

Supporting Information

Photo-induced silylation cyclization of indole-tethered 1,6-enynes to access silylated pyrrolo[1,2-a]indole derivatives

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General Information.....	2
Typical procedure for the reaction.....	2
Scaled-up experiment.....	2
Protocol for the synthesis of enynes.....	3
Mechanistic studies.....	3
Physical data and references for the following products.....	3
Copies of the ¹ H NMR, ¹³ C NMR, ¹⁹ F NMR.....	21

General Information

^1H and ^{13}C NMR and ^{19}F NMR spectra were recorded on a Bruker advance III 400 or 600 spectrometer in CDCl_3 with TMS as the internal standard. High-resolution mass spectral analysis (HRMS (ESI-TOF)) data were measured on a Waters Xevo G2-XS qTOF. All products were identified by ^1H and ^{13}C NMR, HRMS. The raw materials were purchased from Energy, Meryer, J&K Chemicals, or Aldrich and used without further purification.

Typical procedure for the reaction

Reaction conditions 1: A mixture of indole-tethered 1,6-enynes (1 equiv., 0.1 mmol), TTMSS (1.5 equiv.), 4CzIPN (0.03 equiv.), Cs_2CO_3 (0.5 equiv.), KI (1.2 equiv.), $(i\text{-Pr})_3\text{SiSH}$ (0.2 equiv.), and MeCN (3 mL), were added into a 15 mL quartz tube, which was lighted by 18W blue LEDs at room temperature, N_2 (18 W blue LEDs, 450 nm, purchased by Shenzhen Jinrui photoelectric Company, CN; the distance between them was 1.0 cm). After the silylation process was finished, the mixture was condensed under vacuum and purified by column chromatography to access the silylated pyrrolo[1,2-a]indoles.

Reaction conditions 2: A mixture of indole-tethered 1,6-enynes (1 equiv., 0.1 mmol), silylboronate (2.5 equiv.), 4CzIPN (0.05 equiv.), EtONa (0.2 equiv.), and EtOH (2 mL), in a 15 mL quartz tube, were initiated by 18W blue LEDs at room temperature, N_2 . After the cyclization reaction was completed, the same post-processing was performed.

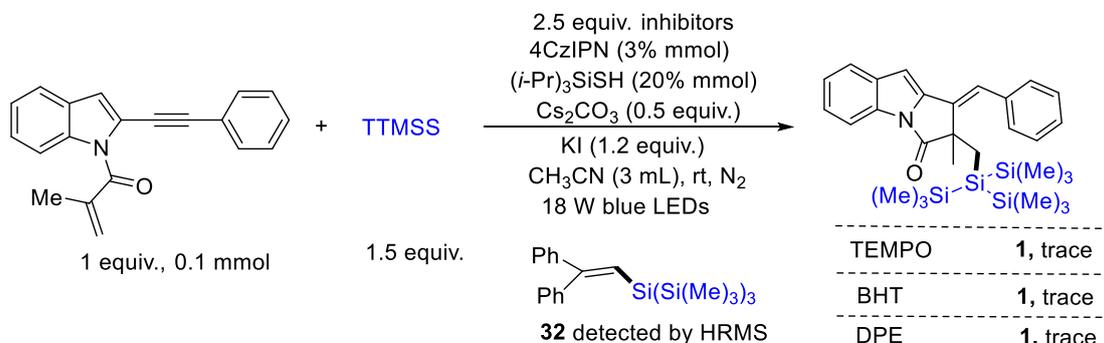
Scaled-up experiment

A mixture of 2-methyl-1-(2-(phenylethynyl)-1H-indol-1-yl)prop-2-en-1-one (1 equiv., 1 mmol, 285 mg), TTMSS (1.5 equiv.), 4CzIPN (0.03 equiv.), Cs_2CO_3 (0.5 equiv.), KI (1.2 equiv.), $(i\text{-Pr})_3\text{SiSH}$ (0.2 equiv.), and MeCN (7 mL), were added into a 15 mL quartz tube, which was lighted by 18W blue LEDs at room temperature, N_2 . After 12 h, the mixture was condensed under vacuum and purified by column chromatography to access the silylated product **1** in a 73% yield (391 mg).

Protocol for the synthesis of enynes

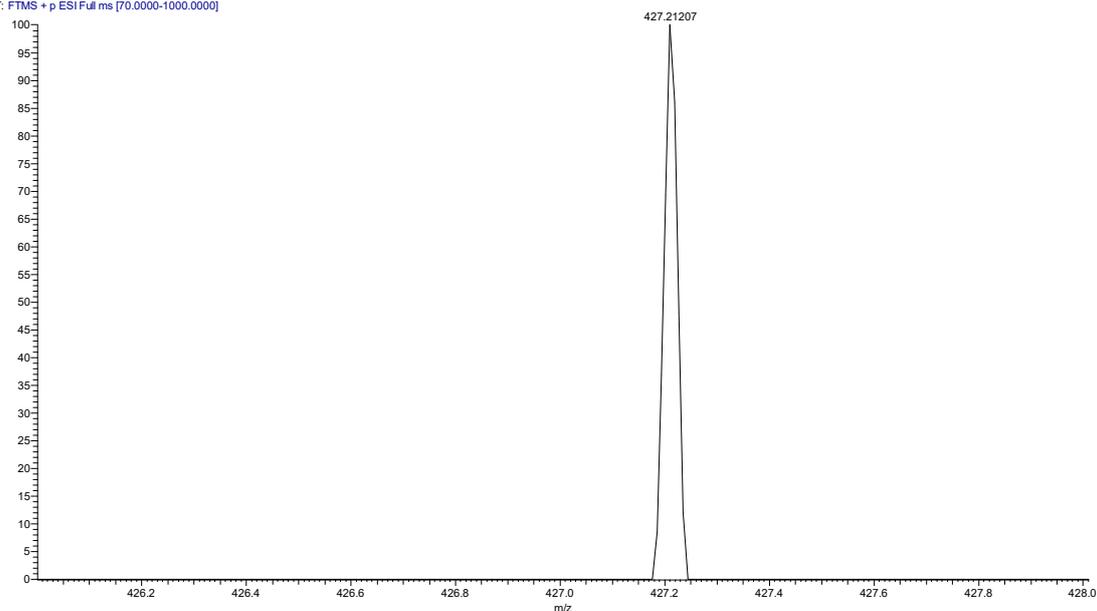
A range of indole-tethered 1,6-enynes was obtained according to reference 10 in the manuscript.

Mechanistic studies



Sample No.	Formula (M)	Ion Formula	Measured m/z	Calc m/z	Diff (ppm)
32	$\text{C}_{23}\text{H}_{38}\text{Si}_4$	$\text{C}_{23}\text{H}_{39}\text{Si}_4$	427.2121	427.2123	-0.5

Y:507 #124 RT: 0.16 AV: 1 NL: 2.83E6
T: FTMS + p ESI Full ms [70.0000-1000.0000]



Physical data and references for the following products

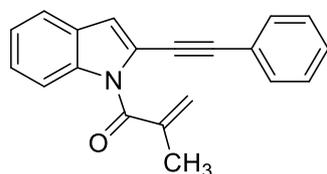
References:

1. C. Guo, L.-J. Li, Q. Yan, J. Chen, Z.-Q. Liu, Q. Li, S.-F. Ni and Z.-J. Li, *Org. Lett.*, **2024**, *26*, 3069-3074.
2. C. Guo, J. Chen, L. Li, X. Gu, Q. Yan, K. Sun and Z.-J. Li, *Adv. Synth. Catal.*, **2025**, *367*, e202500245.
3. H.-D. Zuo, X. Chen, Y. Yuan, Y. Zhang, J.-W. Liu, S.-H. Yan, W.-J. Hao and B. Jiang, *Org. Lett.* **2024**, *26*, 3810-3815.
4. H.-D. Zuo, X. Chen, Y. Zhang, J.-W. Liu, S.-H. Yan, G.-G. Li and J.-Y. Wang, *Org. Lett.*, **2024**, *26*, 3828-3833.

Physical data for the following products:

1-s. 2-methyl-1-(2-(phenylethynyl)-1H-indol-1-yl)prop-2-en-1-one

Brown solid after purification by flash column chromatography (petroleum ether/ethyl acetate = 100/1). 0.43g, the overall yield after four steps 30%. (with the initial system scale up to 5 mmol).

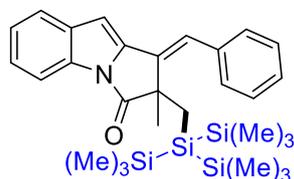


¹H NMR (400 MHz, CDCl₃): δ 8.15-8.12 (m, 1H), 7.58 (d, *J* = 7.2 Hz, 1H), 7.54 – 7.46 (m, 2H), 7.44 – 7.34 (m, 4H), 7.30 (t, *J* = 7.7 Hz, 1H), 7.00 (s, 1H), 5.76 (d, *J* = 2.1 Hz, 1H), 5.60 (s, 1H), 2.27 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 170.5, 140.5, 136.8, 131.0, 128.8, 128.7, 128.5, 125.7, 124.6, 123.7, 122.4, 120.7, 120.6, 116.0, 115.1, 97.6, 81.5, 19.2.

1. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 46.4 mg, 87% yield



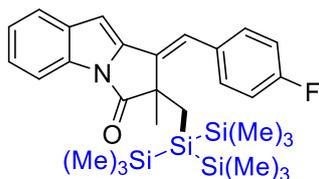
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.62 (d, *J* = 7.6 Hz, 2H), 7.50 – 7.44 (m, 3H), 7.38 – 7.30 (m, 2H), 7.28-7.27 (m, 1H), 6.74 (s, 1H), 6.58 (s, 1H), 1.69 (d, *J* = 13.0 Hz, 1H), 1.60 (s, 3H), 1.56 (d, *J* = 13.0 Hz, 1H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.7, 138.6, 136.4, 136.0, 134.9, 130.7, 128.6, 128.5, 128.0, 125.1, 124.8, 124.3, 121.4, 114.1, 102.7, 54.1, 30.5, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₄NOSi₄[M + H]⁺, 534.2422; Measured, 534.2484.

2. (E)-1-(4-fluorobenzylidene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 37.0 mg, 67% yield



¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.60 (d, *J* = 5.6 Hz, 1H), 7.58 (d, *J* = 5.5 Hz, 1H), 7.50 (d, *J* = 7.5 Hz, 1H), 7.34 (t, *J* = 7.6 Hz, 1H), 7.28 (d, *J* = 7.4 Hz, 1H), 7.15 (t, *J* = 8.5 Hz, 2H), 6.68 (s, 1H), 6.52 (s, 1H), 1.68 (d, *J* = 14.6 Hz, 1H), 1.58 (s, 3H), 1.54 (d, *J* = 14.8 Hz, 1H), 0.12 (s, 27H).

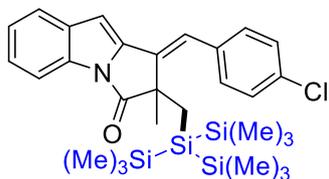
¹³C NMR (100 MHz, CDCl₃): δ 174.6, 162.2 (d, *J* = 246.6 Hz), 138.4, 136.1, 134.8, 132.4 (d, *J* = 4.3 Hz), 130.7, 130.4 (d, *J* = 8.4 Hz), 125.0, 124.4, 123.8, 121.4, 115.5 (d, *J* = 21.7 Hz), 114.1, 102.6, 54.1, 30.4, 19.6, 1.4

¹⁹F NMR (565 MHz, CDCl₃): δ -112.74 (s, 1F).

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃FNOSi₄[M + H]⁺, 552.2327; Measured, 552.2385.

3. (E)-1-(4-chlorobenzylidene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 38.0 mg, 67% yield



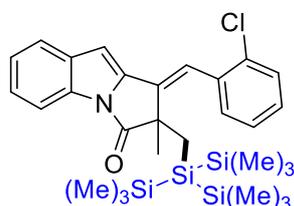
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.55 (d, *J* = 8.2 Hz, 2H), 7.51 (d, *J* = 7.7 Hz, 1H), 7.43 (d, *J* = 8.2 Hz, 2H), 7.34 (t, *J* = 7.6 Hz, 1H), 7.28 (d, *J* = 7.4 Hz, 1H), 6.70 (s, 1H), 6.50 (s, 1H), 1.69 (d, *J* = 14.7 Hz, 1H), 1.58 (s, 3H), 1.54 (d, *J* = 14.8 Hz, 1H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.5, 138.2, 136.7, 134.8, 134.8, 133.6, 130.8, 129.9, 128.8, 125.1, 124.4, 123.6, 121.5, 114.1, 102.9, 54.2, 30.4, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃ClNOSi₄[M + H]⁺, 568.2032; Measured, 568.2092.

4. (E)-1-(2-chlorobenzylidene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 45.1 mg, 80% yield



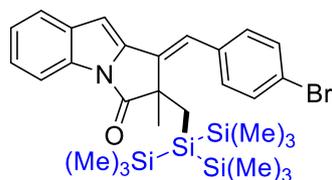
¹H NMR (400 MHz, CDCl₃): δ 8.09 (d, *J* = 8.0 Hz, 1H), 7.84 (d, *J* = 7.3 Hz, 1H), 7.49 (d, *J* = 9.4 Hz, 1H), 7.46 (d, *J* = 7.8 Hz, 1H), 7.37-7.31 (m, 3H), 7.27-7.25 (m, 1H), 6.67 (s, 1H), 6.46 (s, 1H), 1.69 (d, *J* = 14.8 Hz, 1H), 1.62 (s, 3H), 1.60 (d, *J* = 14.7 Hz, 1H), 0.17 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.4, 138.3, 138.1, 134.8, 134.6, 133.7, 130.7, 129.9, 129.4, 126.5, 125.0, 124.3, 122.0, 121.4, 114.1, 102.5, 53.8, 28.9, 20.6, 1.4

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃ClNOSi₄[M + H]⁺, 568.2032; Measured, 568.2117.

5. (E)-1-(4-bromobenzylidene)-2-((1,1,1,2,3,3,3-heptamethyltrisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 32.4 mg, 53% yield



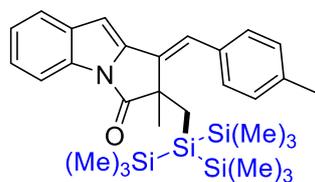
¹H NMR (400 MHz, CDCl₃): δ 8.09 (d, *J* = 7.7 Hz, 1H), 7.62 (d, *J* = 7.7 Hz, 1H), 7.58 (d, *J* = 6.5 Hz, 1H), 7.50 (t, *J* = 8.4 Hz, 2H), 7.45 (d, *J* = 7.2 Hz, 1H), 7.33 (d, *J* = 7.0 Hz, 1H), 6.72 (d, *J* = 11.2 Hz, 1H), 6.58 (s, 1H), 6.47 (s, 1H), 1.68 (d, *J* = 15.0 Hz, 1H), 1.58 (s, 3H), 1.54 (d, *J* = 15.1 Hz, 1H), 0.11 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.4, 131.7, 130.2, 128.6, 128.5, 128.0, 125.1, 124.8, 124.4, 124.3, 123.6, 121.5, 121.4, 114.1, 102.9, 54.2, 30.4, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃BrNOSi₄[M + H]⁺, 612.1527; Measured, 612.1582.

6. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1-(4-methylbenzylidene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 42.3 mg, 77% yield



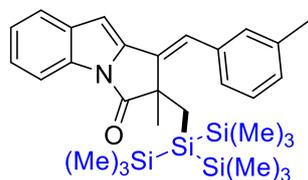
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 7.9 Hz, 1H), 7.51 (t, *J* = 8.0 Hz, 3H), 7.33 (t, *J* = 8.0 Hz, 1H), 7.27 (d, *J* = 7.1 Hz, 2H), 7.24 (s, 1H), 6.77 (s, 1H), 6.55 (s, 1H), 2.43 (s, 3H), 1.69 (d, *J* = 14.8 Hz, 1H), 1.59 (s, 3H), 1.56 (d, *J* = 14.0 Hz, 1H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 138.8, 138.0, 135.1, 135.0, 133.4, 130.7, 129.2, 128.5, 125.2, 124.7, 124.3, 121.3, 114.0, 102.5, 54.1, 30.6, 21.4, 19.5, 1.4

HRMS (ESI, *m/z*): calcd for C₃₀H₄₆NOSi₄[M + H]⁺, 548.2578; Measured, 548.2651.

7. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1-(3-methylbenzylidene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 44.3 mg, 81% yield



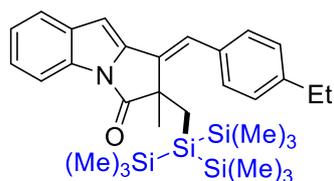
¹H NMR (400 MHz, CDCl₃): δ 8.11 (d, *J* = 7.4 Hz, 1H), 7.50 (d, *J* = 7.8 Hz, 1H), 7.46 (d, *J* = 7.8 Hz, 1H), 7.41 (s, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.32 (d, *J* = 7.7 Hz, 1H), 7.27 (d, *J* = 8.3 Hz, 1H), 7.18 (d, *J* = 7.6 Hz, 1H), 6.73 (s, 1H), 6.56 (s, 1H), 2.43 (s, 3H), 1.70 (d, *J* = 14.9 Hz, 1H), 1.60 (s, 3H), 1.57 (d, *J* = 14.6 Hz, 1H), 0.14 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.7, 138.7, 138.1, 136.3, 135.8, 134.9, 130.7, 129.3, 128.8, 128.4, 125.6, 125.3, 124.8, 124.3, 121.3, 114.0, 102.6, 54.0, 30.3, 21.4, 19.7, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₀H₄₆NOSi₄[M + H]⁺, 548.2578; Measured, 548.2640.

8. (E)-1-(4-ethylbenzylidene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 47.3 mg, 84% yield (13:1).



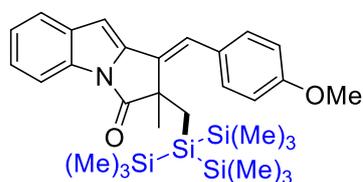
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.55 (d, *J* = 7.7 Hz, 2H), 7.51 (d, *J* = 7.9 Hz, 1H), 7.34 (d, *J* = 7.5 Hz, 1H), 7.29 (d, *J* = 8.5 Hz, 3H), 6.79 (s, 1H), 6.55 (s, 1H), 2.73 (q, *J* = 7.7 Hz, 2H), 1.69 (d, *J* = 14.1 Hz, 1H), 1.59 (s, 3H), 1.56 (d, *J* = 14.3 Hz, 1H), 1.31 (t, *J* = 7.6 Hz, 3H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 144.3, 138.8, 135.1, 135.0, 133.6, 130.7, 128.6, 127.9, 125.2, 124.7, 124.3, 121.3, 114.03, 102.5, 54.1, 30.6, 28.7, 19.5, 15.4, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₁H₄₈NOSi₄[M + H]⁺, 562.2735; Measured, 562.2800.

9. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-1-(4-methoxybenzylidene)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 41.9 mg, 74% yield (10:1).



¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.57 (d, *J* = 8.3 Hz, 2H), 7.50 (d, *J* = 8.0 Hz, 1H), 7.34 – 7.28 (m, 2H), 6.99 (d, *J* = 8.1 Hz, 2H), 6.77 (s, 1H), 6.52 (s, 1H), 3.89 (s, 3H), 1.69 (d, *J* = 14.9 Hz, 1H), 1.58 (s, 3H), 1.55 (d, *J* = 14.6 Hz, 1H), 0.11 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 159.3, 139.0, 135.0, 134.2, 130.7, 130.0, 128.8, 124.9, 124.7, 124.3, 121.3, 114.0, 113.8, 102.2, 55.3, 54.1, 30.7, 19.5, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₀H₄₆NO₂Si₄[M + H]⁺, 564.2527; Measured, 564.2600.

10. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1-(4-(trifluoromethyl)benzylidene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 33.8 mg, 56% yield (10:1).



^1H NMR (400 MHz, CDCl_3): δ 8.10 (d, J = 8.0 Hz, 1H), 7.75-7.70 (m, 4H), 7.52 (d, J = 7.9 Hz, 1H), 7.38 – 7.33 (m, 1H), 7.29 (d, J = 7.6 Hz, 1H), 6.71 (s, 1H), 6.56 (s, 1H), 1.70 (d, J = 15.9 Hz, 1H), 1.60 (s, 3H), 1.56 (d, J = 14.8 Hz, 1H), 0.12 (s, 27H).

^{13}C NMR (100 MHz, CDCl_3): δ 174.3, 140.2, 138.2, 137.9, 134.8, 130.9, 128.9, 125.6 (q, J = 3.5 Hz), 125.4, 124.6 (q, J = 271.1 Hz), 124.6, 123.2, 121.6, 114.2, 103.3, 54.4, 30.4, 19.7, 1.4.

^{19}F NMR (565 MHz, CDCl_3): δ -62.53 (s, 3F)

HRMS (ESI, m/z): calcd for $\text{C}_{30}\text{H}_{43}\text{F}_3\text{NOSi}_4$ [$\text{M} + \text{H}$] $^+$, 602.2296; Measured, 602.2368.

11. methyl (E)-4-((2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-3-oxo-2,3-dihydro-1H-pyrrolo[1,2-a]indol-1-ylidene)methyl)benzoate

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 36.1 mg, 61% yield



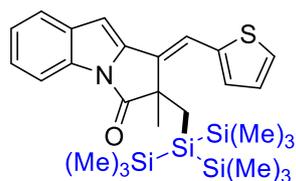
^1H NMR (400 MHz, CDCl_3): δ 8.13 (d, J = 8.2 Hz, 2H), 8.10 (d, J = 8.2 Hz, 1H), 7.69 (d, J = 8.1 Hz, 2H), 7.50 (d, J = 8.0 Hz, 1H), 7.35 (t, J = 7.5 Hz, 1H), 7.28 (d, J = 8.2 Hz, 1H), 6.74 (s, 1H), 6.57 (s, 1H), 3.96 (s, 3H), 1.70 (d, J = 14.7 Hz, 1H), 1.60 (s, 3H), 1.56 (d, J = 8.0 Hz, 1H), 0.12 (s, 27H).

^{13}C NMR (100 MHz, CDCl_3): δ 174.3, 166.7, 141.1, 138.0, 134.7, 130.8, 129.8, 129.7, 129.4, 128.5, 125.2, 124.5, 123.7, 121.5, 114.1, 103.3, 54.3, 52.2, 30.3, 19.7, 1.4.

HRMS (ESI, m/z): calcd for $\text{C}_{31}\text{H}_{46}\text{NO}_3\text{Si}_4$ [$\text{M} + \text{H}$] $^+$, 592.2477; Measured, 592.2532.

12. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1-(thiophen-2-ylmethylene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 35.6 mg, 66% yield



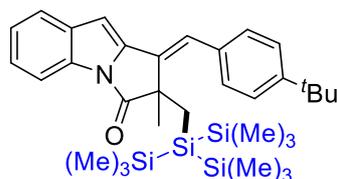
¹H NMR (400 MHz, CDCl₃): δ 8.12 (d, *J* = 7.8 Hz, 1H), 7.61 (d, *J* = 7.6 Hz, 1H), 7.44 (d, *J* = 5.1 Hz, 1H), 7.36 – 7.32 (m, 4H), 7.15 (t, *J* = 4.4 Hz, 1H), 6.65 (s, 1H), 1.73 (d, *J* = 14.5 Hz, 1H), 1.58 (s, 3H), 1.52 (d, *J* = 14.8 Hz, 1H), 0.08 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.5, 139.1, 138.3, 135.1, 133.0, 130.8, 129.1, 127.3, 126.4, 125.1, 124.4, 121.6, 117.5, 114.1, 104.2, 54.7, 30.9, 19.4, 1.3.

HRMS (ESI, *m/z*): calcd for C₂₇H₄₂NOSSi₄[M + H]⁺, 540.1986; Measured, 540.2044.

13. (E)-1-(4-(tert-butyl)benzylidene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow solid after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 48.3 mg, 82% yield. Mp: 143-144 °C



¹H NMR (400 MHz, CDCl₃): δ 8.06 (d, *J* = 6.0 Hz, 1H), 7.58 (d, *J* = 8.3 Hz, 1H), 7.43-7.39 (m, 4H), 7.34 – 7.26 (m, 2H), 7.20 (s, 1H), 6.65 (s, 1H), 1.69 (d, *J* = 14.6 Hz, 1H), 1.65 (d, *J* = 15.9 Hz, 1H), 1.62 (s, 3H), 1.35 (s, 9H), 0.04 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 175.1, 150.9, 143.2, 135.7, 135.5, 132.4, 130.8, 129.3, 126.0, 125.4, 124.3, 124.0, 121.0, 114.1, 97.2, 53.3, 34.6, 31.2, 27.2, 18.8, 1.5

HRMS (ESI, *m/z*): calcd for C₃₃H₅₂NOSi₄[M + H]⁺, 590.3048; Measured, 590.3109.

14. (E)-1-([1,1'-biphenyl]-4-ylmethylene)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 40.5 mg, 68% yield



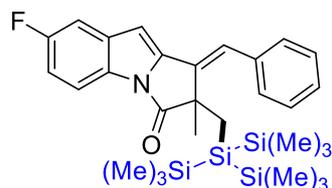
¹H NMR (400 MHz, CDCl₃): δ 8.11 (d, *J* = 8.0 Hz, 1H), 7.70 (s, 5H), 7.68 (s, 1H), 7.52-7.47 (m, 3H), 7.41-7.32 (m, 2H), 7.29 (s, 1H), 6.85 (s, 1H), 6.60 (s, 1H), 1.71 (d, *J* = 14.7 Hz, 1H), 1.61 (s, 3H), 1.56 (d, *J* = 14.0 Hz, 1H), 0.13 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.7, 140.7, 140.4, 138.7, 135.9, 135.4, 134.9, 130.8, 129.1, 128.9, 127.6, 127.1, 127.0, 124.9, 124.7, 124.4, 121.4, 114.1, 102.8, 54.3, 30.6, 19.6, 1.4

HRMS (ESI, *m/z*): calcd for C₃₅H₄₈NOSi₄[M + H]⁺, 610.2735; Measured, 610.2788.

15. (E)-1-benzylidene-7-fluoro-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 38.8 mg, 71% yield



¹H NMR (400 MHz, CDCl₃): δ 8.02 (dd, *J* = 8.9, 4.6 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 2H), 7.46 (t, *J* = 7.6 Hz, 2H), 7.37 (t, *J* = 7.4 Hz, 1H), 7.14 (dd, *J* = 9.1, 2.4 Hz, 1H), 7.08-7.02 (m, 1H), 6.67 (s, 1H), 6.61 (s, 1H), 1.68 (d, *J* = 14.7 Hz, 1H), 1.59 (s, 3H), 1.55 (d, *J* = 14.8 Hz, 1H), 0.12 (s, 27H).

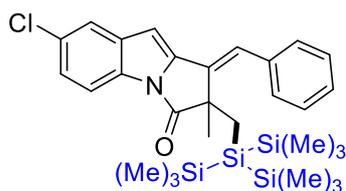
¹³C NMR (100 MHz, CDCl₃): δ 174.4, 160.0 (d, *J* = 239.7 Hz), 140.2, 136.1, 135.9 (d, *J* = 10.2 Hz), 135.7, 128.6, 128.5, 128.2, 127.2, 125.8, 114.9 (d, *J* = 9.6 Hz), 112.9 (d, *J* = 25.7 Hz), 106.8 (d, *J* = 24.1 Hz), 102.4 (d, *J* = 4.3 Hz), 53.9, 30.4, 19.6, 1.4.

¹⁹F NMR (565 MHz, CDCl₃): δ -117.55 (s, 1F)

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃FNOSi₄[M + H]⁺, 552.2327; Measured, 552.2390.

16. (E)-1-benzylidene-7-chloro-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 35.6 mg, 60% yield



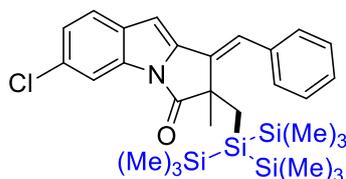
¹H NMR (400 MHz, CDCl₃): δ 8.00 (d, *J* = 8.6 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 2H), 7.45 (t, *J* = 7.2 Hz, 3H), 7.38 (t, *J* = 7.3 Hz, 1H), 7.29 (d, *J* = 1.9 Hz, 1H), 6.64 (s, 1H), 6.62 (s, 1H), 1.68 (d, *J* = 14.7 Hz, 1H), 1.59 (s, 3H), 1.55 (d, *J* = 14.9 Hz, 1H), 0.11 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.5, 139.9, 136.1, 136.0, 135.7, 129.8, 129.0, 128.6, 128.3, 126.0, 125.1, 120.9, 114.9, 101.8, 54.0, 30.4, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃ClNOSi₄[M + H]⁺, 568.2032; Measured, 568.2091.

17. (E)-1-benzylidene-6-chloro-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 27.8 mg, 53% yield



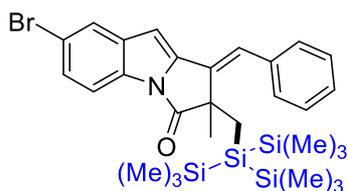
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 1.9 Hz, 1H), 7.60 (d, *J* = 7.6 Hz, 2H), 7.46 (t, *J* = 7.7 Hz, 2H), 7.39 (t, *J* = 8.4 Hz, 2H), 7.23 (dd, *J* = 8.4, 1.9 Hz, 1H), 6.69 (s, 1H), 6.61 (s, 1H), 1.69 (d, *J* = 14.7 Hz, 1H), 1.60 (s, 3H), 1.57 (d, *J* = 14.8 Hz, 1H), 0.14 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.6, 139.2, 136.2, 135.8, 133.3, 130.9, 130.6, 128.6, 128.5, 128.2, 125.6, 125.0, 122.1, 114.1, 102.2, 54.1, 30.5, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃BrNOSi₄[M + H]⁺, 568.2032; Measured, 568.2089.

18. (E)-1-benzylidene-7-bromo-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 33.6 mg, 55% yield



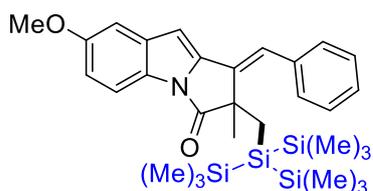
¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 8.0 Hz, 1H), 7.62 (d, *J* = 7.6 Hz, 2H), 7.50 – 7.46 (m, 2H), 7.38 – 7.28 (m, 3H), 6.74 (s, 1H), 6.58 (s, 1H), 1.69 (d, *J* = 13.6 Hz, 1H), 1.60 (s, 3H), 1.56 (d, *J* = 13.6 Hz, 1H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.7, 138.6, 136.3, 136.0, 134.9, 130.7, 128.6, 128.5, 128.0, 125.1, 124.8, 124.3, 121.4, 114.1, 102.7, 54.1, 30.5, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₂₉H₄₃BrNOSi₄[M + H]⁺, 612.1527; Measured, 612.1578.

19. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-7-methoxy-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 41.0 mg, 73% yield (8:1).



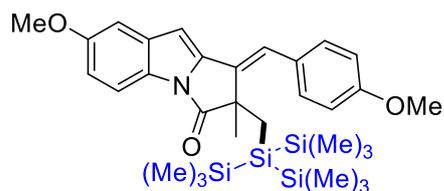
¹H NMR (400 MHz, CDCl₃): δ 7.98 (d, *J* = 9.3 Hz, 1H), 7.61 (d, *J* = 7.6 Hz, 2H), 7.45 (t, *J* = 7.3 Hz, 2H), 7.36 (d, *J* = 7.8 Hz, 1H), 6.96-6.93 (m, 2H), 6.68 (s, 1H), 6.56 (s, 1H), 3.84 (s, 3H), 1.69 (d, *J* = 14.6 Hz, 1H), 1.59 (s, 3H), 1.56 (d, *J* = 12.4 Hz, 1H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.2, 157.0, 139.4, 136.4, 136.0, 135.9, 129.4, 128.6, 128.5, 128.0, 124.8, 114.7, 113.9, 103.5, 102.6, 55.6, 53.9, 30.5, 19.6, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₀H₄₆NO₂Si₄[M + H]⁺, 564.2527; Measured, 564.2590.

20. (E)-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-7-methoxy-1-(4-methoxybenzylidene)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 35.2 mg, 59% yield



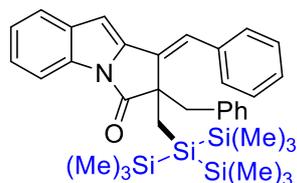
¹H NMR (400 MHz, CDCl₃): δ 7.97 (d, *J* = 8.7 Hz, 1H), 7.59 – 7.52 (m, 2H), 7.00 – 6.93 (m, 4H), 6.71 (s, 1H), 6.49 (s, 1H), 3.88 (s, 3H), 3.84 (s, 3H), 1.67 (d, *J* = 13.9 Hz, 1H), 1.56 (s, 3H), 1.53 (d, *J* = 14.0 Hz, 1H), 0.10 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.4, 159.2, 156.9, 139.7, 136.0, 134.2, 130.0, 128.8, 125.5, 124.7, 114.7, 113.8, 113.6, 103.5, 102.1, 55.6, 55.3, 53.9, 30.7, 19.4, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₁H₄₈NO₃Si₄[M + H]⁺, 594.2633; Measured, 594.2690.

21. (E)-2-benzyl-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

An orange oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 34.1 mg, 57% yield



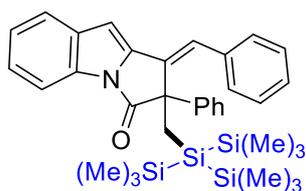
¹H NMR (400 MHz, CDCl₃): δ 8.06 (d, *J* = 8.2 Hz, 1H), 7.54 (d, *J* = 7.6 Hz, 2H), 7.45 (t, *J* = 7.5 Hz, 2H), 7.38-7.33 (m, 2H), 7.27 (d, *J* = 8.7 Hz, 1H), 7.19 (d, *J* = 8.0 Hz, 1H), 7.07 (d, *J* = 5.0 Hz, 2H), 7.00 (d, *J* = 5.0 Hz, 3H), 6.51 (s, 1H), 6.44 (s, 1H), 3.40 (d, *J* = 12.7 Hz, 1H), 3.02 (d, *J* = 12.8 Hz, 1H), 1.84 (d, *J* = 14.6 Hz, 1H), 1.64 (d, *J* = 14.7 Hz, 1H), 0.13 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 173.5, 139.0, 136.2, 135.9, 134.6, 132.9, 130.4, 130.0, 128.6, 128.5, 128.1, 127.6, 126.7, 125.9, 124.6, 124.2, 121.2, 113.8, 102.2, 59.6, 50.5, 17.9, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₅H₄₈NOSi₄[M + H]⁺, 610.2735; Measured, 610.2807.

22. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-phenyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown solid after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 35.1 mg, 59% yield. Mp: 139-140 °C



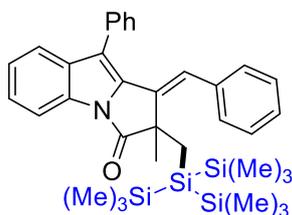
¹H NMR (400 MHz, CDCl₃): δ 8.08 (d, *J* = 8.1 Hz, 1H), 7.64 (d, *J* = 7.6 Hz, 2H), 7.54 (d, *J* = 7.5 Hz, 2H), 7.51 (d, *J* = 7.4 Hz, 1H), 7.46 (t, *J* = 7.4 Hz, 2H), 7.38 (d, *J* = 7.4 Hz, 1H), 7.32 (t, *J* = 7.4 Hz, 3H), 7.28 (d, *J* = 5.0 Hz, 1H), 7.25 (d, *J* = 6.0 Hz, 1H), 6.83 (s, 1H), 6.54 (s, 1H), 2.28 (d, *J* = 14.4 Hz, 1H), 1.89 (d, *J* = 14.8 Hz, 1H), 0.10 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 172.6, 143.6, 138.8, 136.1, 134.8, 134.5, 130.8, 128.7, 128.7, 128.5, 128.3, 127.9, 127.4, 126.6, 125.0, 124.5, 121.4, 114.1, 103.0, 62.3, 19.0, 1.3.

HRMS (ESI, *m/z*): calcd for C₃₄H₄₄NOSi₄[M - H]⁺, 594.2578; Measured, 594.2482.

23. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-9-phenyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A brown solid after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 49.9 mg, 82% yield. Mp: 129-130 °C



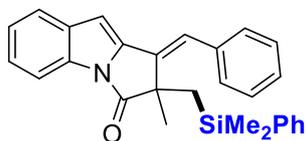
¹H NMR (400 MHz, CDCl₃): δ 8.23 (d, *J* = 8.0 Hz, 1H), 7.73 (d, *J* = 8.0 Hz, 1H), 7.41 (t, *J* = 7.1 Hz, 1H), 7.33 (d, *J* = 7.0 Hz, 1H), 7.06 (t, *J* = 7.4 Hz, 1H), 7.00 (d, *J* = 6.8 Hz, 2H), 6.91 (t, *J* = 7.7 Hz, 3H), 6.84 (d, *J* = 7.6 Hz, 2H), 6.69 (t, *J* = 7.6 Hz, 2H), 6.59 (s, 1H), 1.75 (d, *J* = 14.8 Hz, 1H), 1.66 (s, 3H), 1.61 (d, *J* = 14.7 Hz, 1H), 0.16 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.5, 135.8, 135.2, 134.7, 134.4, 133.5, 131.1, 128.6, 127.8, 127.4, 127.0, 126.9, 126.7, 125.3, 124.5, 124.5, 120.5, 118.2, 114.2, 55.6, 30.3, 19.5, 1.4.

HRMS (ESI, *m/z*): calcd for C₃₅H₄₈NOSi₄[M + H]⁺, 610.2735; Measured, 610.2792.

24. (E)-1-benzylidene-2-((dimethyl(phenyl)silyl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 17.7 mg, 42% yield



¹H NMR (400 MHz, CDCl₃): δ 7.93 (d, *J* = 7.8 Hz, 1H), 7.50 – 7.43 (m, 3H), 7.44 (d, *J* = 1.9 Hz, 2H), 7.42 (d, *J* = 1.6 Hz, 1H), 7.30-7.27 (m, 4H), 7.15 – 7.04 (m, 3H), 6.59 (s, 1H), 6.52 (s, 1H), 1.75 (d, *J* = 14.8 Hz, 1H), 1.59 (s, 3H), 1.48 (d, *J* = 14.8 Hz, 1H), 0.15 (s, 3H), 0.13 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 174.7, 138.5, 137.9, 136.4, 135.0, 134.5, 133.3, 130.5, 128.7, 128.5, 128.3, 128.0, 127.5, 125.9, 124.6, 124.3, 121.2, 114.1, 102.2, 52.9, 29.9, 27.7, -1.9, -1.9.

HRMS (ESI, m/z): calcd for C₂₈H₂₇NONaSi₄[M + Na]⁺, 444.1862; Measured, 444.1754.

25. (E)-2-((dimethyl(phenyl)silyl)methyl)-2-methyl-1-(4-methylbenzylidene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 18.7 mg, 43% yield



¹H NMR (400 MHz, CDCl₃): δ 7.92 (d, *J* = 7.7 Hz, 1H), 7.46 (d, *J* = 7.6 Hz, 1H), 7.35 (d, *J* = 7.8 Hz, 2H), 7.28 (s, 2H), 7.24 (d, *J* = 7.7 Hz, 4H), 7.11 – 7.06 (m, 3H), 6.62 (s, 1H), 6.49 (s, 1H), 2.43 (s, 3H), 1.73 (d, *J* = 14.8 Hz, 1H), 1.58 (s, 3H), 1.46 (d, *J* = 14.8 Hz, 1H), 0.14 (s, 3H), 0.12 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 138.7, 138.0, 137.9, 135.0, 133.8, 133.4, 133.3, 130.4, 129.1, 128.7, 128.3, 127.4, 126.0, 124.5, 124.3, 121.1, 114.1, 102.1, 52.9, 29.9, 27.7, 21.4, -1.9, -1.9.

HRMS (ESI, m/z): calcd for C₂₉H₃₀NOSi[M + H]⁺, 436.2018; Measured, 436.2091.

26. (E)-2-((dimethyl(phenyl)silyl)methyl)-1-(4-ethylbenzylidene)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 22 mg, 47% yield



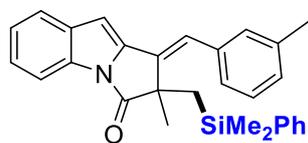
¹H NMR (400 MHz, CDCl₃): δ 7.92 (d, *J* = 7.6 Hz, 1H), 7.47 (d, *J* = 7.5 Hz, 1H), 7.39 (d, *J* = 7.8 Hz, 2H), 7.28 (d, *J* = 9.0 Hz, 4H), 7.25 (d, *J* = 4.6 Hz, 2H), 7.08 (d, *J* = 6.6 Hz, 3H), 6.64 (s, 1H), 6.49 (s, 1H), 2.73 (q, *J* = 7.6 Hz, 2H), 1.73 (d, *J* = 14.8 Hz, 1H), 1.57 (s, 3H), 1.46 (d, *J* = 14.7 Hz, 1H), 1.31 (t, *J* = 7.5 Hz, 3H), 0.14 (s, 3H), 0.12 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 144.3, 138.8, 138.0, 135.0, 133.7, 133.7, 133.3, 130.5, 128.7, 128.4, 127.9, 127.4, 126.0, 124.5, 124.3, 121.1, 114.1, 102.1, 52.9, 29.9, 28.8, 27.7, 15.5, -1.9, -1.9.

HRMS (ESI, m/z): calcd for C₃₀H₃₂NOSi[M + H]⁺, 450.2175; Measured, 450.2248.

27. (E)-2-((dimethyl(phenyl)silyl)methyl)-2-methyl-1-(3-methylbenzylidene)-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A green oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 17.8 mg, 41% yield



¹H NMR (400 MHz, CDCl₃): δ 7.94 (d, *J* = 7.8 Hz, 1H), 7.47 (d, *J* = 7.5 Hz, 1H), 7.32 (d, *J* = 7.1 Hz, 2H), 7.29 (dd, *J* = 7.7, 1.6 Hz, 5H), 7.18 (s, 1H), 7.18-7.07 (m, 3H), 6.58 (s, 1H), 6.49 (s, 1H), 2.42 (s, 3H), 1.74 (d, *J* = 14.8 Hz, 1H), 1.59 (s, 3H), 1.48 (d, *J* = 14.8 Hz, 1H), 0.15 (s, 3H), 0.14 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 174.8, 138.7, 138.1, 136.3, 135.1, 134.3, 133.4, 130.5, 129.1, 128.8, 128.4, 127.5, 126.2, 125.4, 124.7, 124.3, 121.3, 114.2, 102.2, 53.0, 30.0, 27.7, 21.5, -1.8, -2.0.

HRMS (ESI, m/z): calcd for C₂₉H₃₀NOSi[M + H]⁺, 436.2018; Measured, 436.2091.

28. (E)-1-(4-(tert-butyl)benzylidene)-2-((dimethyl(phenyl)silyl)methyl)-2-methyl-1,2-dihydro-3H-pyrrolo[1,2-a]indol-3-one

A green oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1).

19.1 mg, 40% yield



¹H NMR (400 MHz, CDCl₃): δ 7.91 (d, *J* = 7.6 Hz, 1H), 7.48 (dd, *J* = 6.9, 1.6 Hz, 2H), 7.44 (d, *J* = 5.8 Hz, 3H), 7.28 (dd, *J* = 7.6, 1.8 Hz, 4H), 7.11 – 7.06 (m, 3H), 6.69 (s, 1H), 6.49 (s, 1H), 1.73 (d, *J* = 14.8 Hz, 1H), 1.57 (s, 3H), 1.46 (d, *J* = 14.8 Hz, 1H), 1.39 (s, 9H), 0.15 (s, 3H), 0.11 (s, 3H).

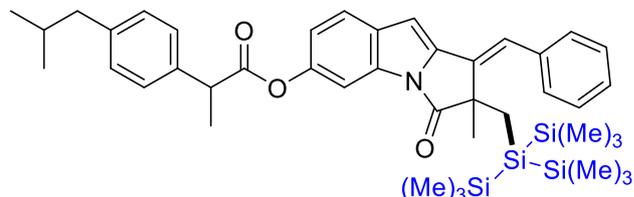
¹³C NMR (100 MHz, CDCl₃): δ 174.8, 151.2, 138.7, 138.0, 135.0, 133.6, 133.3, 130.4, 128.7, 128.1, 127.4, 125.9, 125.4, 124.5, 124.3, 121.1, 114.1, 102.1, 53.0, 34.8, 31.3, 29.9, 27.7, -1.8, -2.0.

HRMS (ESI, m/z): calcd for C₃₂H₃₆NOSi[M + H]⁺, 478.2488; Measured, 478.2561.

29. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-3-oxo-2,3-dihydro-1H-pyrrolo[1,2-a]indol-6-yl 2-(4-isobutylphenyl)propanoate

A brown oil after purification by flash column chromatography (petroleum ether/ethyl acetate =

80/1). 33.9 mg, 46% yield (3:1).



¹H NMR (400 MHz, CDCl₃): δ 8.03 (d, *J* = 8.6 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 1H), 7.44 (t, *J* = 7.0 Hz, 2H), 7.39 (d, *J* = 8.8 Hz, 1H), 7.32 (d, *J* = 8.3 Hz, 2H), 7.17 (t, *J* = 7.4 Hz, 3H), 7.12 (t, *J* = 2.5 Hz, 1H), 6.97 – 6.93 (m, 1H), 6.65 (s, 1H), 6.60 (s, 1H), 4.01–3.93 (m, 1H), 2.49 (d, *J* = 6.7 Hz, 2H), 1.91 – 1.85 (m, 1H), 1.69 (d, *J* = 14.8 Hz, 1H),

1.62 (d, $J = 7.2$ Hz, 3H), 1.59 (s, 3H), 1.57 (d, $J = 15.4$ Hz, 1H), 0.93 (d, $J = 6.6$ Hz, 6H), 0.12 (s, 27H).

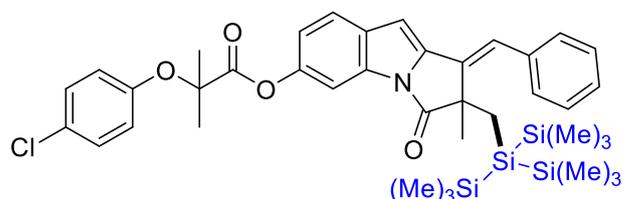
^{13}C NMR (100 MHz, CDCl_3): δ 174.5, 173.6, 147.7, 140.9, 139.8, 137.4, 136.3, 135.9, 135.6, 129.6, 128.7, 128.6, 127.3, 127.3, 125.7, 118.7, 114.5, 113.8, 102.6, 97.5, 54.0, 45.3, 45.1, 30.5, 30.3, 22.5, 19.7, 18.6, 1.5.

HRMS (ESI, m/z): calcd for $\text{C}_{42}\text{H}_{59}\text{NO}_3\text{NaSi}_4[\text{M} + \text{Na}]^+$, 760.3572; Measured, 760.3464.

30. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-3-oxo-2,3-dihydro-1H-pyrrolo[1,2-a]indol-6-yl-2-(4-chlorophenoxy)-2-methylpropanoate

A green oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1).

32.0 mg, 43% yield (3:1)



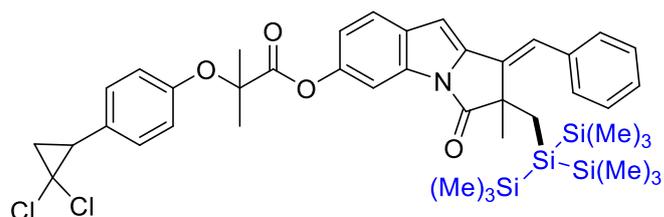
^1H NMR (400 MHz, CDCl_3): δ 8.11 (d, $J = 8.7$ Hz, 1H), 7.62 (d, $J = 7.6$ Hz, 2H), 7.48 (t, $J = 7.3$ Hz, 2H), 7.29 (dd, $J = 6.9, 2.0$ Hz, 3H), 7.16 (d, $J = 2.2$ Hz, 1H), 6.99-6.95 (m, 3H), 6.71 (s, 1H), 6.65 (s, 1H), 1.78 (s, 6H), 1.69 (d, $J = 10.9$ Hz, 1H), 1.63 (s, 3H), 1.60 (d, $J = 12.3$ Hz, 1H), 0.16 (s, 27H).

^{13}C NMR (100 MHz, CDCl_3): δ 174.4, 173.0, 154.0, 147.2, 140.0, 136.1, 135.8, 135.6, 129.3, 128.6, 128.5, 128.2, 125.9, 120.4, 120.4, 118.2, 114.6, 113.5, 102.4, 97.3, 79.5, 54.0, 30.4, 25.3, 19.6, 1.4.

HRMS (ESI, m/z): calcd for $\text{C}_{39}\text{H}_{53}\text{ClNO}_4\text{Si}_4$ $[\text{M} + \text{H}]^+$, 746.2662; Measured, 746.2735.

31. (E)-1-benzylidene-2-((1,1,1,3,3,3-hexamethyl-2-(trimethylsilyl)trisilan-2-yl)methyl)-2-methyl-3-oxo-2,3-dihydro-1H-pyrrolo[1,2-a]indol-6-yl 2-(4-(2,2-dichlorocyclopropyl)phenoxy)-2-methylpropanoate

A yellow oil after purification by flash column chromatography (petroleum ether/ethyl acetate = 80/1). 45.1 mg, 55% yield (3:1).



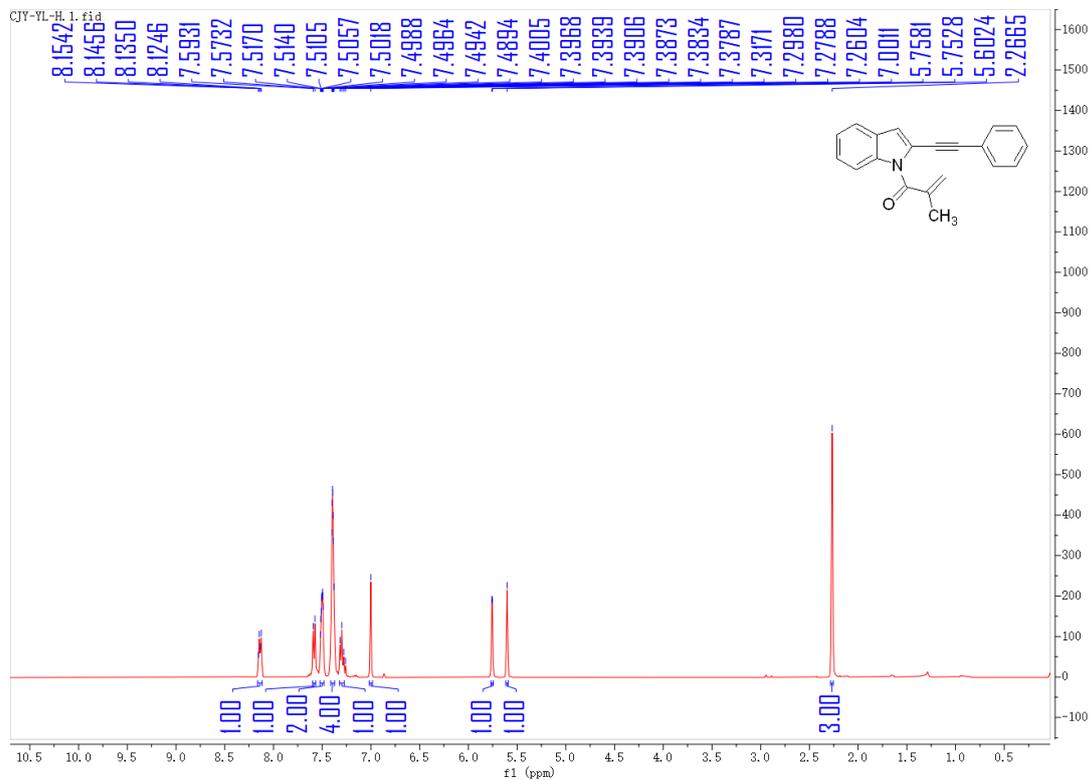
¹H NMR (400 MHz, CDCl₃): δ 8.04 (d, *J* = 8.7 Hz, 1H), 7.58 (d, *J* = 7.6 Hz, 1H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.18 (d, *J* = 8.2 Hz, 2H), 7.04 (s, 1H), 7.00-6.94 (m, 3H), 6.91 (t, *J* = 8.7 Hz, 2H), 6.64 (s, 1H), 6.60 (s, 1H), 2.90-2.85 (m, 1H), 1.97 (dd, *J* = 10.7, 7.5 Hz, 2H), 1.84 (d, *J* = 11.9 Hz, 1H), 1.77 (s, 6H), 1.72 (d, *J* = 15.9 Hz, 1H), 1.58 (s, 3H), 0.12 (s, 27H).

¹³C NMR (100 MHz, CDCl₃): δ 174.4, 173.2, 155.0, 147.2, 139.9, 136.1, 135.7, 135.5, 129.8, 129.4, 128.5, 128.4, 128.2, 125.8, 118.4, 118.3, 114.5, 113.6, 102.4, 97.3, 79.2, 60.9, 53.9, 34.8, 30.4, 25.8, 25.5, 19.6, 1.4.

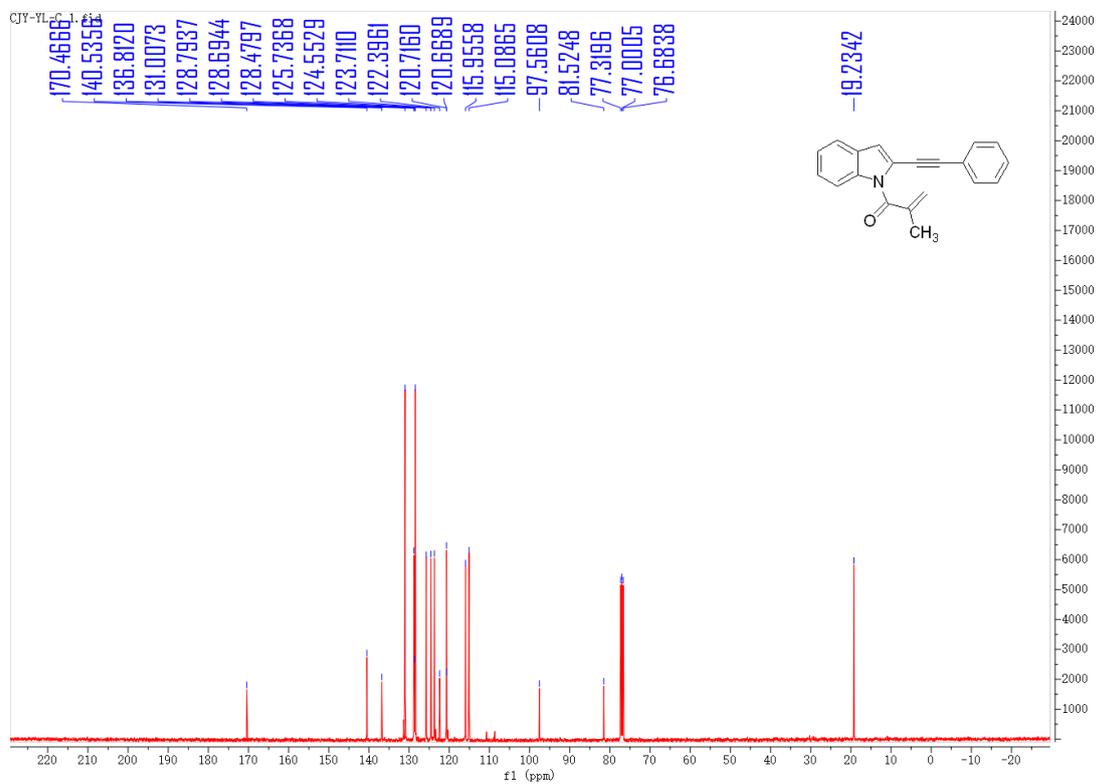
HRMS (ESI, *m/z*): calcd for C₄₂H₅₆Cl₂NO₄Si₄ [M + H]⁺, 820.2585; Measured, 820.2658.

Copies of the ^1H NMR, ^{13}C NMR, ^{19}F NMR

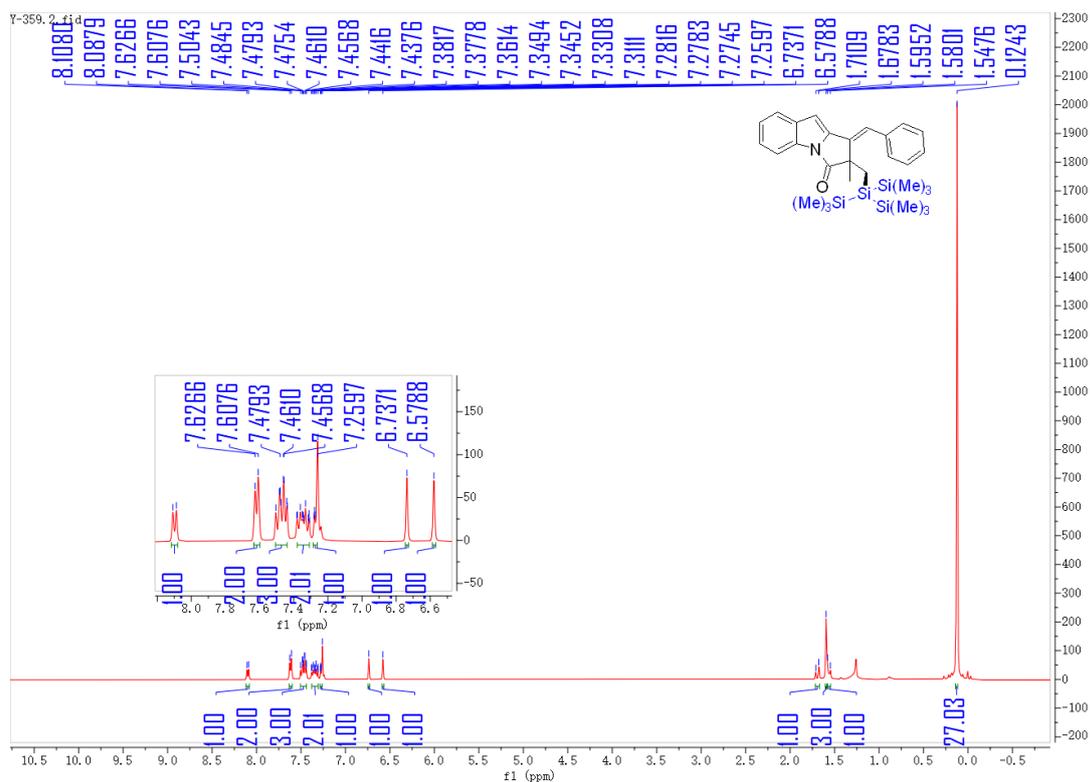
1-s- ^1H NMR (400 MHz, CDCl_3)



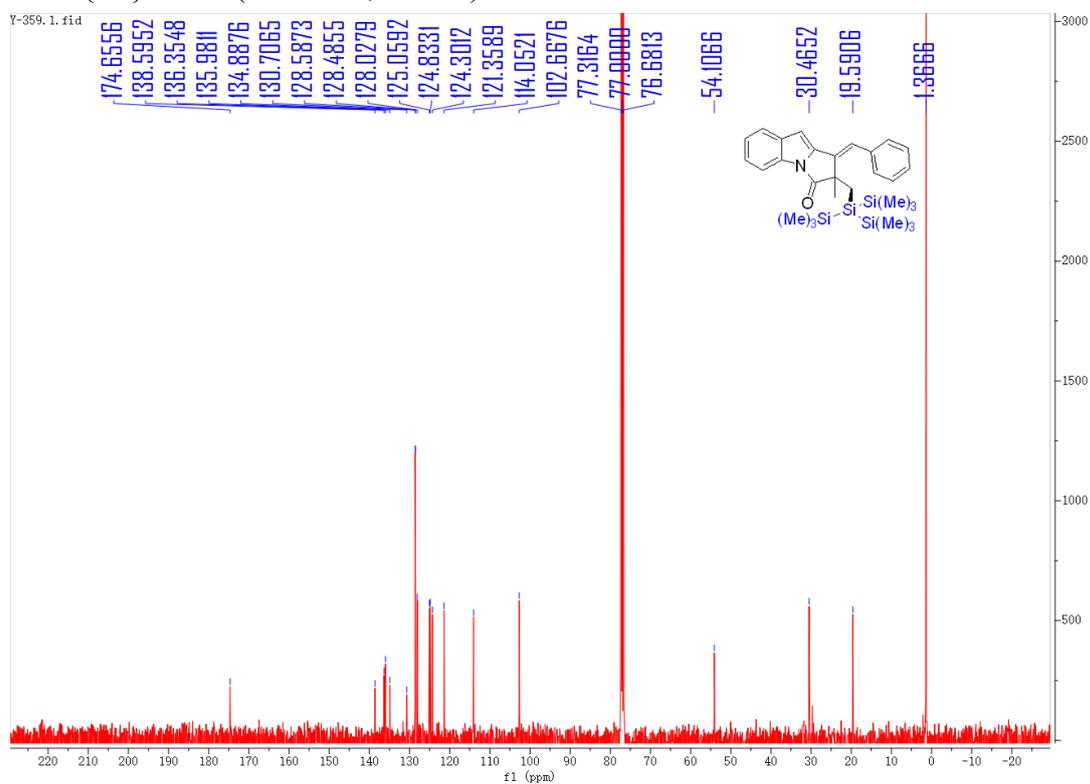
1-s- ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, CDCl_3)



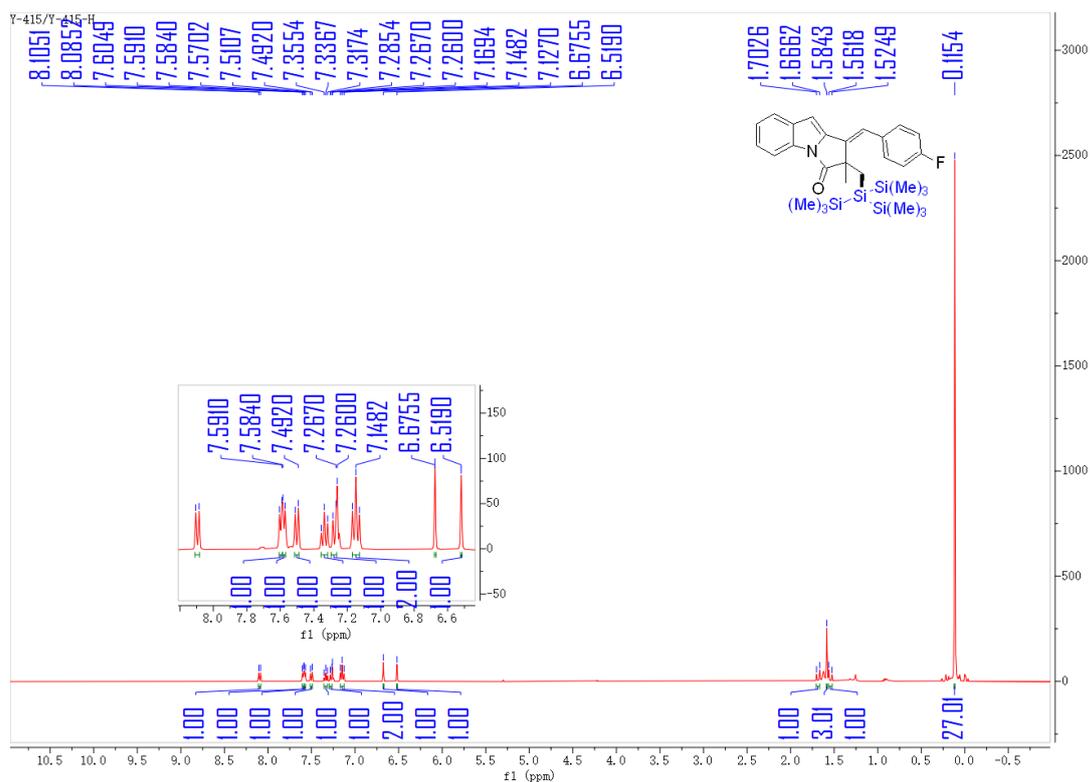
$1\text{-}^1\text{H}$ NMR (400 MHz, CDCl_3)



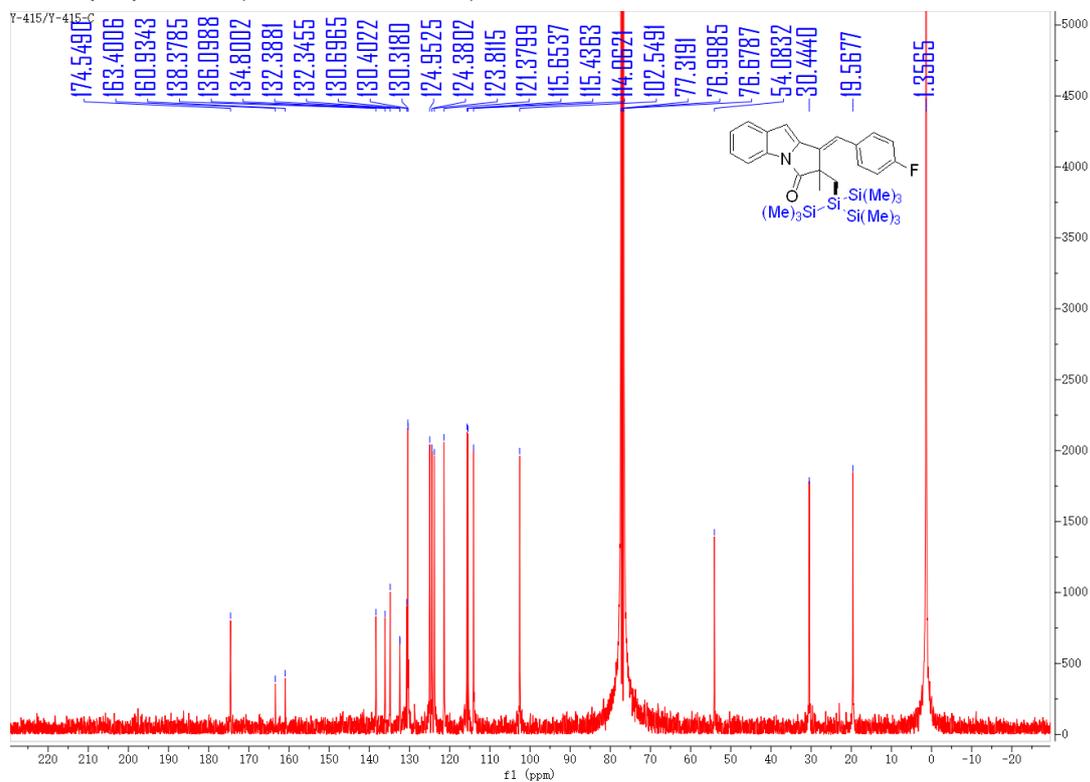
$1\text{-}^{13}\text{C}\{^1\text{H}\}$ NMR (100 MHz, CDCl_3)



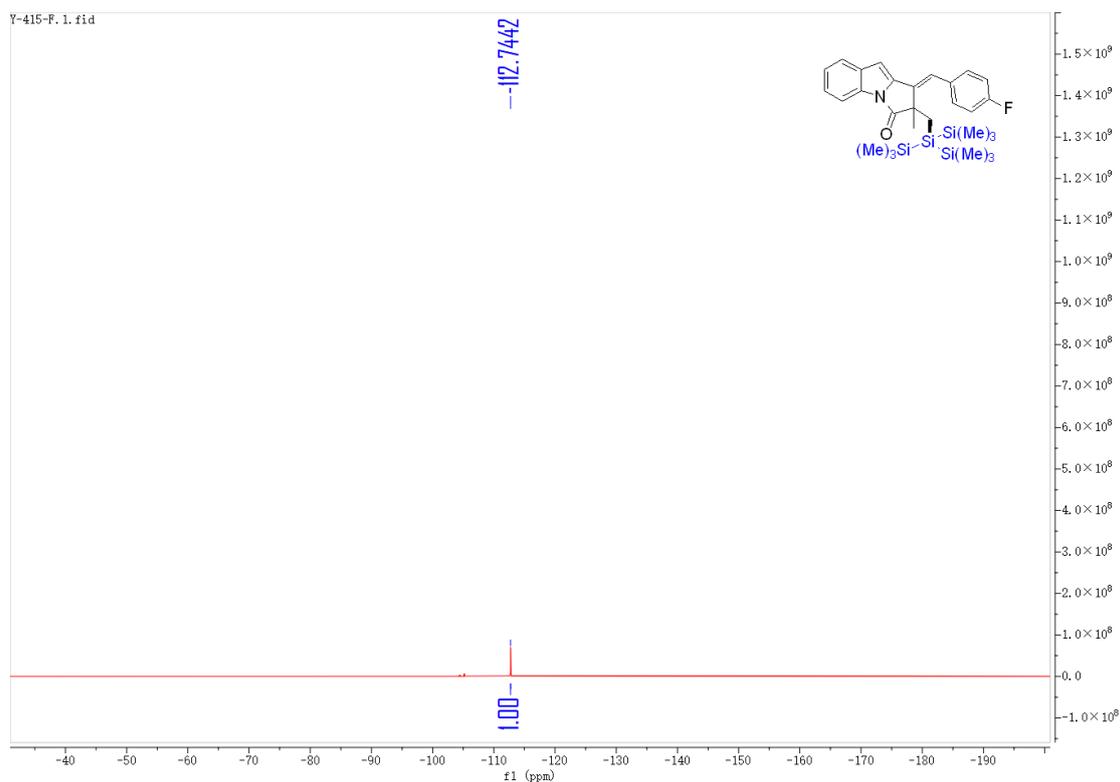
2-¹H NMR (400 MHz, CDCl₃)



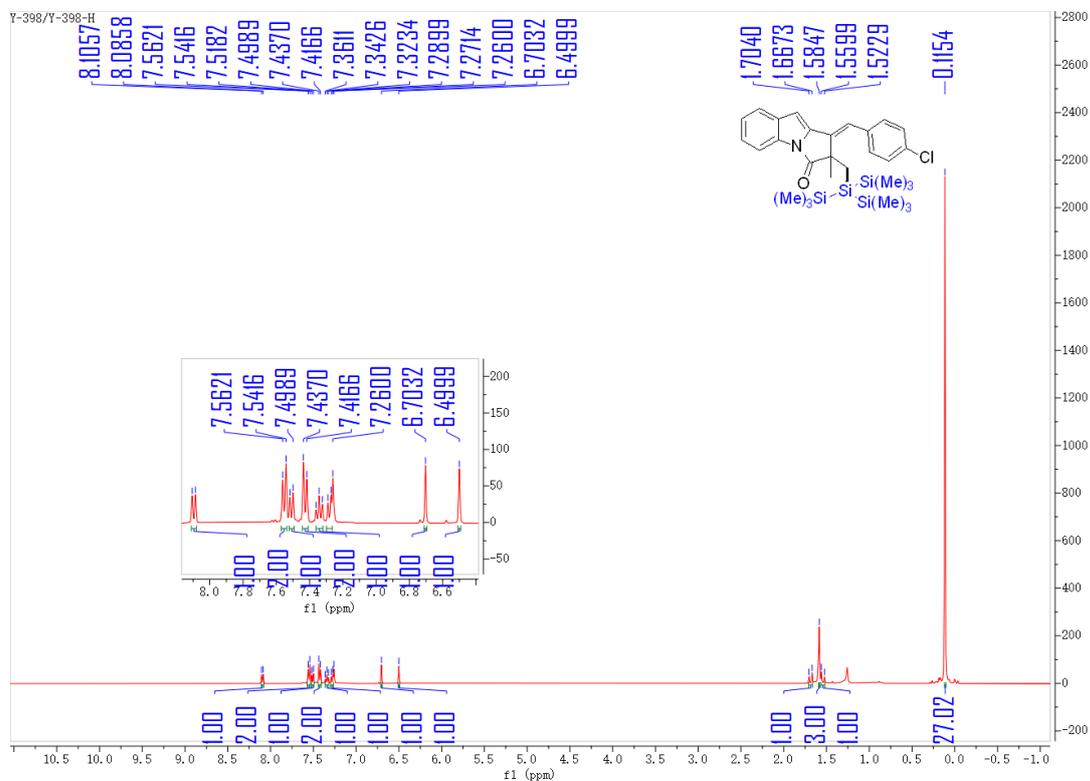
2-¹³C {¹H} NMR (100 MHz, CDCl₃)



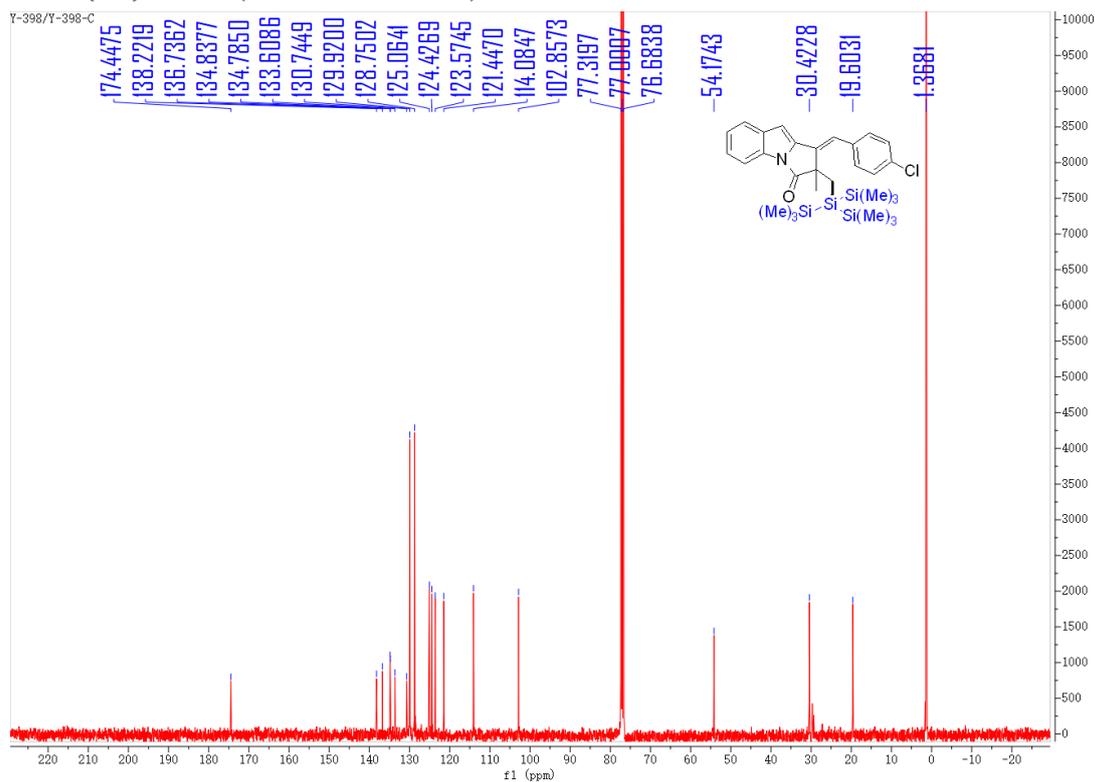
2-¹⁹F NMR (565 MHz, CDCl₃)



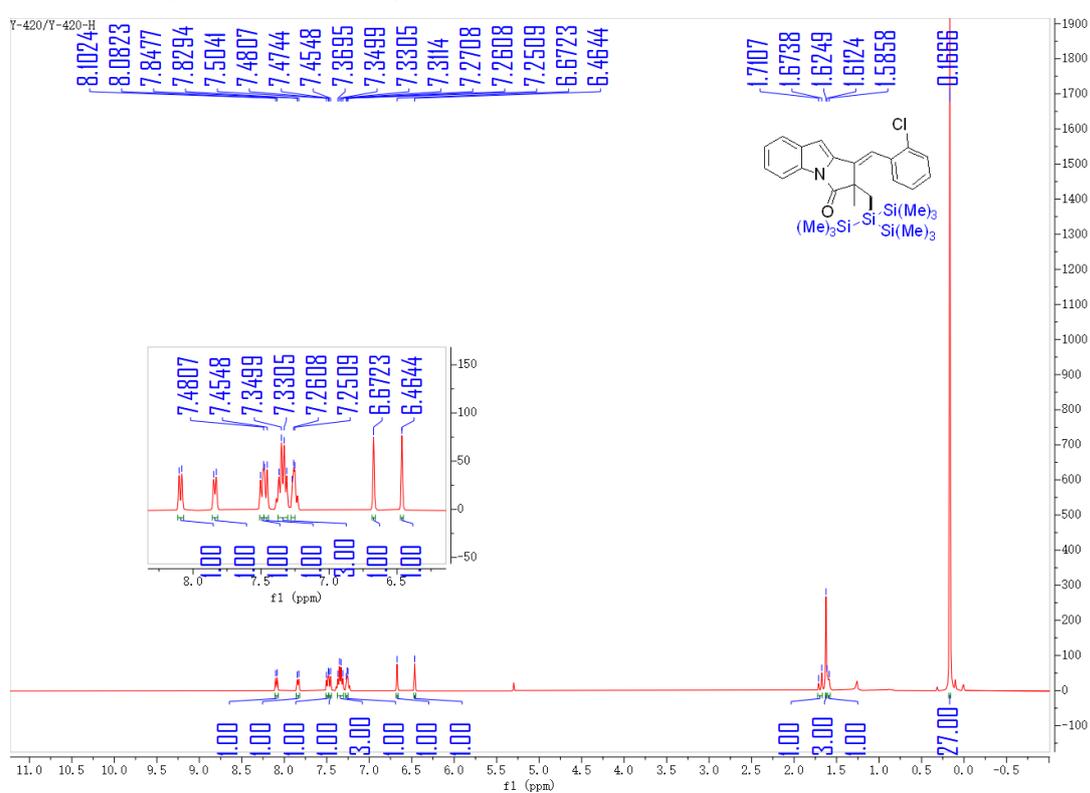
3-¹H NMR (400 MHz, CDCl₃)



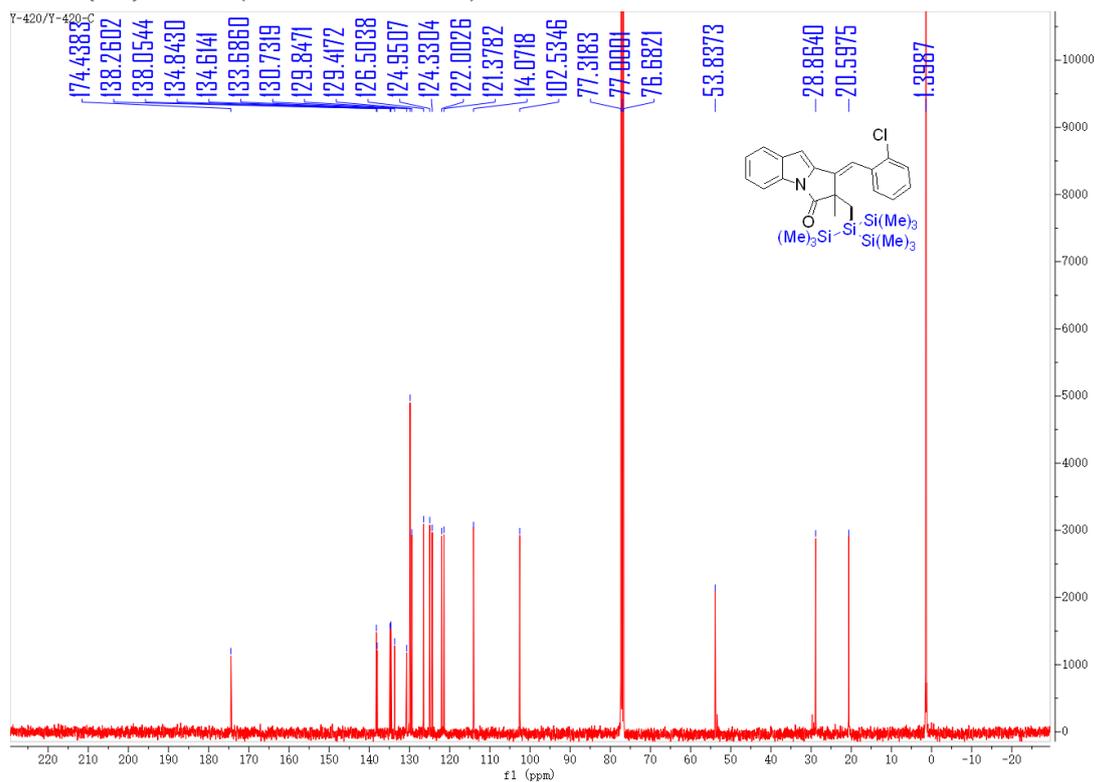
3-¹³C{¹H} NMR (100 MHz, CDCl₃)



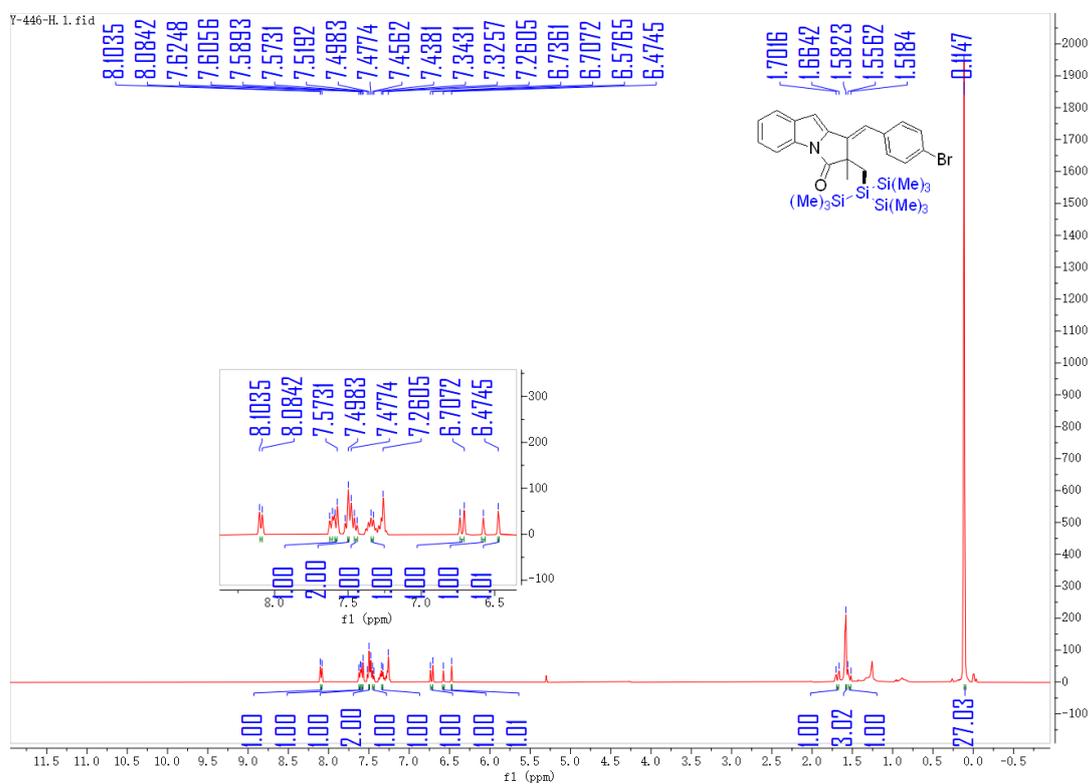
4-¹H NMR (400 MHz, CDCl₃)



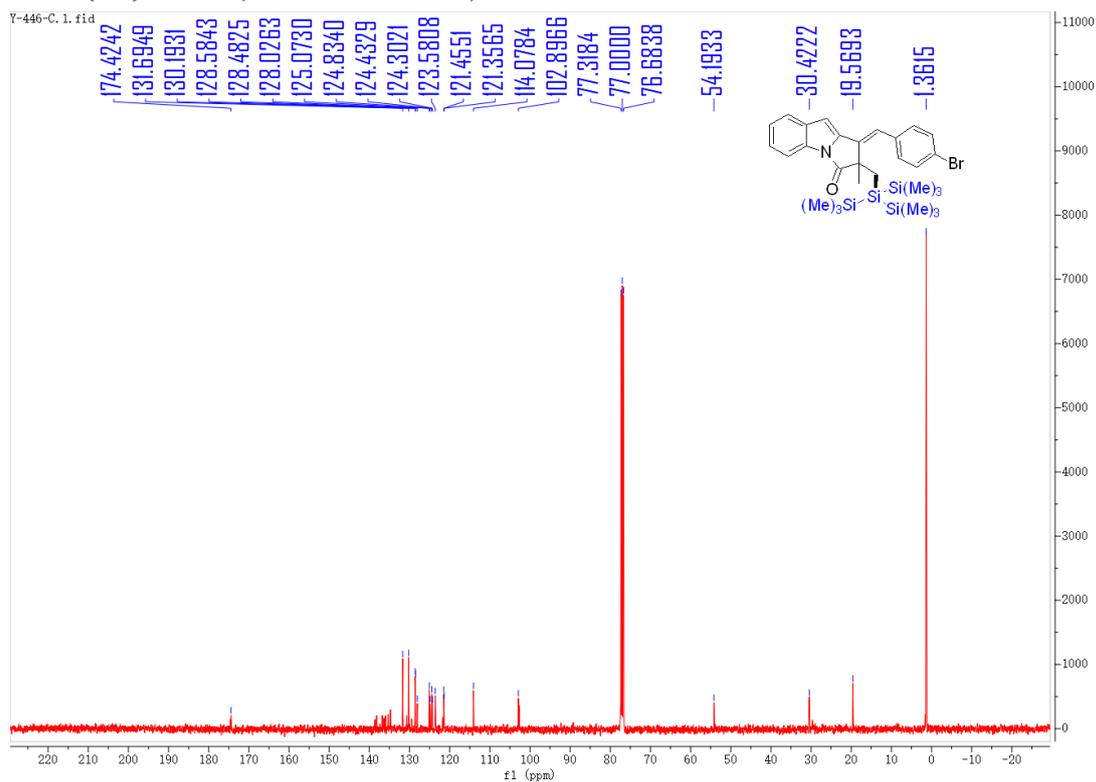
4-¹³C{¹H} NMR (100 MHz, CDCl₃)



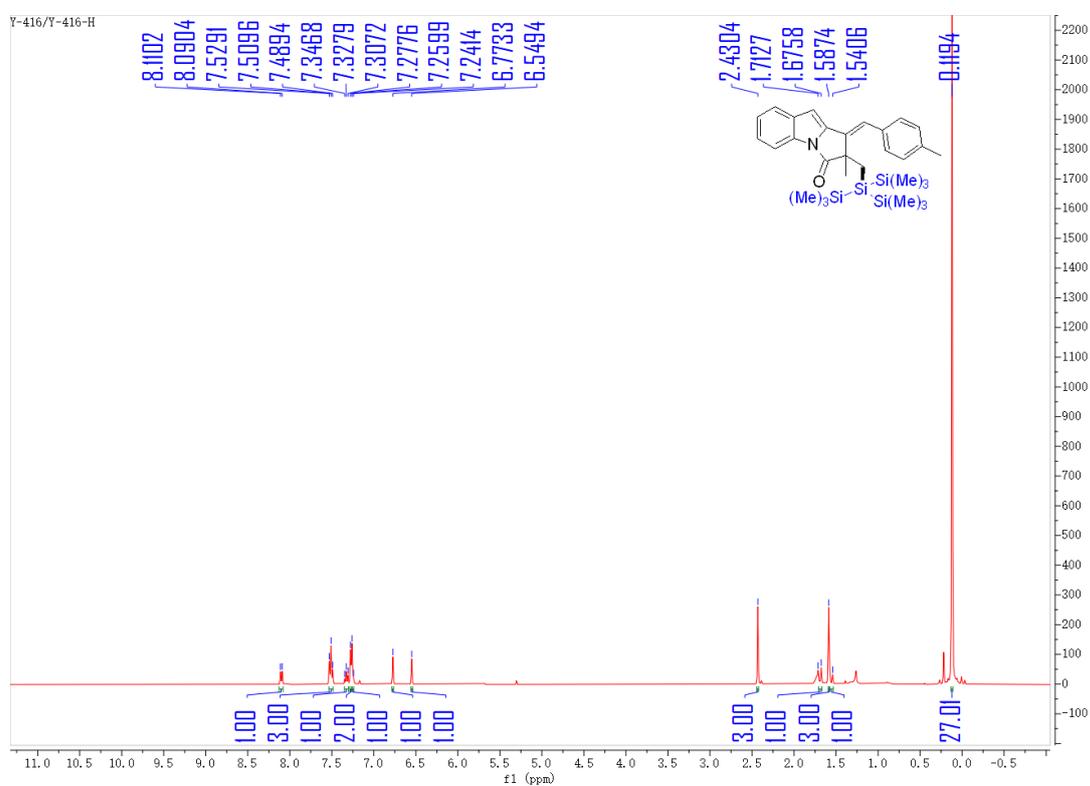
5-¹H NMR (400 MHz, CDCl₃)



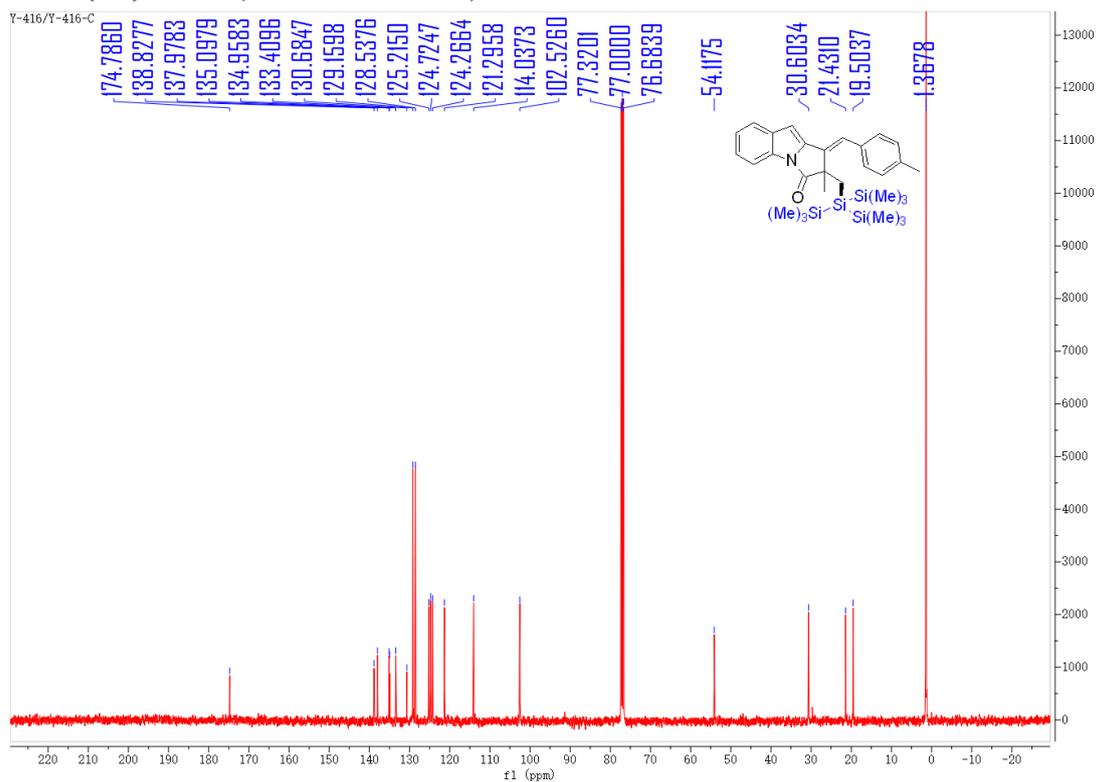
5-¹³C{¹H} NMR (100 MHz, CDCl₃)



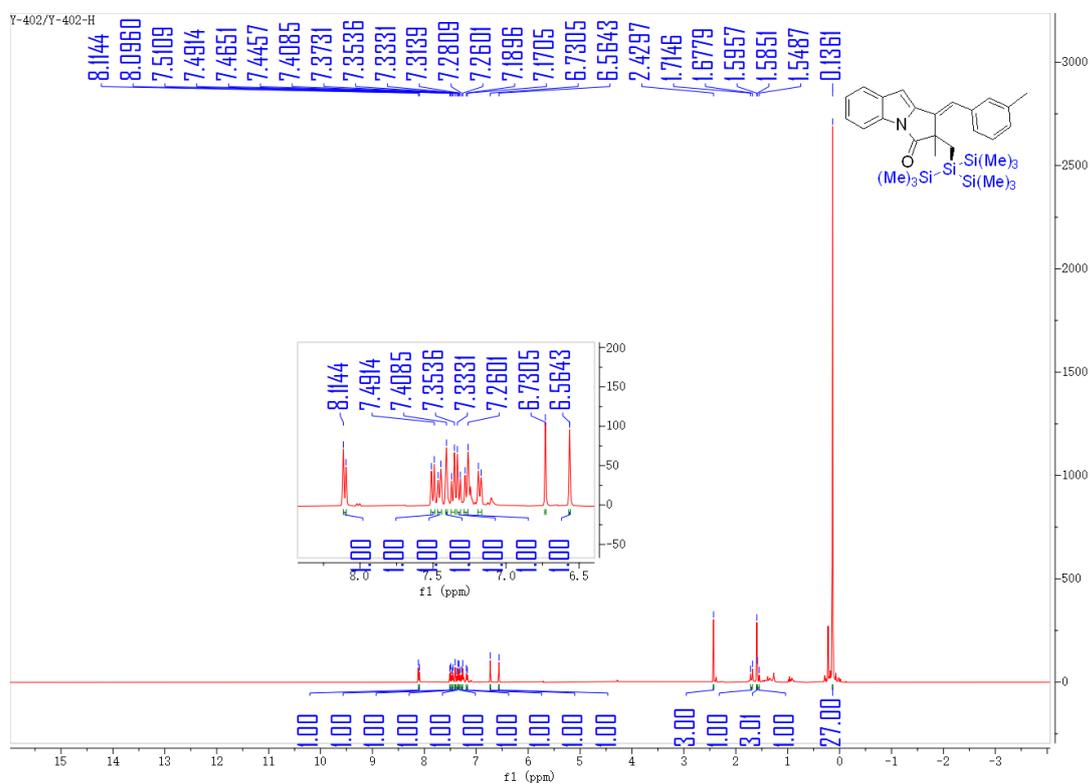
6-¹H NMR (400 MHz, CDCl₃)



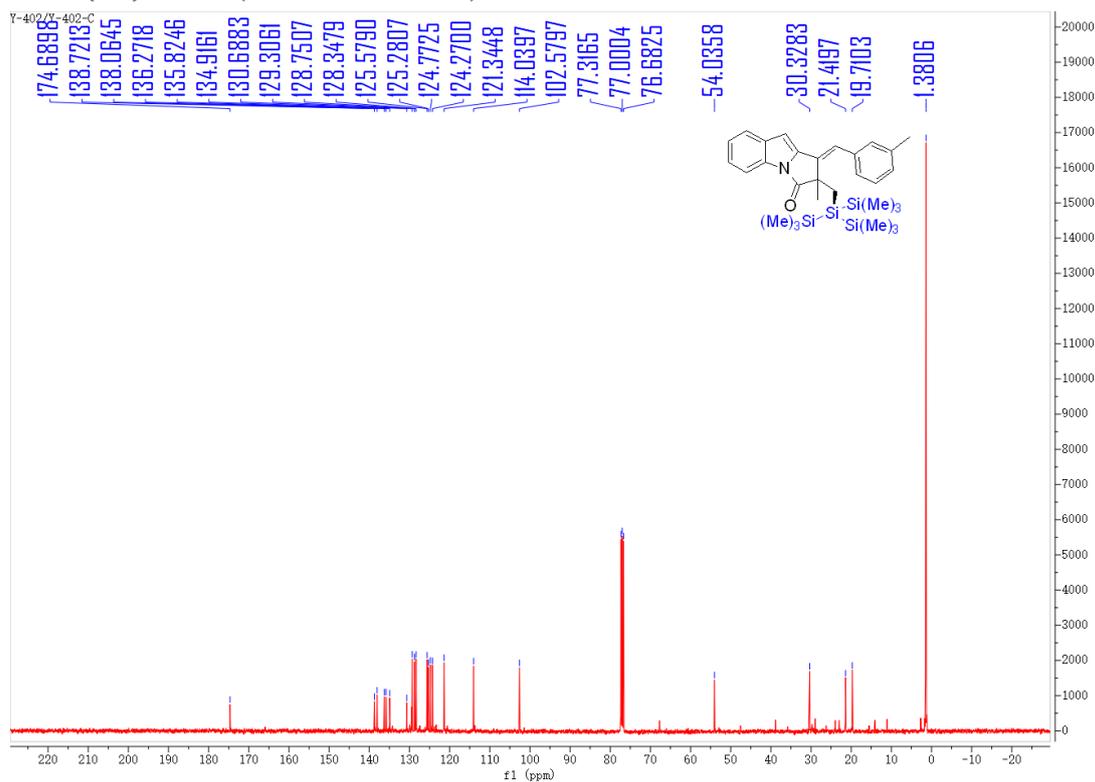
6-¹³C{¹H} NMR (100 MHz, CDCl₃)



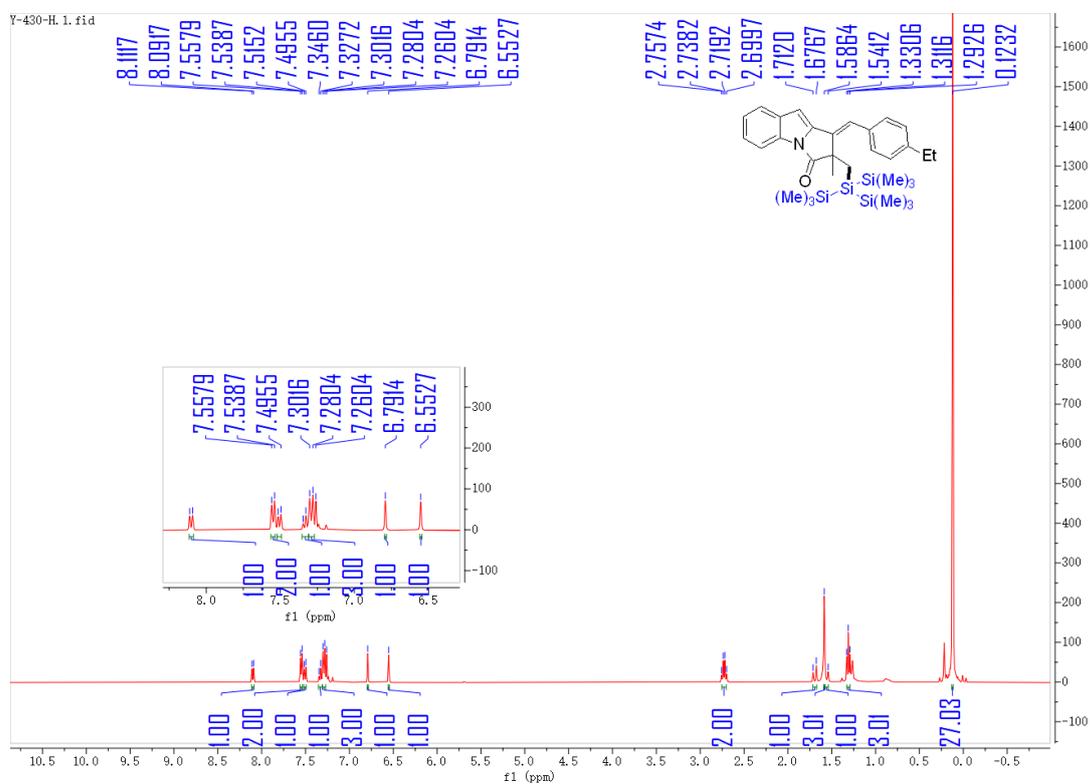
7-¹H NMR (400 MHz, CDCl₃)



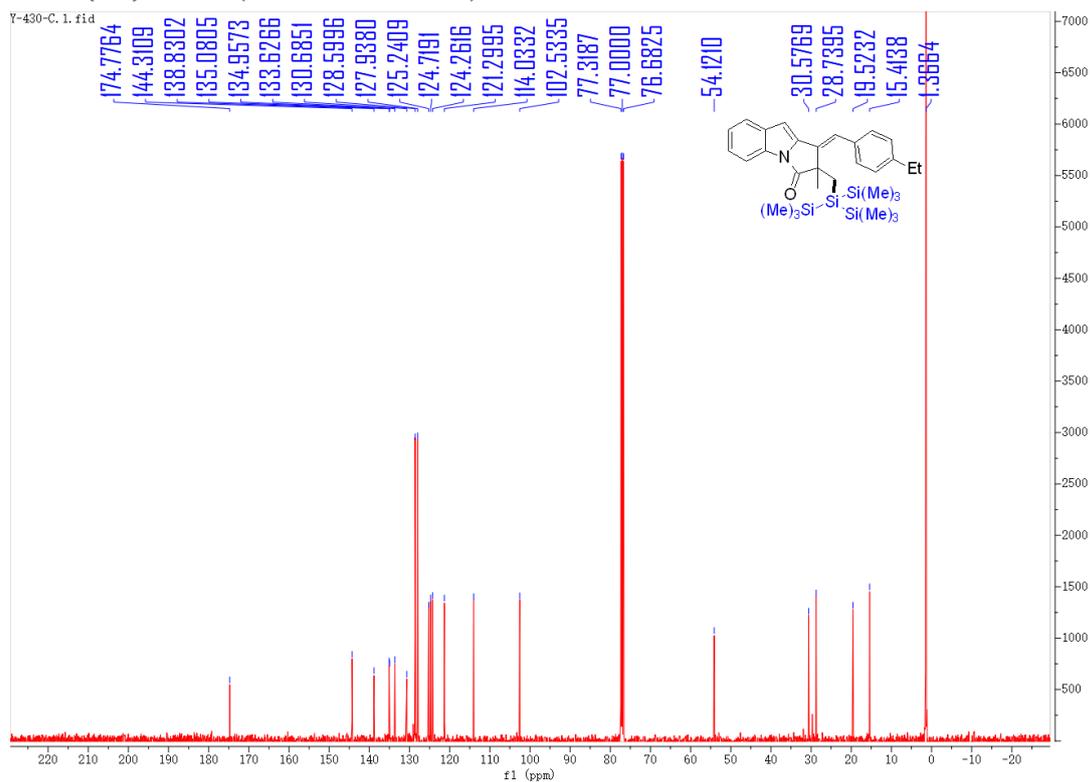
7-¹³C{¹H} NMR (100 MHz, CDCl₃)



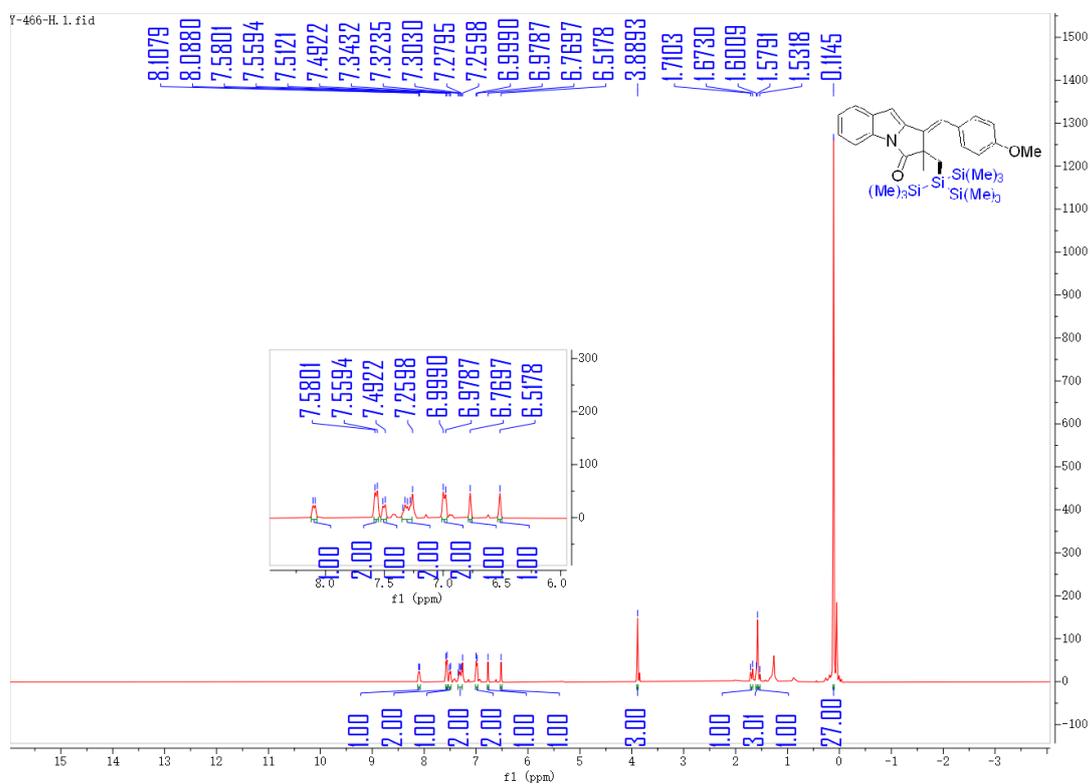
8-¹H NMR (400 MHz, CDCl₃)



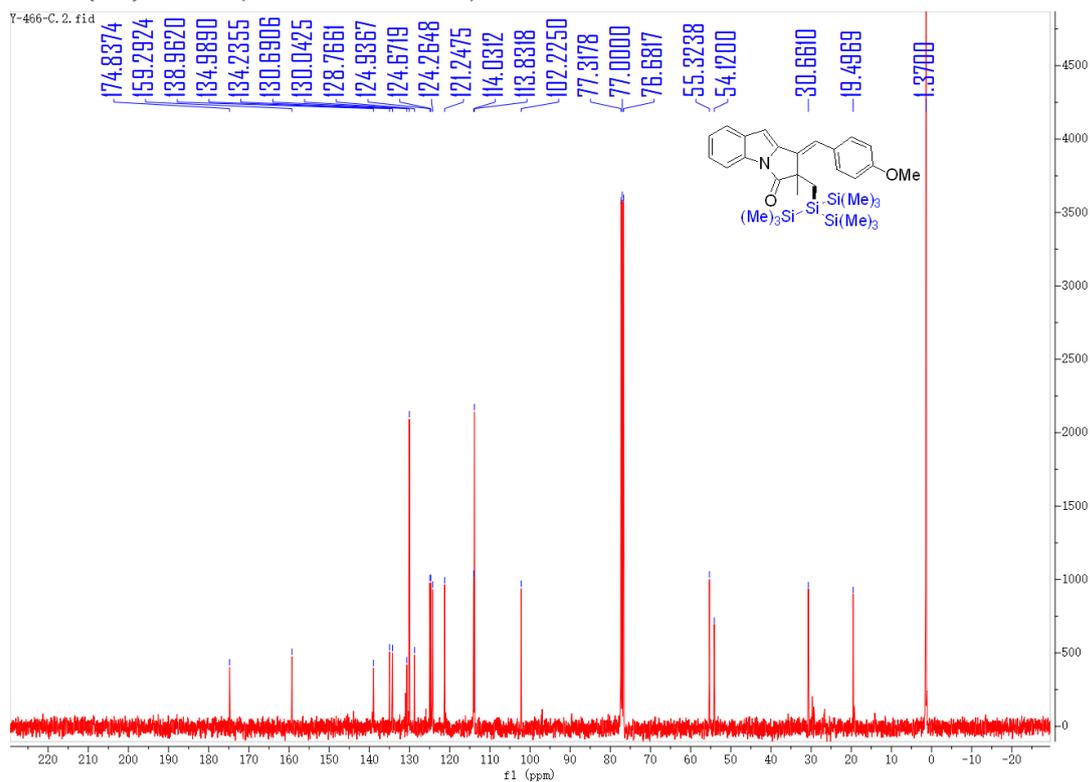
8-¹³C{¹H} NMR (100 MHz, CDCl₃)



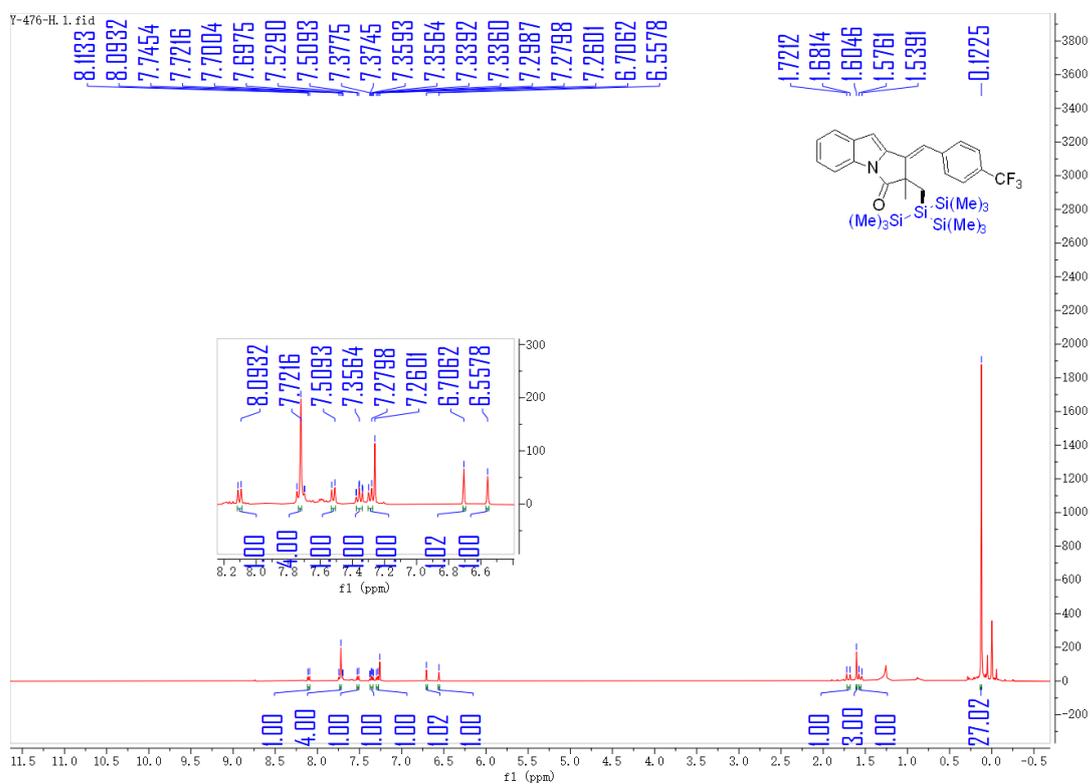
9-¹H NMR (400 MHz, CDCl₃)



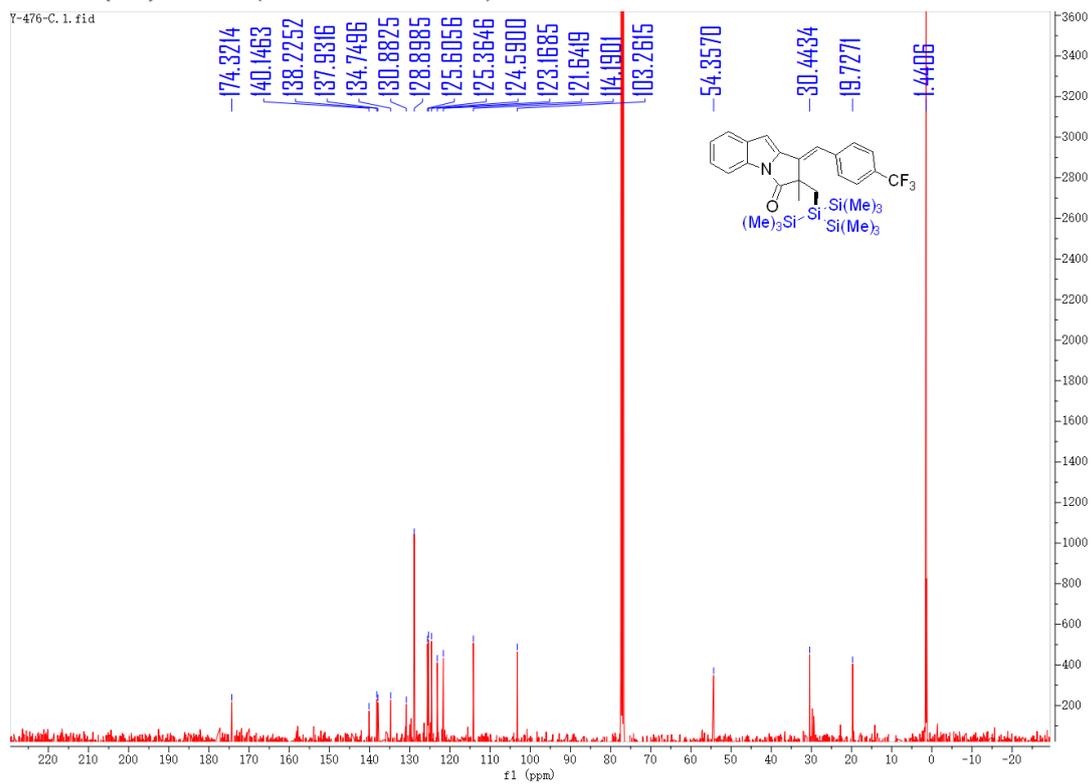
9-¹³C{¹H} NMR (100 MHz, CDCl₃)



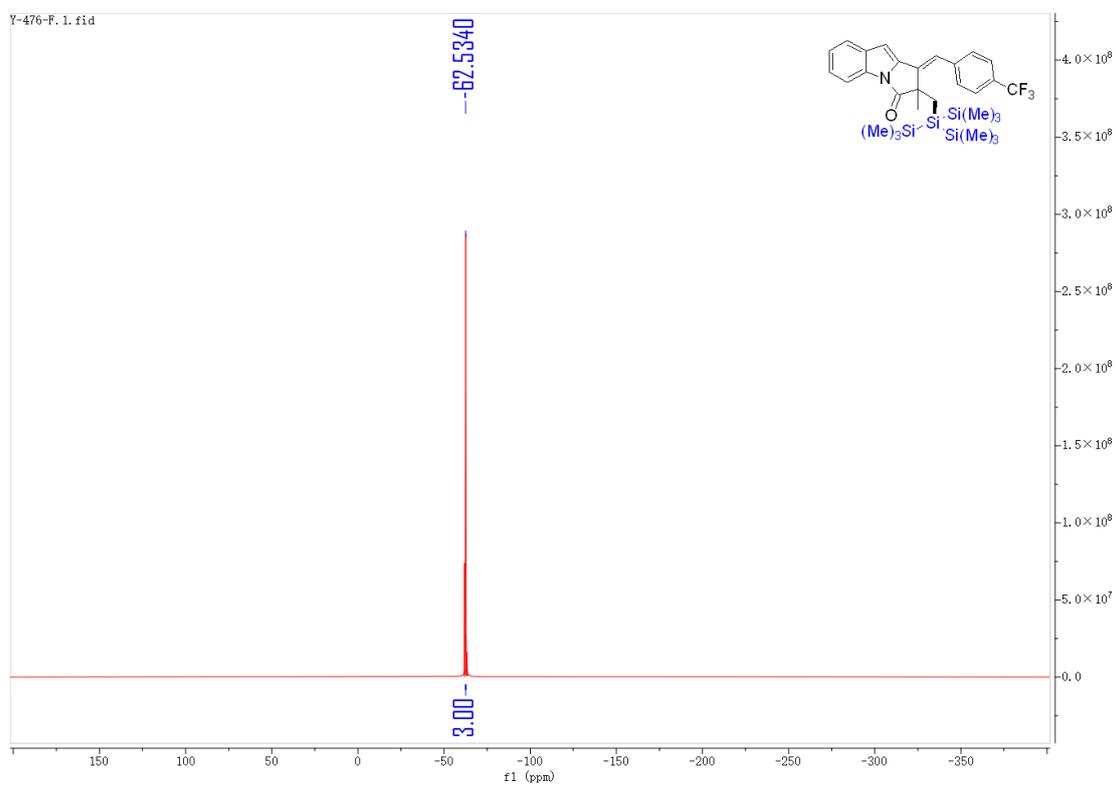
10-¹H NMR (400 MHz, CDCl₃)



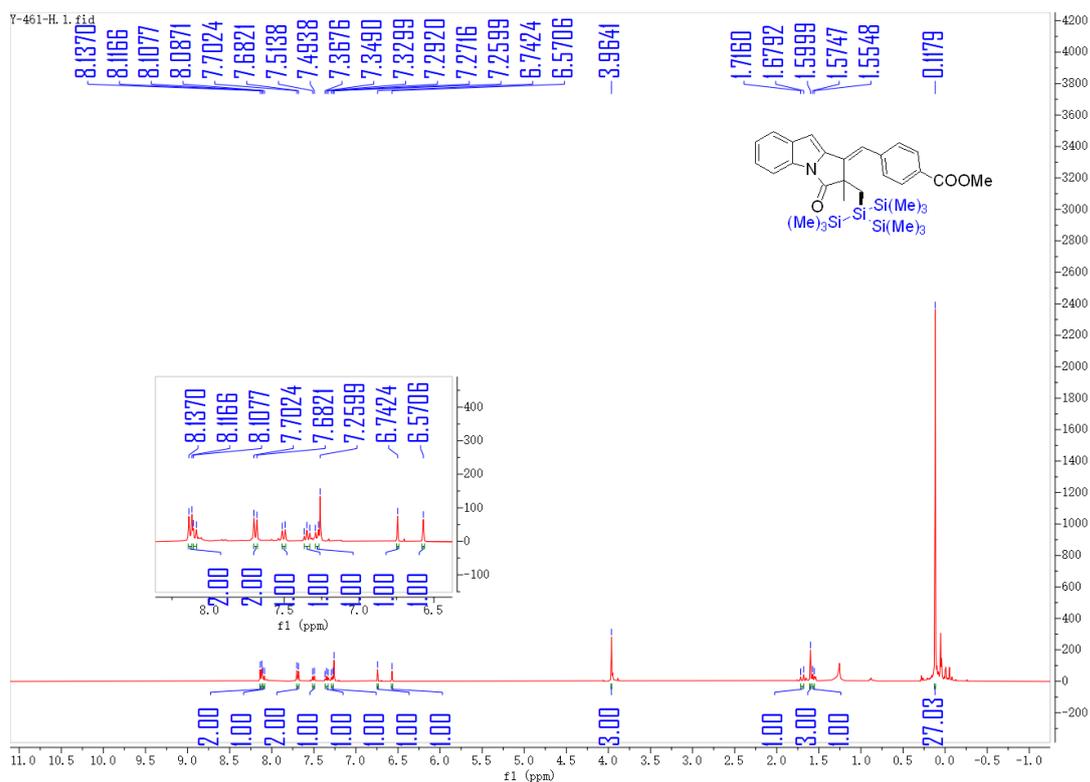
10-¹³C{¹H} NMR (100 MHz, CDCl₃)



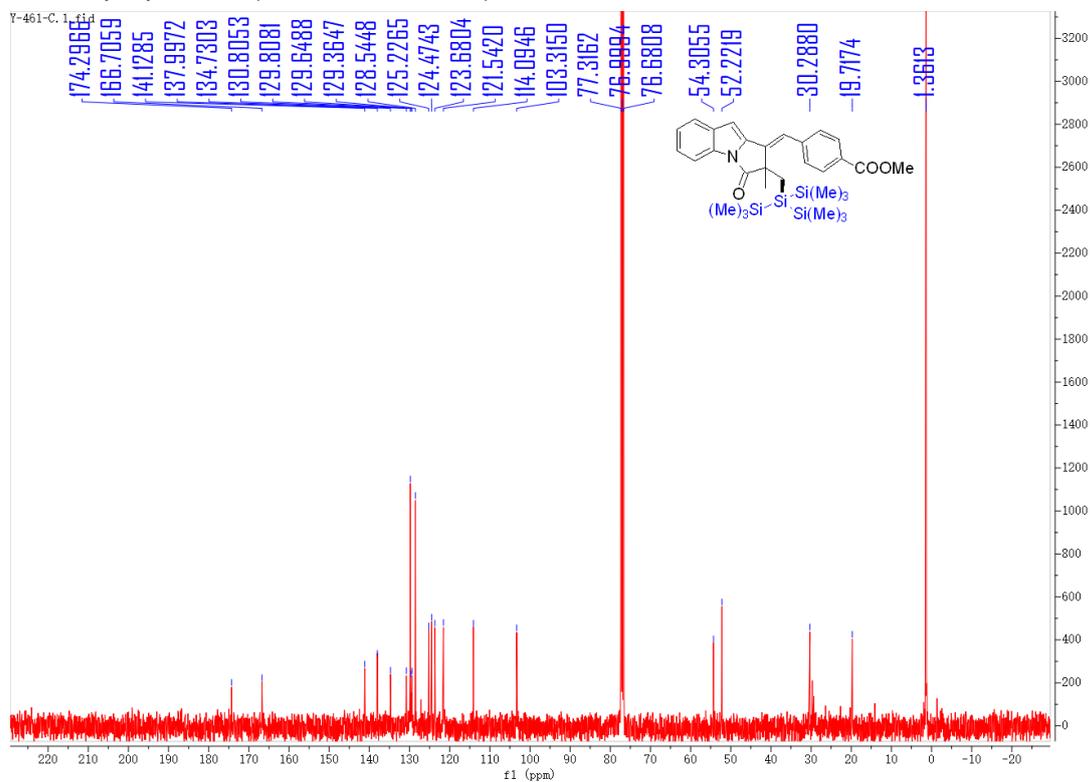
10-¹⁹F NMR (565 MHz, CDCl₃)



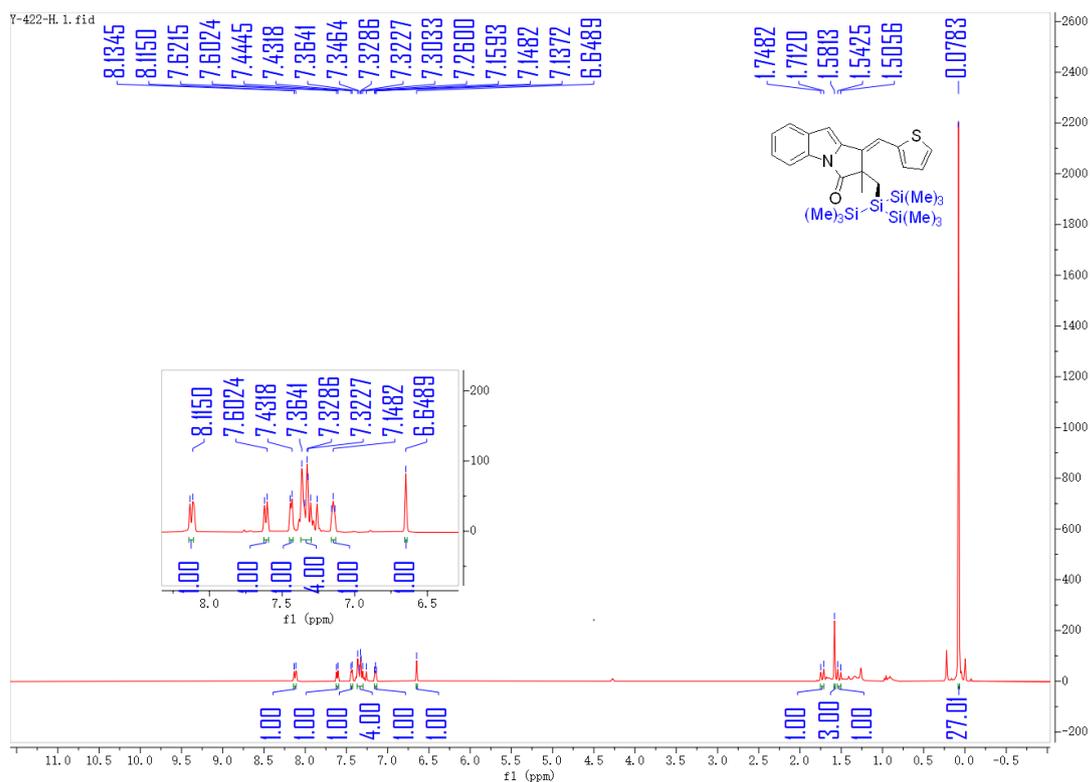
11-¹H NMR (400 MHz, CDCl₃)



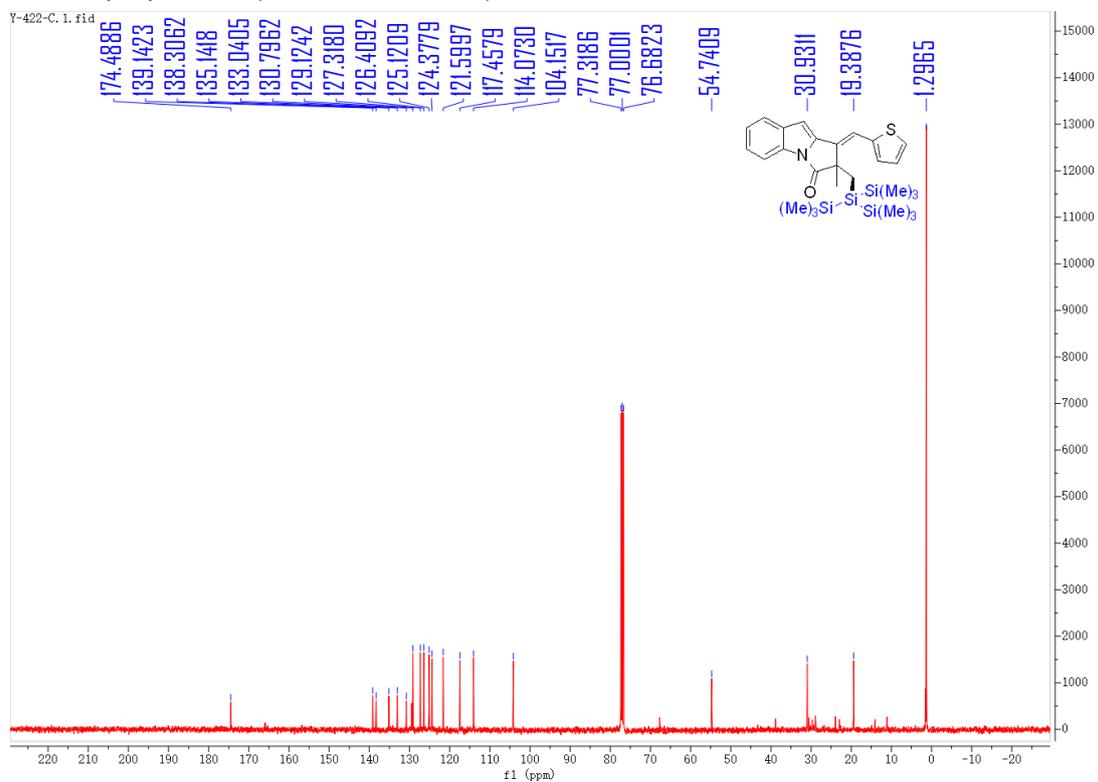
11-¹³C{¹H} NMR (100 MHz, CDCl₃)



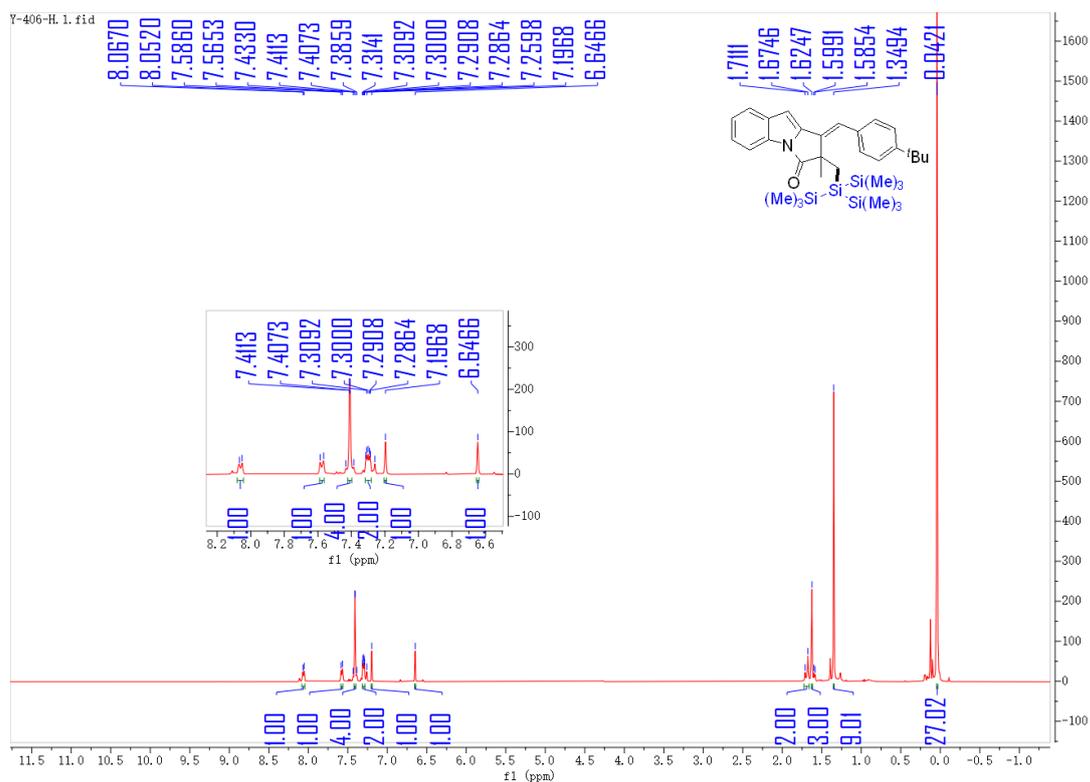
12-¹H NMR (400 MHz, CDCl₃)



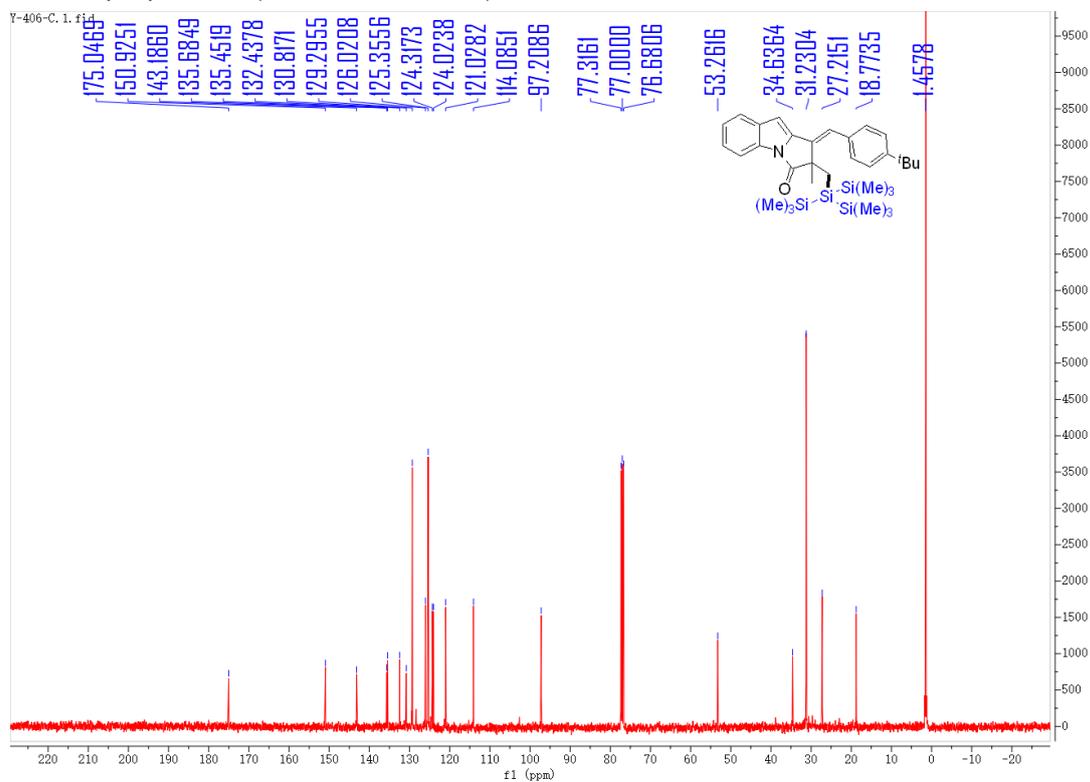
12-¹³C {¹H} NMR (100 MHz, CDCl₃)



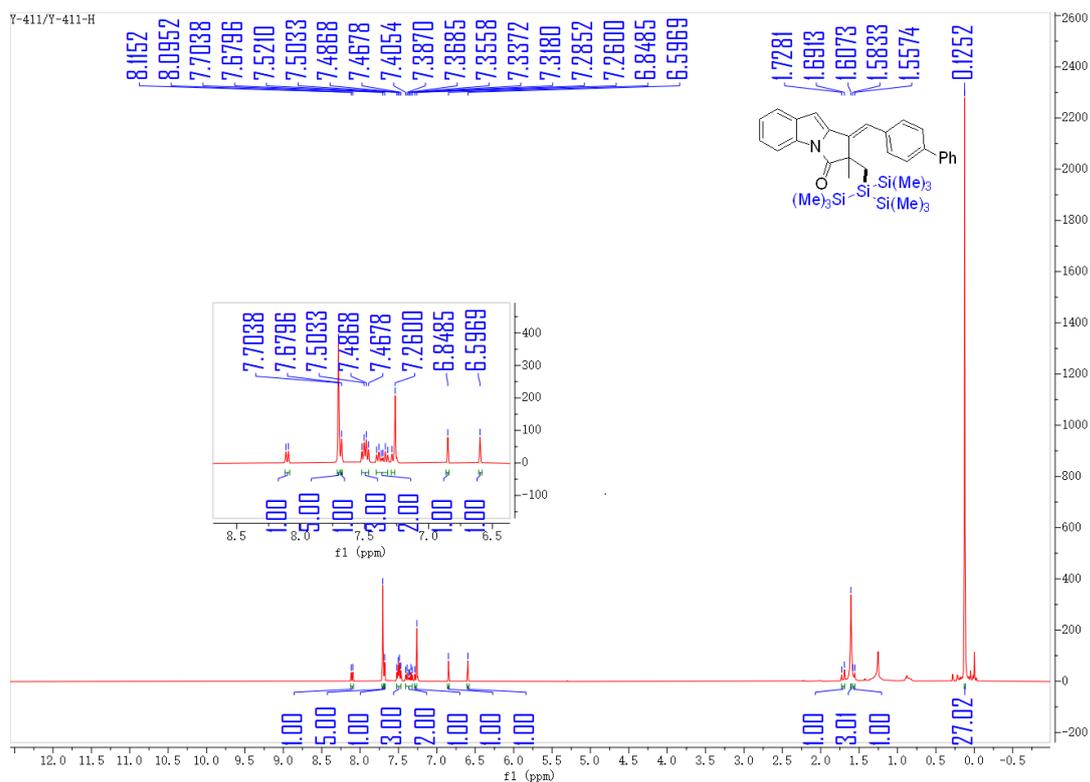
13-¹H NMR (400 MHz, CDCl₃)



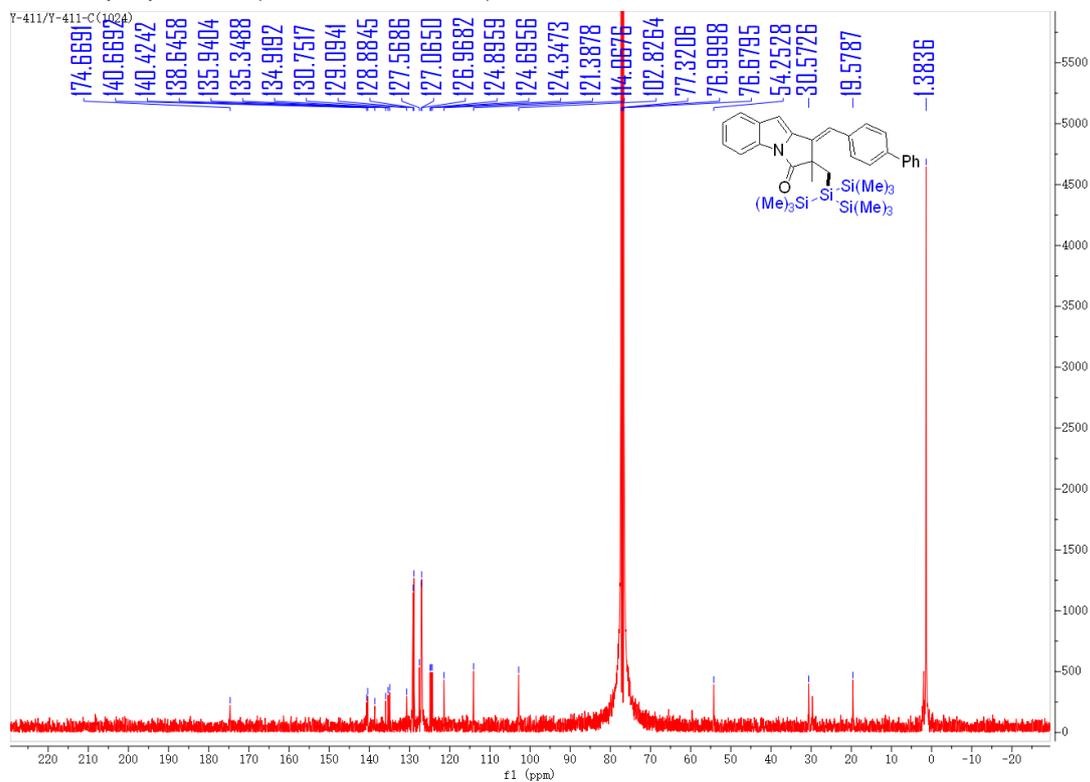
13-¹³C {¹H} NMR (100 MHz, CDCl₃)



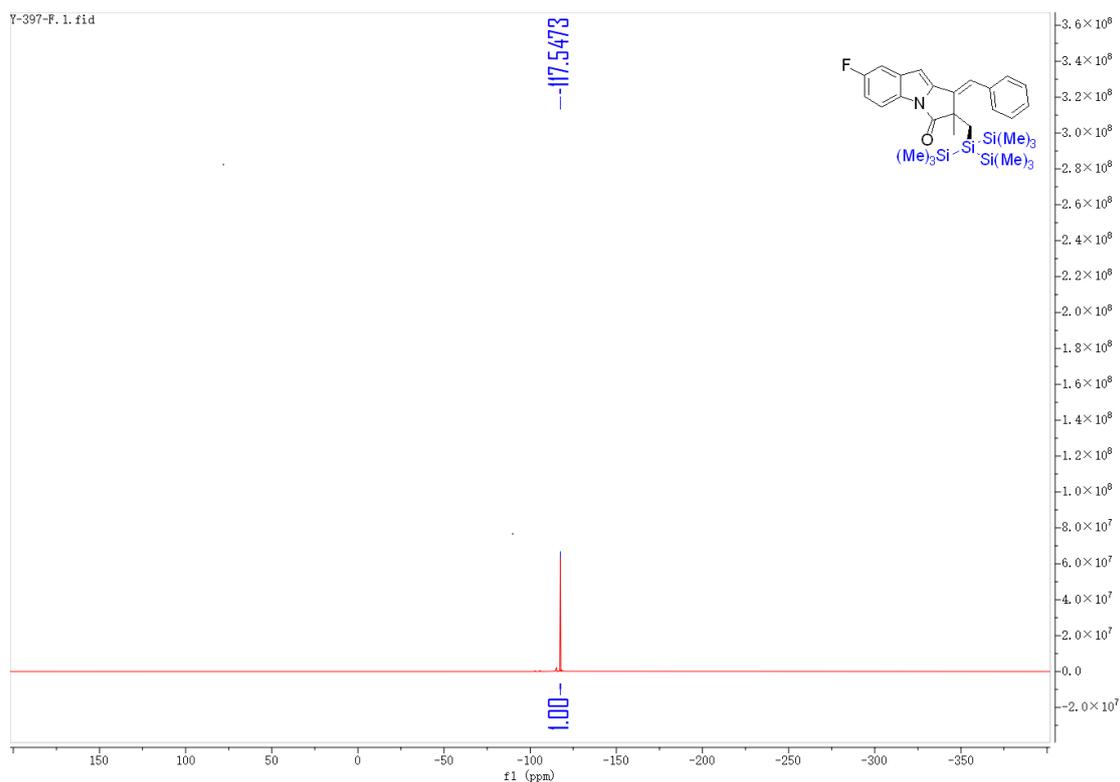
14-¹H NMR (400 MHz, CDCl₃)



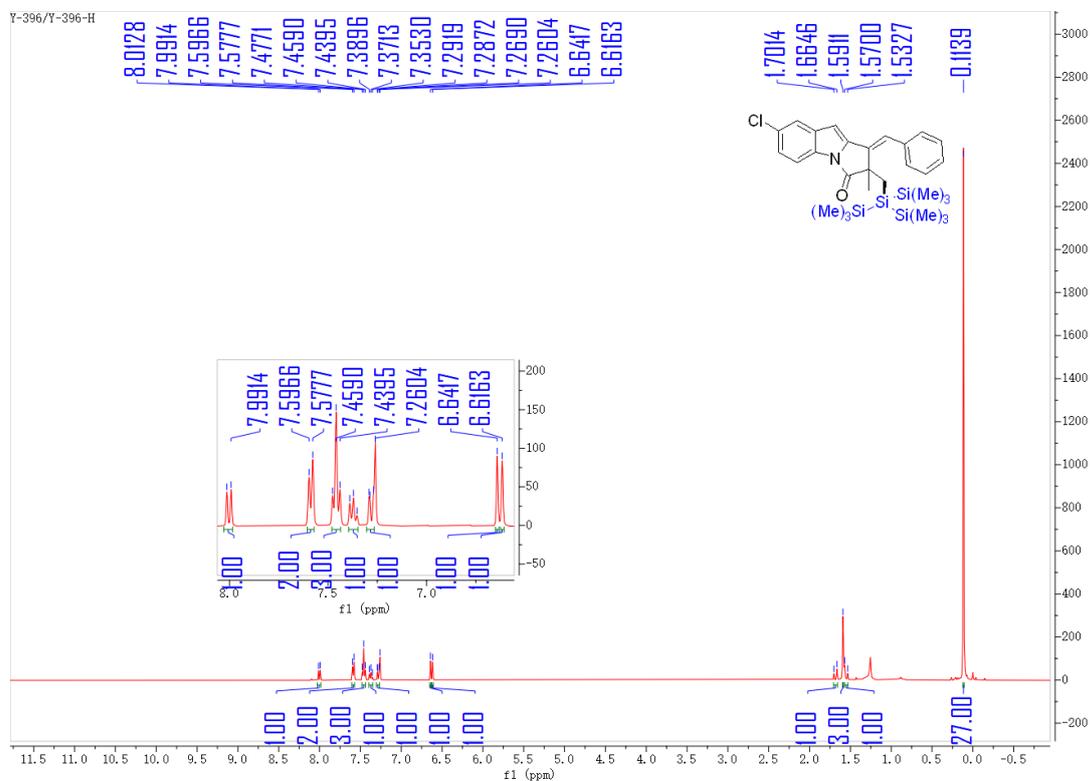
14-¹³C {¹H} NMR (100 MHz, CDCl₃)



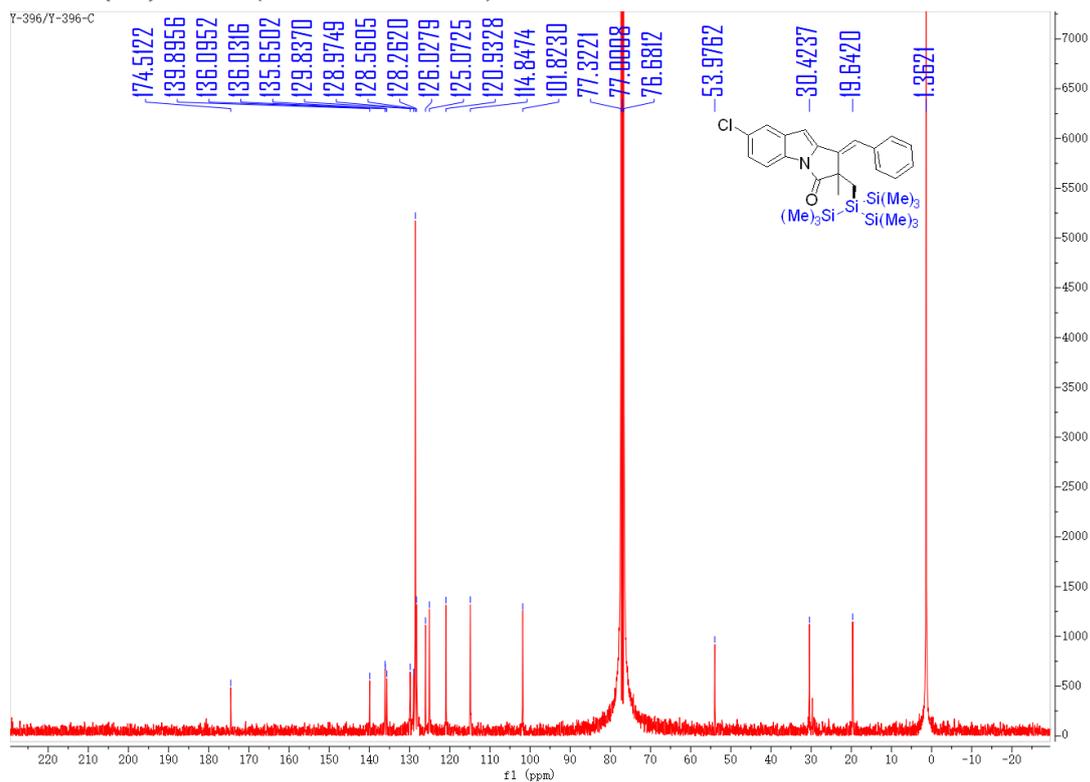
15-¹⁹F NMR (565 MHz, CDCl₃)



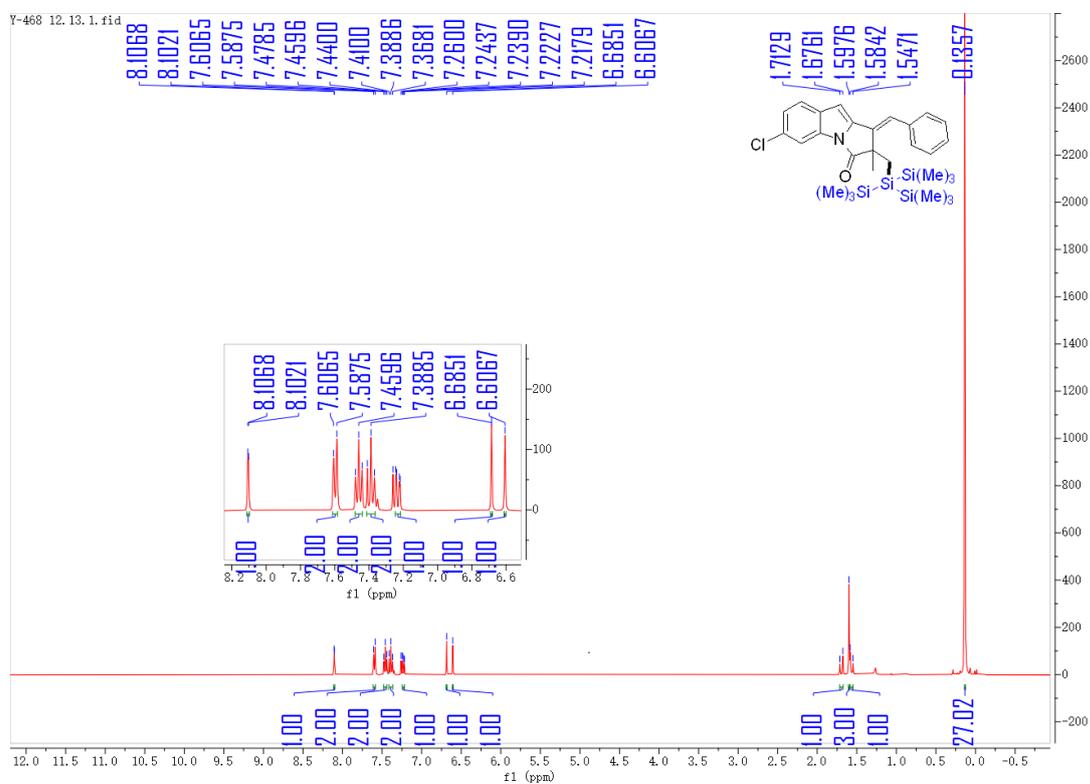
16-¹H NMR (400 MHz, CDCl₃)



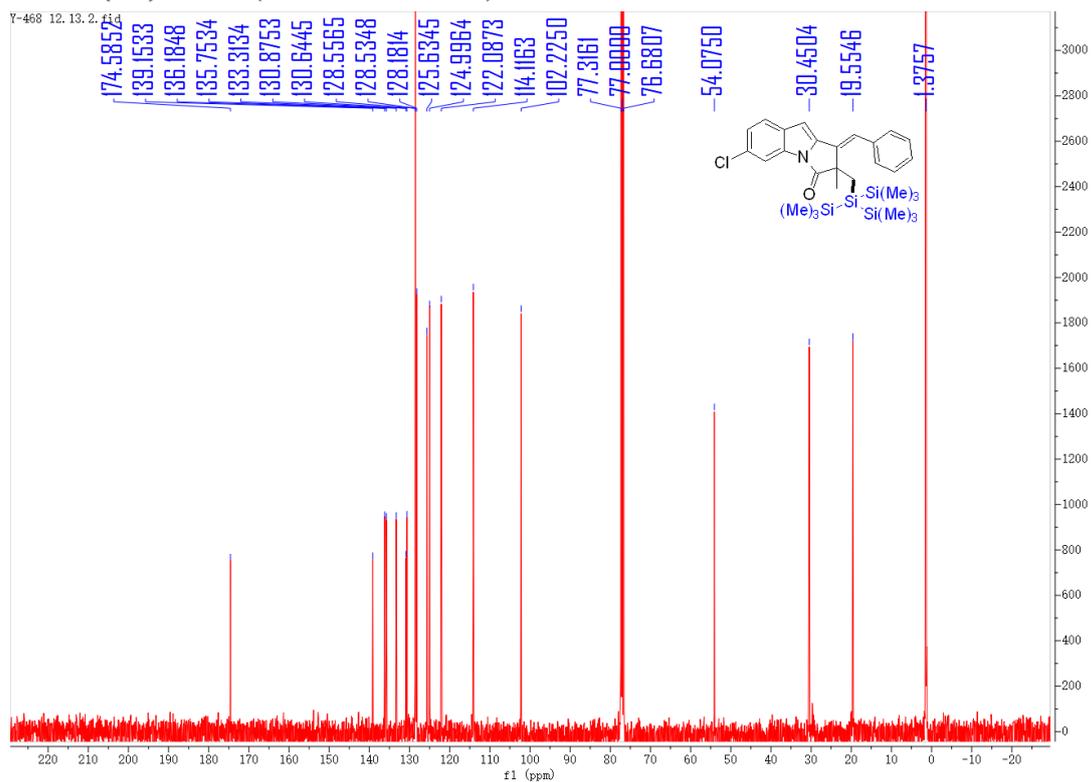
16-¹³C{¹H} NMR (100 MHz, CDCl₃)



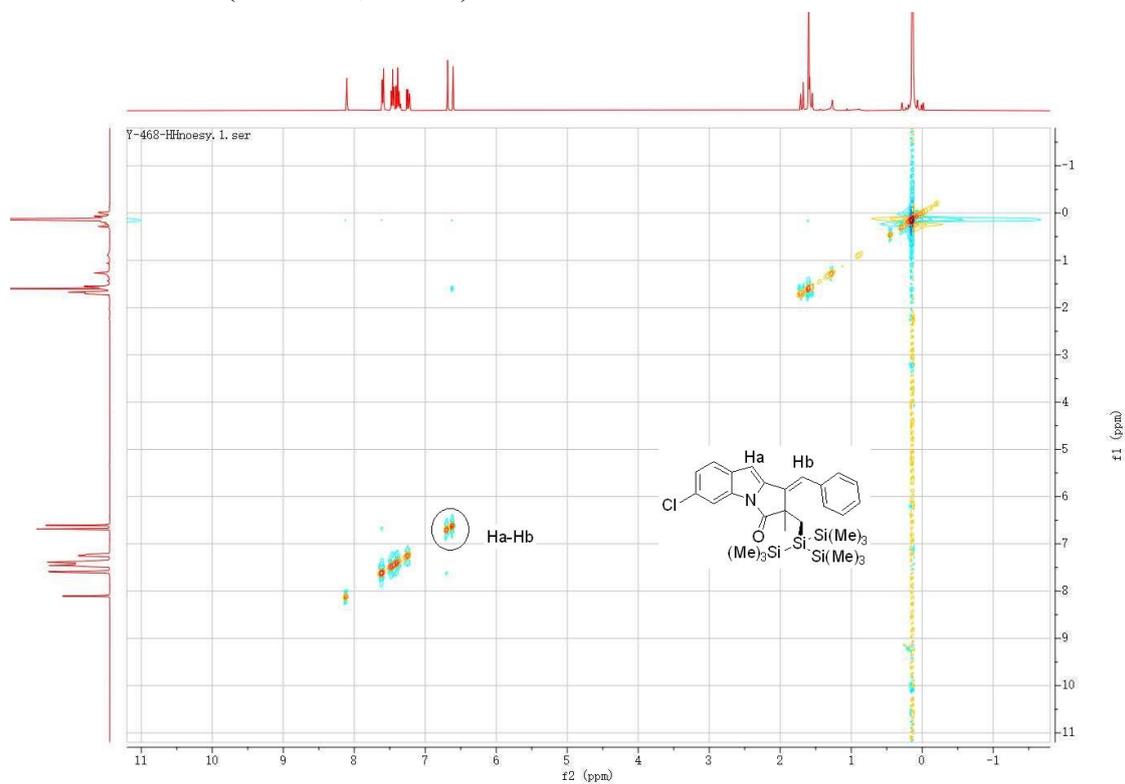
17-¹H NMR (400 MHz, CDCl₃)



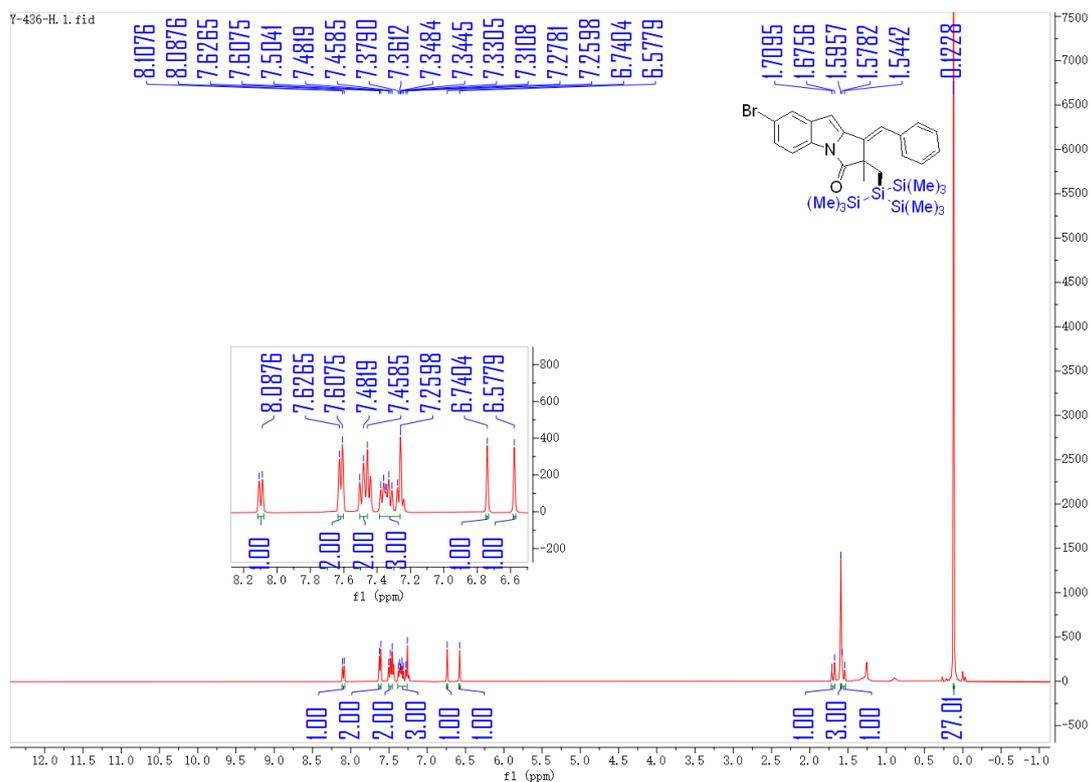
17-¹³C{¹H} NMR (100 MHz, CDCl₃)



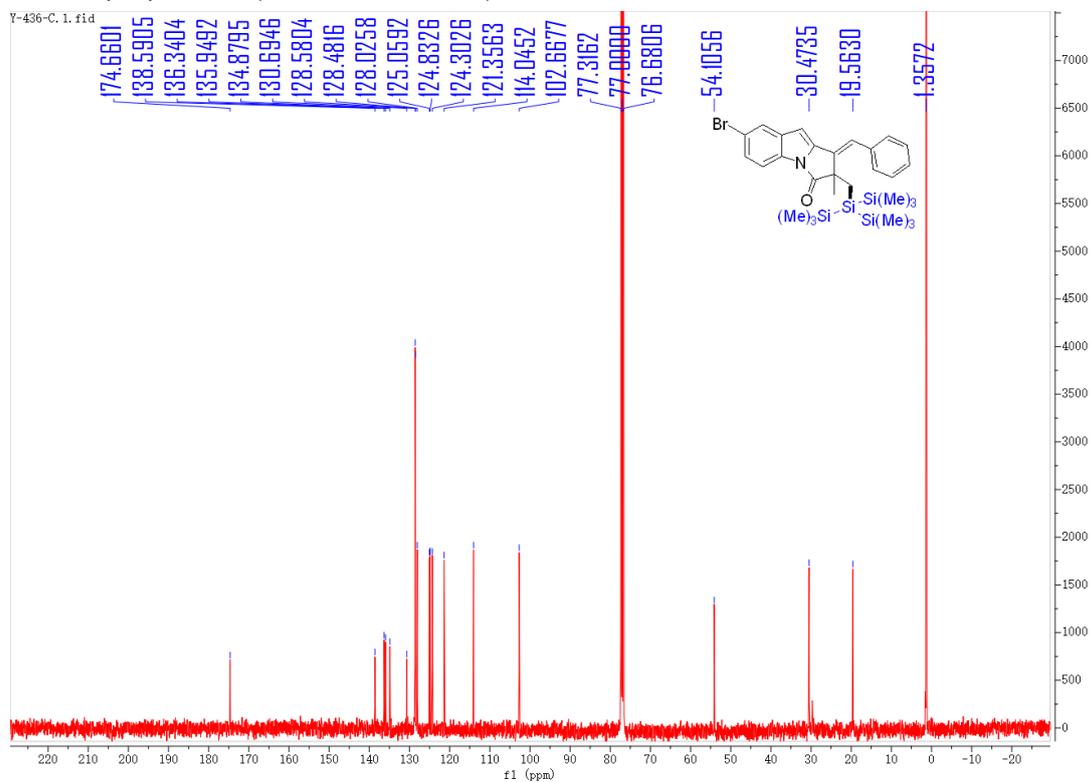
17-HH-NOESY (400 MHz, CDCl₃)



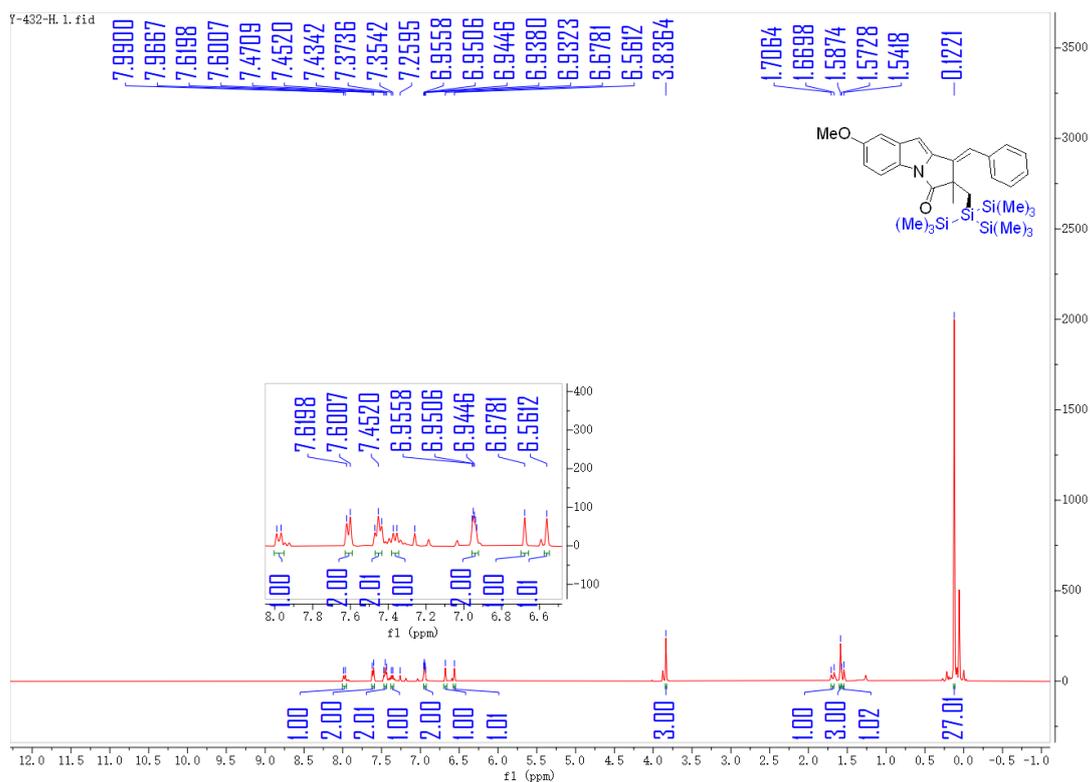
18-¹H NMR (400 MHz, CDCl₃)



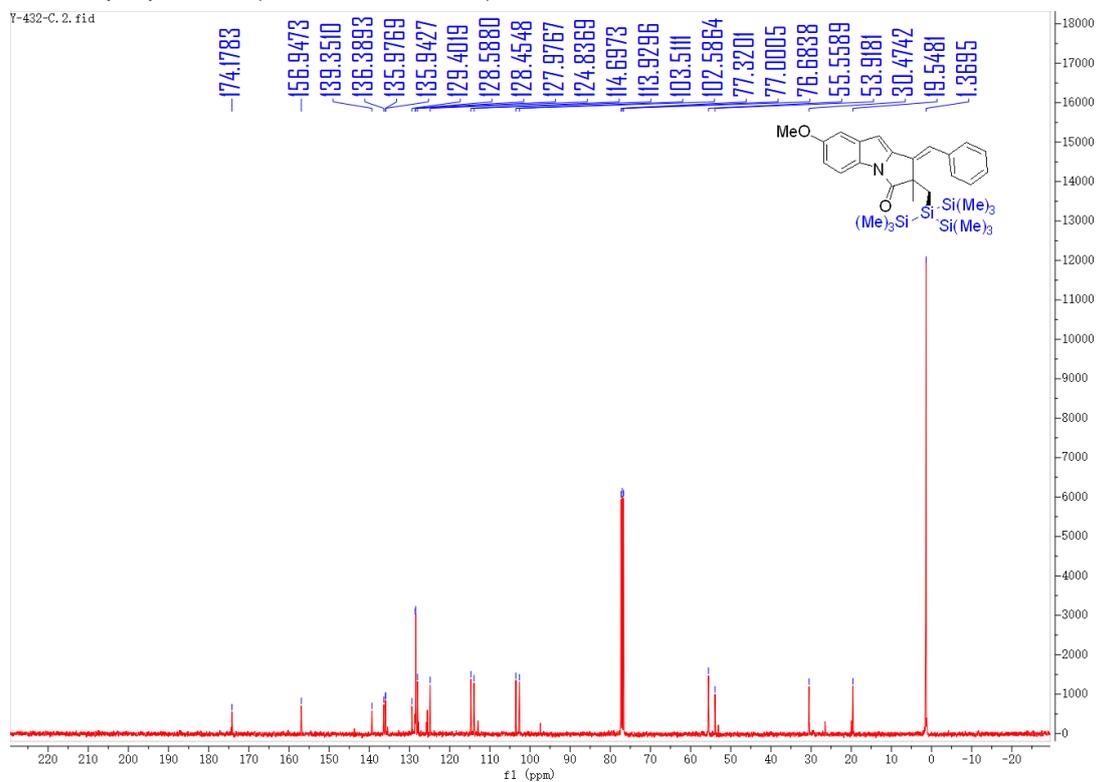
18-¹³C {¹H} NMR (100 MHz, CDCl₃)



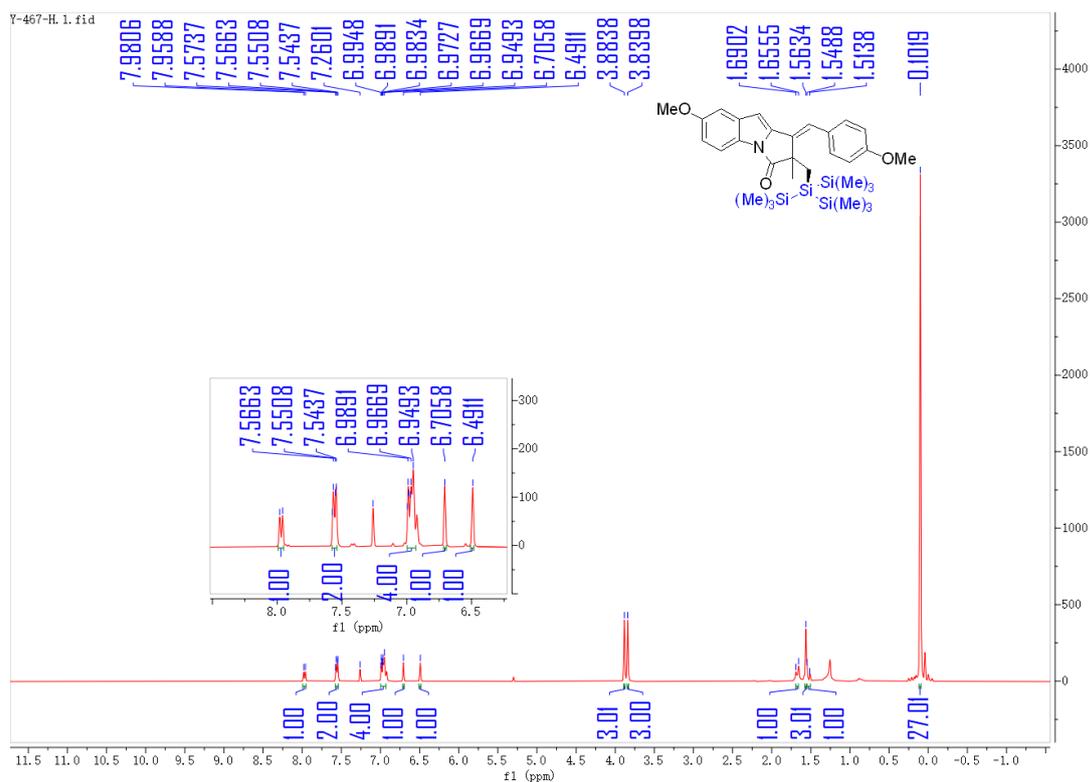
19-¹H NMR (400 MHz, CDCl₃)



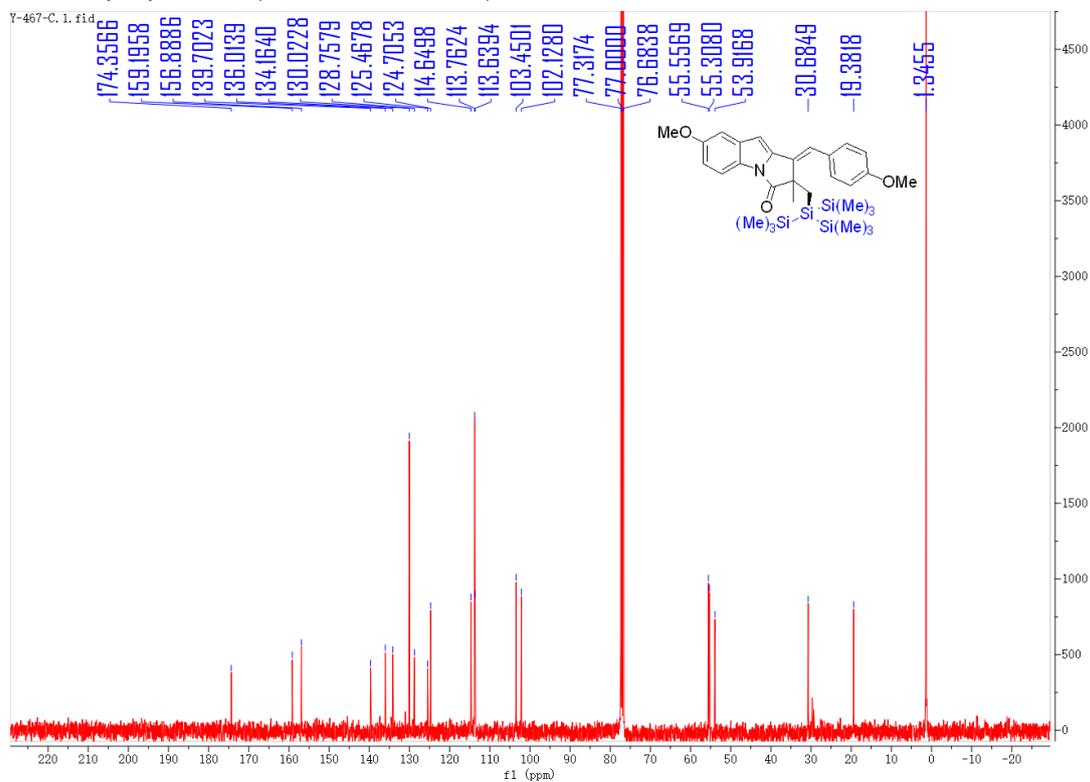
19-¹³C {¹H} NMR (100 MHz, CDCl₃)



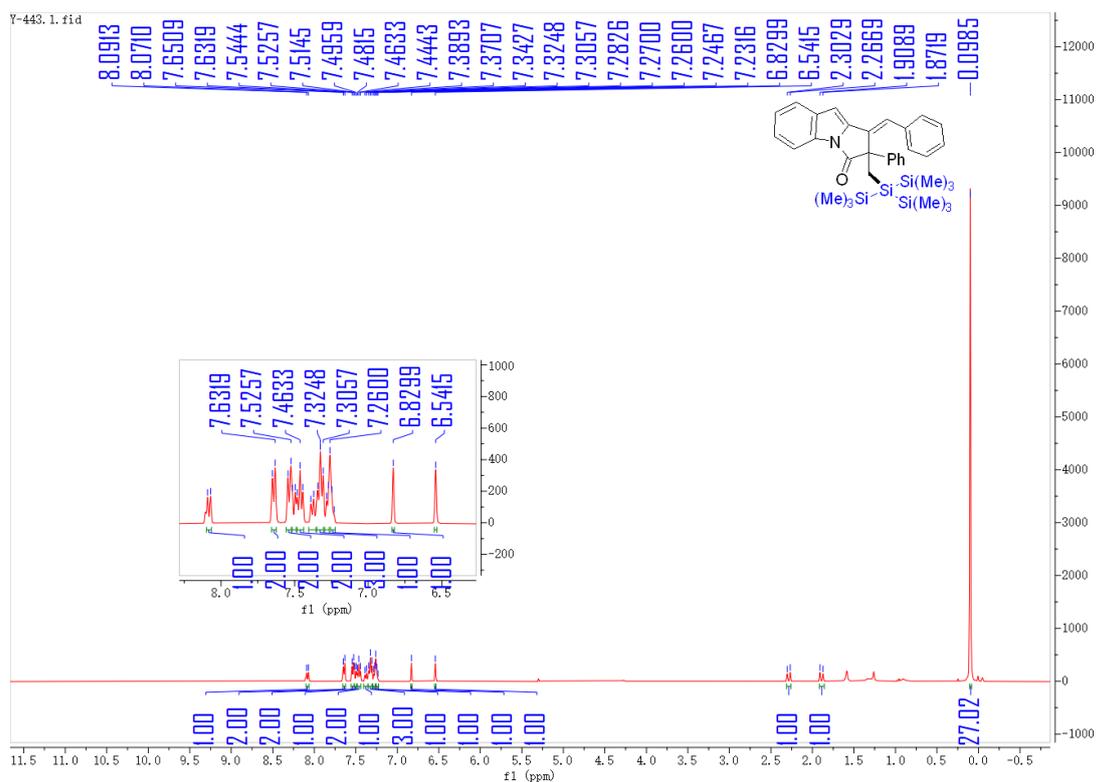
20-¹H NMR (400 MHz, CDCl₃)



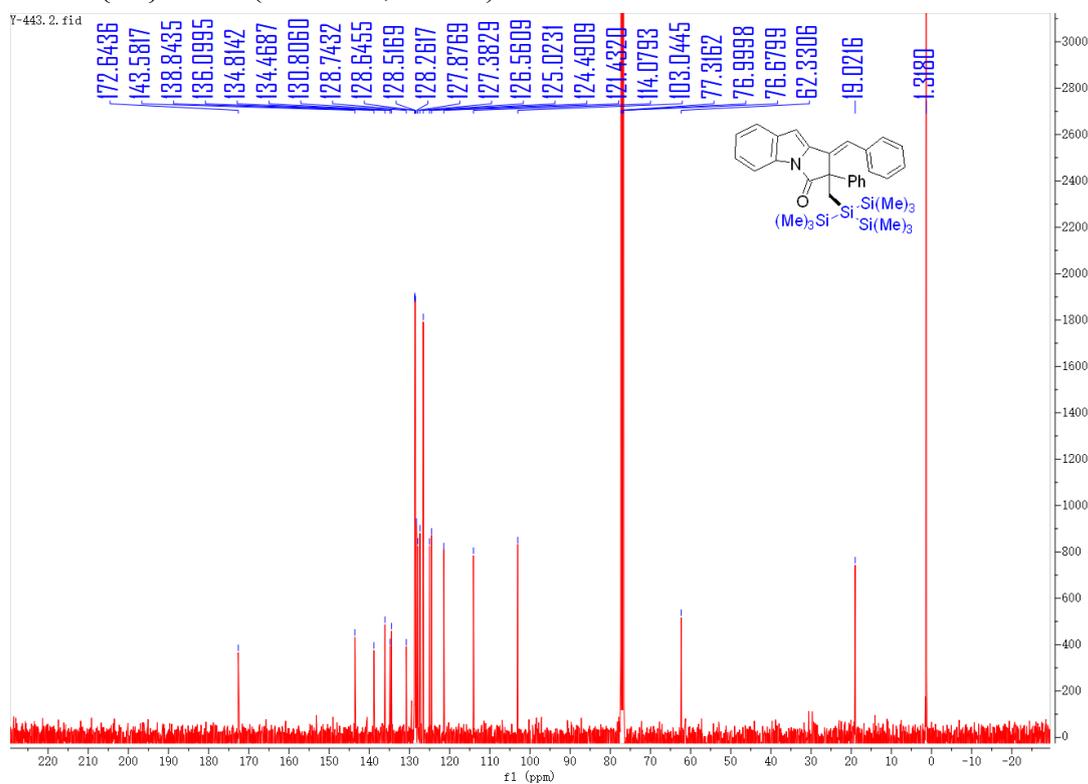
20-¹³C {¹H} NMR (100 MHz, CDCl₃)



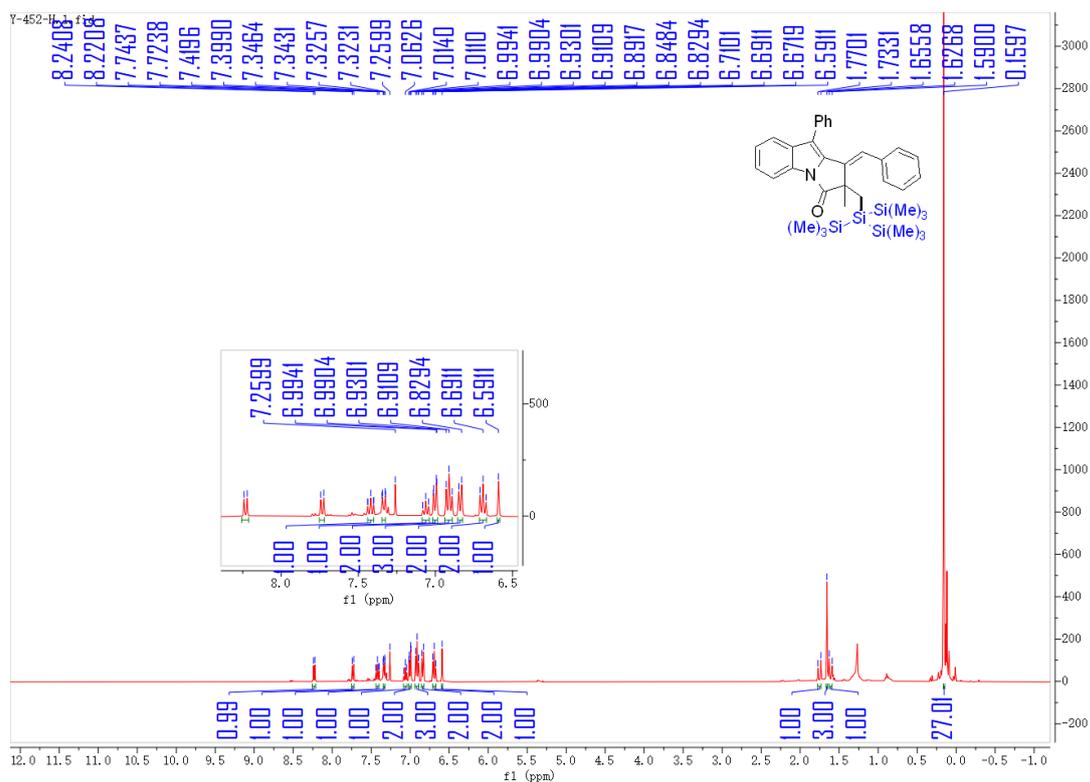
22-¹H NMR (400 MHz, CDCl₃)



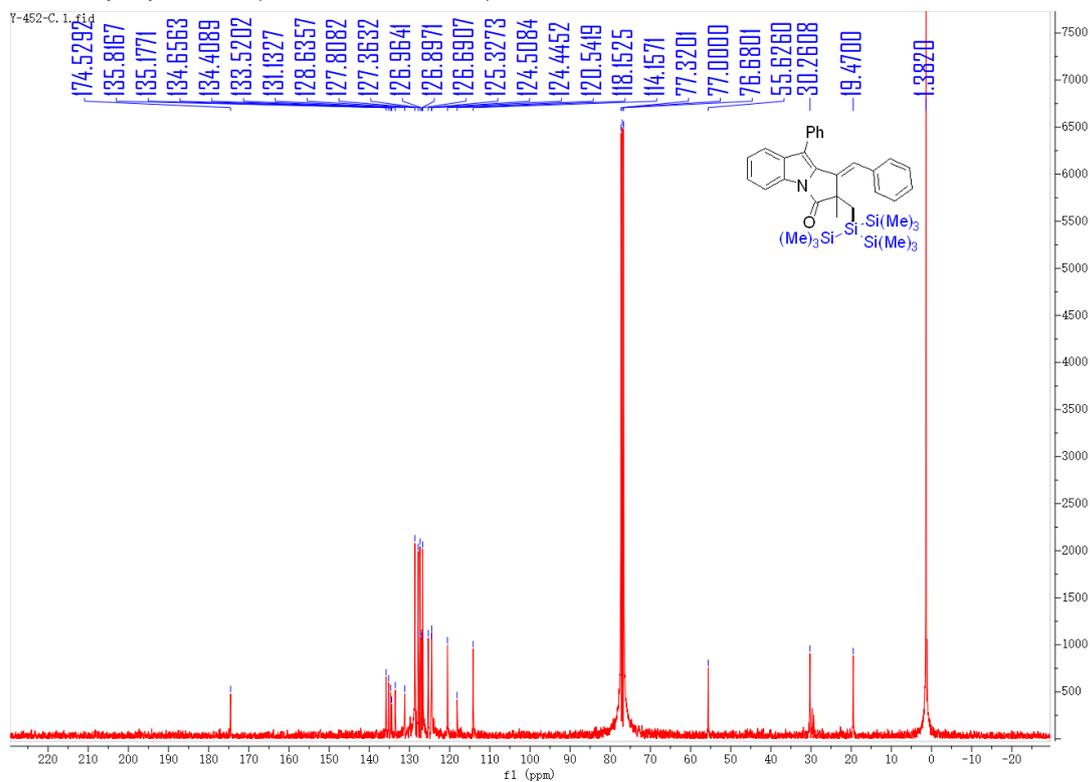
22-¹³C {¹H} NMR (100 MHz, CDCl₃)



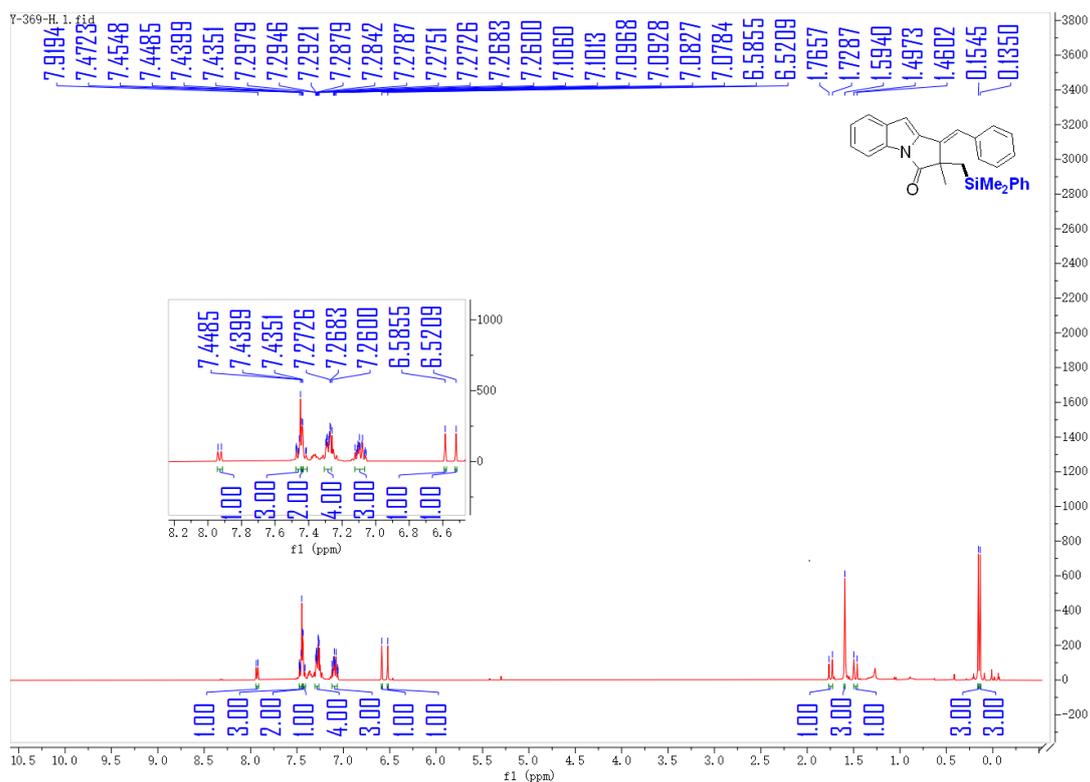
23-¹H NMR (400 MHz, CDCl₃)



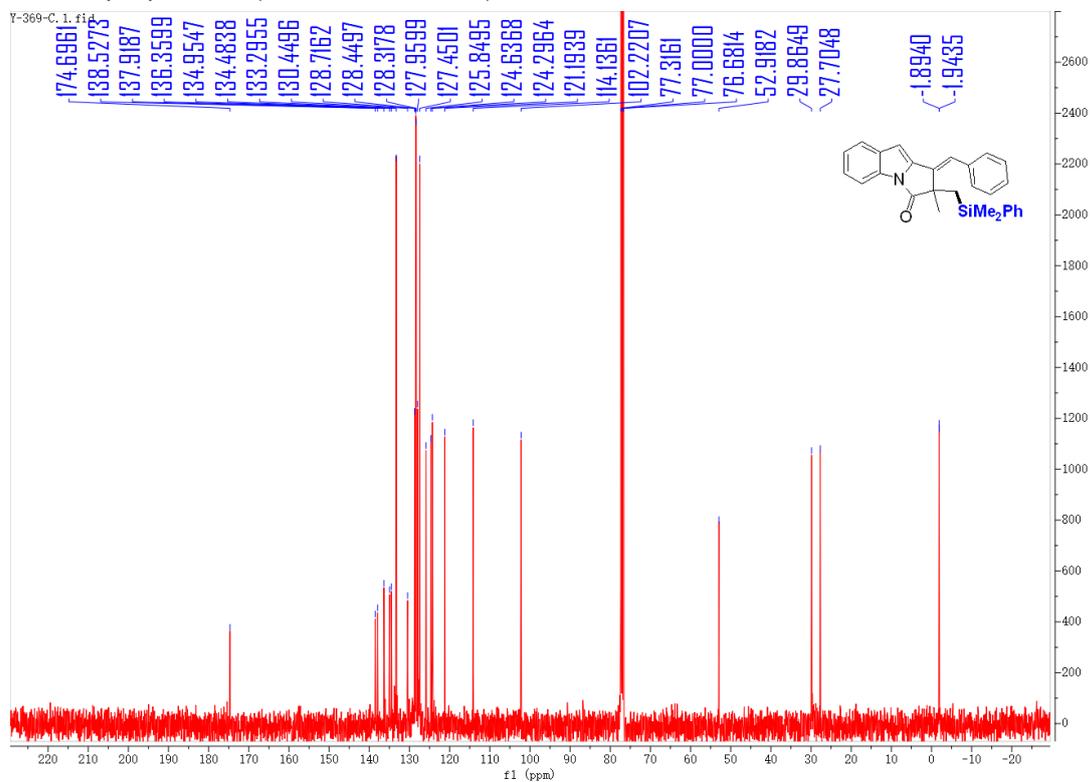
23-¹³C {¹H} NMR (100 MHz, CDCl₃)



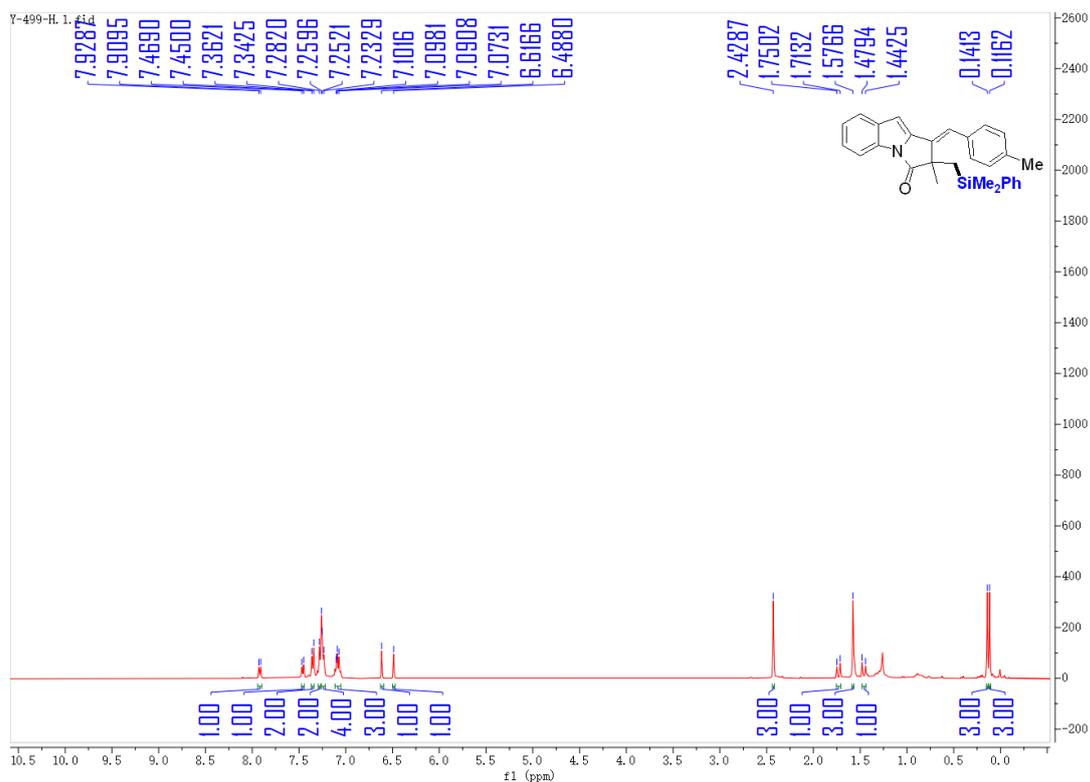
24-¹H NMR (400 MHz, CDCl₃)



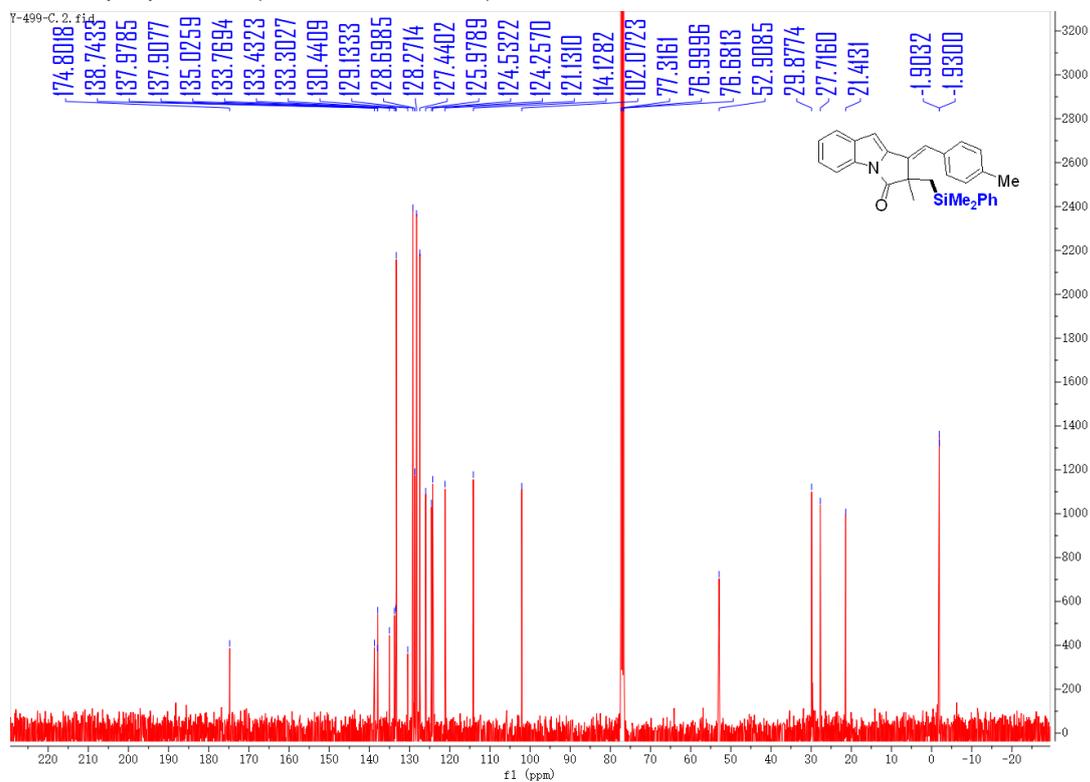
24-¹³C {¹H} NMR (100 MHz, CDCl₃)



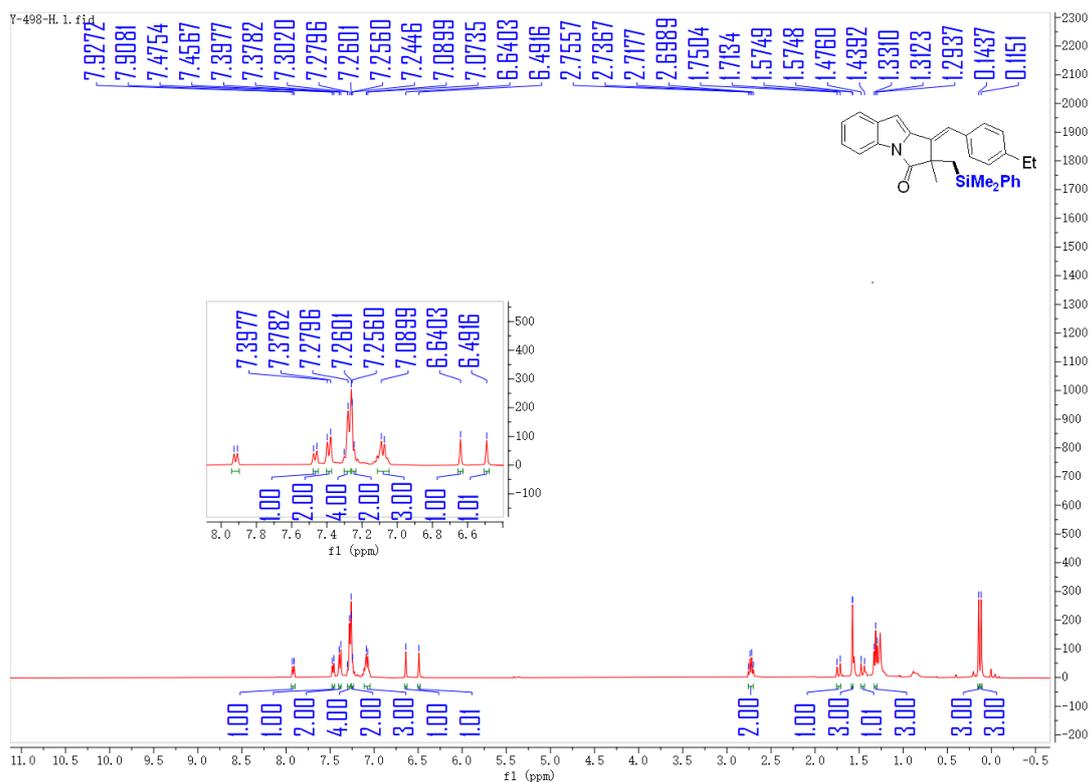
25-¹H NMR (400 MHz, CDCl₃)



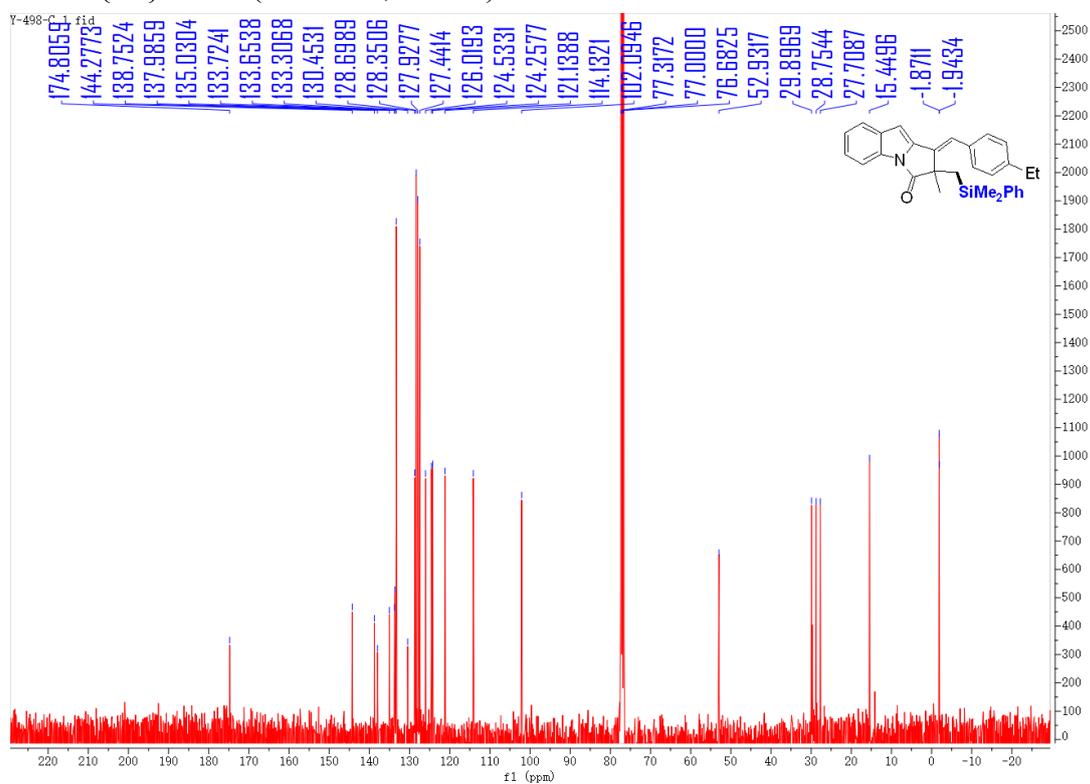
25-¹³C {¹H} NMR (100 MHz, CDCl₃)



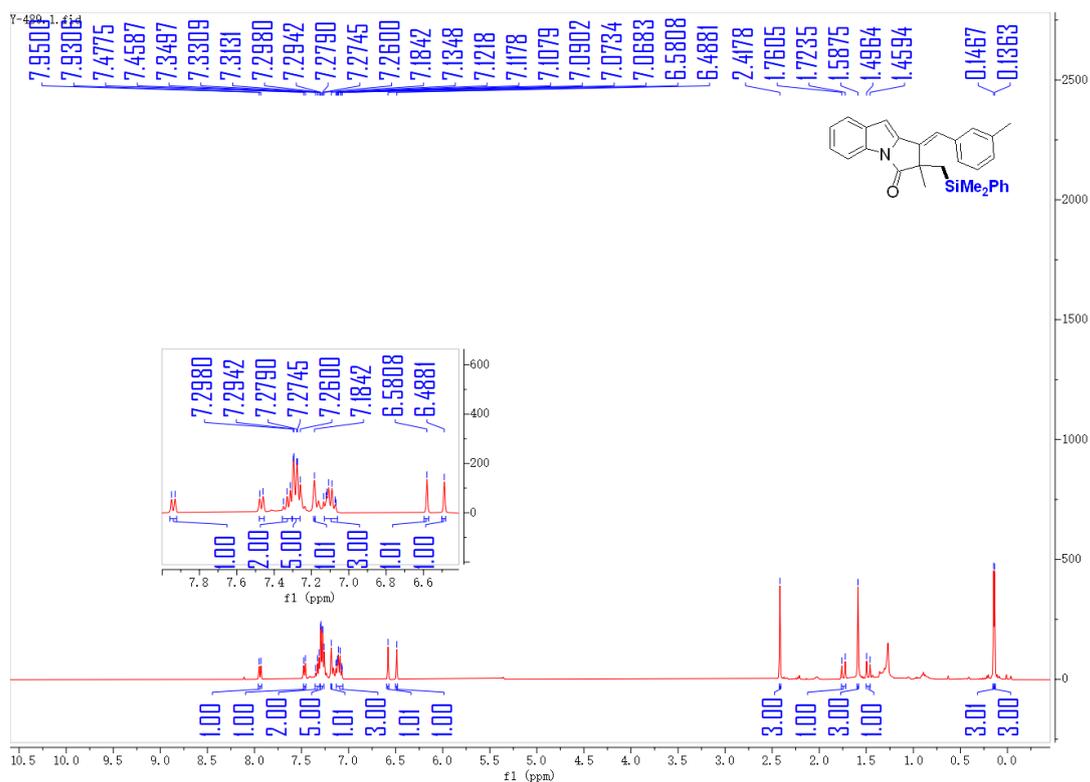
26-¹H NMR (400 MHz, CDCl₃)



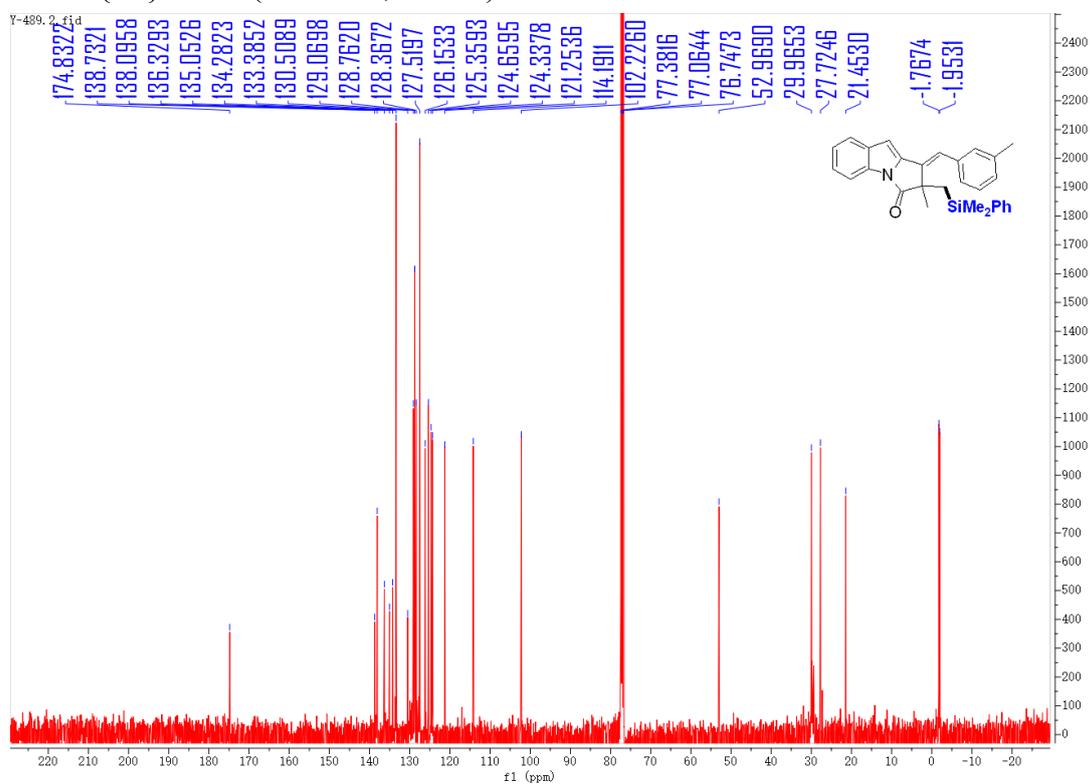
26-¹³C {¹H} NMR (100 MHz, CDCl₃)



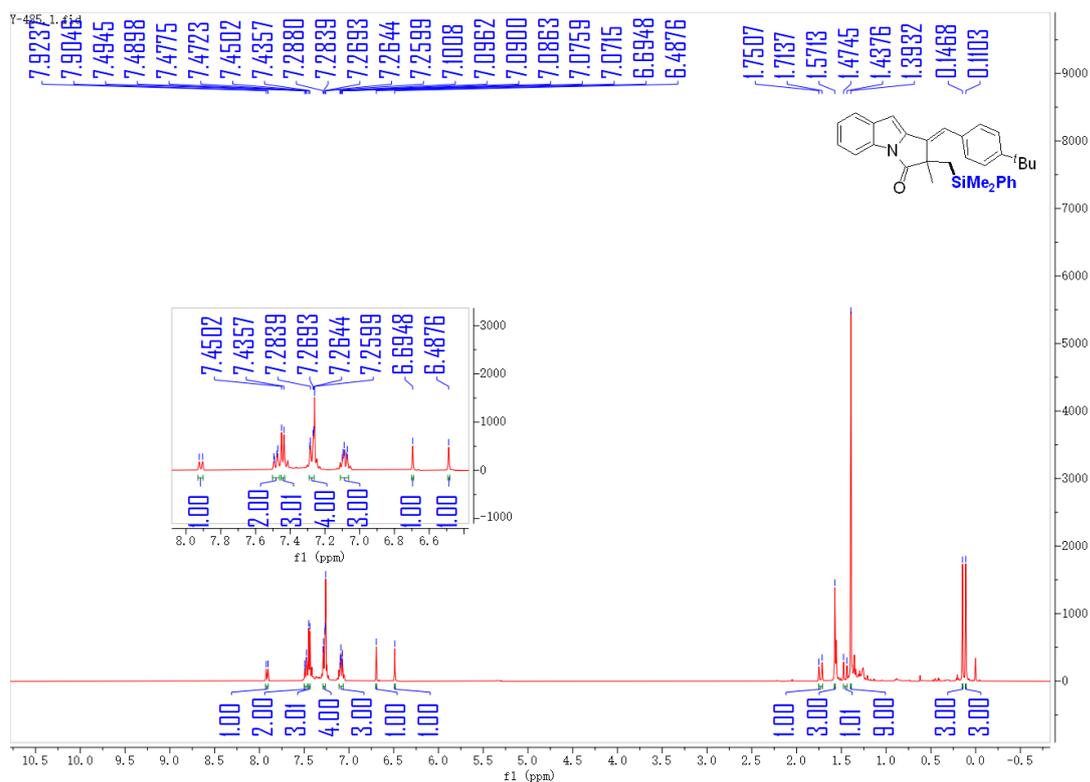
27-¹H NMR (400 MHz, CDCl₃)



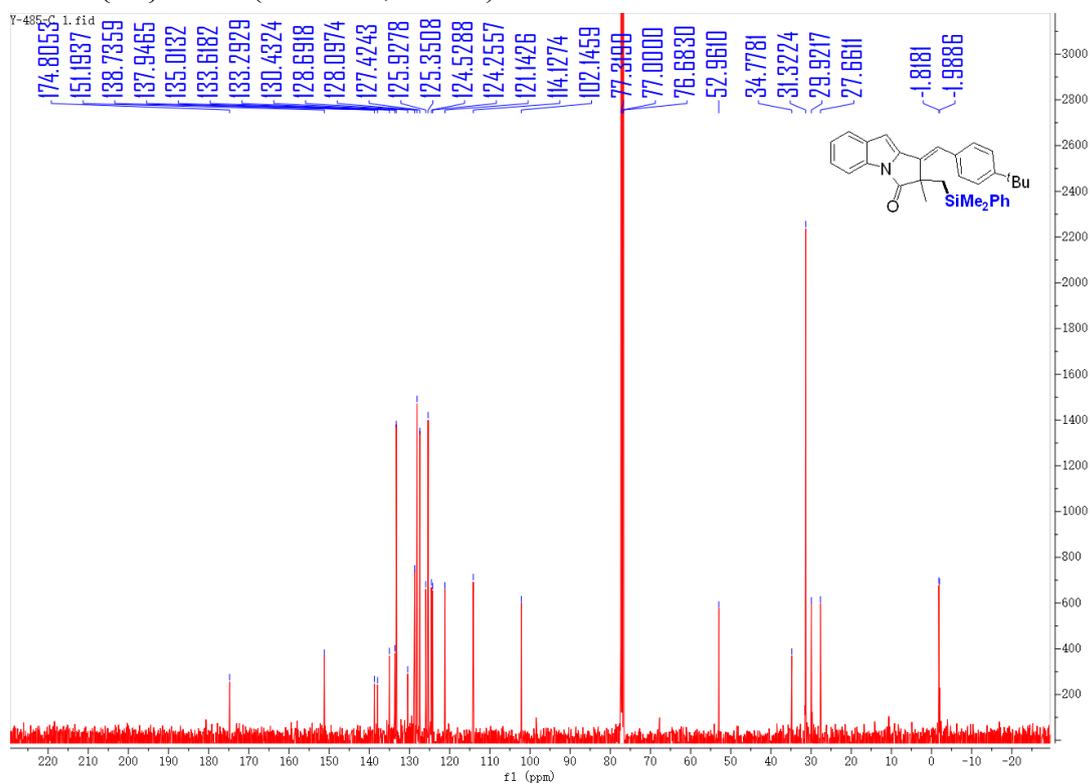
27-¹³C {¹H} NMR (100 MHz, CDCl₃)



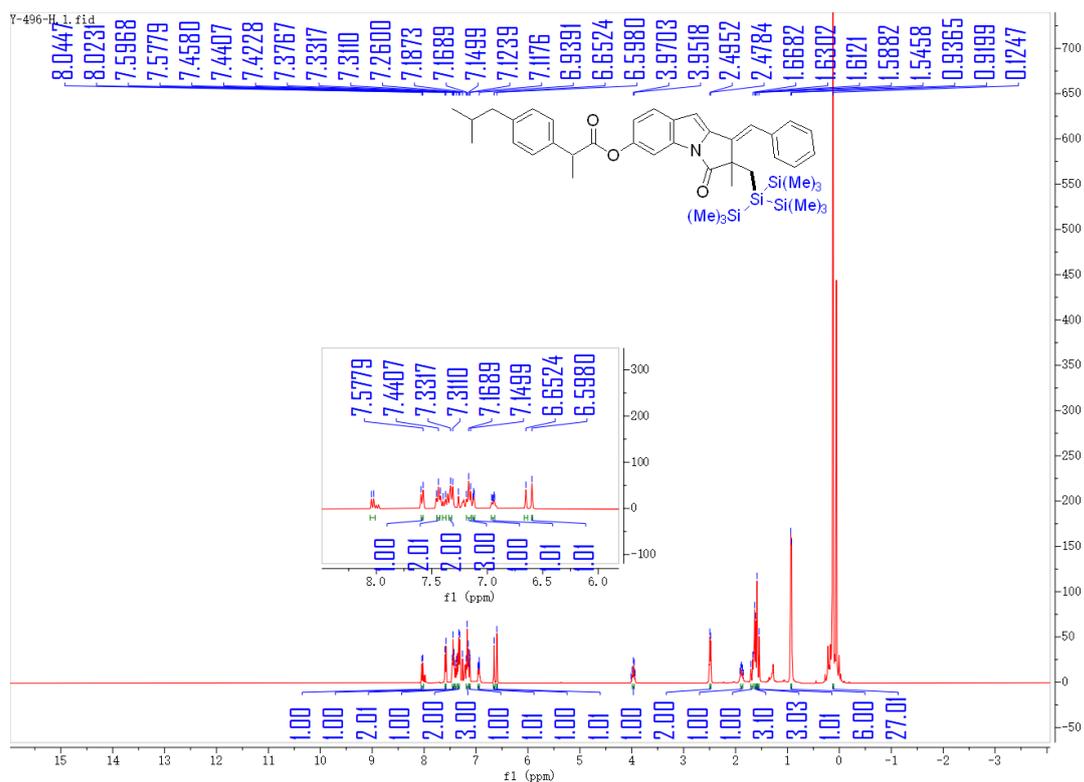
28-¹H NMR (400 MHz, CDCl₃)



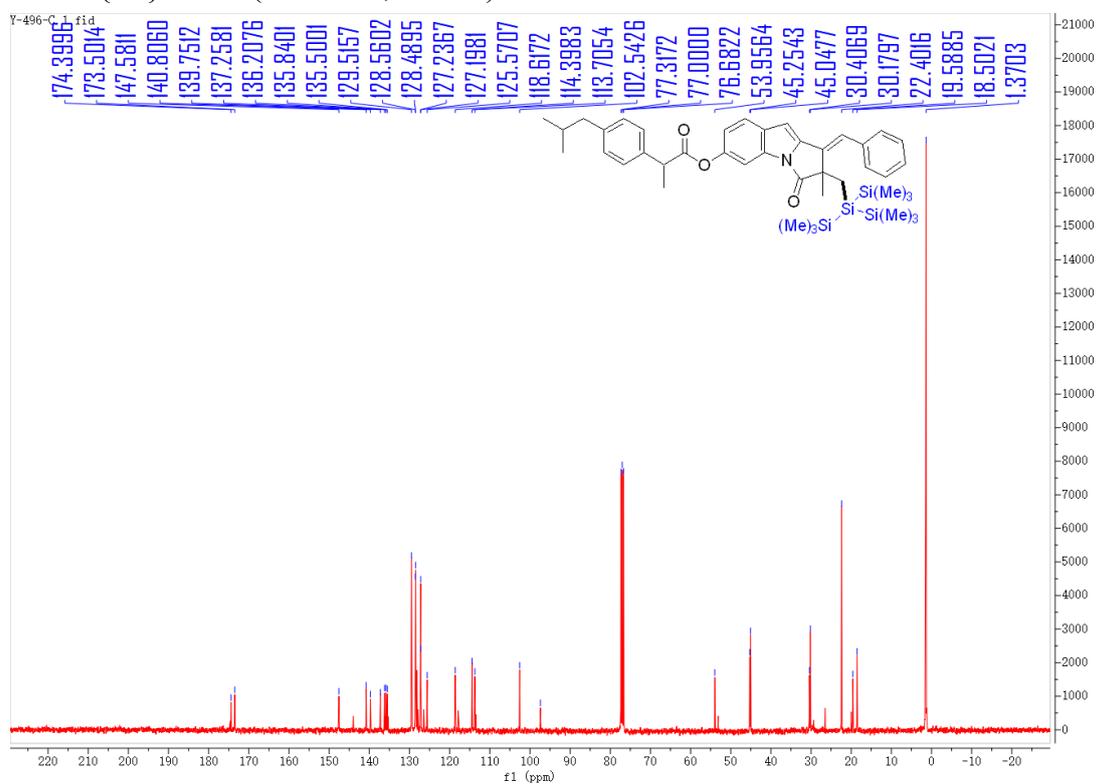
28-¹³C {¹H} NMR (100 MHz, CDCl₃)



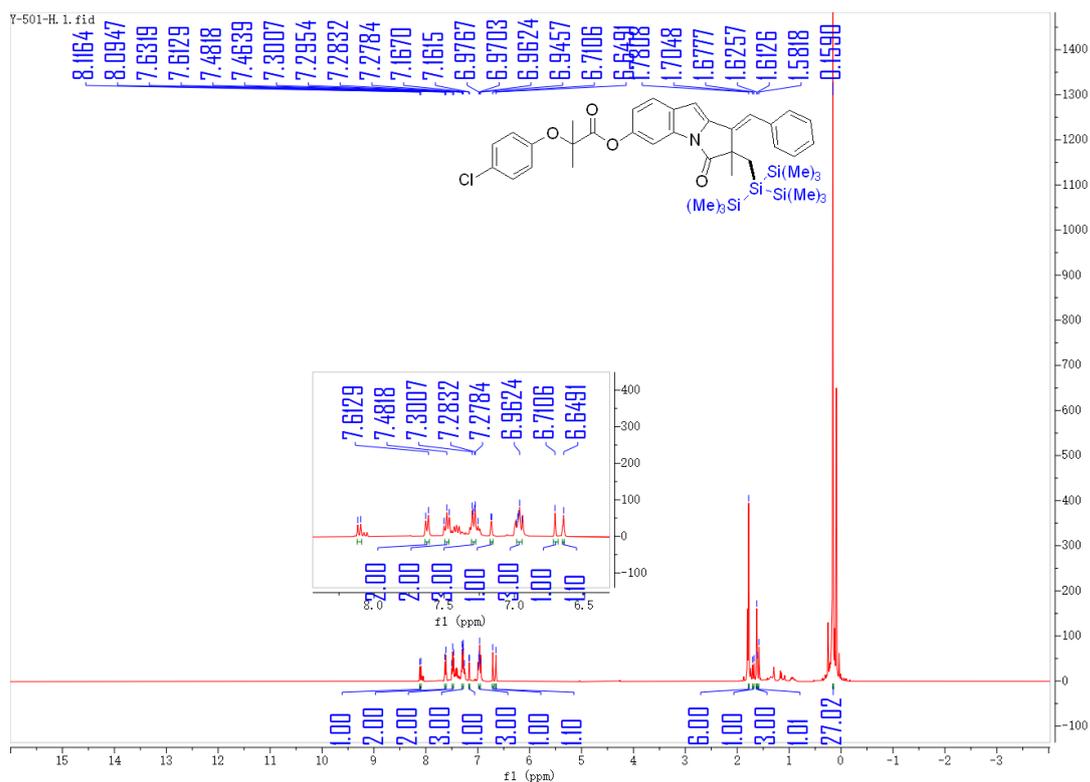
29-¹H NMR (400 MHz, CDCl₃)



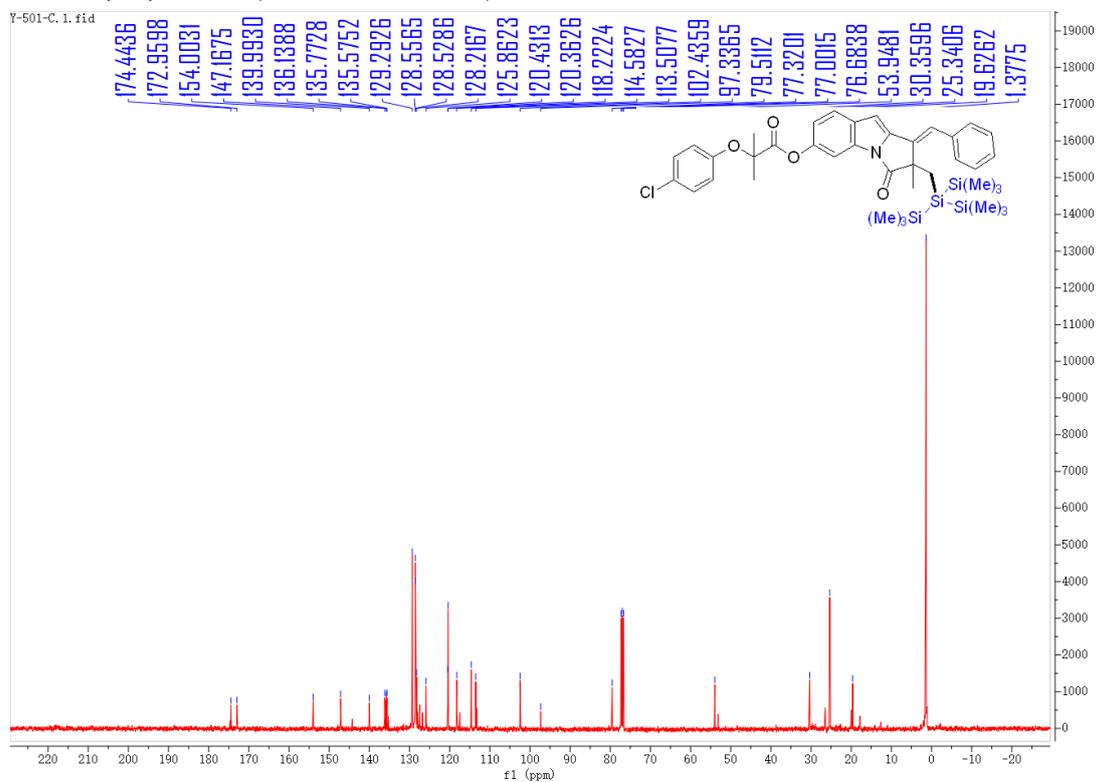
29-¹³C {¹H} NMR (100 MHz, CDCl₃)



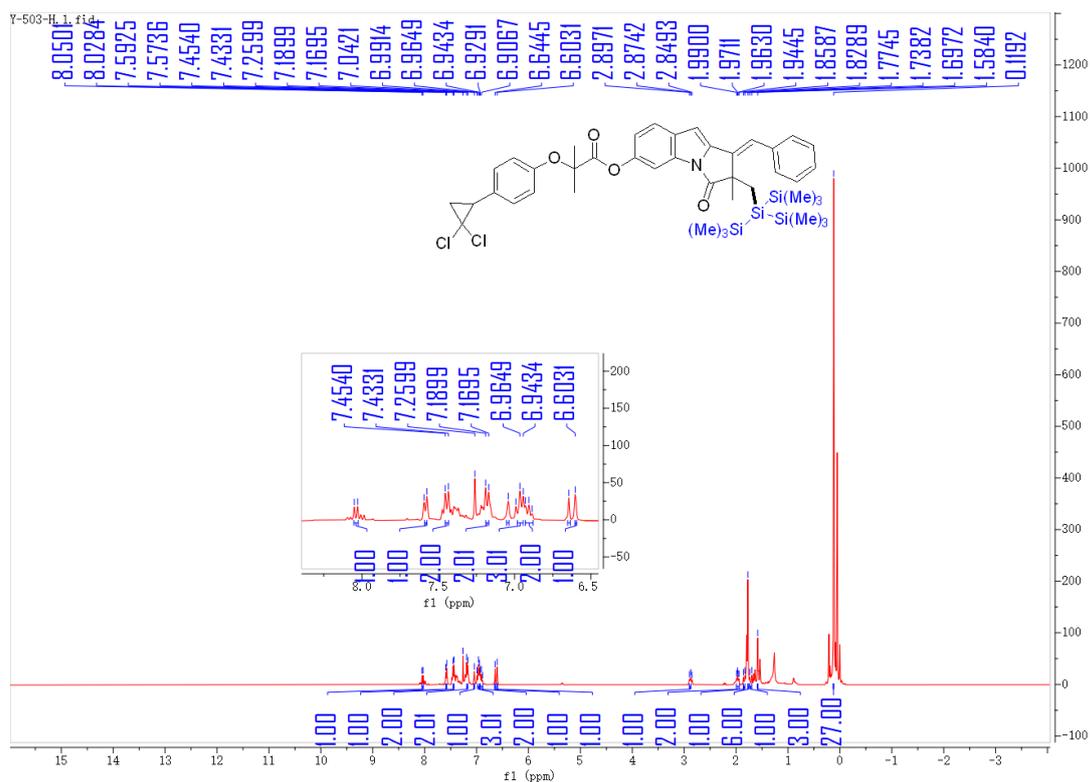
30-¹H NMR (400 MHz, CDCl₃)



30-¹³C {¹H} NMR (100 MHz, CDCl₃)



31-¹H NMR (400 MHz, CDCl₃)



31-¹³C {¹H} NMR (100 MHz, CDCl₃)

