenyl)-1-phenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (5f)



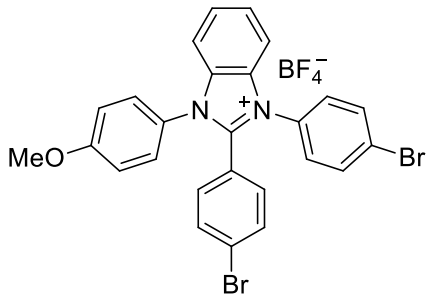
Following the general procedure A, 1-phenyl benzoimidazole **1j** (38.8 mg, 0.2 mmol) and bis(4-bromophenyl)iodonium tetrafluoroborate **2e** (105.1 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5f** as brown solid (70 mg, 59% yield, AE = 52%). M.p.: 154–156 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 8.05–7.76 (m, 6H), 7.66–7.58 (m, 8H), 7.47–7.26 (m, 3H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): δ = 149.7, 139.3, 137.7, 133.5, 133.1, 132.7, 132.4, 132.2, 132.0, 131.6, 131.1, 130.4, 129.6, 128.0, 127.4, 126.8, 124.4, 120.4, 113.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{25}H_{17}Br_2N_2^+$ ([M−BF_4^-]$^+$) 504.9738, found 504.9735.

2,3-Bis(4-Methoxyphenyl)-1-phenyl-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (5g)



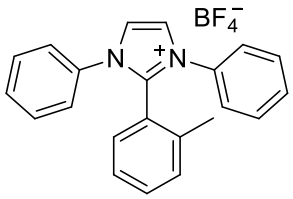
Following the general procedure A, 1-phenyl benzoimidazole **1j** (38.8 mg, 0.2 mmol) and bis(4-methoxyphenyl)iodonium tetrafluoroborate **2f** (85.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5g** as white solid (54 mg, 55% yield, AE = 47%). M.p.: 122–124 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.63–7.1 (m, 2H), 7.59–7.51 (m, 7H), 7.45–7.42 (m, 2H), 7.33 (d, *J* = 9.0 Hz, 2H), 6.99 (d, *J* = 9.0 Hz, 2H), 6.72 (d, *J* = 9.0 Hz, 2H), 3.84 (s, 3H), 3.71 (s, 3H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): δ = 162. 6, 161.1, 150.6, 133.4, 133.3, 133.1, 132.9, 130.8, 130.5, 129.2, 127.9, 127.7, 125.3, 115.6, 114.6, 113.6, 113.4, 112.6, 55.8, 55.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{27}H_{23}N_2O_2^+$ ([M−BF_4^-]$^+$) 407.1760, found 407.1763.

2,3-Bis(4-bromophenyl)-1-(4-methoxyphenyl)-1*H*-benzo[d]imidazol-3-ium Tetrafluoroborate (5h)



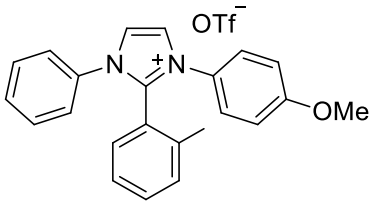
Following the general procedure A, 1-(4-methoxyphenyl)-1*H*-benzo[d]imidazole **1m** (44.9 mg, 0.2 mmol) and bis(4-bromophenyl)iodonium tetrafluoroborate **2e** (105.1 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5h** as yellow solid (78 mg, 63% yield, AE = 52%). M.p.: 142–144 ℃. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.59–7.57 (m, 4H), 7.53–7.49 (m, 4H), 7.42–7.33 (m, 6H), 6.93 (d, *J* = 8.8 Hz, 2H), 3.82 (s, 3H) ppm. ^{13}C NMR (101 MHz, $CDCl_3$): δ = 161.3, 149.5, 133.8, 133.4, 133.1, 132.8, 132.5, 131.7, 129.7, 129.2, 128.03, 127.99, 127.9, 125.5, 124.9, 119.9, 115.6, 113.7, 113.3, 55.8 ppm. HRMS (ESI) *m/z*: calcd for $C_{26}H_{19}Br_2N_2O^+$ ([M−BF_4^-]$^+$) 534.9844, found 534.9846.

1,3-Diphenyl-2-(*o*-tolyl)-1*H*-imidazol-3-ium Tetrafluoroborate (5i)



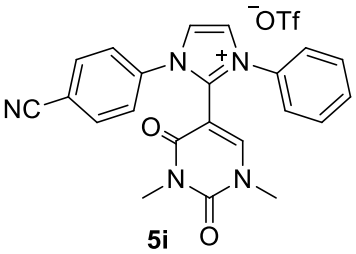
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and phenyl(*o*-tolyl)iodonium tetrafluoroborate **2g** (76.4 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5i** as a gray solid (50 mg, 63% yield, AE = 48%). M.p.: 178–180 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.79 (s, 2H), 7.64 (t, *J* = 7.0 Hz, 1H), 7.42–7.36 (m, 10H), 7.31 (t, *J* = 7.5 Hz, 1H), 7.18 (d, *J* = 7.5 Hz, 1H), 7.06 (d, *J* = 7.5 Hz, 1H), 1.91 (s, 3H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 144.6, 138.2, 134.8, 132.7, 132.6, 130.7, 130.6, 130.0, 126.9, 125.8, 124.3, 120.9, 19.7 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{19}N_2^+$ ([M−BF_4^-]$^+$) 311.1548, found 311.1556.

3-(4-Methoxyphenyl)-1-phenyl-2-(*o*-tolyl)-1*H*-imidazol-3-ium Trifluoromethanesulfonate (5j)

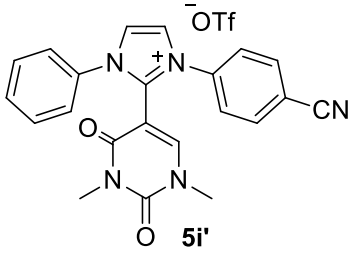


Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and (4-methoxyphenyl)(o-tolyl)iodonium triflate **2h** (94.8 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5j** as a gray solid (45 mg, 46% yield, AE = 36%). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 7.90 (s, 2H), 7.79 (d, *J* = 7.5 Hz, 1H), 7.47 (d, *J* = 7.5 Hz, 2H), 7.42–7.36 (m, 5H), 7.32 (t, *J* = 7.5 Hz, 1H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.08 (d, *J* = 7.5 Hz, 1H), 6.86 (d, *J* = 7.5 Hz, 2H), 3.76 (s, 3H), 1.94 (s, 3H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): *δ* = 160.9, 144.5, 138.1, 134.8, 133.1, 132.6, 130.7, 130.6, 130.1, 127.3, 127.2, 126.93, 125.9, 124.9, 124.4, 120.9, 115.2, 55.8, 20.0 ppm. HRMS (ESI) *m/z*: calcd for $C_{23}H_{21}N_2O^+$ ([M−OTf^-]$^+$) 341.1654, found 341.1655.

3-(4-Cyanophenyl)-2-(1,3-dimethyl-2,4-dioxo-1,2,3,4-tetrahydropyrimidin-5-yl)-1-phenyl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (5k or 5k′)



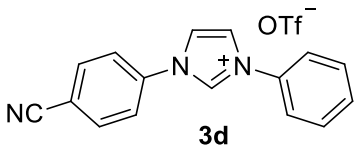
Following the general procedure A, 4-(1*H*-imidazol-1-yl)benzonitrile **1f** (33.8 mg, 0.2 mmol) and (1,3-dimethyl-2,4-dioxo-1,2,3,4-tetrahydropyrimidin-5-yl)(phenyl)iodonium triflate **2i** (98.4 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5k** as a white solid (34 mg, 32% yield, AE = 26%).



Following the general procedure A, the reaction of 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and (4-cyanophenyl)(1,3-dimethyl-2,4-dioxo-1,2,3,4-tetrahydropyrimidin-5-yl)iodonium triflate **2j** (103.4 mg, 0.2 mmol) afforded **5k′** as a white solid (62 mg, 58% yield, AE = 47%). M.p.: 132–134 ℃. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 8.43 (s, 1H), 7.88–7.83 (m, 4H),

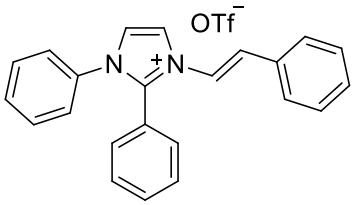
7.66-7.55 (m, 7H), 3.29 (s, 3H), 3.21 (s, 3H) ppm. ^{13}C NMR (126 MHz, $CDCl_3$): δ = 160.9, 151.7, 150.4, 139.7, 138.3, 134.5, 134.2, 131.6, 130.5, 127.4, 126.2, 124.9, 124.1, 117.1, 115.6, 94.1, 38.2, 28.5 ppm. HRMS (ESI) *m/z*: calcd for $C_{22}H_{18}N_5O_2^+$ ([M−OTf$^-$]$^+$) 384.1460, found 384.1461.

1-(4-Cyanophenyl)-3-phenyl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (3e).[11] In the reaction of **1f** and **2h**, **3d** was isolated as a side-product (white solid, 17 mg, 25% yield). ^{1}H NMR (500 MHz, DMSO-d_6): δ = 10.37 (s, 1H), 8.58 (t, *J* = 1.5 Hz, 2H), 7.97 (d, *J* = 9.0 Hz, 2H), 7.91 (d, *J* = 8.0 Hz, 2H), 7.83 (d, *J* = 8.5 Hz, 2H), 7.72 (t, *J* = 8.0 Hz, 2H), 7.64 (t, *J* = 7.5 Hz, 1H) ppm.



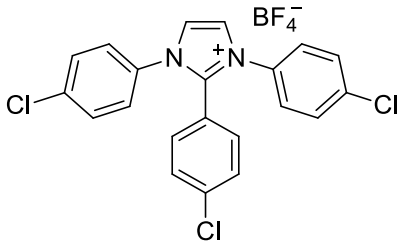
3d

(*E*)-1,2-Diphenyl-3-styryl-1*H*-imidazol-3-ium Trifluoromethanesulfonate (5l)



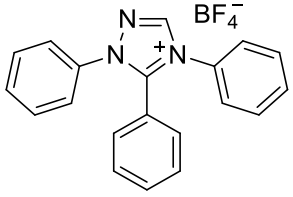
Following the general procedure A, 1-phenylimidazole **1a** (28.8 mg, 0.2 mmol) and (*E*)-phenyl(styryl)iodonium triflate **2k** (91.2 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **5l** as a white solid (67 mg, 71% yield, AE = 56%). M.p.: 181–183 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.66 (s, 1H), 8.39 (s, 1H), 7.62–7.48 (m, 13H), 7.40 (m, 4H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 143.7, 134.8, 132.8, 132.3, 131.3, 130.3, 129.6, 129.3, 129.1, 129.0, 127.4, 127.1, 126.3, 124.7, 120.9, 120.7, 119.8 ppm. HRMS (ESI) *m/z*: calcd for $C_{23}H_{19}N_2^+$ ([M−OTf$^-$]$^+$) 323.1548, found 323.1557.

1,2,3-Tris(4-chlorophenyl)-1*H*-imidazol-3-ium Tetrafluoroborate (7b).



Following the general procedure B, imidazole **6a** (13.6 mg, 0.2 mmol) and bis(4-chlorophenyl)iodonium tetrafluoroborate **2d** (166.8 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **7b** as a white solid (80 mg, 82% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 8.43 (s, 2H), 7.66 (d, *J* = 8.4 Hz, 4H), 7.51–7.49 (m, 6H), 7.42 (d, *J* = 8.4 Hz, 2H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 143.6, 137.2, 135.2, 133.5, 133.1, 129.9, 129.1, 128.2, 124.2, 120.0 ppm. HRMS (ESI) *m/z*: calcd for $C_{21}H_{14}Cl_3N_2^+$ ([M−BF_4^-]$^+$) 399.0223, found 399.0217.

1,4,5-Triphenyl-1*H*-1,2,4-triazol-4-ium Tetrafluoroborate (7d).

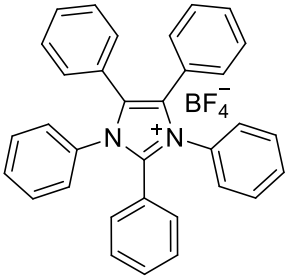


Following the general procedure A, 1-phenyl-1*H*-1,2,4-triazole **1s** (29.0 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 50/1→20/1, v/v) afforded **7d** as a white solid (32 mg, 42%

yield, AE = 31%).

Following the general procedure B, the reaction of 1*H*-1,2,4-triazole **6c** (28.8 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) afforded **7d** as a gray solid (31 mg, 40% yield). M.p.: 204–206 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 9.92 (s, 1H), 7.62–7.53 (m, 11H), 7.49–7.42 (m, 4H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 151.0, 144.8, 135.1, 133.0, 131.8, 131.3, 130.8, 130.1, 130.0, 129.1, 126.5, 125.8, 124.0, 119.2 ppm. HRMS (ESI) *m/z*: calcd for $C_{20}H_{16}N_3^+$ ([M−BF_4^-]$^+$) 298.1344, found 298.1340.

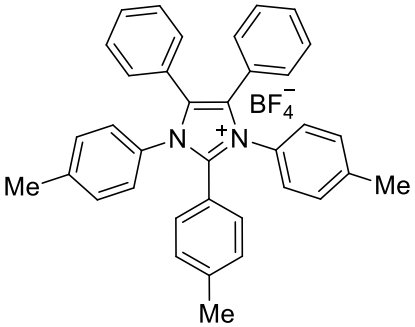
1,2,3,4,5-Pentaphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (8a)[13]



Following the general procedure A, 1,4,5-triphenyl-1*H*-imidazole **1t** (59.3 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (73.6 mg, 0.2 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 100/1→50/1, v/v) afforded **8a** as a white solid (83 mg, 78% yield, AE = 62%).

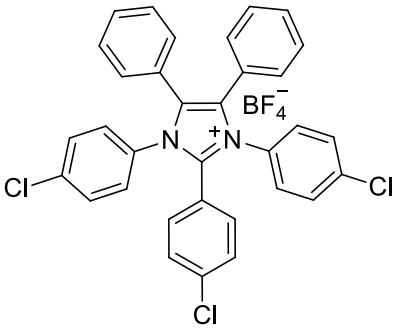
Following the general procedure B, the reaction of 4,5-diphenyl-1*H*-imidazole **6d** (44.1 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) afforded **8a** as a white solid (81 mg, 76% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 7.49–7.47 (m, 6H), 7.39–7.36 (m, 7H), 7.32–7.25 (m, 12H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 144.9, 133.3, 131.7, 131.5, 131.0, 130.8, 130.3, 129.7, 129.4, 128.6, 128.4, 128.1, 125.4, 122.1 ppm. HRMS (ESI) *m/z*: calcd for $C_{33}H_{25}N_2^+$ ([M−BF_4^-]$^+$) 449.2018, found 449.2014.

4,5-Diphenyl-1,2,3-tri-*p*-tolyl-1*H*-imidazol-3-ium Tetrafluoroborate (8b)



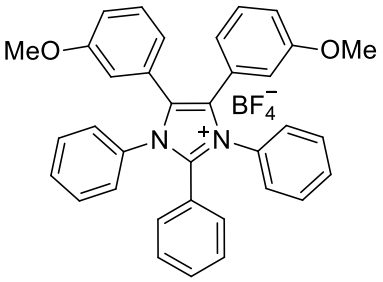
Following the general procedure B, 4,5-diphenyl-1*H*-imidazole **6d** (44.1 mg, 0.2 mmol) and di-*p*-tolyliodonium tetrafluoroborate **2c** (158.4 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc = 10/1→1/1, v/v) afforded **8b** as a white solid (71 mg, 61% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 7.33–7.30 (m, 12H), 7.23–7.17 (m, 8H), 7.13 (d, *J* = 7.6 Hz, 2H), 2.23 (s, 6H), 2.21 (s, 3H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 145.1, 141.5, 140.0, 131.6, 130.9, 130.8, 130.7, 129.8, 129.7, 129.0, 128.5, 127.8, 125.5, 119.3, 20.8, 20.6 ppm. HRMS (ESI) *m/z*: calcd for $C_{36}H_{31}N_2^+$ ([M−BF_4^-]$^+$) 491.2487, found 491.2489.

1,2,3-Tris(4-chlorophenyl)-4,5-diphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (8c)



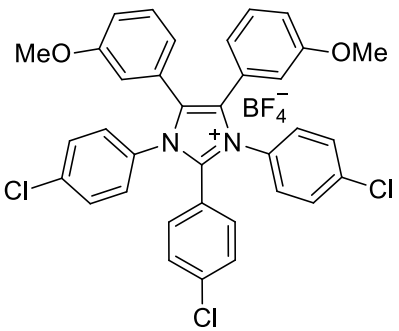
Following the general procedure B, 4,5-diphenyl-1*H*-imidazole **6d** (44.1 mg, 0.2 mmol) and bis(4-chlorophenyl)iodonium tetrafluoroborate **2d** (174.7 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc = 10/1→1/1, v/v) afforded **8c** as a white solid (106 mg, 83% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 7.54–7.52 (m, 12H), 7.38–7.32 (m, 6H), 7.24–7.22 (m, 4H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 143.9, 137.0, 135.2, 132.9, 131.9, 130.7, 130.0, 129.8, 129.8, 129.0, 128.8, 124.9, 120.6 ppm. HRMS (ESI) *m/z*: calcd for $C_{33}H_{22}Cl_3N_2^+$ ([M−BF_4^-]$^+$) 551.0849, found 551.0837.

4,5-Bis(3-methoxyphenyl)-1,2,3-triphenyl-1*H*-imidazol-3-ium Tetrafluoroborate (8d)



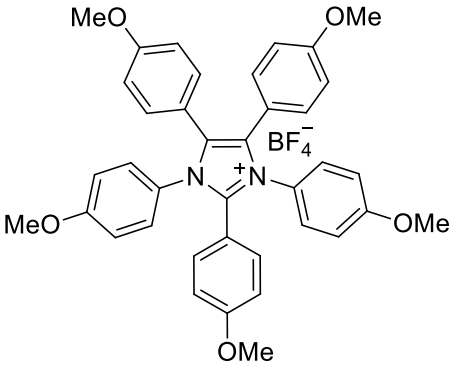
Following the general procedure B, 4,5-bis(3-methoxyphenyl)-1*H*-imidazole **6e** (56.1 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc = 10/1→1/1, v/v) afforded **8d** as a white solid (83 mg, 70% yield). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 7.50–7.44 (m, 6H), 7.42–7.36 (m, 7H), 7.1 (t, *J* = 9.5 Hz, 2H), 7.24 (t, *J* = 10.0 Hz, 2H), 6.91 (dd, *J* = 10.0 Hz, 3.0 Hz, 2H), 6.83 (d, *J* = 9.5 Hz, 2H), 6.77 (t, *J* = 2.5 Hz, 2H), 3.57 (s, 6H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): δ = 158.8, 144.9, 133.3, 131.6, 131.4, 131.0, 130.4, 129.9, 129.5, 128.5, 128.2, 126.6, 122.9, 122.1, 116.4, 115. 2, 55.0 ppm. HRMS (ESI) *m/z*: calcd for $C_{39}H_{29}N_2O_2^+$ ([M−BF_4^-]$^+$) 509.2229, found509.2235.

1,2,3-Tris(4-chlorophenyl)-4,5-bis(3-methoxyphenyl)-1*H*-imidazol-3-ium Tetrafluoroborate (8e)



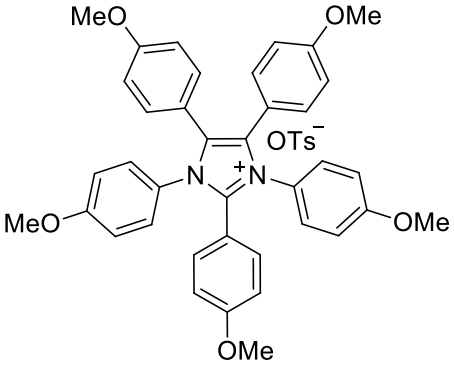
Following the general procedure B, 4,5-bis(3-methoxyphenyl)-1*H*-imidazole **6e** (56.1 mg, 0.2 mmol) and bis(4-chlorophenyl)iodonium tetrafluoroborate **2d** (174.7 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc = 10/1→1/1, v/v) afforded **8e** as a white solid (95 mg, 69% yield). M.p.: > 240 ℃. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 7.55 (d, *J* =11.0 Hz, 4H), 7.51–7.45 (m, 8H), 7.28 (t, *J* =10.0 Hz, 2H), 6.96 (dd, *J* = 10.5 Hz, 3.0 Hz, 2H), 6.80 (d, *J* = 10.0 Hz, 2H), 6.74 (t, *J* =2.0 Hz, 2H), 3.60 (s, 6H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): δ = 158.8, 144.0, 137.1, 135.3, 132.9, 131.9, 131.6, 130.2, 129.88, 129.86, 129. 1, 126.1, 122.9, 120.5, 116.4, 115.4, 55.1 ppm. HRMS (ESI) *m/z*: calcd for $C_{35}H_{26}Cl_3N_2O_2^+$ ([M−BF_4^-]$^+$) 611.1060, found 611.1061.

1,2,3,4,5-Pentakis(4-methoxyphenyl)-1*H*-imidazol-3-ium Tetrafluoroborate (8f)



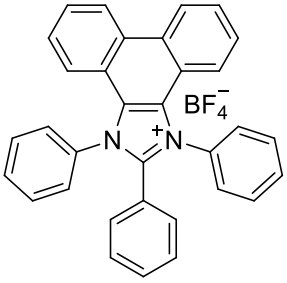
Following the general procedure B, 4,5-bis(4-methoxyphenyl)-1*H*-imidazole **6f** (56.1 mg, 0.2 mmol) and bis(4-methoxyphenyl)iodonium tetrafluoroborate **2f** (171.2 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc = 10/1→1/1, v/v) afforded **8f** as a white solid (89 mg, 65% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 7.37–7.34 (m, 6H), 7.13 (d, *J* =8.8 Hz, 4H), 6.93 (d, *J* = 8.8 Hz, 4H), 6.86 (d, *J* = 8.4 Hz, 6H), 3.70 (s, 6H), 3.69 (s, 6H), 3.68 (s, 3H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 161.0, 159.81, 159.78, 145.1, 132.7, 132.2, 131.3, 129.5, 126.2, 117.7, 114.5, 114.2, 114.1, 114.0, 55.4, 55.3, 55.1 ppm. HRMS (ESI) *m/z*: calcd for $C_{38}H_{35}N_2O_5^+$ ([M−BF_4^-]$^+$) 599.2546, found 599.2547.

1,2,3,4,5-Pentakis(4-methoxyphenyl)-1*H*-imidazol-3-ium Tosylates (8f-OTs)



Following the general procedure B, 4,5-bis(4-methoxyphenyl)-1*H*-imidazole **6f** (56.1 mg, 0.2 mmol) and bis(4-methoxyphenyl)iodonium tosylates **2f-OTs** (204.9 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/EtOAc~CH_2Cl_2/MeOH = 1/1~20/1, v/v) afforded **8f-OTs** as a gray solid (75mg, 49% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 7.50 (d, *J* =8.0 Hz, 2H), 7.40–7.37 (m, 6H), 7.16–7.10 (m, 6H), 6.92 (d, *J* = 8.8 Hz, 4H), 6.85 (d, *J* = 8.4 Hz, 6H), 3.70 (s, 6H), 3.69 (s, 6H), 3.68 (s, 3H), 2.28 (s, 3H) ppm. ^{13}C NMR (126 MHz, DMSO-d_6): *δ* = 161.0, 159.9, 159.8, 145.9, 145.1, 137.6, 132.8, 132.3, 131.3, 129.6, 128.1, 126.2, 125.5, 117.8, 114.4, 114.3, 114.0, 113.9, 55.4, 55.3, 55.1, 20.8 ppm. HRMS (ESI) *m/z*: calcd for $C_{38}H_{35}N_2O_5^+$ ([M−BF_4^-]$^+$) 599.2546, found 599.2546.

1,2,3-Priphenyl-1*H*-phenanthro[9,10-d]imidazol-3-ium Tetrafluoroborate (9)



Following the general procedure B, 1*H*-phenanthro[9,10-d]imidazole **6e** (43.7 mg, 0.2 mmol) and diphenyliodonium tetrafluoroborate **2a** (147.2 mg, 0.4 mmol) were used. Purification via a silica (100-200 meshes) gel column (CH_2Cl_2/MeOH = 50/1→30/1, v/v) afforded **9** as a white solid (45 mg, 42% yield). M.p.: > 240 ℃. ^{1}H NMR (400 MHz, DMSO-d_6): δ = 9.16 (d, *J* = 8.8 Hz, 2H), 7.88–7.83 (m, 6H), 7.73–7.71 (m, 6H), 7.65 (d, *J* = 7.2 Hz, 2H), 7.58 (t, *J*

= 7.6 Hz, 2H), 7.38–7.31 (m, 3H), 7.12 (d, J = 8.4 Hz, 2H) ppm. ^{13}C NMR (101 MHz, DMSO-d_6): δ = 149.6, 134.8, 131.8, 131.7, 131.2, 130.7, 129.6, 128.4, 128.2, 128.2, 125.9, 125.1, 121.5, 120.8, 119.9 ppm. HRMS (ESI) *m/z*: calcd for $C_{33}H_{23}N_2^+$ ([M−BF_4^-]$^+$) 447.1861, found 447.1861.

IX. References

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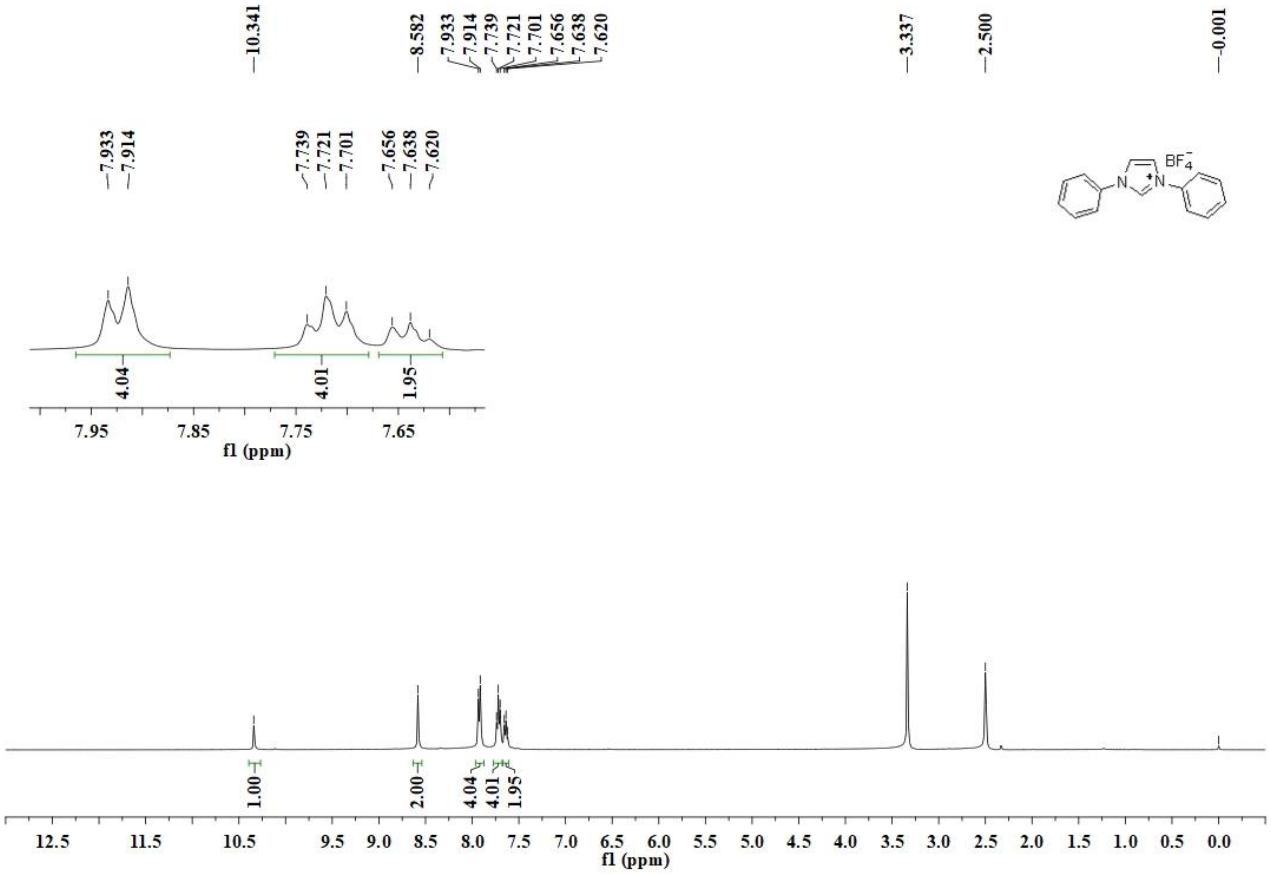
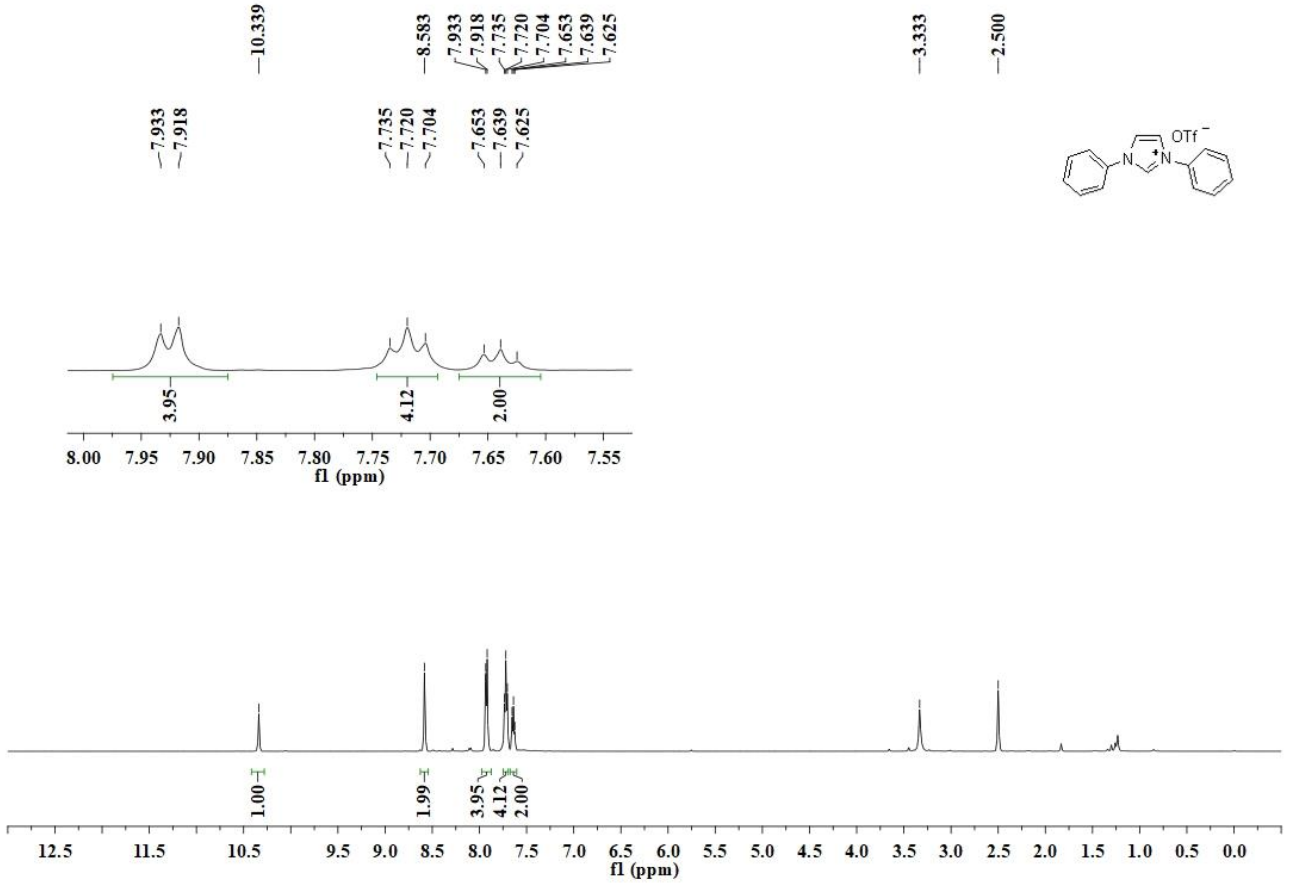
X. Copies of ^{1}H, ^{13}C and ^{19}F NMR spectra

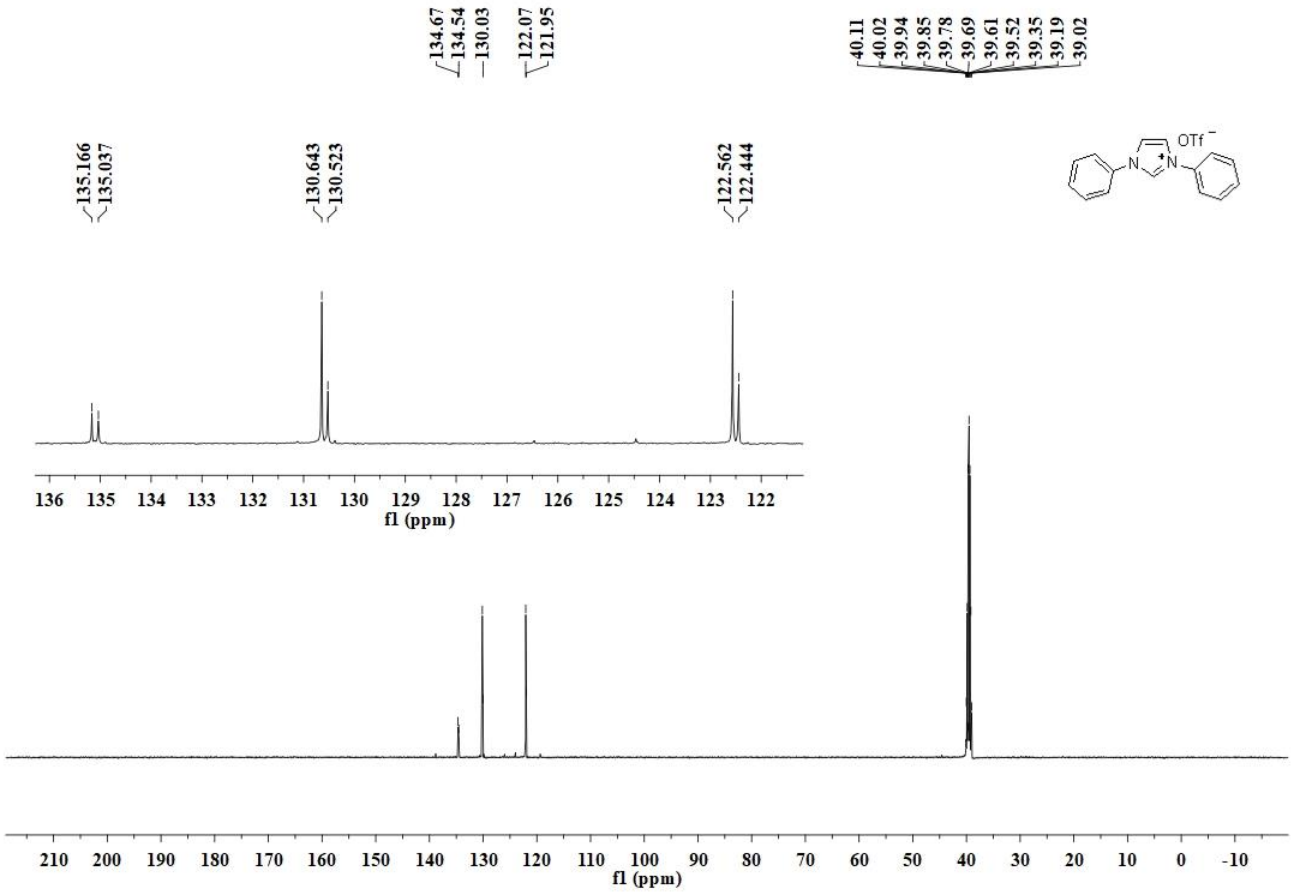
^{1}H NMR (400 MHz, DMSO-*d6*) of **3a**



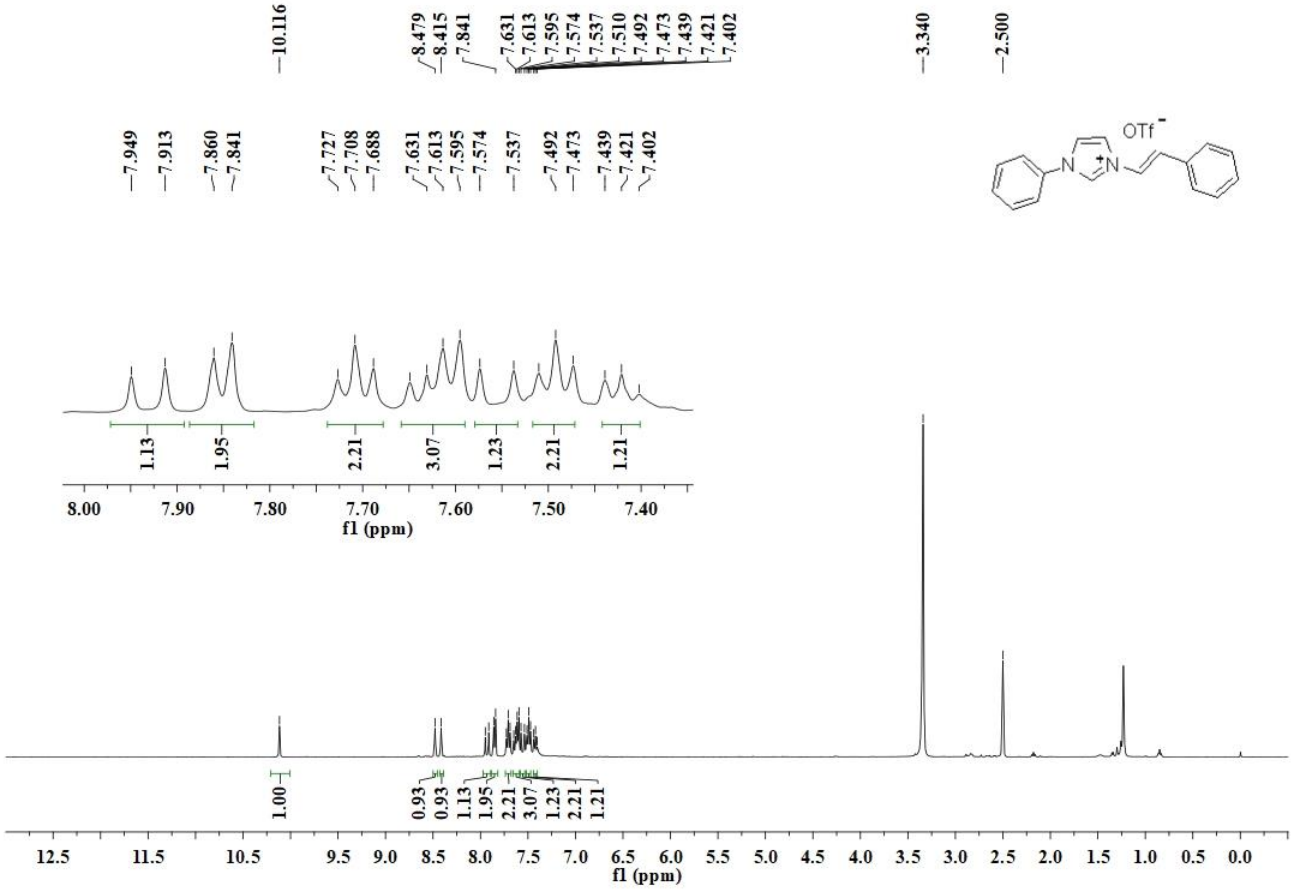
^{1}H NMR (500 MHz, DMSO-*d6*) of **3a-OTf**



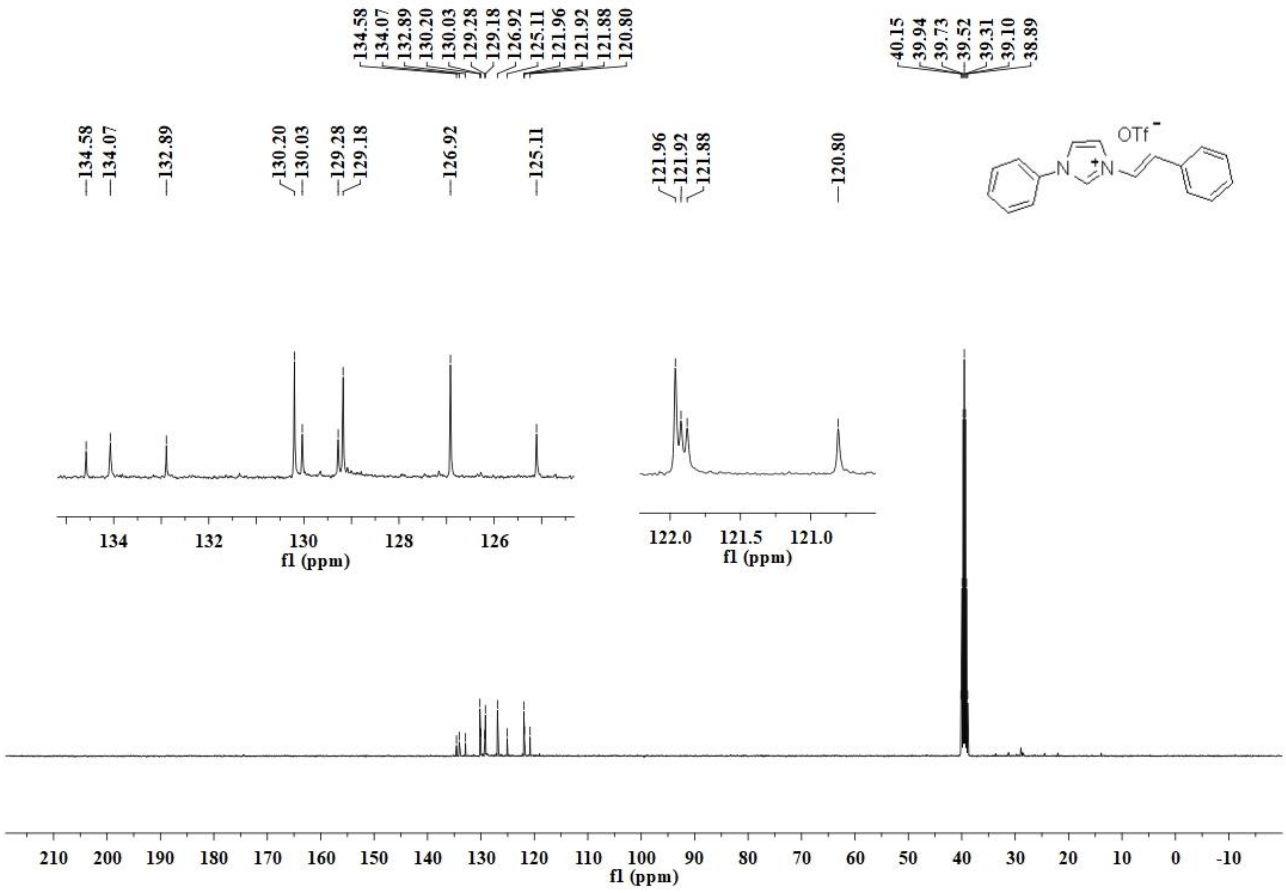
^{13}C NMR (126 MHz, DMSO-*d6*) of **3a-OTf**



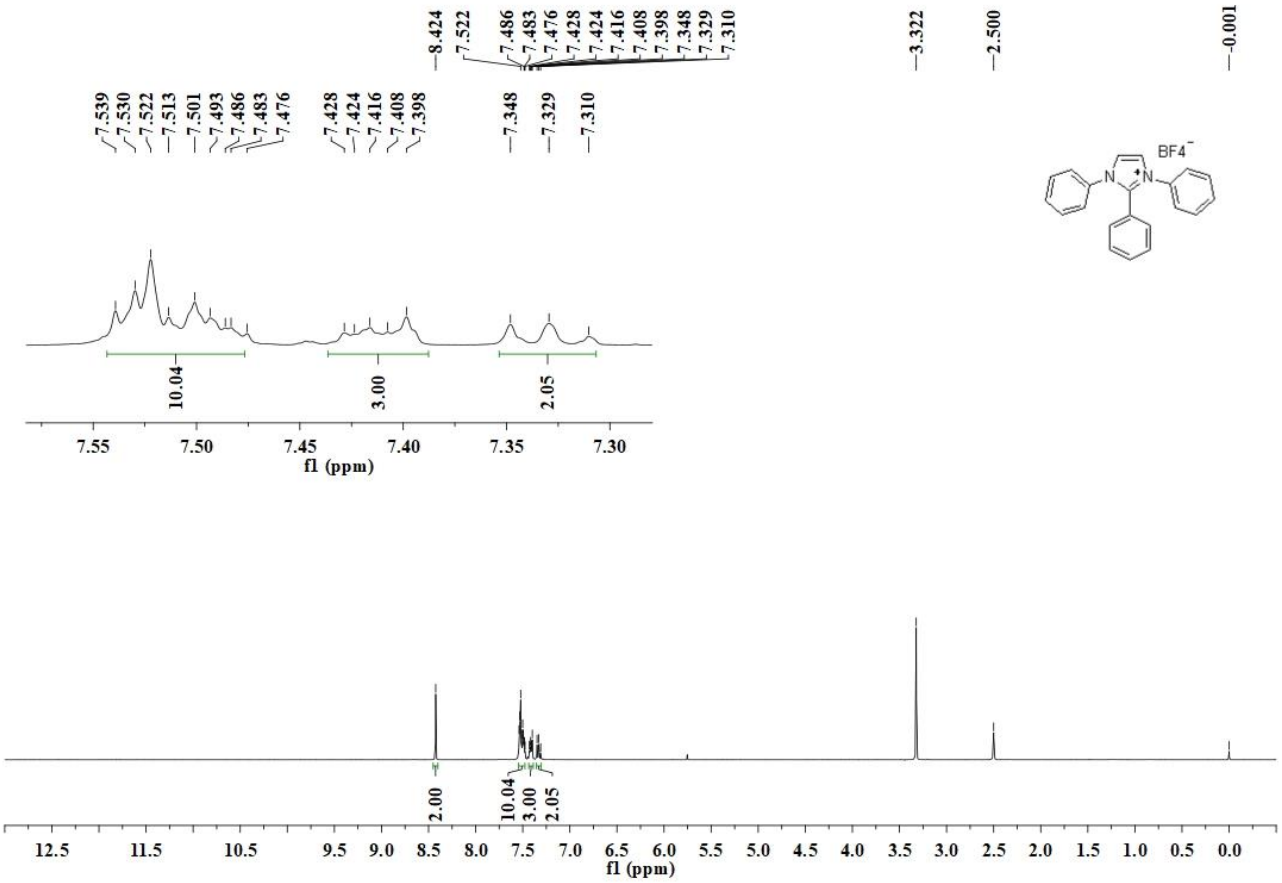
^{1}H NMR (400 MHz, DMSO-*d6*) of **3d**



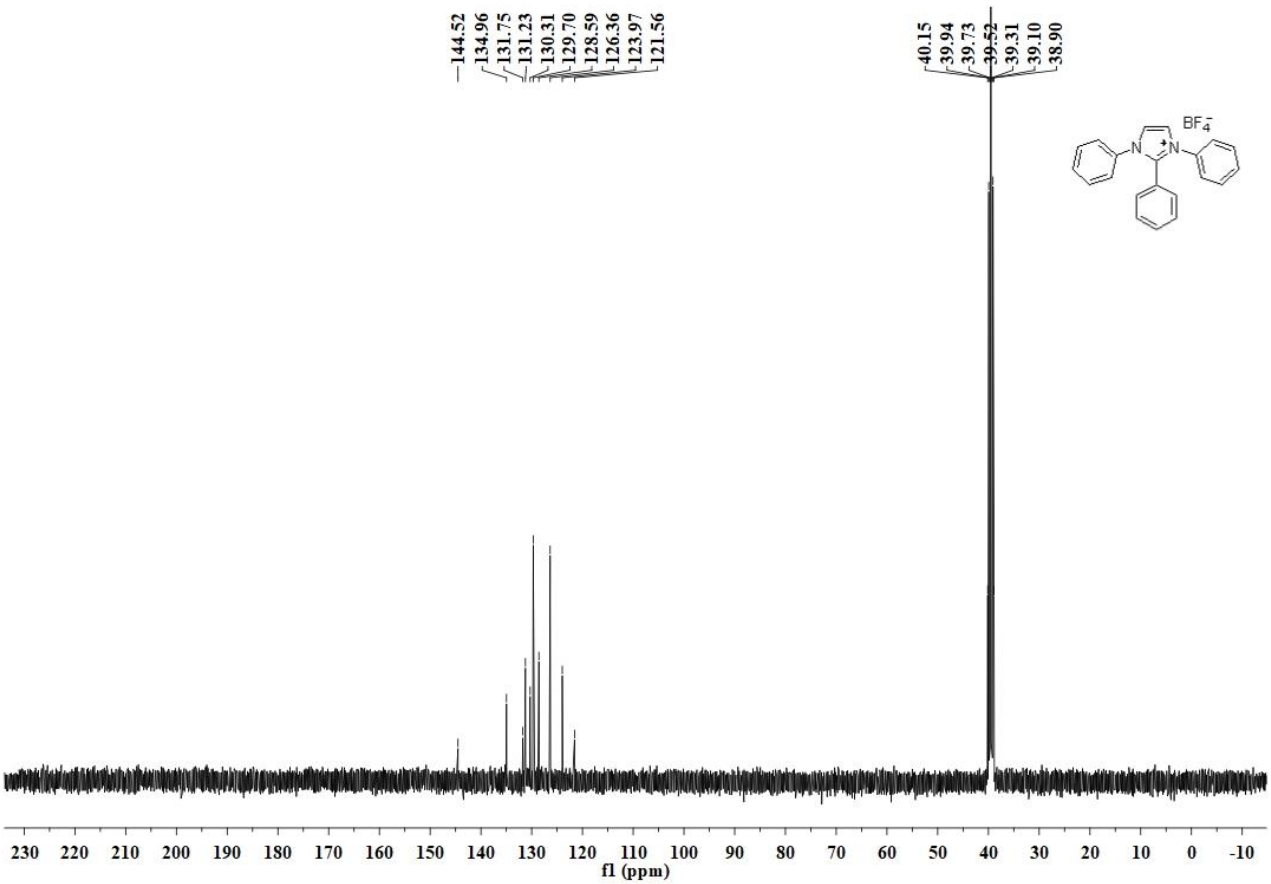
^{13}C NMR (101 MHz, DMSO-*d6*) of **3d**



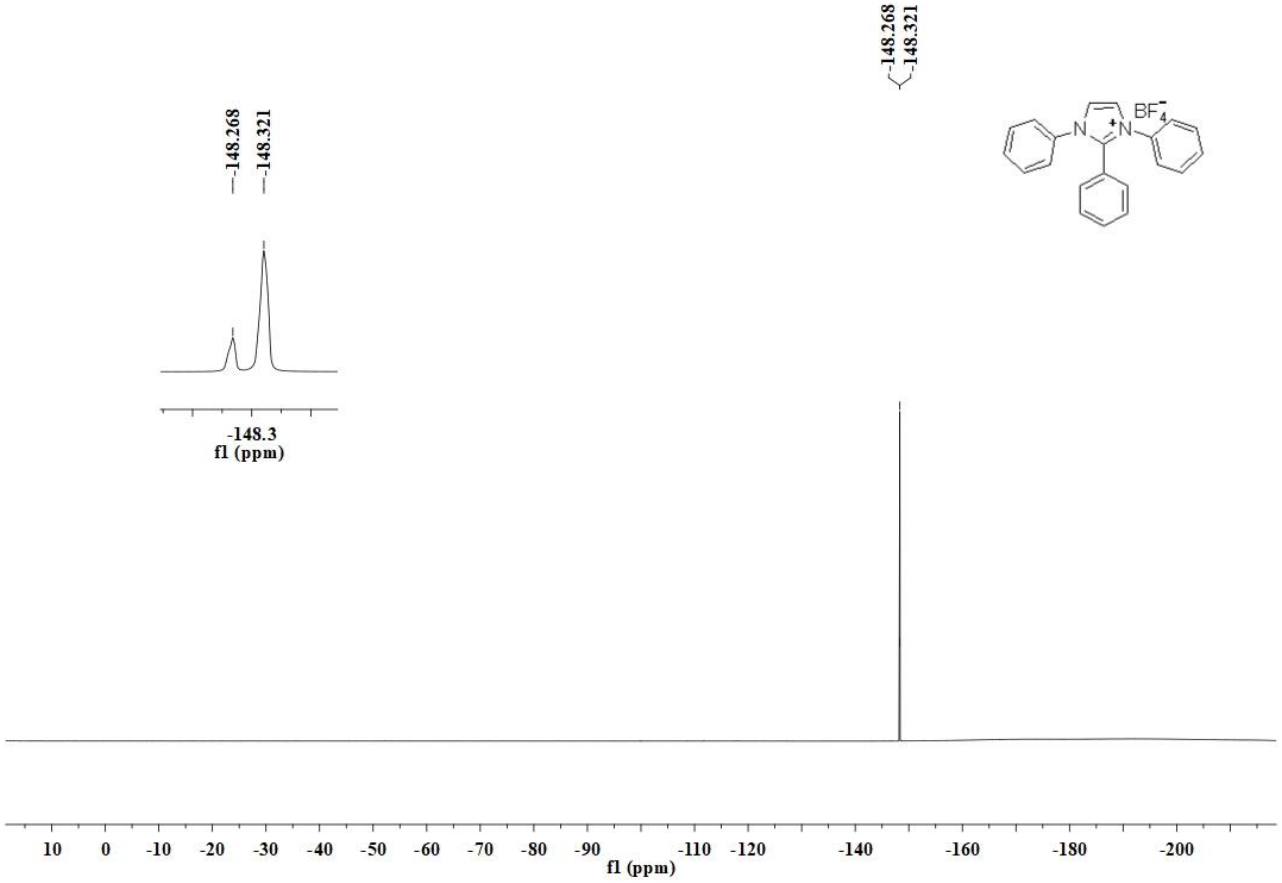
^{1}H NMR (400 MHz, DMSO-*d6*) of **4a/7a**



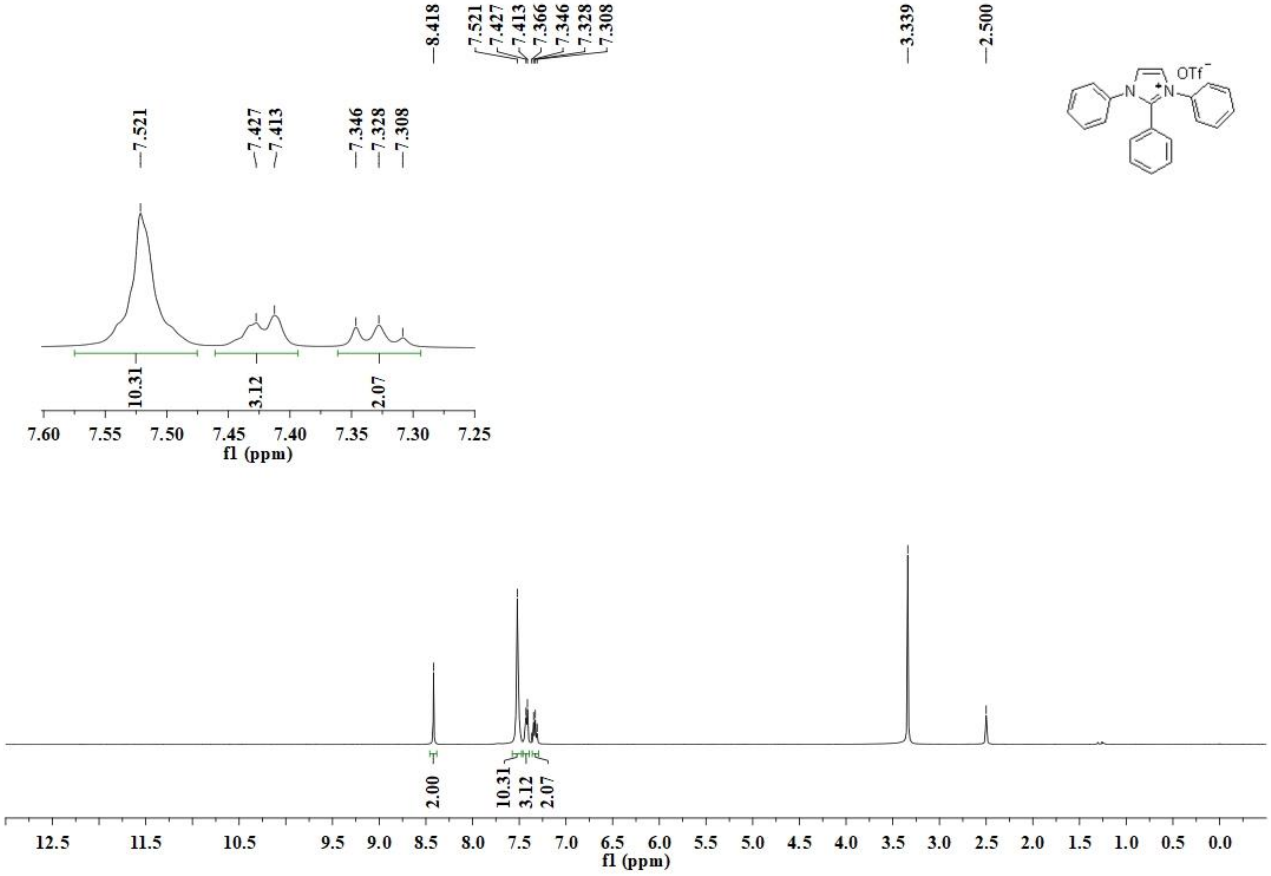
^{13}C NMR (101 MHz, DMSO-*d6*) of **4/7a**



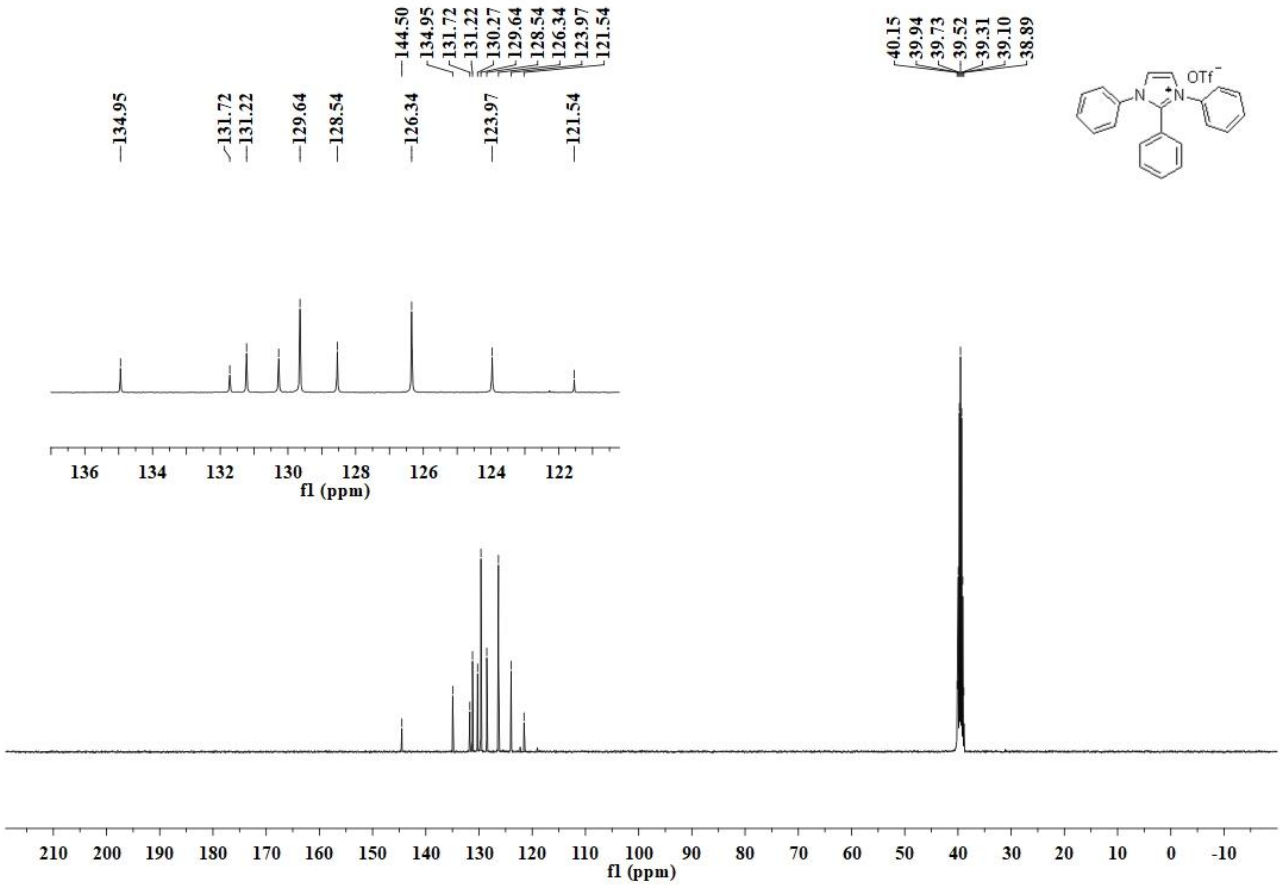
^{19}F NMR (376 MHz, DMSO-*d6*) of **4a**/**7a**



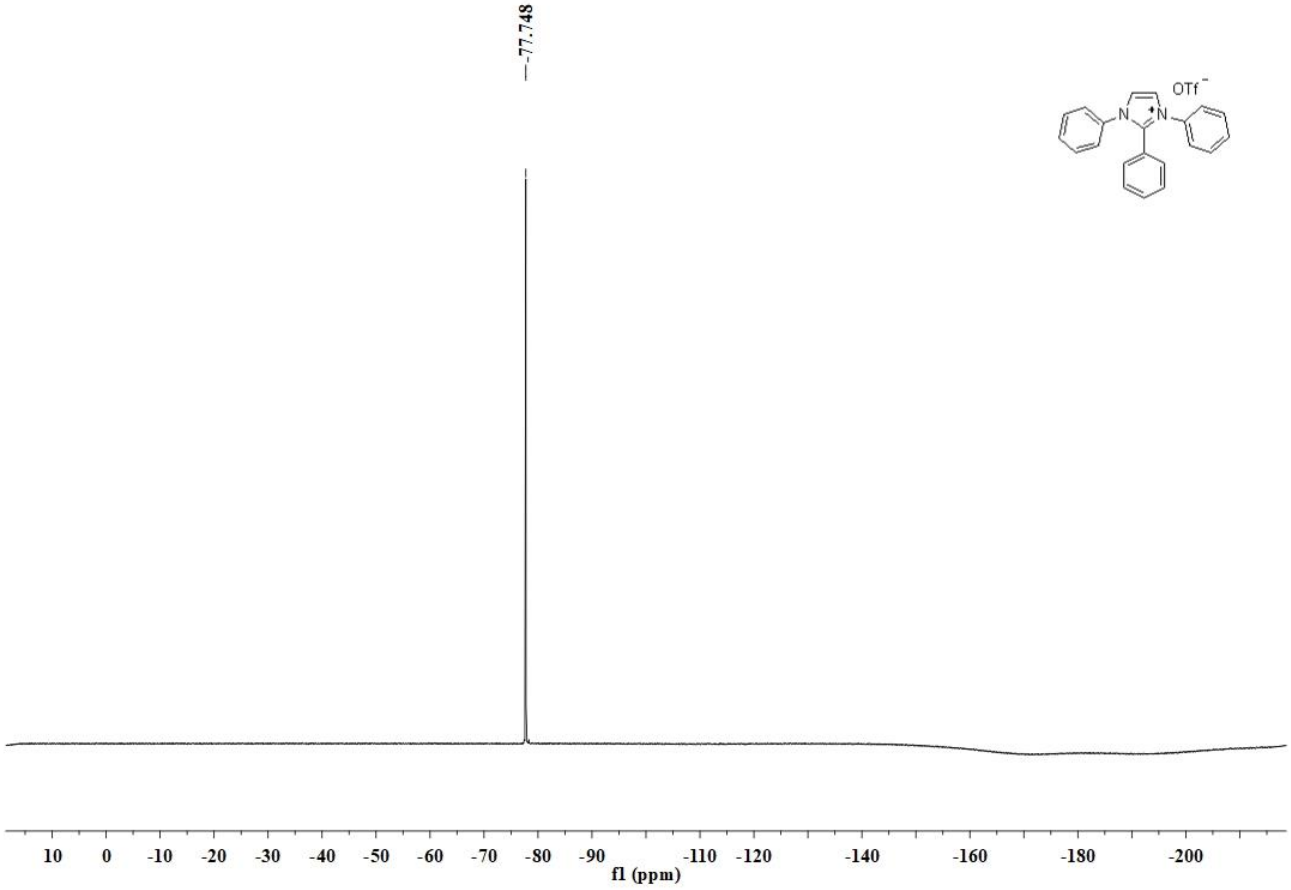
^{1}H NMR (400 MHz, DMSO-*d6*) of **4a-OTf**



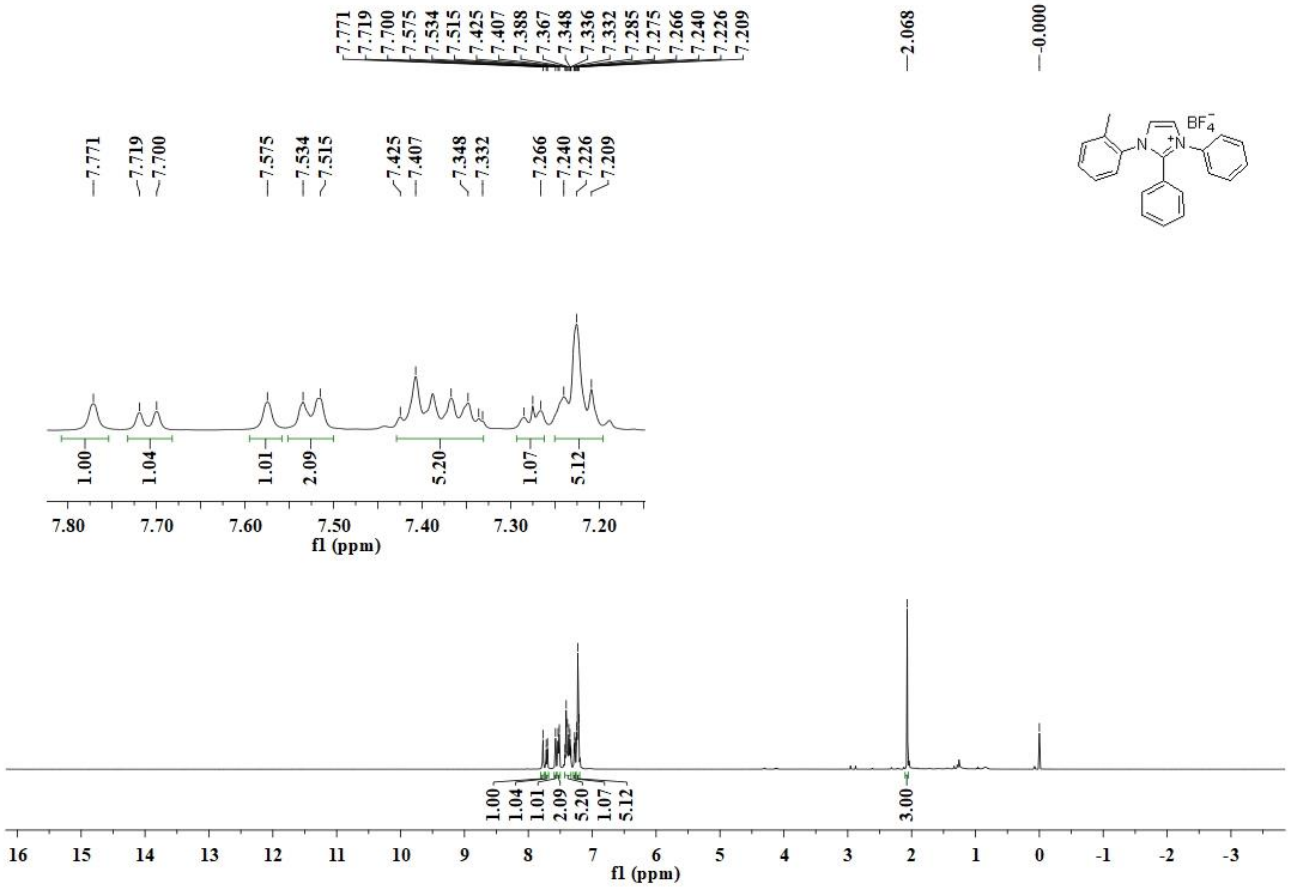
^{13}C NMR (101 MHz, DMSO-*d6*) of **4a-OTf**



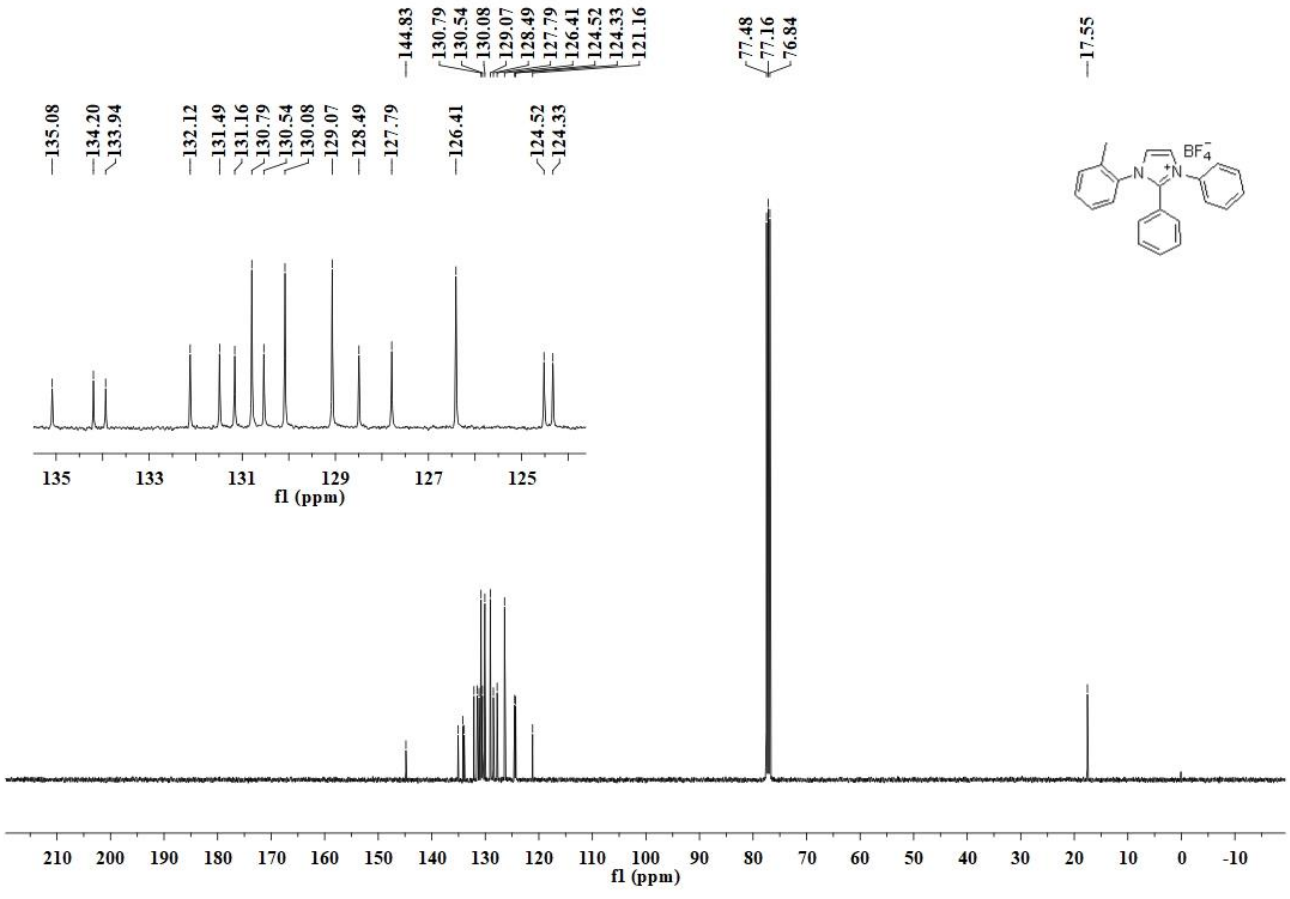
^{19}F NMR (376 MHz, DMSO-*d6*) of **4a-OTf**



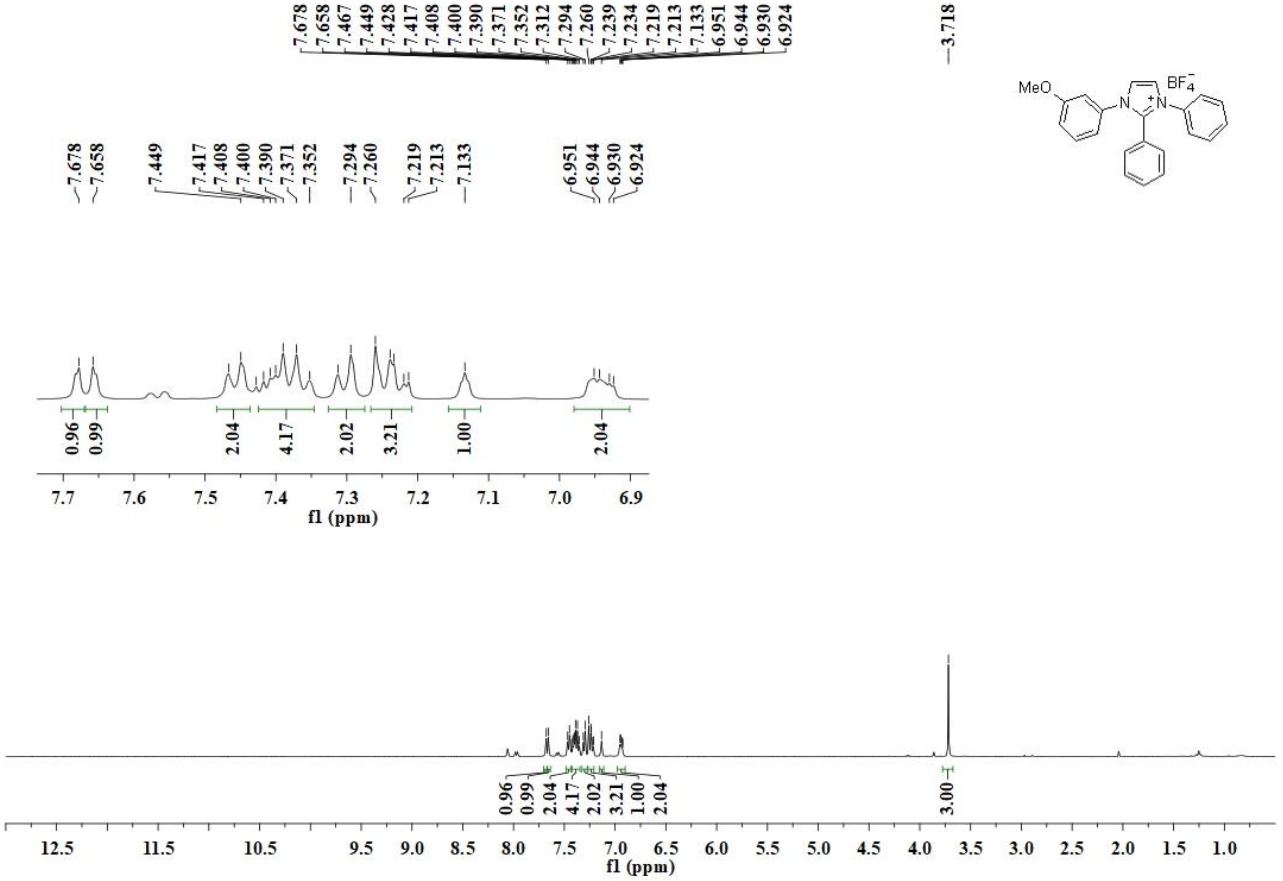
^{1}H NMR (400 MHz, $CDCl_3$) of **4b**



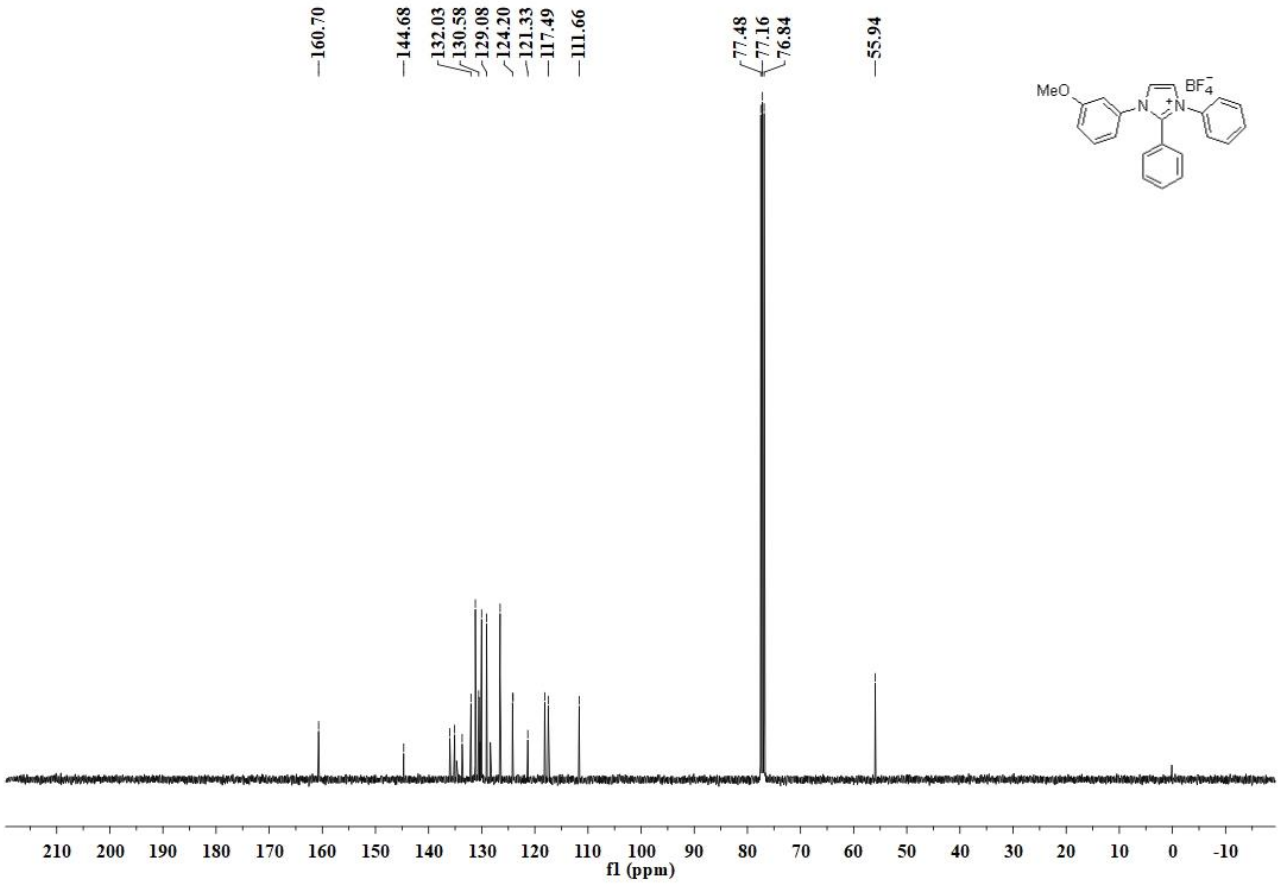
^{13}C NMR (101 MHz, $CDCl_3$) of **4b**



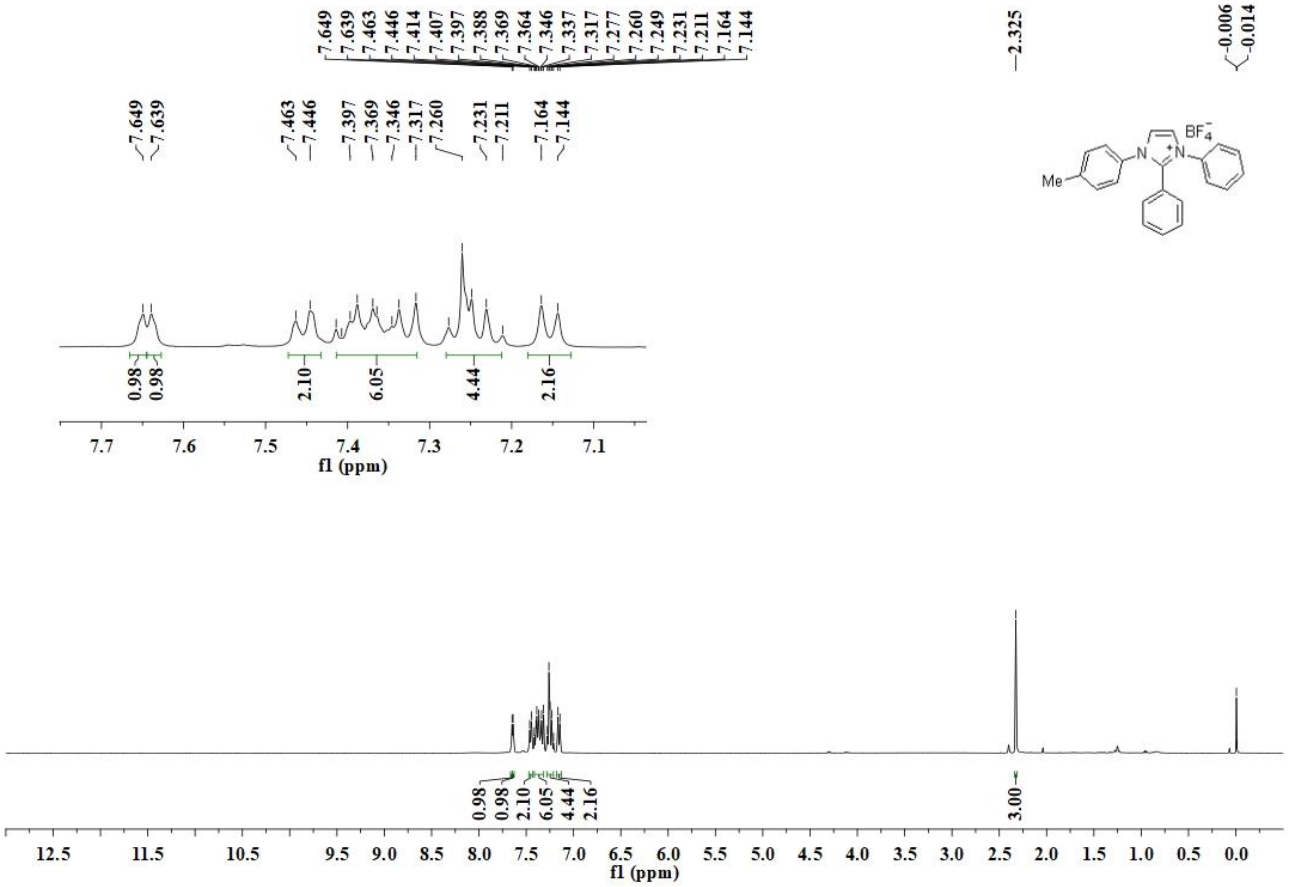
^{1}H NMR (400 MHz, $CDCl_3$) of **4c**



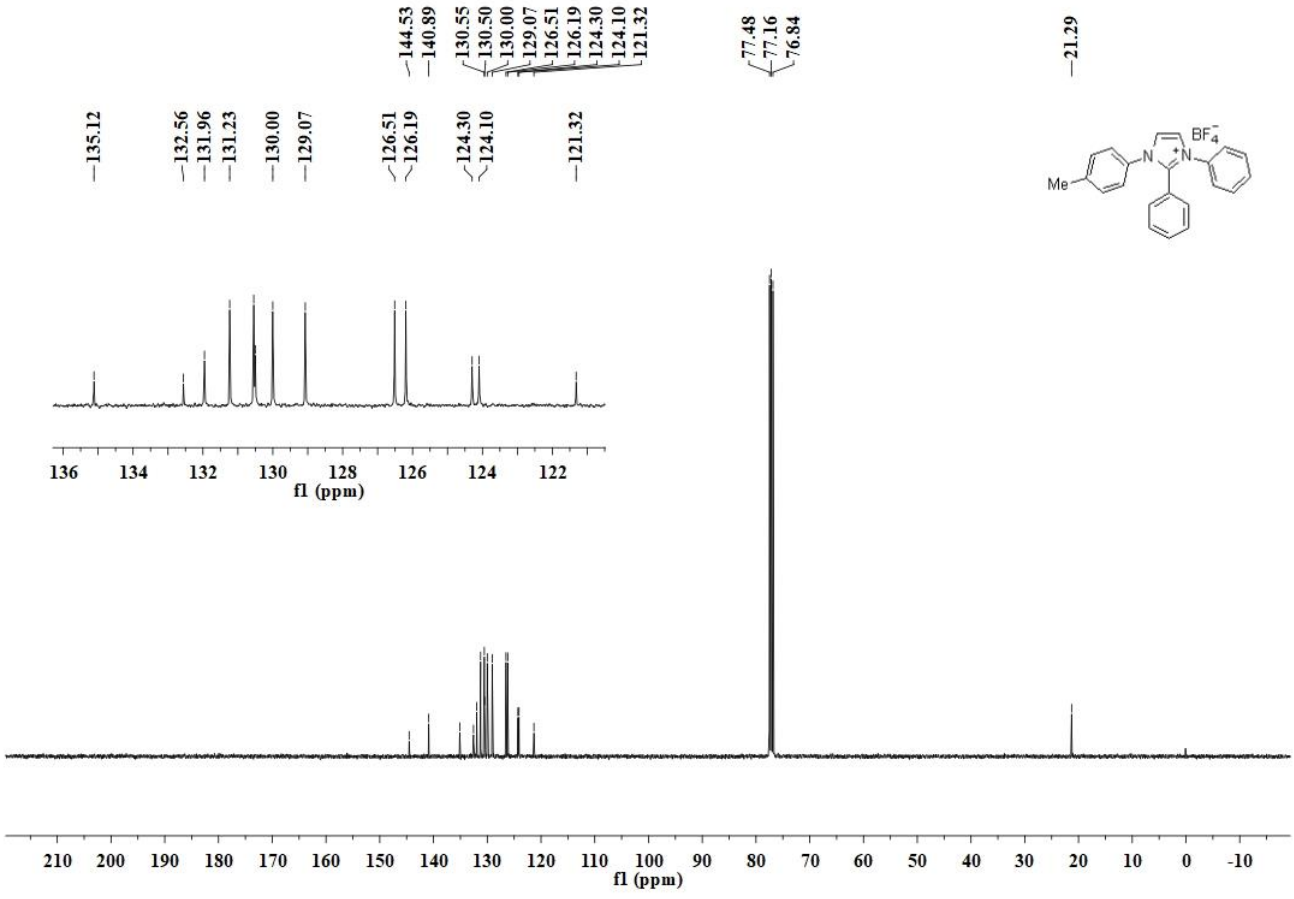
^{13}C NMR (101 MHz, $CDCl_3$) of **4c**



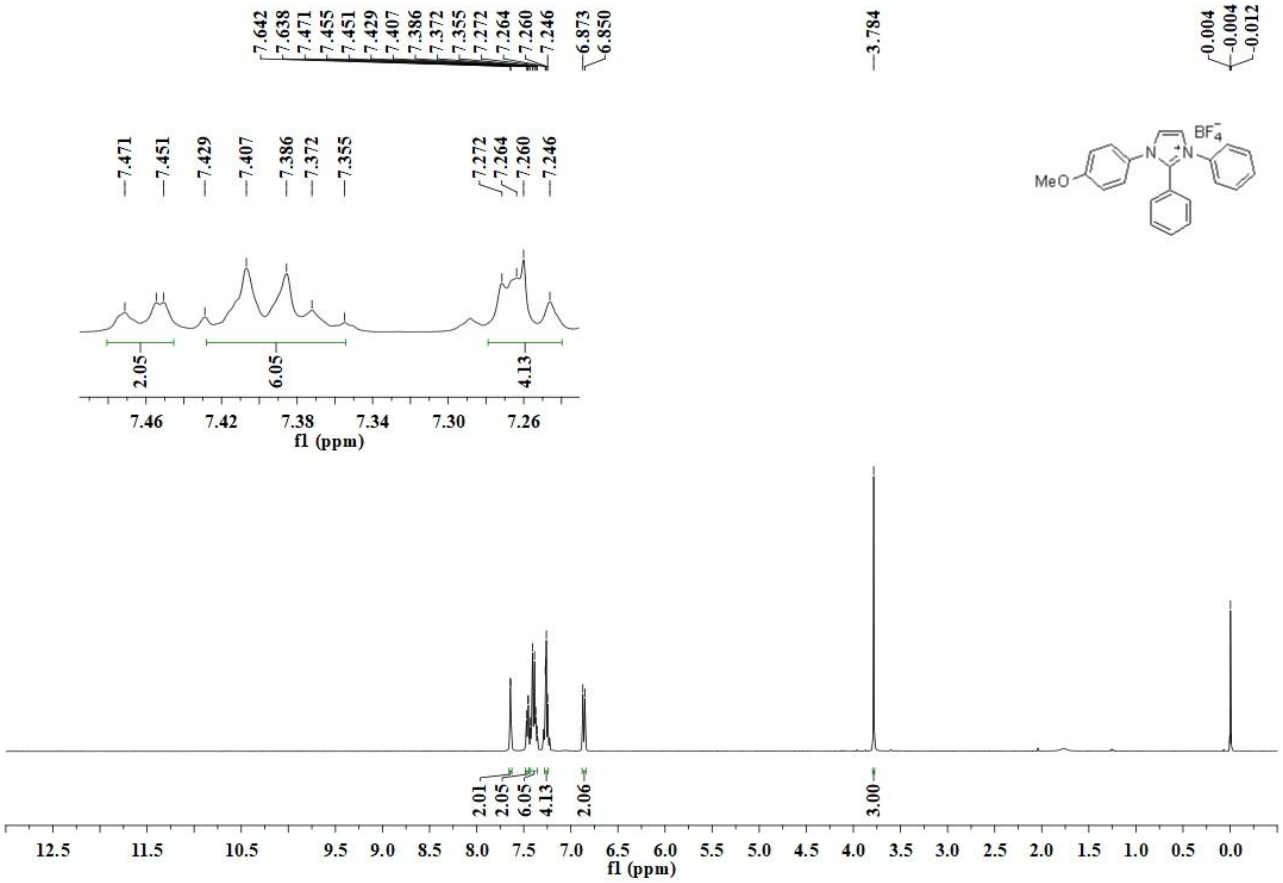
^{1}H NMR (400 MHz, $CDCl_3$) of **4d**



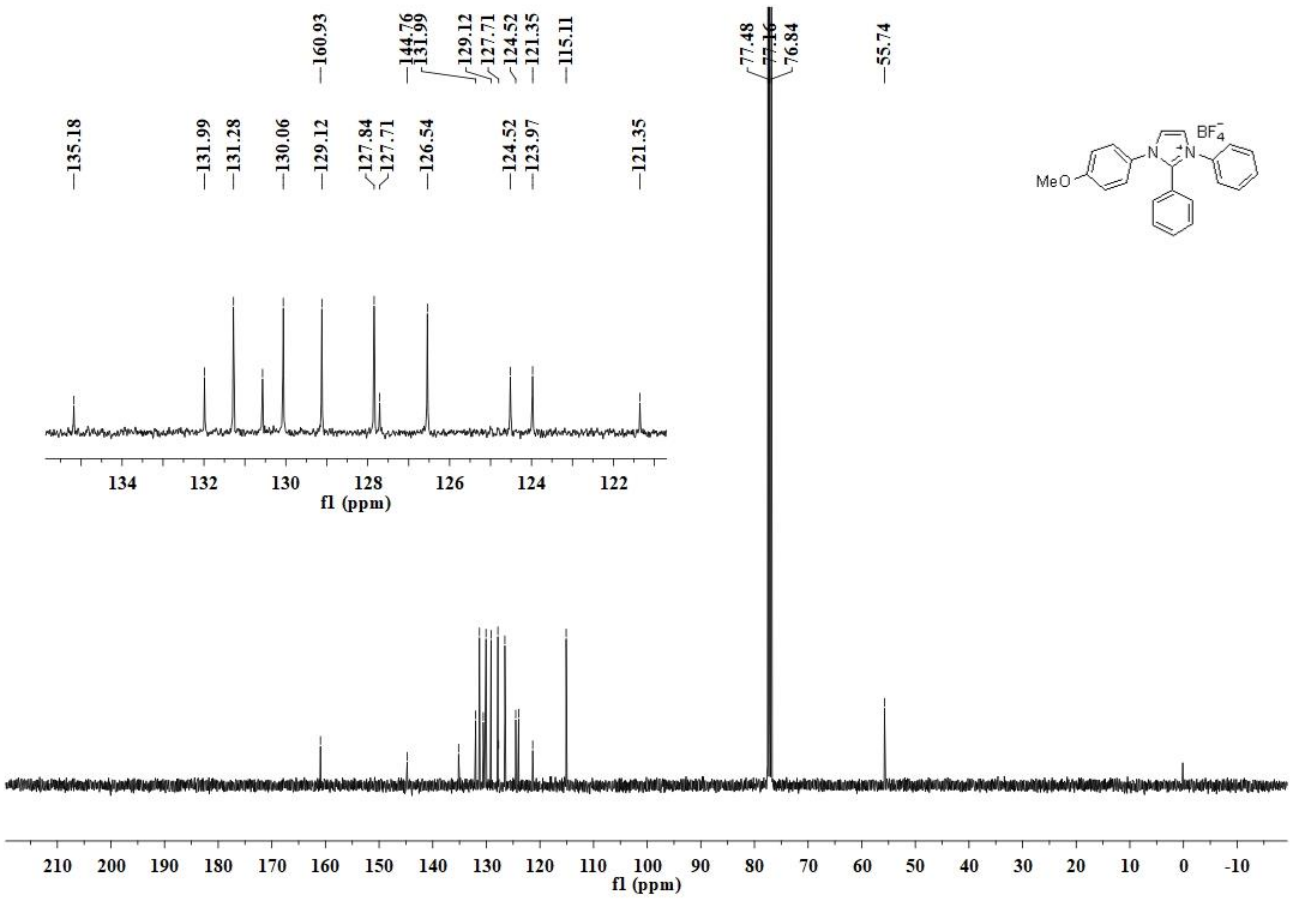
^{13}C NMR (101 MHz, $CDCl_3$) of **4d**



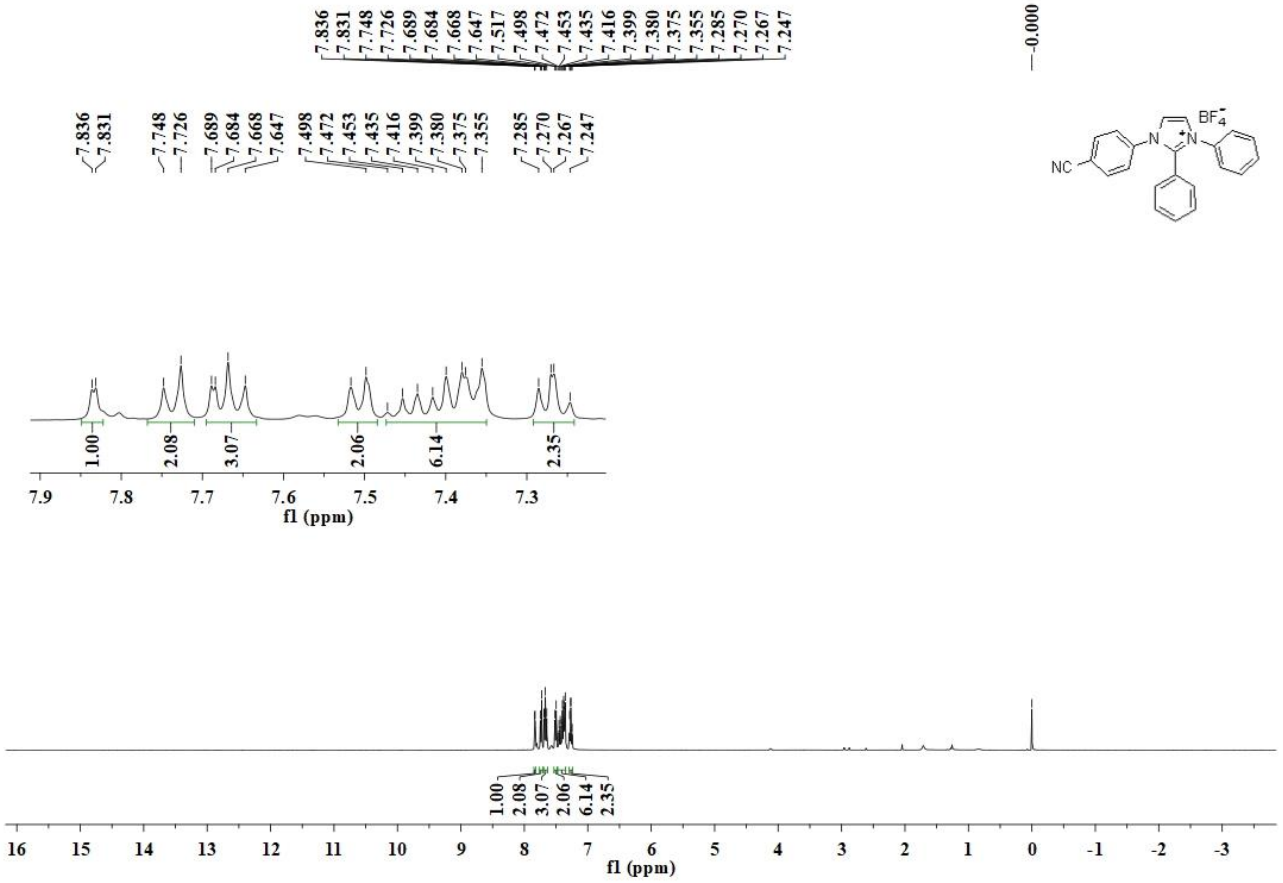
^{1}H NMR (400 MHz, $CDCl_3$) of **4e**



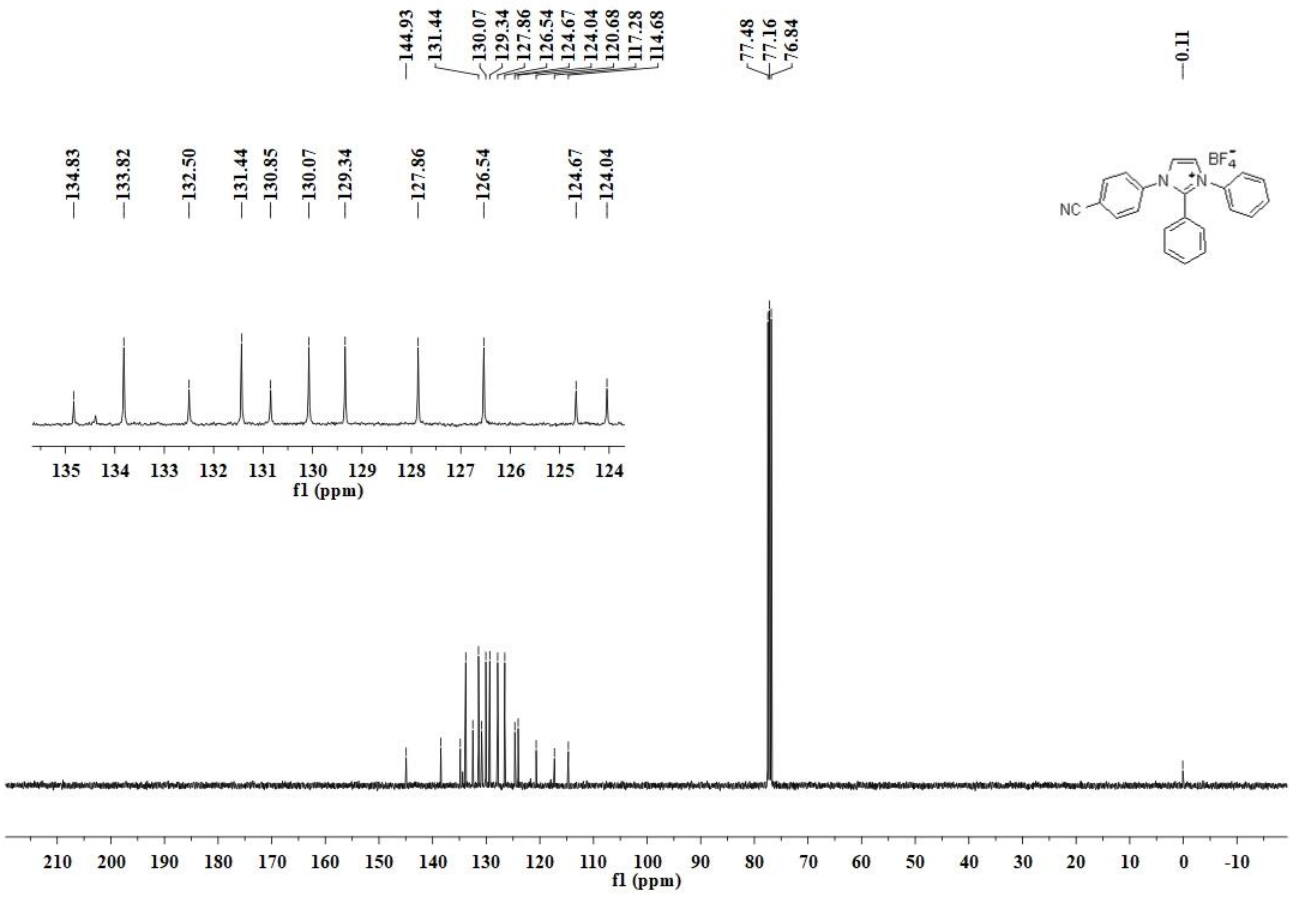
^{13}C NMR (101 MHz, $CDCl_3$) of **4e**



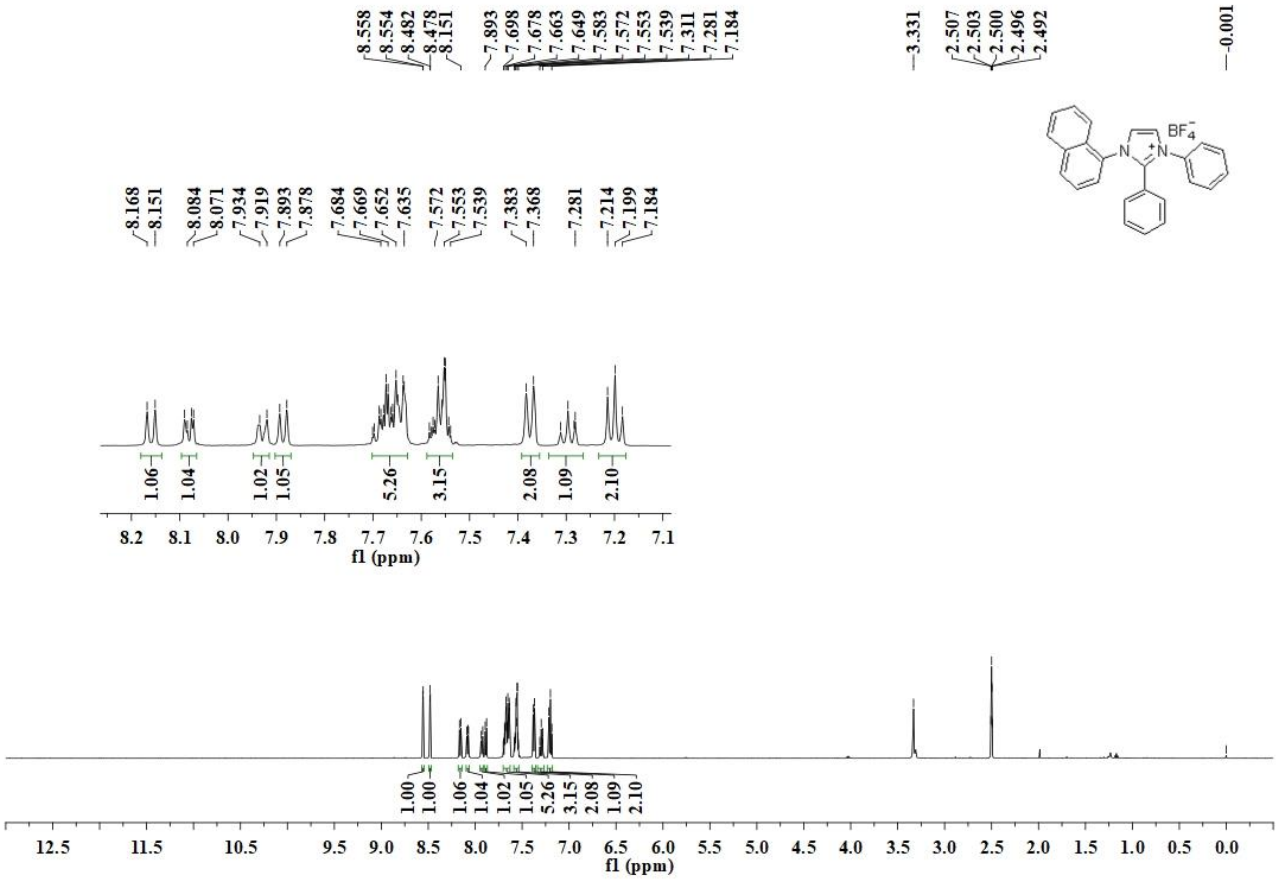
^{1}H NMR (400 MHz, $CDCl_3$) of **4f**



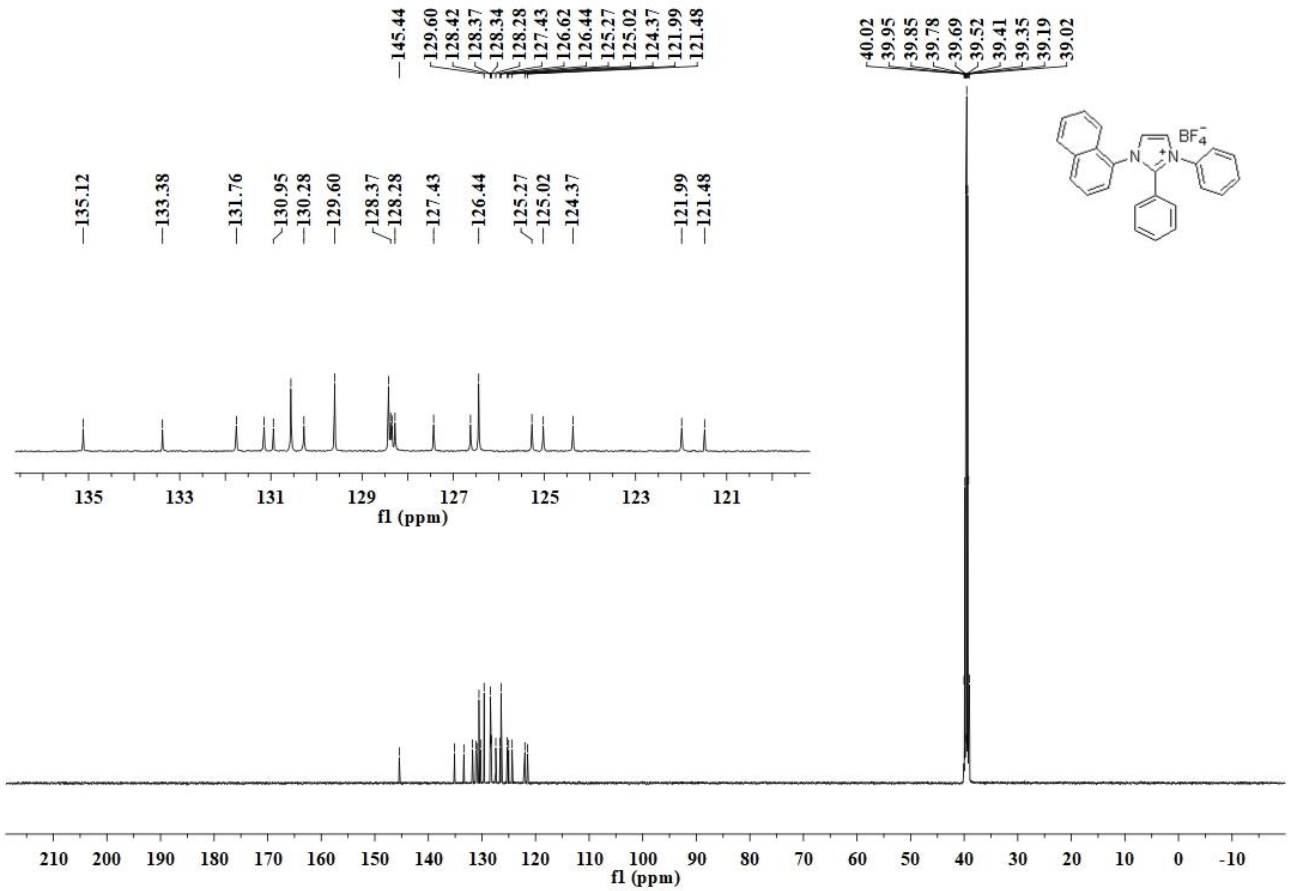
^{13}C NMR (101 MHz, $CDCl_3$) of **4f**



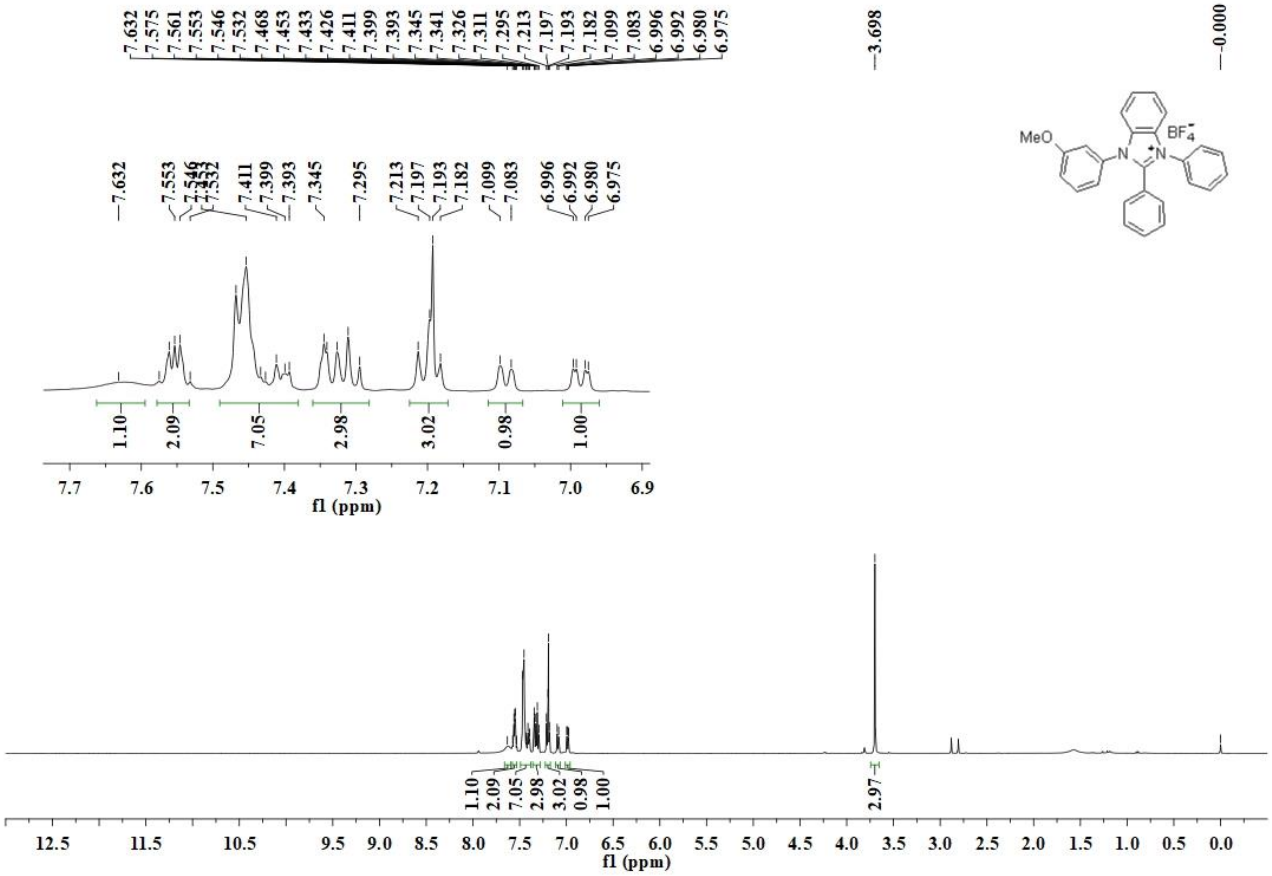
^{1}H NMR (500 MHz, DMSO-*d6*) of **4g**



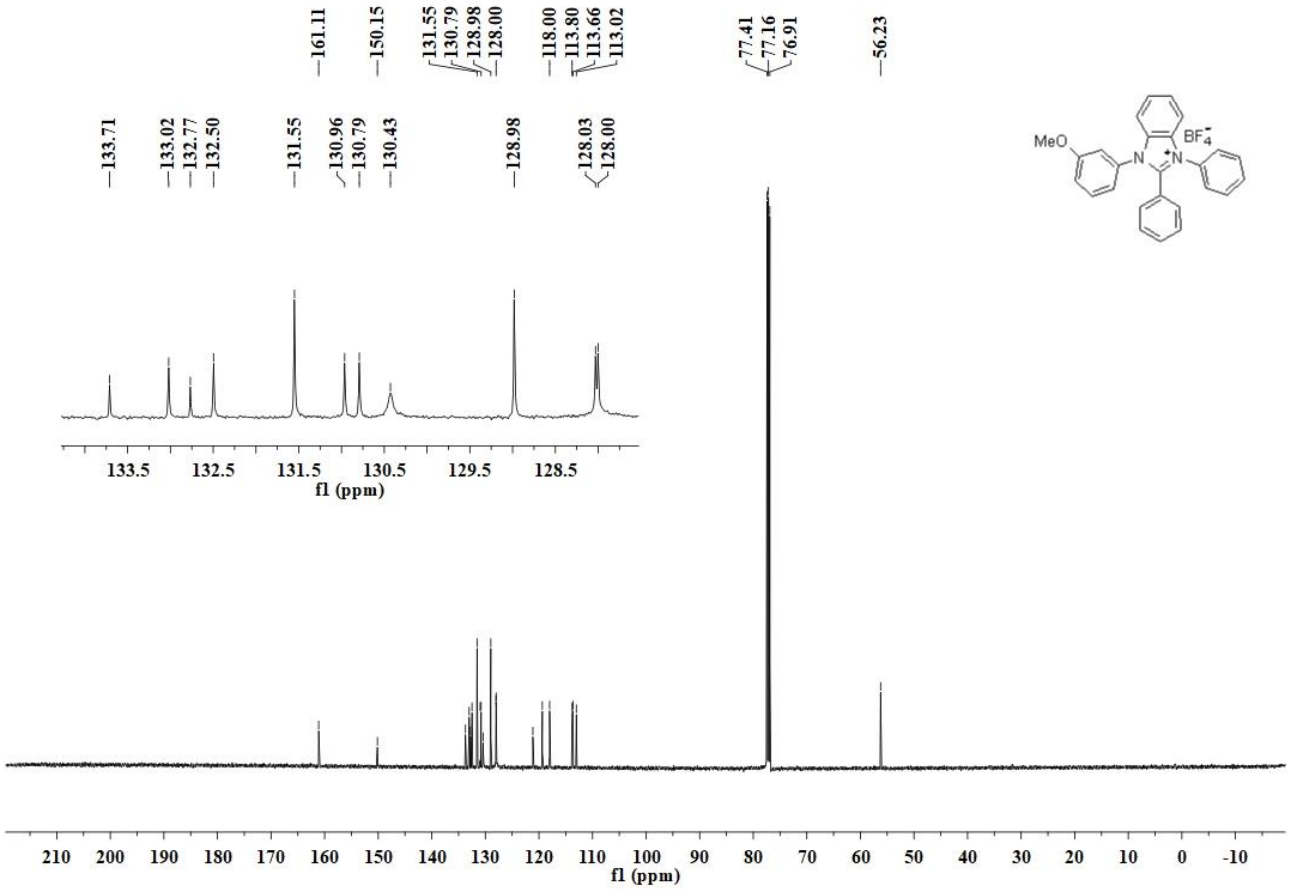
^{13}C NMR (126 MHz, DMSO-*d6*) of **4g**



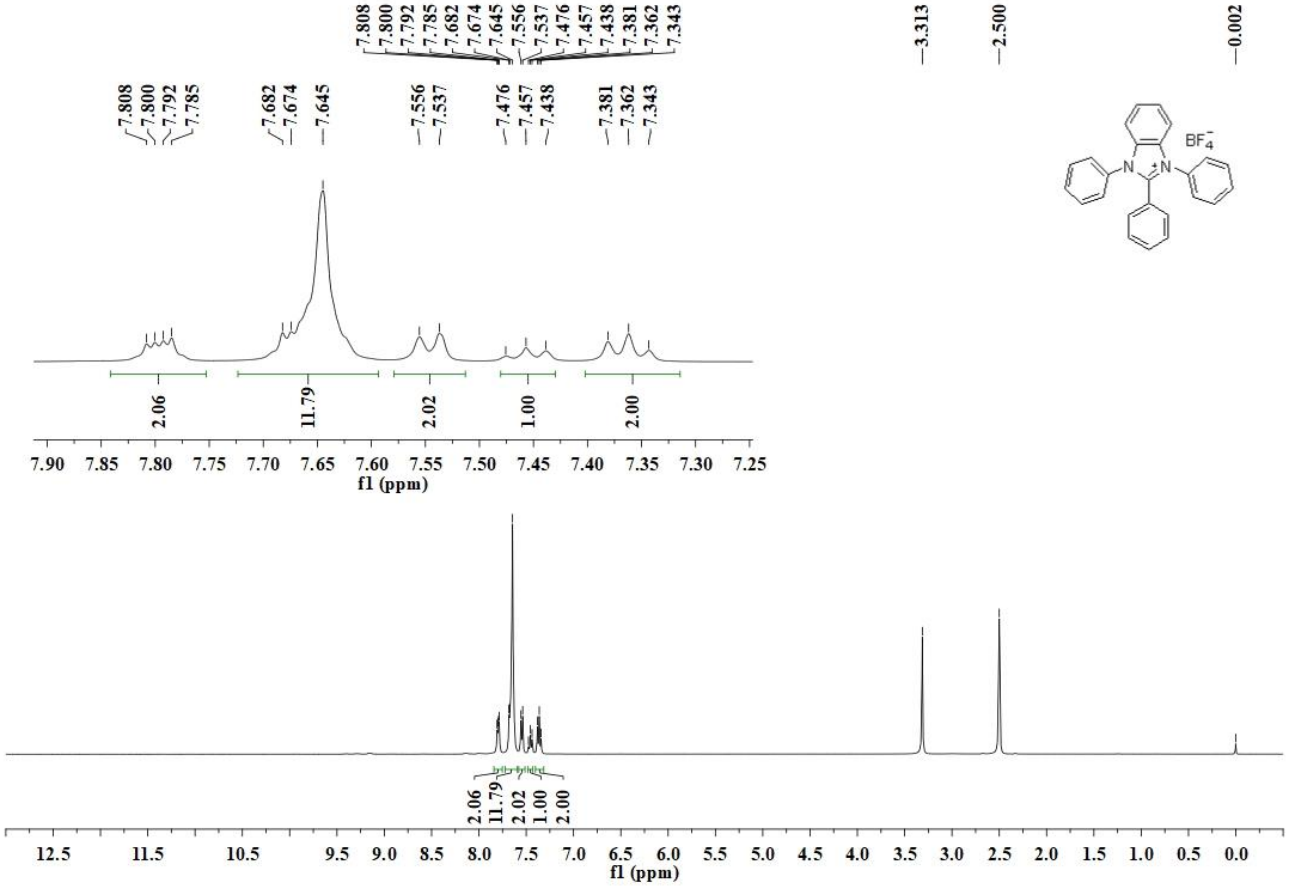
^{1}H NMR (500 MHz, $CDCl_3$) of **4h**



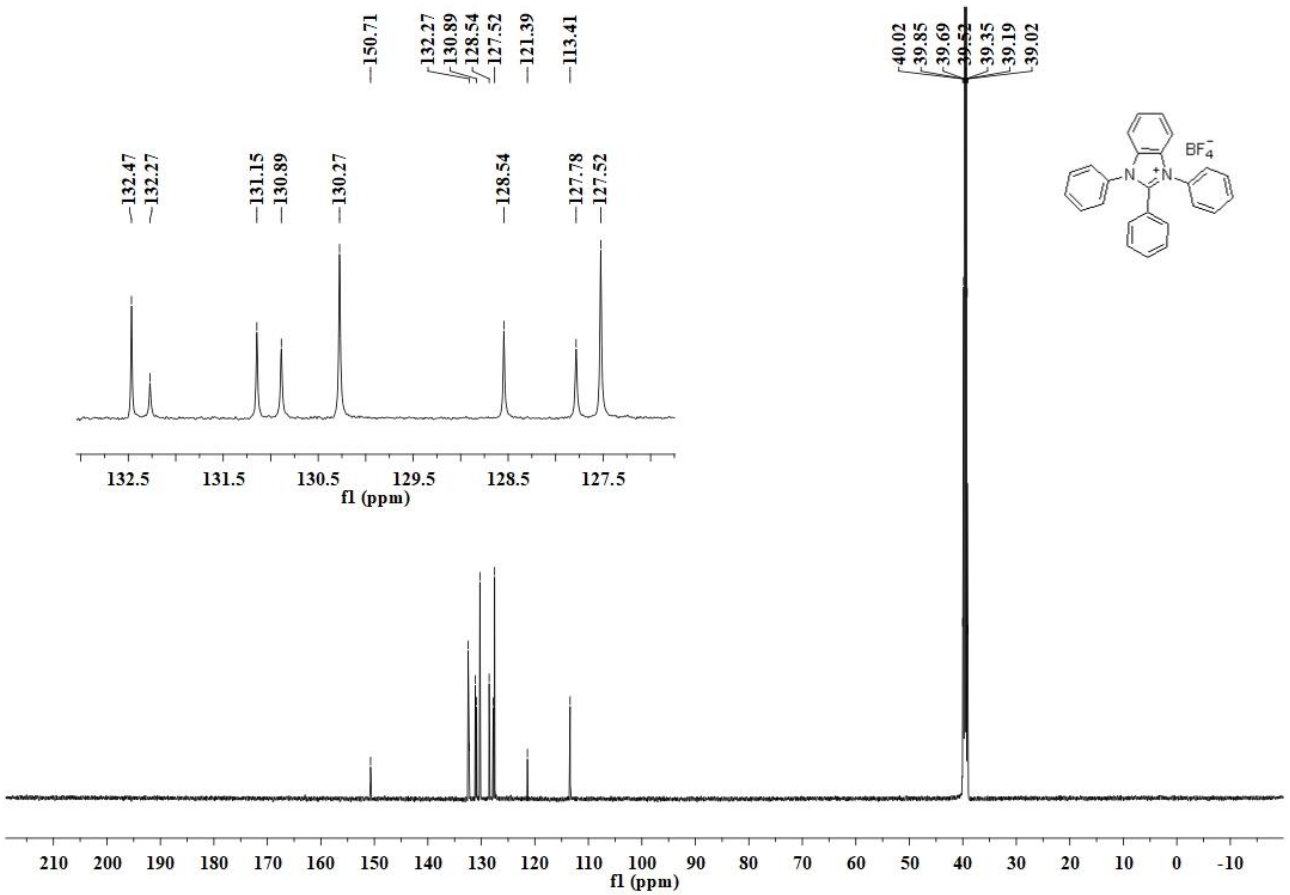
^{13}C NMR (126 MHz, $CDCl_3$) of **4h**



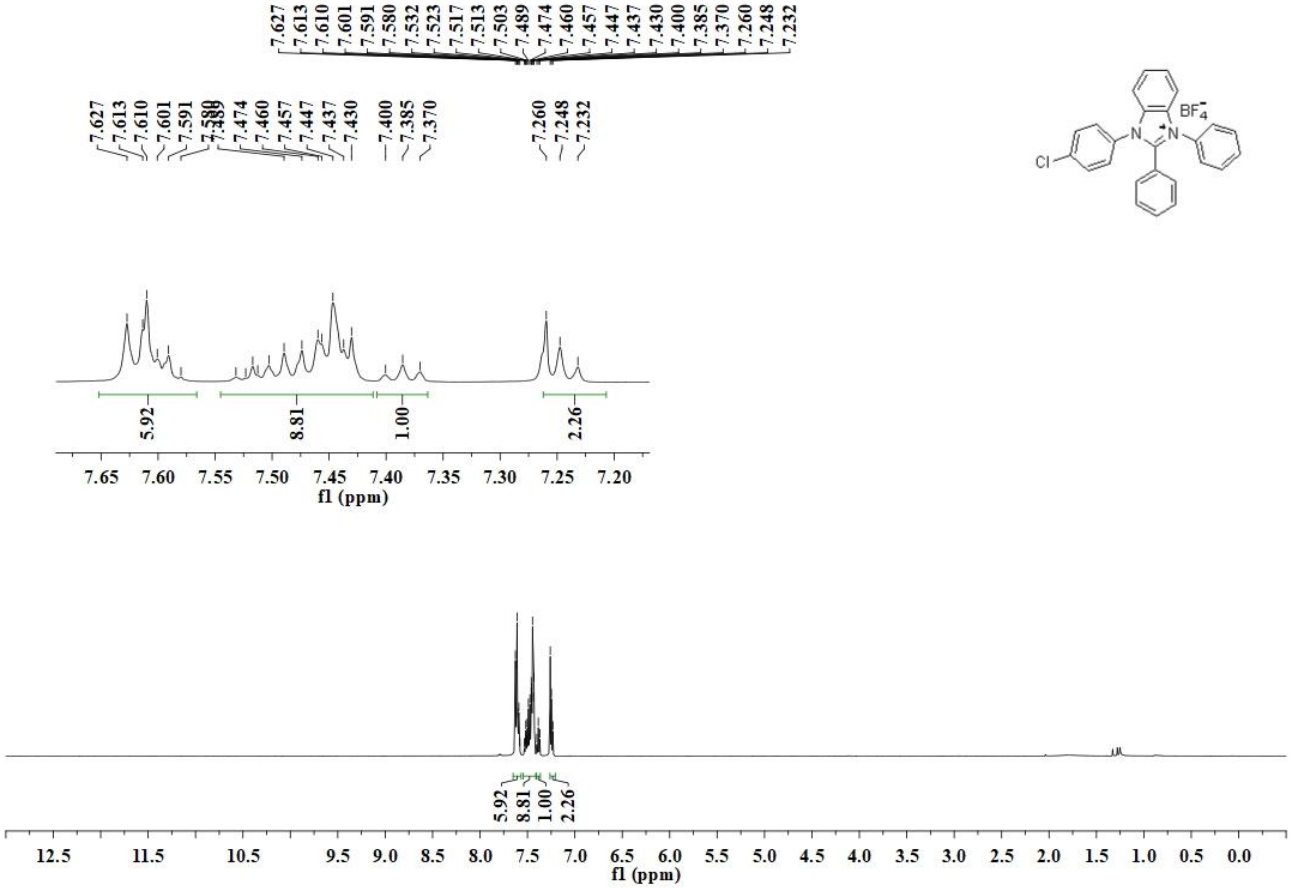
^{1}H NMR (500 MHz, DMSO-*d6*) of **4i/7c**



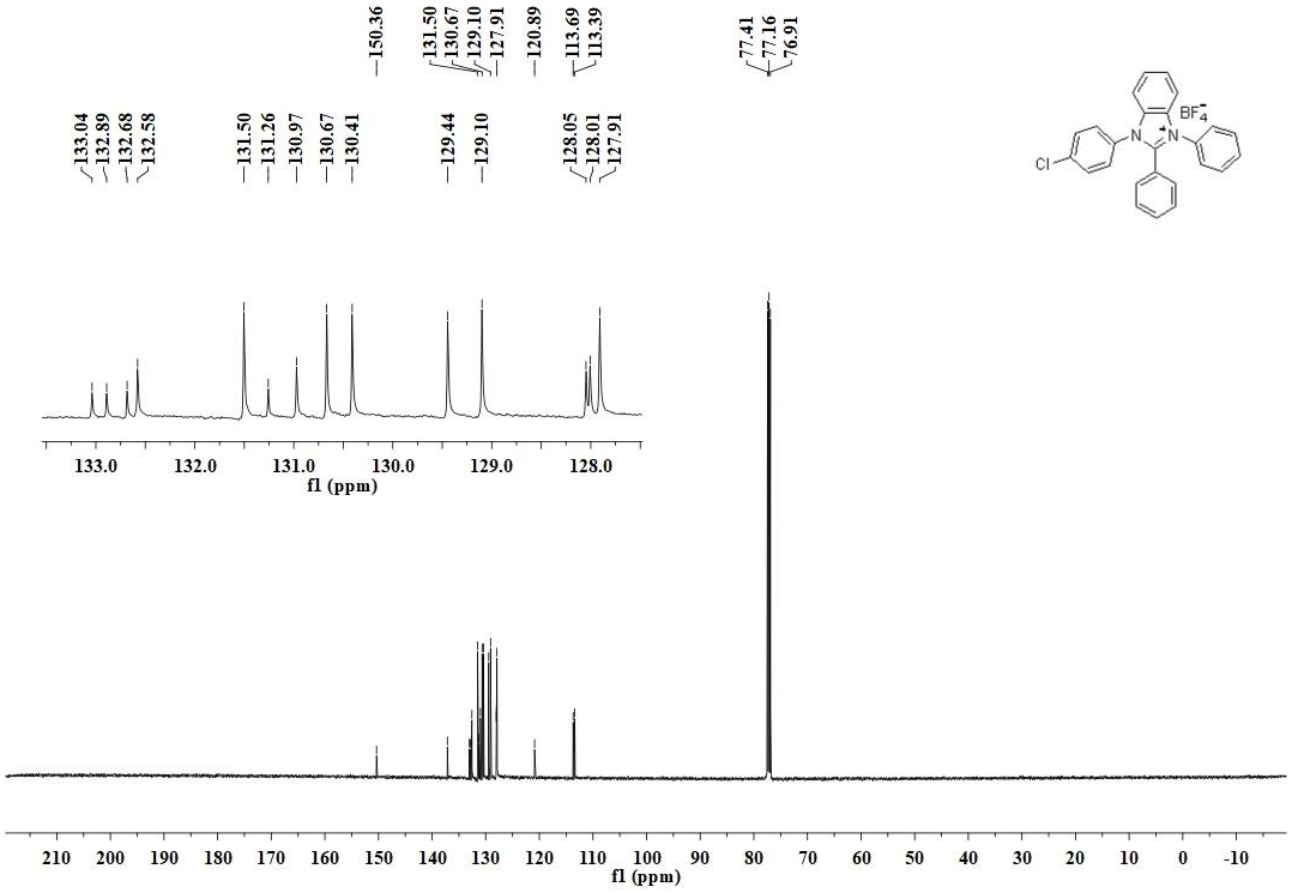
^{13}C NMR (126 MHz, DMSO-*d6*) of **4i/7c**



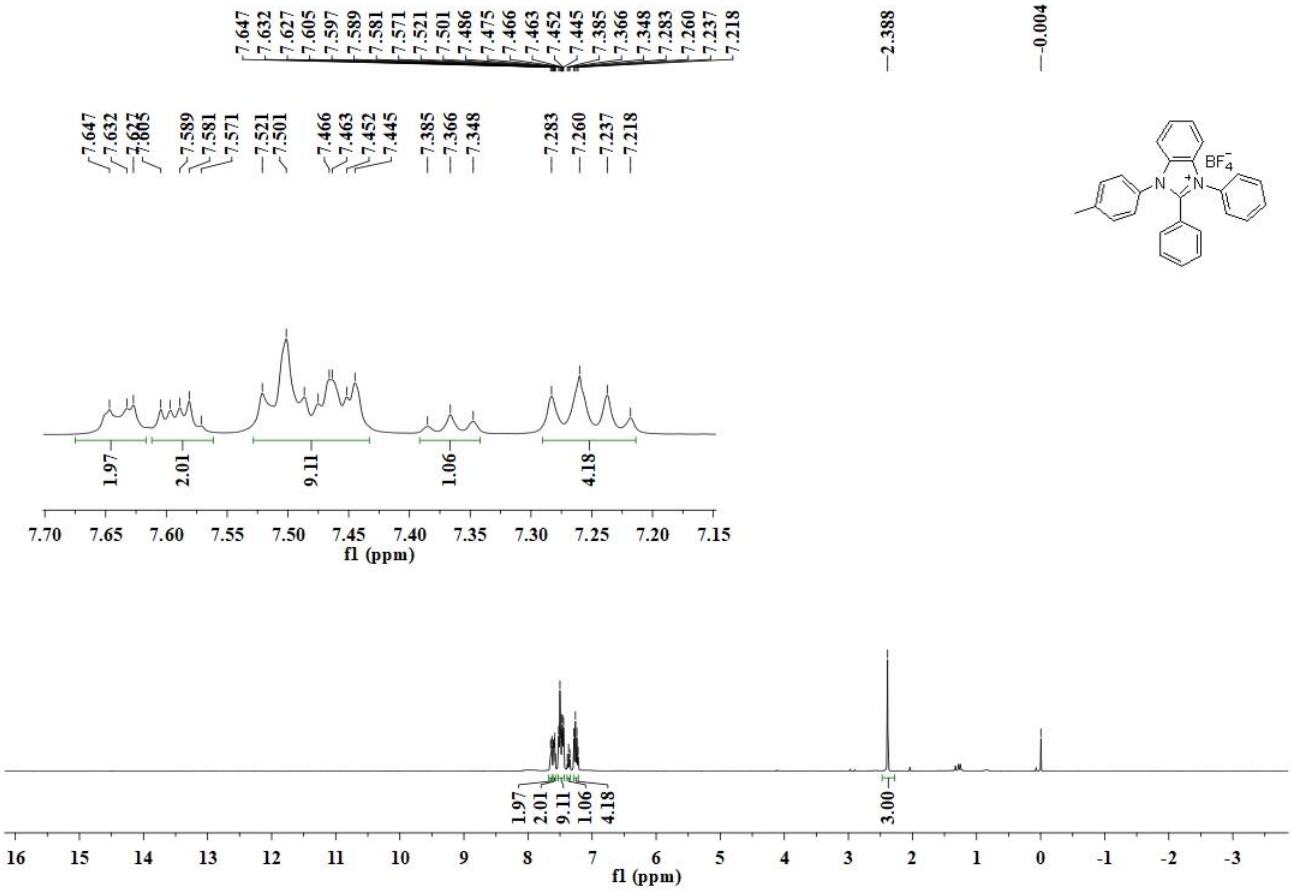
^{1}H NMR (500 MHz, $CDCl_3$) of **4j**



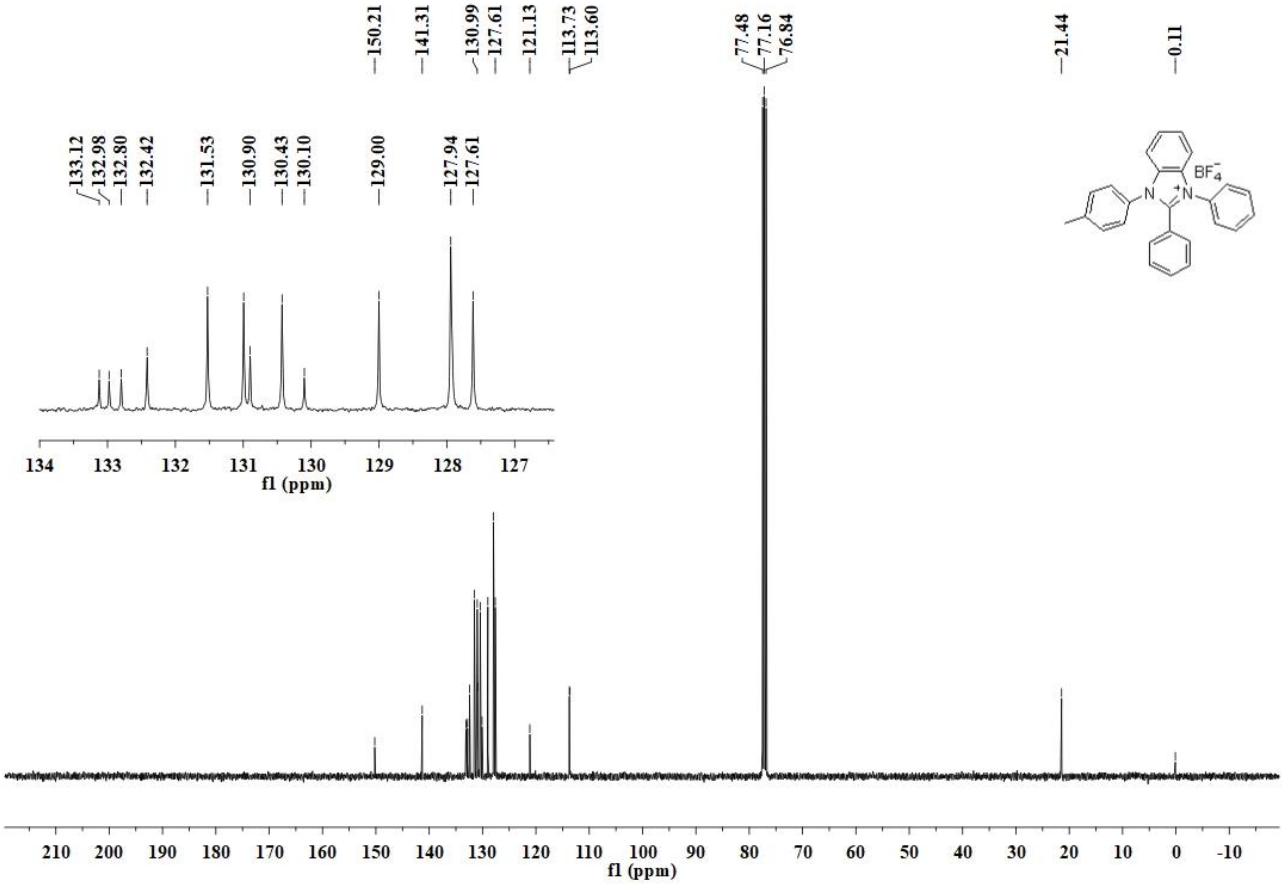
^{13}C NMR (126 MHz, $CDCl_3$) of **4j**



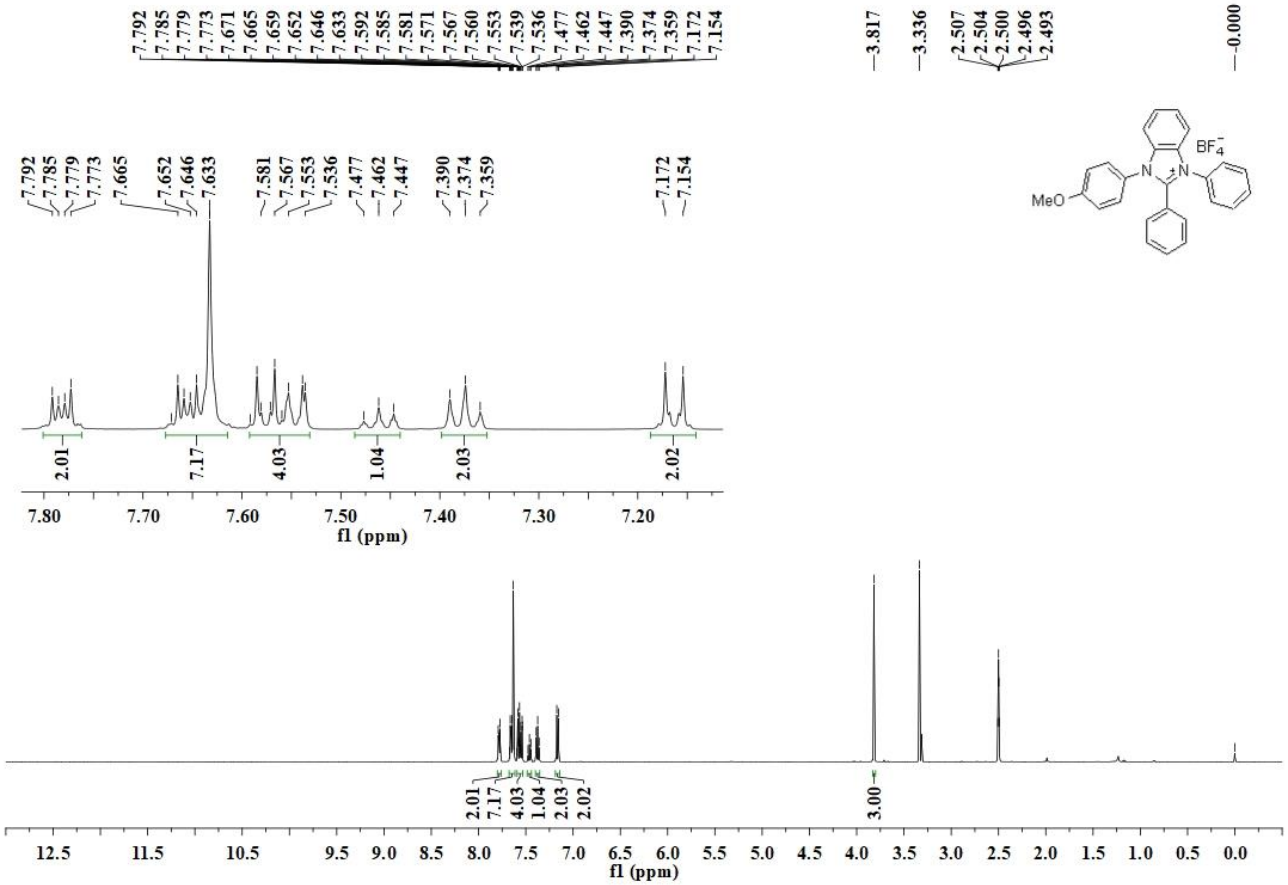
^{1}H NMR (400 MHz, $CDCl_3$) of **4k**



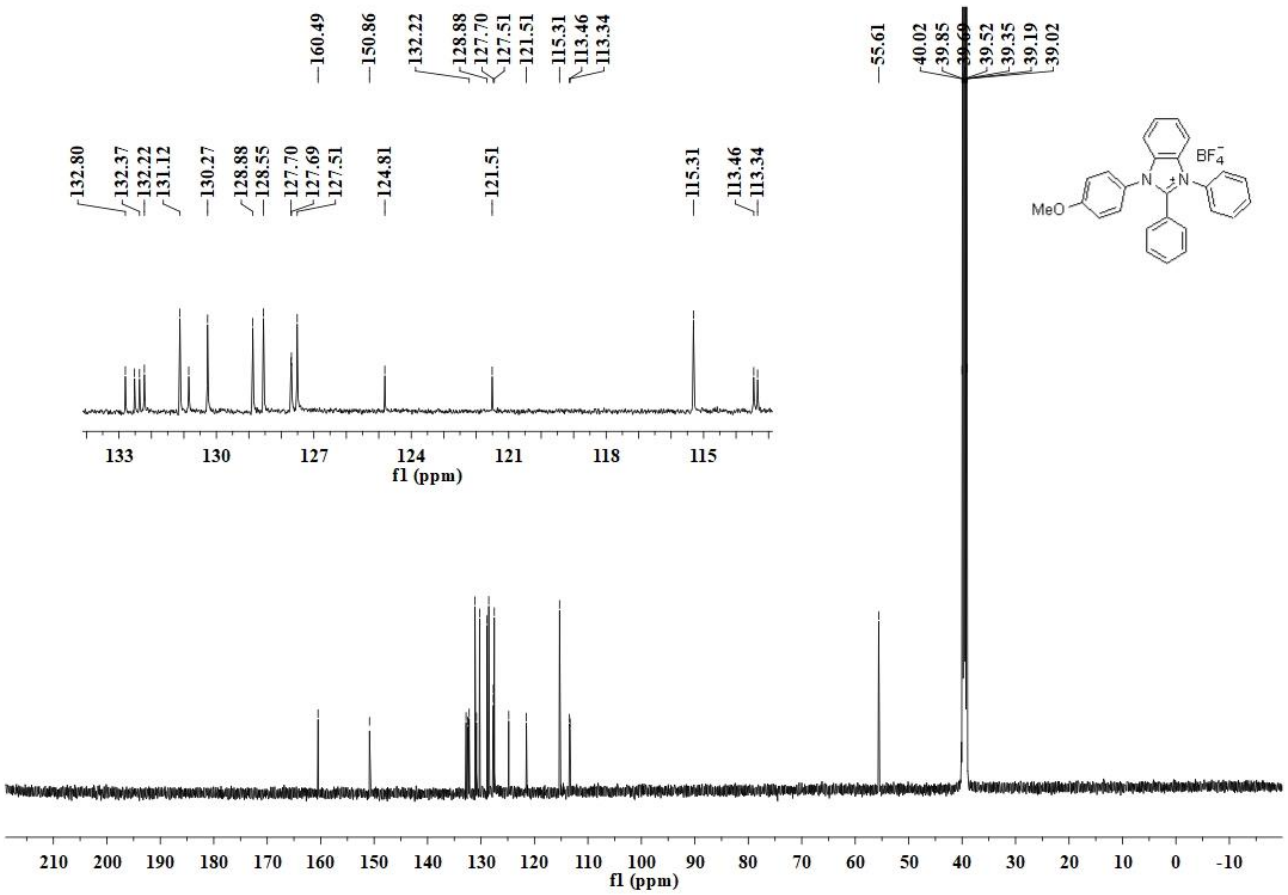
^{13}C NMR (101 MHz, $CDCl_3$) of **4k**



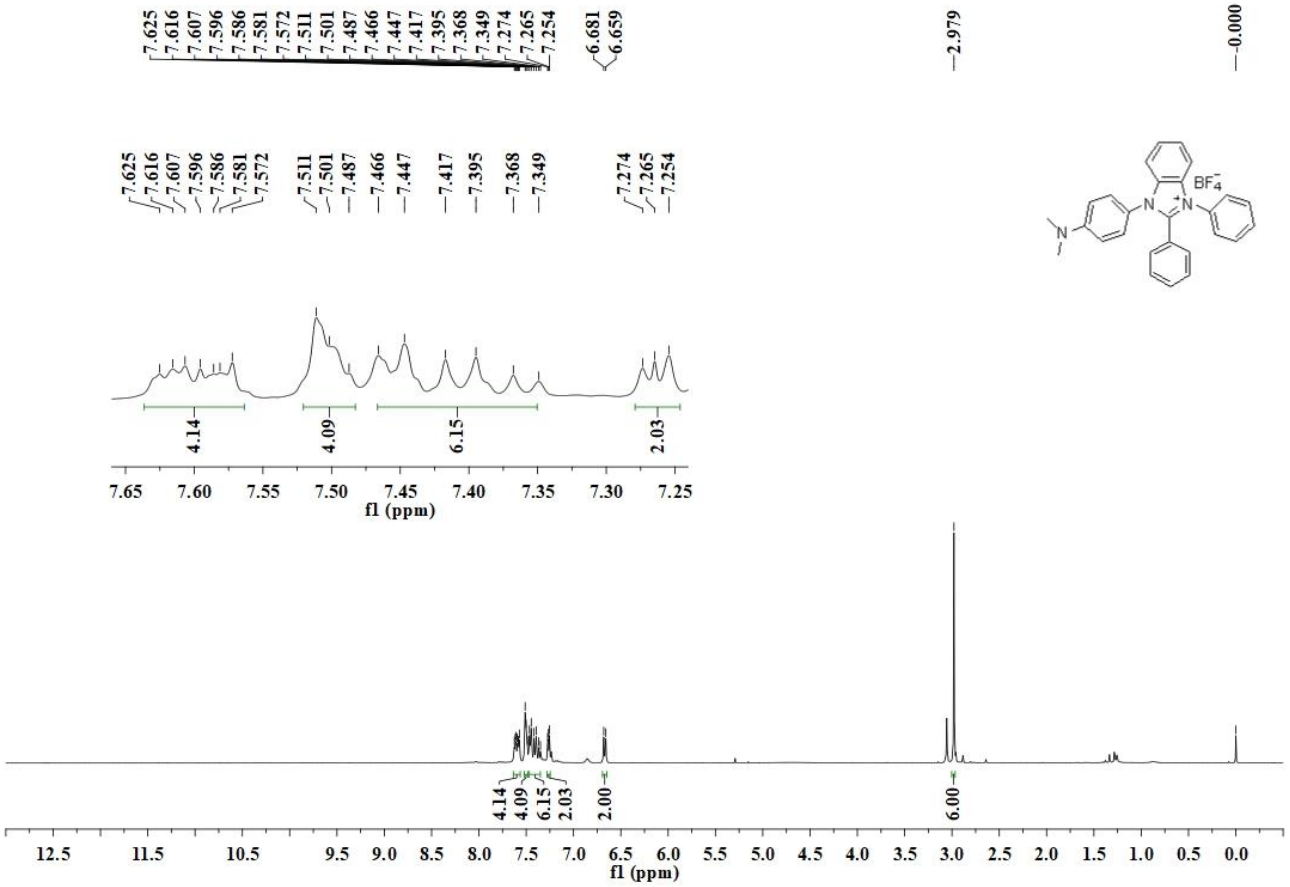
^{1}H NMR (500 MHz, DMSO-*d6*) of **4l**



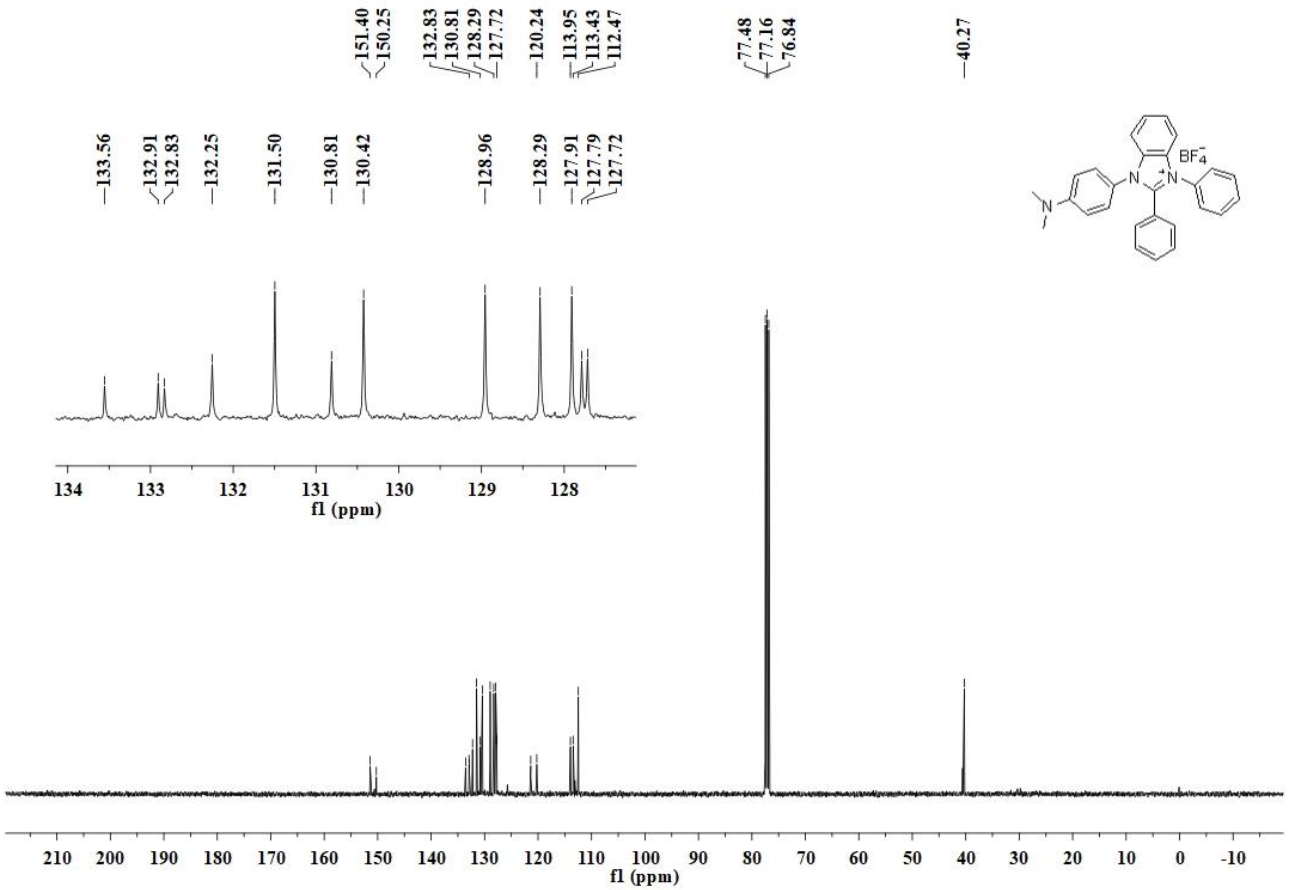
^{13}C NMR (126 MHz, DMSO-*d6*) of **4l**



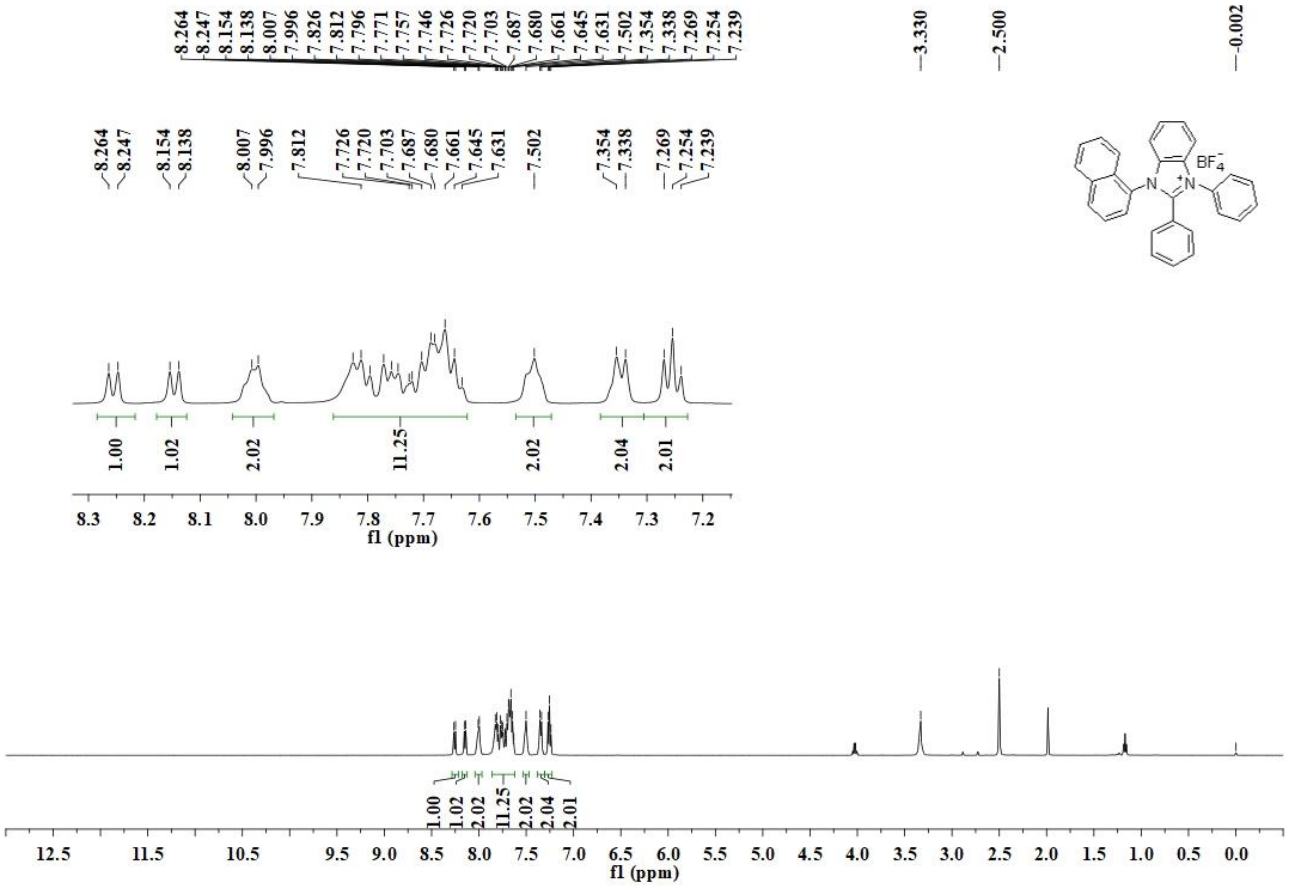
^{1}H NMR (400 MHz, $CDCl_3$) of **4m**



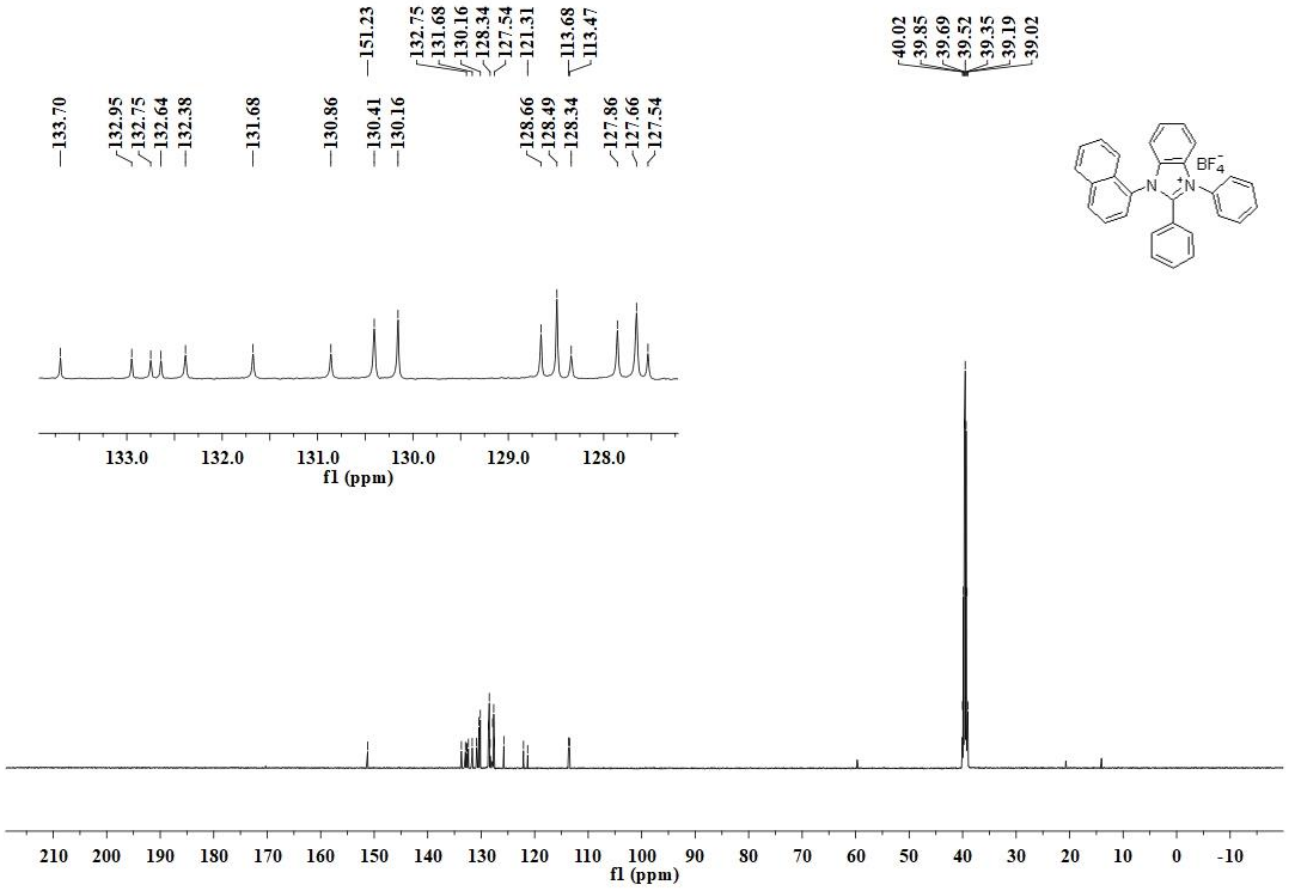
^{13}C NMR (101 MHz, $CDCl_3$) of **4m**



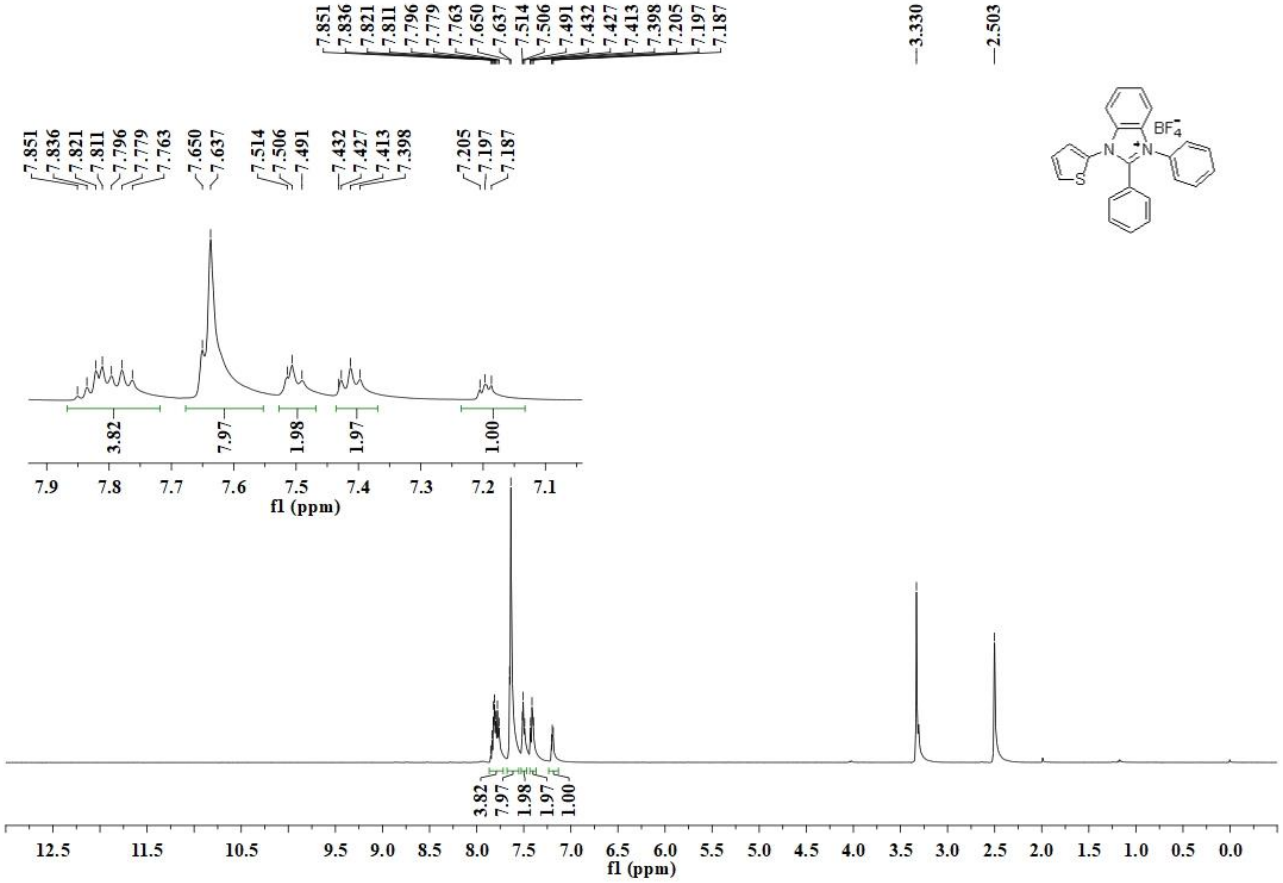
^{1}H NMR (500 MHz, DMSO-*d6*) of **4n**



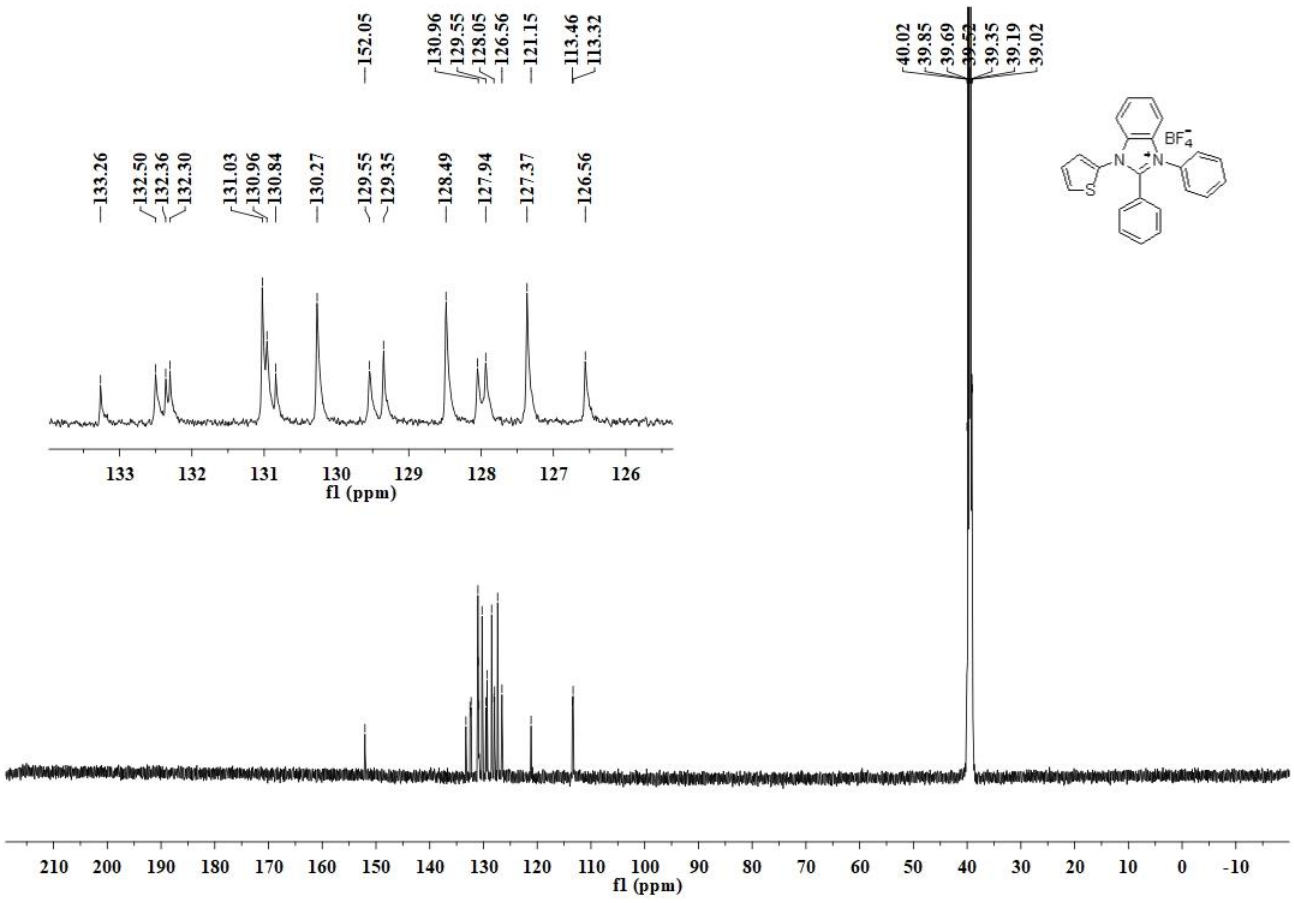
^{13}C NMR (126 MHz, DMSO-*d6*) of **4n**



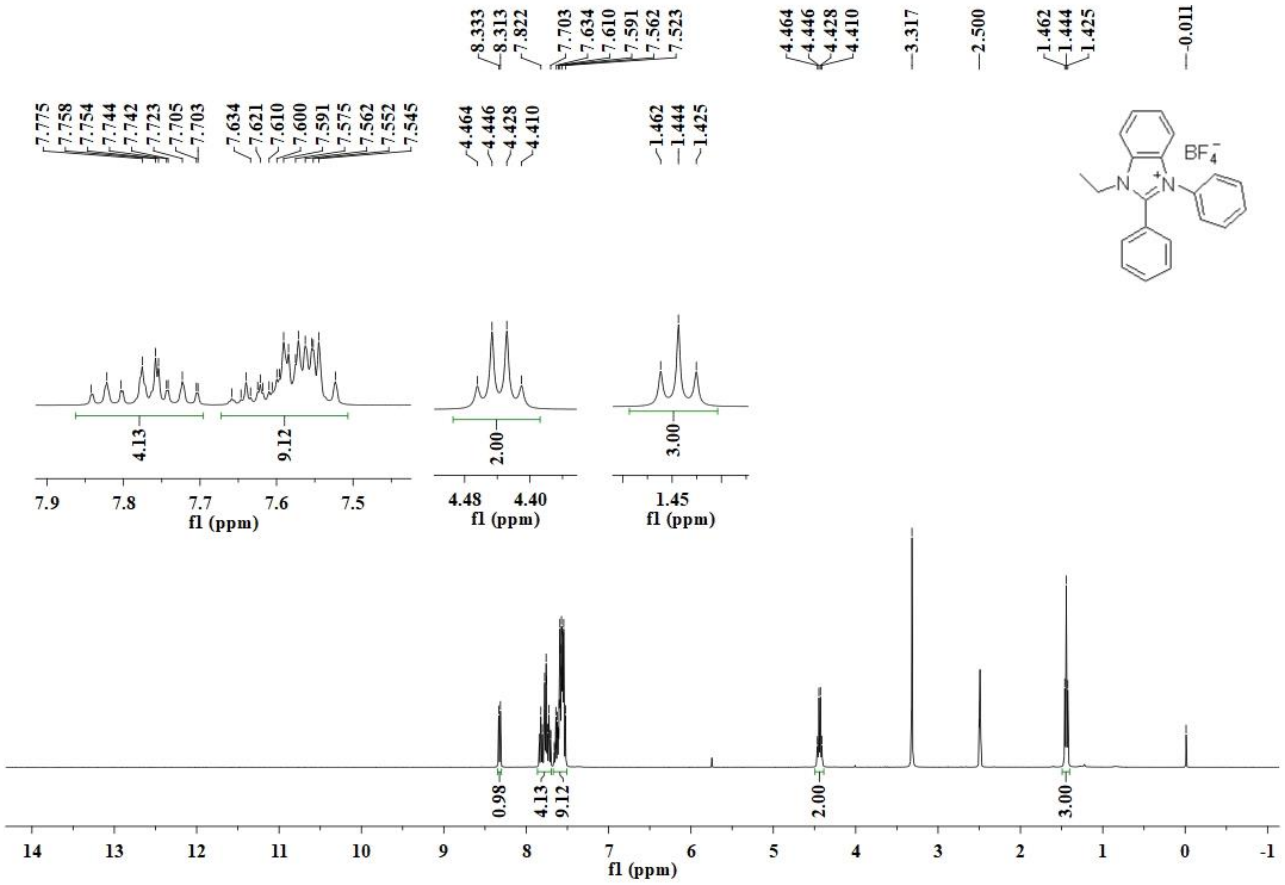
^{1}H NMR (500 MHz, DMSO-*d6*) of **4o**



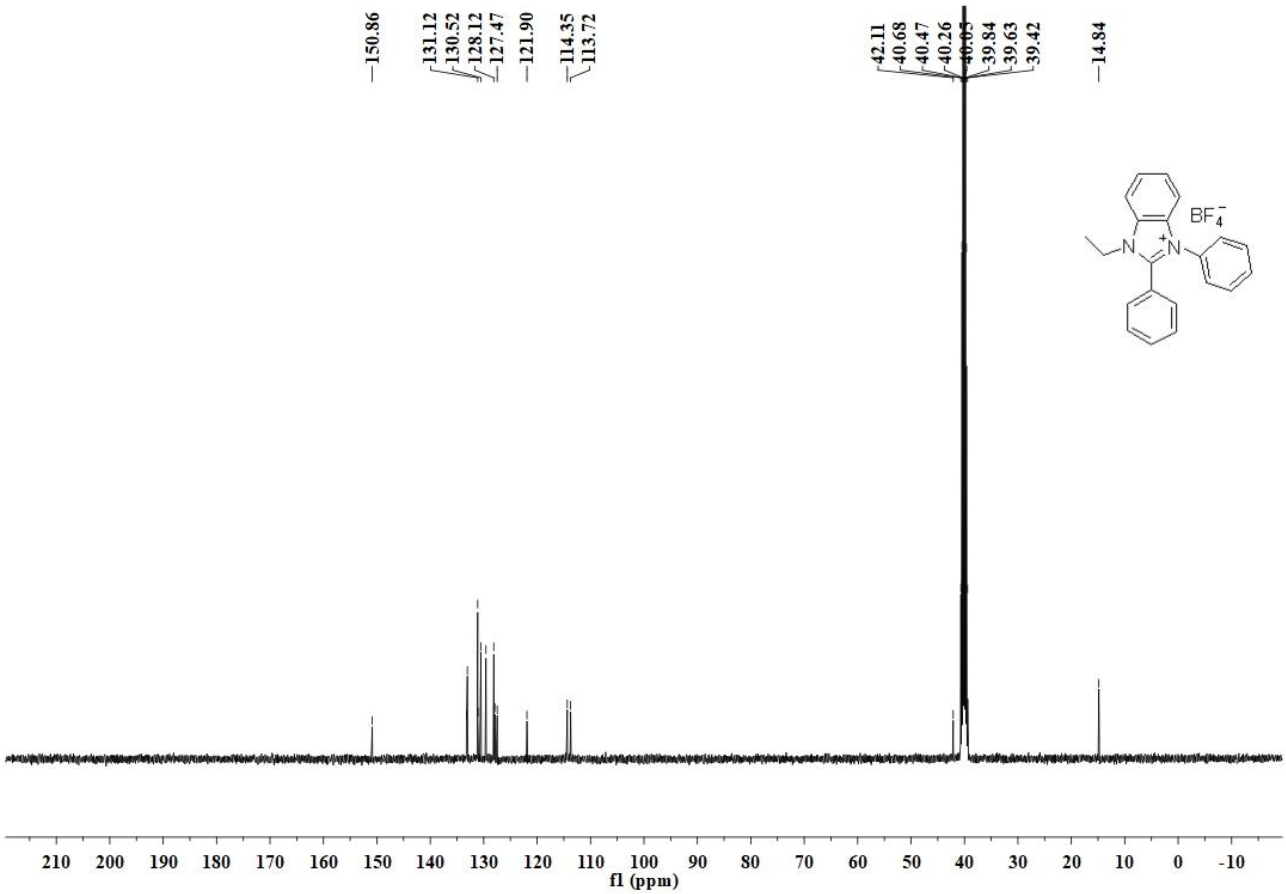
^{13}C NMR (126 MHz, DMSO-*d6*) of **4o**



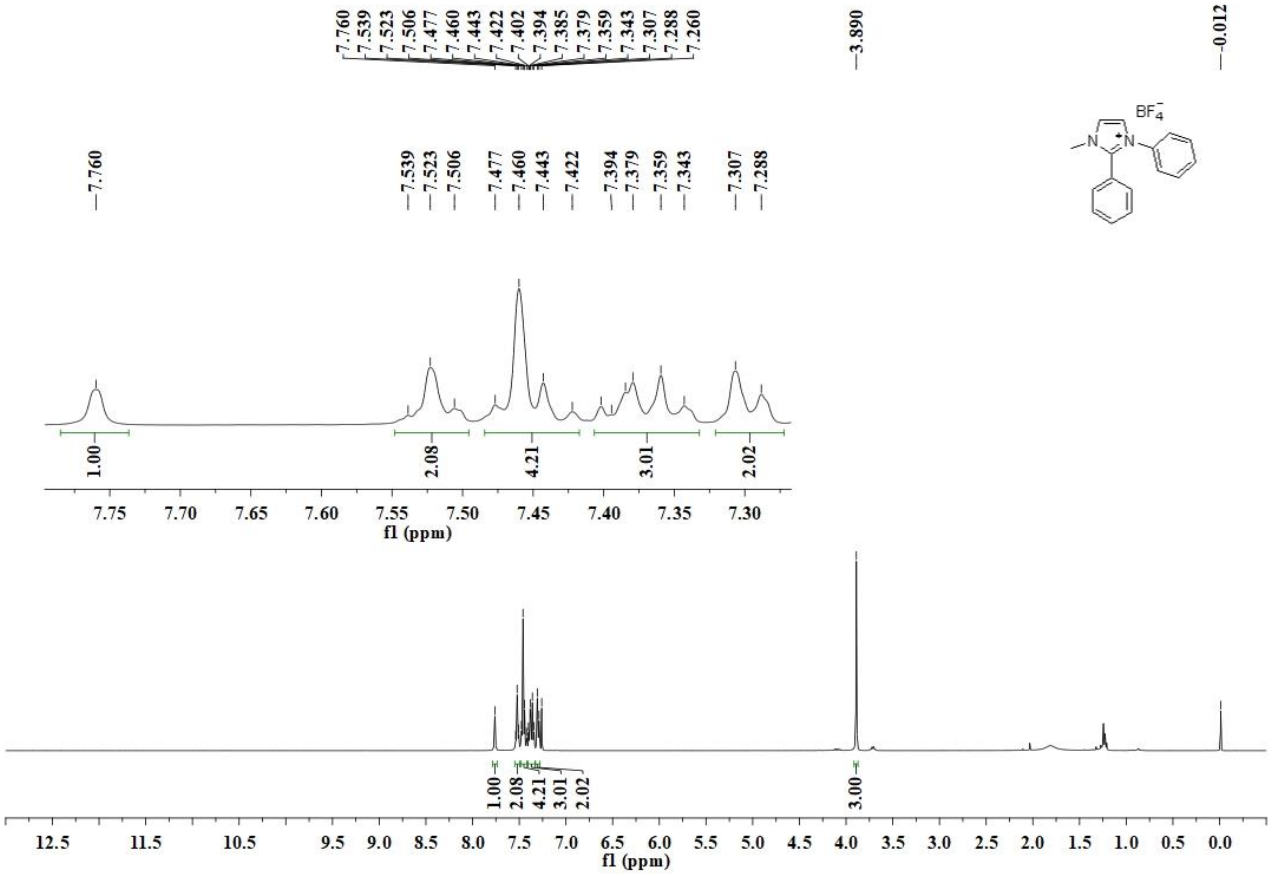
^{1}H NMR (400 MHz, DMSO-*d6*) of **4p**



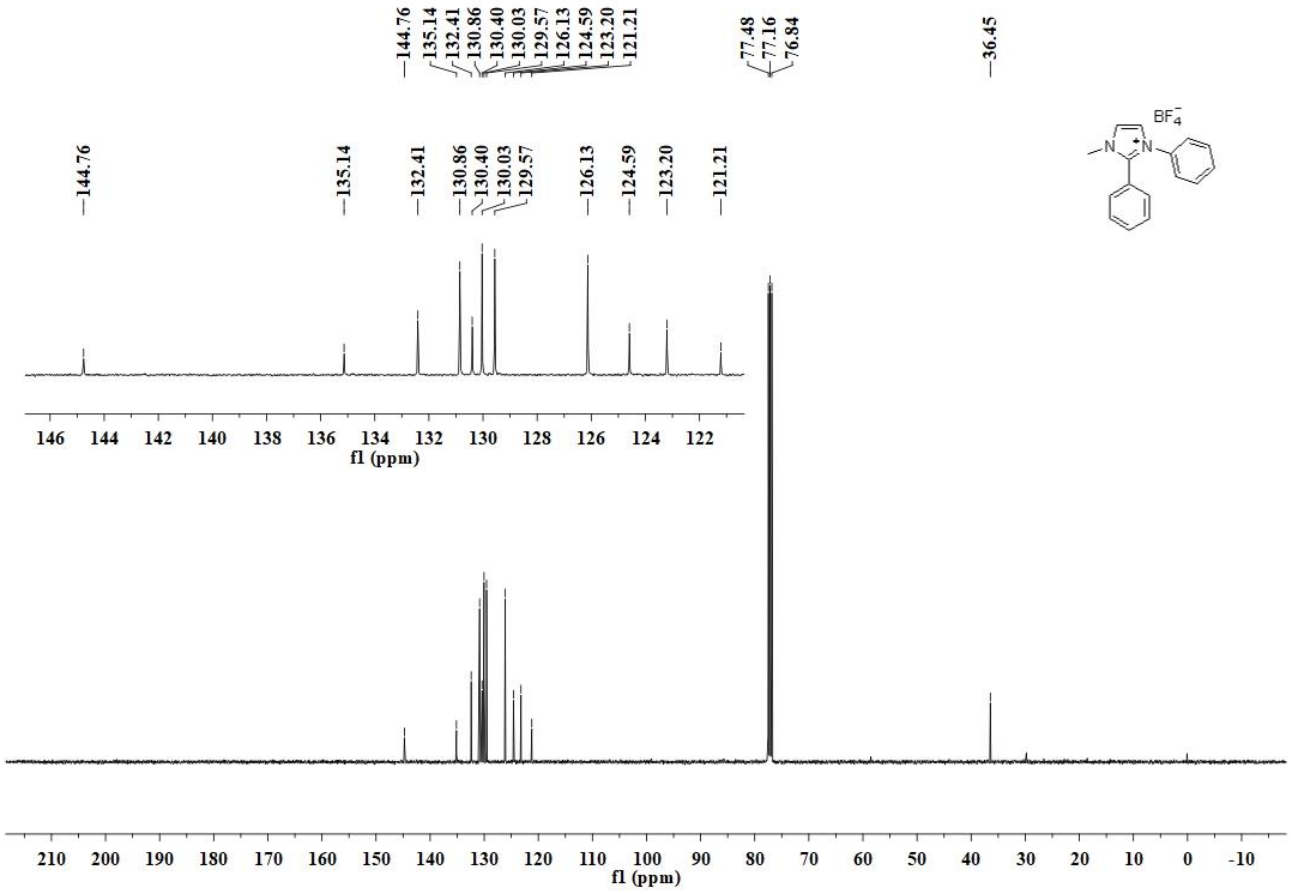
^{13}C NMR (101 MHz, DMSO-*d6*) of **4p**



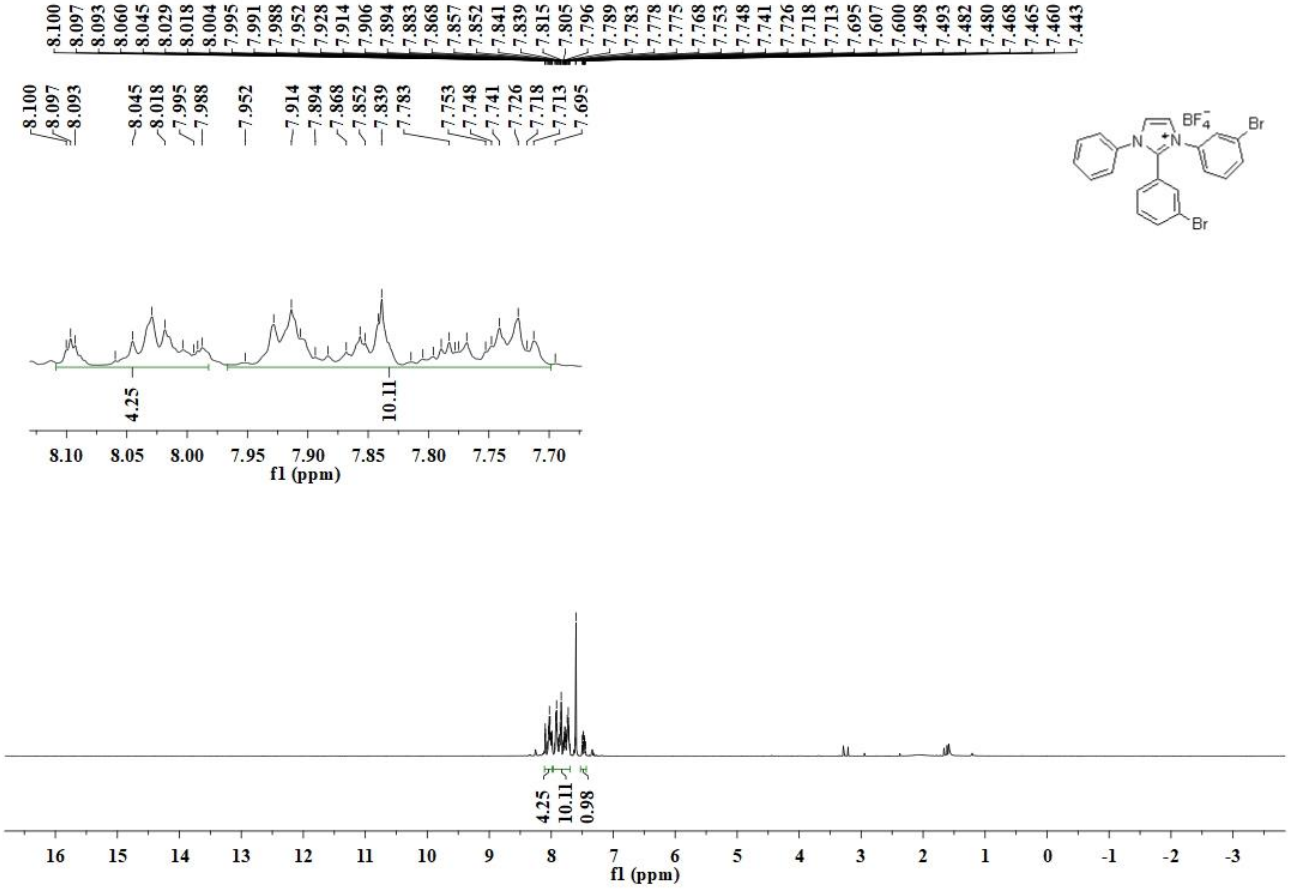
^{1}H NMR (400 MHz, $CDCl_3$) of **4q**



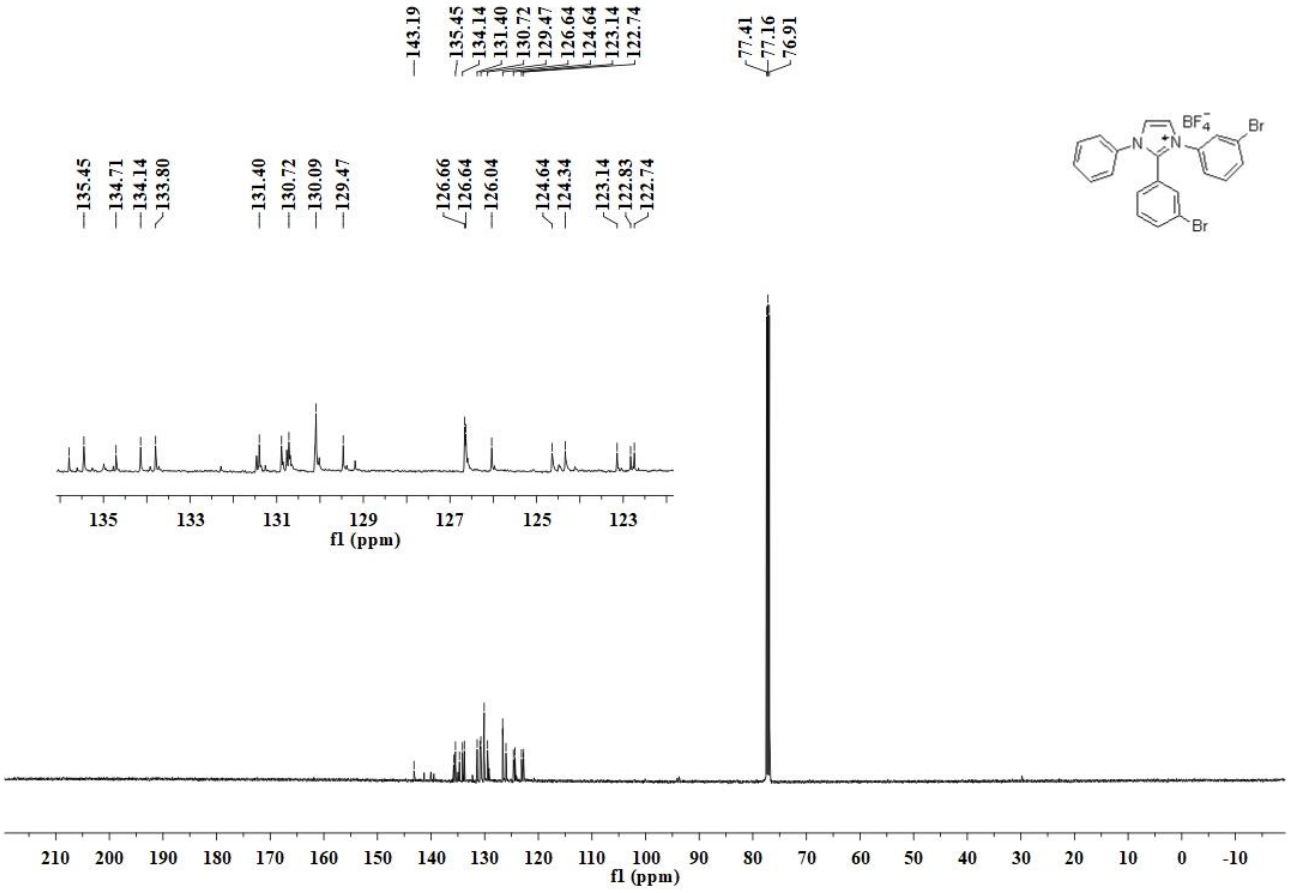
^{13}C NMR (101 MHz, $CDCl_3$) of **4q**



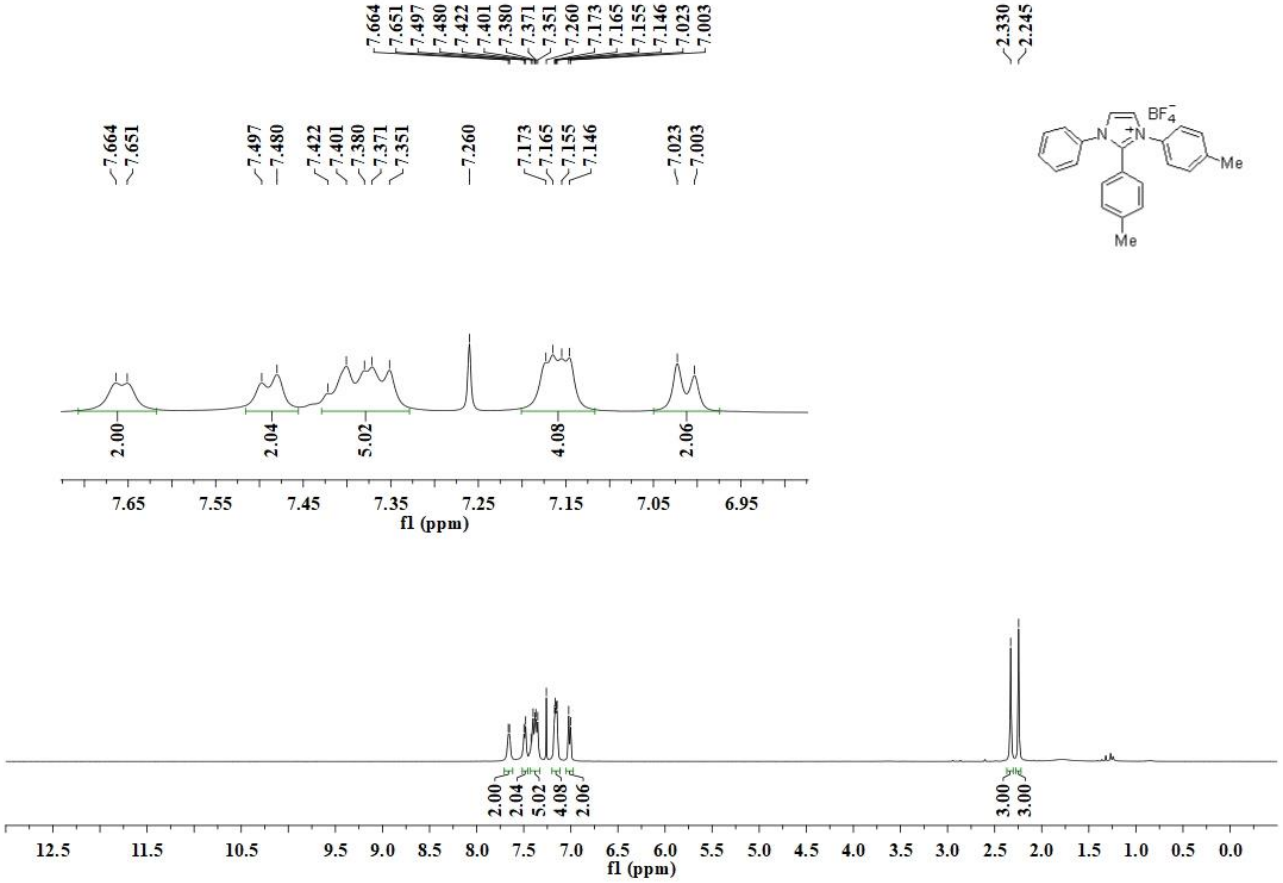
^{1}H NMR (500 MHz, $CDCl_3$) of **5a**



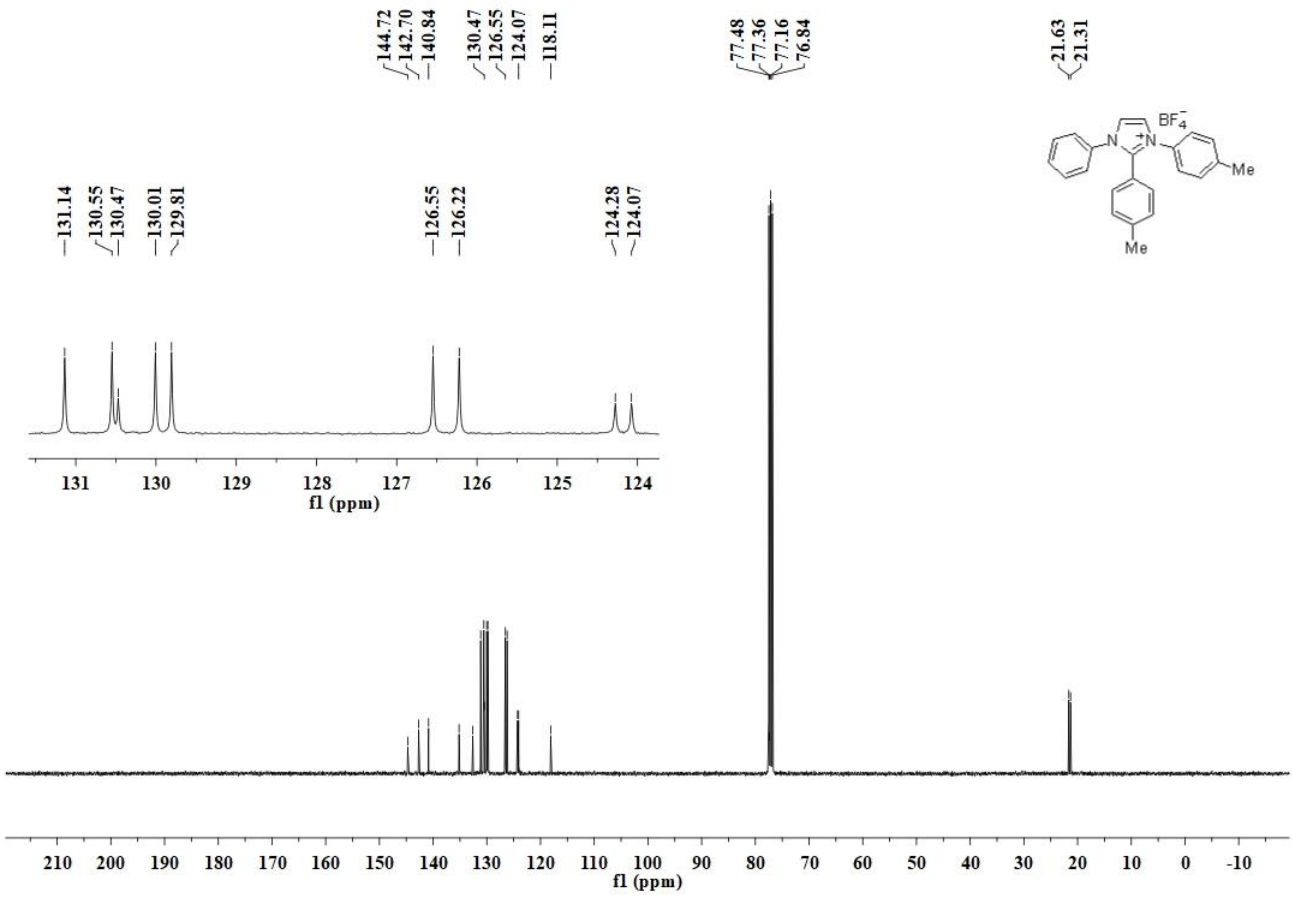
^{13}C NMR (126 MHz, $CDCl_3$) of **5a**



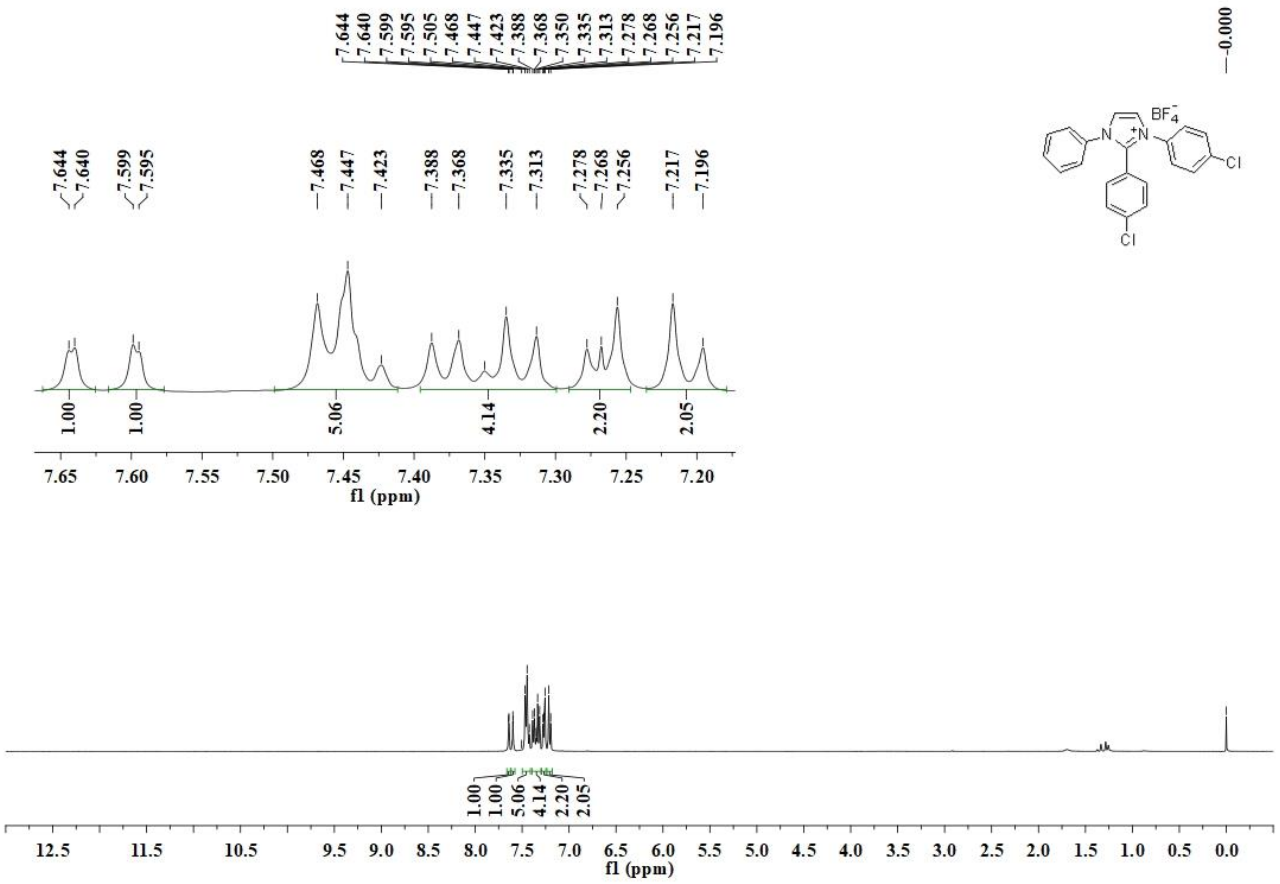
^{1}H NMR (500 MHz, $CDCl_3$) of **5b**



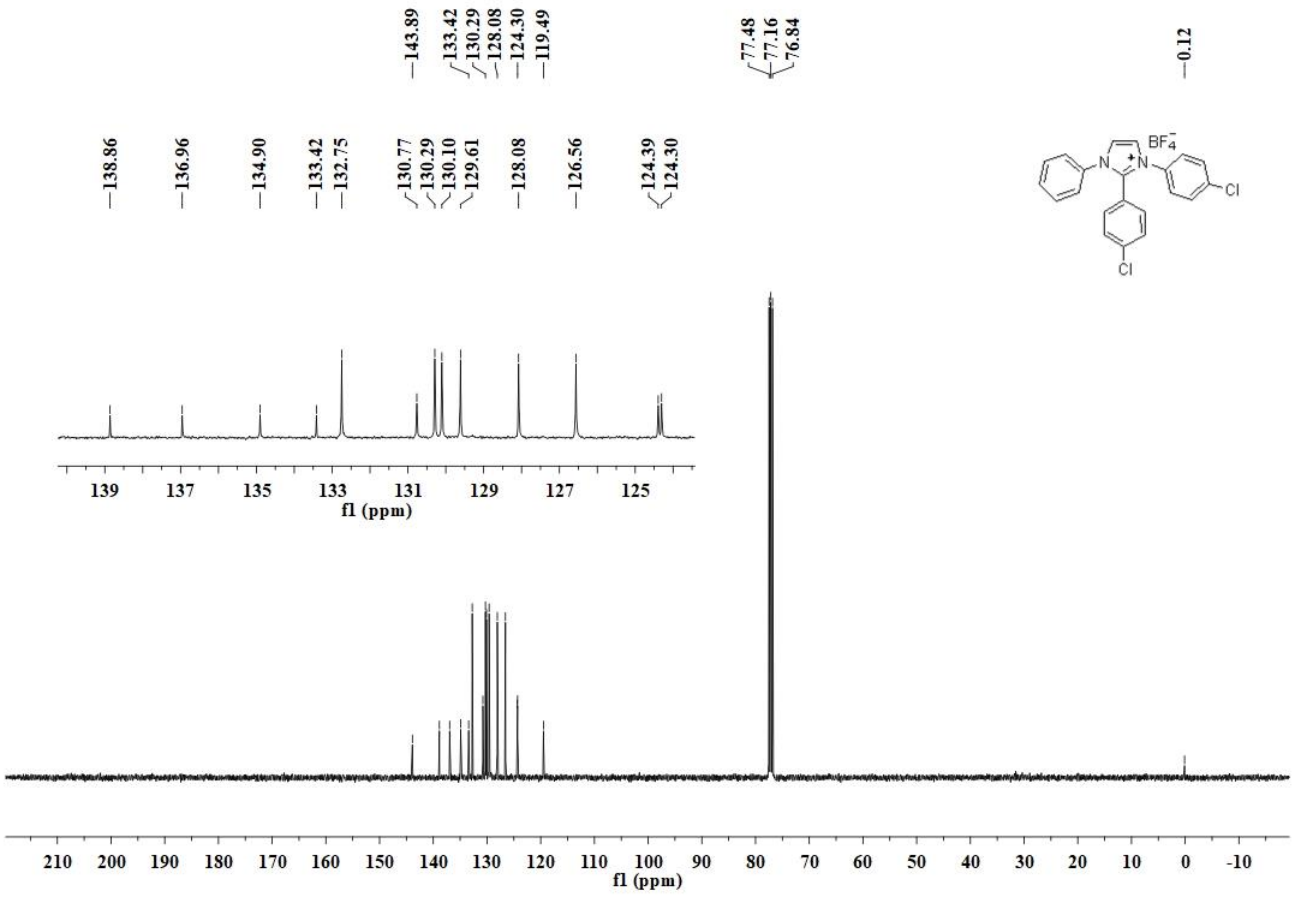
^{13}C NMR (126 MHz, $CDCl_3$) of **5b**



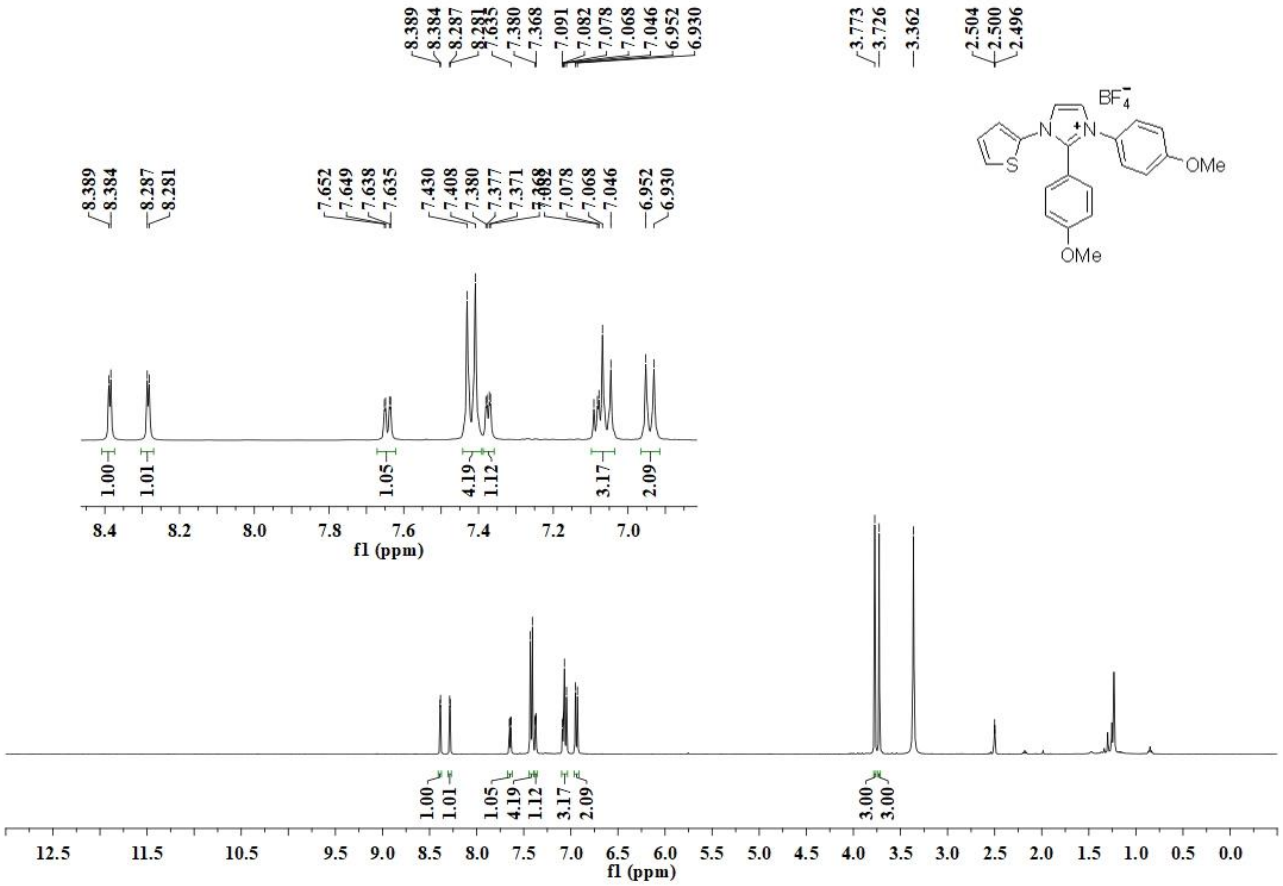
^{1}H NMR (400 MHz, $CDCl_3$) of **5c**



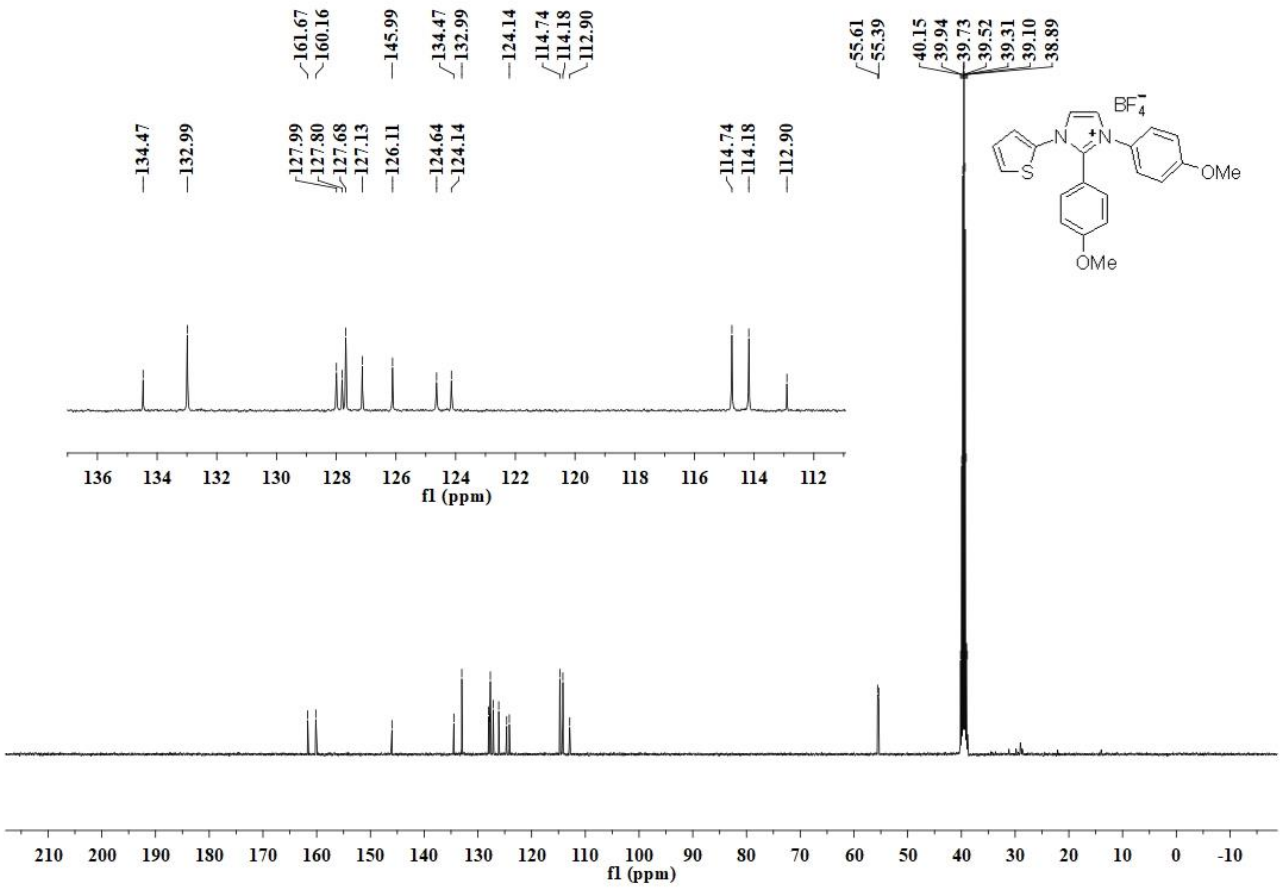
^{13}C NMR (101 MHz, $CDCl_3$) of **5c**



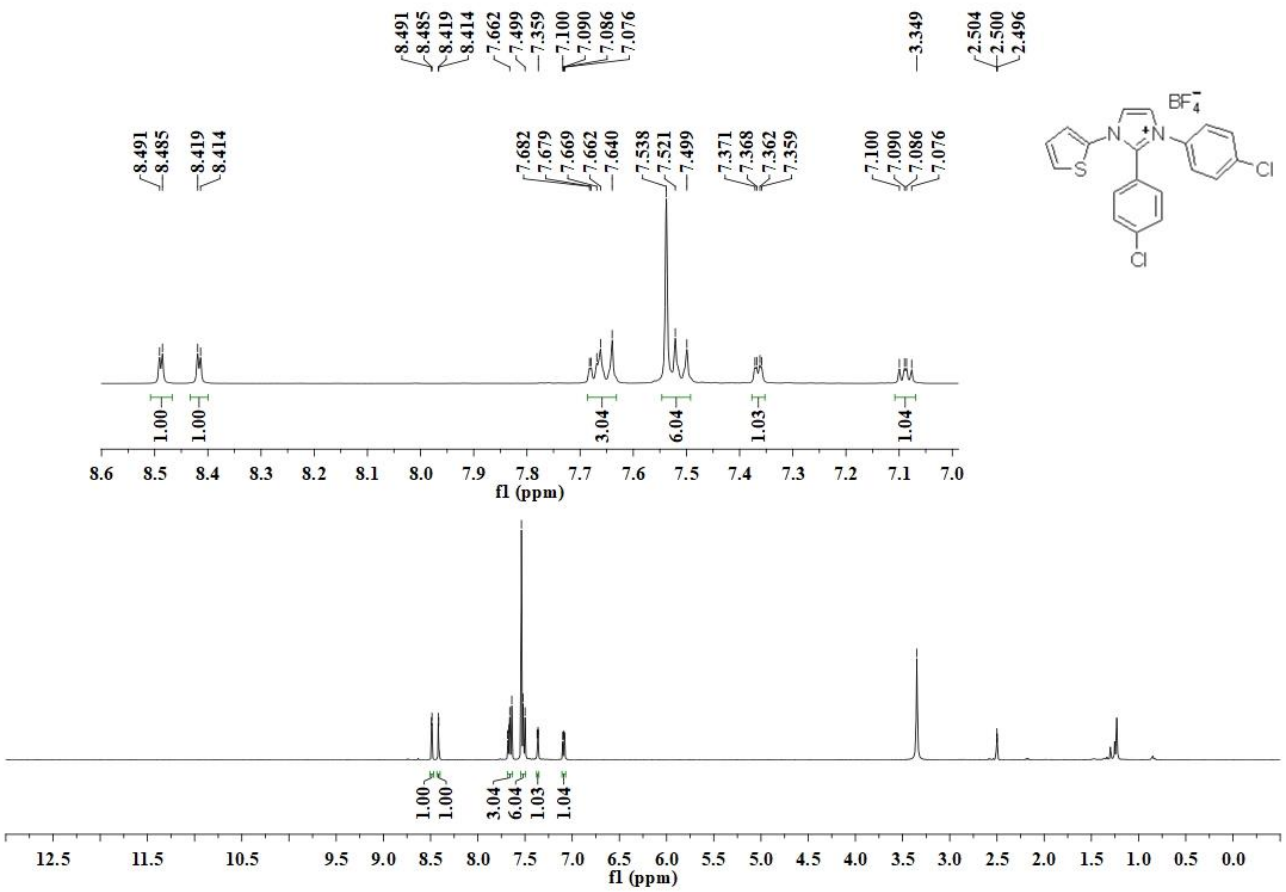
^{1}H NMR (400 MHz, DMSO-*d6*) of **5d**



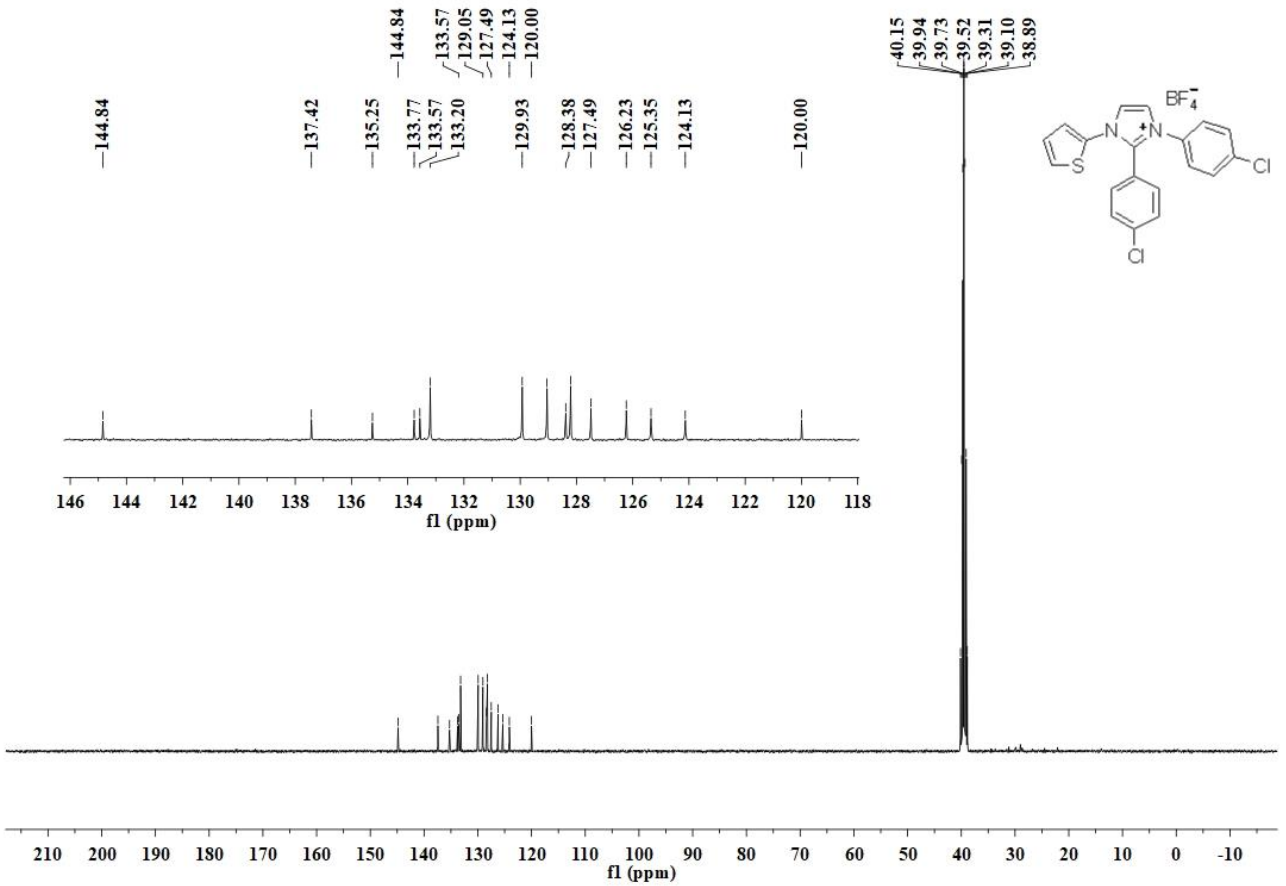
^{1}H NMR (400 MHz, DMSO-*d6*) of **5d**



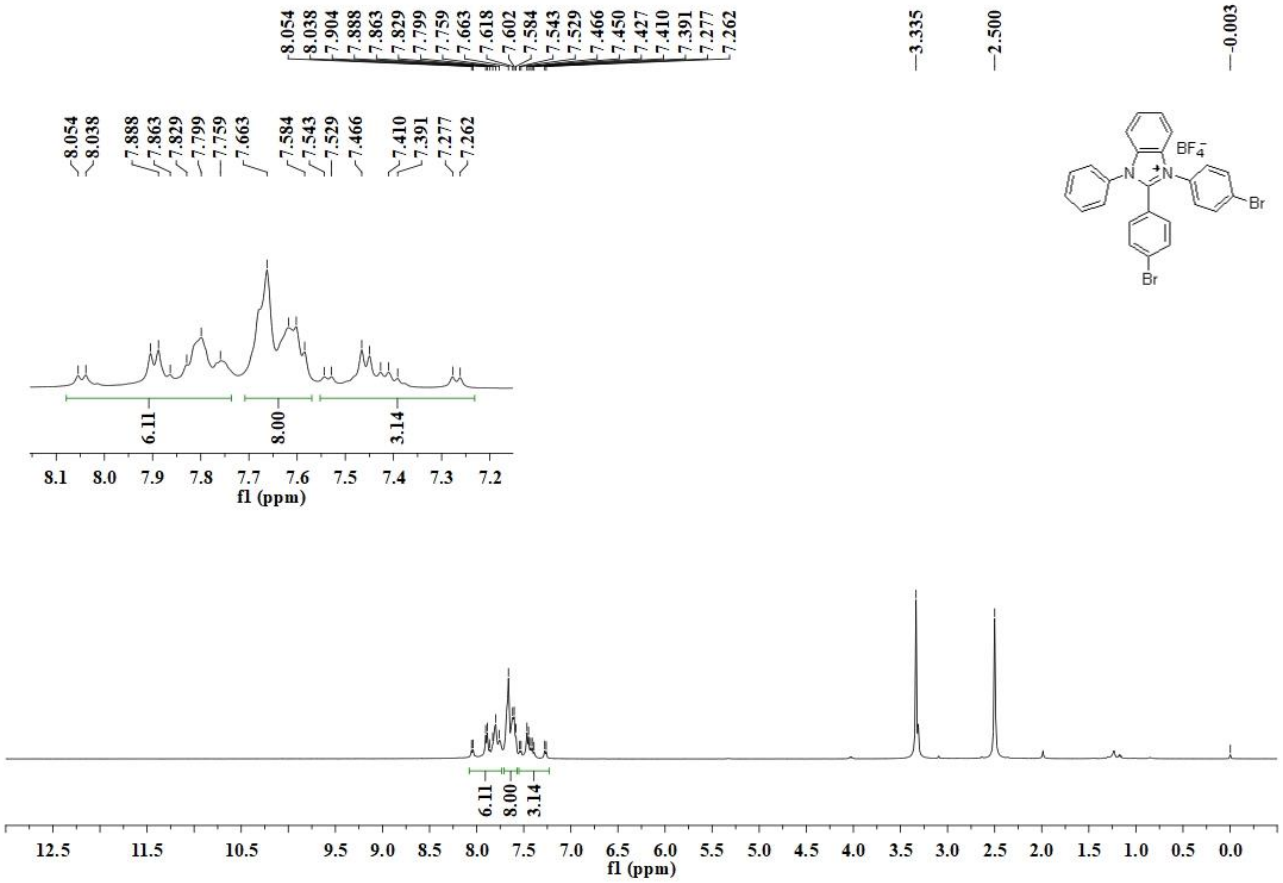
^{1}H NMR (400 MHz, DMSO-*d6*) of **5e**



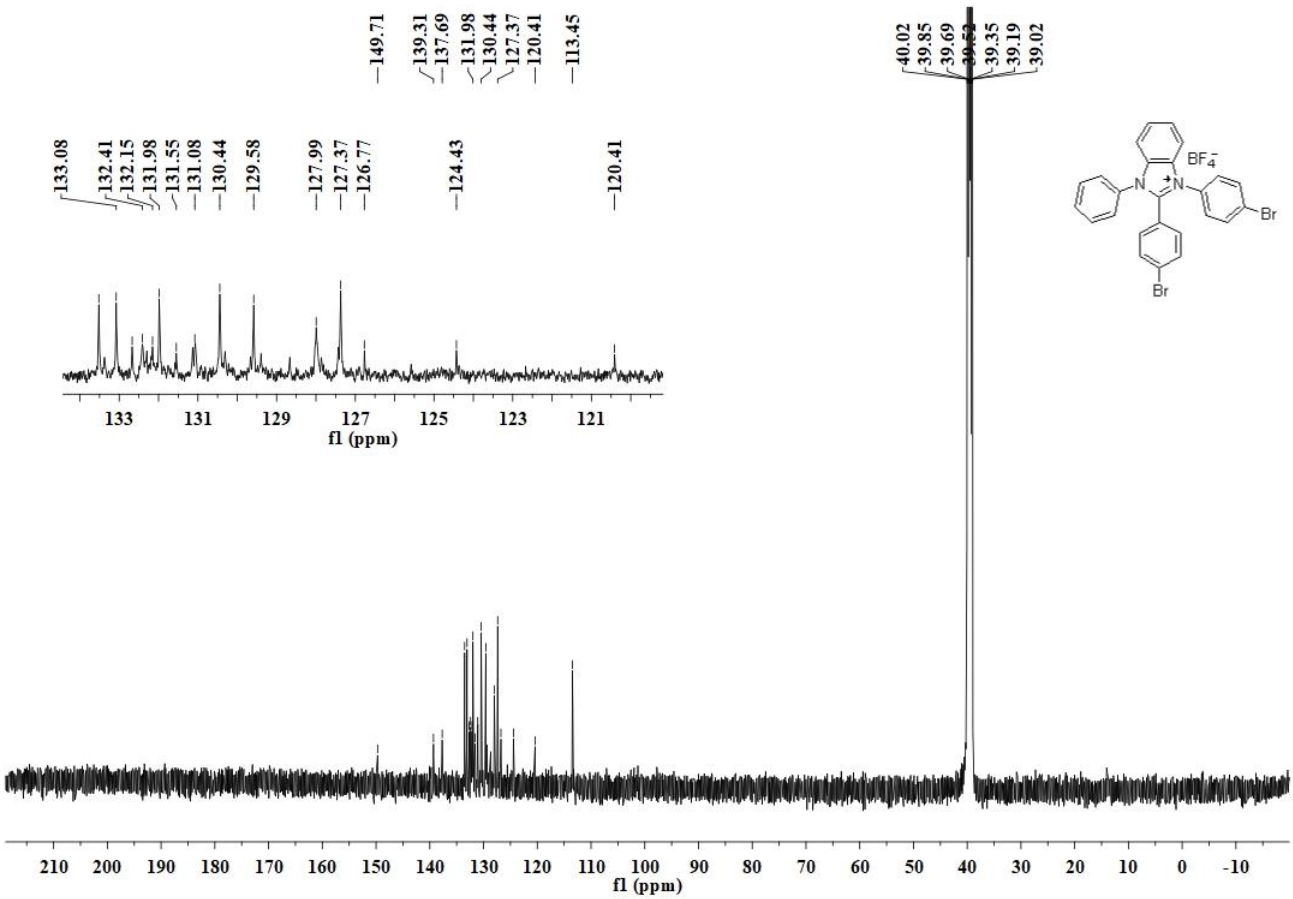
^{1}H NMR (400 MHz, DMSO-*d6*) of **5e**



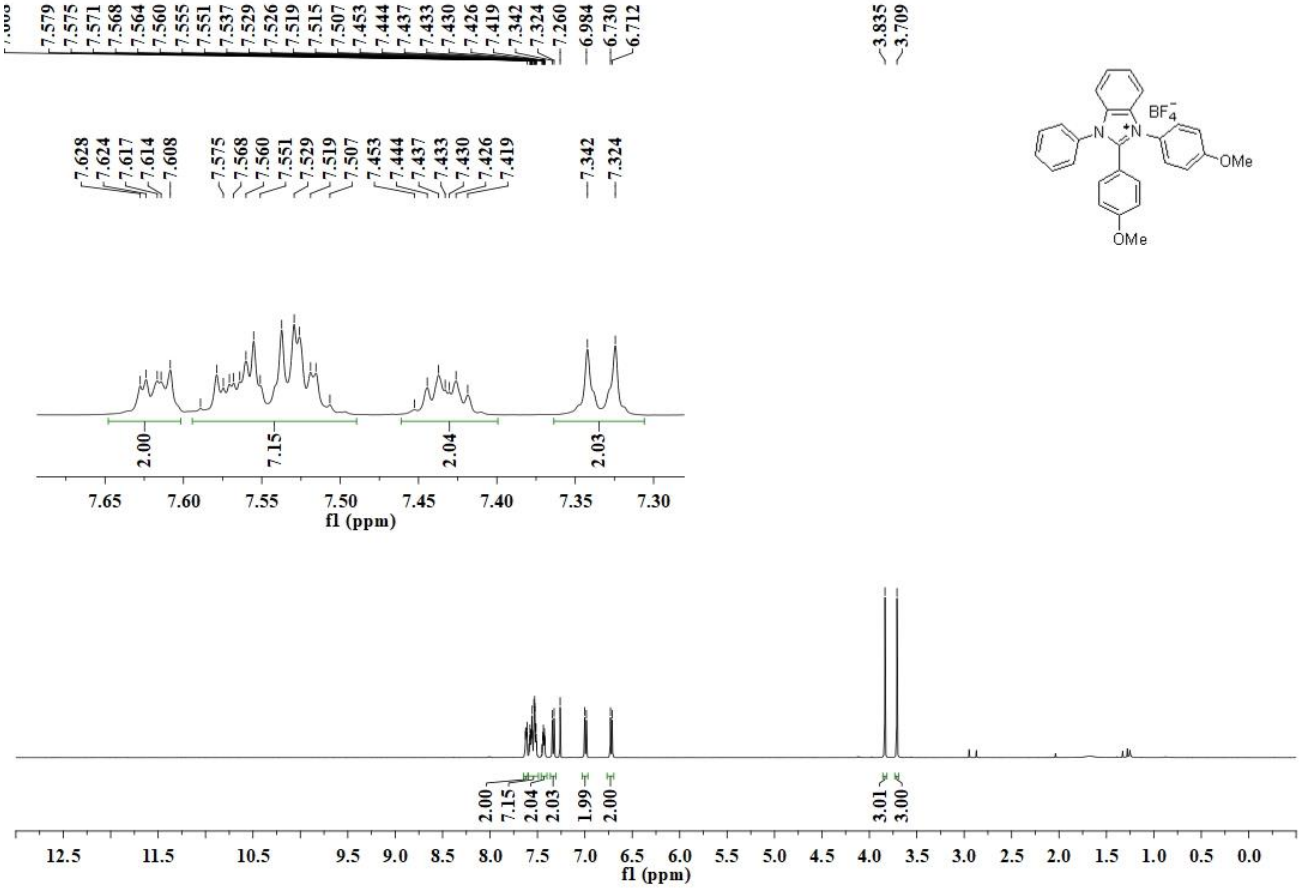
^{1}H NMR (500 MHz, DMSO-*d6*) of **5f**



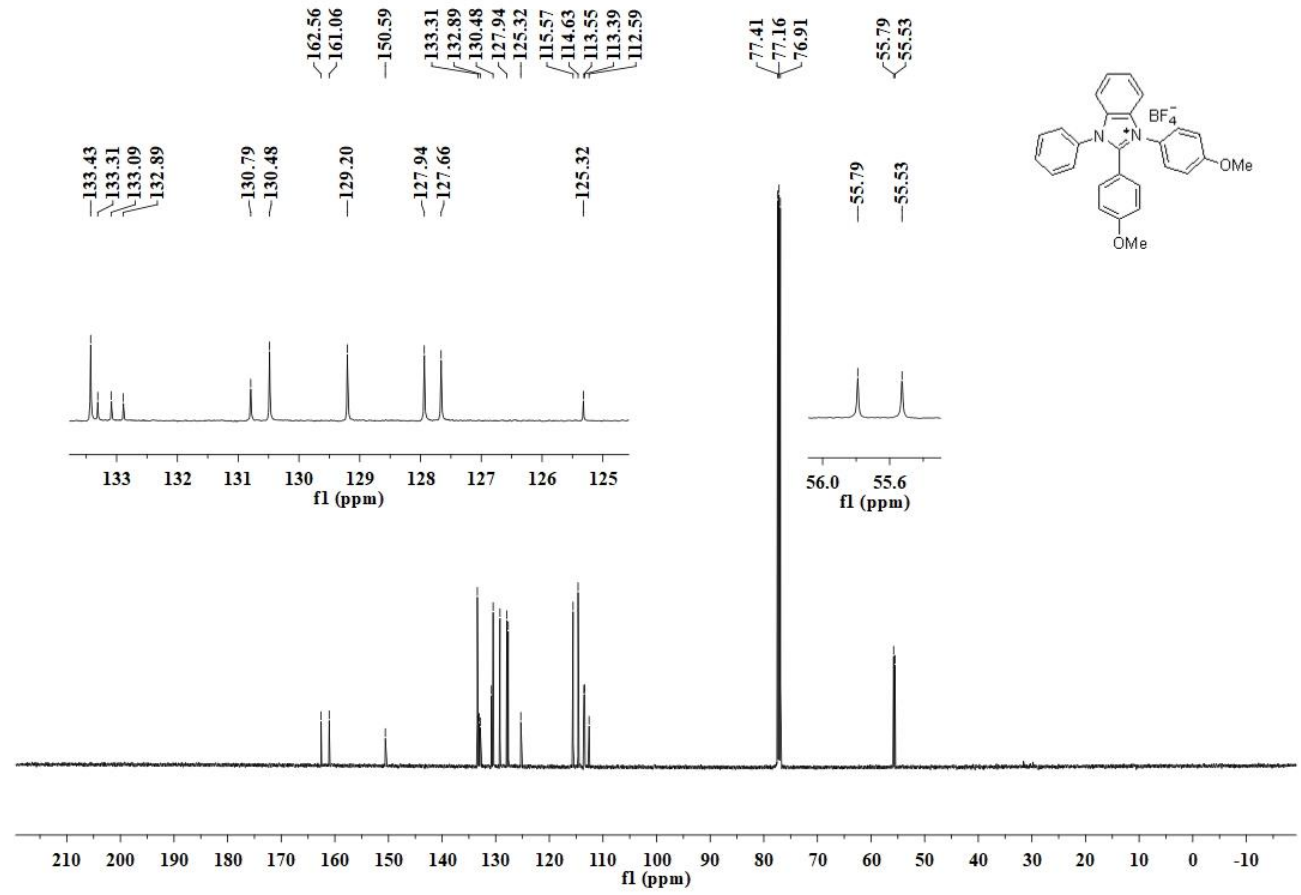
^{13}C NMR (126 MHz, DMSO-*d6*) of **5f**



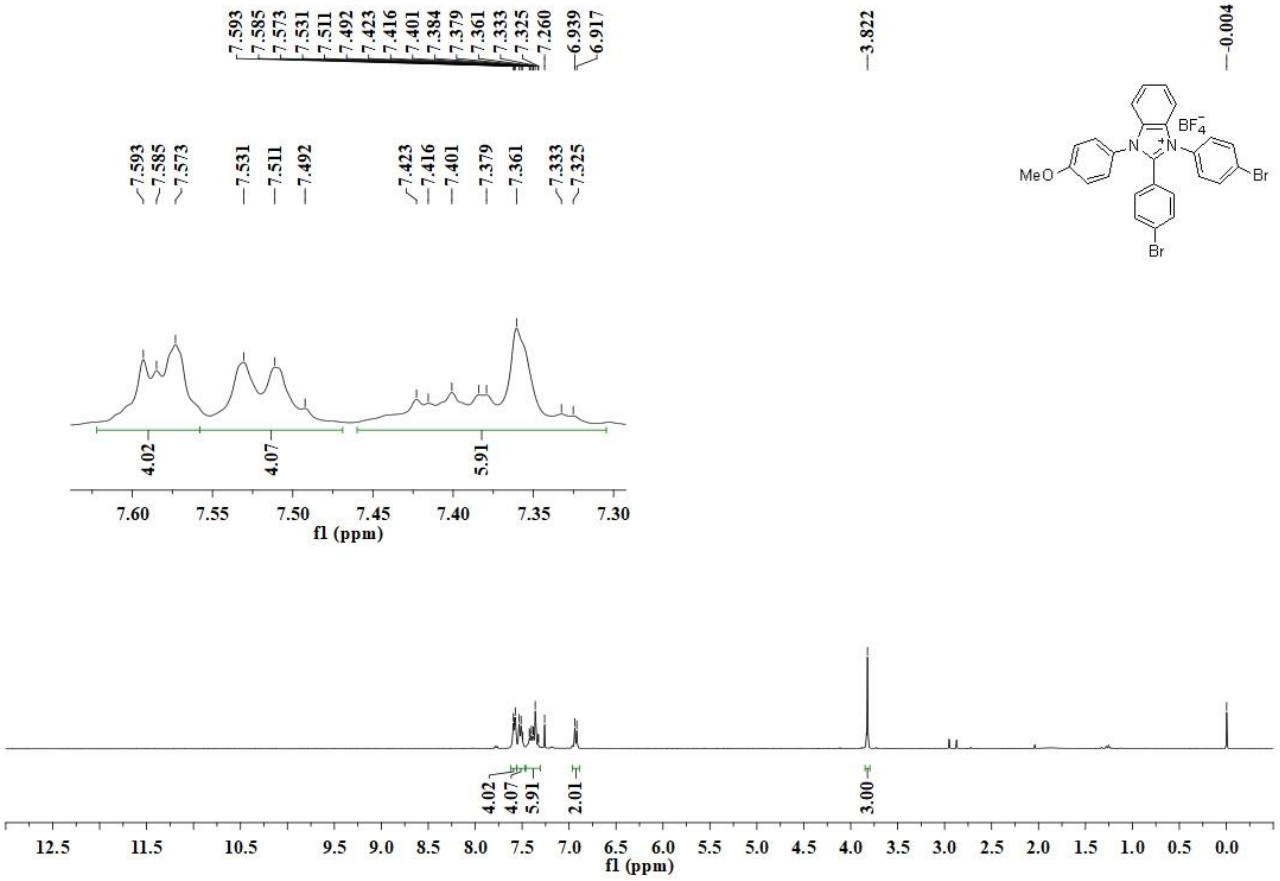
^{1}H NMR (500 MHz, $CDCl_3$) of **5g**



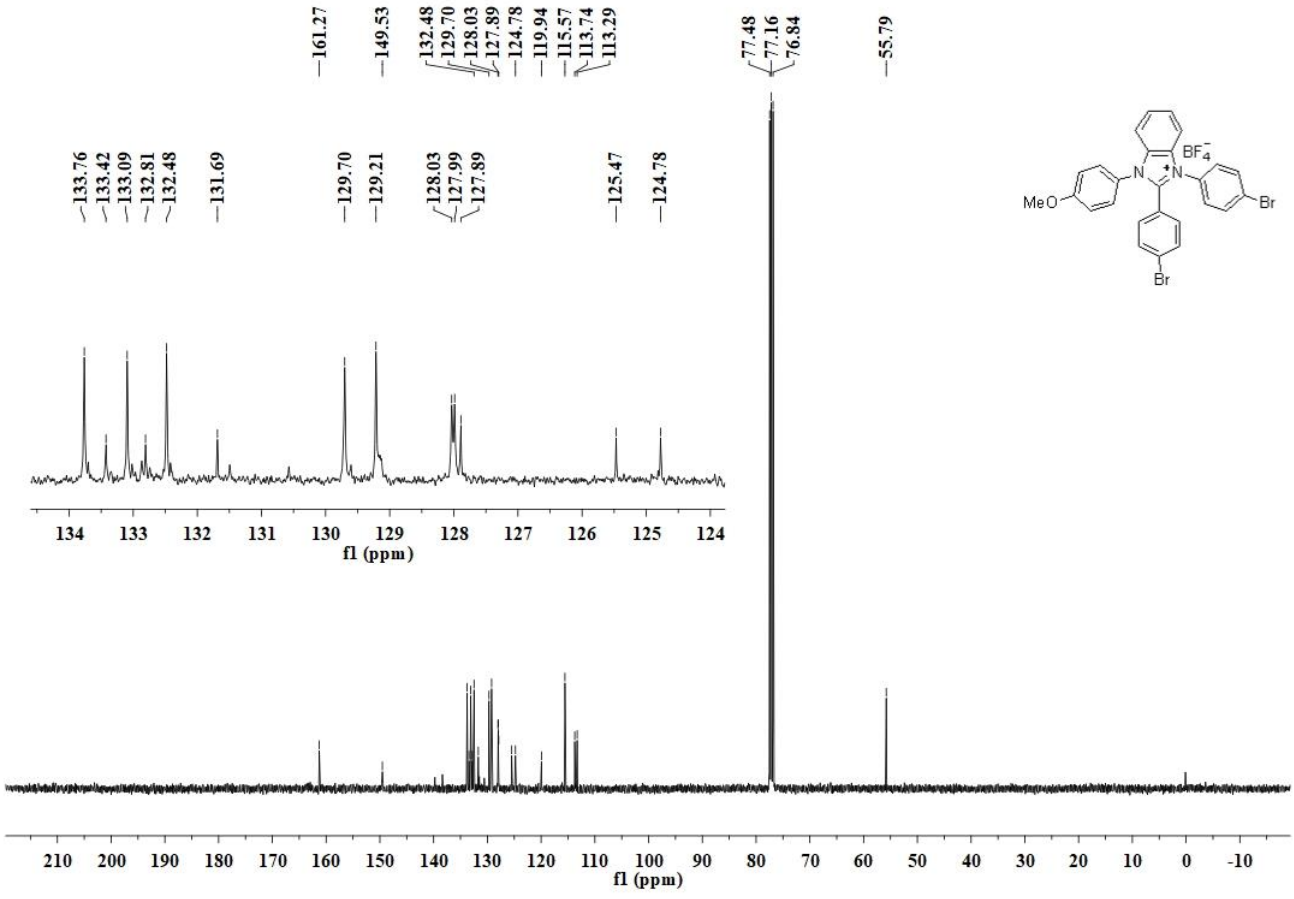
^{13}C NMR (126 MHz, $CDCl_3$) of **5g**



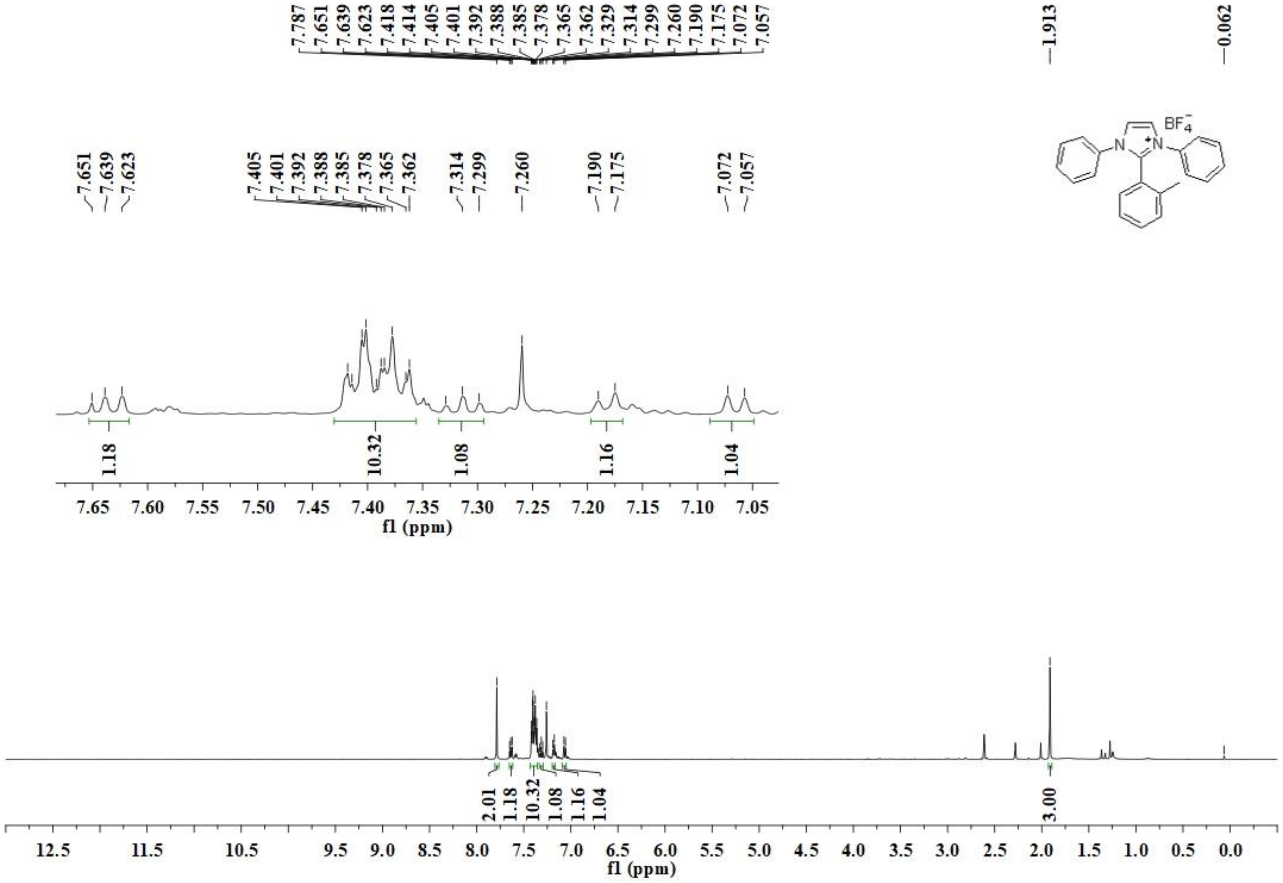
^{1}H NMR (400 MHz, $CDCl_3$) of **5h**



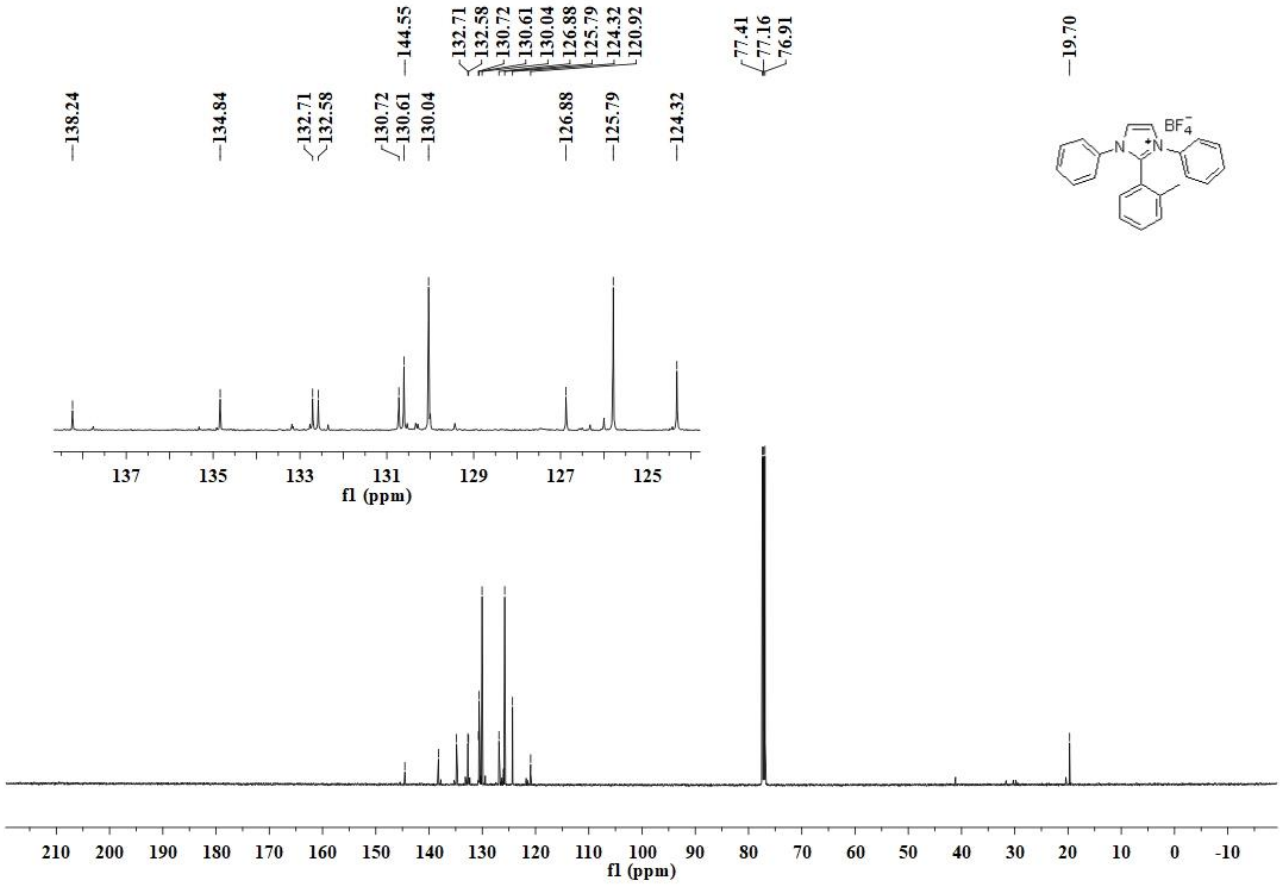
^{13}C NMR (101 MHz, $CDCl_3$) of **5h**



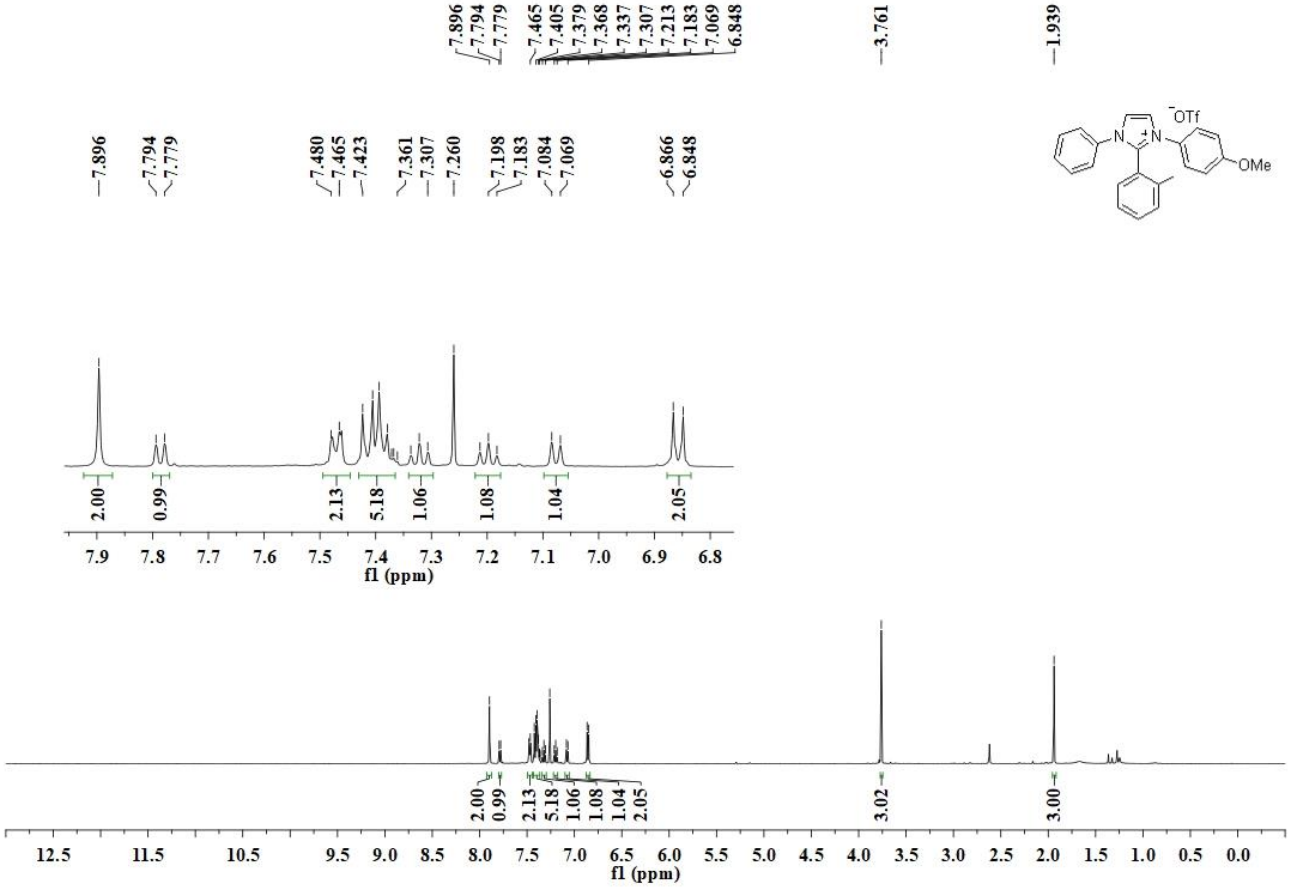
^{1}H NMR (500 MHz, $CDCl_3$) of **5i**



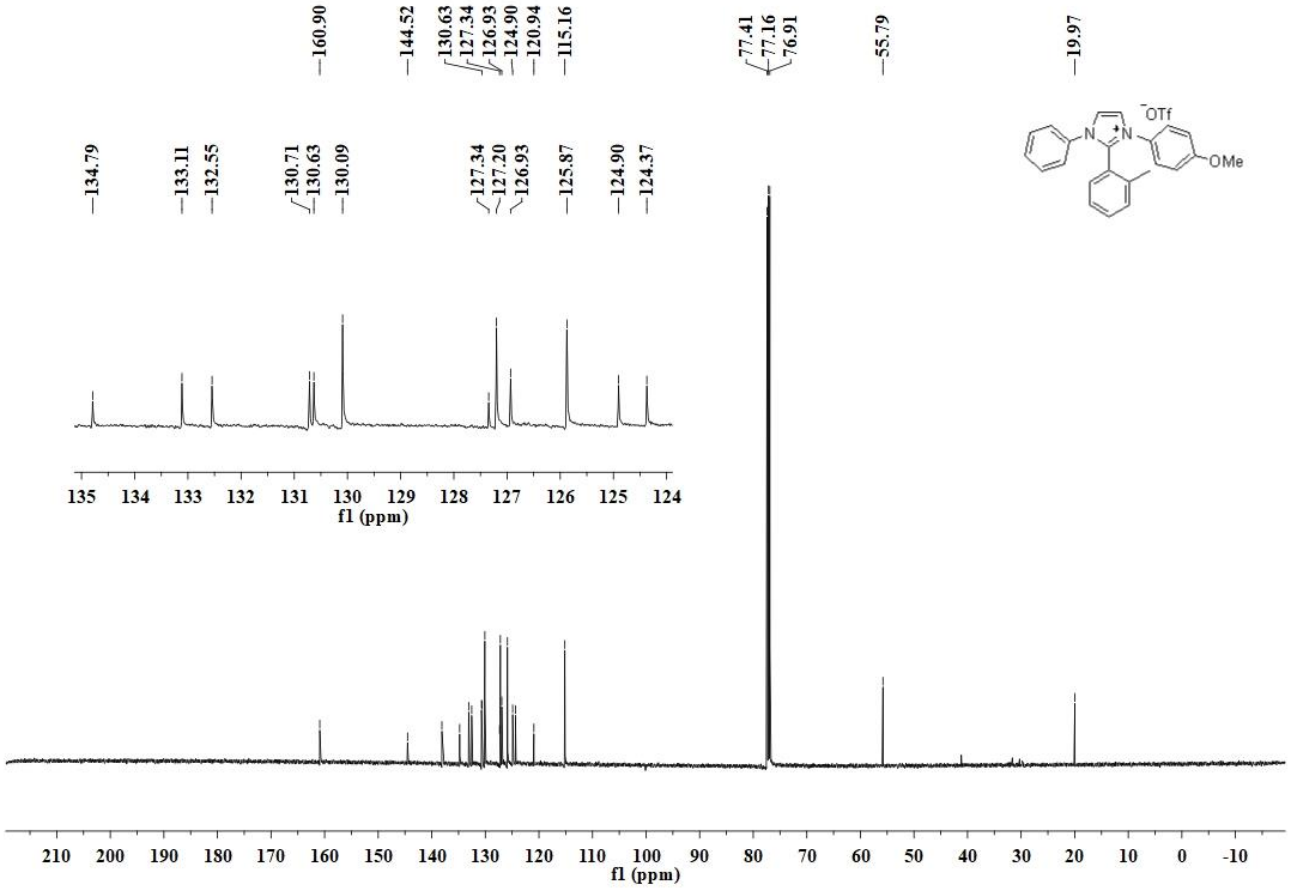
^{13}C NMR (126 MHz, $CDCl_3$) of **5i**



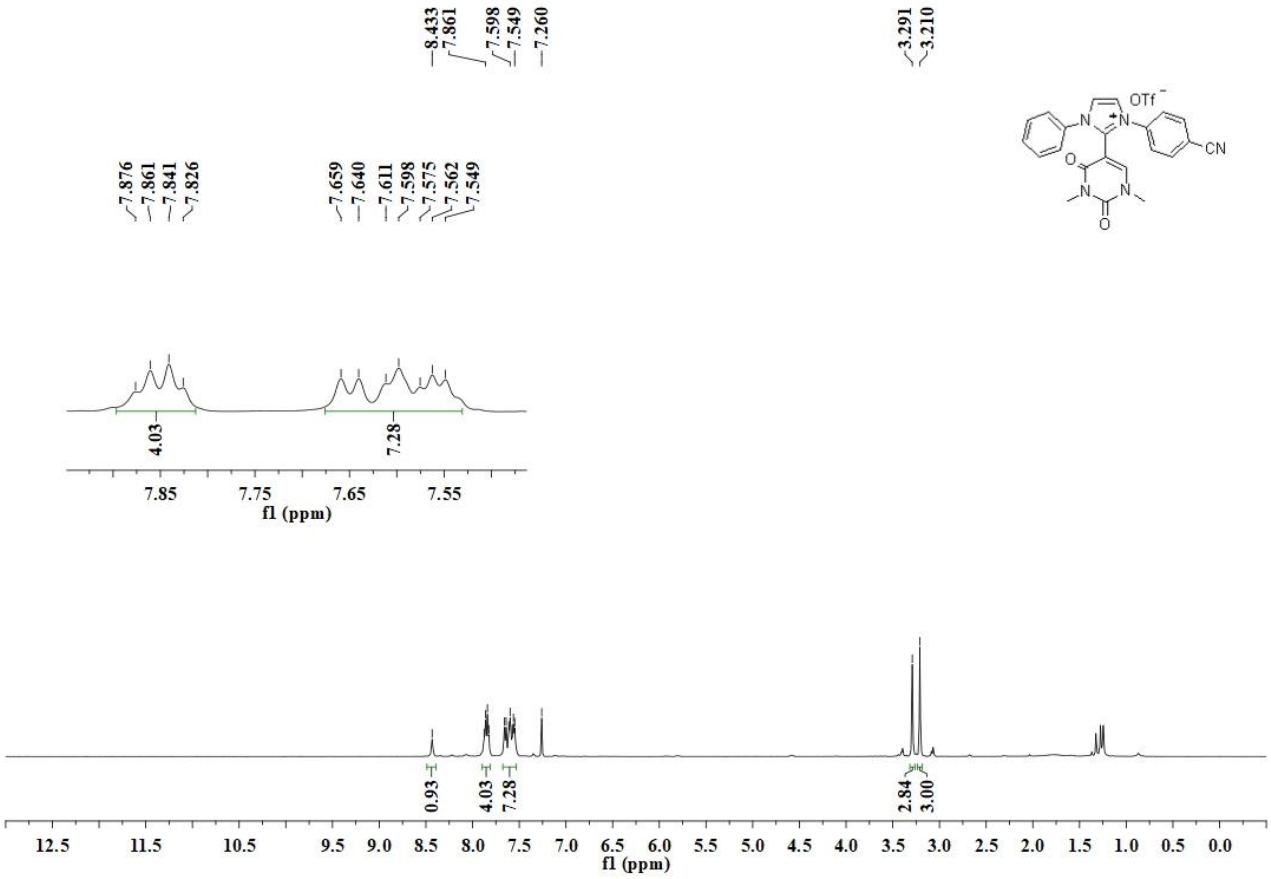
^{1}H NMR (500 MHz, $CDCl_3$) of **5j**



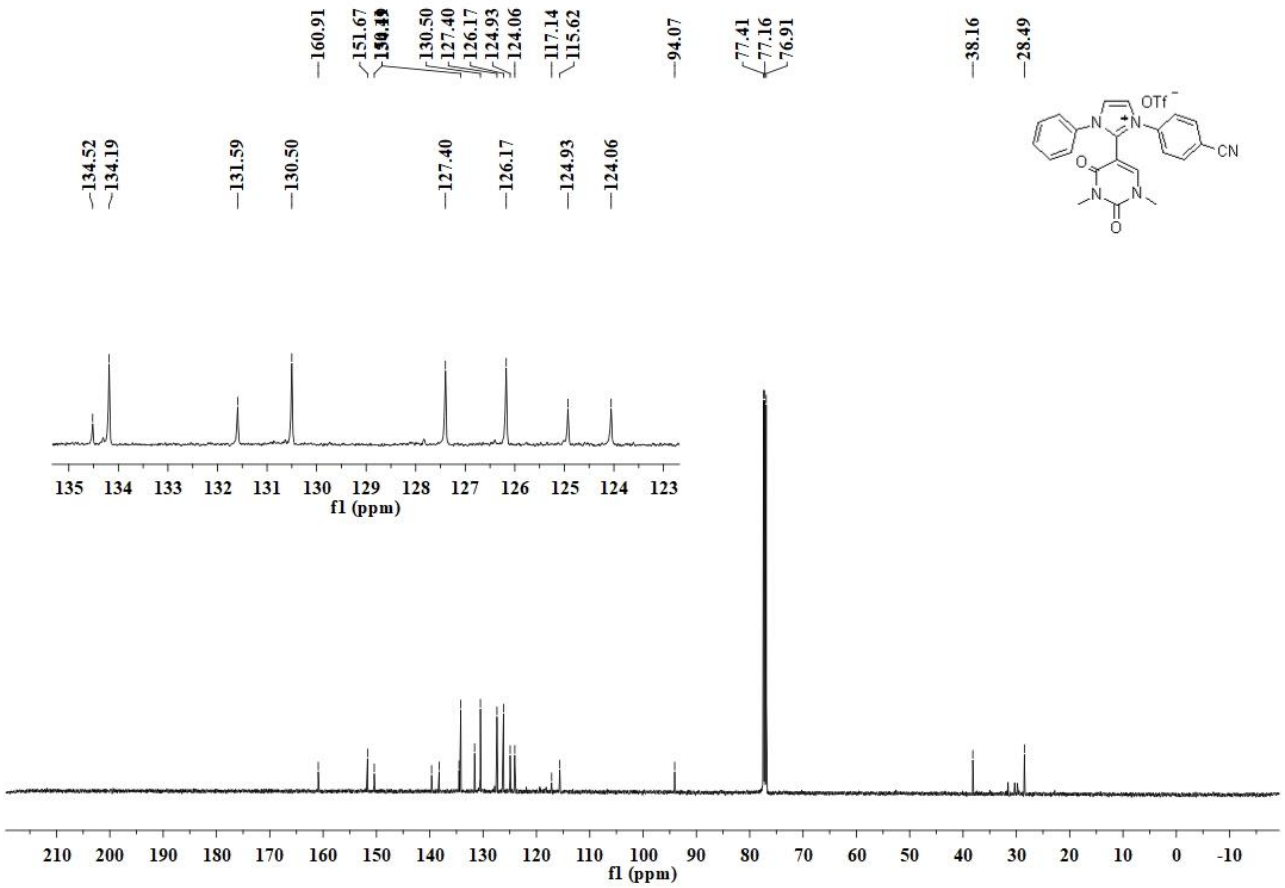
^{13}C NMR (126 MHz, $CDCl_3$) of **5j**



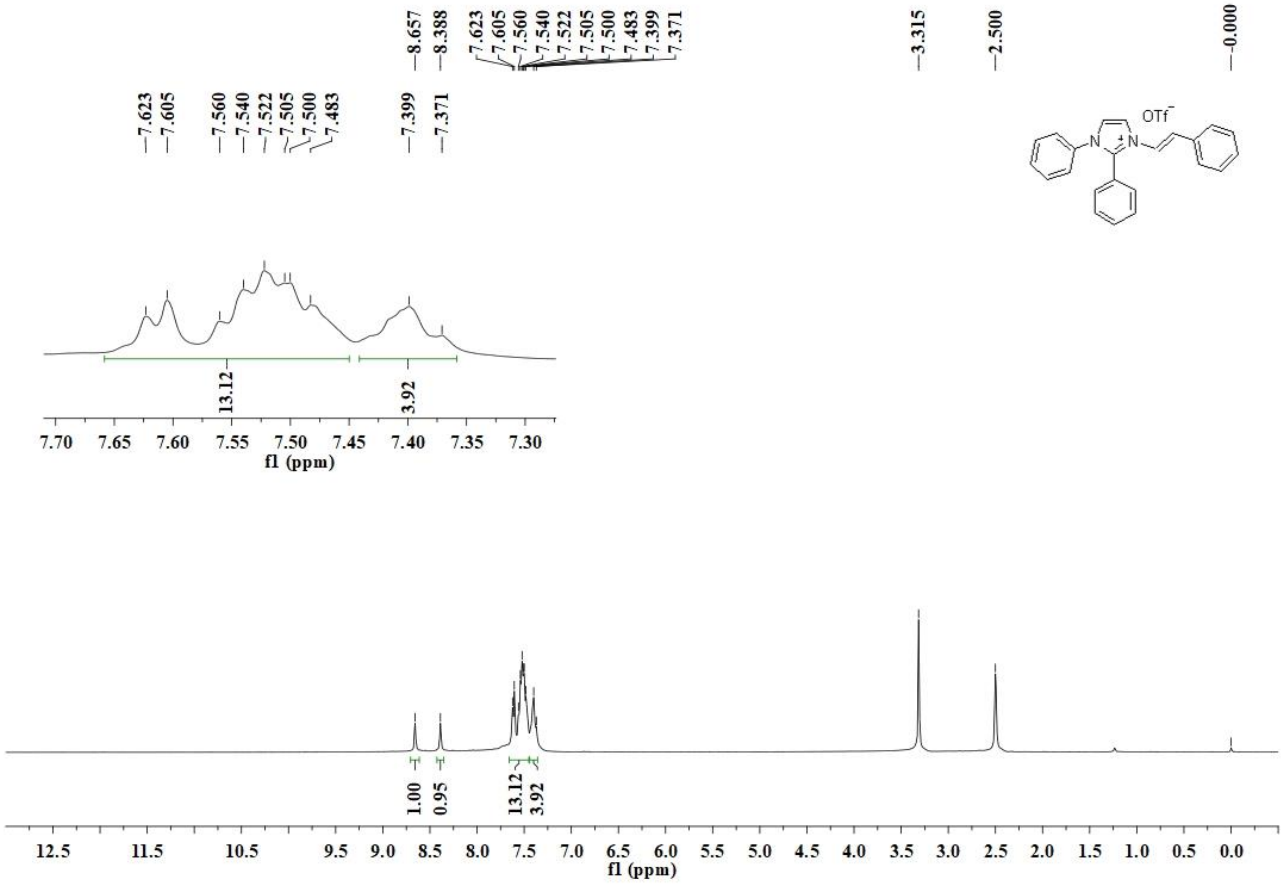
^{1}H NMR (500 MHz, $CDCl_3$) of **5k/5k′**



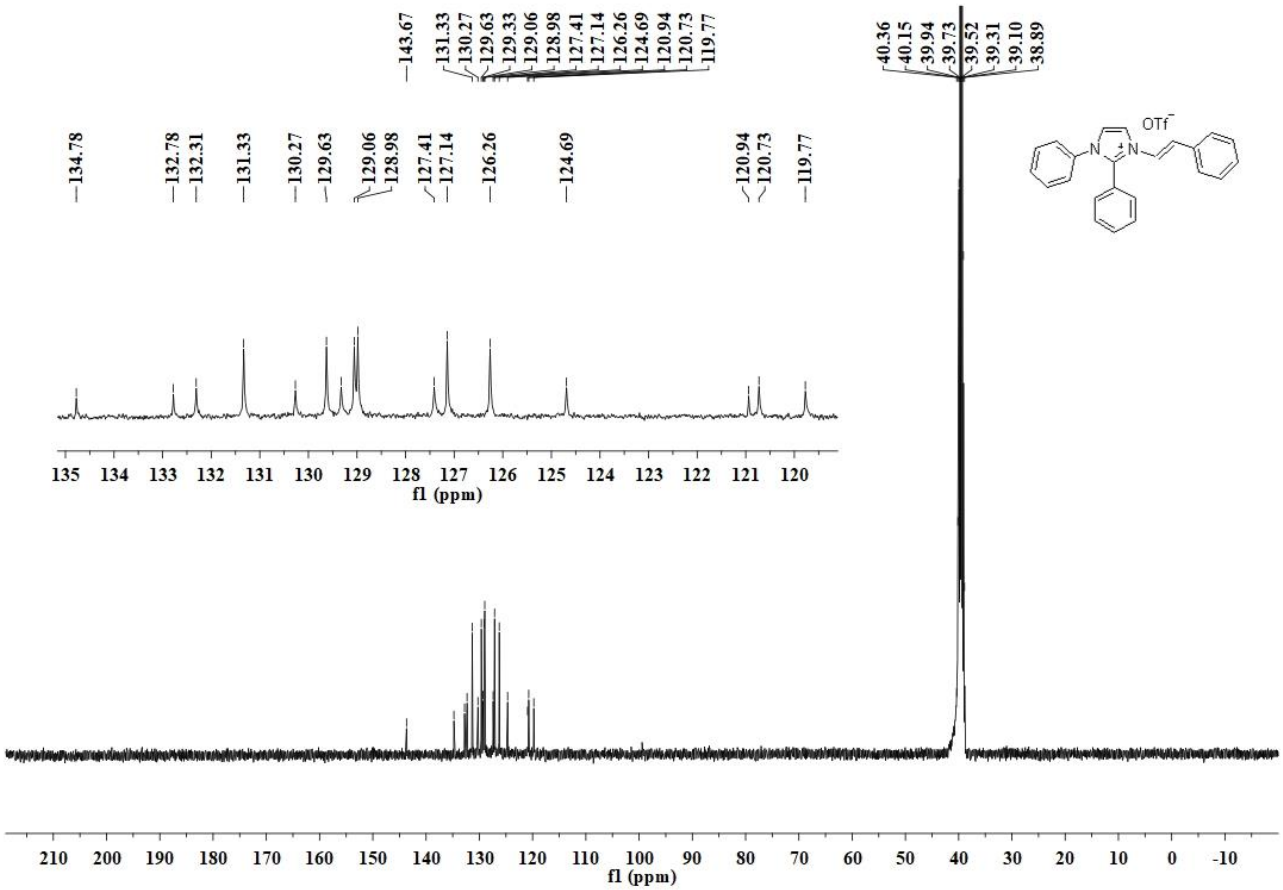
^{13}C NMR (126 MHz, $CDCl_3$) of **5k/5k′**



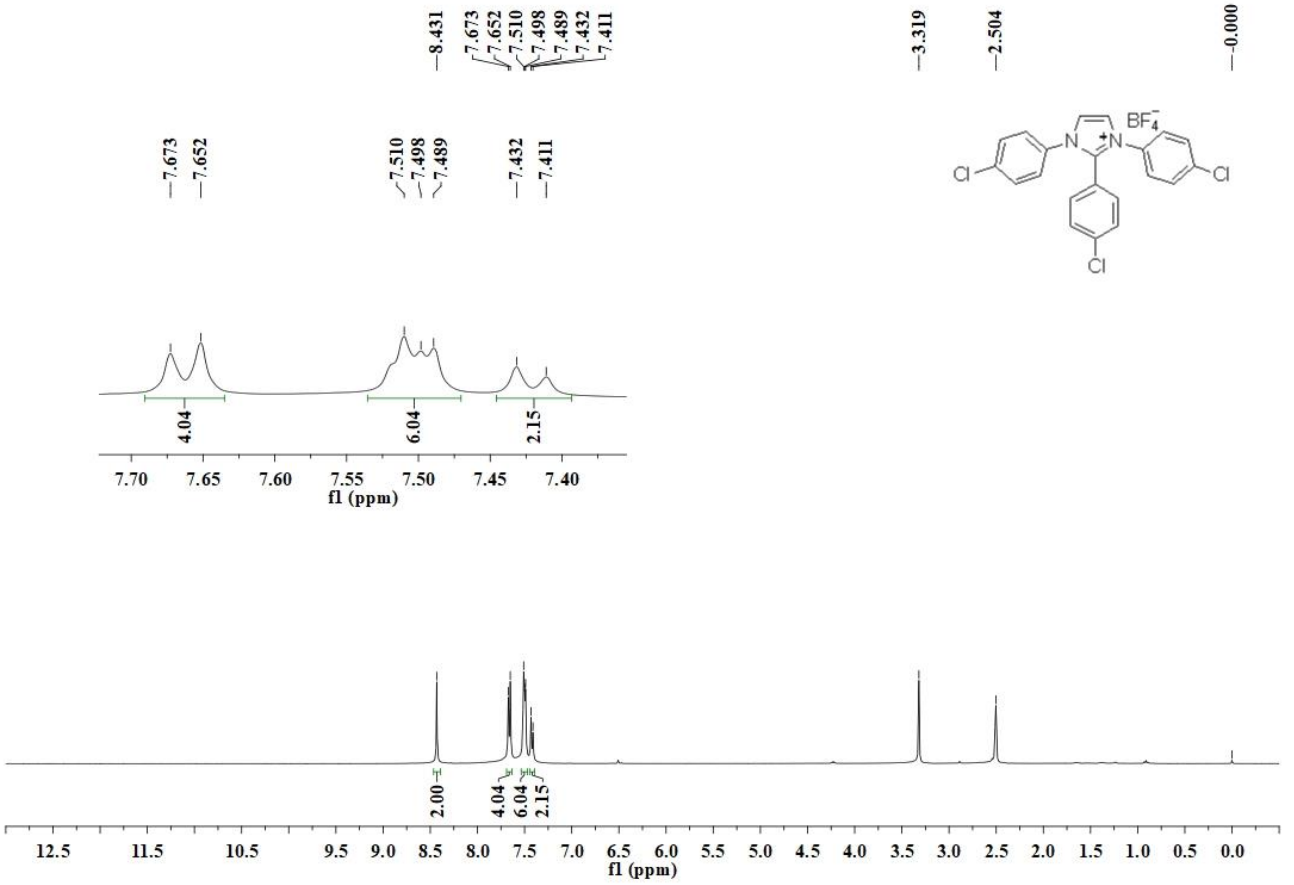
^{1}H NMR (400 MHz, DMSO-*d6*) of **5l**



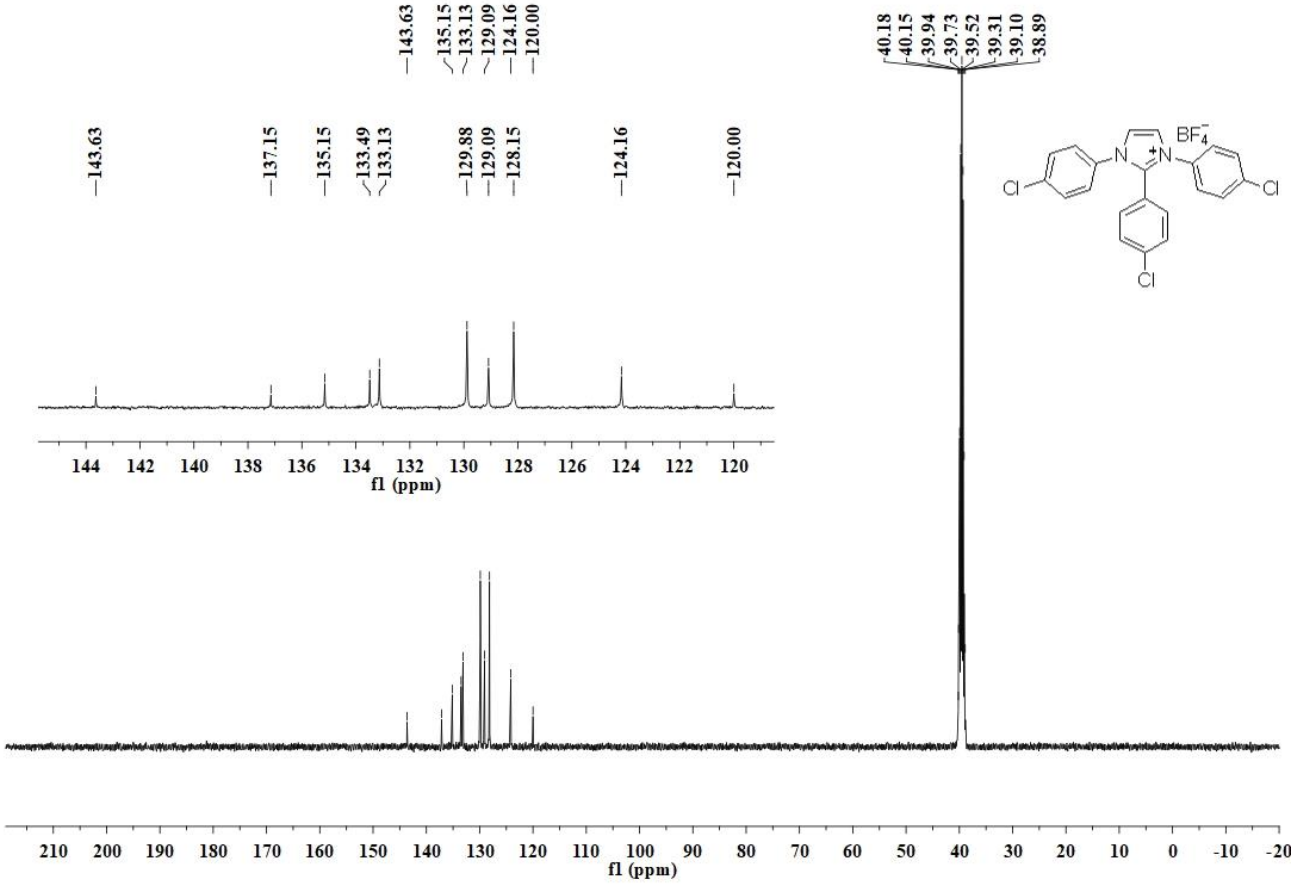
^{13}C NMR (101 MHz, DMSO-*d6*) of **5l**



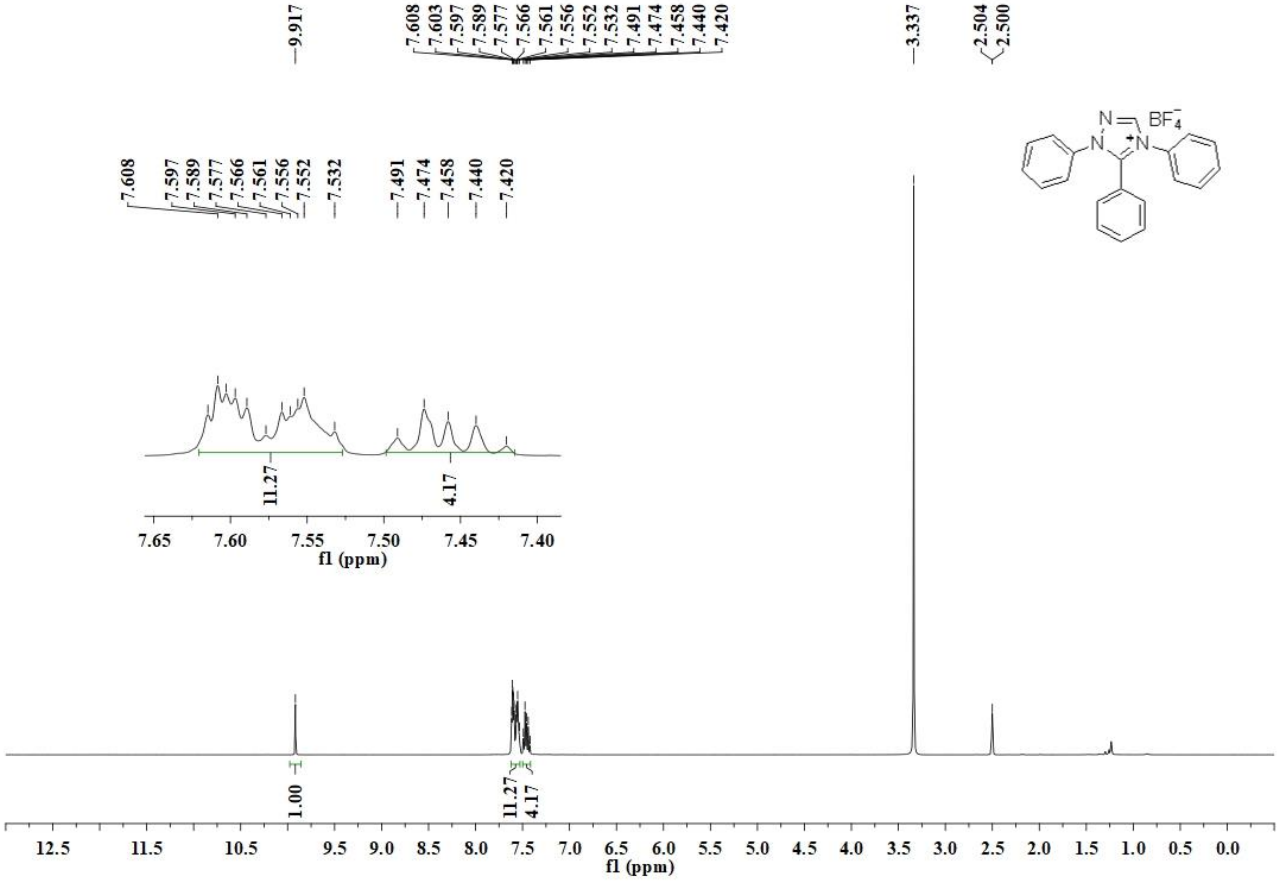
^{1}H NMR (400 MHz, DMSO-*d6*) of **7b**



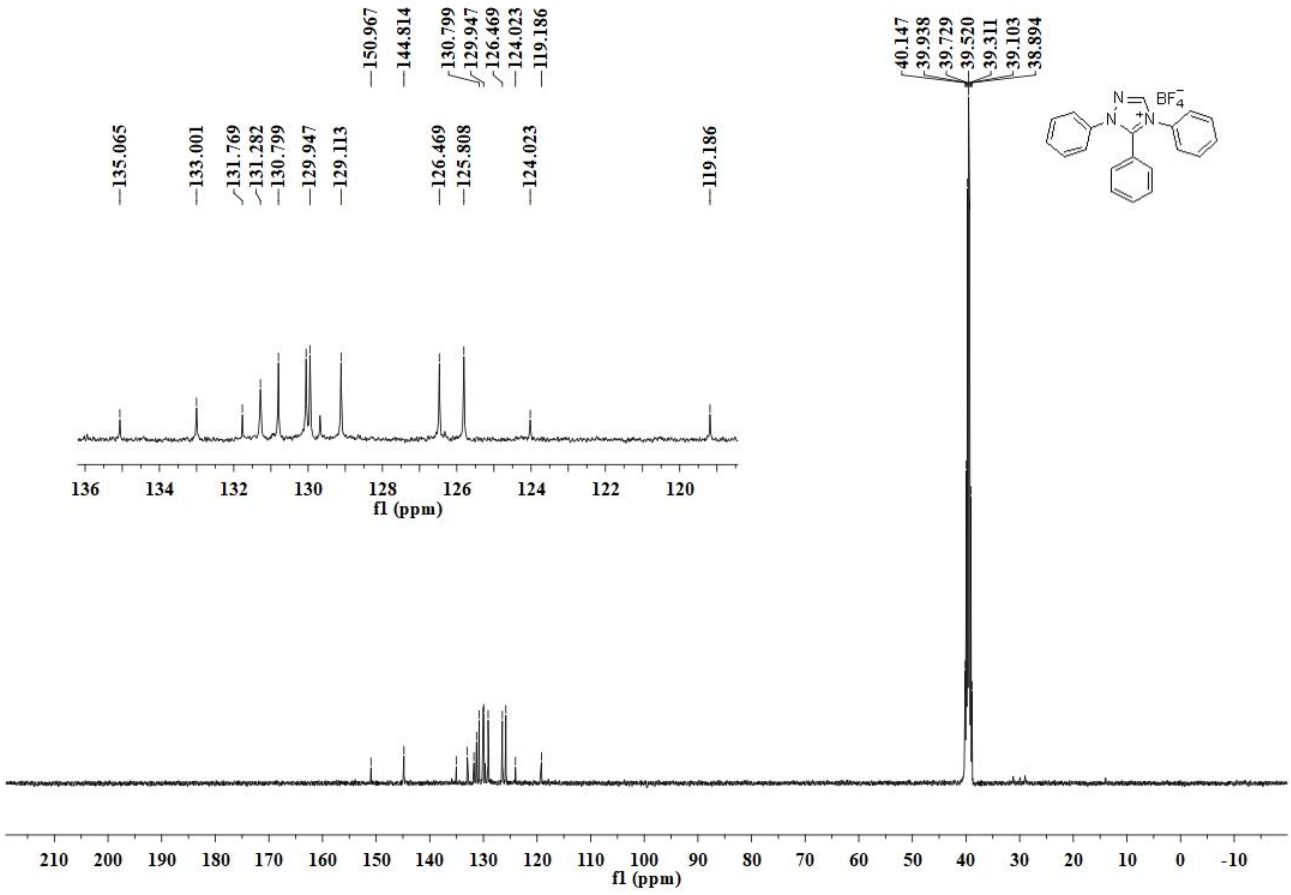
^{13}C NMR (101 MHz, DMSO-*d6*) of **7b**



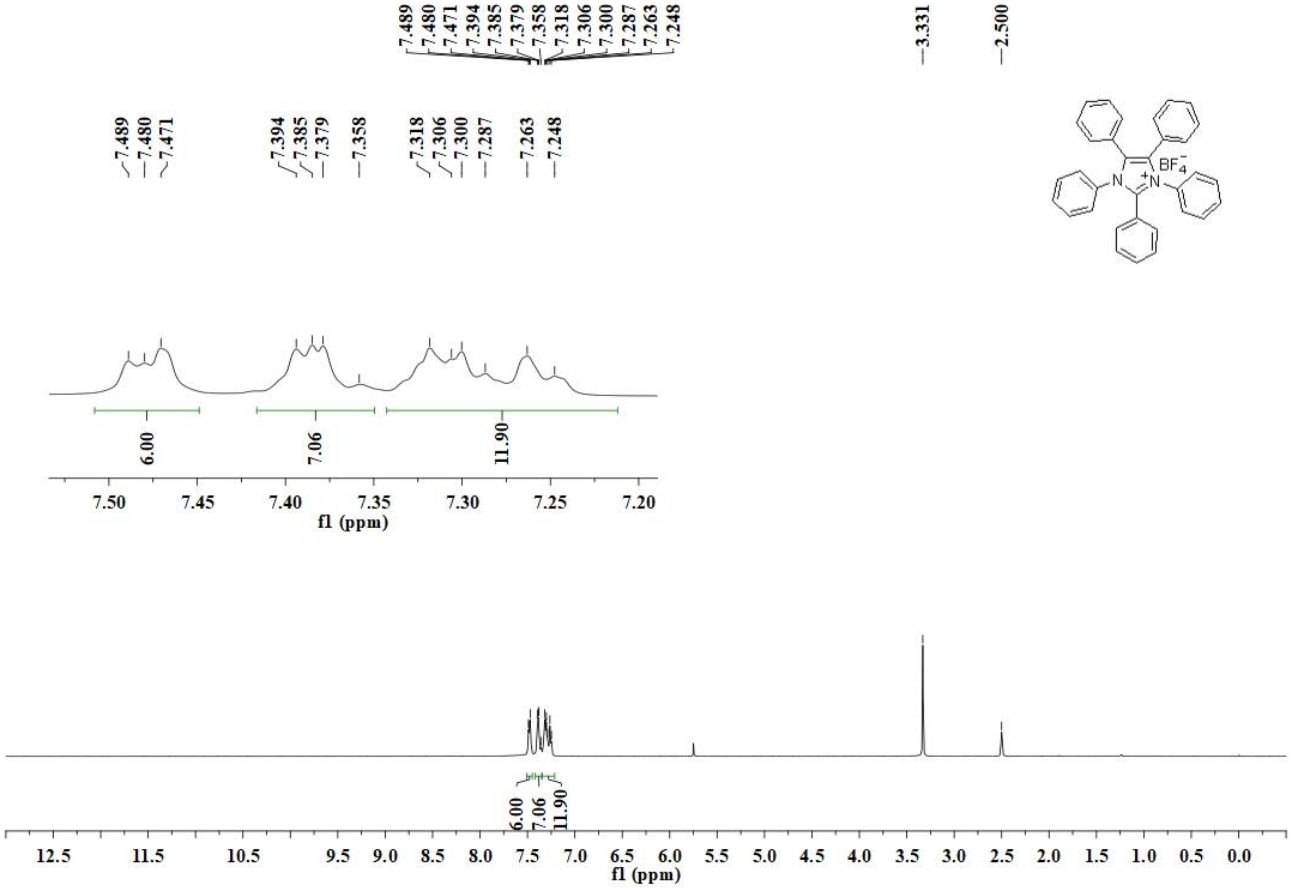
^{1}H NMR (400 MHz, DMSO-*d6*) of **7d**



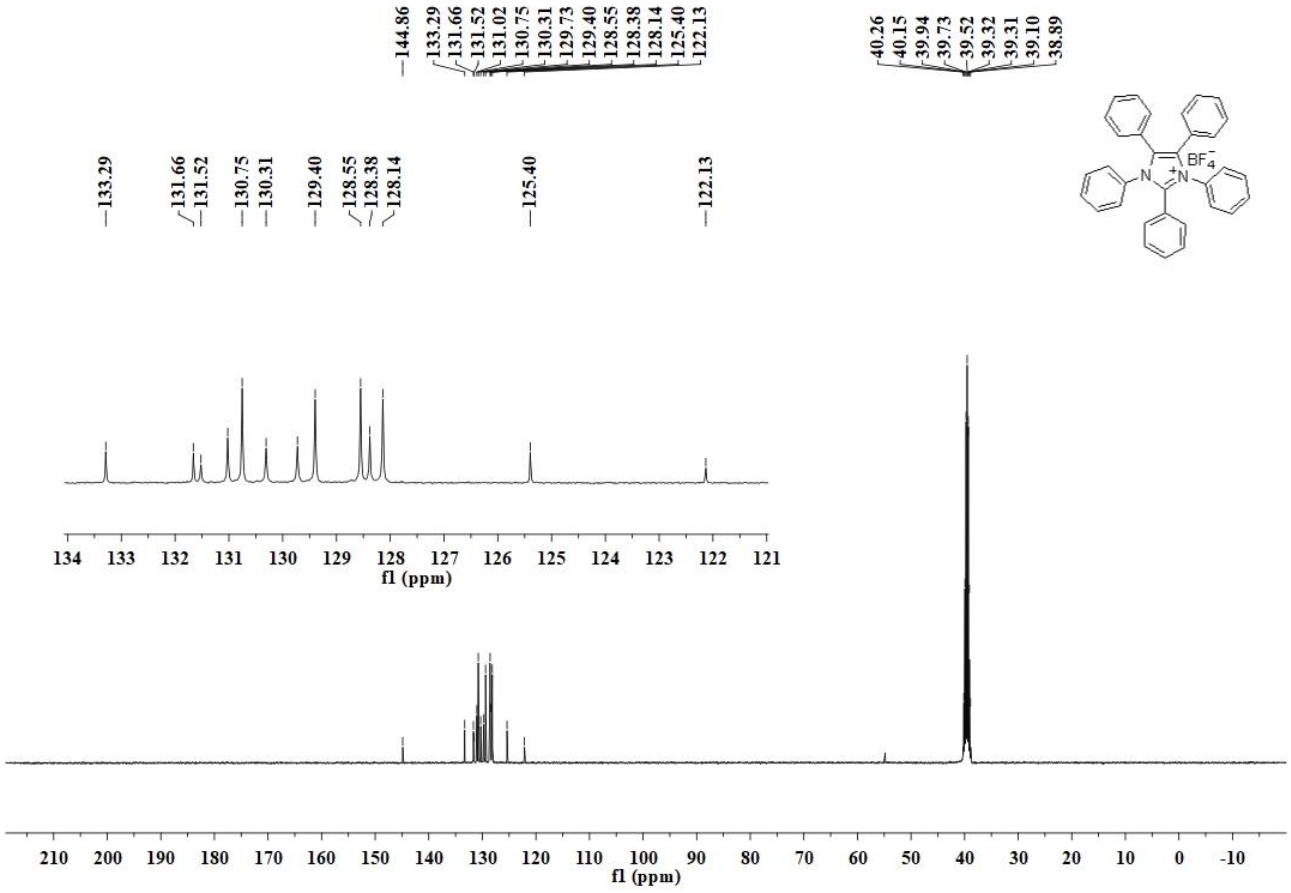
^{13}C NMR (101 MHz, DMSO-*d6*) of **7d**



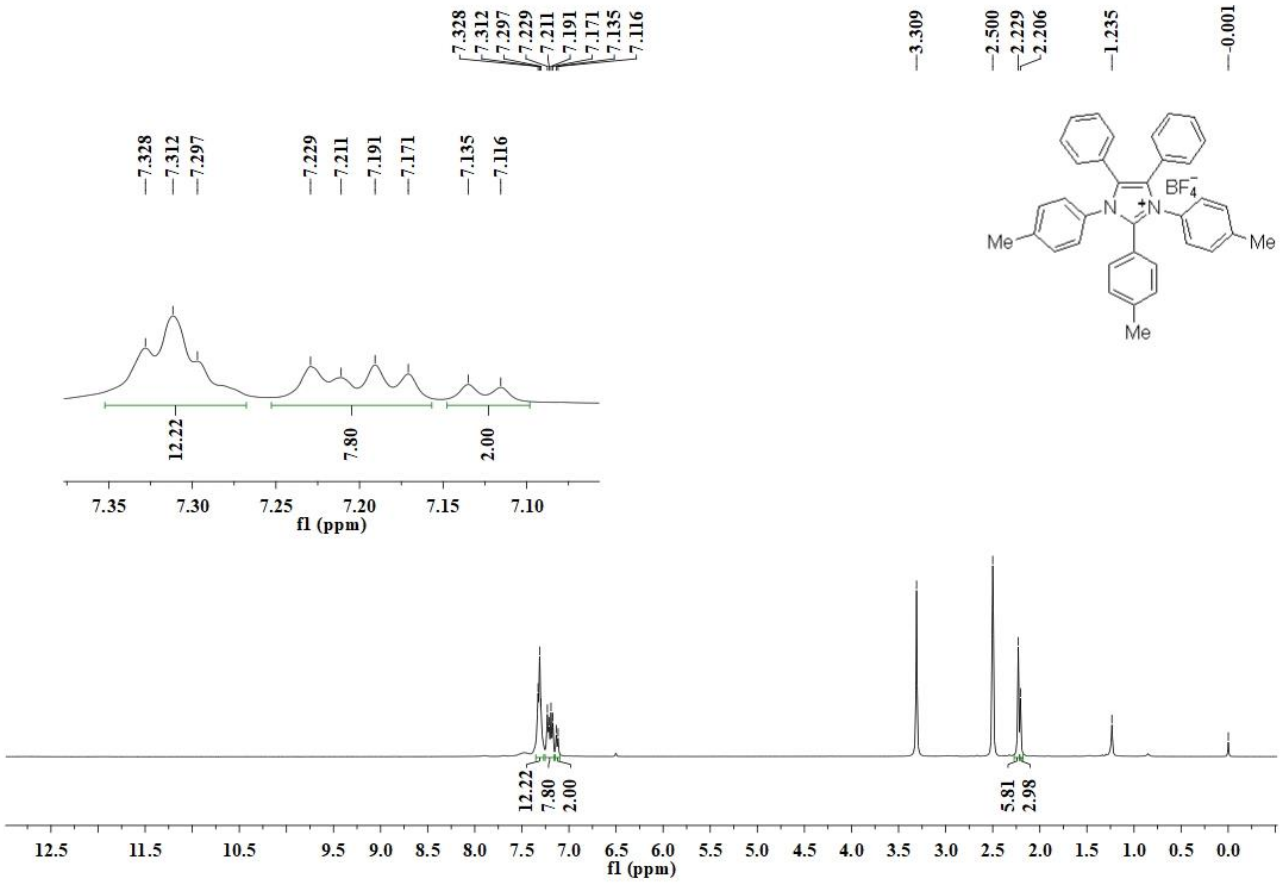
^{1}H NMR (400 MHz, DMSO-*d6*) of **8a**



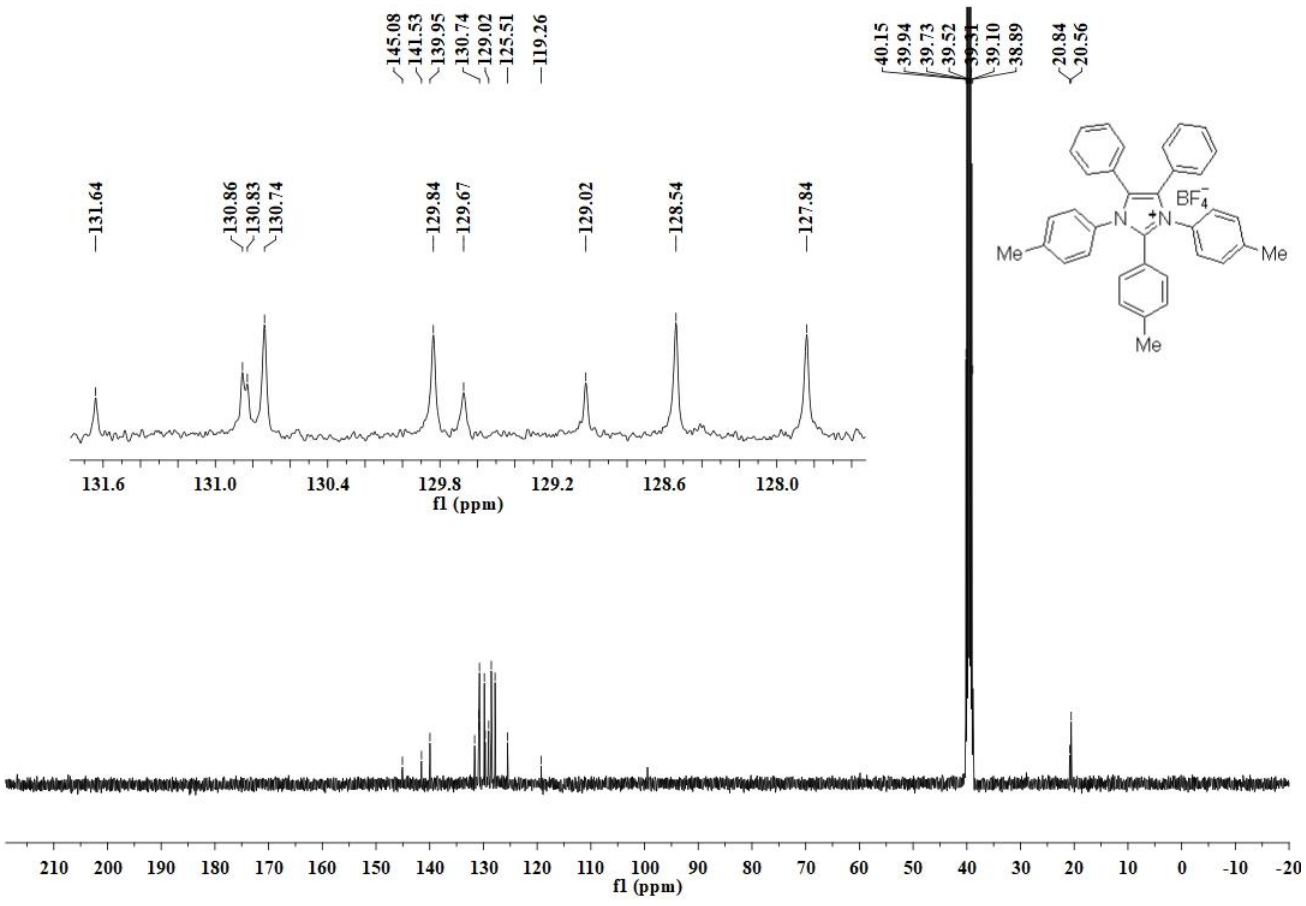
^{13}C NMR (101 MHz, DMSO-*d6*) of **8a**



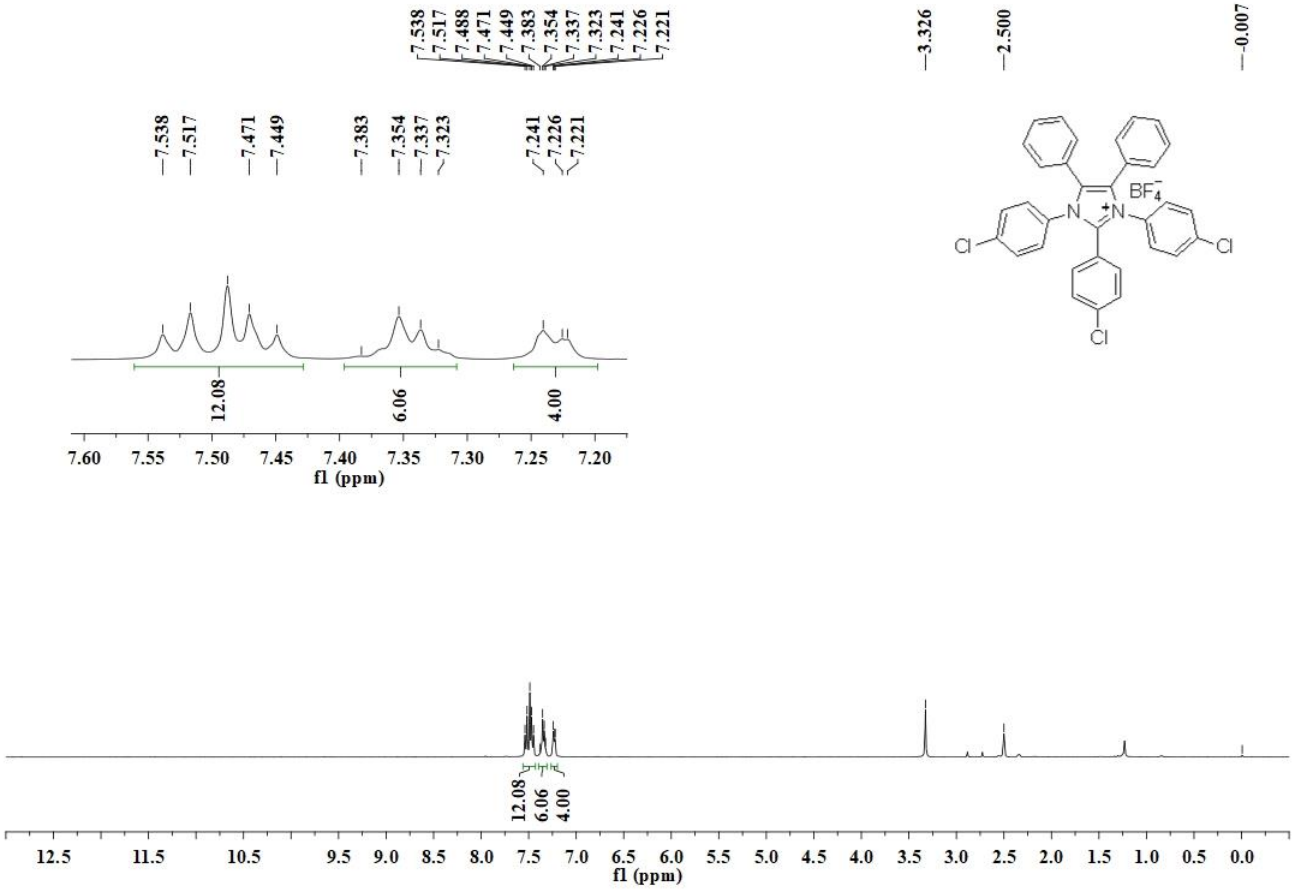
^{1}H NMR (400 MHz, DMSO-*d6*) of **8b**



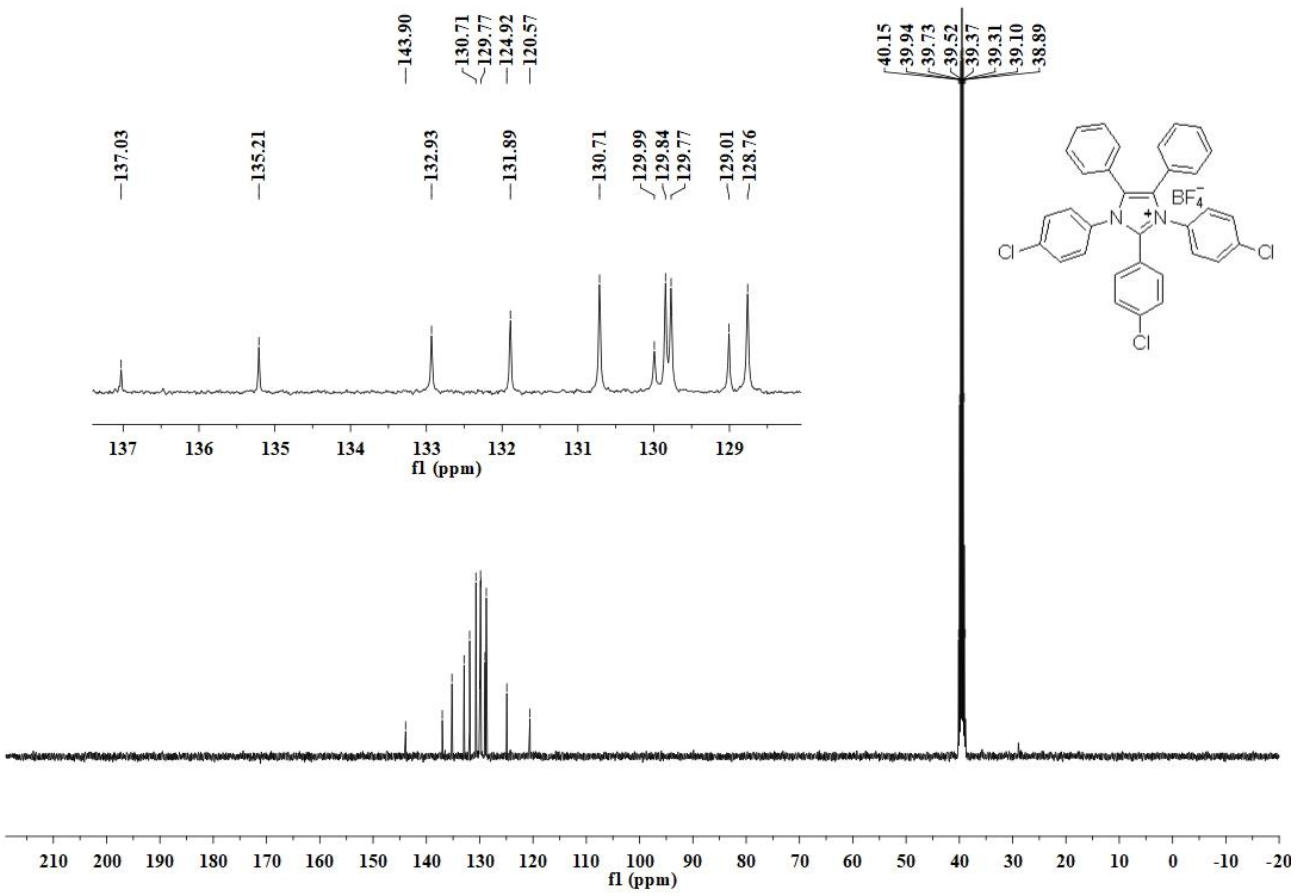
^{13}C NMR (101 MHz, DMSO-*d6*) of **8b**



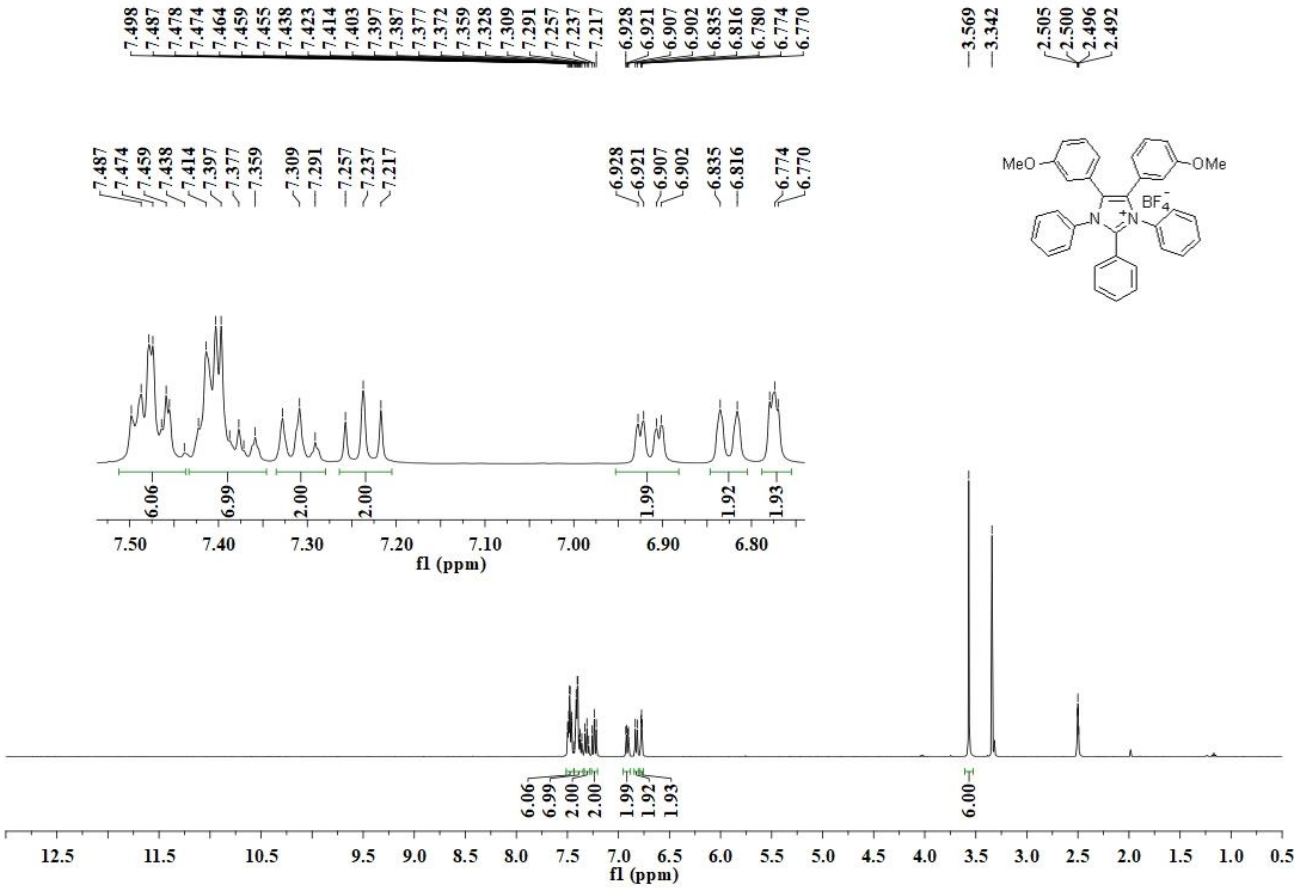
^{1}H NMR (400 MHz, DMSO-*d6*) of **8c**



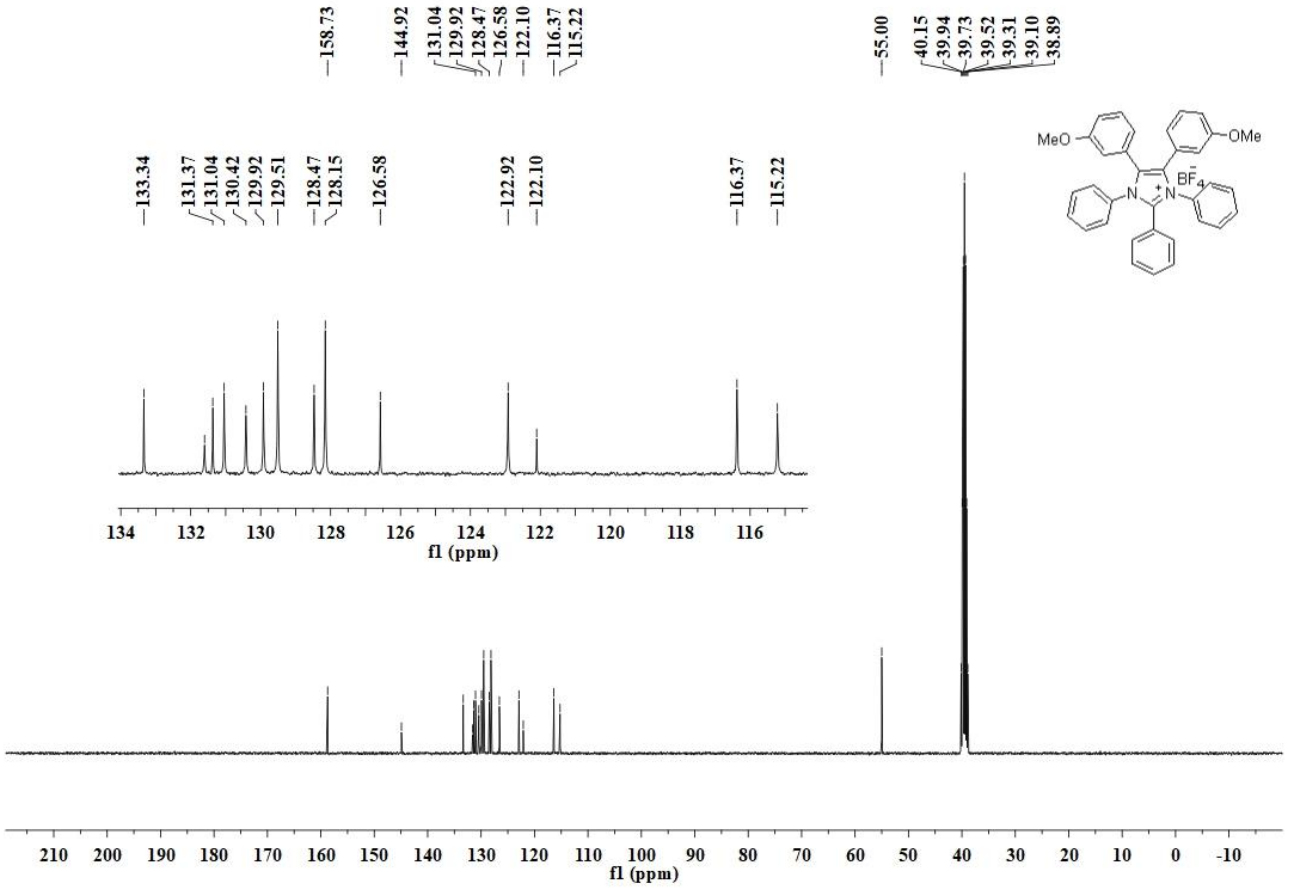
^{13}C NMR (101 MHz, DMSO-*d6*) of **8c**



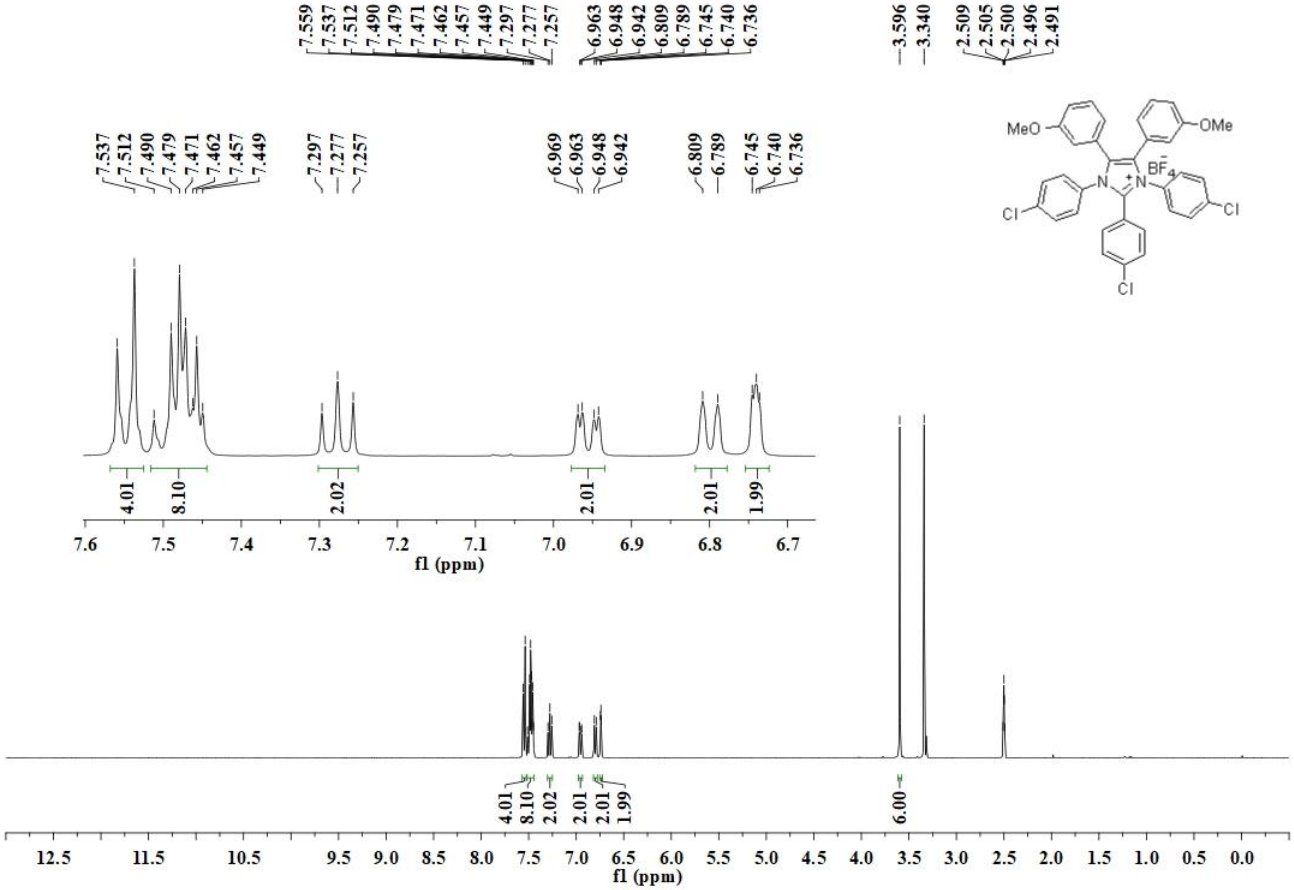
^{1}H NMR (500 MHz, DMSO-*d6*) of **8d**



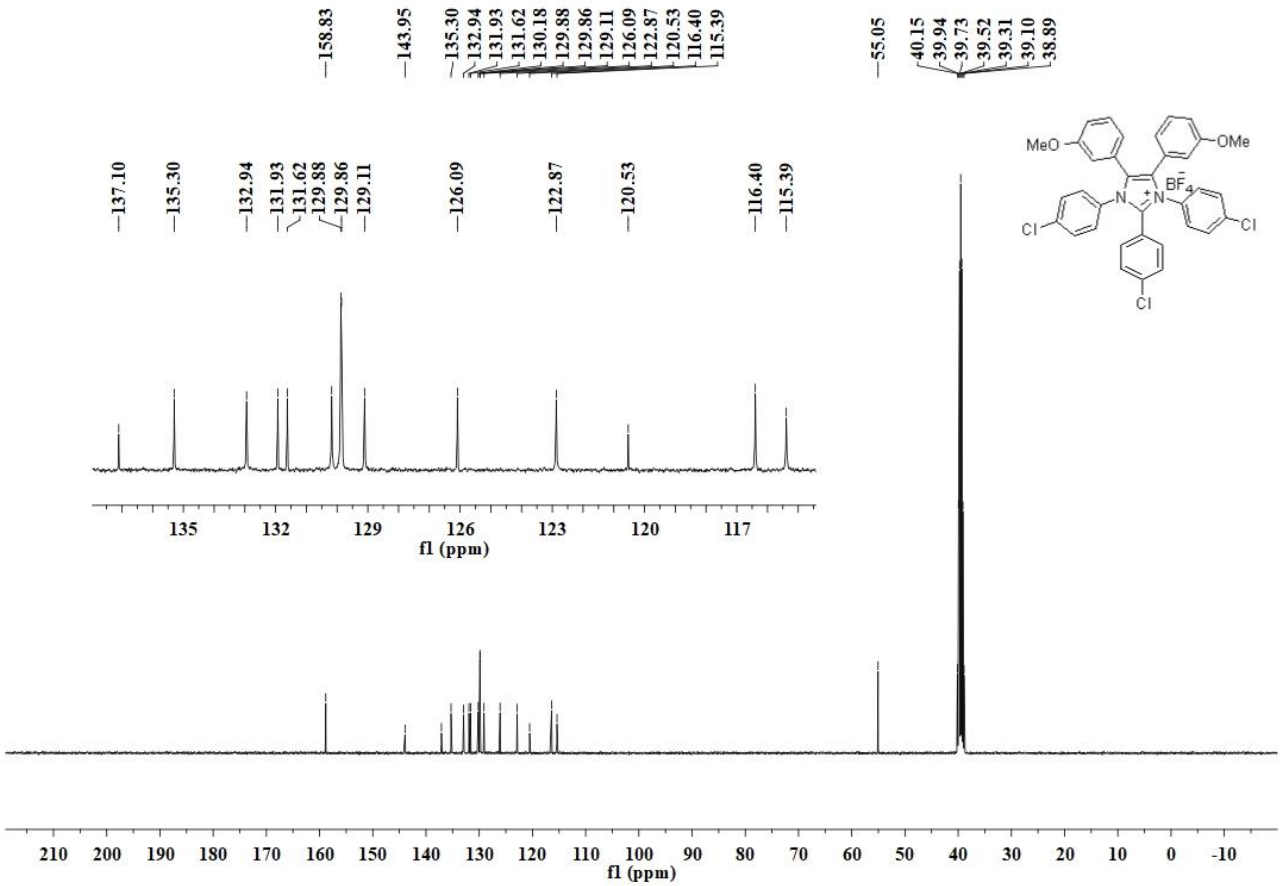
^{13}C NMR (126 MHz, DMSO-*d6*) of **8d**



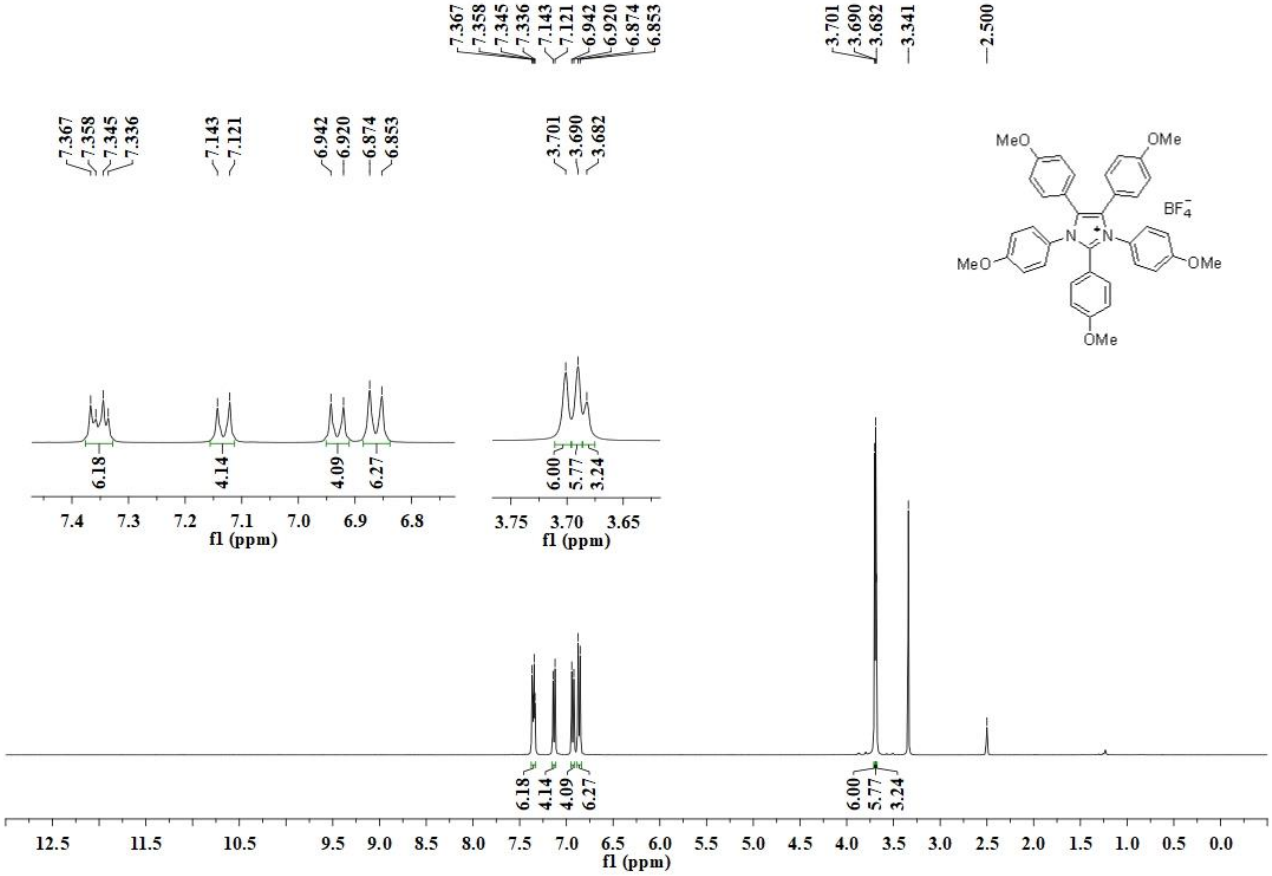
^{1}H NMR (500 MHz, DMSO-*d6*) of **8e**



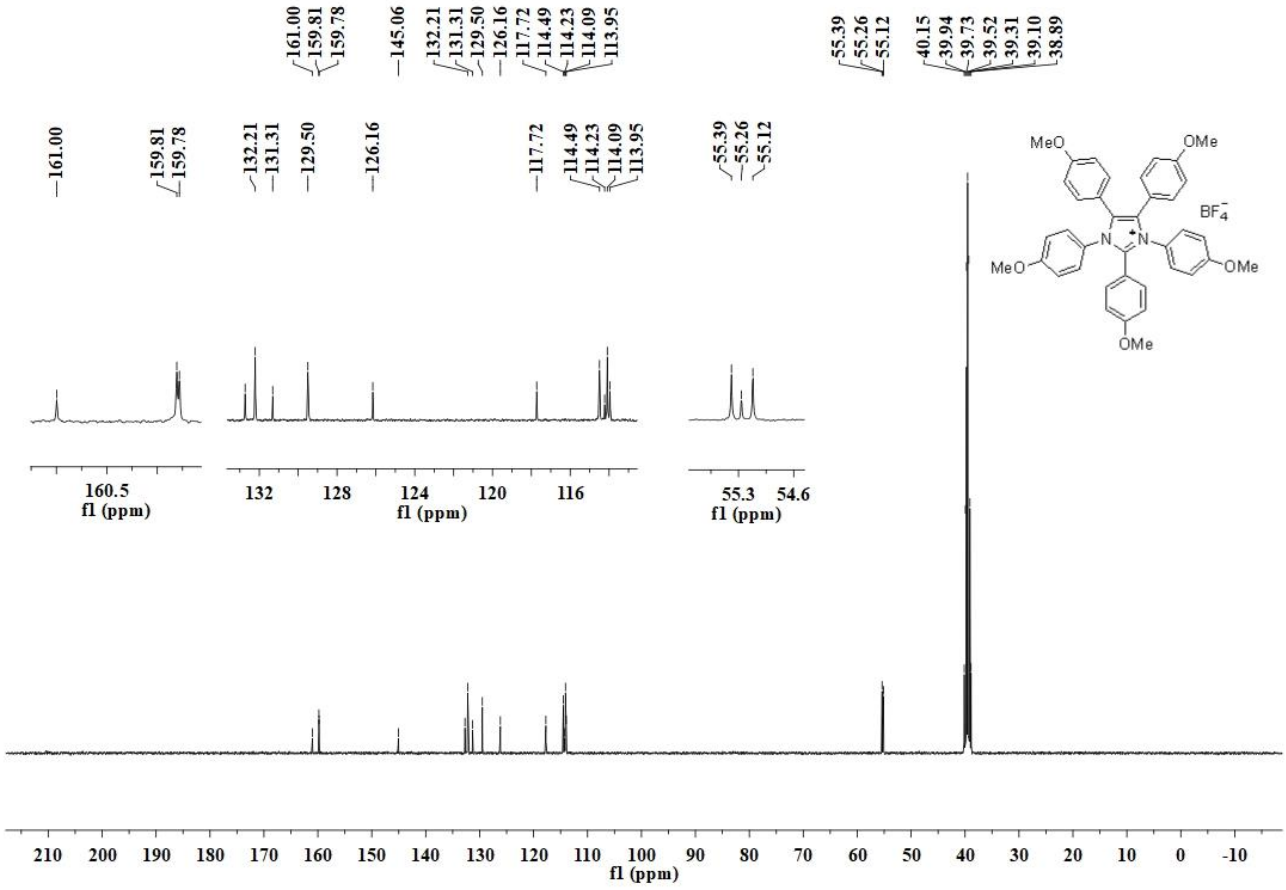
^{13}C NMR (126 MHz, DMSO-*d6*) of **8e**



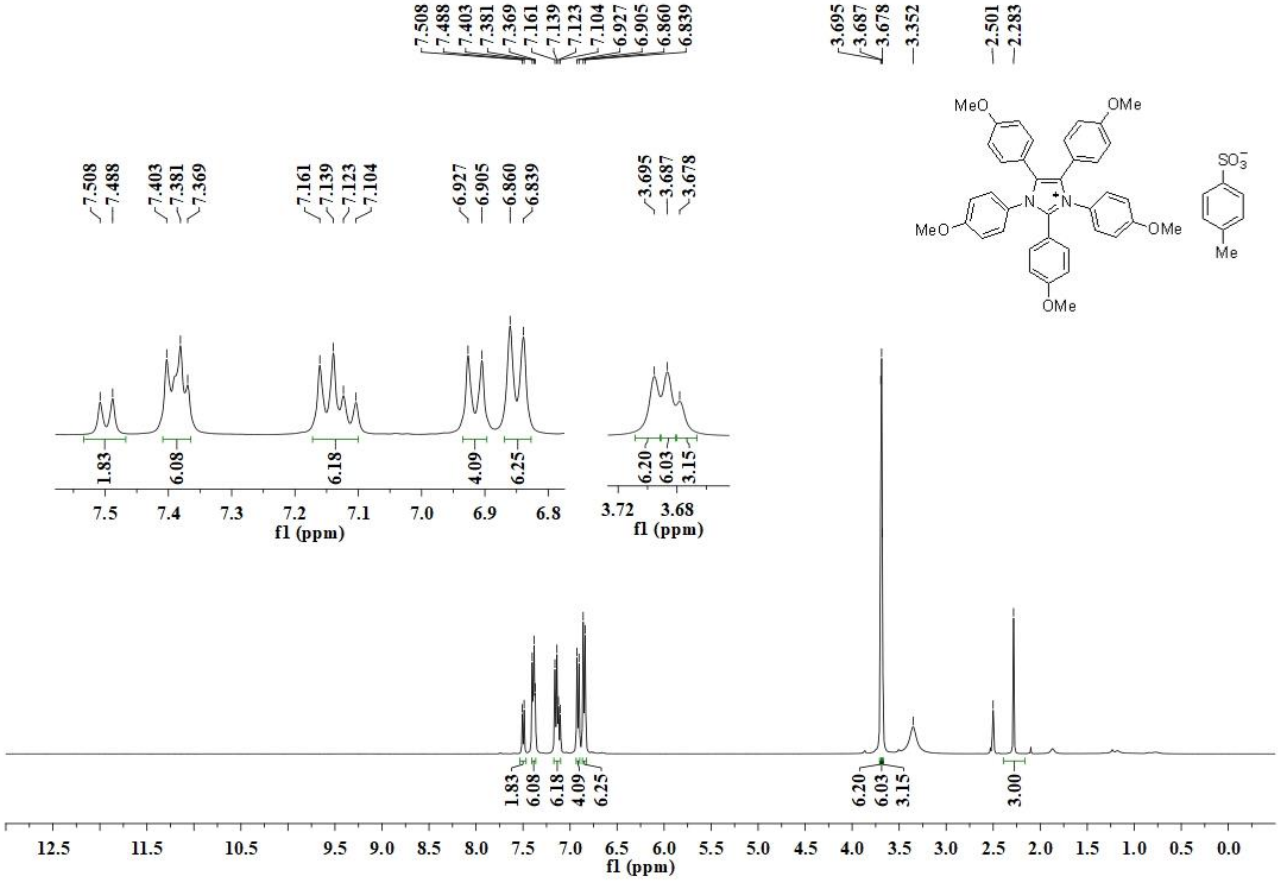
^{1}H NMR (400 MHz, DMSO-*d6*) of **8f**



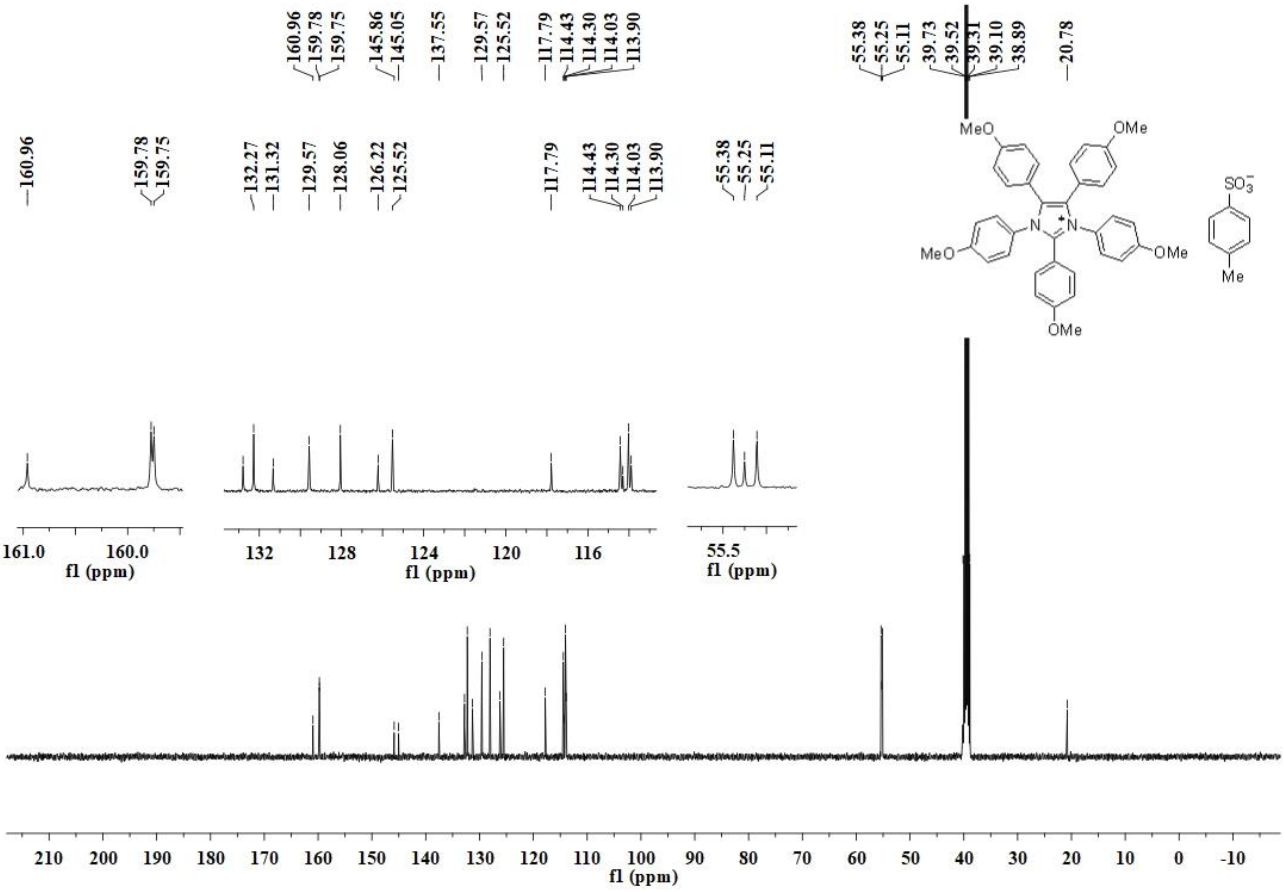
^{13}C NMR (101 MHz, DMSO-*d6*) of **8f**



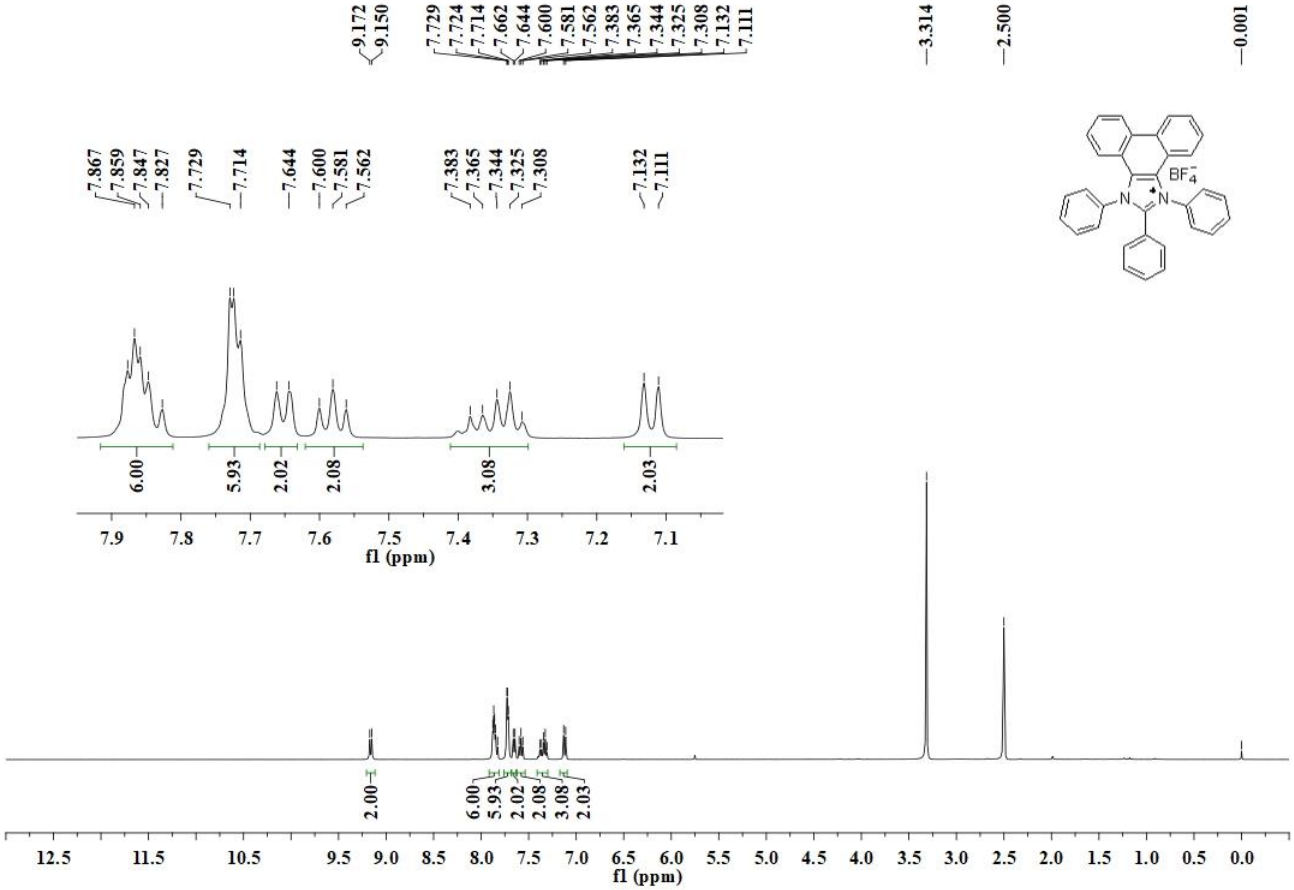
^{1}H NMR (400 MHz, DMSO-*d6*) of **8f-OTs**



^{13}C NMR (101 MHz, DMSO-*d6*) of **8f-OTs**



^{1}H NMR (400 MHz, DMSO-*d6*) of **9**



^{13}C NMR (101 MHz, DMSO-*d6*) of **9**