

Supplementary Information

Base-Controlled Copper-Catalyzed Cascade Multi-Component Reactions of Cyanamides, Diaryliodonium Triflates and Propargylamine for Rapid Assembly of **Polysubstituted 2-aminoimidazoles and 2-iminoimidazoles**

Run Yang^{‡a}, Yimin Zhao^{‡a}, Shihan Wang^a, Canming Wu^b, Jihui Li^{*a,b}, Shuying Xu^{*a}

Key Laboratory of Ministry of Education for Advanced Materials in Tropical Island Resources,

School of Chemical Engineering and Technology, Hainan University, Haikou 570228, PR China

School of Science, Hainan University, Haikou 570228, PR China

Key Laboratory of Solid Waste Resource Utilization and Environmental Protection, Hainan University, Haikou

570228, PR China

lijihui@hainanu.edu.cn

‡ The authors contributed equally to this work.

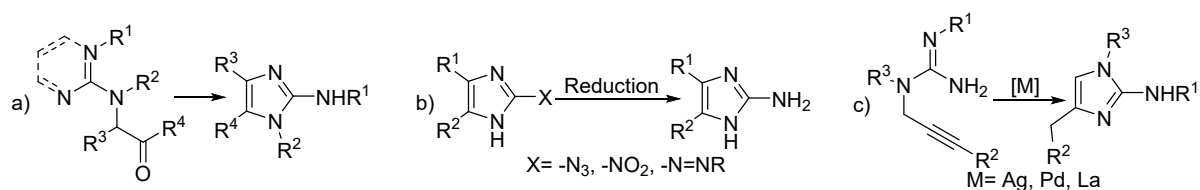
General information.....	2
Associated schemes and discussion.....	2
Preparation of starting materials.....	5
The general procedure for the synthesis of 2-aminoimidazoles and 2-iminoimidazoles.....	5
Analytical data of 2-aminoimidazoles and 2-iminoimidazoles.....	7
NMR spectra of 2-aminoimidazoles and 2-iminoimidazoles.....	26

1. General Information

All starting materials were purchased from commercial sources and used as received. The base and solvents were obtained from commercial suppliers, the solvents and liquid bases were dried using 4 Å molecular sieves. The copper and palladium catalysts were purchased from Shanghai Aladdin Biochemical Technology Co., Ltd in China. Merck silica gel thin-layer chromatography was used to monitor reaction process. Silica gel preparative TLC plate purchased from Shanxiesser Biotechnology Co., Ltd. in China was used to purify reaction product (Developing solvent: EtOAc/petroleum ether = 1/1-3/1, petroleum ether/EtOAc/ EtOH/Et₃N = 20/1/1/1-10/1/1/1).

NMR spectra were recorded on a Bruker Advance NEO spectrometer at 400 MHz (¹H)) and 100 MHz (¹³C), residual solvent peaks (CDCl₃: δ = 7.26, 77.16) were used as an internal reference. Chemical shifts (δ) were reported in ppm, and coupling constants (J) were given in Hertz (Hz). The multiplicities were reported as: s = singlet, d = doublet, t = triplet, q = quadruplet, sept = septuplet, m = multiplet, bs = broad signal. **The isomers of 2-aminoimidazoles were identified by ¹H-¹H NOESY spectra, and their ratios were quantified by ¹H NMR.** High resolution mass spectra (HRMS) were recorded by Shimadzu LCMS-IT-TOF mass spectrometer using ESI-TOF techniques. Fourier transform infrared (FTIR) spectra were performed on a Bruker T27 spectrometer in 4000-400 cm⁻¹ range with KBr pellets.

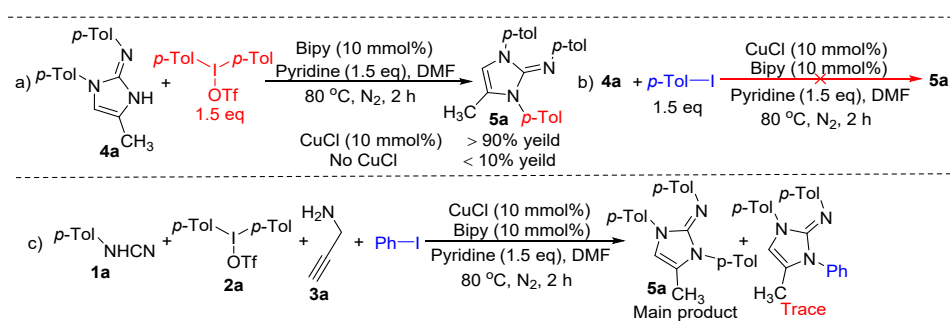
2. Associated schemes and discussion



Scheme S1. Previous method of synthesis of 2-aminoimidazoles.

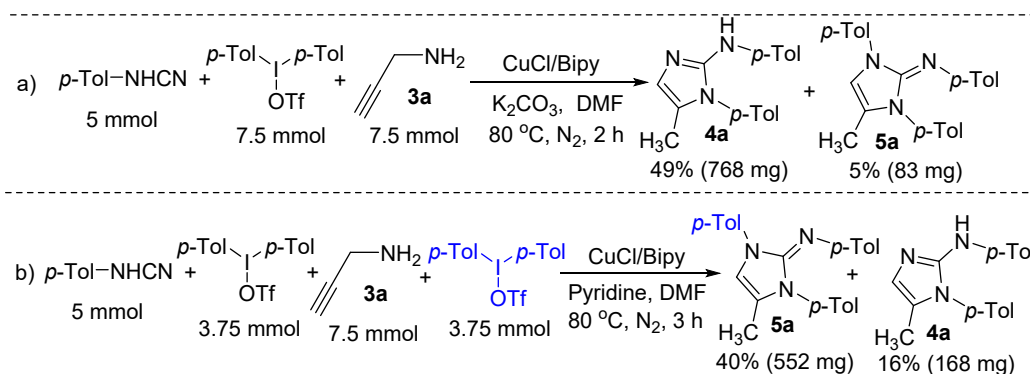
To point out **1,3,5-trisubstituted 2-iminoimidazoles (5)** was resulted from C-N coupling of 1,5-disubstituted 2-aminoimidazoles (**4**) with diaryliodonium triflates or in-situ generated aryliodides, the control experiments were performed (Scheme S2). The reaction of di(*p*-tolyl)iodonium triflate proceeded rapidly to produce **5a** in high yield (> 90%) under simulative optimal reaction conditions within 2 h (Scheme S2a), but the reaction of *p*-tolyl iodide rarely produced **5a** with recovery of most **4a** (Scheme S2b). Additionally, the C-N coupling with di(*p*-tolyl)iodonium triflate rarely took place

without copper (Scheme S2a). Phenylation product was hardly detected as adding phenyliodide into the reaction system of *p*-tolylcyanamide, di(*p*-tolyl)iodonium triflate, and propargylamine under the standard reaction conditions (Scheme S2c), confirming the C-N coupling of in-situ generated aryl iodide hardly occurred. Therefore, 1,3,5-trisubstituted 2-iminoimidazoles was resulted from the cascade four-component reaction of cyanamides, diaryliodonium triflates, propargylamine, and diaryliodonium triflates via sequential guanidination/hydroamination/C-N coupling with promotion of pyridine. This copper-catalyzed C-N coupling of diaryliodonium triflates with 2-aminoimidazoles should be a highly efficient method for the synthesis of N-aryl 2-aminoimidazoles.



Scheme S2. Control experiments.

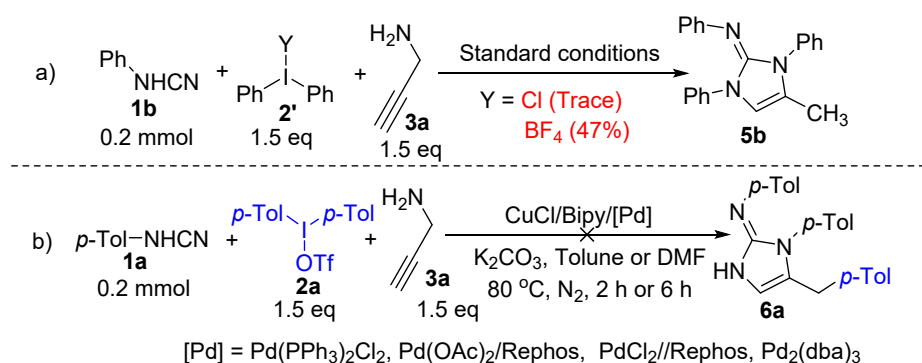
The large scale synthesis of 1,5-disubstituted 2-aminoimidazoles (**4**) and 1,3,5-trisubstituted 2-iminoimidazoles (**5**) was demonstrated to be feasible by the cascade reactions of *p*-tolylcyanamide, di(*p*-tolyl)iodonium triflate, and propargylamine (Scheme S3). The desired products **4a** and **5a** were obtained in 49% and 5% yields for the K_2CO_3 -accelerated cascade reaction on a 5 mmol scale, respectively. The **5a** was produced in 40% yield via the pyridine-promoted four-component cascade reaction on a 3.75 mmol scale, accompanying with the formation of **4a** in



Scheme S3. The scaled synthesis of 2-aminoimidazole (**4a**) and 2-iminoimidazole (**5a**).

16% yield. This ratio of **5a/4a** (2.5/1) was much lower than that (9.4/1) achieved on a 0.15 mmol, showing the C-N coupling of **4a** with di(*p*-tolyl)iodonium triflate dramatically slowed down comparing to guanidination and hydroamination in a large scale reaction.

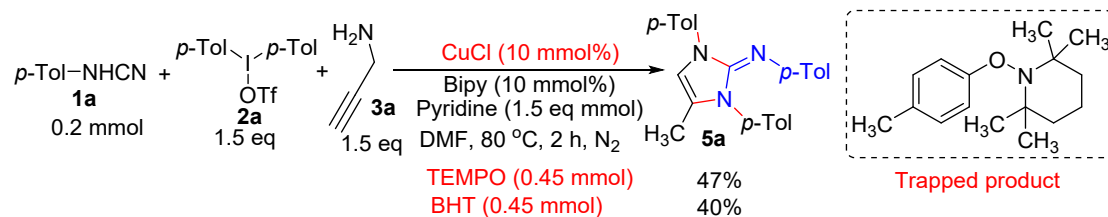
The effect of counter anions was evaluated using commercially available diphenyliodonium tetrafluoroborate and chloride (Scheme S4a). The four-component cascade reaction of tetrafluoroborate afforded corresponding product **5b** with lower yields comparing the corresponding triflate. While the chloride was employed, no desired product was observed and the intermediate **4b** was rarely generated. Thus, the counter anion imposed great influence on the cascade reaction as the first step guanidination was subjected to the oxidative addition of counter anion to Cu (I).¹



Scheme S4. Effect of counter anion on the four-component cascade reaction (a) and atom-economical reaction of di(*p*-tolyl)iodonium triflate (b) .

The atom-economical three-component reaction of diaryliodonium triflates with cyanamides and propargylamine was also investigated under the relay catalysis of copper and palladium using K_2CO_3 as base. Brief investigation showed that this reaction failed to afford desired product as the Heck coupling of in-situ generated aryl iodide rarely occurred accompanying with multiple side reactions even using different palladium catalysts (Scheme S4b).

As diaryliodonium could induce radical reaction,² the radical trapper (TEMPO and BHT) were added to the four-component cascade reaction for investigating the reaction mechanism (Scheme S5). The reaction provided decreased yields of desired product (**5a**) with these radical trappers. Moreover, the trapped product of *p*-tolyl radical was detected during the reaction with TEMPO, suggesting radical reaction occurred in the cascade process. It was demonstrated that TEMPO rarely imposed influence on the guanidination in our previous work.¹ Thus, the radical pathway should be mainly involved in the C-N coupling of 2-aminoimidazoles (**4**) with diaryliodonium triflates.



Scheme S5. Radical trap experiments.

References

1. J. Li, H. Wang, Y. Hou, W. Yu, S. Xu, and Y. C. Zhang, *Eur. J. Org. Chem.*, 2016, 2388-2392.
2. S. M. Zeitler, P. Chakma and M. R. Golder, *Chem. Sci.*, 2022, **13**, 4131-4138.

3. Preparation of starting materials

A. The general procedures for preparation of cyanamides.

The cyanamides were synthesized through the substitution of cyanogen bromide with amines (J. Li, L. Neville, *Org. Lett.*, 2013, **15**, 6124-6127.). Aromatic cyanamides were prepared in toluene using NaHCO_3 as base, and purified by silica gel column chromatography. Aliphatic cyanamides were prepared in Et_2O using excessive amount of aliphatic amines. The aliphatic cyanamides except benzylcyanamide were obtained by filtration and removal of the solvent in vacuo, and used without further purification. The benzylcyanamide was purified by silica gel column chromatography.

B. The general procedure for preparation of diaryliodonium triflates.

The diaryliodonium triflates were synthesized according to the reported methods in the literature (M. Bielawski, M. Zhu, B. Olofsson, *Adv. Synth. Catal.*, 2007, **349**, 2610-2618.). The reaction of arenes, I_2 (or aryl iodides) and HOTf was performed in CH_2Cl_2 with *m*-Chloroperbenzoic acid as oxidant, the reaction mixture was concentrated under vacuum and recrystallized in Et_2O to obtain pure diaryliodonium triflates. The reaction mixture was washed by distilled water to remove excessive HOTf before concentration for recrystallization if necessary.

4. The general procedure for the synthesis of 2-aminoimidazoles and 2-iminoimidazoles.

A. The synthesis of 1,5-disubstituted 2-aminoimidazoles (4) through cooper-catalyzed three-component cascade reaction of cyanamides, diaryliodonium triflates and propargyl amine.

Cyanamide (0.2 mmol), diaryliodonium triflate (1.5 eq), K_2CO_3 (1.5 eq), 2,2'-bipyridine (10 mmol%) and CuCl (10 mmol%) were quickly added into a round bottom sidearm flask (25 mL) under nitrogen atmosphere, evacuated and backfilled with nitrogen in balloon for four times. Then,

DMF (1.5 mL) and propargylamine (1.5 eq) were injected into the mixture, and the reaction mixture was stirred at 80 °C for 2 hours under nitrogen atmosphere. The obtained reaction mixture was cooled down to room temperature, quenched with H₂O, and extracted with EtOAc (3 × 10 mL). The combined EtOAc phase was washed with saturated NaCl solution, dried by anhydrous MgSO₄, and concentrated under reduced pressure to get crude product. The crude product was then purified by silica gel preparative TLC plate using developing solvent (EtOAc/petroleum ether = 1/1-3/1, petroleum ether/EtOAc/ EtOH/Et₃N = 20/1/1/1-10/1/1/1) to get the desired product.

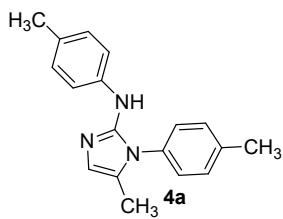
B. The synthesis of 1,3,5-trisubstituted 2-iminoimidazoles (5) through four-component cascade reaction of cyanamides, diaryliodonium triflates, propargyl amine, and diaryliodonium triflates.

Cyanamide (0.2 mmol), diaryliodonium triflate (1.5 eq), 2,2'-bipyridine (10 mmol%) and CuCl (10 mmol%) were quickly added into a round bottom sidearm flask (25 mL) under nitrogen atmosphere, evacuated and backfilled with nitrogen in balloon for four times. Then, DMF (1.5 mL), pyridine (1.5 eq) and propargylamine (1.5 eq) were injected into the mixture, and the reaction mixture was stirred at 80 °C for 2 hours under nitrogen atmosphere. The obtained reaction mixture was cooled down to room temperature, quenched with H₂O, and extracted with EtOAc (3 × 10 mL). The combined EtOAc phase was washed with saturated NaCl solution, dried by anhydrous MgSO₄, and concentrated under reduced pressure to get crude product. The crude product was purified by silica gel preparative TLC plate using developing solvent (EtOAc/petroleum ether = 1/1-3/1, petroleum ether/EtOAc/ EtOH/Et₃N = 20/1/1/1-10/1/1/1) to get the desired product.

C. The procedure for investigating copper and palladium relay catalyzed atom-economical three-component cascade reaction of diaryliodonium triflates, cyanamides and propargylamine.

p-Tolylcyanamide (0.2 mmol), di(*p*-tolyl)iodonium triflate (1.5 eq), K₂CO₃ (3 eq), 2,2'-bipyridine (10 mmol%), CuCl (10 mmol%), and palladium catalyst (5 or 10 mmol%) were quickly added into a round bottom sidearm flask (25 mL) under nitrogen atmosphere, evacuated and backfilled with nitrogen in balloon for four times. Then, DMF (or toluene) (1.5 mL) and propargylamine (1.5 eq) were injected into the mixture, and stirred at 80 °C for 2 (6) hours under nitrogen atmosphere. The reaction was monitored by silica gel thin-layer chromatography.

Analytical data of 2-aminoimidazoles and 2-iminoimidazoles:



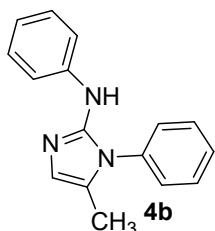
4a was prepared according to the general procedure **3A**, colorless waxy solid, 60% yield (33 mg) + 7% yield of **5a** (5 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.30 (d, *J* = 8.0 Hz, 2H), 7.16 (q, *J* = 8.0 Hz, 4 H), 7.01 (d, *J* = 4.0 Hz, 2 H), 6.61 (s, 1 H), 5.63 (br, 1 H), 2.42 (s, 3 H), 2.23 (s, 3 H), 1.97 (s, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 144.12, 139.06, 138.68, 132.10, 130.57, 129.90, 129.33, 127.53, 123.90, 121.63, 116.48, 21.08, 20.48, 10.06.

IR: 3410.35 cm⁻¹, 2924.42 cm⁻¹, 2854.77 cm⁻¹, 1606.01 cm⁻¹, 1455.11 cm⁻¹, 1248.15 cm⁻¹, 817.11 cm⁻¹, 742.12 cm⁻¹, 506.26 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₈H₂₀N₃ ([M+H]⁺): 278.1652, found 278.1651.



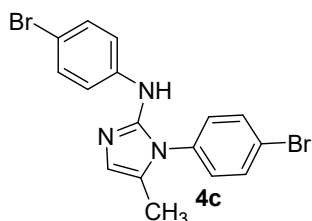
4b was prepared according to the general procedure **3A**, slightly yellow waxy solid, 60% yield (30 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.40-7.45 (m, 3 H), 7.11-7.22 (m, 6 H), 6.79 (*t*, *J* = 8.0 Hz, 1 H), 6.59 (s, 1 H), 5.62 (br, 1 H), 1.93 (s, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 143.59, 141.31, 134.88, 130.00, 129.00, 128.92, 127.78, 124.16, 122.12, 120.63, 116.27, 10.16.

IR: 3305.98 cm⁻¹, 2923.28 cm⁻¹, 2852.86 cm⁻¹, 1672.75 cm⁻¹, 1459.93 cm⁻¹, 1162.26 cm⁻¹, 1031.33 cm⁻¹, 750.56 cm⁻¹, 694.35 cm⁻¹, 498.70 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₆H₁₆N₃ ([M+H]⁺) 250.1339, found 250.1340.



4c was prepared according to the general procedure **3A**, colorless waxy solid, 44% yield (36 mg).

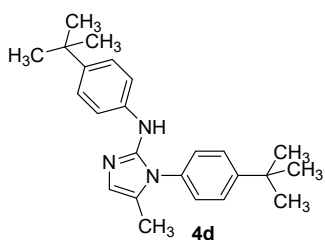
¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.65 (d, *J* = 8.0 Hz, 2 H), 7.28 (d, *J* = 12.0 Hz, 2 H), 7.10-7.16 (m, 4 H),

6.65 (s, 1 H), 2.00 (s, 3 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 142.99, 140.48, 133.75, 133.33, 131.79, 129.33, 124.56, 123.26, 122.47, 117.92, 112.86, 10.20.

IR: 3424.11 cm^{-1} , 2921.02 cm^{-1} , 2851.45 cm^{-1} , 1661.04 cm^{-1} , 1541.84 cm^{-1} , 1487.60 cm^{-1} , 1383.73 cm^{-1} , 1253.88 cm^{-1} , 1071.15 cm^{-1} , 820.78 cm^{-1} , 554.62 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{16}\text{H}_{14}\text{Br}_2\text{N}_3$ ($[\text{M}+\text{H}]^+$) 407.9529, found 407.9526.



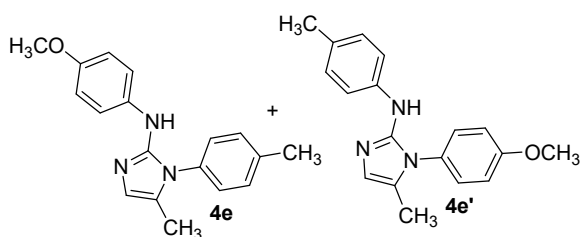
4d was prepared according to the general procedure **3A**, colorless waxy solid, 58% yield (42 mg).

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.51 (d, $J = 8.0$ Hz, 2 H), 7.18-7.22 (m, 6 H), 6.63 (s, 1 H), 2.00 (s, 3 H), 1.37 (s, 9 H), 1.26 (s, 9 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 152.10, 144.40, 143.77, 138.39, 132.05, 127.24, 126.87, 125.68, 124.05, 121.25, 116.83, 34.77, 34.01, 31.38, 31.23, 10.24.

IR: 3251.91 cm^{-1} , 2960.54 cm^{-1} , 2867.79 cm^{-1} , 1668.18 cm^{-1} , 1598.53 cm^{-1} , 1516.44 cm^{-1} , 1265.01 cm^{-1} , 1112.91 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{24}\text{H}_{32}\text{N}_3$ ($[\text{M}+\text{H}]^+$) 362.2591, found 362.2588.



4e and **4e'** were prepared according to the general procedure **3A**, slightly yellow waxy solid, 65% yield (38 mg, $4\text{e}/4\text{e}' = 1/2$).

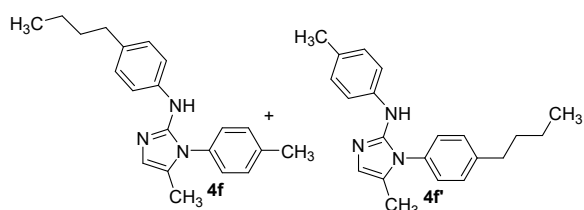
^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.31 (d, $J = 8.0$ Hz, 0.67 H), 7.15-7.23 (m, 4.08 H), 7.00-7.03 (m, 2.84 H), 6.78 (d, $J = 8.0$ Hz, 0.76 H), 6.60-6.62 (d, $J = 8.0$ Hz, 1.00 H), 5.78 (br, 1.00 H), 3.86 (s, 2.00 H), 3.74 (s, 1.00 H), 2.43 (s, 1.00 H), 2.25 (s, 2.00 H), 1.97 (s, 3.00 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 159.81, 154.24, 144.84, 144.41, 139.10, 138.63, 134.50, 132.15, 130.61, 130.04, 129.39, 129.08, 127.60, 127.25, 124.16, 123.87, 121.41, 121.27, 118.70, 116.59, 115.13, 114.24, 55.50,

21.14, 20.54, 10.11, 10.09.

IR: 3419.55 cm^{-1} , 2924.37, 2853.75 cm^{-1} , 1668.43 cm^{-1} , 1513.06 cm^{-1} , 1247.72 cm^{-1} , 1107.53 cm^{-1} , 1037.53 cm^{-1} , 831.88 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{18}\text{H}_{20}\text{N}_3\text{O}$ ($[\text{M}+\text{H}]^+$) 294.1601, found 294.1585.



4f and **4f'** were prepared according to the general procedure

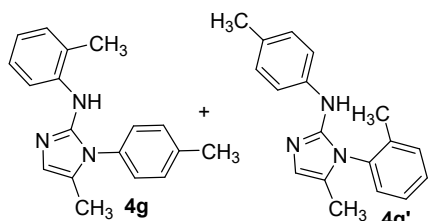
3A, colorless waxy solid, 68% yield (44 mg, **4f/4f'** = 1/1).

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.32 (d, $J = 8.0$ Hz, 1.89 H), 7.15-7.20 (m, 3.90 H), 7.02 (d, $J = 8.0$ Hz, 1.94 H), 6.63 (s, 0.93 H), 2.68 (t, $J = 8.0$ Hz, 0.98 H), 2.51 (t, $J = 8.0$ Hz, 1.05 H), 2.43 (s, 1.58 H), 2.25 (s, 1.55 H), 1.99 (s, 3.00 H), 1.62 (m, 1.17 H), 1.43 (m, 1.05 H), 1.30 (m, 2.49 H), 0.96 (t, $J = 8.0$ Hz, 1.48 H), 0.89 (t, $J = 8.0$ Hz, 1.68 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 144.30, 144.05, 139.12, 138.81, 138.66, 135.34, 132.32, 132.21, 130.62, 130.12, 129.92, 129.41, 128.82, 127.63, 127.58, 124.03, 121.66, 121.62, 116.73, 116.69, 35.26, 34.81, 33.79, 33.36, 22.36, 22.20, 21.16, 20.56, 13.91, 10.19, 10.16.

IR: 3424.02 cm^{-1} , 2925.44 cm^{-1} , 2855.81 cm^{-1} , 1598.12 cm^{-1} , 1515.52 cm^{-1} , 1379.54 cm^{-1} , 1245.99 cm^{-1} , 1115.43 cm^{-1} , 818.83 cm^{-1} , 506.69 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{21}\text{H}_{26}\text{N}_3$ ($[\text{M}+\text{H}]^+$) 320.2121, found 320.2121.



4g and **4g'** were prepared according to the general procedure **3A**, colorless

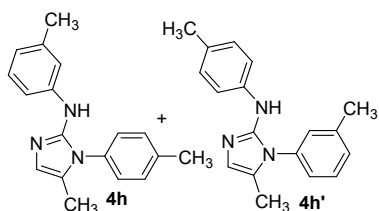
waxy solid, 56% yield (31 mg, **4g/4g'** > 10/1) was obtained for **4g**.

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.34-7.41 (m, 3.11 H), 7.19-7.22 (m, 3.03 H), 7.02 (d, $J = 8.0$ Hz, 2.01 H), 6.67 (s, 0.95 H), 5.57 (br, 0.94 H), 2.25 (s, 3.00 H), 2.05 (s, 2.98 H), 1.90 (s, 2.97 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 144.08, 138.33, 137.26, 133.48, 131.58, 130.28, 129.74, 129.39, 128.93, 127.47, 123.44, 121.53, 116.88, 20.55, 17.20, 9.78.

IR: 3290.41 cm^{-1} , 2923.45 cm^{-1} , 2854.61 cm^{-1} , 1668.28 cm^{-1} , 1549.50 cm^{-1} , 1378.11 cm^{-1} , 1246.57 cm^{-1} , 1117.01 cm^{-1} , 1042.06 cm^{-1} , 809.08 cm^{-1} , 504.09 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{17}\text{H}_{18}\text{N}_3$ ($[\text{M}+\text{H}]^+$) 278.1652, found 278.1651.



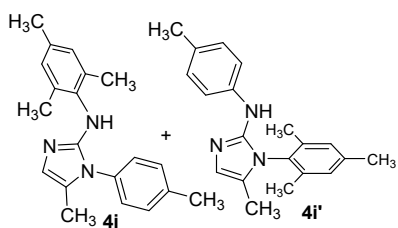
4h and **4h'** were prepared according to the general procedure **3A**, colorless waxy solid, 57% yield (32 mg, **4h/4h'** = 1.4/1).

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.40 (t, J = 8.0 Hz, 0.44 H), 7.27-7.32 (m, 1.56 H), 7.10-7.20 (m, 2.02 H), 7.01-7.08 (m, 3.45 H), 6.63-6.70 (m, 1.55 H), 5.75 (br, 0.89 H), 2.43 (s, 1.74 H), 2.41 (s, 1.25 H), 2.28 (s, 1.73 H), 2.25 (s, 1.26 H), 1.99 (s, 3.00 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 144.21, 143.81, 141.16, 140.22, 139.16, 138.77, 138.54, 134.77, 132.15, 130.62, 130.22, 129.81, 129.76, 129.40, 128.79, 128.39, 127.57, 124.80, 124.14, 123.91, 121.68, 121.57, 121.49, 116.95, 116.85, 113.56, 21.49, 21.26, 21.15, 20.55, 10.15.

IR: 3243.58 cm^{-1} , 2923.20 cm^{-1} , 2859.12 cm^{-1} , 1670.69 cm^{-1} , 1549.80 cm^{-1} , 1250.77 cm^{-1} , 1044.07 cm^{-1} , 818.52 cm^{-1} , 508.85 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{18}\text{H}_{20}\text{N}_3$ ($[\text{M}+\text{H}]^+$) 278.1652, found 278.1649.



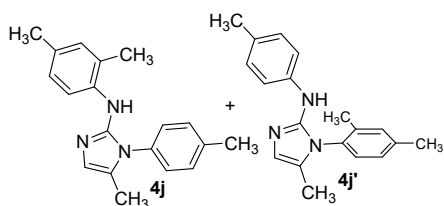
4i and **4i'** were prepared according to the general procedure **3A**, slightly yellow waxy solid, 49% yield (30 mg, **4i/4i'** < 1/10) was obtained for **4i'**.

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.24 (d, J = 8.0 Hz, 2.06 H), 7.00-7.02 (m, 4.15 H), 6.70 (s, 0.97 H), 5.76 (br, 0.93 H), 2.35 (s, 3.07 H), 2.24 (s, 3.06 H), 1.98 (s, 6.04 H), 1.86 (s, 3.00 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 143.72, 139.51, 138.00, 137.11, 130.54, 129.60, 129.49, 129.36, 122.63, 21.09, 20.58, 17.47, 9.49.

IR: 3417.60 cm^{-1} , 2922.95 cm^{-1} , 2855.32 cm^{-1} , 1598.89 cm^{-1} , 1549.68 cm^{-1} , 1375.99 cm^{-1} , 1244.52 cm^{-1} , 1041.54 cm^{-1} , 809.88 cm^{-1} , 503.07 cm^{-1} .

HRMS m/z (ES^+): calcd for $C_{20}H_{24}N_3$ ($[M+H]^+$) 306.1965, found 306.1957.



4j and **4j'** were prepared according to the general procedure **3A**, colorless

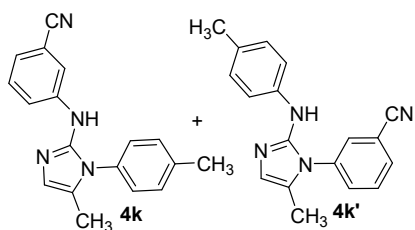
waxy solid, 55% yield (32 mg, **4j/4j'** < 1/10) was obtained for **4j'**.

1H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.24 (d, $J = 8.0$ Hz, 1.86 H), 7.20 (s, 1.01 H), 7.15 (d, $J = 8.0$ Hz, 1.14 H), 7.09 (d, $J = 8.0$ Hz, 1.19 H), 7.03 (d, $J = 8.0$ Hz, 2.13 H), 6.65 (s, 1.02 H), 2.41 (s, 3.01 H), 2.25 (s, 3.08 H), 2.00 (s, 3.13 H), 1.90 (s, 3.00 H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 139.79, 138.50, 136.90, 132.28, 130.80, 130.04, 129.41, 128.67, 128.17, 121.73, 116.58, 21.15, 20.56, 17.13.

IR: 3418.57 cm^{-1} , 2923.39 cm^{-1} , 2855.63 cm^{-1} , 1598.61 cm^{-1} , 1549.77 cm^{-1} , 1378.20 cm^{-1} , 1242.30 cm^{-1} , 1041.51 cm^{-1} , 815.38 cm^{-1} , 504.21 cm^{-1} .

HRMS m/z (ES^+): calcd for $C_{19}H_{22}N_3$ ($[M+H]^+$) 292.1808, found 292.1808.



4k and **4k'** were prepared according to the general procedure **3A**, slightly

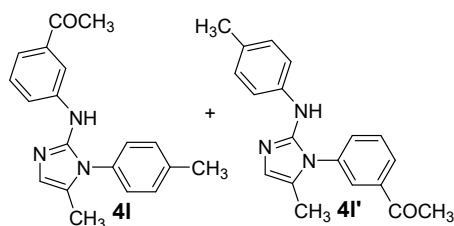
yellow waxy solid, 59% yield (34 mg, **4k/4k'** = 2.5/1).

1H NMR (400 MHz, $CDCl_3$): δ (ppm) 7.44-7.69 (m, 2.71 H), 7.20-7.32 (m, 2.32 H), 7.94-7.13 (m, 3.45 H), 6.17 (br, 0.73 H), 5.88 (br, 0.27 H), 2.41 (s, 2.16 H), 2.21 (s, 0.87 H), 1.98-1.99 (m, 3.00 H).

^{13}C NMR (100 MHz, $CDCl_3$): δ (ppm) 143.98, 142.29, 139.38, 139.07, 136.22, 132.29, 132.14, 131.74, 131.10, 130.77, 130.64, 130.39, 129.56, 129.39, 127.37, 124.99, 124.14, 123.62, 123.05, 122.03, 120.10, 118.90, 118.67, 117.32, 116.73, 113.90, 112.49, 21.08, 20.45, 10.26, 10.03.

IR: 3337.70 cm^{-1} , 2923.62 cm^{-1} , 2859.06 cm^{-1} , 2230.28 cm^{-1} , 1665.12 cm^{-1} , 1443.43 cm^{-1} , 1150.49 cm^{-1} , 1044.28 cm^{-1} , 791.31 cm^{-1} , 687.16 cm^{-1} .

HRMS m/z (ES^+): calcd for $C_{18}H_{17}N_4$ ($[M+H]^+$) 289.1448, found 289.1448.



4I and 4I' were prepared according to the general procedure 3A, slightly

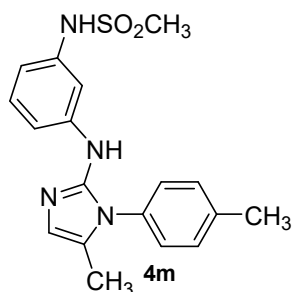
yellow waxy solid, 59% yield (37 mg, 4I/4I' = 2/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 8.01 (d, *J* = 8 Hz, 0.31 H), 7.79-7.85 (m, 1.07 H), 7.48-7.62 (m, 1.02 H), 7.40-7.46 (m, 1.09 H), 7.31-7.34 (m, 2.20 H), 7.15 (d, *J* = 8.0 Hz, 1.39 H), 7.08 (d, *J* = 8.0 Hz, 0.57 H), 6.98 (d, *J* = 8.0 Hz, 0.66 H), 6.65 (d, *J* = 8.0 Hz, 0.93 H), 2.58 (s, 1.00 H), 2.54 (s, 2.17 H), 2.43 (s, 2.09 H), 2.22 (s, 0.94 H), 1.99 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 198.38, 196.64, 149.06, 144.02, 143.21, 141.73, 139.37, 139.03, 138.67, 137.61, 136.92, 135.66, 132.20, 131.90, 130.73, 130.24, 129.42, 129.27, 128.52, 127.52, 124.45, 124.12, 122.93, 121.93, 120.65, 120.59, 116.67, 115.47, 26.63, 26.60, 20.50, 10.26, 10.07.

IR: 3261.48 cm⁻¹, 2857.47 cm⁻¹, 1600.38 cm⁻¹, 1550.98 cm⁻¹, 1443.20 cm⁻¹, 1286.62 cm⁻¹, 1176.92 cm⁻¹, 911.21 cm⁻¹, 1042.98 cm⁻¹, 815.56 cm⁻¹, 544.09 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₉H₂₀N₃O ([M+H]⁺) 306.1601, found 306.1600.



4m were prepared according to the general procedure 3A, colorless waxy solid, 39%

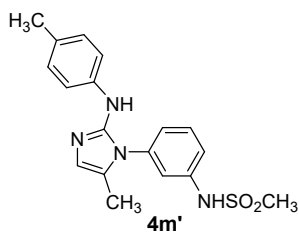
yield (28 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.27-7.32 (m, 3.12 H), 7.16 (d, *J* = 8 Hz, 1.96 H), 7.06 (t, *J* = 8 Hz, 1.16 H), 6.78 (d, *J* = 8 Hz, 1.97 H), 6.62 (s, 1.03 H), 2.77 (s, 3.06 H), 2.43 (s, 3.04 H), 1.98 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 143.07, 139.33, 138.47, 131.87, 130.61, 129.92, 127.45, 125.09, 121.64, 112.39, 111.53, 107.44, 38.66, 21.16, 10.18.

IR: 3256.08 cm⁻¹, 2924.67 cm⁻¹, 2222.35 cm⁻¹, 1549.71 cm⁻¹, 1413.27 cm⁻¹, 1328.72 cm⁻¹, 1112.41 cm⁻¹, 979.11 cm⁻¹, 732.15 cm⁻¹, 518.33 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₈H₂₁N₄O₂S ([M+H]⁺) 357.1380, found 357.1383.



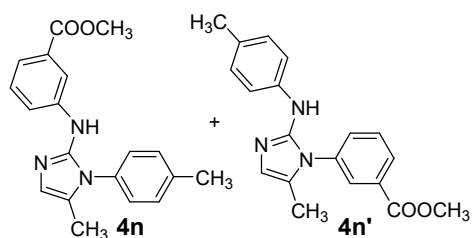
4m' were prepared according to the general procedure **3A**, colorless waxy solid, 17% yield (12 mg).

¹H NMR (400 MHz, d₆-DMSO): δ (ppm) 10.00 (s, 1.01 H), 7.82 (s, 0.96 H), 7.49 (t, *J* = 8 Hz, 1.03 H), 7.27 (d, *J* = 8 Hz, 1.15 H), 7.08-7.15 (m, 3.99 H), 6.94 (d, *J* = 8 Hz, 1.96 H), 6.59 (s, 0.97 H), 3.01 (s, 3.08 H), 2.17 (s, 2.83 H), 1.96 (s, 3.00 H).

¹³C NMR (100 MHz, d₆-DMSO): δ (ppm) 144.09, 141.17, 139.93, 136.33, 130.88, 129.38, 128.17, 124.33, 123.30, 122.36, 119.87, 118.77, 116.31, 40.60, 40.39, 40.18, 20.67, 10.68, 9.02.

IR: 3343.39 cm⁻¹, 2923.71 cm⁻¹, 1654.49 cm⁻¹, 1480.80 cm⁻¹, 1328.57 cm⁻¹, 1149.08 cm⁻¹, 968.75 cm⁻¹, 807.54 cm⁻¹, 510.16 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₈H₂₁N₄O₂S ([M+H]⁺) 357.1380, found 357.1377.



4n and **4n'** were prepared according to the general procedure **3A**,

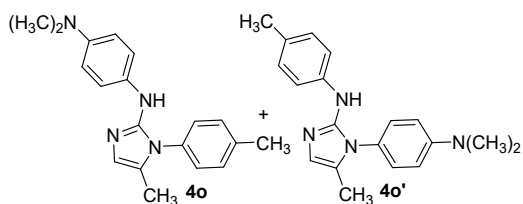
slightly yellow waxy solid, 47% yield (30 mg, **4n/4n'** = 1.2/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 8.12 (d, *J* = 8 Hz, 0.45 H), 7.95 (s, 0.42 H), 7.81 (d, *J* = 12 Hz, 0.52 H), 7.66 (d, *J* = 4 Hz, 0.50 H), 7.57-7.61 (m, 0.47 H), 7.48-7.54 (m, 1.01 H), 7.27-7.34 (m, 1.57 H), 7.11-7.17 (m, 2.00 H), 7.02 (d, *J* = 4 Hz, 0.94 H), 6.66 (s, 0.97 H), 3.93 (s, 1.39 H), 3.86 (s, 1.61 H), 2.44 (s, 1.61 H), 2.24 (s, 1.44 H), 2.00 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 167.08, 165.71, 144.11, 143.20, 141.47, 139.35, 138.72, 135.33, 132.20, 132.11, 131.92, 130.71, 130.58, 130.33, 130.07, 129.94, 129.15, 128.87, 127.52, 124.47, 124.04, 122.27, 121.87, 121.55, 120.47, 117.09, 116.85, 52.47, 52.01, 21.14, 20.53, 10.21, 10.09.

IR: 3244.15 cm⁻¹, 2923.62 cm⁻¹, 1669.71 cm⁻¹, 1551.34 cm⁻¹, 1449.09 cm⁻¹, 1330.18 cm⁻¹, 1226.68 cm⁻¹, 1109.13 cm⁻¹, 810.82 cm⁻¹, 734.18 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₉H₂₀N₃O₂ ([M+H]⁺) 322.1550, found 322.1550.



4o and **4o'** were prepared according to the general procedure **3A**,

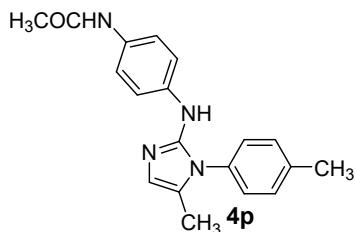
slightly yellow waxy solid, 58% yield (36 mg, **4o/4o'** = 1/5). Only ^1H NMR and ^{13}C NMR data of **4o'** was reported here.

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.20 (d, $J = 8.0$ Hz, 2.26 H), 7.10 (d, $J = 8.0$ Hz, 2.07 H), 7.01 (d, $J = 8.0$ Hz, 2.27 H), 6.76 (d, $J = 8.0$ Hz, 1.89 H), 6.59 (s, 1.03 H), 3.02 (s, 6.00 H), 2.24 (s, 3 H), 1.96 (s, 3.05 H).

^{13}C NMR (100 MHz, CDCl_3): δ (ppm) 150.61, 150.54, 144.68, 144.60, 138.46, 138.39, 130.26, 129.49, 129.41, 128.63, 128.55, 124.57, 122.44, 122.37, 120.39, 120.31, 116.98, 116.90, 112.74, 112.67, 40.32, 20.56, 10.06.

IR: 3431.94 cm^{-1} , 2923.42 cm^{-1} , 2857.42 cm^{-1} , 2217.23 cm^{-1} , 1608.09 cm^{-1} , 1523.81 cm^{-1} , 1354.81 cm^{-1} , 1231.82 cm^{-1} , 817.02 cm^{-1} , 501.70 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{19}\text{H}_{23}\text{N}_4$ ($[\text{M}+\text{H}]^+$) 307.1917, found 307.1918.



4p were prepared according to the general procedure **3A**, colorless waxy solid, 20%

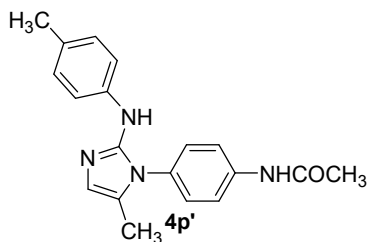
yield (13 mg).

^1H NMR (400 MHz, CDCl_3): δ (ppm) 7.30-7.33 (m, 4.17 H), 7.14-7.16 (m, 4.23 H), 6.58 (s, 1.03 H), 2.43 (s, 3.17 H), 2.07 (s, 3.07 H), 1.98 (s, 3.00 H).

^{13}C NMR (100 MHz, $d_6\text{-DMSO}$): δ (ppm) 168.50, 144.03, 139.30, 137.65, 131.98, 131.63, 130.70, 127.56, 124.30, 121.42, 121.26, 117.05, 24.17, 21.17, 10.13.

IR: 3098.97 cm^{-1} , 2924.55 cm^{-1} , 1608.44 cm^{-1} , 1515.27 cm^{-1} , 1376.76 cm^{-1} , 1246.07 cm^{-1} , 1039.63 cm^{-1} , 822.71 cm^{-1} , 759.37 cm^{-1} , 515.48 cm^{-1} .

HRMS m/z (ES^+): calcd for $\text{C}_{19}\text{H}_{21}\text{N}_4\text{O}$ ($[\text{M}+\text{H}]^+$) 321.1710, found 321.1715.



4p' were prepared according to the general procedure **3A**, colorless waxy solid,

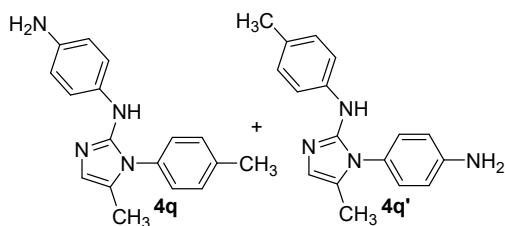
48% yield (31 mg).

¹H NMR (400 MHz, d₆-DMSO): δ (ppm) 10.14 (s, 1.04 H), 7.70 (d, *J* = 8 Hz, 2.03 H), 7.55 (s, 0.93 H), 7.23 (d, *J* = 12 Hz, 2.01 H), 7.10 (d, *J* = 8 Hz, 2.08 H), 6.91 (d, *J* = 8 Hz, 2.03), 6.55 (s, 0.97 H), 2.16 (s, 3.00 H), 2.07 (3.10 H), 1.93 (3.00 H).

¹³C NMR (100 MHz, d₆-DMSO): δ (ppm) 168.53, 143.73, 141.15, 139.28, 129.76, 128.84, 128.114, 127.29, 124.18, 121.92, 119.55, 115.51, 40.14, 24.03, 20.19, 10.18.

IR: 3423.22 cm⁻¹, 2857.45 cm⁻¹, 2125.85 cm⁻¹, 2001.46 cm⁻¹, 1542.85 cm⁻¹, 1257.45 cm⁻¹, 1005.54 cm⁻¹, 762.54 cm⁻¹, 625.06 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₉H₂₁N₄O ([M+H]⁺) 321.1710, found 321.1711.



4q and **4q'** were prepared according to the general procedure **3A**,

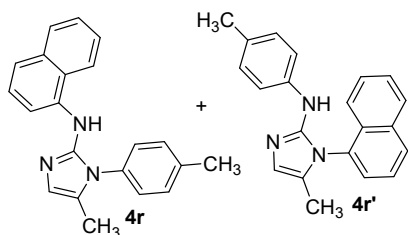
colorless waxy solid, 36% yield (20 mg, **4q/4q'** < 1/10) was obtained for **4q'**.

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.22 (d, *J* = 8 Hz, 2.27 H), 7.02-7.04 (m, 4.01 H), 6.76 (d, *J* = 8 Hz, 1.85 H), 6.60 (s, 1.21 H), 2.25 (s, 3.00 H), 1.97 (s, 3.15 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 147.19, 144.53, 138.65, 129.98, 129.42, 128.97, 124.80, 124.24, 121.12, 116.57, 115.73, 20.57, 10.07.

IR: 3415.13 cm⁻¹, 2923.21 cm⁻¹, 1613.55 cm⁻¹, 1516.74 cm⁻¹, 1382.07 cm⁻¹, 1298.58 cm⁻¹, 1040.08 cm⁻¹, 811.60 cm⁻¹, 529.85 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₁₇H₁₉N₄ ([M+H]⁺) 279.1604, found 279.1594.



4r and **4r'** were prepared according to the general procedure **3A**, colorless

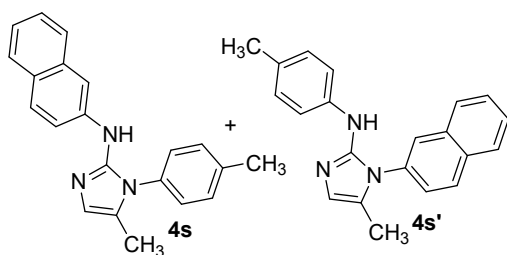
waxy solid, 54% yield (34 mg, **4r/4r'** < 1/10) was obtained for **4r'**.

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.97-8.03 (m, 2.07 H), 7.40-7.62 (m, 4.34 H), 7.61(m, 1.09 H), 7.16 (d, *J* = 8.0 Hz, 2.15 H), 6.98 (d, *J* = 8.0 Hz, 2.10 H), 6.76 (s, 1.02 H), 5.48 (br, 0.96 H), 2.22 (s, 3.05 H), 1.88 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 144.98, 138.31, 134.52, 130.06, 129.83, 129.32, 129.19, 129.05, 128.35, 127.43, 126.75, 126.17, 125.78, 124.66, 123.83, 121.50, 120.86, 116.81, 20.52, 9.73.

IR: 3416.66 cm⁻¹, 2922.23 cm⁻¹, 2856.42 cm⁻¹, 1669.80 cm⁻¹, 1550.30 cm⁻¹, 1417.92 cm⁻¹, 1245.05 cm⁻¹, 806.04 cm⁻¹, 776.54 cm⁻¹, 504.17 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₁H₂₀N₃ ([M+H]⁺) 314.1652, found 314.1646.



4s and **4s'** were prepared according to the general procedure **3A**,

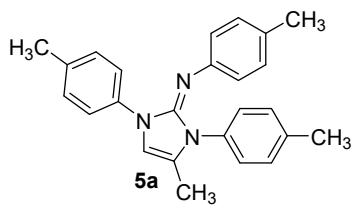
colorless waxy solid, 59% yield (37 mg, **4s/4s'** = 1/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.87-8.0 (m, 2.05 H), 7.58-7.78 (m, 3.13 H), 7.16-7.38 (m, 5.00 H), 7.01 (d, *J* = 8.0 Hz, 0.96 H), 6.71(d, *J* = 12.0 Hz, 0.96 H), 5.98 (br, 0.49 H), 5.75 (br, 0.52 H), 2.44 (s, 1.56 H), 2.25 (s, 1.41 H), 2.02-2.03 (m, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 144.40, 144.30, 143.64, 143.54, 139.36, 138.88, 138.66, 138.56, 134.55, 133.56, 132.99, 132.17, 130.78, 130.29, 129.51, 128.98, 128.72, 128.11, 127.97, 127.87, 127.67, 127.50, 127.36, 127.30, 126.98, 126.86, 126.76, 126.25, 125.37, 124.46, 124.13, 123.32, 121.93, 118.35, 116.68, 110.75, 21.15, 20.53, 10.24, 10.16.

IR: 3419.18 cm⁻¹, 3053.15 cm⁻¹, 2922.30 cm⁻¹, 1667.46 cm⁻¹, 1551.86 cm⁻¹, 1512.34 cm⁻¹, 1395.91 cm⁻¹, 815.41 cm⁻¹, 749.15 cm⁻¹, 475.63 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₁H₂₀N₃ ([M+H]⁺) 314.1652, found 314.1647.



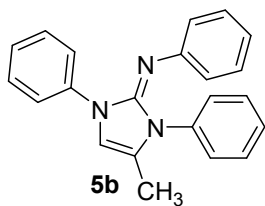
5a was prepared according to the general procedure **3B**, colorless waxy solid, 67% yield (37 mg) + 7% yield of **4a** (3 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.41 (d, *J* = 8.0 Hz, 2 H), 7.18 (d, *J* = 8.0 Hz, 2 H), 7.07 (d, *J* = 8.0 Hz, 4 H), 6.58 (m, 3 H), 6.45 (t, *J* = 8.0 Hz, 2 H), 2.17-2.28 (m, 6 H), 2.04 (s, 3 H), 1.95 (d, *J* = 4.0 Hz, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 144.23, 143.00, 138.36, 136.76, 134.37, 132.01, 129.59, 129.49, 129.03, 128.50, 127.71, 124.56, 123.71, 120.08, 112.42, 21.01, 20.90, 20.40, 10.75.

IR: 3423.09 cm⁻¹, 2923.53 cm⁻¹, 2853.23 cm⁻¹, 1632.99 cm⁻¹, 1595.22 cm⁻¹, 1510.27 cm⁻¹, 1380.42 cm⁻¹, 1108.11 cm⁻¹, 815.22 cm⁻¹, 515.66 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₅H₂₆N₃ ([M+H]⁺) 368.2121, found 368.2125.



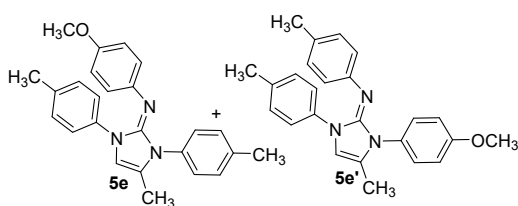
5b was prepared according to the general procedure **3B**, colorless waxy solid, 54% yield (26 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.52 (d, *J* = 8.0 Hz, 2 H), 7.10-7.30 (m, 8 H), 6.75 (t, *J* = 8.0 Hz, 2 H), 6.52 (d, *J* = 8.0 Hz, 2 H), 6.42-6.46 (m, 2 H), 1.89 (s, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 149.00, 145.25, 138.35, 136.20, 128.72, 128.68, 128.20, 127.81, 127.34, 125.41, 123.15, 122.59, 121.69, 118.77, 110.34, 11.09.

IR: 3448.42 cm⁻¹, 3056.81 cm⁻¹, 2924.68 cm⁻¹, 1624.51 cm⁻¹, 1567.51 cm⁻¹, 1494.27 cm⁻¹, 1400.80 cm⁻¹, 1200.89 cm⁻¹, 757.79 cm⁻¹, 690.75 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₂H₂₀N₃ ([M+H]⁺) 326.1652, found 326.1651.



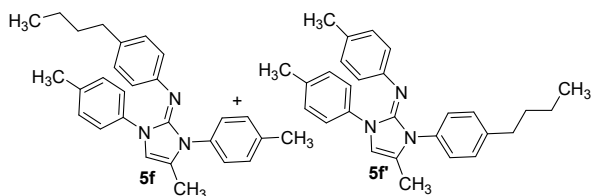
5e and **5e'** were prepared according to the general procedure **3B**, slightly yellow waxy solid, 61% yield (35 mg, **5e/5e'** = 1/2).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.35 (t, *J* = 8.0 Hz, 2.09 H), 7.07-7.09 (m, 4.81 H), 6.73 (d, *J* = 8.0 Hz, 1.39 H), 6.58 (d, *J* = 8.0 Hz, 1.38 H), 6.33-6.45 (m, 3.74 H), 3.74 (s, 2.04 H), 3.59 (s, 0.98 H), 2.28-2.29 (m, 4.19 H), 2.06 (s, 2.02 H), 1.86-1.87 (m, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 158.73, 153.05, 149.39, 145.48, 145.38, 145.28, 145.20, 141.95, 141.87, 137.38, 135.73, 135.59, 135.56, 135.51, 135.45, 133.46, 133.38, 129.42, 129.39, 129.35, 129.31, 128.69, 128.42, 128.10, 128.01, 123.50, 123.35, 123.21, 122.79, 122.61, 121.44, 121.36, 114.00, 113.50, 110.66, 55.70, 55.42, 20.99, 20.88, 20.44, 10.89, 10.84.

IR: 2924.20 cm⁻¹, 2853.79 cm⁻¹, 1631.33 cm⁻¹, 1510.59 cm⁻¹, 1401.82 cm⁻¹, 1247.61 cm⁻¹, 1033.15 cm⁻¹, 820.39 cm⁻¹, 525.83 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₅H₂₆N₃O ([M+H]⁺) 384.2070, found 384.2053.



5f and **5f'** were prepared according to the general procedure

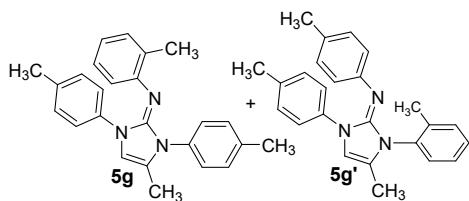
3B, colorless waxy solid, 68% yield (42 mg, **5f/5f'** = 1/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.43 (d, *J* = 8.0 Hz, 0.96 H), 7.35 (*J* = 8.0 Hz, 1.02 H), 6.96-7.08 (m, 6.43 H), 6.54-6.57 (m, 2.00 H), 6.36-6.44 (m, 3.00 H), 2.51 (*t*, *J* = 8.0 Hz, 1.12 H), 2.26-2.33 (m, 5.70 H), 2.04 (s, 1.52 H), 1.87 (s, 3.00 H), 1.50 (sept, 1.16 H), 1.19-1.39 (m, 3.57 H), 0.88-0.93 (m, 3.36 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 146.22, 145.95, 145.36, 145.22, 137.20, 135.87, 135.22, 135.21, 135.15, 133.67, 133.57, 133.33, 133.27, 129.34, 129.30, 129.25, 128.58, 128.31, 128.08, 128.01, 127.89, 127.73, 127.66, 123.33, 123.26, 123.19, 122.68, 122.65, 121.60, 121.54, 110.48, 110.31, 35.14, 34.75, 34.26, 33.68, 21.98, 20.98, 20.89, 20.87, 20.45, 14.01, 13.94, 10.98, 10.96.

IR: 2924.89 cm⁻¹, 2859.45 cm⁻¹, 1592.93 cm⁻¹, 1511.06 cm⁻¹, 1397.11 cm⁻¹, 1202.82 cm⁻¹, 1035.25 cm⁻¹, 819.28 cm⁻¹, 517.31 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₈H₃₂N₃ ([M+H]⁺) 410.2591, found 410.2592.



5g and **5g'** were prepared according to the general procedure **3B**,

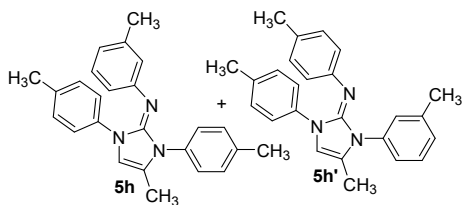
colorless waxy solid, 63% yield (35 mg, **5g/5g'** = 2/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.39-7.44 (m, 2.03 H), 6.96-7.13 (m, 6.19 H), 6.71 (d, *J* = 8.0 Hz, 0.32 H), 6.55 (d, *J* = 8.0 Hz, 1.73 H), 6.33-6.45 (m, 3.06 H), 2.30 (s, 3.00 H), 2.26 (s, 0.98 H), 2.17 (s, 2.03 H), 2.10 (s, 0.99 H), 2.04 (s, 2.07 H), 1.84 (s, 0.82 H), 1.75 (s, 2.02 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 147.66, 146.07, 144.82, 144.19, 137.05, 136.92, 135.97, 135.12, 134.97, 134.86, 133.53, 130.51, 129.19, 129.06, 129.01, 128.97, 128.12, 128.09, 127.82, 123.21, 123.02, 122.31, 122.17, 122.10, 121.63, 119.29, 110.04, 109.95, 20.96, 20.87, 20.44, 18.73, 17.82, 10.92, 10.49.

IR: 3447.08 cm⁻¹, 2959.71 cm⁻¹, 2921.78 cm⁻¹, 1616.66 cm⁻¹, 1579.44 cm⁻¹, 1537.39 cm⁻¹, 1454.44 cm⁻¹, 1259.89 cm⁻¹, 1081.64 cm⁻¹, 800.76 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₅H₂₆N₃ ([M+H]⁺) 368.2121, found 368.2121.



5h and **5h'** were prepared according to the general procedure **3B**,

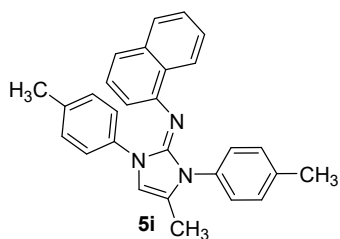
slightly yellow waxy solid, 73% yield (40 mg, **5h/5h'** = 1.3/1).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.34-7.38 (m, 2.15 H), 6.93-7.12 (m, 6.49 H), 6.69 (t, *J* = 8.0 Hz, 0.61 H), 6.57 (d, *J* = 8.0 Hz, 0.85 H), 6.38-6.58 (m, 2.32 H), 6.28 (m, 1.08 H), 2.28-2.29 (m, 3.00 H), 2.26 (s, 1.71 H), 2.20 (s, 1.22 H), 2.05 (s, 1.26 H), 1.98 (s, 1.62 H), 1.88-1.89 (m, 2.83 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 148.16, 145.75, 145.30, 145.23, 138.52, 137.33, 136.88, 135.74, 135.63, 135.43, 135.33, 133.30, 129.24, 129.20, 129.18, 129.11, 128.33, 128.18, 128.06, 128.00, 127.81, 127.66, 123.28, 118.60, 110.71, 110.63, 20.99, 20.94, 20.86, 20.41, 10.92, 10.88.

IR: 3421.75 cm⁻¹, 2992.89 cm⁻¹, 2854.09 cm⁻¹, 1589.80 cm⁻¹, 1401.75 cm⁻¹, 1206.86 cm⁻¹, 815.01 cm⁻¹, 742.28 cm⁻¹, 517.57 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₅H₂₆N₃ ([M+H]⁺) 368.2121, found 368.2113.



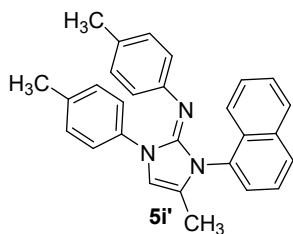
5i was prepared according to the general procedure **3B**, colorless waxy solid, 17% yield (10 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 8.09-8.12 (m, 1 H), 7.52-7.56 (m, 1 H), 7.44 (d, *J* = 8.0 Hz, 2 H), 7.29-7.33 (m, 2 H), 6.93-7.03 (m, 3 H), 6.74-6.86 (m, 3 H), 6.51 (d, *J* = 8.0 Hz, 2 H), 6.50 (d, *J* = 4.0 Hz, 1 H), 6.39 (s, 1 H), 2.27 (s, 3 H), 2.15 (s, 3 H), 1.84 (s, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 145.69, 145.00, 137.07, 135.85, 135.18, 134.20, 133.09, 129.12, 128.71, 127.68, 127.30, 125.53, 124.77, 124.45, 123.76, 123.20, 122.35, 118.98, 116.90, 20.88, 20.86, 10.85.

IR: 2923.15 cm⁻¹, 2855.77 cm⁻¹, 1598.97 cm⁻¹, 1510.97 cm⁻¹, 1404.69 cm⁻¹, 1204.20 cm⁻¹, 1103.37 cm⁻¹, 817.73 cm⁻¹, 773.94 cm⁻¹, 505.90 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₈H₂₆N₃ ([M+H]⁺) 404.2121, found 404.2121.



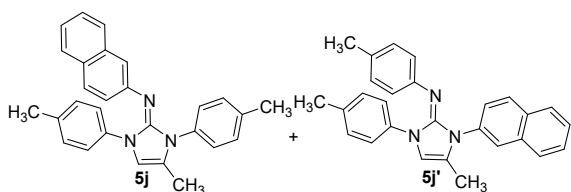
5i' was prepared according to the general procedure **3B**, colorless waxy solid, 41% yield (25 mg).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.61-7.74 (m, 3 H), 7.52 (d, *J* = 8.0 Hz, 2 H), 7.41-7.49 (m, 2 H), 7.22-7.28 (m, 2 H), 7.15 (d, *J* = 8.0 Hz, 2 H), 6.52 (d, *J* = 4.0 Hz, 1 H), 6.27 (d, *J* = 8.0 Hz, 2 H), 6.21 (d, *J* = 8.0 Hz, 2 H), 2.33 (s, 3 H), 1.91 (s, 3 H), 1.72 (s, 3 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 145.64, 145.43, 136.02, 135.13, 134.09, 132.81, 131.14, 129.43, 128.46, 128.34, 128.17, 128.05, 127.74, 126.81, 126.15, 125.13, 123.46, 123.07, 122.98, 121.82, 110.19, 20.99, 20.39, 10.42.

IR: 2923.15 cm⁻¹, 2855.77 cm⁻¹, 1598.97 cm⁻¹, 1510.97 cm⁻¹, 1404.69 cm⁻¹, 1204.20 cm⁻¹, 1103.37 cm⁻¹, 817.73 cm⁻¹, 773.94 cm⁻¹, 505.90 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₈H₂₆N₃ ([M+H]⁺) 404.2121, found 404.2121.



5j and **5j'** were prepared according to the general procedure **3B**,

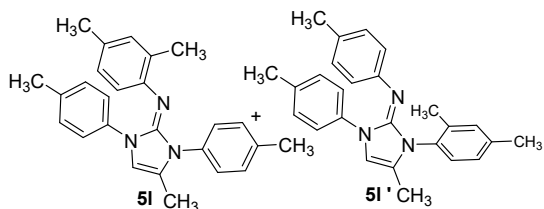
colorless waxy solid, 63% yield (38 mg, **5j/5j'** = 1/1.3).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.58-7.78 (m, 1.42 H), 7.51 (s, 0.45 H), 7.30-7.50 (m, 4.76 H), 7.19-7.24 (m, 2.58 H), 7.02-7.11 (m, 1.19 H), 6.91 (d, *J* = 8.0 Hz, 1.19 H), 6.79-6.84 (m, 1.13 H), 6.76-6.69 (m, 1.12 H), 6.41-6.43 (m, 2.74 H), 2.29 (s, 1.38 H), 2.19 (s, 1.60 H), 2.07 (s, 1.57 H), 1.89 (m, 3.00 H), 1.82 (s, 1.34 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 147.07, 146.20, 145.88, 145.48, 137.45, 135.95, 135.81, 135.52, 135.26, 134.38, 133.74, 133.47, 133.09, 132.19, 129.32, 128.55, 128.26, 128.22, 128.13, 127.90, 127.85, 127.52, 127.19, 127.12, 127.07, 126.28, 126.20, 126.17, 120.05, 124.88, 123.93, 123.34, 122.67, 122.46, 121.63, 116.60, 110.79, 110.64, 20.98, 20.89, 20.29, 11.17, 11.04.

IR: 3421.75 cm⁻¹, 2922.89 cm⁻¹, 2854.09 cm⁻¹, 1589.80 cm⁻¹, 1401.75 cm⁻¹, 1206.86 cm⁻¹, 815.01 cm⁻¹, 742.28 cm⁻¹, 517.57 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₈H₂₆N₃ ([M+H]⁺) 404.2121, found 404.2114.



5l and **5l'** were prepared according to the general procedure **3B**,

colorless waxy solid, 61% yield (35 mg, **5l/5l'** = 1/3.7).

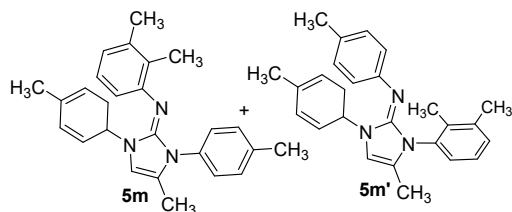
¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.42 (d, *J* = 8.0 Hz, 0.41 H), 7.36 (d, *J* = 8.0 Hz, 1.53 H), 7.05-7.08 (m, 2.03 H), 6.95-7.00 (m, 1.66 H), 6.87-6.89 (m, 1.55 H), 6.51-6.56 (m, 1.76 H), 6.42 (d, *J* = 8.0 Hz, 1.53 H), 6.28-6.35 (m, 1.38 H), 2.29-2.30 (m, 3.12 H), 2.25-2.26 (m, 3.00 H), 2.12 (s, 2.34 H), 2.04-2.06 (m, 3.51 H), 1.83 (s, 0.56 H), 1.75 (s, 2.26 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 146.12, 144.94, 144.86, 144.16, 138.03, 136.98, 136.48, 136.02, 134.93, 134.76, 133.57, 132.45, 131.17, 129.53, 129.14, 129.02, 128.92, 128.64, 128.57, 128.02, 127.85, 127.85, 126.90, 125.70, 123.24, 123.05, 122.34, 122.31, 122.01, 121.65, 109.91, 109.86, 20.93, 20.85, 20.43, 18.62, 17.73, 10.90, 10.47.

IR: 2921.17, 2859.39 cm⁻¹, 1631.82 cm⁻¹, 1509.12 cm⁻¹, 1397.13 cm⁻¹, 1157.64 cm⁻¹, 1036.83 cm⁻¹, 817.20 cm⁻¹,

514.78 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₆H₂₈N₃ ([M+H]⁺) 382.2278, found 382.2275.



5m and **5m'** were prepared according to the general procedure **3B**,

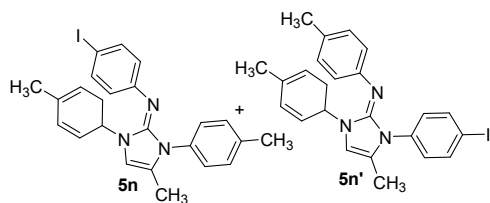
slightly yellow waxy solid, 57% yield (32 mg, **5m/5m'** = 1/1.4).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.39-7.42 (m, 1.96 H), 7.03-7.07 (m, 2.14 H), 6.90-6.97 (m, 3.40 H), 6.46-6.50 (m, 1.62 H), 6.28-6.39 (m, 3.04 H), 2.27 (s, 3.00 H), 2.22 (s, 1.36 H), 2.11 (s, 1.89 H), 1.99-2.00 (m, 3.63 H), 1.94 (s, 2.47 H), 1.80 (s, 1.19 H), 1.74 (s, 1.71 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 147.81, 146.05, 144.99, 144.26, 137.74, 136.95, 136.11, 136.08, 135.83, 135.47, 135.19, 134.91, 134.72, 133.53, 129.42, 129.23, 129.01, 128.73, 128.05, 127.92, 127.85, 127.61, 127.22, 125.64, 124.56, 123.11, 123.00, 122.51, 122.07, 121.65, 121.24, 120.34, 109.76, 20.93, 20.89, 20.42, 20.06, 14.44, 10.91, 10.49.

IR: 3421.73 cm⁻¹, 2923.04 cm⁻¹, 1599.49 cm⁻¹, 1412.91 cm⁻¹, 1470.55 cm⁻¹, 1400.34 cm⁻¹, 1209.06 cm⁻¹, 816.35 cm⁻¹, 714.78 cm⁻¹, 521.26 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₆H₂₈N₃ ([M+H]⁺) 382.2286, found 382.2278.



5n and **5n'** were prepared according to the general procedure **3B**,

slightly yellow waxy solid, 65% yield (47 mg, **5n/5n'** = 1.5/1).

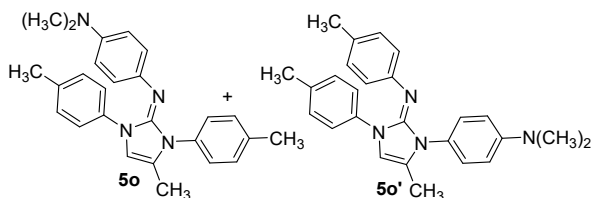
¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.52 (d, *J* = 8.0 Hz, 0.80 H), 7.30-7.34 (m, 2.07 H), 6.97-7.09 (m, 5.90 H), 6.89 (d, *J* = 8.0 Hz, 0.81 H), 6.58 (d, *J* = 8.0 Hz, 0.79 H), 6.36-6.39 (m, 1.76 H), 6.24-6.26 (m, 1.23 H), 2.31-2.32 (d, *J* = 4.0 Hz, 3.78 H), 2.29 (s, 1.23 H), 2.10 (s, 1.22 H), 1.88-1.89 (m, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 149.05, 145.58, 145.54, 144.73, 137.77, 136.38, 135.89, 135.79, 135.58, 135.52, 135.48, 133.16, 130.01, 129.50, 129.39, 129.30, 128.65, 128.46, 127.86, 123.94, 123.40, 123.31, 122.65, 121.91, 121.54, 111.13, 110.66, 92.39, 80.13, 21.10, 20.95, 20.91, 20.54, 10.99, 10.92.

IR: 3448.71 cm⁻¹, 2922.36 cm⁻¹, 2854.76 cm⁻¹, 1626.73 cm⁻¹, 1566.05 cm⁻¹, 1513.01 cm⁻¹, 1403.18 cm⁻¹, 1201.13

cm⁻¹, 1040.53 cm⁻¹, 817.97 cm⁻¹, 710.84 cm⁻¹, 520.18 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₄H₂₃N₃ ([M+H]⁺) 480.0931, found 480.0923.



5o and **5o'** were prepared according to the general procedure

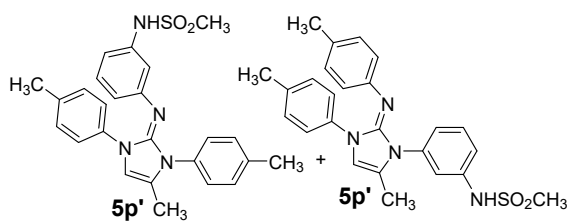
3B, slightly yellow waxy solid, 69% yield (41 mg, **5o/5o'** = 1/5).

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.39 (d, *J* = 12.0 Hz, 2.05 H), 7.06 (d, *J* = 8.0 Hz, 2.14 H), 6.96-7.00 (m, 2.42 H), 6.50-6.56 (m, 3.49 H), 6.40 (d, *J* = 8.0 Hz, 2.08 H), 6.29-6.34 (m, 1.39 H), 2.88 (s, 5.14 H), 2.65 (s, 0.98 H), 2.28 (s, 3.11 H), 2.26 (s, 0.58 H), 2.05 (s, 2.56 H), 1.86 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 149.72, 146.51, 145.57, 144.98, 141.05, 136.70, 136.14, 136.05, 134.88, 134.70, 133.88, 129.16, 129.11, 128.91, 128.15, 128.08, 127.35, 125.23, 123.13, 123.07, 122.44, 122.25, 121.60, 115.11, 112.36, 110.09, 109.74, 42.61, 40.65, 20.99, 20.87, 20.47, 10.02, 10.91.

IR: 3536.18 cm⁻¹, 2922.33 cm⁻¹, 2857.09 cm⁻¹, 1594.69 cm⁻¹, 1513.99 cm⁻¹, 1213.72 cm⁻¹, 1045.96 cm⁻¹, 816.80 cm⁻¹, 522.11 cm⁻¹.

HRMS *m/z* (ES⁺): calcd for C₂₆H₂₉N₄ ([M+H]⁺) 397.2387, found 397.2387.



5p and **5p'** were prepared according to the general procedure

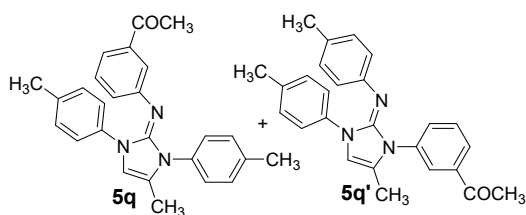
3B, colorless waxy solid, 40% yield (27 mg, **5p/5p'** < 1/5) was obtained for **5p'**.

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.27 (s, 1.03 H), 7.17-7.19 (m, 0.96 H), 7.11 (d, *J* = 8 Hz, 2.02 H), 6.94-6.99 (m, 4.03 H), 6.62 (d, *J* = 8 Hz, 2.00 H), 6.55 (d, *J* = 8 Hz, 2.01 H), 6.38 (s, 0.97 H), 2.69 (s, 2.90 H), 2.24 (s, 2.99 H), 2.05 (s, 3.09 H), 1.89 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 145.40, 143.08, 140.47, 136.91, 135.09, 134.48, 130.07, 129.74, 129.23, 128.77, 124.40, 124.07, 122.87, 121.20, 120.76, 120.68, 112.68, 39.14, 20.90, 20.48, 10.57.

IR: 2924.19 cm⁻¹, 1596.88 cm⁻¹, 1512.07 cm⁻¹, 1402.94 cm⁻¹, 1330.49 cm⁻¹, 1153.51 cm⁻¹, 970.98 cm⁻¹, 798.56 cm⁻¹, 697.28 cm⁻¹, 519.55 cm⁻¹.

HRMS m/z (ES^+): calcd for $C_{25}H_{27}N_4O_2S$ ($[M+H]^+$) 447.1849, found 447.1849.



5q and **5q'** were prepared according to the general procedure **3B**,

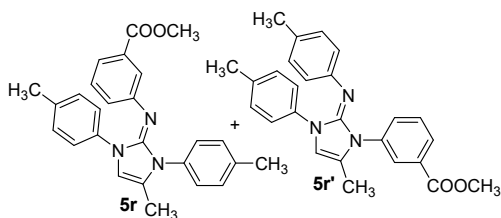
colorless waxy solid, 42% yield (25mg, **5q/5q'** > 5/1) was obtained for **5q**.

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.34 (d, $J = 8$ Hz, 2.03 H), 6.98-7.08 (m, 8.21 H), 6.88 (t, $J = 8$ Hz, 1.04 H), 6.81 (d, $J = 4$ Hz, 1.00 H), 6.41 (s, 0.97 H), 2.38 (s, 2.91 H), 2.27 (s, 3.10 H), 2.25 (s, 3.13 H), 1.91 (s, 3.00 H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) 198.89, 149.26, 145.85, 137.73, 136.52, 135.96, 135.45, 133.17, 129.51, 129.42, 128.04, 127.87, 126.50, 123.60, 122.97, 121.00, 118.62, 111.02, 26.59, 21.03, 20.95, 10.93.

IR: 2923.24 cm⁻¹, 1567.12 cm⁻¹, 1514.49 cm⁻¹, 1403.38 cm⁻¹, 1194.99 cm⁻¹, 816.57 cm⁻¹, 692.65 cm⁻¹, 521.29 cm⁻¹.

HRMS m/z (ES^+): calcd for $C_{26}H_{26}N_3O$ ($[M+H]^+$) 396.2070, found 396.2076.



5r and **5r'** were prepared according to the general procedure **3B**,

colorless waxy solid, 49% yield (30 mg, **5r/5r'** = 2/1)

¹H NMR (400 MHz, CDCl₃): δ (ppm) 7.76-7.82 (m, 0.62 H), 7.42 (d, $J = 4$ Hz, 0.63 H), 7.33-7.36 (m, 1.72 H), 7.24-7.28 (m, 0.55 H), 7.08-7.12 (m, 4.84 H), 7.01 (d, $J = 4$ Hz, 1.42 H), 6.82 (m, 0.72 H), 6.73 (d, $J = 12$ Hz, 0.70 H), 6.52 (d, $J = 8$ Hz, 0.64 H), 6.39 (d, $J = 8$ Hz, 1.62 H), 3.90 (s, 0.9 H), 3.81 (s, 2.01 H), 2.30 (s, 1.16 H), 2.27 (s, 2.25 H), 2.24 (s, 2.17 H), 2.01 (s, 0.95 H), 1.88 (d, $J = 8$ Hz, 3.00 H).

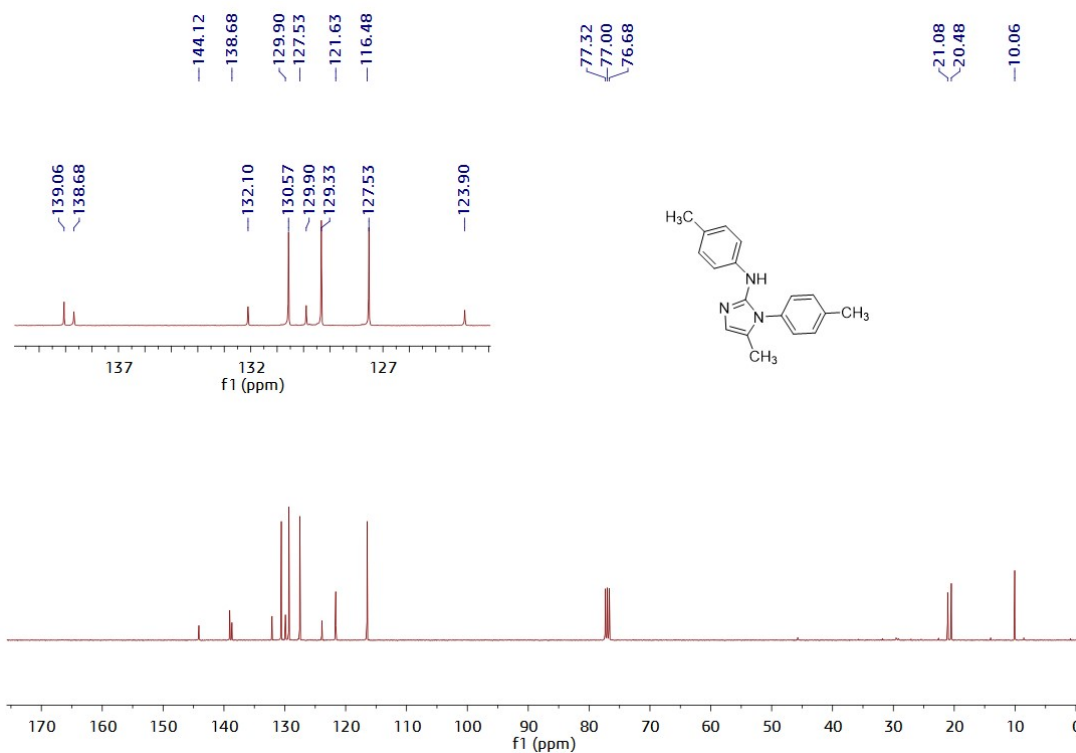
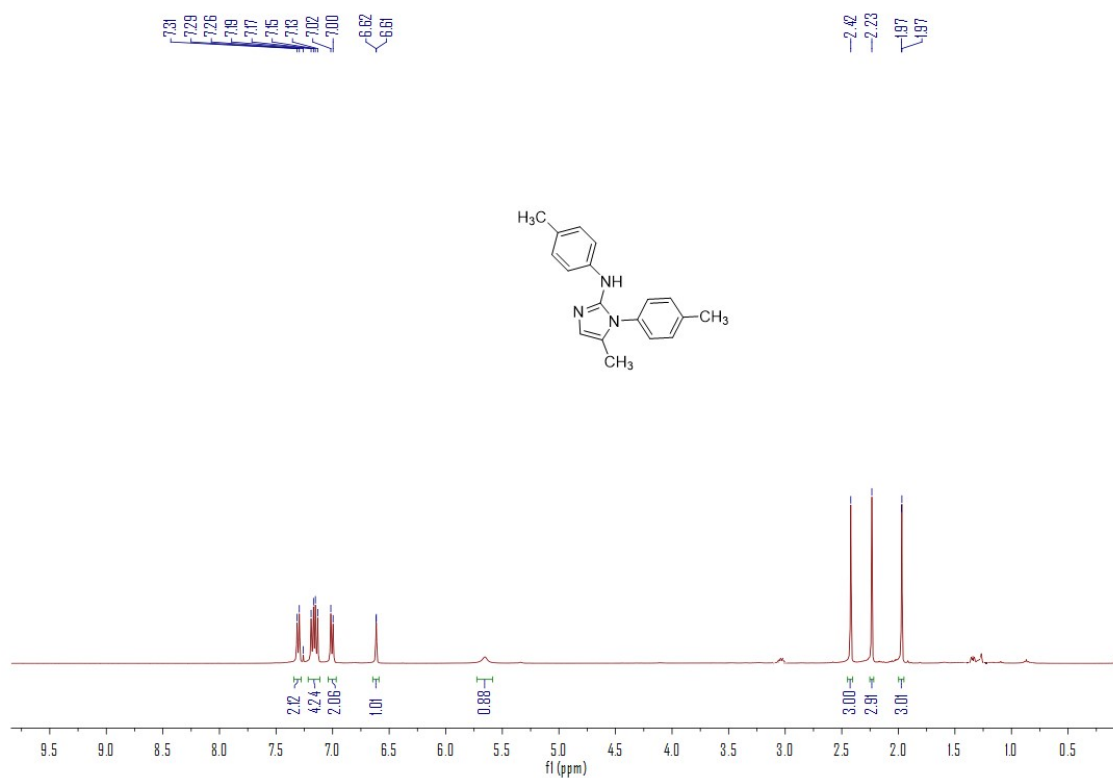
¹³C NMR (100 MHz, CDCl₃): δ (ppm) 167.65, 166.11, 149.24, 145.90, 145.78, 144.97, 137.54, 136.46, 135.70, 135.65, 135.51, 135.31, 133.22, 132.56, 130.59, 129.38, 129.31, 129.12, 128.37, 128.19, 127.85, 127.71, 126.24, 123.50, 123.20, 122.20, 121.97, 121.63, 119.50, 110.95, 110.74, 52.16, 51.60, 20.95, 20.88, 20.38, 10.99, 10.88.

IR: 2923.29 cm⁻¹, 1568.73 cm⁻¹, 1513.78 cm⁻¹, 1357.94 cm⁻¹, 1282.14 cm⁻¹, 1103.89 cm⁻¹, 815.97 cm⁻¹, 732.39 cm⁻¹, 522.01 cm⁻¹.

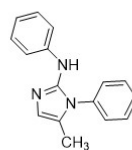
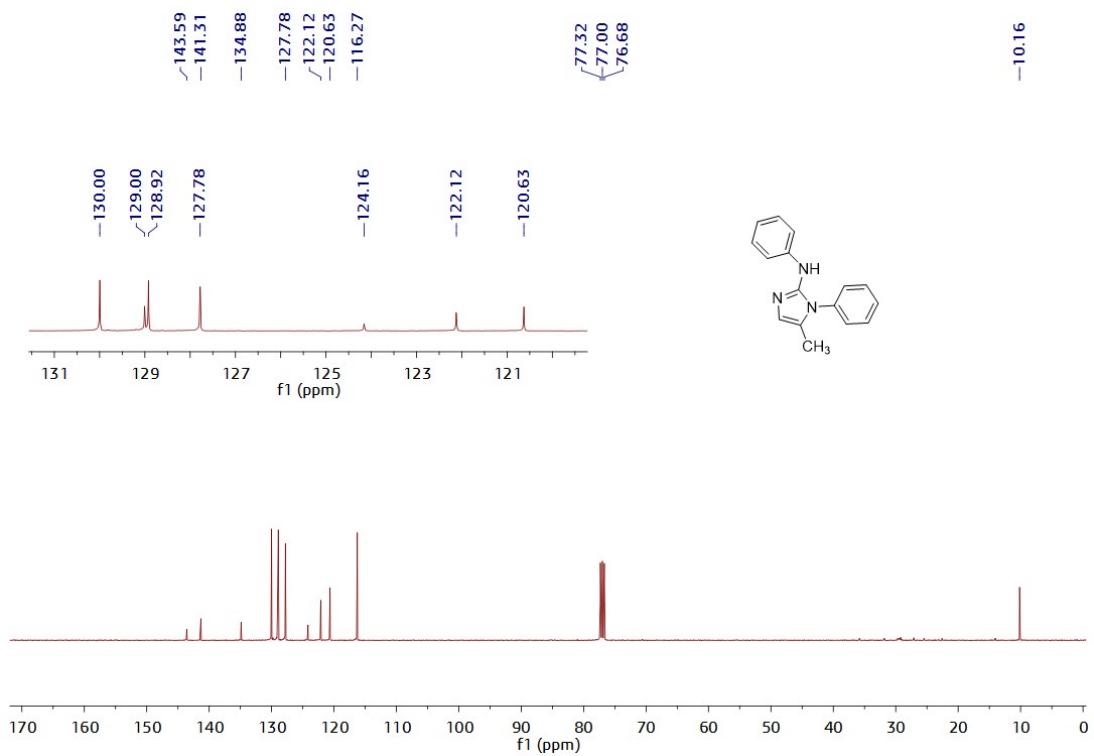
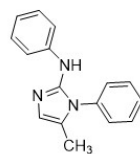
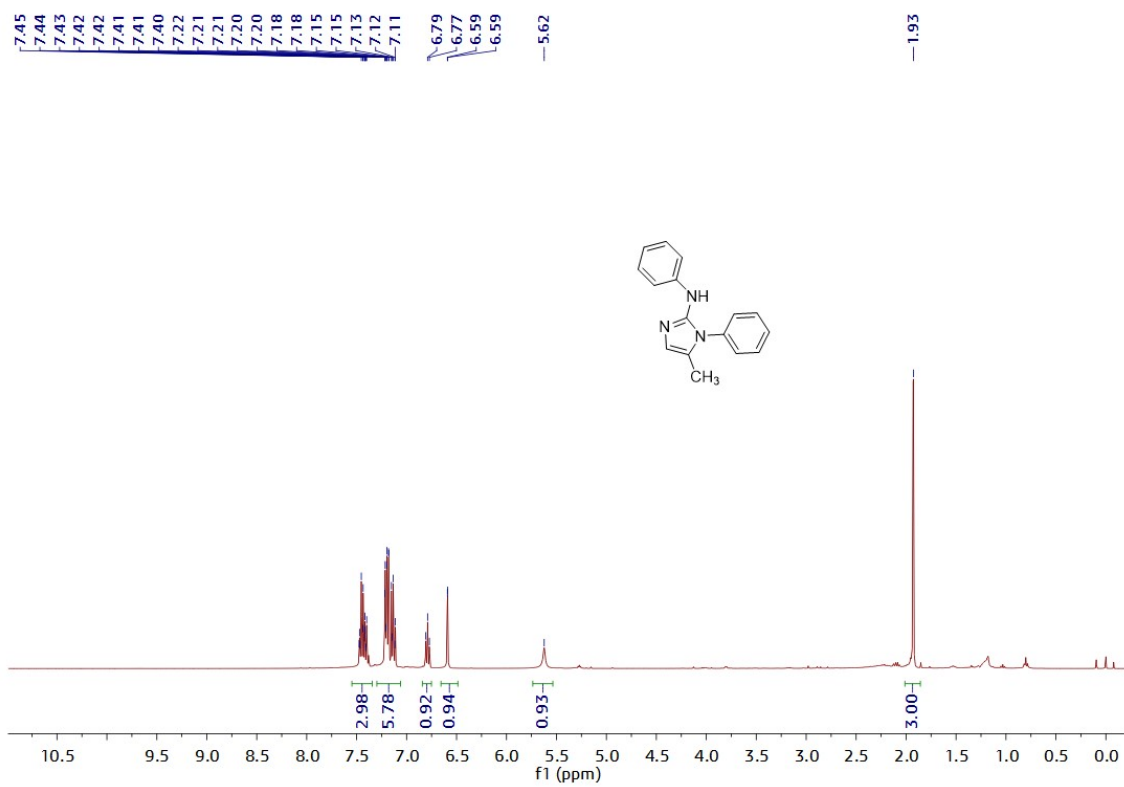
HRMS m/z (ES^+): calcd for $C_{26}H_{26}N_3O_2$ ($[M+H]^+$) 412.2020, found 412.2020.

NMR spectra of 2-aminoimidazoles and 2-iminoimidazoles:

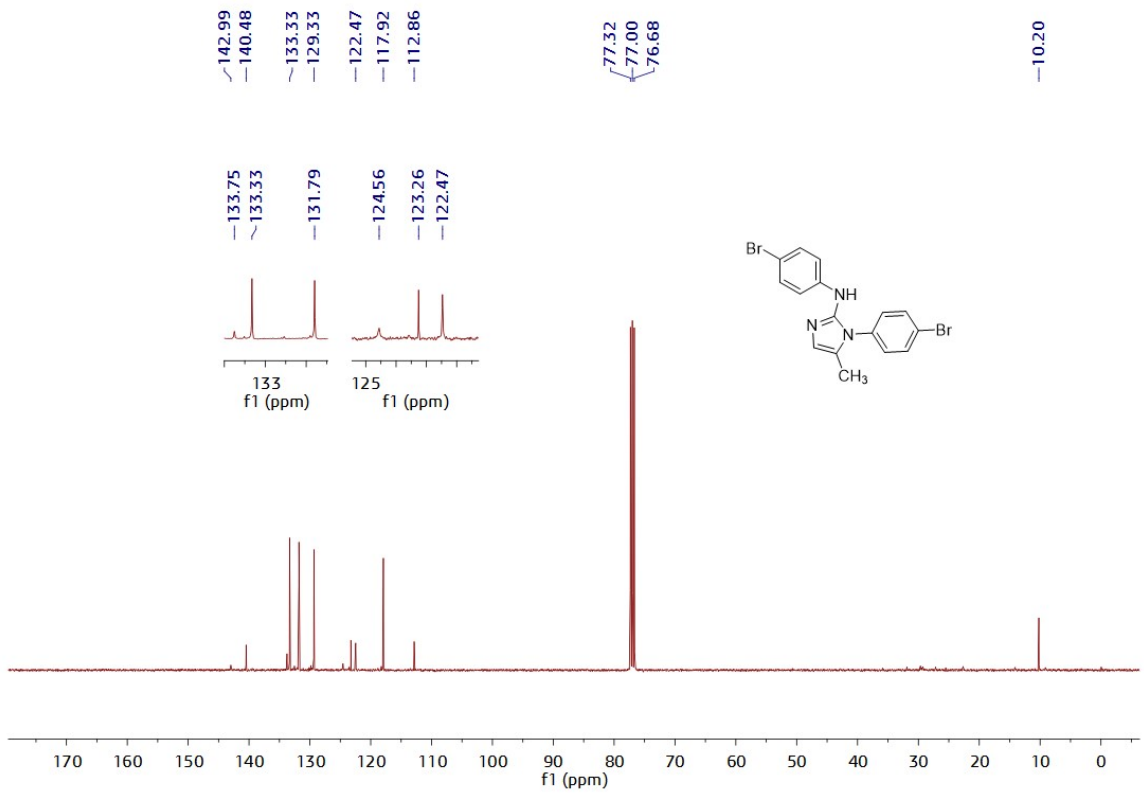
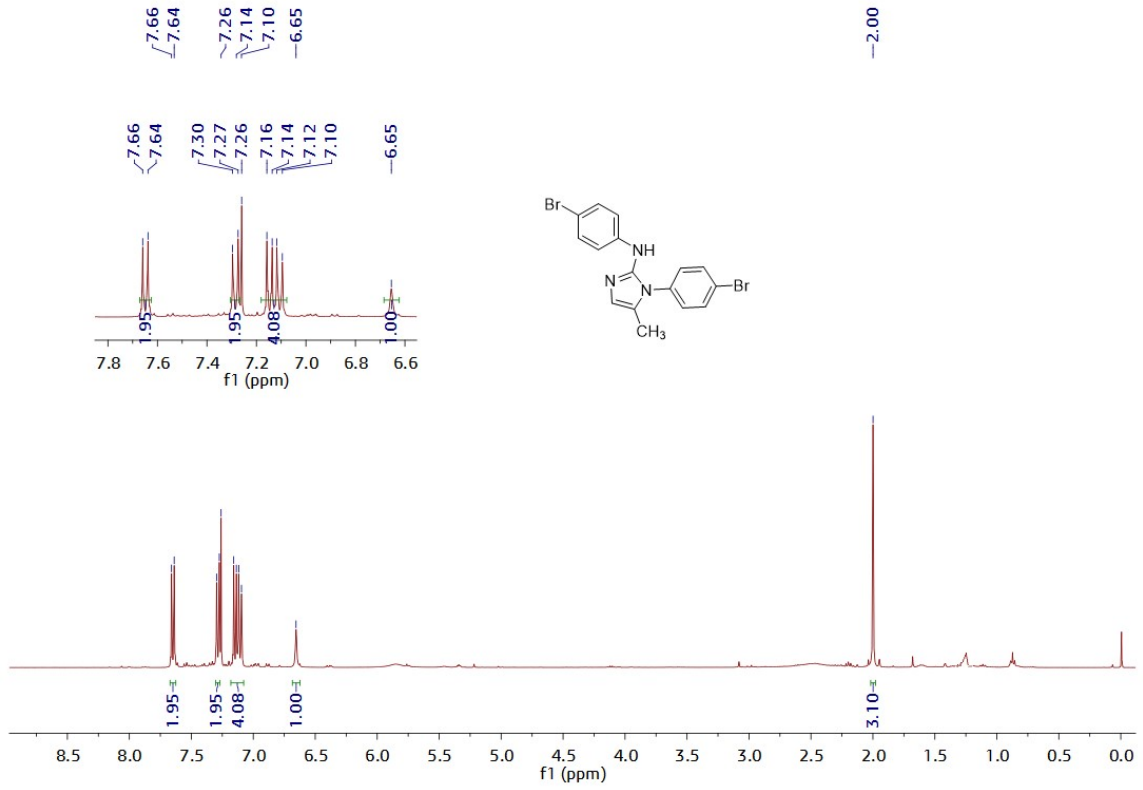
4a:



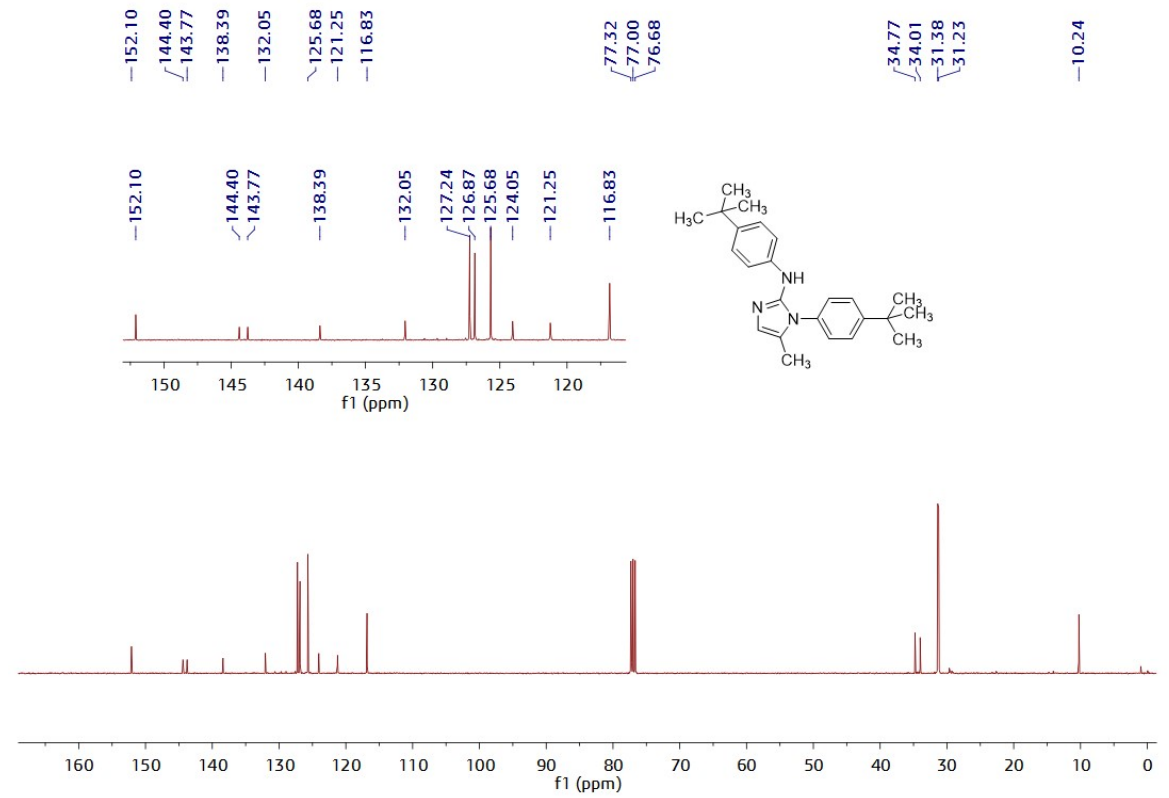
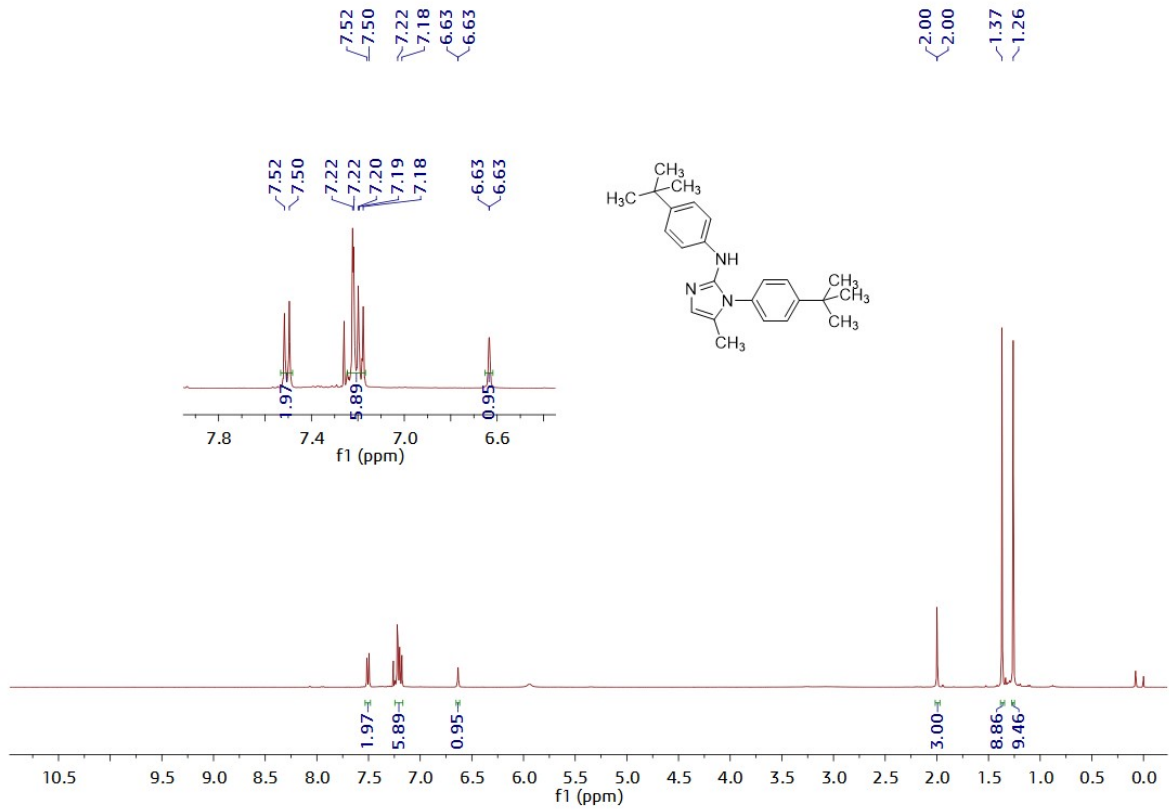
4b:



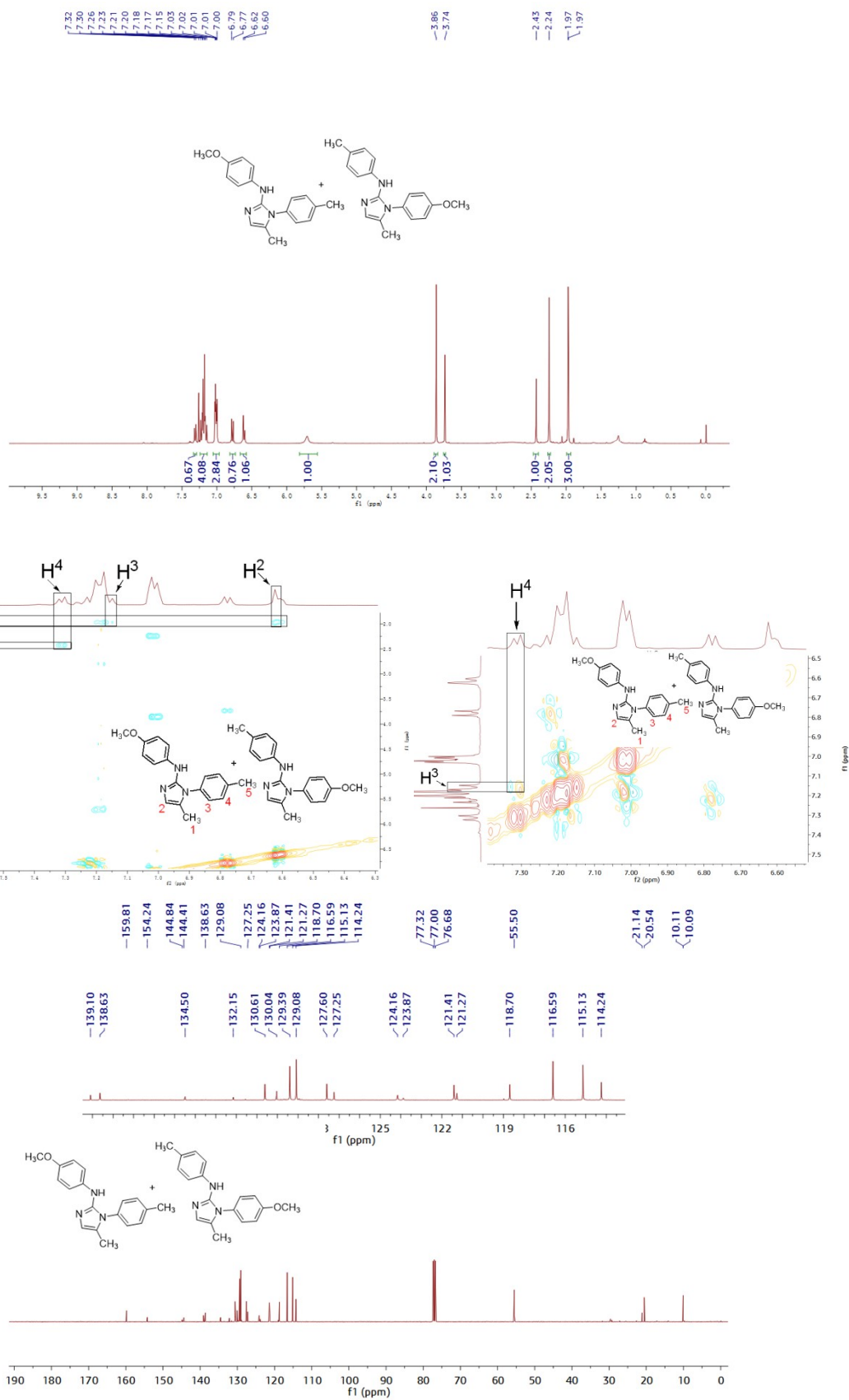
4c:



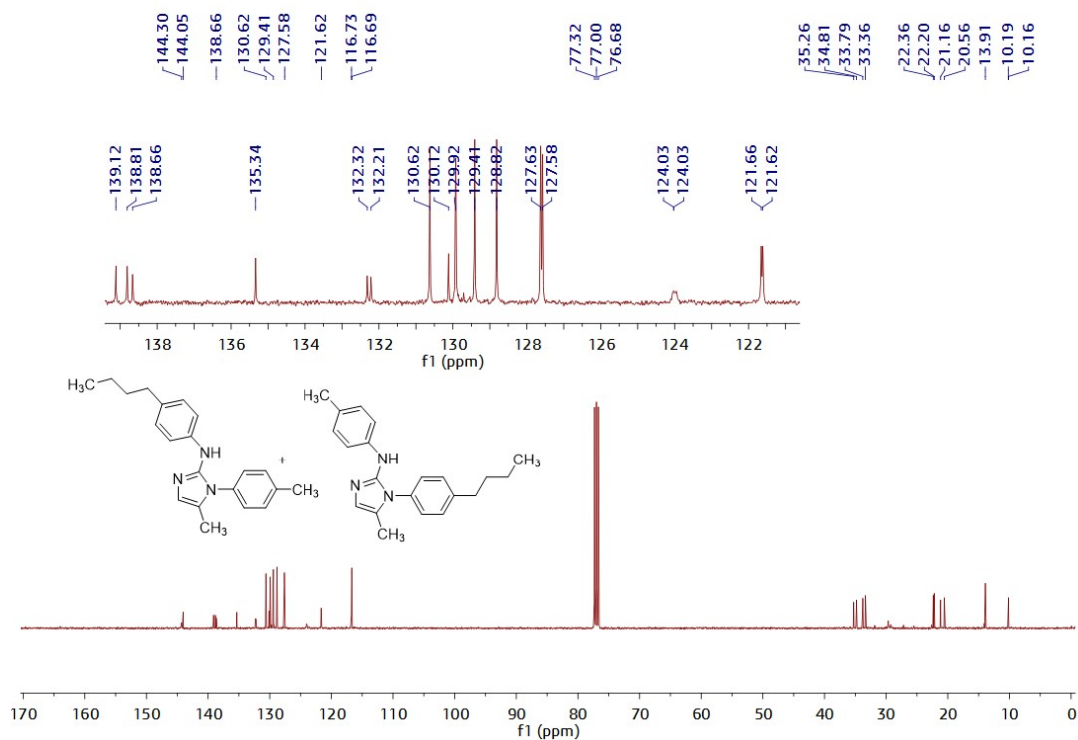
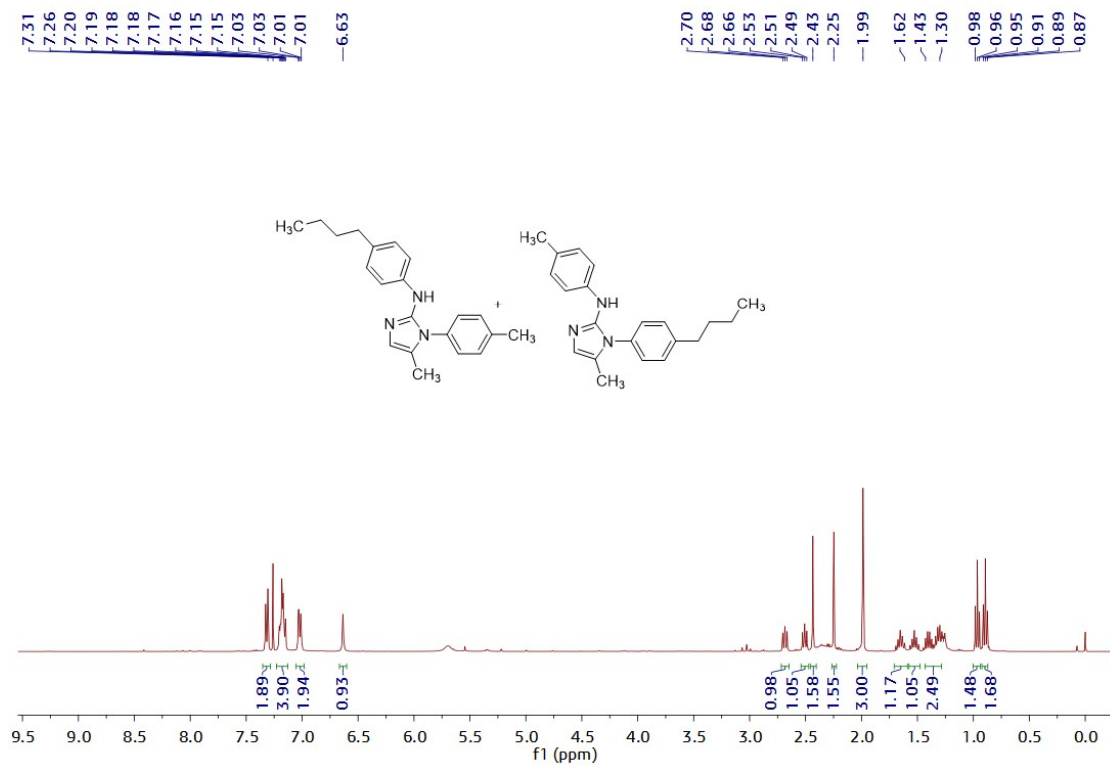
4d:



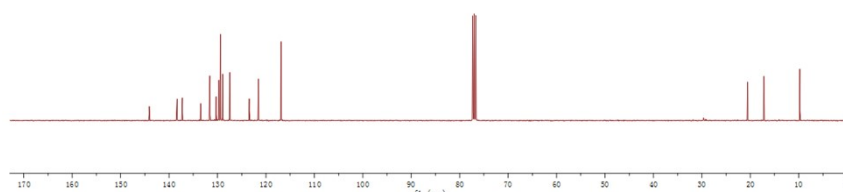
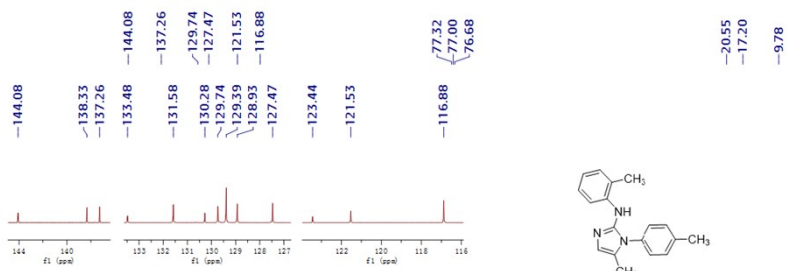
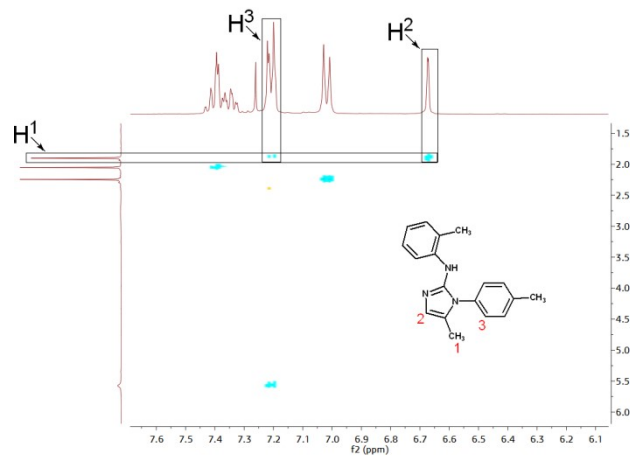
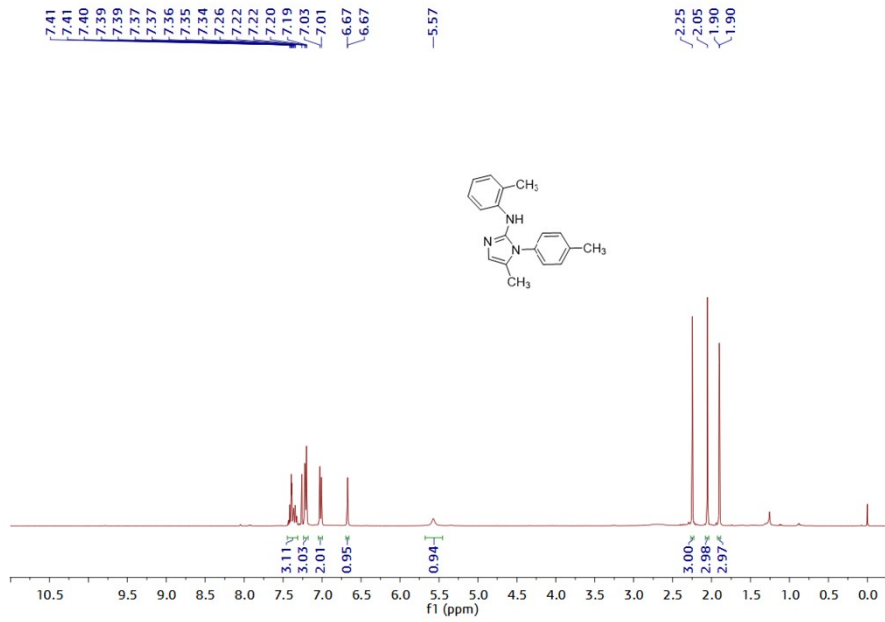
4e/4e':



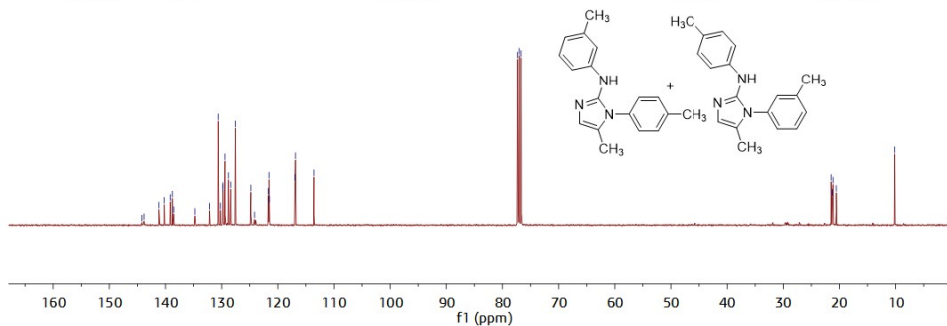
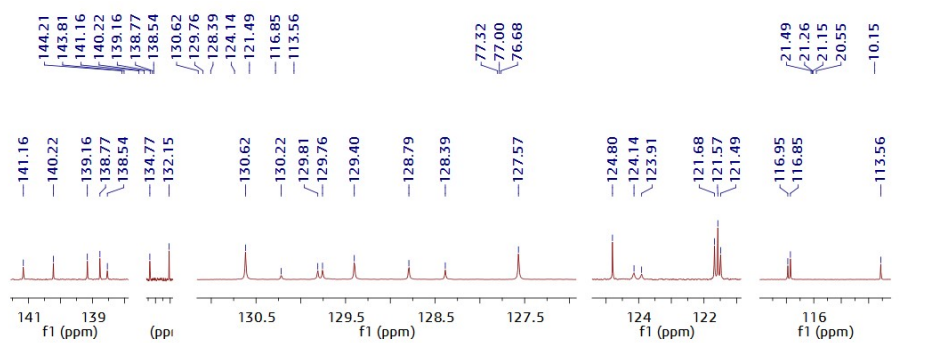
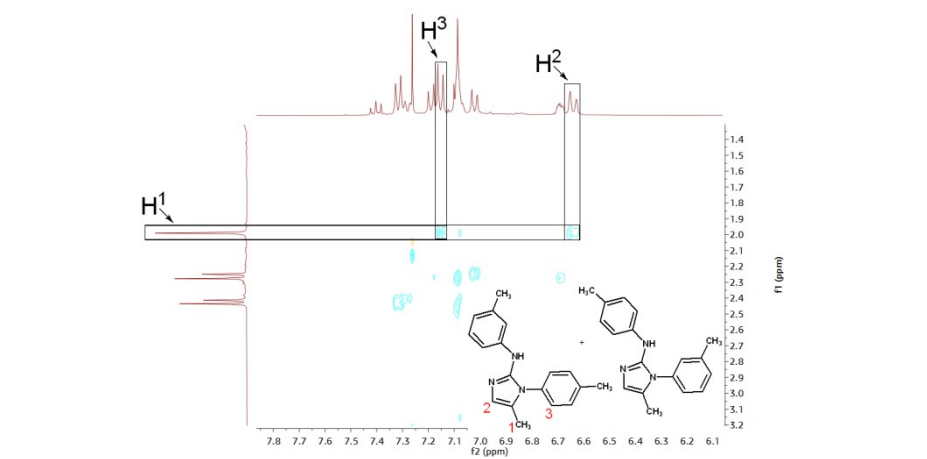
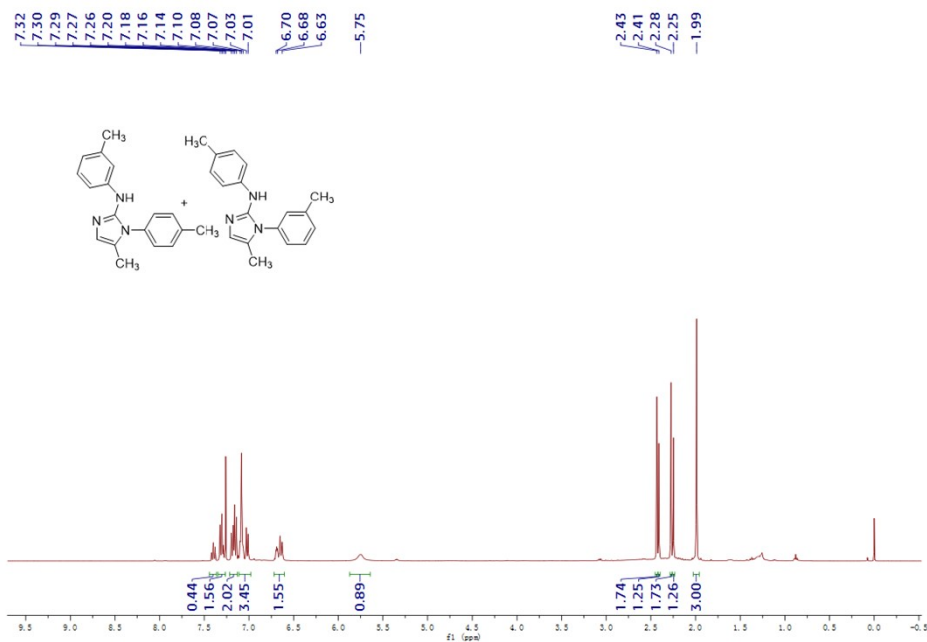
4f/4f'



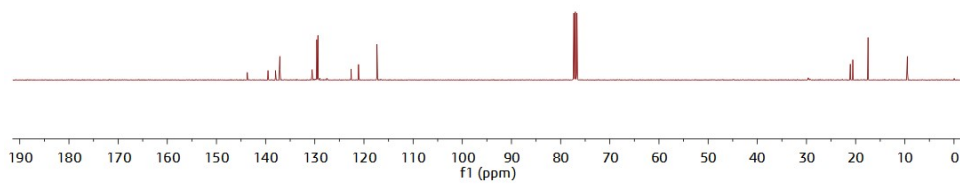
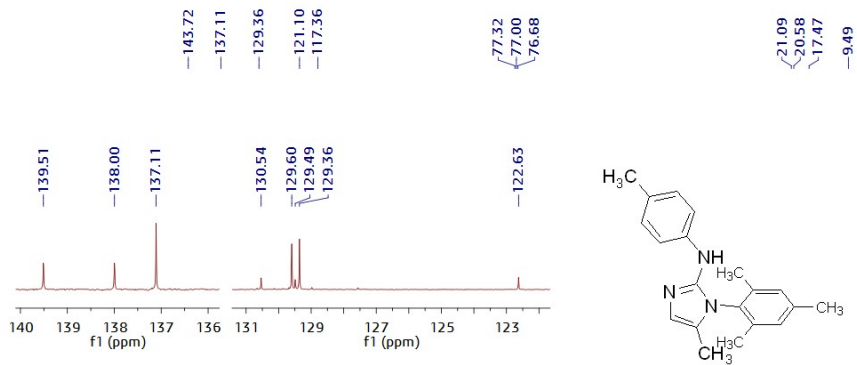
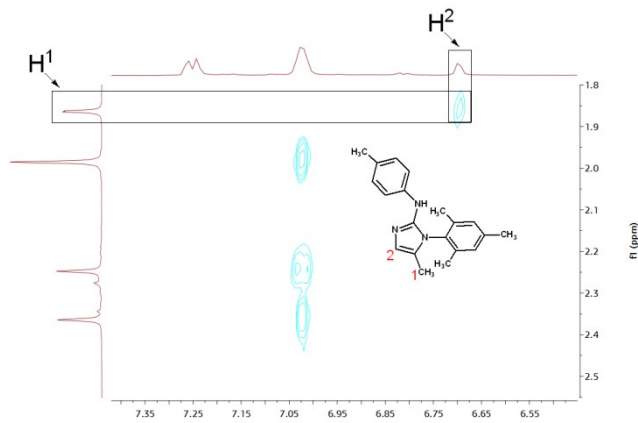
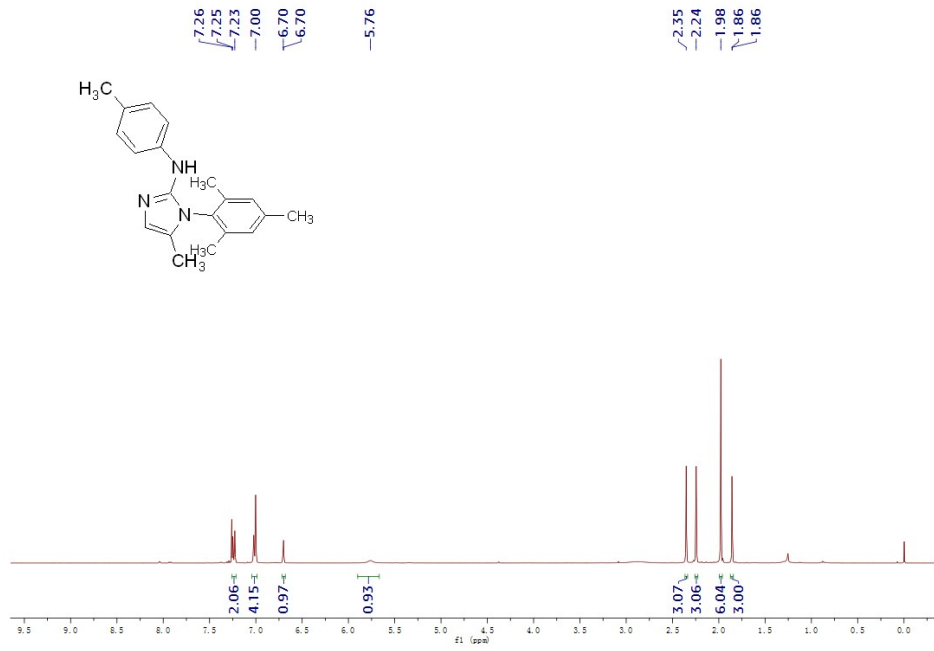
4g:



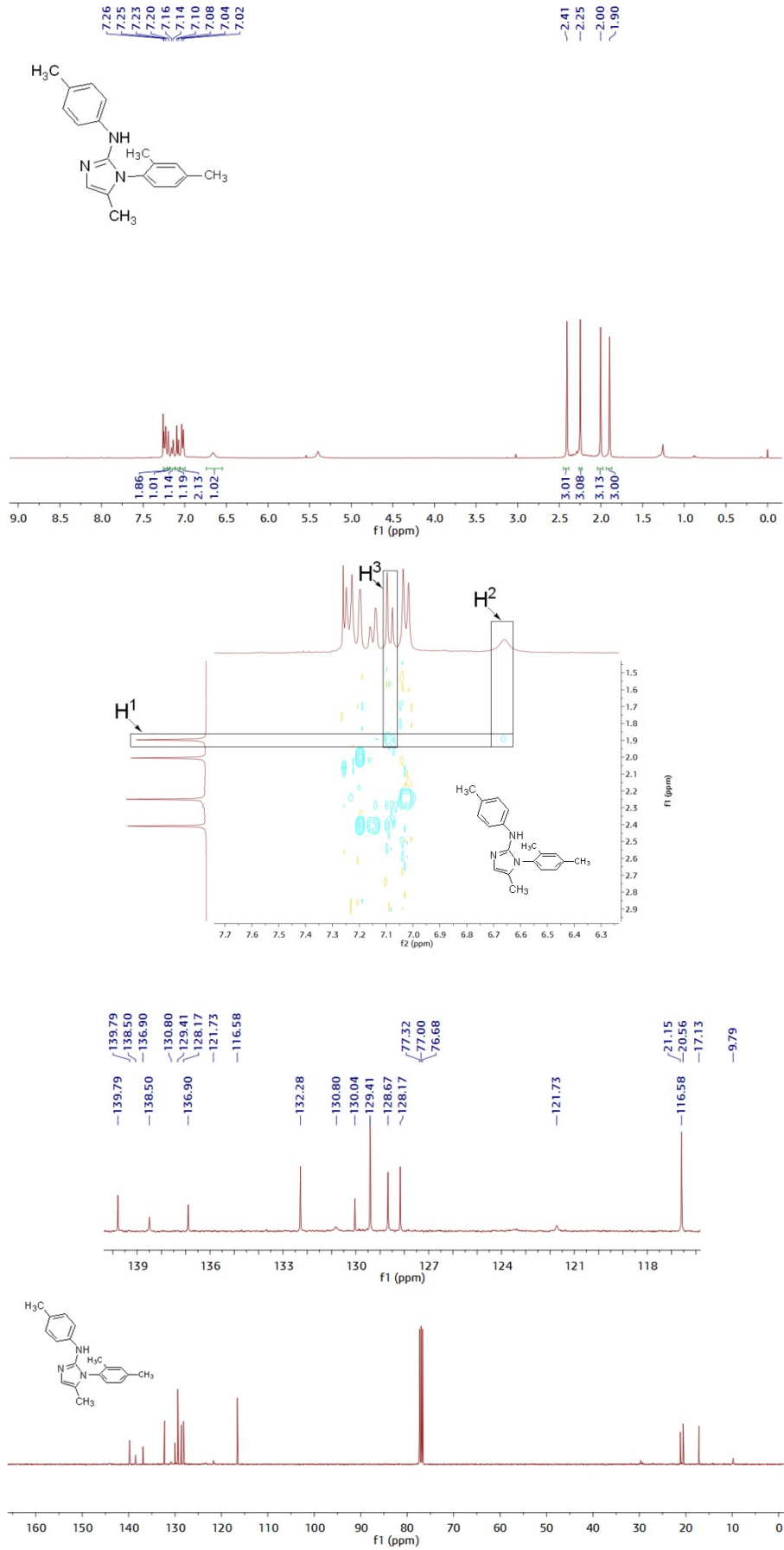
4h/4h':



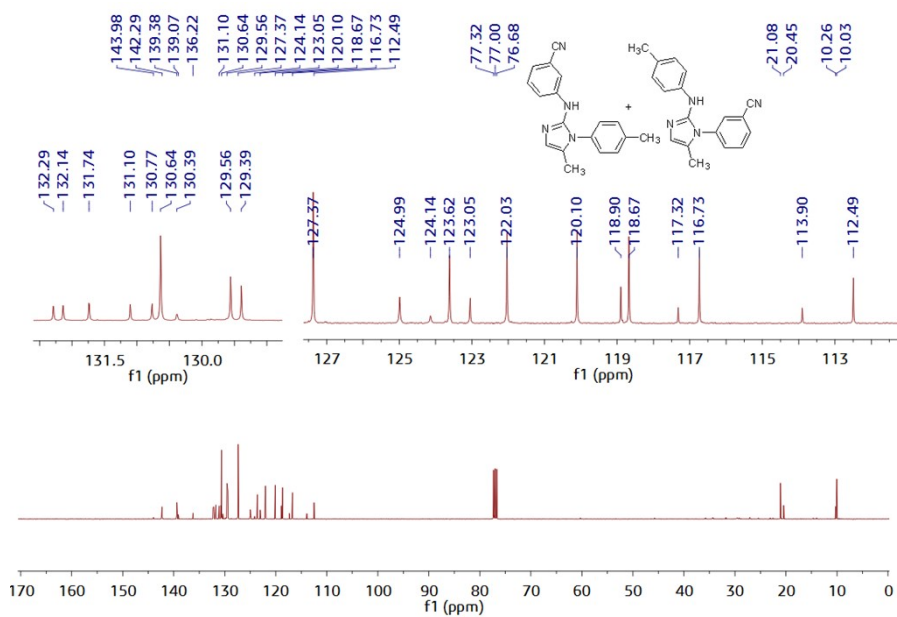
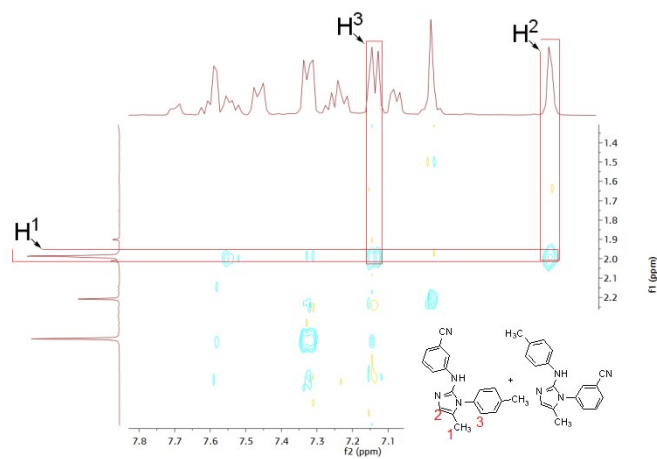
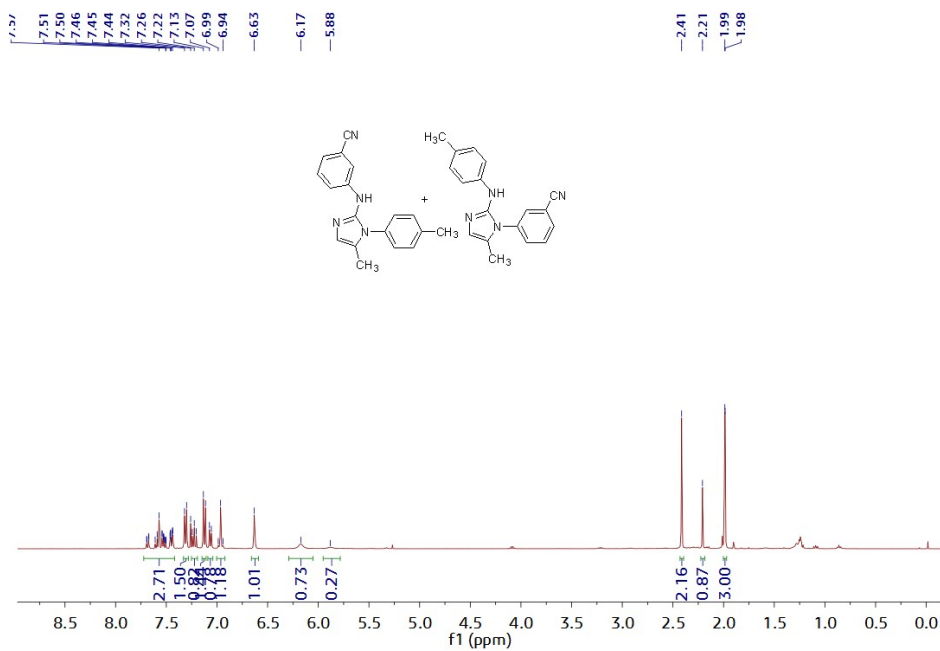
4i':



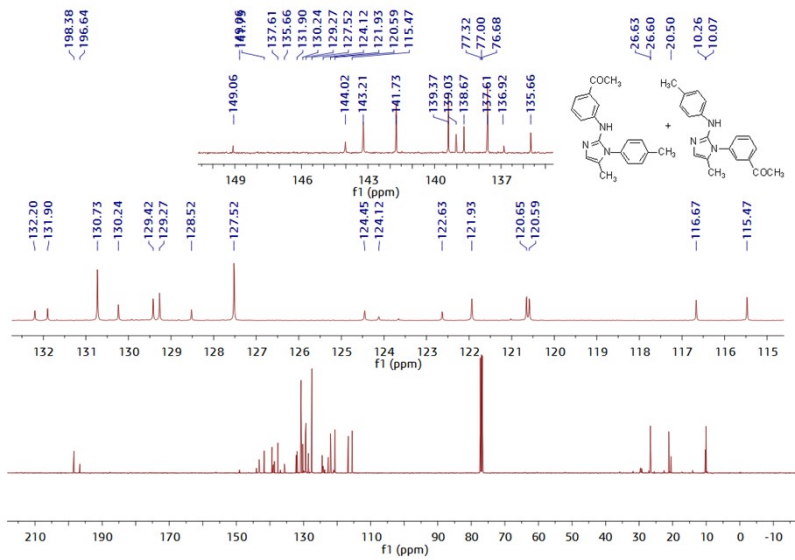
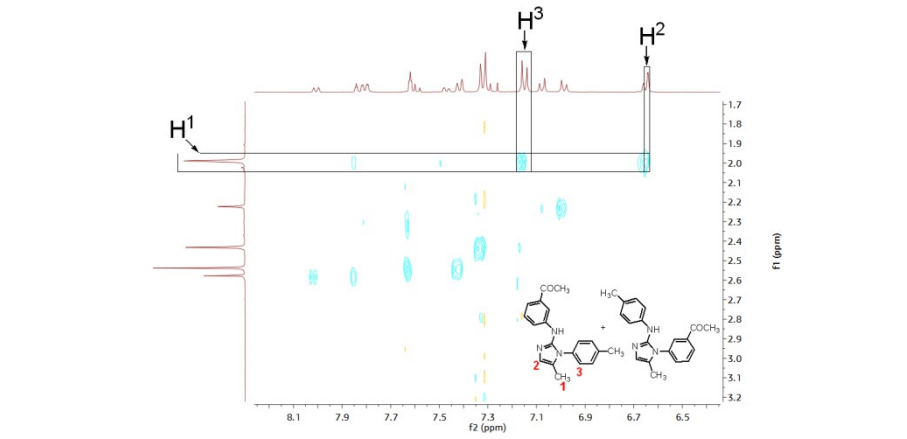
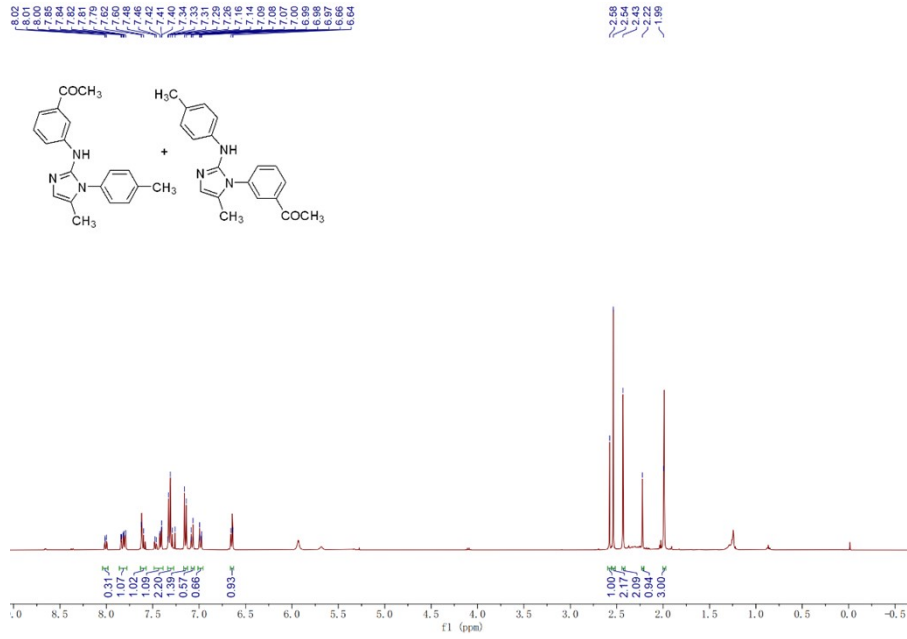
4j':



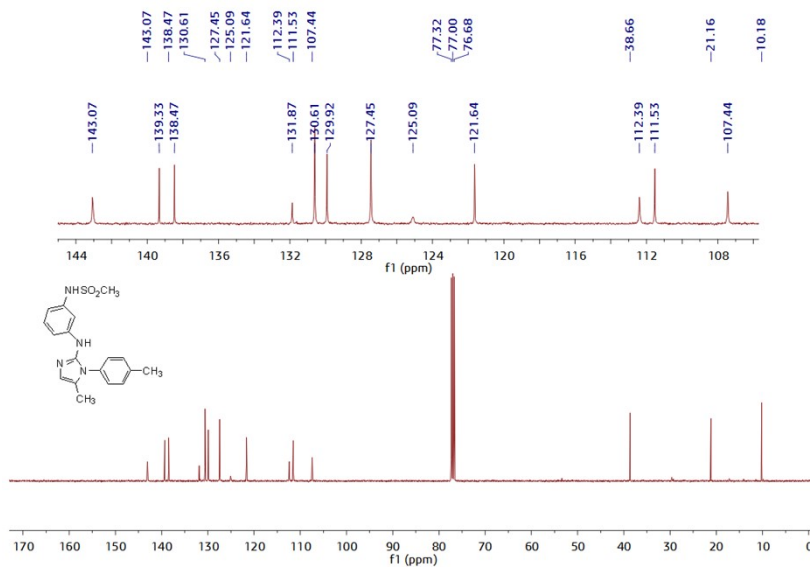
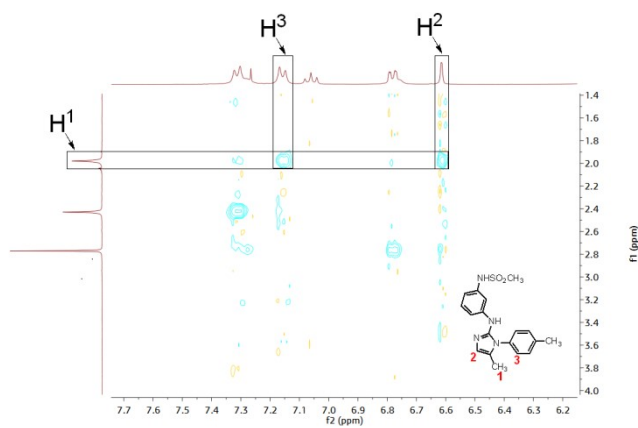
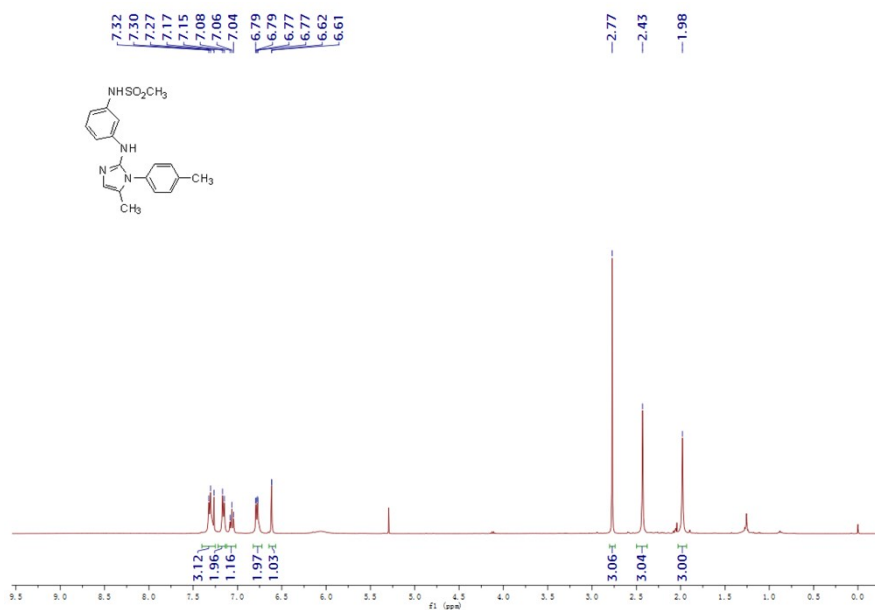
4k/4k':



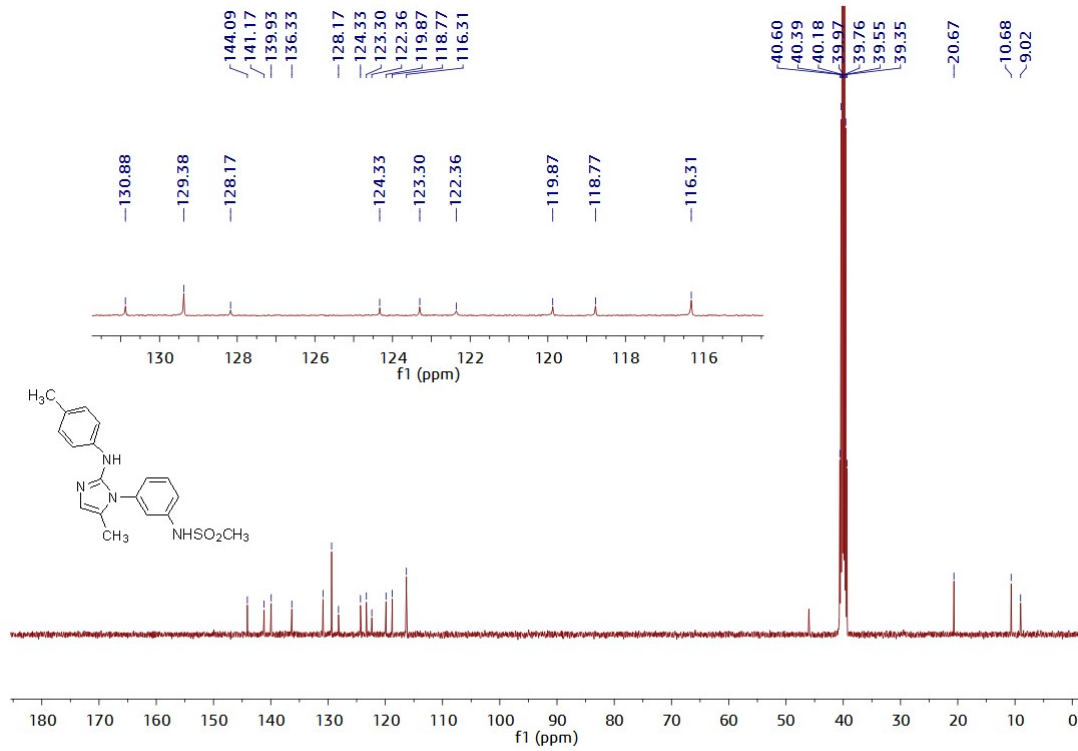
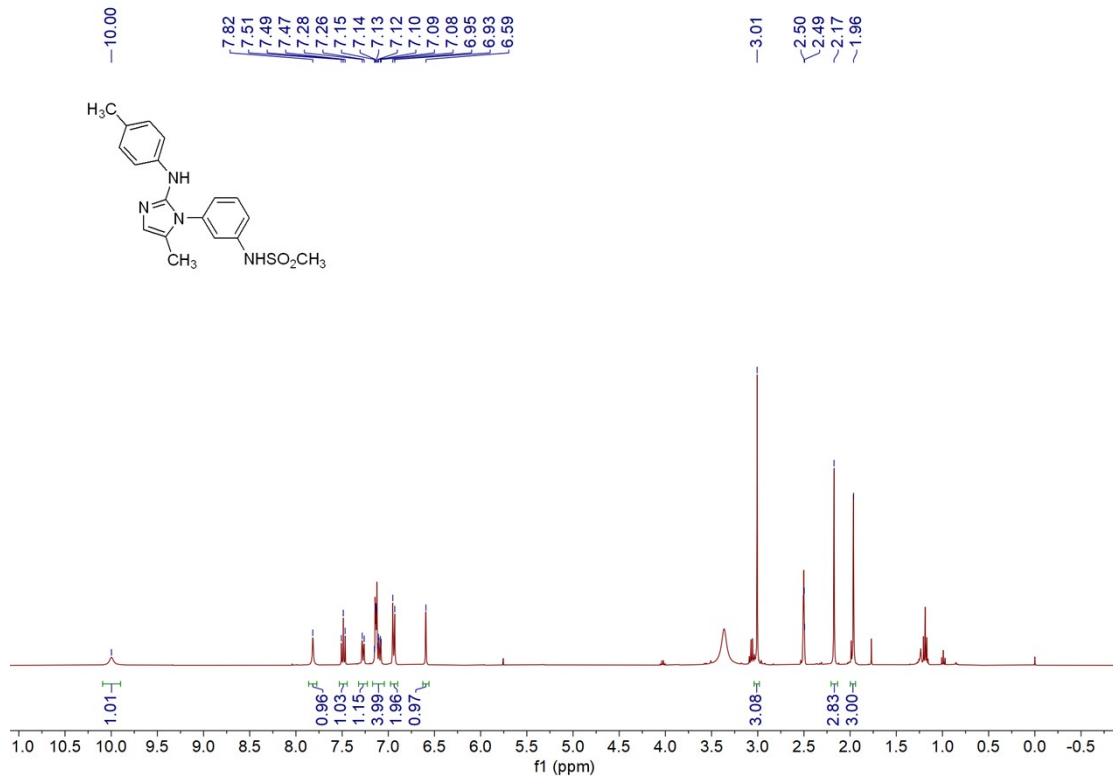
41/41':



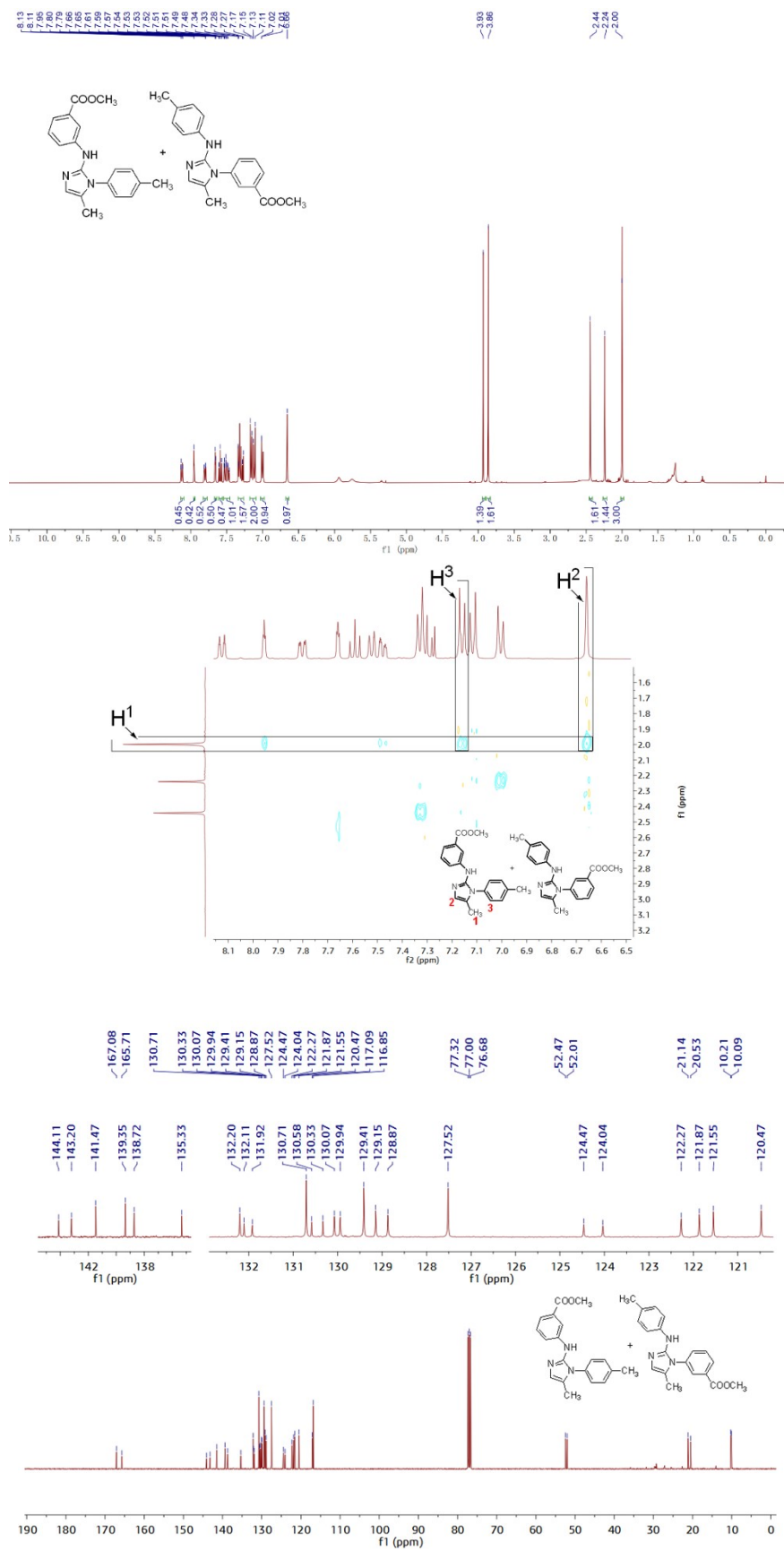
4m:



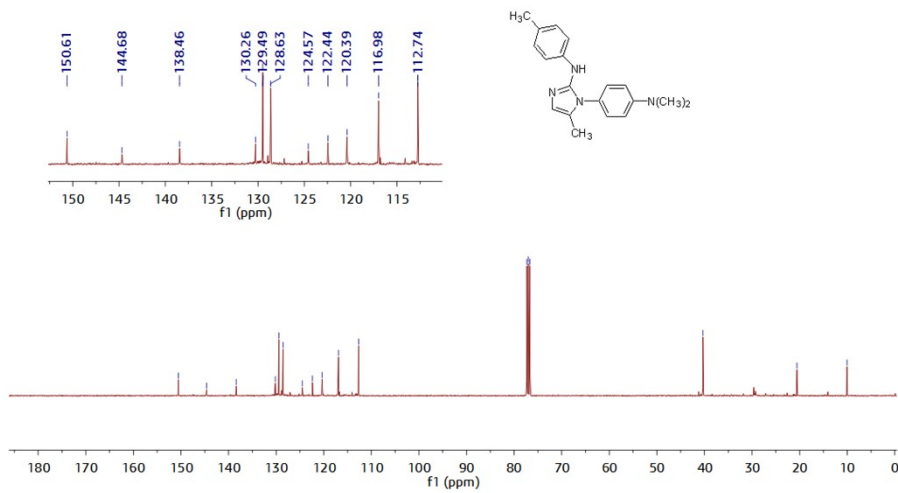
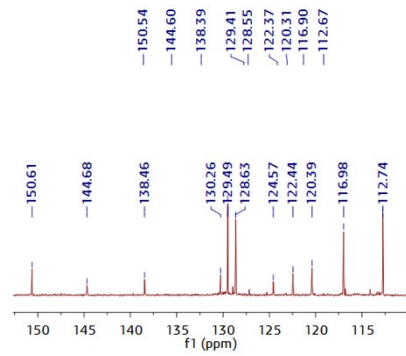
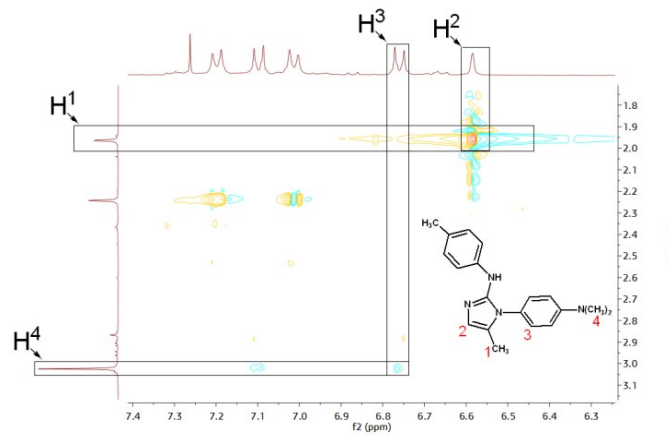
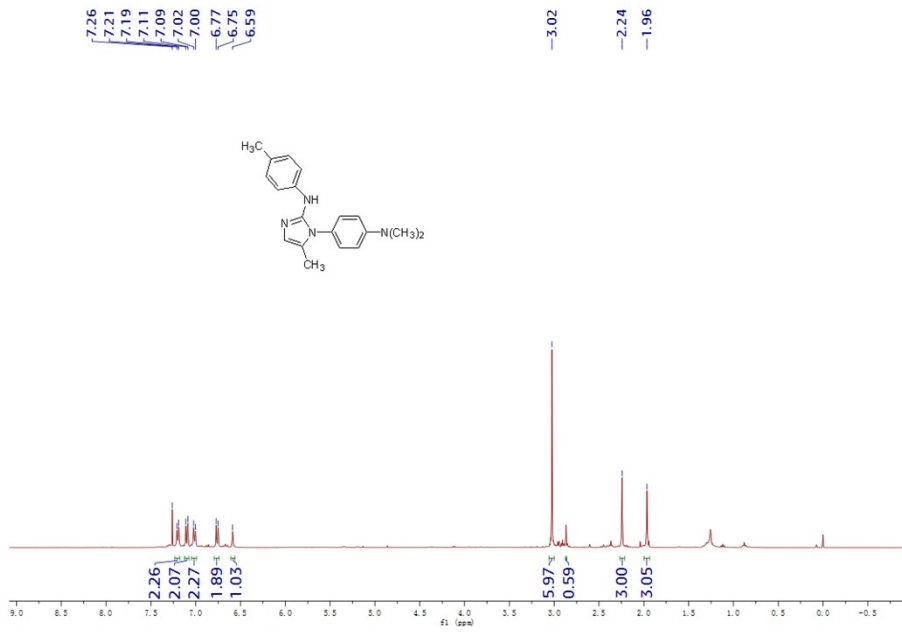
4m':



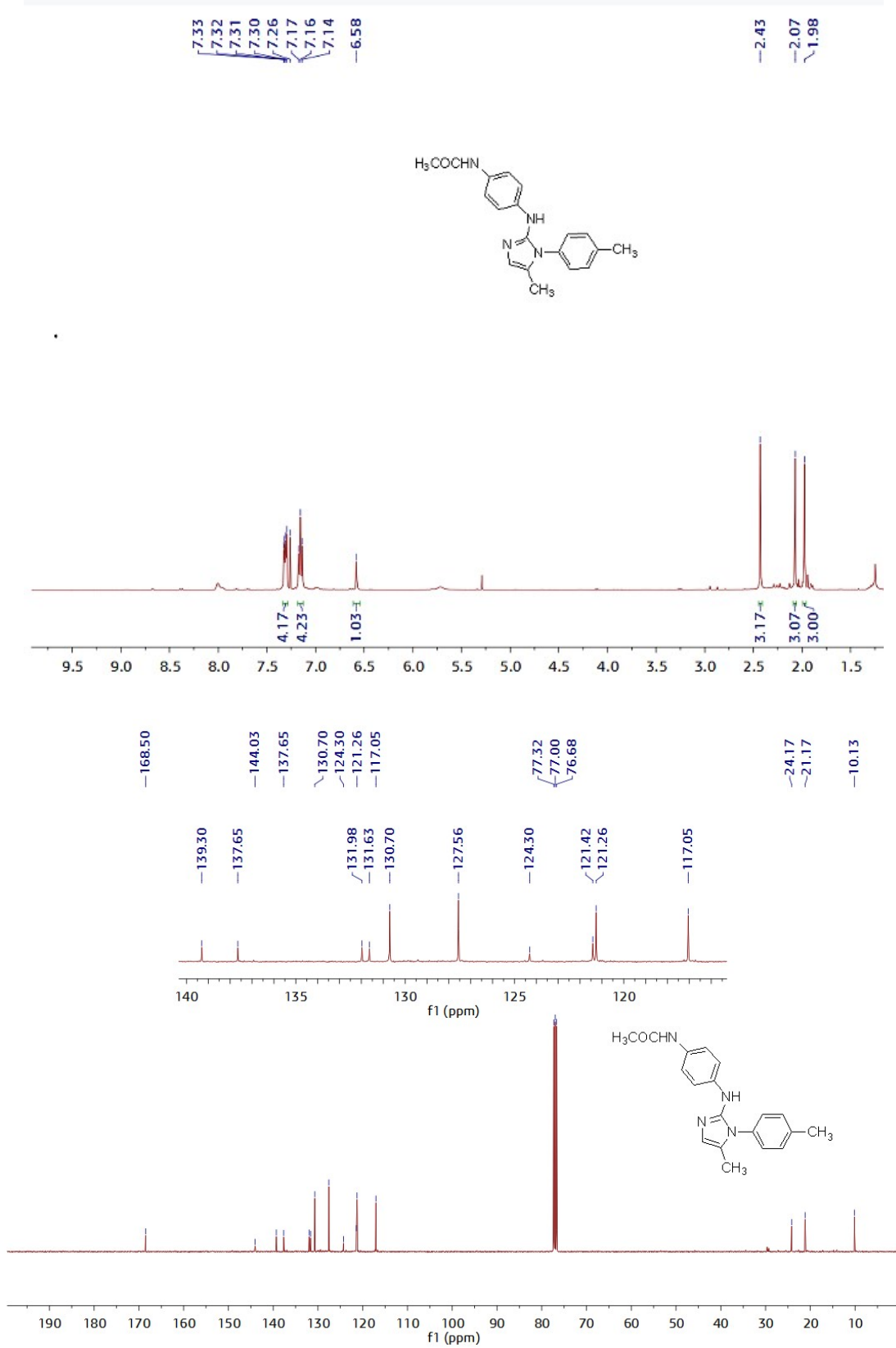
4n/4n':



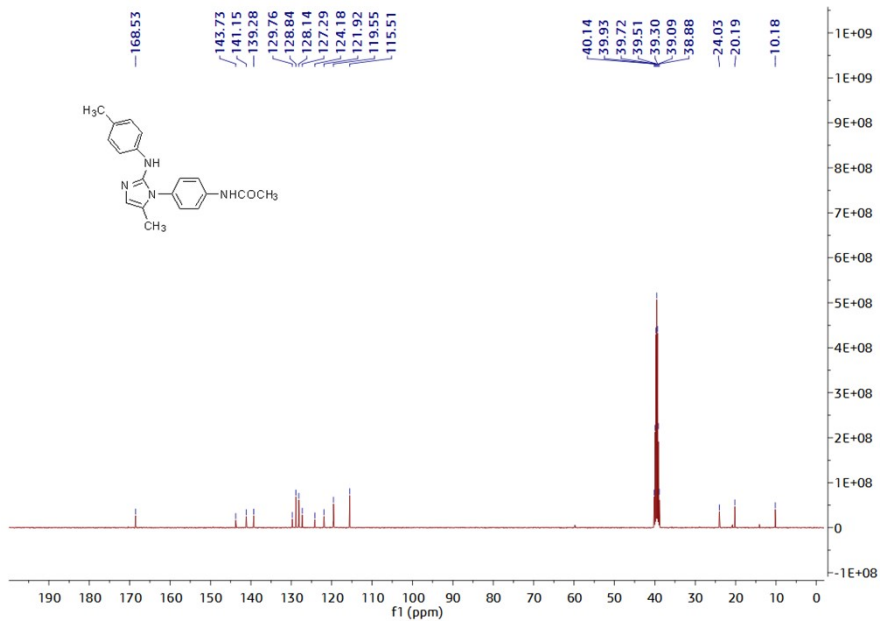
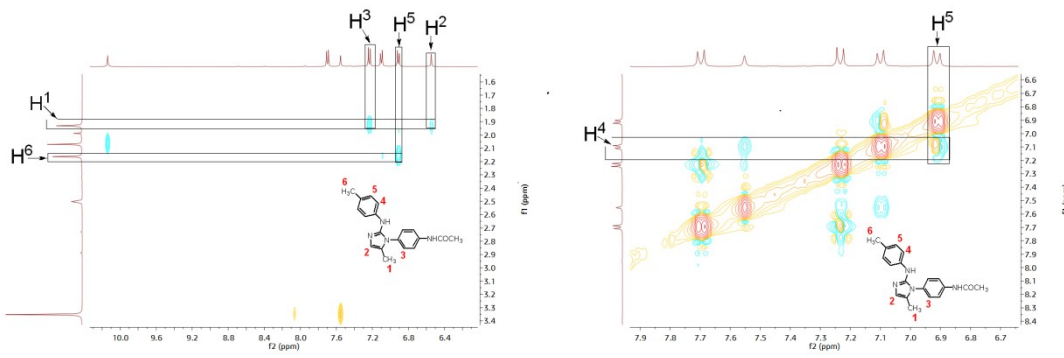
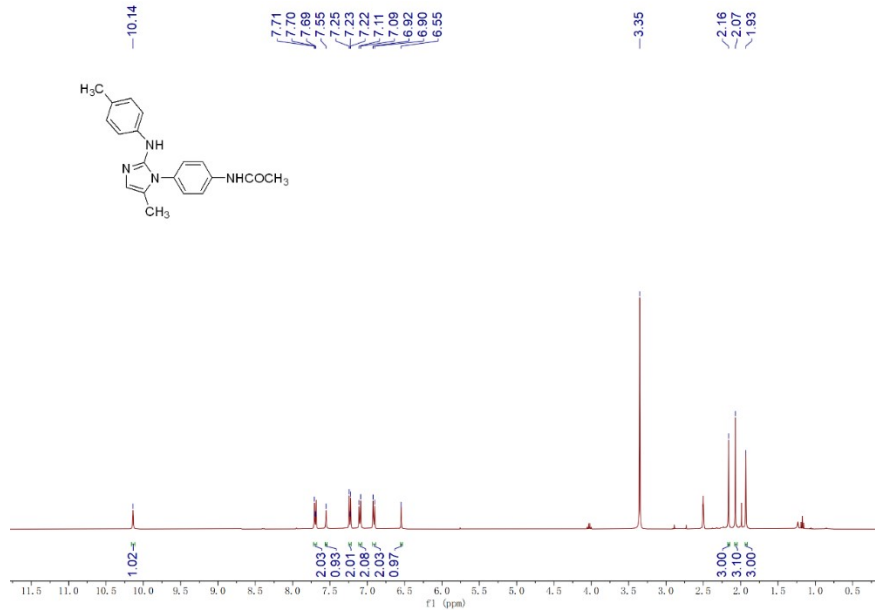
40':



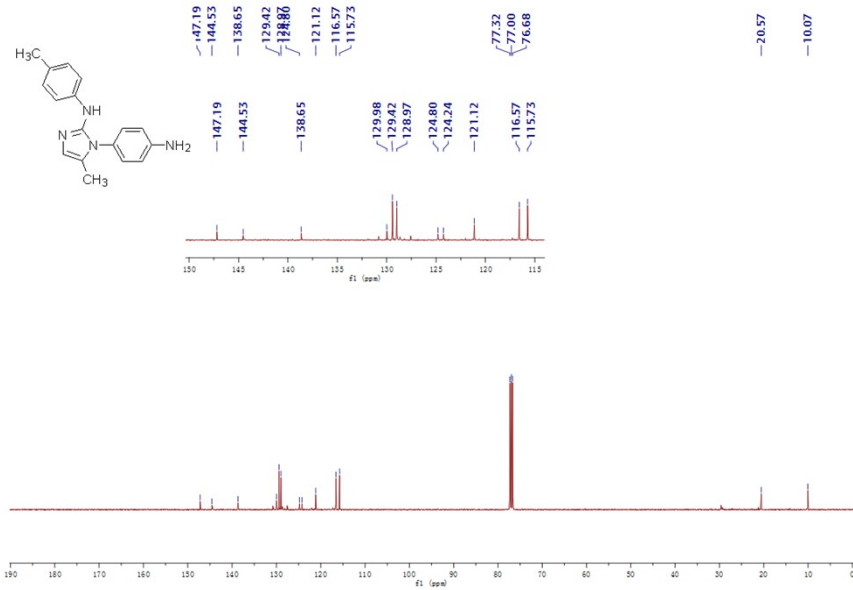
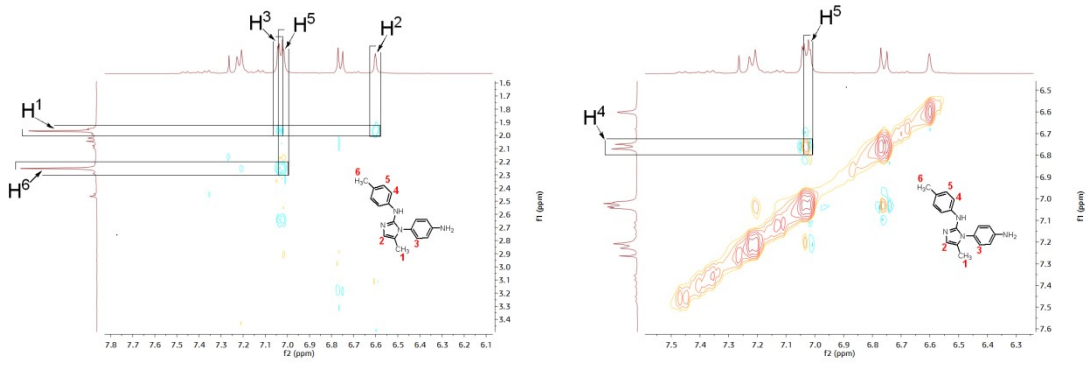
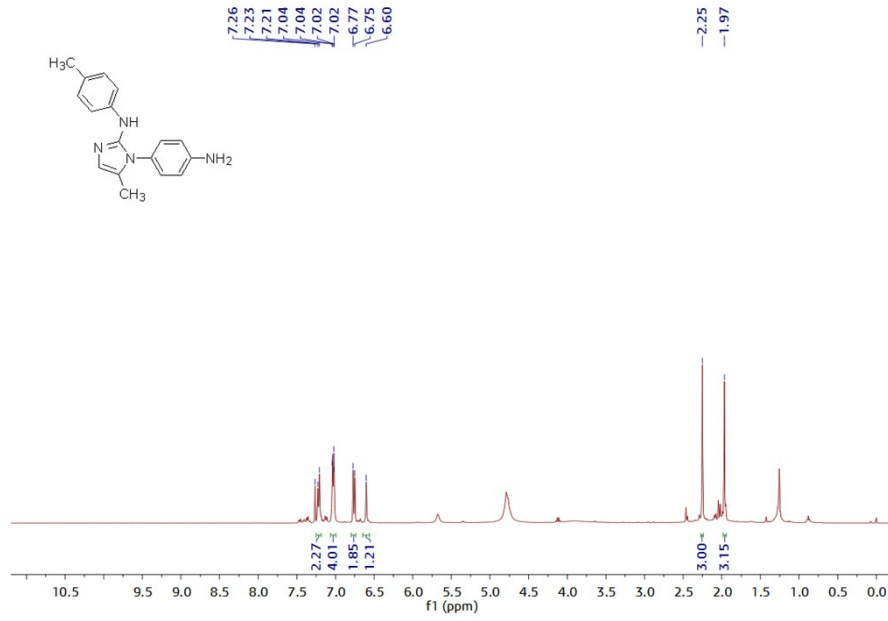
4p:



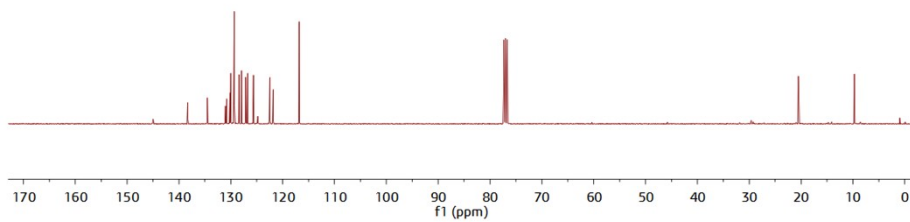
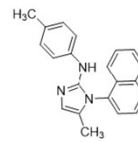
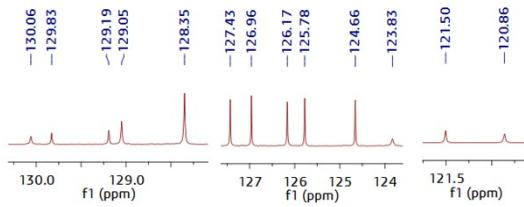
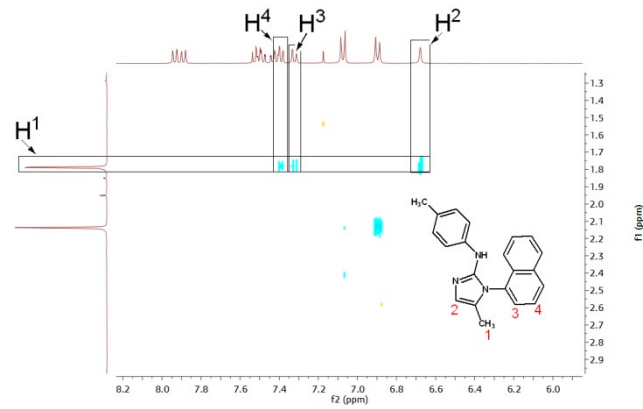
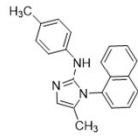
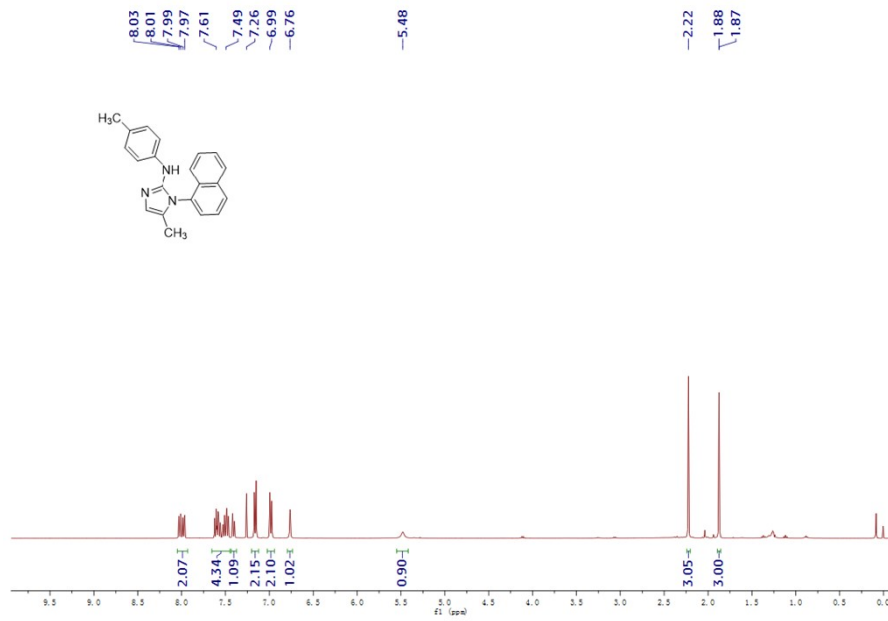
4p¹:



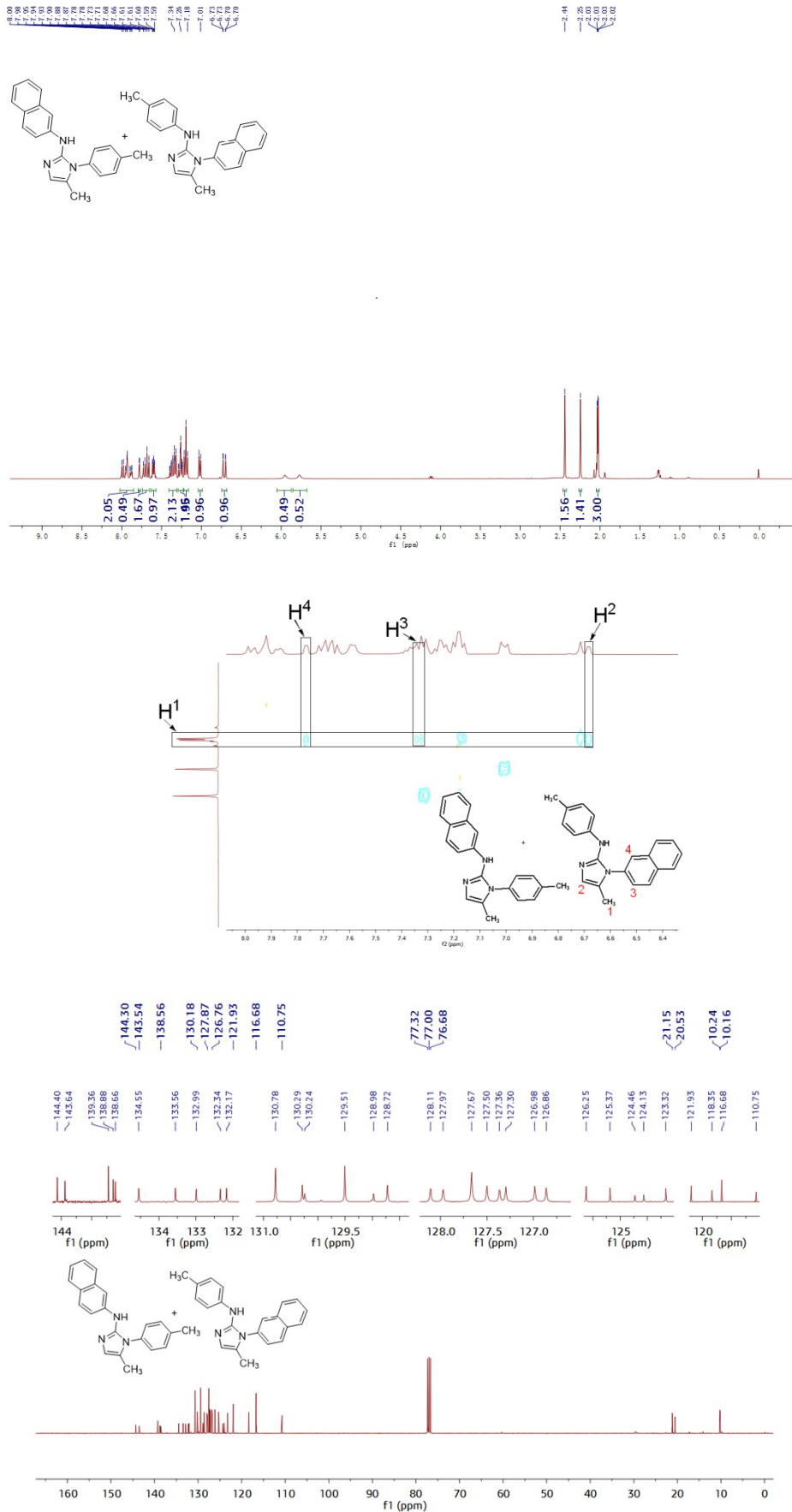
4q':



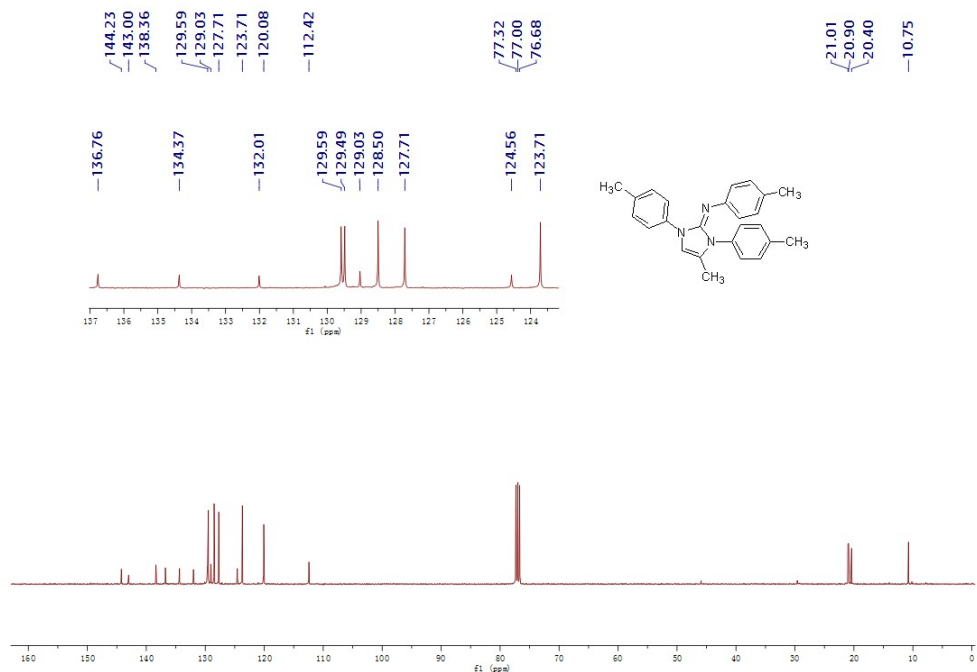
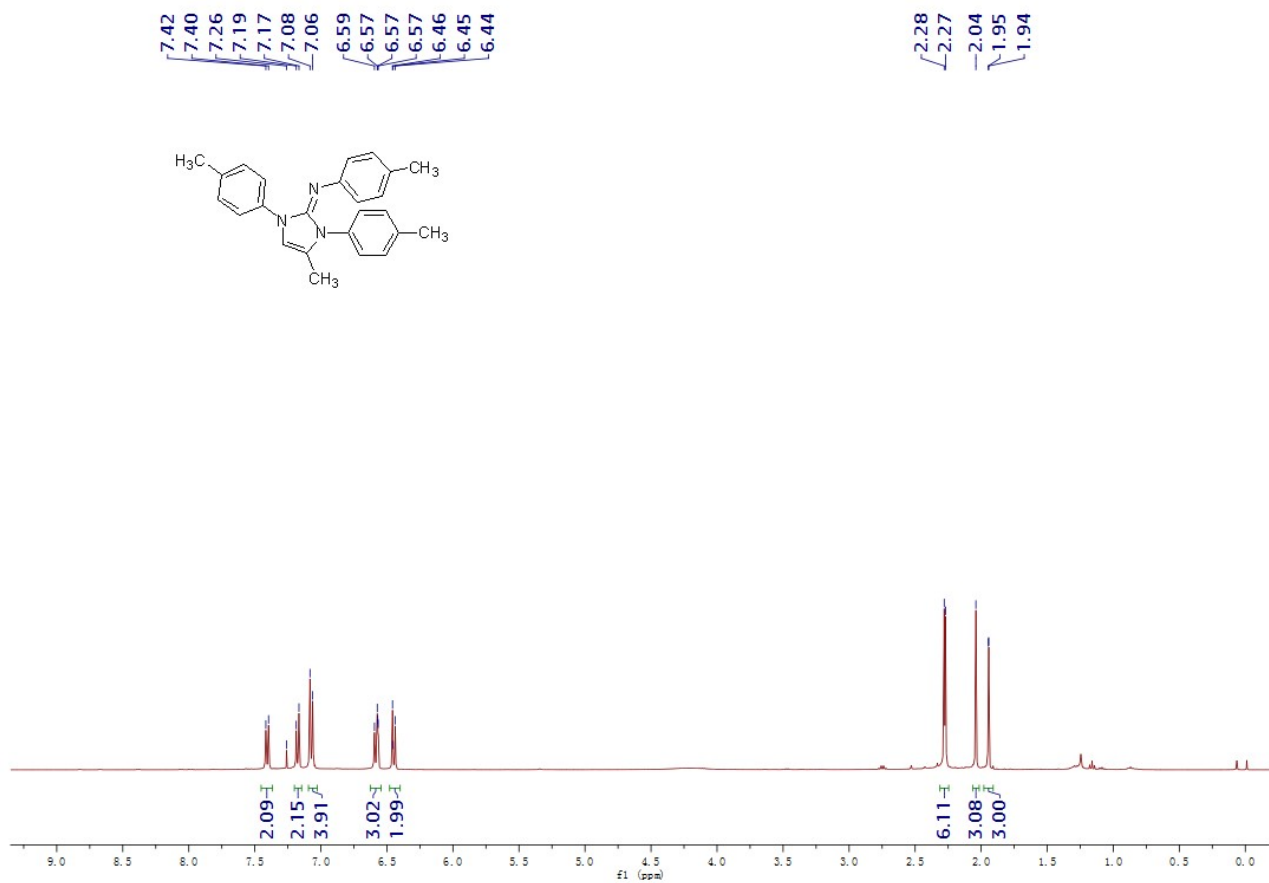
4r':



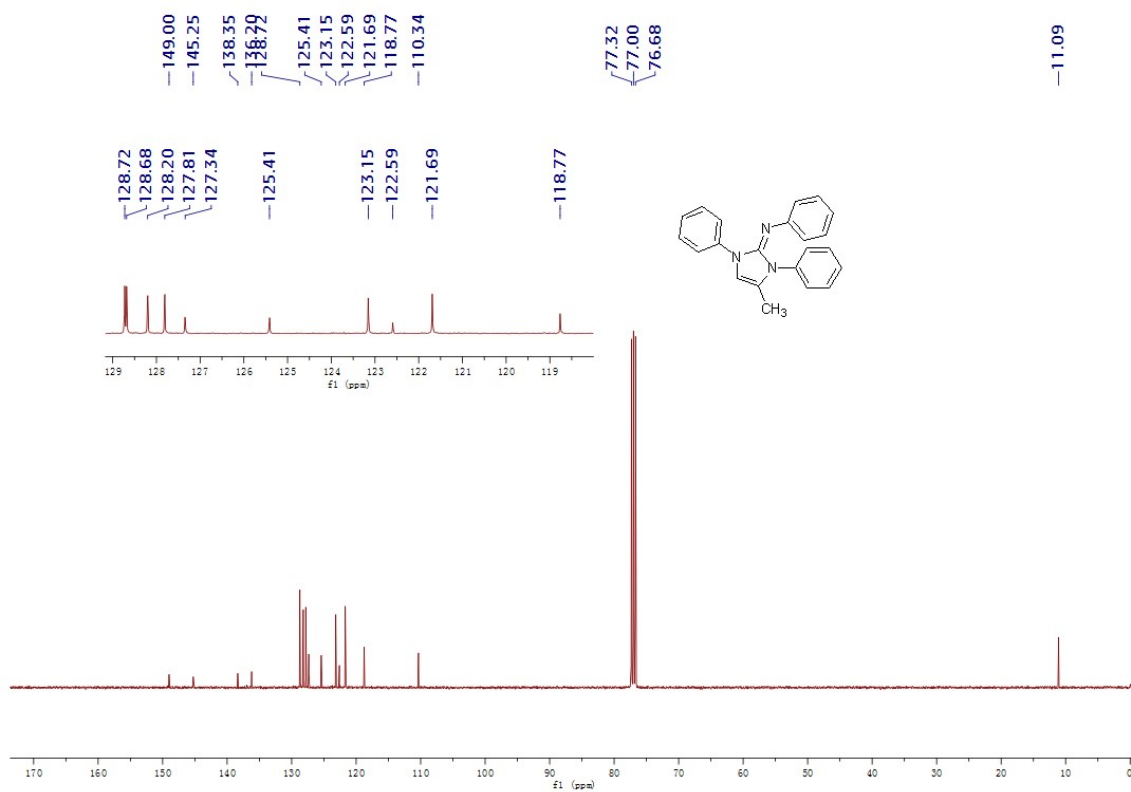
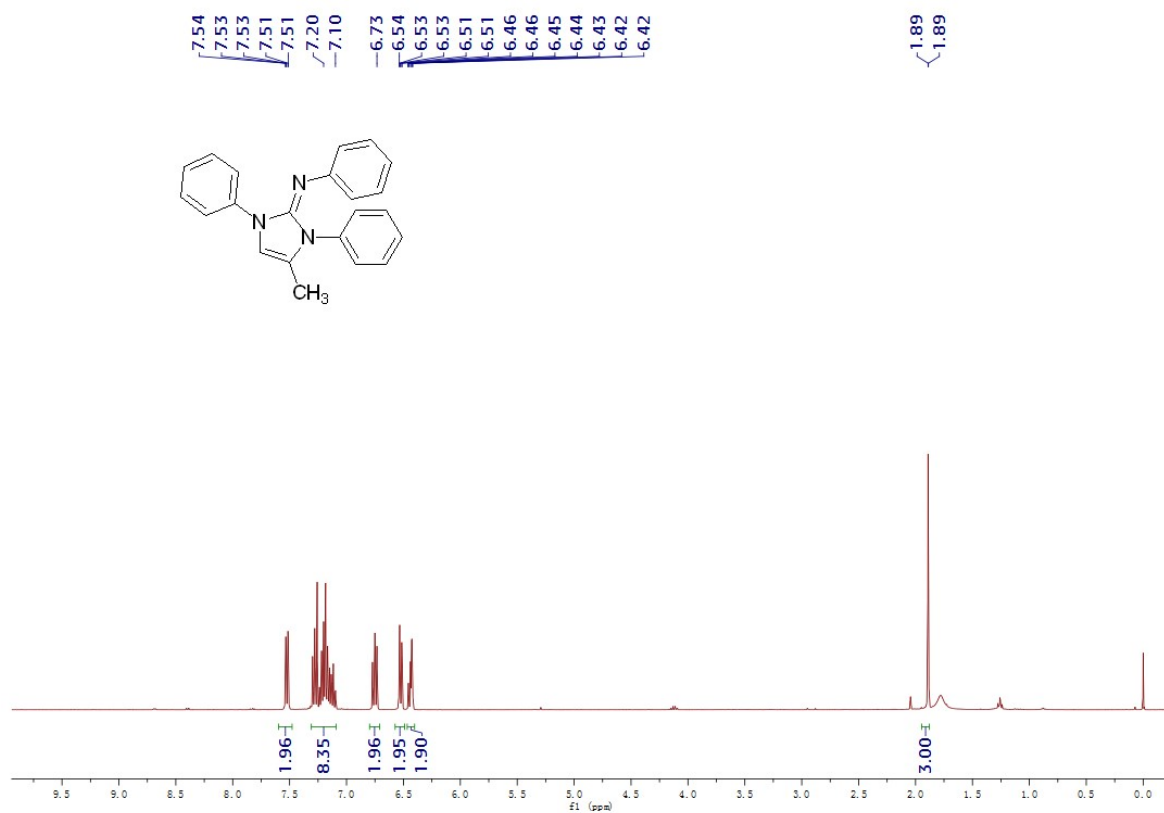
4s/4s':



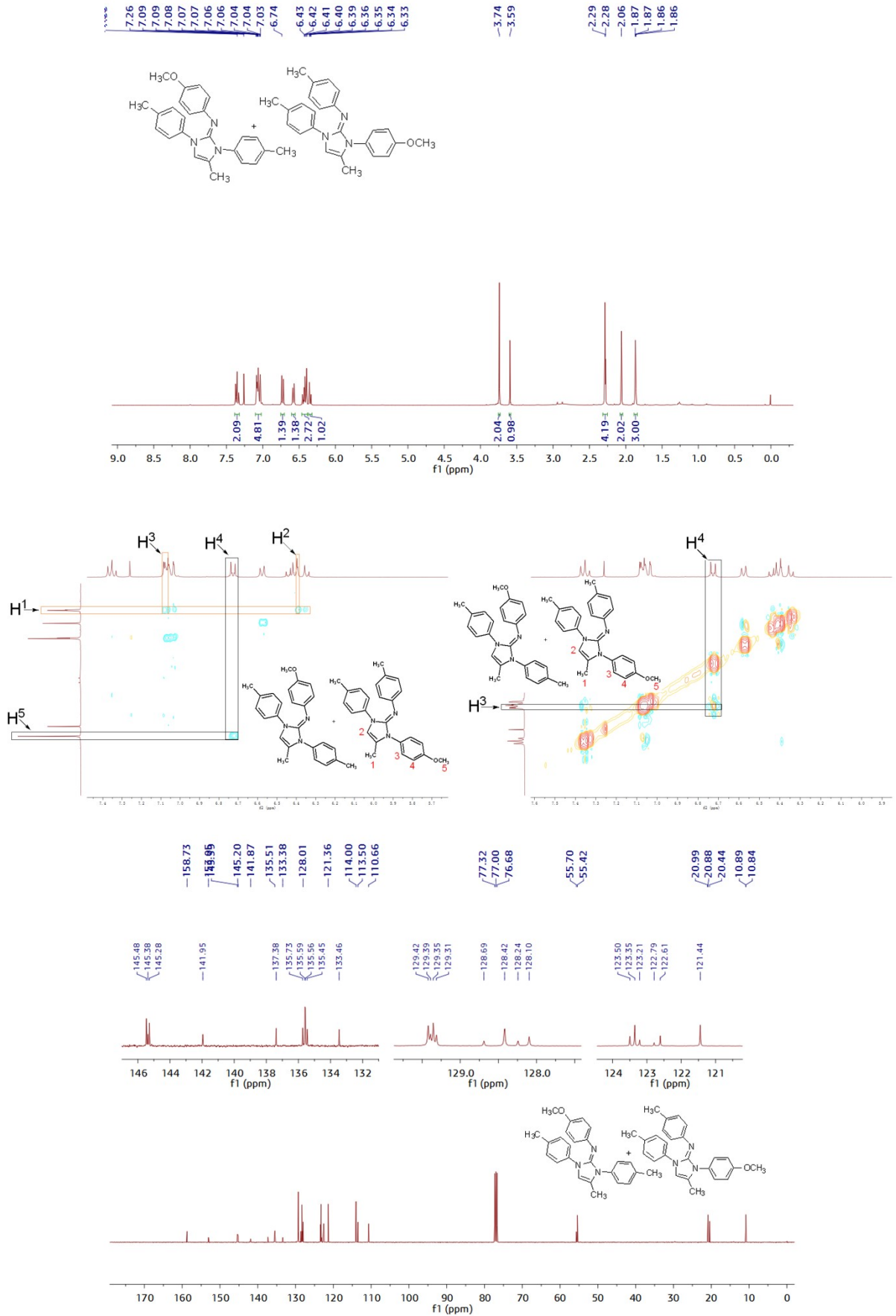
5a:



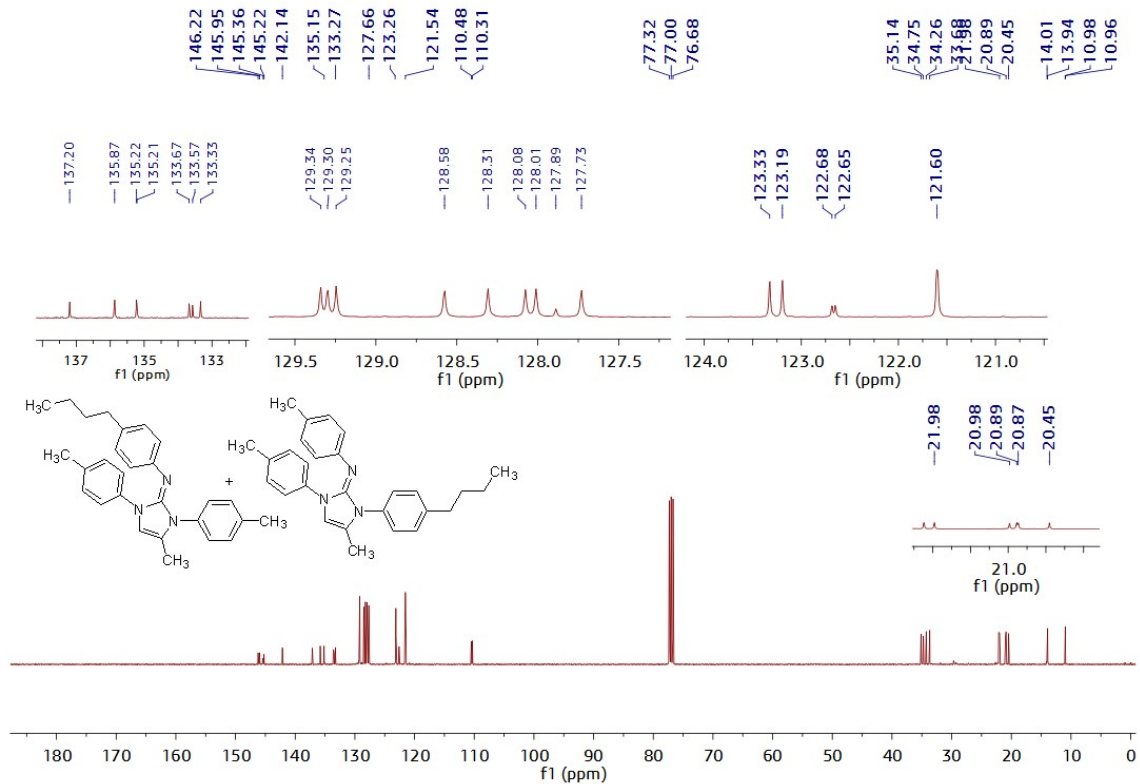
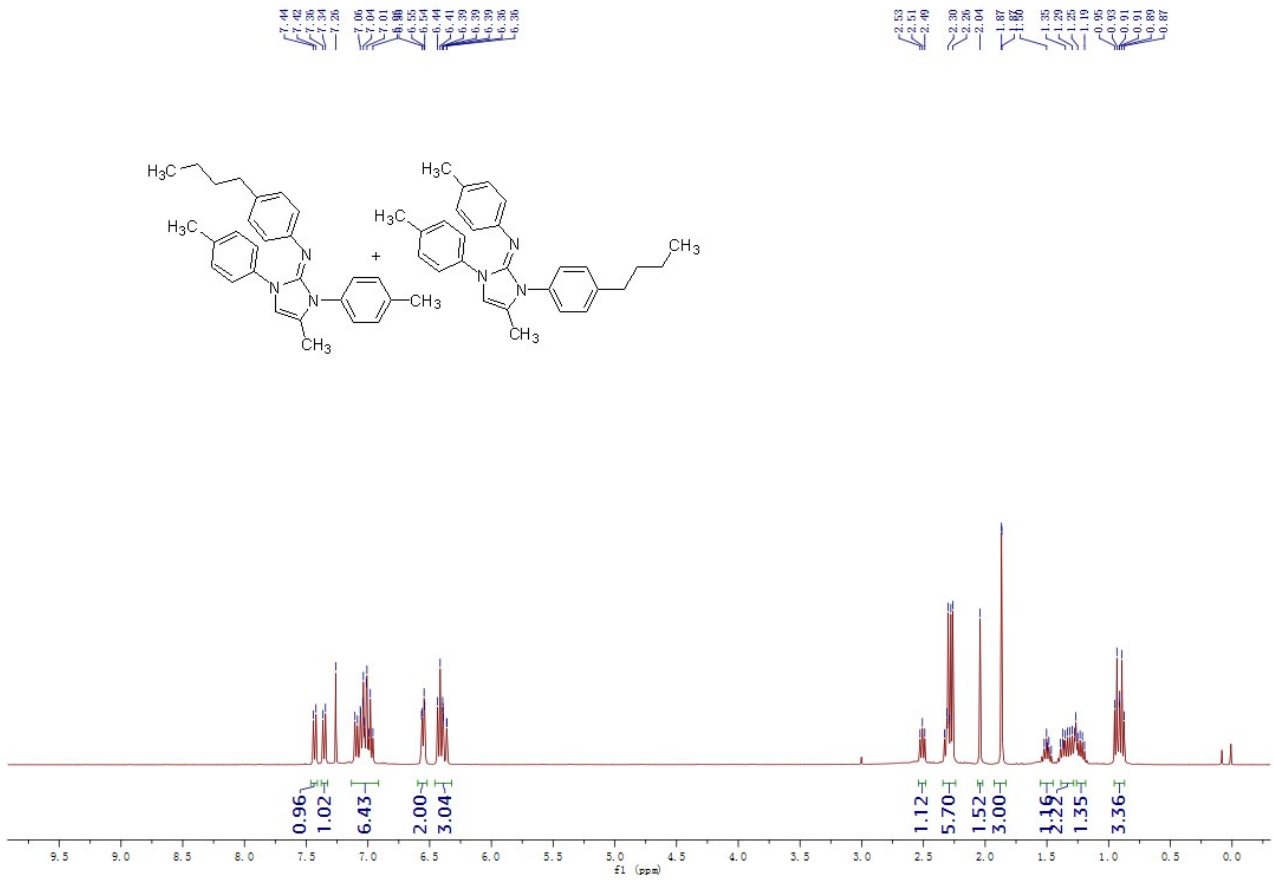
5b:



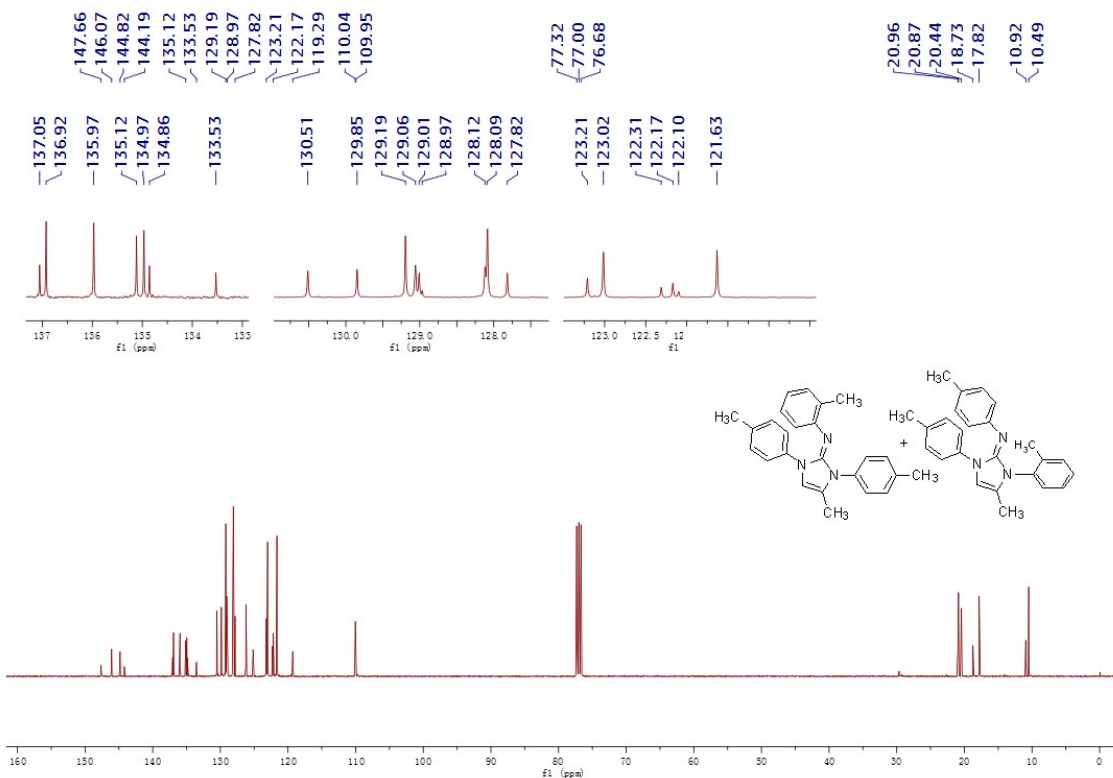
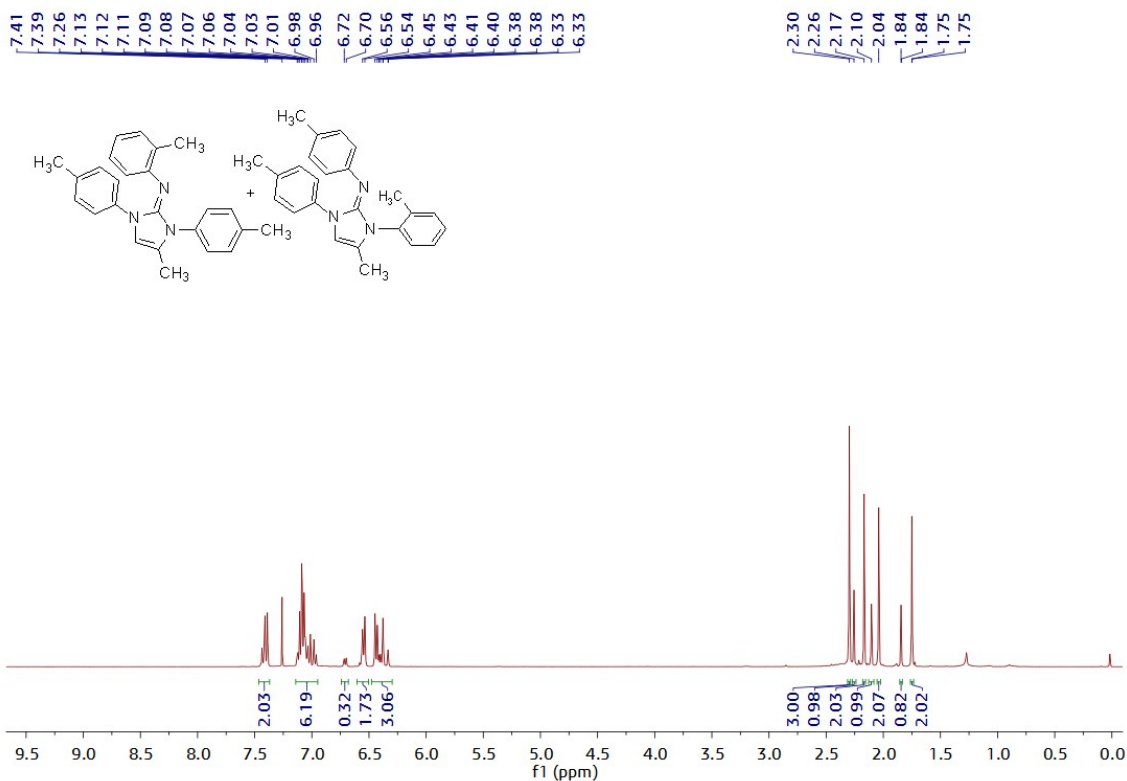
5e/5e':



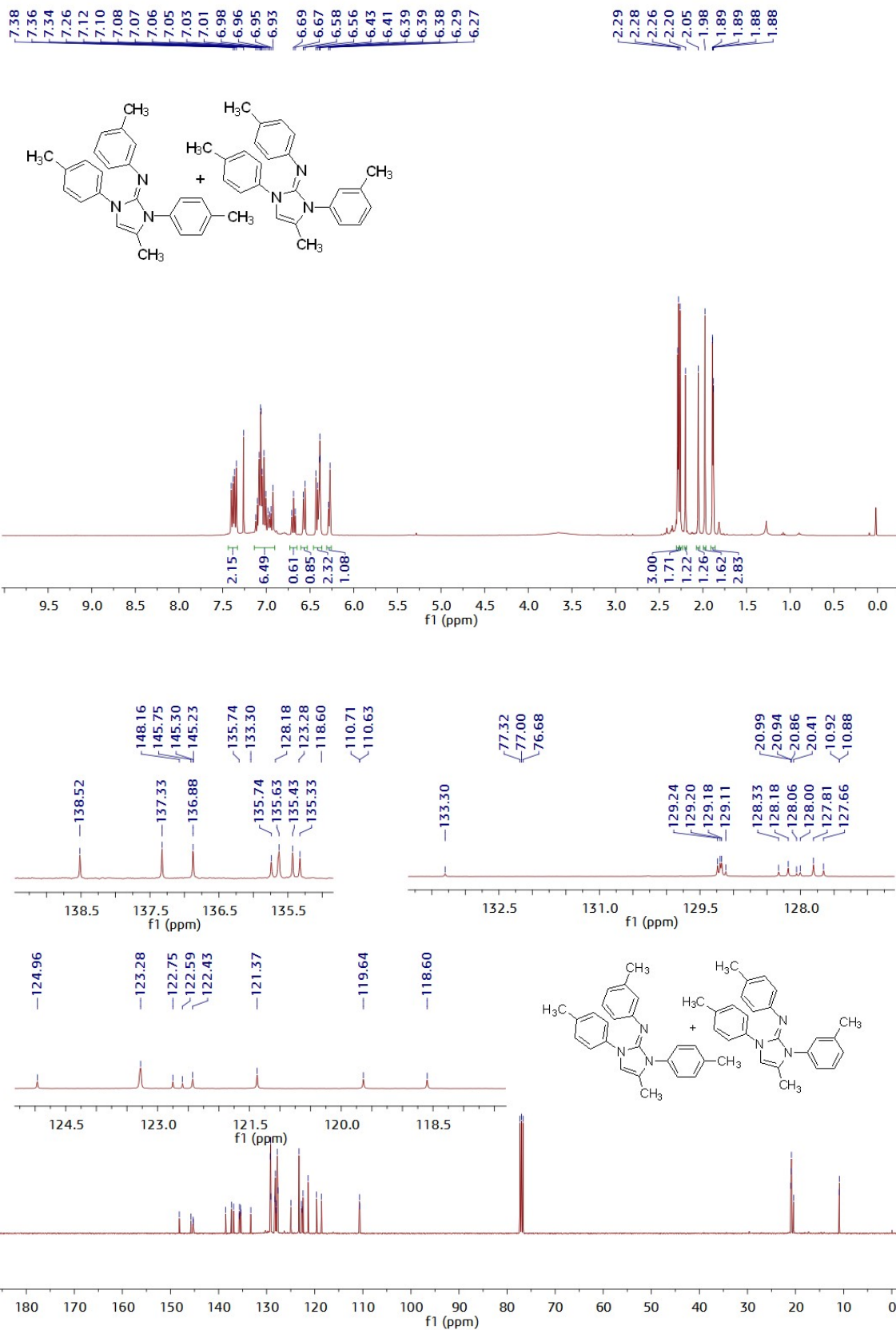
5f/5f':



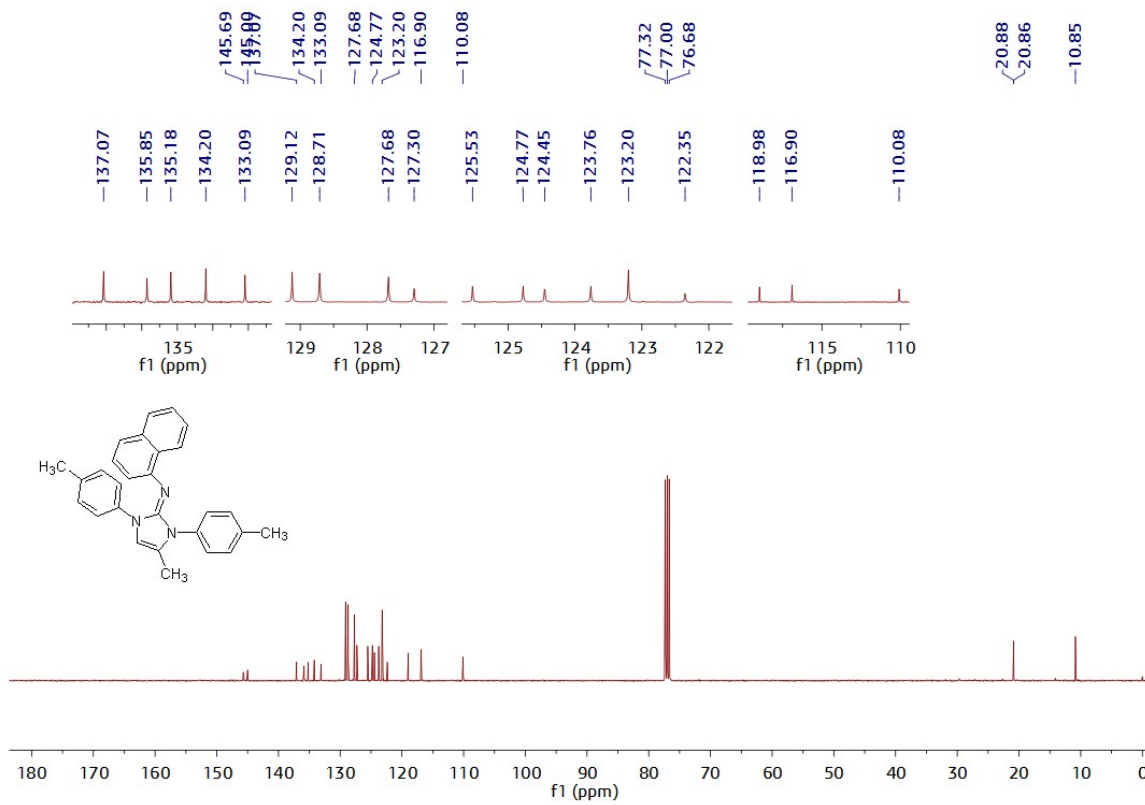
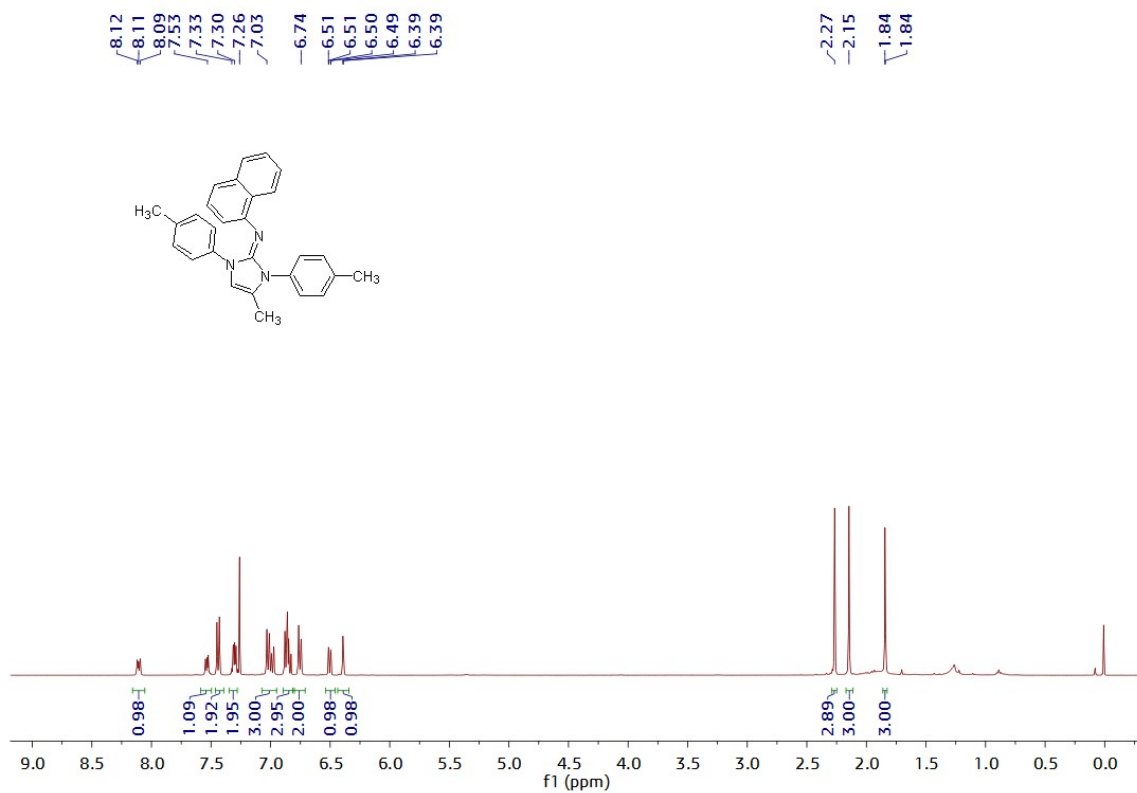
5g/5g':



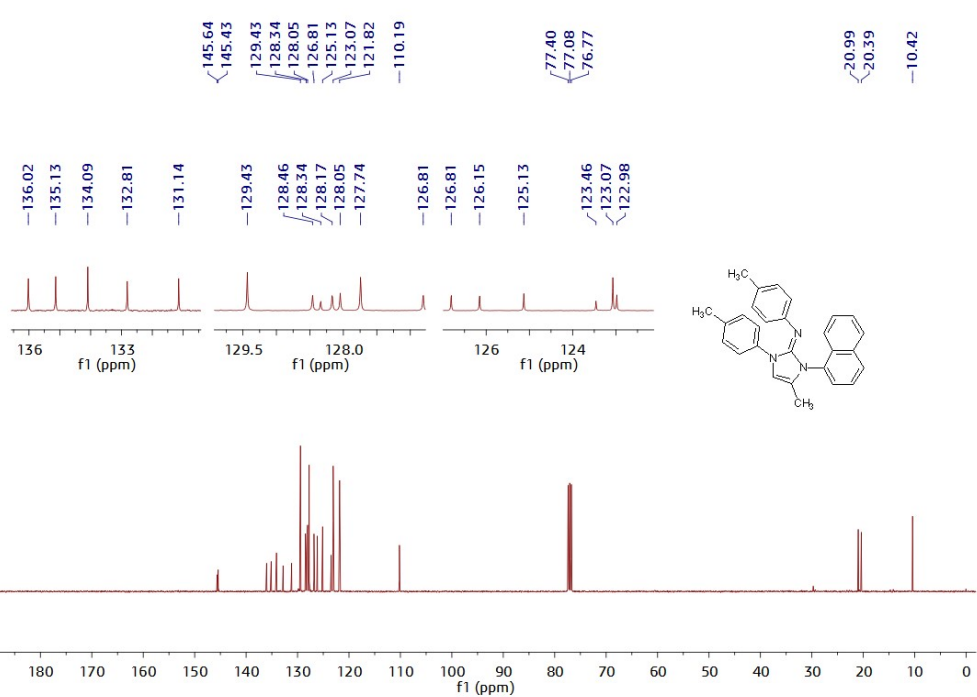
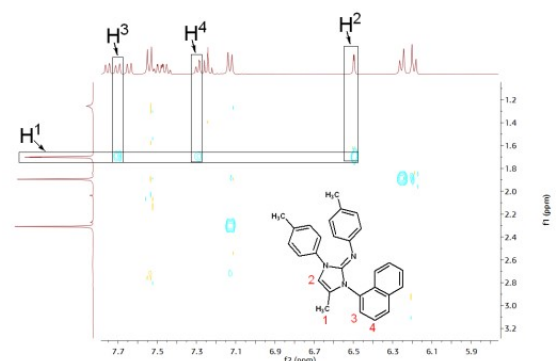
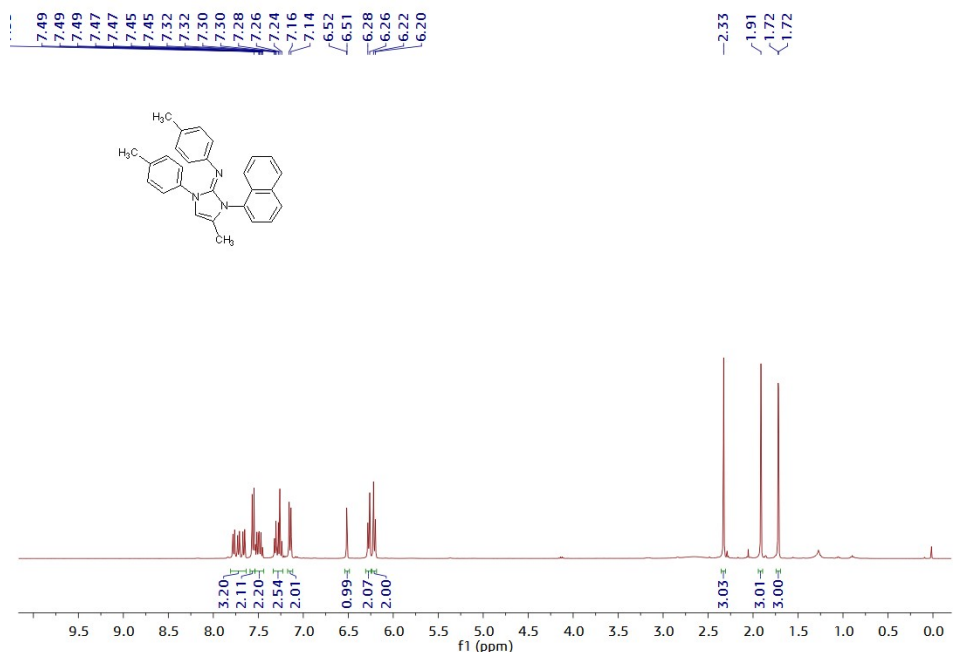
5h/5h':



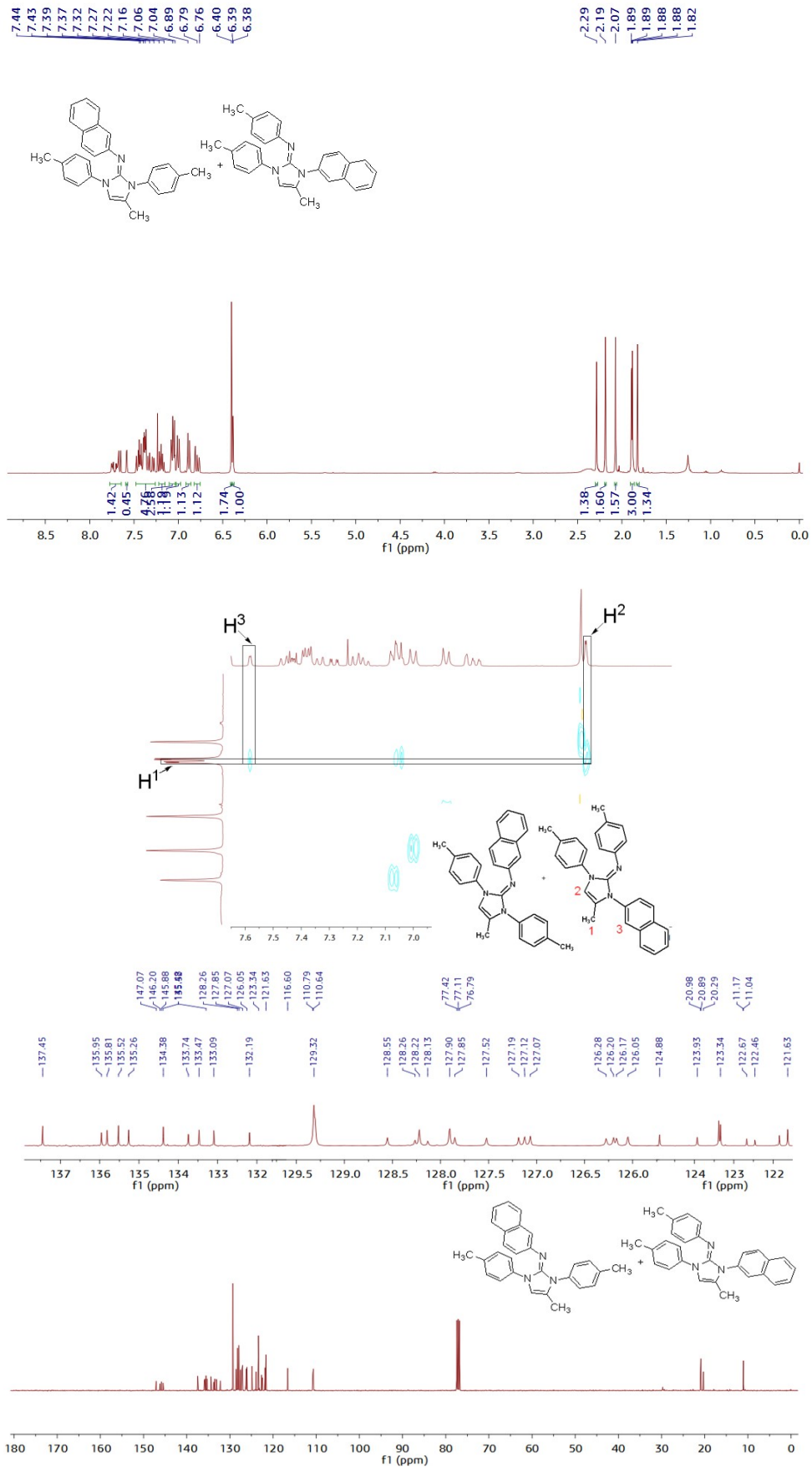
5i:



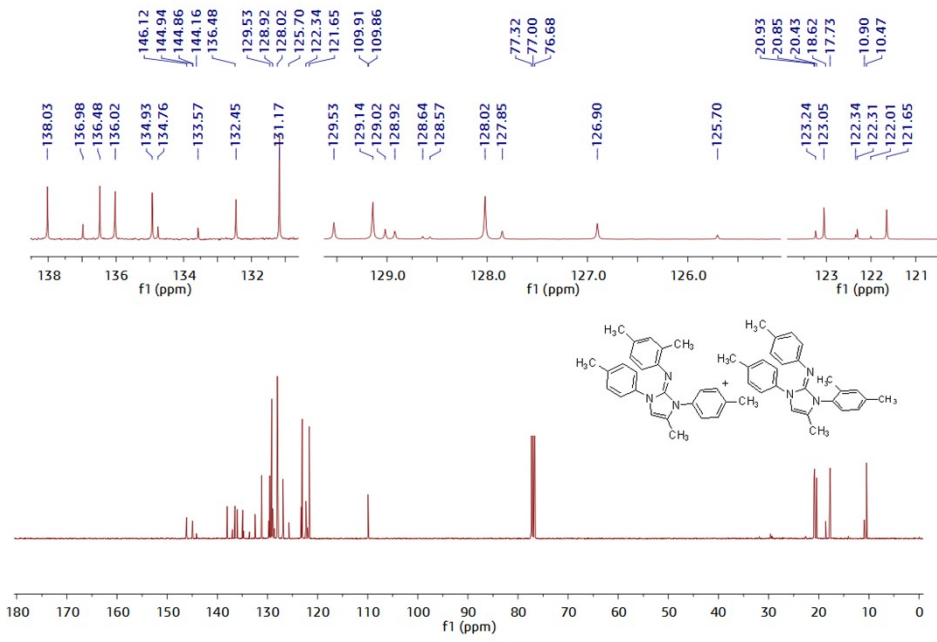
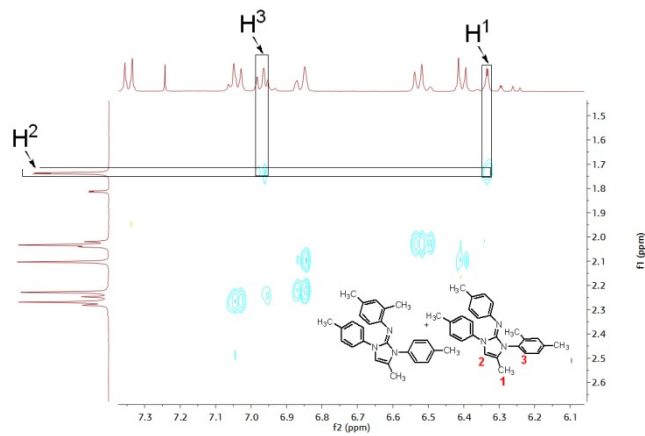
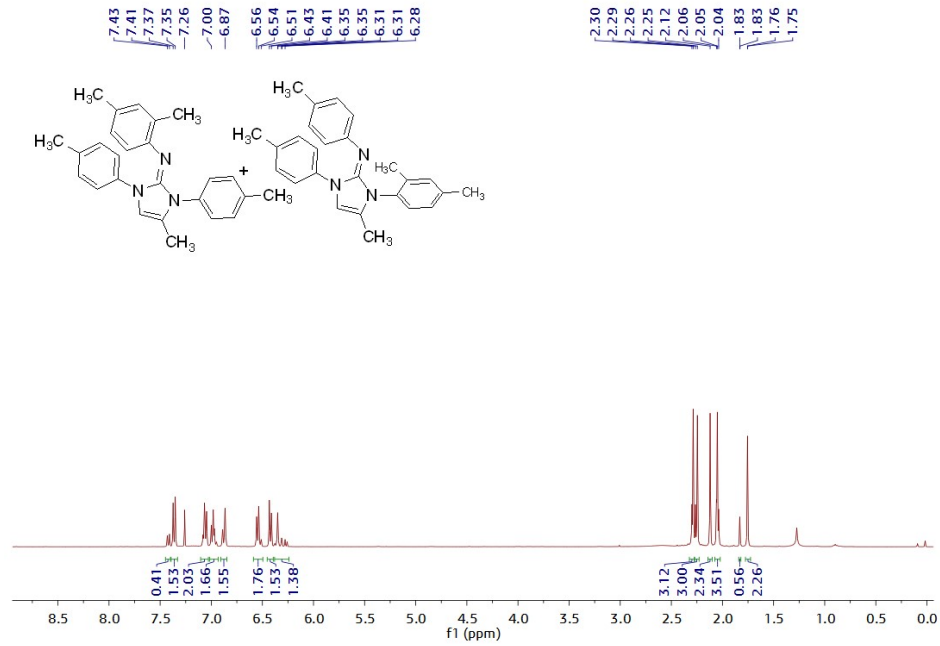
5i'



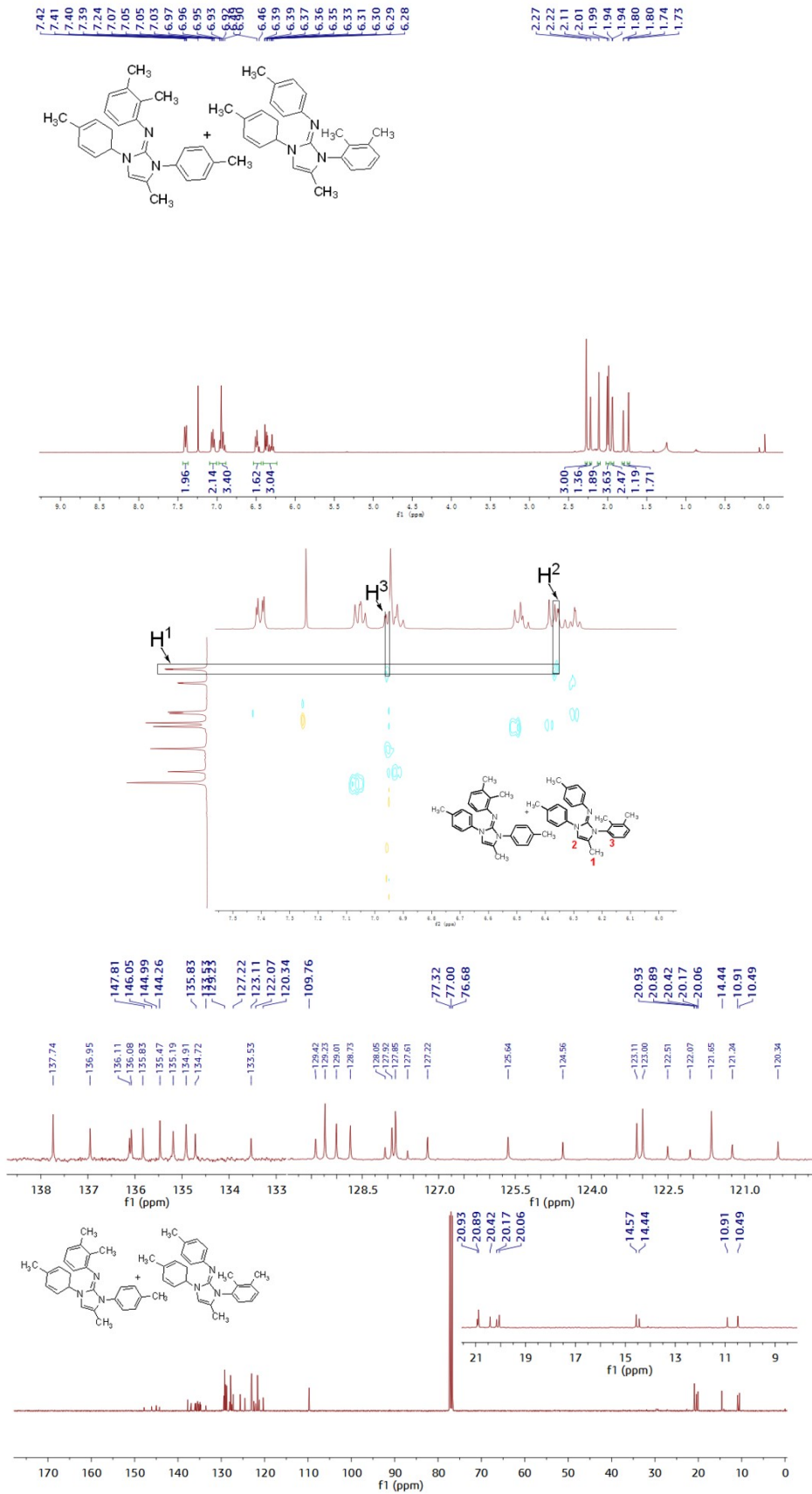
5j/5j':



51/51':



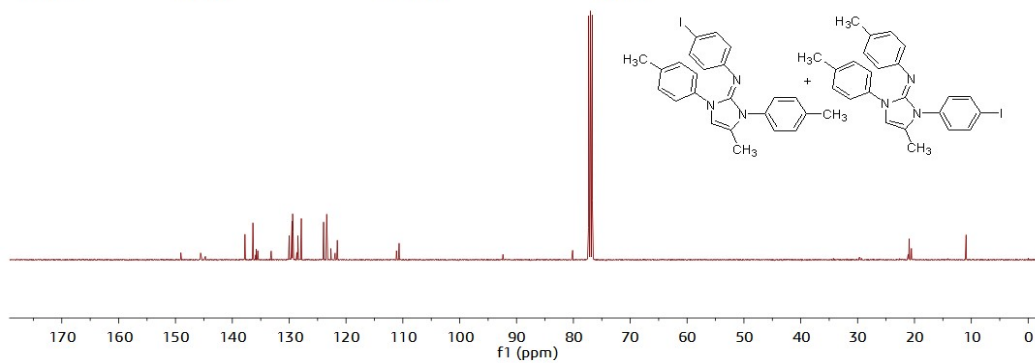
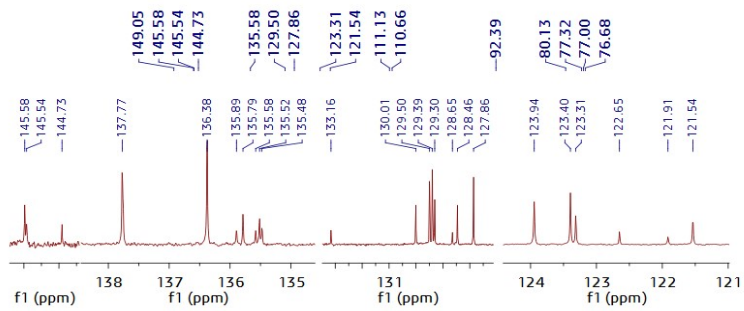
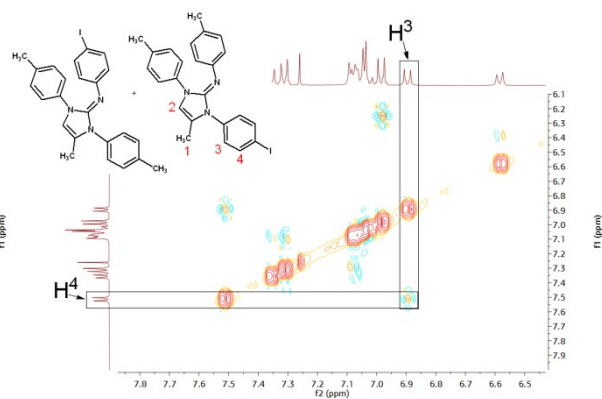
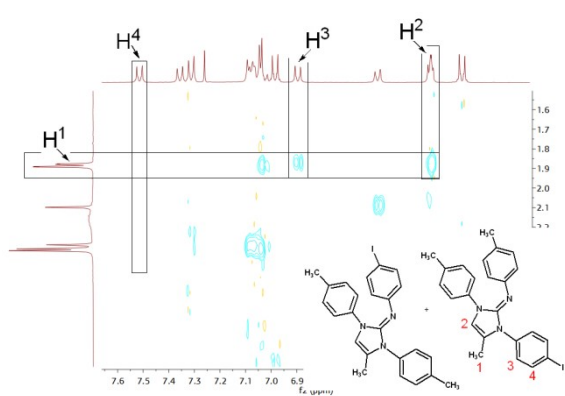
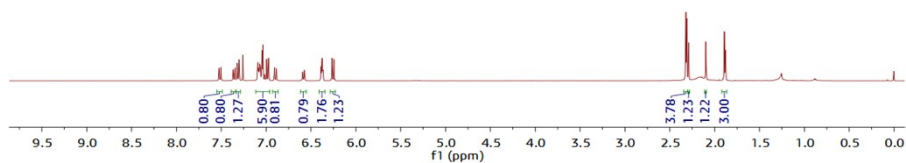
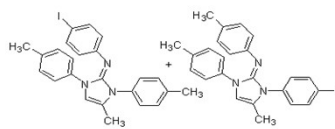
5m/5m':



5n/5n':

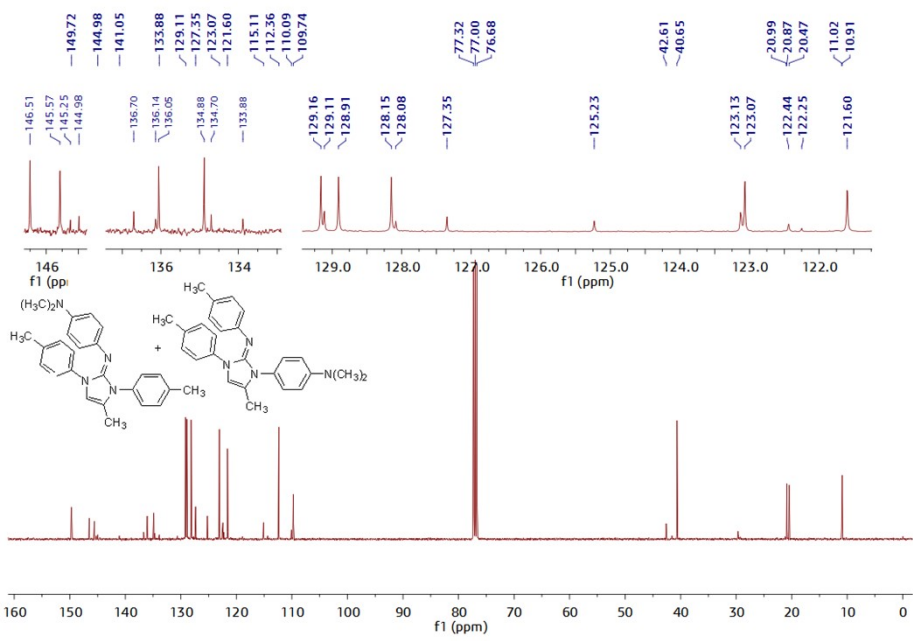
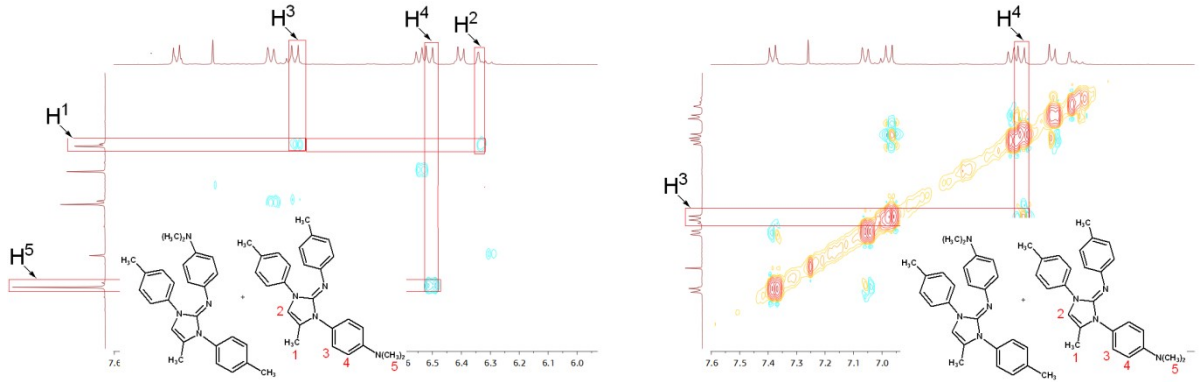
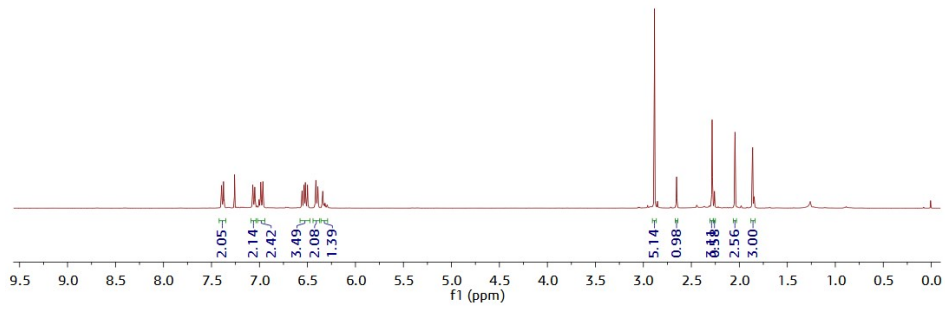
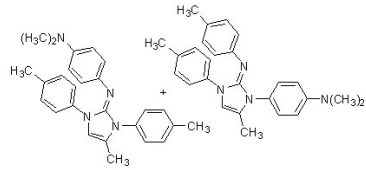
7.30
7.26
7.09
7.08
7.07
7.06
7.05
7.04
7.03
7.00
6.99
6.98
6.97
6.91
6.89
6.59
6.57
6.39
6.38
6.37
6.37
6.26
6.25
6.24

2.32
2.31
2.29
2.10
1.89
1.88
1.88

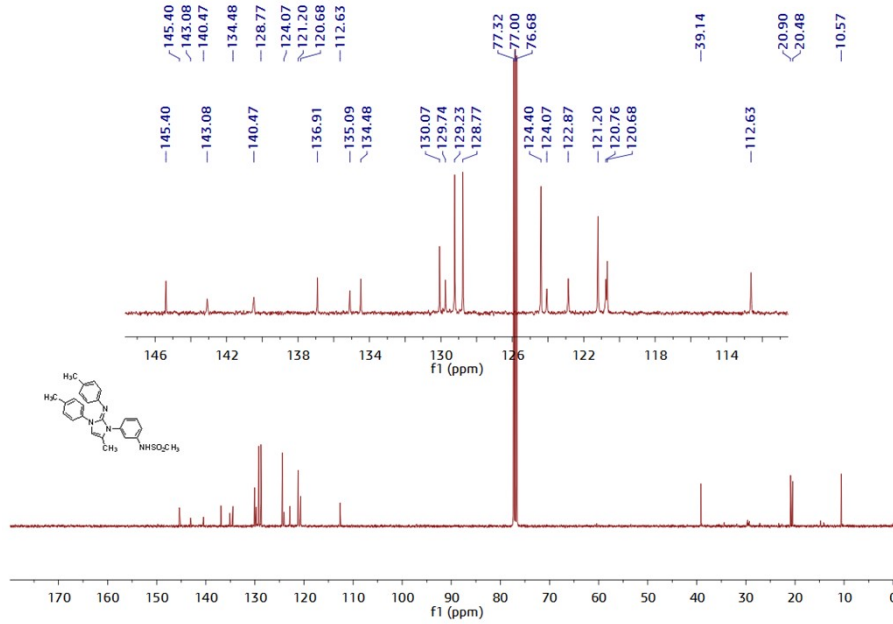
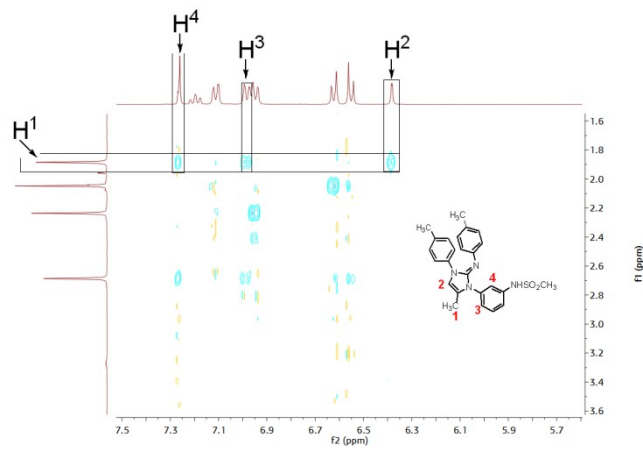
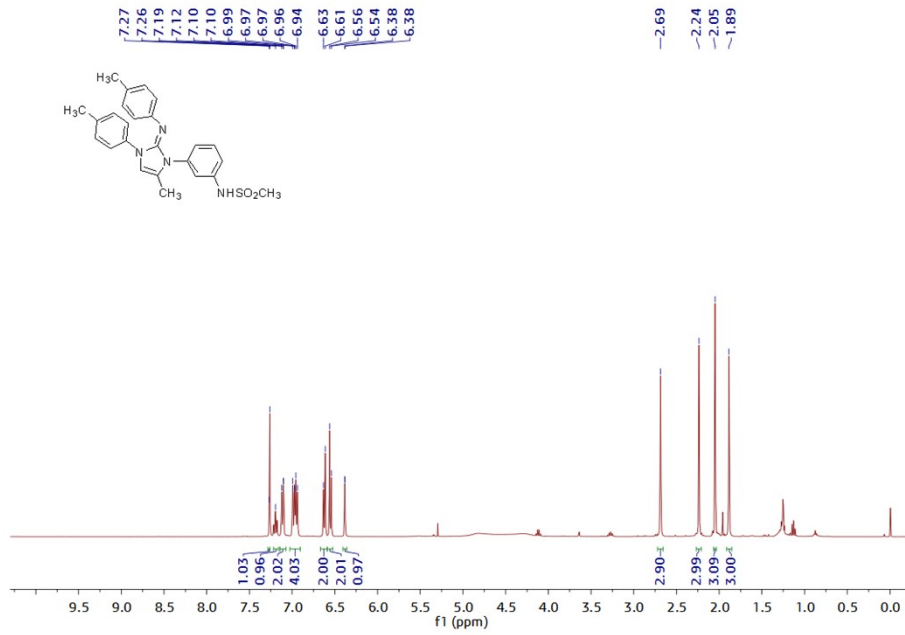


5o/5o':

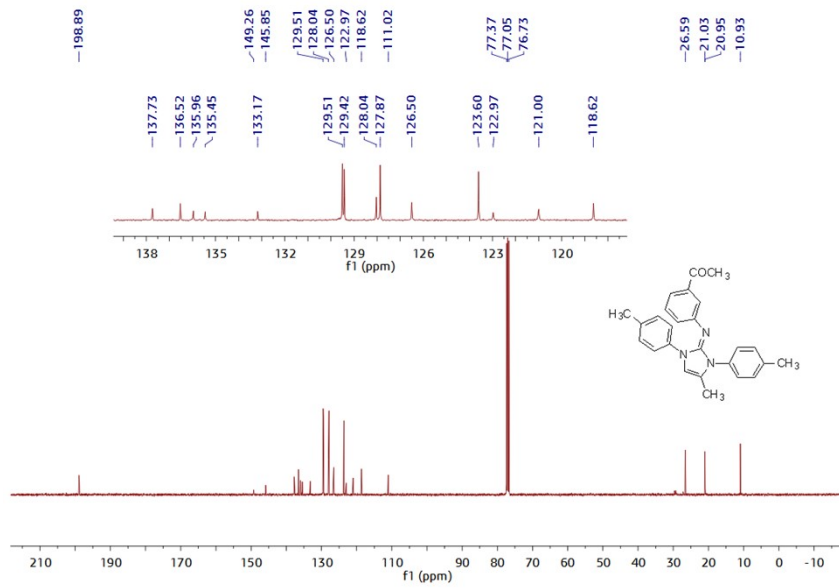
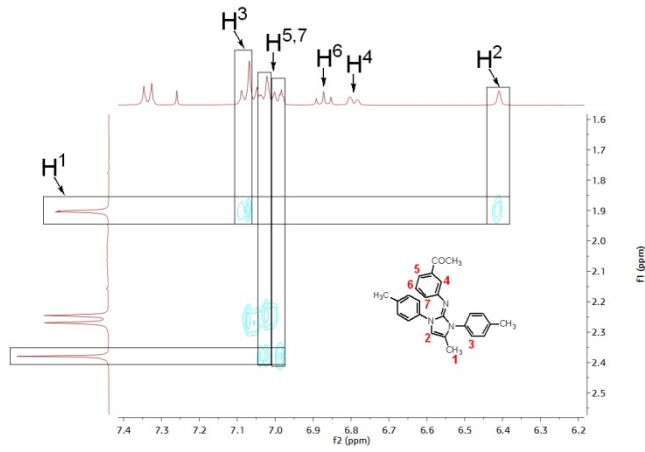
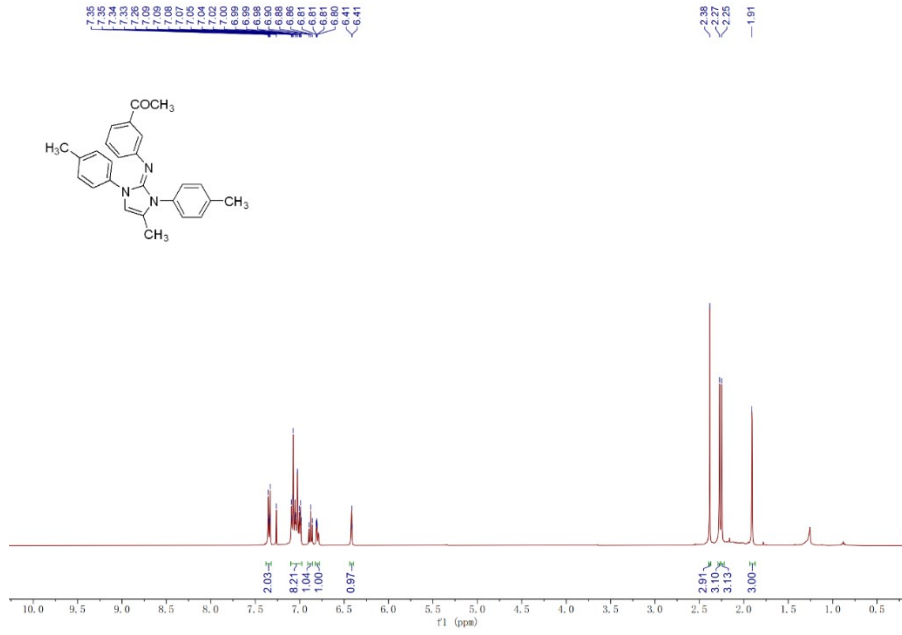
7.40
7.39
7.37
7.37
7.26
6.96
6.56
6.54
6.52
6.50
6.41
6.39
6.34
6.34
6.33
6.32
6.29
2.88
2.65
2.28
2.26
2.05
1.86



5p':



5q:



5r / 5r':

