Supporting Information

Divergent Synthesis of Silicon-Containing Peptides via Pd-Catalyzed Post-Assembly γ-C(sp^3)–H Silylation

Bei-Bei Zhan, Jun Fan, Liang Jin, Bing-Feng Shi*
Department of Chemistry, Zhejiang University, Hangzhou, 310027, China
*Email: bfshi@zju.edu.cn

Table of Contents

1. General Information

Nuclear magnetic resonance (NMR) spectra were recorded with Bruker AVANCE 400MHz. ^{1}H and ^{13}C chemical shifts are reported in ppm downfield of tetramethylsilane and referenced to residual solvent peak as following: $CHCl_3$= 7.26 (^{1}H NMR), $(CH_3)_2SO$ = 2.50 (^{1}H NMR), toluene = 2.08, 6.97, 7.01, 7.09 (^{1}H NMR), $CDCl_3$= 77.16 (^{13}C NMR), $(CD_3)_2SO$ = 40.00 (^{13}C NMR).Multiplicities are reported using the following abbreviations: s = singlet, d = doublet, dd = doublet of doublets, ddd = doublet of doublet of doublets, dddd = doublet of doublet of doublet of doublets, t = triplet, q = quartet, m = multiplet. High-resolution mass spectra (HRMS) for new compounds were recorded on ESI-TOF. Unless otherwise noted, all commercial materials were purchased from Adamas, Aladdin and Energy Chemicals and used without further purification. $Pd(OAc)_2$ was obtained from Stream®.

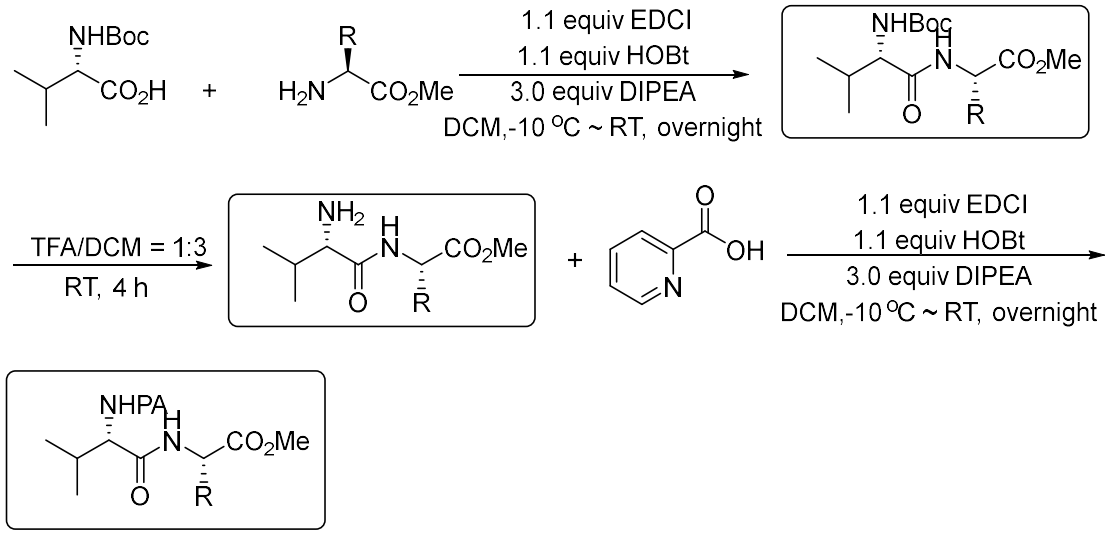
2. Synthesis and Characterization of Starting Materials

2-1. Synthesis of Starting Materials

The preparation of substrates **1a-1m**, **1q**, **1r**, **3o and 5e-5h** have been reported.[1-9]

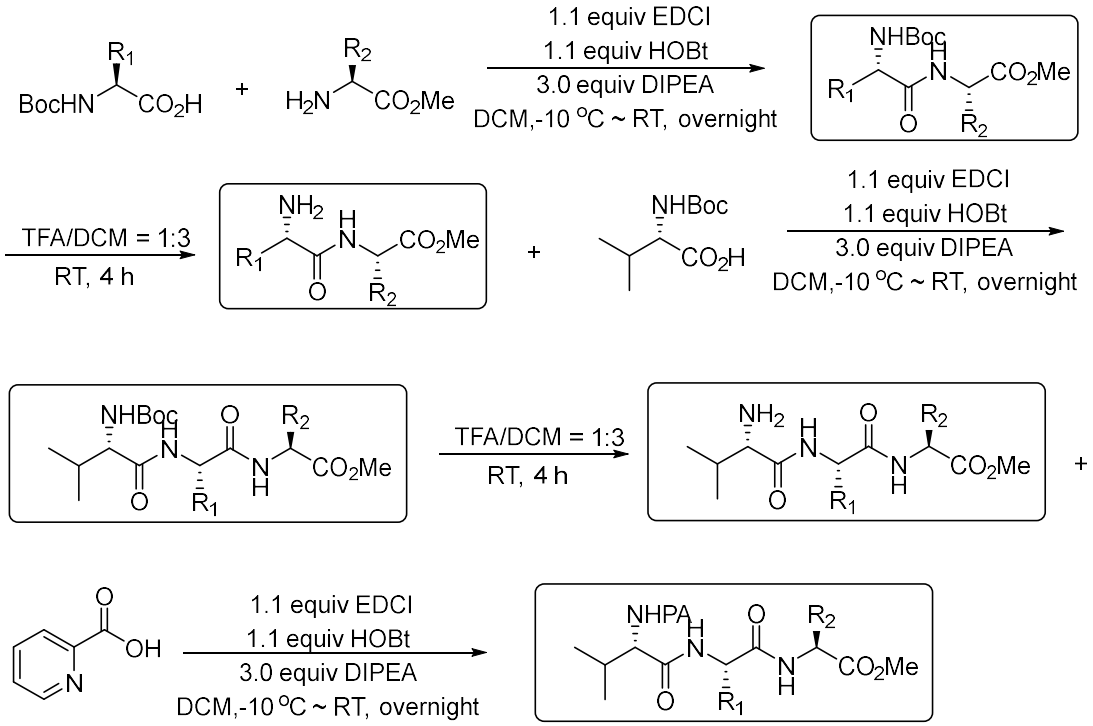
General Procedure (GP-1) for the synthesis of peptides.

A) Synthesis of dipeptides 3a-3n.



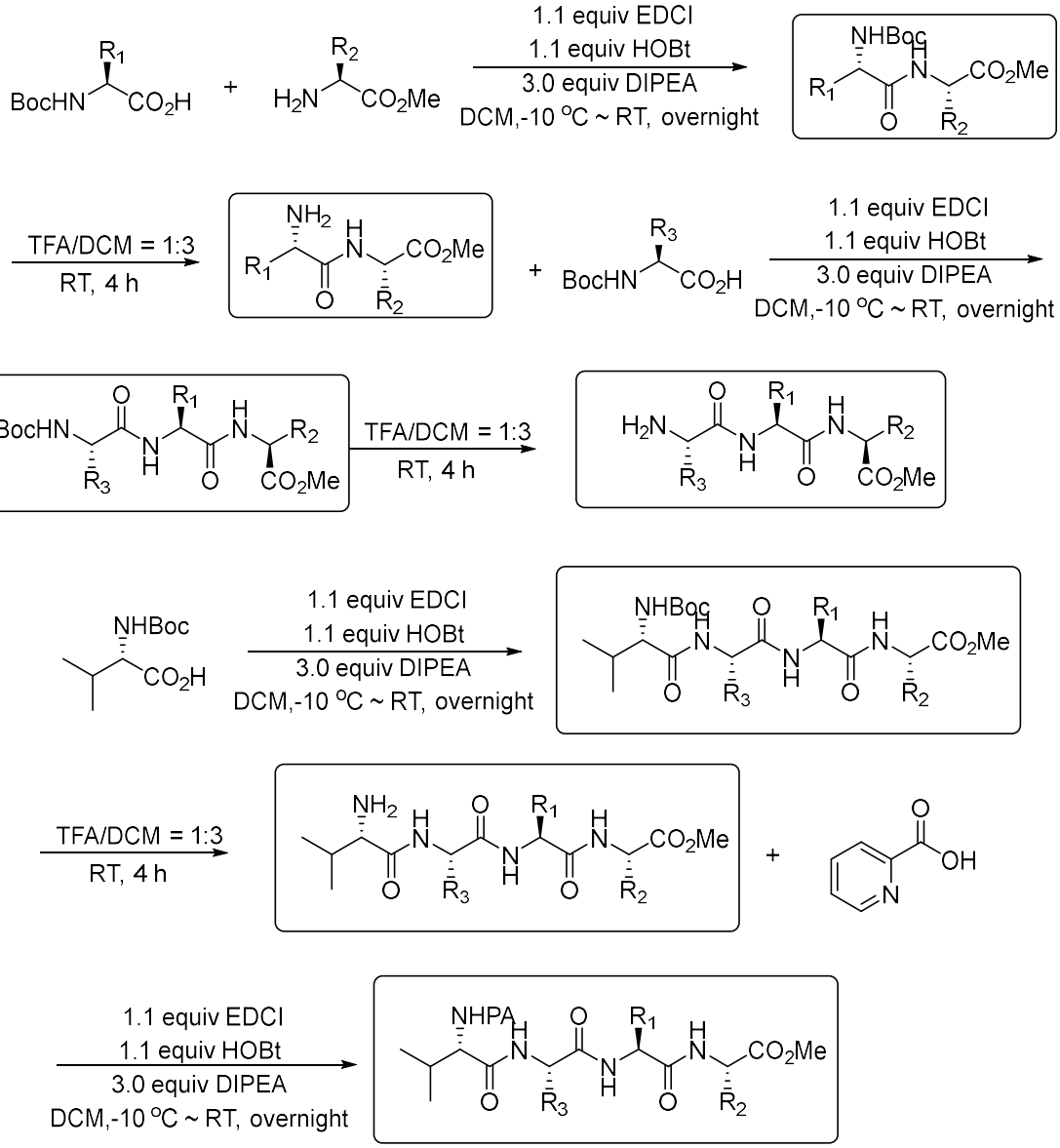
A mixture of Boc-*L*-valine (1.0 eq), amino acid methyl esters (1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM was stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The mixture dissolved in DCM was treated with trifluoroacetic acid for 4 hours and then concentrated in vacuo. The crude oil was finally mixed with picolinic acid(1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM and stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The resulting residue was purified by flash chromatography to give the corresponding dipeptides.

B) Synthesis of tripeptides 5a-5d.



A mixture of Boc-*L*-amino acid (1.0 eq), amino acid methyl esters (1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM was stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The mixture dissolved in DCM was treated with trifluoroacetic acid for 4 hours and then concentrated in vacuo, repeat the operation again. The crude oil was finally mixed with picolinic acid(1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM and stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The resulting residue was purified by flash chromatography to give the corresponding tripeptides.

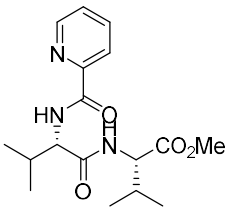
C) Synthesis of tetrapeptides 5i-5j.



A mixture of Boc-*L*-amino acid (1.0 eq), amino acid methyl esters (1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM was stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The mixture dissolved in DCM was treated with trifluoroacetic acid for 4 hours and then concentrated in vacuo, repeat the operation for twice. The crude oil was finally mixed with picolinic acid(1.1 eq), EDCI (1.1 eq), HOBt (1.1 eq), and DIPEA (3.0 eq) in DCM and stirred at -10 °C for 2 hours, then warmed to room temperature for overnight. Water was added and the mixture was extracted with DCM. The combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The resulting residue was purified by flash chromatography to give the corresponding tetrapeptides.

2-2. Characterization of Starting Materials

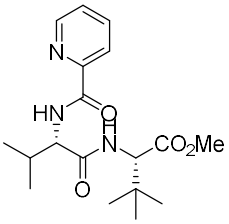
(S)-Methyl 3-methyl-2-((S)-3-methyl-2-(picolinamido)butanamido)butanoate (3a)



3a

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.66 – 8.49 (m, 2H), 8.19 (d, *J* = 7.6 Hz, 1H), 7.84 (td, *J* = 8.0, 1.6 Hz, 1H), 7.46 – 7.41 (m, 1H), 6.69 (d, *J* = 8.4 Hz, 1H), 4.57 – 4.49 (m, 2H), 3.73 (s, 3H), 2.36 – 2.26 (m, 1H), 2.22 – 2.10 (m, 1H), 1.03 (dd, *J* = 6.8, 3.2 Hz, 6H), 0.93 – 0.85 (m, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.37, 171.19, 164.66, 149.49, 148.46, 137.46, 126.51, 122.46, 58.94, 57.32, 52.27, 31.22, 31.10, 19.53, 19.04, 18.31, 17.93. **HRMS (ESI):** calcd. for $C_{17}H_{25}N_3O_4Na$ $(M + Na)^+$: 358.1737, found:358.1721

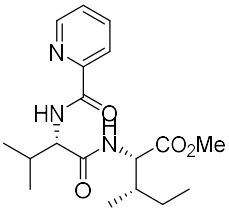
(S)-Methyl 3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)butanamido)butanoate (3b)



3b

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.70 – 8.45 (m, 2H), 8.21 (d, *J* = 7.2 Hz, 1H), 7.85 (t, *J* = 6.8 Hz, 1H), 7.52 – 7.30 (m, 1H), 6.89 – 6.65 (m, 1H), 4.79 – 4.31 (m, 2H), 3.72 (s, 3H), 2.40 – 2.20 (m, 1H), 1.18 – 0.75 (m, 15H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.92, 171.00, 164.66, 149.45, 148.44, 137.45, 126.51, 122.48, 60.27, 58.89, 51.92, 34.71, 30.96, 26.68, 19.54, 18.35. **HRMS (ESI):** calcd. for $C_{18}H_{27}N_3O_4Na$ $(M + Na)^+$: 372.1893, found:372.1893.

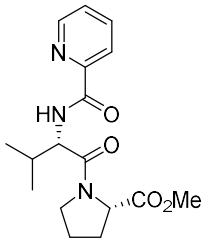
(2S,3S)-Methyl 3-methyl-2-((S)-3-methyl-2-(picolinamido)butanamido)pentanoate (3c)



3c

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.63 – 8.49 (m, 2H), 8.19 (d, *J* = 7.8 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.44 – 7.39 (m, 1H), 6.78 (d, *J* = 8.4 Hz, 1H), 4.61 – 4.51 (m, 2H), 3.72 (s, 3H), 2.35 – 2.25 (m, 1H), 1.93 – 1.81 (m, 1H), 1.42 – 1.35 (m, 1H), 1.18 – 1.09 (m, 1H), 1.02 (dd, *J* = 6.8, 4.8 Hz, 6H), 0.89 – 0.78 (m, 7H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.33, 171.07, 164.61, 149.54, 148.44, 137.41, 126.46, 122.45, 58.82, 56.62, 52.16, 37.83, 31.24, 25.32, 19.47, 18.30, 15.54, 11.63. **HRMS (ESI):** calcd. for $C_{18}H_{27}N_3O_4Na(M + Na)^+$: 372.1893, found: 372.1879.

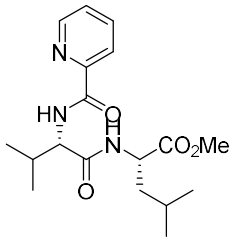
(S)-Methyl 1-((S)-3-methyl-2-(picolinamido)butanoyl)pyrrolidine-2-carboxylate (3d)



3d

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.62 (d, *J* = 9.2 Hz, 1H), 8.54 (d, *J* = 4.8 Hz, 1H), 8.12 (d, *J* = 7.6 Hz, 1H), 7.80 (td, *J* = 7.6, 1.6 Hz, 1H), 7.43 – 7.34 (m, 1H), 4.77 (dd, *J* = 9.2, 7.2 Hz, 1H), 4.51 (dd, *J* = 8.4, 5.0 Hz, 1H), 3.96 – 3.85 (m, 1H), 3.79 – 3.68 (m, 4H), 2.31 – 2.14 (m, 2H), 2.11 – 1.93 (m, 3H), 1.09 (d, *J* = 6.8 Hz, 3H), 1.02 (d, *J* = 6.8 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.60, 170.67, 164.38, 149.65, 148.44, 137.26, 126.30, 122.25, 58.99, 55.89, 52.27, 47.42, 31.76, 29.18, 25.12, 19.41, 18.07. **HRMS (ESI):** calcd. for $C_{17}H_{23}N_3O_4Na(M +Na)^+$: 356.1581, found: 356.1564.

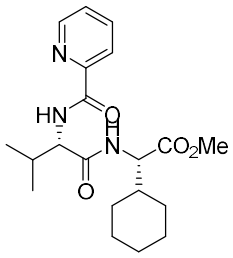
(S)-Methyl 4-methyl-2-((S)-3-methyl-2-(picolinamido)butanamido)pentanoate (3e)



3e

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.64 – 8.49 (m, 2H), 8.17 (d, *J* = 8.0 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.40 (m, 1H), 6.67 (d, *J* = 7.9 Hz, 1H), 4.65 – 4.56 (m, 1H), 4.52 (dd, *J* = 9.2, 6.8 Hz, 1H), 3.72 (s, 3H), 2.40 – 2.21 (m, 1H), 1.67 – 1.48 (m, 3H), 1.03 (t, *J* = 6.4 Hz, 6H), 0.85 (dd, *J* = 6.0, 1.2 Hz, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 173.38, 171.02, 164.63, 149.51, 148.47, 137.43, 126.49, 122.43, 58.71, 52.36, 50.95, 41.43, 31.30, 24.93, 22.78, 22.03, 19.46, 18.26. **HRMS (ESI):** calcd. for $C_{18}H_{27}N_3O_4Na$ $(M + Na)^+$: 372.1893, found:372.1885.

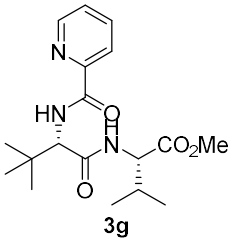
(S)-Methyl 2-cyclohexyl-2-((S)-3-methyl-2-(picolinamido)butanamido)acetate (3f)



3f

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.70 – 8.47 (m, 2H), 8.19 (d, *J* = 8.0 Hz, 1H), 7.92 – 7.80 (m, 1H), 7.43 (dd, *J* = 7.6, 4.8 Hz, 1H), 6.60 (d, *J* = 8.4 Hz, 1H), 4.59 – 4.44 (m, 2H), 3.73 (s, 3H), 2.35 – 2.24 (m, 1H), 1.80 – 1.46 (m, 6H), 1.21 – 0.90 (m, 11H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.34, 171.03, 164.66, 149.54, 148.47, 137.43, 126.50, 122.45, 58.87, 57.07, 52.24, 40.89, 31.17, 29.53, 28.37, 26.02, 25.99, 19.52, 18.29. **HRMS (ESI):** calcd. for $C_{20}H_{29}N_3O_4Na$ $(M + Na)^+$: 398.2050, found: 398.2040.

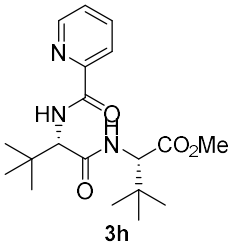
(S)-Methyl 2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3-methylbutanoate (3g)



3g

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77 (d, *J* = 9.6 Hz, 1H), 8.57 (d, *J* = 4.4 Hz, 1H), 8.23 (d, *J* = 7.6 Hz, 1H), 7.83 (t, *J* = 7.6 Hz, 1H), 7.46 – 7.36 (m, 1H), 6.93 (d, *J* = 8.4 Hz, 1H), 4.69 (d, *J* = 9.6 Hz, 1H), 4.54 (dd, *J* = 7.6, 5.6 Hz, 1H), 3.74 (s, 3H), 2.16 – 2.05 (m, 1H), 1.09 (s, 9H), 0.85 (dd, *J* = 11.2, 6.8 Hz, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.46, 170.66, 164.28, 149.62, 148.46, 137.35, 126.37, 122.52, 60.73, 57.30, 52.15, 35.20, 31.17, 26.78, 19.04, 18.02. **HRMS (ESI):** calcd. for $C_{18}H_{27}N_3O_4Na$ $(M + Na)^+$: 372.1893, found: 372.1888.

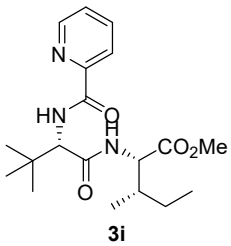
(S)-Methyl 2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3,3-dimethylbutanoate (3h)



3h

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75 (d, *J* = 9.6 Hz, 1H), 8.57 (d, *J* = 4.4 Hz, 1H), 8.25 (d, *J* = 7.6 Hz, 1H), 7.83 (t, *J* = 7.6 Hz, 1H), 7.45 – 7.35 (m, 1H), 6.95 – 6.63 (m, 1H), 4.71 – 4.55 (m, 1H), 4.44 (d, *J* = 8.8 Hz, 1H), 3.72 (s, 3H), 1.07 (s, 9H), 0.92 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.93, 170.52, 164.30, 149.63, 148.44, 137.35, 126.36, 122.56, 60.76, 60.30, 51.82, 35.21, 34.60, 26.79, 26.71. **HRMS (ESI):** calcd. for $C_{19}H_{29}N_3O_4Na$ $(M + Na)^+$: 386.2050, found: 386.2032.

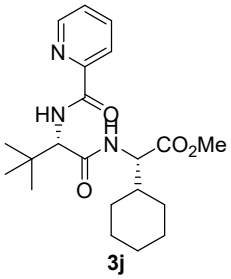
(2S,3S)-Methyl 2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3-methylpentanoate (3i)



3i

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77 (d, *J* = 9.6 Hz, 1H), 8.55 (d, *J* = 3.2 Hz, 1H), 8.30 – 8.15 (m, 1H), 7.90 – 7.75 (m, 1H), 7.46 – 7.35 (m, 1H), 7.25 – 6.80 (m, 1H), 4.78 – 4.65 (m, 1H), 4.62 – 4.50 (m, 1H), 3.72 (s, 3H), 1.91 – 1.75 (m, 1H), 1.42 – 1.27 (m, 1H), 1.26 – 0.99 (m, 10H), 0.88 – 0.63 (m, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.43, 170.54, 164.20, 149.61, 148.41, 137.31, 126.31, 122.51, 60.46, 56.53, 52.02, 37.74, 35.23, 26.73, 25.32, 15.52, 11.55. **HRMS (ESI):** calcd. for $C_{19}H_{29}N_3O_4Na$ $(M + Na)^+$: 386.2050, found: 386.2032.

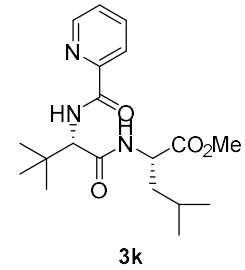
(S)-Methyl 2-cyclohexyl-2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)acetate (3j)



3j

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.77 (d, *J* = 9.6 Hz, 1H), 8.58 (d, *J* = 4.4 Hz, 1H), 8.21 (d, *J* = 7.6 Hz, 1H), 7.83 (t, *J* = 7.6 Hz, 1H), 7.45 – 7.37 (m, 1H), 6.77 (d, *J* = 8.4 Hz, 1H), 4.62 (d, *J* = 9.6 Hz, 1H), 4.47 (dd, *J* = 8.0, 5.6 Hz, 1H), 3.73 (s, 3H), 1.78 – 1.67 (m, 1H), 1.69 – 1.48 (m, 5H), 1.12 – 0.94 (m, 14H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.45, 170.48, 164.29, 149.60, 148.48, 137.37, 126.40, 122.50, 60.73, 57.18, 52.13, 40.66, 35.35, 29.44, 28.57, 26.77, 25.97, 25.95, 25.91. **HRMS (ESI):** calcd. for $C_{21}H_{31}N_3O_4Na$ $(M + Na)^+$: 412.2206, found: 412.2193.

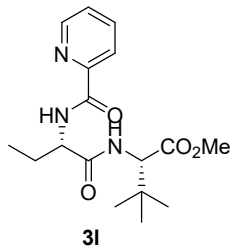
(S)-Methyl2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-4-methylpentanoate (3k)



3k

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.78 (d, *J* = 10.0 Hz, 1H), 8.57 (d, *J* = 4.4 Hz, 1H), 8.19 (d, *J* = 8.0 Hz, 1H), 7.83 (t, *J* = 7.8 Hz, 1H), 7.47 – 7.36 (m, 1H), 6.96 (d, *J* = 8.0 Hz, 1H), 4.63 (d, *J* = 10.0 Hz, 1H), 4.61 – 4.53 (m, 1H), 3.73 (s, 3H), 1.64 – 1.42 (m, 3H), 1.09 (s, 9H), 0.84 – 0.77 (m, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 173.49, 170.40, 164.25, 149.57, 148.51, 137.38, 126.41, 122.46, 60.59, 52.26, 50.91, 41.30, 35.37, 26.74, 24.86, 22.65, 22.07. **HRMS (ESI):** calcd. for $C_{19}H_{29}N_3O_4$ Na $(M + Na)^+$: 386.2050, found: 386.2032.

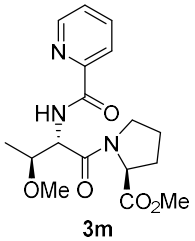
Methyl (S)-3,3-dimethyl-2-((S)-2-(picolinamido)butanamido)butanoate (3l)



3l

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.56 (d, *J* = 4.4 Hz, 1H), 8.46 (d, *J* = 8.0 Hz, 1H), 8.19 (d, *J* = 7.6 Hz, 1H), 7.91 – 7.78 (m, 1H), 7.50 – 7.38 (m, 1H), 6.90 (d, *J* = 9.2 Hz, 1H), 4.60 (q, *J* = 7.6 Hz, 1H), 4.44 (d, *J* = 9.2 Hz, 1H), 3.72 (s, 3H), 2.09 – 1.93 (m, 1H), 1.88 – 1.75 (m, 1H), 0.99 (t, *J* = 7.2 Hz, 3H), 0.93 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.92, 171.27, 164.77, 149.38, 148.45, 137.50, 126.58, 122.43, 60.35, 54.80, 51.94, 34.76, 26.65, 25.32, 10.27. **HRMS (ESI):** calcd. for $C_{17}H_{25}N_3O_4Na$ $(M + Na)^+$: 358.1737, found: 358.1731.

(S)-Methyl 1-((2S,3S)-3-methoxy-2-(picolinamido)butanoyl)pyrrolidine-2-carboxylate(3m)

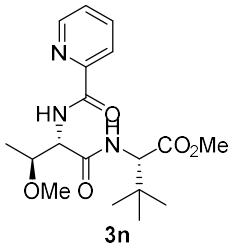


3m

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.78 (d, *J* = 8.0 Hz, 1H), 8.55 – 8.50 (m, 1H), 8.12 – 8.05 (m, 1H), 7.82 – 7.74 (m, 1H), 7.41 – 7.34 (m, 1H), 4.90 (dd, *J* = 8.0, 5.2 Hz, 1H), 4.52 (dd, *J* = 8.8, 5.2 Hz, 1H), 3.92 – 3.73 (m, 3H), 3.71 (s, 3H), 3.42 (s, 3H), 2.26 – 2.14 (m, 1H), 2.10 – 2.02 (m, 1H), 2.00 – 1.91 (m, 2H), 1.28 (d, *J* = 6.4 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.49, 168.88, 164.39, 149.56, 148.46,

137.19, 126.30, 122.15, 77.63, 59.14, 57.18, 55.11, 52.24, 47.55, 29.12, 25.18, 15.88. **HRMS (ESI):** calcd. for $C_{17}H_{23}N_3O_5Na$ $(M + Na)^+$: 372.1529, found: 372.1517.

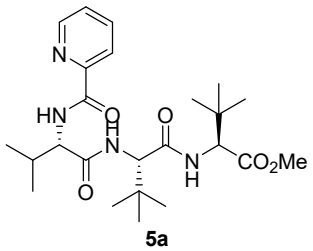
(S)-Methyl 2-((2S,3S)-3-methoxy-2-(picolinamido)butanamido)-3,3-dimethylbutanoate (3n)



3n

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.85 (d, *J* = 6.4 Hz, 1H), 8.61 – 8.56 (m, 1H), 8.15 (dd, *J* = 8.0 Hz, 0.8 Hz, 1H), 7.88 – 7.79 (m, 1H), 7.46 – 7.40 (m, 1H), 7.32 – 7.25 (m, 1H), 4.81 – 4.71 (m, 1H), 4.38 (dd, *J* = 8.8, 1.6 Hz, 1H), 4.11 – 3.96 (m, 1H), 3.74 – 3.66 (m, 3H), 3.52 – 3.46 (m, 3H), 1.16 (dd, *J* = 6.4, 1.6 Hz, 3H), 0.98 (d, *J* = 1.6 Hz, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.74, 169.56, 164.86, 149.53, 148.61, 137.37, 126.54, 122.28, 76.05, 60.70, 57.08, 56.14, 51.83, 34.45, 26.69, 14.30. **HRMS (ESI):** calcd. for $C_{18}H_{27}N_3O_5Na$ (M + Na)$^+$: 388.1842, found: 388.1826.

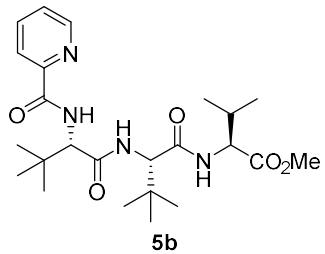
(S)-Methyl 2-((S)-3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)butanamido)butanamido)-3,3-dimethylbutanoate (5a)



5a

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 – 8.51 (m, 2H), 8.21 (d, *J* = 7.2 Hz, 1H), 7.82 (t, *J* = 6.4 Hz, 1H), 7.50 – 7.32 (m, 1H), 7.02 – 6.83 (m, 1H), 6.78– 6.52 (m, 1H), 4.65 – 4.49 (m, 1H), 4.43 (d, *J* = 8.5 Hz, 2H), 3.70 (s, 3H),2.31 –2.20 (m, 1H),1.10 – 0.70 (m, 24H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.81, 171.32, 170.33, 164.55, 149.55, 148.32, 137.41, 126.39, 122.61, 60.77, 60.18, 58.95, 51.86, 34.75, 34.65, 31.14, 26.66, 26.64, 19.44, 18.37. **HRMS (ESI):** calcd. for $C_{24}H_{38}N_4O_5Na$ $(M + Na)^+$: 485.2734, found: 485.2718.

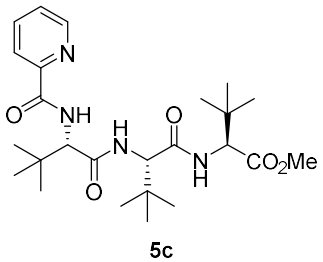
(S)-Methyl 2-((S)-2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3,3-dimethylbutanamido)-3-methylbutanoate (5b)



5b

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.73 (d, *J* = 9.6 Hz, 1H), 8.57 – 8.52 (m, 1H), 8.25 (dd, *J* = 7.6, 4.8Hz, 1H), 7.84 – 7.76 (m, 1H), 7.43 – 7.35 (m, 1H), 6.81 (dd, *J* = 24.8, 8.8 Hz, 1H), 6.45 (dd, *J* = 30.8, 8.4 Hz, 1H), 4.73 – 4.50 (m, 2H), 4.31 (dd, *J* = 8.8, 4.8 Hz, 1H), 3.80 – 3.65 (m, 3H), 2.22 – 2.07 (m, 1H), 1.08 – 1.00 (m, 9H), 0.96 – 0.85 (m, 15H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.36, 172.33, 170.55, 170.53, 170.39, 170.36, 164.22, 149.63, 148.34, 137.38, 126.30, 122.73, 122.68, 60.91, 60.46, 57.11, 52.25, 35.30, 34.61, 31.24, 26.81, 26.65, 19.03, 17.86. **HRMS (ESI):** calcd. for $C_{24}H_{38}N_4O_5Na$ $(M + Na)^+$: 485.2734, found: 485.2714.

(S)-Methyl 2-((S)-2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3,3-dimethylbutanamido)-3,3-dimethylbutanoate (5c)

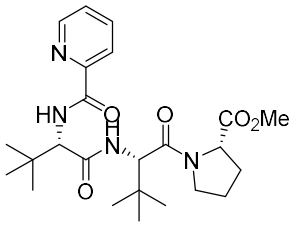


5c

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.72 (d, *J* = 9.6 Hz, 1H), 8.61 – 8.53 (m, 1H), 8.22 (dd, *J* = 7.6, 0.8 Hz, 1H), 7.82 (td, *J* = 7.6, 1.2 Hz, 1H), 7.45 – 7.36 (m, 1H), 6.75 – 6.60 (m, 1H), 6.40 – 6.20 (m, 1H), 4.59 – 4.51 (m, 1H), 4.45 (d, *J* = 9.2 Hz, 1H), 4.28 (d, *J* = 9.0 Hz, 1H), 3.72 (s, 3H), 1.05 (s, 9H), 0.96 (s, 9H), 0.92 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.80, 170.54, 170.13, 164.26, 149.66, 148.39, 137.38, 126.34, 122.62, 61.05, 61.02, 60.12, 51.95, 35.28, 34.84, 26.82, 26.68. **HRMS (ESI):** calcd. for $C_{25}H_{40}N_4O_5Na$ $(M + Na)^+$:499.2891, found: 499.2865.

(S)-Methyl 1-((S)-2-((S)-3,3-dimethyl-2-(picolinamido)butanamido)-3,3-dimeth-

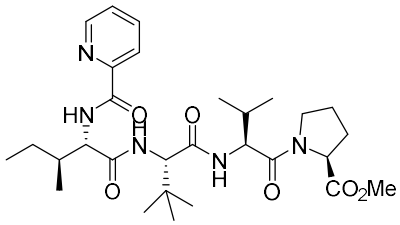
ylbutanoyl)pyrrolidine-2-carboxylate (5d)



5d

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.70 (d, *J* = 9.2 Hz, 1H), 8.60 – 8.45 (m, 1H), 8.18 (d, *J* = 7.8 Hz, 1H), 7.81 (t, *J* = 7.2 Hz, 1H), 7.46 – 7.34 (m, 1H), 6.60 – 6.40 (m, 1H), 4.59 (d, *J* = 8.8 Hz, 1H), 4.52 – 4.38 (m, 2H), 3.99 – 3.85 (m, 1H), 3.81 – 3.60 (m, 4H), 2.3 – 1.85 (m, 4H), 1.15 – 0.90 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.65, 170.45, 170.00, 164.22, 149.62, 148.39, 137.38, 126.35, 122.51, 61.04, 58.96, 57.27, 52.20, 48.11, 35.40, 35.30, 29.23, 26.89, 26.50, 25.28. **HRMS (ESI):** calcd. for $C_{24}H_{36}N_4O_5Na$ $(M + Na)^+$: 483.2577, found: 483.2547.

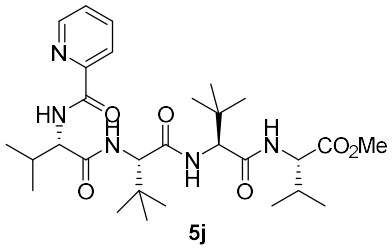
(S)-Methyl 1-((S)-2-((S)-3,3-dimethyl-2-((2S,3S)-3-methyl-2-(picolinamido)pentanamido)butanamido)-3-methylbutanoyl)pyrrolidine-2-carboxylate (5i)



5i

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.56 (d, *J* = 7.2 Hz, 2H), 8.17 (d, *J* = 8.0 Hz, 1H), 7.83 (t, *J* = 7.6 Hz, 1H), 7.48 – 7.37 (m, 1H), 6.75 – 6.65 (m, 1H), 6.55 – 6.35 (m, 1H), 4.68 – 4.58 (m, 1H), 4.54 – 4.49 (m, 1H), 4.27 (d, *J* = 8.8 Hz, 1H), 3.83 – 3.59 (m, 5H), 2.29 – 2.18 (m, 1H), 2.14 – 2.07 (m, 1H), 2.01 – 1.91 (m, 3H), 1.64 – 1.51 (m, 1H), 1.23 – 1.13 (m, 1H), 1.06 – 0.81 (m, 21H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.48, 171.03, 170.33, 170.32, 164.53, 149.56, 148.40, 137.39, 126.40, 122.47, 61.06, 58.88, 58.22, 55.53, 52.29, 47.35, 37.38, 34.75, 31.23, 29.13, 26.75, 25.11, 25.08, 19.37, 17.50, 15.67, 11.35. **HRMS (ESI):** calcd. for $C_{29}H_{45}N_5O_6Na$ $(M + Na)^+$: 582.3262, found: 582.3223.

Methyl ((S)-2-((S)-3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)butanamido)butanamido)-3,3-dimethylbutanoyl)-L-valinate (5j)

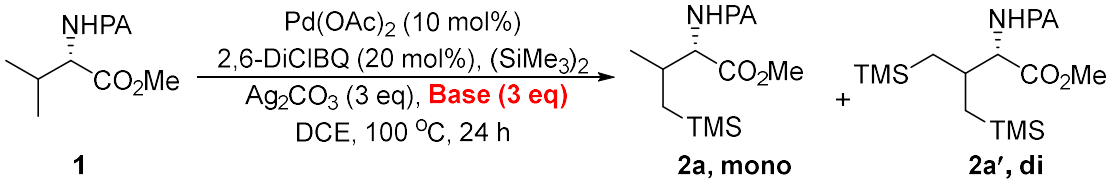


5j

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.69 (d, *J* = 9.6 Hz, 1H), 8.62 – 8.53 (m, 1H), 8.31 (d, *J* = 8.0 Hz, 1H), 8.07 (d, *J* = 10.4 Hz, 1H), 7.90 – 7.82 (m, 1H), 7.79 – 7.68 (m, 1H), 7.44 – 7.39 (m, 1H), 6.25 (d, *J* = 9.2 Hz, 1H), 5.09 – 4.98 (m, 1H), 4.79 – 4.67 (m, 1H), 4.60 (dd, *J* = 9.2, 5.2 Hz, 1H), 4.48 (dd, *J* = 9.6, 2.0 Hz, 1H), 3.74 (s, 3H), 2.20 – 2.05 (m, 2H), 1.01 (s, 9H), 0.96 (s, 9H), 0.93 – 0.85 (m, 9H), 0.78 (d, *J* = 6.8 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.78, 171.65, 170.71, 170.66, 164.42, 149.61, 148.46, 137.48, 126.42, 122.79, 61.11, 60.24, 57.84, 57.14, 52.17, 35.66, 33.91, 32.37, 31.21, 27.05, 26.63, 19.45, 19.27, 18.21, 17.95. **HRMS (ESI):** calcd. for $C_{29}H_{47}N_5O_6Na$ $(M + Na)^+$: 584.3418, found: 584.3399.

3. Optimization of Reaction Conditions

Table S1: Optimization by varying different bases

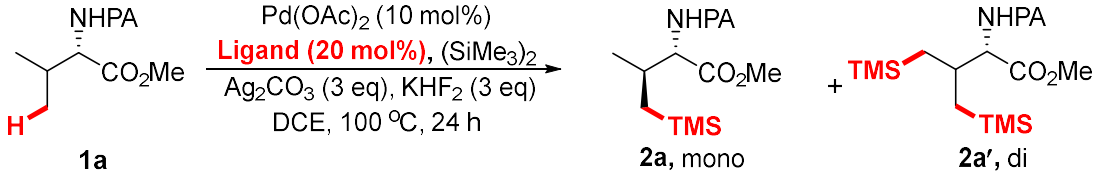


1 **2a, mono** **2a′, di**

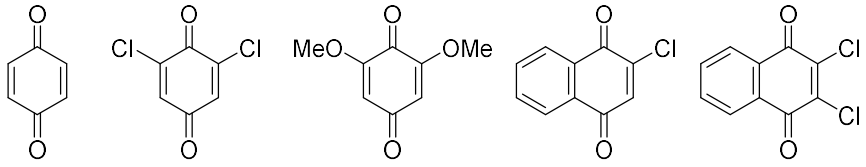
Entry	Base	Yield (%)[a]
1	---	32 (mono)
2	KHF_2	84 (m/d=3.9:1)[b]
3	Na_2CO_3	71 (m/d=2.5:1)
4	$NaHCO_3$	60 (m/d=3.0:1)
5	Na_3PO_4	70 (m/d=2.5:1)
6	K_2HPO_4	70 (m/d=2.7:1)

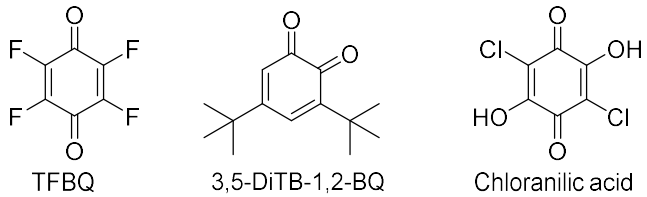
[a] ^{1}H NMR yield using 1,3,5-trimethoxybenzene as the internal standard. [b] Isolated yield.

Table S2: Optimization by varying different ligands.



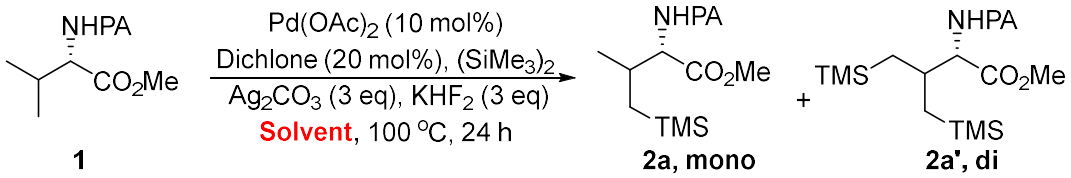
Entry	Ligand	Yield (%)[a]
1	---	16 (mono)
2	BQ	73 (m/d=3.1:1)
3	2,6-DiClBQ	84 (m/d=3.9:1)[b]
4	2,6-DiOMeBQ	66 (m/d=2.7:1)
5	2-ClNQ	78 (m/d=3.4:1)
6	Dichlone	88 (m/d=1.7:1, 99% ee) [b,c]
7	TFBQ	trace
8	3,5-DiTB-1,2-BQ	trace
9	Chloranilic acid	trace





[a] ^{1}H NMR yield using 1,3,5-trimethoxybenzene as the internal standard. [b] Isolated yield. [c] The ee value was determined by HPLC. BQ = benzoquinon e; 2,6-DiClBQ = 2,6-dichloro-1,4-benzoquinone; 2,6-DiOMeBQ = 2,6-dimethoxy-1,4-benzoquinone; 2-ClNQ = 2-chloro-1,4-naphthoquinone. Dichlone = 2,3-Dichloro-1,4-naphthoquinone. TFBQ = Tetrafluoro-1,4-benzoquinone; 3,5-DiTB-1,2-BQ = 3,5-di-*tert*-butylcyclohexa-3,5-diene-1,2-dione

Table S3: Optimization by varying different solvents.

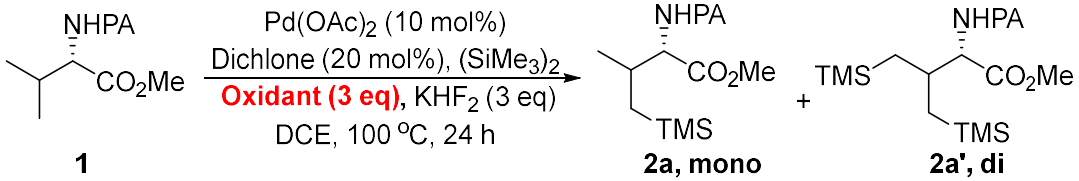


1 **2a, mono** **2a', di**

Entry	Solvent	Yield (%)[a]
1	DCE	88 (m/d=1.7:1)[b]
2	Toluene	36 (mono)
3	MeCN	0
4	*t*-BuOH	trace
5	Dioxane	trace
6	DCE	0[c]

[a] ^{1}H NMR yield using 1,3,5-trimethoxybenzene as the internal standard. [b] Isolated yield. [c]Without $Pd(OAc)_2$.

Table S4: Optimization by varying different oxidants.

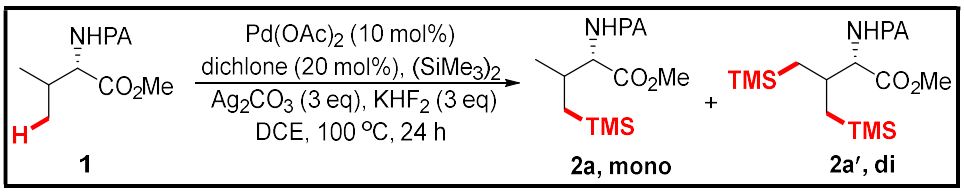


1 **2a, mono** **2a', di**

Entry	Oxidant	Yield (%)[a]
1	---	0
2	Ag_2CO_3	88 (m/d=1.7:1) [b]
3	AgOAc	0
4	Ag_2SO_4	10 (mono)
5	Ag_2O	15 (mono)
6	Ag_3PO_3	trace
7	BQ	10 (mono)

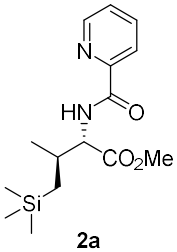
[a] ^{1}H NMR yield using 1,3,5-trimethoxybenzene as the internal standard. [b] Isolated yield.

4. General Procedure (GP-2) for γ-C(sp^3)−H silylation



To a 50 mL Schlenk tube were added amine derivative **1** (23.6 mg, 0.1 mmol, 1.0 equiv), $Pd(OAc)_2$ (2.3 mg, 10 mol%), hexamethyldisiliane (3.0 equiv), dichlone (4.5 mg, 0.2 equiv), Ag_2CO_3 (82.5 mg, 3.0 equiv), KHF_2 (23.4 mg, 3.0 equiv), 1,1-dichloroethane (1.0 mL). The mixture was then stirred at 100 °C for 24 hours. After being cooled to room temperature, the reaction was diluted with DCM and filtered through a pad of Celite, which was washed with DCM. The solvent was removed under vacuum directly and the crude product was purified by silica gel column chromatography to afford the desired product **2a** and **2a'**.

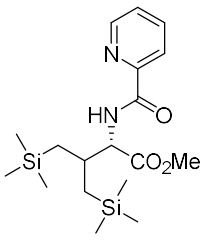
(2S,3S)-methyl 3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanoate (2a)



2a

The compound **2a** was prepared according to the **GP-2** with starting materials **1a**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2a** was obtained as a colorless oil (16.8 mg, 55%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.57 (m, 1H), 8.53 (d, *J* = 9.2 Hz, 1H), 8.22 – 8.14 (m, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.39 (m, 1H), 4.78 – 4.72 (m, 1H), 3.80 – 3.72 (m, 3H), 2.42 – 2.26 (m, 1H), 1.08 – 0.96 (m, 3H), 0.81 – 0.62(m, 1H), 0.57 – 0.44 (m, 1H), 0.05 – 0 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.33, 164.49, 149.64, 148.40, 137.42, 126.44, 122.47, 58.98, 52.26, 33.09, 19.57, 19.28, -0.81. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.30, 164.49, 149.64, 148.40, 137.42, 126.44, 122.47, 58.98, 52.28, 33.09, 21.18, 18.06, -0.71. **HRMS (ESI):** calcd. for $C_{15}H_{24}N_2O_3SiNa$ $(M + Na)^+$: 331.1448, found: 331.1443; Enantiomeric excess was determined by HPLC with a Daicel Chiralpak IB-N5, n-hexane/2-propanol = 97/3, v = 0.8 ml/min, λ = 254 nm, t (minor) =14.9 min, t (major) = 16.1min, t (minor) =21.2 min, 99% ee, d.r. = 4.4:1.

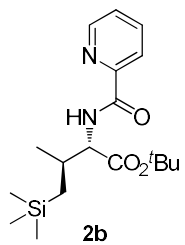
Methyl (S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoate (2a')



2a′

The compound **2a'** was prepared according to the **GP-2** with starting materials **1a**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2a'** was obtained as a colorless oil (12.5 mg, 33%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.66 – 8.58 (m, 1H), 8.53 (d, *J* = 9.2 Hz, 1H), 8.19 (dt, *J* = 7.8, 1.1 Hz, 1H), 7.84 (td, *J* = 7.6, 1.2 Hz, 1H), 7.49 – 7.42 (m, 1H), 4.80 (dd, *J* = 9.2, 2.8 Hz, 1H), 3.75 (s, 3H), 2.49 – 2.38 (m, 1H), 0.81 (dd, *J* = 15.2, 10.0 Hz, 1H), 0.74 – 0.59 (m, 2H), 0.48 (dd, *J* = 14.8, 4.0 Hz, 1H), 0.12 – 0.04 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.44, 164.67, 149.78, 148.42, 137.42, 126.42, 122.46, 57.58, 52.31, 33.75, 21.74, 21.00, -0.68, -0.73. **HRMS (ESI):** calcd. for $C_{18}H_{32}N_2O_3Si_2Na$ $(M + Na)^+$: 403.1843, found: 403.1848.

(2S,3S)-tert-butyl 3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanoate (2b)

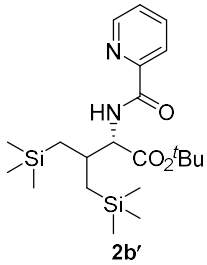


2b

The compound **2b** was prepared according to the **GP-2** with starting materials **1b**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2b** was obtained as a colorless oil (17.8 mg, 50%, d.r. = 3:1). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.70 – 8.48 (m, 2H), 8.17 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.38 (m, 1H), 4.72 – 4.59 (m, 1H), 2.41 – 2.25 (m, 1H), 1.48 (s, 9H), 1.02 (d, *J* =

6.8 Hz, 3H), 0.85 – 0.62 (m, 1H), 0.56 – 0.40 (m, 1H), 0.06 – 0 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.09, 164.43, 149.91, 148.42, 137.35, 126.30, 122.40, 81.95, 59.21, 33.40, 28.26, 19.54, 19.14, -0.62. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.03, 164.37, 149.91, 148.42, 137.35, 126.30, 122.40, 81.95, 59.25, 33.35, 28.23, 21.04, 18.05, -0.70. **HRMS (ESI):** calcd. for $C_{18}H_{30}N_2O_3SiNa$ $(M + Na)^+$: 373.1917, found: 373.1917.

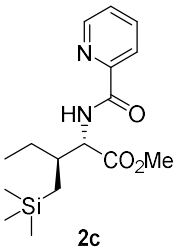
tert-Butyl (S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoate (2b')



2b′

The compound **2b'** was prepared according to the **GP-2** with starting materials **1b**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2b'** was obtained as a colorless oil (2.7 mg, 7%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.63 – 8.45 (m, 2H), 8.18 (d, *J* = 7.6 Hz, 1H), 7.83 (t, *J* = 7.6 Hz, 1H), 7.42 (dd, *J* = 7.6, 4.8 Hz, 1H), 4.69 (dt, *J* = 9.2, 1.6 Hz, 1H), 2.48 – 2.37 (m, 1H), 1.49 (s, 9H), 0.82 – 0.72 (m, 2H), 0.64 (dd, *J* = 14.4, 10.0 Hz, 1H), 0.44 (dd, *J* = 14.8, 4.0 Hz, 1H), 0.08 (d, *J* = 3.2 Hz, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.17, 164.52, 150.00, 148.42, 137.34, 126.27, 122.36, 81.84, 57.78, 34.22, 28.28, 21.23, 20.90, -0.46, -0.69. **HRMS (ESI):** calcd. for $C_{21}H_{38}N_2O_3Si_2Na$ $(M + Na)^+$: 445.2313, found: 445.2323.

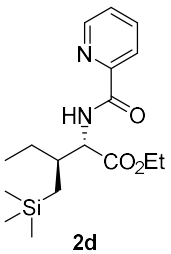
Methyl (2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoate (2c)



2c

The compound **2c** was prepared according to the **GP-2** with starting materials **1c**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2c** was obtained as a colorless oil (20.1 mg, 62%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.63 – 8.56 (m, 1H), 8.52 (d, *J* = 9.2 Hz, 1H), 8.17 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.40 (m, 1H), 4.83 (dd, *J* = 9.2, 4.0 Hz, 1H), 3.76 (s, 3H), 2.16 – 2.05 (m, 1H), 1.58 – 1.35 (m, 2H), 0.99 (t, *J* = 7.2 Hz, 3H), 0.67 (dd, *J* = 14.8, 6.0 Hz, 1H), 0.52 (dd, *J* = 14.8, 7.6 Hz, 1H), 0.03 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.45, 164.36, 149.67, 148.40, 137.43, 126.43, 122.42, 56.25, 52.26, 39.36, 25.75, 17.89, 11.60, -0.83. **HRMS (ESI):** calcd. for $C_{16}H_{26}N_2O_3SiNa$ $(M + Na)^+$: 345.1604, found: 345.1600.

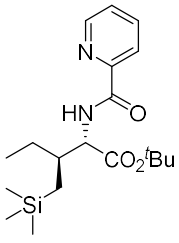
Ethyl (2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoate (2d)



2d

The compound **2d** was prepared according to the **GP-2** with starting materials **1d**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2d** was obtained as a colorless oil (16.4 mg, 49%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.64 – 8.49 (m, 2H), 8.17 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.38 (m, 1H), 4.81 (dd, *J* = 9.2, 4.4 Hz, 1H),4.30 – 4.15 (m, 2H), 2.16 – 2.03 (m, 1H), 1.57 – 1.46 (m, 1H), 1.46 – 1.36 (m, 1H), 1.29 (t, *J* = 7.2 Hz, 3H), 0.99 (t, *J* = 7.4 Hz, 3H), 0.69 (dd, *J* = 14.8, 6.0 Hz, 1H), 0.52 (dd, *J* = 14.8, 8.0 Hz, 1H), 0.03 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.95, 164.32, 149.74, 148.40, 137.40, 126.38, 122.38, 61.27, 56.19, 39.48, 25.79, 17.86, 14.39, 11.63, -0.83. **HRMS (ESI):** calcd. for $C_{17}H_{28}N_2O_3SiNa$ $(M + Na)^+$: 359.1761, found: 359.1758.

tert-Butyl (2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoate (2e)

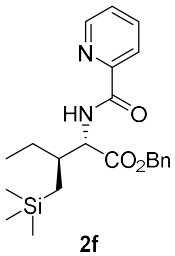


2e

The compound **2e** was prepared according to the **GP-2** with starting materials **1e**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2e** was obtained as a colorless oil (16.8 mg, 47%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.65 – 8.50 (m, 2H), 8.17 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.45 – 7.38 (m, 1H), 4.73 (dd, *J* = 8.8, 3.6 Hz, 1H), 2.12 – 1.97 (m, 1H), 1.58 – 1.45 (m, 10H), 1.44 – 1.36 (m, 1H), 1.01 (t, *J* = 7.6 Hz, 3H), 0.72 (dd, *J* = 14.8, 6.0 Hz, 1H), 0.48 (dd, *J*

= 14.8, 7.6 Hz, 1H), 0.02 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.09, 164.19, 149.90, 148.41, 137.35, 126.28, 122.30, 81.96, 56.35, 39.78, 28.27, 28.24, 26.02, 17.79, 11.83, -0.84. **HRMS (ESI):** calcd. for $C_{19}H_{32}N_2O_3SiNa$ $(M + Na)^+$: 387.2074, found: 387.2068.

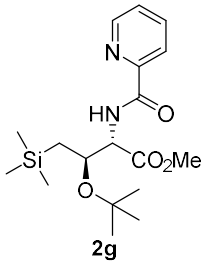
Benzyl (2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoate (2f)



2f

The compound **2f** was prepared according to the **GP-2** with starting materials **1f**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2f** was obtained as a colorless oil (17 mg, 43%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.64 – 8.49 (m, 2H), 8.18 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.40 (m, 1H), 7.40 – 7.28 (m, 5H), 5.30 – 5.23 (m, 1H), 5.19 – 5.13 (m, 1H), 4.87 (dd, *J* = 9.2, 4.4 Hz, 1H), 2.17 – 2.04 (m, 1H), 1.50 – 1.33 (m, 2H), 0.94 (t, *J* = 7.6 Hz, 3H), 0.65 (dd, *J* = 14.8, 6.0 Hz, 1H), 0.47 (dd, *J* = 14.8, 8.0 Hz, 1H), 0.05 – 0 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.84, 164.36, 149.68, 148.39, 137.41, 135.74, 128.67, 128.44, 128.42, 126.42, 122.40, 66.97, 56.25, 39.50, 25.66, 17.79, 11.48, -0.85. **HRMS (ESI):** calcd. for $C_{22}H_{30}N_2O_3SiNa$ $(M + Na)^+$: 429.1917, found: 429.1920.

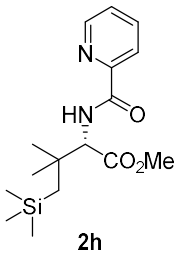
Methyl (2S,3R)-3-(tert-butoxy)-2-(picolinamido)-4-(trimethylsilyl)butanoate (2g)



2g

The compound **2g** was prepared according to the **GP-2** with starting materials **1g**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2g** was obtained as a colorless oil (21.3 mg, 58%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.69 (d, *J* = 9.6 Hz, 1H), 8.64 – 8.57 (m, 1H), 8.17 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.82 (td, *J* = 7.6, 1.6 Hz, 1H), 7.45 – 7.37 (m, 1H), 4.66 (d, *J* = 9.2 Hz, 1H), 4.32 (dt, *J* = 11.6, 2.0 Hz, 1H), 3.72 (s, 3H), 1.25 – 1.11 (m, 10H), 0.95 – 0.78 (m, 1H), 0.10 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.63, 165.13, 149.86, 148.58, 137.23, 126.31, 122.48, 74.29, 69.43, 57.56, 52.37, 28.56, 24.45, -0.73. **HRMS (ESI):** calcd. for $C_{18}H_{30}N_2O_4SiNa$ $(M + Na)^+$: 389.1867, found: 389.1861.

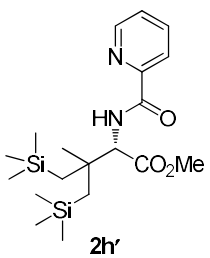
Methyl (S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanoate (2h)



2h

The compound **2h** was prepared according to the **GP-2** with starting materials **1h**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2h** was obtained as a colorless oil (16.1 mg, 50%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.54 (m, 2H), 8.17 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.39 (m, 1H), 4.64 (d, *J* = 9.6 Hz, 1H), 3.74 (s, 3H), 1.11 (d, *J* = 9.6 Hz, 6H), 0.90 – 0.74 (m, 2H), 0.11 – 0.04 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.00, 164.23, 149.67, 148.43, 137.43, 126.43, 122.51, 62.12, 51.90, 38.09, 28.00, 26.92, 26.71, 1.07. **HRMS (ESI):** calcd. for $C_{16}H_{26}N_2O_3SiNa$ $(M + Na)^+$: 345.1604, found:345.1600.

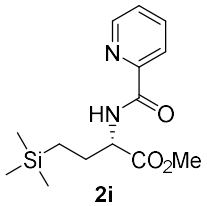
Methyl (S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoate (2h')



2h′

The compound **2h'** was prepared according to the **GP-2** with starting materials **1h**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2h'** was obtained as a colorless oil (8.8 mg, 23%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.56 (m, 2H), 8.17 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.40 (m, 1H), 4.78 (d, *J* = 9.6 Hz, 1H), 3.75 (s, 3H), 1.16 (s, 3H), 1.02 (d, *J* = 14.8 Hz, 1H), 0.98 – 0.90 (m, 2H), 0.79 (d, *J* = 14.8 Hz, 1H), 0.15 – 0.05 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.11, 164.36, 149.72, 148.46, 137.44, 126.42, 122.46, 61.43, 51.86, 40.90, 29.35, 29.05, 27.41, 1.22, 1.15. **HRMS (ESI):** calcd. for $C_{19}H_{34}N_2O_3Si_2Na$ $(M + Na)^+$: 417.2000, found: 417.1996.

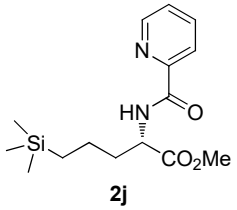
Methyl (S)-2-(picolinamido)-4-(trimethylsilyl)butanoate (2i)



2i

The compound **2i** was prepared according to the **GP-2** with starting materials **1i**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2i** was obtained as a colorless oil (17.6 mg, 60%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.65 – 8.57 (m, 1H), 8.49 (d, *J* = 8.8 Hz, 1H), 8.17 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 2.0 Hz, 1H), 7.49 – 7.40 (m, 1H), 4.84 – 4.74 (m, 1H), 3.77 (s, 3H), 2.02 – 1.89 (m, 1H), 1.88 – 1.77 (m, 1H), 0.65 – 0.45 (m, 2H), -0.02 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.78, 164.22, 149.62, 148.39, 137.44, 126.47, 122.46, 54.64, 52.43, 27.44, 11.93, -1.79. **HRMS (ESI):** calcd. for $C_{14}H_{22}N_2O_3SiNa$ $(M + Na)^+$: 317.1291, found: 317.1284.

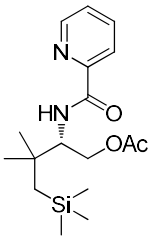
(S)-methyl 2-(picolinamido)-5-(trimethylsilyl)pentanoate (2j)



2j

The compound **2j** was prepared according to the **GP-2** with starting materials **1j**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2j** was obtained as a colorless oil (3.5mg, 11%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.62 – 8.55 (m, 1H), 8.42 (d, *J* = 8.2 Hz, 1H), 8.24 – 8.14 (m, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.49 – 7.38 (m, 1H), 4.90 – 4.68 (m, 1H), 3.82 – 3.73 (m, 3H), 2.08 – 1.93 (m, 1H), 1.92 – 1.75 (m, 1H), 1.43 – 1.36 (m, 1H), 1.07 – 0.95 (m, 1H), 0.91 – 0.46 (m, 2H), 0.00 – -0.07 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 173.05, 148.39, 137.44, 126.47, 122.46, 52.44, 52.20, 36.40, 20.15, 16.36, -1.58. **HRMS (ESI):** calcd. for $C_{15}H_{14}N_2O_3SiH$ $(M + H)^+$: 309.1629, found: 309.1631.

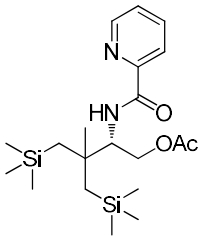
(S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butyl acetate (2k)



2k

The compound **2k** was prepared according to the **GP-2** with starting materials **1k**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2k** was obtained as a colorless oil (11.8 mg, 35%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.58 (d, *J* = 4.8 Hz, 1H), 8.24 – 8.05 (m, 2H), 7.90 – 7.78 (m, 1H), 7.46 – 7.39 (m, 1H), 4.42 – 4.32 (m, 1H), 4.28 – 4.14 (m, 2H), 1.97 (s, 3H), 1.07 (d, *J* = 11.2 Hz, 6H), 0.79 (s, 2H), 0.08 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.44, 164.56, 149.91, 148.26, 137.50, 126.30, 122.53, 64.16, 57.79, 37.26, 28.34, 27.20, 26.81, 21.07, 1.12. **HRMS (ESI):** calcd. for $C_{17}H_{28}N_2O_3SiH$ $(M + H)^+$: 359.1761, found: 359.1755.

(S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butyl acetate (2k')

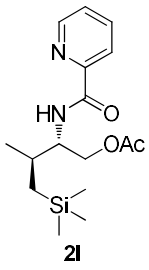


2k′

The compound **2k'** was prepared according to the **GP-2** with starting materials **1k** and **2a**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2k'** was obtained as a colorless oil (7.2 mg, 18%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.64 – 8.57 (m, 1H), 8.20 (dt, *J* = 8.0, 1.2 Hz, 1H), 8.13 (d, *J* = 10.0 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.38 (m, 1H), 4.46 – 4.38 (m, 1H), 4.33 – 4.16 (m, 2H), 1.97 (s, 3H), 1.10 (s, 3H), 0.98 – 0.87 (m, 3H), 0.73 (d, *J* = 14.4 Hz, 1H), 0.19 – 0.05 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.57, 164.64, 149.95, 148.28, 137.52, 126.29, 122.48, 64.49, 57.13, 40.47, 30.14, 29.17, 27.82, 21.07, 1.31, 1.19. **HRMS (ESI):** calcd. for $C_{20}H_{36}N_2O_3Si_2Na$ $(M + Na)^+$: 431.2056, found:431.2052.

(2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butyl acetate (2l)

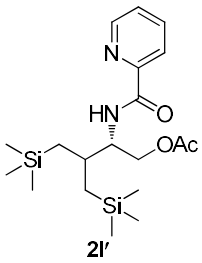
The compound **2l** was prepared according to the **GP-2** with starting materials **1l**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2l** was obtained as a colorless oil (16.9 mg, 53%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.59 – 8.52 (m,



2l

1H), 8.19 (dt, *J* = 8.0, 1.2 Hz, 1H), 8.12 (d, *J* = 8.8 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.39 (m, 1H), 4.30 – 4.14 (m, 3H), 2.15 – 1.95 (m, 4H), 1.82 – 1.66 (m, 1H), 1.05 – 0.97 (m, 3H), 0.79 – 0.73 (m, 1H), 0.51 – 0.41 (m, 1H),0.03 – 0 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.20, 164.45, 149.92, 148.25, 137.48, 126.32, 122.47, 64.36, 54.42, 31.25, 21.02, 19.53, 19.39, -0.67. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.20, 164.40, 149.92, 148.25, 137.48, 126.32, 122.48, 64.70, 54.58, 31.15, 21.37, 19.53, 18.22, -0.65. **HRMS (ESI):** calcd. for $C_{16}H_{26}N_2O_3SiNa$ $(M + Na)^+$: 345.1604, found: 345.1595.

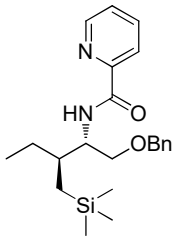
(S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butyl acetate (2l')



2l′

The compound **2l'** was prepared according to the **GP-2** with starting materials **1l**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2l'** was obtained as a colorless oil (6.0 mg, 16%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.61 – 8.55 (m, 1H), 8.20 (dt, *J* = 8.0, 1.2 Hz, 1H), 8.14 (d, *J* = 9.6 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.40 (m, 1H), 4.45 – 4.32 (m, 1H), 4.15 (dd, *J* = 6.8, 1.6 Hz, 2H), 2.18 – 2.08 (m, 1H), 2.03 (s, 3H), 0.82 – 0.70 (m, 2H), 0.58 (dd, *J* = 14.2, 8.8 Hz, 1H), 0.48 (dd, *J* = 14.8, 4.8 Hz, 1H), 0.15 – 0.02 (m, 18H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.13, 164.48, 150.03, 148.27, 137.48, 126.30, 122.41, 64.12, 52.62, 31.72, 21.62, 21.00, 20.19, -0.54. **HRMS (ESI):** calcd. for $C_{19}H_{34}N_2O_3Si_2Na$ $(M + Na)^+$: 417.2000, found: 417.2005.

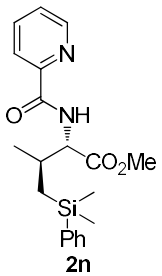
N-((2S,3S)-1-(benzyloxy)-3-((trimethylsilyl)methyl)pentan-2-yl)picolinamide(2m)



2m

The compound **2m** was prepared according to the **GP-2** with starting materials **1m**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2m** was obtained as a colorless oil (14 mg, 37%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.60 – 8.52 (m, 1H), 8.31 – 8.16 (m, 2H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.45 – 7.37 (m, 1H), 7.35 – 7.20 (m, 5H), 4.62 – 4.45 (m, 2H), 4.32 – 4.21 (m, 1H), 3.74 – 3.64 (m, 1H), 3.60 – 3.52 (m, 1H), 2.15 – 1.85 (m, 1H), 1.55 – 1.33 (m, 2H), 0.91 (t, *J* = 7.6 Hz, 3H), 0.65 (dd, *J* = 14.8, 5.2 Hz, 1H), 0.55 (dd, *J* = 14.8, 8.4 Hz, 1H), 0.02 (s, 9H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 164.10, 150.28, 148.20, 138.50, 137.40, 128.44, 127.74, 127.66, 126.11, 122.38, 73.14, 70.06, 52.59, 36.55, 24.88, 17.48, 10.85, -0.58. **HRMS (ESI):** calcd. for $C_{22}H_{32}N_2O_2SiNa$ $(M + Na)^+$:407.2125, found: 407.2119.

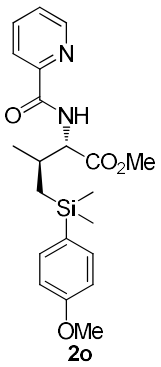
(2S,3S)-methyl 4-(dimethyl(phenyl)silyl)-3-methyl-2-(picolinamido)butanoate (2n)



2n

The compound **2n** was prepared according to the **GP-2** with starting materials **1n**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2n** was obtained as a colorless oil (19.7 mg, 53%, d.r. = 4:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.60 (d, *J* = 4.8 Hz, 1H), 8.52 (d, *J* = 9.2 Hz, 1H), 8.17 (d, *J* = 8.0 Hz, 1H), 7.84 (t, *J* = 7.6 Hz, 1H), 7.55 – 7.44 (m, 2H), 7.46 – 7.41 (m, 1H), 7.38 – 7.28 (m, 3H), 4.79 – 4.68 (m, 1H), 3.77– 3.65 (m, 3H), 2.41 – 2.27 (m, 1H), 1.03 – 0.90 (m, 4H), 0.79 – 0.68 (m, 1H), 0.39 – 0.26 (m, 6H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.24, 164.51, 149.61, 148.40, 138.94, 137.41, 133.66, 129.15, 127.96, 126.44, 122.47, 58.89, 52.22, 32.95, 19.62, 18.52, -2.09, -2.37. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.16, 164.44, 149.61, 148.40, 138.94, 137.41, 133.66, 129.06, 127.92, 126.44, 122.47, 58.89, 52.29, 32.95, 20.29, 18.11, -2.09, -2.37. **HRMS (ESI):** calcd. for $C_{20}H_{26}N_2O_3SiNa$ $(M + Na)^+$: 393.1604, found: 393.1595.

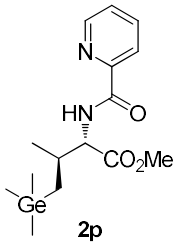
(2S,3S)-methyl4-((4-methoxyphenyl)dimethylsilyl)-3-methyl-2-(picolinamido)butanoate (2o)



2o

The compound **2o** was prepared according to the **GP-2** with starting materials **1o**, purified by column chromatography in hexane: ethyl acetate = 8:1. **2o** was obtained as a colorless oil (18 mg, 45%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.66 – 8.57 (m, 1H), 8.52 (d, *J* = 9.2 Hz, 1H),8.20 – 814 (m, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.37 (m, 3H), 6.97 – 6.81 (m, 2H), 4.77 – 4.69 (m, 1H),3.84 – 3.77 (m, 3H), 3.76 – 3.66 (m, 3H), 2.40 – 2.26 (m, 1H), 1.05 – 0.86 (m, 4H), 0.75 – 0.65 (m, 1H), 0.35 – 0.25 (m, 6H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.28, 164.51, 160.53, 149.61, 148.40, 137.41, 135.11, 129.70, 126.45, 122.47, 113.74, 58.92, 55.15, 52.23, 32.97, 19.60, 18.73, -1.91, -2.14. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.19, 164.43, 160.46, 149.61, 148.40, 137.41, 135.11, 129.84, 126.45, 122.47, 113.70, 58.92, 55.11, 52.29, 32.97, 20.49, 18.11, -1.91, -2.14. **HRMS (ESI):** calcd. for $C_{21}H_{28}N_2O_4SiNa$ $(M + Na)^+$: 423.1700, found: 423.1706.

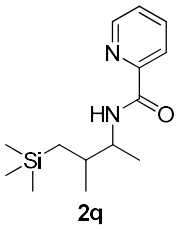
(2S,3S)-methyl 3-methyl-2-(picolinamido)-4-(trimethylgermyl)butanoate (2p)



2p

The compound **2p** was prepared according to the **GP-2** with starting materials **1a** (0.2mmol), purified by column chromatography in hexane: ethyl acetate = 8:1. **2p** was obtained as a colorless oil (24.1mg, 34%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.66 – 8.46 (m, 2H), 8.18 (d, *J* = 7.8 Hz, 1H), 7.84 (td, *J* = 8.0, 1.6 Hz, 1H), 7.50 – 7.36 (m, 1H), 4.82 – 4.69 (m, 1H), 3.76 (s, 3H), 2.42 – 2.24 (m, 1H), 1.04 – 0.98 (m, 3H), 0.96 – 0.79 (m, 1H), 0.75 – 0.65 (m, 1H), 0.22 – 0.07 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.30, 164.45, 149.67, 148.41, 137.43, 126.45, 122.49, 58.89, 52.28, 34.12, 19.80, 19.27, -1.34. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.30, 164.45, 149.67, 148.41, 137.43, 126.45, 122.49, 58.82, 52.31, 34.09, 21.71, 17.83, -1.27. **HRMS (ESI):** calcd. for $C_{15}H_{24}N_2O_3GeNa$ $(M + Na)^+$: 377.0891, found: 377.0893.

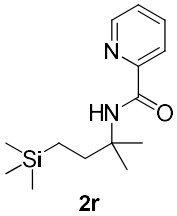
N-(3-methyl-4-(trimethylsilyl)butan-2-yl)picolinamide (2q)



2q

The compound **2q** was prepared according to the **GP-2** with starting materials **1q** (0.2mmol), purified by column chromatography in hexane: ethyl acetate = 8:1. **2q** was obtained as a colorless oil (22.5 mg, 43%, d.r. = 1.4:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.54 (d, *J* = 4.4 Hz, 1H), 8.19 (d, *J* = 7.8 Hz, 1H), 8.09 – 7.91 (m, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.34 (m, 1H), 4.16 – 3.99 (m, 1H), 1.97 – 1.82 (m, 1H), 1.22 – 1.14 (m, 3H), 1.04 – 0.92 (m, 3H), 0.80 – 0.61 (m, 1H), 0.47 – 0.35 (m, 1H), 0.10 – -0.05 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 163.67, 150.39, 148.10, 137.42, 126.06, 122.33, 51.17, 34.45, 20.11, 18.52, 16.89, -0.64. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 163.67, 150.39, 148.10, 137.42, 126.06, 122.33, 51.33, 34.62, 20.39, 18.29, 17.51, -0.64. **HRMS (ESI):** calcd. for $C_{14}H_{24}N_2OSiH$ $(M + H)^+$: 265.1731, found: 265.1732.

N-(2-methyl-4-(trimethylsilyl)butan-2-yl)picolinamide (2r)

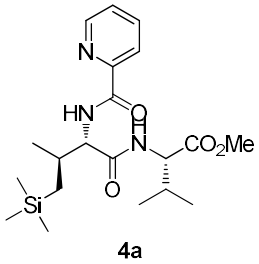


2r

The compound **2r** was prepared according to the **GP-2** with starting materials **1r** (0.2mmol), purified by column chromatography in hexane: ethyl acetate = 8:1. **2r** was obtained as a colorless oil (5.4 mg, 10%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.56 – 8.48 (m, 1H), 8.20 – 8.14 (m, 1H), 7.98 – 7.89 (m, 1H), 7.82 (td, *J* = 7.6, 1.6 Hz, 1H), 7.42 – 7.35 (m, 1H), 1.82 – 1.71 (m, 2H), 1.44 (s, 6H), 0.53 – 0.44 (m, 2H),

-0.01 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 163.32, 151.09, 147.90, 137.46, 125.91, 121.83, 54.41, 34.87, 26.37, 10.49, -1.69. **HRMS (ESI):** calcd. for $C_{14}H_{24}N_2OSiH$ $(M + H)^+$: 265.1731, found: 265.1729.

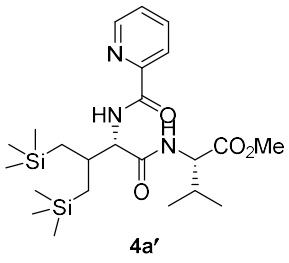
(S)-methyl 3-methyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)butanoate (4a)



4a

The compound **4a** was prepared according to the **GP-2** with starting materials **3a**, purified by column chromatography in hexane: acetone = 4:1. **4a** was obtained as a colorless oil (16.9 mg, 42%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.67 – 8.48 (m, 2H), 8.22 – 8.15 (m, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.38 (m, 1H), 6.67 – 6.55 (m, 1H), 4.58 – 4.46 (m, 2H), 3.72 (s, 3H), 2.40 – 2.27 (m, 1H), 2.21 – 2.10 (m, 1H), 1.03 (d, *J* = 6.8, 3H), 0.88 (t, *J* = 6.6 Hz, 6H), 0.83 – 0.75 (m, 1H), 0.53 – 0.41 (m, 1H), 0.05 – 0 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.29, 171.17, 164.78, 149.55, 148.48, 137.44, 126.50, 122.47, 60.29, 57.32, 52.22, 32.75, 31.29, 19.52, 19.43, 19.04, 17.96, -0.69. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.27, 171.17, 164.75, 149.51, 148.48, 137.47, 126.53, 122.47, 60.61, 57.32, 52.22, 32.40, 31.29, 19.52, 19.43, 19.04, 18.11, -0.63. **HRMS (ESI):** calcd. for $C_{20}H_{33}N_3O_4SiNa$ $(M + Na)^+$: 430.2132, found: 430.2127.

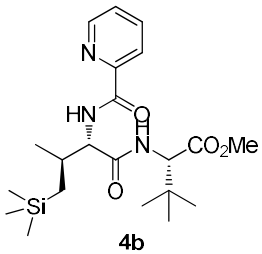
Methyl ((S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoyl)-L-valinate (4a')



4a′

The compound **4a'** was prepared according to the **GP-2** with starting materials **3a**, purified by column chromatography in hexane: acetone = 4:1. **4a'** was obtained as a colorless oil (13 mg, 27%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.51 (m, 2H), 8.20 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.87 (td, *J* = 7.6, 1.6 Hz, 1H), 7.50 – 7.43 (m, 1H), 6.55 (d, *J* = 9.2 Hz, 1H), 4.60 (dd, *J* = 8.7, 3.0 Hz, 1H), 4.44 (d, *J* = 9.2 Hz, 1H), 3.69 (s, 3H), 2.63 – 2.44 (m, 1H), 0.94 (s, 9H), 0.80 (dd, *J* = 14.4, 3.6 Hz, 1H), 0.74 (dd, *J* = 15.2, 10.0 Hz, 1H), 0.63 (dd, *J* = 14.4, 10.0 Hz, 1H), 0.53 (dd, *J* = 15.2, 4.0 Hz, 1H), 0.17 – 0 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.82, 170.90, 165.00, 149.59, 148.52, 137.56, 126.60, 122.53, 60.25, 58.87, 51.93, 34.88, 33.21, 26.71, 21.53, 20.96, -0.50, -0.56. **HRMS (ESI):** calcd. for $C_{23}H_{41}N_3O_4Si_2Na$ $(M + Na)^+$: 502.2527, found: 502.2516.

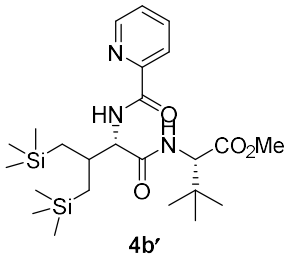
(S)-methyl 3,3-dimethyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)butanoate (4b)



4b

The compound **4b** was prepared according to the **GP-2** with starting materials **3b**, purified by column chromatography in hexane: acetone = 4:1. **4b** was obtained as a colorless oil (16.4 mg, 39%, d.r. = 4:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.64 – 8.48 (m, 2H), 8.19 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.40 (m, 1H), 6.68 – 6.55 (m, 1H), 4.54 – 4.48 (m, 1H),4.47 – 4.41 (m, 1H), 3.75 – 3.68 (m, 3H), 2.40 – 2.28 (m, 1H), 1.02 (d, *J* = 6.8 Hz, 3H), 0.94 (s, 9H), 0.82 – 0.72 (m, 1H), 0.51 – 0.40 (m, 1H), 0.05 – 0 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.87, 170.96, 164.84, 149.55, 148.50, 137.46, 126.52, 122.48, 60.29, 51.91, 34.76, 32.62, 26.69, 19.58, 19.39, -0.69. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.87, 170.98, 164.84, 149.55, 148.50, 137.46, 126.56, 122.48, 60.73, 51.91, 34.76, 32.62, 26.69, 19.58, 19.39, -0.62. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_4SiNa$ $(M + Na)^+$: 444.2289, found: 444.2280.

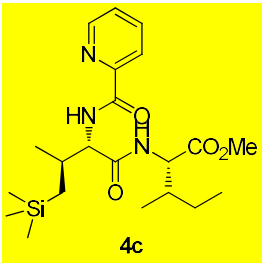
Methyl (S)-3,3-dimethyl-2-((S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)bu- tanamido)butanoate (4b')



4b′

The compound **4b'** was prepared according to the **GP-2** with starting materials **3b**, purified by column chromatography in hexane: acetone = 4:1. **4b'** was obtained as a colorless oil (7.1 mg, 15%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.51 (m, 2H), 8.20 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.87 (td, *J* = 7.6, 1.6 Hz, 1H), 7.50 – 7.42 (m, 1H), 6.55 (d, *J* = 9.2 Hz, 1H), 4.60 (dd, *J* = 8.4, 3.0 Hz, 1H), 4.44 (d, *J* = 9.2 Hz, 1H), 3.69 (s, 3H), 2.61 – 2.50 (m, 1H), 0.94 (s, 9H), 0.80 (dd, *J* = 14.0, 3.6 Hz, 1H), 0.74 (dd, *J* = 15.2, 10.0 Hz, 1H), 0.63 (dd, *J* = 14.0, 10.0 Hz, 1H), 0.53 (dd, *J* = 15.2, 4.0 Hz, 1H), 0.10 – 0.03 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.82, 170.90, 165.00, 149.59, 148.52, 137.56, 126.60, 122.53, 60.25, 58.87, 51.93, 34.88, 33.21, 26.71, 21.53, 20.96, -0.50, -0.56. **HRMS (ESI):** calcd. for $C_{24}H_{43}N_3O_4Si_2Na$ $(M + Na)^+$: 516.2684, found: 516.2665.

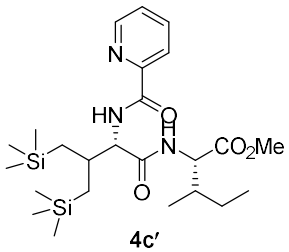
(2S,3R)-methyl 3-methyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl) butanamido)pentanoate (4c)



4c

The compound **4c** was prepared according to the **GP-2** with starting materials **3c**, purified by column chromatography in hexane: acetone = 4:1. **4c** was obtained as a colorless oil (16.0 mg, 38%, d.r. = 2.5:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.67 – 8.44 (m, 2H), 8.18 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.89 – 7.81 (m, 1H), 7.49 – 7.39 (m, 1H), 6.63 – 6.49 (m, 1H), 4.58 (dd, *J* = 8.4, 5.2 Hz, 1H), 4.53 – 4.42 (m, 1H), 3.72 (s, 3H), 2.41 – 2.25 (m, 1H), 1.96 – 1.82 (m, 2H), 1.45 – 1.33 (m, 1H), 1.21 – 1.08 (m, 1H), 1.06 – 0.99 (m, 3H), 0.90 – 0.83 (m, 6H), 0.82 – 0.74 (m, 1H), 0.51 – 0.41 (m, 1H), 0.03 – 0.01 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.25, 170.98, 164.78, 149.54, 148.49, 137.45, 126.51, 122.47, 60.27, 56.62, 52.20, 37.94, 32.80, 25.33, 19.52, 19.39, 15.55, 11.65, -0.68. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.22, 170.98, 164.78, 149.54, 148.48, 137.49, 126.54, 122.47, 60.60, 56.62, 52.20, 37.91, 32.80, 25.33, 21.31, 18.10, 15.55, 11.65, -0.62. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_4SiNa$ $(M + Na)^+$: 444.2289, found: 444.2280.

Methyl ((S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoyl)-L-alloisoleucinate (4c')

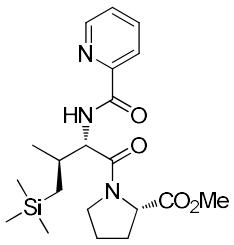


4c′

The compound **4c'** was prepared according to the **GP-2** with starting materials **3c**, purified by column chromatography in hexane: acetone = 4:1. **4c'** was obtained as a colorless oil (7.8 mg, 16%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.69 – 8.53 (m, 2H), 8.20 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.86 (td, *J* = 7.6, 1.6 Hz, 1H), 7.50 – 7.38 (m, 1H), 6.51 (d, *J* = 8.4 Hz, 1H), 4.65 – 4.53 (m, 2H), 3.70 (s, 3H), 2.61 – 2.48 (m, 1H), 1.92 – 1.84 (m, 1H), 1.47 – 1.39 (m, 1H), 1.19 – 1.10 (m, 1H), 0.93 – 0.84 (m, 6H), 0.81 – 0.70 (m, 2H), 0.63 (dd, *J* = 14.0, 9.6 Hz, 1H), 0.53 (dd, *J* = 15.2, 4.0 Hz, 1H), 0.14 – -0.00 (m, 17H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.24, 170.84, 164.95, 149.58, 148.50, 137.55, 126.59, 122.52, 58.82, 56.62, 52.23, 38.11, 33.37, 25.38, 21.52, 20.90, 15.56, 11.66, -0.51, -0.57. **HRMS (ESI):** calcd. for $C_{24}H_{43}N_3O_4Si_2Na$ $(M + Na)^+$: 516.2684, found: 516.2667.

(S)-methyl 1-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanoyl)pyrolidine-2-carboxylate (4d)

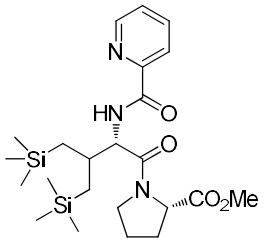
The compound **4d** was prepared according to the **GP-2** with starting materials **3d**, purified by column



4d

chromatography in hexane: acetone = 4:1. **4d** was obtained as a colorless oil (19.4 mg, 48%, d.r. = 2:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.68 – 8.50 (m, 2H), 8.12 (d, *J* = 7.6 Hz, 1H), 7.81 (td, *J* = 7.6, 1.6 Hz, 1H), 7.44 – 7.32 (m, 1H), 4.86 – 4.70 (m, 1H), 4.56 – 4.45 (m, 1H), 3.99 – 3.85 (m, 1H), 3.80 – 3.62 (m, 4H), 2.26 – 2.17 (m, 2H), 2.09 – 1.92 (m, 3H), 1.16 – 1.00 (m, 3H), 0.99 – 0.84 (m, 1H), 0.57 – 0.35 (m, 1H), 0.06 – -0.06 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.53, 170.83, 164.49, 149.67, 148.46, 137.26, 126.29, 122.28, 59.01, 57.45, 52.24, 47.50, 33.46, 29.20, 25.15, 19.29, 19.19, -0.57. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.53, 170.63, 164.40, 149.72, 148.42, 137.26, 126.29, 122.28, 59.01, 57.55, 52.24, 47.43, 33.02, 29.20, 25.15, 21.13, 17.72, -0.59. **HRMS (ESI):** calcd. for $C_{20}H_{31}N_3O_4SiNa$ (M + Na)$^+$: 428.1976, found: 428.1984.

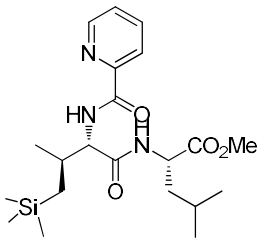
Methyl ((S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoyl)-L-prolinate (4d')



4d'

The compound **4d'** was prepared according to the **GP-2** with starting materials **3d**, purified by column chromatography in hexane: acetone = 4:1. **4d'** was obtained as a colorless oil (3.4 mg, 7%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.71 – 8.50 (m, 2H), 8.14 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.81 (td, *J* = 7.6, 1.6 Hz, 1H), 7.44 – 7.37 (m, 1H), 4.89 (dd, *J* = 9.6, 4.4 Hz, 1H), 4.51 (dd, *J* = 8.4, 5.6 Hz, 1H), 3.96 – 3.81 (m, 1H), 3.76 – 3.62 (m, 4H), 2.44 – 2.30 (m, 1H), 2.26 – 2.19 (m, 1H), 2.15 – 2.06 (m, 1H), 2.02 – 1.89 (m, 2H), 1.01 – 0.88 (m, 2H), 0.69 – 0.54 (m, 2H), 0.14 – 0.04 (m, 18H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.56, 170.74, 164.76, 149.95, 148.49, 137.27, 126.26, 122.28, 59.25, 56.22, 52.23, 47.43, 33.25, 29.07, 25.50, 21.56, 19.67, -0.18, -0.27. **HRMS (ESI):** calcd. for $C_{23}H_{39}N_3O_4Si_2Na$ (M + Na)$^+$:500.2371, found: 500.2380.

(S)-methyl 4-methyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)pentanoate (4e)

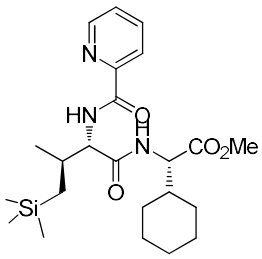


4e

The compound **4e** was prepared according to the **GP-2** with starting materials **3e**, purified by column chromatography in hexane: acetone = 4:1. **4e** was obtained as a colorless oil (12.3 mg, 30%, d.r. = 3.5:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.63 – 8.49 (m, 2H), 8.18 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.85 (td, *J* = 7.8, 1.6 Hz, 1H), 7.47 – 7.41 (m, 1H), 6.48 – 6.37 (m, 1H), 4.67 – 4.58 (m, 1H), 4.54 – 4.42 (m, 1H), 3.72 (s, 3H), 2.39 – 2.26 (m, 1H), 1.67 – 1.48 (m, 3H), 1.03 (d, *J* = 6.8 Hz, 3H), 0.93 – 0.83 (m, 6H), 0.81 – 0.73 (m, 1H), 0.55 – 0.42 (m, 1H), 0.05 – 0.01 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 173.28, 170.96, 164.79, 149.56, 148.50, 137.46, 126.53, 122.48, 60.23, 52.39, 50.92, 41.64, 32.80, 24.96, 22.85, 22.06, 19.47, 19.38, -0.66. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 173.28, 170.96, 164.76, 149.56, 148.48, 137.48, 126.53, 122.48, 60.23, 52.39, 50.94, 41.64, 32.80, 24.96, 22.82, 22.06, 21.29, 18.06, -0.61. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_4SiNa$ (M + Na)$^+$: 444.2289, found: 444.2286.

(S)-methyl 2-cyclohexyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)acetate (4f)

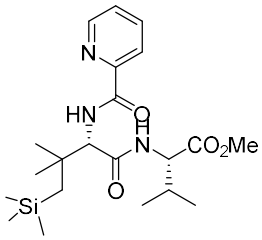
The compound **4f** was prepared according to the **GP-2** with starting materials **3f**, purified by column chromatography in hexane: acetone = 4:1. **4f** was obtained as a colorless oil (12.3 mg, 30%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.67 – 8.48 (m, 2H),



4f

8.18 (dt, *J* = 7.8, 1.2 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.39 (m, 1H), 6.59 – 6.45 (m, 1H), 4.61 – 4.43 (m, 2H), 3.71 (s, 3H), 2.42 – 2.25 (m, 1H), 1.81 – 1.74 (m, 1H), 1.70 – 1.51 (m, 5H), 1.20 – 1.11 (m, 2H), 1.08 – 0.92 (m, 6H), 0.84 – 0.74 (m, 1H), 0.51 – 0.41 (m, 1H), 0.06 – -0.01 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.28, 171.00, 164.81, 149.58, 148.49, 137.45, 126.51, 122.47, 60.27, 57.03, 52.22, 41.01, 32.79, 29.56, 28.40, 26.03, 19.55, 19.38, -0.68. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.28, 171.00, 164.76, 149.58, 148.49, 137.47, 126.53, 122.47, 60.62, 57.03, 52.22, 40.99, 32.43, 29.41, 28.37, 26.03, 21.34, 18.14, -0.62. **HRMS (ESI):** calcd. for $C_{23}H_{37}N_3O_4SiNa$ $(M + Na)^+$: 470.2445, found: 470.2424.

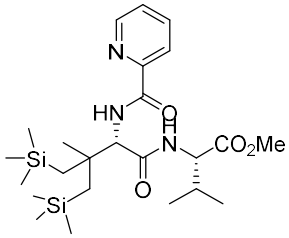
Methyl ((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanoyl)-L-valinate (4g)



4g

The compound **4g** was prepared according to the **GP-2** with starting materials **3g**, purified by column chromatography in hexane: acetone = 6:1. **4g** was obtained as a colorless oil (19.6 mg, 47%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.76 (d, *J* = 9.6 Hz, 1H), 8.62 – 8.54 (m, 1H), 8.21 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.38 (m, 1H), 6.72 (d, *J* = 8.4 Hz, 1H), 4.59 – 4.49 (m, 2H), 3.73 (s, 3H), 2.16 – 2.05 (m, 1H), 1.14 (d, *J* = 9.6 Hz, 6H), 0.99 (d, *J* = 14.5 Hz, 1H), 0.90 – 0.78 (m, 7H), 0.04 (s, 9H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.33, 170.71, 164.37, 149.65, 148.49, 137.36, 126.38, 122.49, 62.96, 57.26, 52.16, 38.06, 31.21, 27.78, 26.55, 26.53, 19.03, 17.99, 1.10. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_4Si$ Na $(M + Na)^+$: 444.2289, found: 444.2280.

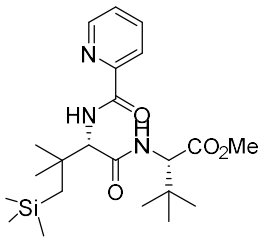
Methyl ((S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoyl)-L-valinate (4g')



4g′

The compound **4g'** was prepared according to the **GP-2** with starting materials **3g**, purified by column chromatography in hexane: acetone = 6:1. **4g'** was obtained as a colorless oil (8.2 mg, 17%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.68 (d, *J* = 9.2 Hz, 1H), 8.64 – 8.54 (m, 1H), 8.16 (d, *J* = 8.0 Hz, 1H), 7.90 – 7.78 (m, 1H), 7.44 (dd, *J* = 7.6, 4.8 Hz, 1H), 6.34 (d, *J* = 8.4 Hz, 1H), 4.56 – 4.43 (m, 2H), 3.72 (s, 3H), 2.21 – 2.07 (m, 1H), 1.34 – 1.25 (m, 2H), 1.21 (s, 3H), 1.02 – 0.94 (m, 2H), 0.88 (d, *J* = 6.9 Hz, 6H), 0.18 – 0.04 (m, 18H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.24, 170.56, 164.63, 149.64, 148.53, 137.46, 126.46, 122.38, 62.28, 57.24, 52.21, 40.38, 31.37, 29.42, 28.90, 27.77, 19.02, 17.98, 1.29, 1.20. **HRMS (ESI):** calcd. for $C_{24}H_{43}N_3O_4Si_2Na$ $(M + Na)^+$: 516.2684, found: 516.2665.

Methyl(S)-2-((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)-3,3-dimethylbutanoate (4h)

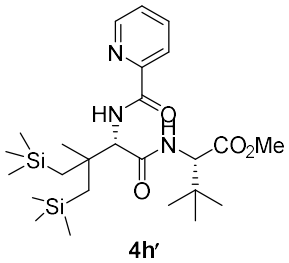


4h

The compound **4h** was prepared according to the **GP-2** with starting materials **3h**, purified by column chromatography in hexane: acetone = 6:1. **4h** was obtained as a colorless oil (20.6 mg, 48%). **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.75 (d, *J* = 10.0 Hz, 1H), 8.64 – 8.53 (m, 1H), 8.23 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.37 (m, 1H), 6.70 (d, *J* = 9.0 Hz, 1H), 4.56 (d, *J* = 10.0 Hz, 1H), 4.43 (d, *J* = 9.0 Hz, 1H), 3.72 (s, 3H), 1.13 (s, 3H), 1.11 (s, 3H), 0.98 (d, *J* = 14.8 Hz, 1H), 0.92 (s, 9H), 0.79 (d, *J* = 14.4 Hz, 1H), 0.03 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 171.86, 170.61, 164.38, 149.65,

148.47, 137.36, 126.36, 122.53, 62.91, 60.26, 51.82, 38.07, 34.61, 27.90, 26.69, 26.59, 26.37, 1.07. **HRMS (ESI):** calcd. for $C_{22}H_{37}N_3O_4SiNa$ $(M + Na)^+$: 458.2445, found: 458.2429.

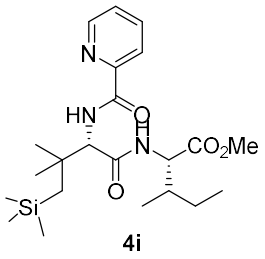
Methyl(S)-3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanamido)butanoate (4h')



4h'

The compound **4h'** was prepared according to the **GP-2** with starting materials **3h**, purified by column chromatography in hexane: acetone = 6:1. **4h'** was obtained as a colorless oil (8.6 mg, 17%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.78 – 8.63 (m, 1H), 8.60 (d, *J* = 4.8 Hz, 1H), 8.21 – 8.09 (m, 1H), 7.92 – 7.77 (m, 1H), 7.49 – 7.35 (m, 1H), 6.41 (d, *J* = 9.2 Hz, 1H), 4.48 (dd, *J* = 9.2, 1.6 Hz, 1H), 4.42 (dd, *J* = 9.2, 1.6 Hz, 1H), 3.78 – 3.64 (m, 3H), 1.29 (d, *J* = 14.8 Hz, 2H), 1.20 (s, 3H), 1.03 (d, *J* = 14.8 Hz, 2H), 0.93 (s, 9H), 0.17 – 0.03 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.79, 170.45, 164.65, 149.62, 148.53, 137.46, 126.47, 122.37, 62.24, 60.21, 51.87, 40.37, 34.76, 29.41, 28.97, 27.77, 26.70, 1.27, 1.20. **HRMS (ESI):** calcd. for $C_{25}H_{45}N_3O_4Si_2Na$ $(M + Na)^+$: 530.2841, found: 530.2829.

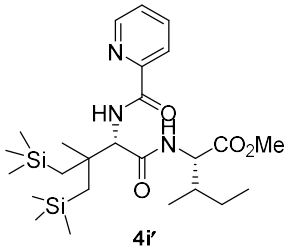
Methyl((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanoyl)-L-alloisoleucinate (4i)



4i

The compound **4i** was prepared according to the **GP-2** with starting materials **3i**, purified by column chromatography in hexane: acetone = 4:1. **4i** was obtained as a colorless oil (15.4 mg, 36%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.76 (d, *J* = 9.6 Hz, 1H), 8.59 (d, *J* = 4.4 Hz, 1H), 8.24 – 8.14 (m, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.37 (m, 1H), 6.73 – 6.52 (m, 1H), 4.57 (dd, *J* = 8.4, 4.8 Hz, 1H), 4.50 (td, *J* = 9.6, 4.4 Hz, 1H), 3.73 (s, 3H), 1.91 – 1.77 (m, 1H), 1.44 – 1.32 (m, 1H), 1.19 – 1.05 (m, 7H), 0.98 (d, *J* = 14.4 Hz, 1H), 0.88 – 0.77 (m, 7H), 0.04 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.26, 170.52, 164.37, 149.65, 148.50, 137.36, 126.38, 122.48, 62.97, 56.53, 52.12, 38.11, 37.86, 27.78, 26.54, 25.35, 15.56, 11.66, 1.10. **HRMS (ESI):** calcd. for $C_{22}H_{37}N_3O_4SiNa$ $(M + Na)^+$: 458.2445, found: 458.2434.

Methyl ((S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanoyl)-L-alloisoleucinate (4i')

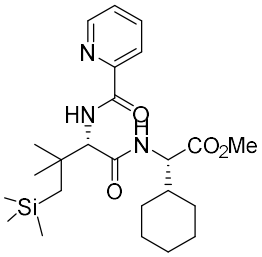


4i'

The compound **4i'** was prepared according to the **GP-2** with starting materials **3i**, purified by column chromatography in hexane: acetone = 4:1. **4i'** was obtained as a colorless oil (5.1 mg, 10%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.70 – 8.56 (m, 1H), 8.55 – 8.46 (m, 1H), 8.08 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.76 (td, *J* = 7.6, 1.6 Hz, 1H), 7.39 – 7.29 (m, 1H), 6.26 (d, *J* = 8.4 Hz, 1H), 4.49 (dd, *J* = 8.4, 4.8 Hz, 1H), 4.39 (d, *J* = 9.2 Hz, 1H), 3.63 (s, 3H), 1.85 – 1.73 (m, 1H), 1.37 – 1.26 (m, 1H), 1.21 (d, *J* = 14.8 Hz, 2H), 1.12 (s, 3H), 1.09 – 1.04 (m, 1H), 0.93 (d, *J* = 14.8 Hz, 1H), 0.87 (d, *J* = 11.4 Hz, 1H), 0.81 – 0.74 (m, 6H), 0.14 – -0.07 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.21, 170.41, 164.62, 149.65, 148.53, 137.46, 126.46, 122.38, 62.24, 56.55, 52.16, 40.44, 38.00, 29.40, 28.87, 27.76, 25.37, 15.55, 11.69, 1.29, 1.21. **HRMS (ESI):** calcd. for $C_{25}H_{45}N_3O_4Si_2Na$ $(M + Na)^+$: 530.2841, found: 530.2832.

Methyl(S)-2-cyclohexyl-2-((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)acetate (4j)

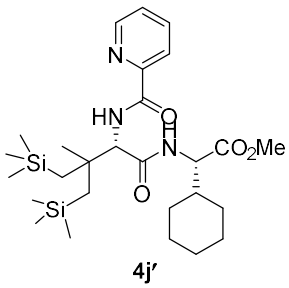
The compound **4j** was prepared according to the **GP-2** with starting materials **3j**, purified by column chromatography in hexane: acetone = 4:1. **4j** was obtained as a colorless oil (16.9 mg, 37%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.76 (d, *J* = 10.0 Hz, 1H), 8.63 – 8.52 (m, 1H), 8.19 (dd, *J* = 7.6, 1.2 Hz, 1H),



4j

7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.36 (m, 1H), 6.58 (d, *J* = 8.4 Hz, 1H), 4.55 – 4.41 (m, 2H), 3.72 (s, 3H), 1.78 – 1.52 (m, 6H), 1.17 – 0.93 (m, 12H), 0.82 (d, *J* = 14.4 Hz, 1H), 0.04 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.30, 170.53, 164.38, 149.67, 148.50, 137.35, 126.38, 122.46, 62.95, 57.09, 52.13, 40.79, 38.16, 29.47, 28.51, 27.78, 26.58, 26.54, 25.99, 25.94, 1.10. **HRMS (ESI):** calcd. for $C_{24}H_{39}N_3O_4SiNa$ $(M + Na)^+$: 484.2602, found: 484.2597.

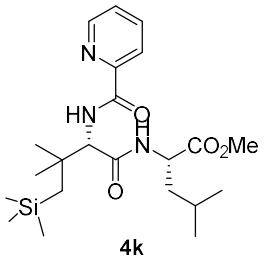
Methyl (S)-2-cyclohexyl-2-((S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)-methyl)butanamido)acetate (4j')



4j′

The compound **4j'** was prepared according to the **GP-2** with starting materials **3j**, purified by column chromatography in hexane: acetone = 4:1. **4j'** was obtained as a colorless oil (6.5 mg, 13%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.76 – 8.64 (m, 1H), 8.63 – 8.56 (m, 1H), 8.17 (d, *J* = 7.6 Hz, 1H), 7.85 (td, *J* = 7.6, 2.0 Hz, 1H), 7.48 – 7.40 (m, 1H), 6.34 (d, *J* = 8.6 Hz, 1H), 4.59 – 4.45 (m, 2H), 3.74 – 3.68 (m, 3H), 1.82 – 1.74 (m, 1H), 1.66 – 1.47 (m, 5H), 1.34 – 1.28 (m, 2H), 1.21 (s, 3H), 1.17 – 1.12 (m, 2H), 1.03 – 0.89 (m, 5H), 0.17 – 0.03 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.22, 170.44, 164.65, 148.54, 137.46, 126.47, 122.38, 62.26, 56.92, 52.18, 41.12, 40.40, 29.56, 29.45, 28.39, 27.79, 26.05, 26.03, 1.30, 1.21. **HRMS (ESI):** calcd. for $C_{27}H_{47}N_3O_4Si_2Na$ $(M + Na)^+$: 556.2997, found: 556.2980.

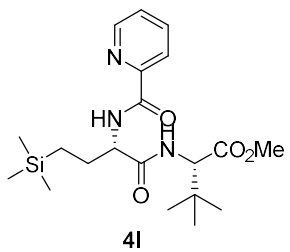
Methyl((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanoyl)-L-leucinate (4k)



4k

The compound **4k** was prepared according to the **GP-2** with starting materials **3k**, purified by column chromatography in hexane: acetone = 4:1. **4k** was obtained as a colorless oil (15.1 mg, 42%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.76 (d, *J* = 10.0 Hz, 1H), 8.66 – 8.54 (m, 1H), 8.18 (dt, *J* =8.0, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.45 – 7.39 (m, 1H), 6.67 (d, *J* = 8.0 Hz, 1H), 4.63 – 4.56 (m, 1H), 4.50 (d, *J* = 10.0 Hz, 1H), 3.72 (s, 3H), 1.65 – 1.54 (m, 2H), 1.52 – 1.43 (m, 1H), 1.14 (d, *J* = 10.0 Hz, 6H), 0.98 (d, *J* = 14.8 Hz, 1H), 0.86 – 0.79 (m, 7H), 0.04 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 173.33, 170.44, 164.35, 149.65, 148.52, 137.37, 126.40, 122.45, 62.85, 52.27, 50.87, 41.46, 38.20, 27.67, 26.55, 26.49, 24.88, 22.70, 22.11, 1.12. **HRMS (ESI):** calcd. for $C_{22}H_{37}N_3O_4SiNa$ $(M + Na)^+$: 458.2445, found: 458.2434.

Methyl (S)-3,3-dimethyl-2-((S)-2-(picolinamido)-4-(trimethylsilyl)butanamido)butanoate (4l)

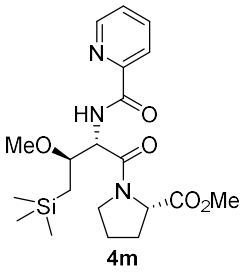


4l

The compound **4l** was prepared according to the **GP-2** with starting materials **3l**, purified by column chromatography in hexane: acetone = 4:1. **4l** was obtained as a colorless oil (16.1 mg, 40%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.61 – 8.54 (m, 1H), 8.46 (d, *J* = 8.4 Hz, 1H), 8.23 – 8.13 (m, 1H), 7.89 – 7.80 (m, 1H), 7.49 – 7.37 (m, 1H), 6.83 (d, *J* = 9.2 Hz, 1H), 4.64 – 4.53 (m, 1H), 4.44 (d, *J* = 9.2 Hz, 1H), 3.71 (s, 3H), 2.04 – 1.93 (m, 1H), 1.82 – 1.70 (m, 1H), 0.93 (s, 9H), 0.60 – 0.50 (m, 2H), -0.02 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.82, 171.26, 164.70, 149.43, 148.47, 137.49, 126.56, 122.42, 60.30, 55.95, 51.91, 34.80, 26.63, 26.60, 12.37, -1.76. **HRMS (ESI):** calcd. for

$C_{20}H_{33}N_3O_4SiNa$ $(M + Na)^+$: 430.2133, found: 430.2128.

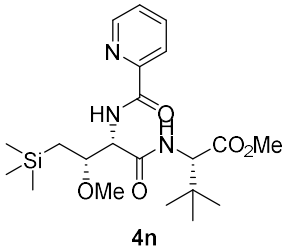
Methyl((2S,3S)-3-methoxy-2-(picolinamido)-4-(trimethylsilyl)butanoyl)-L-prolinate (4m)



4m

The compound **4m** was prepared according to the **GP-2** with starting materials **3m**, purified by column chromatography in hexane: acetone = 4:1. **4m** was obtained as a colorless oil (18.7mg, 45%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.92 – 8.75 (m, 1H), 8.61 – 8.49 (m, 1H), 8.15 – 8.07 (m, 1H), 7.85 – 7.76 (m, 1H), 7.43 – 7.34 (m, 1H), 5.06 – 4.89 (m, 1H), 4.53 (dd, *J* = 8.4, 5.2 Hz, 1H), 3.86 – 3.63 (m, 6H), 3.53 – 3.44 (m, 3H), 2.26 – 2.14 (m, 1H), 2.12 – 2.02 (m, 1H), 2.00 – 1.93 (m, 2H), 1.04 – 0.96 (m, 1H), 0.96 – 0.89 (m, 1H), 0.07 – -0.03 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.42, 169.25, 164.31, 149.63, 148.54, 137.22, 126.32, 122.16, 80.42, 59.34, 57.75, 55.29, 52.20, 47.51, 29.10, 25.30, 19.76, -0.76. **HRMS (ESI):** calcd. for $C_{20}H_{31}N_3O_5SiNa$ $(M + Na)^+$: 444.1925, found: 444.1911.

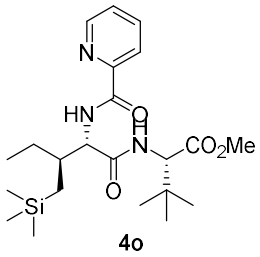
Methyl(S)-2-((2S,3S)-3-methoxy-2-(picolinamido)-4-(trimethylsilyl)butanamido)-3,3-dimethylbutanoate (4n)



4n

The compound **4n** was prepared according to the **GP-2** with starting materials **3n**, purified by column chromatography in hexane: acetone = 4:1. **4n** was obtained as a colorless oil (14.2mg, 33%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.96 – 8.79 (m, 1H), 8.64 – 8.56 (m, 1H), 8.15 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.41 (m, 1H), 7.38 (d, *J* = 8.8 Hz, 1H), 4.89 – 4.77 (m, 1H), 4.47 – 4.32 (m, 1H), 3.98 – 3.90 (m, 1H), 3.71 (s, 3H), 3.60 (s, 3H), 0.99 (s, 9H), 0.91 (dd, *J* = 14.7, 10.5 Hz, 1H), 0.73 (dd, *J* = 14.7, 4.6 Hz, 1H), 0.06 – -0.02 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.52, 169.82, 164.76, 149.57, 148.64, 137.38, 126.52, 122.22, 79.11, 60.87, 57.34, 54.87, 51.80, 34.31, 26.75, 17.59, -0.84. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_5SiNa$ $(M + Na)^+$: 460.2238, found: 460.2225.

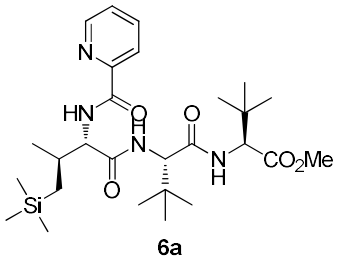
Methyl (S)-3,3-dimethyl-2-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanamido)butanoate (4o)



4o

The compound **4o** was prepared according to the **GP-2** with starting materials **3o**, purified by column chromatography in hexane: acetone = 4:1. **4o** was obtained as a colorless oil (21.2mg, 33%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.62 – 8.53 (m, 1H), 8.50 (d, *J* = 9.2 Hz, 1H), 8.18 (dt, *J* = 8.0, 1.2 Hz, 1H), 7.85 (td, *J* = 7.6, 1.6 Hz, 1H), 7.50 – 7.39 (m, 1H), 6.60 (d, *J* = 9.2 Hz, 1H), 4.53 (dd, *J* = 9.2, 6.8 Hz, 1H), 4.43 (d, *J* = 9.2 Hz, 1H), 3.70 (s, 3H), 2.34 – 2.17 (m, 1H), 1.57 – 1.41 (m, 2H), 1.02 – 0.85 (m, 12H), 0.64 – 0.55 (m, 2H), 0.02 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.80, 171.06, 164.62, 149.44, 148.47, 137.50, 126.55, 122.42, 60.26, 57.79, 51.92, 37.32, 34.79, 26.66, 24.63, 17.36, 10.43, -0.71. **HRMS (ESI):** calcd. for $C_{22}H_{37}N_3O_4SiNa$ $(M + Na)^+$: 458.2445, found: 458.2429.

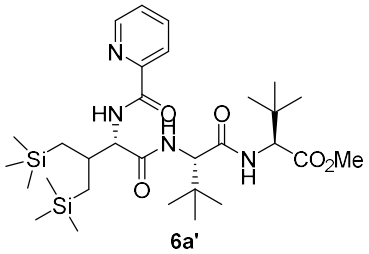
(S)-methyl 2-((S)-3,3-dimethyl-2-((2S,3S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)butanamido)-3,3-dimethylbutanoate (6a)



6a

The compound **6a** was prepared according to the **GP-2** with starting materials **5a**, purified by column chromatography in hexane: acetone = 4:1. **6a** was obtained as a colorless oil (24.6 mg, 46%, d.r. = 4:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.67 – 8.49 (m, 2H), 8.19 (d, *J* = 7.6 Hz, 1H), 7.91 – 7.77 (m, 1H), 7.42 (dd, *J* = 7.6, 4.8 Hz, 1H), 6.76 (d, *J* = 9.2 Hz, 1H), 6.45 – 6.30 (m, 1H), 4.55 – 4.44 (m, 1H), 4.43 – 4.36 (m, 1H), 4.35 – 4.27 (m, 1H), 3.71 (s, 3H), 2.41 – 2.23 (m, 1H), 1.04 – 0.90 (m, 21H), 0.78 (d, *J* = 14.4 Hz, 1H), 0.49 – 0.37 (m, 1H), 0.04 – -0.04 (m, 9H). **Major: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.77, 171.09, 170.19, 164.70, 149.59, 148.43, 137.43, 126.46, 122.54, 60.84, 60.53, 60.29, 51.91, 34.93, 34.74, 32.74, 26.73, 26.68, 19.65, 19.37, -0.65. **Minor: ^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.77, 171.09, 170.19, 164.70, 149.55, 148.43, 137.46, 126.49, 122.54, 60.98, 60.77, 60.19, 51.91, 34.88, 34.86, 32.74, 26.73, 26.68, 21.23, 18.13, -0.61. **HRMS (ESI):** calcd. for $C_{27}H_{46}N_4O_5SiNa$ $(M + Na)^+$: 557.3129, found: 557.3109.

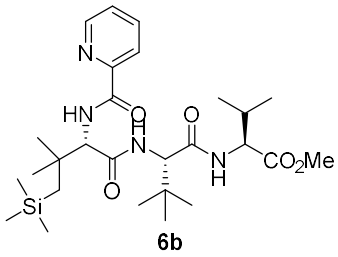
Methyl (S)-2-((S)-3,3-dimethyl-2-((S)-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)methyl)butanamido)butanamido)-3,3-dimethylbutanoate (6a')



6a'

The compound **6a'** was prepared according to the **GP-2** with starting materials **5a**, purified by column chromatography in hexane: acetone = 4:1. **6a'** was obtained as a colorless oil (11.6 mg, 19%).**^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.70 – 8.49 (m, 2H), 8.17 (d, *J* = 7.6 Hz, 1H), 7.93 – 7.78 (m, 1H), 7.45 (dd, *J* = 7.6, 4.8 Hz, 1H), 6.70 (d, *J* = 8.8 Hz, 1H), 6.22 (d, *J* = 8.8 Hz, 1H), 4.59 (dd, *J* = 8.4, 3.2 Hz, 1H), 4.36 (d, *J* = 8.8 Hz, 1H), 4.25 (d, *J* = 8.8 Hz, 1H), 3.70 (s, 3H), 2.59 – 2.47 (m, 1H), 1.06 – 0.89 (m, 18H), 0.80 (dd, *J* = 14.4, 4.4 Hz, 1H), 0.73 (dd, *J* = 15.2 9.2 Hz, 1H), 0.64 (dd, *J* = 14.4, 9.2 Hz, 1H), 0.50 (dd, *J* = 15.4, 4.4 Hz, 1H), 0.18 – -0.02 (m, 18H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 171.75, 170.96, 170.12, 164.87, 149.56, 148.48, 137.51, 126.57, 122.50, 61.01, 60.34, 58.97, 51.92, 34.98, 34.70, 33.35, 26.74, 21.47, 21.13, -0.43, -0.60. **HRMS (ESI):** calcd. for $C_{30}H_{54}N_4O_5Si_2Na$ $(M + Na)^+$: 629.3525, found: 629.3516.

Methyl((S)-2-((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)-3,3-dimethylbu-tanoyl)-L-valinate (6b)

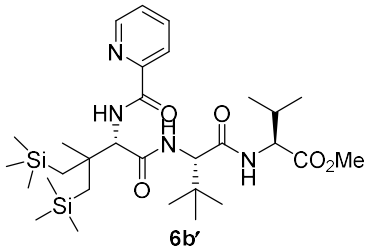


6b

The compound **6b** was prepared according to the **GP-2** with starting materials **5b**, purified by column chromatography in hexane: acetone = 4:1. **6b** was obtained as a colorless oil (18.3 mg, 34%).**^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.72 (d, *J* = 9.6 Hz, 1H), 8.64 – 8.52 (m, 1H), 8.27 – 8.15 (m, 1H), 7.82 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.37 (m, 1H), 6.66 (d, *J* = 9.2 Hz, 1H), 6.27 (d, *J* = 8.8 Hz, 1H), 4.55 (dd, *J* = 8.8, 5.2 Hz, 1H), 4.47 (d, *J* = 9.6 Hz, 1H), 4.27 (d, *J* = 9.2Hz, 1H), 3.73 (s, 3H), 2.24 – 2.13 (m, 1H), 1.16 – 1.05 (m, 6H), 0.99 – 0.85 (m, 16H), 0.78 (d, *J* = 14.4 Hz, 1H), 0.02 (s, 9H). **^{13}C NMR (101 MHz, CDCl$_3$)** δ 172.28, 170.60, 170.30, 164.34, 149.68, 148.43, 137.40, 126.35, 122.59, 63.17, 60.97, 57.12, 52.29, 38.15, 34.79, 31.32, 27.73, 26.67, 26.65, 19.14, 17.86, 1.08. **HRMS (ESI):** calcd. for $C_{27}H_{46}N_4O_5SiNa$ $(M + Na)^+$: 557.3129, found: 557.3116.

Methyl((S)-3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)-4-(trimethylsilyl)-3-((trimethylsilyl)m-ethyl)butanamido)butanoyl)-L-valinate (6b')

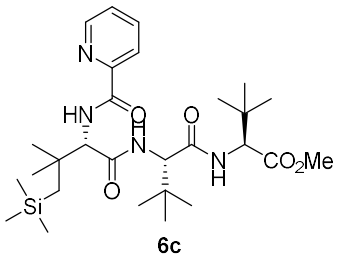
The compound **6b'** was prepared according to the **GP-2** with starting materials **5b**, purified by column chromatography in hexane: acetone = 4:1. **6b'** was obtained as a colorless oil (5.2 mg, 9%).**^{1}H NMR**



6b′

(400 MHz, $CDCl_3$) δ 8.66 (d, *J* = 8.8 Hz, 1H), 8.63 – 8.57 (m, 1H), 8.15 (dd, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.49 – 7.38 (m, 1H), 6.51 (d, *J* = 8.8 Hz, 1H), 6.11 (d, *J* = 9.2 Hz, 1H), 4.53 (dd, *J* = 8.8, 4.8Hz, 1H), 4.47 (d, *J* = 8.8 Hz, 1H), 4.24 (d, *J* = 9.2 Hz, 1H), 3.73 (s, 3H), 2.24 – 2.13 (m, 1H), 1.19 (s, 3H), 1.04 – 0.81 (m, 19H), 0.16 – 0.04 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.22, 170.59, 170.30, 164.57, 149.71, 148.51, 137.43, 126.43, 122.40, 62.60, 61.06, 57.15, 52.30, 40.52, 34.94, 31.33, 29.67, 29.42, 28.99, 27.83, 26.72, 19.20, 17.82, 1.27, 1.16. **HRMS (ESI):** calcd. for $C_{30}H_{54}N_4O_5Si_2Na$ $(M + Na)^+$: 629.3525, found: 629.3512.

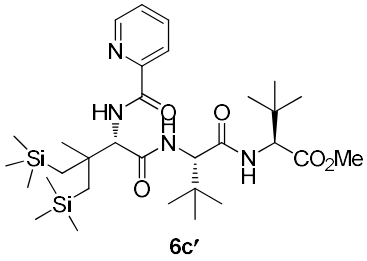
Methyl (S)-2-((S)-2-((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)-3,3-dimeth-ylbutanamido)-3,3-dimethylbutanoate (6c)



6c

The compound **6c** was prepared according to the **GP-2** with starting materials **5c**, purified by column chromatography in hexane: acetone = 4:1. **6c** was obtained as a colorless oil (18.4 mg, 34%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.72 (d, *J* = 9.6 Hz, 1H), 8.62 – 8.53 (m, 1H), 8.26 – 8.15 (m, 1H), 7.82 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.36 (m, 1H), 6.64 (d, *J* = 9.2 Hz, 1H), 6.26 (d, *J* = 9.2 Hz, 1H), 4.45 (dd, *J* = 9.2, 8.0 Hz, 2H), 4.26 (d, *J* = 9.2 Hz, 1H), 3.71 (s, 3H), 1.10 (d, *J* = 10.0 Hz, 6H), 0.98 – 0.89 (m, 19H), 0.78 (d, *J* = 14.4 Hz, 1H), 0.02 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.79, 170.60, 170.09, 164.33, 149.69, 148.43, 137.38, 126.34, 122.58, 63.16, 61.00, 60.10, 51.95, 38.11, 34.91, 34.87, 27.66, 26.73, 26.67, 1.10. **HRMS (ESI):** calcd. for $C_{28}H_{48}N_4O_5SiNa$ $(M + Na)^+$: 571.3286, found: 571.3266.

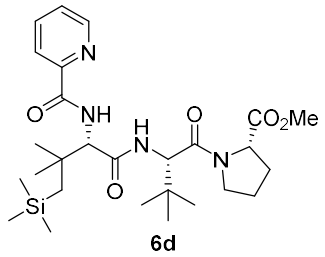
Methyl (S)-2-((S)-3,3-dimethyl-2-((S)-3-methyl-2-(picolinamido)-4-(trimethylsily-l)-3-((trimethylsi-lyl)methyl)butanamido)butanamido)-3,3-dimethylbutanoate (6c')



6c′

The compound **6c'** was prepared according to the **GP-2** with starting materials **5c**, purified by column chromatography in hexane: acetone = 4:1. **6c'** was obtained as a colorless oil (5.7 mg, 9%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.66 (d, *J* = 8.8 Hz, 1H), 8.61 (dt, *J* = 4.8, 1.2 Hz, 1H), 8.14 (d, *J* = 7.6 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46 – 7.39 (m, 1H), 6.50 (d, *J* = 8.8 Hz, 1H), 6.16 (d, *J* = 9.2 Hz, 1H), 4.47 (d, *J* = 8.8 Hz, 1H), 4.42 (d, *J* = 9.2 Hz, 1H), 4.24 (d, *J* = 8.8 Hz, 1H), 3.72 (s, 3H), 1.18 (s, 3H), 1.04 – 0.84 (m, 22H), 0.15 – 0.02 (m, 18H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.76, 170.58, 170.08, 164.53, 149.71, 148.50, 137.42, 126.42, 122.40, 62.55, 61.07, 60.12, 51.96, 40.52, 35.06, 34.91, 29.67, 29.42, 28.93, 27.82, 26.74, 26.72, 1.29, 1.16. calcd. for $C_{31}H_{56}N_4O_5Si_2Na$ $(M + Na)^+$: 643.3681, found: 643.3671.

Methyl ((S)-2-((S)-3,3-dimethyl-2-(picolinamido)-4-(trimethylsilyl)butanamido)-3,3-dimethylbutanoyl)-L-prolinate (6d)

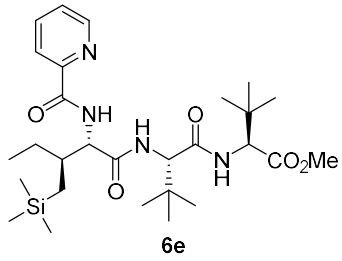


6d

The compound **6d** was prepared according to the **GP-2** with starting materials **5d**, purified by column chromatography in hexane: acetone = 4:1. **6d** was obtained as a colorless oil (19.5 mg, 37%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.76 – 8.63 (m, 1H), 8.61 – 8.49 (m, 1H), 8.21 –

8.05 (m, 1H), 7.87 – 7.72 (m, 1H), 7.44 – 7.35 (m, 1H), 6.49 (dd, *J* = 9.2, 3.2 Hz, 1H), 4.86 – 4.58 (m, 1H), 4.58 – 4.46 (m, 1H), 4.44 – 4.32 (m, 1H), 3.97 – 3.85 (m, 1H), 3.75 – 3.63 (m, 4H), 2.25 – 2.15 (m, 1H), 2.10 – 1.98 (m, 2H), 1.95 – 1.88 (m, 1H), 1.12 – 1.07 (m, 6H), 1.05 – 0.85 (m, 10H), 0.73 (d, *J* = 14.4 Hz, 1H), 0.07 – -0.01 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.61, 170.54, 170.02, 164.31, 149.65, 148.42, 137.39, 126.35, 122.48, 63.14, 58.94, 57.11, 52.22, 48.08, 38.14, 35.52, 29.23, 27.83, 26.79, 26.74, 26.56, 26.48, 25.26, 1.05. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.69, 170.54, 170.20, 164.19, 149.65, 148.47, 137.27, 126.29, 122.26, 63.14, 59.09, 57.17, 52.22, 48.20, 38.14, 36.23, 29.23, 27.83, 26.79, 26.74, 26.56, 26.48, 25.26, 1.05. **HRMS (ESI):** calcd. for $C_{28}H_{45}N_3O_5SiNa$ $(M + Na)^+$: 554.3021, found: 554.3006.

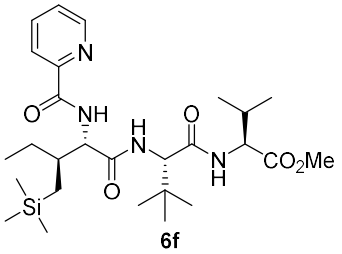
Methyl (S)-2-((S)-3,3-dimethyl-2-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanemido)butanamido)-3,3-dimethylbutanoate (6e)



6e

The compound **6e** was prepared according to the **GP-2** with starting materials **5e**, purified by column chromatography in hexane: acetone = 4:1. **6e** was obtained as a colorless oil (20.3 mg, 37%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.60 – 8.54 (m, 1H), 8.50 (d, *J* = 8.8 Hz, 1H), 8.16 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.84 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.40 (m, 1H), 6.73 (d, *J* = 9.2 Hz, 1H), 6.25 (d, *J* = 9.2 Hz, 1H), 4.54 (dd, *J* = 8.8, 6.4 Hz, 1H), 4.40 (d, *J* = 9.2 Hz, 1H), 4.25 (d, *J* = 9.2 Hz, 1H), 3.71 (s, 3H), 2.28 – 2.18 (m, 1H), 1.57 – 1.39 (m, 2H), 1.00 – 0.88 (m, 21H), 0.58 (d, *J* = 7.2 Hz, 2H), 0.01 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.76, 171.16, 170.13, 164.53, 149.51, 148.44, 137.46, 126.50, 122.45, 61.07, 60.21, 57.79, 51.95, 37.53, 34.95, 34.84, 26.72, 26.68, 24.61, 17.33, 10.41, -0.70. **HRMS (ESI):** calcd. for $C_{28}H_{48}N_4O_5SiNa$ $(M + Na)^+$: 571.3286, found: 571.3261.

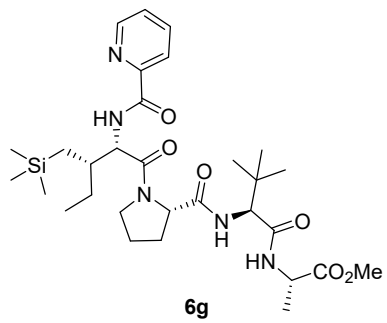
Methyl ((S)-3,3-dimethyl-2-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanamido)butanoyl)-L-valinate (6f)



6f

The compound **6f** was prepared according to the **GP-2** with starting materials **5f**, purified by column chromatography in hexane: acetone = 4:1. **6f** was obtained as a colorless oil (17.1 mg, 32%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.68 – 8.45 (m, 2H), 8.16 (d, *J* = 7.8 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.37 (m, 1H), 6.82 – 6.67 (m, 1H), 6.40 – 6.24 (m, 1H), 4.61 – 4.46 (m, 2H), 4.27 (dd, *J* = 92, 1.6 Hz, 1H), 3.72 (s, 3H), 2.27 – 2.19 (m, 1H), 2.19 – 2.12 (m, 1H), 1.58 – 1.39 (m, 2H), 1.00 – 0.81 (m, 18H), 0.58 (d, *J* = 6.8 Hz, 2H), 0.00 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.21, 171.18, 170.33, 164.56, 149.48, 148.43, 137.47, 126.51, 122.45, 61.02, 57.83, 57.22, 52.26, 37.53, 34.82, 31.27, 26.68, 24.61, 19.13, 17.89, 17.35, 10.41, -0.72. **HRMS (ESI):** calcd. for $C_{27}H_{46}N_4O_5SiNa$ $(M + Na)^+$: 557.3129, found: 557.3116.

Methyl ((S)-3,3-dimethyl-2-((S)-1-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoyl)-pyrrolidine-2-carboxamido)butanoyl)-L-alaninate (6g)

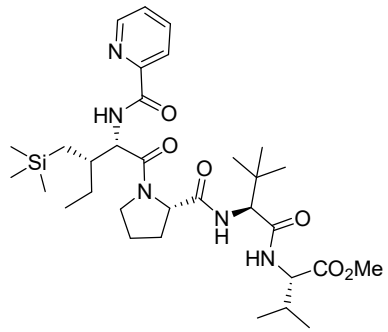


6g

The compound **6g** was prepared according to the **GP-2** with starting materials **5g**, purified by column chromatography in hexane: acetone = 4:1. **6g** was obtained as a colorless oil (23 mg, 38%). The product **6g** was partially racemic. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.62 – 8.35 (m, 2H), 8.17 – 8.08 (m, 1H), 7.88 – 7.76 (m, 1H), 7.45 – 7.36 (m, 1H), 7.30 – 7.16 (m, 1H), 6.49 – 6.31 (m, 1H), 4.95 – 4.74 (m, 1H), 4.60 – 4.45 (m, 2H), 4.22 –

4.11 (m, 1H), 4.09 – 3.86 (m, 1H), 3.79 – 3.68 (m, 4H), 2.19 – 2.10 (m, 2H), 2.02 – 1.92 (m, 3H), 1.60 – 1.45 (m, 1H), 1.38 (d, *J* = 7.2 Hz, 3H), 1.11 – 0.81 (m, 14H), 0.77 – 0.62 (m, 1H), 0.09 – -0.06 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 173.29, 172.01, 171.28, 169.92, 164.17, 149.63, 148.43, 137.32, 126.33, 122.32, 61.41, 61.23, 60.64, 54.62, 52.49, 48.17, 48.05, 38.03, 34.87, 34.60, 28.29, 26.85, 26.77, 25.36, 23.57, 18.25, 16.59, 15.53, 14.74, 9.64, -0.58. **HRMS (ESI):** calcd. for $C_{30}H_{49}N_5O_6SiNa$ $(M + Na)^+$: 626.3344, found: 626.3329.

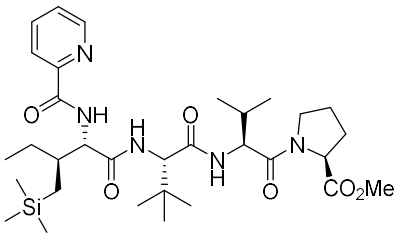
Methyl ((S)-3,3-dimethyl-2-((S)-1-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanoyl)-pyrrolidine-2-carboxamido)butanoyl)-L-valinate (6h)



6h

The compound **6h** was prepared according to the **GP-2** with starting materials **5h**, purified by column chromatography in hexane: acetone = 4:1. **6h** was obtained as a colorless oil (18.7 mg, 30%). The product **6h** was partially racemic.**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.58 – 8.43 (m, 2H), 8.15 – 8.07 (m, 1H), 7.84 – 7.77 (m, 1H), 7.45 – 7.35 (m, 1H), 7.31 – 7.11 (m, 1H), 6.35 – 6.16 (m, 1H), 4.95 – 4.74 (m, 1H), 4.61 – 4.45 (m, 2H), 4.18 (dd, *J* = 8.6, 3.0 Hz, 1H), 4.10 – 3.86 (m, 1H), 3.81 – 3.63 (m, 4H), 2.19 – 2.11 (m, 3H), 2.01 – 1.88 (m, 3H), 1.57 – 1.49 (m, 1H), 1.07 – 0.98 (m, 10H), 0.95 – 0.81 (m, 9H), 0.79 – 0.69 (m, 1H), 0.69 – 0.56 (m, 1H), 0.10 – -0.08 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.26, 172.02, 171.29, 170.45, 164.16, 149.64, 148.43, 137.32, 126.32, 122.32, 61.57, 60.58, 57.17, 54.61, 52.20, 48.17, 38.02, 34.70, 34.39, 31.28, 28.22, 26.87, 26.79, 25.35, 23.55, 19.02, 17.89, 9.59, -0.58. **HRMS (ESI):** calcd. for $C_{32}H_{53}N_5O_6SiNa$ $(M + Na)^+$: 654.3657, found: 654.3636.

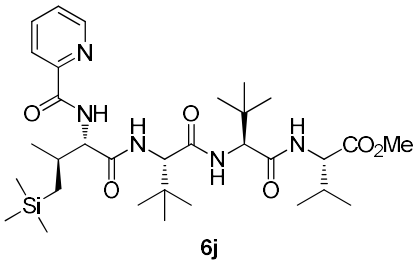
Methyl ((S)-3,3-dimethyl-2-((2S,3S)-2-(picolinamido)-3-((trimethylsilyl)methyl)pentanamido)butanoyl)-L-valyl-L-prolinate (6i)



6i

The compound **6i** was prepared according to the **GP-2** with starting materials **5i**, purified by column chromatography in hexane: acetone = 4:1. **6i** was obtained as a colorless oil (15.8 mg, 25%).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.60 – 8.54 (m, 1H), 8.52 (d, *J* = 9.2 Hz, 1H), 8.16 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.47 – 7.39 (m, 1H), 6.71 (d, *J* = 9.2 Hz, 1H), 6.49 – 6.33 (m, 1H), 4.68 – 4.42 (m, 3H), 4.24 (d, *J* = 9.2 Hz, 1H), 3.80 – 3.64 (m, 5H), 2.28 – 2.18 (m, 2H), 2.15 – 1.96 (m, 4H), 1.53 – 1.47 (m, 1H), 1.03 – 0.84 (m, 19H), 0.65 – 0.50 (m, 2H), 0.10 – -0.05 (m, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.50, 170.97, 170.28, 164.51, 149.55, 148.44, 137.42, 126.46, 122.41, 61.09, 58.89, 57.71, 55.54, 52.32, 47.34, 37.61, 34.92, 31.29, 29.14, 26.78, 25.14, 24.62, 19.54, 17.53, 17.32, 10.42, -0.70. **HRMS (ESI):** calcd. for $C_{32}H_{53}N_5O_6SiNa$ $(M + Na)^+$: 654.3657, found: 654.3638.

(4S, 5S,8S,11S,14S)-methyl 8,11-di-tert-butyl-14-isopropyl-2,2,4-trimethyl-6,9,12-trioxo-5-(picolinamido)-7,10,13-triaza-2-silapentadecan-15-oate (6j)



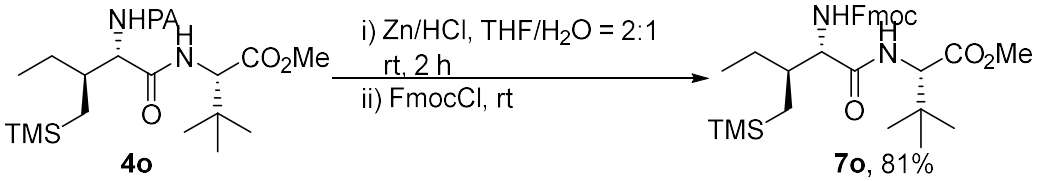
6j

The compound **6j** was prepared according to the **GP-2** with starting materials **5j**, purified by column chromatography in hexane: acetone = 4:1. **6j** was obtained as a colorless oil (17.1 mg, 27%, d.r. = 3:1), diastereomeric ratio was determinated by ^{1}H NMR. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.69 – 8.54 (m, 2H), 8.36 – 8.27 (m, 1H), 7.89 – 7.80 (m, 1H), 7.77 – 7.50 (m,

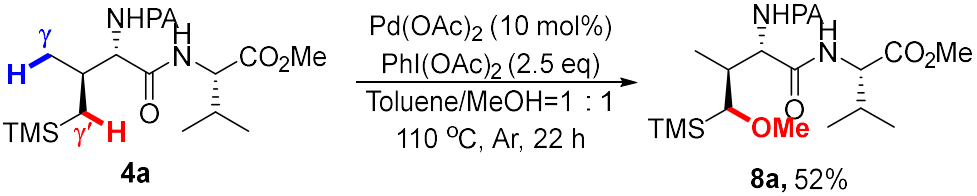
1H), 7.46 – 7.30 (m, 2H), 6.37 – 6.16 (m, 1H), 4.87 – 4.74 (m, 1H), 4.70 – 4.55 (m, 2H), 4.47 – 4.37 (m, 1H), 3.75 (s, 3H), 2.21 – 2.05 (m, 2H), 1.00 – 0.78 (m, 28H), 0.48 – 0.26 (m, 1H), 0.00 – -0.10 (m, 9H). **Major: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.70, 171.63, 170.92, 170.63, 170.43, 164.44, 149.66, 148.44, 137.45, 126.38, 122.78, 60.99, 60.15, 59.98, 57.04, 52.21, 35.67, 34.21, 33.64, 31.18, 27.07, 26.64, 19.80, 19.68, 19.25, 17.86, -0.69. **Minor: ^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.65, 171.63, 170.92, 170.47, 170.37, 164.28, 149.68, 148.44, 137.45, 126.38, 122.74, 61.05, 60.15, 59.98, 57.08, 52.27, 35.67, 34.46, 33.23, 31.25, 27.02, 26.64, 19.80, 19.68, 19.17, 17.91, -0.62. **HRMS (ESI):** calcd. for $C_{32}H_{55}N_5O_6SiNa$ $(M + Na)^+$: 656.3813, found: 656.3802.

5. Applications of the Alkylation Reaction

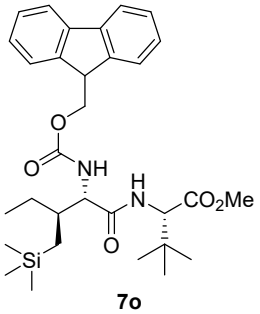
a) Removal of the PA Group



b) Sequential Reactions



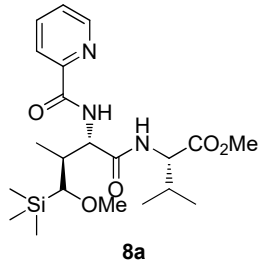
Methyl (S)-2-((2S,3S)-2-((((9H-fluoren-9-yl)methoxy)carbonyl)amino)-3-((trimethylsilyl)methyl)-pentanamido)-3,3-dimethylbutanoate (7o)



7o

A solution of **4o** (0.2 mmol) in THF/H_2O (2:1, 3 mL) was treated with **ex**cess zinc dust (15 eq) and aqueous HCl (1.5 M, 2 ml) at room temperature and stirred for 2 hours. Then the mixture was basified by solid $NaHCO_3$, 9-fluorenylmethyl chloroformate (3 eq) was charged into the system and the mixture was stirred overnight. The mixture was extracted with EA, the combined organic layers was washed with water and brine, dried over anhydrous Na_2SO_4, and concentrated in vacuo. The resulting residue was purified by column chromatography in petroleum ether: ethyl acetate: dichloromethane = 7:1:1 to give the corresponding product **7o** as a white solid (88.9 mg, 81%). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.76 (dt, *J* = 7.6, 1.2 Hz, 2H), 7.58 (d, *J* = 7.6 Hz, 2H), 7.44 – 7.36 (m, 2H), 7.34 – 7.27 (m, 2H), 6.39 (d, *J* = 9.2 Hz, 1H), 5.35 (d, *J* = 8.8 Hz, 1H), 4.45 (d, *J* = 9.2 Hz, 1H), 4.40 (d, *J* = 7.2 Hz, 2H), 4.23 (t, *J* = 7.2 Hz, 1H), 4.16 – 4.06 (m, 1H), 3.71 (s, 3H), 2.11 – 1.96 (m, 1H), 1.52 – 1.30 (m, 2H), 1.01 – 0.82 (m, 12H), 0.54 (d, *J* = 6.8 Hz, 2H), 0.03 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 171.74, 171.29, 156.34, 143.99, 143.87, 141.42, 127.85, 127.22, 125.19, 120.12, 120.10, 67.25, 60.23, 59.22, 51.92, 47.27, 37.90, 34.84, 26.68, 24.57, 17.18, 10.46, -0.74. **HRMS (ESI):** calcd. for $C_{31}H_{44}N_2O_5SiNa$ $(M + Na)^+$: 575.2911, found: 575.2900.

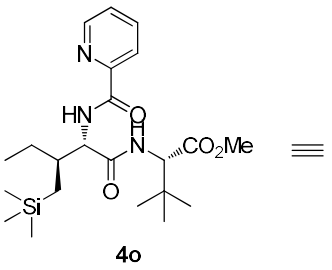
(S)-methyl 2-((2S,3S,4R)-4-methoxy-3-methyl-2-(picolinamido)-4-(trimethylsilyl) butanamido)-3-methylbutanoate (8a)



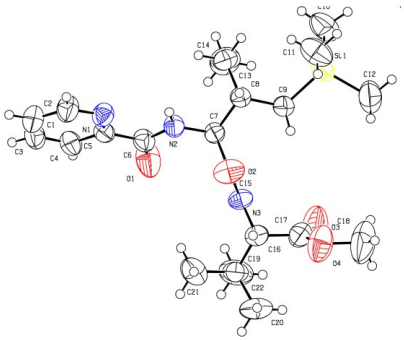
8a

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.35 (d, *J* = 7.6 Hz, 1H), 8.67 – 8.51 (m, 1H), 8.17 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.83 (td, *J* = 7.6, 1.6 Hz, 1H), 7.48 – 7.38 (m, 1H), 7.11 (d, *J* = 8.4 Hz, 1H), 4.60 (dd, *J* = 7.6, 5.2 Hz, 1H), 4.52 (dd, *J* = 8.4, 4.8 Hz, 1H), 3.70 (s, 3H), 3.47 (s, 3H), 3.38 (d, *J* = 2.0 Hz, 1H), 2.50 – 2.41 (m, 1H), 2.22 – 2.10 (m, 1H), 1.09 (d, *J* = 7.2 Hz, 3H), 0.94 – 0.88 (m, 6H), 0.12 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 172.17, 171.47, 165.45, 149.80, 148.63, 137.34, 126.38, 122.41, 78.37, 60.09, 59.77, 57.47, 52.19, 37.24, 31.32, 19.10, 17.99, 13.76, -1.28. **HRMS (ESI):** calcd. for $C_{21}H_{35}N_3O_5SiNa$ $(M + Na)^+$: 460.2238, found: 460.2230.

6. Crystal Structure of 4o



4o



Bond precision:	C-C = 0.0064 A		Wavelength=1.54184
Cell:	a=9.1154(3)	b=9.7854(3)	c=14.6304(5)
	alpha=90	beta=96.443(4)	gamma=90
Temperature:	293 K		
	Calculated		Reported
Volume	1296.76(7)		1296.75(8)
Space group	P 21		P 1 21 1
Hall group	P 2yb		P 2yb
Moiety formula	C22 H37 N3 O4 Si		C22 H37 N3 O4 Si
Sum formula	C22 H37 N3 O4 Si		C22 H37 N3 O4 Si
Mr	435.64		435.63
Dx,g cm^{-3}	1.116		1.116
Z	2		2
Mu (mm^{-1})	1.034		1.034
F000	472.0		472.0
F000'	473.81		
h,k,lmax	10,11,17		10,11,17
Nref	4615[2456]		4503
Tmin,Tmax	0.639, 0.675		0.668, 1.000
Tmin'	0.580		

Correction method= # Reported T Limits: Tmin=0.668 Tmax=1.000

AbsCorr = MULTI-SCAN

Data completeness= 1.83/0.98 Theta(max)= 66.895

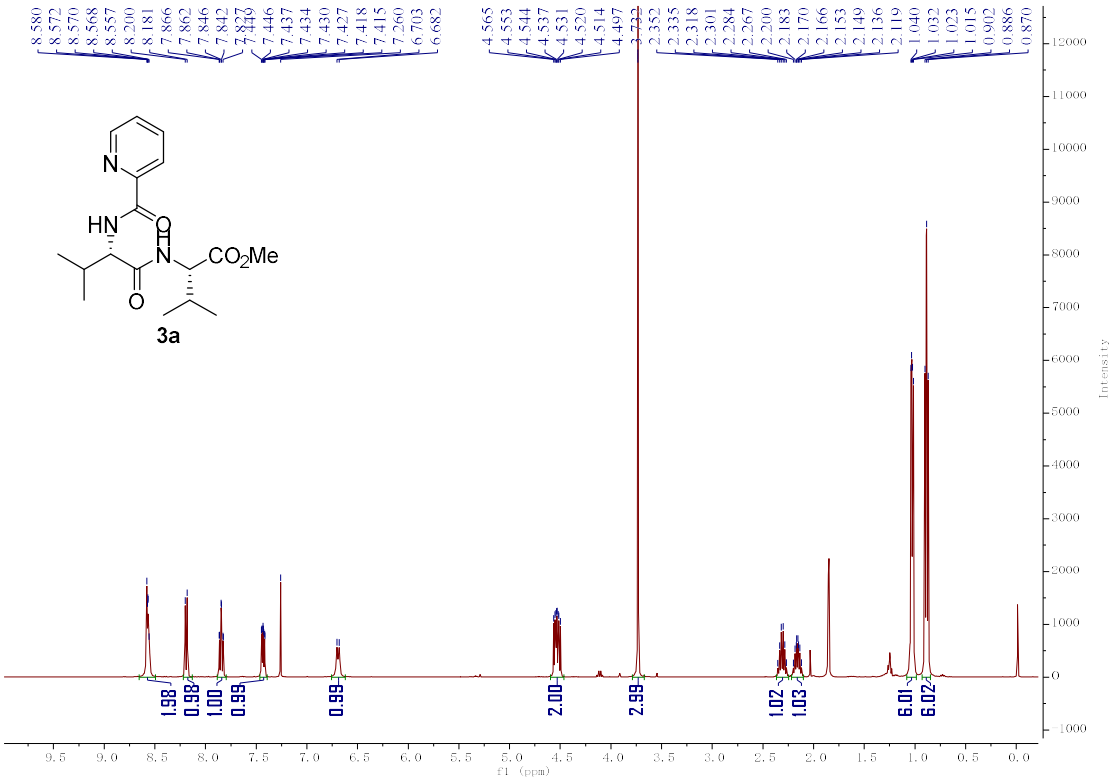
R(reflections)= 0.0526(3949) wR2(reflections)= 0.1478(4503)

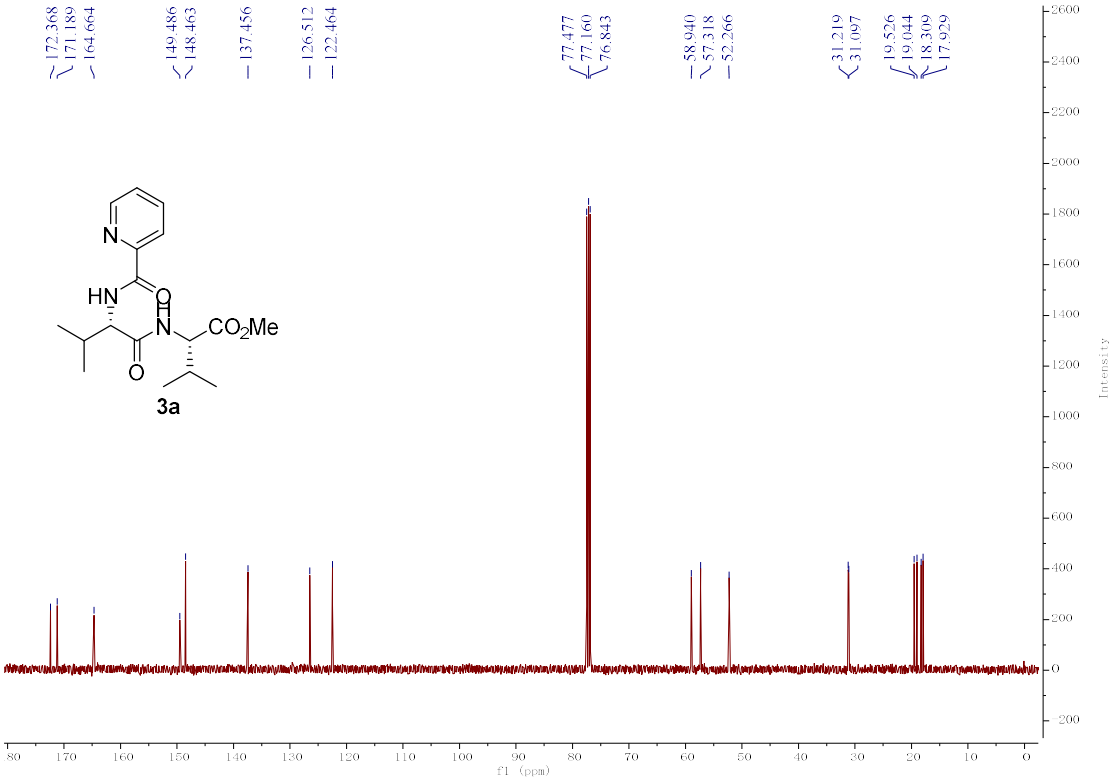
S = 1.039 Npar= 279

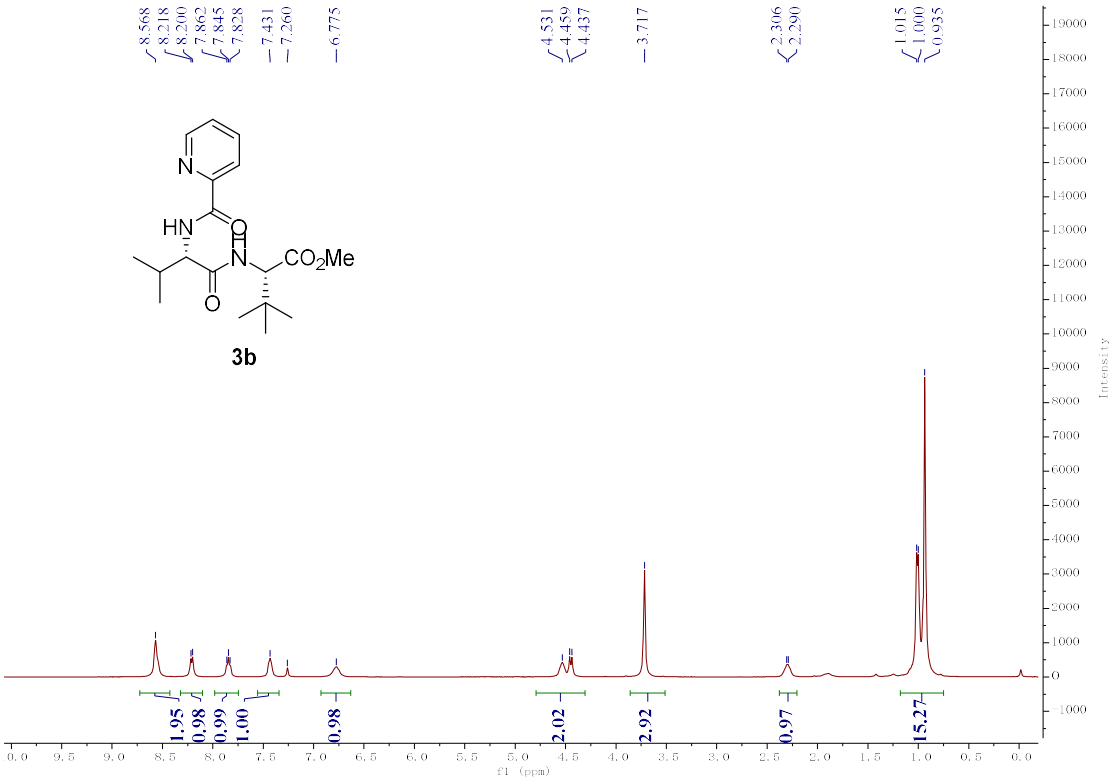
7. References

1. He, G.; Chen. G. A Practical Strategy for the Structural Diversification of Aliphatic Scaffolds through the Palladium-Catalyzed Picolinamide-Directed Remote Functionalization of Unactivated C(sp^3)-H Bonds. *Angew. Chem., Int. Ed.* **2011**, *50*, 5192-5196.
2. He, G.; Zhao, Y.; Zhang, S.; Lu, C.; Chen, G. Highly Efficient Syntheses of Azetidines, Pyrrolidines, and Indolines via Palladium Catalyzed Intramolecular Amination of C(sp^3)-H and C(sp^2)-H Bonds at γ and δ Positions. *J. Am. Chem. Soc.* **2012**, *134*, 3-6.
3. Zhang, L.-S.; Chen, G.; Wang, X.; Guo, Q.-Y.; Zhang, X.-S.; Pan, F.; Chen, K.; Shi, Z.-J. Direct Borylation of Primary C-H Bonds in Functionalized Molecules by Palladium Catalysis. *Angew. Chem., Int. Ed.* **2014**, *53*, 3899-3903.
4. Zhang, S.-Y.; He, G.; Zhao, Y.; Wright, K.; Nack, W. A.;Chen, G. Efficient Alkyl Ether Synthesis via Palladium-Catalyzed, Picolinamide-Directed Alkoxylation of Unactivated C(sp^3)-H and C(sp^2)-H Bonds at Remote Positions. *J. Am. Chem. Soc.* **2012**, *134*, 7313-7216.
5. Zhang, S.-Y.; He, G.; Nack, W. A.; Zhao, Y.; Li, Q.; Chen, G. Palladium-Catalyzed Picolinamide-Directed Alkylation of Unactivated C(sp^3)-H Bonds with Alkyl Iodides. *J. Am. Chem. Soc.* **2013**, *135*, 2124-2127.
6. Fan, M.; Ma, D.-W. Palladium-Catalyzed Direct Functionalization of 2-Aminobutanoic Acid Derivatives: Application of a Convenient and Versatile Auxiliary. *Angew. Chem., Int. Ed.* **2013**, *52*, 12152-12155.
7. Rodriguez, N.; Romero-Revilla, J. A.; Fernandez-Ibanez, M. A.; Carretero, J. C. Palladium-catalyzed *N*-(2-pyridyl)sulfonyl-directed C(sp^3)-H γ-arylation of Amino Acid Derivatives. *Chem. Sci.* **2013**, *4*, 175-179.
8. Xu, J.-W.; Zhang, Z.-Z.; Rao, W.-H.; Shi, B.-F. Site-Selective Alkenylation of δ-C(sp^3)-H Bonds with Alkynes via a Six-Membered Palladacycle. *J. Am. Chem. Soc.* **2016**, *138*, 10750-11753.
9. Zhan, B.-B.; Li, Y.; Xu, J.-W.; Nie, X.-L.; Fan, J.; Jin, L.; Shi, B.-F. Site-Selective δ-C(sp^3)-H Alkylation of Amino Acids and Peptides with Maleimides via a Six-Membered Palladacycle. *Angew. Chem. Int. Ed.* **2018**, *57*, 5858-5862.

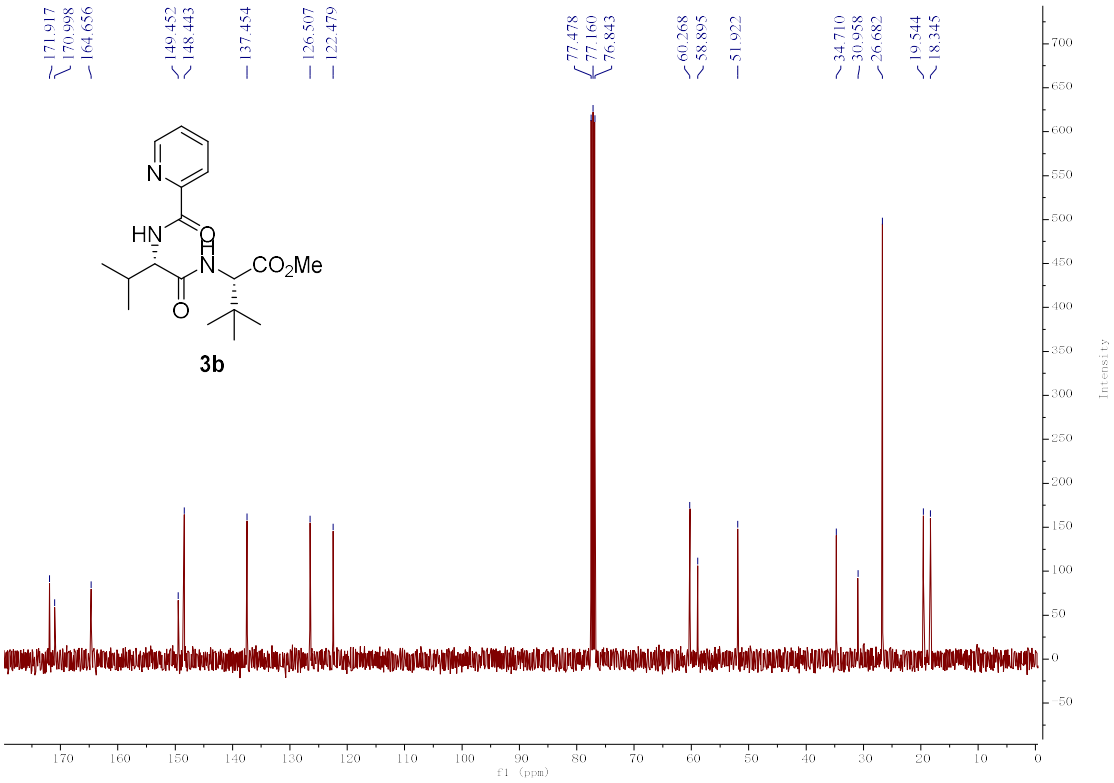
8. NMR Spectra



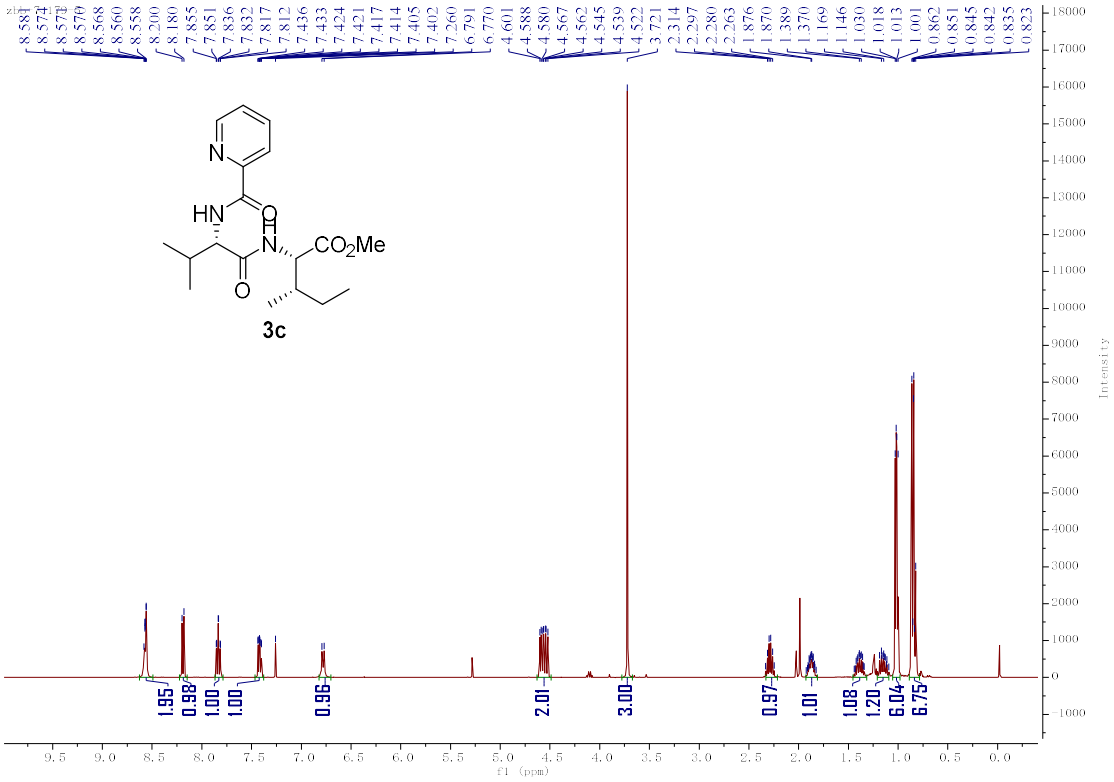


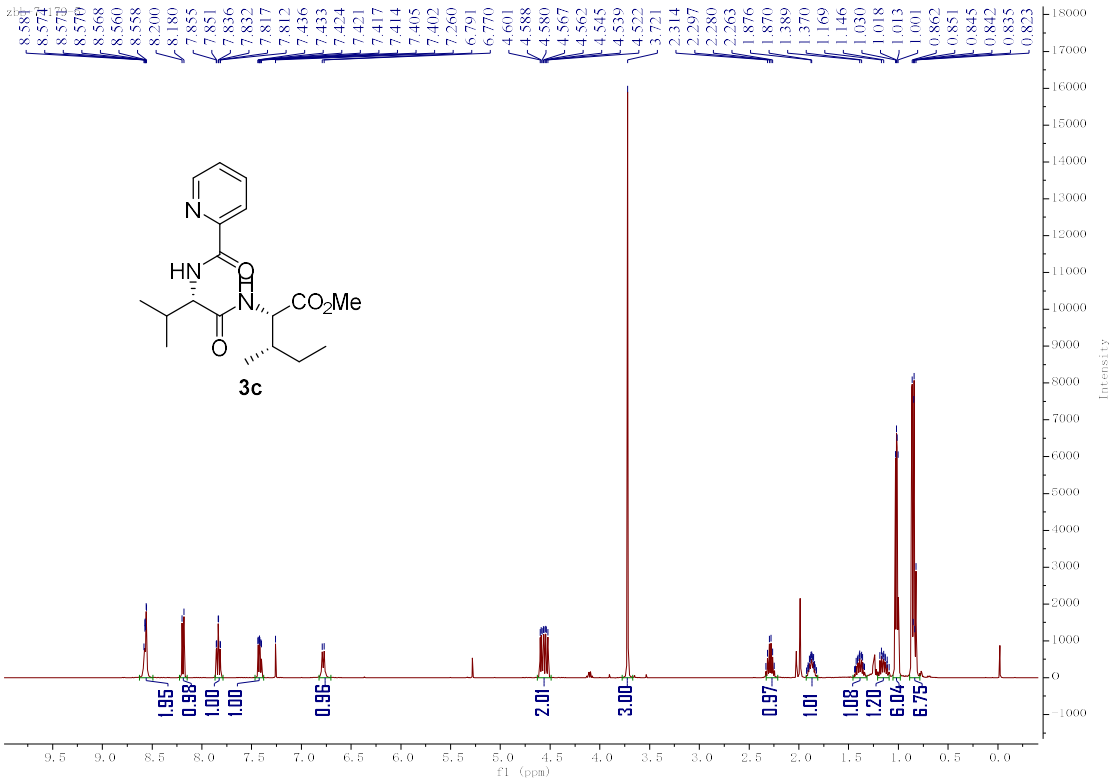

8.568
8.218
8.200
7.862
7.845
7.828
7.431
7.260
6.775
4.531
4.459
4.437
3.717
2.306
2.290
1.015
1.000
0.935
1.95
0.98
0.99
1.00
0.98
2.02
2.92
0.97
15.27
f1 (ppm)
Intensity
HN
N
O
N
CO2Me
O

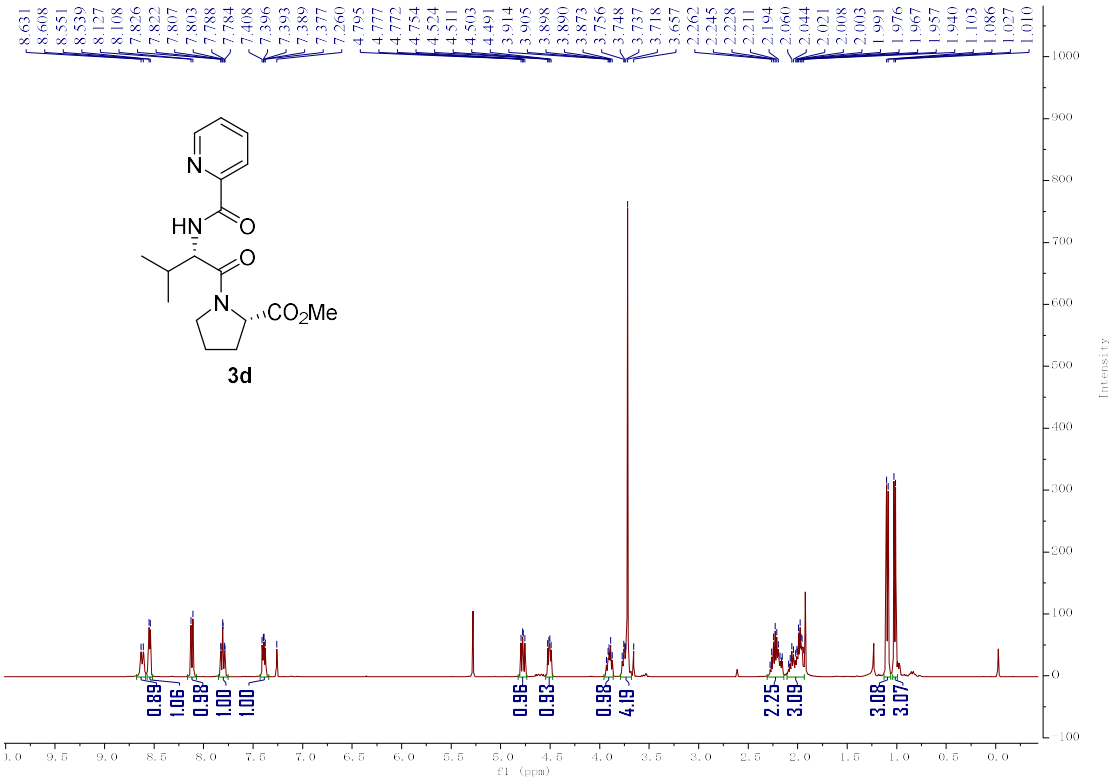
3b

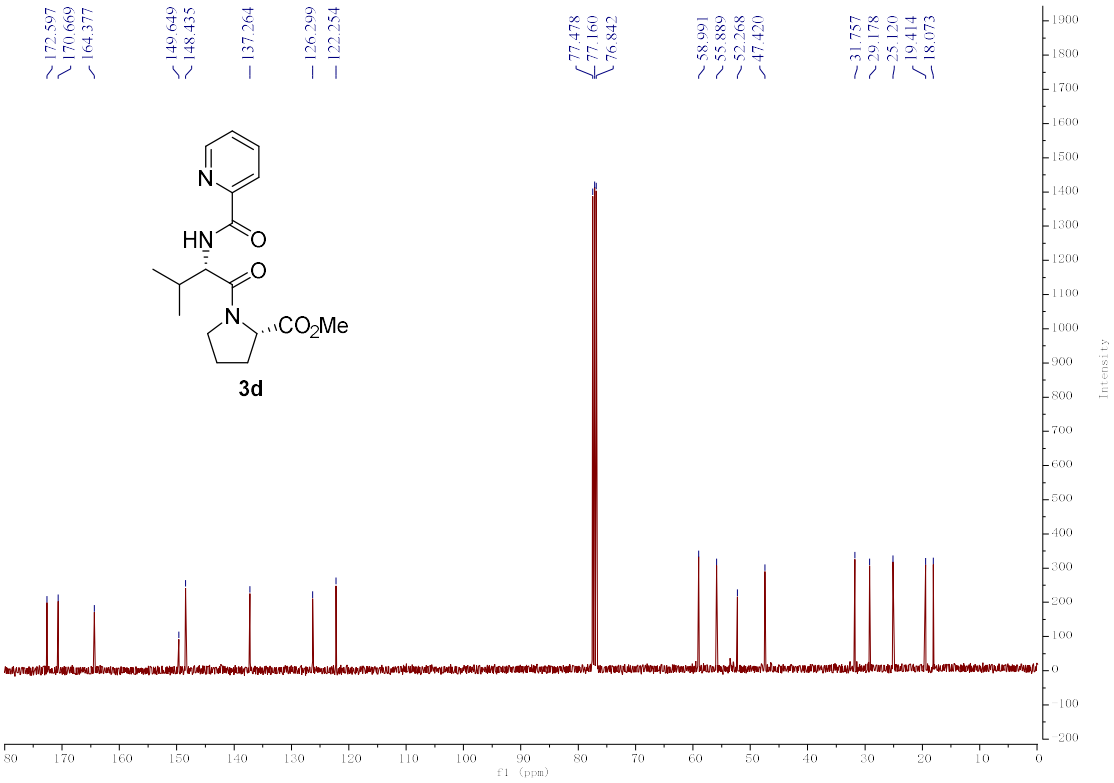

171.917
170.998
164.656
149.452
148.443
137.454
126.507
122.479
77.478
77.160
76.843
60.268
58.895
51.922
34.710
30.958
26.682
19.544
18.345
f1 (ppm)
Intensity
HN
N
O
N
CO2Me
O

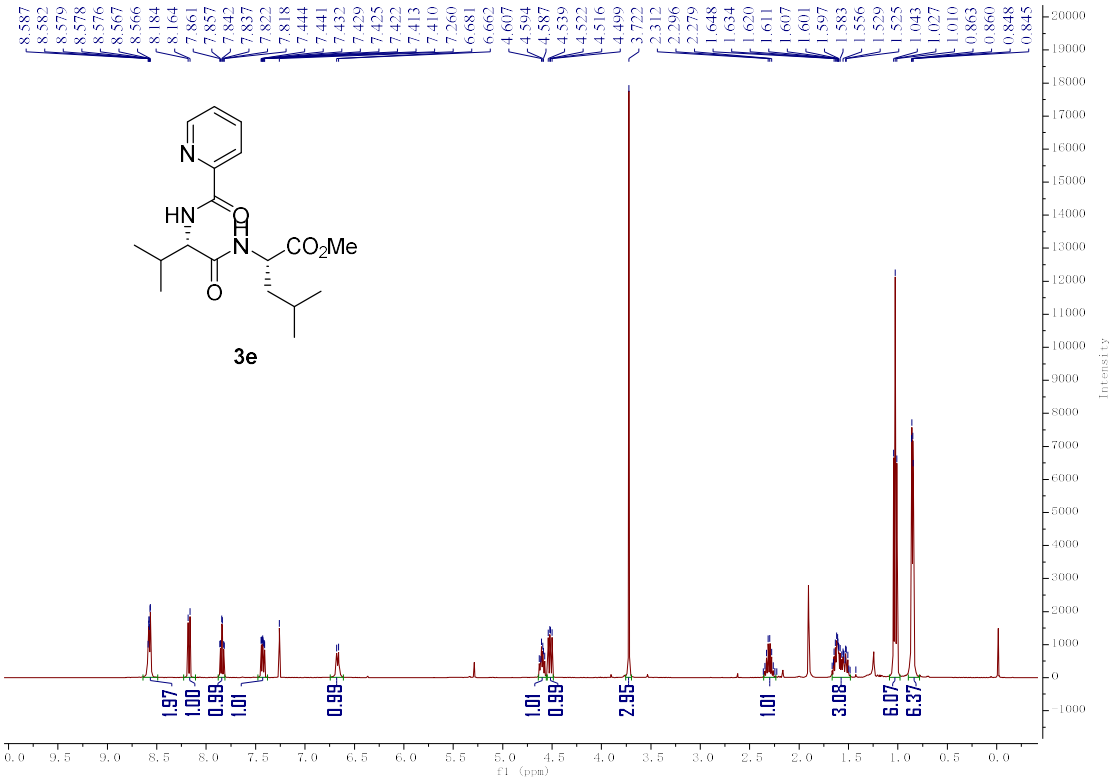
3b

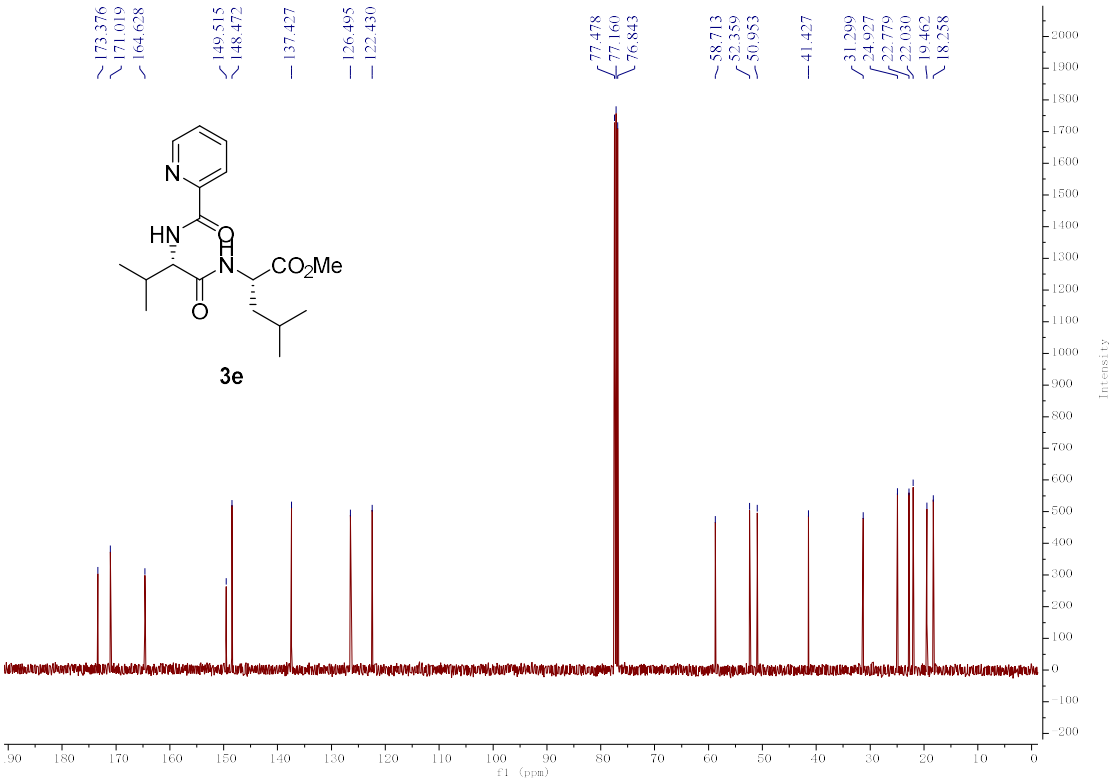

3c
1.95
0.98
1.00
1.00
0.96
2.01
3.00
0.97
1.01
1.08
1.20
6.04
6.75
f1 (ppm)
Intensity

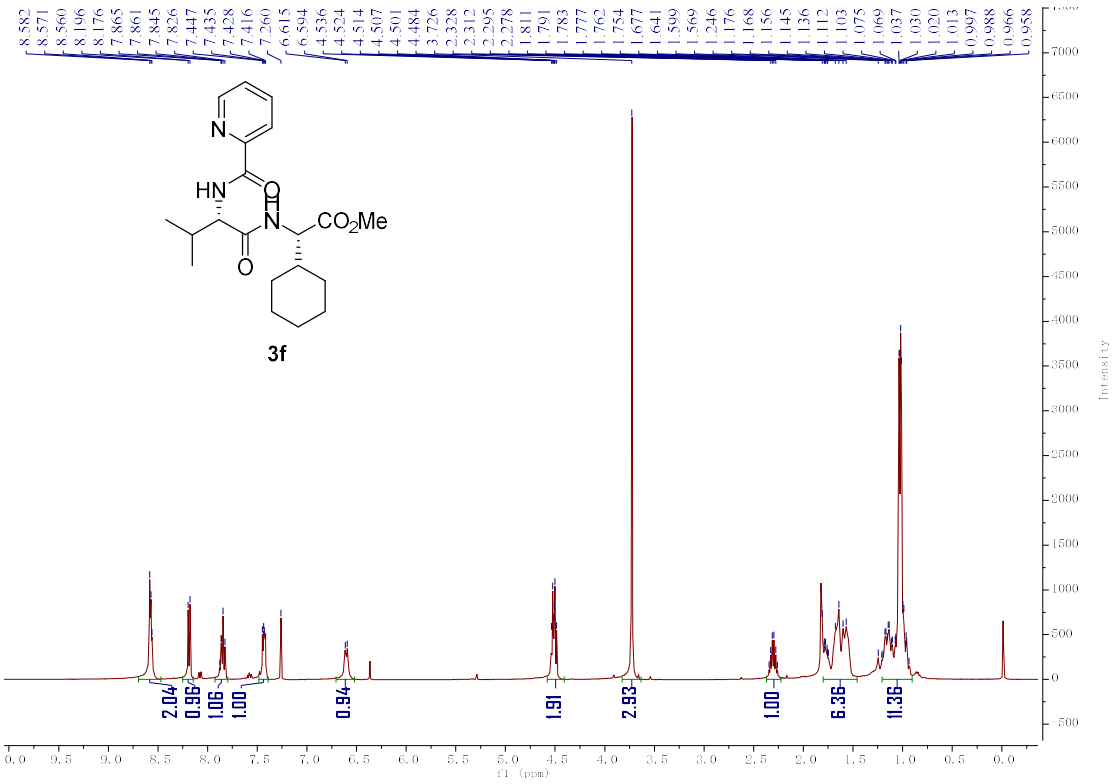

3c
1.95
0.98
1.00
1.00
0.96
2.01
3.00
0.97
1.01
1.08
1.20
6.04
6.75
f1 (ppm)
Intensity

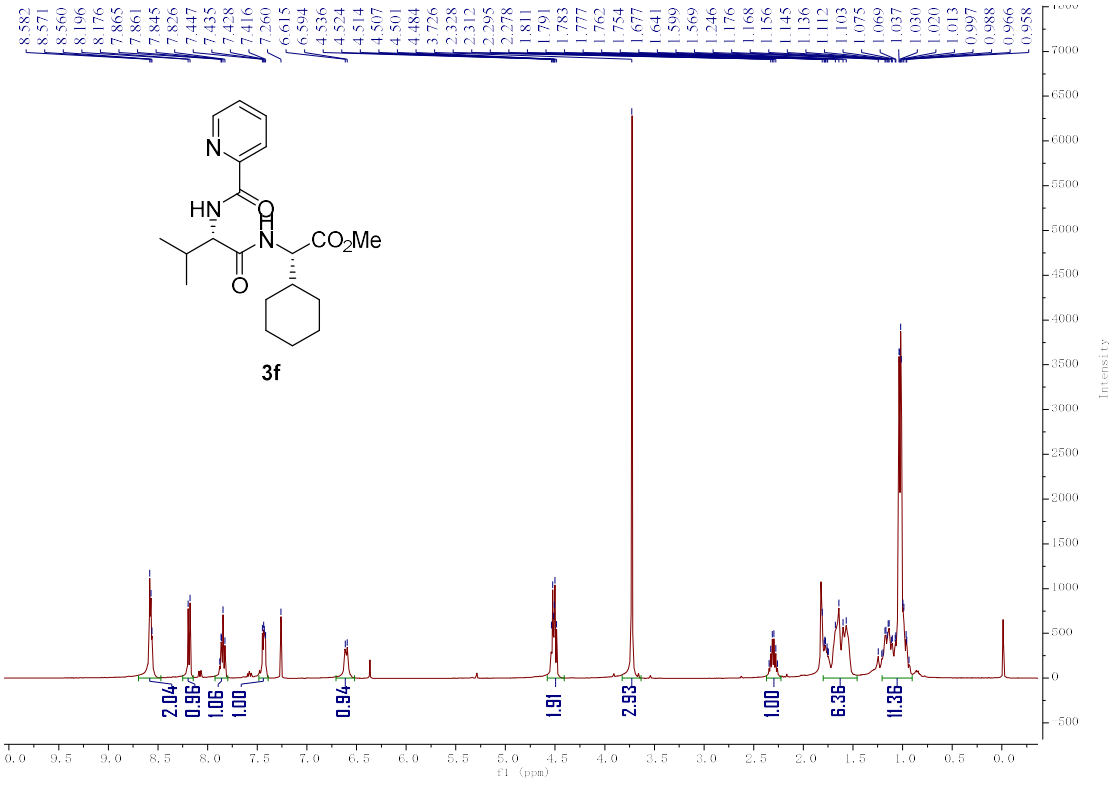

8.631
8.608
8.551
8.539
8.127
8.108
7.826
7.822
7.807
7.803
7.788
7.784
7.408
7.396
7.393
7.389
7.377
7.260
4.795
4.777
4.772
4.754
4.524
4.511
4.503
4.491
3.914
3.905
3.898
3.890
3.873
3.756
3.748
3.737
3.718
3.657
2.262
2.245
2.228
2.211
2.194
2.060
2.044
2.021
2.008
2.003
1.991
1.976
1.967
1.957
1.940
1.103
1.086
1.027
1.010
N
HN
O
O
N
CO2Me
3d
0.89
1.06
0.98
1.00
1.00
0.96
0.93
0.98
4.19
2.25
3.09
3.08
3.07
f1 (ppm)
Intensity

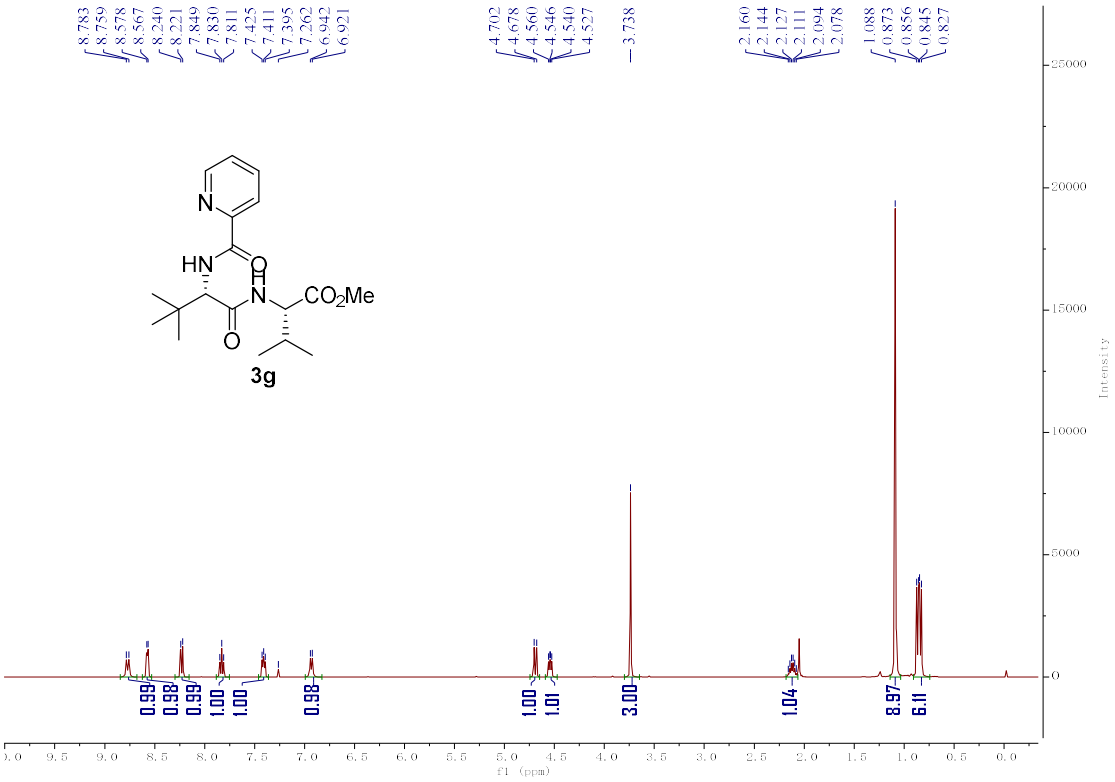

172.597
170.669
164.377
149.649
148.435
137.264
126.299
122.254
77.478
77.160
76.842
58.991
55.889
52.268
47.420
31.757
29.178
25.120
19.414
18.073
N
HN
O
O
N
CO2Me
3d
f1 (ppm)
Intensity

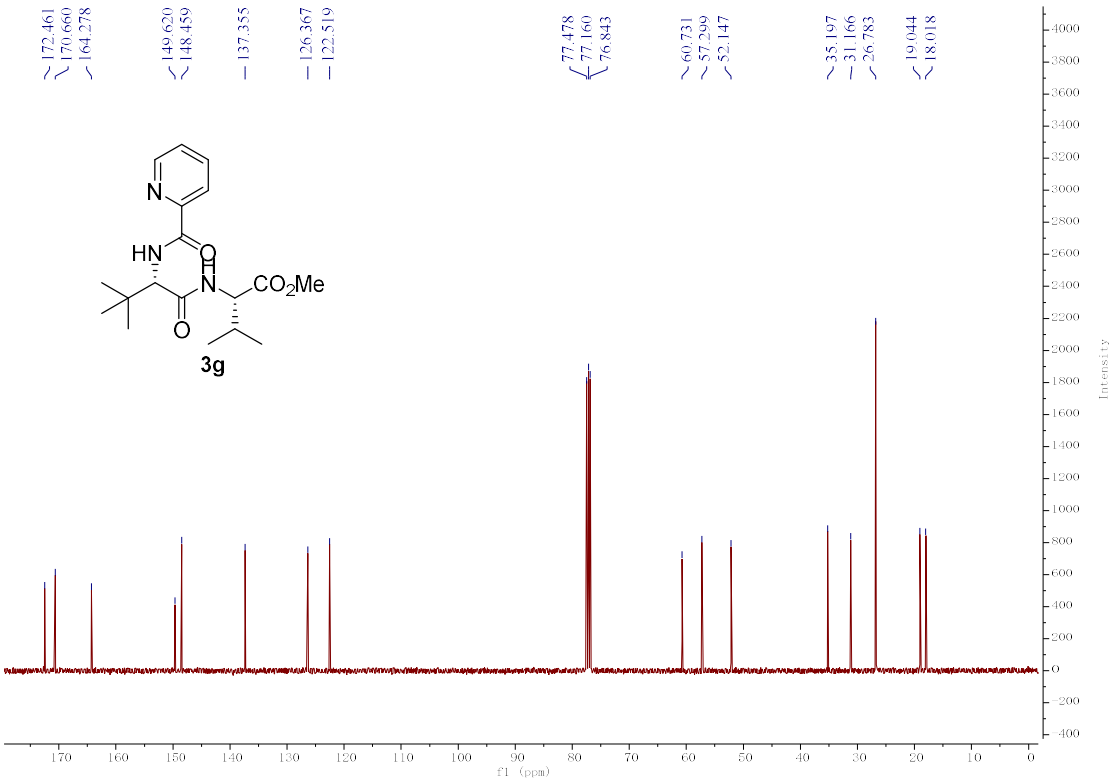

8.587
8.582
8.579
8.578
8.576
8.567
8.566
8.184
8.164
7.861
7.857
7.842
7.837
7.822
7.818
7.444
7.441
7.432
7.429
7.425
7.422
7.413
7.410
7.260
6.681
6.662
4.607
4.594
4.587
4.539
4.522
4.516
4.499
3.722
2.312
2.296
2.279
1.648
1.634
1.620
1.611
1.607
1.601
1.597
1.583
1.556
1.529
1.525
1.043
1.027
1.010
0.863
0.860
0.848
0.845
N
HN
O
N
CO2Me
O
3e
1.97
1.00
0.99
1.01
0.99
1.01
0.99
2.95
1.01
3.08
6.07
6.37
Intensity
f1 (ppm)

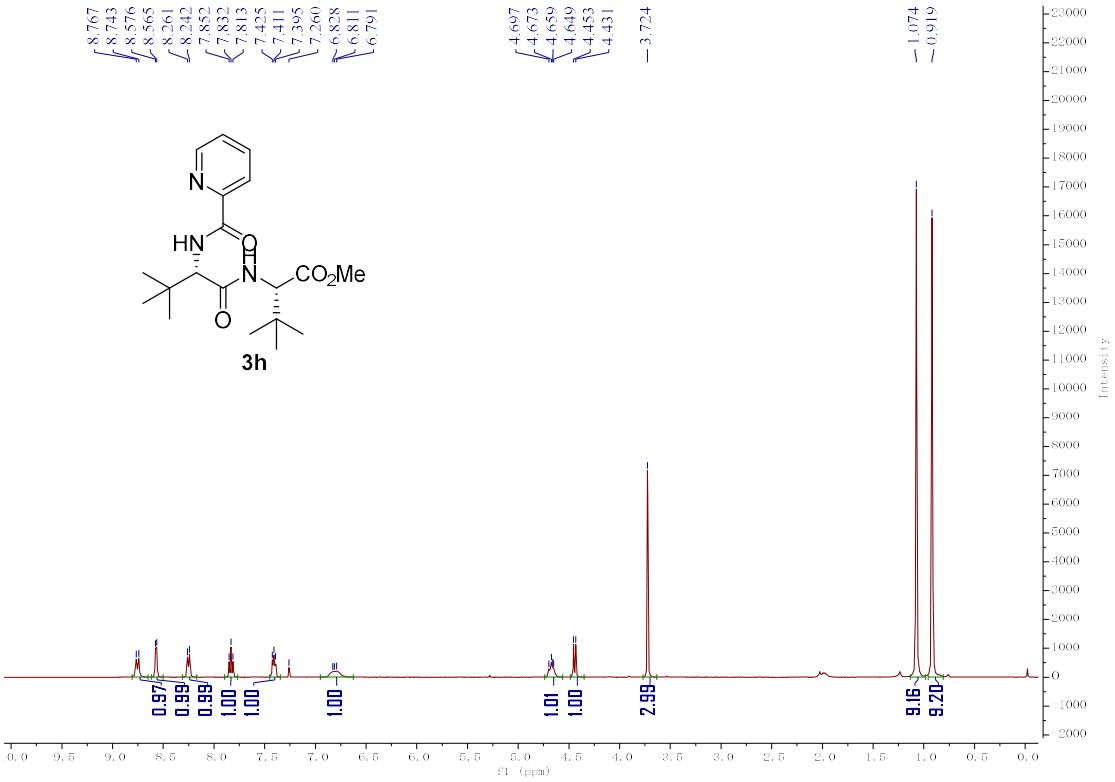

173.376
171.019
164.628
149.515
148.472
137.427
126.495
122.430
77.478
77.160
76.843
58.713
52.359
50.953
41.427
31.299
24.927
22.779
22.030
19.462
18.258
N
HN
O
N
CO2Me
O
3e
Intensity
f1 (ppm)

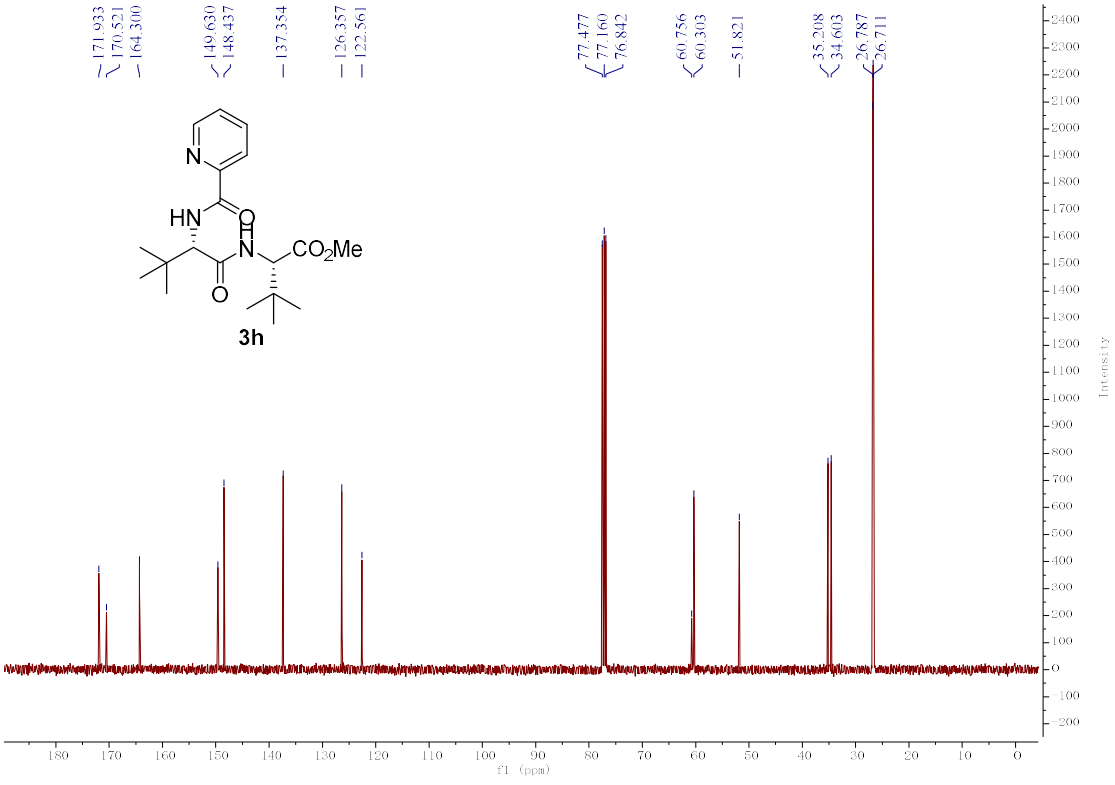

3f
2.04
0.96
1.06
1.00
0.94
1.91
2.93
1.00
6.36
11.36
f1 (ppm)
Intensity

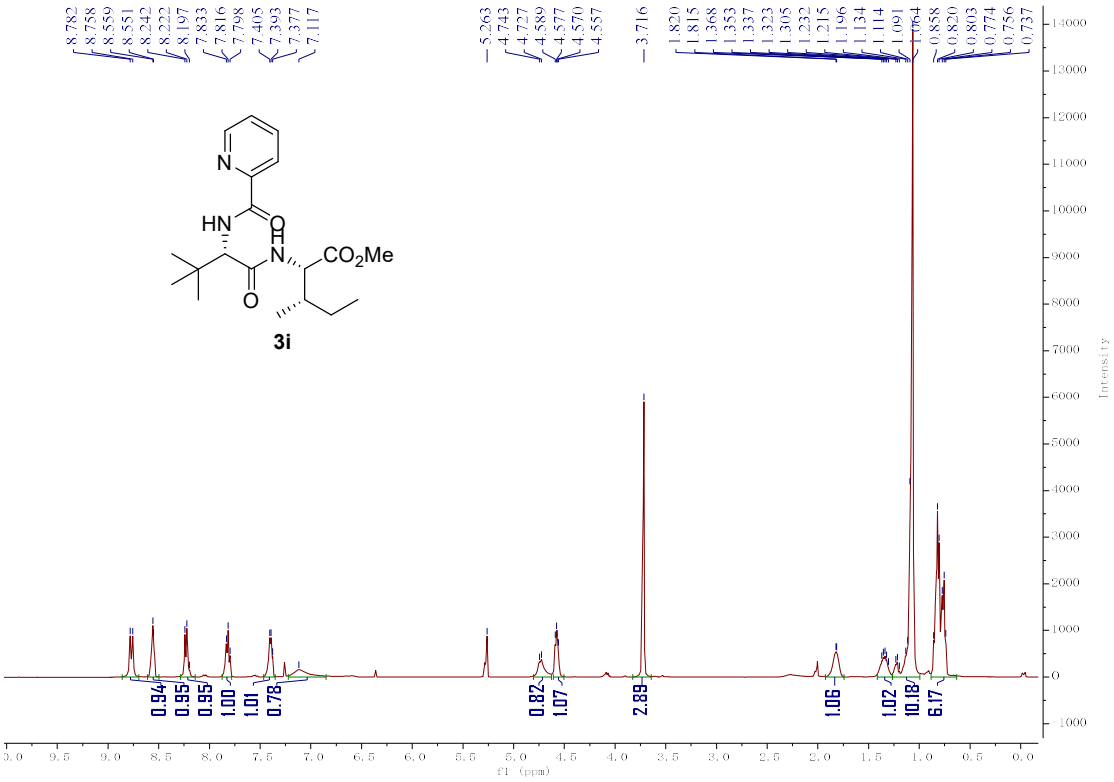

3f
2.04
0.96
1.06
1.00
0.94
1.91
2.93
1.00
6.36
11.36
f1 (ppm)
Intensity

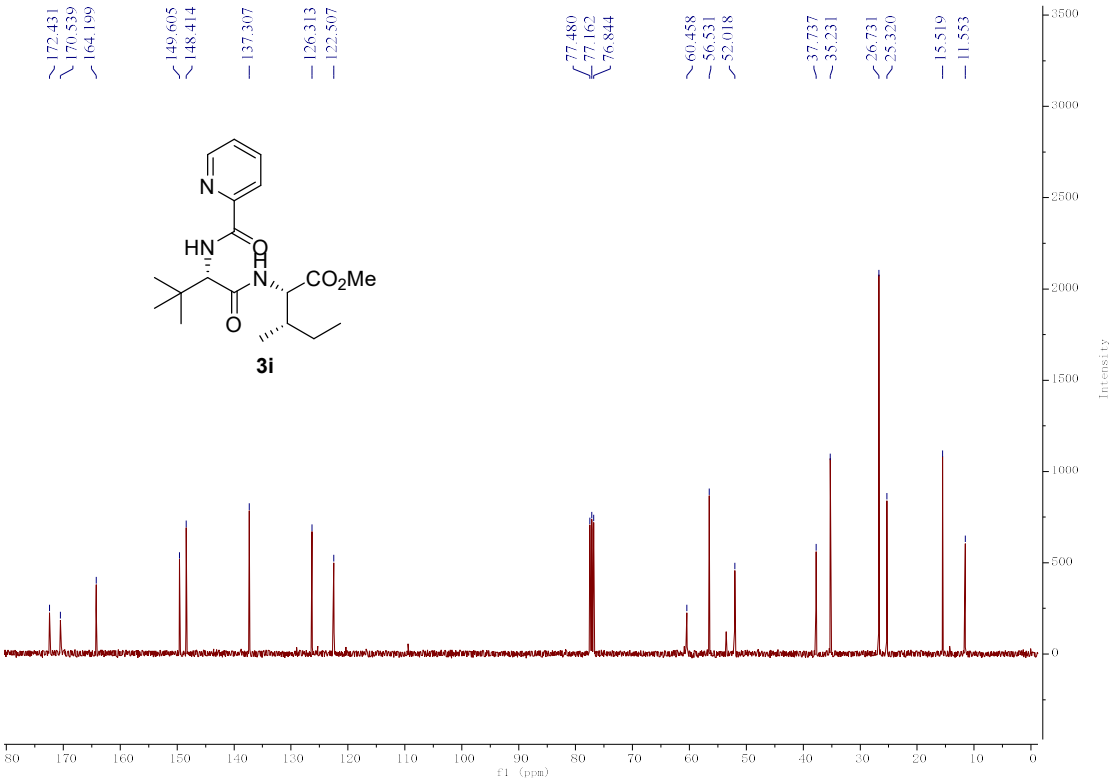

8.783
8.759
8.578
8.567
8.240
8.221
7.849
7.830
7.811
7.425
7.411
7.395
7.262
6.942
6.921
4.702
4.678
4.560
4.546
4.540
4.527
3.738
2.160
2.144
2.127
2.111
2.094
2.078
1.088
0.873
0.856
0.845
0.827
N
HN
O
N
CO2Me
O
3g
0.99
0.98
0.99
1.00
1.00
0.98
1.00
1.01
3.00
1.04
8.97
6.11
f1 (ppm)
Intensity

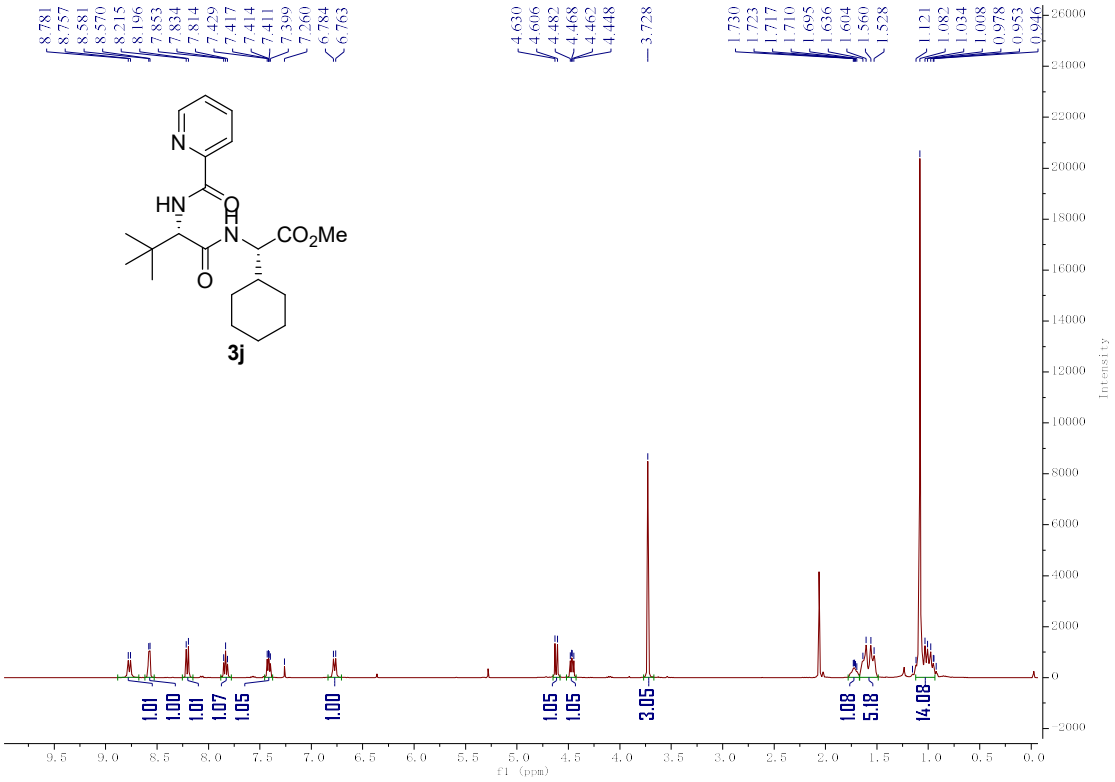

172.461
170.660
164.278
149.620
148.459
137.355
126.367
122.519
77.478
77.160
76.843
60.731
57.299
52.147
35.197
31.166
26.783
19.044
18.018
N
HN
O
N
CO2Me
O
3g
f1 (ppm)
Intensity

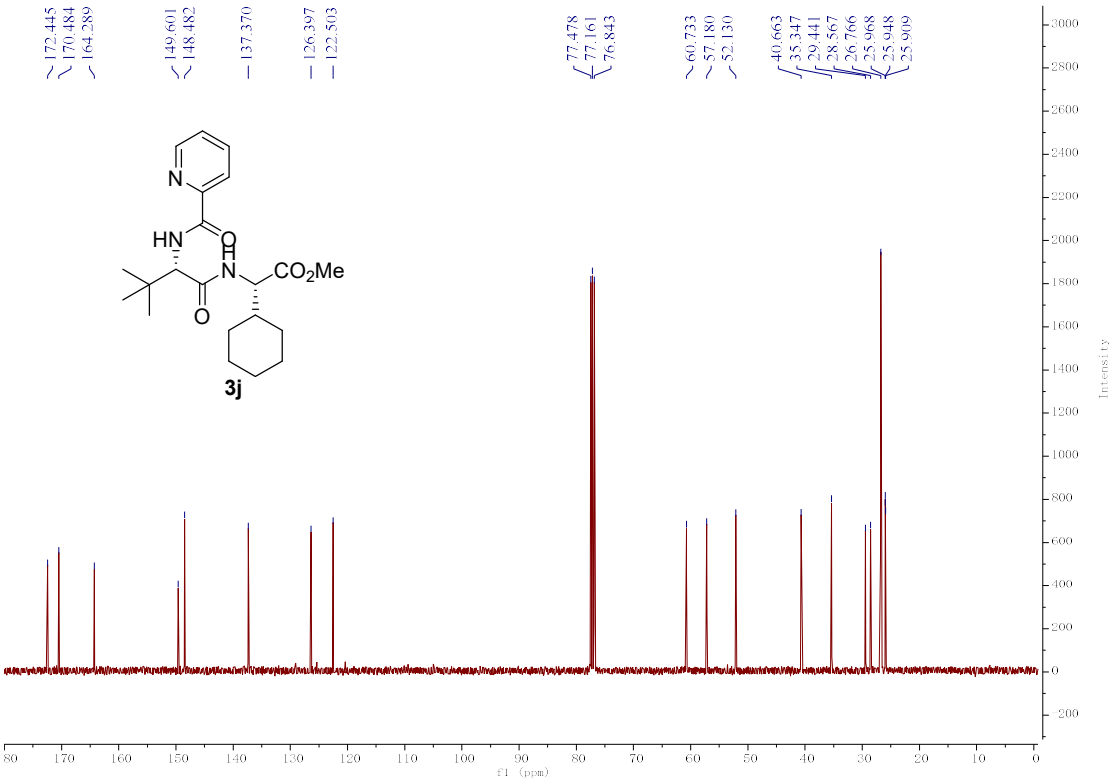

8.767
8.743
8.576
8.565
8.261
8.242
7.852
7.832
7.813
7.425
7.411
7.395
7.260
6.828
6.811
6.791
4.697
4.673
4.659
4.649
4.453
4.431
3.724
1.074
0.919
0.97
0.99
0.99
1.00
1.00
1.00
1.01
1.00
2.99
9.16
9.20
3h
f1 (ppm)
Intensity

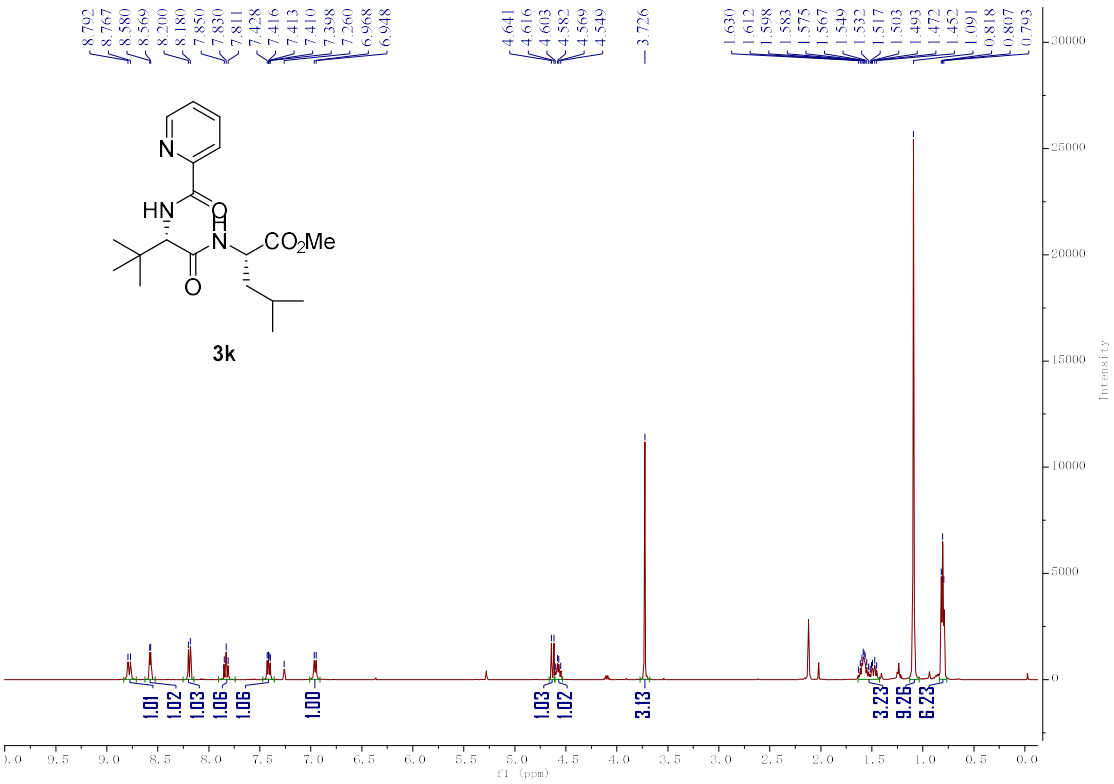

171.933
170.521
164.300
149.630
148.437
137.354
126.357
122.561
77.477
77.160
76.842
60.756
60.303
51.821
35.208
34.603
26.787
26.711
3h
f1 (ppm)
Intensity

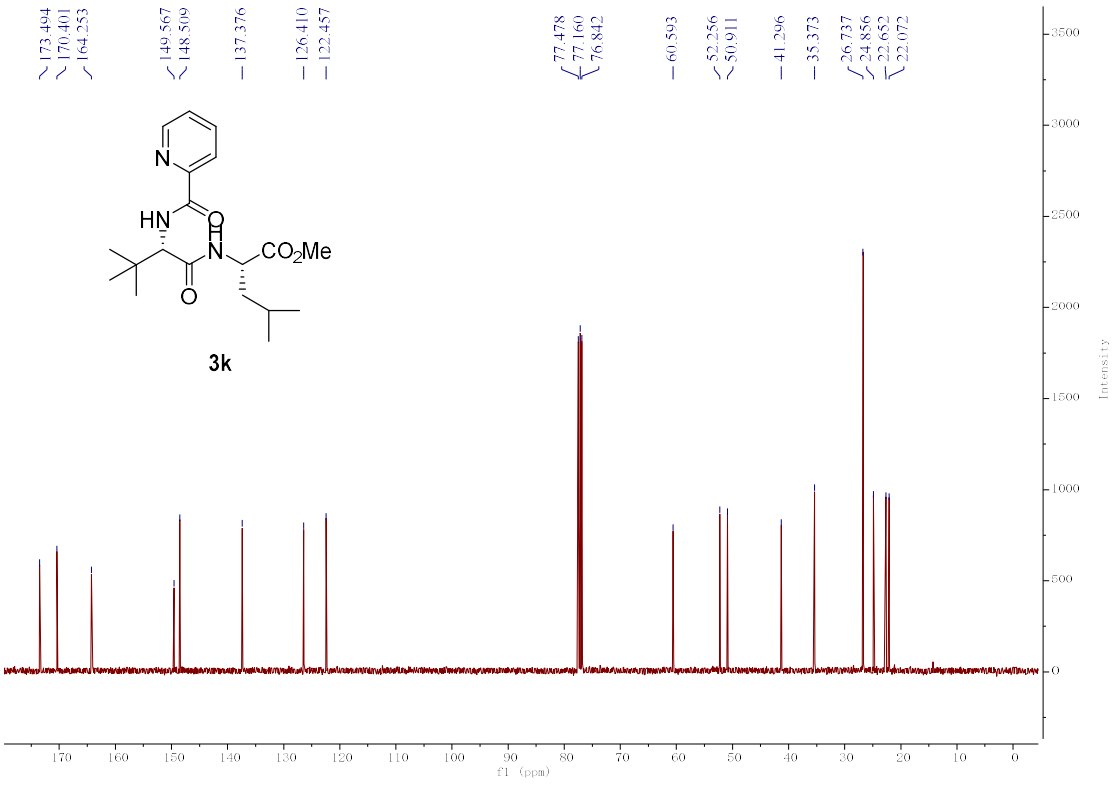

8.782
8.758
8.559
8.551
8.242
8.222
8.197
7.833
7.816
7.798
7.405
7.393
7.377
7.117
5.263
4.743
4.727
4.589
4.577
4.570
4.557
3.716
1.820
1.815
1.368
1.353
1.337
1.323
1.305
1.232
1.215
1.196
1.134
1.114
1.091
1.064
0.858
0.820
0.803
0.774
0.756
0.737
N
HN
O
N
CO2Me
O
3i
0.94
0.95
0.95
1.00
1.01
0.78
0.82
1.07
2.89
1.06
1.02
10.18
6.17
f1 (ppm)
Intensity

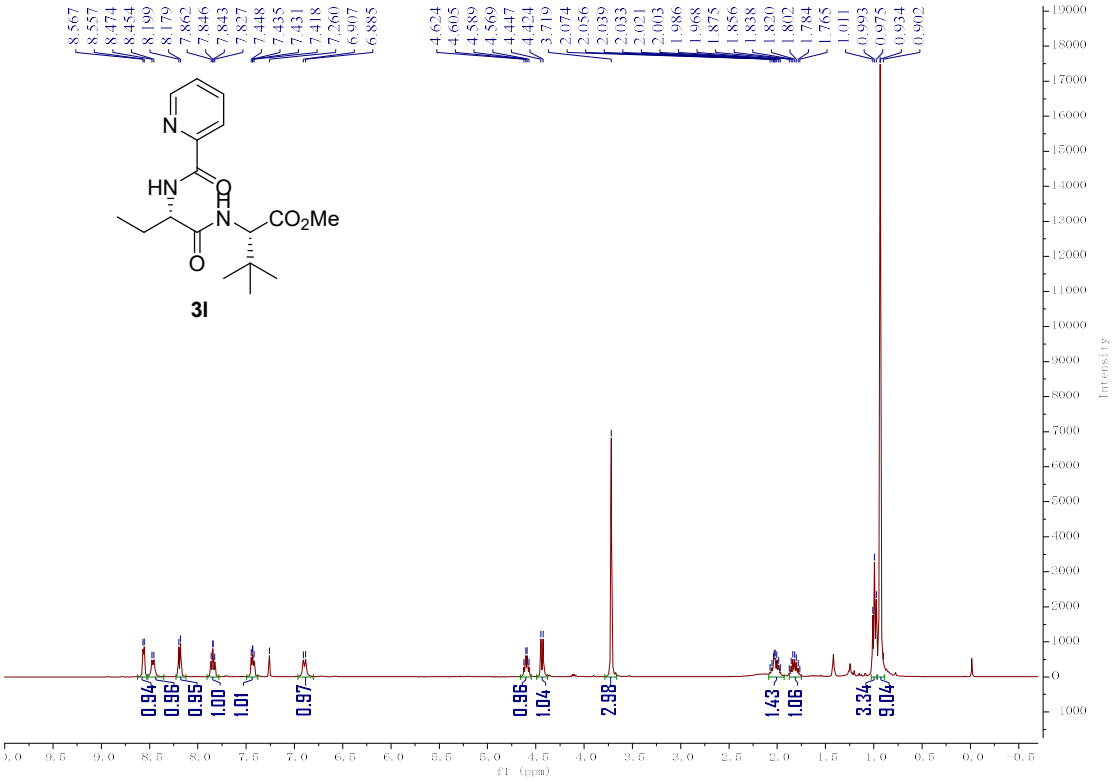

172.431
170.539
164.199
149.605
148.414
137.307
126.313
122.507
77.480
77.162
76.844
60.458
56.531
52.018
37.737
35.231
26.731
25.320
15.519
11.553
N
HN
O
N
CO2Me
O
3i
f1 (ppm)
Intensity

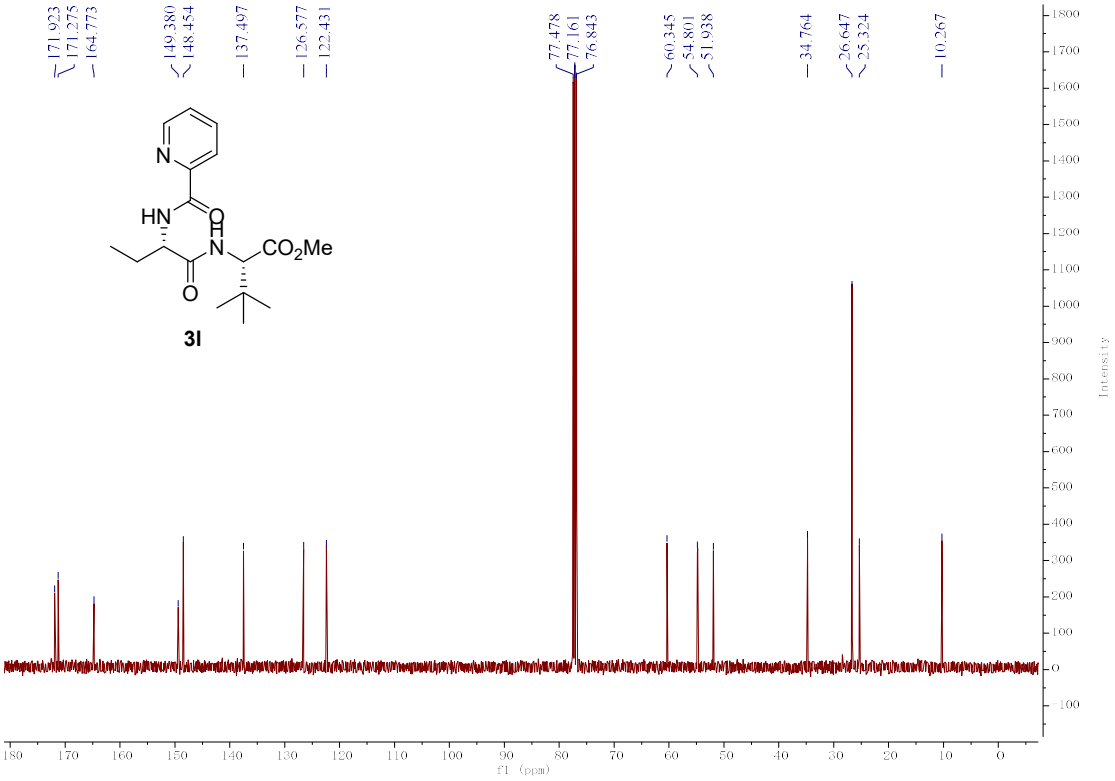

8.781
8.757
8.581
8.570
8.215
8.196
7.853
7.834
7.814
7.429
7.417
7.414
7.411
7.399
7.260
6.784
6.763
4.630
4.606
4.482
4.468
4.462
4.448
3.728
1.730
1.723
1.717
1.710
1.695
1.636
1.604
1.560
1.528
1.121
1.082
1.034
1.008
0.978
0.953
0.946
1.01
1.00
1.01
1.07
1.05
1.00
1.05
1.05
3.05
1.08
5.18
14.08
f1 (ppm)
Intensity
3j

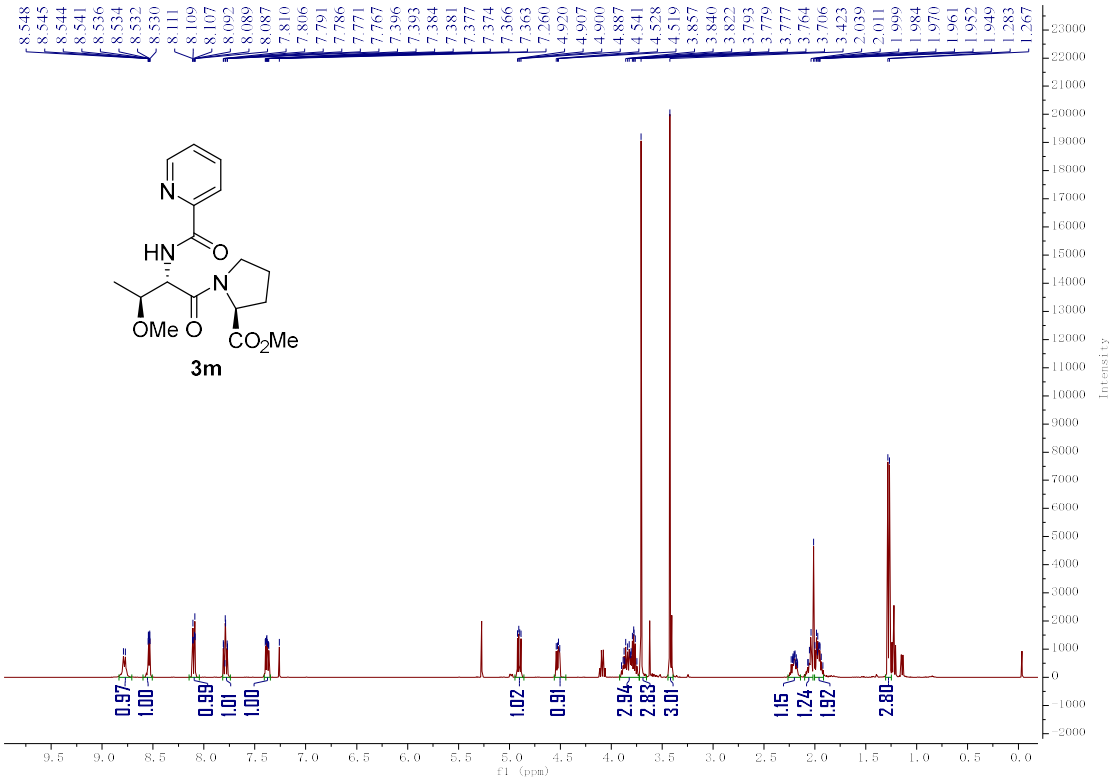

172.445
170.484
164.289
149.601
148.482
137.370
126.397
122.503
77.478
77.161
76.843
60.733
57.180
52.130
40.663
35.347
29.441
28.567
26.766
25.968
25.948
25.909
f1 (ppm)
Intensity
3j

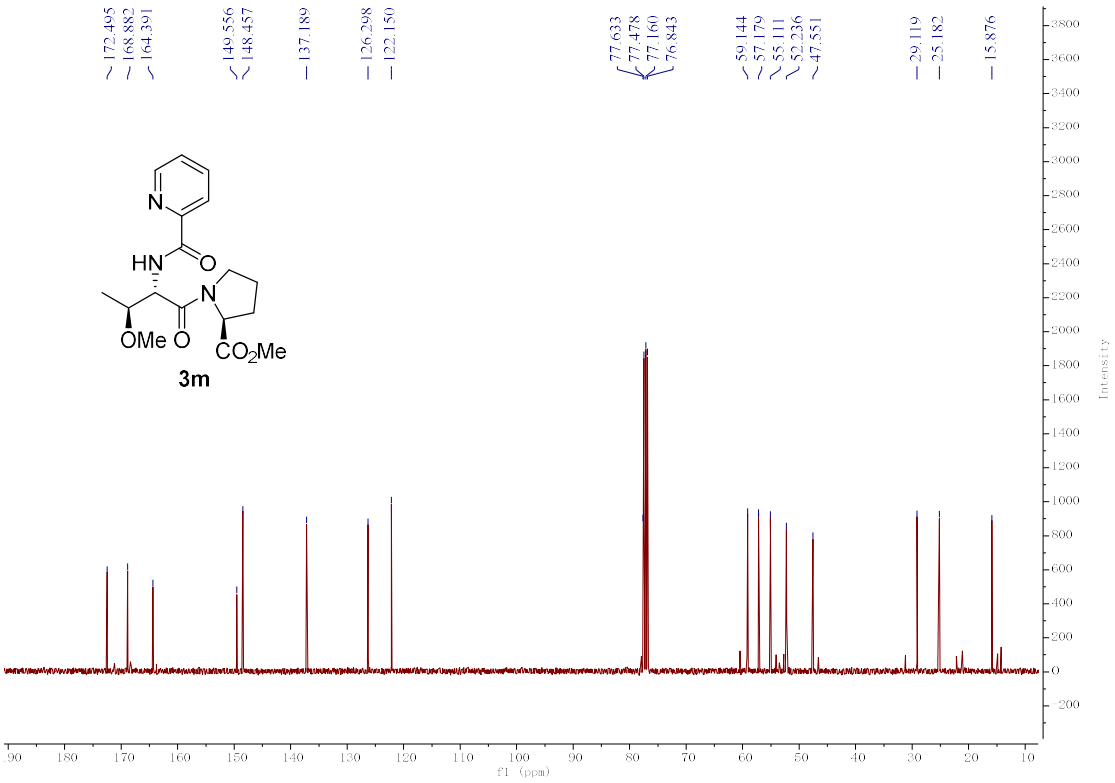

8.792
8.767
8.580
8.569
8.200
8.180
7.850
7.830
7.811
7.428
7.416
7.413
7.410
7.398
7.260
6.968
6.948
4.641
4.616
4.603
4.582
4.569
4.549
3.726
1.630
1.612
1.598
1.583
1.575
1.567
1.549
1.532
1.517
1.503
1.493
1.472
1.452
1.091
0.818
0.807
0.793
HN
O
N
CO2Me
O
3k
1.01
1.02
1.03
1.06
1.06
1.00
1.03
1.02
3.13
3.23
9.26
6.23
Intensity
f1 (ppm)

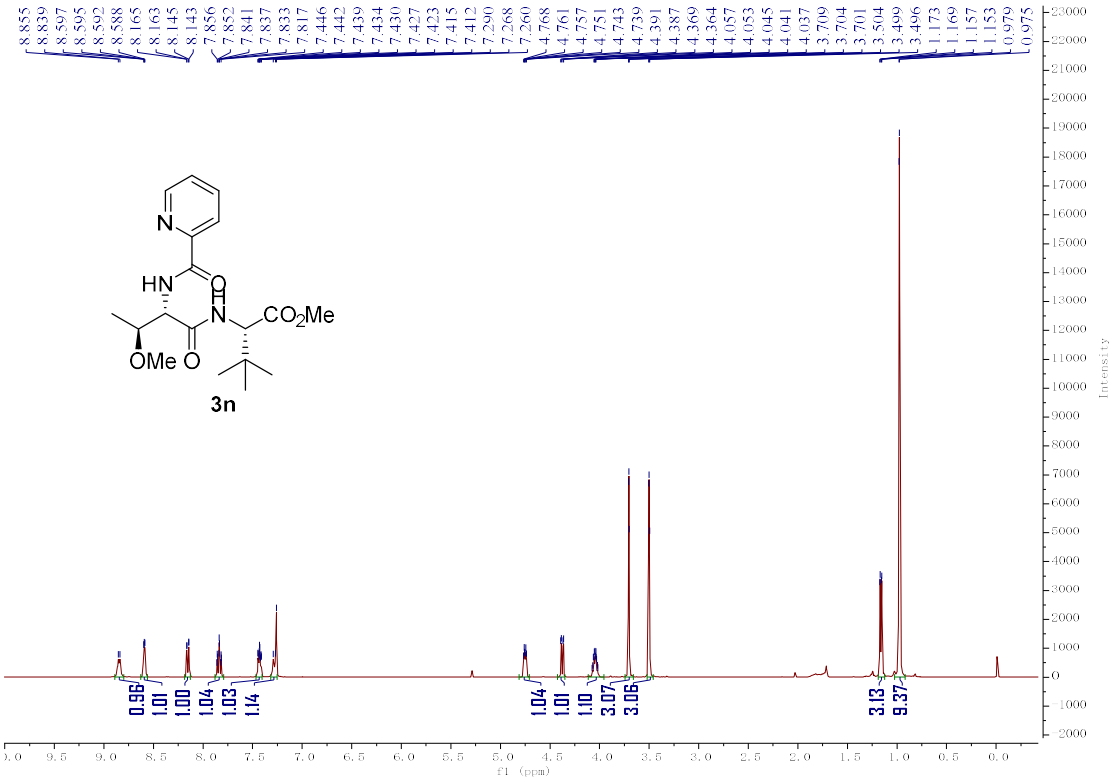

173.494
170.401
164.253
149.567
148.509
137.376
126.410
122.457
77.478
77.160
76.842
60.593
52.256
50.911
41.296
35.373
26.737
24.856
22.652
22.072
HN
O
N
CO2Me
O
3k
Intensity
f1 (ppm)

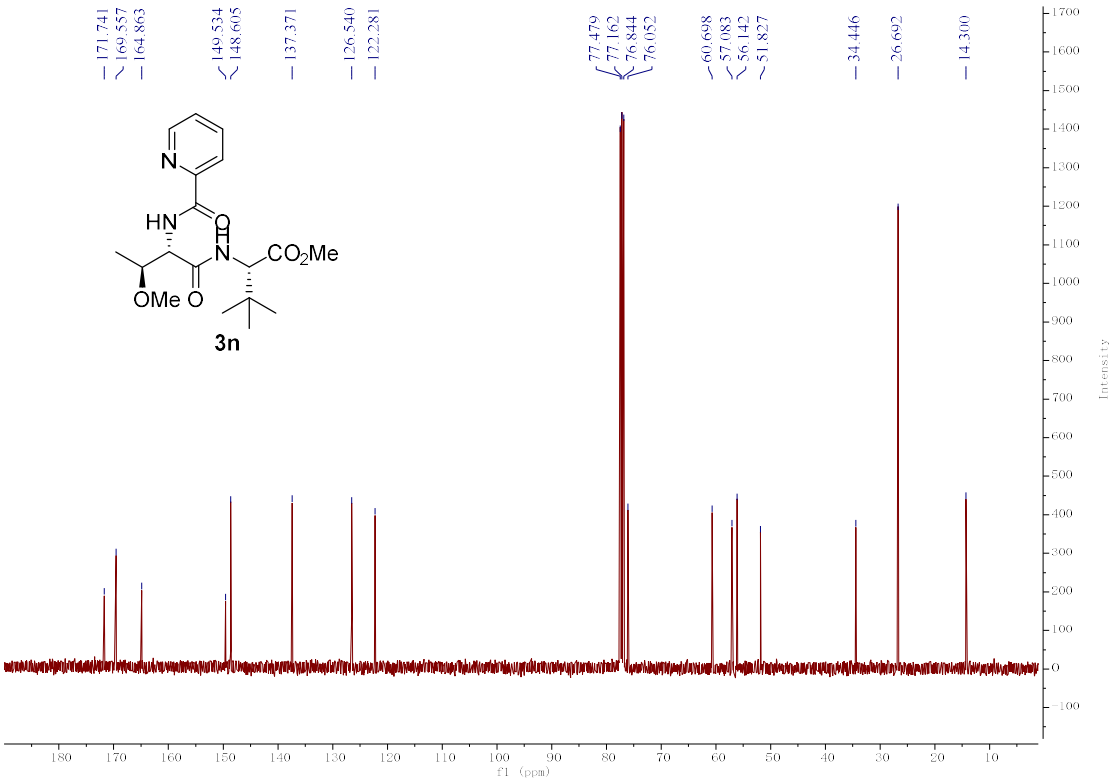

8.567
8.557
8.474
8.454
8.199
8.179
7.862
7.846
7.843
7.827
7.448
7.435
7.431
7.418
7.260
6.907
6.885
4.624
4.605
4.589
4.569
4.447
4.424
3.719
2.074
2.056
2.039
2.033
2.021
2.003
1.986
1.968
1.875
1.856
1.838
1.820
1.802
1.784
1.765
1.011
0.993
0.975
0.934
0.902
N
HN
O
N
H
CO2Me
O
3l
0.94
0.96
0.95
1.00
1.01
0.97
0.96
1.04
2.98
1.43
1.06
3.34
9.04
f1 (ppm)
Intensity

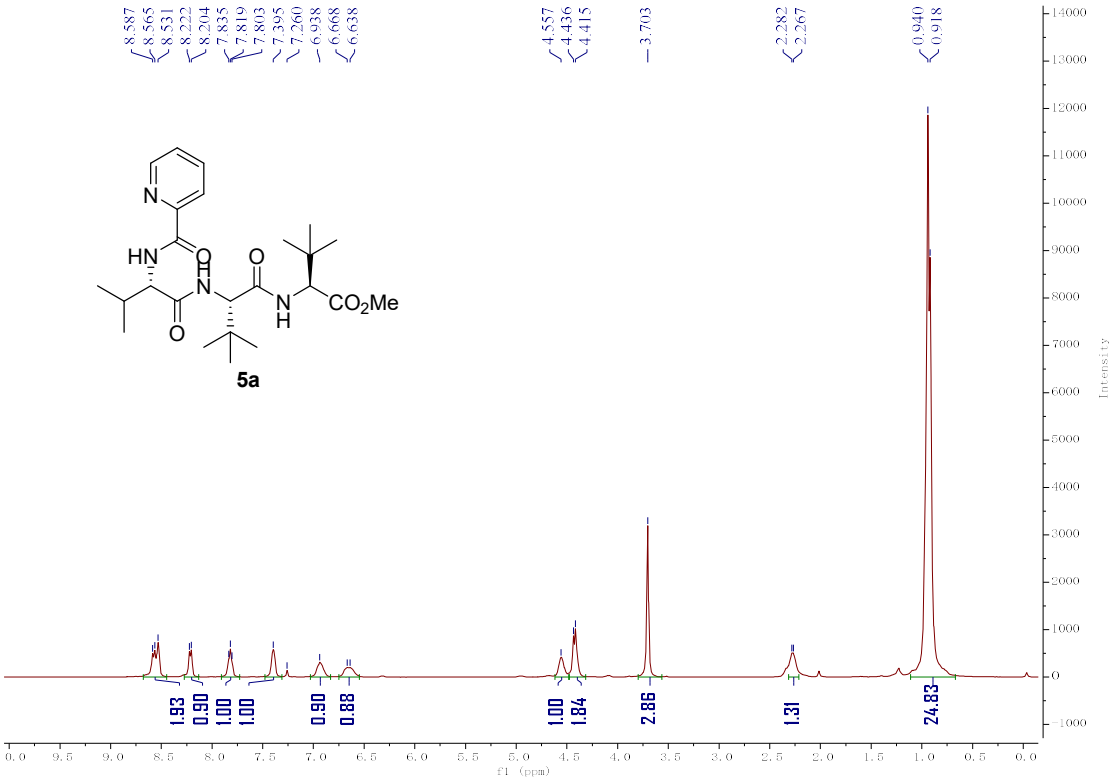

171.923
171.275
164.773
149.380
148.454
137.497
126.577
122.431
77.478
77.161
76.843
60.345
54.801
51.938
34.764
26.647
25.324
10.267
N
HN
O
N
H
CO2Me
O
3l
f1 (ppm)
Intensity

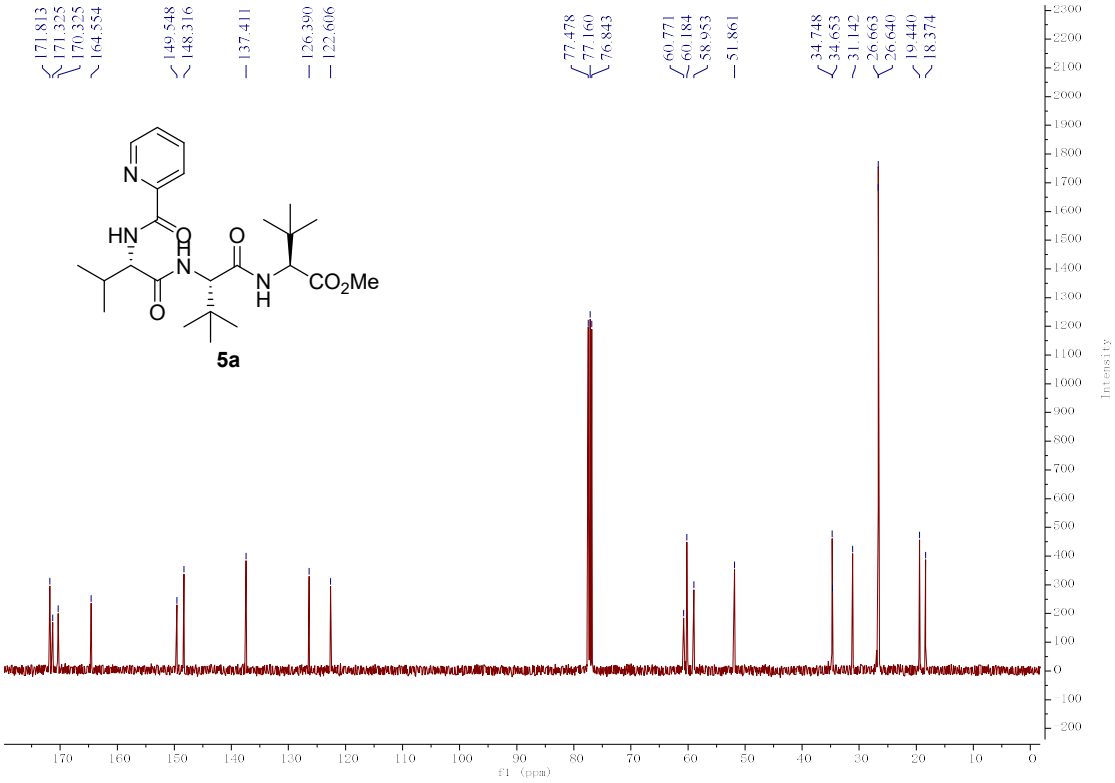

8.548
8.545
8.544
8.541
8.536
8.534
8.532
8.530
8.111
8.109
8.107
8.092
8.089
8.087
7.810
7.806
7.791
7.786
7.771
7.767
7.396
7.393
7.384
7.381
7.377
7.374
7.366
7.363
7.260
4.920
4.907
4.900
4.887
4.541
4.528
4.519
3.857
3.840
3.822
3.793
3.779
3.777
3.764
3.706
3.423
2.039
2.011
1.999
1.984
1.970
1.961
1.952
1.949
1.283
1.267
N
HN
O
N
OMe O
CO2Me
3m
0.97
1.00
0.99
1.01
1.00
1.02
0.91
2.94
2.83
3.01
1.15
1.24
1.92
2.80
f1 (ppm)
Intensity

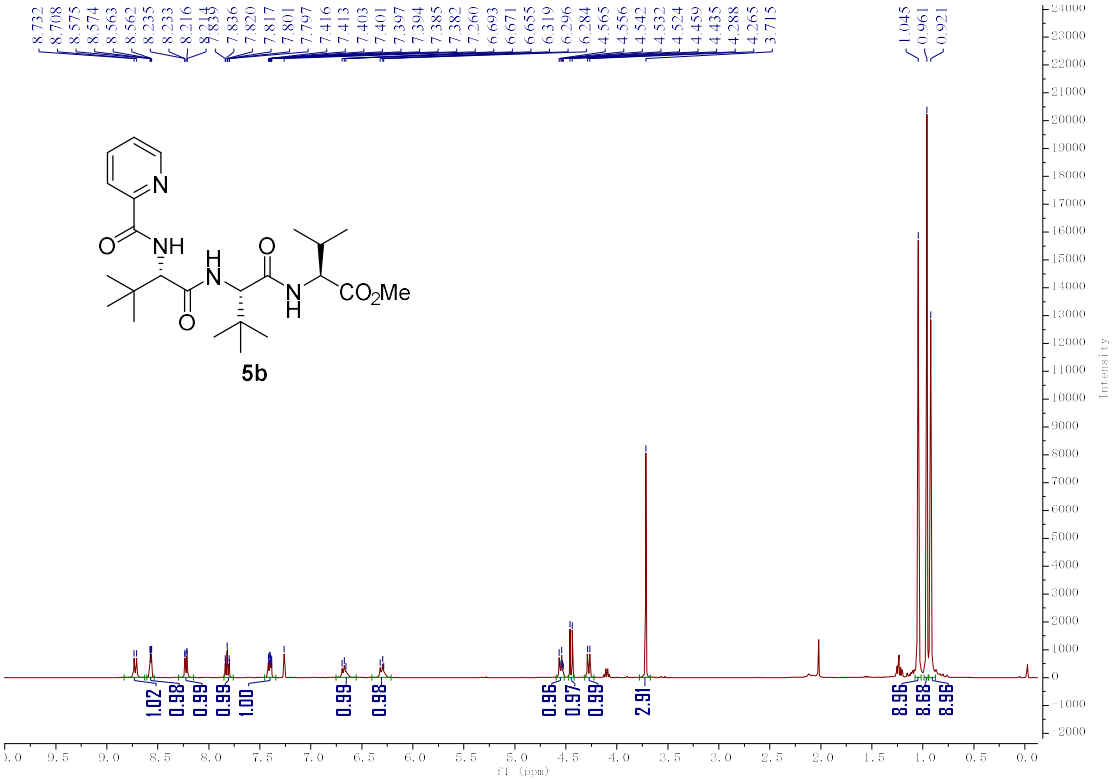

172.495
168.882
164.391
149.556
148.457
137.189
126.298
122.150
77.633
77.478
77.160
76.843
59.144
57.179
55.111
52.236
47.551
29.119
25.182
15.876
N
HN
O
N
OMe O
CO2Me
3m
f1 (ppm)
Intensity

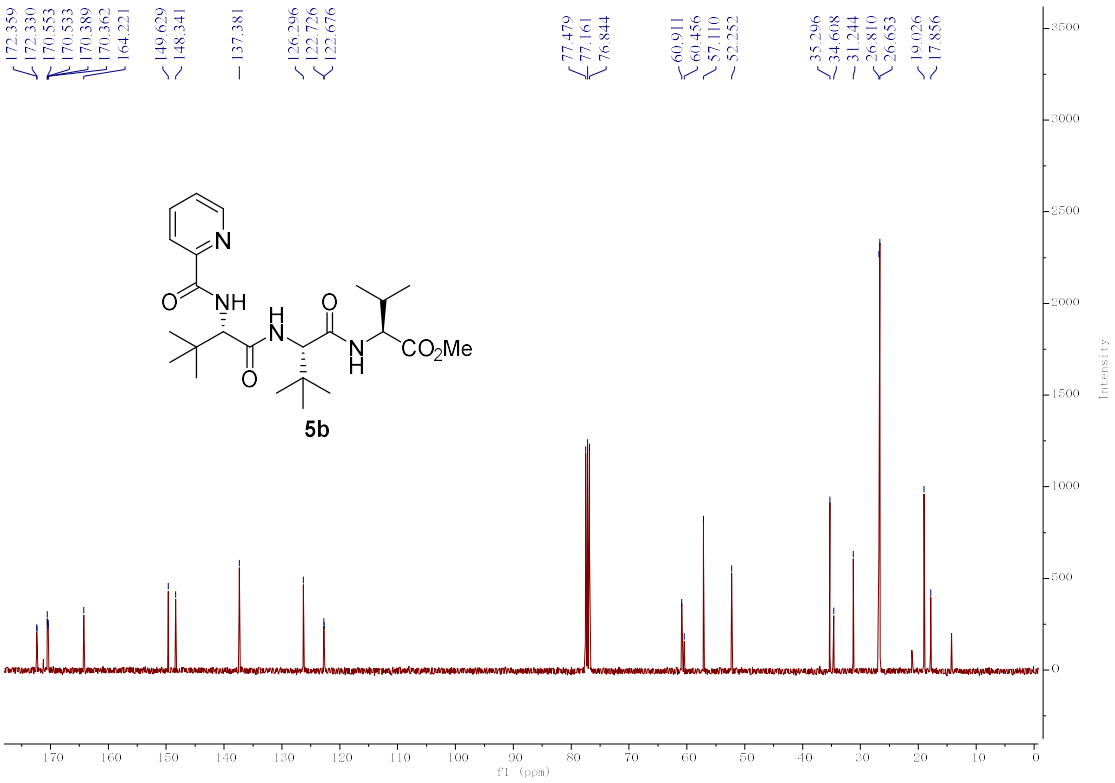

8.855
8.839
8.597
8.595
8.592
8.588
8.165
8.163
8.145
8.143
7.856
7.852
7.841
7.837
7.833
7.817
7.446
7.442
7.439
7.434
7.430
7.427
7.423
7.415
7.412
7.290
7.268
7.260
4.768
4.761
4.757
4.751
4.743
4.739
4.391
4.387
4.369
4.364
4.057
4.053
4.045
4.041
4.037
3.709
3.704
3.701
3.504
3.499
3.496
1.173
1.169
1.157
1.153
0.979
0.975
N
HN
O
N
CO2Me
OMe O
3n
0.98
1.01
1.00
1.04
1.03
1.14
1.04
1.01
1.10
3.07
3.06
3.13
9.37
f1 (ppm)
Intensity

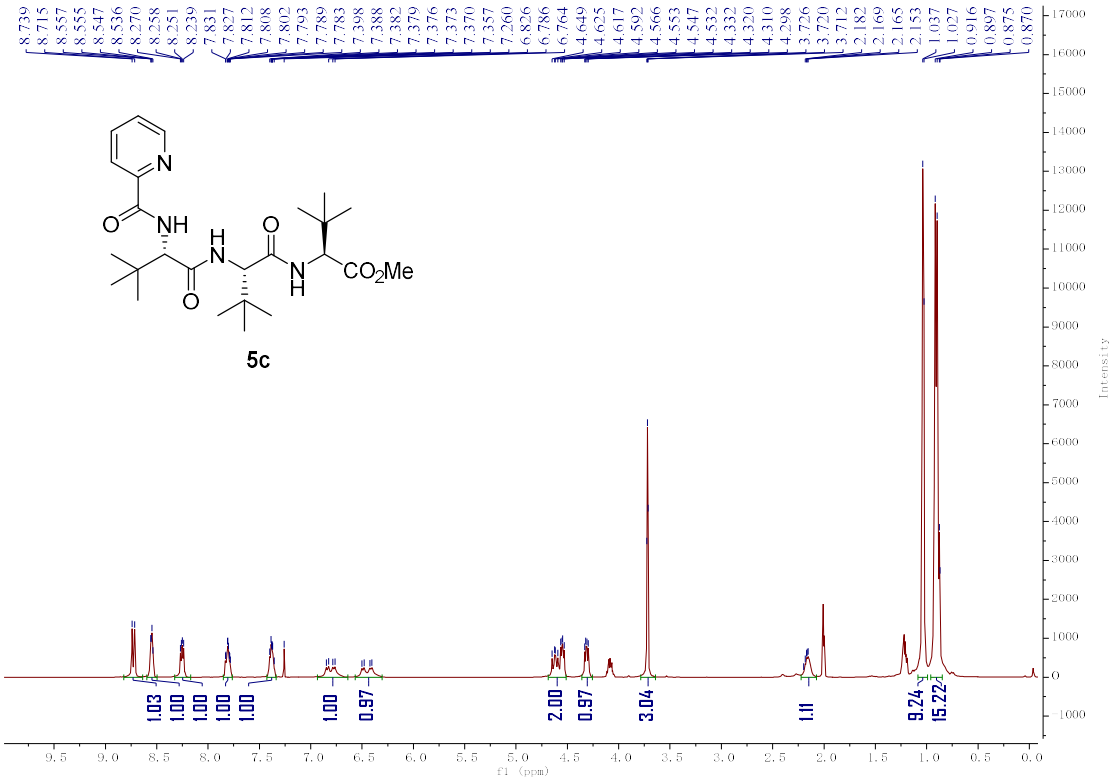

171.741
169.557
164.863
149.534
148.605
137.371
126.540
122.281
77.479
77.162
76.844
76.052
60.698
57.083
56.142
51.827
34.446
26.692
14.300
N
HN
O
N
CO2Me
OMe O
3n
f1 (ppm)
Intensity

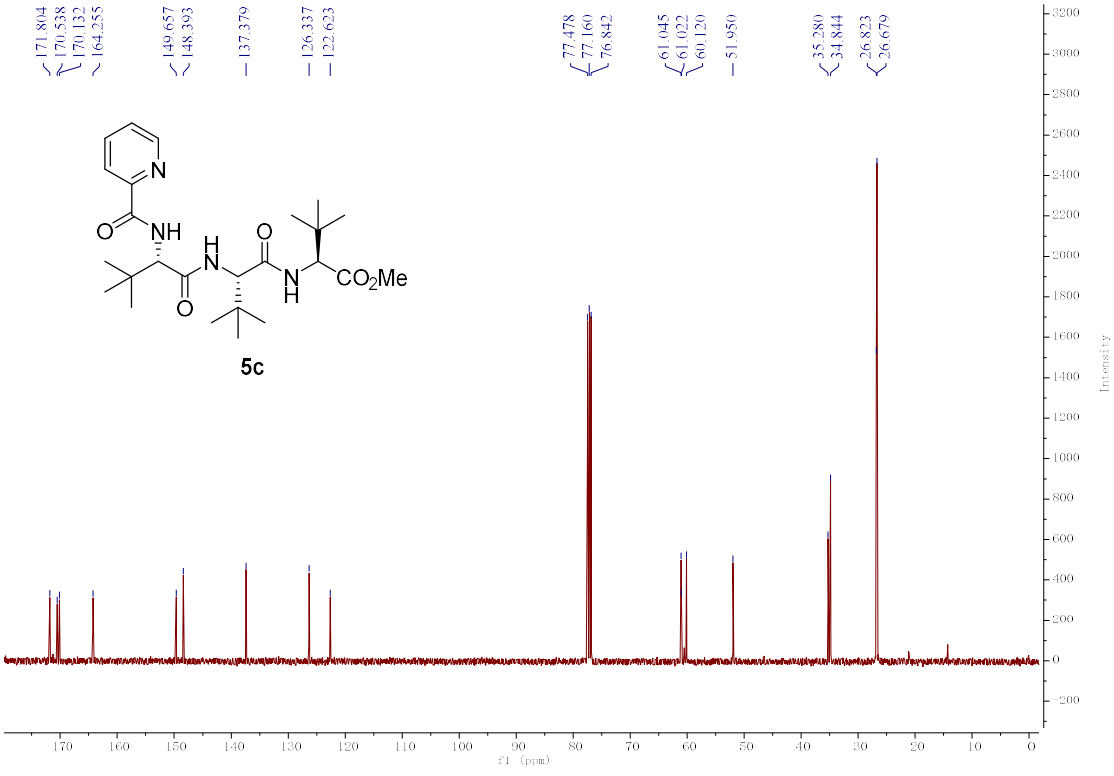

8.587
8.565
8.531
8.222
8.204
7.835
7.819
7.803
7.395
7.260
6.938
6.668
6.638
4.557
4.436
4.415
3.703
2.282
2.267
0.940
0.918
1.83
0.90
1.00
1.00
0.90
0.88
1.00
1.84
2.86
1.31
24.83
5a
f1 (ppm)
Intensity

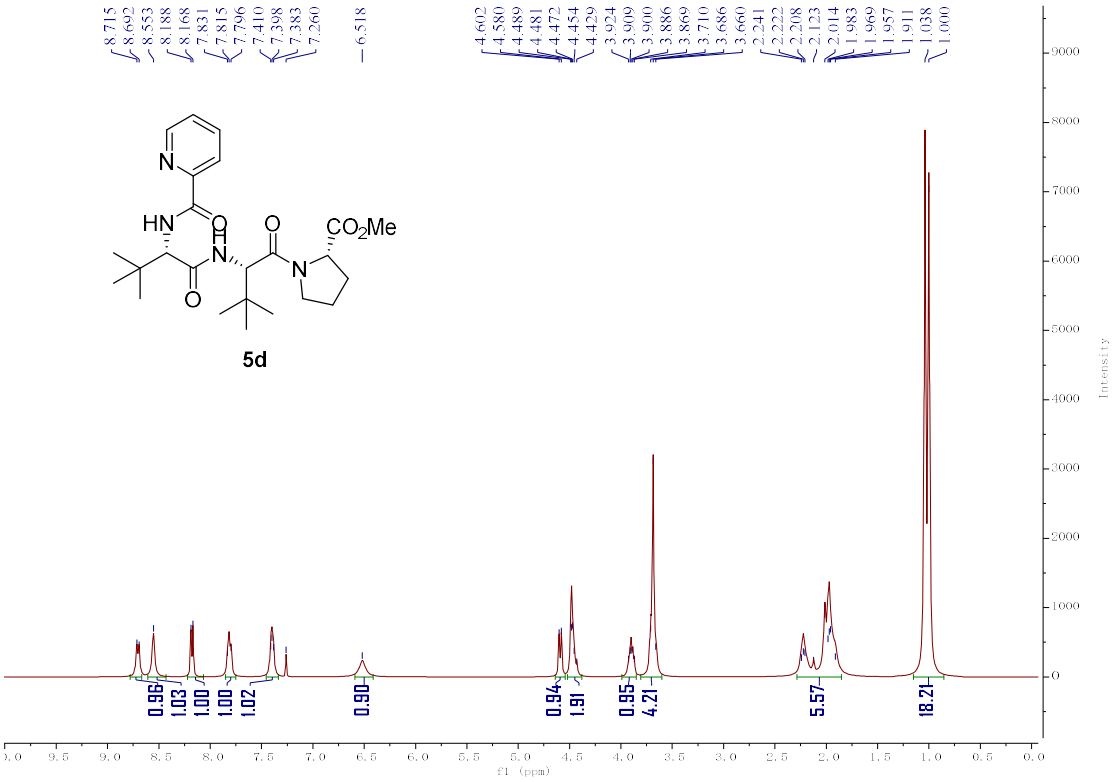

171.813
171.325
170.325
164.554
149.548
148.316
137.411
126.390
122.606
77.478
77.160
76.843
60.771
60.184
58.953
51.861
34.748
34.653
31.142
26.663
26.640
19.440
18.374
5a
f1 (ppm)
Intensity


8.732
8.708
8.575
8.574
8.563
8.562
8.235
8.233
8.216
8.214
7.839
7.836
7.820
7.817
7.801
7.797
7.416
7.413
7.403
7.401
7.397
7.394
7.385
7.382
7.260
6.693
6.671
6.655
6.319
6.296
6.284
4.565
4.556
4.542
4.532
4.524
4.459
4.435
4.288
4.265
3.715
1.045
0.961
0.921
1.02
0.98
0.99
0.99
1.00
0.99
0.98
0.96
0.97
0.99
2.91
8.96
8.68
8.98
5b
f1 (ppm)
Intensity

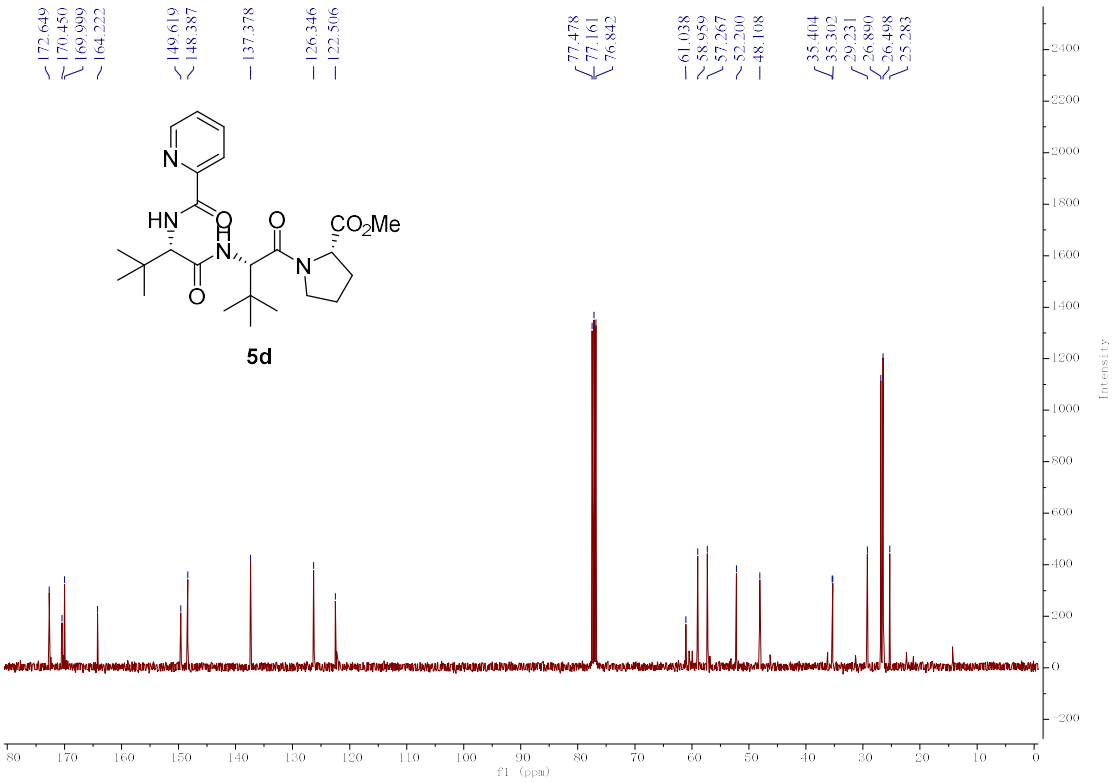

172.359
172.330
170.553
170.533
170.389
170.362
164.221
149.629
148.341
137.381
126.296
122.726
122.676
77.479
77.161
76.844
60.911
60.456
57.110
52.252
35.296
34.608
31.244
26.810
26.653
19.026
17.856
5b
f1 (ppm)
Intensity


8.739
8.715
8.557
8.555
8.547
8.536
8.270
8.258
8.251
8.239
7.831
7.827
7.812
7.808
7.802
7.793
7.789
7.783
7.398
7.388
7.382
7.379
7.376
7.373
7.370
7.357
7.260
6.826
6.786
6.764
4.649
4.625
4.617
4.592
4.566
4.553
4.547
4.532
4.332
4.320
4.310
4.298
3.726
3.720
3.712
2.182
2.169
2.165
2.153
1.037
1.027
0.916
0.897
0.875
0.870
N
O
NH
H
N
O
N
H
O
CO2Me
5c
1.03
1.00
1.00
1.00
1.00
1.00
0.97
2.00
0.97
3.04
1.11
9.24
15.22
f1 (ppm)
Intensity

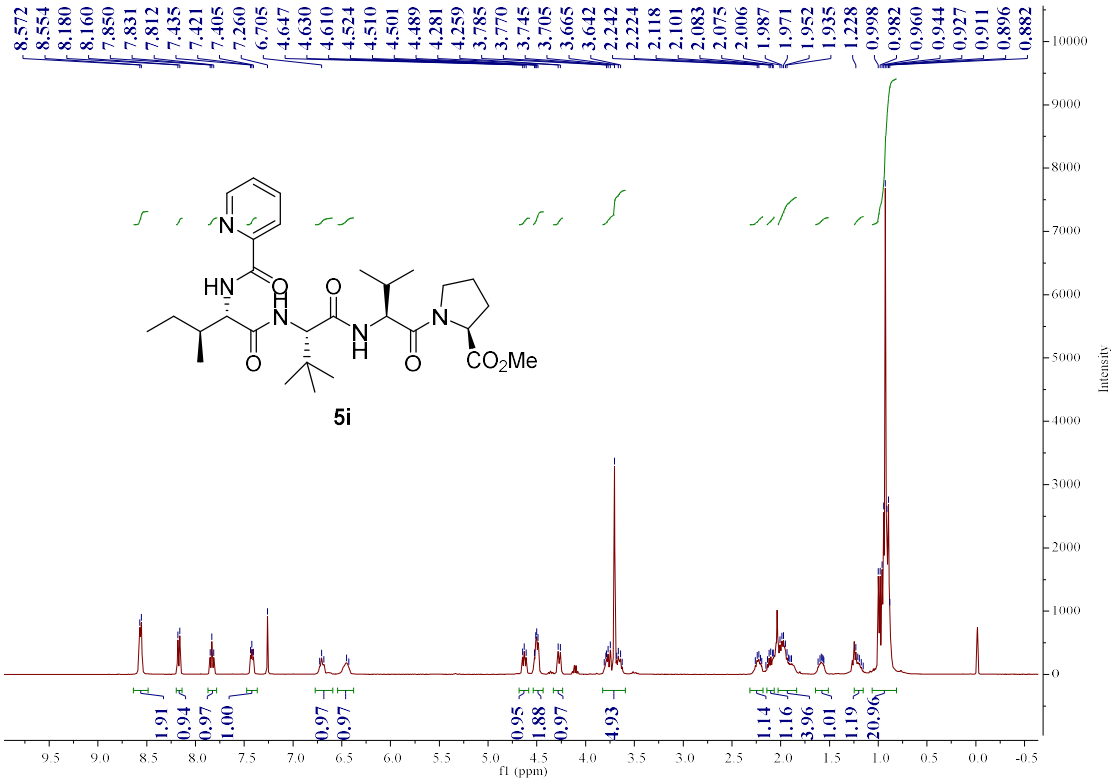

171.804
170.538
170.132
164.255
149.657
148.393
137.379
126.337
122.623
77.478
77.160
76.842
61.045
61.022
60.120
51.950
35.280
34.844
26.823
26.679
N
O
NH
H
N
O
N
H
O
CO2Me
5c
f1 (ppm)
Intensity

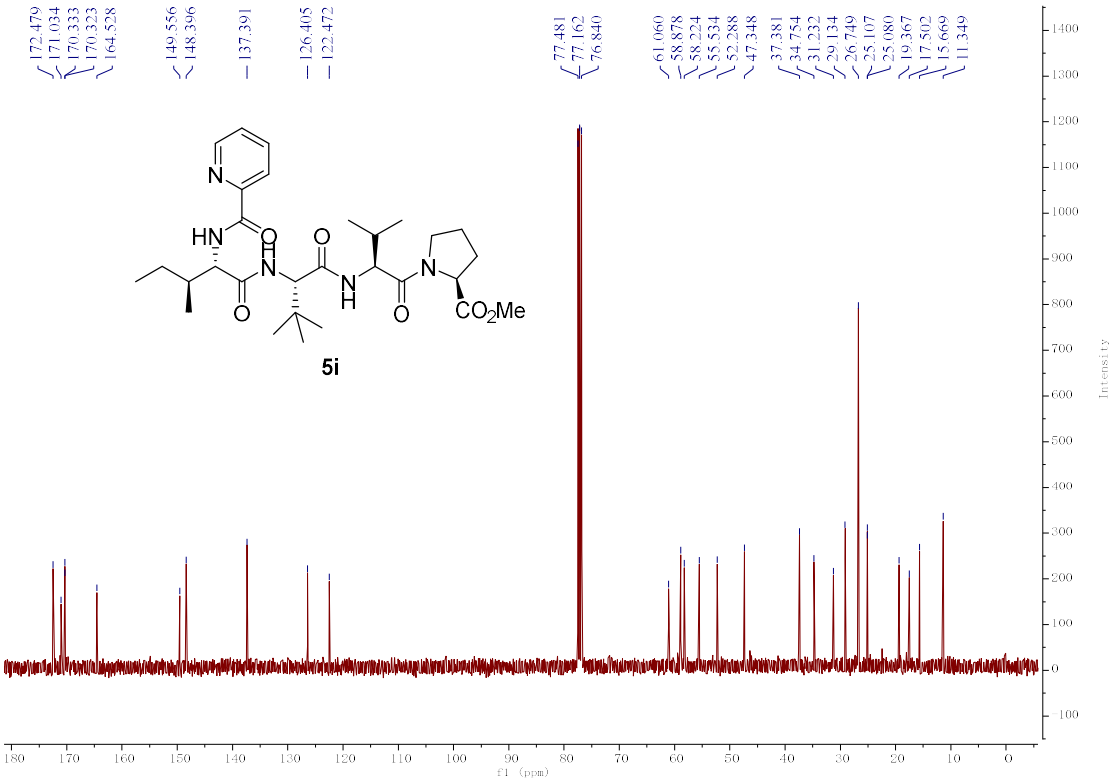

8.715
8.692
8.553
8.188
8.168
7.831
7.815
7.796
7.410
7.398
7.383
7.260
6.518
4.602
4.580
4.489
4.481
4.472
4.454
4.429
3.924
3.909
3.900
3.886
3.869
3.710
3.686
3.660
2.241
2.222
2.208
2.123
2.014
1.983
1.969
1.957
1.911
1.038
1.000
HN
O
N
O
O
N
CO2Me
0.96
1.03
1.00
1.00
1.02
0.90
0.94
1.91
0.95
4.21
5.57
18.21
f1 (ppm)
Intensity

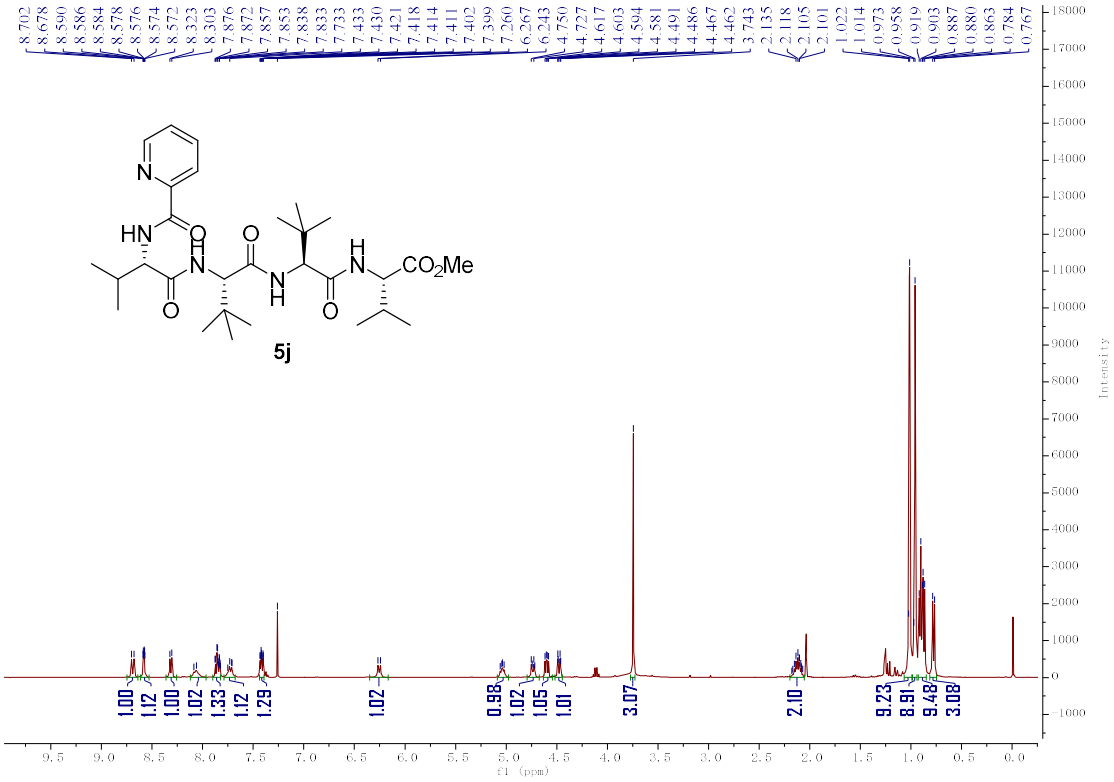
5d

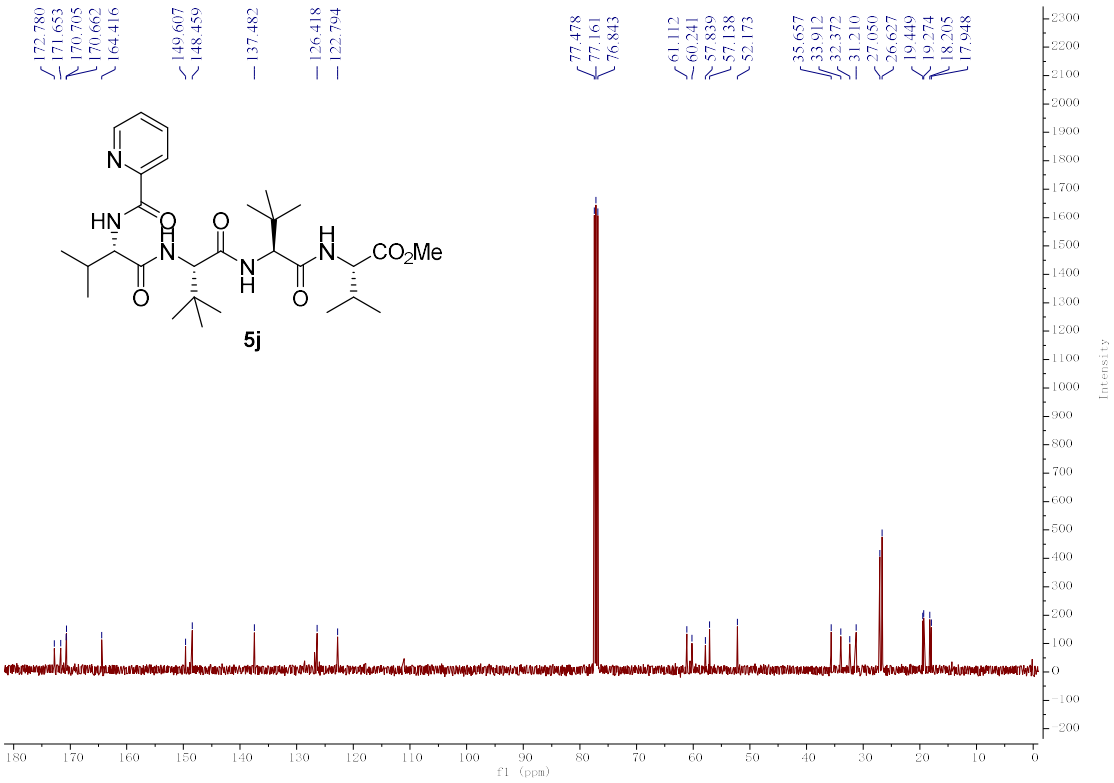

172.649
170.450
169.999
164.222
149.619
148.387
137.378
126.346
122.506
77.478
77.161
76.842
61.038
58.959
57.267
52.200
48.108
35.404
35.302
29.231
26.890
26.498
25.283
HN
O
N
O
O
N
CO2Me
f1 (ppm)
Intensity

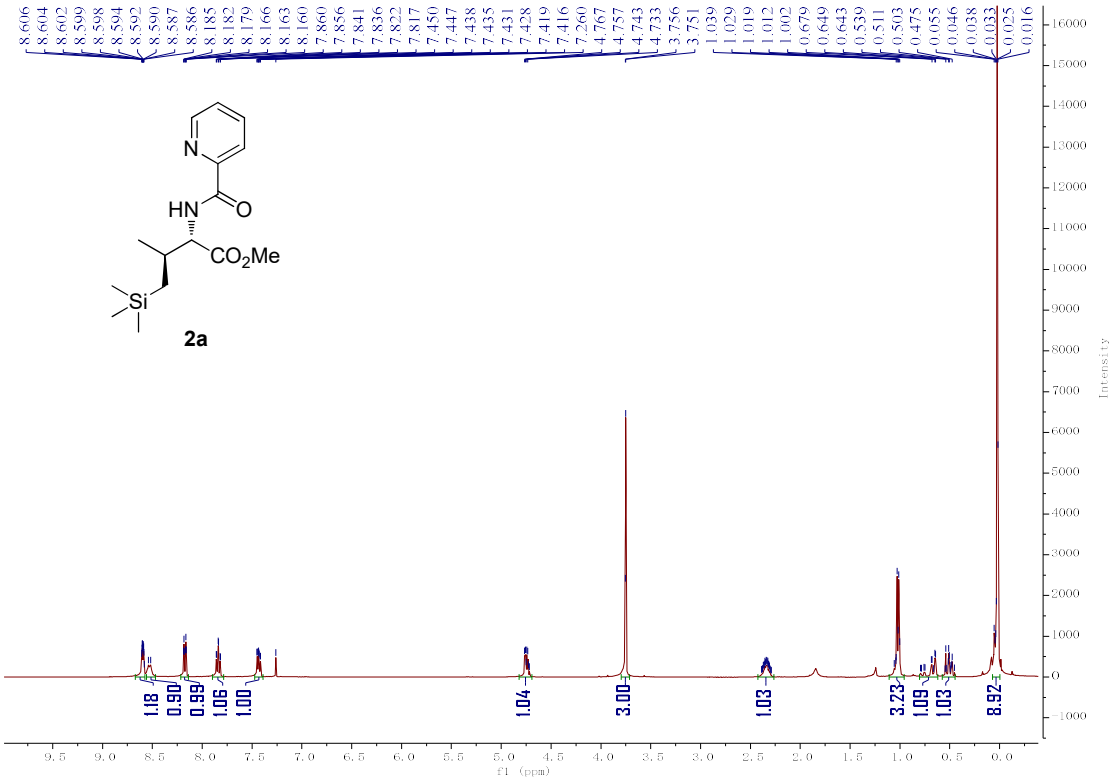
5d

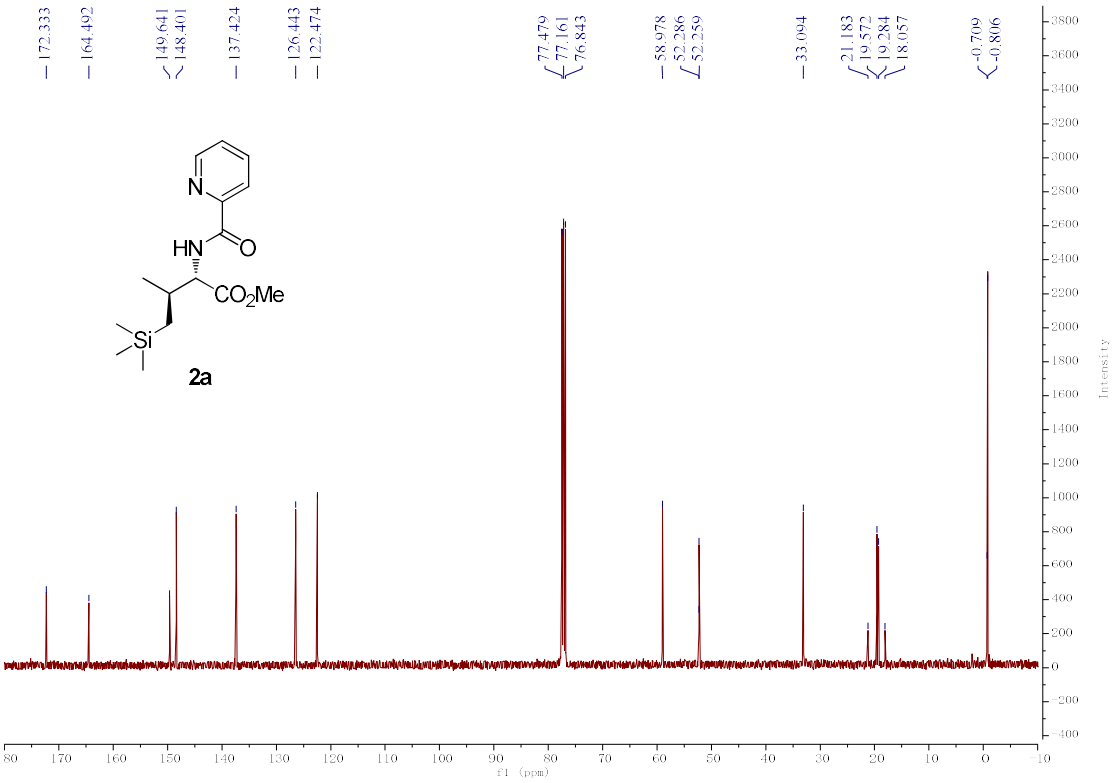

8.572
8.554
8.180
8.160
7.850
7.831
7.812
7.435
7.421
7.405
7.260
6.705
4.647
4.630
4.610
4.524
4.510
4.501
4.489
4.281
4.259
3.785
3.770
3.745
3.705
3.665
3.642
2.242
2.224
2.118
2.101
2.083
2.075
2.006
1.987
1.971
1.952
1.935
1.228
0.998
0.982
0.960
0.944
0.927
0.911
0.896
0.882
HN
O
N
O
N
H
O
N
O
CO2Me
5i
1.91
0.94
0.97
1.00
0.97
0.97
0.95
1.88
0.97
4.93
1.14
1.16
3.96
1.01
1.19
20.96
f1 (ppm)
Intensity

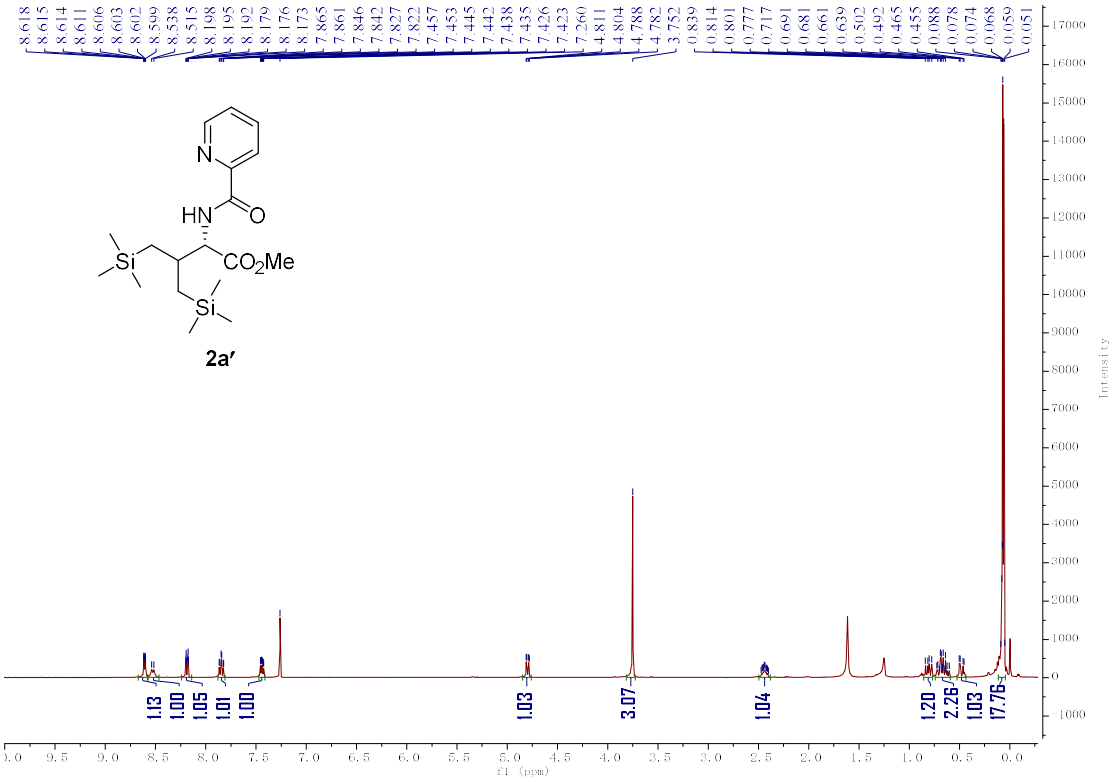

172.479
171.034
170.333
170.323
164.528
149.556
148.396
137.391
126.405
122.472
77.481
77.162
76.840
61.060
58.878
58.224
55.534
52.288
47.348
37.381
34.754
31.232
29.134
26.749
25.107
25.080
19.367
17.502
15.669
11.349
N
HN
O
O
N
H
O
N
O
CO2Me
5i
f1 (ppm)
Intensity

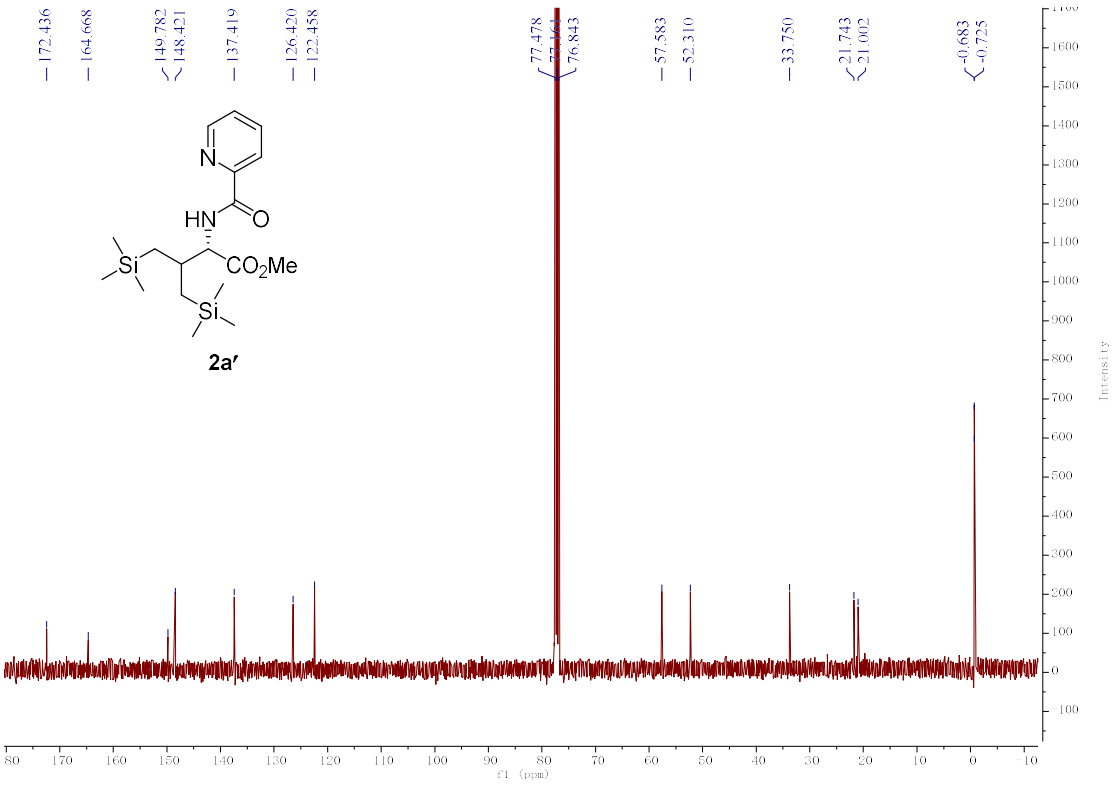

8.702
8.678
8.590
8.586
8.584
8.578
8.576
8.574
8.572
8.323
8.303
7.876
7.872
7.857
7.853
7.838
7.833
7.733
7.433
7.430
7.421
7.418
7.414
7.411
7.402
7.399
7.260
6.267
6.243
4.750
4.727
4.617
4.603
4.594
4.581
4.491
4.486
4.467
4.462
3.743
2.135
2.118
2.105
2.101
1.022
1.014
0.973
0.958
0.919
0.903
0.887
0.880
0.863
0.784
0.767
HN
O
N
H
O
N
H
O
N
H
O
CO2Me
5j
1.00
1.12
1.00
1.02
1.33
1.12
1.29
1.02
0.98
1.02
1.05
1.01
3.07
2.10
9.23
8.91
9.48
3.08
f1 (ppm)
Intensity

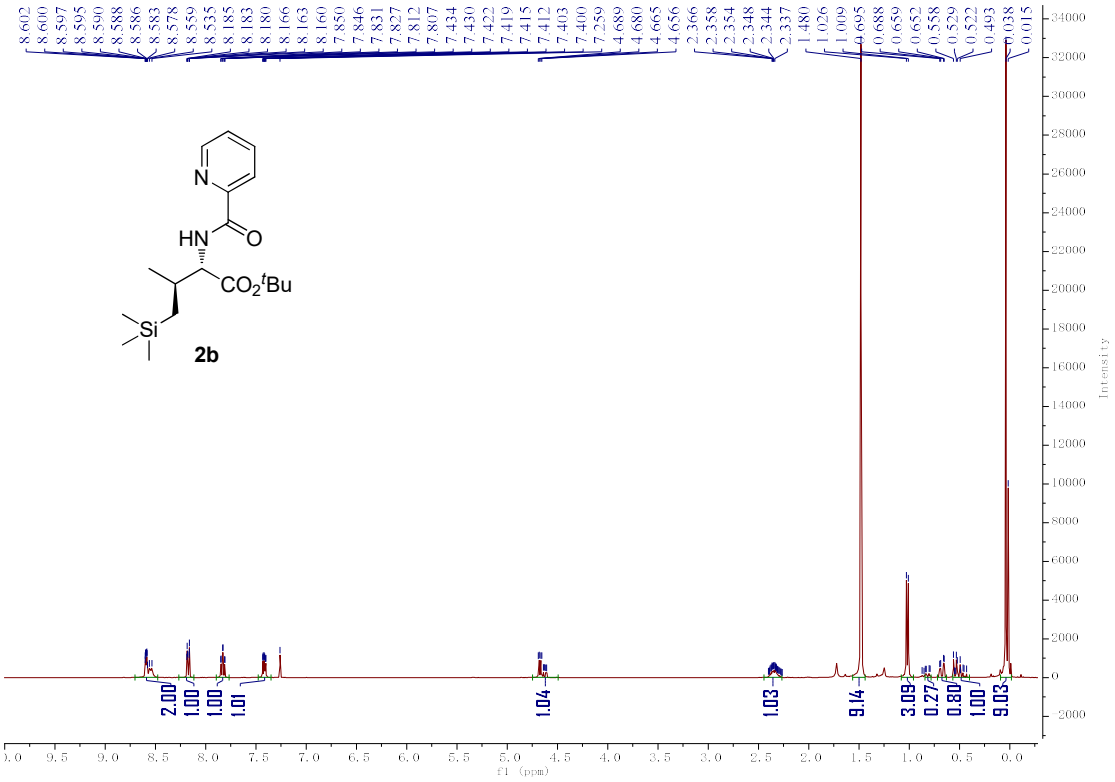

172.780
171.653
170.705
170.662
164.416
149.607
148.459
137.482
126.418
122.794
77.478
77.161
76.843
61.112
60.241
57.839
57.138
52.173
35.657
33.912
32.372
31.210
27.050
26.627
19.449
19.274
18.205
17.948
HN
O
N
H
O
N
H
O
N
H
O
CO2Me
5j
f1 (ppm)
Intensity

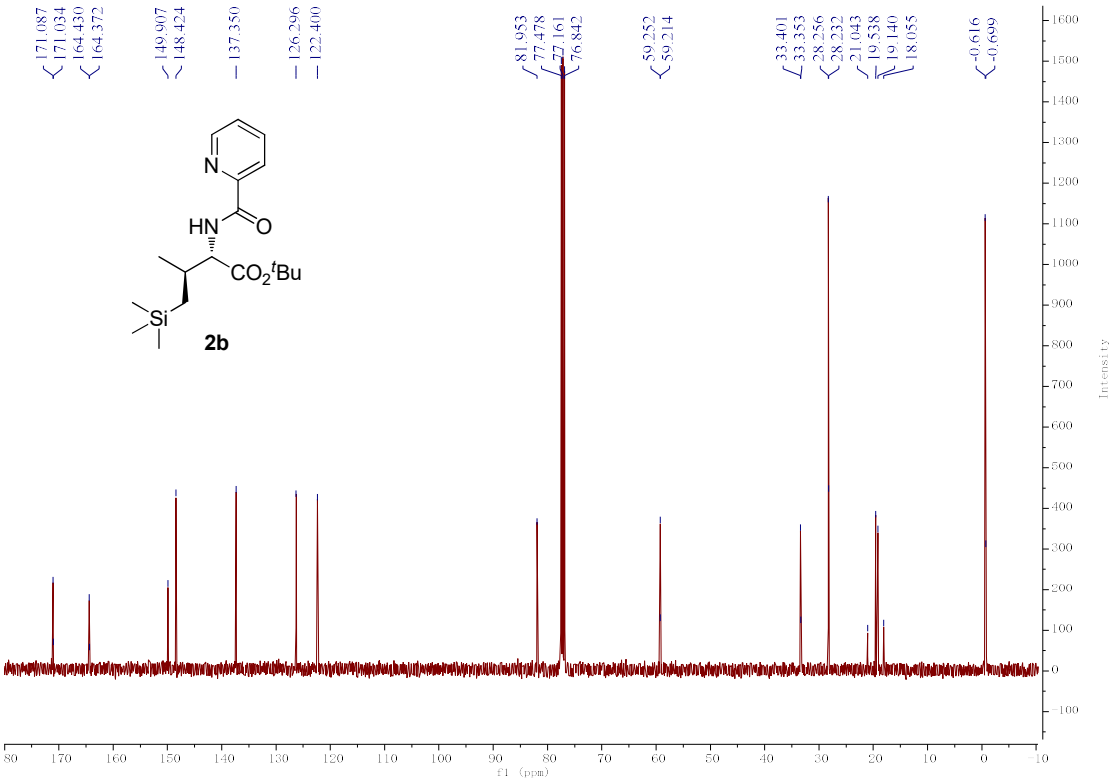

8.606
8.604
8.602
8.599
8.598
8.594
8.592
8.590
8.587
8.586
8.185
8.182
8.179
8.166
8.163
8.160
7.860
7.856
7.841
7.836
7.822
7.817
7.450
7.447
7.438
7.435
7.431
7.428
7.419
7.416
7.260
4.767
4.757
4.743
4.733
3.756
3.751
1.039
1.029
1.019
1.012
1.002
0.679
0.649
0.643
0.539
0.511
0.503
0.475
0.055
0.046
0.038
0.033
0.025
0.016
N
HN
O
CO2Me
Si
2a
1.18
0.90
0.99
1.06
1.00
1.04
3.00
1.03
3.23
1.09
1.03
8.92
f1 (ppm)
Intensity

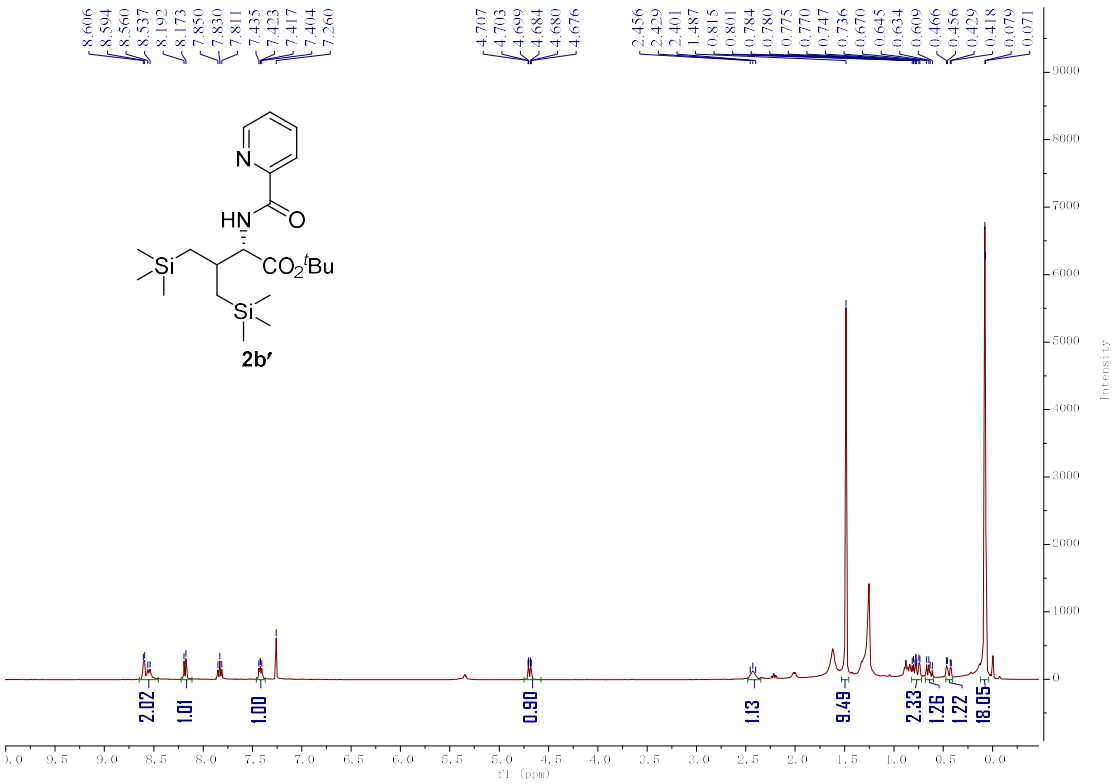

172.333
164.492
149.641
148.401
137.424
126.443
122.474
77.479
77.161
76.843
58.978
52.286
52.259
33.094
21.183
19.572
19.284
18.057
-0.709
-0.806
N
HN
O
CO2Me
Si
2a
f1 (ppm)
Intensity

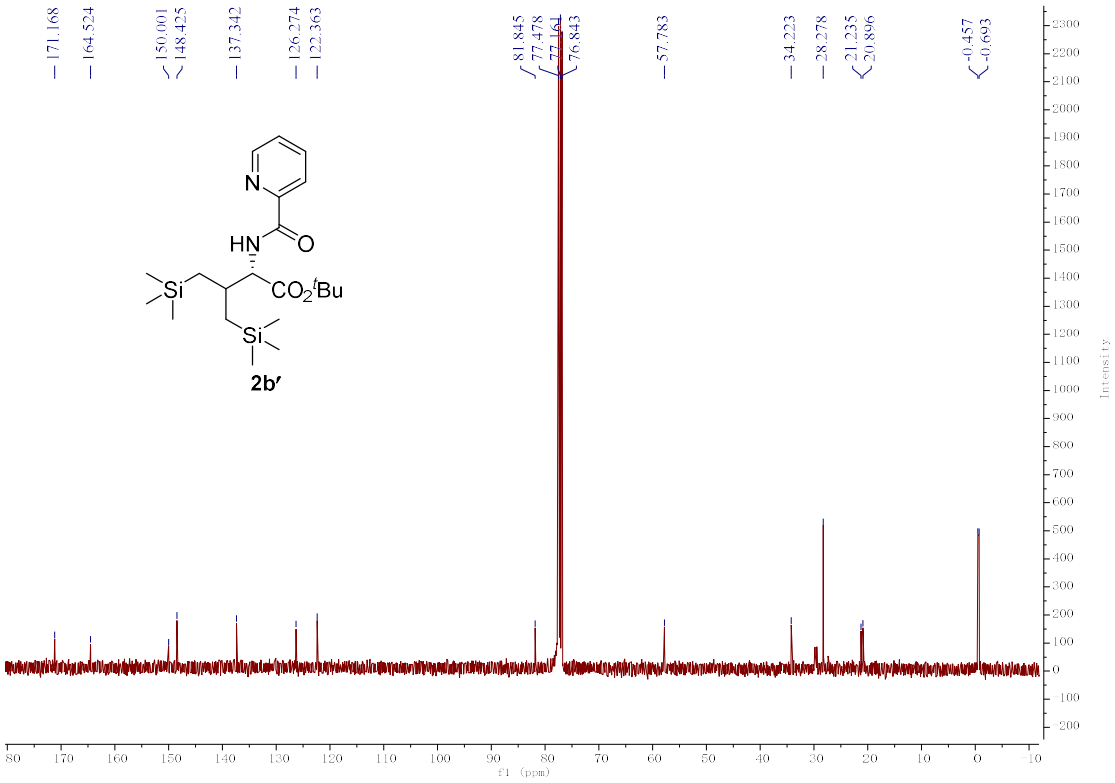

8.618
8.615
8.614
8.611
8.606
8.603
8.602
8.599
8.538
8.515
8.198
8.195
8.192
8.179
8.176
8.173
7.865
7.861
7.846
7.842
7.827
7.822
7.457
7.453
7.445
7.442
7.438
7.435
7.426
7.423
7.260
4.811
4.804
4.788
4.782
3.752
0.839
0.814
0.801
0.777
0.717
0.691
0.681
0.661
0.639
0.502
0.492
0.465
0.455
0.088
0.078
0.074
0.068
0.059
0.051
N
HN
O
Si
CO2Me
Si
2a′
1.13
1.00
1.05
1.01
1.00
1.03
3.07
1.04
1.20
2.26
1.03
17.76
Intensity
f1 (ppm)

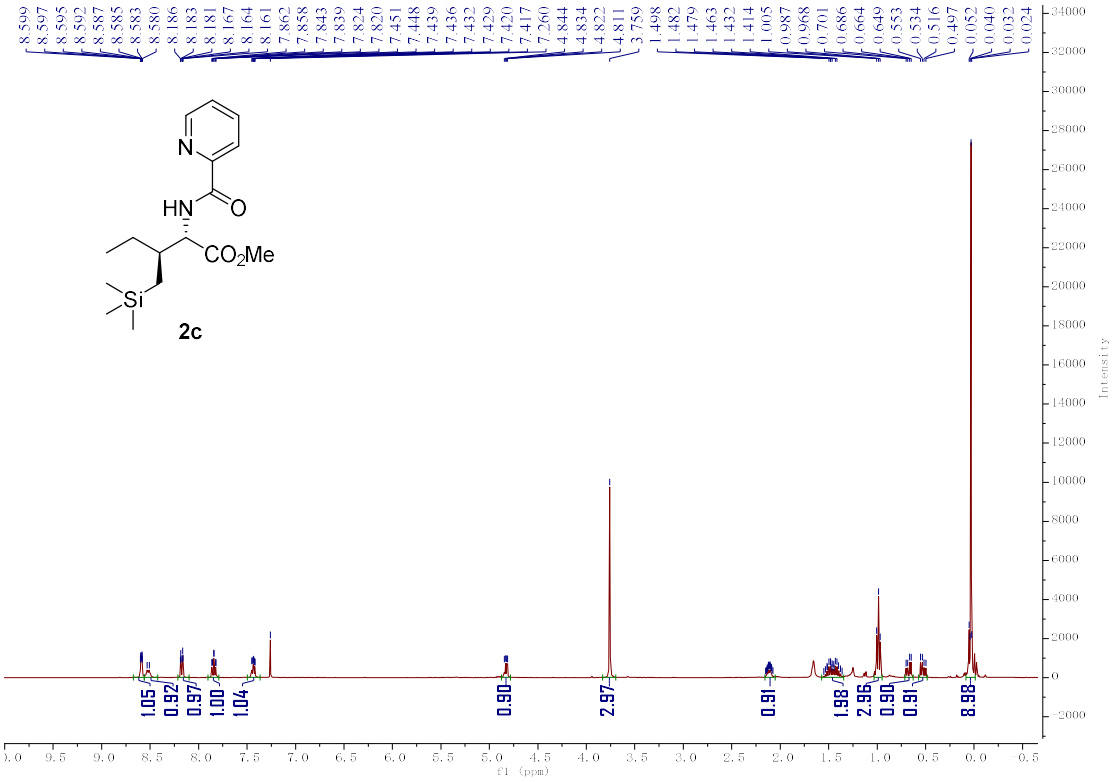

172.436
164.668
149.782
148.421
137.419
126.420
122.458
77.478
77.163
76.843
57.583
52.310
33.750
21.743
21.002
0.683
-0.725
N
HN
O
Si
CO2Me
Si
2a′
Intensity
f1 (ppm)

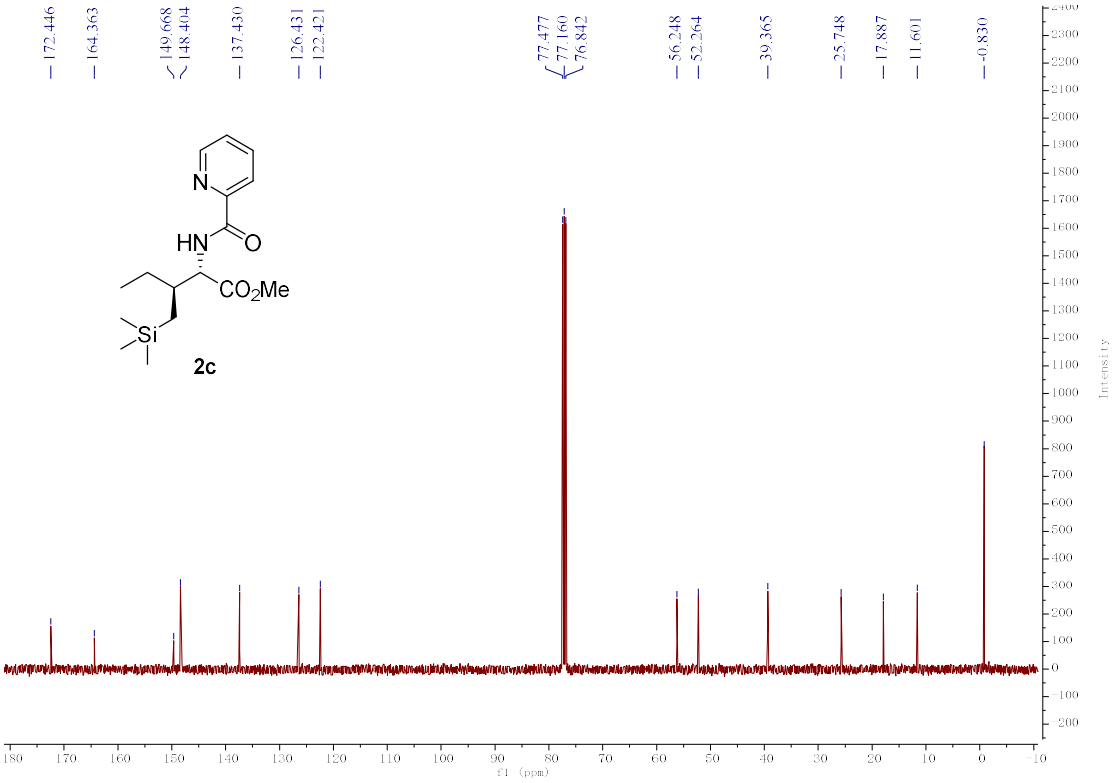

8.602
8.600
8.597
8.595
8.590
8.588
8.586
8.583
8.578
8.559
8.535
8.185
8.183
8.180
8.166
8.163
8.160
7.850
7.846
7.831
7.827
7.812
7.807
7.434
7.430
7.422
7.419
7.415
7.412
7.403
7.400
7.259
4.689
4.680
4.665
4.656
2.366
2.358
2.354
2.348
2.344
2.337
1.480
1.026
1.009
0.695
0.688
0.659
0.652
0.558
0.529
0.522
0.493
0.038
0.015
N
HN
O
CO2tBu
Si
2b
2.00
1.00
1.00
1.01
1.04
1.03
9.14
3.09
0.27
0.80
1.00
9.03
f1 (ppm)
Intensity

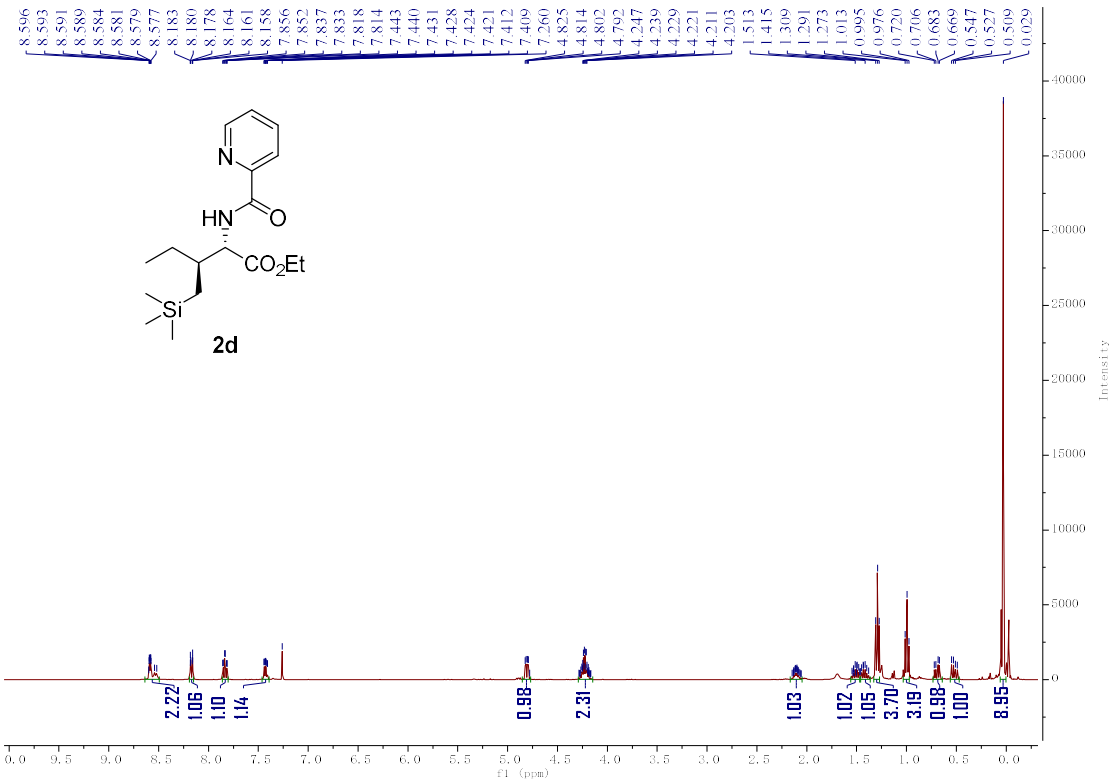

171.087
171.034
164.430
164.372
149.907
148.424
137.350
126.296
122.400
81.953
77.478
77.161
76.842
59.252
59.214
33.401
33.353
28.256
28.232
21.043
19.538
19.140
18.055
-0.616
-0.699
N
HN
O
CO2tBu
Si
2b
f1 (ppm)
Intensity

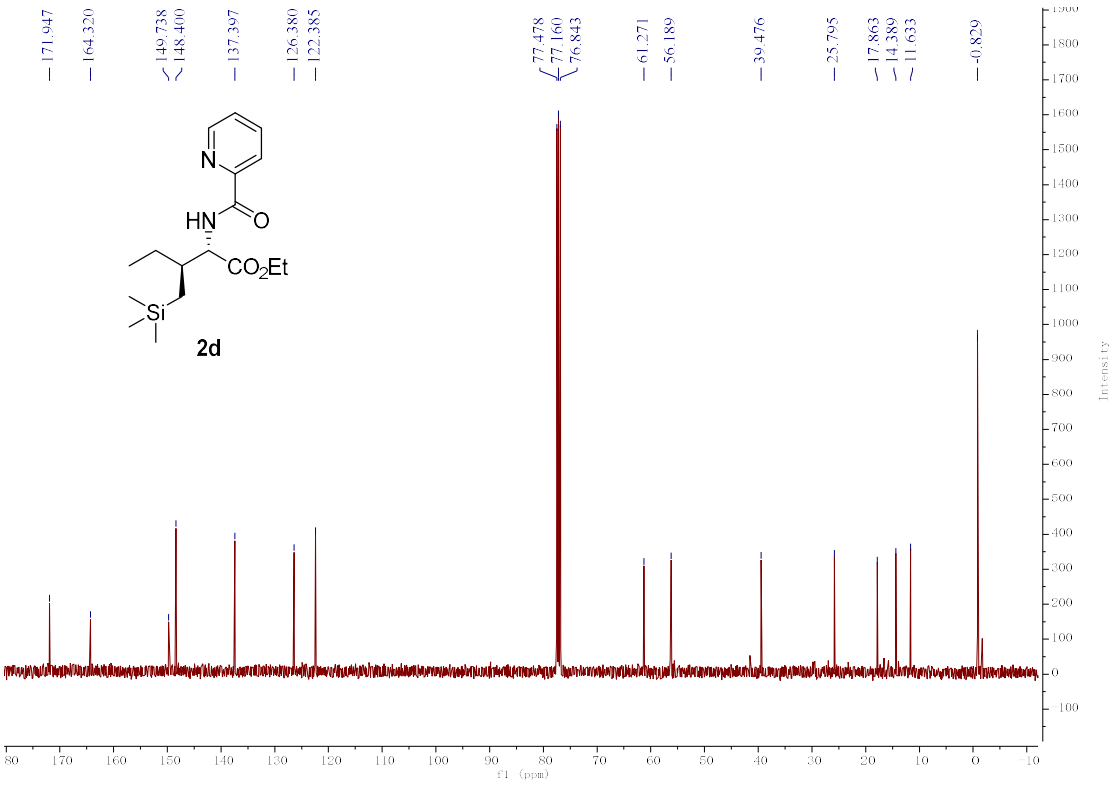

8.606
8.594
8.560
8.537
8.192
8.173
7.850
7.830
7.811
7.435
7.423
7.417
7.404
7.260
4.707
4.703
4.699
4.684
4.680
4.676
2.456
2.429
2.401
1.487
0.815
0.801
0.784
0.780
0.775
0.770
0.747
0.736
0.670
0.645
0.634
0.609
0.466
0.456
0.429
0.418
0.079
0.071
N
HN
O
Si
CO2tBu
Si
2b′
2.02
1.01
1.00
0.90
1.13
9.49
2.33
1.26
1.22
18.05
f1 (ppm)
Intensity

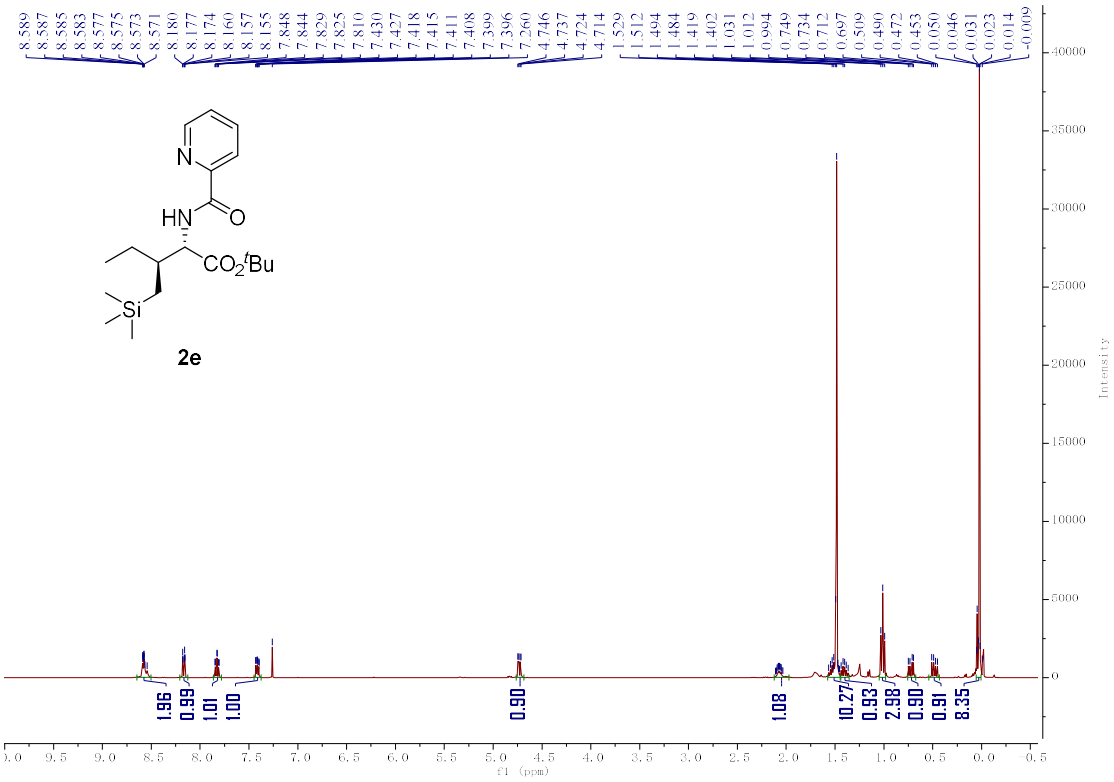

171.168
164.524
150.001
148.425
137.342
126.274
122.363
81.845
77.478
77.161
76.843
57.783
34.223
28.278
21.235
20.896
-0.457
-0.693
N
HN
O
Si
CO2tBu
Si
2b′
f1 (ppm)
Intensity

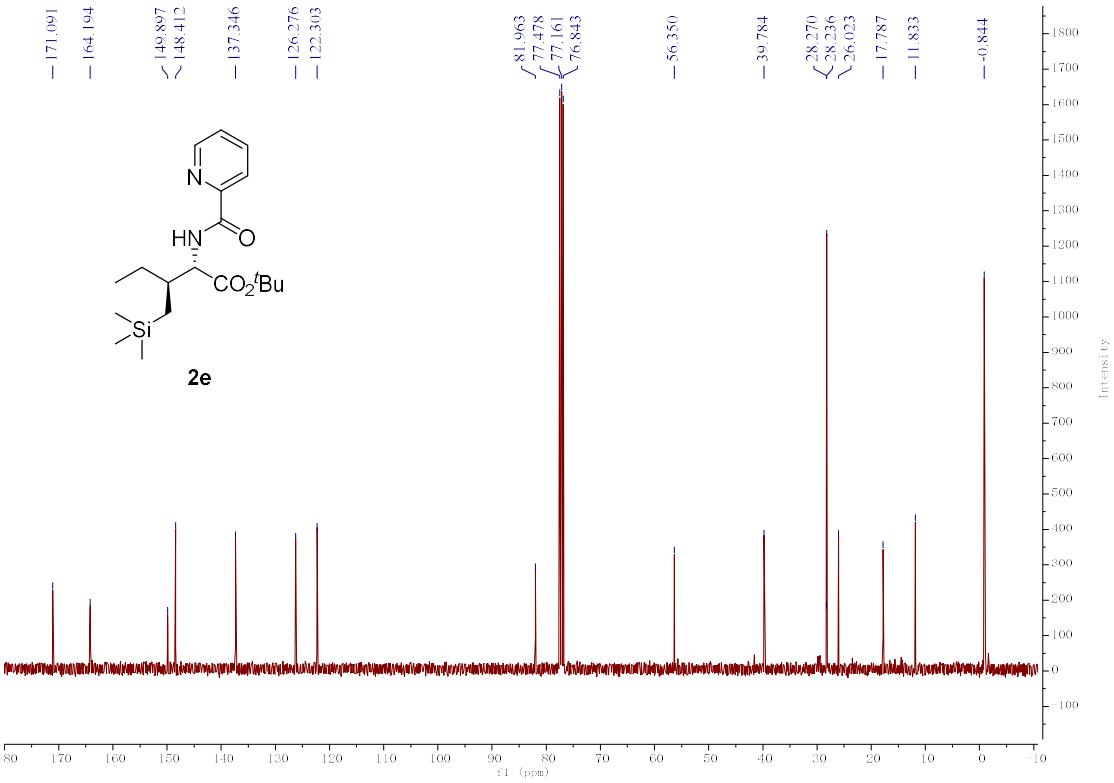

8.599
8.597
8.595
8.592
8.587
8.585
8.583
8.580
8.186
8.183
8.181
8.167
8.164
8.161
7.862
7.858
7.843
7.839
7.824
7.820
7.451
7.448
7.439
7.436
7.432
7.429
7.420
7.417
7.260
4.844
4.834
4.822
4.811
3.759
1.498
1.482
1.479
1.463
1.432
1.414
1.005
0.987
0.968
0.701
0.686
0.664
0.649
0.553
0.534
0.516
0.497
0.052
0.040
0.032
0.024
N
HN
O
CO2Me
Si
2c
1.05
0.92
0.97
1.00
1.04
0.90
2.97
0.91
1.98
2.96
0.90
0.91
8.98
Intensity
f1 (ppm)

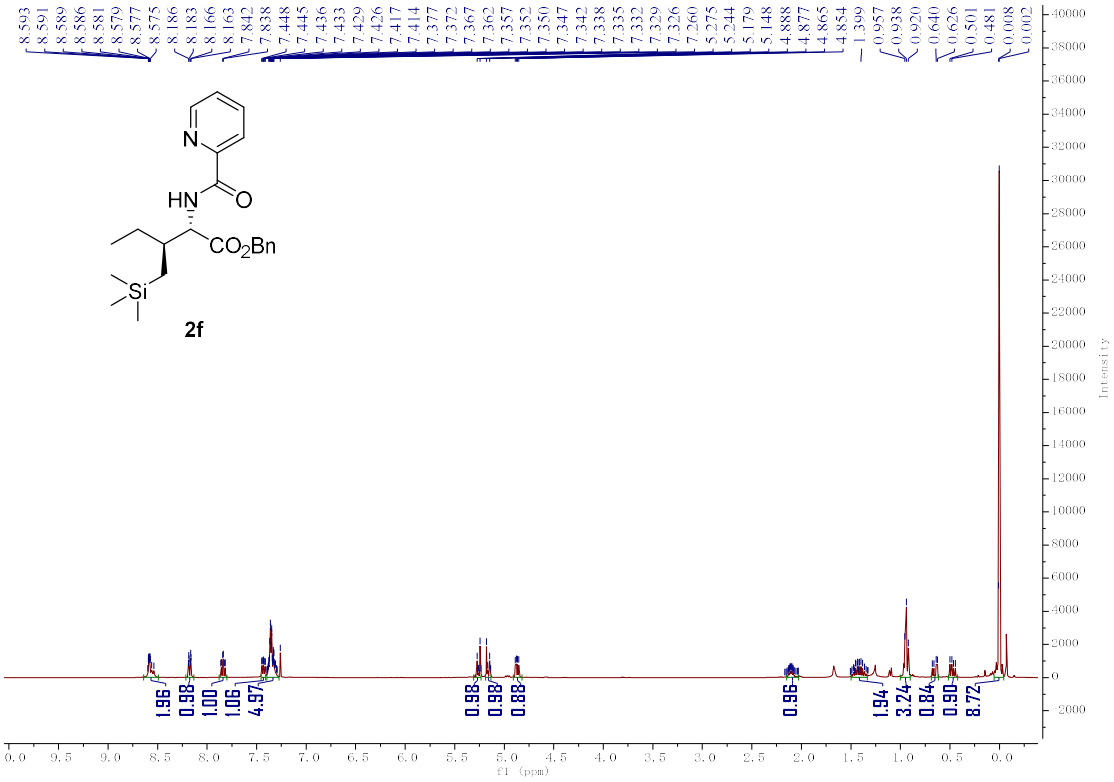

172.446
164.363
149.668
148.404
137.430
126.431
122.421
77.477
77.160
76.842
56.248
52.264
39.365
25.748
17.887
11.601
-0.830
N
HN
O
CO2Me
Si
2c
Intensity
f1 (ppm)

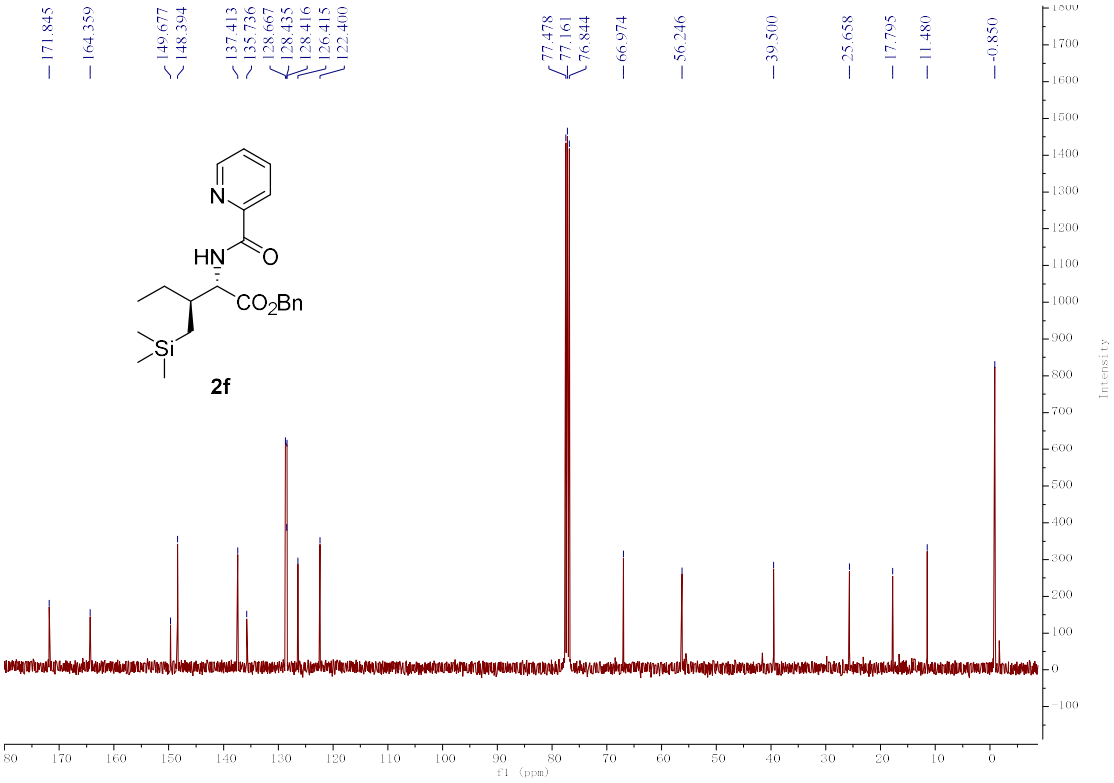

8.596
8.593
8.591
8.589
8.584
8.581
8.579
8.577
8.183
8.180
8.178
8.164
8.161
8.158
7.856
7.852
7.837
7.833
7.818
7.814
7.443
7.440
7.431
7.428
7.424
7.421
7.412
7.409
7.260
4.825
4.814
4.802
4.792
4.247
4.239
4.229
4.221
4.211
4.203
1.513
1.415
1.309
1.291
1.273
1.013
0.995
0.976
0.720
0.706
0.683
0.669
0.547
0.527
0.509
0.029
N
HN
O
CO2Et
Si
2d
2.22
1.06
1.10
1.14
0.98
2.31
1.03
1.02
1.05
3.70
3.19
0.98
1.00
8.95
f1 (ppm)
Intensity

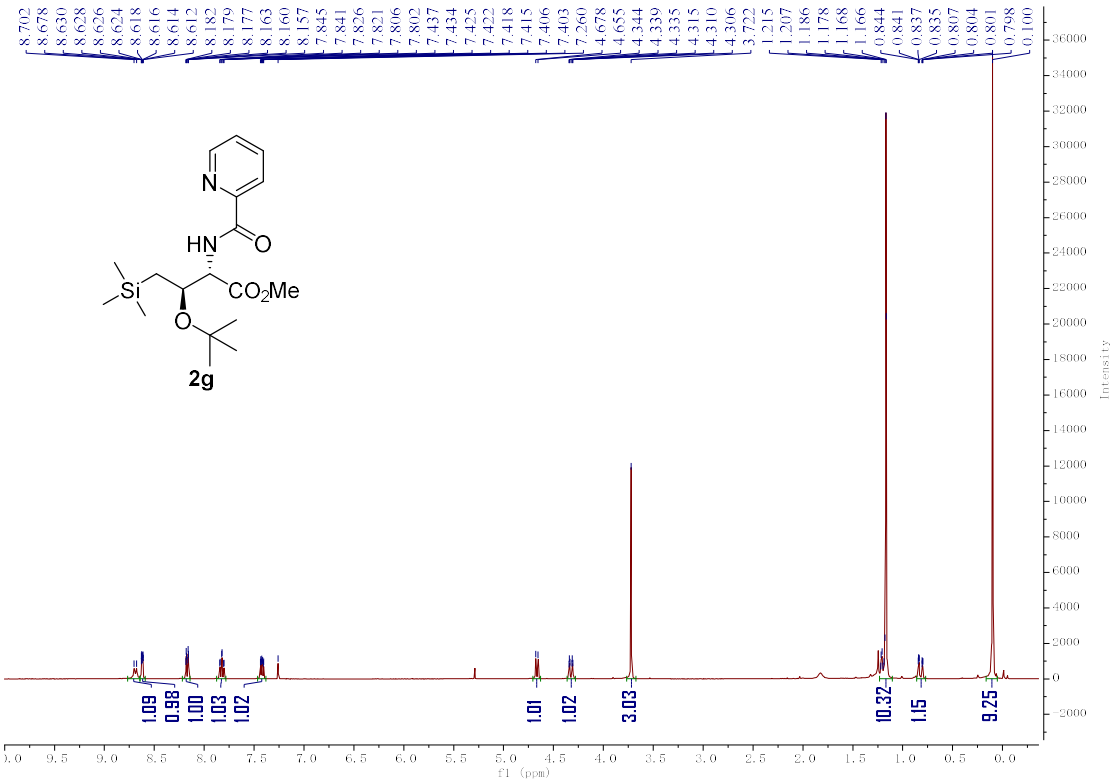

171.947
164.320
149.738
148.400
137.397
126.380
122.385
77.478
77.160
76.843
61.271
56.189
39.476
25.795
17.863
14.389
11.633
-0.829
N
HN
O
CO2Et
Si
2d
f1 (ppm)
Intensity

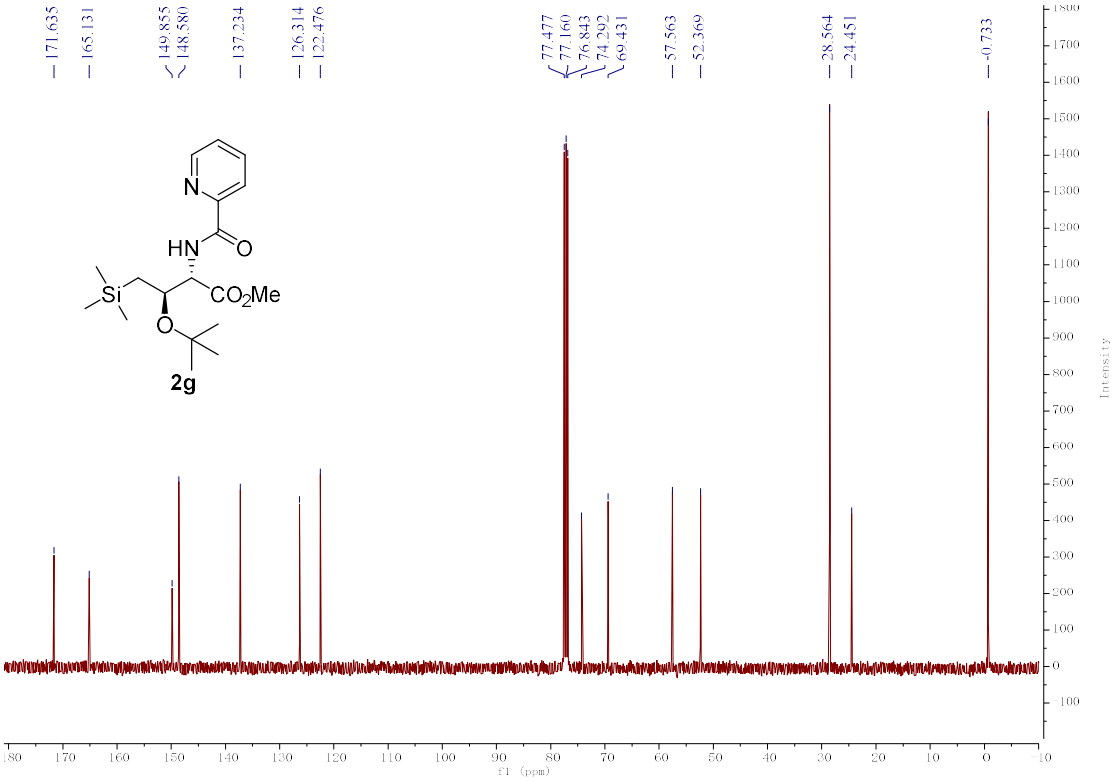

8.589
8.587
8.585
8.583
8.577
8.575
8.573
8.571
8.180
8.177
8.174
8.160
8.157
8.155
7.848
7.844
7.829
7.825
7.810
7.430
7.427
7.418
7.415
7.411
7.408
7.399
7.396
7.260
4.746
4.737
4.724
4.714
1.529
1.512
1.494
1.484
1.419
1.402
1.031
1.012
0.994
0.749
0.734
0.712
0.697
0.509
0.490
0.472
0.453
0.050
0.046
0.031
0.023
0.014
-0.009
N
HN
O
CO2tBu
Si
2e
1.96
0.99
1.01
1.00
0.90
1.08
10.27
0.93
2.98
0.90
0.91
8.35
f1 (ppm)
Intensity

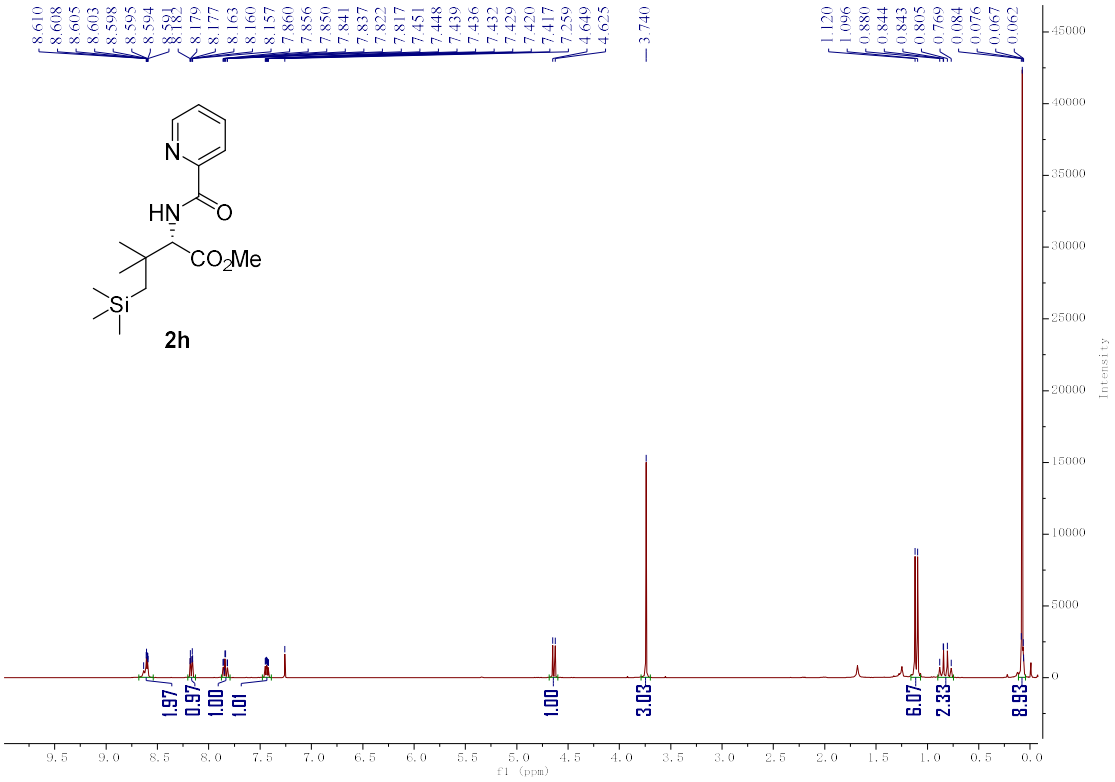

171.091
164.194
149.897
148.412
137.346
126.276
122.303
81.963
77.478
77.161
76.843
56.350
39.784
28.270
28.236
26.023
17.787
11.833
-0.844
N
HN
O
CO2tBu
Si
2e
f1 (ppm)
Intensity

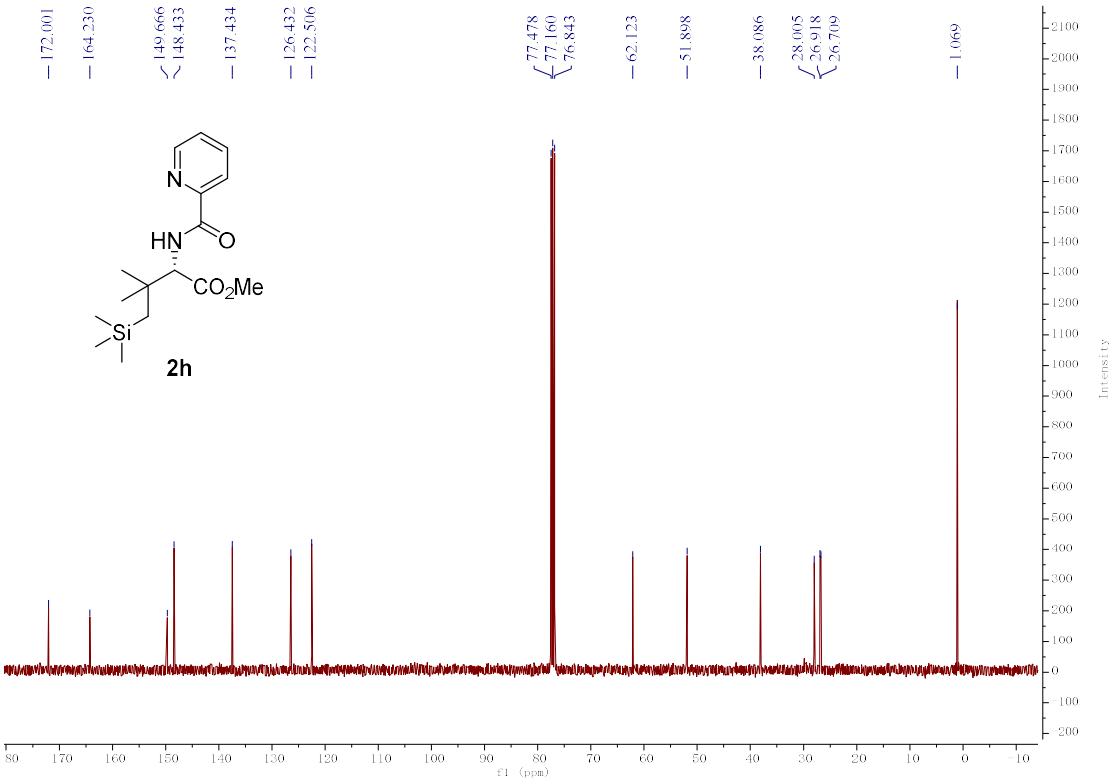

8.593
8.591
8.589
8.586
8.581
8.579
8.577
8.575
8.186
8.183
8.166
8.163
7.842
7.838
7.448
7.445
7.436
7.433
7.429
7.426
7.417
7.414
7.377
7.372
7.367
7.362
7.357
7.352
7.350
7.347
7.342
7.338
7.335
7.332
7.329
7.326
7.260
5.275
5.244
5.179
5.148
4.888
4.877
4.865
4.854
1.399
0.957
0.938
0.920
0.640
0.626
0.501
0.481
0.008
0.002
N
HN
O
CO2Bn
Si
2f
1.96
0.98
1.00
1.06
4.97
0.98
0.98
0.88
0.96
1.94
3.24
0.84
0.90
8.72
f1 (ppm)
Intensity

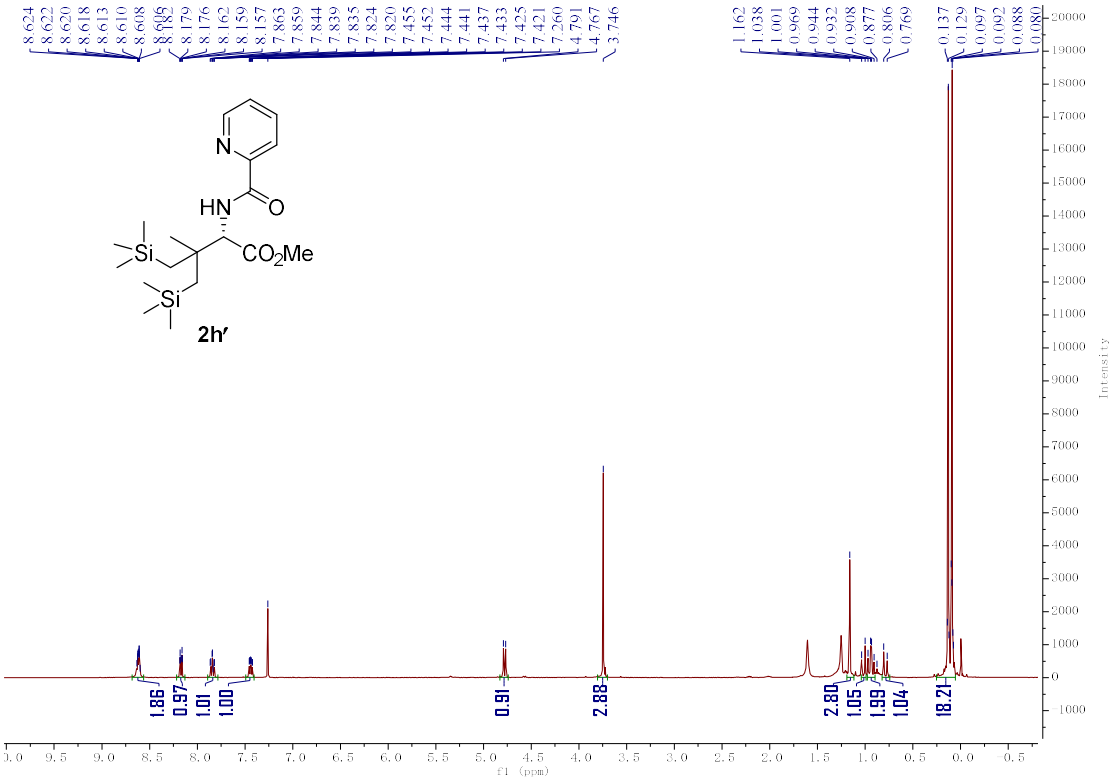

171.845
164.359
149.677
148.394
137.413
135.736
128.667
128.435
128.416
126.415
122.400
77.478
77.161
76.844
66.974
56.246
39.500
25.658
17.795
11.480
-0.850
N
HN
O
CO2Bn
Si
2f
f1 (ppm)
Intensity

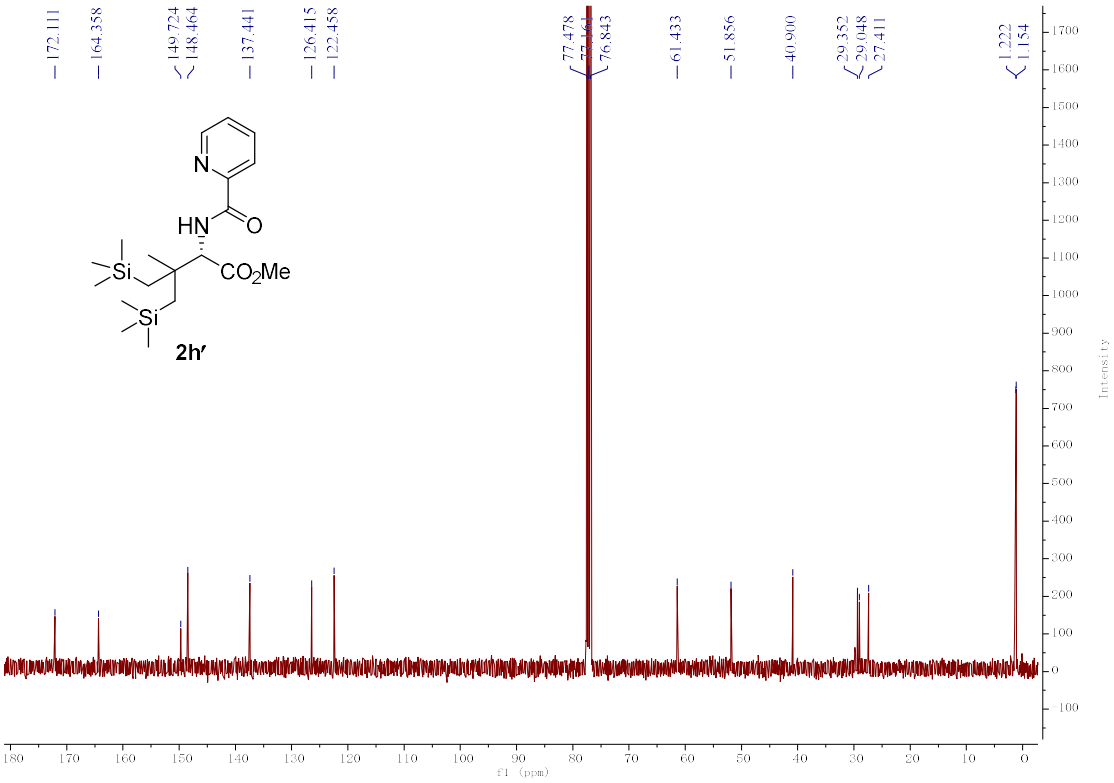

8.702
8.678
8.630
8.628
8.626
8.624
8.618
8.616
8.614
8.612
8.182
8.179
8.177
8.163
8.160
8.157
7.845
7.841
7.826
7.821
7.806
7.802
7.437
7.434
7.425
7.422
7.418
7.415
7.406
7.403
7.260
4.678
4.655
4.344
4.339
4.335
4.315
4.310
4.306
3.722
1.215
1.207
1.186
1.178
1.168
1.166
0.844
0.841
0.837
0.835
0.807
0.804
0.801
0.798
0.100
N
HN
O
Si
CO2Me
O
2g
1.09
0.98
1.00
1.03
1.02
1.01
1.02
3.03
10.32
1.15
9.25
f1 (ppm)
Intensity

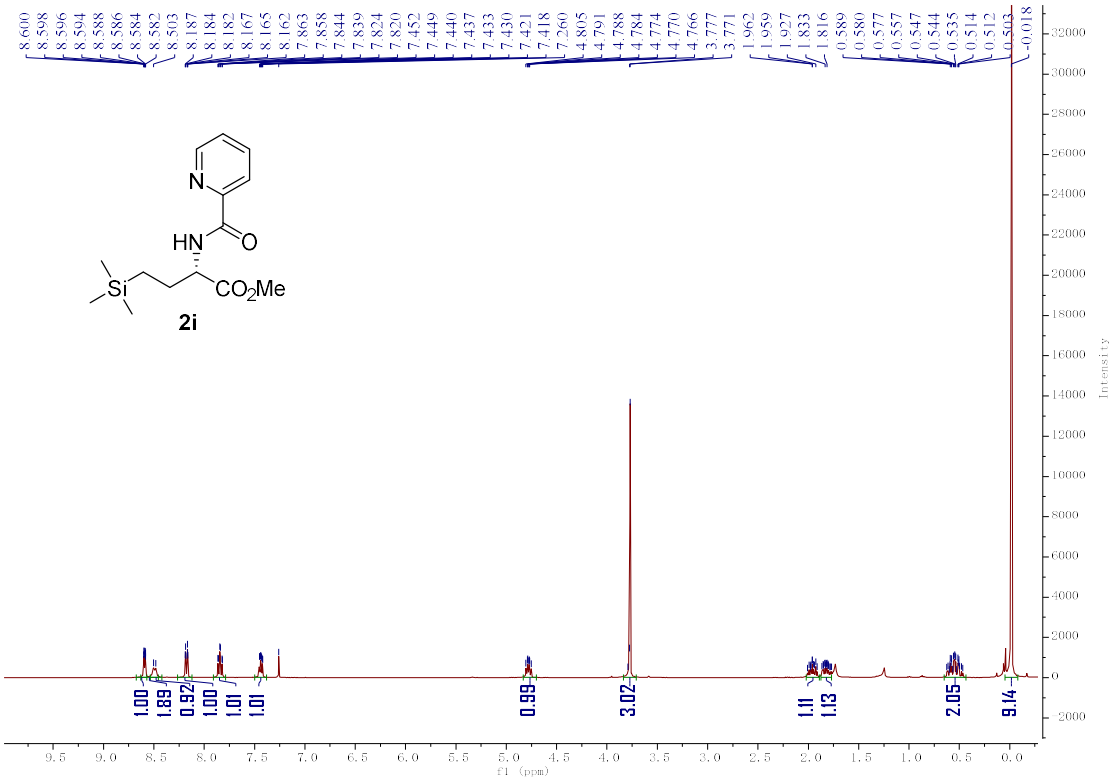

171.635
165.131
149.855
148.580
137.234
126.314
122.476
77.477
77.160
76.843
74.292
69.431
57.563
52.369
28.564
24.451
-0.733
N
HN
O
Si
CO2Me
O
2g
f1 (ppm)
Intensity

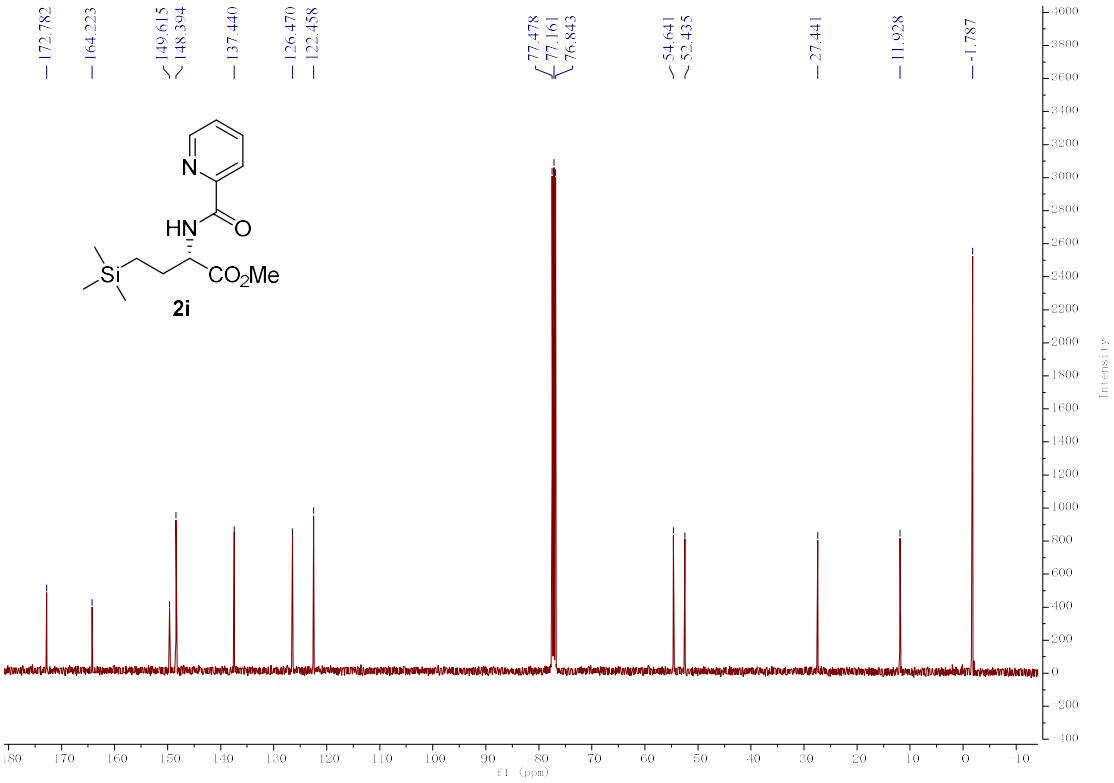

8.610
8.608
8.605
8.603
8.598
8.595
8.594
8.591
8.182
8.179
8.177
8.163
8.160
8.157
7.860
7.856
7.850
7.841
7.837
7.822
7.817
7.451
7.448
7.439
7.436
7.432
7.429
7.420
7.417
7.259
4.649
4.625
3.740
1.120
1.096
0.880
0.844
0.843
0.805
0.769
0.084
0.076
0.067
0.062
N
HN
O
CO2Me
Si
2h
1.97
0.97
1.00
1.01
1.00
3.03
6.07
2.33
8.93
f1 (ppm)
Intensity

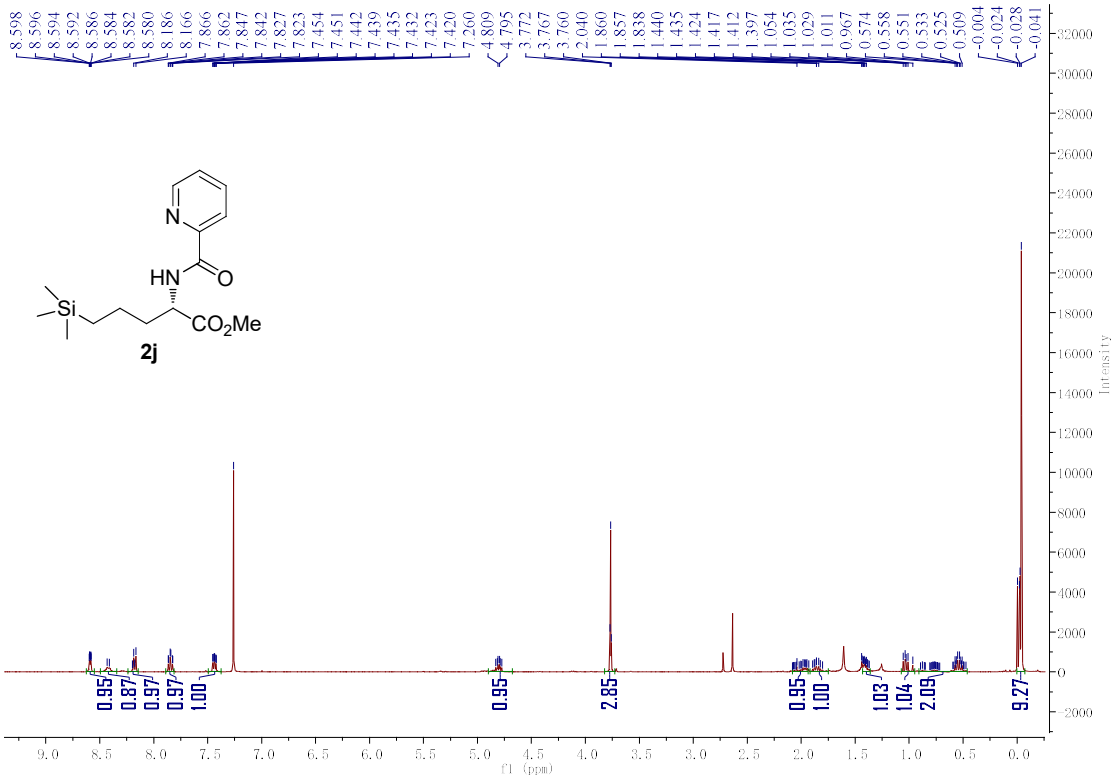

172.001
164.230
149.666
148.433
137.434
126.432
122.506
77.478
77.160
76.843
62.123
51.898
38.086
28.005
26.918
26.709
1.069
N
HN
O
CO2Me
Si
2h
f1 (ppm)
Intensity

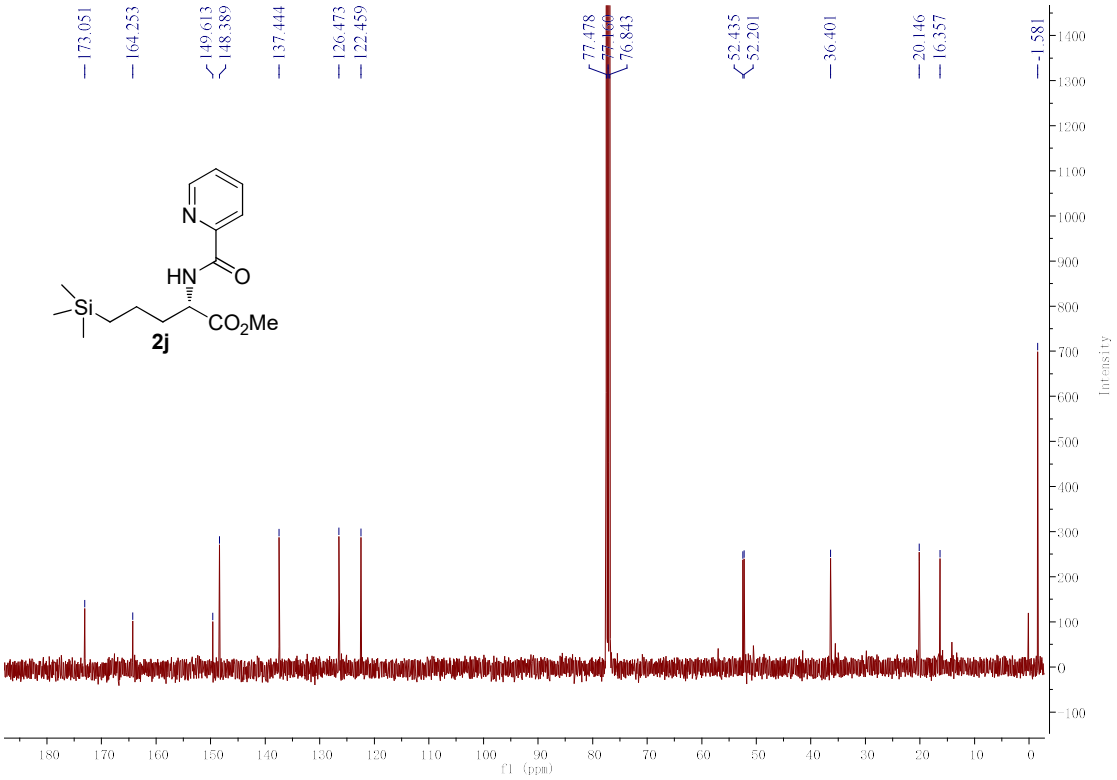

8.624
8.622
8.620
8.618
8.613
8.610
8.608
8.185
8.182
8.179
8.176
8.162
8.159
8.157
7.863
7.859
7.844
7.839
7.835
7.824
7.820
7.455
7.452
7.444
7.441
7.437
7.433
7.425
7.421
7.260
4.791
4.767
3.746
1.162
1.038
1.001
0.969
0.944
0.932
0.908
0.877
0.806
0.769
0.137
0.129
0.097
0.092
0.088
0.080
N
HN
O
Si
CO2Me
Si
2h′
1.86
0.97
1.01
1.00
0.91
2.88
2.80
1.05
1.99
1.04
18.21
Intensity
f1 (ppm)

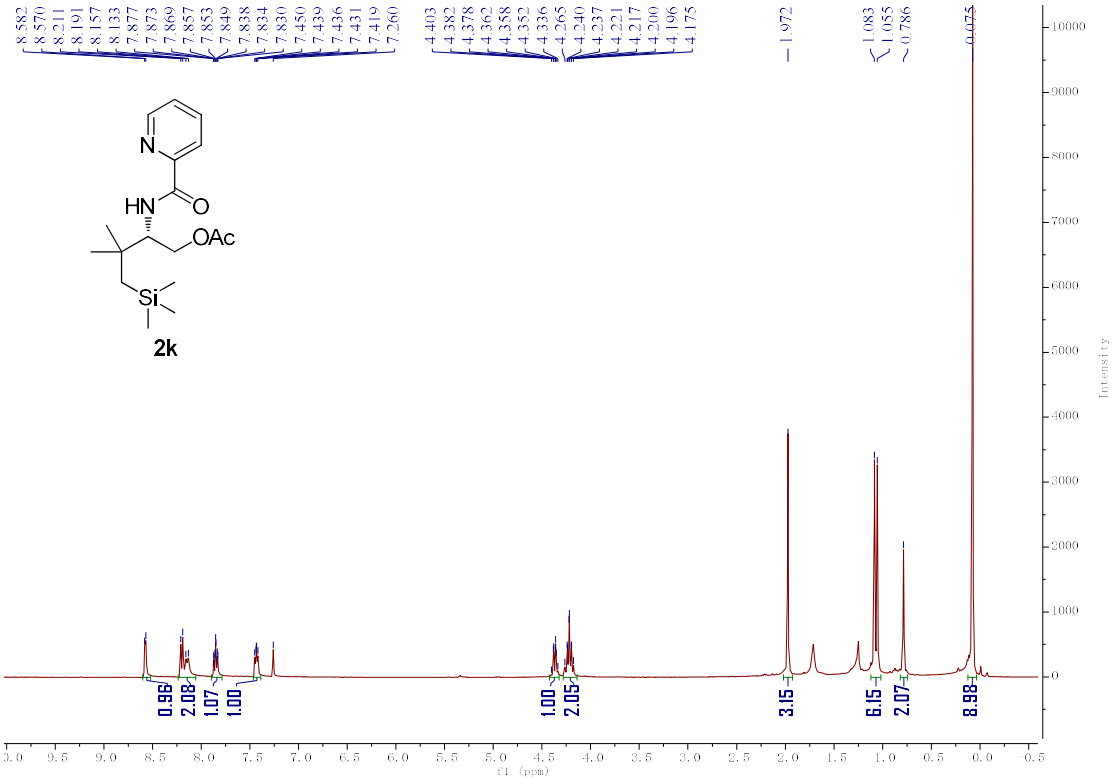

172.111
164.358
149.724
148.464
137.441
126.415
122.458
77.478
77.161
76.843
61.433
51.856
40.900
29.352
29.048
27.411
1.222
1.154
N
HN
O
Si
CO2Me
Si
2h′
Intensity
f1 (ppm)

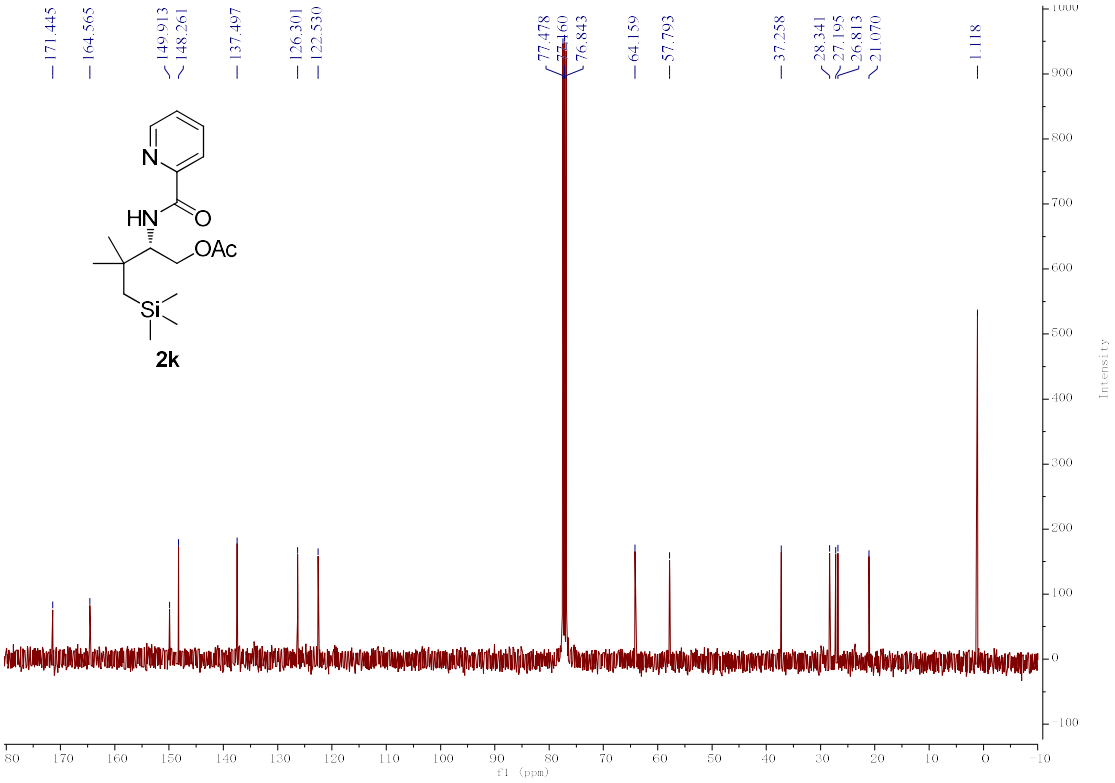

8.600
8.598
8.596
8.594
8.588
8.586
8.584
8.582
8.503
8.187
8.184
8.182
8.167
8.165
8.162
7.863
7.858
7.844
7.839
7.824
7.820
7.452
7.449
7.440
7.437
7.433
7.430
7.421
7.418
7.260
4.805
4.791
4.788
4.784
4.774
4.770
4.766
3.777
3.771
1.962
1.959
1.927
1.833
1.816
0.589
0.580
0.577
0.557
0.547
0.544
0.535
0.514
0.512
0.503
-0.018
N
HN
O
Si
CO2Me
2i
1.00
1.89
0.92
1.00
1.01
1.01
0.99
3.02
1.11
1.13
2.05
9.14
Intensity
f1 (ppm)

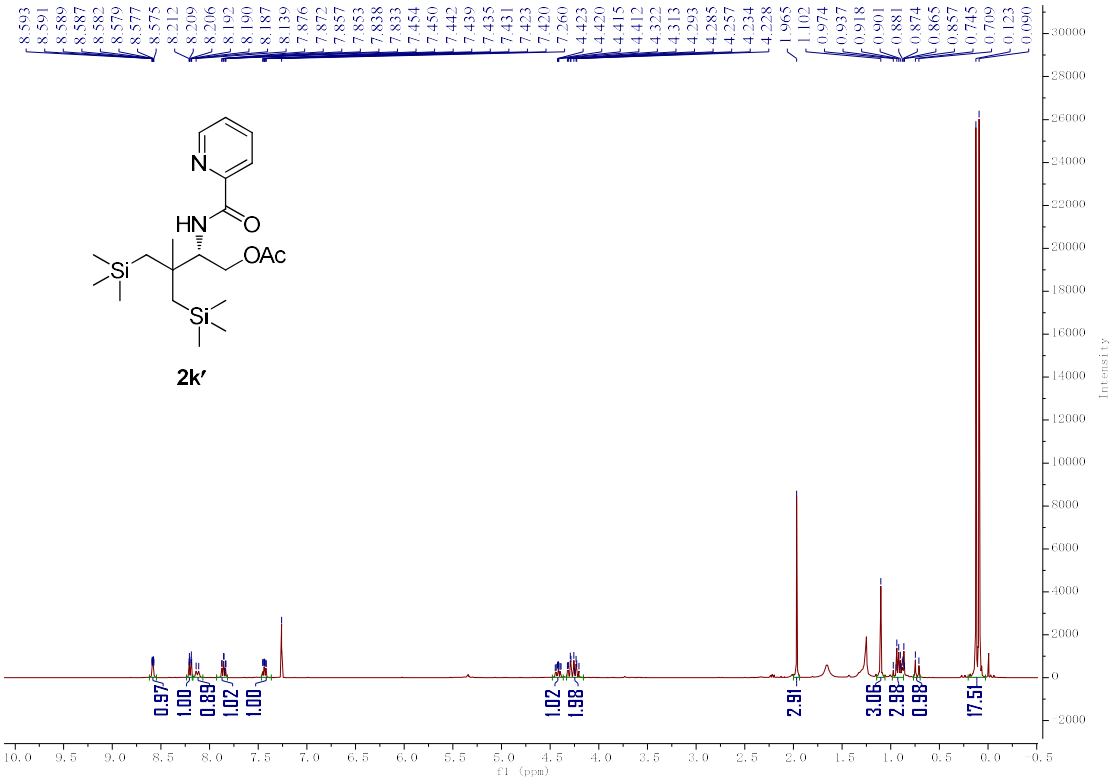

172.782
164.223
149.615
148.394
137.440
126.470
122.458
77.478
77.161
76.843
54.641
52.435
27.441
11.928
-1.787
N
HN
O
Si
CO2Me
2i
Intensity
f1 (ppm)

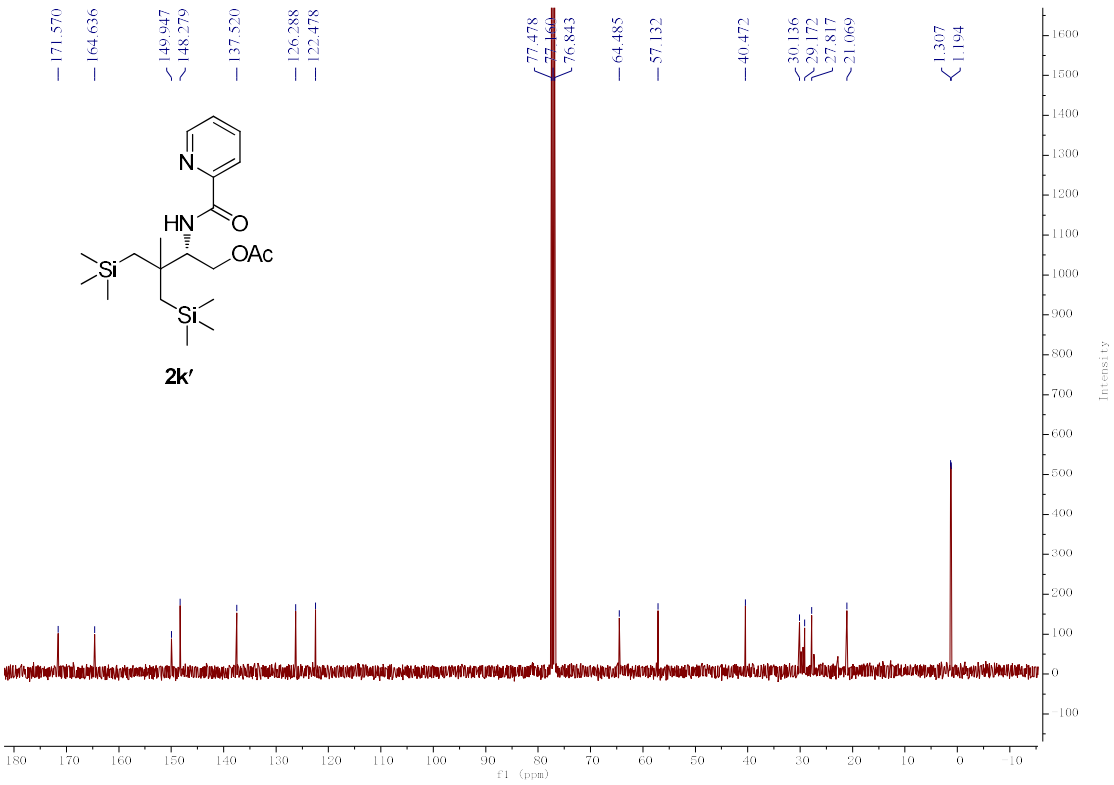

8.598
8.596
8.594
8.592
8.586
8.584
8.582
8.580
8.186
8.166
7.866
7.862
7.847
7.842
7.827
7.823
7.454
7.451
7.442
7.439
7.435
7.432
7.423
7.420
7.260
4.809
4.795
3.772
3.767
3.760
2.040
1.860
1.857
1.838
1.440
1.435
1.424
1.417
1.412
1.397
1.054
1.035
1.029
1.011
0.967
0.574
0.558
0.551
0.533
0.525
0.509
-0.004
-0.024
-0.028
-0.041
N
HN
O
Si
CO2Me
2j
0.95
0.87
0.97
0.97
1.00
0.95
2.85
0.95
1.00
1.03
1.04
2.09
9.27
f1 (ppm)
Intensity

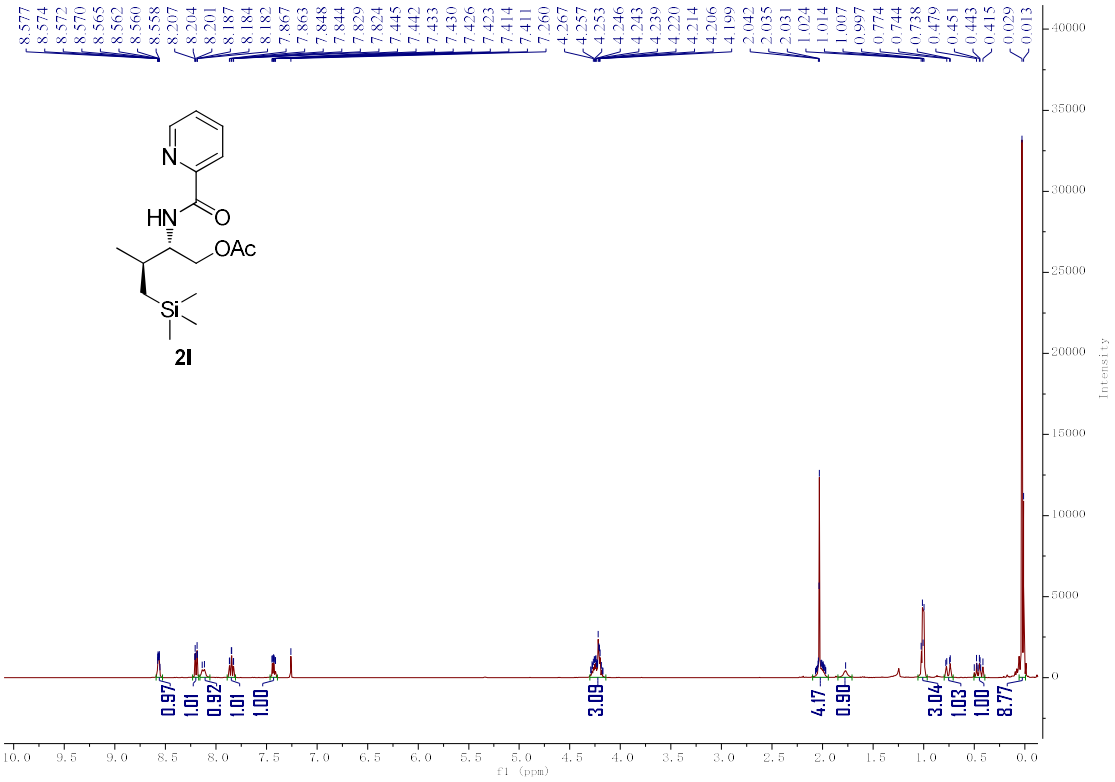

173.051
164.253
149.613
148.389
137.444
126.473
122.459
77.478
77.160
76.843
52.435
52.201
36.401
20.146
16.357
1.581
N
HN
O
Si
CO2Me
2j
f1 (ppm)
Intensity

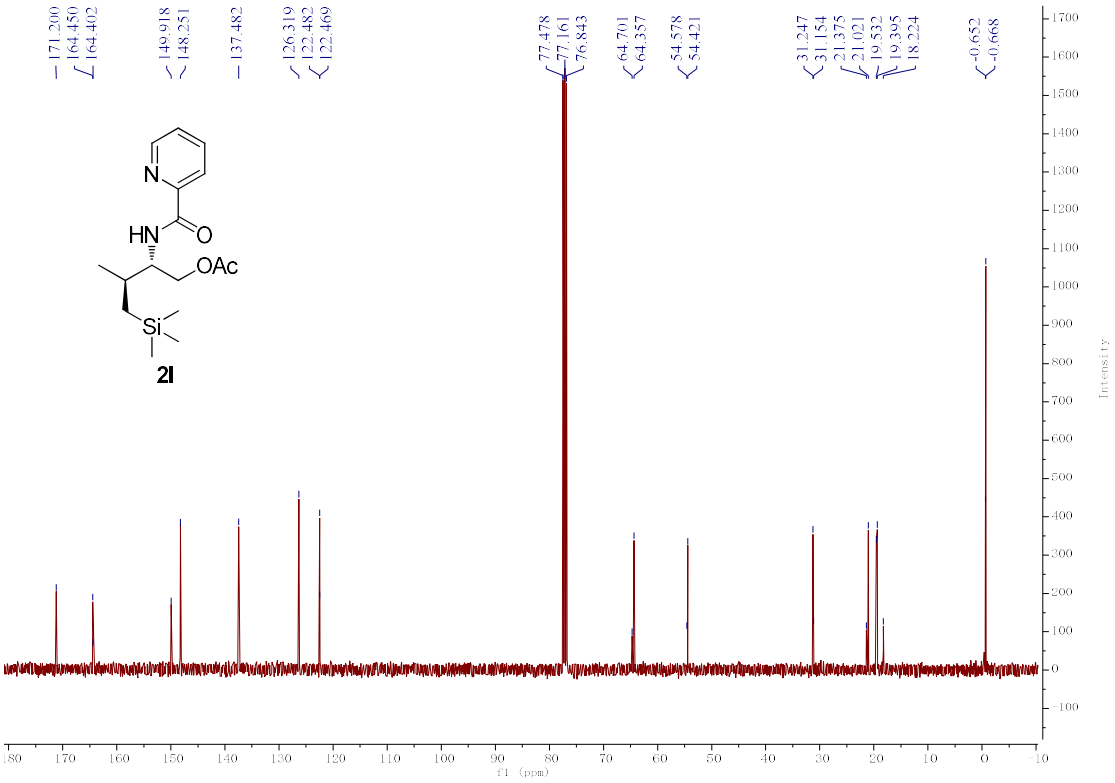

8.582
8.570
8.211
8.191
8.157
8.133
7.877
7.873
7.869
7.857
7.853
7.849
7.838
7.834
7.830
7.450
7.439
7.436
7.431
7.419
7.260
4.403
4.382
4.378
4.362
4.358
4.352
4.336
4.265
4.240
4.237
4.221
4.217
4.200
4.196
4.175
1.972
1.083
1.055
0.786
0.975
N
HN
O
OAc
Si
2k
0.98
2.08
1.07
1.00
1.00
2.05
3.15
6.15
2.07
8.98
f1 (ppm)
Intensity

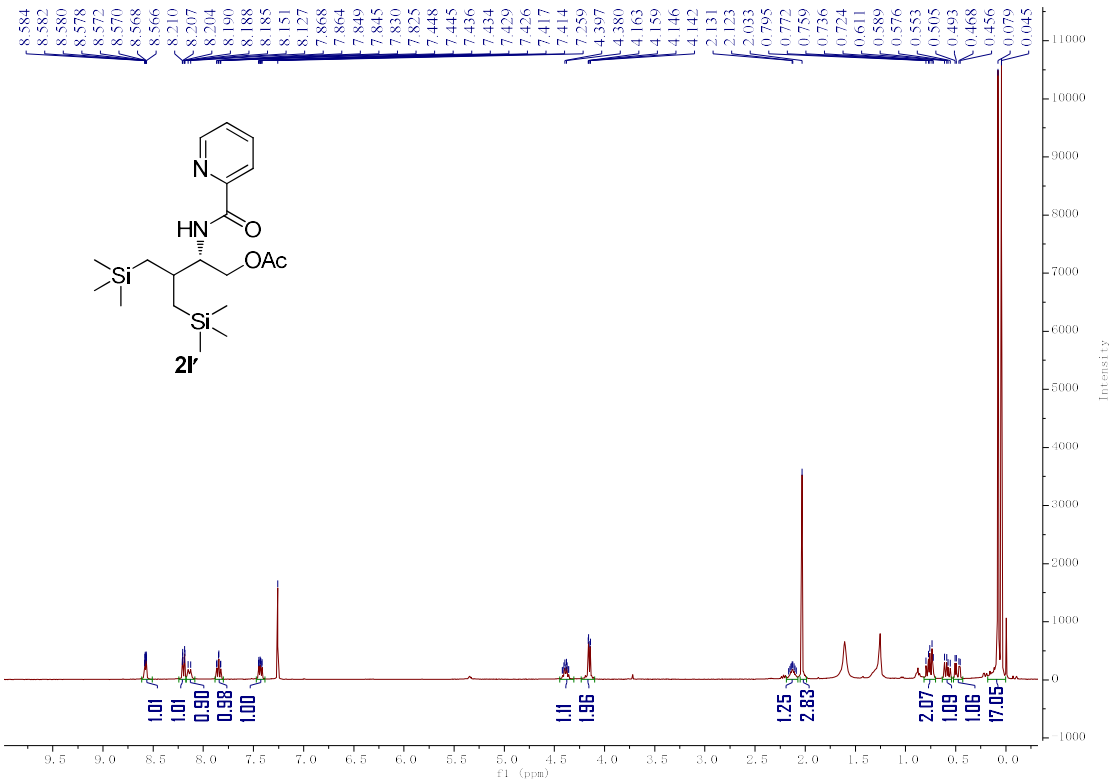

171.445
164.565
149.913
148.261
137.497
126.301
122.530
77.478
77.160
76.843
64.159
57.793
37.258
28.341
27.195
26.813
21.070
1.118
N
HN
O
OAc
Si
2k
f1 (ppm)
Intensity

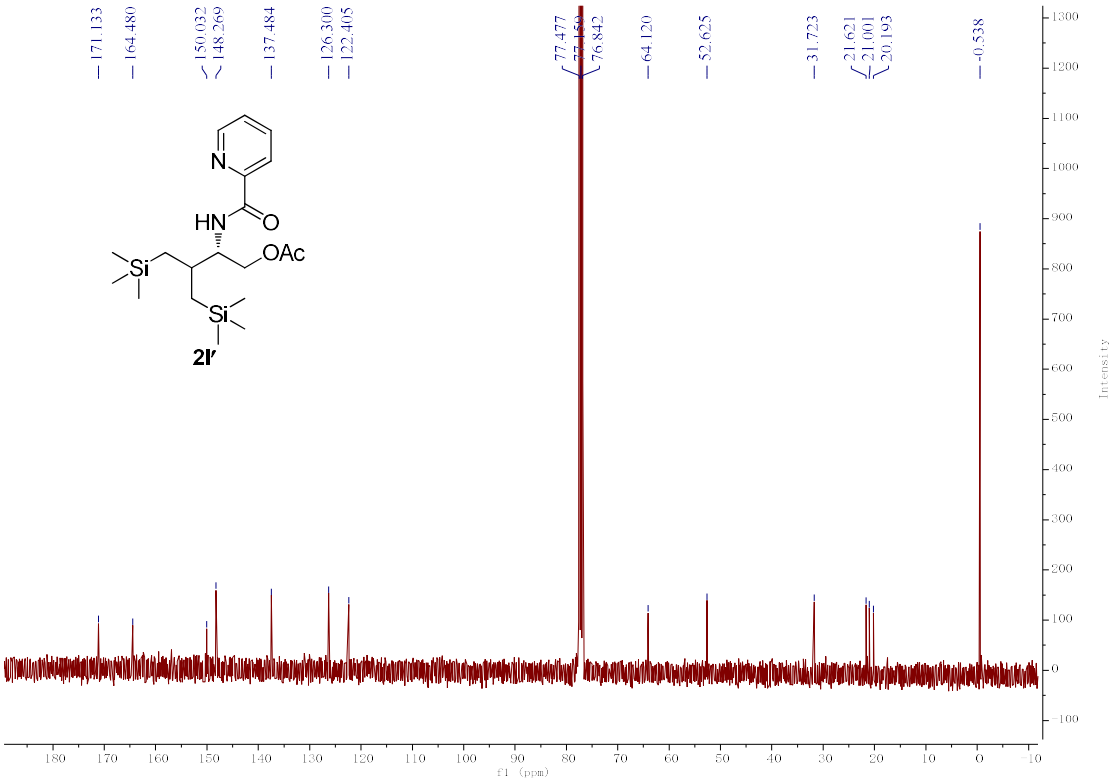

8.593
8.591
8.589
8.587
8.582
8.579
8.577
8.575
8.212
8.209
8.206
8.192
8.190
8.187
8.139
7.876
7.872
7.857
7.853
7.838
7.833
7.454
7.450
7.442
7.439
7.435
7.431
7.423
7.420
7.260
4.423
4.420
4.415
4.412
4.332
4.313
4.293
4.285
4.257
4.234
4.228
1.965
1.102
0.974
0.937
0.918
0.901
0.881
0.874
0.865
0.857
0.745
0.709
0.123
0.090
N
HN
O
OAc
Si
Si
2k′
0.97
1.00
0.89
1.02
1.00
1.02
1.98
2.91
3.06
2.98
0.98
17.51
f1 (ppm)
Intensity

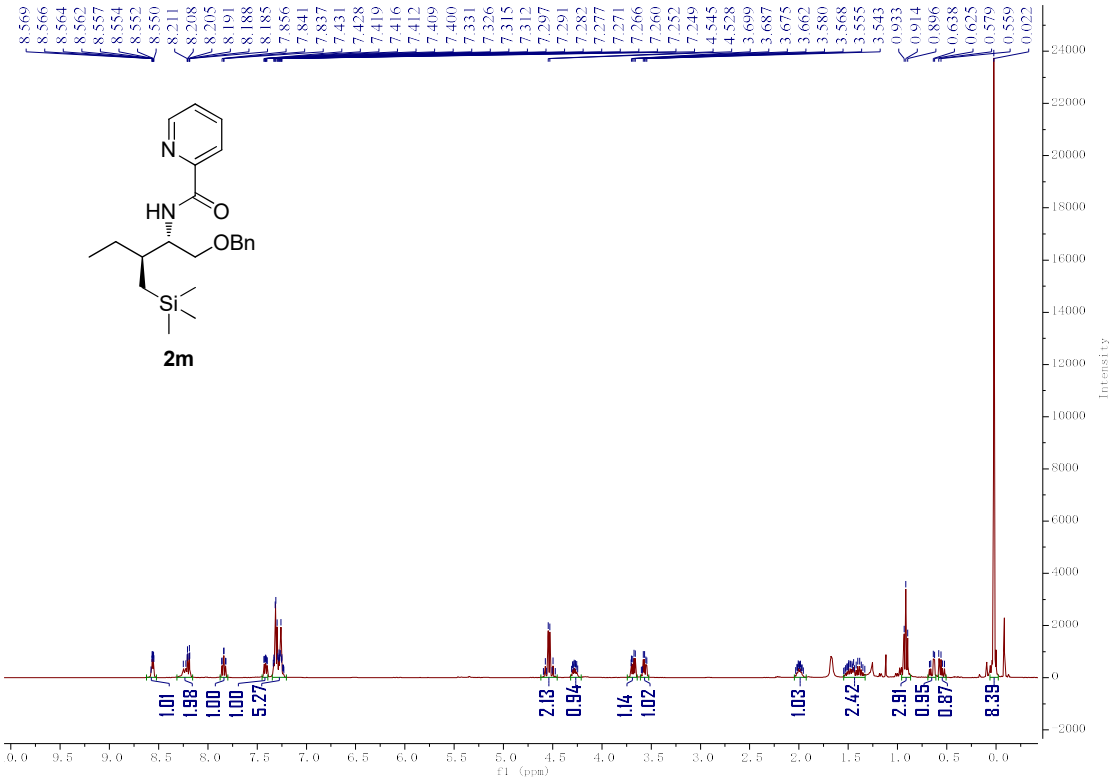

171.570
164.636
149.947
148.279
137.520
126.288
122.478
77.478
77.160
76.843
64.485
57.132
40.472
30.136
29.172
27.817
21.069
1.307
1.194
N
HN
O
OAc
Si
Si
2k′
f1 (ppm)
Intensity

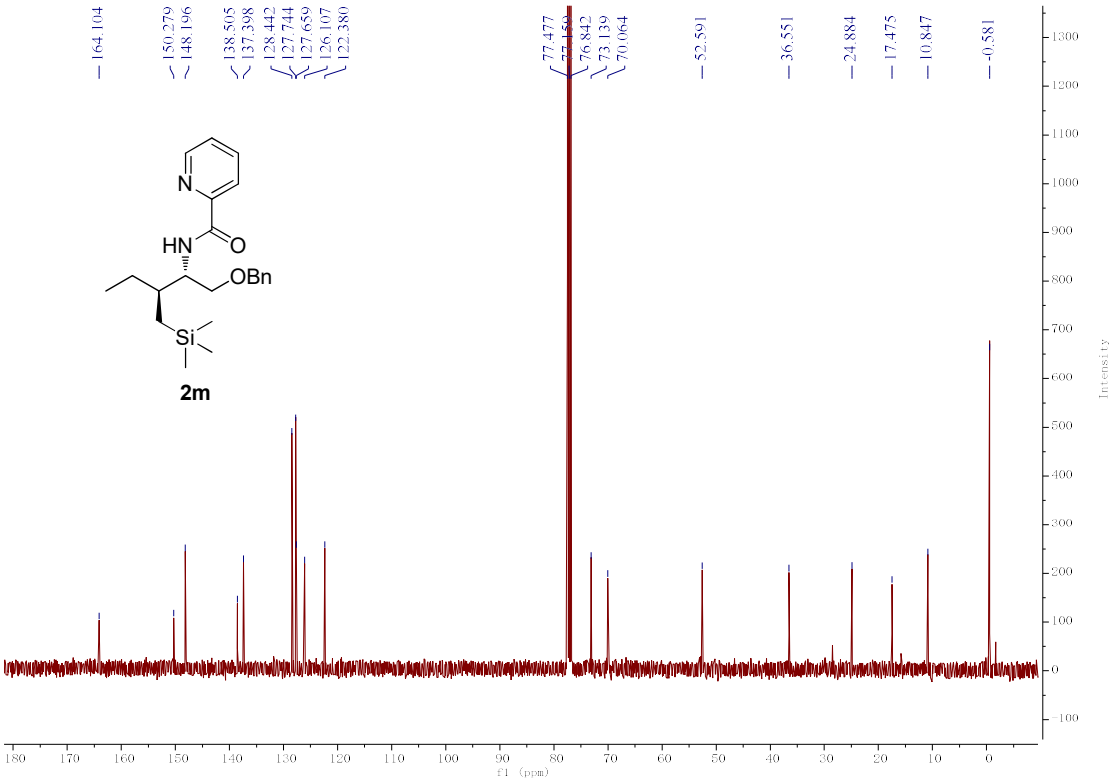

8.577
8.574
8.572
8.570
8.565
8.562
8.560
8.558
8.207
8.204
8.201
8.187
8.184
8.182
7.867
7.863
7.848
7.844
7.829
7.824
7.445
7.442
7.433
7.430
7.426
7.423
7.414
7.411
7.260
4.267
4.257
4.253
4.246
4.243
4.239
4.220
4.214
4.206
4.199
2.042
2.035
2.031
1.024
1.014
1.007
0.997
0.774
0.744
0.738
0.479
0.451
0.443
0.415
0.029
0.013
N
HN
O
OAc
Si
2l
0.97
1.01
0.92
1.01
1.00
3.09
4.17
0.90
3.04
1.03
1.00
8.77
f1 (ppm)
Intensity

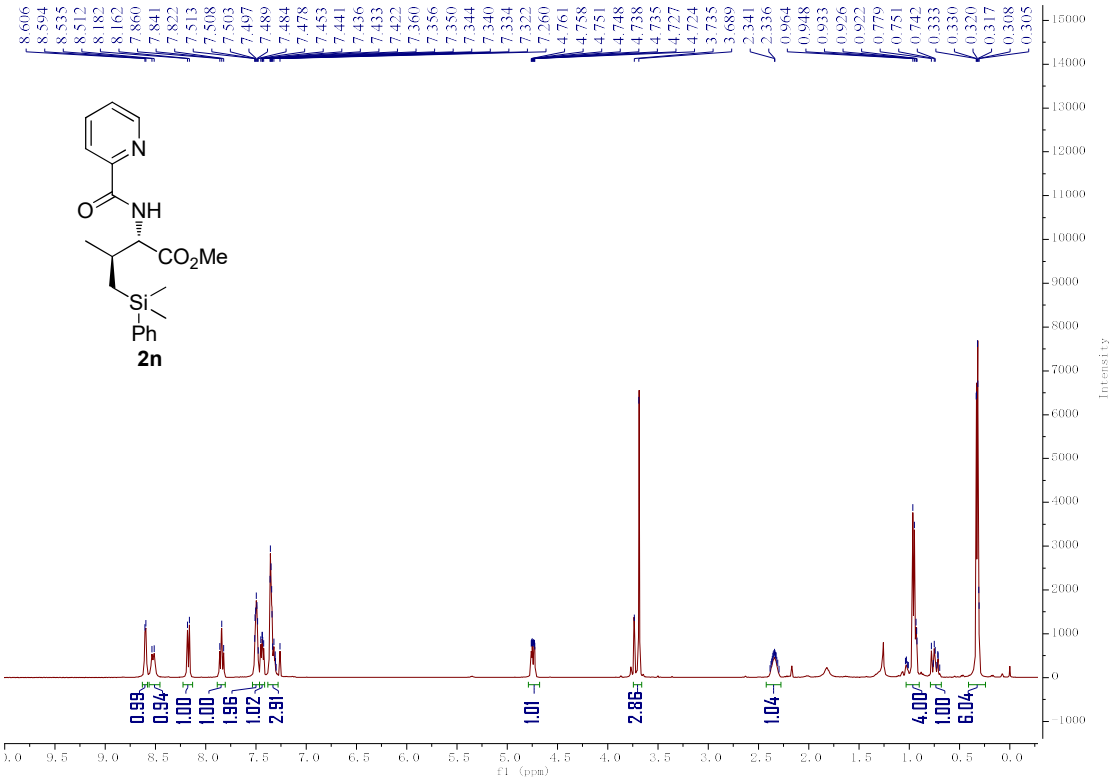

171.200
164.450
164.402
149.918
148.251
137.482
126.319
122.482
122.469
77.478
77.161
76.843
64.701
64.357
54.578
54.421
31.247
31.154
21.375
21.021
19.532
19.395
18.224
-0.652
-0.668
N
HN
O
OAc
Si
2l
f1 (ppm)
Intensity

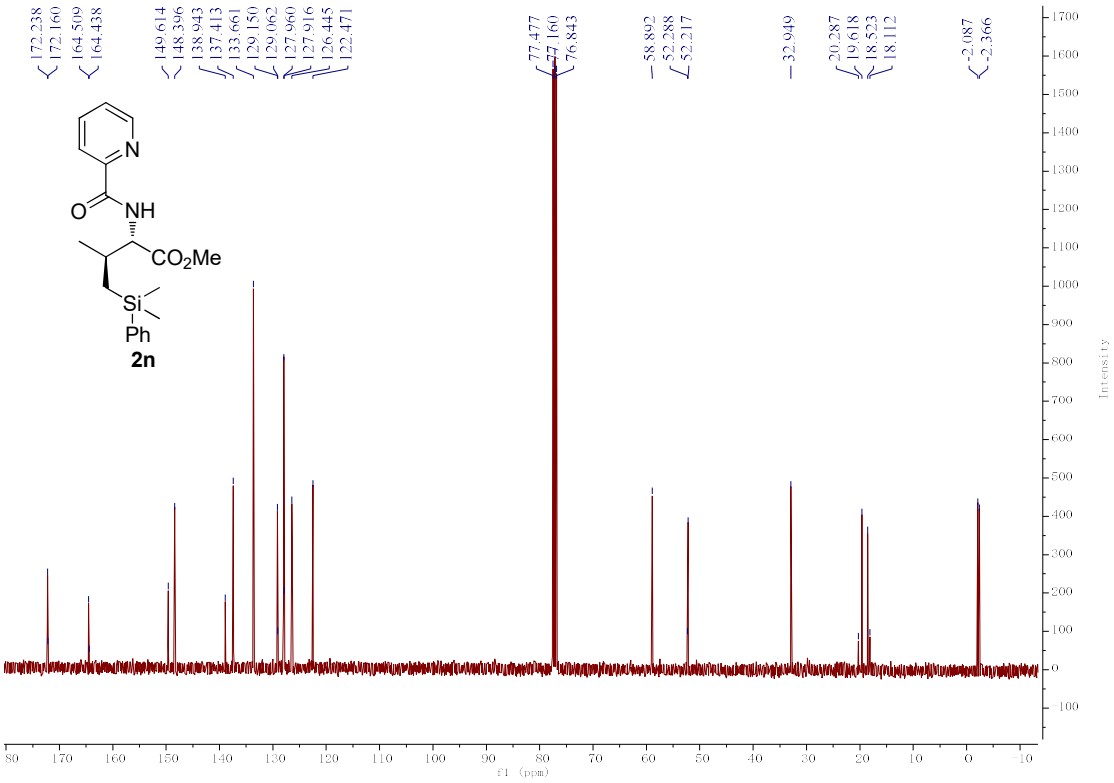

8.584
8.582
8.580
8.578
8.572
8.570
8.568
8.566
8.210
8.207
8.204
8.190
8.188
8.185
8.151
8.127
7.868
7.864
7.849
7.845
7.830
7.825
7.448
7.445
7.436
7.434
7.429
7.426
7.417
7.414
7.259
4.397
4.380
4.163
4.159
4.146
4.142
2.131
2.123
2.033
0.795
0.772
0.759
0.736
0.724
0.611
0.589
0.576
0.553
0.505
0.493
0.468
0.456
0.079
0.045
N
HN
O
OAc
Si
Si
2l′
1.01
1.01
0.90
0.98
1.00
1.11
1.96
1.25
2.83
2.07
1.09
1.06
17.05
f1 (ppm)
Intensity

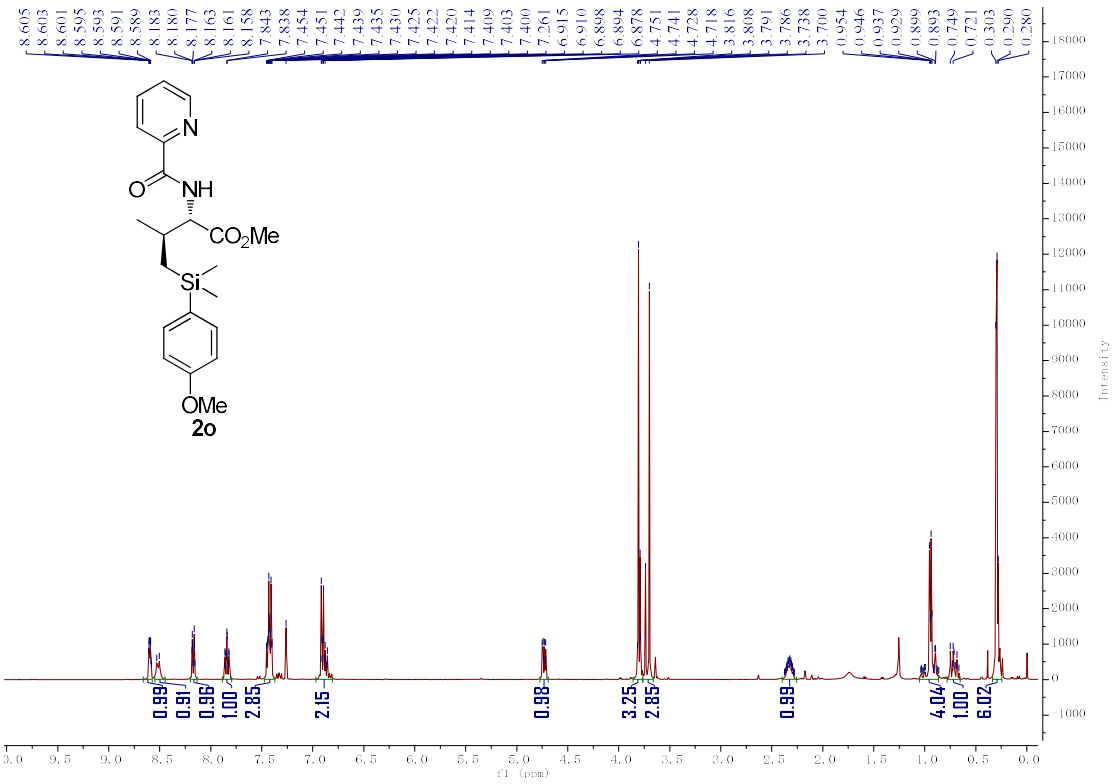

171.133
164.480
150.032
148.269
137.484
126.300
122.405
77.477
77.160
76.842
64.120
52.625
31.723
21.621
21.001
20.193
-0.538
N
HN
O
OAc
Si
Si
2l′
f1 (ppm)
Intensity

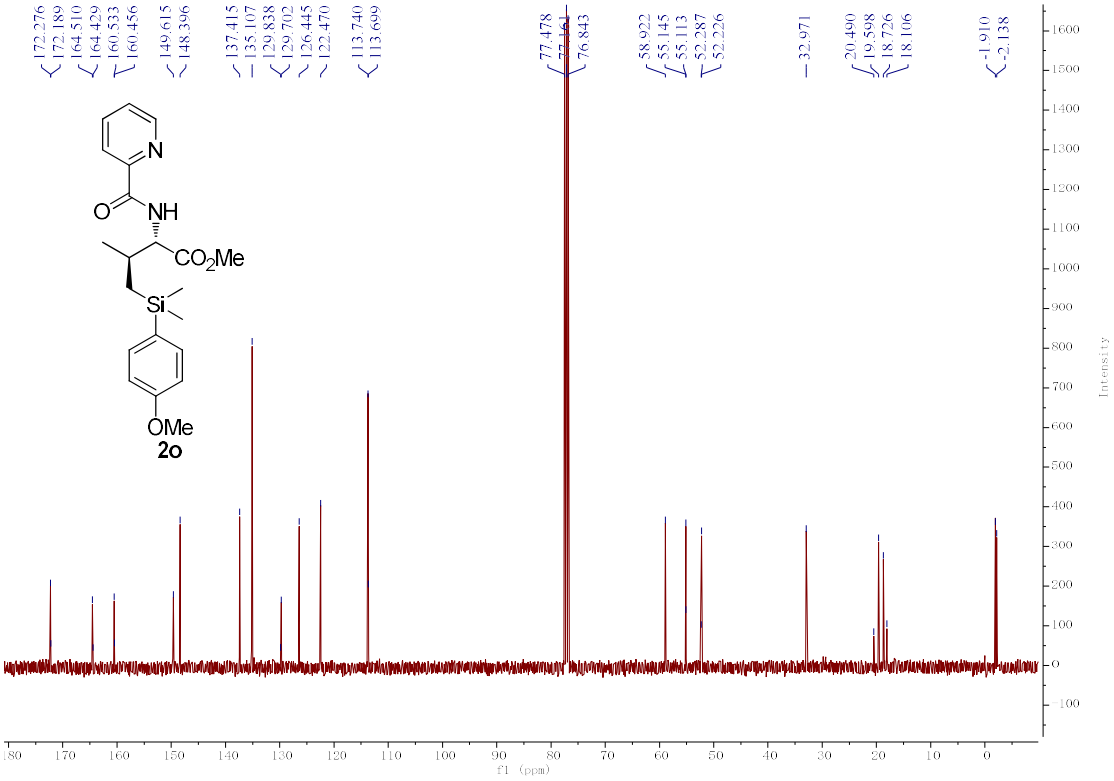

8.569
8.566
8.564
8.562
8.557
8.554
8.552
8.550
8.211
8.208
8.205
8.191
8.188
8.185
7.856
7.841
7.837
7.431
7.428
7.419
7.416
7.412
7.409
7.400
7.331
7.326
7.315
7.312
7.297
7.291
7.282
7.277
7.271
7.266
7.260
7.252
7.249
4.545
4.528
3.699
3.687
3.675
3.662
3.580
3.568
3.555
3.543
0.933
0.914
0.806
0.638
0.625
0.579
0.559
0.022
N
HN
O
OBn
Si
2m
1.01
1.98
1.00
1.00
5.27
2.13
0.94
1.14
1.02
1.03
2.42
2.91
0.95
0.87
8.39
f1 (ppm)
Intensity

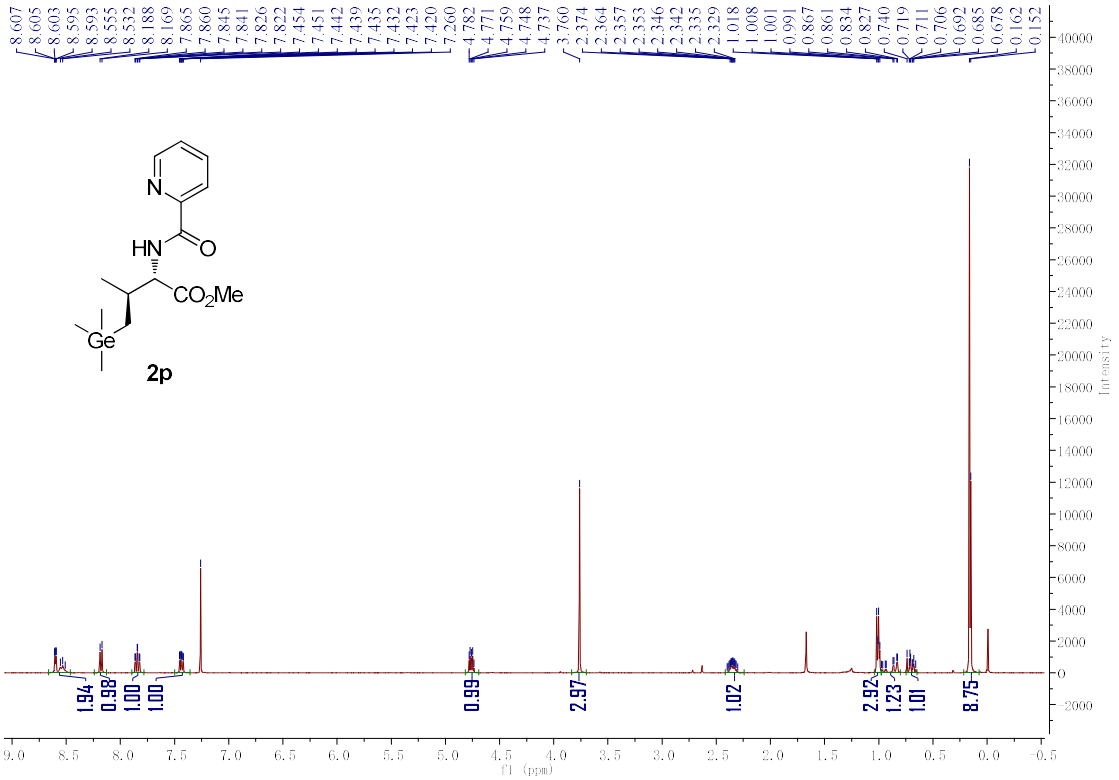

164.104
150.279
148.196
138.505
137.398
128.442
127.744
127.659
126.107
122.380
77.477
76.842
73.139
70.064
52.591
36.551
24.884
17.475
10.847
-0.581
N
HN
O
OBn
Si
2m
f1 (ppm)
Intensity

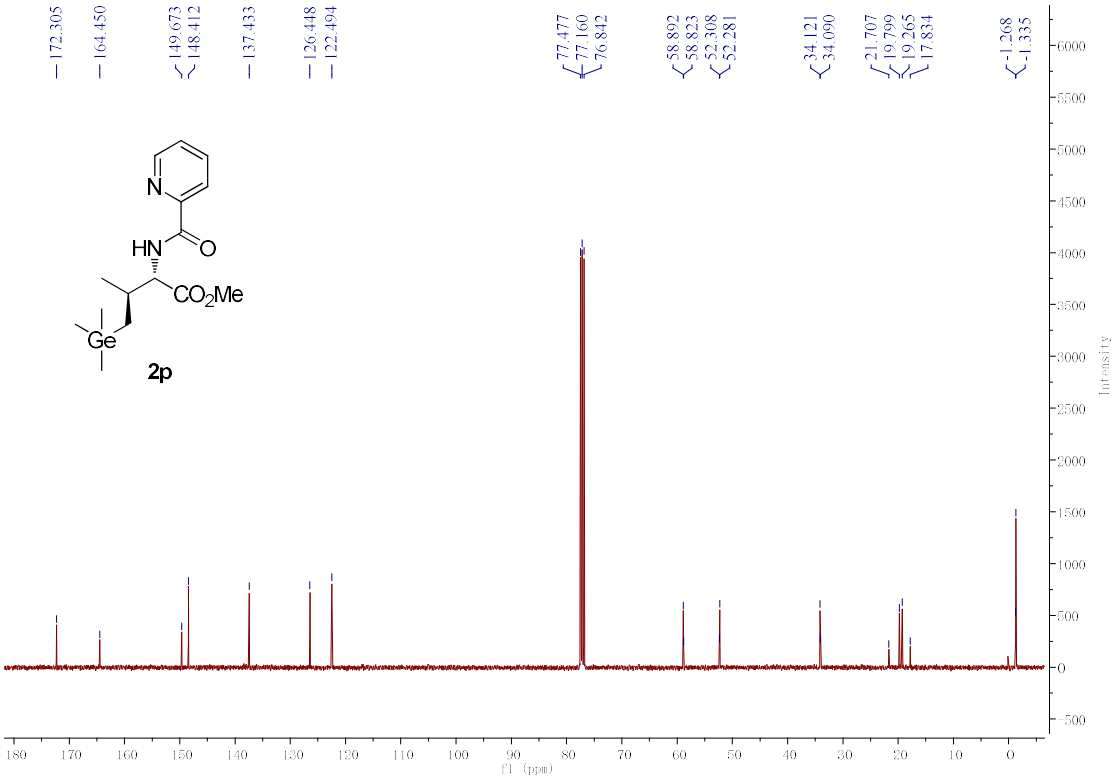

8.606
8.594
8.535
8.512
8.182
8.162
7.860
7.841
7.822
7.513
7.508
7.503
7.497
7.489
7.484
7.478
7.453
7.441
7.436
7.433
7.422
7.360
7.356
7.350
7.344
7.340
7.334
7.322
7.260
4.761
4.758
4.751
4.748
4.738
4.735
4.727
4.724
3.735
3.689
2.341
2.336
0.964
0.948
0.933
0.926
0.922
0.779
0.751
0.742
0.333
0.330
0.320
0.317
0.308
0.305
N
O
NH
CO2Me
Si
Ph
2n
0.99
0.94
1.00
1.00
1.96
1.02
2.91
1.01
2.86
1.04
4.00
1.00
6.04
f1 (ppm)
Intensity

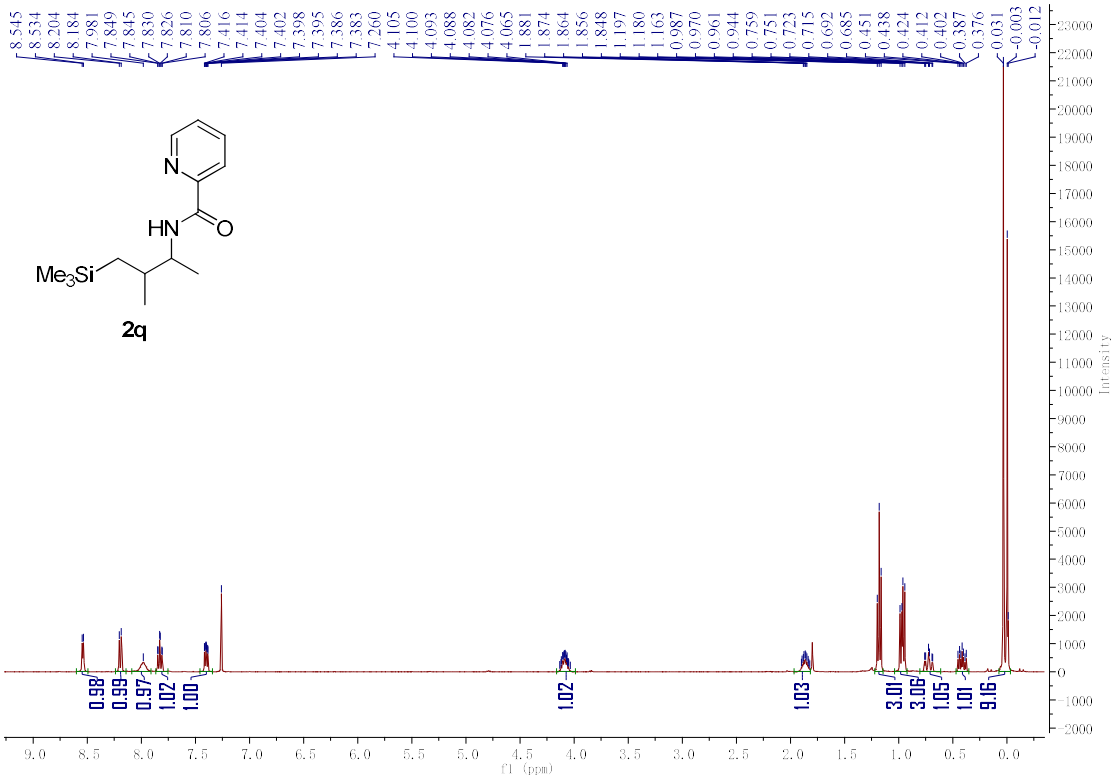

172.238
172.160
164.509
164.438
149.614
148.396
138.943
137.413
133.661
129.150
129.062
127.960
127.916
126.445
122.471
77.477
77.160
76.843
58.892
52.288
52.217
32.949
20.287
19.618
18.523
18.112
-2.087
-2.366
N
O
NH
CO2Me
Si
Ph
2n
f1 (ppm)
Intensity

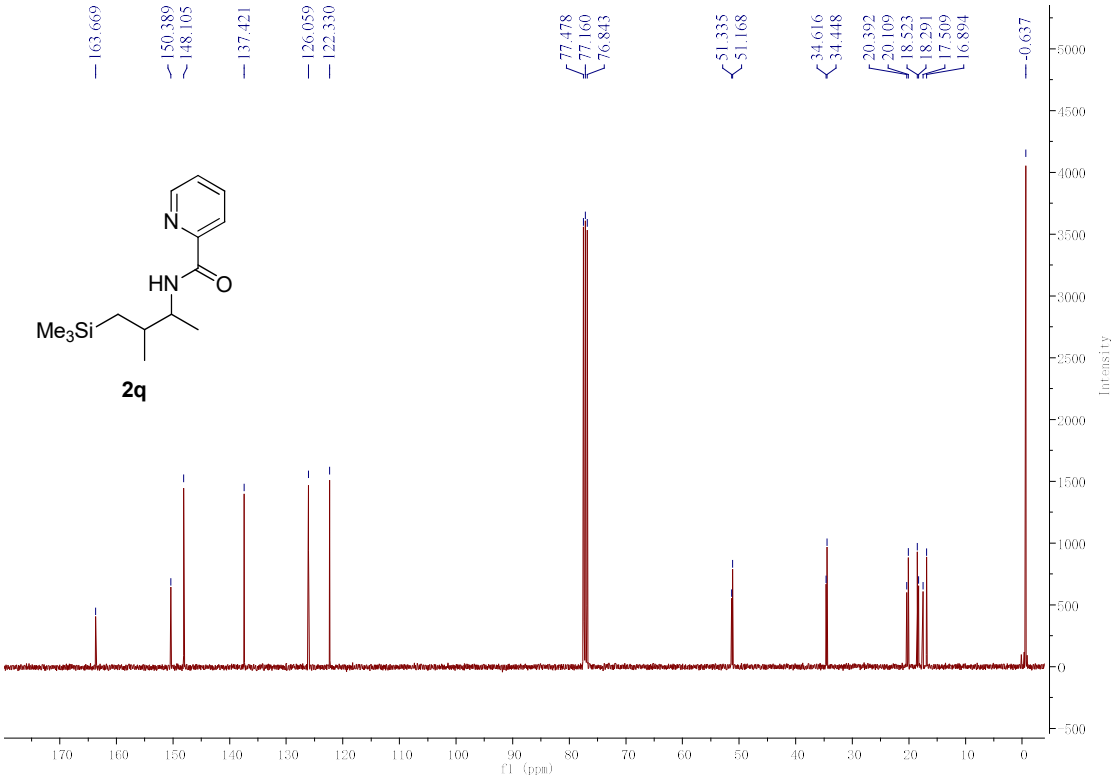

8.605
8.603
8.601
8.595
8.593
8.591
8.589
8.183
8.180
8.177
8.163
8.161
8.158
7.843
7.838
7.454
7.451
7.442
7.439
7.435
7.430
7.425
7.422
7.420
7.414
7.409
7.403
7.400
7.261
6.915
6.910
6.898
6.894
6.878
4.751
4.741
4.728
4.718
3.816
3.808
3.791
3.786
3.738
3.700
0.954
0.946
0.937
0.929
0.899
0.893
0.749
0.721
0.303
0.290
0.280
N
O
NH
CO2Me
Si
OMe
2o
0.99
0.91
0.98
1.00
2.85
2.15
0.98
3.25
2.85
0.99
4.04
1.00
6.02
f1 (ppm)
Intensity

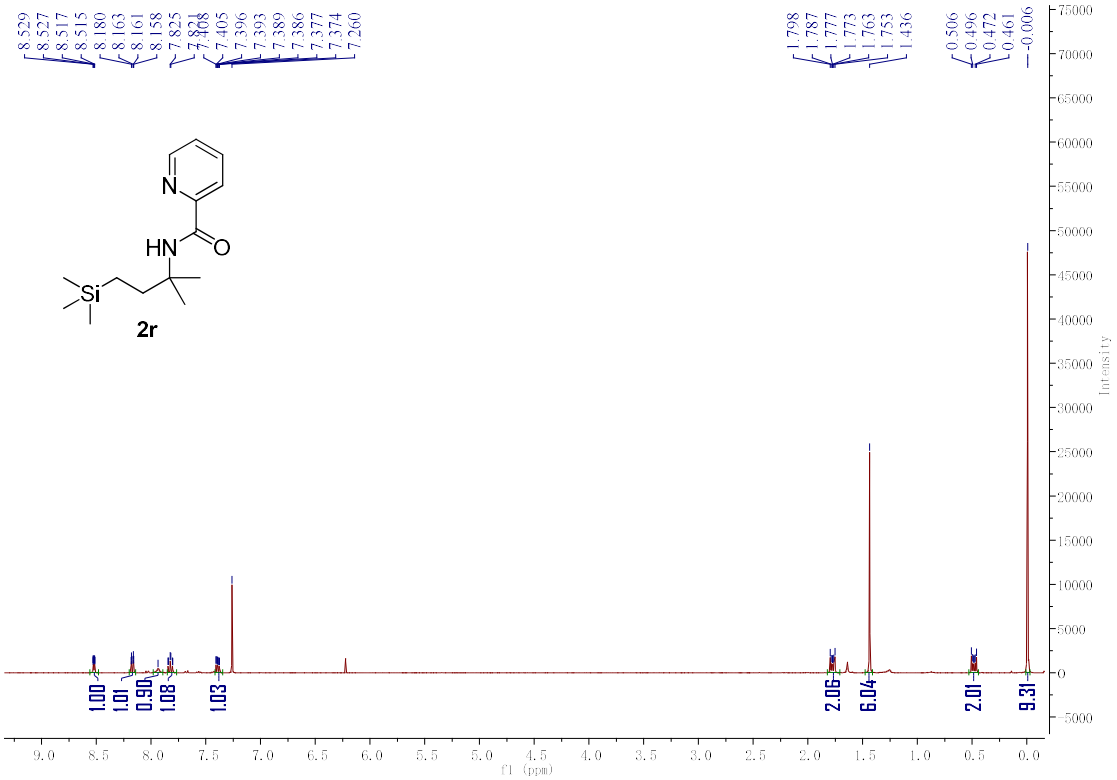

172.276
172.189
164.510
164.429
160.533
160.456
149.615
148.396
137.415
135.107
129.838
129.702
126.445
122.470
113.740
113.699
77.478
77.161
76.843
58.922
55.145
55.113
52.287
52.226
32.971
20.490
19.598
18.726
18.106
-1.910
-2.138
N
O
NH
CO2Me
Si
OMe
2o
f1 (ppm)
Intensity

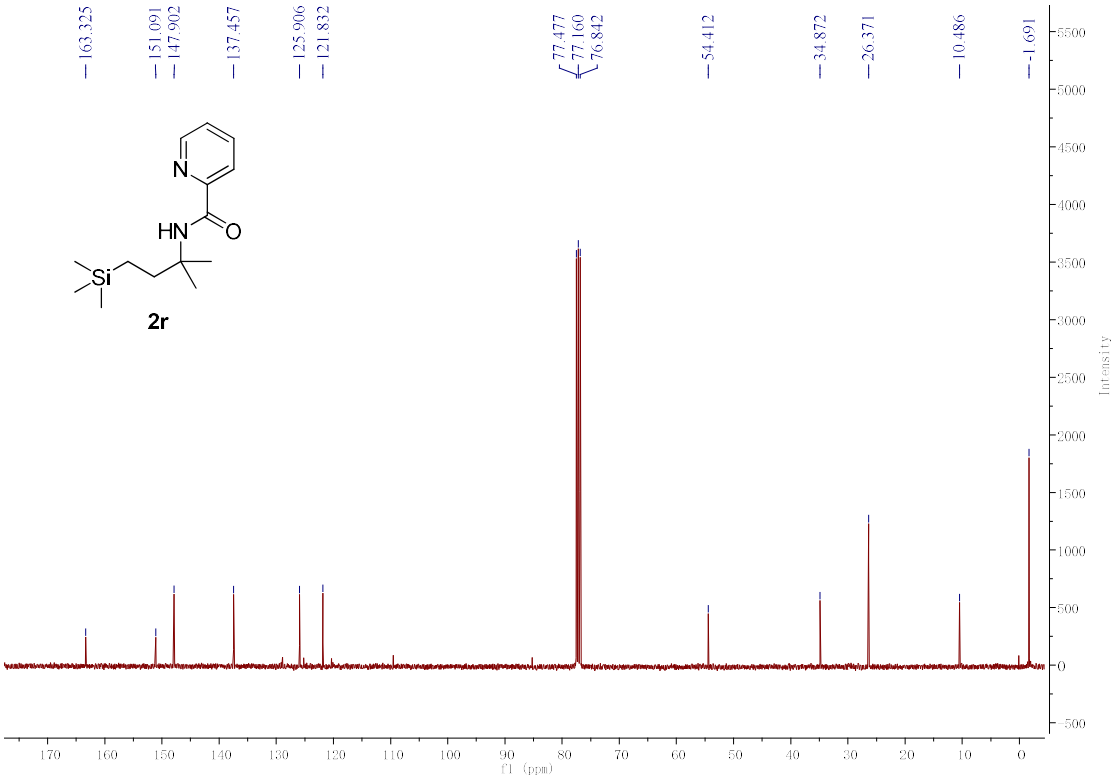

8.607
8.605
8.603
8.595
8.593
8.555
8.532
8.188
8.169
7.865
7.860
7.845
7.841
7.826
7.822
7.454
7.451
7.442
7.439
7.435
7.432
7.423
7.420
7.260
4.782
4.771
4.759
4.748
4.737
3.760
2.374
2.364
2.357
2.353
2.346
2.342
2.335
2.329
1.018
1.008
1.001
0.991
0.867
0.861
0.834
0.827
0.740
0.719
0.711
0.706
0.692
0.685
0.678
0.162
0.152
N
HN
O
CO2Me
Ge
2p
1.94
0.98
1.00
1.00
0.99
2.97
1.02
2.92
1.23
1.01
8.75
Intensity
f1 (ppm)

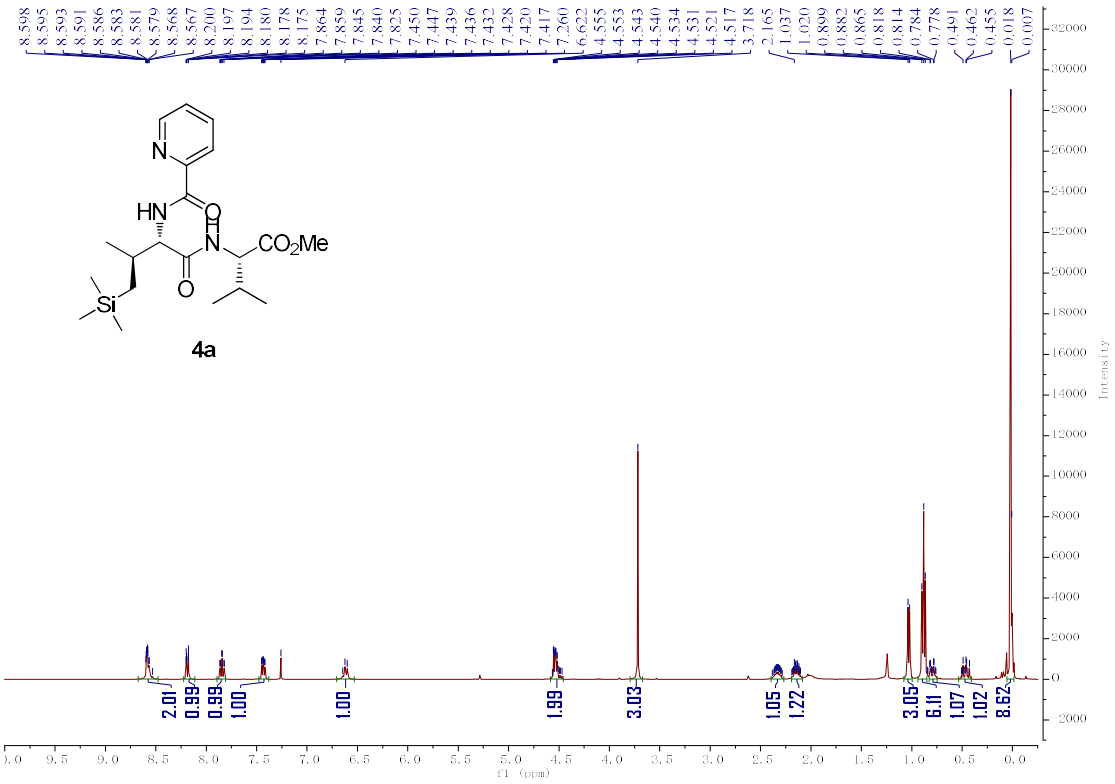

172.305
164.450
149.673
148.412
137.433
126.448
122.494
77.477
77.160
76.842
58.892
58.823
52.308
52.281
34.121
34.090
21.707
19.799
19.265
17.834
-1.268
-1.335
N
HN
O
CO2Me
Ge
2p
Intensity
f1 (ppm)

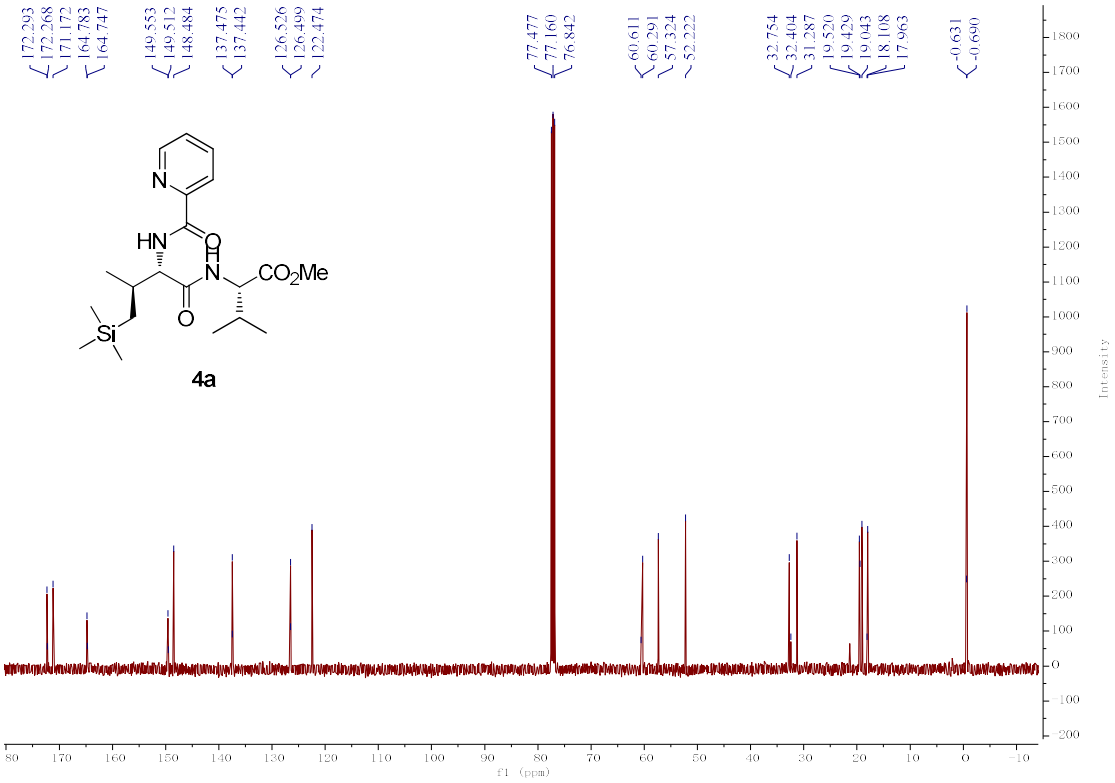

8.545
8.534
8.204
8.184
7.981
7.849
7.845
7.830
7.826
7.810
7.806
7.416
7.414
7.404
7.402
7.398
7.395
7.386
7.383
7.260
4.105
4.100
4.093
4.088
4.082
4.076
4.065
1.881
1.874
1.864
1.856
1.848
1.197
1.180
1.163
0.987
0.970
0.961
0.944
0.759
0.751
0.723
0.715
0.692
0.685
0.451
0.438
0.424
0.412
0.402
0.387
0.376
0.031
-0.003
-0.012
N
HN
O
Me3Si
2q
0.98
0.99
0.97
1.02
1.00
1.02
1.03
3.01
3.06
1.05
1.01
9.16
Intensity
f1 (ppm)

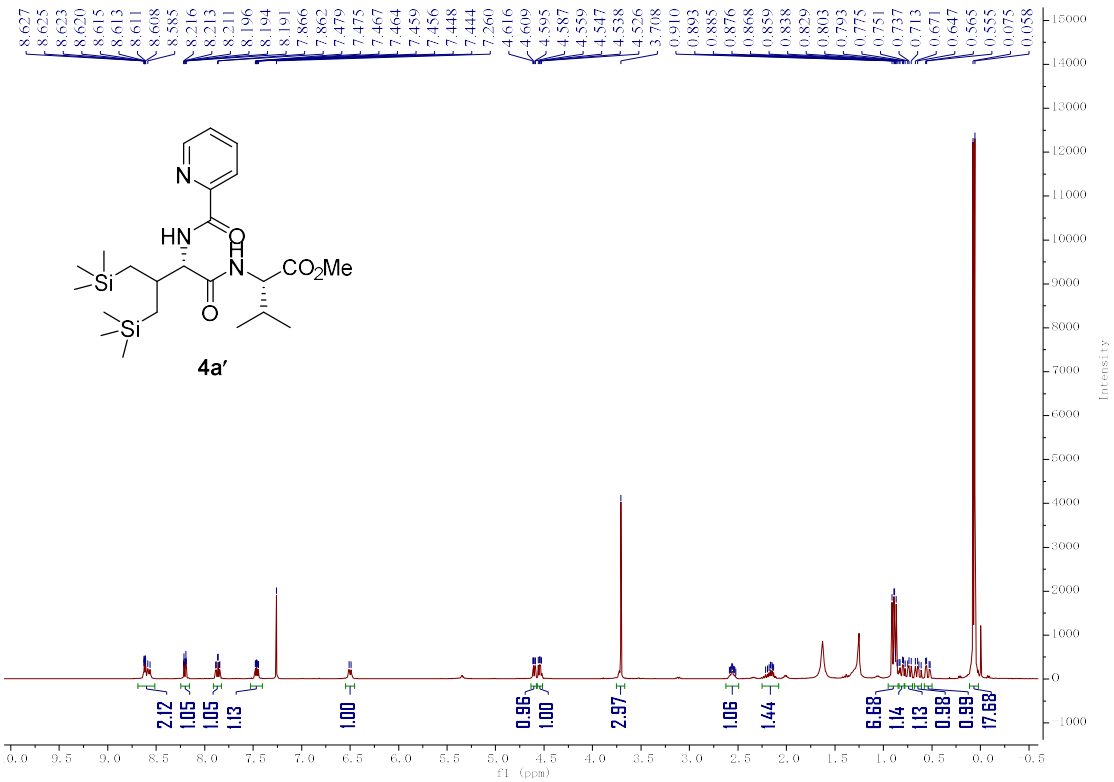

163.669
150.389
148.105
137.421
126.059
122.330
77.478
77.160
76.843
51.335
51.168
34.616
34.448
20.392
20.109
18.523
18.291
17.509
16.894
-0.637
N
HN
O
Me3Si
2q
Intensity
f1 (ppm)

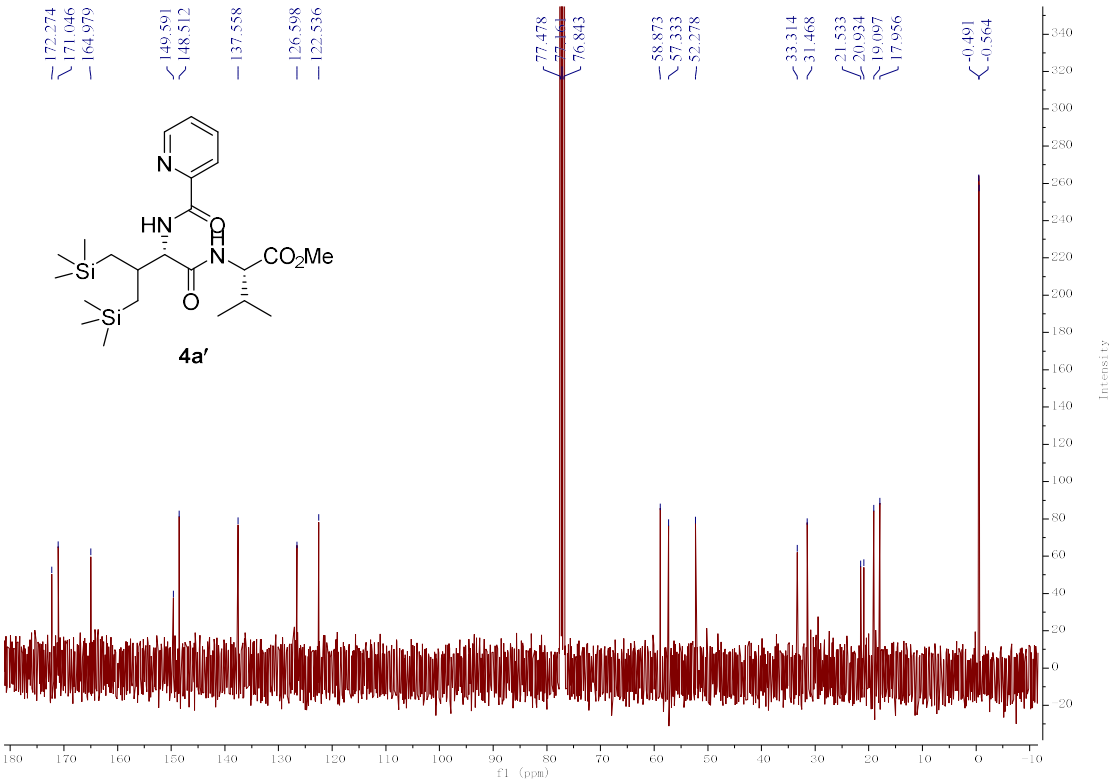

8.529
8.527
8.517
8.515
8.180
8.163
8.161
8.158
7.825
7.821
7.408
7.405
7.396
7.393
7.389
7.386
7.377
7.374
7.260
1.798
1.787
1.777
1.773
1.763
1.753
1.436
0.506
0.496
0.472
0.461
-0.006
N
HN
O
Si
2r
1.00
1.01
0.90
1.08
1.03
2.06
6.04
2.01
9.31
f1 (ppm)
Intensity

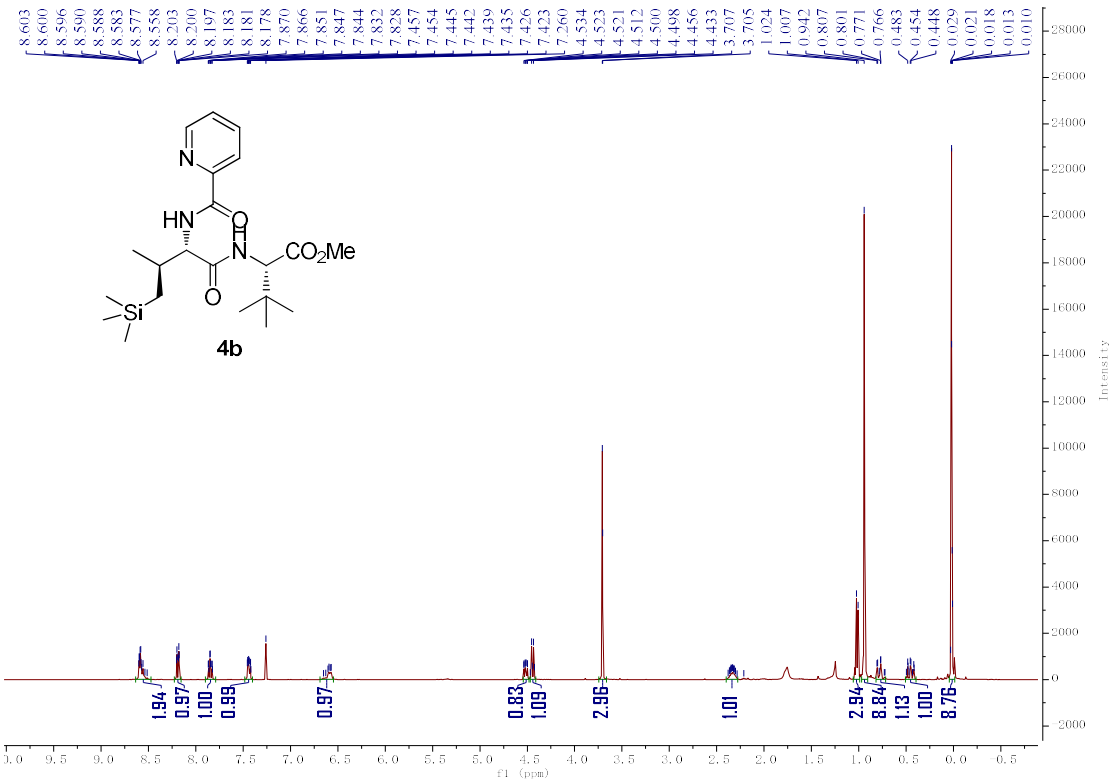

163.325
151.091
147.902
137.457
125.906
121.832
77.477
77.160
76.842
54.412
34.872
26.371
10.486
1.691
N
HN
O
Si
2r
f1 (ppm)
Intensity

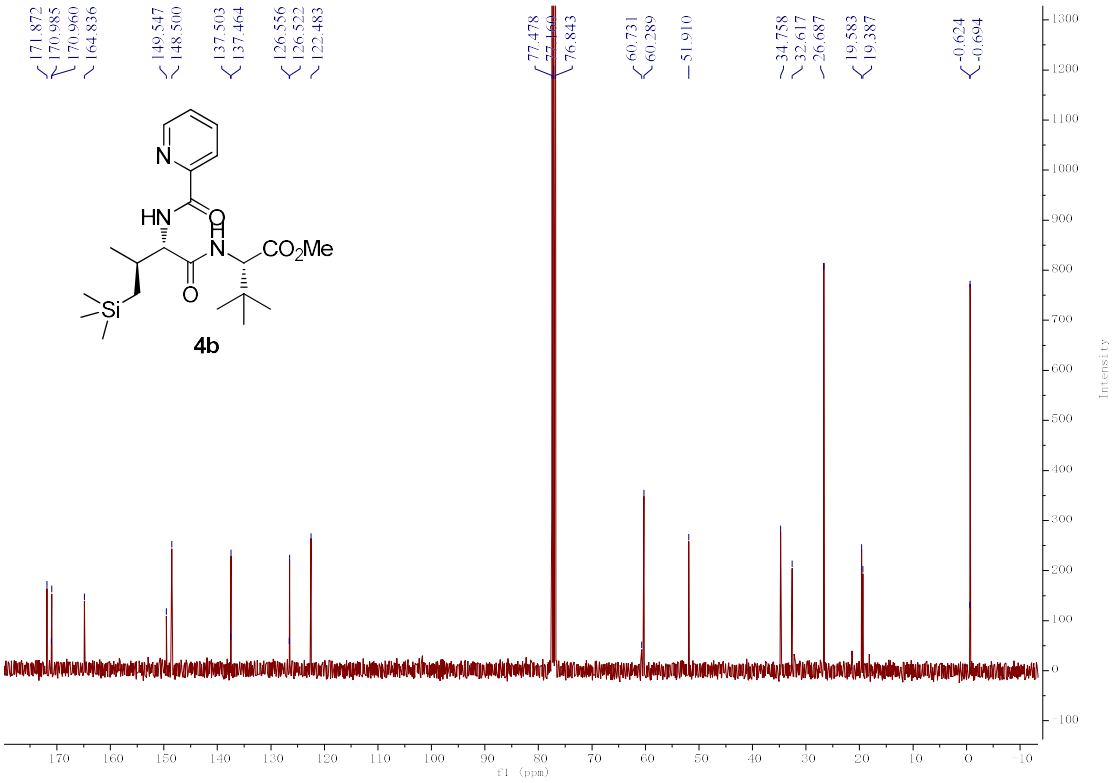

8.598
8.595
8.593
8.591
8.586
8.583
8.581
8.579
8.568
8.567
8.200
8.197
8.194
8.180
8.178
8.175
7.864
7.859
7.845
7.840
7.825
7.450
7.447
7.439
7.436
7.432
7.428
7.420
7.417
7.260
6.622
4.555
4.553
4.543
4.540
4.534
4.531
4.521
4.517
3.718
2.165
1.037
1.020
0.899
0.882
0.865
0.818
0.814
0.784
0.778
0.491
0.462
0.455
0.018
0.007
N
HN
O
N
CO2Me
O
Si
4a
2.01
0.99
0.99
1.00
1.00
1.99
3.03
1.05
1.22
3.05
6.11
1.07
1.02
8.62
f1 (ppm)
Intensity

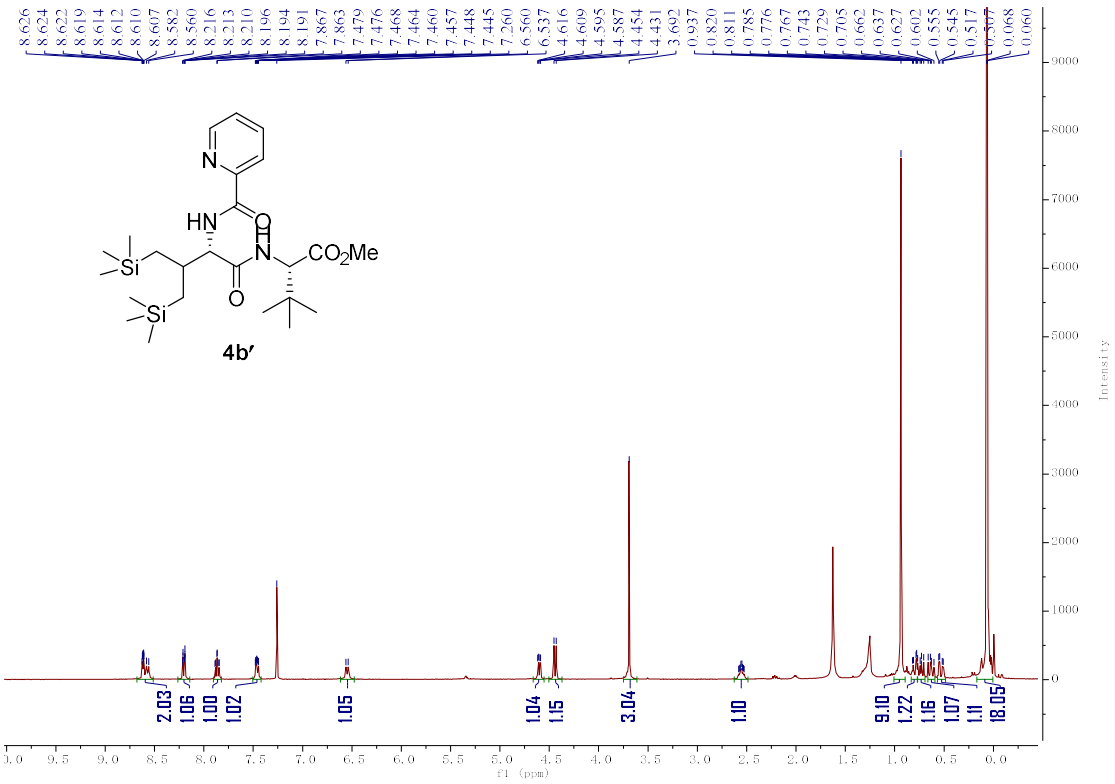

172.293
172.268
171.172
164.783
164.747
149.553
149.512
148.484
137.475
137.442
126.526
126.499
122.474
77.477
77.160
76.842
60.611
60.291
57.324
52.222
32.754
32.404
31.287
19.520
19.429
19.043
18.108
17.963
-0.631
-0.690
N
HN
O
N
CO2Me
O
Si
4a
f1 (ppm)
Intensity

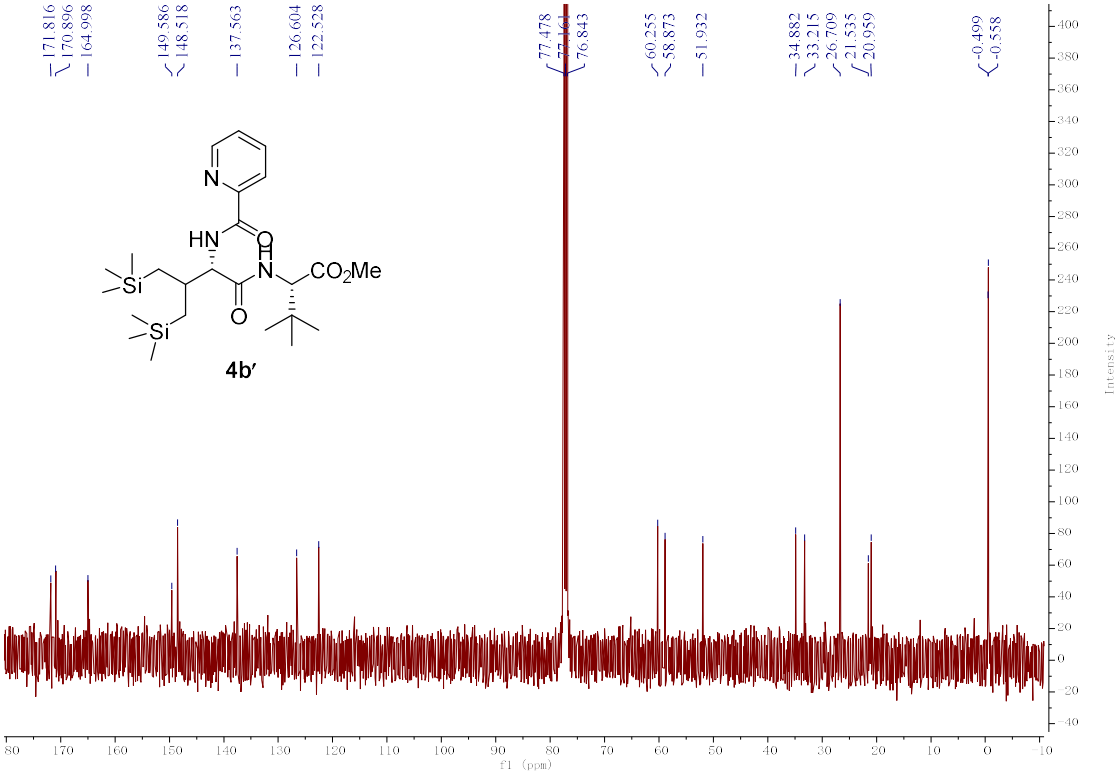

8.627
8.625
8.623
8.620
8.615
8.613
8.611
8.608
8.585
8.216
8.213
8.211
8.196
8.194
8.191
7.866
7.862
7.479
7.475
7.467
7.464
7.459
7.456
7.448
7.444
7.260
4.616
4.609
4.595
4.587
4.559
4.547
4.538
4.526
3.708
0.910
0.893
0.885
0.876
0.868
0.859
0.838
0.829
0.803
0.793
0.775
0.751
0.737
0.713
0.671
0.647
0.565
0.555
0.075
0.058
N
HN
O
N
CO2Me
Si
Si
O
4a′
2.12
1.05
1.05
1.13
1.00
0.96
1.00
2.97
1.06
1.44
6.68
1.14
1.13
0.98
0.99
17.68
f1 (ppm)
Intensity

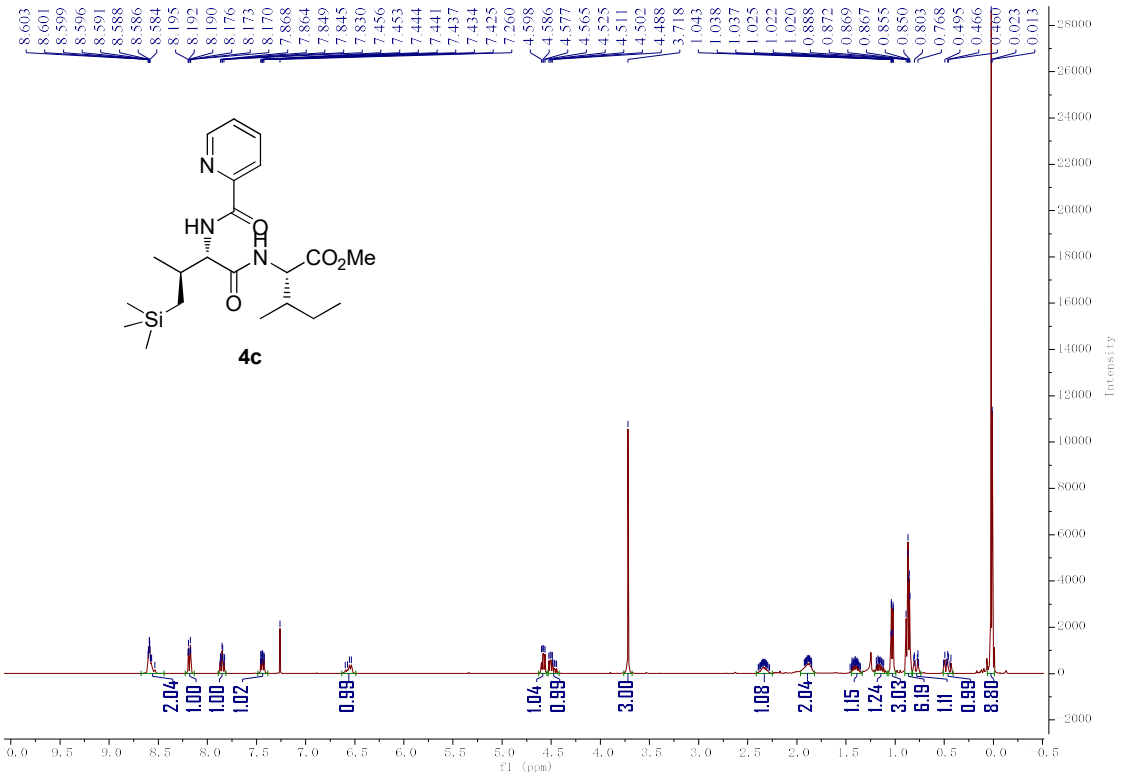

172.274
171.046
164.979
149.591
148.512
137.558
126.598
122.536
77.478
77.161
76.843
58.873
57.333
52.278
33.314
31.468
21.533
20.934
19.097
17.956
-0.491
-0.564
N
HN
O
N
CO2Me
Si
Si
O
4a′
f1 (ppm)
Intensity

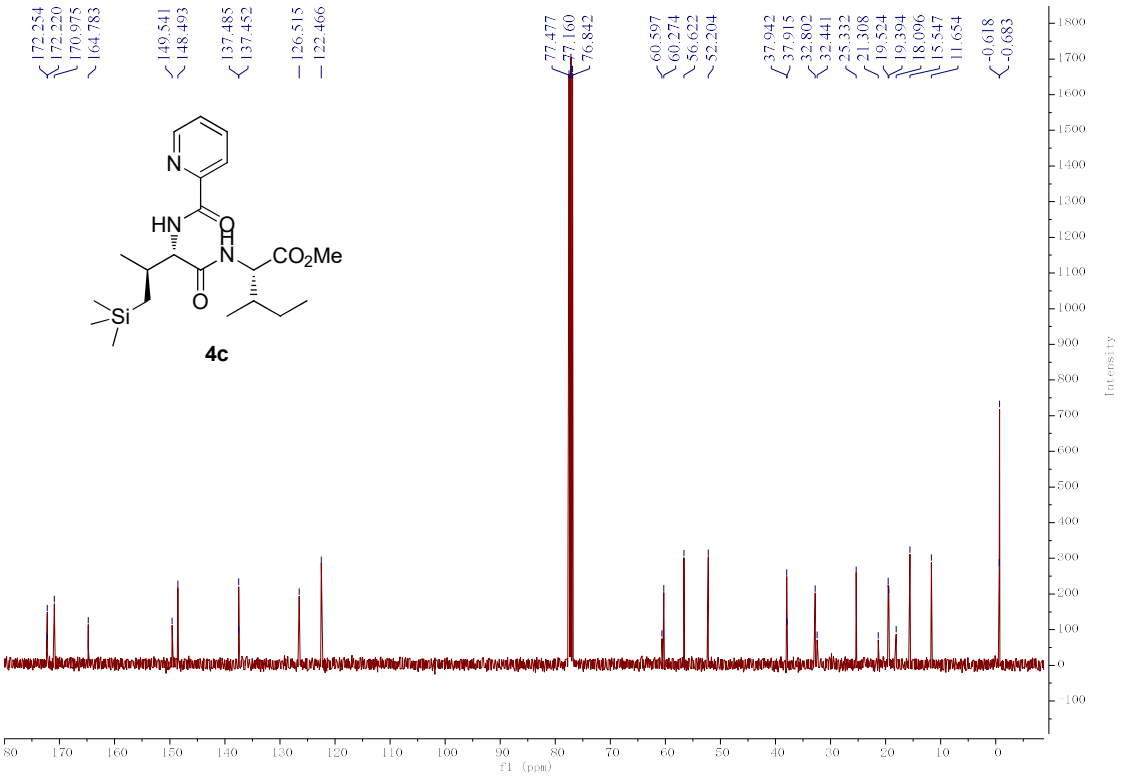

8.603
8.600
8.596
8.590
8.588
8.583
8.577
8.558
8.203
8.200
8.197
8.183
8.181
8.178
7.870
7.866
7.851
7.847
7.844
7.832
7.828
7.457
7.454
7.445
7.442
7.439
7.435
7.426
7.423
7.260
4.534
4.523
4.521
4.512
4.500
4.498
4.456
4.433
3.707
3.705
1.024
1.007
0.942
0.807
0.801
0.771
0.766
0.483
0.454
0.448
0.029
0.021
0.018
0.013
0.010
N
HN
O
N
CO2Me
O
Si
4b
1.94
0.97
1.00
0.99
0.97
0.83
1.09
2.96
1.01
2.94
8.84
1.13
1.00
8.76
Intensity
f1 (ppm)

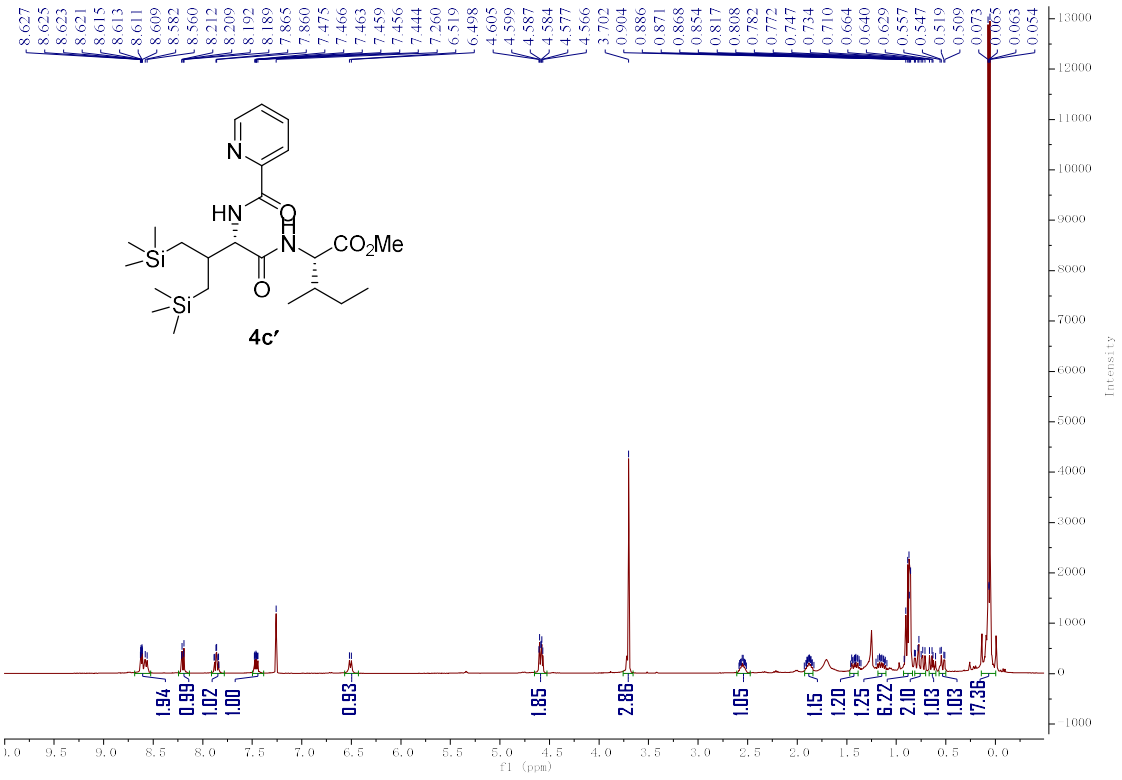

171.872
170.985
170.960
164.836
149.547
148.500
137.503
137.464
126.556
126.522
122.483
77.478
77.160
76.843
60.731
60.289
51.910
34.758
32.617
26.687
19.583
19.387
-0.624
-0.694
N
HN
O
N
CO2Me
O
Si
4b
Intensity
f1 (ppm)

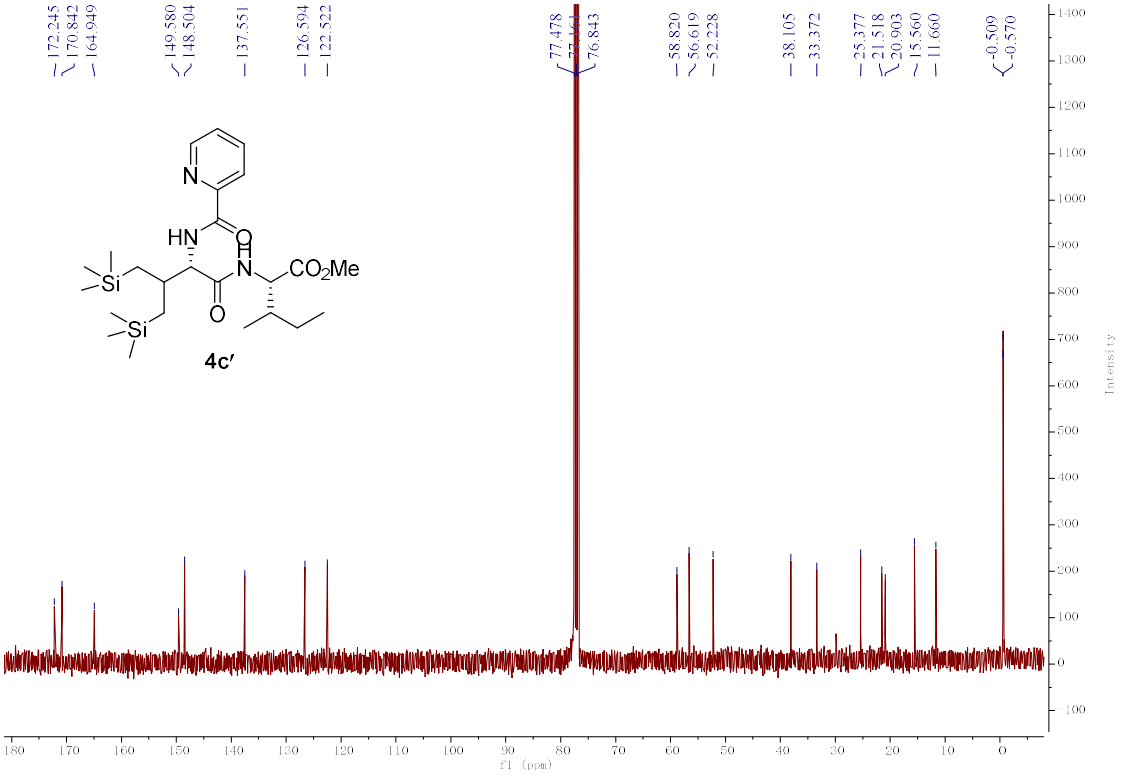

8.626
8.624
8.622
8.619
8.614
8.612
8.610
8.607
8.582
8.560
8.216
8.213
8.210
8.196
8.194
8.191
7.867
7.863
7.479
7.476
7.468
7.464
7.460
7.457
7.448
7.445
7.260
6.560
6.537
4.616
4.609
4.595
4.587
4.454
4.431
3.692
0.937
0.820
0.811
0.785
0.776
0.767
0.743
0.729
0.705
0.662
0.637
0.627
0.602
0.555
0.545
0.517
0.068
0.060
N
HN
O
N
CO2Me
Si
Si
O
4b′
2.03
1.06
1.00
1.02
1.05
1.04
1.15
3.04
1.10
9.10
1.22
1.16
1.07
1.11
18.05
f1 (ppm)
Intensity

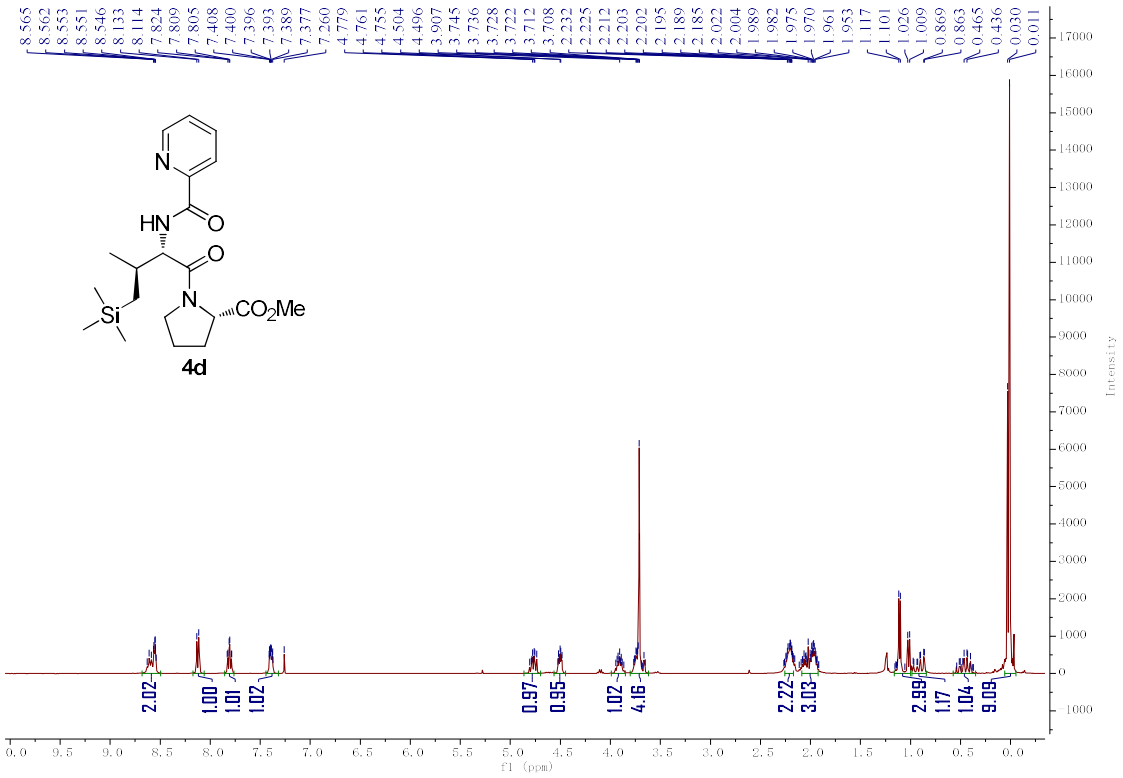

171.816
170.896
164.998
149.586
148.518
137.563
126.604
122.528
77.478
77.164
76.843
60.255
58.873
51.932
34.882
33.215
26.709
21.535
20.959
-0.499
-0.558
N
HN
O
N
CO2Me
Si
Si
O
4b′
f1 (ppm)
Intensity

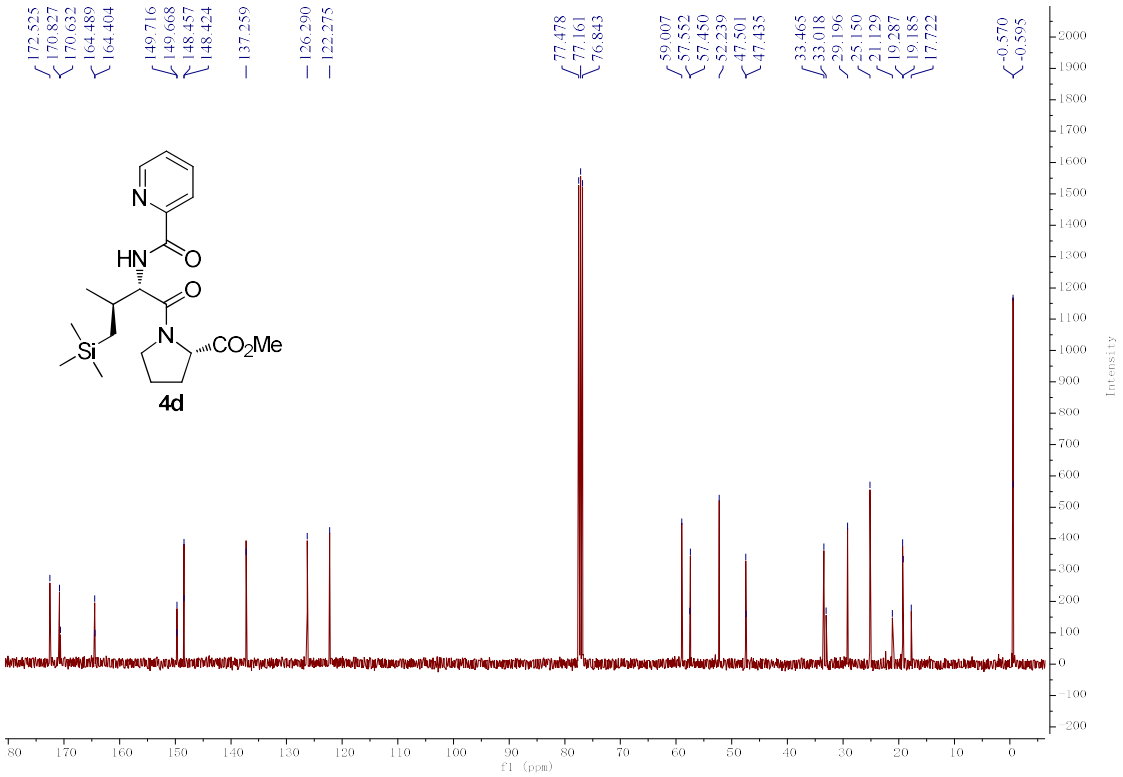

8.603
8.601
8.599
8.596
8.591
8.588
8.586
8.584
8.195
8.192
8.190
8.176
8.173
8.170
7.868
7.864
7.849
7.845
7.830
7.456
7.453
7.444
7.441
7.437
7.434
7.425
7.260
4.598
4.586
4.577
4.565
4.525
4.511
4.502
4.488
3.718
1.043
1.038
1.037
1.025
1.022
1.020
0.888
0.872
0.869
0.867
0.855
0.850
0.803
0.768
0.495
0.466
0.460
0.023
0.013
N
HN
O
N
O
CO2Me
Si
4c
2.04
1.00
1.00
1.02
0.99
1.04
0.99
3.00
1.08
2.04
1.15
1.24
3.03
6.19
1.11
0.99
8.80
Intensity
f1 (ppm)

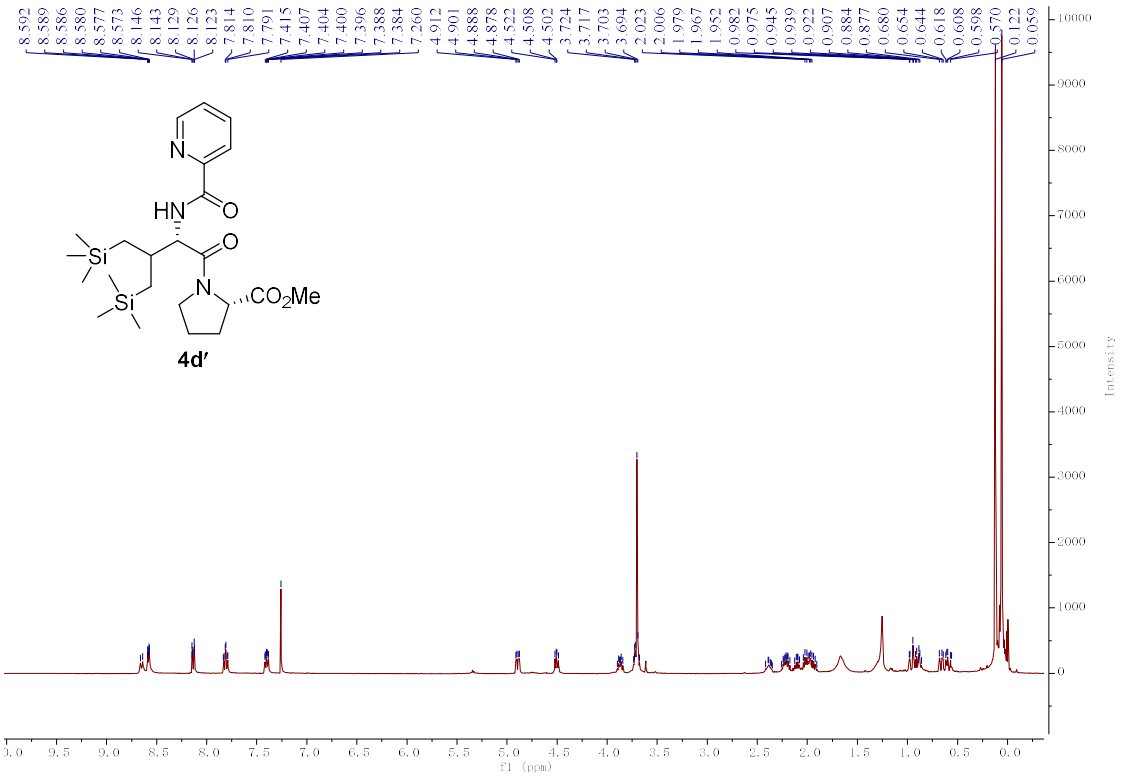

172.254
172.220
170.975
164.783
149.541
148.493
137.485
137.452
126.515
122.466
77.477
77.160
76.842
60.597
60.274
56.622
52.204
37.942
37.915
32.802
32.441
25.332
21.308
19.524
19.394
18.096
15.547
11.654
-0.618
-0.683
N
HN
O
N
O
CO2Me
Si
4c
Intensity
f1 (ppm)

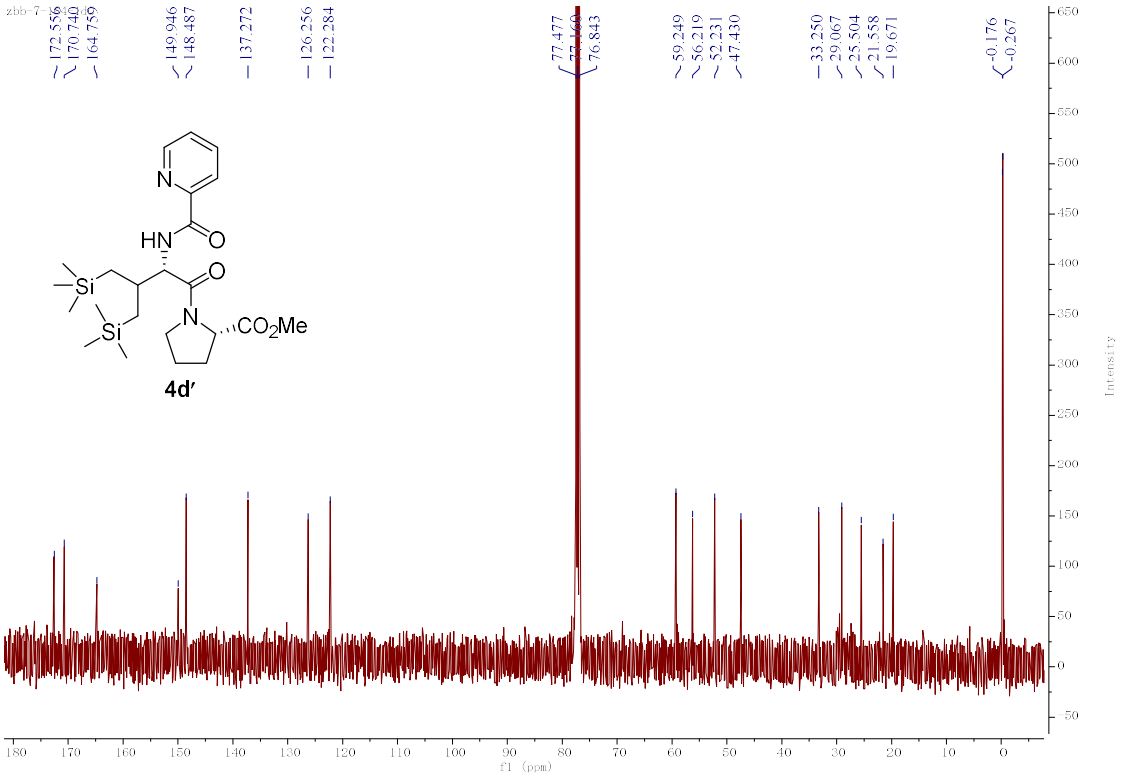

8.627
8.625
8.623
8.621
8.615
8.613
8.611
8.609
8.582
8.560
8.212
8.209
8.192
8.189
7.865
7.860
7.475
7.466
7.463
7.459
7.456
7.444
7.260
6.519
6.498
4.605
4.599
4.587
4.584
4.577
4.566
3.702
0.904
0.886
0.871
0.868
0.854
0.817
0.808
0.782
0.772
0.747
0.734
0.710
0.664
0.640
0.629
0.557
0.547
0.519
0.509
0.073
0.065
0.063
0.054
N
HN
O
N
CO2Me
Si
Si
O
4c′
1.94
0.99
1.02
1.00
0.93
1.85
2.86
1.05
1.15
1.20
1.25
6.22
2.10
1.03
1.03
17.36
f1 (ppm)
Intensity

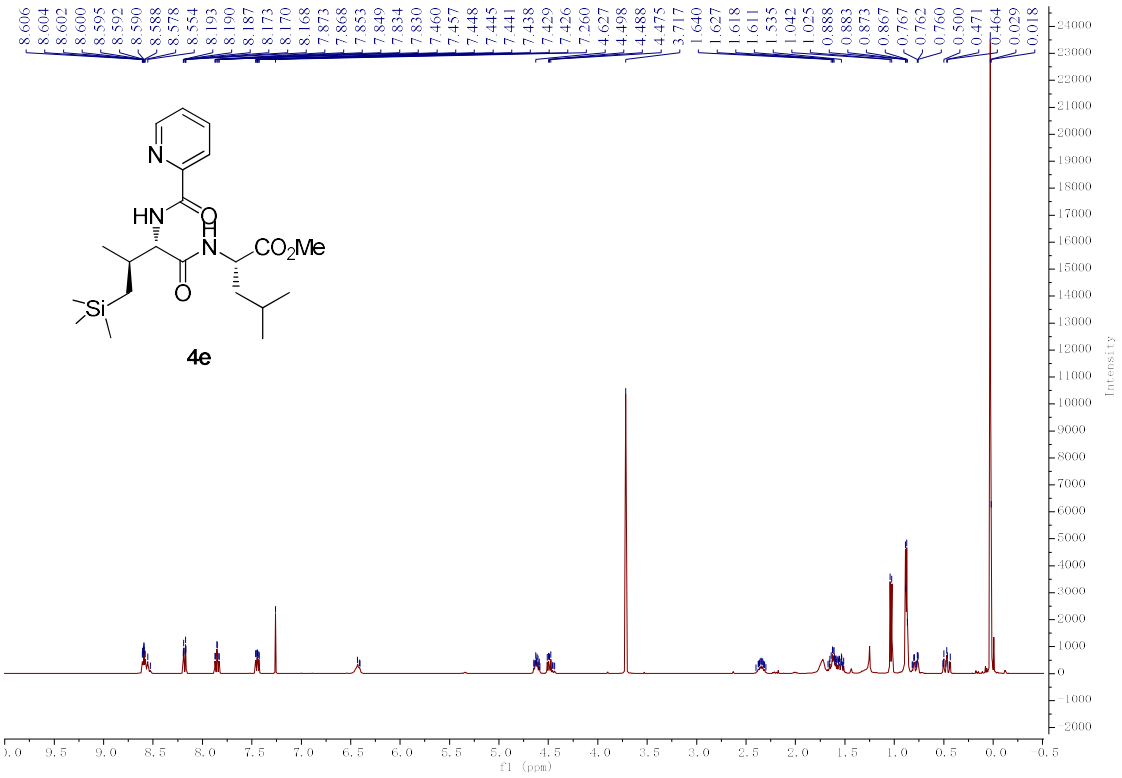

172.245
170.842
164.949
149.580
148.504
137.551
126.594
122.522
77.478
77.161
76.843
58.820
56.619
52.228
38.105
33.372
25.377
21.518
20.903
15.560
11.660
-0.509
-0.570
N
HN
O
N
CO2Me
Si
Si
O
4c′
f1 (ppm)
Intensity

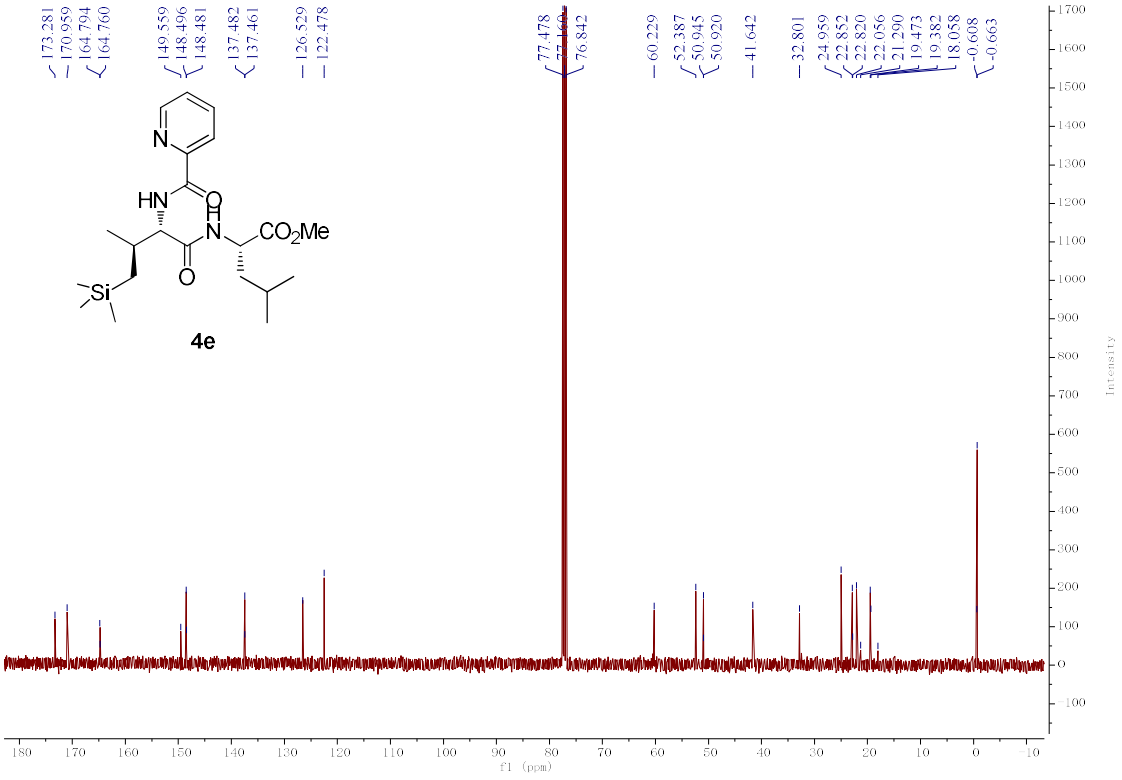

8.565
8.562
8.553
8.551
8.546
8.133
8.114
7.824
7.809
7.805
7.408
7.400
7.396
7.393
7.389
7.377
7.260
4.779
4.761
4.755
4.504
4.496
3.907
3.745
3.736
3.728
3.722
3.712
3.708
2.232
2.225
2.212
2.203
2.202
2.195
2.189
2.185
2.022
2.004
1.989
1.982
1.975
1.970
1.961
1.953
1.117
1.101
1.026
1.009
0.869
0.863
0.465
0.436
0.030
0.011
N
HN
O
O
N
Si
CO2Me
4d
2.02
1.00
1.01
1.02
0.97
0.95
1.02
4.16
2.22
3.03
2.99
1.17
1.04
9.09
f1 (ppm)
Intensity

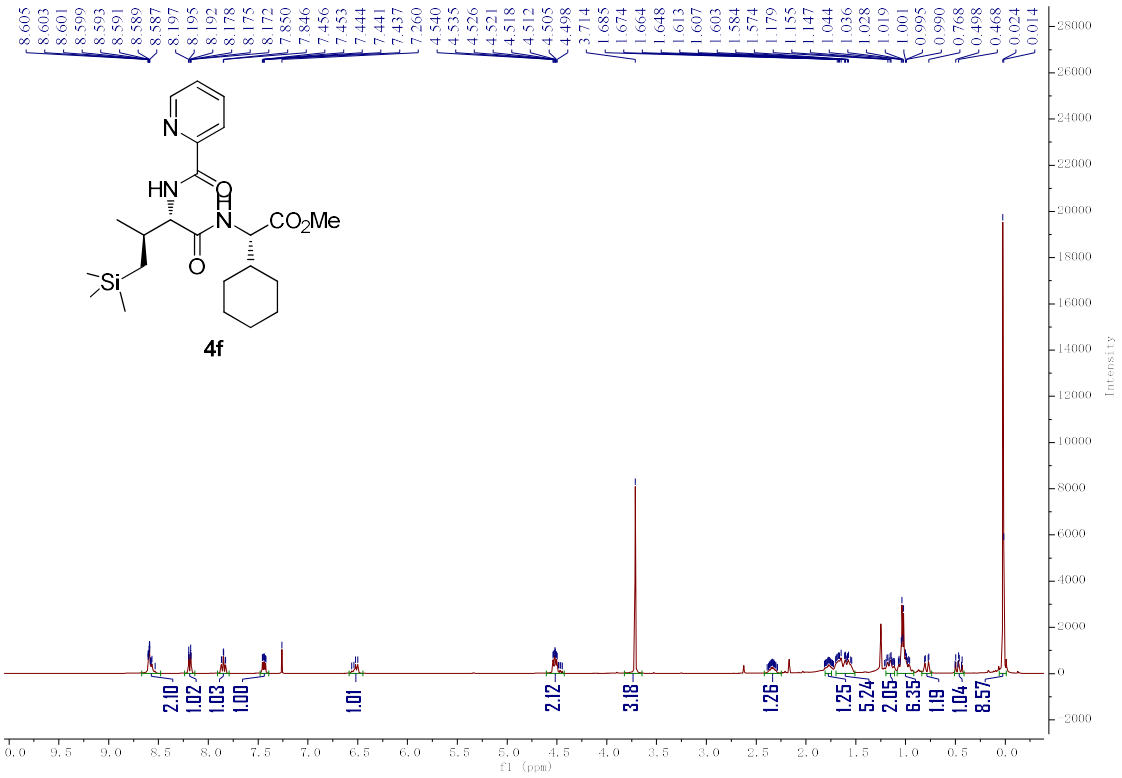

172.525
170.827
170.632
164.489
164.404
149.716
149.668
148.457
148.424
137.259
126.290
122.275
77.478
77.161
76.843
59.007
57.552
57.450
52.239
47.501
47.435
33.465
33.018
29.196
25.150
21.129
19.287
19.185
17.722
-0.570
-0.595
N
HN
O
O
N
Si
CO2Me
4d
f1 (ppm)
Intensity

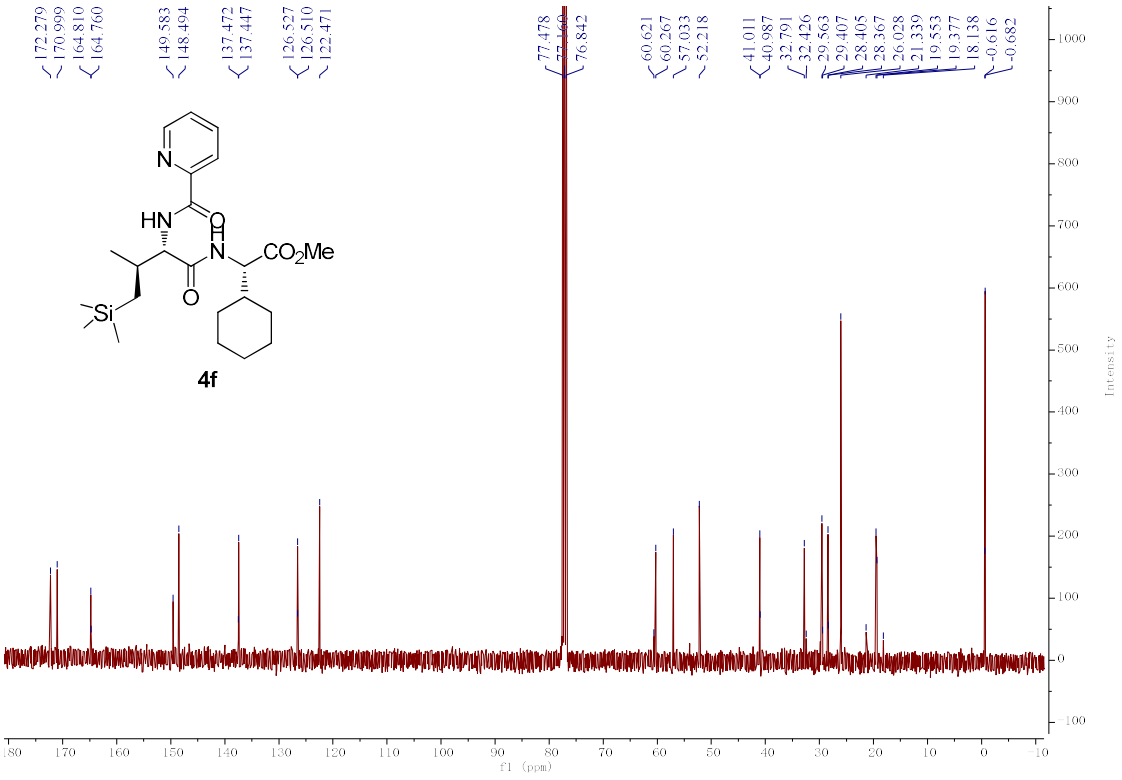

8.592
8.589
8.586
8.580
8.577
8.573
8.146
8.143
8.129
8.126
8.123
7.814
7.810
7.791
7.415
7.407
7.404
7.400
7.396
7.388
7.384
7.260
4.912
4.901
4.888
4.878
4.522
4.508
4.502
3.724
3.717
3.703
3.694
2.023
2.006
1.979
1.967
1.952
0.982
0.975
0.945
0.939
0.922
0.907
0.884
0.877
0.680
0.654
0.644
0.618
0.608
0.598
0.570
0.122
0.059
N
HN
O
O
Si
Si
N
CO2Me
4d′
Intensity
f1 (ppm)

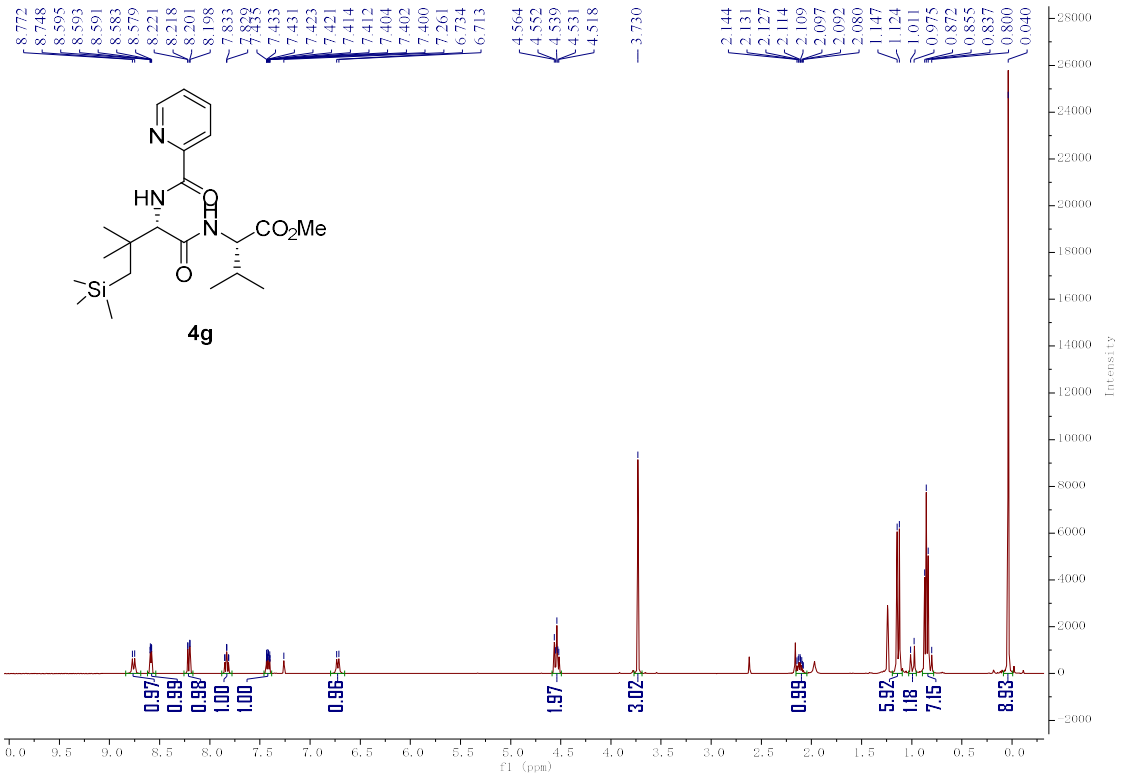

zbb-7-
172.556
170.740
164.759
149.946
148.487
137.272
126.256
122.284
77.477
77.160
76.843
59.249
56.219
52.231
47.430
33.250
29.067
25.504
21.558
19.671
-0.176
-0.267
N
HN
O
O
Si
Si
N
CO2Me
4d′
Intensity
f1 (ppm)

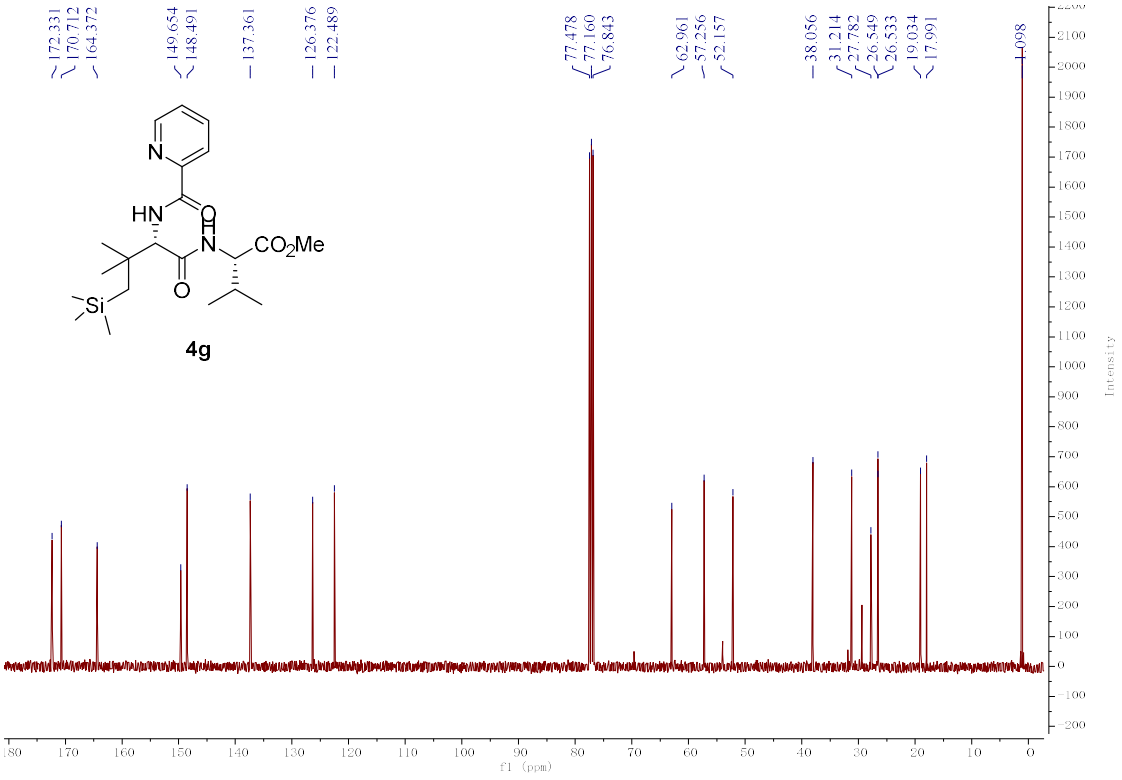

8.606
8.604
8.602
8.600
8.595
8.592
8.590
8.588
8.578
8.554
8.193
8.190
8.187
8.173
8.170
8.168
7.873
7.868
7.853
7.849
7.834
7.830
7.460
7.457
7.448
7.445
7.441
7.438
7.429
7.426
7.260
4.627
4.498
4.488
4.475
3.717
1.640
1.627
1.618
1.611
1.535
1.042
1.025
0.888
0.883
0.873
0.867
0.767
0.762
0.760
0.500
0.471
0.464
0.029
0.018
N
HN
O
N
CO2Me
O
Si
4e
Intensity
f1 (ppm)

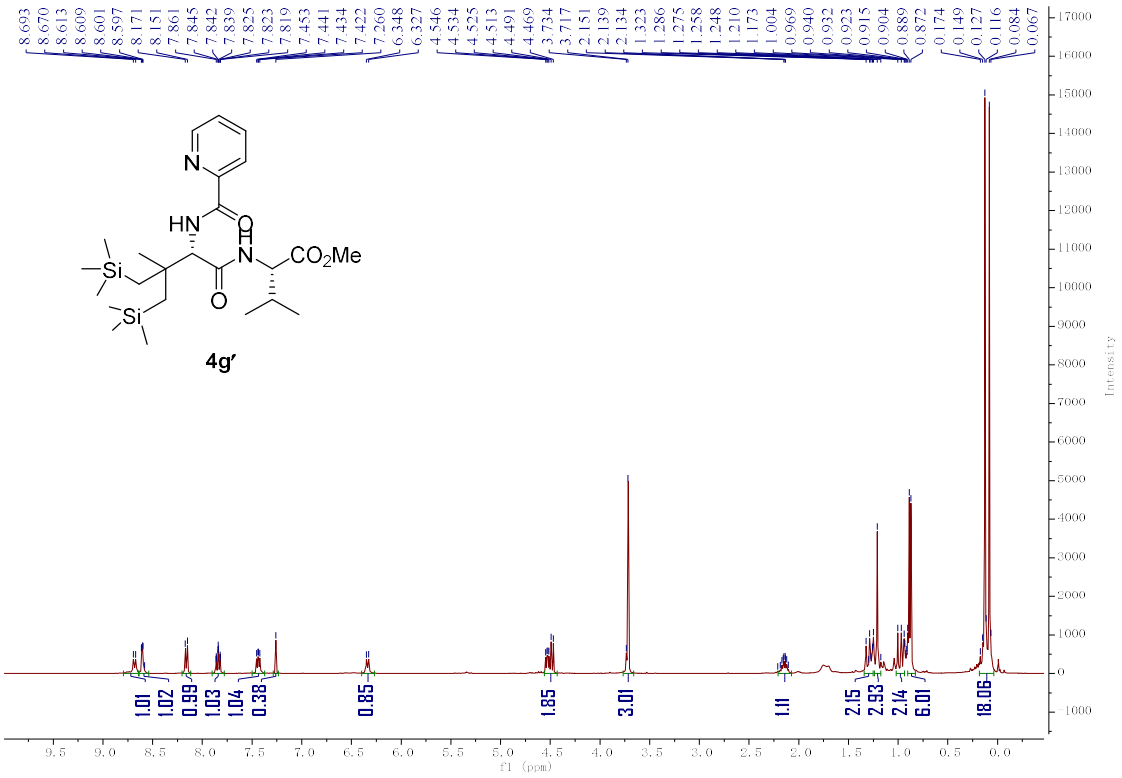

173.281
170.959
164.794
164.760
149.559
148.496
148.481
137.482
137.461
126.529
122.478
77.478
77.160
76.842
60.229
52.387
50.945
50.920
41.642
32.801
24.959
22.852
22.820
22.056
21.290
19.473
19.382
18.058
-0.608
-0.663
N
HN
O
N
CO2Me
O
Si
4e
Intensity
f1 (ppm)

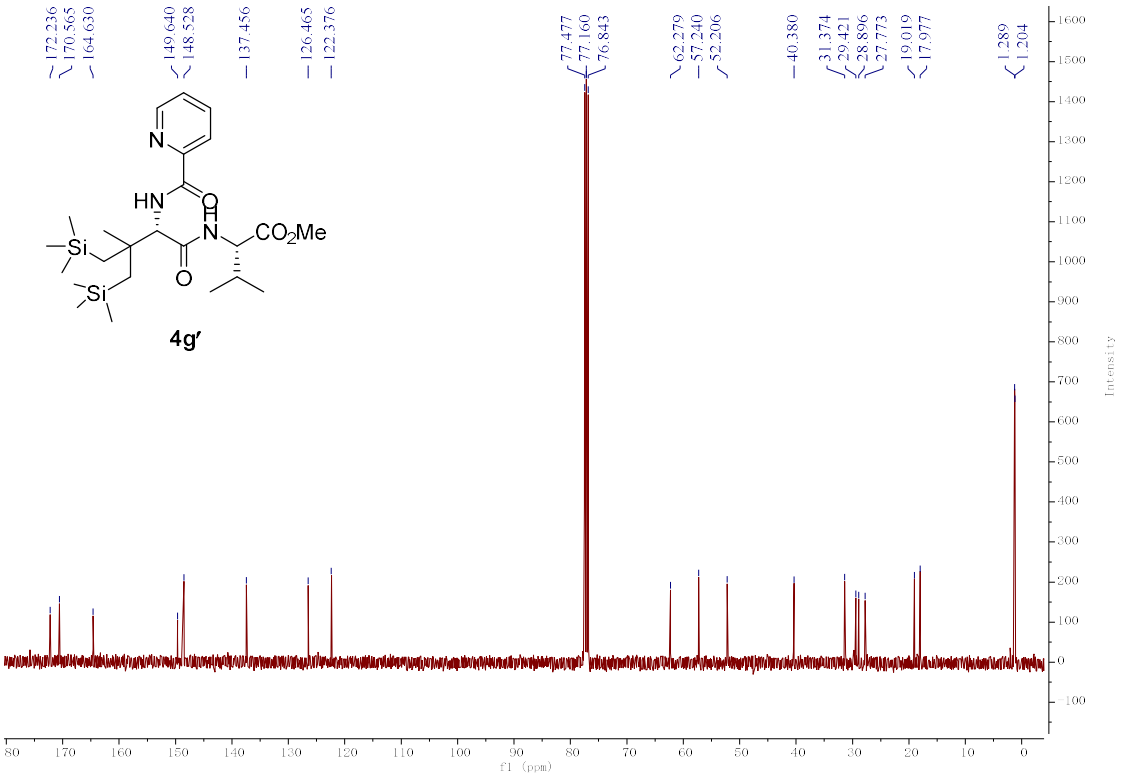

8.605
8.603
8.601
8.599
8.593
8.591
8.589
8.587
8.197
8.195
8.192
8.178
8.175
8.172
7.850
7.846
7.456
7.453
7.444
7.441
7.437
7.260
4.540
4.535
4.526
4.521
4.518
4.512
4.505
4.498
3.714
1.685
1.674
1.664
1.648
1.613
1.607
1.603
1.584
1.574
1.179
1.155
1.147
1.044
1.036
1.028
1.019
1.001
0.995
0.990
0.768
0.498
0.468
0.024
0.014
N
HN
O
N
CO2Me
O
Si
4f
2.10
1.02
1.03
1.00
1.01
2.12
3.18
1.26
1.25
5.24
2.05
6.35
1.19
1.04
8.57
f1 (ppm)
Intensity

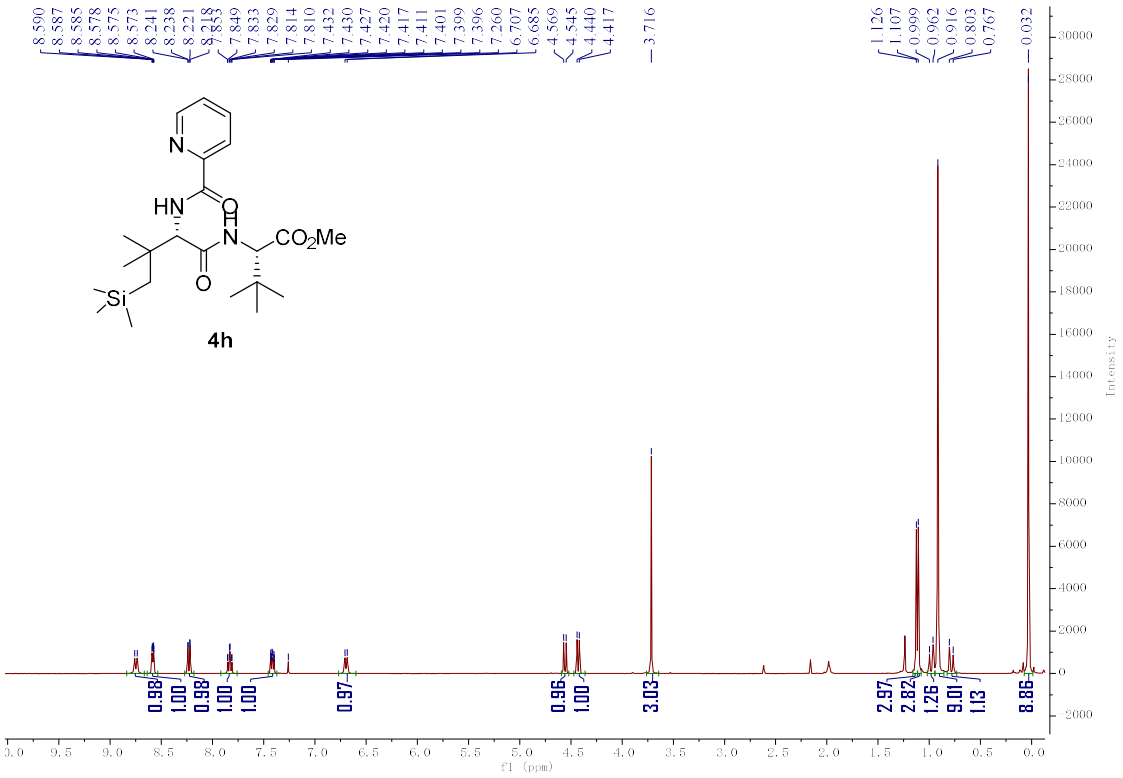

172.279
170.999
164.810
164.760
149.583
148.494
137.472
137.447
126.527
126.510
122.471
77.478
77.160
76.842
60.621
60.267
57.033
52.218
41.011
40.987
32.791
32.426
29.563
29.407
28.405
28.367
26.028
21.339
19.553
19.377
18.138
-0.616
-0.682
N
HN
O
N
CO2Me
O
Si
4f
f1 (ppm)
Intensity

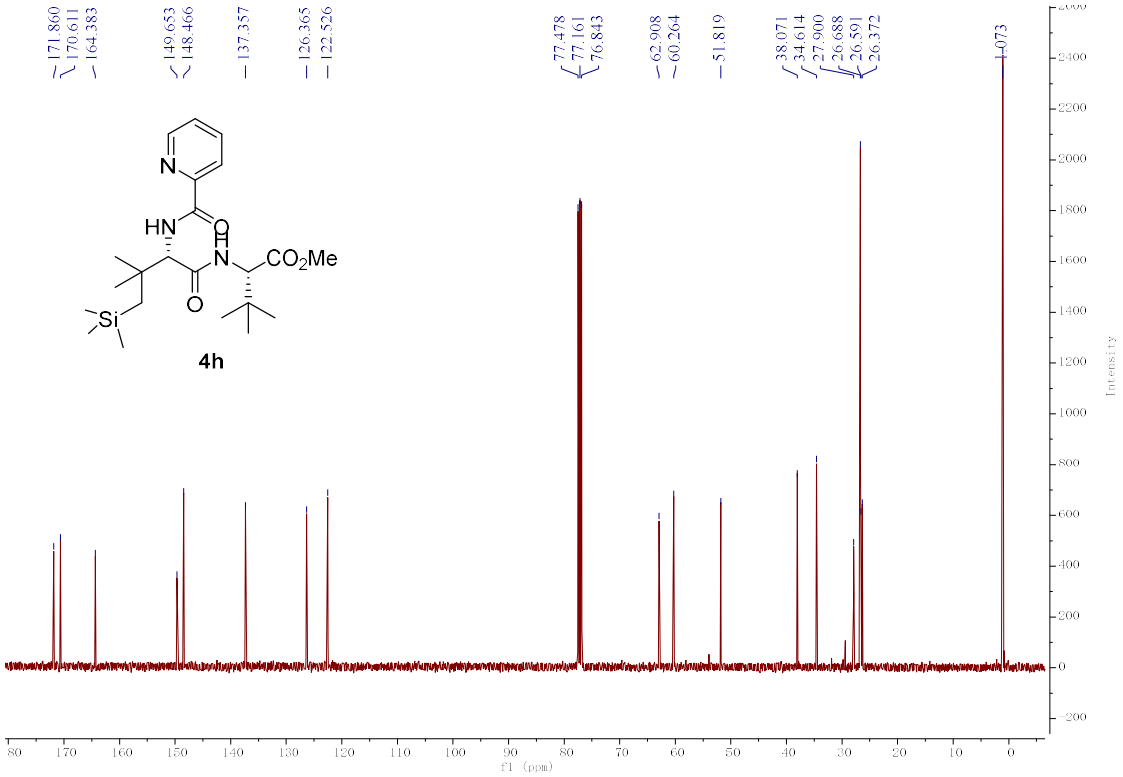

8.772
8.748
8.595
8.593
8.591
8.583
8.579
8.221
8.218
8.201
8.198
7.833
7.829
7.435
7.433
7.431
7.423
7.421
7.414
7.412
7.404
7.402
7.400
7.261
6.734
6.713
4.564
4.552
4.539
4.531
4.518
3.730
2.144
2.131
2.127
2.114
2.109
2.097
2.092
2.080
1.147
1.124
1.011
0.975
0.872
0.855
0.837
0.800
0.040
0.97
0.99
0.98
1.00
1.00
0.96
1.97
3.02
0.99
5.92
1.18
7.15
8.93
f1 (ppm)
Intensity
4g

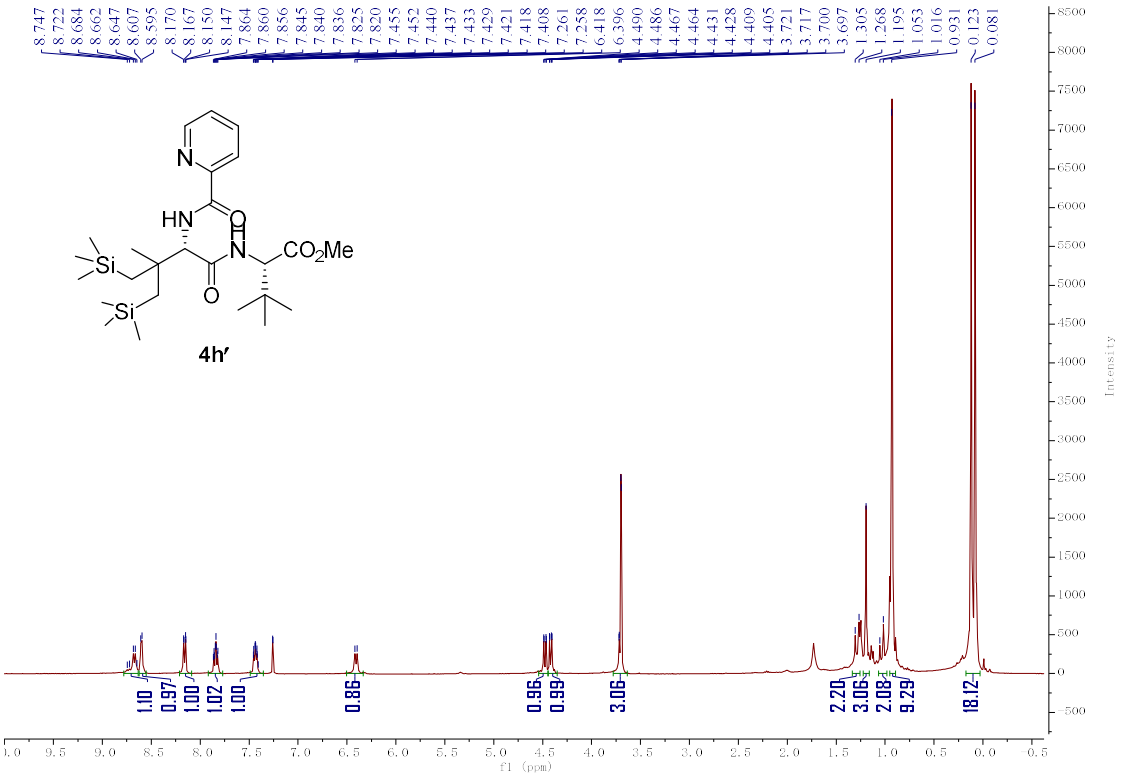

172.331
170.712
164.372
149.654
148.491
137.361
126.376
122.489
77.478
77.160
76.843
62.961
57.256
52.157
38.056
31.214
27.782
26.549
26.533
19.034
17.991
1.098
f1 (ppm)
Intensity
4g

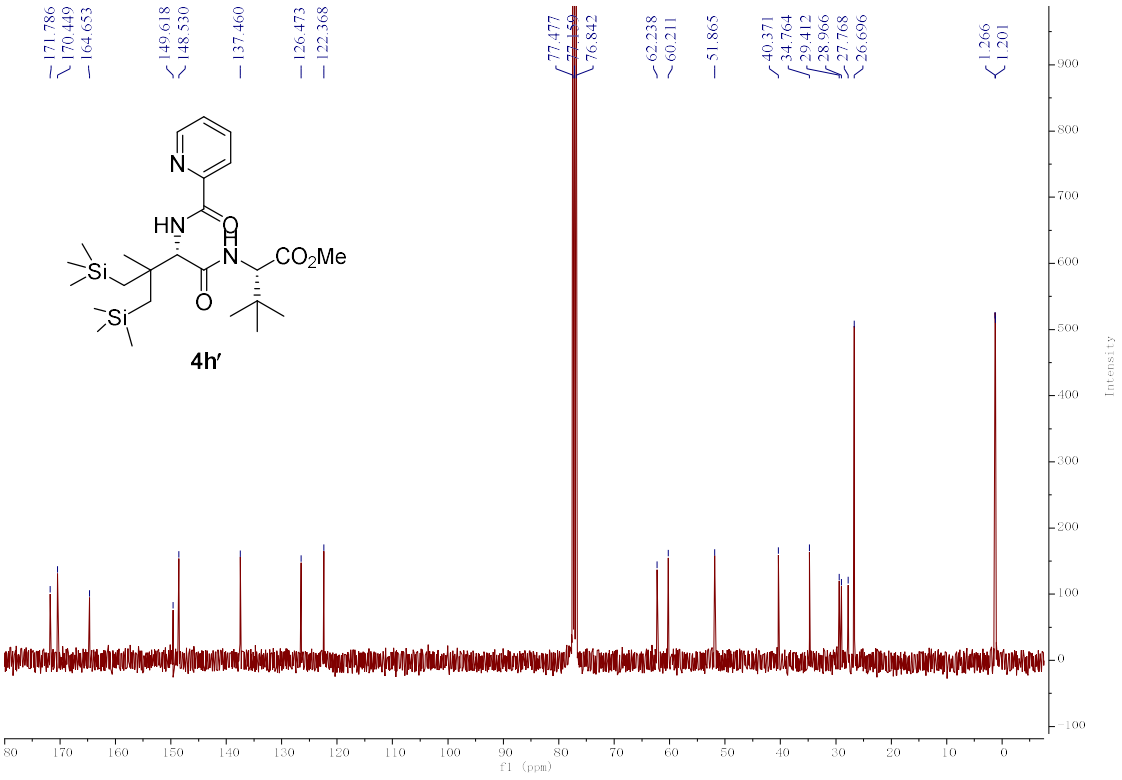

8.693
8.670
8.613
8.609
8.601
8.597
8.171
8.151
7.861
7.845
7.842
7.839
7.825
7.823
7.819
7.453
7.441
7.434
7.422
7.260
6.348
6.327
4.546
4.534
4.525
4.513
4.491
4.469
3.734
3.717
2.151
2.139
2.134
1.323
1.286
1.275
1.258
1.248
1.210
1.173
1.004
0.969
0.940
0.932
0.923
0.915
0.904
0.889
0.872
0.174
0.149
0.127
0.116
0.084
0.067
HN
O
N
CO2Me
Si
Si
O
4g′
1.01
1.02
0.99
1.03
1.04
0.38
0.85
1.85
3.01
1.11
2.15
2.93
2.14
6.01
18.06
f1 (ppm)
Intensity

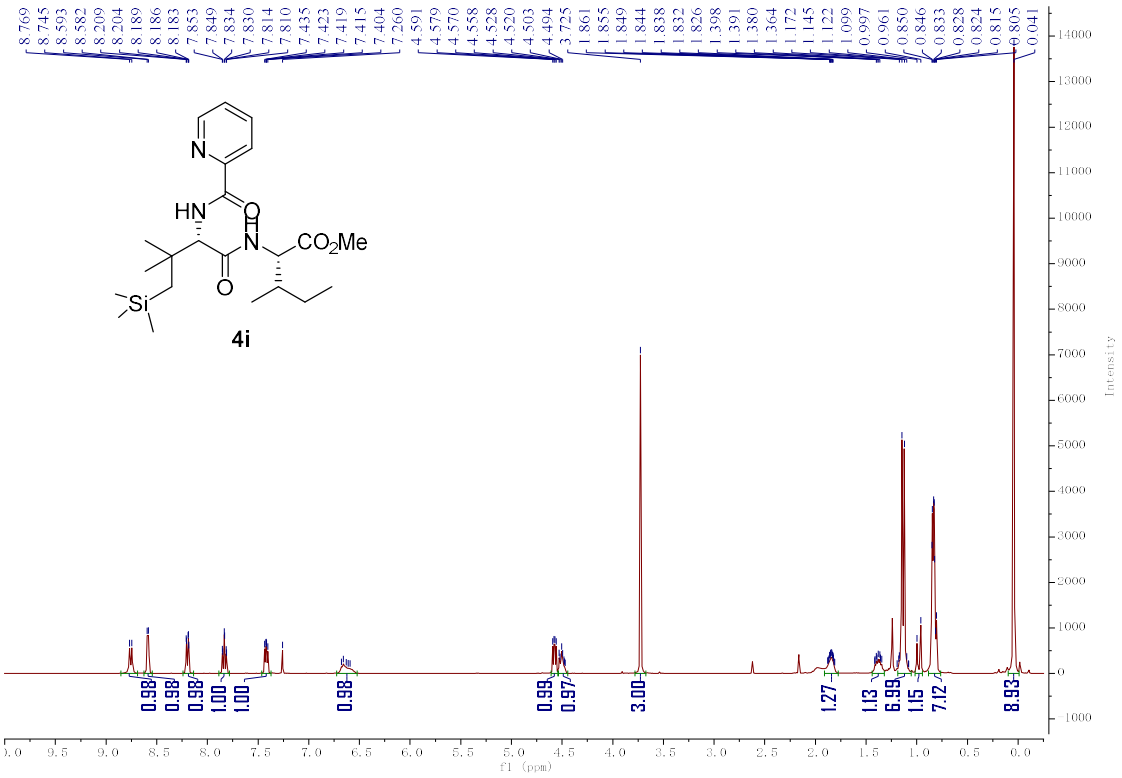

172.236
170.565
164.630
149.640
148.528
137.456
126.465
122.376
77.477
77.160
76.843
62.279
57.240
52.206
40.380
31.374
29.421
28.896
27.773
19.019
17.977
1.289
1.204
HN
O
N
CO2Me
Si
Si
O
4g′
f1 (ppm)
Intensity

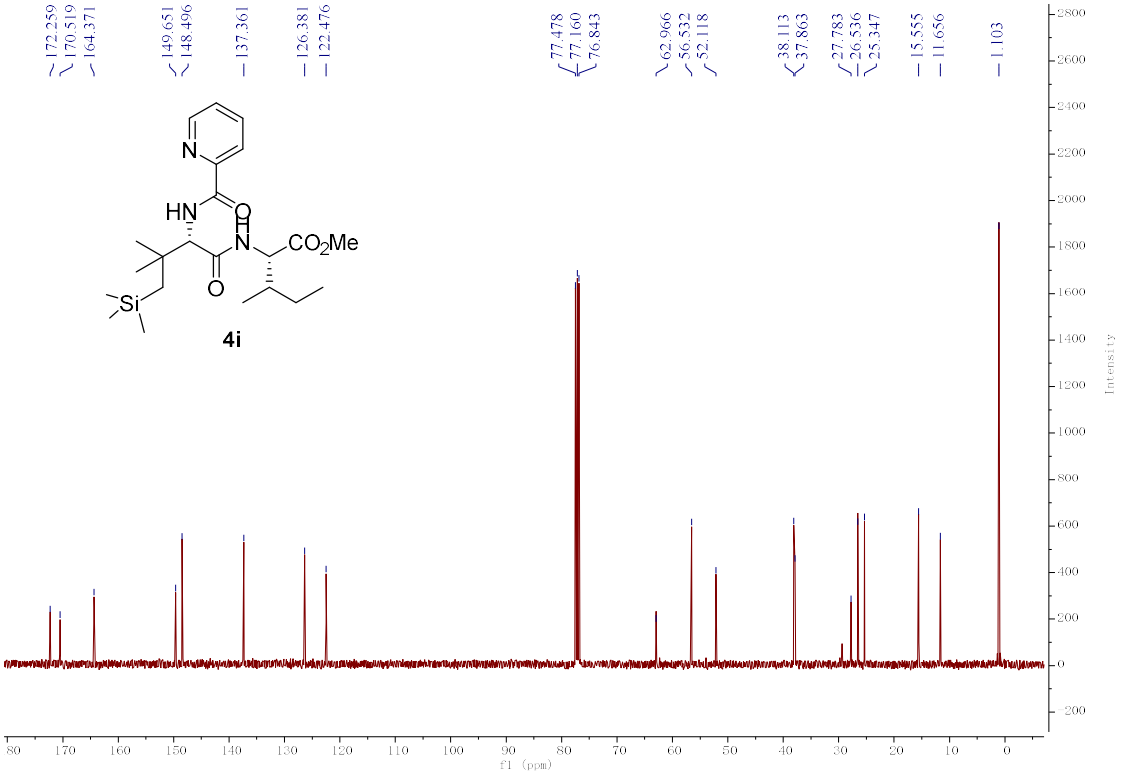

8.590
8.587
8.585
8.578
8.575
8.573
8.241
8.238
8.221
8.218
7.853
7.849
7.833
7.829
7.814
7.810
7.432
7.430
7.427
7.420
7.417
7.411
7.401
7.399
7.396
7.260
6.707
6.685
4.569
4.545
4.440
4.417
3.716
1.126
1.107
0.999
0.962
0.916
0.803
0.767
0.032
N
HN
O
N
CO2Me
O
Si
4h
0.98
1.00
0.98
1.00
1.00
0.97
0.96
1.00
3.03
2.97
2.82
1.26
9.01
1.13
8.86
f1 (ppm)
Intensity

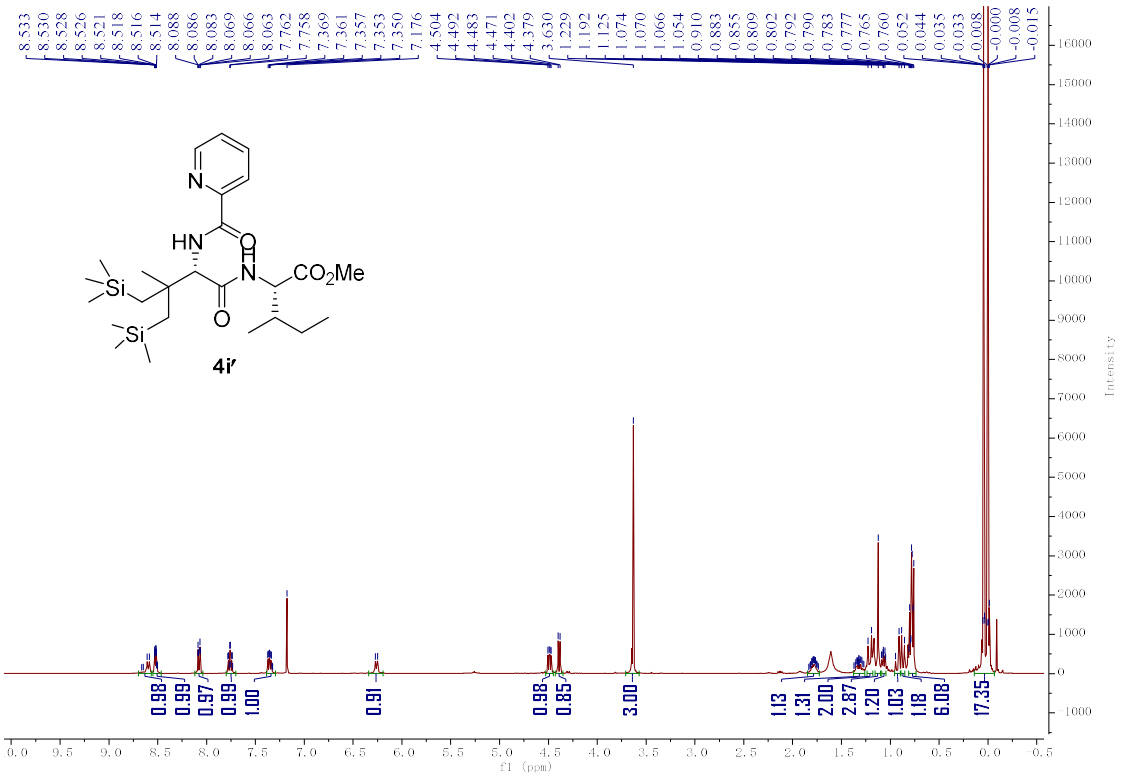

171.860
170.611
164.383
149.653
148.466
137.357
126.365
122.526
77.478
77.161
76.843
62.908
60.264
51.819
38.071
34.614
27.900
26.688
26.591
26.372
14.073
N
HN
O
N
CO2Me
O
Si
4h
f1 (ppm)
Intensity

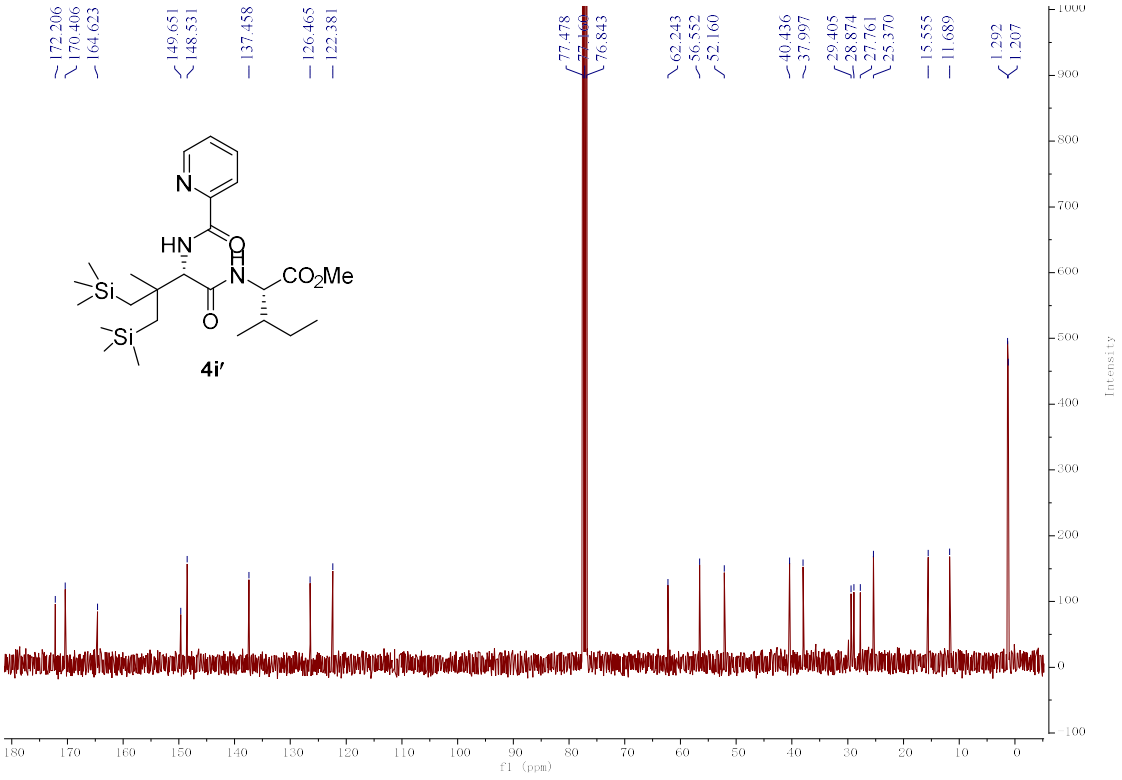

8.747
8.722
8.684
8.662
8.647
8.607
8.595
8.170
8.167
8.150
8.147
7.864
7.860
7.856
7.845
7.840
7.836
7.825
7.820
7.455
7.452
7.440
7.437
7.433
7.429
7.421
7.418
7.408
7.261
7.258
6.418
6.396
4.490
4.486
4.467
4.464
4.431
4.428
4.409
4.405
3.721
3.717
3.700
3.697
1.305
1.268
1.195
1.053
1.016
0.931
0.123
0.081
N
HN
O
N
CO2Me
Si
Si
O
4h′
1.10
0.97
1.00
1.02
1.00
0.86
0.95
0.99
3.05
2.20
3.06
2.09
9.29
18.12
Intensity
f1 (ppm)

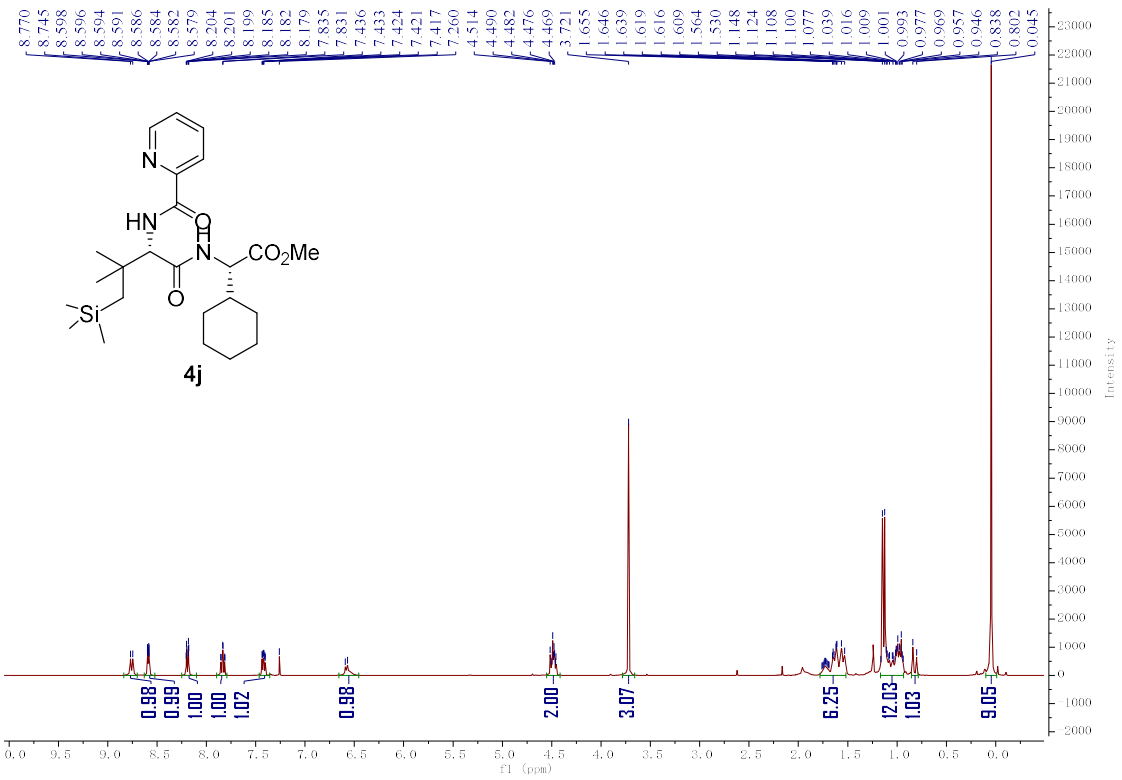

171.786
170.449
164.653
149.618
148.530
137.460
126.473
122.368
77.477
76.842
62.238
60.211
51.865
40.371
34.764
29.412
28.966
27.768
26.696
1.266
1.201
N
HN
O
N
CO2Me
Si
Si
O
4h′
Intensity
f1 (ppm)

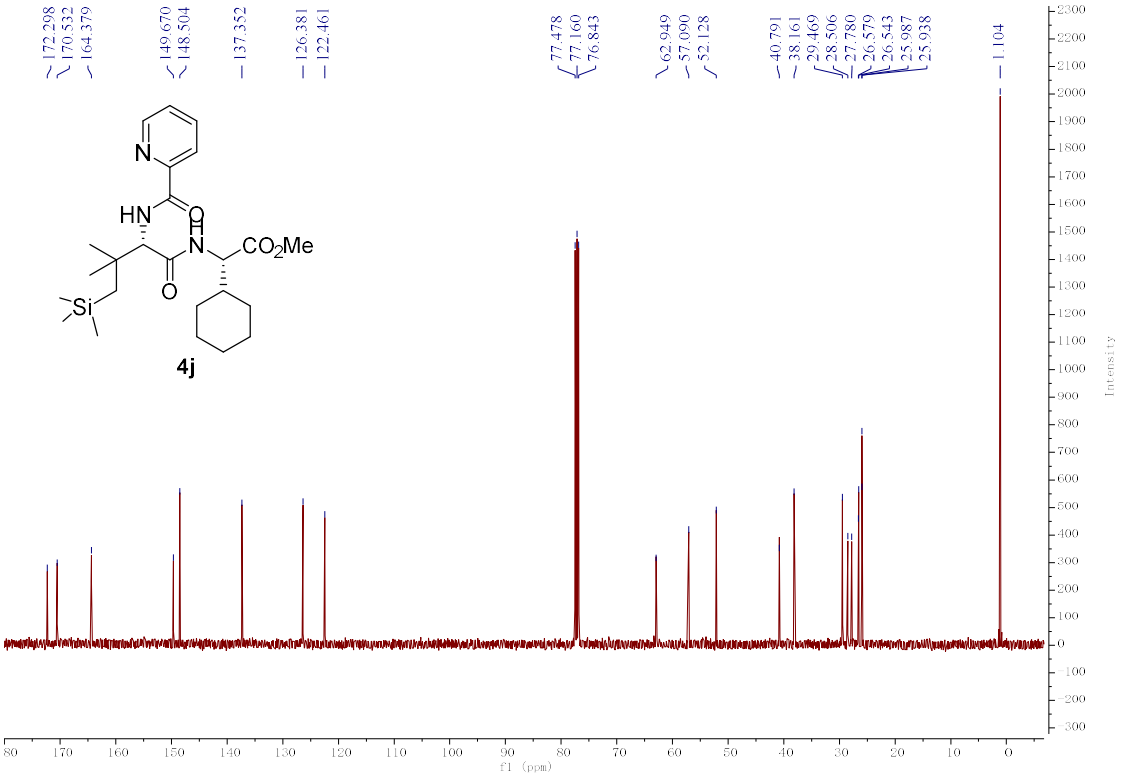

8.769
8.745
8.593
8.582
8.209
8.204
8.189
8.186
8.183
7.853
7.849
7.834
7.830
7.814
7.810
7.435
7.423
7.419
7.415
7.404
7.260
4.591
4.579
4.570
4.558
4.528
4.520
4.503
4.494
3.725
1.861
1.855
1.849
1.844
1.838
1.832
1.826
1.398
1.391
1.380
1.364
1.172
1.145
1.122
1.099
0.997
0.961
0.850
0.846
0.833
0.828
0.824
0.815
0.805
0.041
N
HN
O
N
CO2Me
O
Si
4i
0.98
0.98
0.98
1.00
1.00
0.98
0.99
0.97
3.00
1.27
1.13
6.99
1.15
7.12
8.93
f1 (ppm)
Intensity

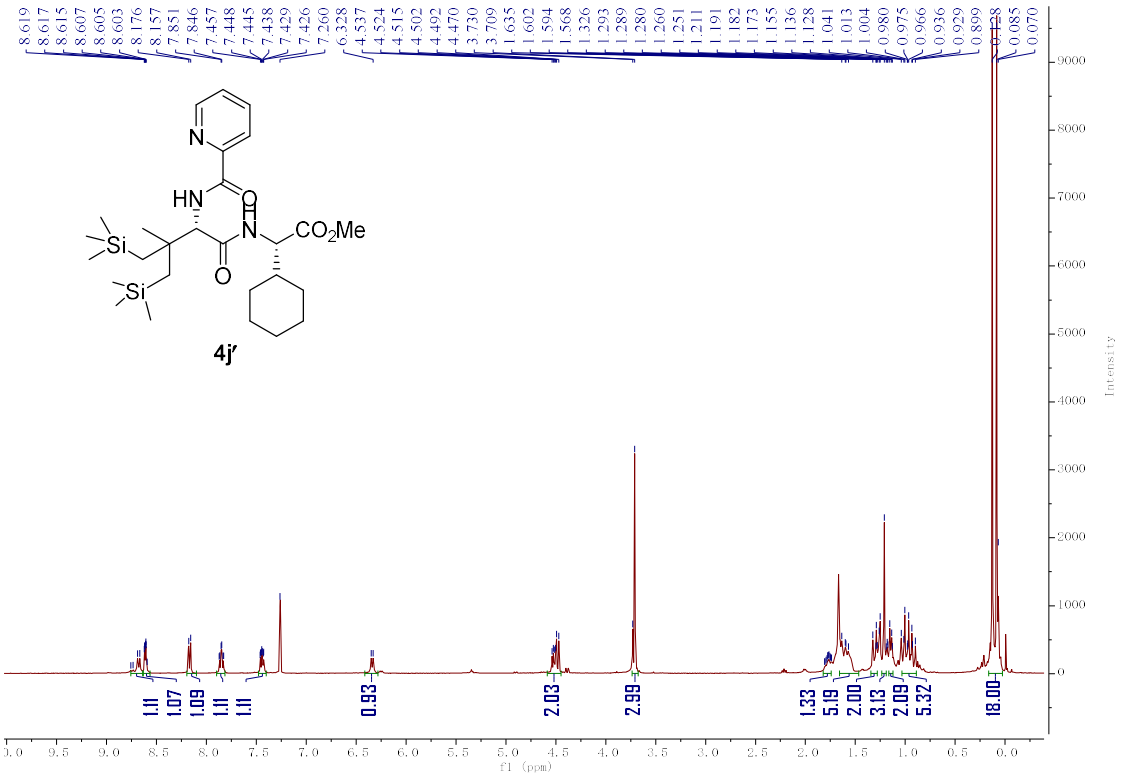

172.259
170.519
164.371
149.651
148.496
137.361
126.381
122.476
77.478
77.160
76.843
62.966
56.532
52.118
38.113
37.863
27.783
26.536
25.347
15.555
11.656
1.103
N
HN
O
N
CO2Me
O
Si
4i
f1 (ppm)
Intensity

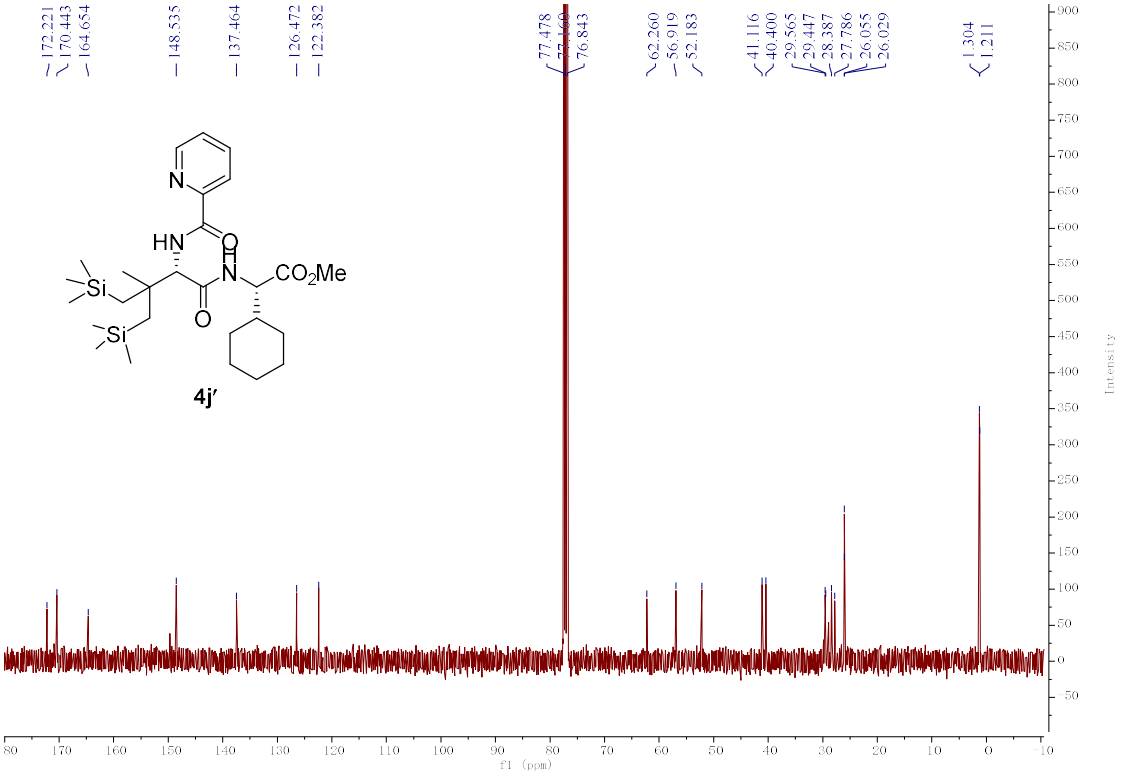

8.533
8.530
8.528
8.526
8.521
8.518
8.516
8.514
8.088
8.086
8.083
8.069
8.066
8.063
7.762
7.758
7.369
7.361
7.357
7.353
7.350
7.176
4.504
4.492
4.483
4.471
4.402
4.379
3.630
1.229
1.192
1.125
1.074
1.070
1.066
1.054
0.910
0.883
0.855
0.809
0.802
0.792
0.790
0.783
0.777
0.765
0.760
0.052
0.044
0.035
0.033
0.008
-0.000
-0.008
-0.015
0.98
0.99
0.97
0.99
1.00
0.91
0.88
0.85
3.00
1.13
1.31
2.00
2.87
1.20
1.03
1.18
6.08
17.35
f1 (ppm)
Intensity
4i′

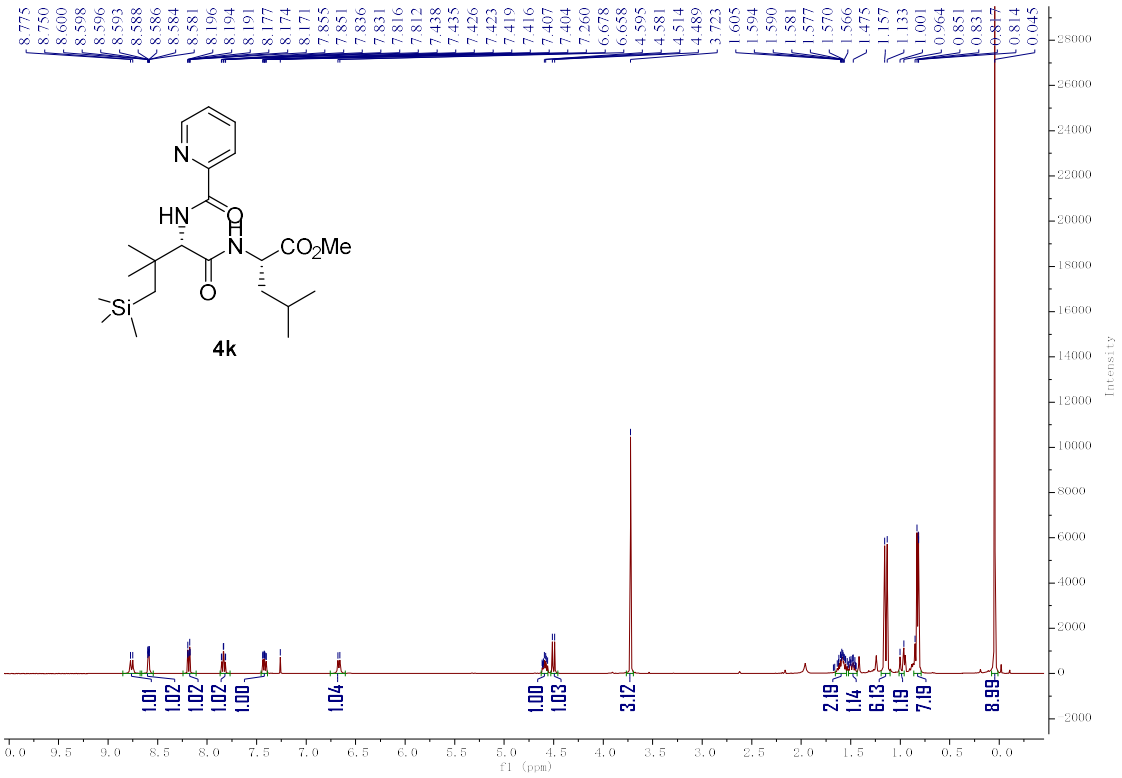

172.206
170.406
164.623
149.651
148.531
137.458
126.465
122.381
77.478
77.160
76.843
62.243
56.552
52.160
40.436
37.997
29.405
28.874
27.761
25.370
15.555
11.689
1.292
1.207
f1 (ppm)
Intensity
4i′

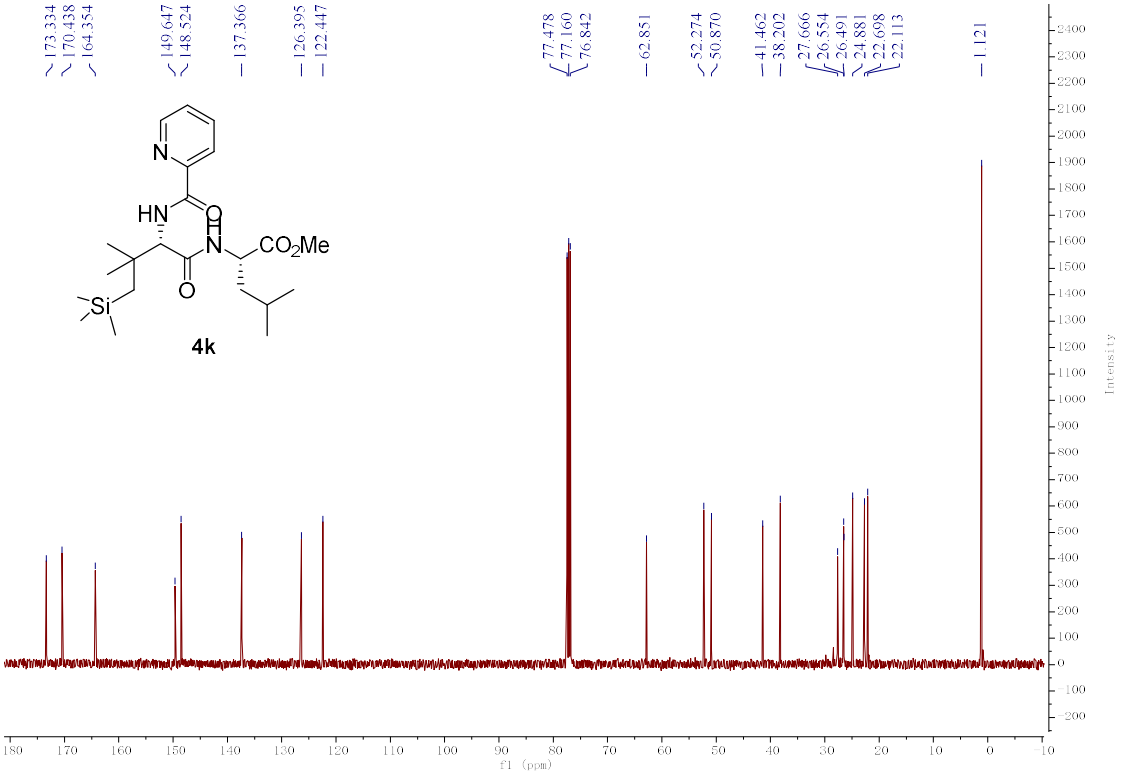

8.770
8.745
8.598
8.596
8.594
8.591
8.586
8.584
8.582
8.579
8.204
8.201
8.199
8.185
8.182
8.179
7.835
7.831
7.436
7.433
7.424
7.421
7.417
7.260
4.514
4.490
4.482
4.476
4.469
3.721
1.655
1.646
1.639
1.619
1.616
1.609
1.564
1.530
1.148
1.124
1.108
1.100
1.077
1.039
1.016
1.009
1.001
0.993
0.977
0.969
0.957
0.946
0.838
0.802
0.045
N
HN
O
N
CO2Me
O
Si
4j
0.98
0.99
1.00
1.00
1.02
0.98
2.00
3.07
6.25
12.03
1.03
9.05
Intensity
f1 (ppm)

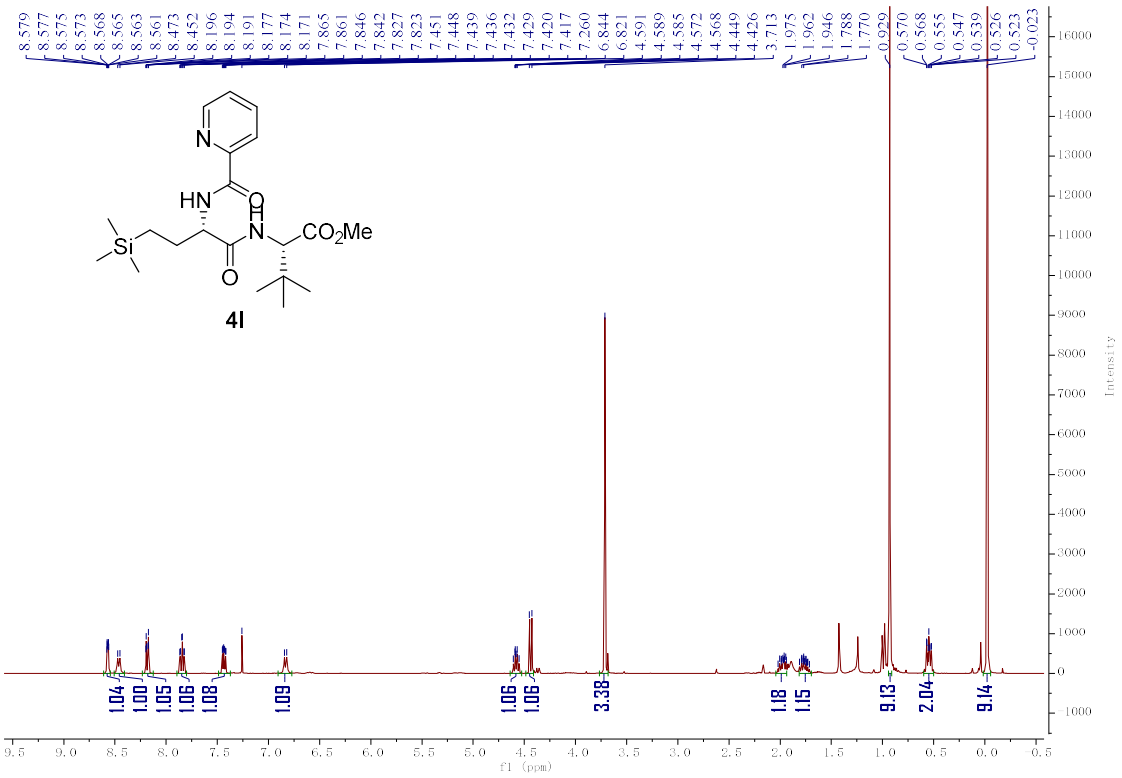

172.298
170.532
164.379
149.670
148.504
137.352
126.381
122.461
77.478
77.160
76.843
62.949
57.090
52.128
40.791
38.161
29.469
28.506
27.780
26.579
26.543
25.987
25.938
1.104
N
HN
O
N
CO2Me
O
Si
4j
Intensity
f1 (ppm)

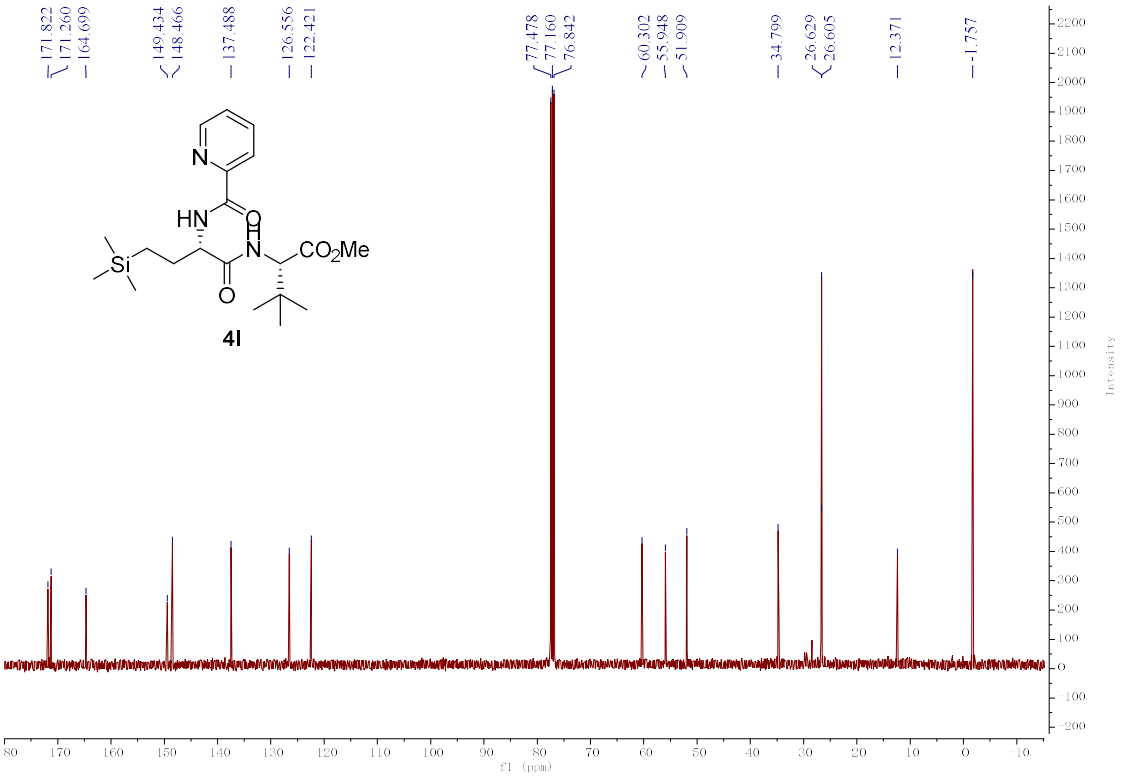

8.619
8.617
8.615
8.607
8.605
8.603
8.176
8.157
7.851
7.846
7.457
7.448
7.445
7.438
7.429
7.426
7.260
6.328
4.537
4.524
4.515
4.502
4.492
4.470
3.730
3.709
1.635
1.602
1.594
1.568
1.326
1.293
1.289
1.280
1.260
1.251
1.211
1.191
1.182
1.173
1.155
1.136
1.128
1.041
1.013
1.004
0.980
0.975
0.966
0.936
0.929
0.899
0.128
0.085
0.070
N
HN
O
N
CO2Me
Si
Si
O
4j′
1.11
1.07
1.09
1.11
1.11
0.93
2.03
2.99
1.33
5.19
2.00
3.13
2.09
5.32
18.00
f1 (ppm)
Intensity

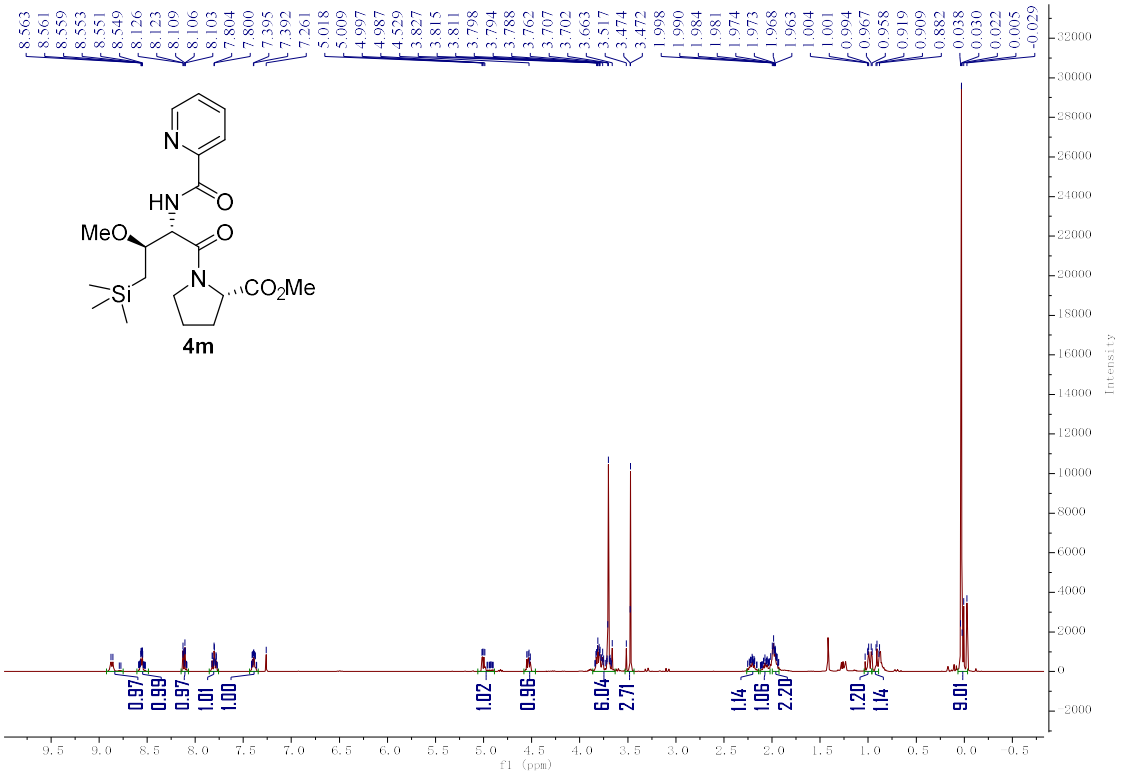

172.221
170.443
164.654
148.535
137.464
126.472
122.382
77.478
77.160
76.843
62.260
56.919
52.183
41.116
40.400
29.565
29.447
28.387
27.786
26.055
26.029
1.304
1.211
N
HN
O
N
CO2Me
Si
Si
O
4j′
f1 (ppm)
Intensity

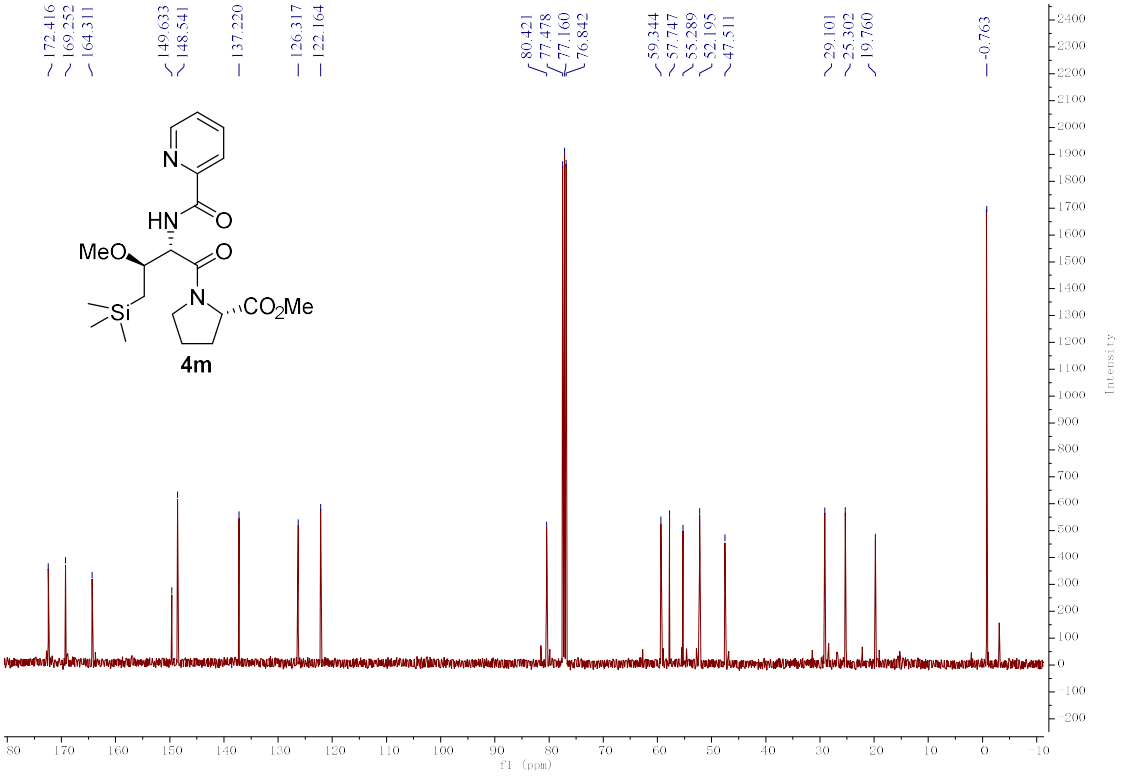

8.775
8.750
8.600
8.598
8.596
8.593
8.588
8.586
8.584
8.581
8.196
8.194
8.191
8.177
8.174
8.171
7.855
7.851
7.836
7.831
7.816
7.812
7.438
7.435
7.426
7.423
7.419
7.416
7.407
7.404
7.260
6.678
6.658
4.595
4.581
4.514
4.489
3.723
1.605
1.594
1.590
1.581
1.577
1.570
1.566
1.475
1.157
1.133
1.001
0.964
0.851
0.831
0.817
0.814
0.045
N
HN
O
N
CO2Me
O
Si
4k
1.01
1.02
1.02
1.02
1.00
1.04
1.00
1.03
3.12
2.19
1.14
6.13
1.19
7.19
8.99
f1 (ppm)
Intensity

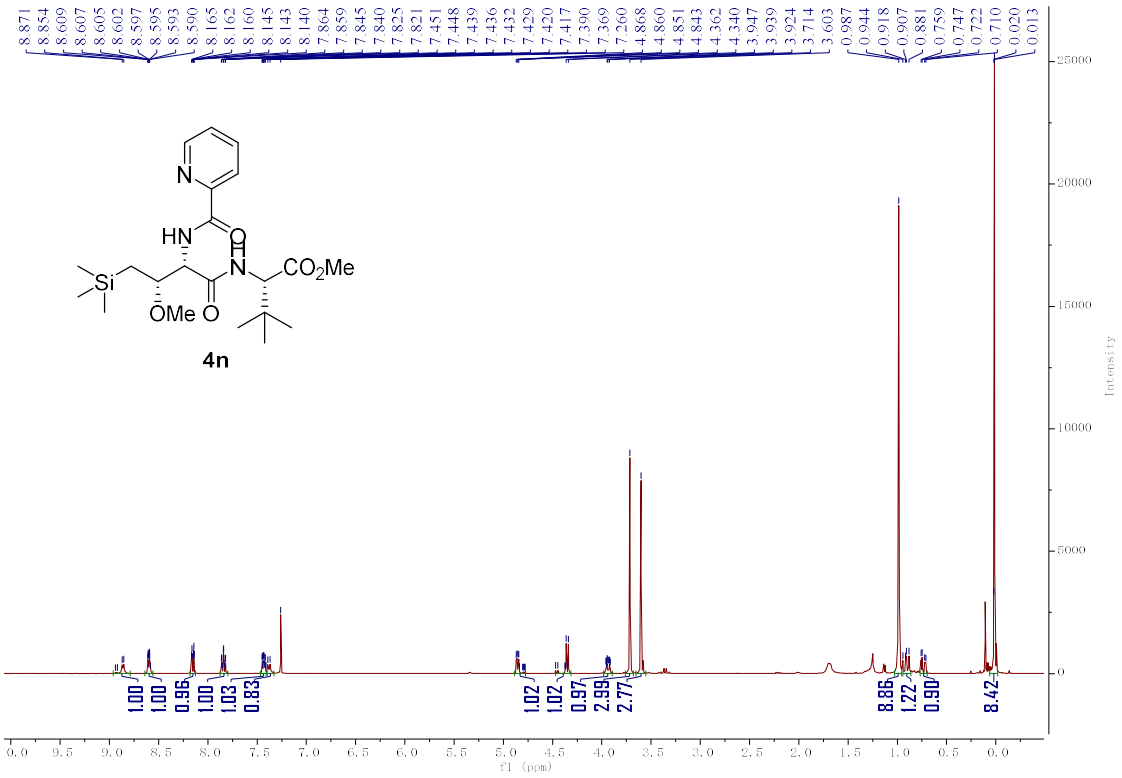

173.334
170.438
164.354
149.647
148.524
137.366
126.395
122.447
77.478
77.160
76.842
62.851
52.274
50.870
41.462
38.202
27.666
26.554
26.491
24.881
22.698
22.113
1.121
N
HN
O
N
CO2Me
O
Si
4k
f1 (ppm)
Intensity

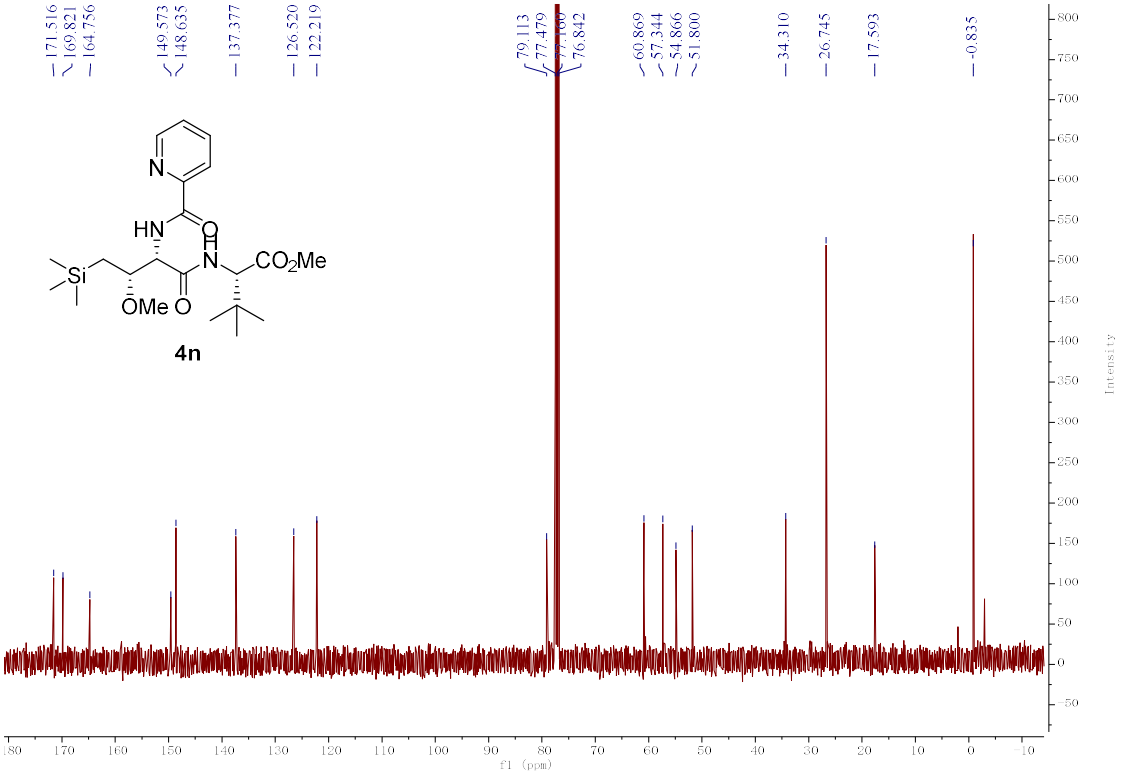

8.579
8.577
8.575
8.573
8.568
8.565
8.563
8.561
8.473
8.452
8.196
8.194
8.191
8.177
8.174
8.171
7.865
7.861
7.846
7.842
7.827
7.823
7.451
7.448
7.439
7.436
7.432
7.429
7.420
7.417
7.260
6.844
6.821
4.591
4.589
4.585
4.572
4.568
4.449
4.426
3.713
1.975
1.962
1.946
1.788
1.770
0.929
0.570
0.568
0.555
0.547
0.539
0.526
0.523
-0.023
N
HN
O
N
O
CO2Me
Si
O
4l
1.04
1.00
1.05
1.06
1.08
1.09
1.06
1.06
3.38
1.18
1.15
9.13
2.04
9.14
f1 (ppm)
Intensity

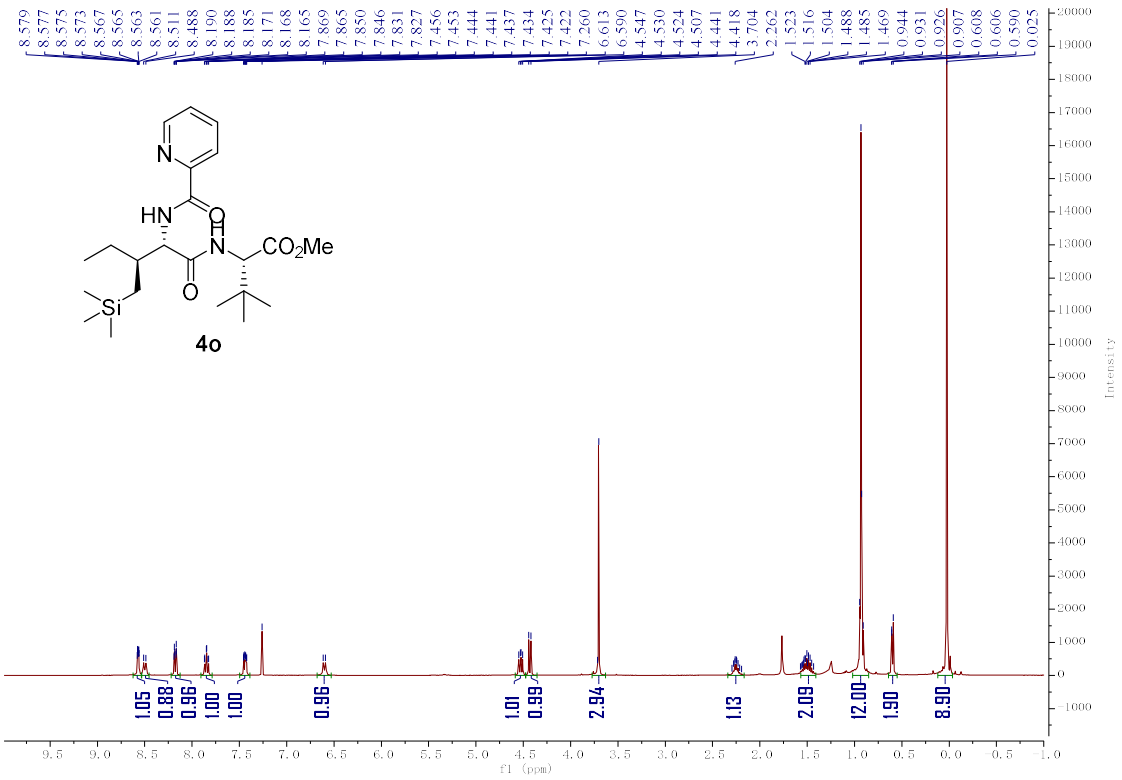

171.822
171.260
164.699
149.434
148.466
137.488
126.556
122.421
77.478
77.160
76.842
60.302
55.948
51.909
34.799
26.629
26.605
12.371
-1.757
N
HN
O
N
O
CO2Me
Si
O
4l
f1 (ppm)
Intensity

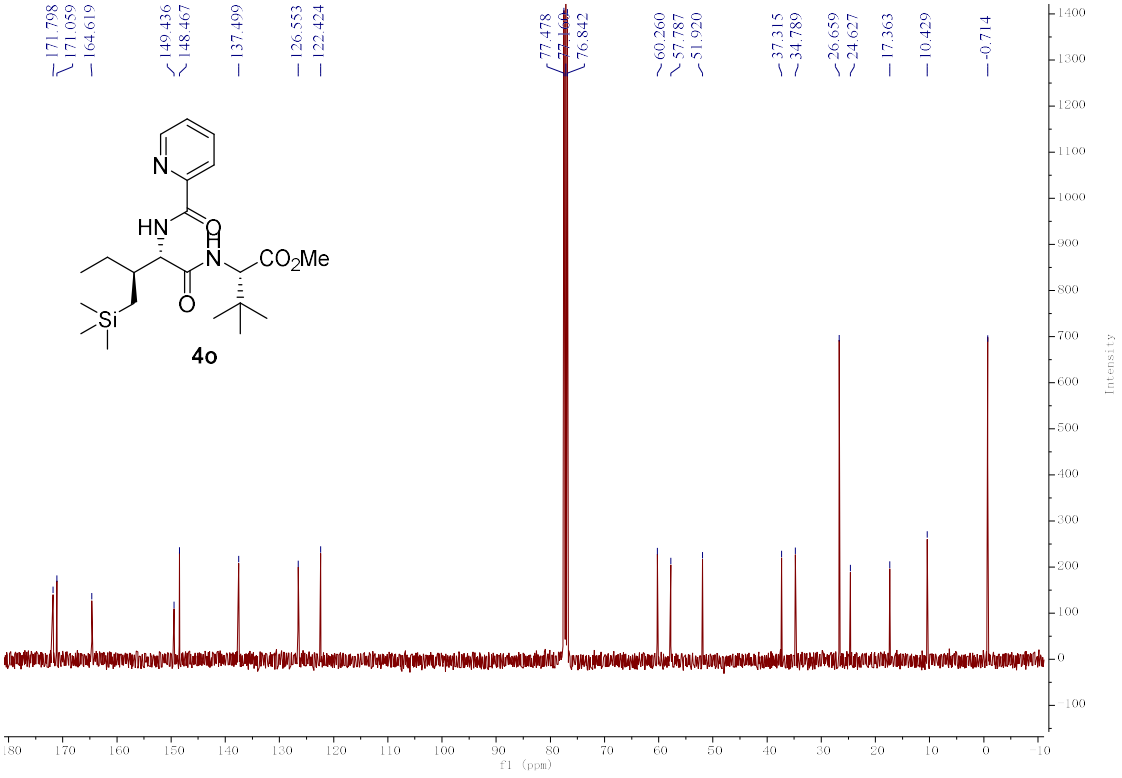

8.563
8.561
8.559
8.553
8.551
8.549
8.126
8.123
8.109
8.106
8.103
7.804
7.800
7.395
7.392
7.261
5.018
5.009
4.997
4.987
4.529
3.827
3.815
3.811
3.798
3.794
3.788
3.762
3.707
3.702
3.663
3.517
3.474
3.472
1.998
1.990
1.984
1.981
1.974
1.973
1.968
1.963
1.004
1.001
0.994
0.967
0.958
0.919
0.909
0.882
0.038
0.030
0.022
0.005
-0.029
N
HN
O
MeO
O
N
Si
CO2Me
4m
0.97
0.99
0.97
1.01
1.00
1.02
0.96
6.04
2.71
1.14
1.06
2.20
1.20
1.14
9.01
f1 (ppm)
Intensity

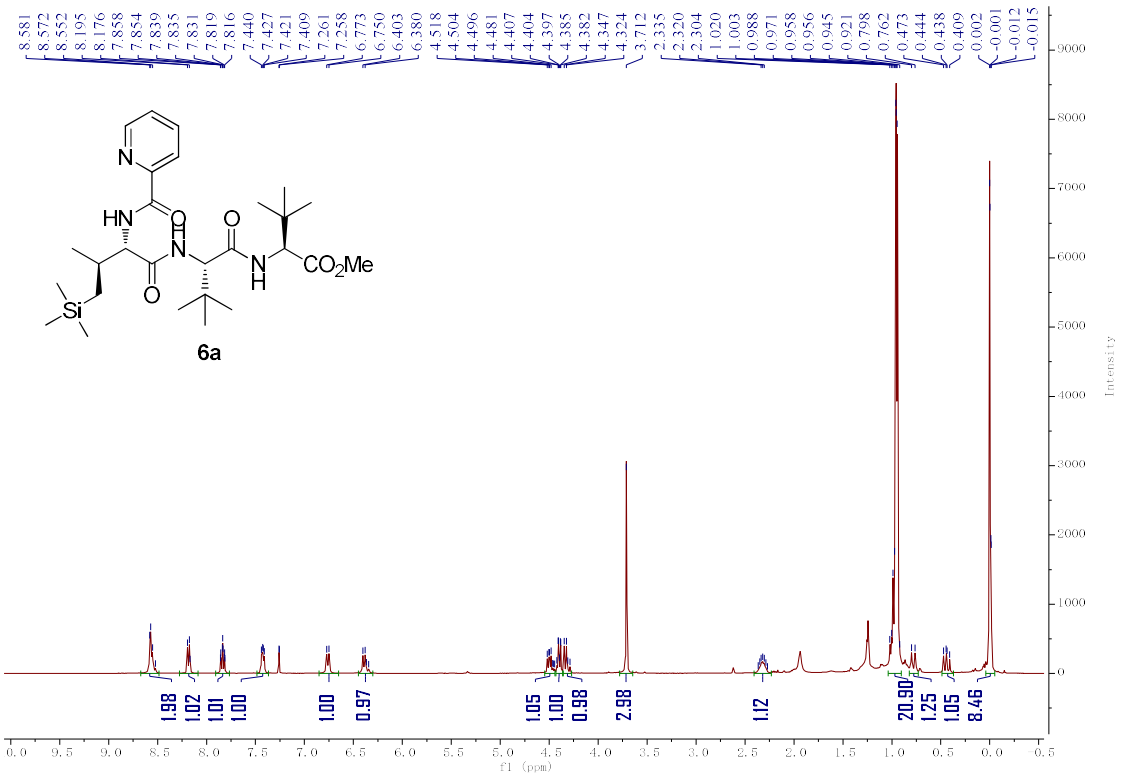

172.416
169.252
164.311
149.633
148.541
137.220
126.317
122.164
80.421
77.478
77.160
76.842
59.344
57.747
55.289
52.195
47.511
29.101
25.302
19.760
-0.763
N
HN
O
MeO
O
N
Si
CO2Me
4m
f1 (ppm)
Intensity

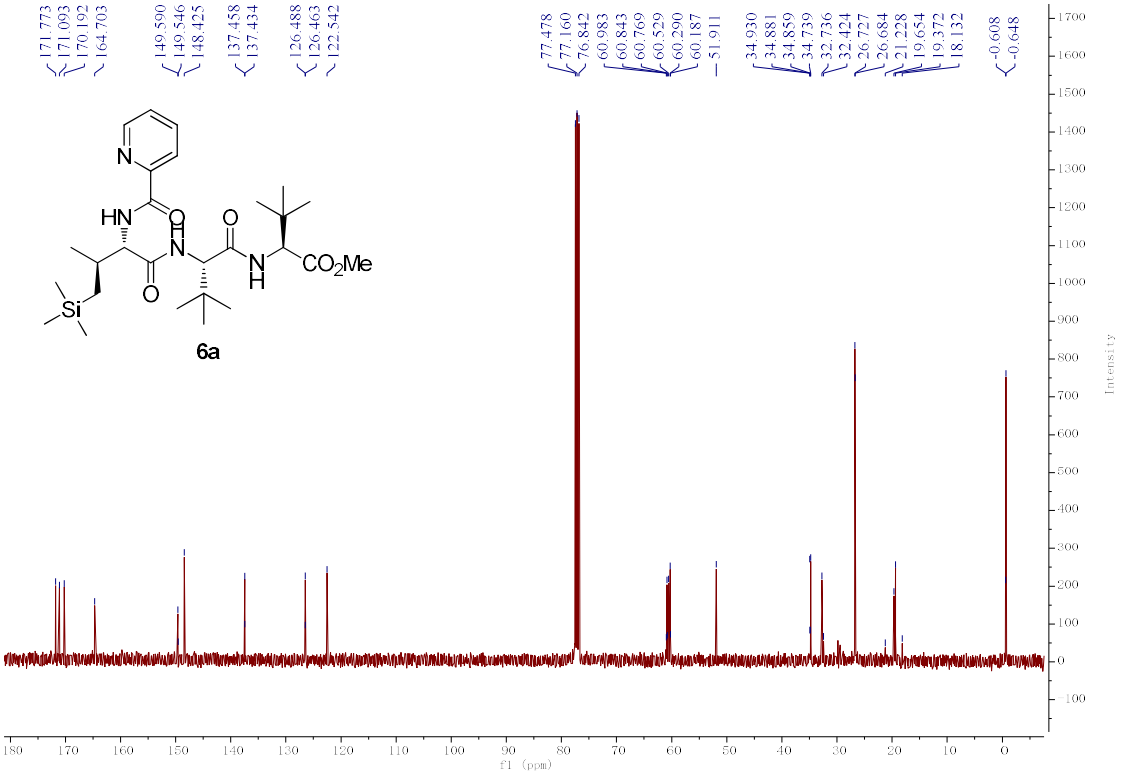

8.871
8.854
8.609
8.607
8.605
8.602
8.597
8.595
8.593
8.590
8.165
8.162
8.160
8.145
8.143
8.140
7.864
7.859
7.845
7.840
7.825
7.821
7.451
7.448
7.439
7.436
7.432
7.429
7.420
7.417
7.390
7.369
7.260
4.868
4.860
4.851
4.843
4.362
4.340
3.947
3.939
3.924
3.714
3.603
0.987
0.944
0.918
0.907
0.881
0.759
0.747
0.722
0.710
0.020
0.013
HN
O
N
CO2Me
Si
OMe O
4n
1.00
1.00
0.96
1.00
1.03
0.83
1.02
1.02
0.97
2.99
2.77
8.85
1.22
0.90
8.42
f1 (ppm)
Intensity

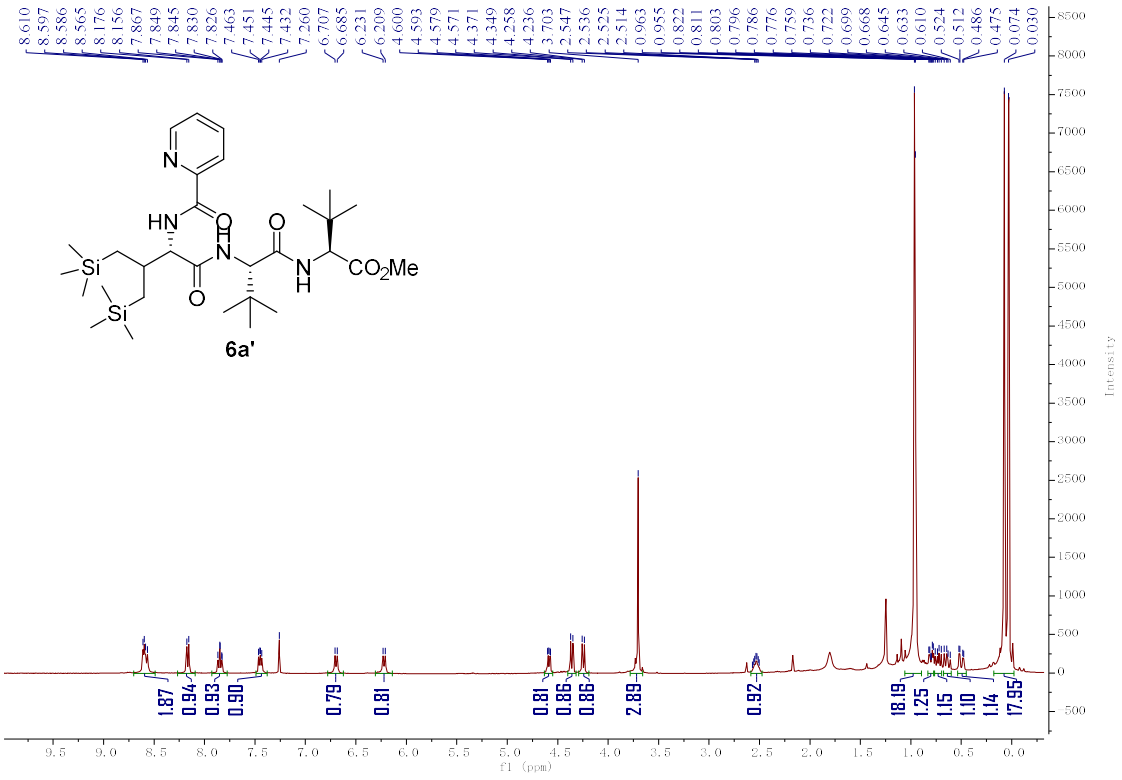

171.516
169.821
164.756
149.573
148.635
137.377
126.520
122.219
79.113
77.479
77.160
76.842
60.869
57.344
54.866
51.800
34.310
26.745
17.593
-0.835
HN
O
N
CO2Me
Si
OMe O
4n
f1 (ppm)
Intensity

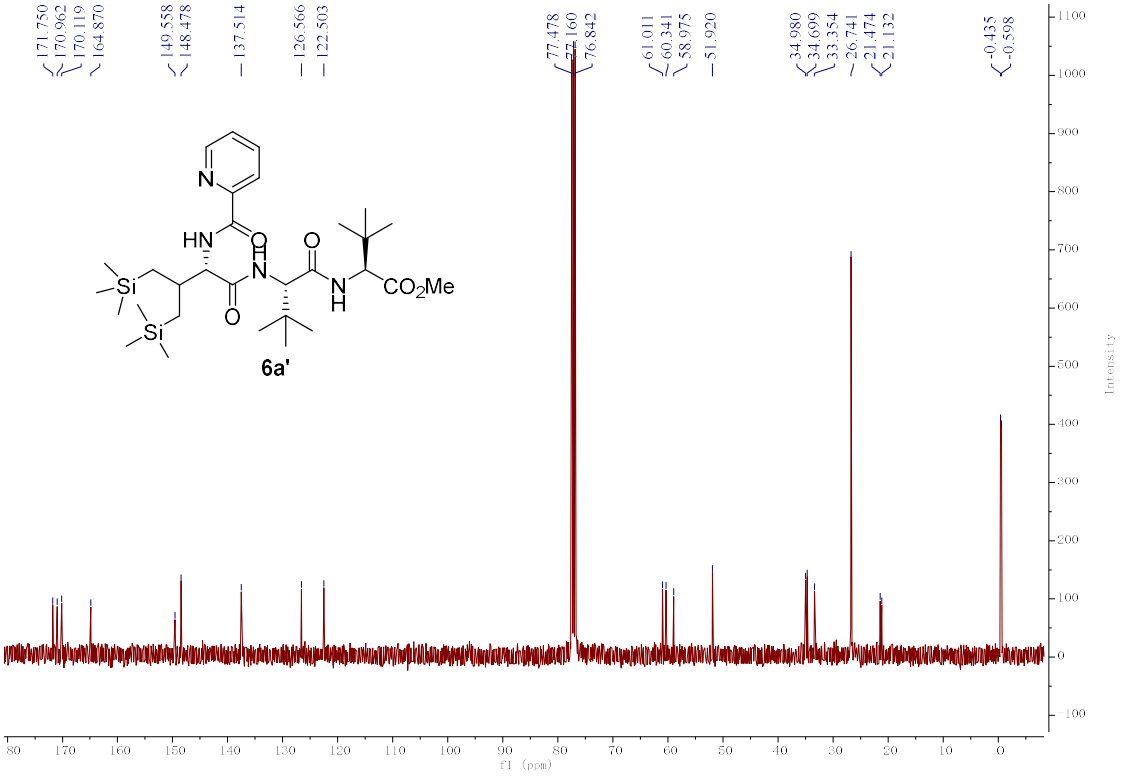

8.579
8.577
8.575
8.573
8.567
8.565
8.563
8.561
8.511
8.488
8.190
8.188
8.185
8.171
8.168
8.165
7.869
7.865
7.850
7.846
7.831
7.827
7.456
7.453
7.444
7.441
7.437
7.434
7.425
7.422
7.260
6.613
6.590
4.547
4.530
4.524
4.507
4.441
4.418
3.704
2.262
1.523
1.516
1.504
1.488
1.485
1.469
0.944
0.931
0.926
0.907
0.608
0.606
0.590
0.025
HN
O
N
CO2Me
O
Si
4o
1.05
0.88
0.96
1.00
1.00
0.96
1.01
0.99
2.94
1.13
2.09
12.00
1.90
8.90
f1 (ppm)
Intensity

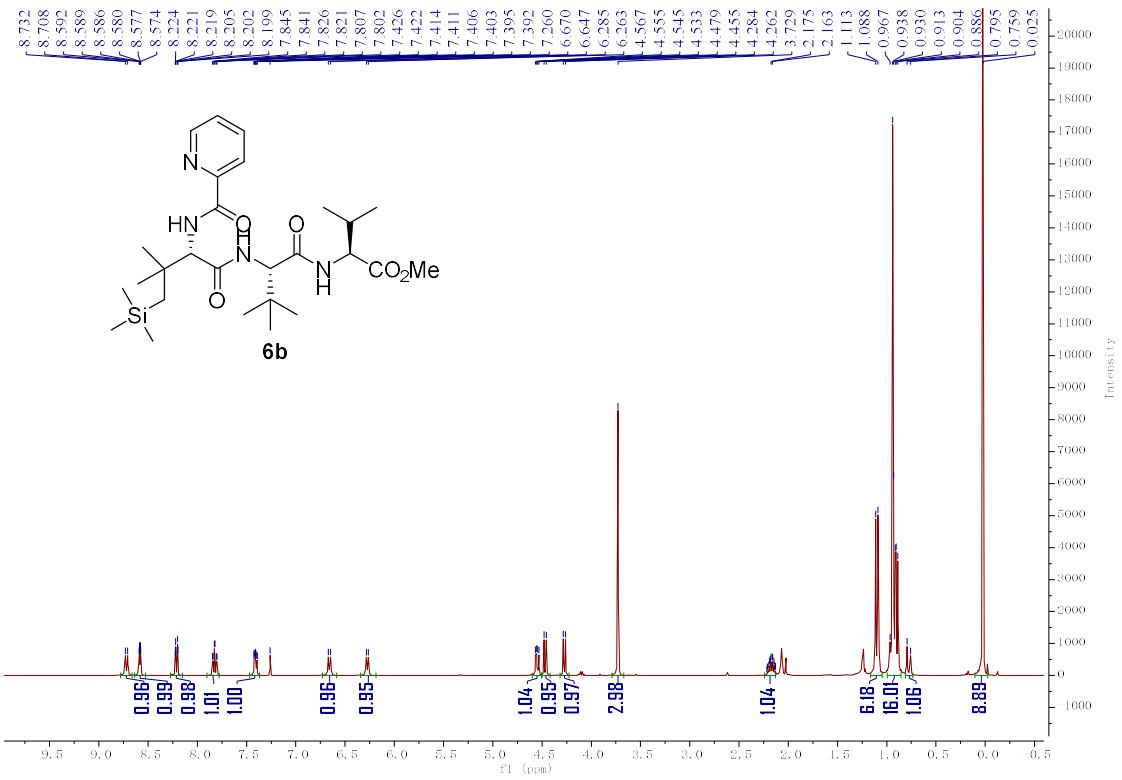

171.798
171.059
164.619
149.436
148.467
137.499
126.553
122.424
77.478
77.160
76.842
60.260
57.787
51.920
37.315
34.789
26.659
24.627
17.363
10.429
-0.714
HN
O
N
CO2Me
O
Si
4o
f1 (ppm)
Intensity

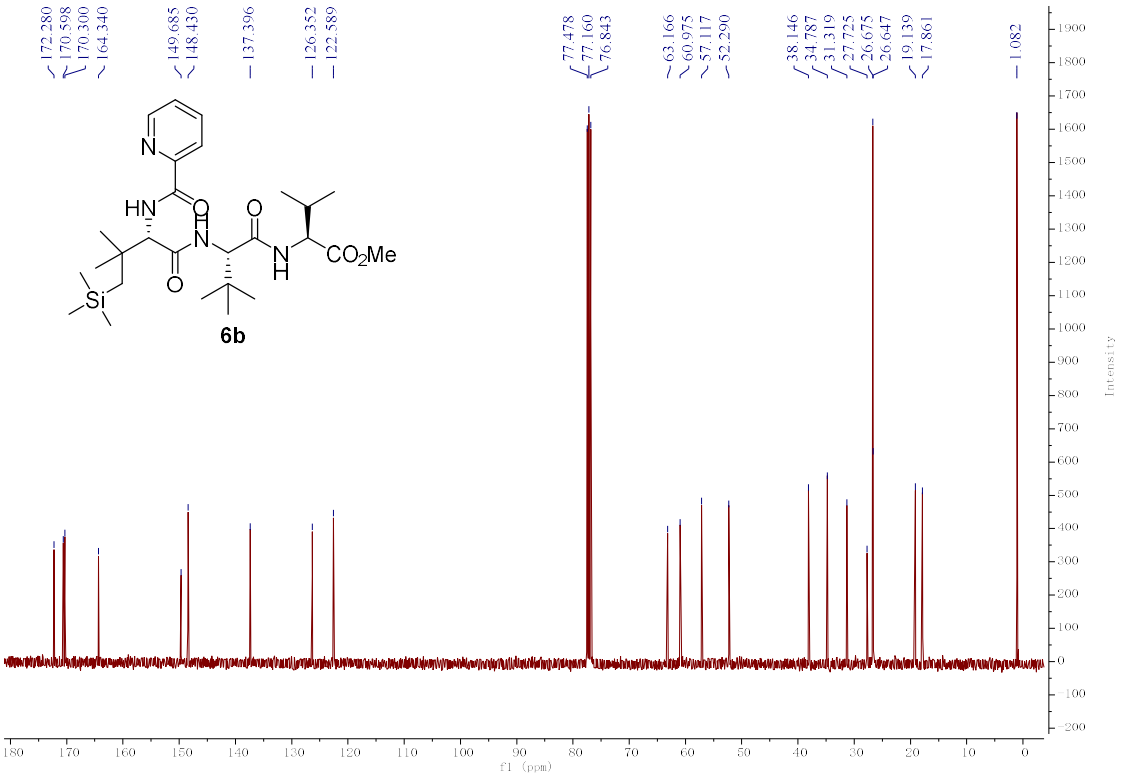

8.581
8.572
8.552
8.195
8.176
7.858
7.854
7.839
7.835
7.831
7.819
7.816
7.440
7.427
7.421
7.409
7.261
7.258
6.773
6.750
6.403
6.380
4.518
4.504
4.496
4.481
4.407
4.404
4.397
4.385
4.382
4.347
4.324
3.712
2.335
2.320
2.304
1.020
1.003
0.988
0.971
0.958
0.956
0.945
0.921
0.798
0.762
0.473
0.444
0.438
0.409
0.002
-0.001
-0.012
-0.015
N
HN
O
O
N
H
N
CO2Me
O
Si
6a
1.98
1.02
1.01
1.00
1.00
0.97
1.05
1.00
0.98
2.98
1.12
20.90
1.25
1.05
8.46
f1 (ppm)
Intensity

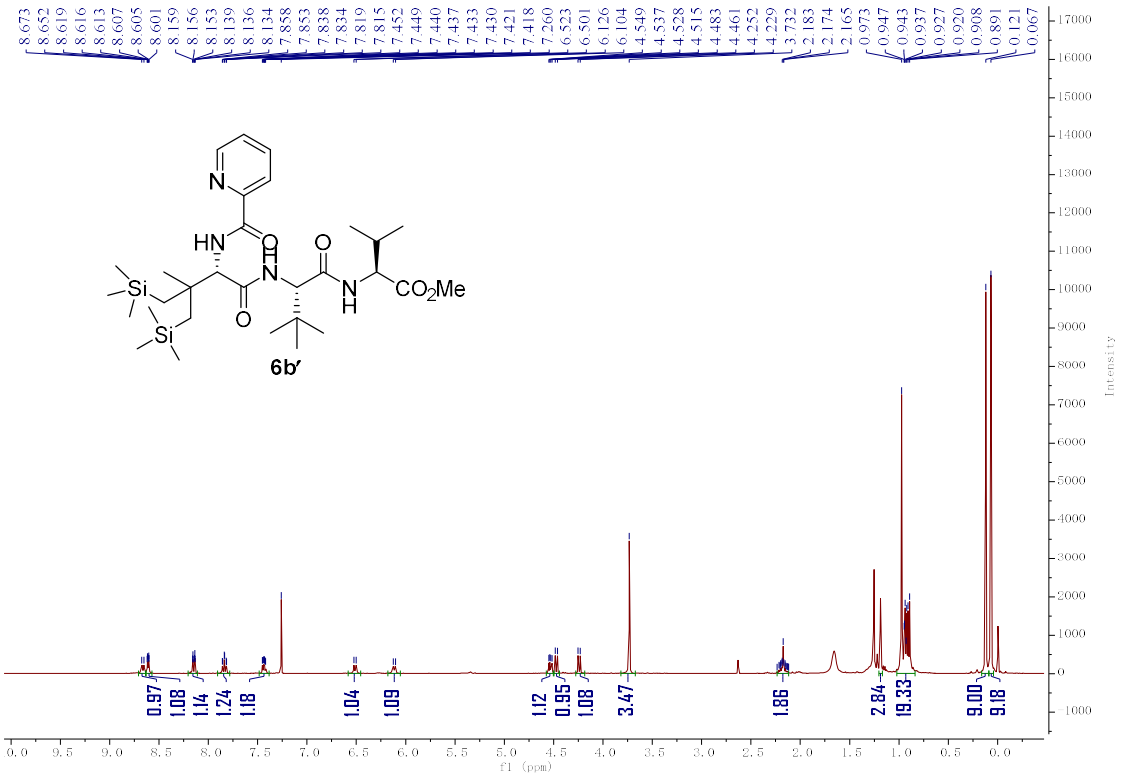

171.773
171.093
170.192
164.703
149.590
149.546
148.425
137.458
137.434
126.488
126.463
122.542
77.478
77.160
76.842
60.983
60.843
60.769
60.529
60.290
60.187
51.911
34.930
34.881
34.859
34.739
32.736
32.424
26.727
26.684
21.228
19.654
19.372
18.132
-0.608
-0.648
N
HN
O
O
N
H
N
CO2Me
O
Si
6a
f1 (ppm)
Intensity

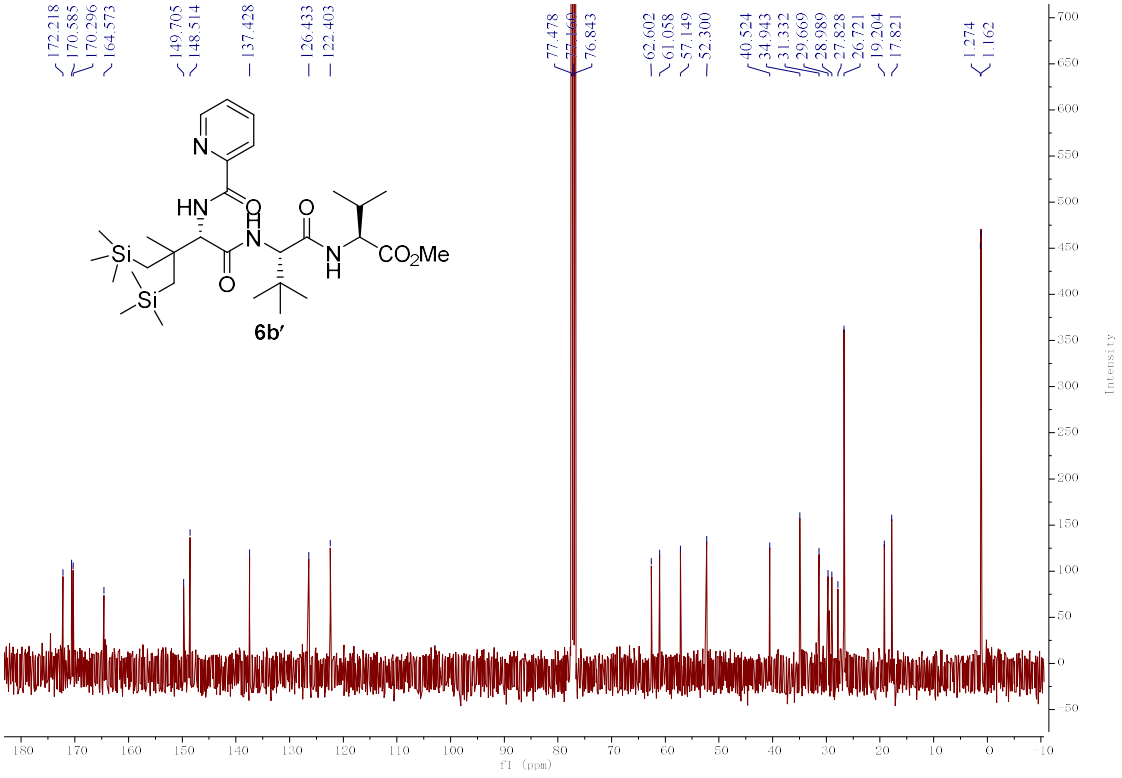

8.610
8.597
8.586
8.565
8.176
8.156
7.867
7.849
7.845
7.830
7.826
7.463
7.451
7.445
7.432
7.260
6.707
6.685
6.231
6.209
4.600
4.593
4.579
4.571
4.371
4.349
4.258
4.236
3.703
2.547
2.536
2.525
2.514
0.963
0.955
0.822
0.811
0.803
0.796
0.786
0.776
0.759
0.736
0.722
0.699
0.668
0.645
0.633
0.610
0.524
0.512
0.486
0.475
0.074
0.030
HN
O
N
O
O
N
H
CO2Me
Si
Si
O
6a'
1.87
0.94
0.93
0.90
0.79
0.81
0.81
0.86
0.86
2.89
0.92
18.19
1.25
1.15
1.10
1.14
17.95
f1 (ppm)
Intensity

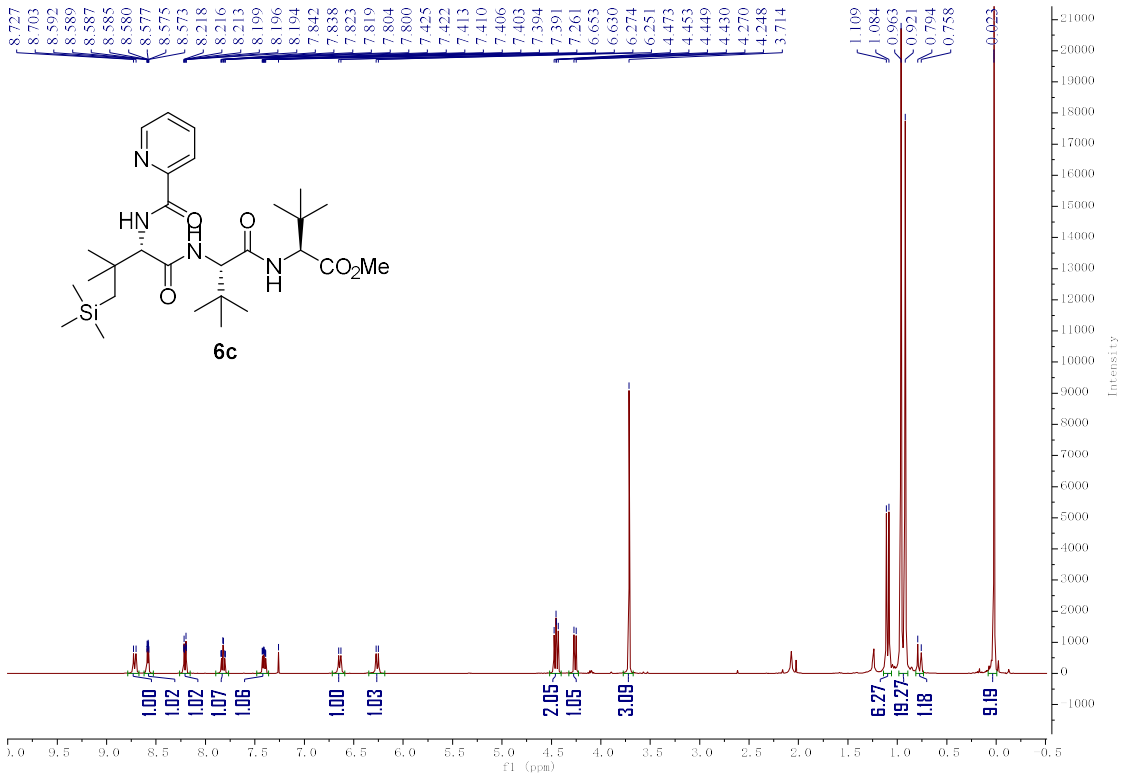

171.750
170.962
170.119
164.870
149.558
148.478
137.514
126.566
122.503
77.478
77.160
76.842
61.011
60.341
58.975
51.920
34.980
34.699
33.354
26.741
21.474
21.132
-0.435
-0.598
HN
O
N
O
O
N
H
CO2Me
Si
Si
O
6a'
f1 (ppm)
Intensity

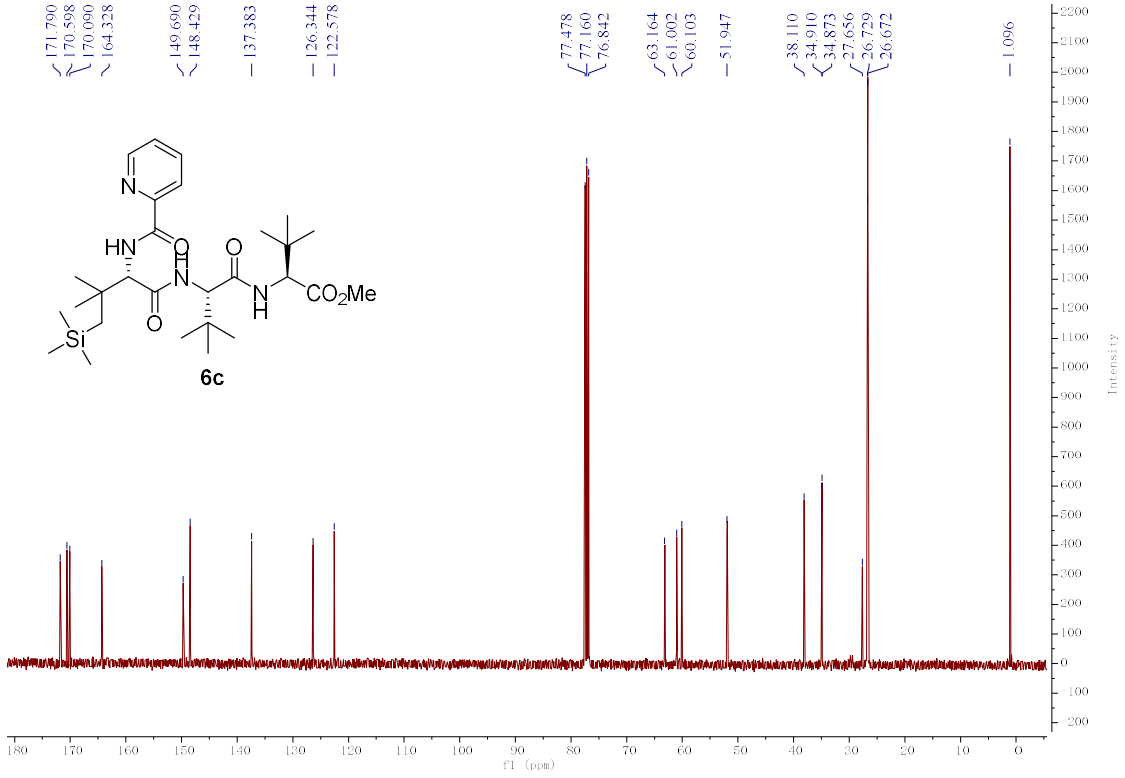

8.732
8.708
8.592
8.589
8.586
8.580
8.577
8.574
8.224
8.221
8.219
8.205
8.202
8.199
7.845
7.841
7.826
7.821
7.807
7.802
7.426
7.422
7.414
7.411
7.406
7.403
7.395
7.392
7.260
6.670
6.647
6.285
6.263
4.567
4.555
4.545
4.533
4.479
4.455
4.284
4.262
3.729
2.175
2.163
1.113
1.088
0.967
0.938
0.930
0.913
0.904
0.886
0.795
0.759
0.025
N
HN
O
O
N
O
N
H
CO2Me
Si
6b
0.96
0.99
0.98
1.01
1.00
0.96
0.95
1.04
0.95
0.97
2.98
1.04
6.18
16.01
1.06
8.89
f1 (ppm)
Intensity

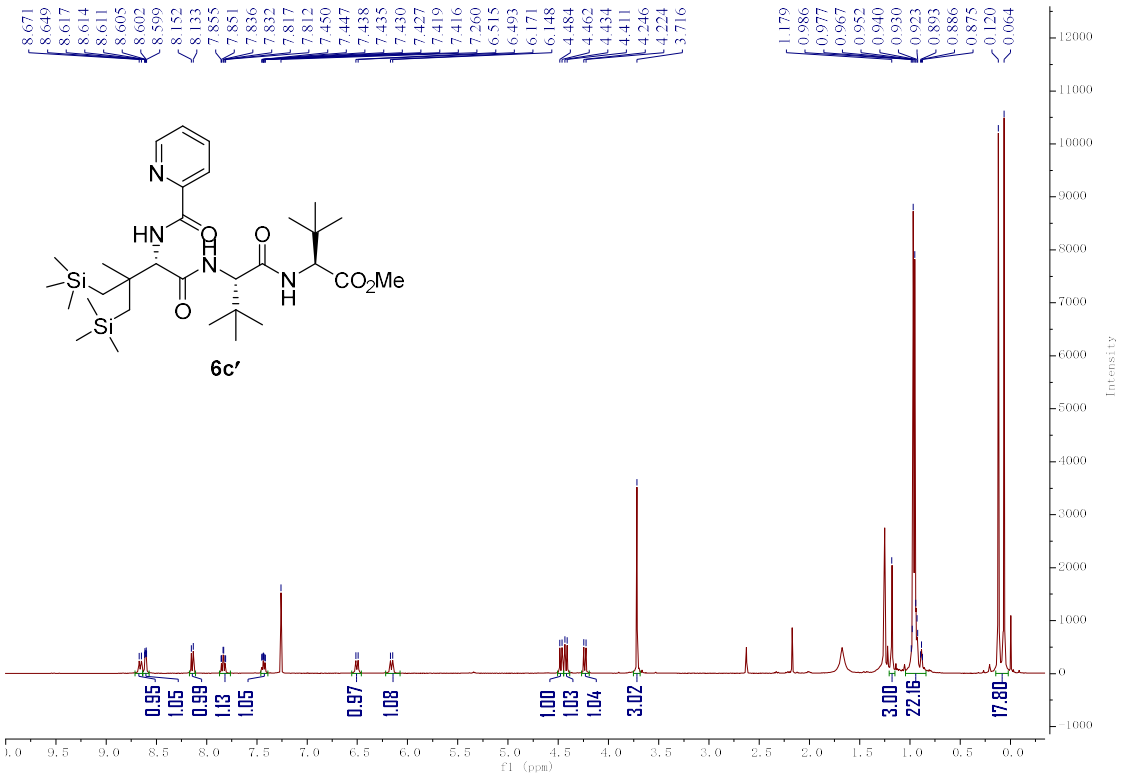

172.280
170.598
170.300
164.340
149.685
148.430
137.396
126.352
122.589
77.478
77.160
76.843
63.166
60.975
57.117
52.290
38.146
34.787
31.319
27.725
26.675
26.647
19.139
17.861
1.082
N
HN
O
O
N
O
N
H
CO2Me
Si
6b
f1 (ppm)
Intensity

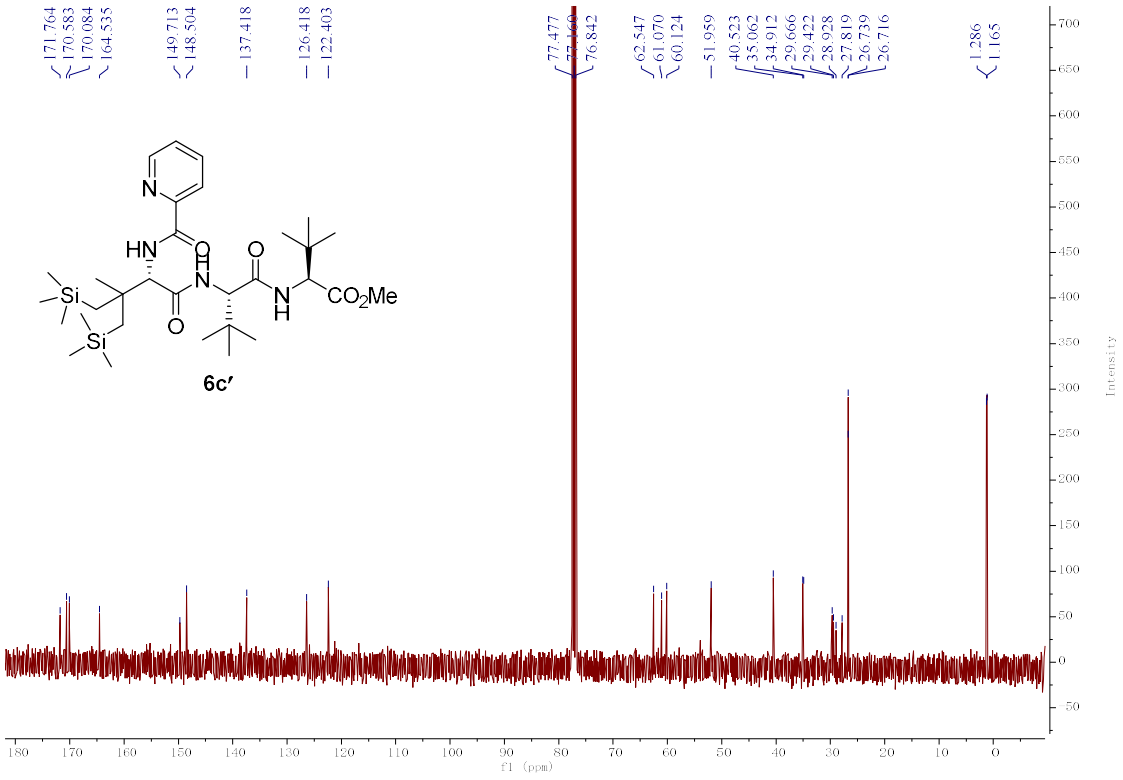

8.673
8.652
8.619
8.616
8.613
8.607
8.605
8.601
8.159
8.156
8.153
8.139
8.136
8.134
7.858
7.853
7.838
7.834
7.819
7.815
7.452
7.449
7.440
7.437
7.433
7.430
7.421
7.418
7.260
6.523
6.501
6.126
6.104
4.549
4.537
4.528
4.515
4.483
4.461
4.252
4.229
3.732
2.183
2.174
2.165
0.973
0.947
0.943
0.937
0.927
0.920
0.908
0.891
0.121
0.067
6b′
0.97
1.08
1.14
1.24
1.18
1.04
1.09
1.12
0.95
1.08
3.47
1.86
2.84
19.33
9.00
9.18
f1 (ppm)
Intensity

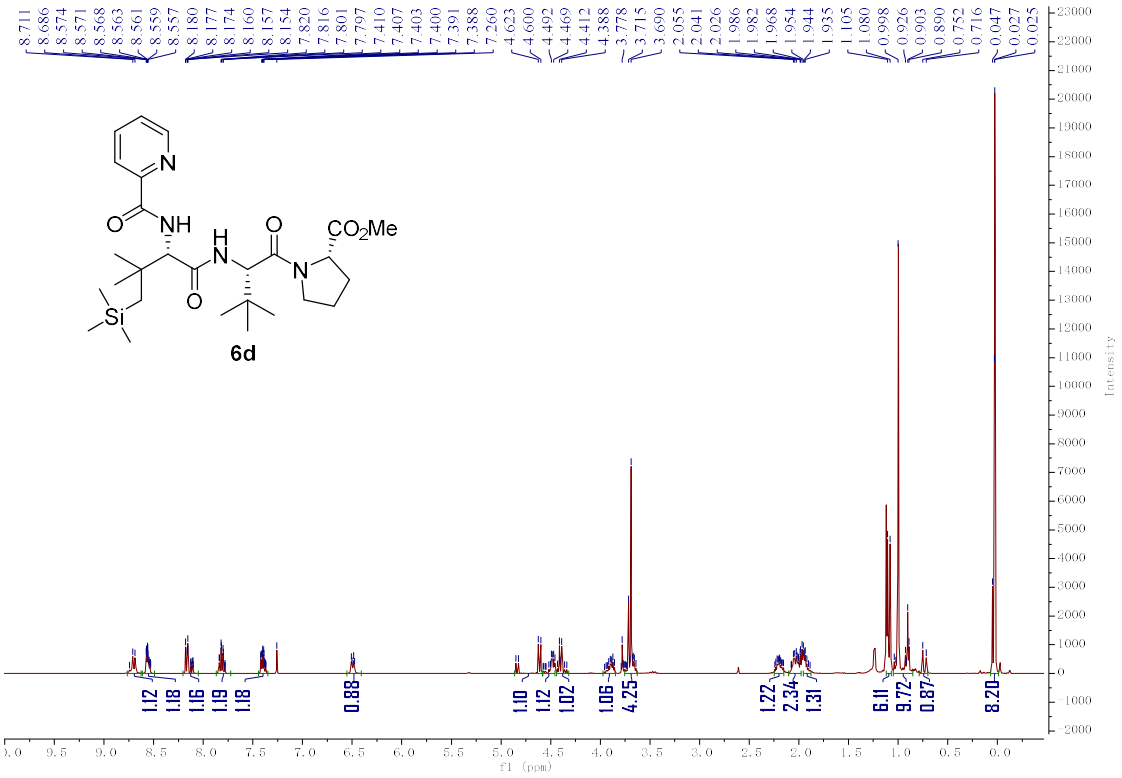

172.218
170.585
170.296
164.573
149.705
148.514
137.428
126.433
122.403
77.478
77.160
76.843
62.602
61.058
57.149
52.300
40.524
34.943
31.332
29.669
28.989
27.828
26.721
19.204
17.821
1.274
1.162
6b′
f1 (ppm)
Intensity

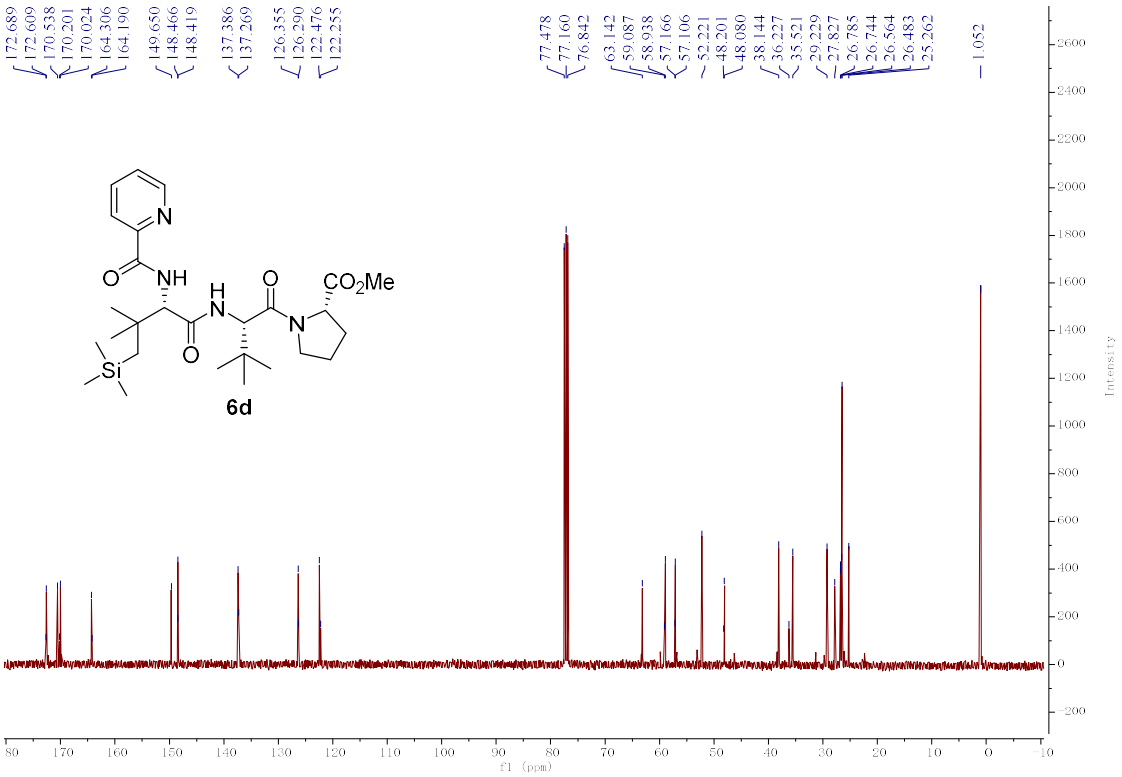

8.727
8.703
8.592
8.589
8.587
8.585
8.580
8.577
8.575
8.573
8.218
8.216
8.213
8.199
8.196
8.194
7.842
7.838
7.823
7.819
7.804
7.800
7.425
7.422
7.413
7.410
7.406
7.403
7.394
7.391
7.261
6.653
6.630
6.274
6.251
4.473
4.453
4.449
4.430
4.270
4.248
3.714
1.109
1.084
0.963
0.921
0.794
0.758
0.023
HN
O
N
H
O
O
N
H
CO2Me
Si
6c
1.00
1.02
1.02
1.07
1.06
1.00
1.03
2.05
1.05
3.09
6.27
19.27
1.18
9.19
f1 (ppm)
Intensity

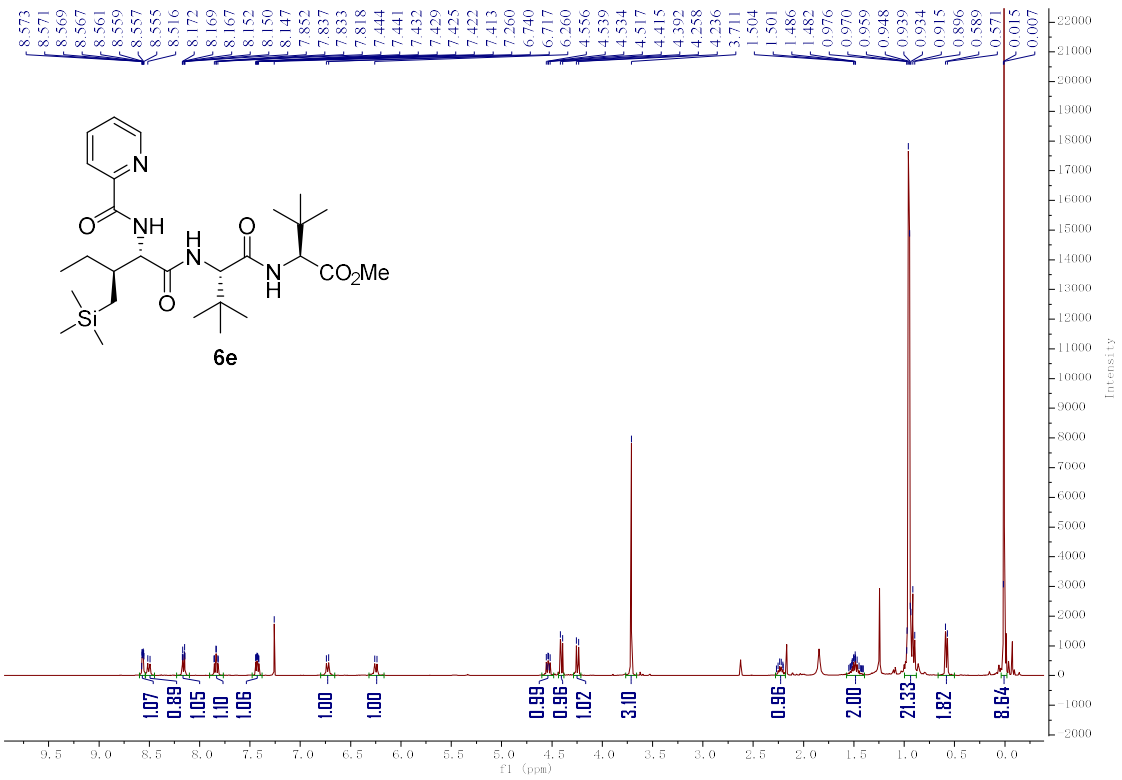

171.790
170.598
170.090
164.328
149.690
148.429
137.383
126.344
122.578
77.478
77.160
76.842
63.164
61.002
60.103
51.947
38.110
34.910
34.873
27.656
26.729
26.672
1.096
HN
O
N
H
O
O
N
H
CO2Me
Si
6c
f1 (ppm)
Intensity

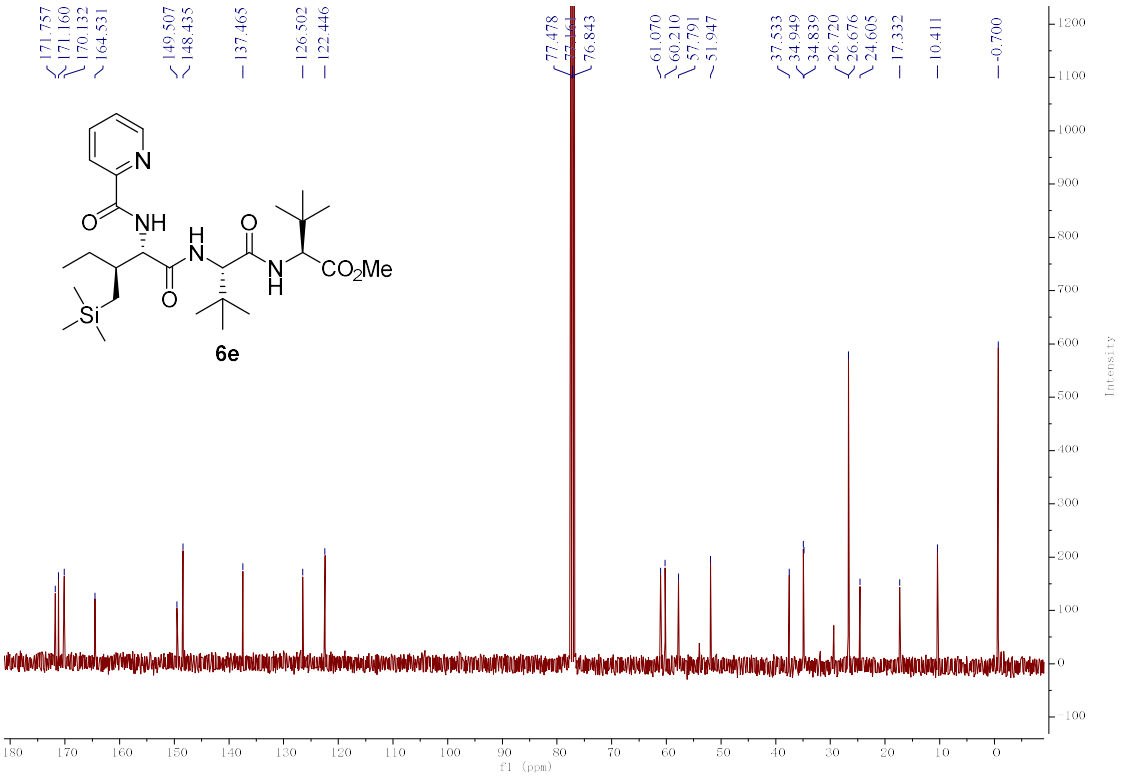

8.671
8.649
8.617
8.614
8.611
8.605
8.602
8.599
8.152
8.133
7.855
7.851
7.836
7.832
7.817
7.812
7.450
7.447
7.438
7.435
7.430
7.427
7.419
7.416
7.260
6.515
6.493
6.171
6.148
4.484
4.462
4.434
4.411
4.246
4.224
3.716
1.179
0.986
0.977
0.967
0.952
0.940
0.930
0.923
0.893
0.886
0.875
0.120
0.064
0.95
1.05
0.99
1.13
1.05
0.97
1.08
1.00
1.03
1.04
3.02
3.00
22.16
17.80
f1 (ppm)
Intensity
6c′

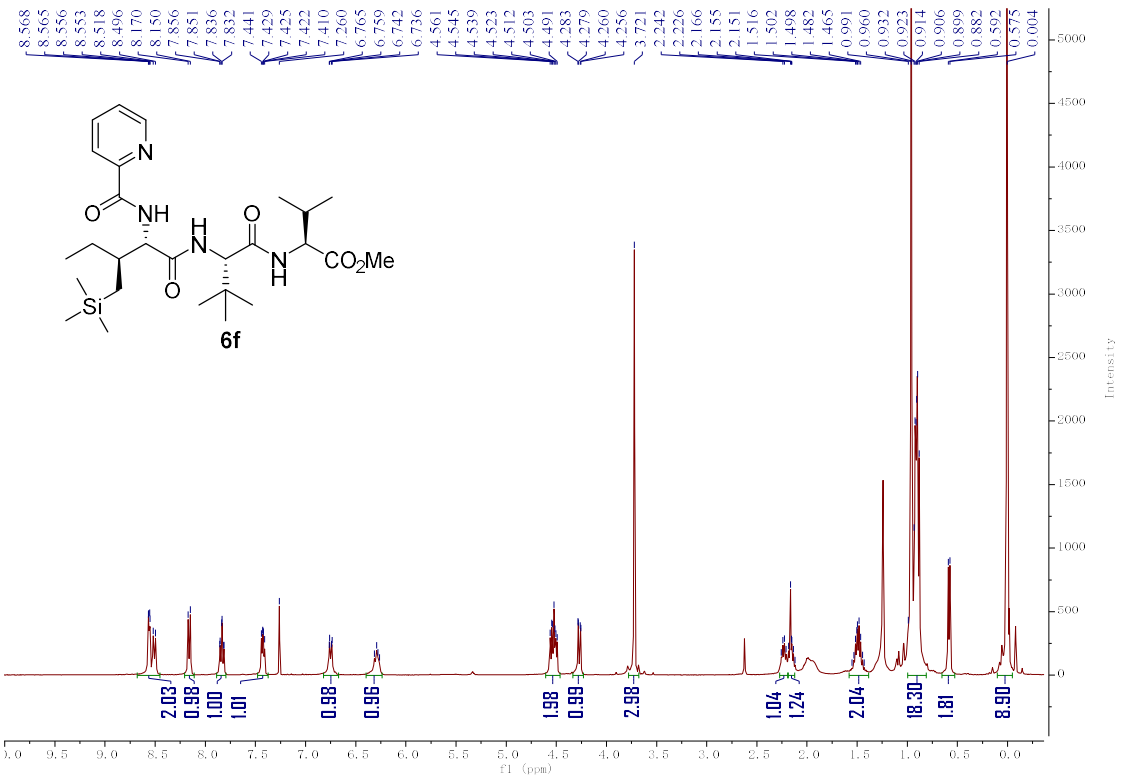

171.764
170.583
170.084
164.535
149.713
148.504
137.418
126.418
122.403
77.477
77.160
76.842
62.547
61.070
60.124
51.959
40.523
35.062
34.912
29.666
29.422
28.928
27.819
26.739
26.716
1.286
1.165
f1 (ppm)
Intensity
6c′

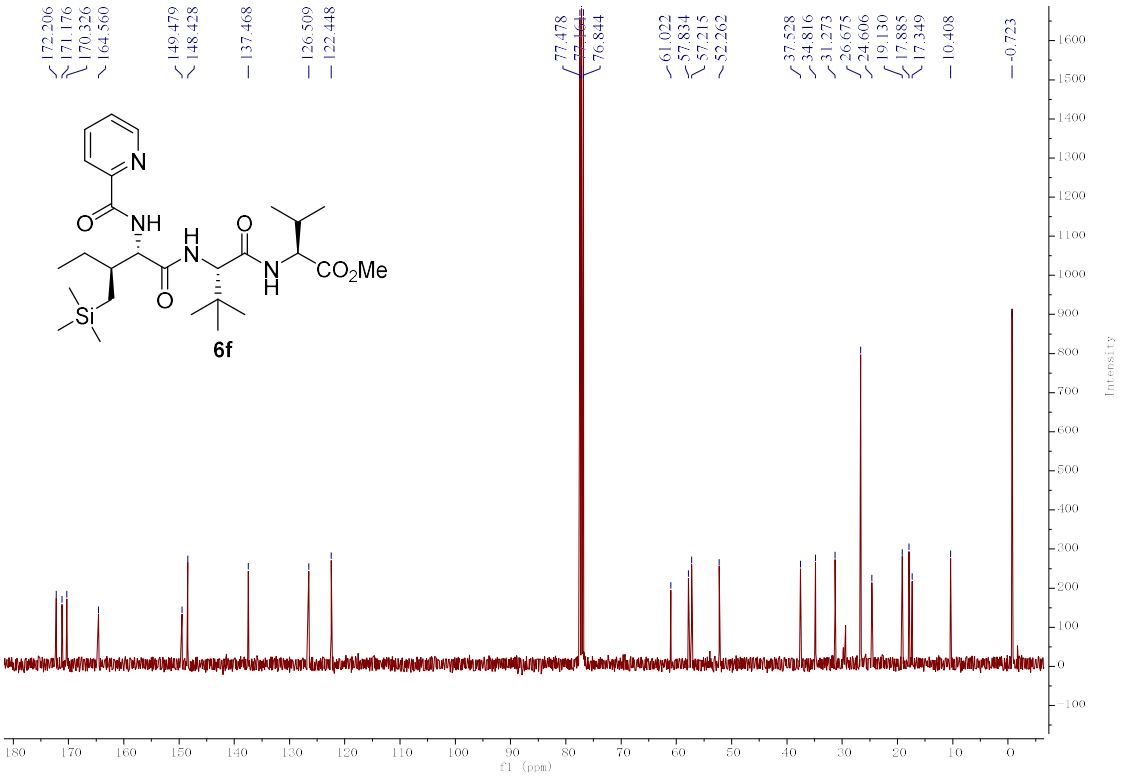

8.711
8.686
8.574
8.571
8.568
8.563
8.561
8.559
8.557
8.180
8.177
8.174
8.160
8.157
8.154
7.820
7.816
7.801
7.797
7.410
7.407
7.403
7.400
7.391
7.388
7.260
4.623
4.600
4.492
4.469
4.412
4.388
3.778
3.715
3.690
2.055
2.041
2.026
1.986
1.982
1.968
1.954
1.944
1.935
1.105
1.080
0.998
0.926
0.903
0.890
0.752
0.716
0.047
0.027
0.025
N
O
NH
H
N
O
O
N
CO2Me
Si
6d
1.12
1.18
1.16
1.19
1.18
0.88
1.10
1.12
1.02
1.06
4.25
1.22
2.34
1.31
6.11
9.72
0.87
8.20
f1 (ppm)
Intensity

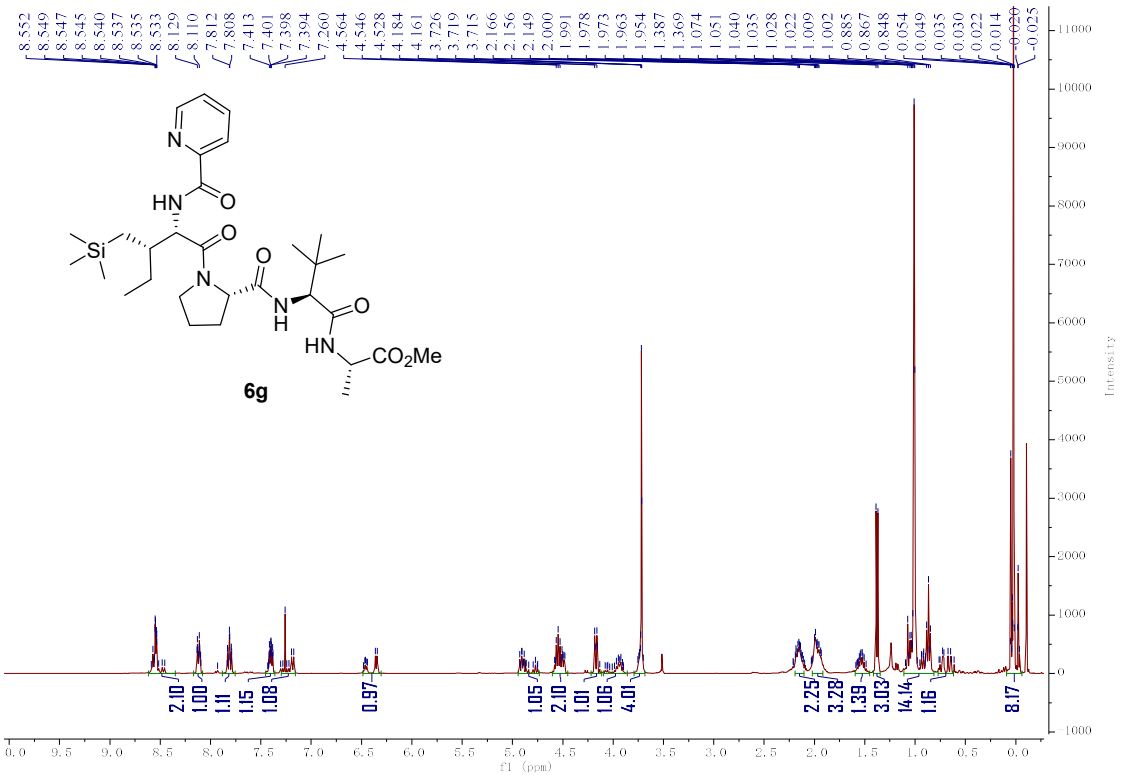

172.689
172.609
170.538
170.201
170.024
164.306
164.190
149.650
148.466
148.419
137.386
137.269
126.355
126.290
122.476
122.255
77.478
77.160
76.842
63.142
59.087
58.938
57.166
57.106
52.221
48.201
48.080
38.144
36.227
35.521
29.229
27.827
26.785
26.744
26.564
26.483
25.262
1.052
N
O
NH
H
N
O
O
N
CO2Me
Si
6d
f1 (ppm)
Intensity

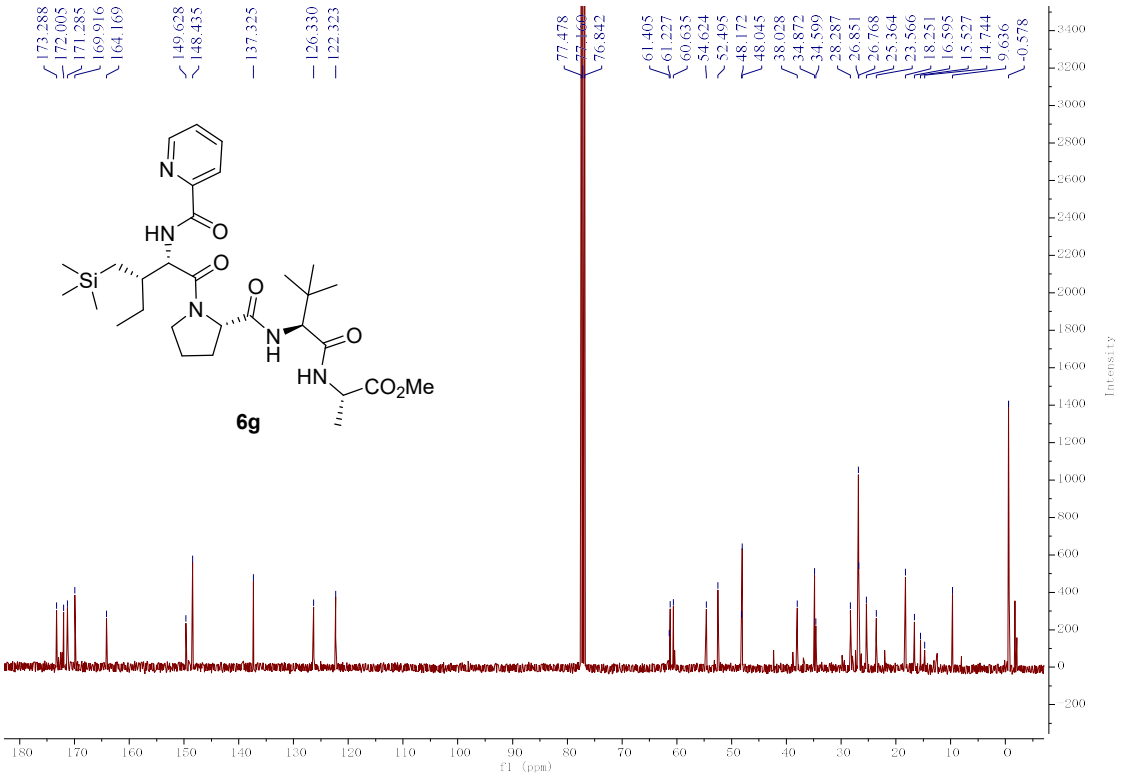

8.573
8.571
8.569
8.567
8.561
8.559
8.557
8.555
8.516
8.172
8.169
8.167
8.152
8.150
8.147
7.852
7.837
7.833
7.818
7.444
7.441
7.432
7.429
7.425
7.422
7.413
7.260
6.740
6.717
6.260
4.556
4.539
4.534
4.517
4.415
4.392
4.258
4.236
3.711
1.504
1.501
1.486
1.482
0.976
0.970
0.959
0.948
0.939
0.934
0.915
0.896
0.589
0.571
0.015
0.007
1.07
0.89
1.05
1.10
1.06
1.00
1.00
0.99
0.96
1.02
3.10
0.96
2.00
21.33
1.82
8.64
f1 (ppm)
Intensity
6e

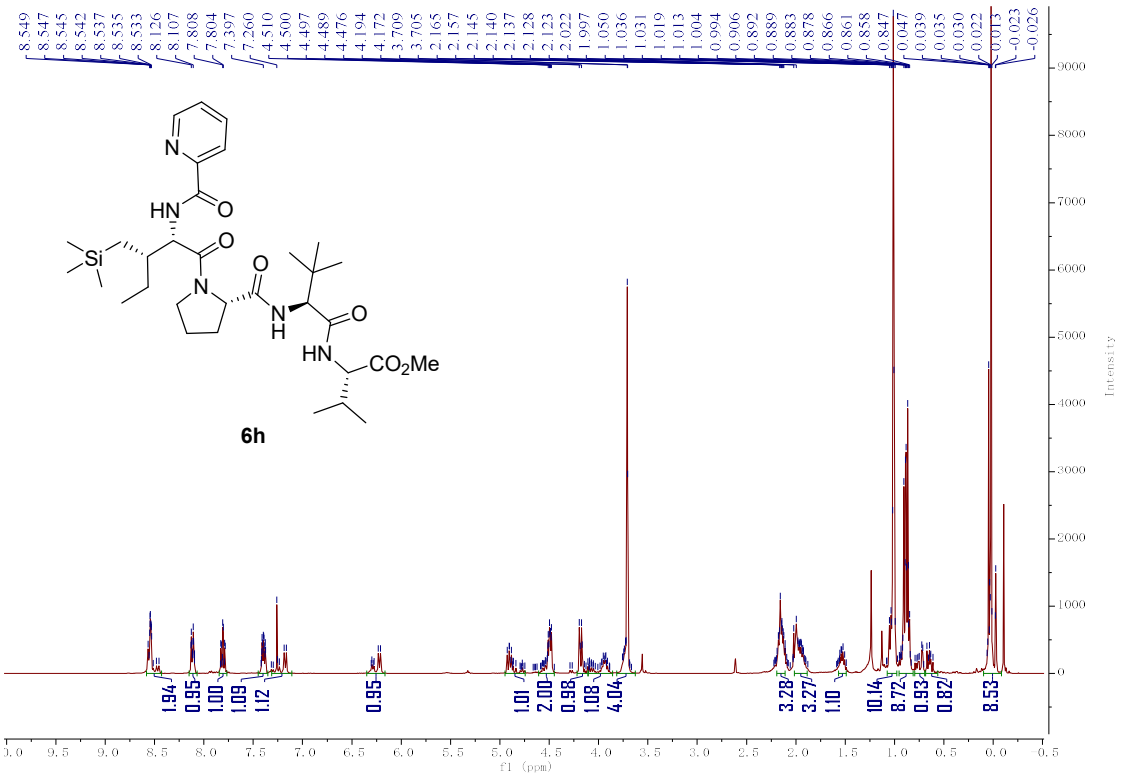

171.757
171.160
170.132
164.531
149.507
148.435
137.465
126.502
122.446
77.478
76.843
61.070
60.210
57.791
51.947
37.533
34.949
34.839
26.720
26.676
24.605
17.332
10.411
-0.700
f1 (ppm)
Intensity
6e

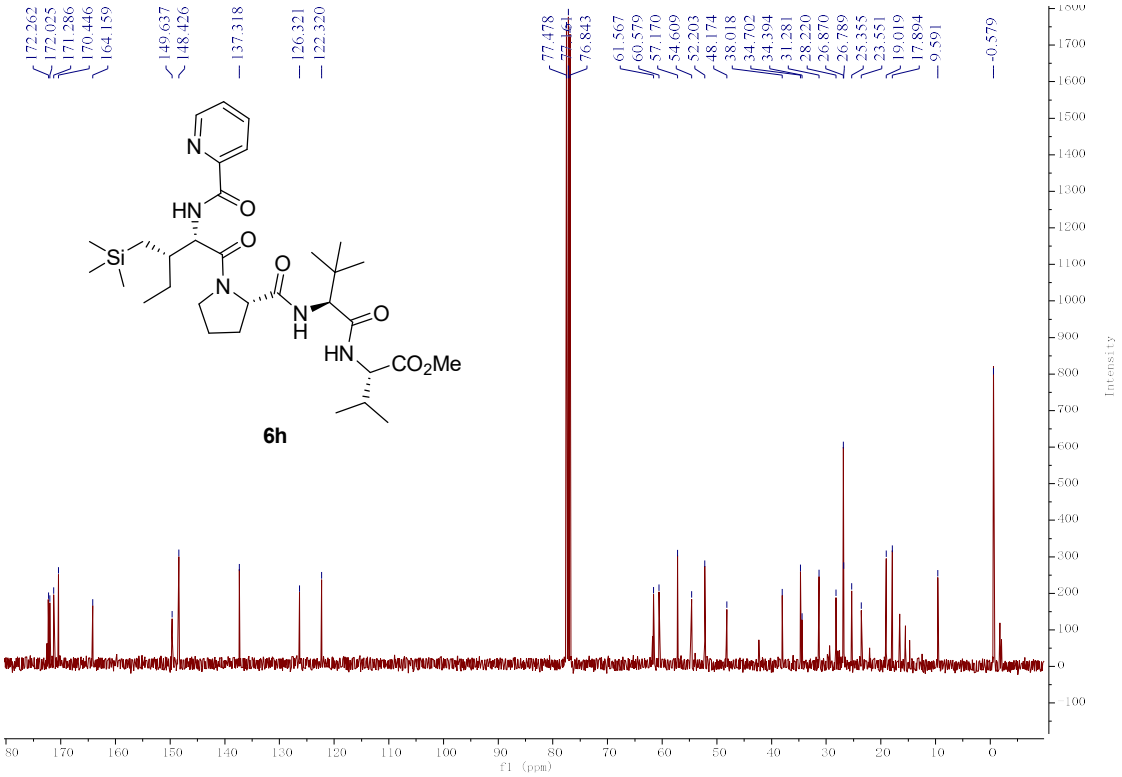

8.568
8.565
8.556
8.553
8.518
8.496
8.170
8.150
7.856
7.851
7.836
7.832
7.441
7.429
7.425
7.422
7.410
7.260
6.765
6.759
6.742
6.736
4.561
4.545
4.539
4.523
4.512
4.503
4.491
4.283
4.279
4.260
4.256
3.721
2.242
2.226
2.166
2.155
2.151
1.516
1.502
1.498
1.482
1.465
0.991
0.960
0.932
0.923
0.914
0.906
0.899
0.882
0.592
0.575
0.004
2.03
0.98
1.00
1.01
0.98
0.96
1.98
0.99
2.98
1.04
1.24
2.04
18.30
1.81
8.90
f1 (ppm)
Intensity
6f

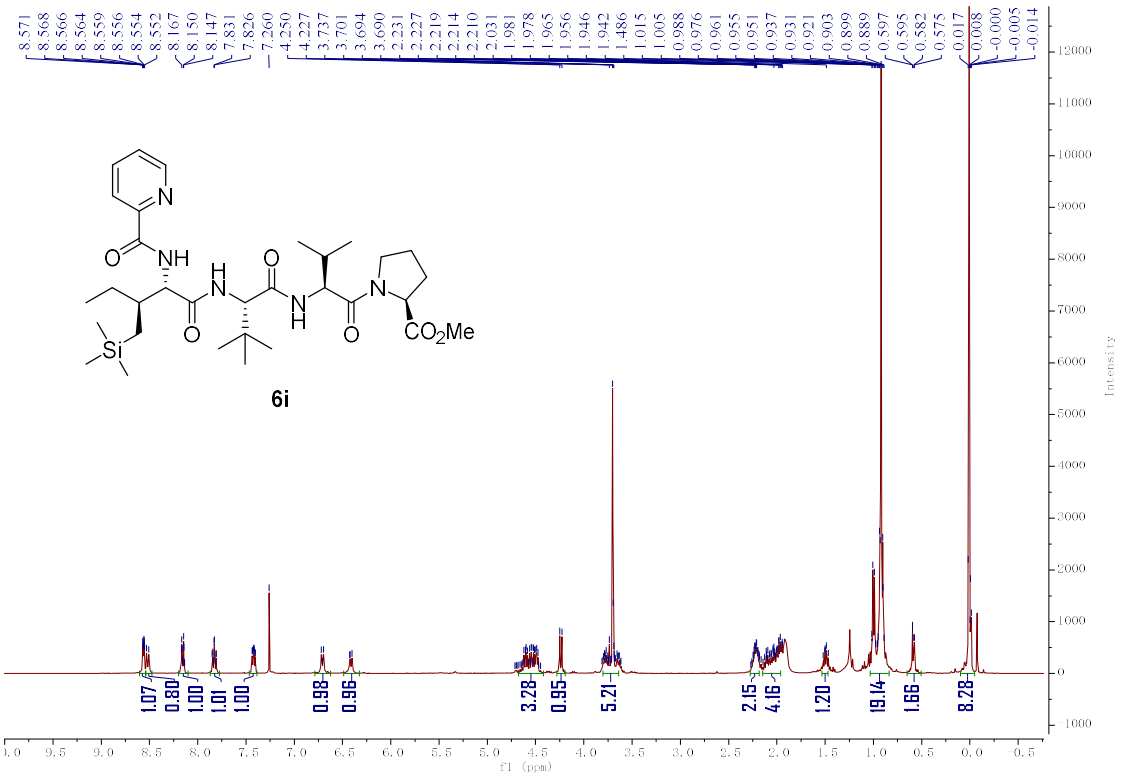

172.206
171.176
170.326
164.560
149.479
148.428
137.468
126.509
122.448
77.478
77.164
76.844
61.022
57.834
57.215
52.262
37.528
34.816
31.273
26.675
24.606
19.130
17.885
17.349
10.408
-0.723
f1 (ppm)
Intensity
6f

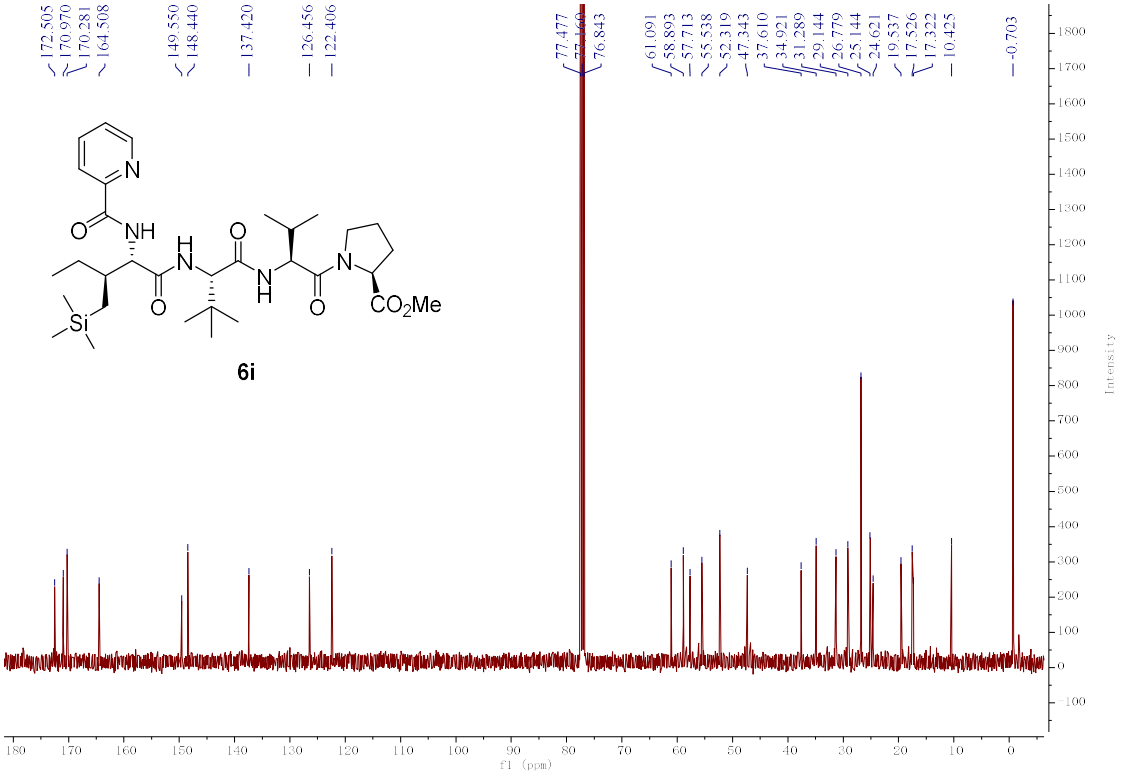

8.552
8.549
8.547
8.545
8.540
8.537
8.535
8.533
8.129
8.110
7.812
7.808
7.413
7.401
7.398
7.394
7.260
4.564
4.546
4.528
4.184
4.161
3.726
3.719
3.715
2.166
2.156
2.149
2.000
1.991
1.978
1.973
1.963
1.954
1.387
1.369
1.074
1.051
1.040
1.035
1.028
1.022
1.009
1.002
0.885
0.867
0.848
0.054
0.049
0.035
0.030
0.022
0.014
-0.020
-0.025
2.10
1.00
1.11
1.15
1.08
0.97
1.05
2.10
1.01
1.06
4.01
2.25
3.28
1.39
3.03
14.14
1.16
8.17
f1 (ppm)
Intensity
6g

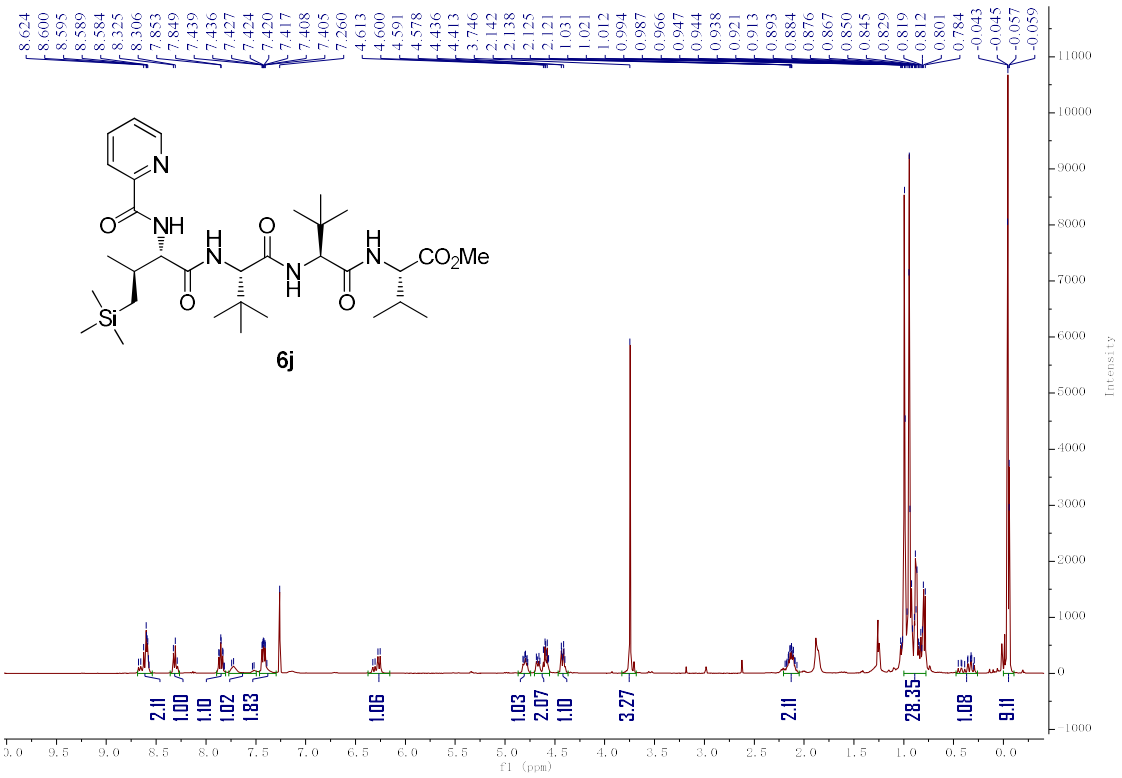

173.288
172.005
171.285
169.916
164.169
149.628
148.435
137.325
126.330
122.323
77.478
77.160
76.842
61.405
61.227
60.635
54.624
52.495
48.172
48.045
38.028
34.872
34.599
28.287
26.851
26.768
25.364
23.566
18.251
16.595
15.527
14.744
9.636
-0.578
f1 (ppm)
Intensity
6g

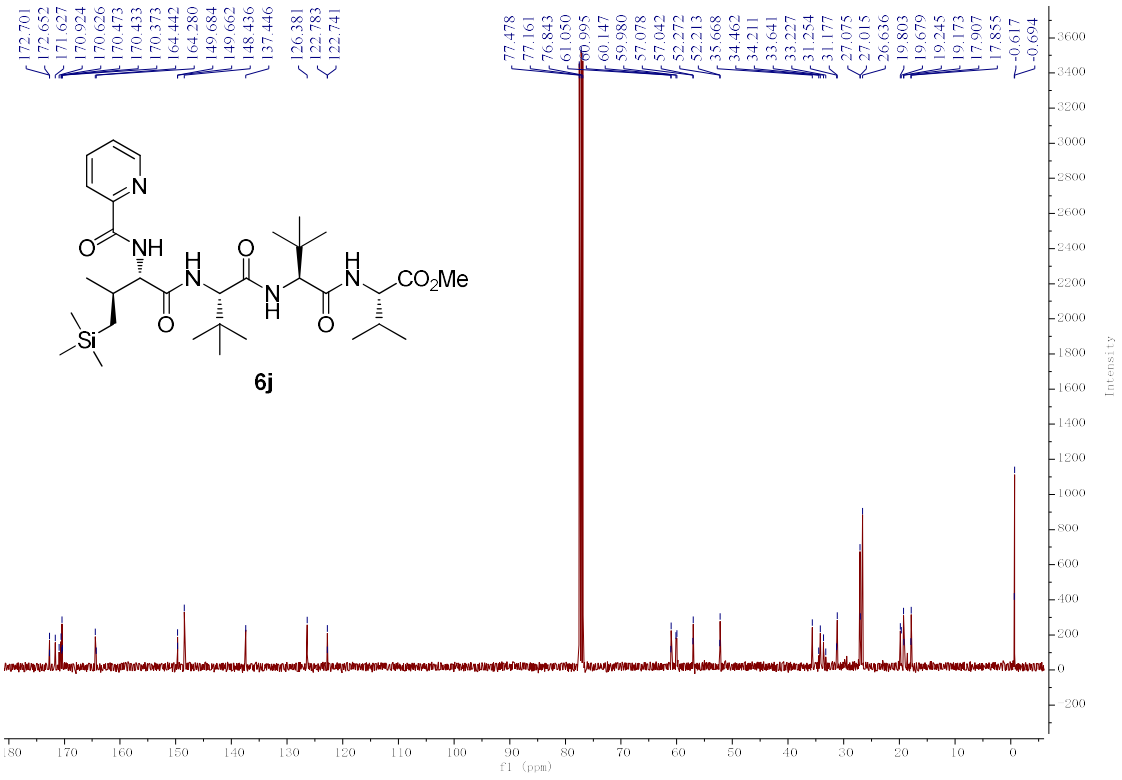

8.549
8.547
8.545
8.542
8.537
8.535
8.533
8.126
8.107
7.808
7.804
7.397
7.260
4.510
4.500
4.497
4.489
4.476
4.194
4.172
3.709
3.705
2.165
2.157
2.145
2.140
2.137
2.128
2.123
2.022
1.997
1.050
1.036
1.031
1.019
1.013
1.004
0.994
0.906
0.892
0.889
0.883
0.878
0.866
0.861
0.858
0.847
0.047
0.039
0.035
0.030
0.022
0.013
-0.023
-0.026
1.94
0.95
1.00
1.09
1.12
0.95
1.01
2.00
0.98
1.08
4.04
3.28
3.27
1.10
10.14
8.72
0.93
0.82
8.53
f1 (ppm)
Intensity
6h

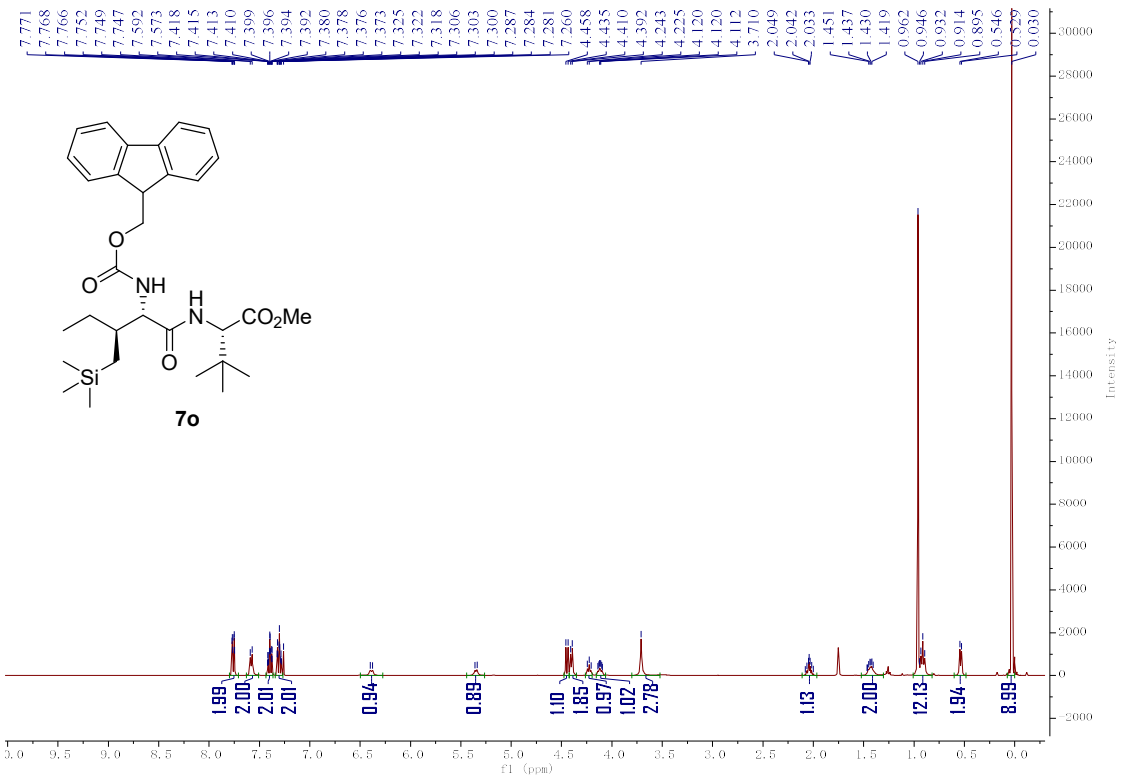

172.262
172.025
171.286
170.446
164.159
149.637
148.426
137.318
126.321
122.320
77.478
77.164
76.843
61.567
60.579
57.170
54.609
52.203
48.174
38.018
34.702
34.394
31.281
28.220
26.870
26.789
25.355
23.551
19.019
17.894
9.591
-0.579
f1 (ppm)
Intensity
6h

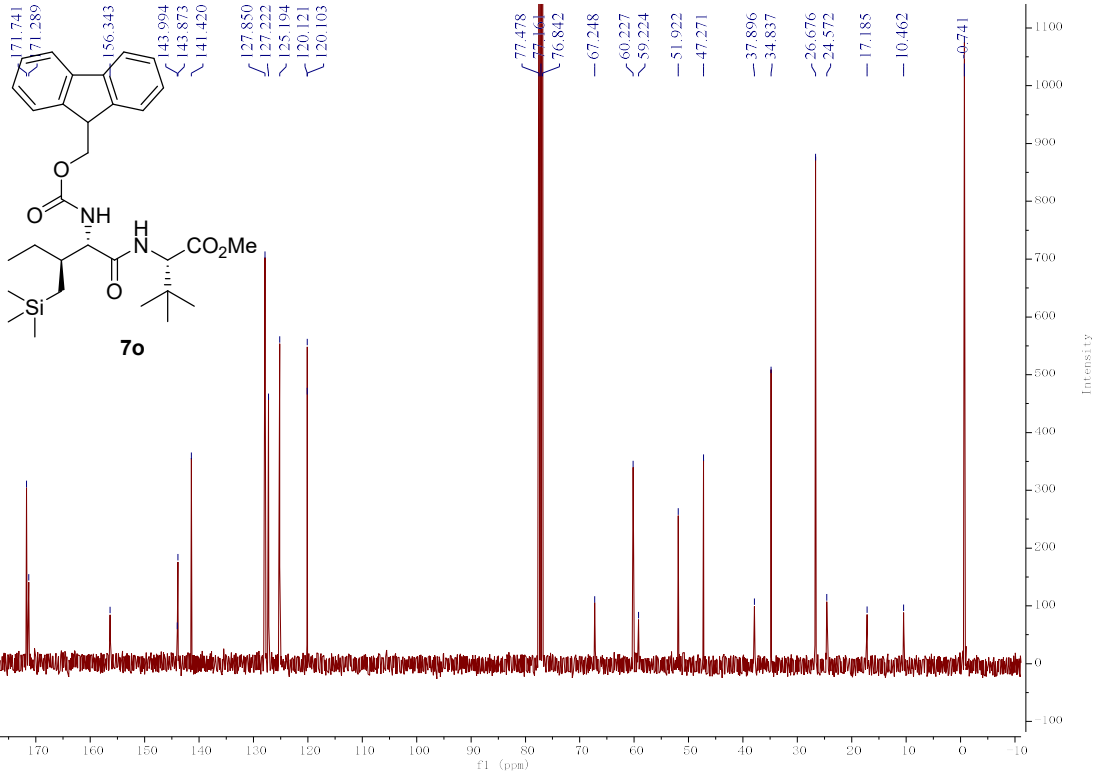

8.571
8.568
8.566
8.564
8.559
8.556
8.554
8.552
8.167
8.150
8.147
7.831
7.826
7.260
4.250
4.227
3.737
3.701
3.694
3.690
2.231
2.227
2.219
2.214
2.210
2.031
1.981
1.978
1.965
1.956
1.946
1.942
1.486
1.015
1.005
0.988
0.976
0.961
0.955
0.951
0.937
0.931
0.921
0.903
0.899
0.889
0.597
0.595
0.582
0.575
0.017
0.008
-0.000
-0.005
-0.014
1.07
0.80
1.00
1.01
1.00
0.98
0.96
3.28
0.95
5.21
2.15
4.16
1.20
19.14
1.66
8.28
f1 (ppm)
Intensity
6i

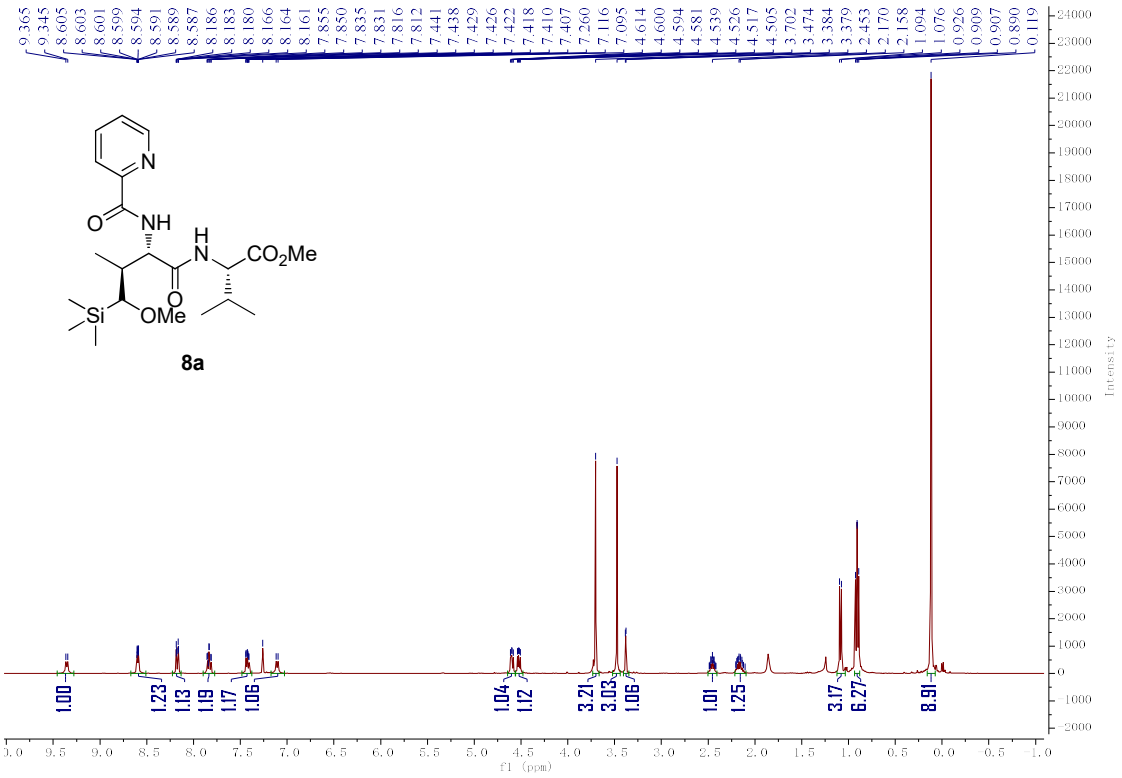

172.505
170.970
170.281
164.508
149.550
148.440
137.420
126.456
122.406
77.477
77.160
76.843
61.091
58.893
57.713
55.538
52.319
47.343
37.610
34.921
31.289
29.144
26.779
25.144
24.621
19.537
17.526
17.322
10.425
-0.703
f1 (ppm)
Intensity
6i

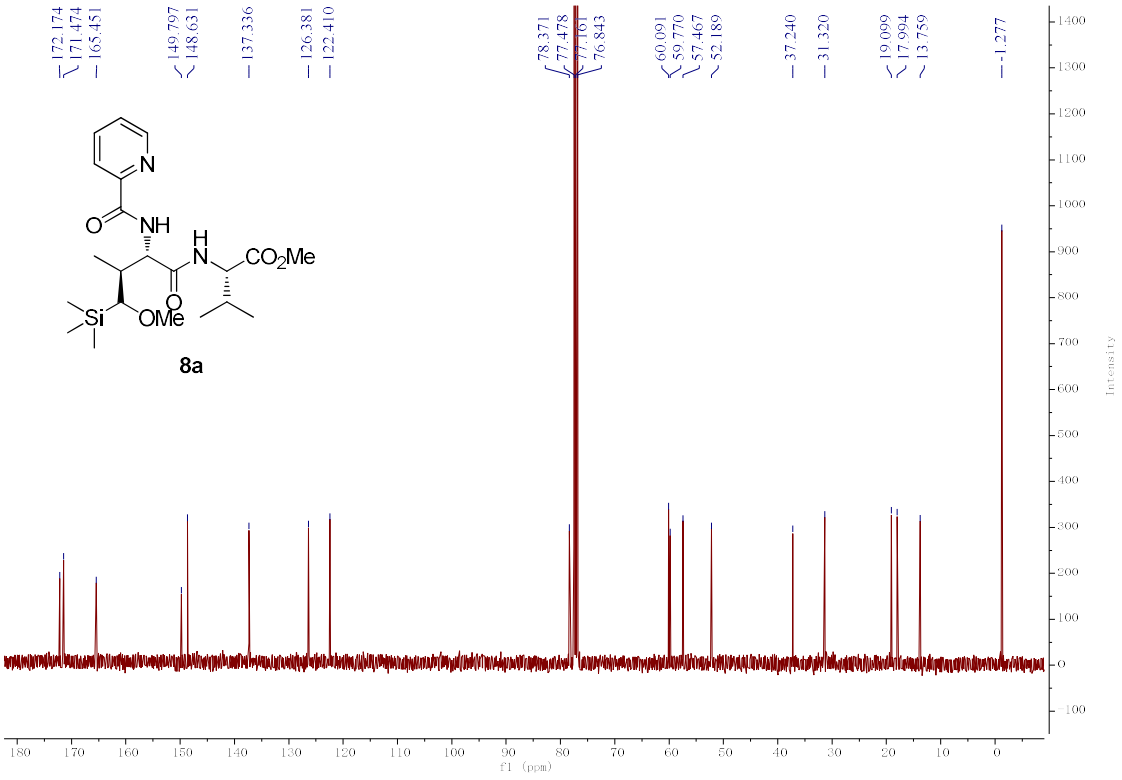

8.624
8.600
8.595
8.589
8.584
8.325
8.306
7.853
7.849
7.439
7.436
7.427
7.424
7.420
7.417
7.408
7.405
7.260
4.613
4.600
4.591
4.578
4.436
4.413
3.746
2.142
2.138
2.125
2.121
1.031
1.021
1.012
0.994
0.987
0.966
0.947
0.944
0.938
0.921
0.913
0.893
0.884
0.876
0.867
0.850
0.845
0.829
0.819
0.812
0.801
0.784
-0.043
-0.045
-0.057
-0.059
6j
2.11
1.00
1.10
1.02
1.83
1.06
1.03
2.07
1.10
3.27
2.11
28.35
1.08
9.11
f1 (ppm)
Intensity


172.701
172.652
171.627
170.924
170.626
170.473
170.433
170.373
164.442
164.280
149.684
149.662
148.436
137.446
126.381
122.783
122.741
77.478
77.161
76.843
61.050
60.995
60.147
59.980
57.078
57.042
52.272
52.213
35.668
34.462
34.211
33.641
33.227
31.254
31.177
27.075
27.015
26.636
19.803
19.679
19.245
19.173
17.907
17.855
-0.617
-0.694
6j
f1 (ppm)
Intensity


7.771
7.768
7.766
7.752
7.749
7.747
7.592
7.573
7.418
7.415
7.413
7.410
7.399
7.396
7.394
7.392
7.380
7.378
7.376
7.373
7.325
7.322
7.318
7.306
7.303
7.300
7.287
7.284
7.281
7.260
4.458
4.435
4.410
4.392
4.243
4.225
4.120
4.120
4.112
3.710
2.049
2.042
2.033
1.451
1.437
1.430
1.419
0.962
0.946
0.932
0.914
0.895
0.546
0.529
0.030
1.99
2.00
2.01
2.01
0.94
0.89
1.10
1.85
0.97
1.02
2.78
1.13
2.00
12.13
1.94
8.93
f1 (ppm)
Intensity


171.741
171.289
156.343
143.994
143.873
141.420
127.850
127.222
125.194
120.121
120.103
77.478
77.162
76.842
67.248
60.227
59.224
51.922
47.271
37.896
34.837
26.676
24.572
17.185
10.462
0.741
f1 (ppm)
Intensity

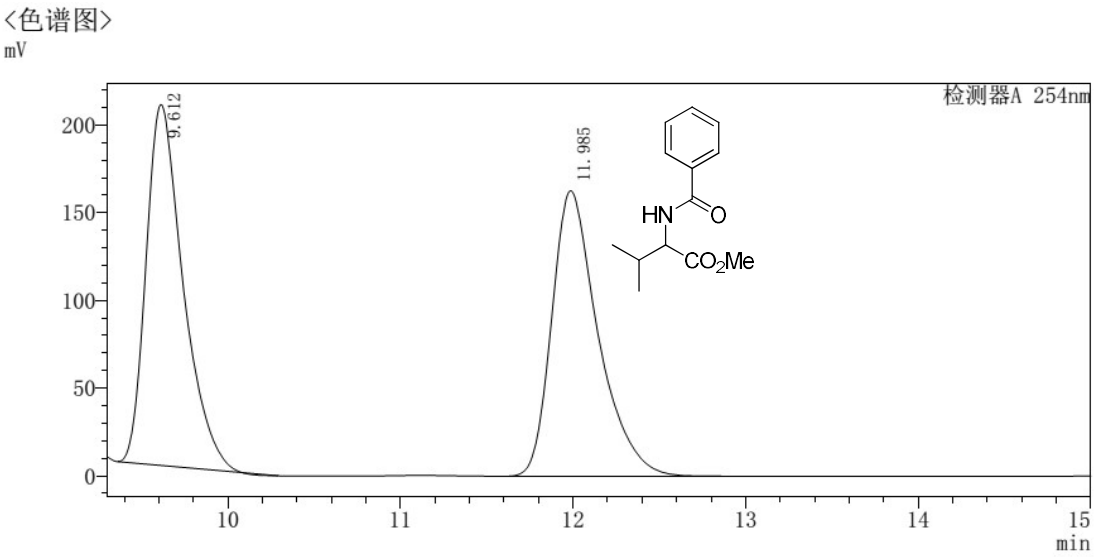

9.365
9.345
8.605
8.603
8.601
8.599
8.594
8.591
8.589
8.587
8.186
8.183
8.180
8.166
8.164
8.161
7.855
7.850
7.835
7.831
7.816
7.812
7.441
7.438
7.429
7.426
7.422
7.418
7.410
7.407
7.260
7.116
7.095
4.614
4.600
4.594
4.581
4.539
4.526
4.517
4.505
3.702
3.474
3.384
3.379
2.453
2.170
2.158
1.094
1.076
0.926
0.909
0.907
0.890
0.119
N
O
NH
H
N
CO2Me
O
Si
OMe
8a
1.00
1.23
1.13
1.19
1.17
1.06
1.04
1.12
3.21
3.03
1.06
1.01
1.25
3.17
6.27
8.91
Intensity
f1 (ppm)


172.174
171.474
165.451
149.797
148.631
137.336
126.381
122.410
78.371
77.478
77.161
76.843
60.091
59.770
57.467
52.189
37.240
31.320
19.099
17.994
13.759
-1.277
N
O
NH
H
N
CO2Me
O
Si
OMe
8a
Intensity
f1 (ppm)

9. Copies of HPLC analysis

1a: AD-H, Hex/*i*PrOH = 90/10, rate = 1.0 mL/min, 254 nm

<色谱图>

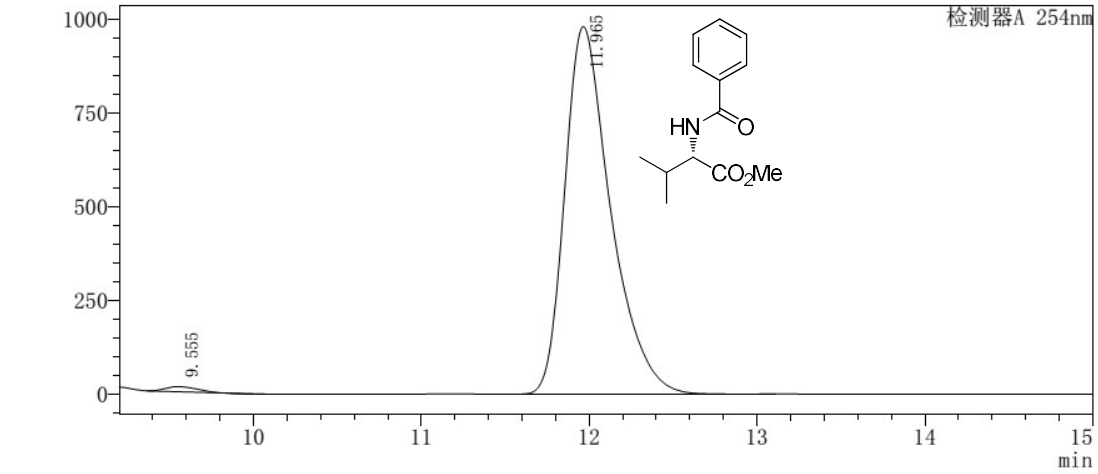


<峰表>

检测器A 254nm

峰号	保留时间	面积	高度	浓度	浓度单位	标记	化合物名
1	9.612	3058710	205780	50.164		M	
2	11.985	3038730	162915	49.836			
总计		6097440	368695				

<色谱图>



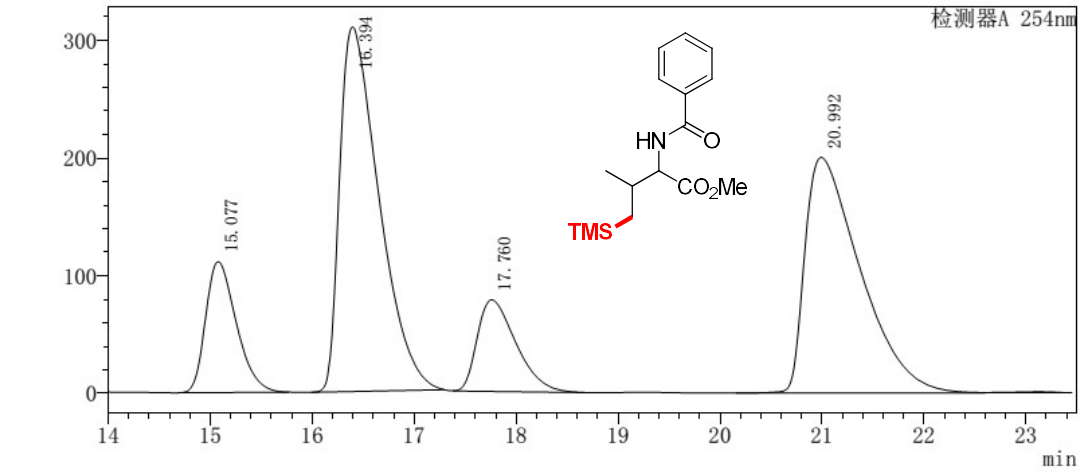
<峰表>

检测器A 254nm

峰号	保留时间	面积	高度	浓度	浓度单位	标记	化合物名
1	9.555	168522	14251	0.897		M	
2	11.965	18622977	980220	99.103		M	
总计		18791498	994471				

2a: IB-N5, Hex/*i*PrOH = 97/3, rate = 0.8 mL/min, 254 nm

<色谱图>

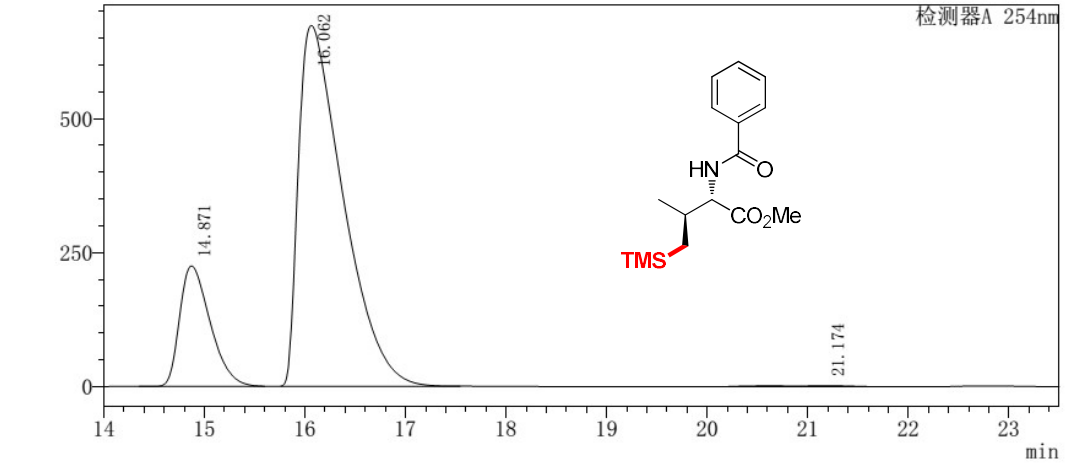


<峰表>

检测器A 254nm

峰号	保留时间	面积	高度	浓度	浓度单位	标记	化合物名
1	15.077	2327032	111312	11.500		M	
2	16.394	8293999	309752	40.990		M	
3	17.760	2051967	77857	10.141			
4	20.992	7561197	200200	37.368		S	
总计		20234195	699121				

<色谱图>



<峰表>

检测器A 254nm

峰号	保留时间	面积	高度	浓度	浓度单位	标记	化合物名
1	14.871	4741003	224983	18.490		M	
2	16.062	20779405	673470	81.040		M	
3	21.174	120636	2195	0.470		M	
总计		25641043	900648				