Supporting Information

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General techniques

NMR spectra were recorded on a JEOL-ECS400 (400 MHz for ^{1}H, 100 MHz for ^{13}C) or JEOL-ECZ400 (400 MHz for ^{1}H, 100 MHz for ^{13}C) instrument in the indicated solvent. Chemical shifts were reported in units of parts per million (ppm) relative to tetramethylsilane (0.00 ppm) in $CDCl_3$ for ^{1}H NMR and $CDCl_3$ (77.16 ppm) for ^{13}C NMR. Multiplicities were reported by using the following abbreviations: s; singlet, d; doublet, t; triplet, q; quartet, m; multiplet, br; broad, *J*; coupling constants in Hertz (Hz). IR spectra were recorded on a JASCO FT/IR-4100 Fourier Transform Infrared Spectrophotometer. Only the strongest and/or structurally important peaks were reported as the IR data given in cm^{-1}. High resolution mass spectra (HRMS) were obtained on a Bruker Daltonics Compact in electrospray ionization (ESI) method. Column chromatography was performed on Silica Gel PSQ 60B purchased from Fuji Silysia Chemical LTD. Analytical HPLC was carried out using a JASCO PU-4580 / JASCO PU4180 HPLC pump system with a JASCO MD-2018 / MD 4010 PDA Detector, a Shimadzu CTO-20A Column Oven, a JASCO LG-4580 Quaternary Gradient Unit, a JASCO DG-4580 Degassing Unit, a JASCO AS-4550 Autosampler, and a JASCO LCNetII/ADC Interface Box. Reactions were monitored by thin-layer chromatography carried out on 0.25 mm E. Merck silica gel plates (60F-254) with UV light, visualized by *n*-butanolic ninhydrin (contains acetic acid) solution.

Micro-flow reactor set-up

Stainless steel V-shaped and T-shaped mixers were purchased from Sanko Seiki Co. Ltd. (inner diameter: 0.25 mm). Teflon® tubes (inner diameter: 0.25 mm or 0.80 mm) were purchased from Senshu Scientific Co., Ltd. PEEK fittings, PEEK unions, stainless steel tubes, stainless steel fittings, stainless steel unions (inner diameter: 0.80 mm) and back pressure regulator (BPR, 40 psi) were purchased from GL Science Inc. Solutions were injected into a micro-flow system with syringe pumps (Harvard PHD ULTRA) equipped gastight syringes (SGE 10 mL). The gastight syringes and the Teflon tubes were connected with joints purchased from Flon Industry Co., Ltd.

The employed micro-flow system for synthesis of α-amino acid *N*-carboxyanhydrides (α-NCAs) was shown in **Figure S-1**. The gastight syringes and V-shaped mixer were connected with the Teflon tubes. The V-shaped mixer and the T-shaped mixer were connected with the reaction tube 1 (Teflon tube). The T-shaped mixer and the BPR were connected with the reaction tube 2 (Teflon tube). The mixers and reaction tubes were immersed in water bath.

The employed micro-flow system for synthesis of urethane-protected α-amino acid *N*-carboxyanhydrides (UNCAs) was shown in **Figure S-2**. The gastight syringes and T-shaped mixer were connected with the Teflon tubes and stainless tubes (for controlling the temperature of solutions). The T-shaped mixer was connected with the reaction tube (Teflon tube). The mixer and reaction tube were immersed in a water bath.

The employed micro-flow system for examination of time-dependent decrease of α-NCAs or benzyl chloroformate in the presence of amine and synthesis of dipeptides was shown in **Figure S-3**. The gastight syringes and T-shaped mixer 1 were connected with the Teflon tubes and stainless tubes (for controlling the temperature of solutions). The T-shaped mixer 1 and the T-shaped mixer 2 were connected with the reaction tube 1 (Teflon tube). The T-shaped mixer 2 was connected with the reaction tube 2 (Teflon tube). The mixers and reaction tubes were immersed in a water bath.

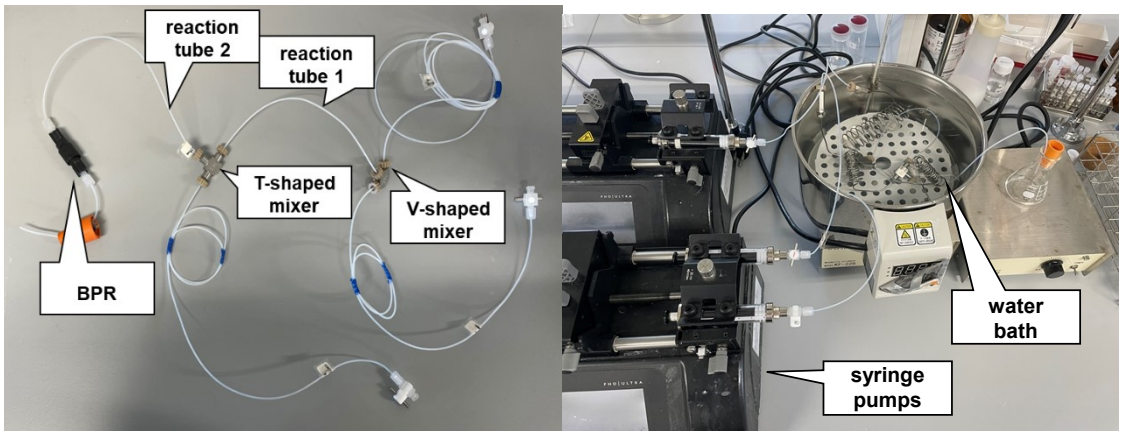


Figure S-1. Micro-flow reactor set-up for synthesis of α-NCAs

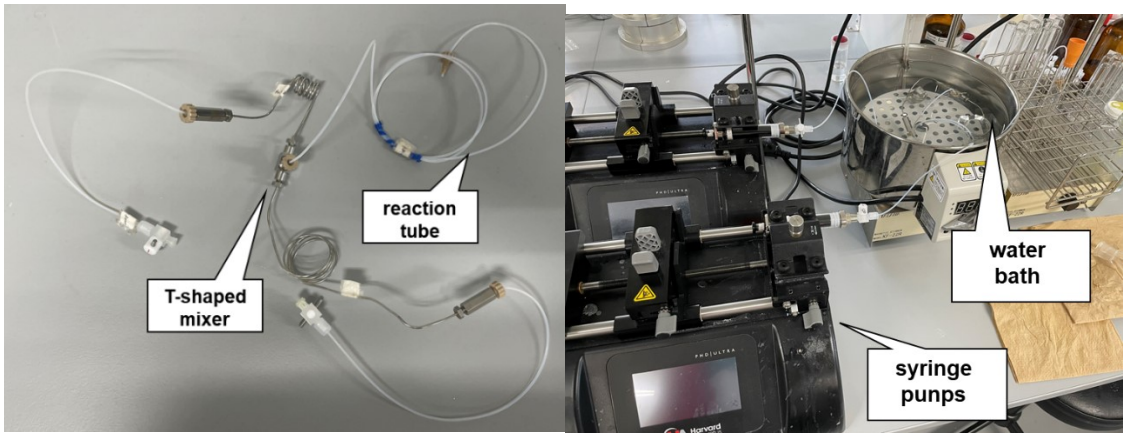


Figure S-2. Micro-flow reactor set-up for synthesis of UNCAs

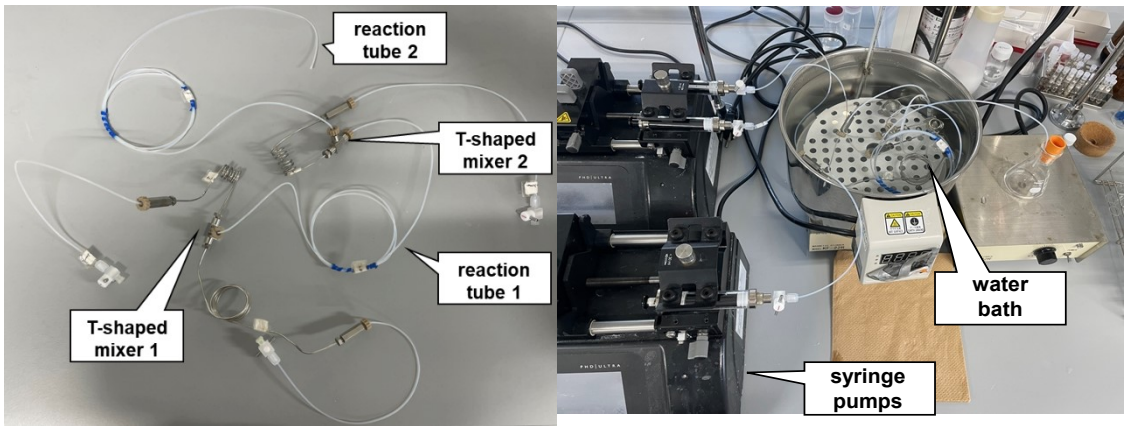
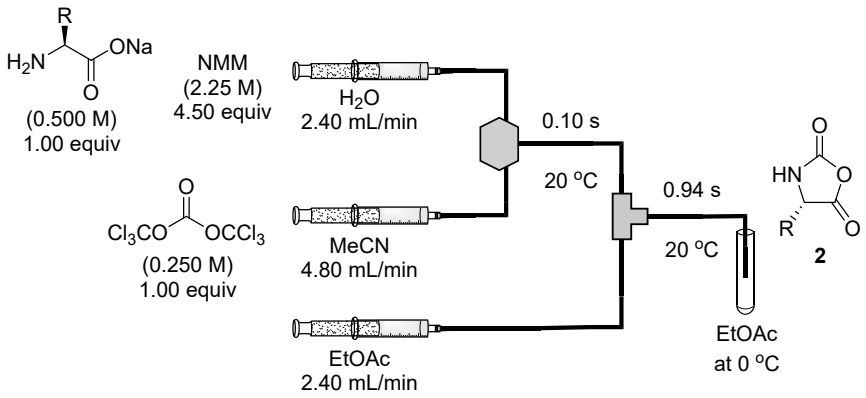


Figure S-3. Micro-flow reactor set-up for examination of time-dependent decrease of α-NCAs or benzyl chloroformate in the presence of amine and synthesis of dipeptides.

General procedure for synthesis of 2

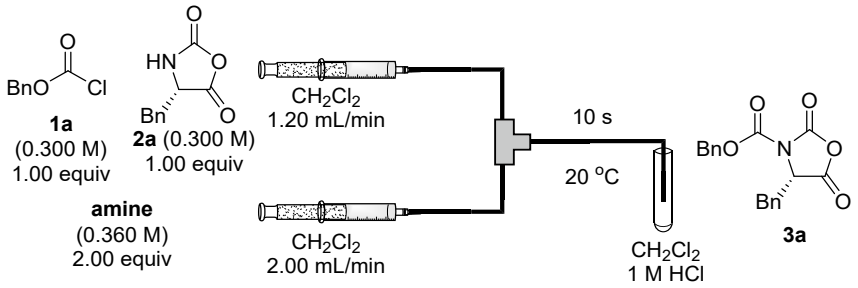


The employed micro-flow system was shown in **Figure S-1**.[S1]

A solution of α-amino acid sodium salt (0.500 M, 1.00 equiv), *N*-methylmorpholine (2.25 M, 4.50 equiv) in H_2O (flow rate: 2.40 mL/min) and a solution of triphosgene (0.250 M, 1.00 equiv) in MeCN (flow rate: 4.80 mL/min) were introduced to the V-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 1 (inner diameter: 0.250 mm, length: 244 mm, volume: 12.0 μL, reaction time: 0.100 s) at the same temperature. Then, the resultant mixture and EtOAc (flow rate: 2.40 mL/min) were introduced to the T-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 2 (inner diameter: 0.800 mm, length: 298 mm, volume: 150 μL, reaction time: 0.940 s) at the same temperature. After being eluted for *ca.* 20 s to reach a steady state, the resultant mixture was poured into EtOAc (appropriate amount) for appropriate time (amount for UNCA synthesis) at 0 °C. The aqueous layer was extracted with EtOAc. The organic layer was washed with brine, dried over $MgSO_4$, filtered and concentrated *in vacuo* at room temperature. The following appropriate purification afforded α-NCA **2**.

Examination of amines for micro-flow synthesis of 3a (for Table 1)

Table S-1. Examination of individual amine for synthesis of UNCA 3a



entry	**amine** (p*K*aH[a])	yield (%)	
		3a	**2a**
1	pyridine (5.2)[S2]	33	67
2	NMI (7.0)[S3]	27	68
3	NMM (7.4)[S2]	56	20
4	*i*-Pr_2NEt (11.4)[S4]	0	0
5	Me_2NBn (8.9)[S3]	91	0
6	*N*-ethylmorpholine (7.7)[S3]	36	20
7	Et_2NBn (9.5)[S3]	5	0
8	DMAP (9.7)[S2]	33	67

[a]The p*K*a of conjugated acids in water.

The employed micro-flow system was shown in **Figure S-2**.

A solution of phenylalanine-NCA **2a** (0.300 M, 1.00 equiv) and benzyl chloroformate **1a** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of **amine** (0.360 M, 2.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube (inner diameter: 0.800 mm, length: 1062 mm, volume: 533 μL, reaction time: 10 s) at the same temperature. After being eluted for 40 s to reach a steady state, the resultant mixture was poured into CH_2Cl_2 (5.0 mL) and 1 M HCl (1.0 mL) for 10-25 s at room temperature. The reaction mixture was washed with 1 M HCl twice and brine, dried over Na_2SO_4, filtered and concentrated *in vacuo*. Yields were determined *via* ^{1}H NMR analysis using 1,1,2-trichloroethane as an internal standard.

Other amine in **Table S-1** did not improve the yield (Ref 25).

Table S-2. Other amines for synthesis of UNCA 3a

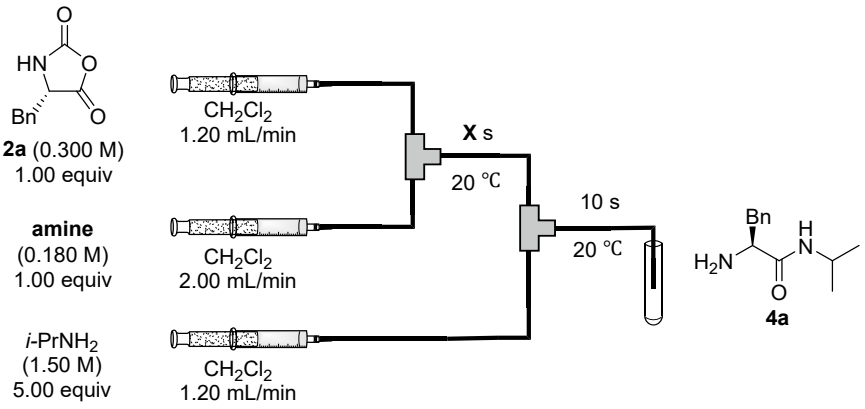
entry	**amine** (p*K*aH[a])	yield (%)	
		3a	**2a**

9	Me_2NBn[b]	66	22
10	*N*-methylpiperidine (10.1)[S3]	61	0
11	2,6-lutidine (7.4)[S2]	<1	91
12[c]	NMe_3 (9.7)[S3]	76	0
13	DABCO (8.8)[S4]	38	0
14	DBU (13.2)[S5]	0	0

[a]The p*K*a of conjugated acids in water. [b]The amount of Me_2NBn was reduced (1.0 equiv). [c]MeCN was used instead of CH_2Cl_2

Time-dependent decrease of 2a in the presence of amine (for Figure 1)

Table S-3. Examination of time-dependent decrease of phenylalanine-NCA (2a) in the presence of amine



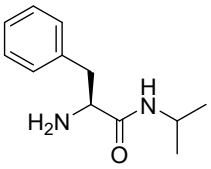
entry	amine	yield of **4a** (%)					
		X (s)	0.5	1.0	2.5	5.0	10
1	pyridine		>99	>99	>99	>99	>99
2	NMI		>99	>99	>99	>99	>99
3	NMM		>99	>99	>99	>99	97
4	Me_2NBn		>99	>99	>99	99	98
5	DMAP		97	93	90	82	69
6	*i*-Pr_2NEt		91	68	36	14	5

The employed micro-flow system was shown in **Figure S-3**.

A solution of **2a** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) and a solution of **amine** (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer 1 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 1 (reaction time: **X** s) at the same temperature. The resultant mixture and a solution of isopropylamine (1.50 M, 5.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) were injected into the T-shaped mixer 2 at 20 °C with

the syringe pumps. The resultant mixture was passed through the reaction tube 2 (inner diameter: 0.800 mm, length: 1458 mm, volume: 733 μL, reaction time: 10 s) at the same temperature. After being eluted for 40-60 s to reach a steady state, the resultant mixture was poured into a test tube for 10-25 s at room temperature. The reaction mixture concentrated *in vacuo.* Yields were determined *via* ^{1}H NMR analysis using 1,1,2-trichloroethane as an internal standard.

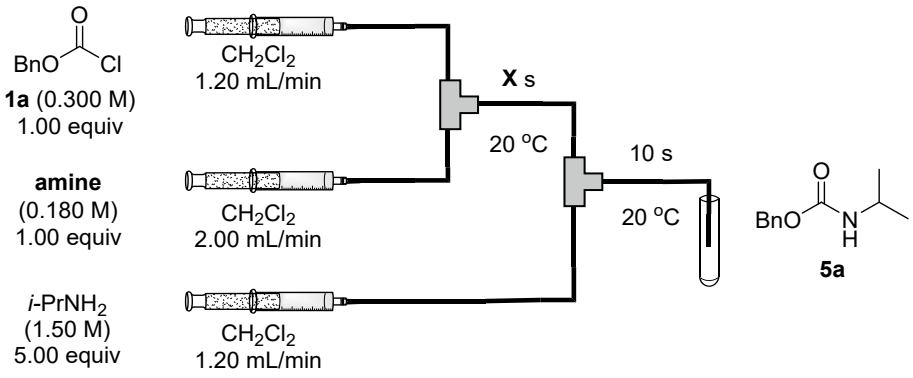
(*S*)-2-Amino-*N*-isopropyl-3-phenylpropanamide (4a)



Colorless oil, IR (neat): 3297, 2968, 1649, 1519, 1455, 1171, 742, 700 cm^{-1} ; $[\alpha]^{31}_{D}$ = -67.98 (c 0.095, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.34-7.21 (m, 5H), 6.98 (brs, 1H), 4.09-4.04 (m, 1H), 3.56 (dd, *J* = 4.0, 9.2 Hz, 1H), 3.25 (dd, *J* = 4.0, 13.6 Hz, 1H), 2.70 (dd, *J* = 9.2, 13.6 Hz, 1H), 1.40 (brs, 2H), 1.13 (d, *J* = 6.8 Hz, 6H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.3, 138.2, 129.5, 128.7, 126.8, 56.7, 41.3, 41.0, 22.93, 22.85 ppm; HRMS (ESI): calcd for $[C_{12}H_{18}N_2O+Na]^{+}$ 229.1311, found 229.1311.

Spectral data of ^{1}H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S1]

Time-dependent decrease of 1a in the presence of amine (for Figure 2)



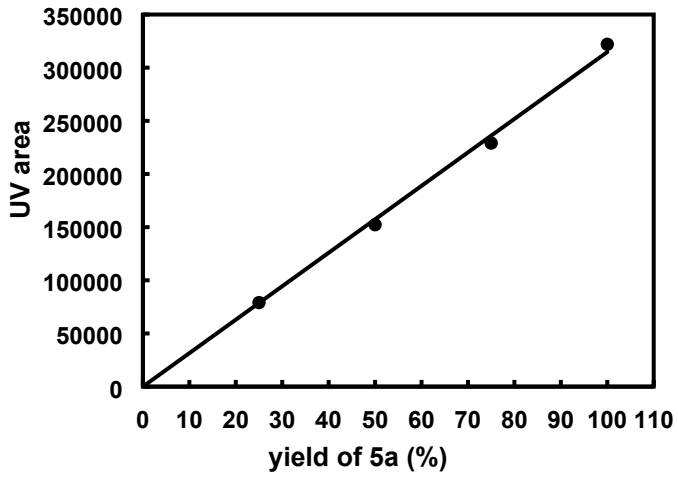


Figure S-4. Calibration curve of 5a

Table S-4. Examination of time-dependent decrease of benzyl chloroformate (1a) in the presence of amine

entry	**amine**	yield of **5a** (%)					
		X (s)	0.5	1.0	2.5	5.0	10
1	pyridine		>99	88	83	67	47
2	NMI		>99	>99	>99	>99	>99
3	NMM		97	79	69	54	42
4	Me_2NBn		87	62	46	23	15
5	DMAP		>99	>99	>99	99	97
6	*i*-Pr_2NEt		>99	>99	99	>99	99

The employed micro-flow system was shown in **Figure S-3**.

A solution of benzyl chloroformate (**1a**) (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) and a solution of **amine** (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer 1 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 1 (reaction time: **X** s) at the same temperature. The resultant mixture and a solution of isopropylamine (1.50 M, 5.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) were injected into the T-shaped mixer 2 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 2 (inner diameter: 0.800 mm, length: 1458 mm, volume: 733 μL, reaction time: 10 s) at the same temperature. After being eluted for 40-60 s to reach a steady state, the resultant mixture was poured into a test tube for 10-25 s at room temperature. Yields were determined *via* HPLC-UV analysis (condition; COSMOSIL 5C_{18}-AR-II 4.6 × 150 mm, Gradient: MeCN+0.1% formic acid/H_2O+0.1% formic acid, 0-3 min: 10%, 3-5 min: 10 to 50%, 5-15 min: 50 to 100%, 15-20 min: 100%, 20-20.01

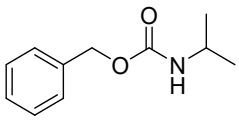
min: 100 to 10 %, 20.01-25 min: 10%, flow rate: 1 mL/min, temperature: 40 °C, detection wavelengths: 254 nm, retention time: 10.5 min (**5a**)). Calibration curve of **5a** was shown in **Figure S-4**.

Calculated reaction rate constants from the obtained data (**Table S-4** and **Figure 2**) are as follows

Table S-5. Calculated reaction rate constants

	pyridine	NMI	NMM	Me_2NBn	DMAP	*i*-Pr_2NEt
reaction rate constant (L/mol s)	1.4×10^3	0	2.1×10^3	5.2×10^3	3.4×10^1	2.7×10^2

Benzyl isopropyl carbamate (5a)

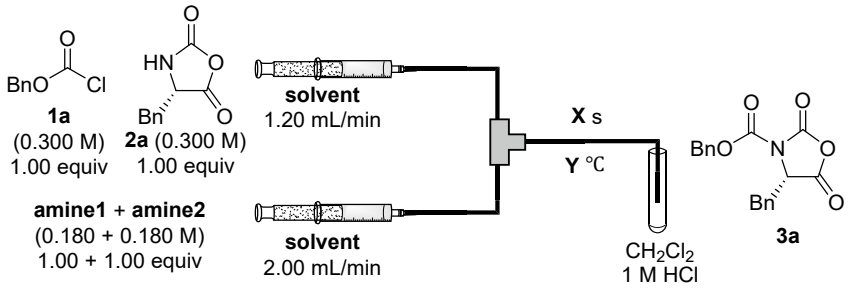


White solid; mp 51-53 °C, IR (neat): 3326, 2971, 1697, 1532, 1455, 1367, 1322, 1249, 1074, 737, 697 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$): δ 7.38-7.25 (m, 5H), 5.08 (s, 2H), 4.65 (brs, 1H), 3.86-3.81 (m, 1H), 1.12 (d, *J* = 8.0 Hz, 6H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 155.6, 136.8, 128.6, 128.1, 66.5, 43.2, 23.1 ppm; HRMS (ESI): calcd for $[C_{11}H_{15}NO_2+Na]^+$ 216.0995, found 216.0999.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S7]

Optimization of reaction conditions for synthesis of 3a (for Table 2)

Table S-6. Examination of combined used of amines for synthesis of UNCA 3a



entry	**amine1**	**amine2**	**X** (s)	**Y** (°C)	**solvent**	yield (%)	
						3a	**2a**
1	*i*-Pr_2NEt	pyridine	10	20	CH_2Cl_2	92	0
2	*i*-Pr_2NEt	Me_2NBn	10	20	CH_2Cl_2	84	0
3	Me_2NBn	pyridine	10	20	CH_2Cl_2	94-96[a]	2-3

						(74)[b]	
4	Et_2NBn	pyridine	10	20	CH_2Cl_2	98	0
5	Me_2NBn	pyridine	10	0	CH_2Cl_2	84	5
6	Me_2NBn	pyridine	10	40	CH_2Cl_2	94	<1
7	Me_2NBn	pyridine	5	20	CH_2Cl_2	94	<1
8	Me_2NBn	pyridine	2.5	20	CH_2Cl_2	85	11
9	Me_2NBn	pyridine	10	20	MeCN	80	<1
10[c]	Me_2NBn	pyridine	10	20	CH_2Cl_2	93	3
11	Me_2NBn	pyridine	10	20	CH_2Cl_2	66[b]	/
12[d]	Me_2NBn	pyridine	10	20	CH_2Cl_2	71-81[a]	<1

[a]Three independent experiments were carried out. [b]Isolated yield. [c]Flow rate is 4.00 mL/min and 2.40 mL/min. [d]Mixing was performed using a magnetic stirrer (1,000 rpm).

The employed micro-flow system was shown in **Figure S-2**.

A solution of α-NCA **2a** (0.300 M, 1.00 equiv) and benzyl chloroformate **1a** (0.300M, 1.00 equiv) in **solvent** (flow rate: 1.20 mL/min), a solution of **amine1** (0.180 M, 1.00 equiv) and **amine2** (0.180 M, 1.00 equiv) in **solvent** (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube (inner diameter: 0.800 mm, length: 1062 mm, volume: 533 μL, reaction time: 10 s) at the same temperature. After being eluted for 40 s to reach a steady state, the resultant mixture was poured into CH_2Cl_2 (5.0 mL) and 1 M HCl (1.0 mL) for 10-25 s at room temperature. The reaction mixture was washed with 1 M HCl twice and brine, dried over Na_2SO_4, filtered and concentrated *in vacuo*. Yields were determined *via* ^{1}H NMR analysis using 1,1,2-trichloroethane as an internal standard.

Other combinations of amine in **Table S-6** did not improve the yield (Ref 25).

Table S-7. Other combinations of amine for synthesis of UNCA 3a

entry	amine	yield (%)	
		3a	**2a**
13	*i*-Pr_2NEt + NMI	42	0
14	*i*-Pr_2NEt + NMM	50	0
15	Me_2NBn + NMI	42	0
16	Me_2NBn + NMM	78	0

Time-dependent decrease of NCAs 2 in the presence of amine

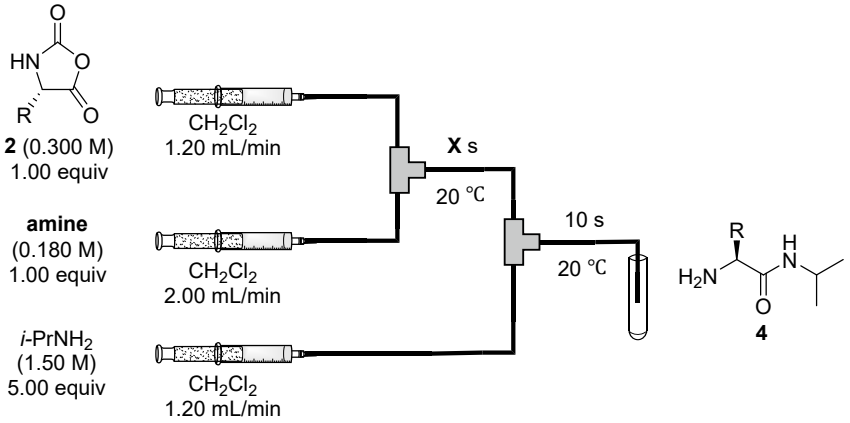


Table S-8. Time dependent decrease of NCAs 2c, 2a, or 2l in the presence of *N*-ethylmorpholine

entry	NCA	yield of **4** (%)					
		X (s)	0.5	1.0	2.5	5.0	10
1	alanine-NCA (**2c**)		>99	97	93	91	82
2	phenylalanine-NCA (**2a**)		>99	>99	>99	>99	98
3	isoleucine-NCA (**2l**)		>99	>99	>99	>99	>99

Table S-9. Time dependent decrease of NCAs 2c, 2a, or 2l in the presence of Me_2NBn

entry	NCA	yield (%)					
		X (s)	0.5	1.0	2.5	5.0	10
1	alanine-NCA (**2c**)		96	94	90	82	75
2	phenylalanine-NCA (**2a**)		>99	>99	>99	99	98
3	isoleucine-NCA (**2l**)		>99	>99	>99	>99	>99

Table S-10. Time dependent decrease of NCAs 2c, 2a, or 2l in the presence of *i*-Pr_2NEt

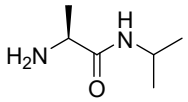
entry	NCA	yield (%)					
		X (s)	0.5	1.0	2.5	5.0	10
1	alanine-NCA (**2c**)		75	62	31	13	3
2	phenylalanine-NCA (**2a**)		91	69	36	14	5
3	isoleucine-NCA (**2l**)		>99	>99	>99	98	86

The employed micro-flow system was shown in **Figure S-3**.

A solution of α-NCA **2** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) and a solution of amine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer 1 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube

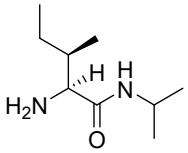
1 (reaction time: **X** s) at the same temperature. The resultant mixture and a solution of isopropylamine (1.50 M, 5.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) were injected into the T-shaped mixer 2 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 2 (inner diameter: 0.800 mm, length: 1458 mm, volume: 733 μL, reaction time: 10 s) at the same temperature. After being eluted for 40-60 s to reach a steady state, the resultant mixture was poured into a test tube for 10-25 s at room temperature. The reaction mixture concentrated *in vacuo.* Yields were determined *via* ^{1}H NMR analysis using 1,1,2-trichloroethane as an internal standard.

(*S*)-2-Amino-*N*-isopropylpropanamide (4b)



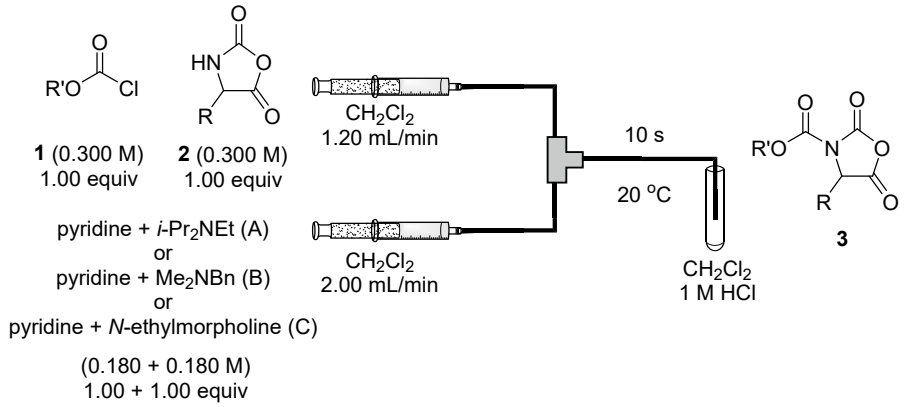
Colorless oil, IR (neat): 3288, 2970, 1647, 1540, 668 cm^{-1} ; $[\alpha]^{31}_D$ = -8.33(c 0.055, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.05 (brs, 1H), 4.09-4.00 (m, 1H), 3.45 (q, *J* = 6.8 Hz, 1H), 1.53 (brs, 2H), 1.32 (d, *J* = 6.8 Hz, 3H), 1.16 (d, *J* = 2.4 Hz, 3H), 1.15 (d, *J* = 2.4 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 174.7, 50.9, 40.8, 22.9, 22.0 ppm; HRMS (ESI): calcd for $[C_6H_{14}N_2O+Na]^+$ 153.0998, found 153.1001.

(2*S*,3*R*)-2-Amino-*N*-isopropyl-3-methylpentanamide (4c)

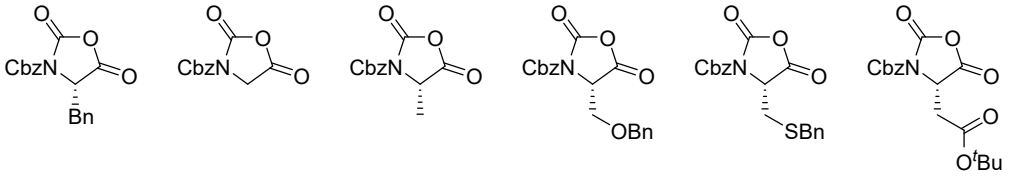


White solid; mp 51-52 °C, IR (neat): 3297, 2965, 1645, 1541, 1457, 668 cm^{-1} ; $[\alpha]^{31}_D$ = -62.0 (c 0.050, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.07 (brs, 1H), 4.10-4.03 (m, 1H), 3.22 (d, *J* = 4.0 Hz, 1H), 2.01-1.97 (m, 1H), 1.43-1.30 (m, 3H), 1.17-1.08 (m, 7H), 0.96 (d, *J* = 6.8 Hz, 3H), 0.91 (t, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.4, 60.0, 40.8, 38.1, 23.7, 23.1, 22.9, 16.3, 12.1 ppm; HRMS (ESI): calcd for $[C_9H_{20}N_2O+Na]^+$ 195.1468, found 195.1466.

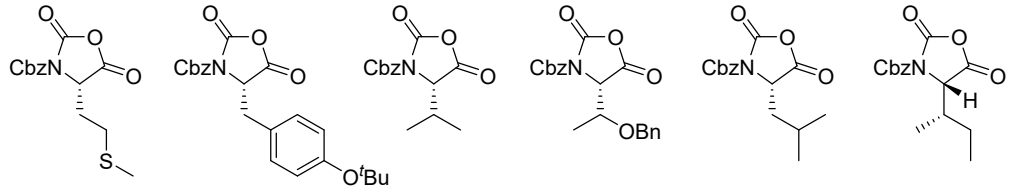
General procedure for examination of substrate scope



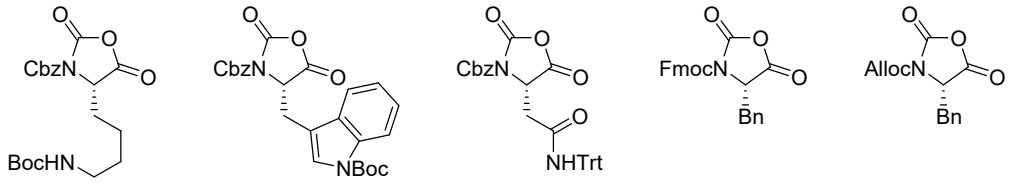
NMR yield (Isolated yield)



3a 96% (74%) | **3b** >99% (93%) | **3c** 83% (73%) | **3d** 96% (74%) | **3e** 71% (68%) | **3f** 98% (77%)



3g 88% (82%) | **3h** 94% (84%) | **3i** 94% (82%) | **3j** 97% (92%) | **3k** 86% (74%) | **3l** 95% (78%)



3m 85% (75%) | **3n** 64% (44%) | **3o** <21% | **3p** 85% (78%) | **3k** 96% (80%)

Substrate scope was examined using **method A** or **method B** or **method C**. The employed micro-flow system was shown in **Figure S-2**.

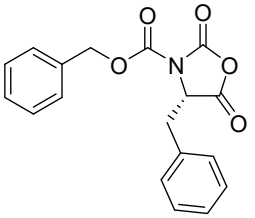
method A: A solution of α-NCA **2** (0.300 M, 1.00 equiv) and alkyl chloroformate **1** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of *i*-Pr_2NEt (0.180 M, 1.00 equiv) and pyridine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube

(inner diameter: 0.800 mm, length: 1062 mm, volume: 533 μL, reaction time: 10 s) at the same temperature. After being eluted for 40 s to reach a steady state, the resultant mixture was poured into CH_2Cl_2 (5.0 mL) and 1 M HCl (1.0 mL) for 10-25 s at room temperature. The reaction mixture was washed with 1 M HCl twice, saturated salt water, dried over Na_2SO_4, filtered and concentrated *in vacuo*. Appropriate purification operation afforded UNCA **3**

method B: A solution of α-NCA **2** (0.300 M, 1.00 equiv) and alkyl chloroformate **1** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of Me_2NBn (0.180 M, 1.00 equiv) and pyridine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The following procedures were same as used in the method A

method C: A solution of α-NCA **2** (0.300 M, 1.00 equiv) and alkyl chloroformate **1** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of *N*-ethylmorpholine (0.180 M, 1.00 equiv) and pyridine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The following procedures were same as used in the method A

Cbz-L-phenylalanine-NCA (3a)



Reaction conditions: method B

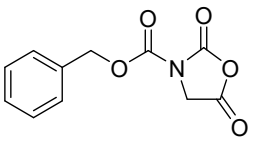
Purification method: Recrystallization from *t*-butylmethylether (TBME)/hexane

35.9 mg, 0.11 mmol, 74%

White solid; mp 107-109 °C, IR (neat): 1867, 1809, 1794, 1755, 1390, 1282, 1142, 960, 703 cm^{-1}; $[\alpha]^{31}_D$ = +150.2 (c 0.93, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.46-7.41 (m, 5H), 7.28-7.19 (m, 3H), 6.91-6.88 (m, 2H), 5.41 (s, 2H), 4.94 (dd, *J* = 2.8, 5.6 Hz, 1H), 3.47 (dd, *J* = 5.6, 14.0 Hz, 1H), 3.28 (dd, *J* = 2.8, 14.0 Hz, 1H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.5, 149.3, 145.7, 134.2, 132.1, 129.5, 129.3, 129.0, 128.9, 128.4, 69.9, 61.0, 35.2 ppm; HRMS (ESI): calcd for $[C_{18}H_{15}NO_5+Na]^+$ 348.0842, found 348,0841.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S8]

Cbz-glycine-NCA (3b)



*NCA was dissolved in THF instead of CH_2Cl_2

Reaction conditions: method C

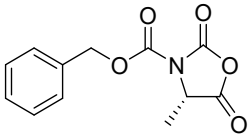
Purification method: Recrystallization from $CHCl_3$/hexane

33.0 mg, 0.14 mmol, 93%

Yellow solid; mp 132-134 °C, IR (neat): 1872, 1825, 1725, 1395, 1362. 1324, 1263, 1211, 1013, 740, 693 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$): δ 7.43-7.38 (m, 5H), 5.35 (s, 2H), 4.52 (s, 2H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 162.1, 149.0, 146.1, 134.1, 129.3, 129.0, 128.8, 70.1, 48.4 ppm; HRMS (ESI): calcd for $[C_{11}H_9NO_5+Na]^+$ 258.0373, found 258.0369.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S10]

Cbz-L-alanine-NCA (3c)



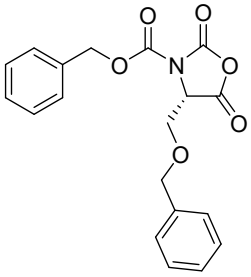
Reaction conditions: method B

Purification method: Recrystallization from Et_2O/hexane

27.4 mg, 0.11 mmol, 73%

White solid; mp 113-115 °C, IR (neat): 1869, 1810, 1739, 1353, 1310, 1262, 1067, 970, 770, 750 cm^{-1}; $[\alpha]^{31}_D$ = +42,4 (c 0.12, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.44-7.38 (m, 5H), 5.38 (d, *J* = 12.0 Hz, 1H), 5.33 (d, J = 12.0 Hz, 1H), 4.71 (q, *J* = 6.8 Hz, 1H), 1.68 (d, *J* = 6.8 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.4, 149.2, 146.0, 134.1, 129.2, 129.0, 128.6, 69.9, 56.1, 16.9 ppm; HRMS (ESI): calcd for $[C_{12}H_{11}NO_5+Na]^+$ 272.0532, found 272.0532.

Cbz-*O*-benzyl-L-serine-NCA (3d)



Reaction conditions: method B

Purification method: Recrystallization from $CHCl_3$/hexane

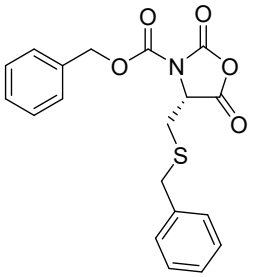
39.3 mg, 0.11mmol, 74%

White solid; mp 81-84 °C, IR (neat): 1875, 1815, 1741, 1387, 1360, 1307, 1273, 987, 745, 698 cm^{-1}; $[\alpha]^{31}_D$ = +56.1(c 0.41, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.37-7.26 (m, 8H), 7.21-7.19 (m, 2H),

5.27 (s, 2H), 4.69 (dd, *J* = 2.0, 2.8 Hz, 1H), 4.51 (d, *J* = 11.6 Hz, 1H), 4.44 (d, *J* = 11.6 Hz, 1H), 4.01 (dd, *J* = 2.8, 10.0 Hz, 1H), 3.87 (dd, *J* = 2.0, 10.0 Hz, 1H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 164.7, 149.0, 146.3, 136.6, 134.1, 129.1, 128.9, 128.7, 128.5, 128.3, 127.8, 73.5, 69.7, 65.4, 61.0 ppm; HRMS (ESI): calcd for $[C_{19}H_{17}NO_6+Na]^+$ 378.0952, found 378.0948.

Spectral data of ^{1}H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S11]

Cbz-*S*-benzyl-L-cysteine-NCA(3e)



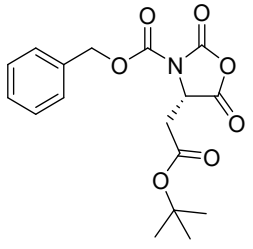
Reaction conditions: method B

Purification method: Recrystallization from $CHCl_3$/hexane

37.7 mg, 0.10mmol, 67%

White solid; mp 102-107 °C (decomp), IR (neat): 1869, 1808, 1732, 1357, 1265, 973, 764, 698 cm^{-1}; $[\alpha]^{31}_D$ = +49.0 (c 0.34, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.40-7.22 (m, 10H), 5.32 (s, 2H), 4.90 (dd, *J* = 2.4, 4.4 Hz, 1H), 3.66 (d, *J* = 13.2 Hz, 1H), 3.59 (d, *J* = 13.2 Hz, 1H), 3.25 (dd, *J* = 4.4, 15.2 Hz, 1H), 3.02 (dd, *J* = 2.4 15.2 Hz, 1H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.0, 149.1, 146.1, 136.9, 134.0, 129.2, 129.1, 129.0, 128.8, 128.6, 127.7, 70.0, 60.8, 37.4, 30.5 ppm; HRMS (ESI): calcd for $[C_{19}H_{17}NO_5S+Na]^+$ 394.0719, found 394.0718

Cbz-5-*t*-butyl-L-glutamte-NCA (3f)



Reaction conditions: method B

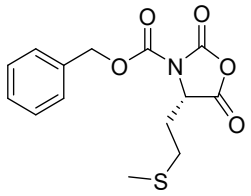
Purification method: Recrystallization from THF/hexane

40.1 mg, 0.11 mmol, 77%

White solid; mp 126-128 °C (decomp.), IR (neat): 1869, 1810, 1738, 1384, 1368, 1299, 1264, 1150, 1007, 977 cm^{-1}; $[\alpha]^{31}_D$ = +53.1(c 0.26, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.42-7.37 (m, 5H),

5.38 (d, *J* = 12.4 Hz, 1H), 5.33 (dd, *J* = 12.4 Hz, 1H), 4.70 (dd, *J* = 2.8, 4.4 Hz, 1H), 3.26 (dd, *J* = 4.4, 18.0 Hz, 1H), 3.04 (dd, *J* = 2.8, 18.0 Hz, 1H), 1.36 (s, 9H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 167.3, 165.6, 149.4, 146.4, 134.2, 129.1, 129.0, 128.5, 83.9, 69.9, 56.6, 35.2, 28.0 ppm; HRMS (ESI): calcd for $[C_{17}H_{19}NO_7+Na]^+$ 372.1052, found 372.1058.

Cbz-L-methionine-NCA (3g)



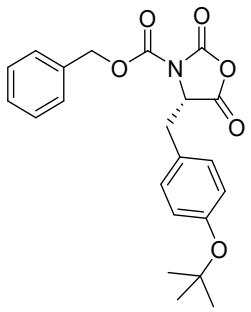
Reaction conditions: method B

Purification method: Recrystallization from $CHCl_3$/hexane

32.2 mg, 0.12 mmol, 82%

White solid; mp 91-93 °C, IR (neat): 1869, 1809, 1740, 1717, 1387, 1301, 1259, 1142, 997, 754 cm^{-1}; $[\alpha]^{31}_D$ = +99.3 (c 0.26, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.44-7.38 (m, 5H), 5.39 (d, *J* = 12.0 Hz, 1H), 5.32 (d, *J* = 12.0 Hz, 1H), 4.81 (dd, *J* = 3.6, 6.0 Hz, 1H), 2.62-2.59 (m, 1H), 2.48-2.39 (m, 3H), 2.00 (s, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.1, 149.3, 146.3, 134.1, 129.2, 129.0, 128.6, 70.0, 58.4, 28.4, 28.0, 15.1 ppm; HRMS (ESI): calcd for $[C_{14}H_{15}NO_5S+Na]^+$ 332.0562, found 332.0570.

Cbz-*O*-*t*-butyl-L-tyrosine-NCA (3h)



Reaction conditions: method A

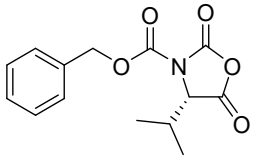
Purification method: Recrystallization from Et_2O/hexane

50.0 mg, 0.13 mmol, 84%

White solid; mp 85-87 °C, IR (neat): 1872, 1809, 1743, 1385, 1361, 1303, 1262, 1005, 745, 698 cm^{-1}; $[\alpha]^{31}_D$ = +110.3 (c 0.33, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.48-7.41 (m, 5H), 6.84-6.77 (m, 4H), 5.40 (s, 2H), 4.90 (dd, *J* = 2.8, 5.2 Hz, 1H), 3.43 (dd, *J* = 5.2, 14.0 Hz, 1H), 3.23 (dd, *J* = 2.8, 14.0 Hz, 1H), 1.30 (s, 9H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.6, 155.6, 149.3, 145.6, 134.2,

130.1, 129.2, 129.0, 128.9, 126.7, 124.7, 78.9, 69.9, 61.2, 34.6, 28.9 ppm; HRMS (ESI): calcd for $[C_{22}H_{23}NO_6+Na]^+$ 420.1422, found 420.1424.

Cbz-L-varine-NCA (3i)



Reaction conditions: method A

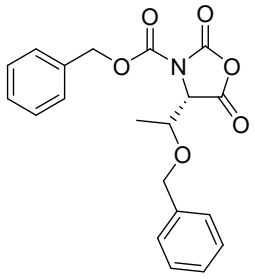
Purification method: Recrystallization from TBME/hexane

34.1 mg, 0.12 mmol, 82%

White solid; mp 78-79 °C, IR (neat): 1870, 1807, 1741, 1387, 1367, 1315, 1239, 1216, 1000, 776, 759 cm^{-1}; $[\alpha]^{31}_D$ = +45.6 (c 0.24, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.44-7.38 (m, 5H), 5.38 (d, *J* = 12.4 Hz, 1H), 5.33 (d, *J* = 12.4 Hz, 1H), 4.60 (d, *J* = 3.6 Hz, 1H), 2.60-2.52 (m, 1H), 1.19 (d, *J* = 7.2 Hz, 3H), 0.94 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 164.4, 149.4, 146.5, 134.2, 129.1, 129.0, 128.4, 69.9, 64.9, 29.9, 17.9, 15.7 ppm; HRMS (ESI): calcd for $[C_{14}H_{15}NO_5+Na]^+$ 300.0842, found 300.0842.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S11]

Cbz-*O*-benzyl-L-threonine-NCA (3j)



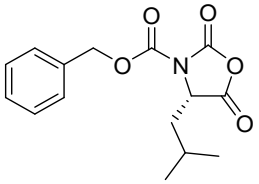
Reaction conditions: method A

Purification method: Wash by hexane

51.1 mg, 0.14 mmol, 92%

Colorless oil, IR (neat): 1873, 1809, 1744, 1456, 1386, 1360, 1258, 1145, 1067, 744, 698 cm^{-1}; $[\alpha]^{31}_D$ = +67.0 (c 0.29, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.40-7.23 (m, 10H), 5.31 (s, 2H), 4.78 (dd, *J* = 0.8, 2.8 Hz, 1H), 4.58 (d, *J* = 12.0 Hz, 1H), 4.45 (d, *J* = 12.0 Hz, 1H), 4.11 (dq, *J* = 2.8, 6.8 Hz, 1H), 1.24 (d, 6.8 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 164.6, 149.8, 146.6, 138.9, 134.1, 129.1, 128.9, 128.6, 128.5, 128.2, 127.8, 73.8, 71.5, 70.0, 64.0, 16.3 ppm; HRMS (ESI): calcd for $[C_{20}H_{19}NO_6+Na]^+$ 392.1104, found 392.1105.

Cbz-L-leucine-NCA (3k)



Reaction conditions: method A

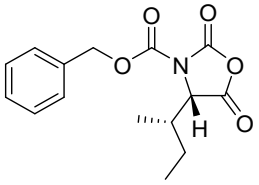
Purification method: Recrystallization from TBME/hexane

32.1 mg, 0.11 mmol, 74%

White solid; mp 74-76 °C, IR (neat): 1871, 1807, 1732, 1393, 1369, 1296, 1217, 1149, 996, 775,761 cm^{-1}; $[\alpha]^{31}_{D}$ = +75.4 (c 0.27, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.44-7.37 (m, 5H), 5.40 (d, *J* = 12.0 Hz, 1H), 5.30 (d, *J* = 12.0 Hz, 1H), 4.69 (dd, *J* = 3.6, 8.4 Hz, 1H), 1.95-1.85 (m, 3H), 0.93 (d, *J* = 6.4 Hz, 3H), 0.90 (d, *J* = 6.4 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.1, 149.2, 146.3, 134.1, 129.2, 129.0, 128.7, 69.9, 58.6, 39.2, 24.2, 23.3, 21.8 ppm; HRMS (ESI): calcd for $[C_{15}H_{17}NO_5+Na]^+$ 314.1002, found 314.1002.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S10]

Cbz-L-isoleucine-NCA (3l)



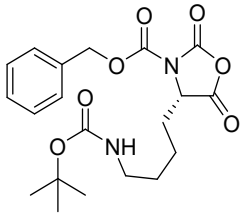
Reaction conditions: method A

Purification method: Recrystallization from TBME/hexane

34.2 mg, 0.11 mmol, 78%

White solid; mp 97-98 °C, IR (neat): 1871, 1808, 1734, 1392, 1369, 1298, 997, 759 cm^{-1}; $[\alpha]^{31}_{D}$ = +67.0 (c 0.29, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.43-7.38 (m, 5H), 5.38 (d, *J* = 12.4 Hz, 1H), 5.32 (dd, *J* = 12.4 Hz, 1H), 4.70 (d, *J* = 3.6 Hz, 1H), 2.30-2.24 (m, 1H), 1.71-1.48 (m, 2H), 0.97 (t, *J* = 7.2 Hz, 3H), 0.91(d, *J* = 7.2, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 164.5, 149.2, 146.5, 134.2, 129.1, 129.0, 128.5, 69.9, 63.6, 36.4, 25.1, 13.3 11.8 ppm; HRMS (ESI): calcd for $[C_{15}H_{17}NO_5+Na]^+$ 314.1002, found 314.1002.

Cbz-N_{ε}-(*t*-butoxycarbonyl)-L-lysine-NCA (3m)



*NCA dissolved in THF instead of CH_2Cl_2

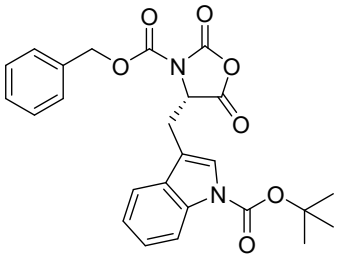
Reaction conditions: method A

Purification method: Recrystallization from $CHCl_3$/hexane

46.1 mg, 0.11 mmol, 75%

Yellow oil, IR (neat): 2934, 1869, 1809, 1741, 1698, 1456, 1364, 1252, 1001, 765, 691 cm^{-1}; $[\alpha]^{31}_D$ = +87.0 (c 0.02, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.44-7.27 (m, 5H), 5.40 (d, *J* = 12.4 Hz, 1H), 5.31 (d, *J* = 12.4 Hz, 1H), 4.71 (dd, *J* = 4.0, 6.8 Hz, 1H), 4.53 (brs, 1H), 3.07-3.04 (m, 2H), 2.11-2.05 (m, 2H), 1.49-1.28 (m, 13H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.9, 156.1, 149.1, 146.2, 134.1, 129.2, 129.0, 128.6, 79.4, 69.9, 59.9, 39.9, 29.6, 29.5, 28.5, 20.6 ppm; HRMS (ESI): calcd for $[C_{20}H_{26}N_2O_7+Na]^+$ 429.1632, found 429.1637.

Cbz-1-*t*-butoxycarbonyl-L-tryptophan-NCA (3n)



* Collection time is 20 s

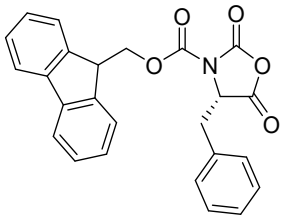
Reaction conditions: method A

Purification method: Recrystallization from Et_2O/hexane

24.5 mg, 0.070 mmol, 44%

Yellow solid; mp 63-69 °C, IR (neat): 1871, 1809, 1733, 1456, 1381, 1361, 1259, 1156, 1007, 747 cm^{-1}; $[\alpha]^{31}_D$ = +62.0 (c 0.085, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 8.09 (d, *J* = 8.0 Hz, 1H), 7.43-7.26 (m, 8H), 7.09 (t, *J* = 8.4 Hz, 1H), 5.41 (d, *J* = 12.0 Hz, 1H), 5.37 (d, *J* = 12.0 Hz, 1H), 4.99 (dd, *J* = 2.8, 6.0 Hz, 1H), 3.61 (dd, *J* = 6.0, 14.8 Hz, 1H), 3.46 (dd, *J* = 2.8, 14.8 Hz, 1H), 1.64 (s, 9H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.6, 149.6, 149.4, 145.7, 134.0, 129.9, 129.2, 129.0, 128.7, 128.3, 125.5, 125.0, 123.1, 118.4, 115.6, 111.4, 84.3, 70.1, 60.6, 28.3, 25.4 ppm; HRMS (ESI): calcd for $[C_{25}H_{24}N_2O_7+Na]^+$ 487.1476, found 487.1481.

Fmoc-L-phenylalanine-NCA (3p)



Reaction conditions: method B

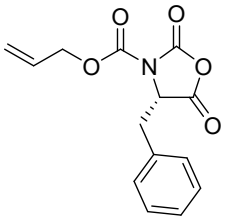
Purification method: Recrystallization from Et_2O/hexane

49.6 mg, 0.11 mmol, 76 %

White solid; mp 61-62 °C, IR (neat): 1870, 1807, 1735, 1361, 1265, 957, 741 cm^{-1}; $[\alpha]^{31}_D$ = +230.4 (c 0.02, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.77 (dd, *J* = 2.6, 8.0 Hz, 2H), 7.69 (d, *J* = 7.2, 1H), 7.64 (d, *J* = 7.2, 1H),7.46-7.21 (m, 7H), 6.85 (dd, *J* = 2.8, 4.4 Hz, 2H), 4.78 (dd, *J* = 6.2, 10.6 Hz, 1H), 4.74 (dd, *J* = 6.2, 10.6 Hz, 1H), 4.68 (dd, *J* = 3.2, 5.2 Hz, 1H), 4.34 (t, *J* = 6.2 Hz, 1H), 3.12-3.03 (m, 2H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.4, 149.2, 145.7, 142.93, 142.86, 141.6, 141.2, 132.0, 129.5, 129.3, 128.40, 128.35, 127.64, 127.58, 125.14 125.07, 120.4, 120.3, 69.8, 61.0, 46.6, 34.9 ppm; HRMS (ESI): calcd for $[C_{25}H_{19}NO_5+Na]^+$ 436.1155, found 436.1162.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S8]

Alloc-L-phenylalanine-NCA (3q)



Reaction conditions: method B

Purification method: Wash with hexane

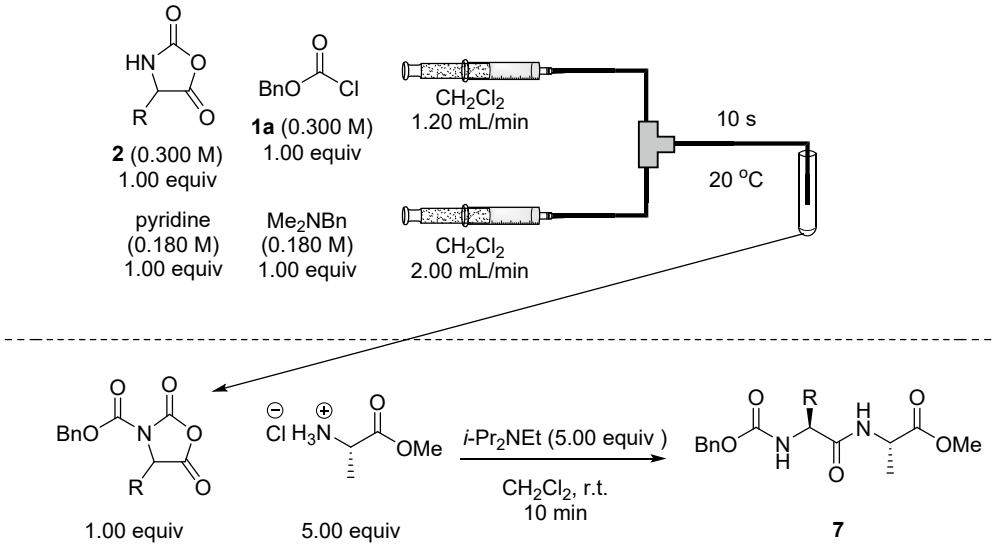
31.2 mg, 0.12 mmol, 80 %

Colorless oil, IR (neat): 1869, 1807, 1740, 1455, 1374, 1309, 1266, 1011, 957, 747, 702 cm^{-1}; $[\alpha]^{31}_D$ = +100.1 (c 0.16, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.33-7.30 (m, 3H), 7.07-7.05 (m, 2H), 6.00 (m, 1H), 5.49 (dd, *J* = 1.2, 17.2 Hz, 1H), 5.39 (dd, *J* = 1.2, 10.6 Hz, 1H), 4.97 (dd, *J* = 2.4, 5.6 Hz, 1H), 4.86 (dd, *J* = 1.2, 5.6 Hz, 2H), 3.54 (dd, *J* = 5.6, 14.4 Hz, 1H), 3.34 (dd, *J* = 2.4, 14.4 Hz, 1H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.5, 149.3, 145.7, 132.2, 130.4, 129.6, 129.3, 128.5, 120.6, 68.8, 61.1, 35.3 ppm; HRMS (ESI): calcd for $[C_{14}H_{13}NO_5+Na]^+$ 298.0686, found 298.0684.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous

literature.[S11]

Evaluation of racemization of UNCA 3 via HPLC analysis

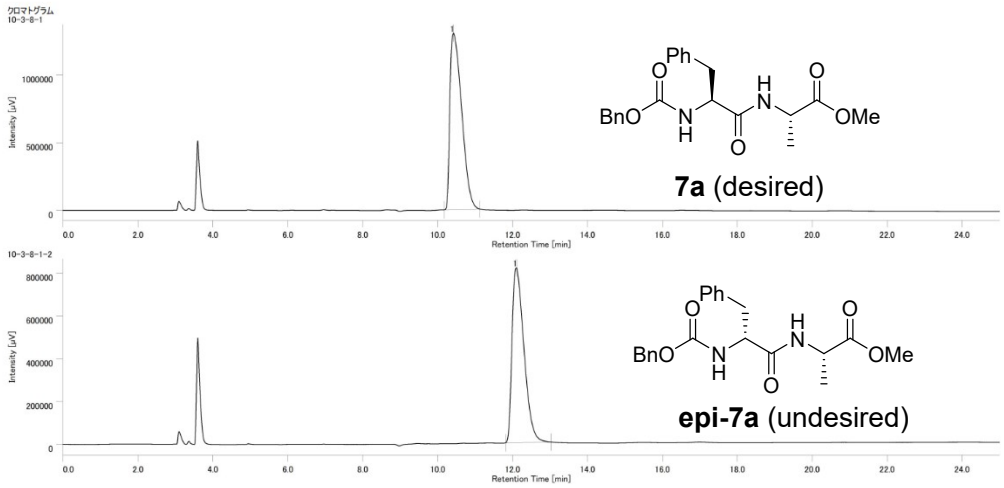


The employed micro-flow system was shown in **Figure S-2**.

A solution of **2** (0.300 M, 1.00 equiv) and benzyl chloroformate **1a** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of Me_2NBn (0.180 M, 1.00 equiv) and pyridine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube (inner diameter: 0.800 mm, length: 1062 mm, volume: 533 μL, reaction time: 10 s) at the same temperature. After being eluted for 40 s to reach a steady state, the resultant mixture was poured into L-alanine methyl ester hydrochloric acid (104.7 mg, 0.75 mmol, 5.0 equiv), *i*-Pr_2NEt (0.75 mmol, 5.0 equiv) and CH_2Cl_2 (5.00 ml), then the mixture was stirred for 10 min at room temperature. The reaction mixture was washed with 1 M HCl, brine, dried over Na_2SO_4, filtered and concentrated *in vacuo* to give a crude mixture. The crude product was purified by preparative TLC (condition: EtOAc/hexane = 1/1). The rate of racemization was determined by HPLC-UV analysis.

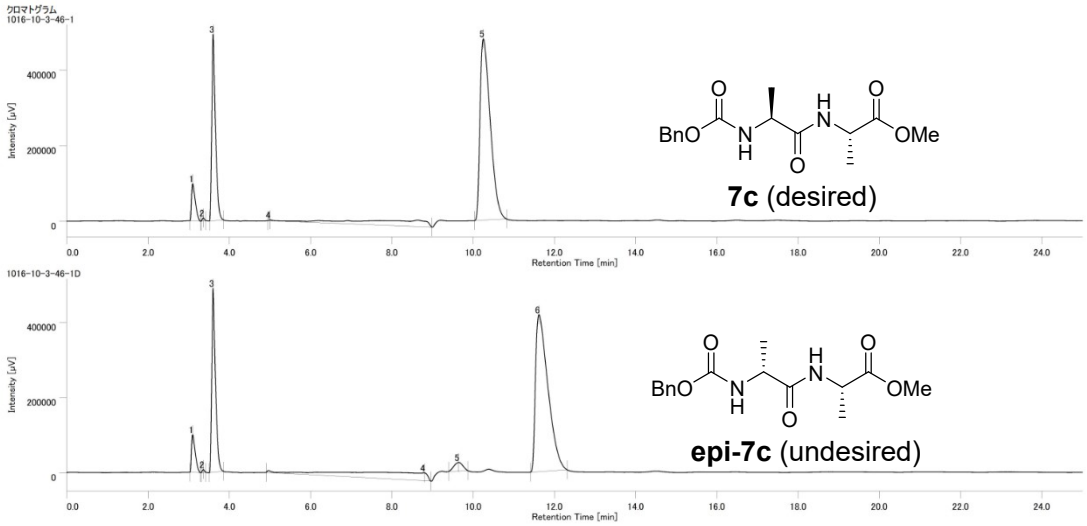
Cbz-L-Phe-L-Ala methyl ester (7a)

HPLC condition; DAICEL CHIRALPAK IB 4.6 × 250 mm, hexane/isopropylalcohol = 90 /10, flow rate: 1 mL/min, detection wavelengths: 254 nm, temperature: 40 °C, retention time: 10.4 min (Cbz-L-Phe-L-Ala methyl ester (**7a)**), 12.1 min (Cbz-D-Phe-L-Ala methyl ester (**epi-7a)**)



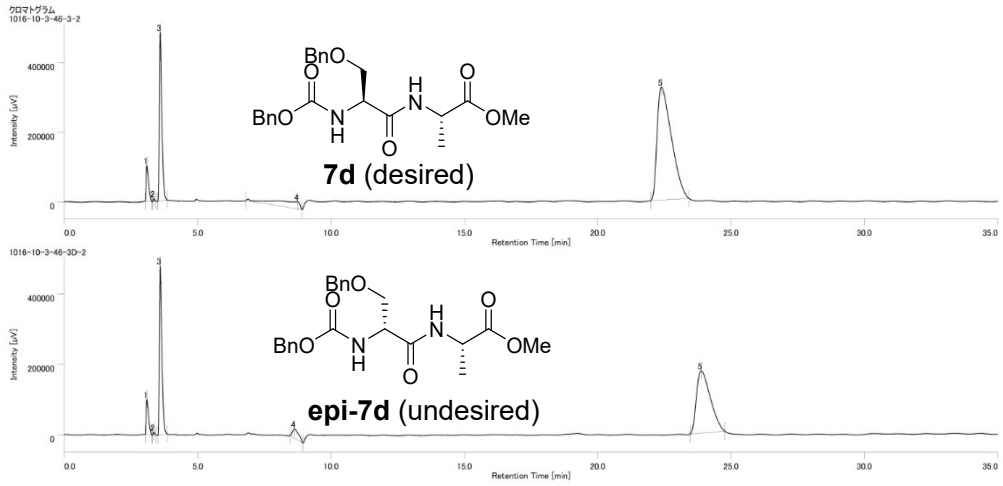
Cbz-L-Ala-L-Ala methyl ester (7c)

HPLC condition; DAICEL CHIRALPAK IB 4.6 mm × 25 cm, hexane/isopropylalcohol = 90 /10, flow rate: 1 mL/min, detection wavelengths: 254 nm, temperature: 40 °C, retention time: 10.3 min (Cbz-L-Ala-L-Ala methyl ester (**7c)**), 23.9 min (Cbz-D-Ala-L-Ala methyl ester (**epi-7c)**)



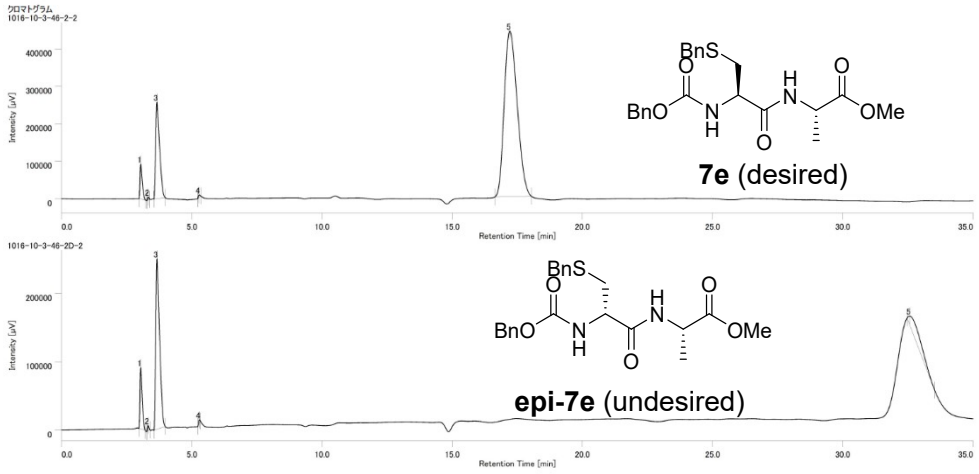
Cbz-L-Ser(Bn)-L-Ala methyl ester (7d)

HPLC condition; DAICEL CHIRALPAK IB 4.6 × 250 mm, hexane/isopropylalcohol = 90 /10, flow rate: 1 mL/min, detection wavelengths: 254 nm, temperature: 40 °C, retention time: 22.4 min (Cbz-L-Ser(Bn)-L-Ala methyl ester (**7d)**), 23.9 min (Cbz-D-Ser(Bn)-L-Ala methyl ester (**epi-7d**))



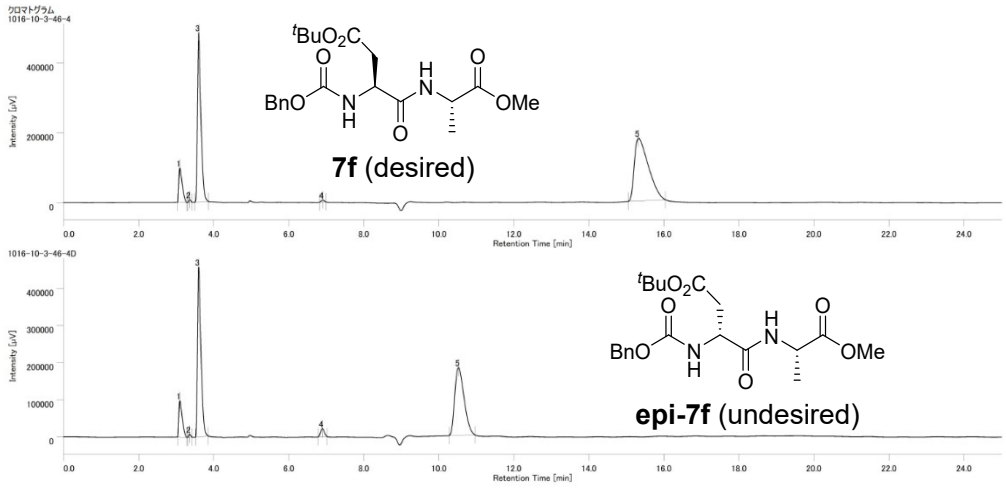
Cbz-L-Cys(Bn)-L-Ala methyl ester (7e)

HPLC condition; DAICEL CHIRALPAK IH 4.6 × 250 mm, hexane/isopropylalcohol = 90/10, flow rate: 1 mL/min, detection wavelengths: 254 nm, temperature: 40 °C, retention time: 17.2 min (Cbz-L-Cys(Bn)-L-Ala methyl ester (7**e**)), 32.6 min (Cbz-D-Cys(Bn)-L-Ala methyl ester (**epi-7e)**)

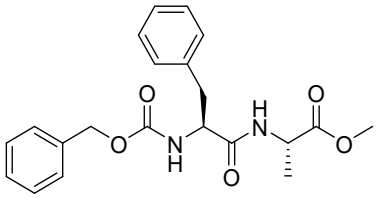


Cbz-L-Asp(O*t*-Bu)-L-Ala methyl ester (7f)

HPLC condition; DAICEL CHIRALPAK IB 4.6 × 250 mm, hexane/isopropylalcohol = 90/10, flow rate: 1 mL/min, detection wavelengths: 254 nm, temperature: 40 °C, retention time: 15.3 min (Cbz-L-Asp(O*t*-Bu)-L-Ala methyl ester (**7f)**), 10.5 min (Cbz-D- Asp(O*t*-Bu)-L-Ala methyl ester (**epi-7f)**)



Cbz-L-Phe-L-Ala methyl ester (7a)

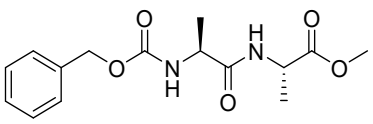


48.3 mg, 0.12 mmol, 84%

White solid; mp 128-129 °C, IR (neat): 3298, 1749, 1689, 1655, 1497, 1453, 1261, 1212, 1047, 743, 698 cm^{-1}; $[\alpha]^{31}_D$ = +2.04 (c 0.38, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.33-7.20 (m, 10H), 6.27 (d, *J* = 6.8 Hz, 1H), 5.47 (d, *J* = 6.8 Hz, 1H), 5.07 (s, 2H), 4.51-4.46 (m, 2H), 3.70 (s, 3H), 3.10-3.00 (m, 2H), 1.21 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 172.9, 170.5, 156.0, 136.34, 136.26, 129.5, 128.8, 128.6, 128.3, 128.1, 127.2, 67.2, 56.1, 52.6, 48.3, 38.6, 18.4 ppm; HRMS (ESI): calcd for $[C_{21}H_{24}N_2O_5+Na]^+$ 407.1582, found 407.1582.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S12]

Cbz-L-Ala-L-Ala methyl ester (7c)



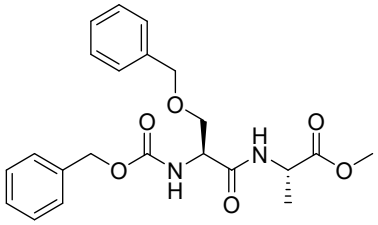
38.6 mg, 0.13 mmol, 84%

White solid; mp 105-106 °C, IR (neat): 3307, 1682, 1669, 1539, 1508, 1455, 1368, 1216, 1154, 1049,

741, 698 cm^{-1}; $[\alpha]^{31}_D$ = -11.1 (c 0.24, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.36-7.27 (m, 5H), 6.67 (brs, 1H), 5.46 (d, *J* = 6.8 Hz, 1H), 5.11 (s, 2H), 4.58-4.54 (m, 1H), 4.30-4.27 (m, 1H), 3.74 (s, 3H), 1.38 (d, *J* = 7.2 Hz, 6H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.3, 172.0, 156.0, 136.3, 128.6, 128.3, 128.2, 67.1, 52.6, 50.5, 48.2, 18.8, 18.3 ppm; HRMS (ESI): calcd for $[C_{15}H_{20}N_2O_5+Na]^+$ 331.1262, found 331.1262.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S13]

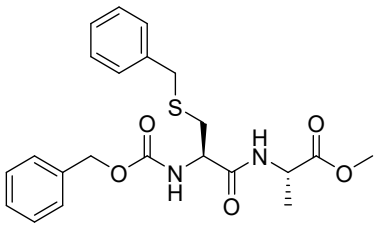
Cbz-L-Ser(Bn)-L-Ala methyl ester (7d)



52.0 mg, 0.13 mmol, 84%

White solid; mp 95-97 °C, IR (neat): 3299, 1741, 1716, 1698, 1682, 1653, 1507, 1455, 1214 cm^{-1}; $[\alpha]^{31}_D$ = +49.0 (c 0.34, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.35-7.26 (m, 10H), 6.90 (brs, 1H), 5.67 (brs, 1H), 5.12 (s, 2H), 4.59-4.54 (m, 3H), 3.93-3.90 (m, 1H), 3.72 (s, 3H), 3.58 (dd, *J* = 2.8, 9.2 Hz, 1H), 1.37 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.1, 169.7, 156.1, 137.4, 136.3, 128.7, 128.6, 128.3, 128.2, 128.1, 127.9, 73.7, 69.9, 67.3, 54.1, 52.5, 48.4, 18.4 ppm; HRMS (ESI): calcd for $[C_{22}H_{26}N_2O_6+Na]^+$ 437.1682, found 437.1690.

Cbz-L-Cys(Bn)-L-Ala methyl ester (7e)

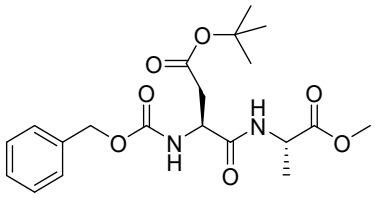


45.1 mg, 0.11 mmol, 70%

White solid; mp 124-126 °C, IR (neat): 3298, 1740, 1682, 1650, 1538, 1454, 1272, 1232, 702 cm^{-1}; $[\alpha]^{31}_D$ = +6.51 (c 0.53, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.36-7.26 (m, 10H), 6.79 (brs, 1H), 5.60 (brs, 1H), 5.13 (s, 2H), 4.58-4.52 (m, 1H), 4.28 (d, *J* = 3.2 Hz, 1H), 3.78-3.71 (m, 5H), 2.90 (dd, *J* = 5.6, 16.4 Hz, 1H), 2.74 (dd, *J* = 6.4, 16.4 Hz, 1H), 1.39 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 172.9, 169.9, 156.0, 138.0, 136.2, 129.1, 128.8, 128.7, 128.4, 128.2, 127.4, 67.3,

54.2, 52.7, 48.4, 36.7, 34.0, 18.4 ppm; HRMS (ESI): calcd for $[C_{22}H_{26}N_2O_5S+Na]^+$ 453.1452, found 453.1455.

Cbz-L-Asp (O*t*-Bu)-L-Ala methyl ester (7f)

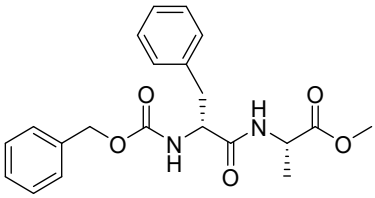


50.7 mg, 0.14 mmol, 97%

White solid; mp 82-84.5 °C, IR (neat): 3307, 1732, 1682, 1669, 1540, 1508, 1456, 1368, 1216, 1154 cm^{-1}; $[\alpha]^{31}_D$ = +19.6 (c 0.27, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.37- 7.31 (m, 5H), 7.05 (d, *J* = 6.0 Hz, 1H), 5.96 (d, *J* = 8.0 Hz, 1H), 5.14 (s, 2H), 4.57-4.51 (m, 2H), 3.73 (s, 3H), 2.92 (dd, *J* = 4.0, 16.8 Hz, 1H), 2.61 (dd, *J* = 6.8, 16.8 Hz, 1H), 1.44 (s, 9H), 1.36 (d, *J* = 8.0 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.0, 171.4, 170.3, 156.1, 136.2, 128.7, 128.4, 128.3, 82.1, 67.3, 52.6, 51.0, 48.4, 37.6, 28.1, 18.2 ppm; HRMS (ESI): calcd for $[C_{20}H_{28}N_2O_7+Na]^+$ 431.1792, found 431.1793.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S14]

Cbz-D-Phe-L-Ala methyl ester (epi-7a)

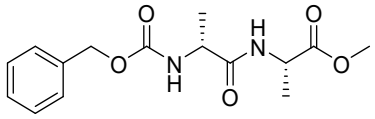


56.5 mg, 0.14 mmol, 98%

White solid; mp 128-130 °C, IR (neat): 3298, 1750, 1698, 1655, 1540, 1496, 1455, 1212, 1047, 698 cm^{-1}; $[\alpha]^{31}_D$ = -3.51 (c 0.26, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.33-7.20 (m, 10H), 6.27 (d, *J* = 6.8 Hz, 1H), 5.47 (brs,1H), 5.07 (s, 2H), 4.51-4.46 (m, 2H), 3.69 (s, 3H), 3.10-3.00 (m, 2H), 1.21 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.1, 170.3, 156.0, 136.5, 136.3, 129.4, 128.8, 128.6, 128.3, 128.1, 127.2, 67.2, 56.3, 52.6, 48.0, 39.0, 18.2 ppm; HRMS (ESI): calcd for $[C_{21}H_{24}N_2O_5+Na]^+$ 407.1582, found 407.1583.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S15]

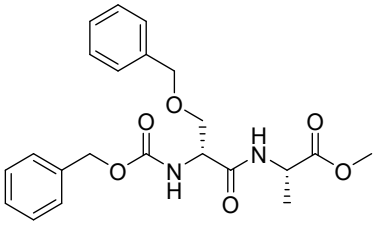
Cbz-D-Ala-L-Ala methyl ester (epi-7c)



38.2 mg, 0.12 mmol, 83%

White solid; mp 133-134 °C, IR (neat): 3307, 1748, 1661, 1539, 1498, 1455, 1213, 1052, 699 cm^{-1}; $[\alpha]^{31}_{D}$ = +14.4 (c 0.40, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.36-7.30 (m, 5H), 6.71 (brs, 1H), 5.40 (brs, 1H), 5.11 (s, 2H), 4.58-4.54 (m, 1H), 4.30 (brs, 1H), 3.73 (s, 3H), 1.38 (d, *J* = 7.2 Hz, 6H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.4, 172.0, 156.1, 136.3, 128.7, 128.3, 128.2, 67.2, 52.6, 50.6, 48.2, 18.7, 18.3 ppm; HRMS (ESI): calcd for $[C_{15}H_{20}N_2O_5+Na]^+$ 331.1262, found 331.1262.

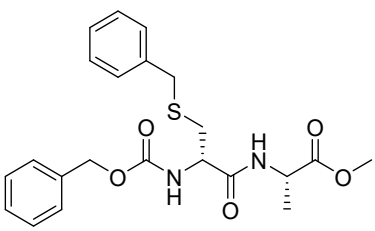
Cbz-D-Ser(Bn)-L-Ala methyl ester (epi-7d)



41.3 mg, 0.11 mmol, 67 %

White solid; mp 111-112 °C, IR (neat): 3311, 1732, 1717, 1670, 1557, 1455, 1153, 1054, 698 cm^{-1}; $[\alpha]^{31}_{D}$ = -14.8(c 0.29, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.35-7.26 (m, 10H), 6.90 (brs, 1H), 5.67 (brs, 1H), 5.12 (s, 2H), 4.59-4.49 (m, 3H), 4.38 (brs, 1H), 3.91 (d, *J* = 3.6 Hz, 1H), 3.74 (s, 3H), 3.58 (dd, *J* = 6.4, 9.2 Hz, 1H), 1.36 (d, *J* = 6.8 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.0, 169.5, 156.2, 137.4, 136.2, 128.7, 128.6, 128.4, 128.3, 128.1, 127.9, 73.6, 69.7, 67.3, 54.4, 52.6, 48.3, 18.4 ppm; HRMS (ESI): calcd for $[C_{22}H_{26}N_2O_6+Na]^+$ 437.1682, found 437.1687.

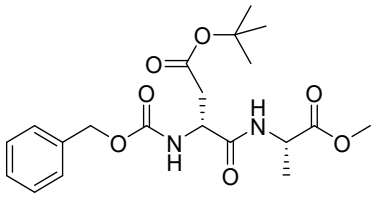
Cbz-D-Cys(Bn)-L-Ala methyl ester (epi-7e)



47.0 mg, 0.11 mmol, 73%

White solid; mp 125-126 °C, IR (neat): 3309, 1732, 1716, 1669, 1682, 1557, 1507, 1455, 1367, 1215, 1154, 698 cm^{-1}; $[\alpha]^{31}_D$ = -0.90 (c 0.29, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.37-7.26 (m, 10H), 6.69 (brs, 1H), 5.58 (brs, 1H), 5.12 (s, 2H), 4.57-4.53 (m, 1H), 4.30 (brs, 1H), 3.73 (s, 3H), 2.88 (dd, *J* = 5.6, 13.6 Hz, 1H), 2.75 (dd, *J* = 6.8, 13.6 Hz, 1H), 1.38 (d, *J* = 6.8 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.0, 169.8, 156.1, 138.0, 136.2, 129.1,128.8, 128.7, 128.4, 128.2, 127.4, 67.4, 54.1, 52.6, 48.3, 36.7, 33.9, 18.3 ppm; HRMS (ESI): calcd for $[C_{22}H_{26}N_2O_5S+Na]^+$ 453.1452, found 453.1459.

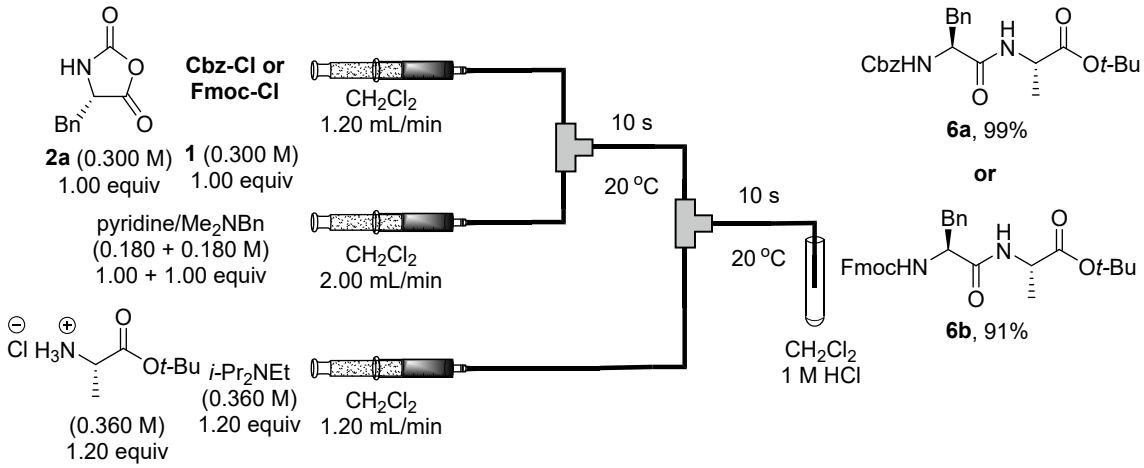
Cbz-D-Asp(O*t*-Bu)-L-Ala methyl ester (epi-7f)



40.7 mg, 0.11 mmol, 67 %

White solid; mp 64-66 °C, IR (neat): 3309, 1733, 1682, 1670, 1557, 1456, 1216, 1154 cm^{-1}; $[\alpha]^{31}_D$ = -13.8 (c 0.01, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.36-7.31 (m, 5H), 6.99 (d, *J* = 5.6 Hz, 1H), 5.90 (d, *J* = 8.0 Hz, 1H), 5.14 (s, 2H), 4.56-4.51 (m, 2H), 3.72 (s, 3H), 2.90 (dd, *J* = 4.0, 17.2 Hz, 1H), 2.60 (dd, *J* = 6.8, 17.2 Hz, 1H), 1.42 (s, 9H), 1.37 (d, *J* = 6.0 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 173.0, 171.4, 170.3, 156.1, 136.2, 128.7, 128.4, 128.3, 82.1, 67.3, 52.6, 51.0, 48.4, 37.6, 28.1, 18.2 ppm; HRMS (ESI): calcd for $[C_{20}H_{28}N_2O_7+Na]^+$ 431.1792, found 431.1793.

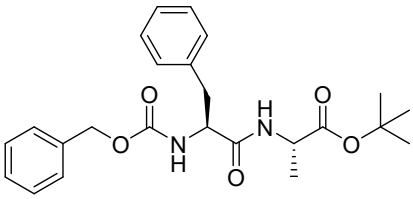
Synthesis of dipeptides 6



The employed micro-flow system was shown in **Figure S-3**.

A solution of **2a** (0.300 M, 1.00 equiv) and alkyl chloroformate **1** (0.300 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min), a solution of Me_2NBn (0.180 M, 1.00 equiv) and pyridine (0.180 M, 1.00 equiv) in CH_2Cl_2 (flow rate: 2.00 mL/min) were injected into the T-shaped mixer 1 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 1 (inner diameter: 0.800 mm, length: 1062 mm, volume: 533 μL, reaction time: 10 s) at the same temperature. The resultant mixture and a solution of L-alanine *t*-butyl ester hydrochloric acid (0.360 M, 1.20 equiv) and *i*-Pr_2NEt (0.360 M, 1.20 equiv) in CH_2Cl_2 (flow rate: 1.20 mL/min) were injected into the T-shaped mixer 2 at 20 °C with the syringe pumps. The resultant mixture was passed through the reaction tube 2 (inner diameter: 0.800 mm, length: 1458 mm, volume: 733 μL, reaction time: 10 s) at the same temperature. After being eluted for 60 s to reach a steady state, the resultant mixture was poured into a test tube including 1.00 ml of 1 M HCl and 5.00 ml of CH_2Cl_2 for 10-25 s at room temperature. The reaction mixture was washed with 1 M HCl twice, saturated salt water, dried over Na_2SO_4, filtered and concentrated *in vacuo* to give a crude product. The crude product was purified by preparative TLC.

Cbz-L-Phe-L-Ala *t*-butyl ester (6a)



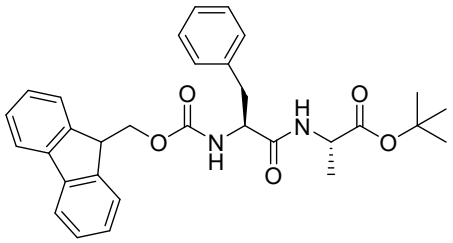
Purification method: The crude product was purified by preparative TLC (condition: EtOAc/hexane = 1/1)

63.2 mg, 0.15 mmol, 99%

White solid; mp 99-100 °C, IR (neat): 3296, 2978, 1734, 1698, 1658, 1497, 1455, 1368, 1259, 1148, 1047, 741, 698 cm^{-1}; $[\alpha]^{31}_D$ = +3.81 (c 0.21, CH_2Cl_2); ^1H NMR (400 MHz, $CDCl_3$): δ 7.34-7.16 (m, 10H), 6.41 (d, *J* = 6.0 Hz, 1H), 5.39 (brs, 1H), 5.08 (s, 2H), 4,45-4.34 (m, 2H), 3.10-3.04 (m, 2H), 1.44 (s, 9H), 1.30 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 171.7, 170.2, 156.0, 136.3, 129.5, 128.8, 128.7, 128.3, 128.2, 127.2, 82.2, 67.1, 56.2, 48.9, 36.7, 28.1, 18.7 ppm; HRMS (ESI): calcd for $[C_{24}H_{30}N_2O_5+Na]^+$ 449.2047, found 449.2047.

Spectral data of ^1H NMR and ^{13}C NMR were well consistent with those reported in previous literature.[S16]

Fmoc-L-Phe-L-Ala *t*-butyl ester (6b)



* Collection time was 20 s.

Purification method: The crude product was purified by preparative TLC twice (condition: EtOAc/hexane = 4/1 and 2/1)

56.1 mg, 0.11 mmol, 91%

White solid; mp 69-71 ^{o}C, IR (neat): 3294, 2977, 1733, 1698, 1654, 1540, 1451, 1368, 1261, 1147, 1043, 757, 739, 699 cm^{-1}; $[\alpha]^{31}_{D}$ = -5.00 (c 0.33, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.75 (d, *J* = 7.6 Hz, 2H), 7.51 (t, *J* = 8.0 Hz, 2H), 7.37 (t, *J* = 7.6 Hz, 2H), 7.31-7.25 (m, 7H), 6.42 (d, *J* = 5.2 Hz, 1H), 5.41 (d, *J* = 5.6 Hz, 1H), 4.43-4.30 (m, 3H), 4.17 (t, *J* = 7.2 Hz, 1H), 3.11-3.06 (m, 2H), 1.44 (s, 9H), 1.31 (d, *J* = 7.2 Hz, 3H) ppm; ^{13}C NMR (100 MHz, $CDCl_3$): δ 171.7, 170.2, 156.0, 143.9, 143.8, 141.4, 136.4, 129.5, 128.8, 127.8, 127.2, 125.2, 120.1, 82.2, 67.2, 56.1, 48.9, 47.2, 38.8, 28.0, 18.7 ppm; HRMS (ESI): calcd for $[C_{31}H_{34}N_2O_5+Na]^+$ 537.2360, found 537.2323.

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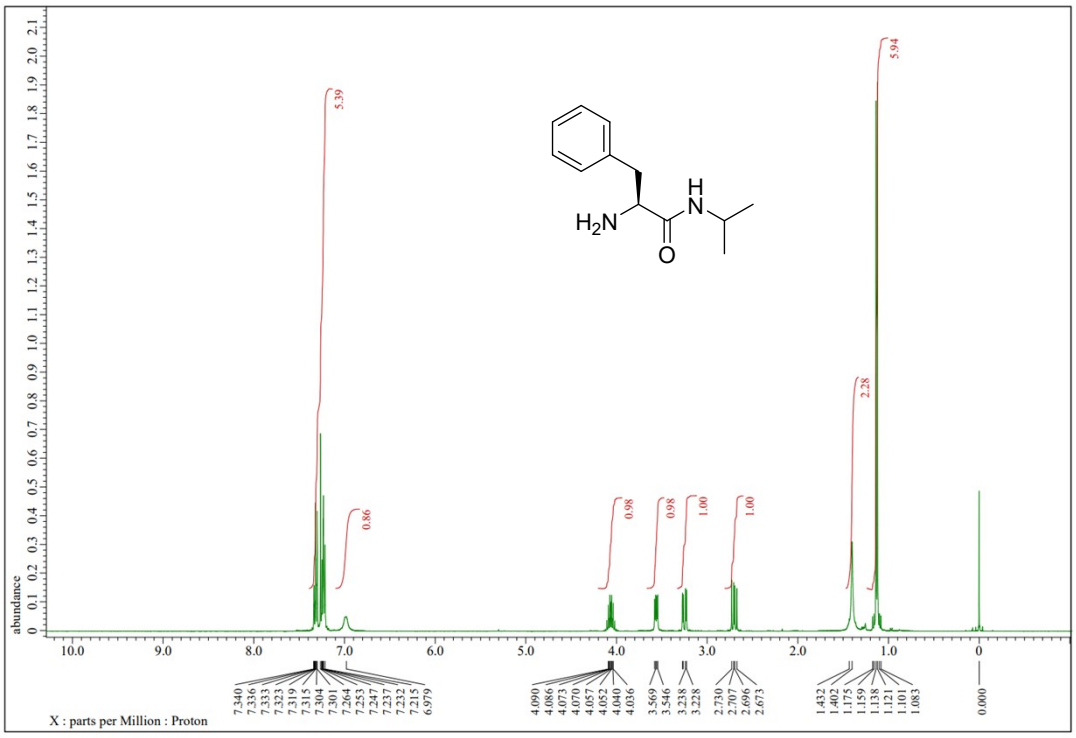
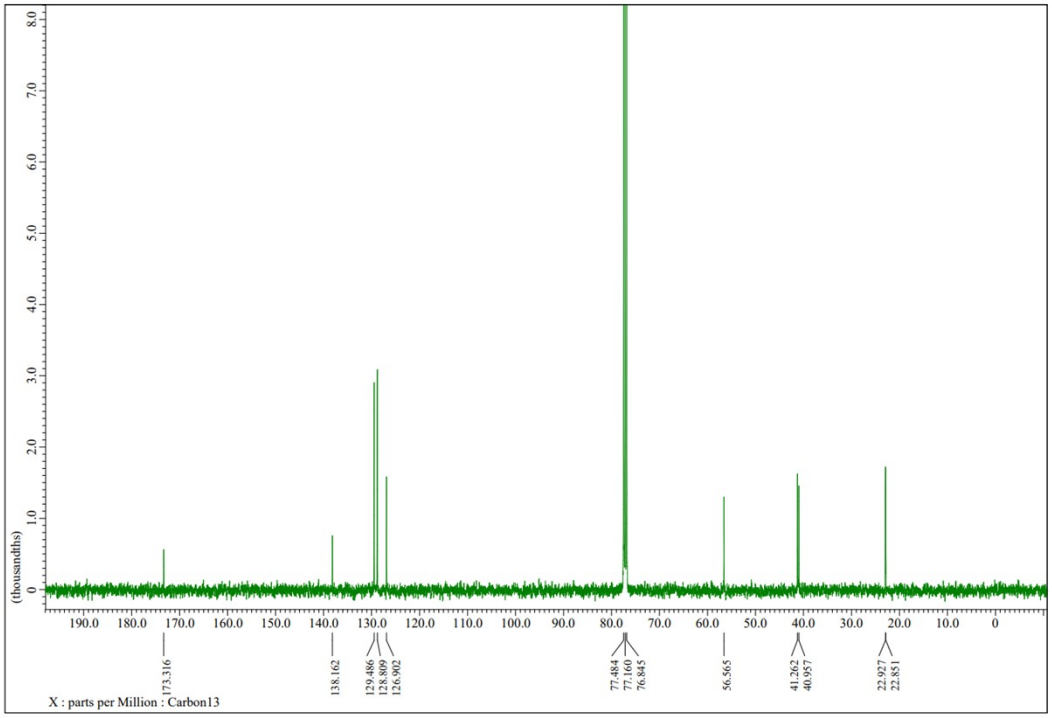
NMR spectra

(*S*)-2-Amino-*N*-isopropyl-3-phenylpropanamide (4a)

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

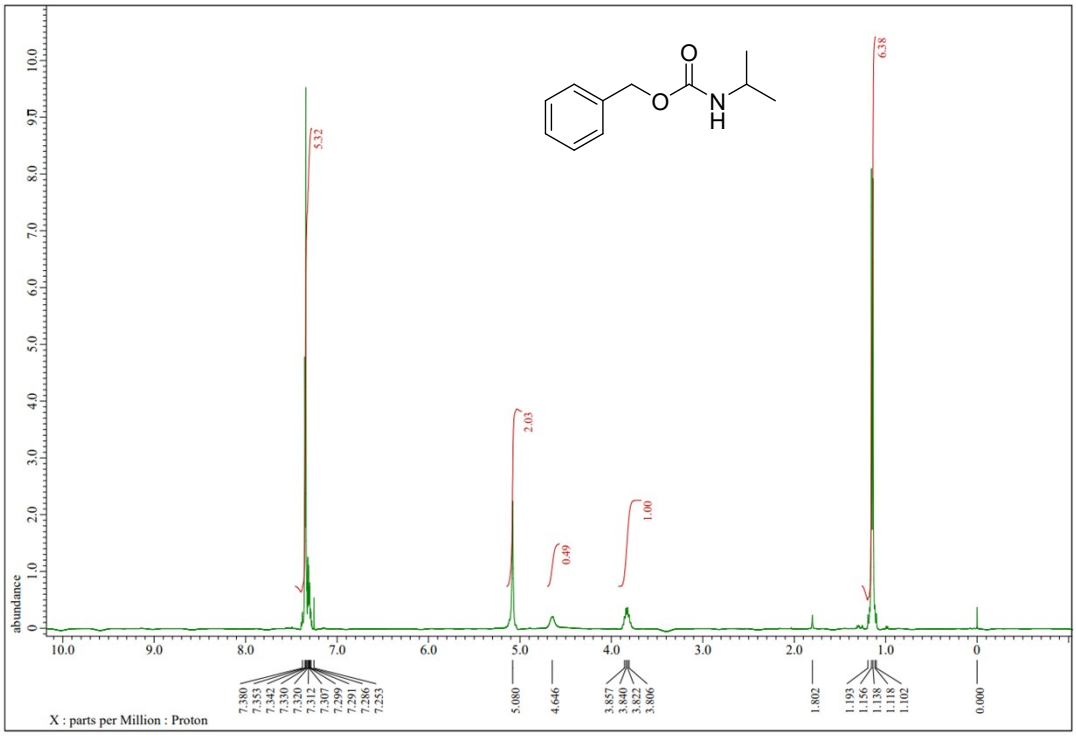


(^{13}C NMR, 100 MHz, $CDCl_3$)

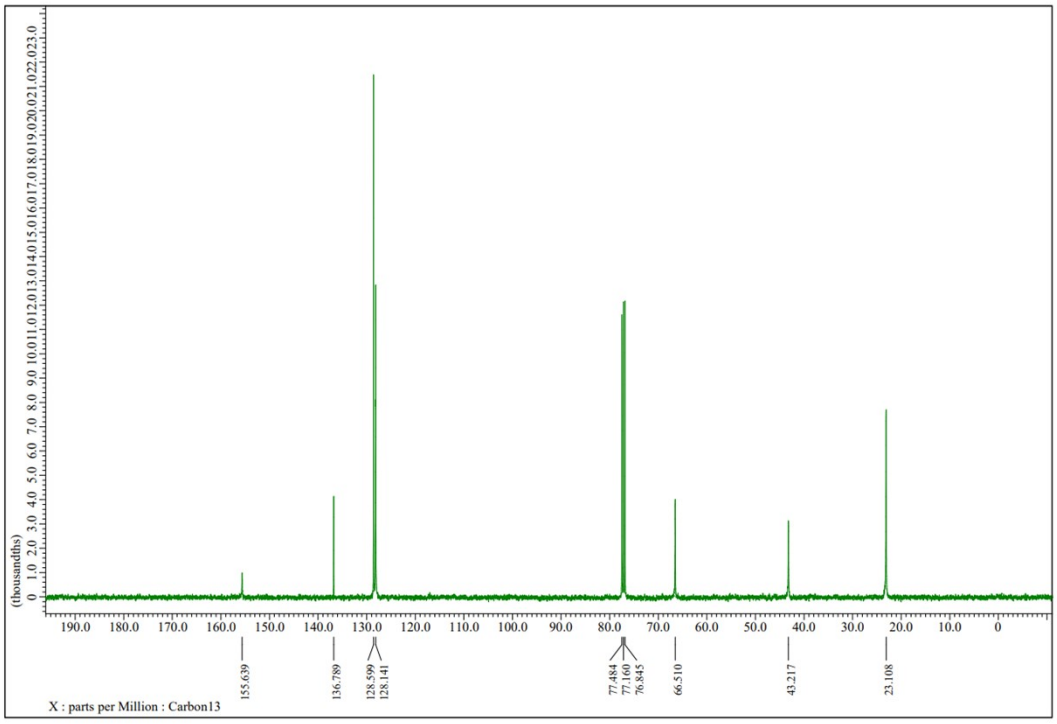


Benzyl isopropyl carbamate (5a)

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

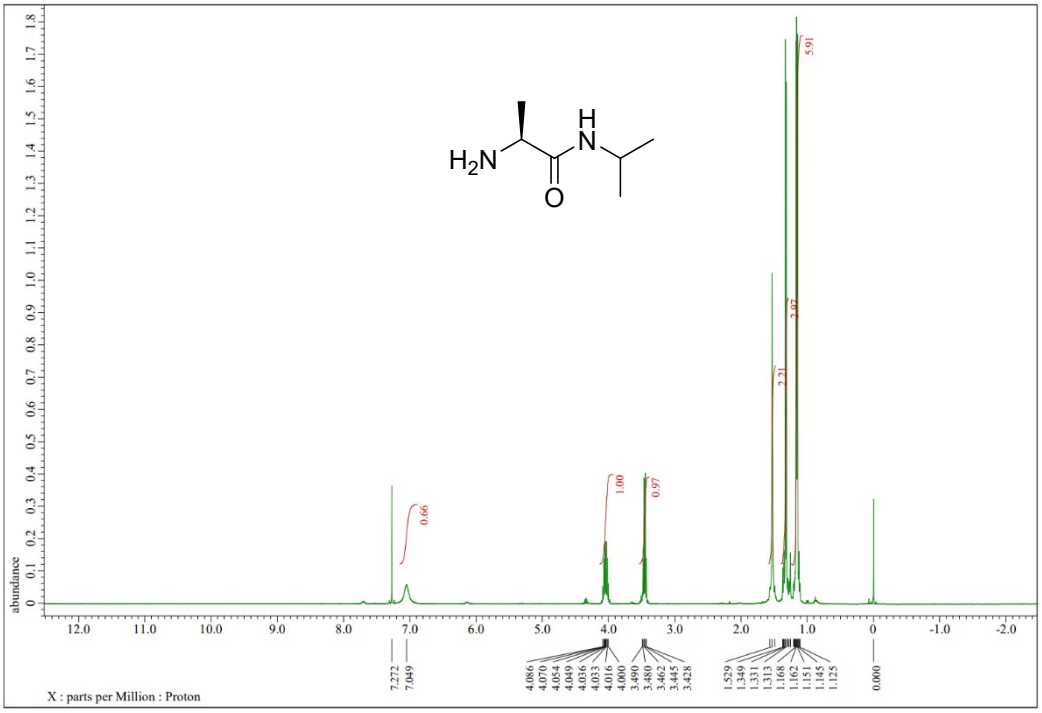


(^{13}C NMR, 100 MHz, $CDCl_3$)

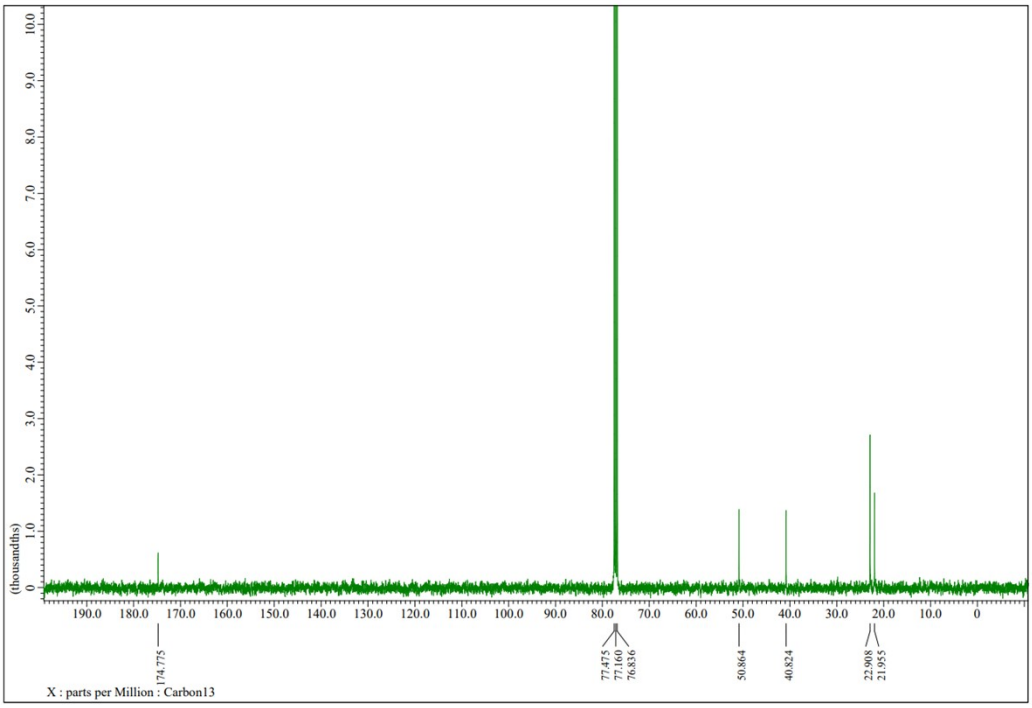


(*S*)-2-Amino-*N*-isopropylpropanamide (4b)

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

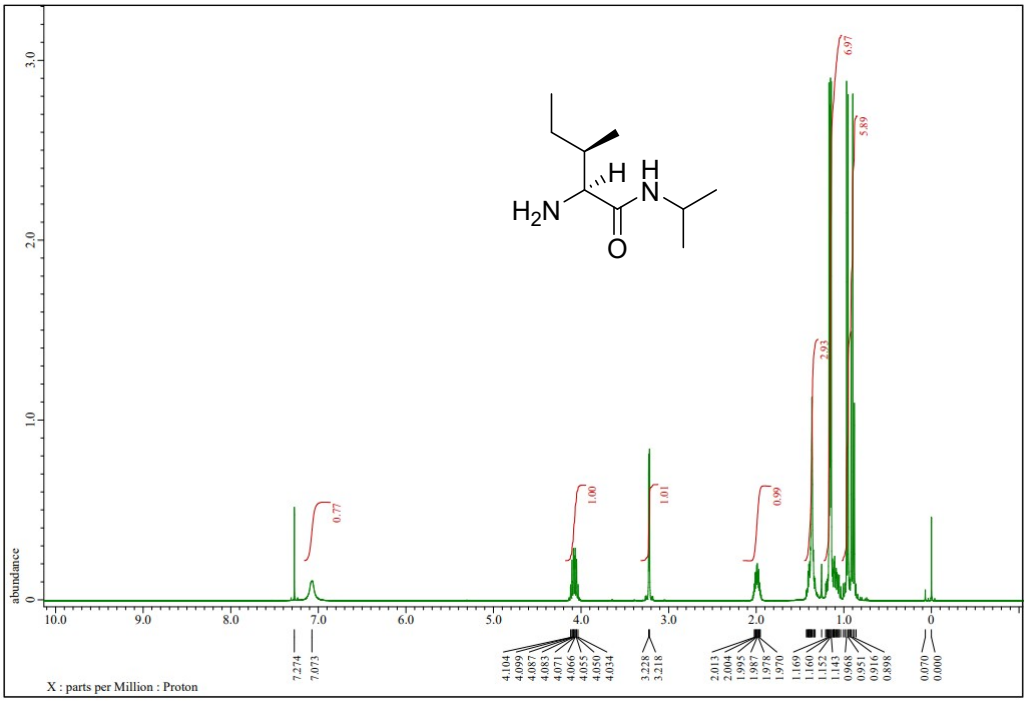


(^{13}C NMR, 100 MHz, $CDCl_3$)

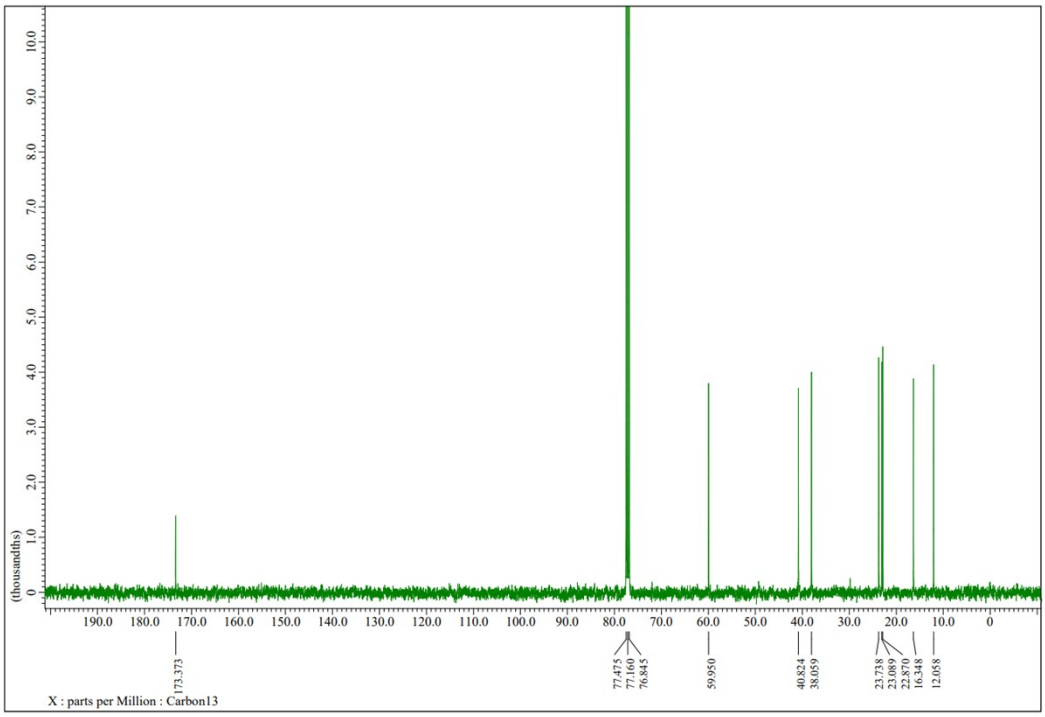


(2*S*,3*R*)-2-Amino-*N*-isopropyl-3-methylpentanamide (4c)

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

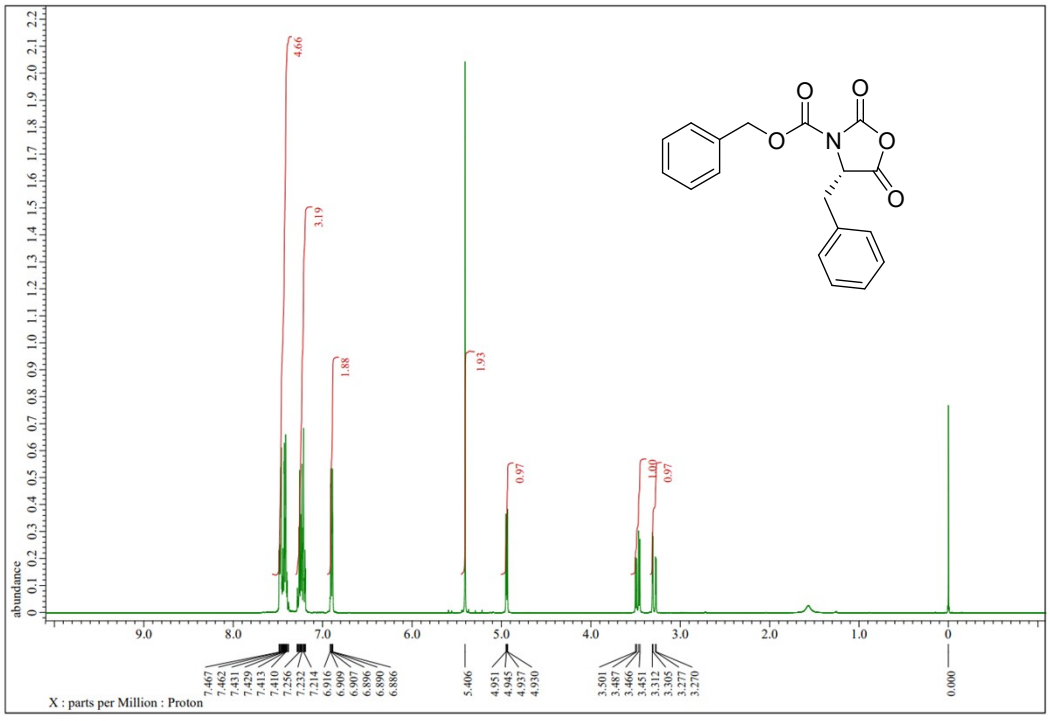


(^{13}C NMR, 100 MHz, $CDCl_3$)

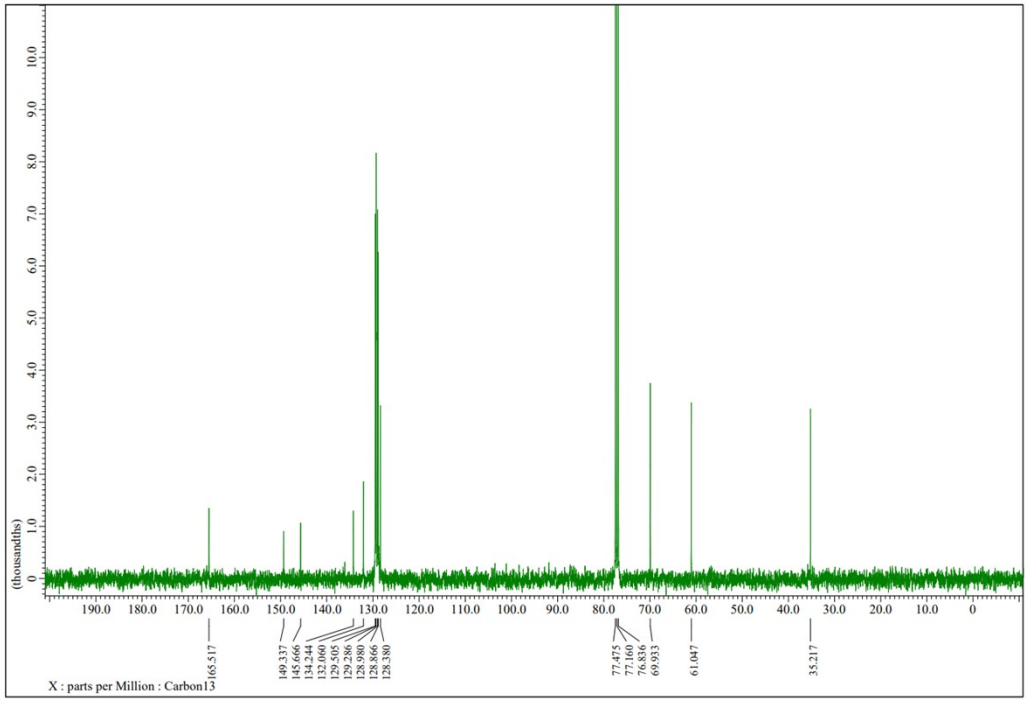


Cbz-L-phenylalanine-NCA (3a)

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

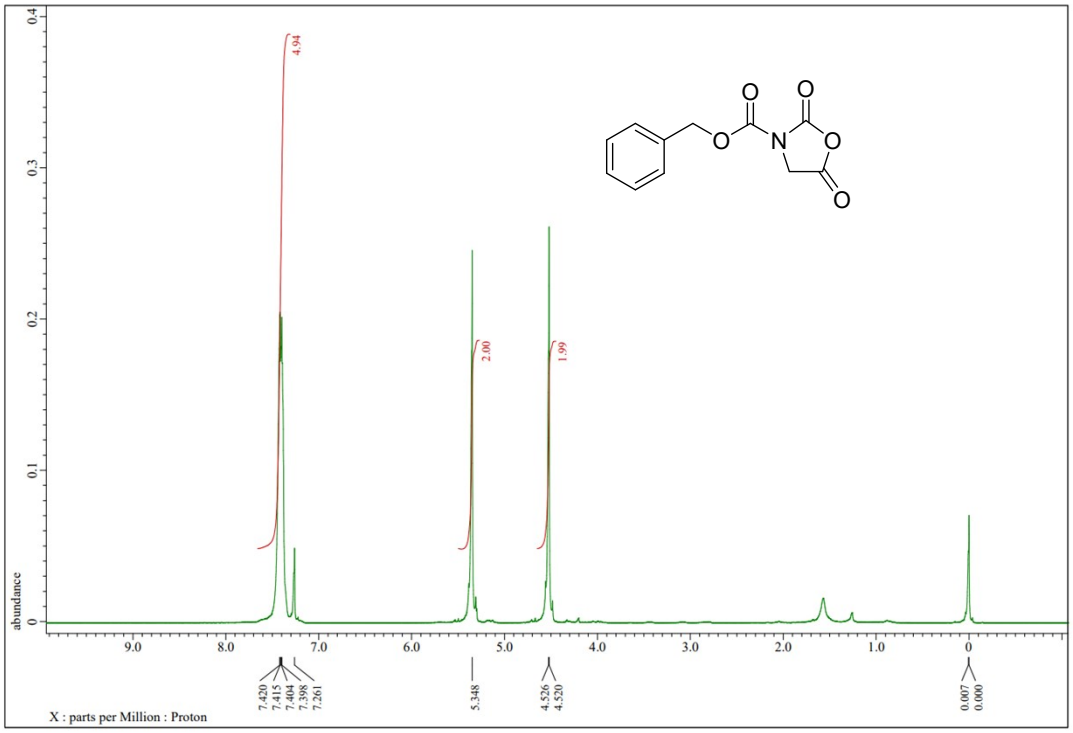


(^{13}C NMR, 100 MHz, $CDCl_3$)

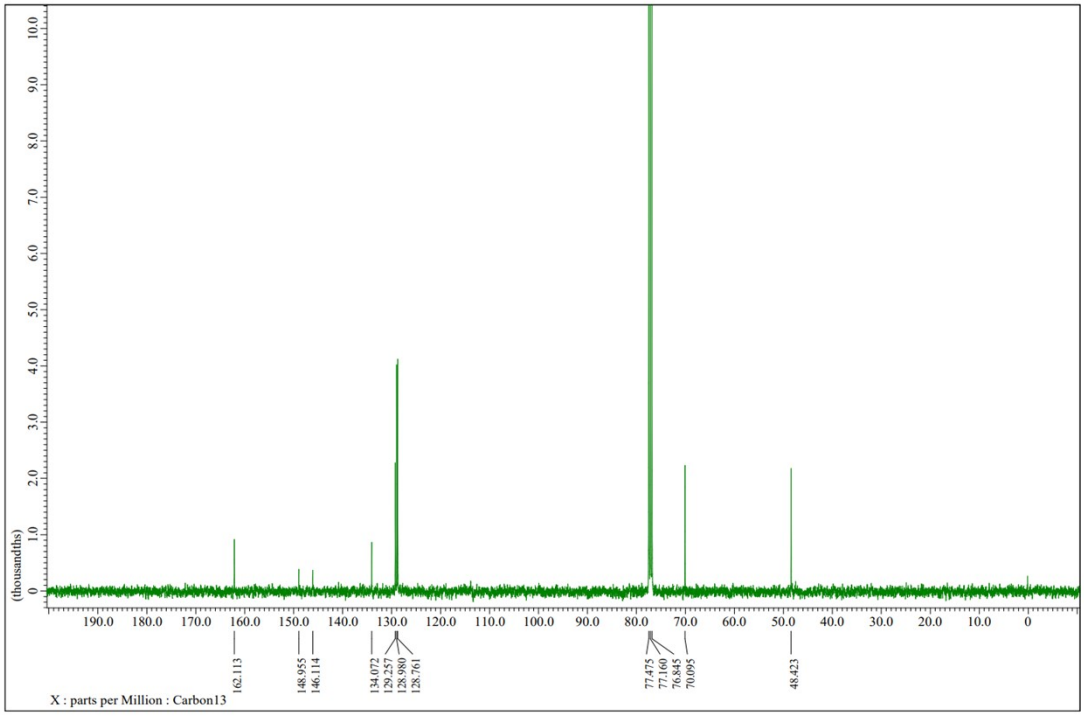


Cbz-glycine-NCA (3b)

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

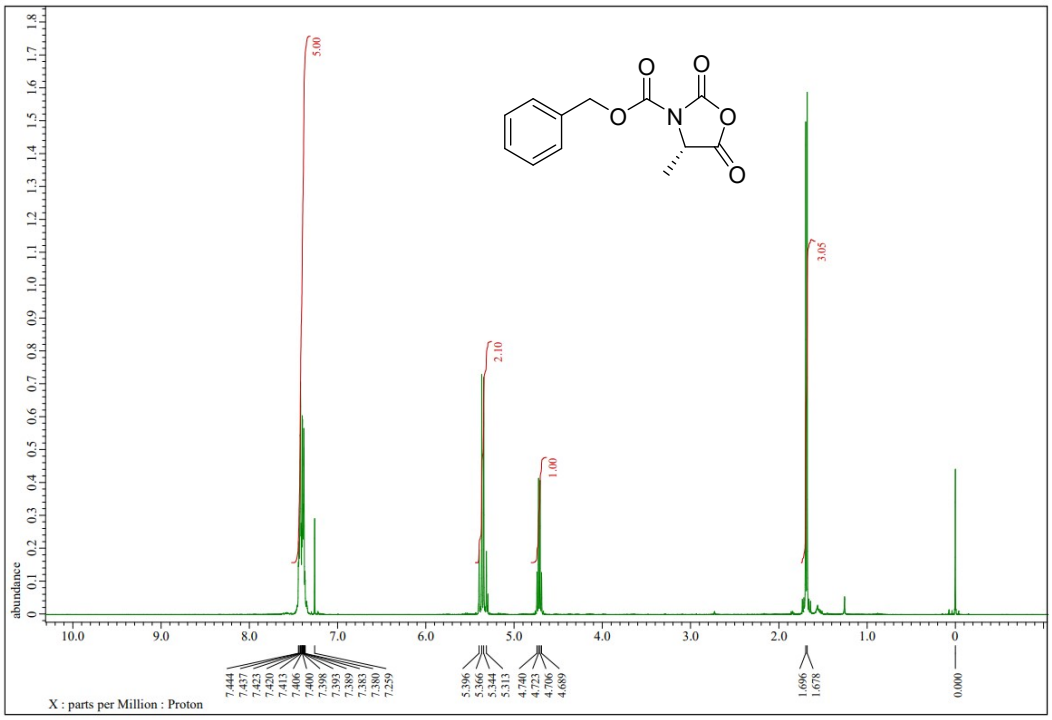


(^{13}C NMR, 100 MHz, $CDCl_3$)

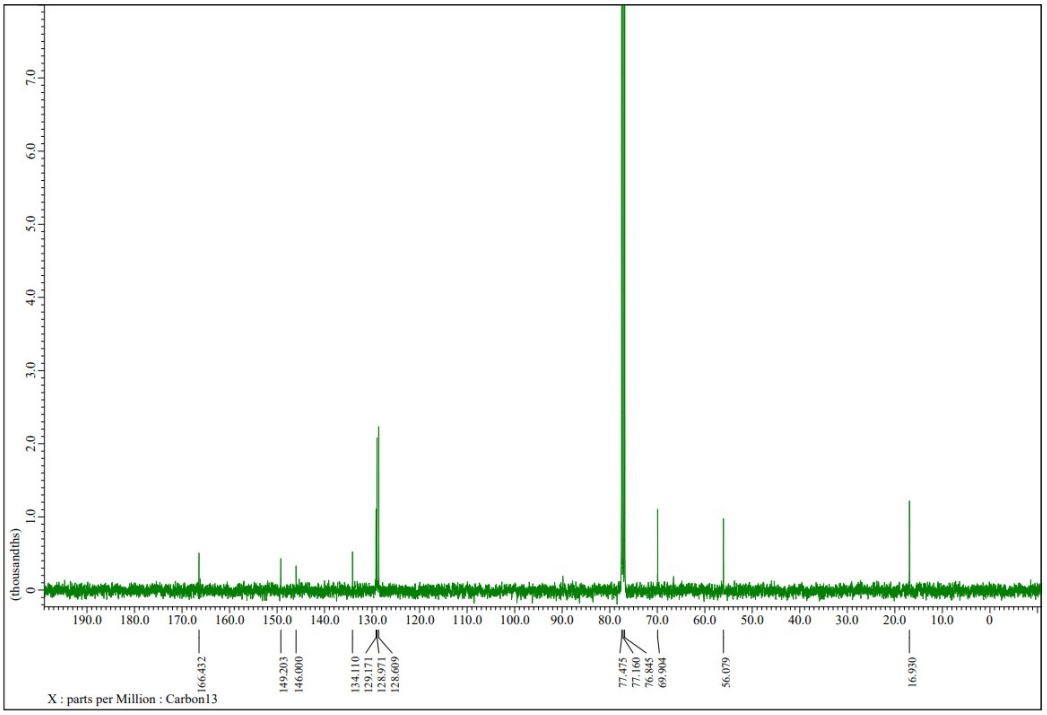


Cbz-L-alanine-NCA (3c)

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

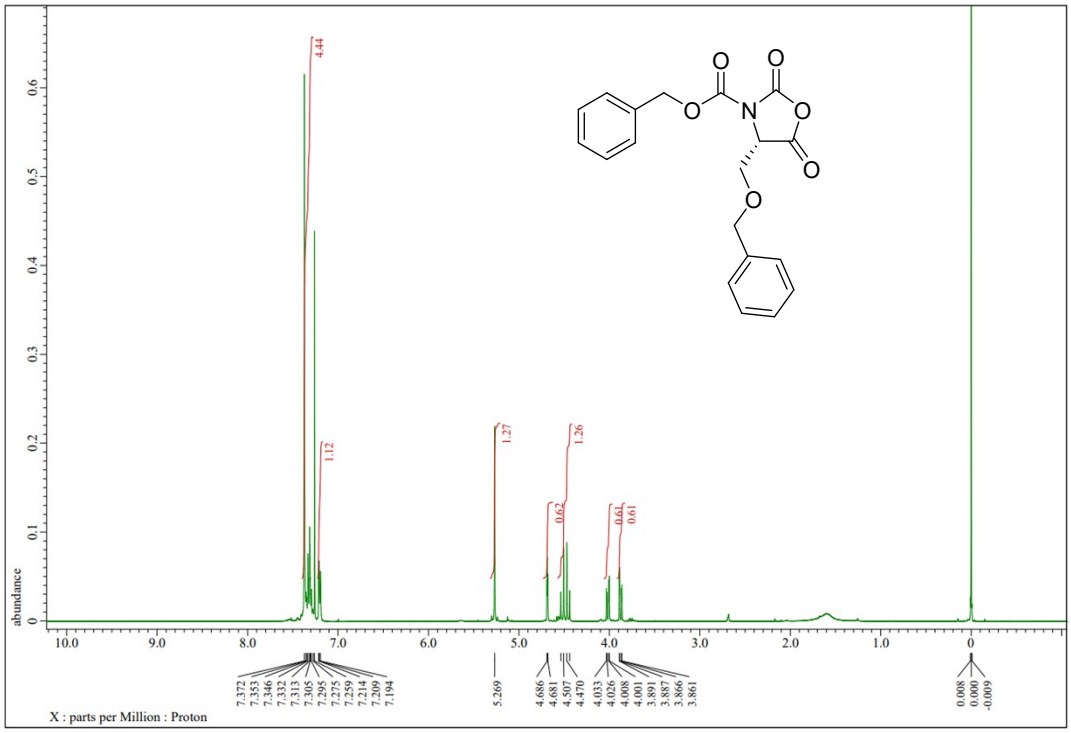


(^{13}C NMR, 100 MHz, $CDCl_3$)

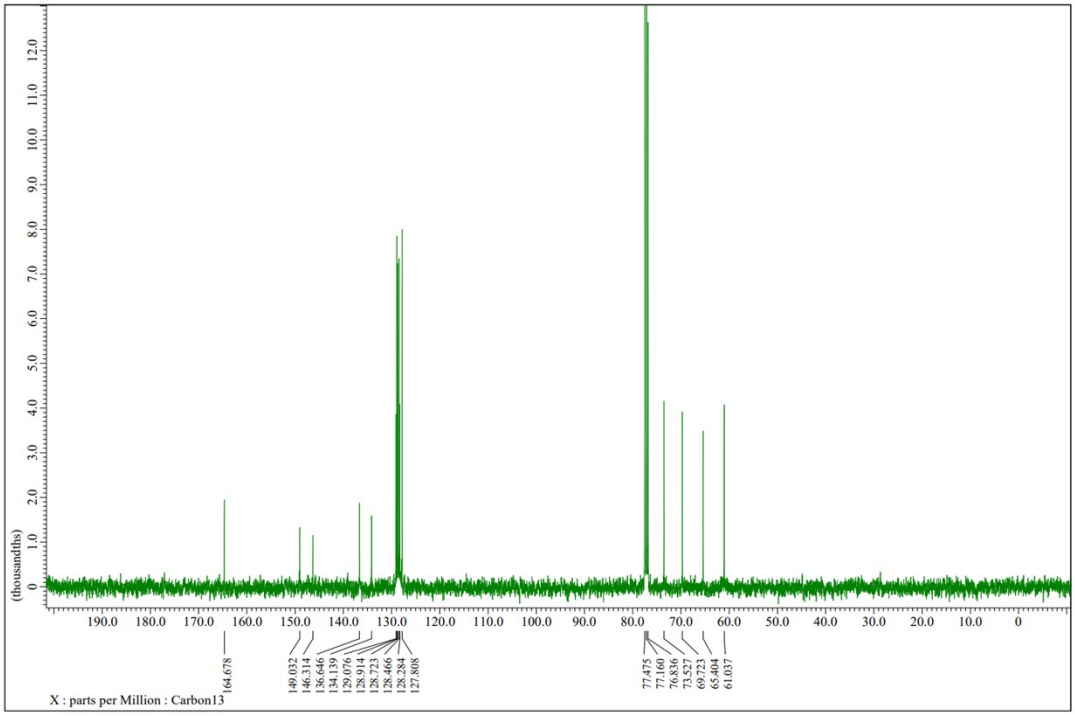


Cbz-*O*-benzyl-L-serine-NCA (3d)

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

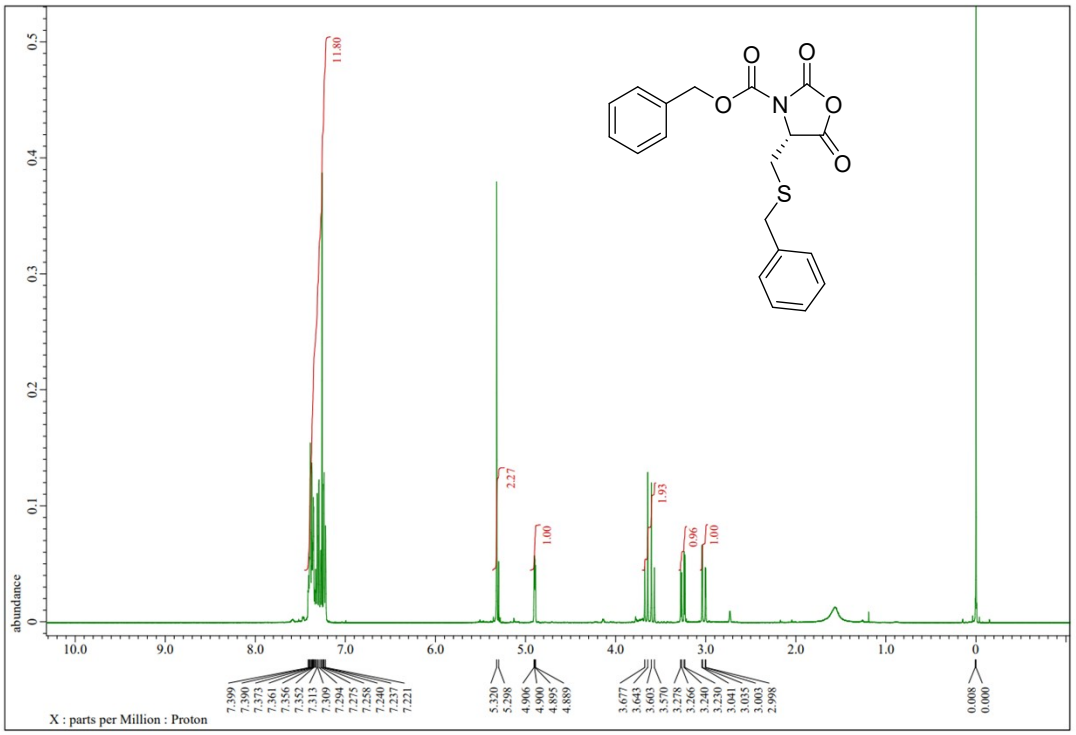


(^{13}C NMR, 100 MHz, $CDCl_3$)

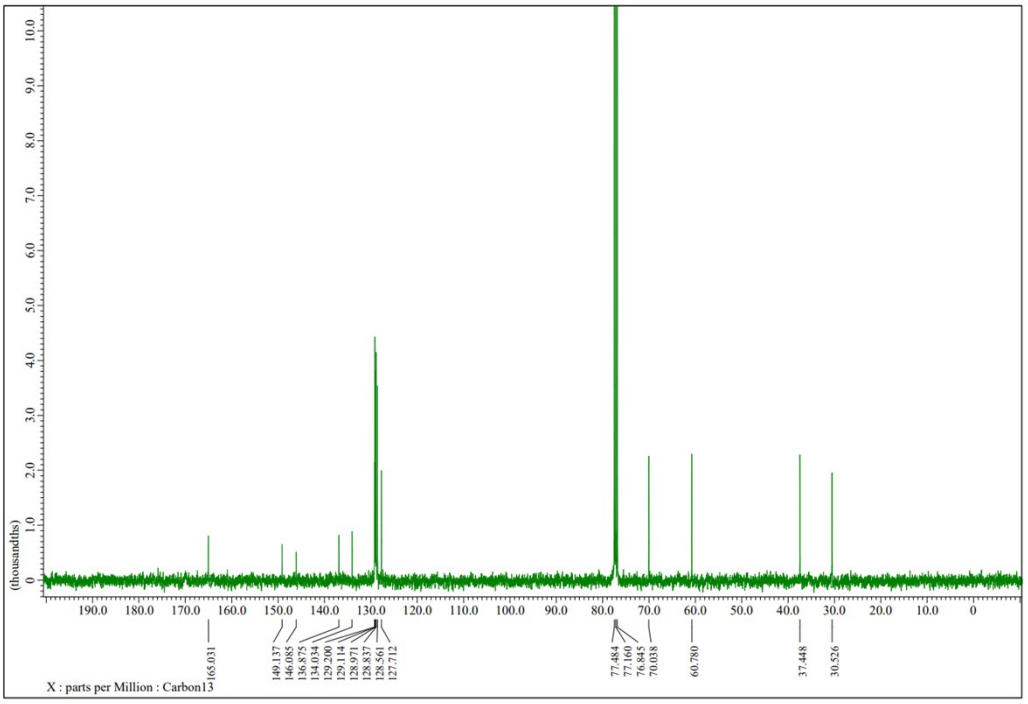


Cbz-*S*-benzyl-L-cysteine-NCA (3e)

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

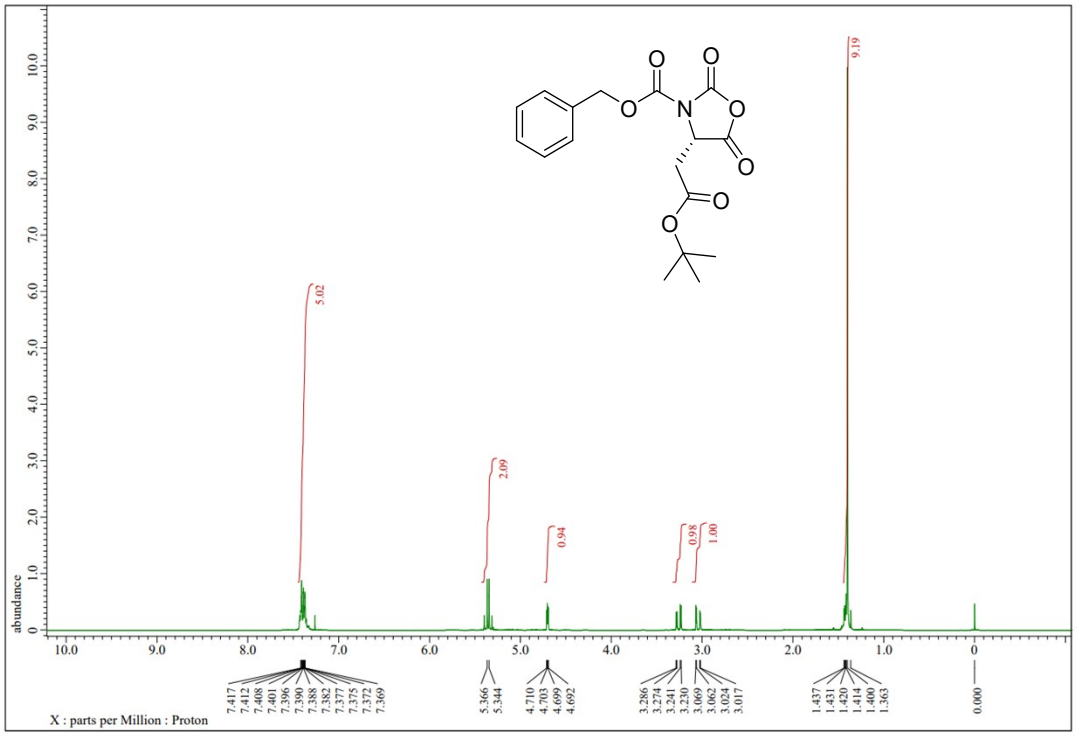


(^{13}C NMR, 100 MHz, $CDCl_3$)

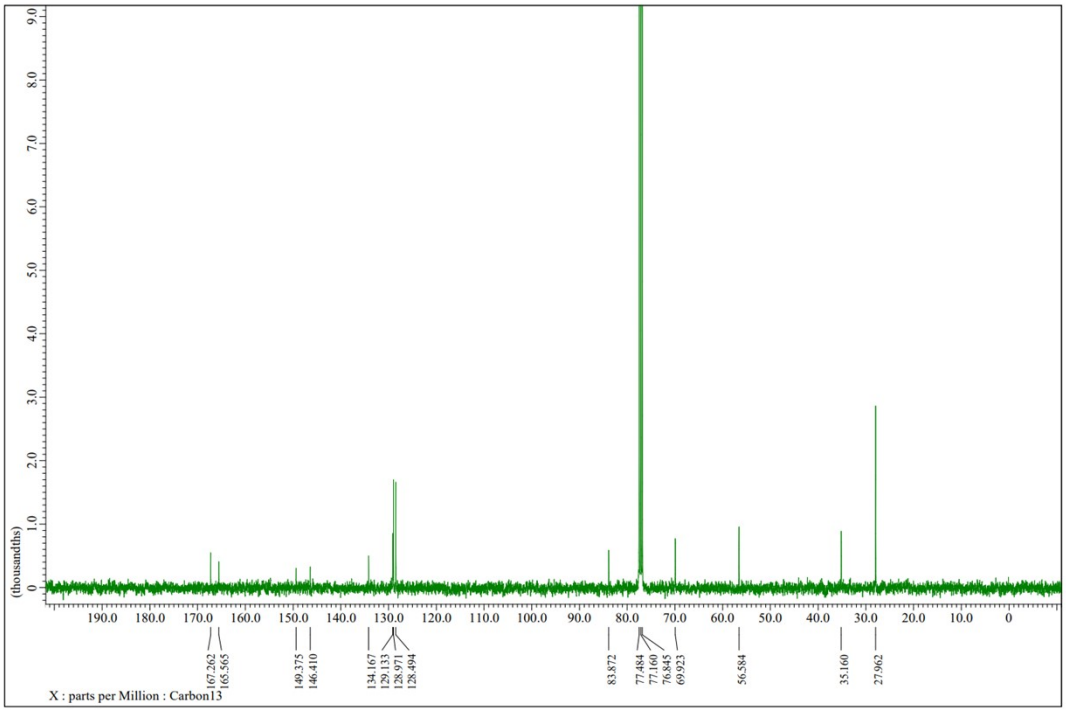


Cbz-5-*t*-butyl-L-glutamate-NCA(3f)

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

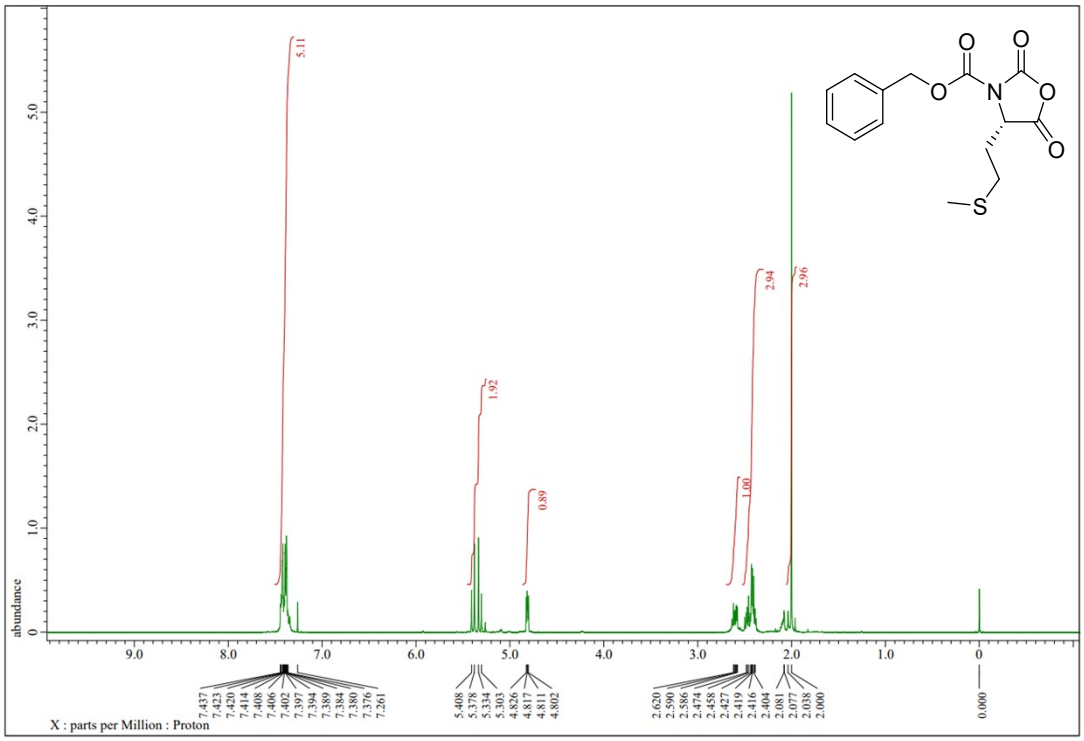


(^{13}C NMR, 100 MHz, $CDCl_3$)

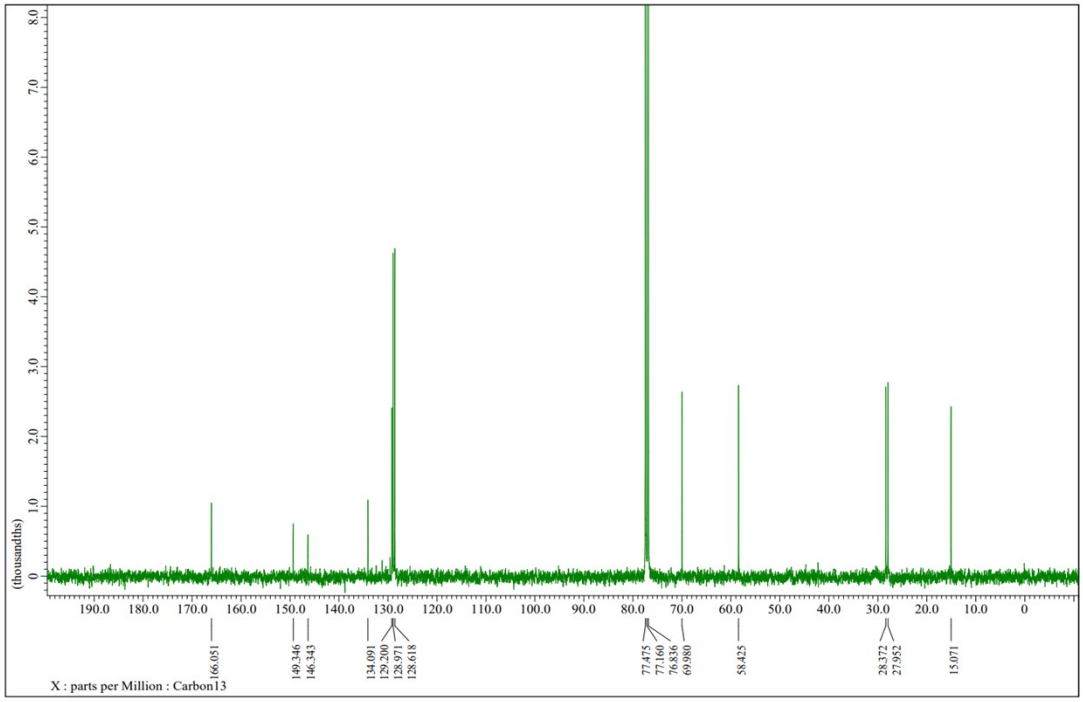


Cbz-L-methionine-NCA (3g)

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

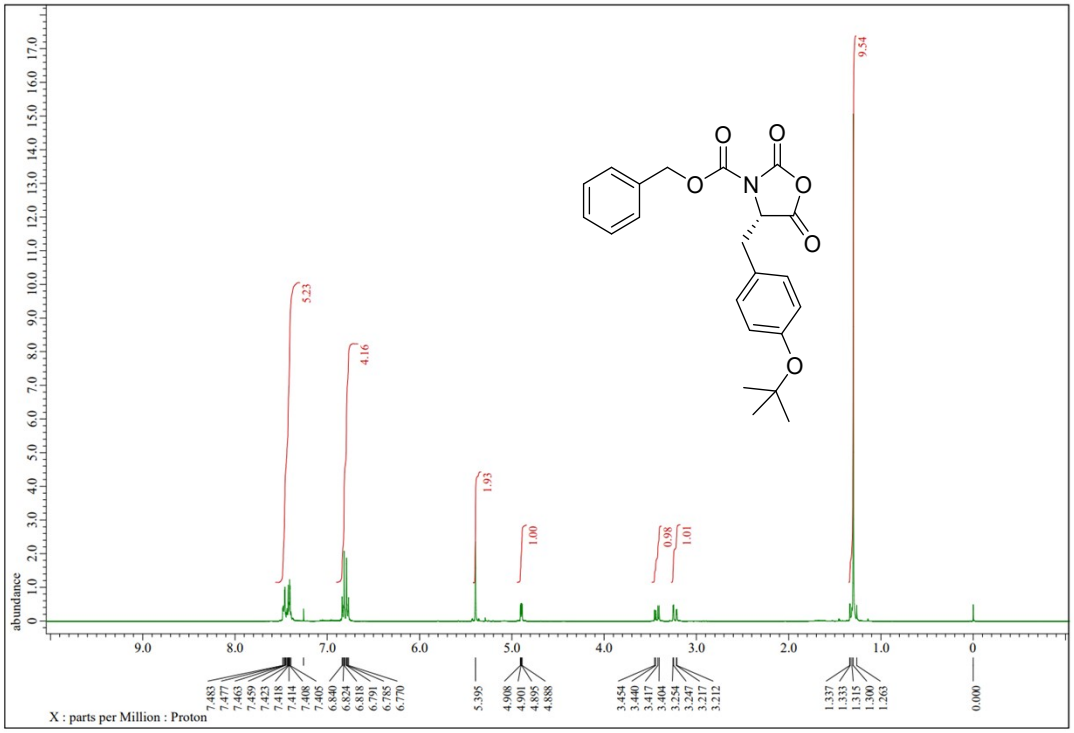


(^{13}C NMR, 100 MHz, $CDCl_3$)

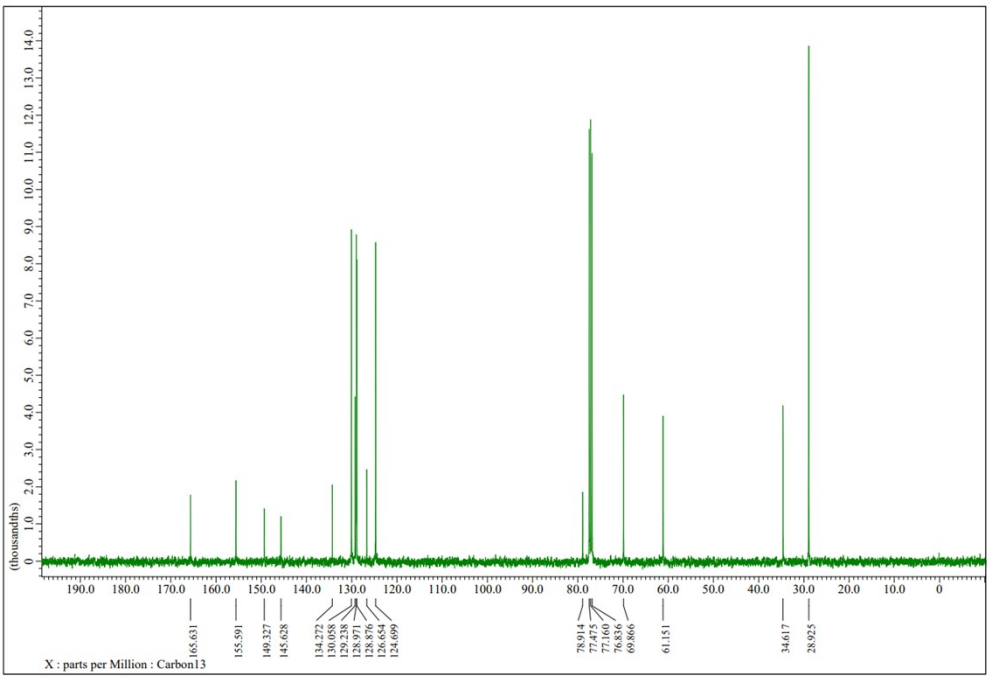


Cbz-*O-t*-butyl-L-tyrosine-NCA(3h)

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

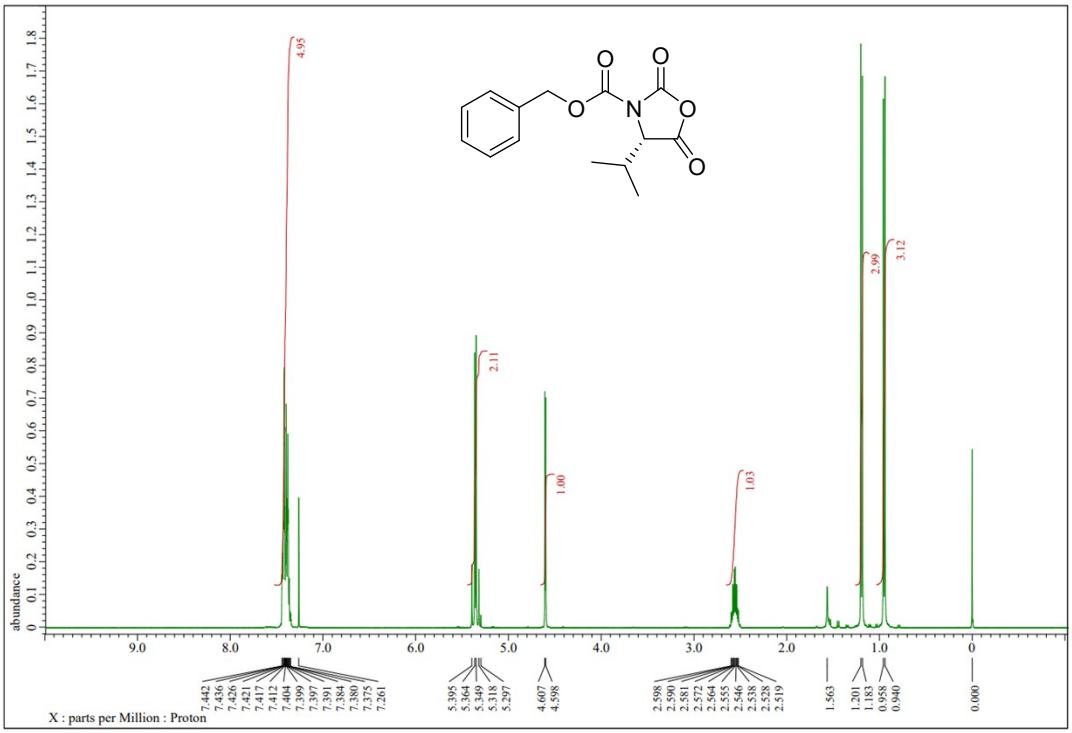


(^{13}C NMR, 100 MHz, $CDCl_3$)

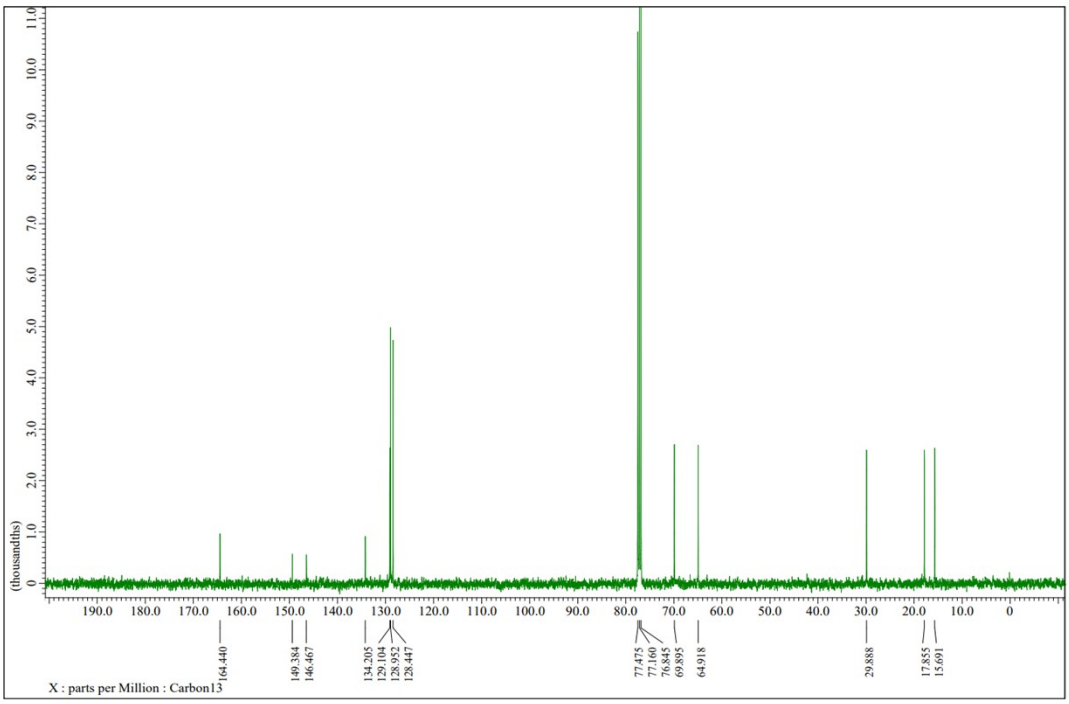


Cbz-L-varine-NCA (3i)

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

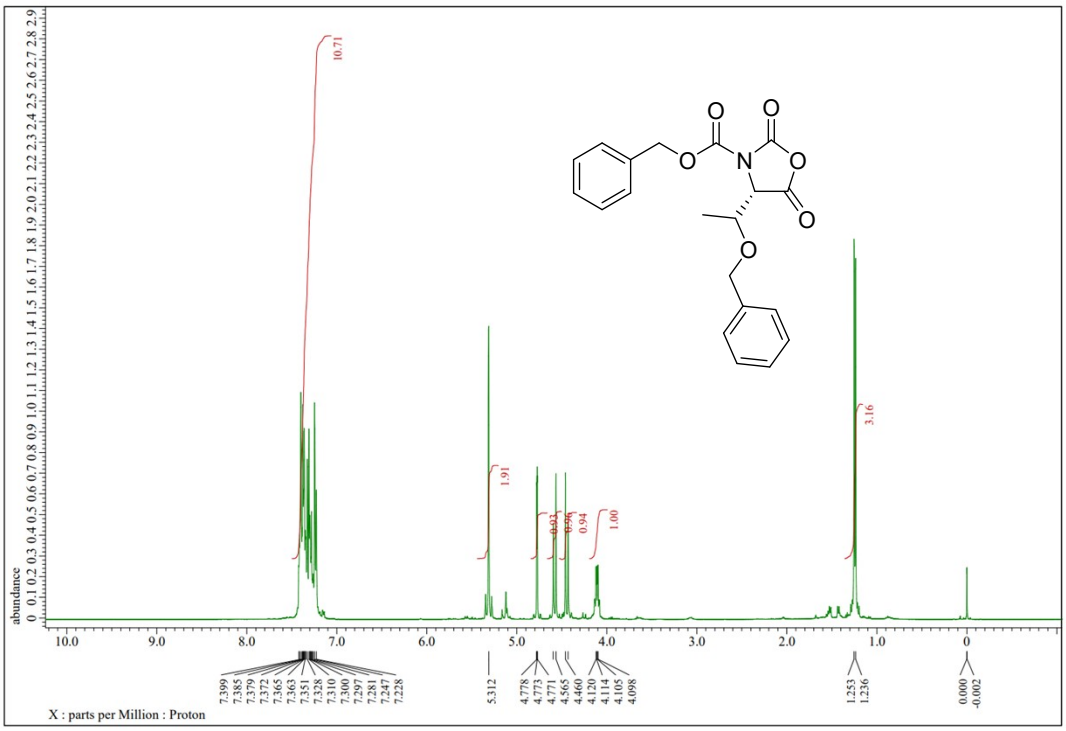


(^{13}C NMR, 100 MHz, $CDCl_3$)

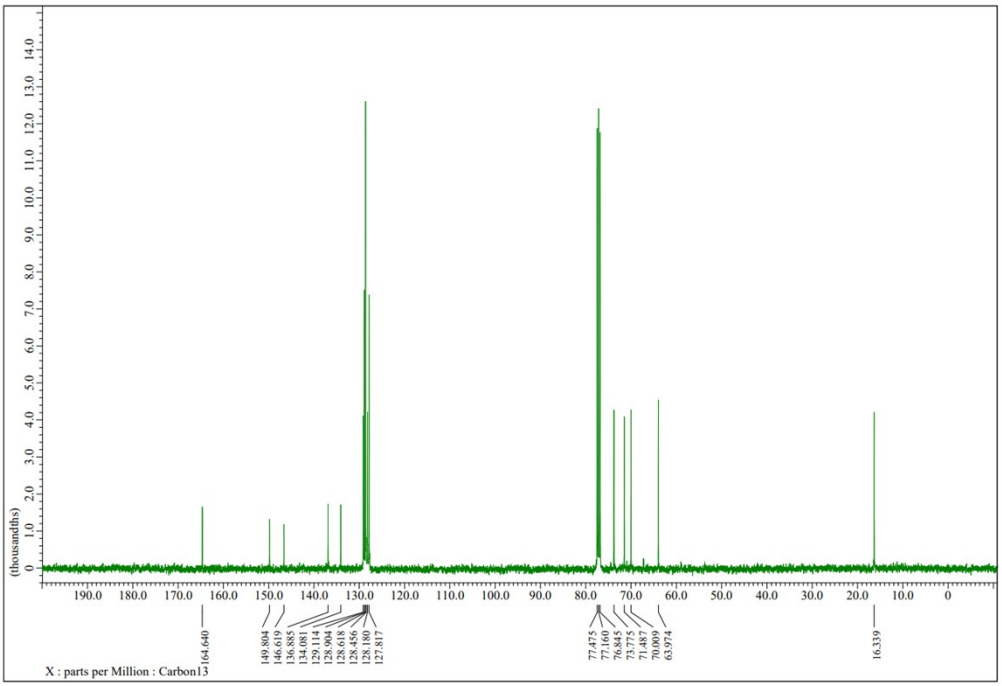


Cbz-*O*-benzyl-L-threonine-NCA (3j)

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

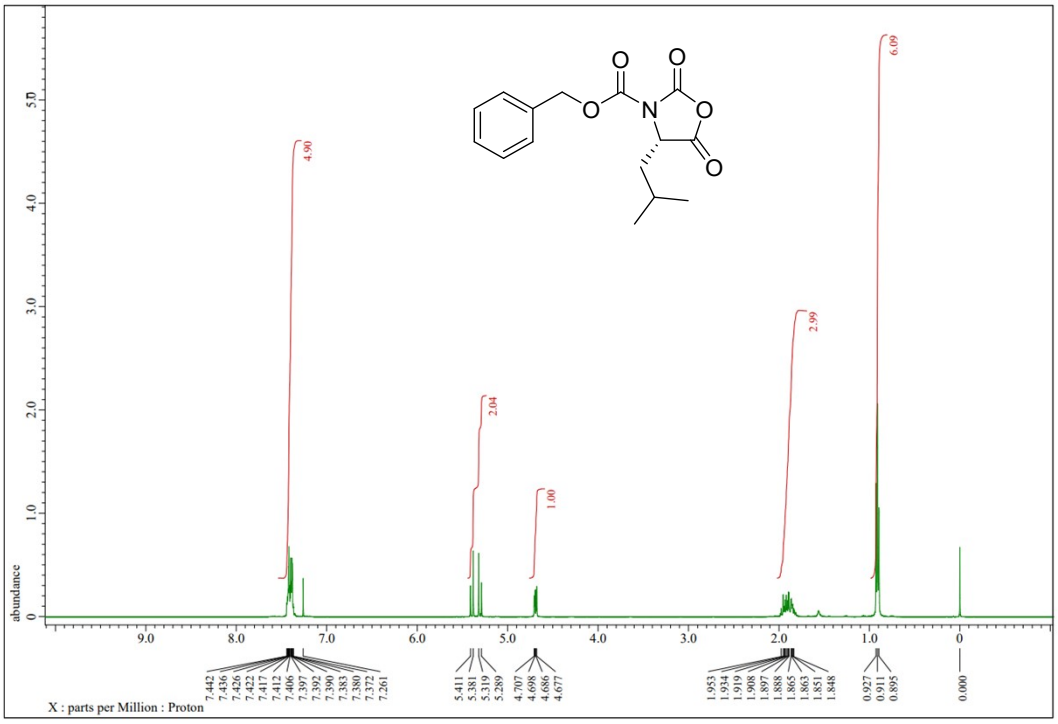


(^{13}C NMR, 100 MHz, $CDCl_3$)

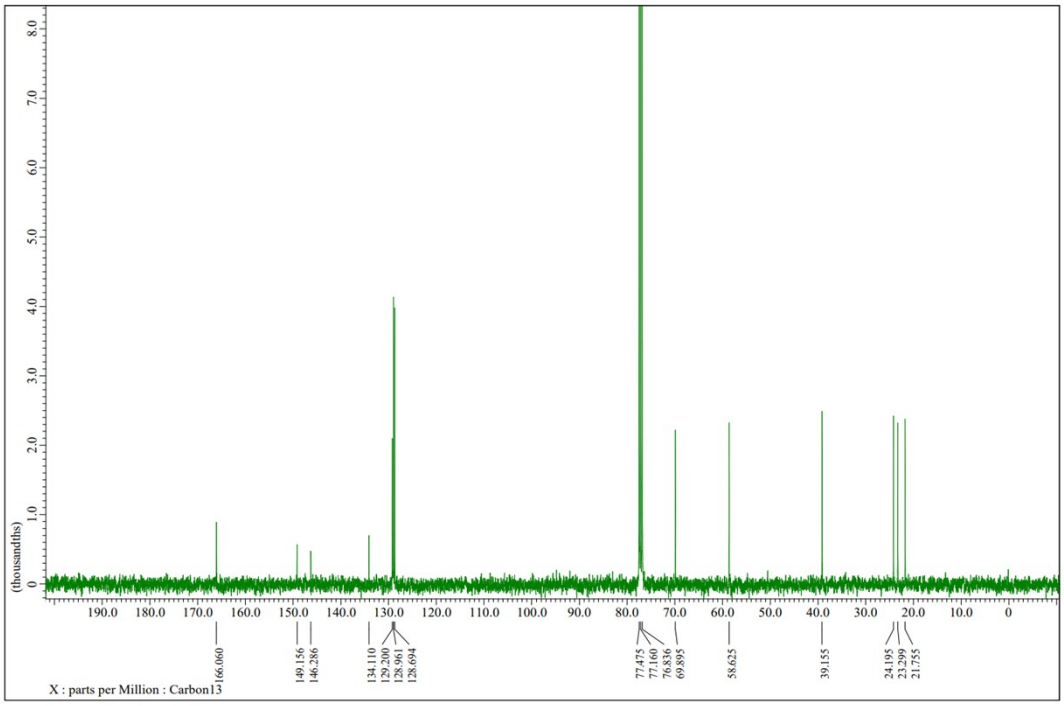


Cbz-L-leucine-NCA (3k)

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

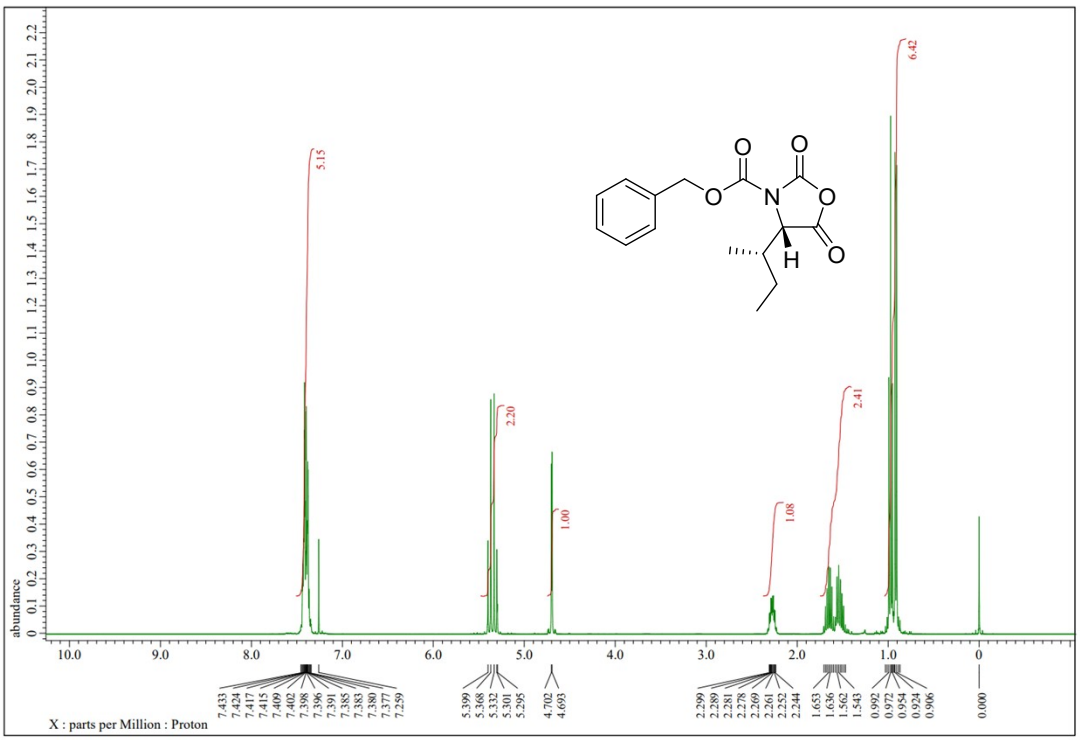


(^{13}C NMR, 100 MHz, $CDCl_3$)

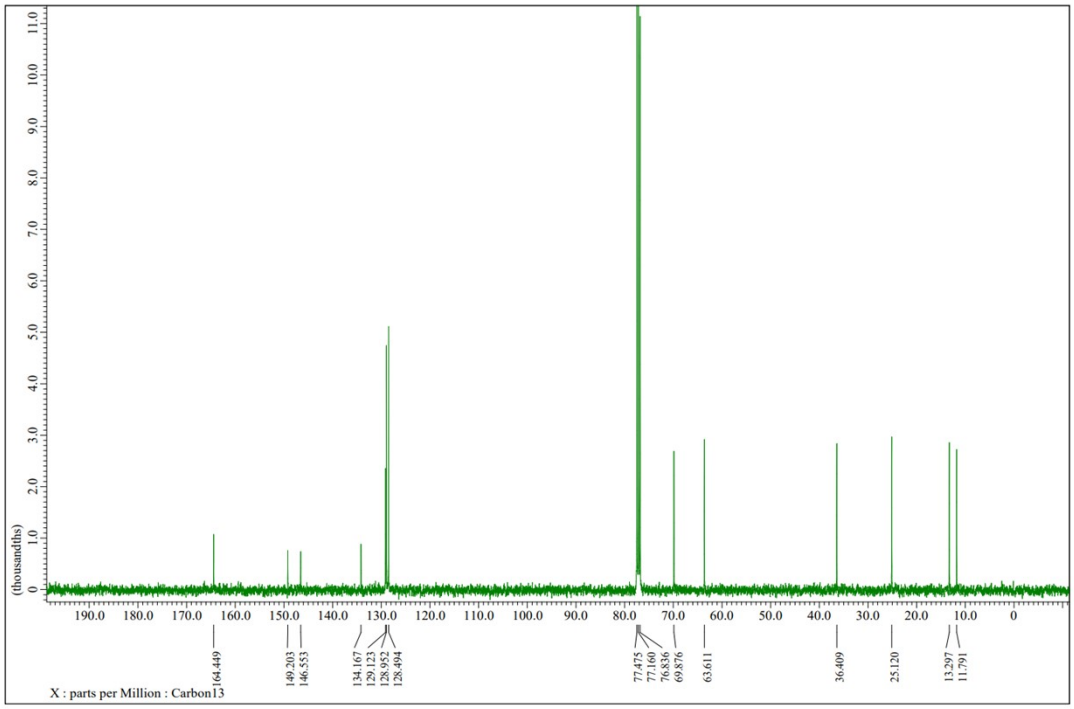


Cbz-L-isoleucine-NCA (3l)

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

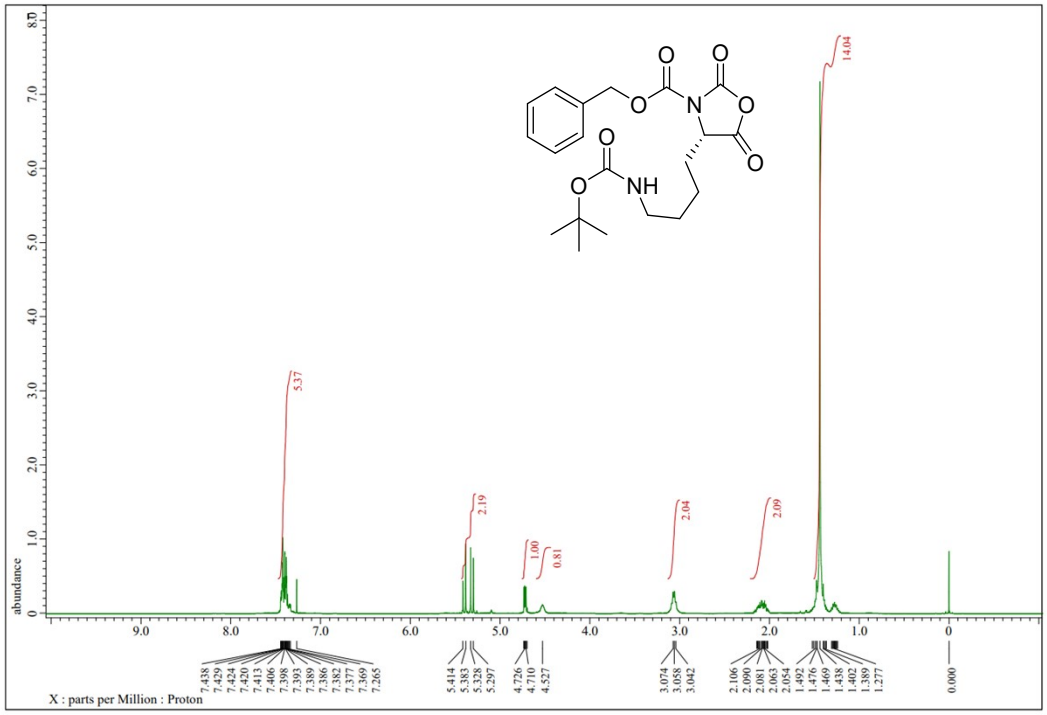


(^{13}C NMR, 100 MHz, $CDCl_3$)

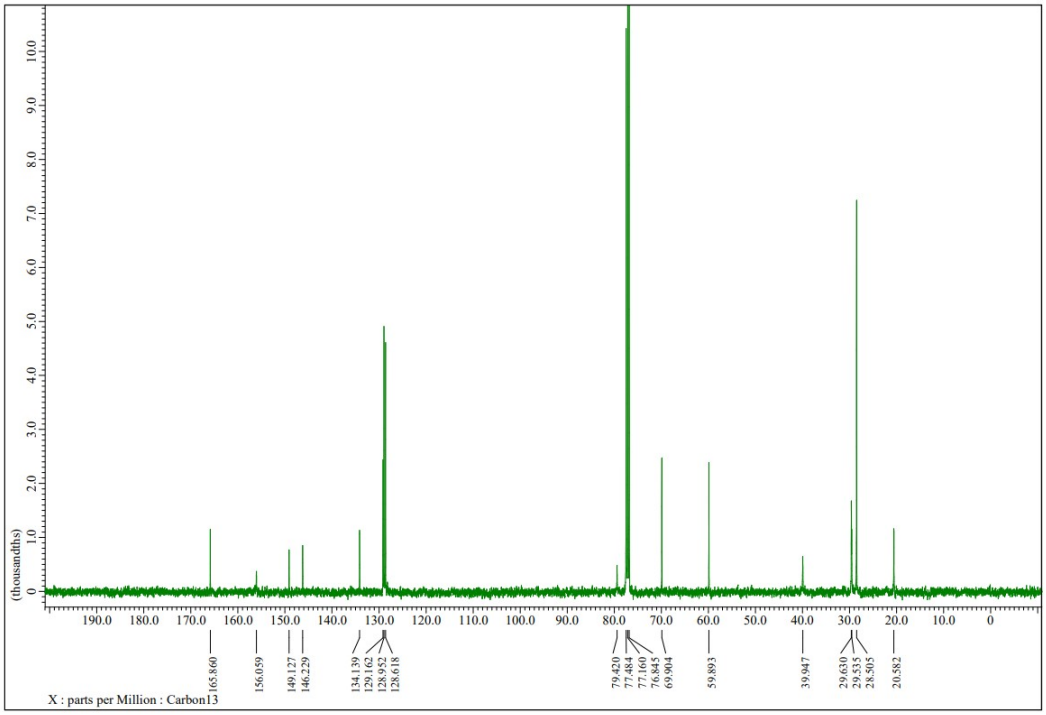


Cbz-N_{ε}-(*t*-butoxycarbonyl)-L-lysine-NCA (3m)

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

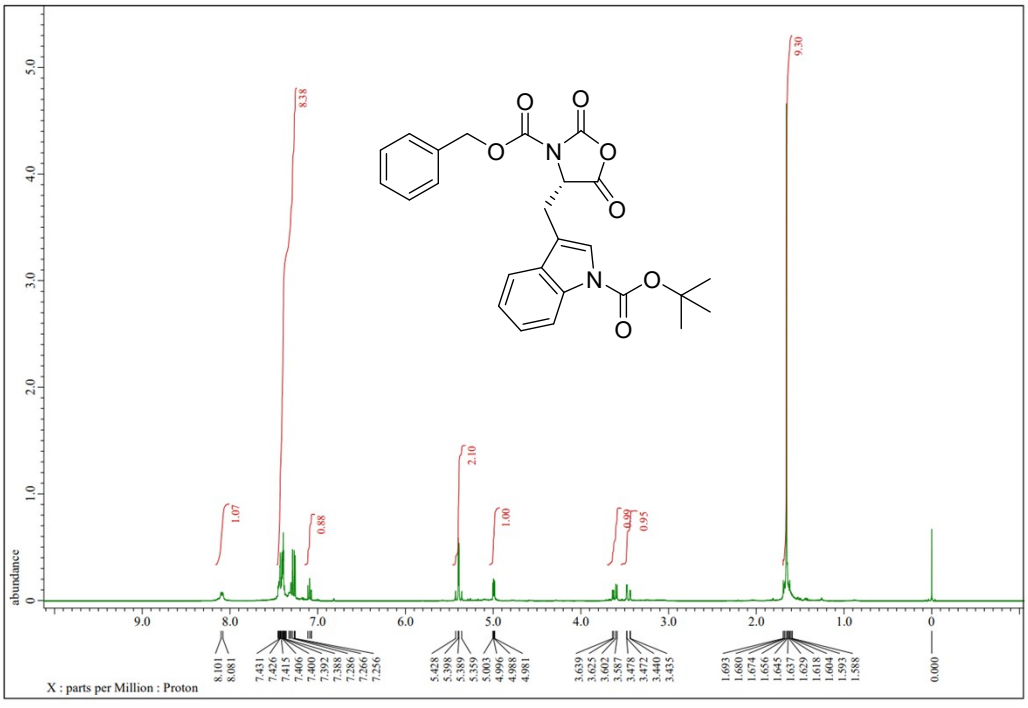


(^{13}C NMR, 100 MHz, $CDCl_3$)

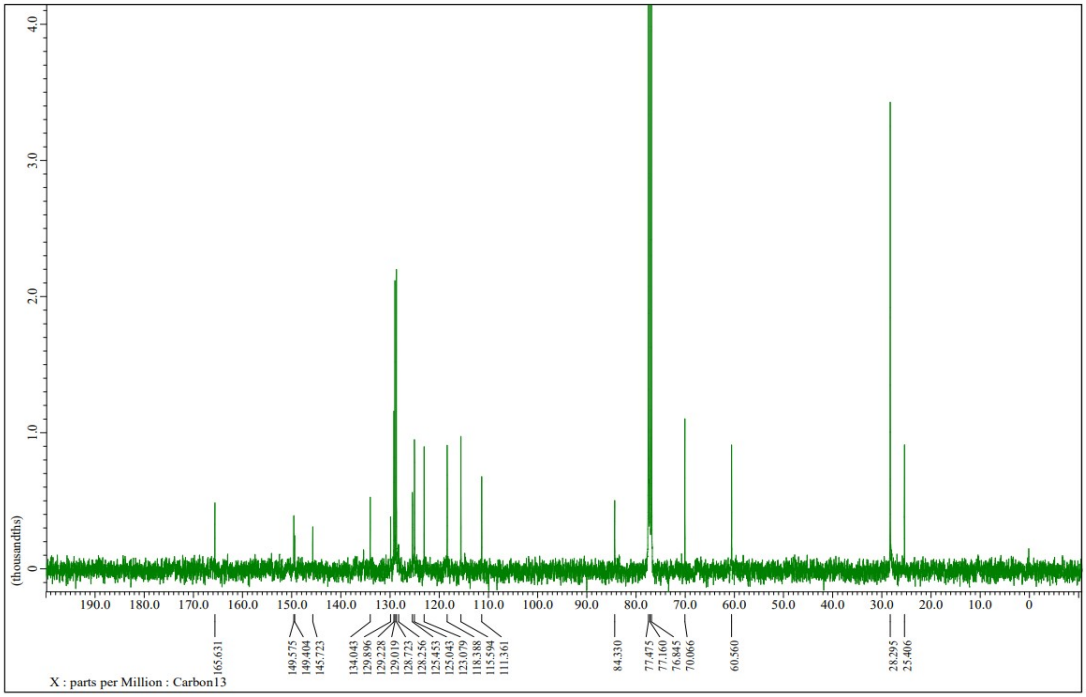


Cbz-1-*t*-butoxycarbonyl-L-tryptophan-NCA(3n)

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

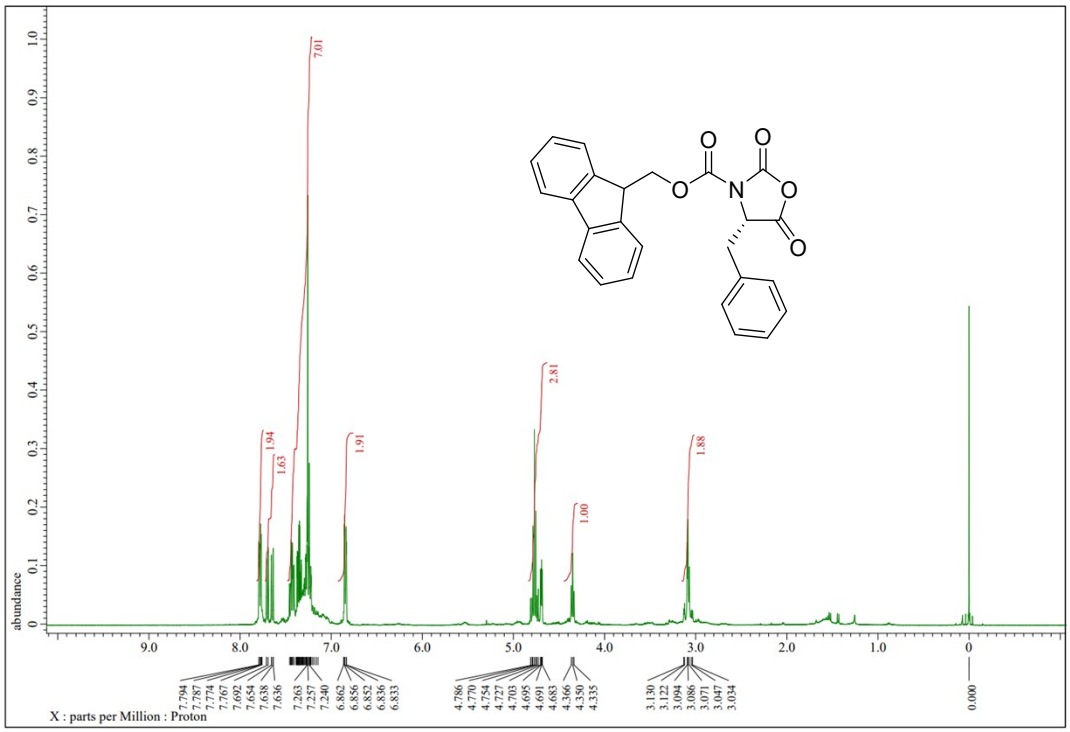


(^{13}C NMR, 100 MHz, $CDCl_3$)

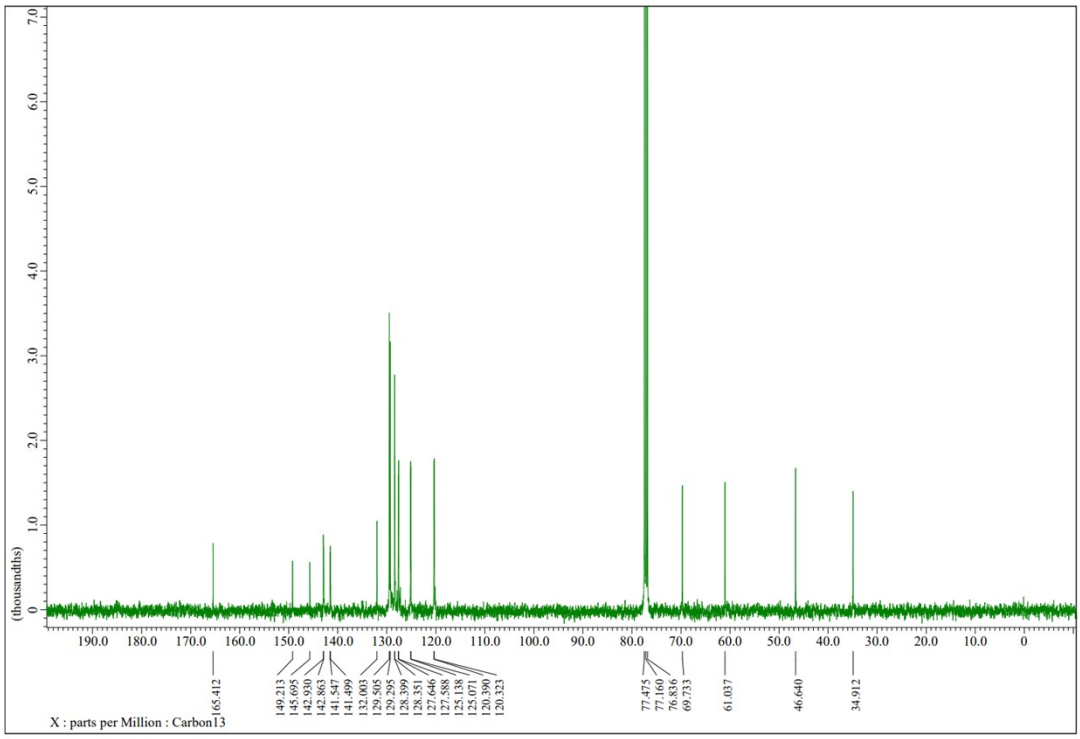


Fmoc-L-phenylalanine-NCA (3p)

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

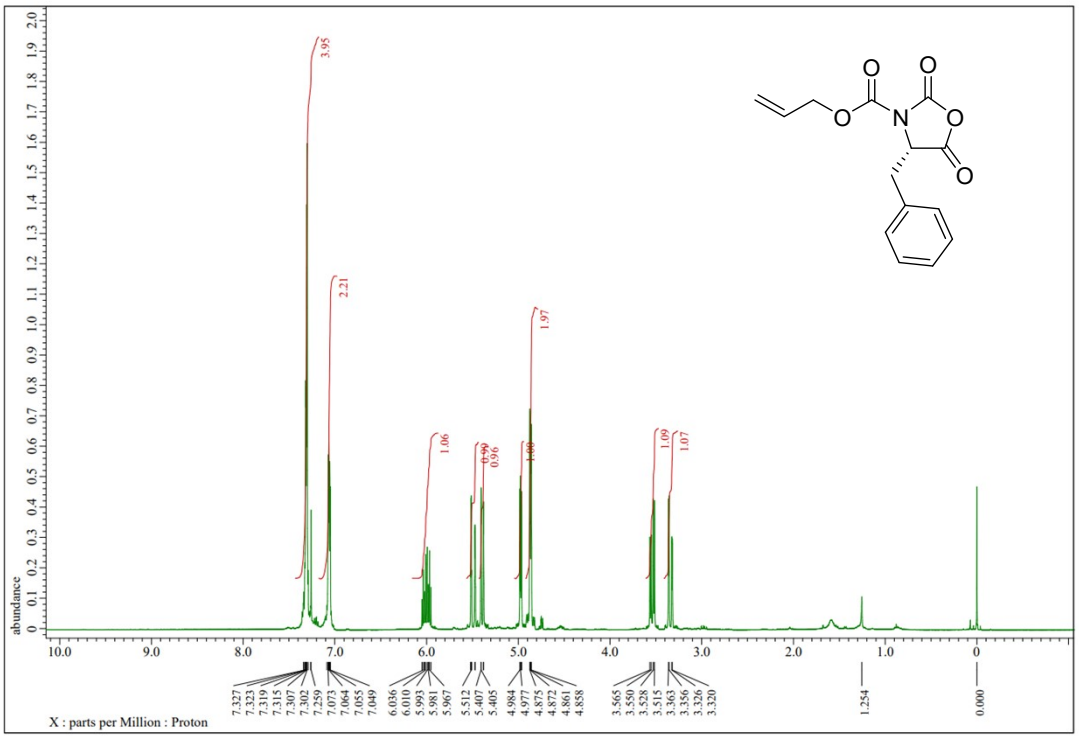


(^{13}C NMR, 100 MHz, $CDCl_3$)

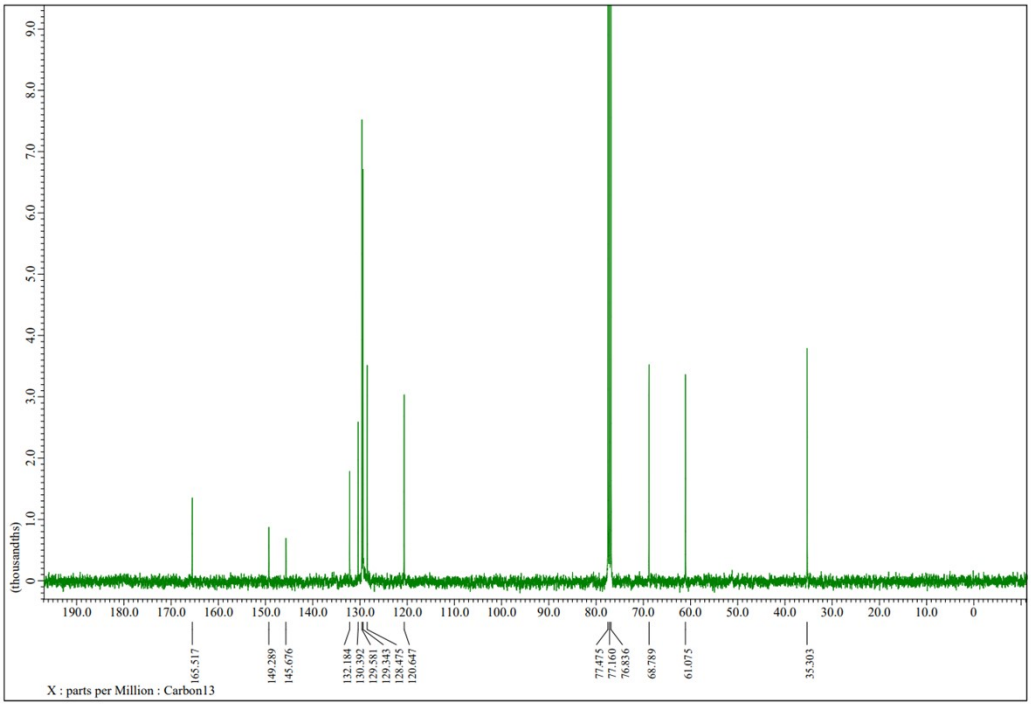


Alloc-L-phenylalanine-NCA (3q)

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

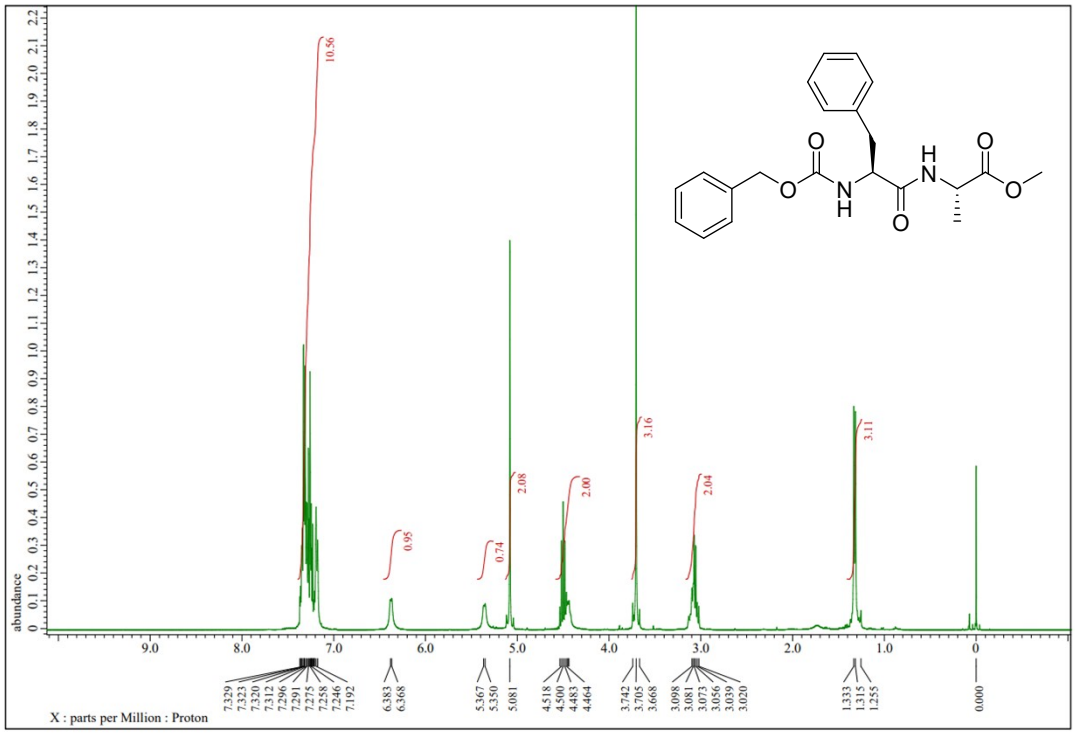


(^{13}C NMR, 100 MHz, $CDCl_3$)

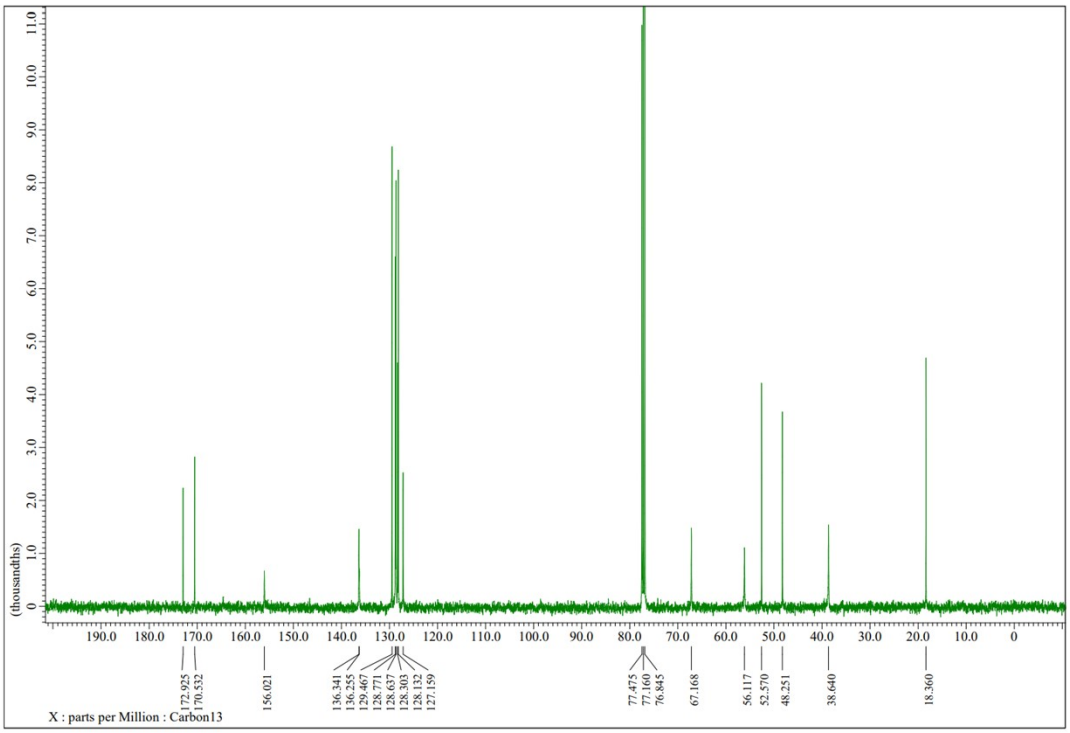


Cbz-L-Phe-L-Ala methyl ester (7a)

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

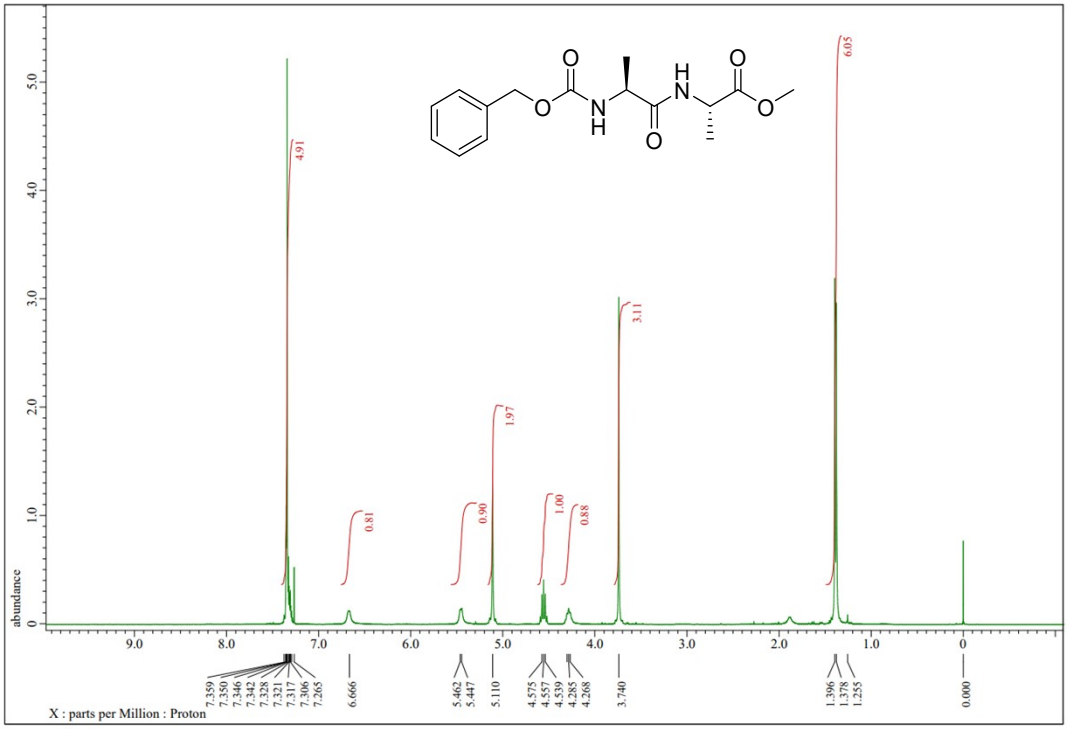


(^{13}C NMR, 100 MHz, $CDCl_3$)

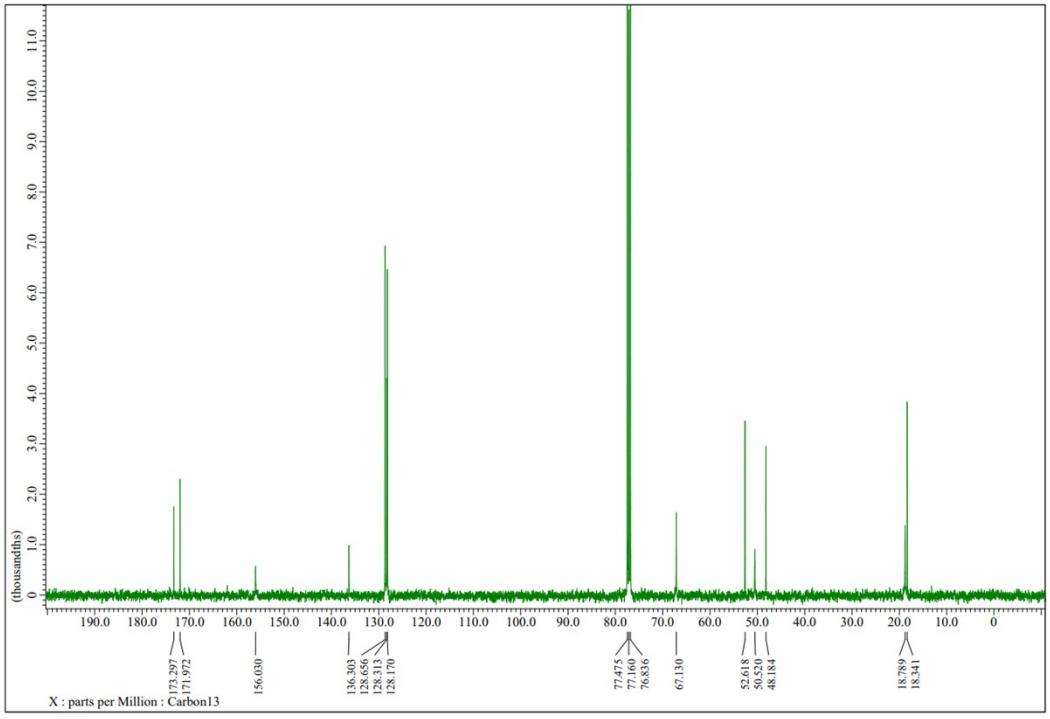


Cbz-L-Ala-L-Ala methyl ester (7c)

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

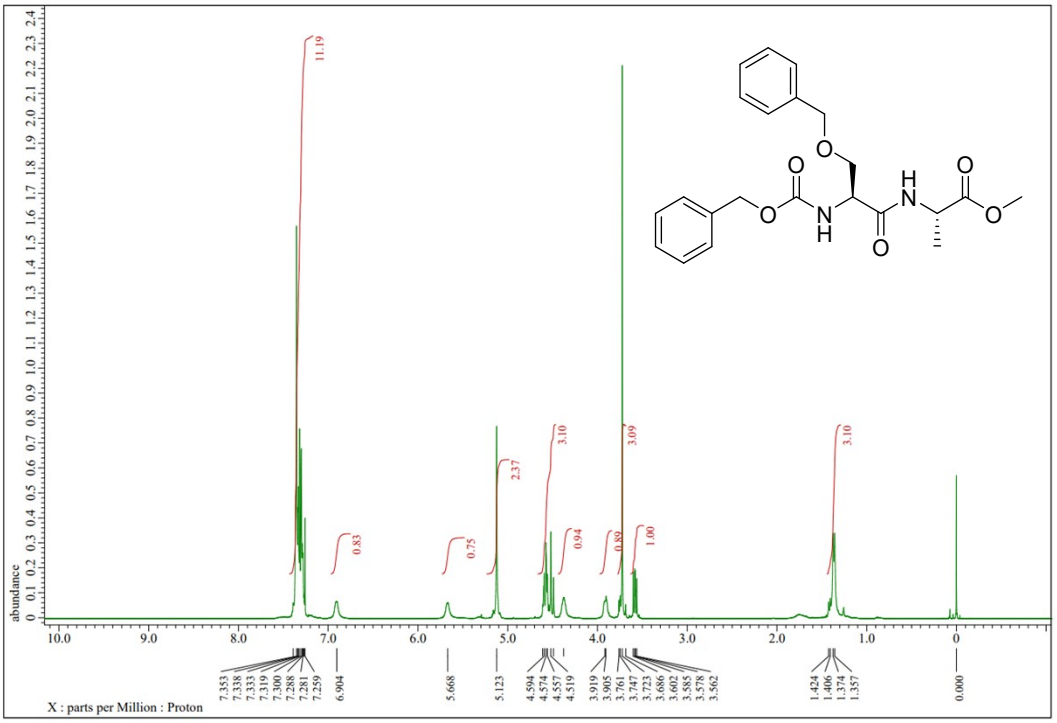


(^{13}C NMR, 100 MHz, $CDCl_3$)

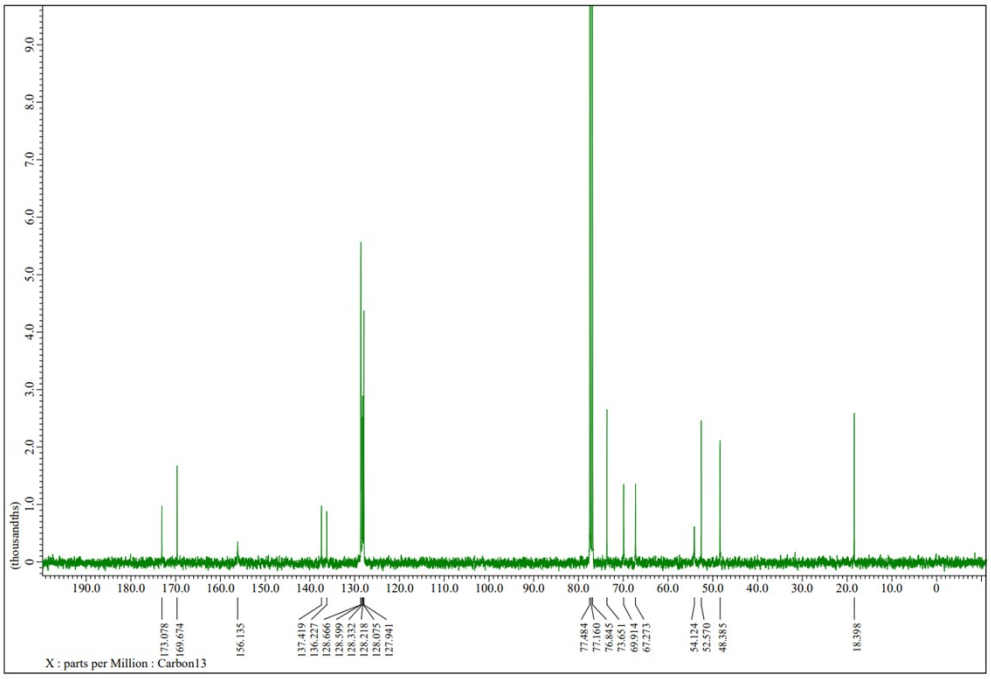


Cbz-L-Ser(Bn)-L-Ala methyl ester (7d)

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

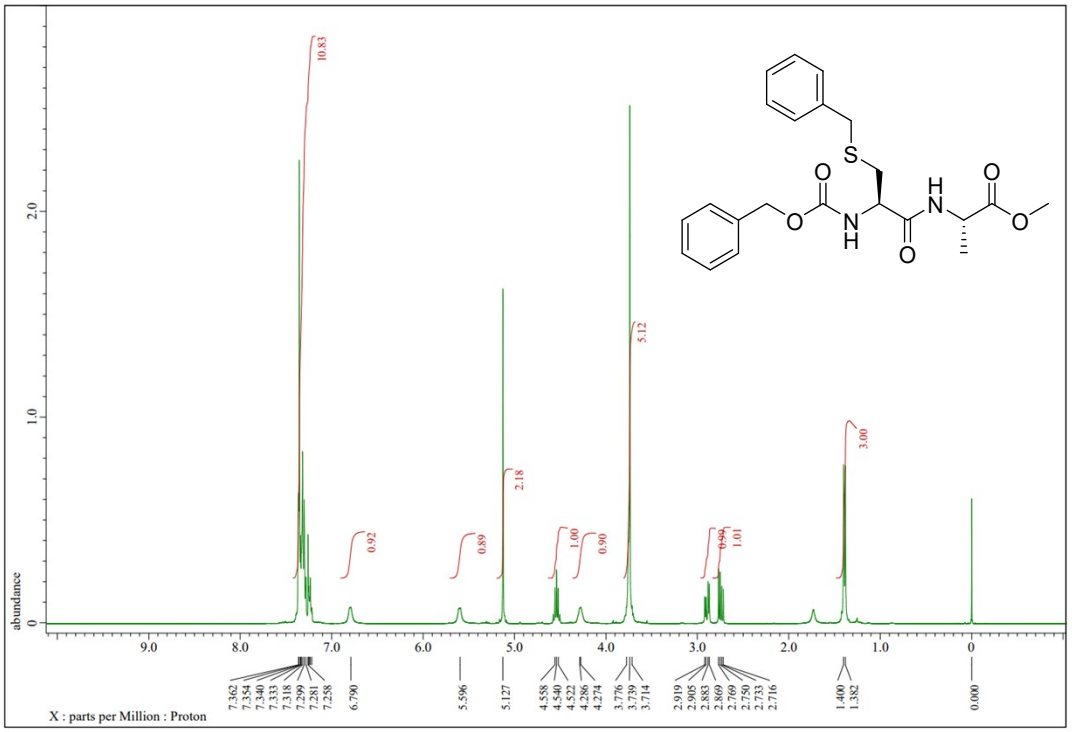


(^{13}C NMR, 100 MHz, $CDCl_3$)

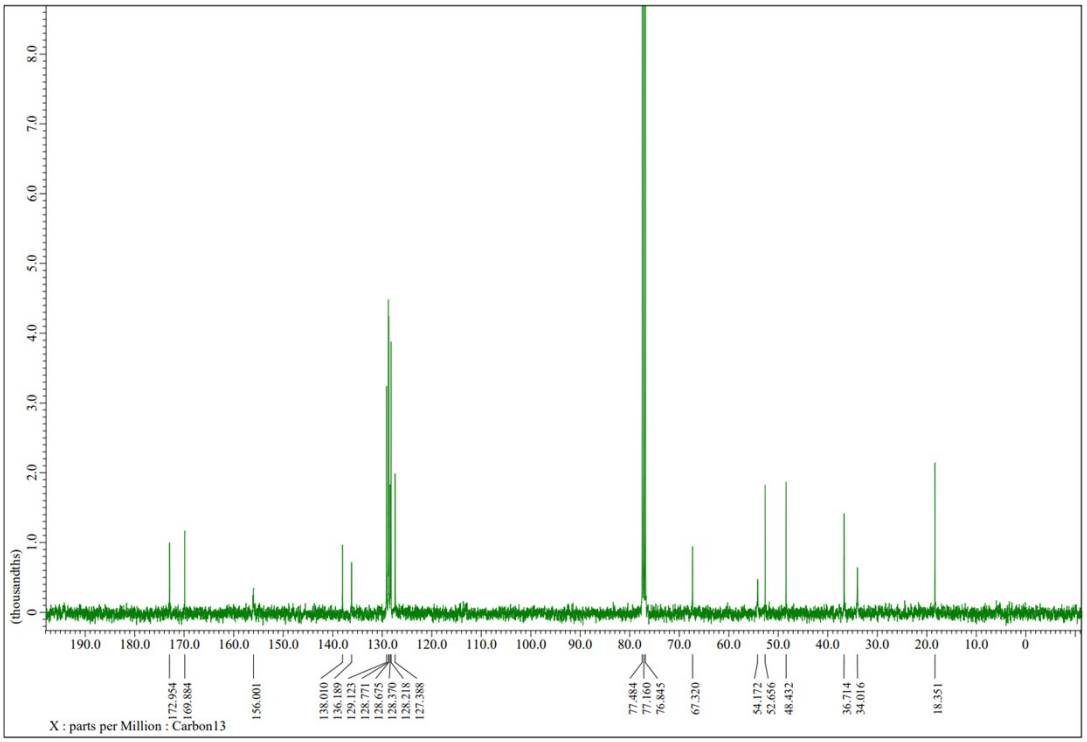


Cbz-L-Cys(Bn)-L-Ala methyl ester (7e)

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

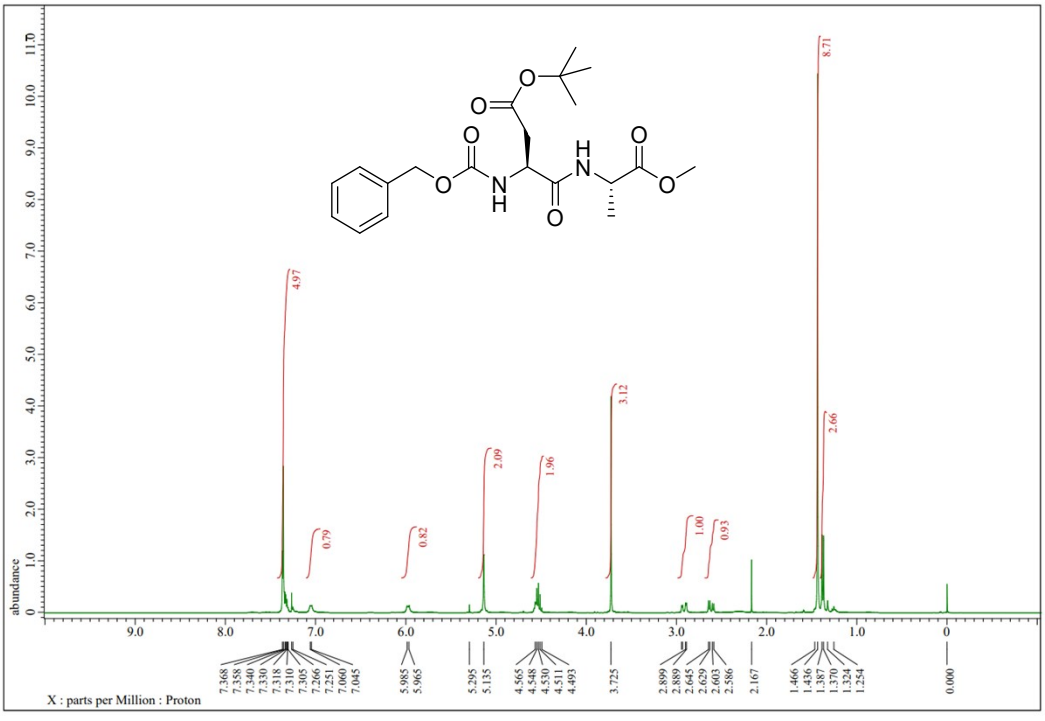


(^{13}C NMR, 100 MHz, $CDCl_3$)

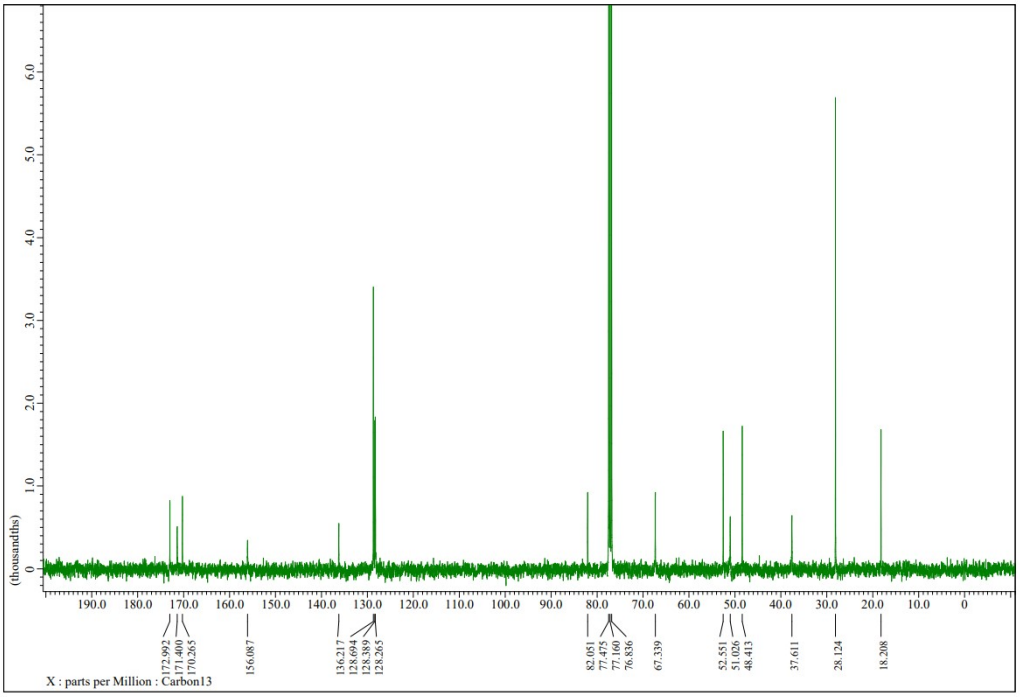


Cbz-L-Asp(O*t*-Bu)-L-Ala methyl ester (7f)

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

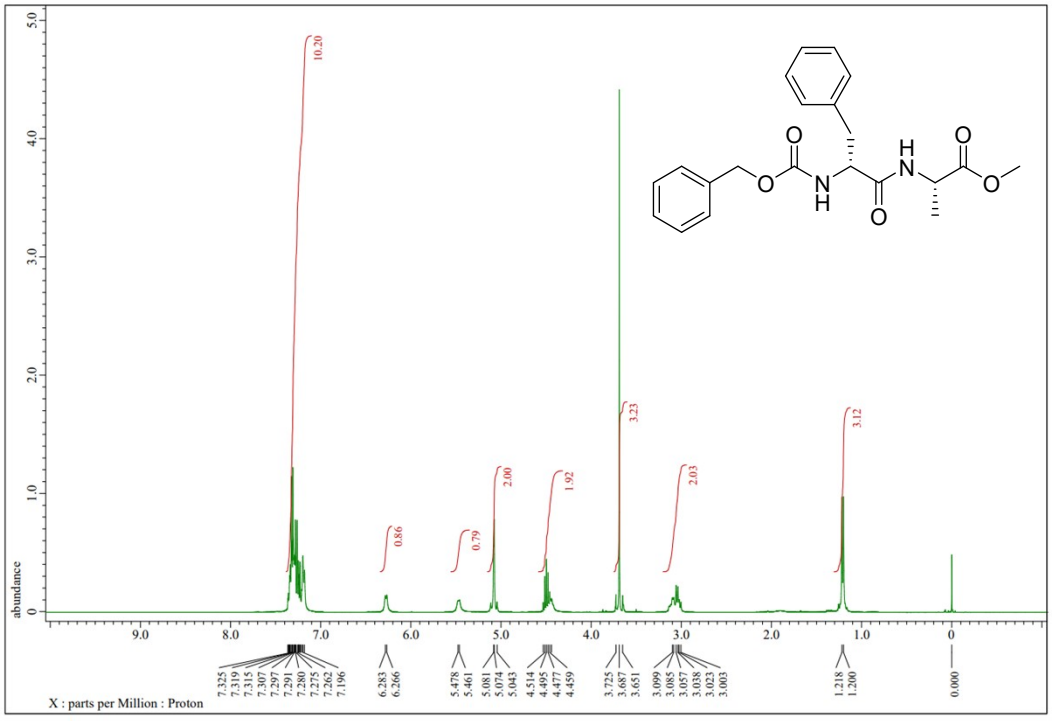


(^{13}C NMR, 100 MHz, $CDCl_3$)

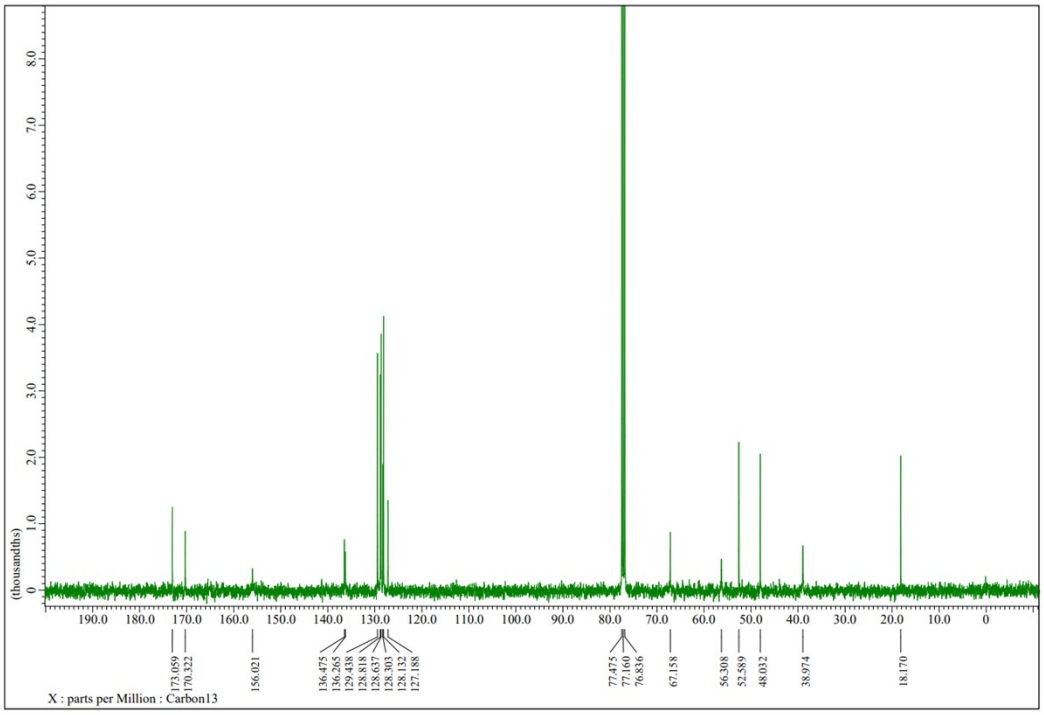


Cbz-D-Phe-L-Ala methyl ester (epi-7a)

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

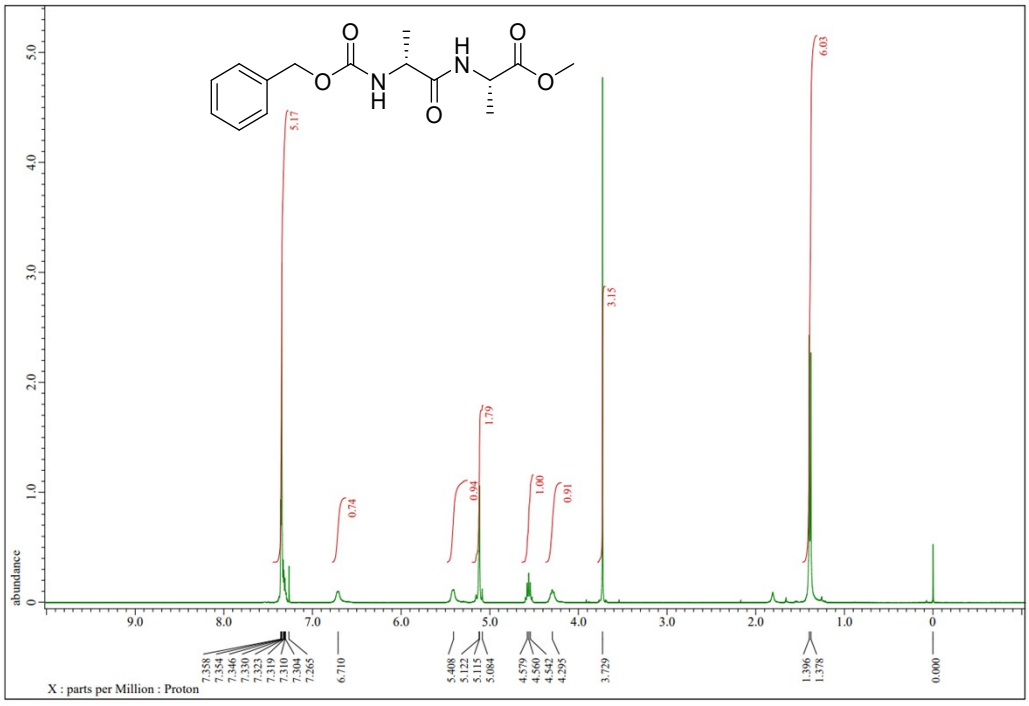


(^{13}C NMR, 100 MHz, $CDCl_3$)

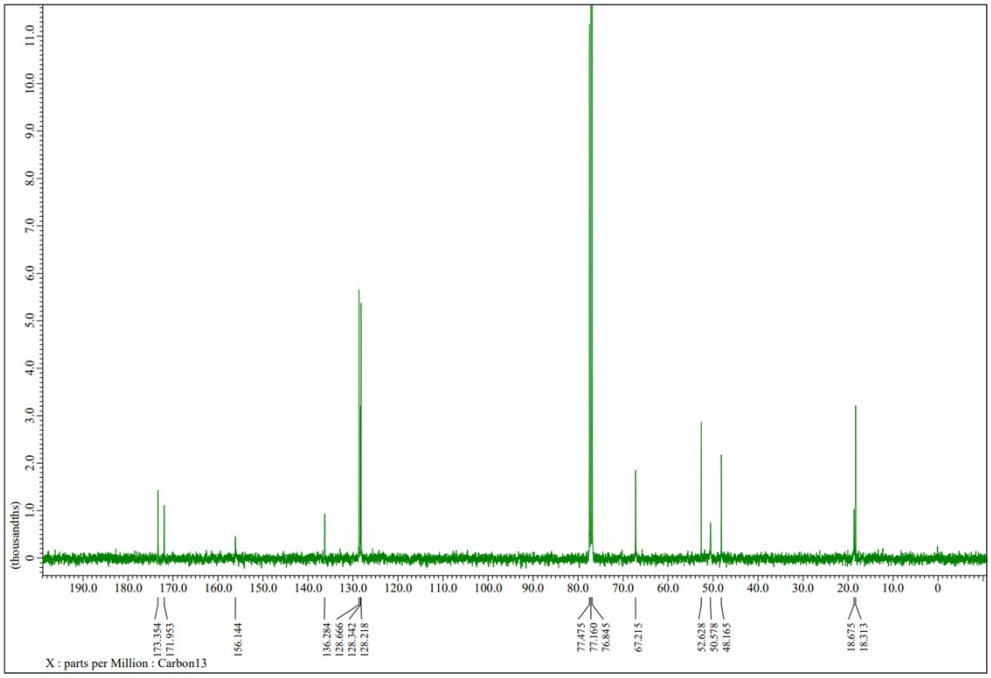


Cbz-D-Ala-L-Ala methyl ester (epi-7c)

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

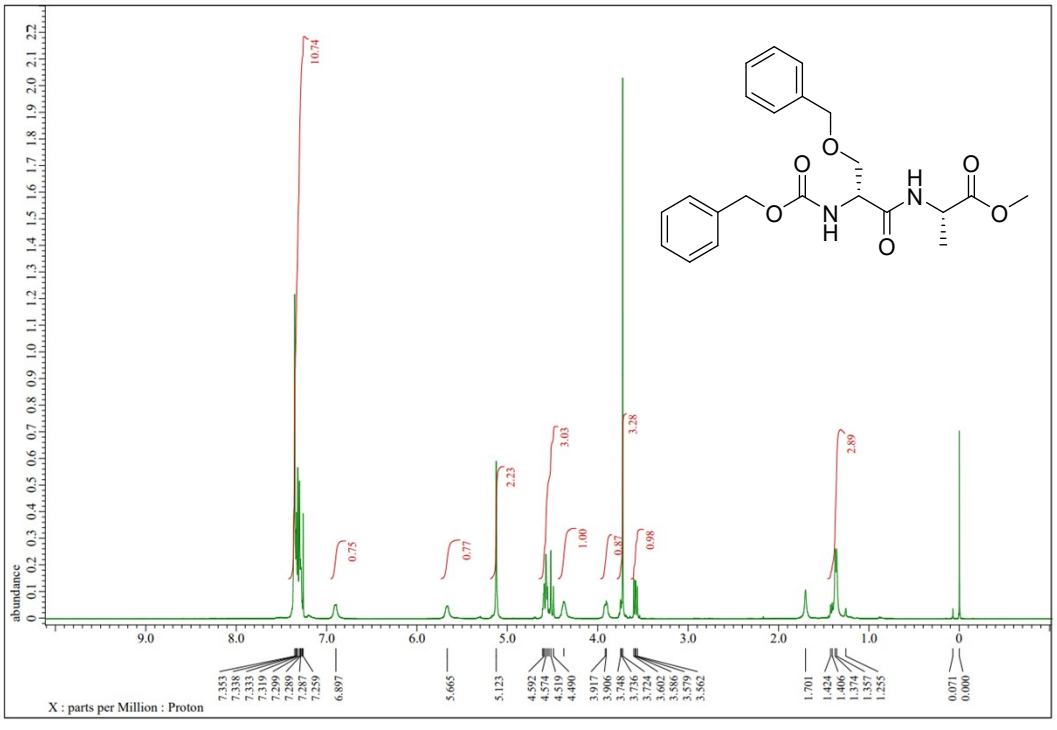


(^{13}C NMR, 100 MHz, $CDCl_3$)

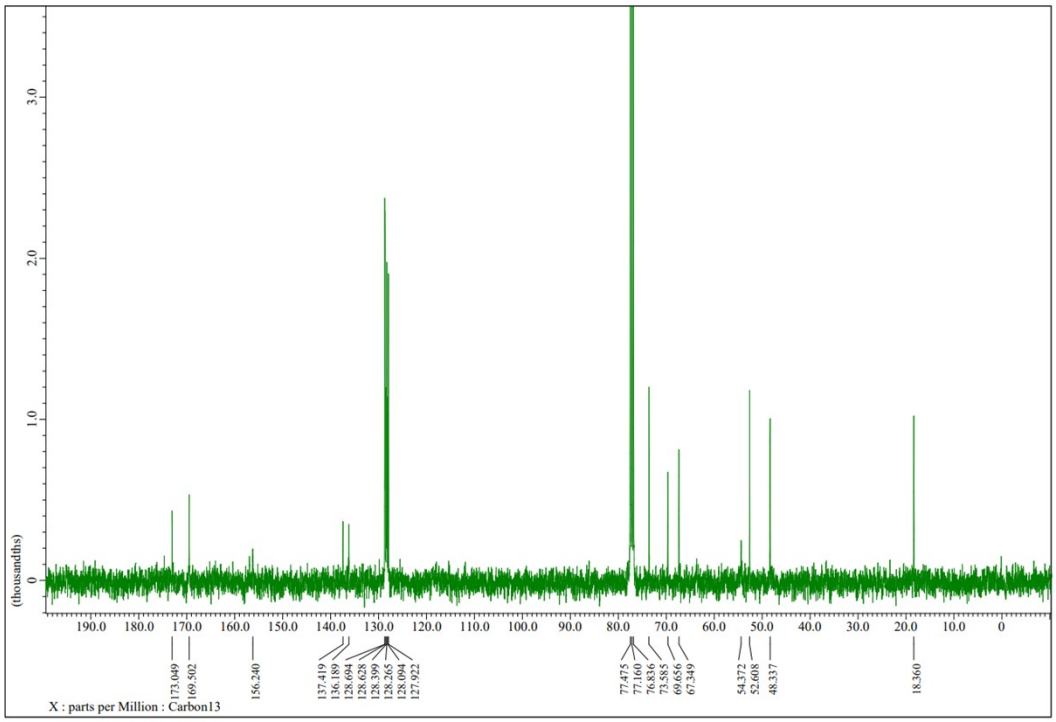


Cbz-D-Ser(Bn)-L-Ala methyl ester (epi-7d)

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

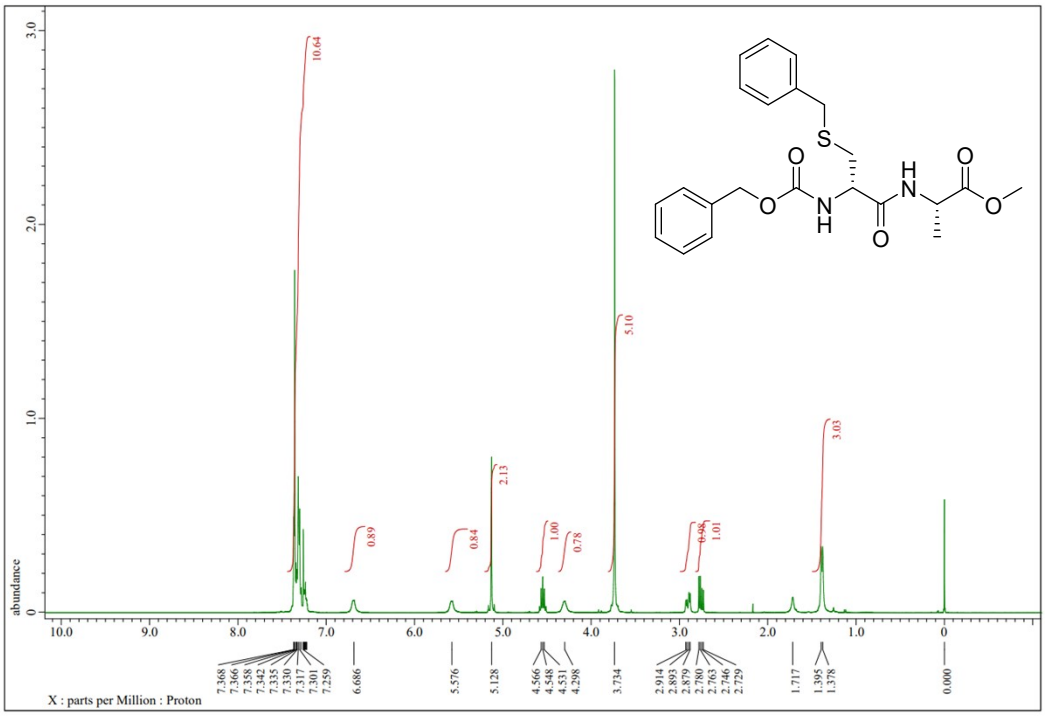


(^{13}C NMR, 100 MHz, $CDCl_3$)

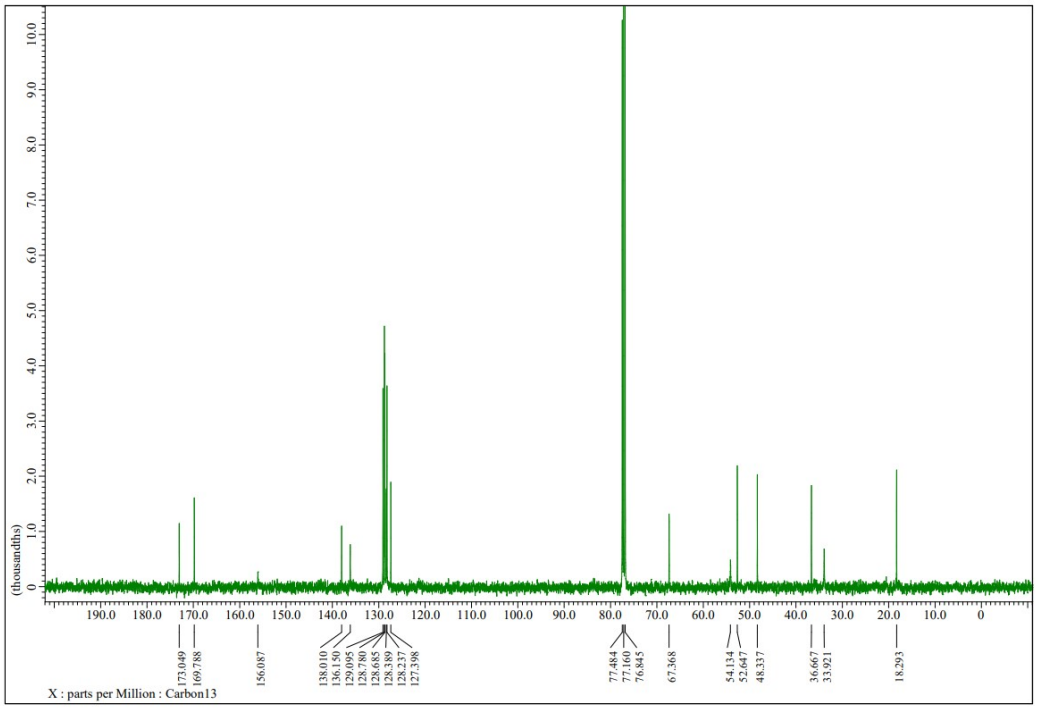


Cbz-D-Cys(Bn)-L-Ala methyl ester (epi-7e)

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

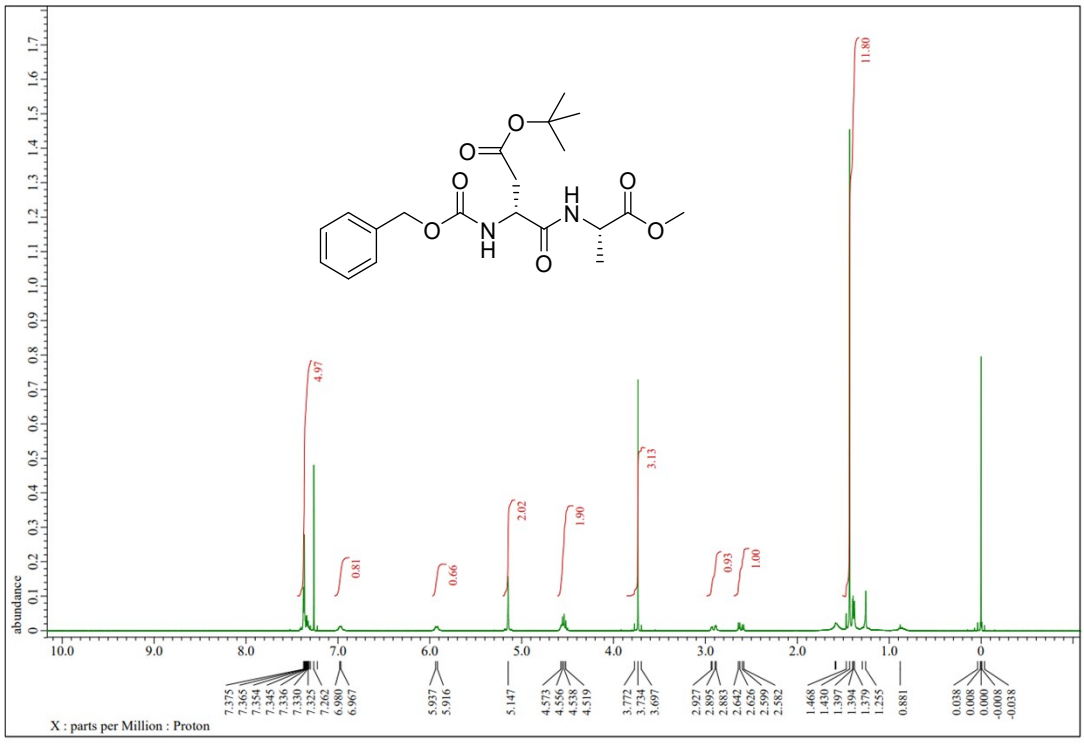


(^{13}C NMR, 100 MHz, $CDCl_3$)

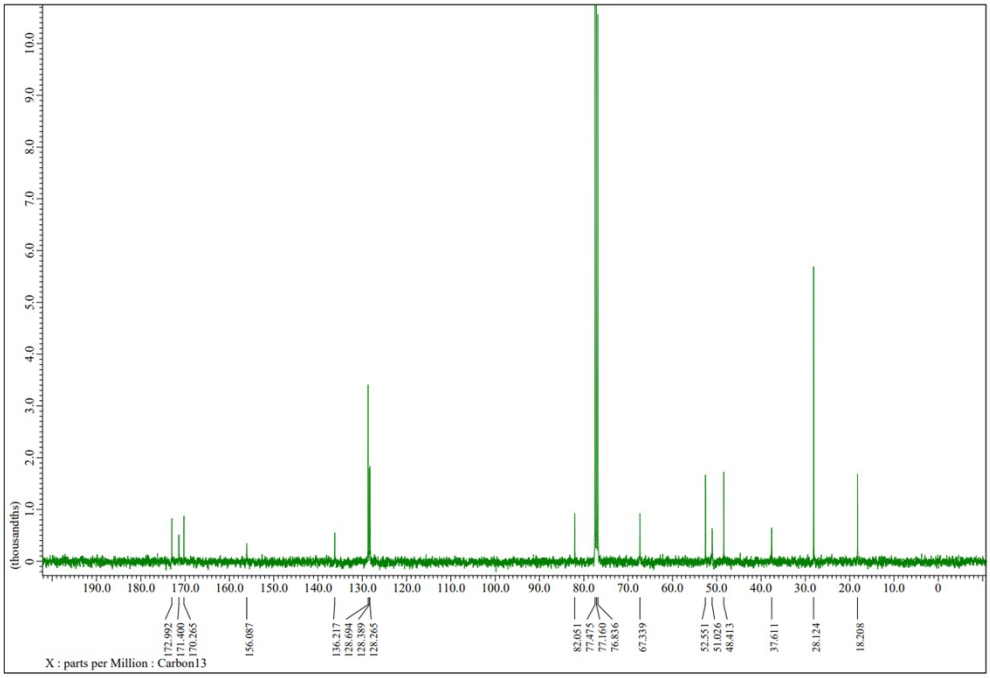


Cbz-D-Asp(O*t*-Bu)-L-Ala methyl ester (epi-7f)

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

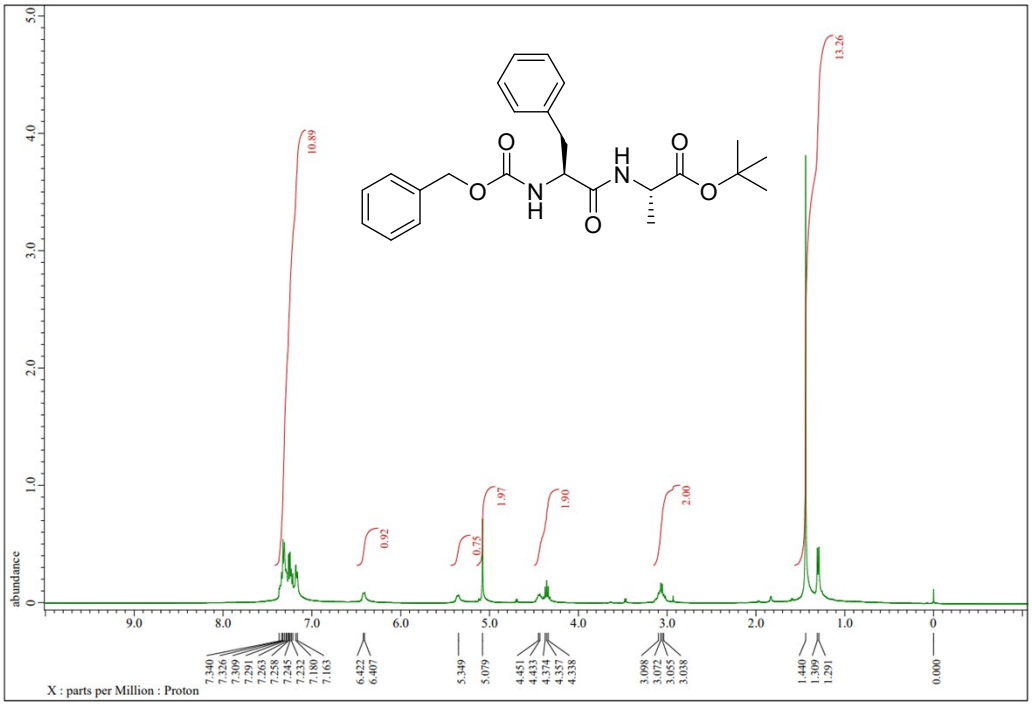


(^{13}C NMR, 100 MHz, $CDCl_3$)

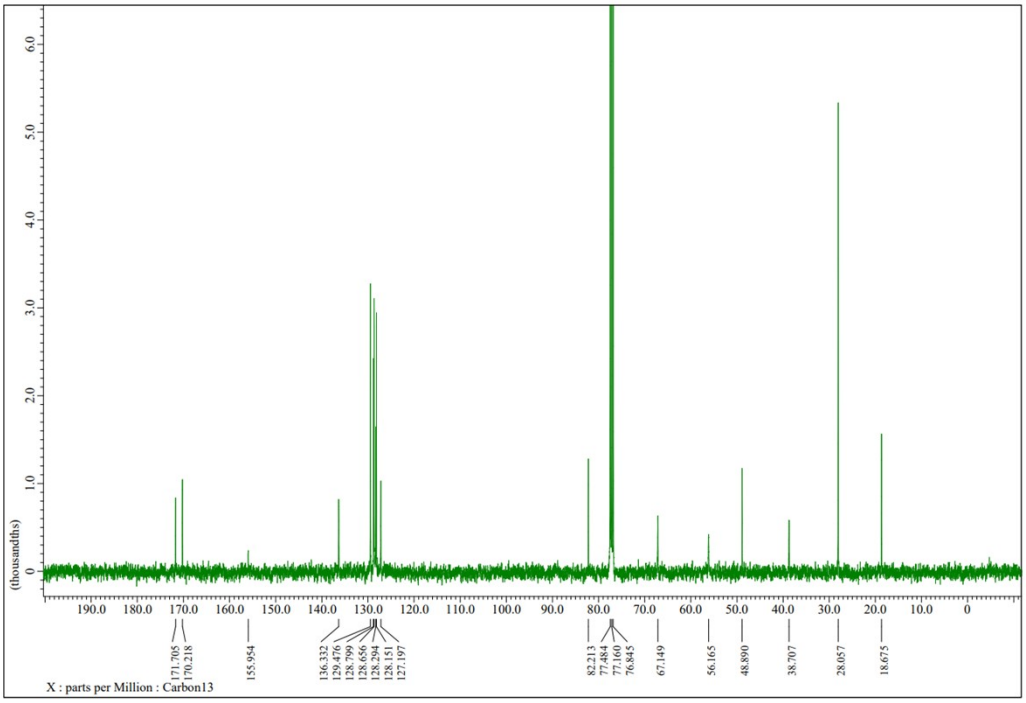


Cbz-L-Phe-L-Ala *t*-butyl ester (6a)

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

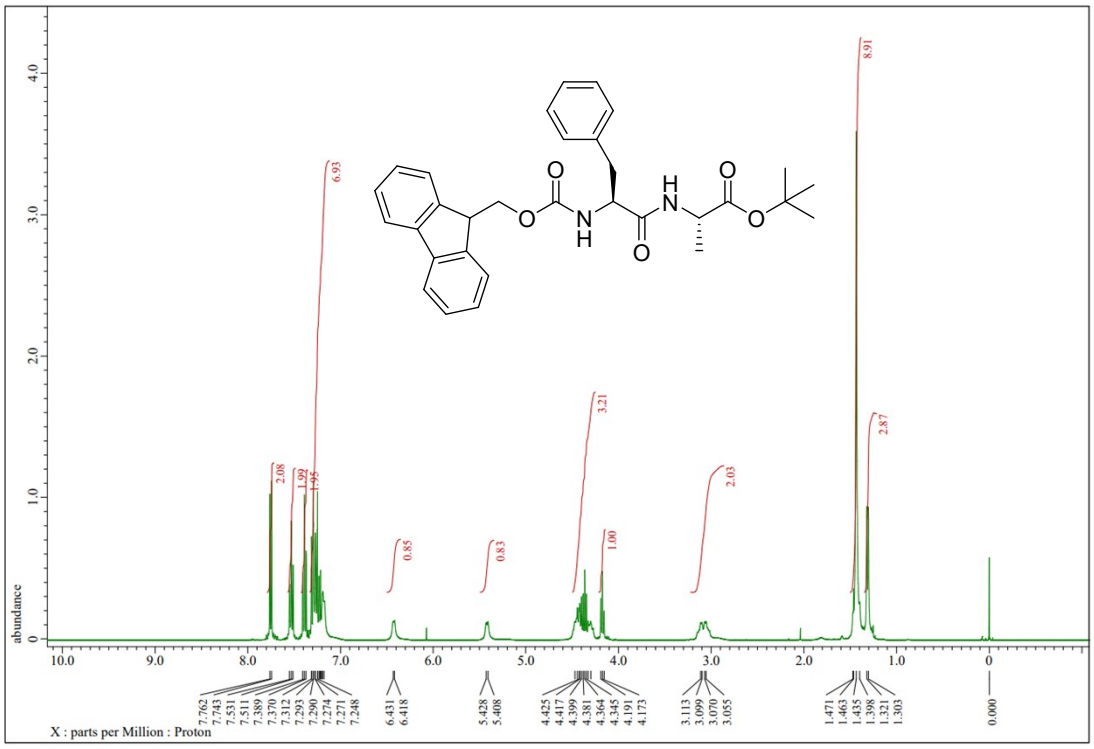


(^{13}C NMR, 100 MHz, $CDCl_3$)



Fmoc-L-Phe-L-Ala methyl ester (6b)

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



(^{13}C NMR, 100 MHz, $CDCl_3$)