Supporting Information

FACILE SYNTHESIS OF 5- to 7-MEMBERED BENZOLACTAM COMPOUNDS VIA STRONGLY FACILITATED ELECTROPHILIC AROMTIC SUBSTITUTION REACTION†

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†Dedicated to Professor Dr. Lutz F. Tietze on the occasion of his 75th Birthday

EXPERIMENTAL DETAILS

I. General methods

Melting points were determined with a Yanaco micro melting point apparatus without correction. ^{1}H (400 MHz) – and ^{13}C (100 MHz) -NMR spectra were recorded on a Bruker Avance400. Chemical shifts were calibrated with tetramethylsilane as an internal standard or with the solvent peak, and are shown in ppm values, and coupling constants are shown in hertz (Hz). The following abbreviations are used: s = singlet, d = doublet, t = triplet, q = quartet, dd = double doublet, ddd = doublet of double doublet, dt = double triplet, dq = double quartet, h = heptet, m = multiplet, and brs = broad singlet. The NMR spectra are measured at 25 ºC if not mentioned. Electron spray ionization time-of-flight mass spectra (ESI-TOF MS) were recorded on a Bruker micrOTOF-05 to give high-resolution mass spectra (HRMS). All of the trifluoromethanesulfonic acid promoted cyclization reactions were performed using heat gun-dried or oven-dried glassware. Trifluoromethanesulfonic acid (TfOH) was dried with trifluoromethanesulfonic acid anhydride and purified with vacuum distillation prior to use. Other commercially available compounds and solvents were used as received. All microwave reactions were carried out in a single-mode microwave (Biotage Initiator™ Eight Synthesizer programmed to heat constantly at the specified power). Reaction temperatures were determined using the built-in, on-line IR-sensor.

II. Synthesis of substrates

Synthesis of dimethyl 2,2'-(carbonylbis(oxy))dibenzoate

This compound was synthesized according to our previous literature (see reference 13).

Substrates:

Typical Procedure of the Synthesis of Carbamoyl Salicylates: Synthesis of methyl 2-((benzylcarbamoyl)oxy)benzoate (1a)

A solution of benzylamine (386 mg, 3.14 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (1009 mg, 3.06 mmol) in tetrahydrofuran (10 mL) was stirred at 20 ºC for 2 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : dichloromethane = 1 : 10) to afford methyl 2-((benzylcarbamoyl)oxy)benzoate (770 mg, 2.70 mmol, 88% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))) as white powder.

Mp. 74.0 - 75.0 ºC (colorless needles, recrystallized from EtOAc/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25ºC), δ (ppm): 7.94 (dd, J = 7.6, 0.8 Hz, 1H, rotamer A and B), 7.50 (ddd, J = 8.0, 8.0, 2.0 Hz, 1H, rotamer A and B), 7.36 - 7.23 (m, 6 H, rotamer A and B), 7.14 (d, J = 8.0 Hz, 1H, rotamer A and B), 5.68 (brs, 0.9H, rotamer A), 5.38 (brs, 0.1H, rotamer B), 4.53 (brs, 0.2H, rotamer B), 4.41 (d, J = 6.4 Hz, 1.8H, rotamer A) 3.75 (s, 3H, rotamer A and B).^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 154.4, 150.5, 138.1, 133.4, 131.4, 128.5, 127.6, 127.4, 125.5, 124.0, 123.9, 51.9, 45.2. ESI-HRMS: Calcd for $C_{16}H_{15}NNaO_4^+$ $[M+Na]^+$: 308.08933. Found: 308.09035.

Synthesis of methyl 2-((benzyl(methyl)carbamoyl)oxy)benzoate (1b)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate**)**. 98% Yield.

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 8.00-7.97 (m, 1H, rotamer A and B), 7.55-7.50 (m, 1H, rotamer A and B), 7.39-7.14 (m, 7H, rotamer A and B), 4.71 (s, 0.8H, rotamer B), 4.56 (s, 1.2H, rotamer A), 3.81 (s, 1.2H, rotamer B), 3.78 (s, 1.8H, rotamer A), 3.07 (s, 1.8H, rotamer A), 2.98 (s, 1.2H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.2, 155.0, 154.3, 151.2, 151.0, 137.0, 133.5, 131.5, 128.6, 128.5, 128.0, 127.5, 127.4, 125.4, 124.2, 124.0, 123.8, 123.7, 52.8, 51.9, 34.4, 34.0. ESI-HRMS: Calcd for $C_{17}H_{17}NNaO_4^+$ $[M+Na]^+$: 322.10498. Found: 322.10656. Anal. Calcd. for $C_{17}H_{17}NO_4$: C, 68.21; H, 5.72; N, 4.68. Found: C, 68.12; H, 5.85; N, 4.75.

Synthesis of methyl 2-((dibenzylcarbamoyl)oxy)benzoate (1c)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate**)**. 69% Yield.

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 8.00 (dd, J = 7.6, 1.6 Hz, 1H), 7.54 (ddd, J = 7.6, 7.2, 1.6 Hz, 1H), 7.40-7.27 (m, 11H), 7.18 (dd, J = 8.0, 1.2 Hz, 1H), 4.64 (s, 2H), 4.52 (s, 2H), 3.77 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.4, 155.0, 151.0, 137.0, 136.9, 133.5, 131.6, 128.64, 128.56, 128.4, 127.8, 127.54, 127.51, 125.6, 124.1, 124.0, 52.0, 49.7, 49.5. ESI-HRMS: Calcd for $C_{23}H_{21}NNaO_4^+$ $[M+Na]^+$: 398.13628. Found: 398.13501.

Synthesis of methyl 2-((benzyl(isopentyl)carbamoyl)oxy)benzoate (1d)

N-isopentylbenzamide was synthesized according to the literature. (reference15)

A solution of *N*-isopentylbenzamide (868 mg, 4.54 mmol) and lithium aluminum hydride (348 mg, 9.16 mmol) in tetrahydrofuran (20 mL) was stirred at 60 ºC for 3 hrs. Then the reaction solution was cooled to 0ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and evaporated to give crude oil. The crude oil was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 2) to afford *N*-benzyl-3-methylbutan-1-amine as colorless oil (747 mg, 4.21 mmol, 93% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.32-7.21 (m, 5H), 3.78 (s, 2H), 2.64 (t, J = 7.2 Hz, 2H), 1.66-1.58 (m, 1H), 1.43-1.38 (m, 2H), 1.20 (brs, 1H), 0.88 (d, J = 6.4 Hz, 6H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 140.6, 128.3, 128.1, 126.8, 54.2, 47.6, 39.2, 26.1, 22.7. ESI-HRMS: Calcd for $C_{12}H_{20}N^+$ $[M+H]^+$: 178.15903. Found: 178.15991.

A solution of *N*-benzyl-3-methylbutan-1-amine (583 mg, 3.29 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (732 mg, 2.22 mmol) in tetrahydrofuran (6.0 mL) was stirred at 50 ºC for 12 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6) to afford methyl 2-((benzyl(isopentyl)carbamoyl)oxy)benzoate (564 mg, 1.59 mmol, 72% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed (approximately 1 : 1 ratio at 25 ºC), δ (ppm): 7.99-7.96 (m, 1H), 7.56-7.48 (m, 1H), 7.40-7.24 (m, 6H), 7.17 (d, J = 8.0 Hz, 0.5H), 7.12 (d, J = 8.0 Hz, 0.5H), 4.71 (s, 1H), 4.55 (s, 1H), 3.82 (s, 1.4H), 3.78 (s, 1.6H), 3.41 (t, J = 7.6 Hz, 1H), 3.33 (t, J = 7.6 Hz, 1H), 1.65-1.49 (m, 3H), 0.91-0.89 (m, 6H). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.39, 165.35, 154.9, 154.2, 151.1,

151.0, 137.6, 137.5, 133.39, 133.37, 131.49, 131.45, 128.53, 128.46, 128.1, 127.5, 127.40, 127.35, 125.4, 125.3, 124.09, 124.05, 124.0, 52.0, 50.63, 50.55, 45.7, 45.1, 36.8, 36.1, 25.9, 25.8, 22.5. ESI-HRMS: Calcd for $C_{21}H_{25}NNaO_4^+$ $[M+Na]^+$: 378.16758. Found: 378.16593. Anal. Calcd. for $C_{21}H_{25}NO_4$: C, 70.96; H, 7.09; N, 3.94. Found: C, 70.98; H, 7.11; N, 4.01.

Synthesis of methyl 2-((benzyl(cyclobutyl)carbamoyl)oxy)benzoate (1e)

A stirring solution of cyclobutanamine (457 mg, 6.42 mmol), triethylamine (0.70 mL) in dichloromethane (10 mL) was added benzoyl chloride (0.60 mL, 5.2 mmol) at 0 ºC. The reaction mixture was stirred under air for 10 min at 20 ºC. Then the solution was diluted with 30 mL of dichloromethane and the whole was washed with aqueous hydrogen chloride (1M, 5mL), aqueous sodium carbonate (2M, 5 mL) and brine (5 mL). The organic phase was dried over sodium sulfate and the solvent was removed under reduced pressure to afford *N*-cyclobutylbenzamide (891 mg, 5.09 mmol, 98% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.77-7.75 (m, 2H), 7.49-7.45 (m, 1H), 7.40-7.38 (m, 2H), 6.53 (br, 1H), 4.63-4.53 (m, 1H), 2.44-2.37 (m, 2H), 2.02-1.92 (m, 2H), 1.78-1.70 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 166.6, 134.6, 131.2, 128.4, 126.9, 45.1, 31.2, 15.1. ESI-HRMS: Calcd for $C_{11}H_{13}NNaO^+$ $[M+Na]^+$: 198.08894. Found: 198.08622.

A solution of *N*-cyclobutylbenzamide (634 mg, 3.62 mmol) and lithium aluminum hydride (303 mg, 7.99 mmol) in tetrahydrofuran (20 mL) was stirred at 60 ºC for 5 hrs. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil, which contains *N*-benzylcyclobutanamine (569.2 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.32-7.22 (m, 5H), 3.70 (s, 2H), 3.34-3.26 (m, 1H), 2.25-2.18 (m, 2H), 1.75-1.59 (m, 4H), 1.36 (brs, 1h). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 140.5, 128.3, 128.2, 126.8, 53.6, 51.1, 31.2, 14.8. ESI-HRMS: Calcd for $C_{11}H_{16}N^+$ $[M+H]^+$: 162.12773. Found: 162.12434.

A solution of *N*-benzylcyclobutanamine (437 mg, 2.71 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (748 mg, 2.26 mmol) in tetrahydrofuran (5.3 mL) was stirred at 50 ºC for 15 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6) to afford methyl 2-((benzyl(cyclobutyl)carbamoyl)oxy)benzoate (595 mg, 1.75 mmol, 78% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))) as colorless oil.

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed (approximately 1 : 1 ratio at 25 ºC), δ (ppm): 7.95 (brs, 1H), 7.52-7.34 (m, 1H), 7.34 (s, 4H), 7.30 (brs, 2H), 7.16 (d, J = 7.6 Hz, 0.5H), 7.01 (d, J = 7.6 Hz, 0.5H), 4.76 (s, 1H), 4.64 (s, 1H), 4.53-4.51 (m, 1H), 3.81 (s, 3H), 2.81-

2.16 (m, 4H), 1.70-1.55 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.3, 154.9, 154.0, 151.0, 150.8, 138.8, 133.3, 131.4, 128.4, 127.0, 126.9, 126.4, 125.3, 124.0, 52.1, 52.0, 51.7, 47.8, 29.4, 28.5, 14.7. ESI-HRMS: Calcd for $C_{20}H_{21}NNaO_4^+$ $[M+Na]^+$: 362.13628. Found: 362.13474. Anal. Calcd. for $C_{20}H_{21}NO_4$: C, 70.78; H, 6.24; N, 4.13. Found: C, 70.87; H, 6.41; N, 4.21.

Synthesis of methyl 2-(((4-methoxybenzyl)(methyl)carbamoyl)oxy)benzoate (1f)

A solution of methyl 4-methoxybenzylcarbamate (600 mg, 3.07 mmol) and lithium aluminum hydride (239 mg, 6.30 mmol) in tetrahydrofuran (20 mL) was stirred at 60 ºC for 13 hrs. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil (389 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.26-7.21 (m, 2H), 6.88-6.84 (m, 2H), 3.80 (3H), 3.68 (s, 2H), 2.44 (s, 3H), 1.37 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 158.6, 132.4, 129.3, 113.7, 55.5, 55.2, 35.9. ESI-HRMS: Calcd for $C_9H_{14}NO^+$ $[M+H]^+$: 152.10699. Found: 152.10710.

A solution of 1-(4-methoxyphenyl)-*N*-methylmethanamine (376 mg, 2.48 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (643 mg, 1.95 mmol) in tetrahydrofuran (6.0 mL) was stirred at room temperature 4 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4) to afford methyl 2-(((4-methoxybenzyl)(methyl)carbamoyl)oxy)benzoate (654 mg, quantitative yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))) as colorless oil.

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.98 (d, J = 7.6 Hz, 1H, rotamer A and B), 7.53 (dd, J = 7.6 Hz, 1H, rotamer A and B), 7.33-7.25 (m, 3H, rotamer A and B), 7.19-7.15 (m, 1H, rotamer A and B), 6.92-6.88 (m, 2H, rotamer A and B), 4.64 (s, 0.8H, rotamer B), 4.49 (s, 1.2H, rotamer A), 3.82-3.77 (m, 6H, rotamer A and B), 3.05 (s, 1.8H, rotamer A), 2.95 (s, 1.2H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.3, 165.2, 159.0, 154.9, 154.3, 151.2, 151.1, 133.5, 131.5, 129.4, 129.1, 129.0, 125.4, 124.2, 124.0, 123.8, 123.7, 113.9, 113.9, 55.2, 52.2, 51.9, 34.2, 33.8. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_5^+$ $[M+Na]^+$: 352.11554. Found: 352.11439. Anal. Calcd. for $C_{18}H_{19}NO_5$: C, 65.64; H, 5.81; N, 4.25. Found: C, 65.54; H, 5.99; N, 4.23.

Synthesis of methyl 2-((methyl(2-methylbenzyl)carbamoyl)oxy)benzoate (1g)

To a solution of 1-(bromomethyl)-2-methylbenzene (926 mg, 5.01 mmol) in tetrahydrofuran (5.0 mL),

methylamine (40% solution in methanol) (5.0 mL) was added at room temperature. The reaction mixture was stirred at room temperature for 1 hr. The solvent was removed in vacuo and crude residue was dissolved in ethyl acetate. The solution was washed with aqueous sodium hydroxide (2M) (10 mL), washed with brine (10 mL), dried over sodium sulfate and the solvent was evaporated under reduced pressure to give *N*-methyl-1-(*o*-tolyl)methanamine as colorless oil (483 mg, 3.57 mmol, 71% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.30-7.13 (m, 4H), 3.73 (s, 2H), 2.49 (s, 3H), 2.34 (s, 3H), 1.27 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 138.2, 136.2, 130.2, 128.3, 126.9, 125.8, 53.7, 36.4, 18.9. ESI-HRMS: Calcd for $C_9H_{14}N^+$ $[M+H]^+$: 136.11208. Found: 136.11103.

A solution of *N*-methyl-1-(*o*-tolyl)methanamine (328 mg, 2.42 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (658 mg, 1.99 mmol) in tetrahydrofuran (4.0 mL) was stirred at room temperature for 12 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 3) to afford methyl 2-((methyl(2-methylbenzyl)carbamoyl)oxy)benzoate (591 mg, 1.89 mmol, 95% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.99-7.96 (m, 1H, rotamer A and B), 7.55-7.48 (m, 1H, rotamer A and B), 7.33-7.10 (m, 6H, rotamer A and B), 4.73 (s, 0.8H, rotamer B), 4.56 (s, 1.2H, rotamer A), 3.84 (s, 3H, rotamer A and B), 3.05 (s, 1.8H, rotamer A), 1.2 (s, 1.2 H, rotamer B), 2.34 (s, 3H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.2, 154.7, 154.6, 151.2, 151.1, 136.5, 135.8, 134.8, 134.6, 133.4, 131.4, 130.4, 128.2, 127.4, 127.2, 126.7, 126.1, 126.0, 125.4, 124.2, 124.0, 123.7, 52.0, 50.6, 34.6, 33.8, 19.04, 18.95. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_4^+$ $[M+Na]^+$: 336.12063. Found: 336.12114. Anal. Calcd. for $C_{18}H_{19}NO_4$: C, 68.99; H, 6.11; N, 4.47. Found: C, 68.88; H, 6.25; N, 4.40.

Synthesis of methyl 2-((methyl(4-methylbenzyl)carbamoyl)oxy)benzoate (1h)

To mixture of 1-(bromomethyl)-4-methylbenzene (1052 mg, 5.69 mmol) and methylamine (40% solution in methanol) (10.0 mL) was stirred at room temperature for 30 min. The solvent was removed in vacuo and crude residue was dissolved in dichloromethane. The solution was washed with aqueous sodium hydroxide (2M) (10 mL), washed with brine (10 mL), dried over sodium sulfate and the solvent was evaporated under reduced pressure to give *N*-methyl-1-(*p*-tolyl)methanamine as colorless oil (known compound) (702 mg, 5.19 mmol, 91% yield).

A solution of *N*-methyl-1-(*p*-tolyl)methanamine (702 mg, 5.19 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (1284 mg, 3.89 mmol) in tetrahydrofuran (4.5 mL) was stirred at 50ºC for

24 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4 ~ 1 : 3) to afford methyl 2-((methyl(4-methylbenzyl)carbamoyl)oxy)benzoate (1046 mg, 3.34 mmol, 86% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.98 (d, J = 7.6 Hz, 1H, rotamer A and B), 7.56-7.51 (m, 1H, rotamer A and B), 7.29-7.26 (m, 3H, rotamer A and B), 7.20-7.16 (m, 3H, rotamer A and B), 4.68 (s, 0.8H, rotamer B), 4.52 (s, 1.2H, rotamer A), 3.83 (s, 1.2H, rotamer B), 3.80 (s, 1.8H, rotamer A), 3.06 (s, 1.8H, rotamer A), 2.97 (s, 1.2H, rotamer B), 2.36 (s, 1.2H, rotamer B), 2.35 (s, 1.8H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.3, 155.0, 154.4, 151.2, 151.1, 137.1, 134.0, 133.5, 131.5, 129.3, 129.2, 128.1, 127.6, 125.4, 124.2, 124.0, 123.8, 52.6, 52.0, 34.4, 34.0, 21.1. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_4^+$ $[M+Na]^+$: 336.12063. Found: 336.12031.

Synthesis of methyl 2-(((4-chlorobenzyl)(methyl)carbamoyl)oxy)benzoate (1i)

To a solution of 1-(bromomethyl)-4-chlorobenzene (995 mg, 4.84 mmol) in tetrahydrofuran (5.0 mL), methylamine (40% solution in methanol) (5.0 mL) was added at room temperature. The reaction mixture was stirred at room temperature for 40 min. The solvent was removed in vacuo and crude residue was dissolved in ethyl acetate (50 mL). The solution was washed with aqueous sodium hydroxide (2M) (10 mL), washed with brine (10 mL), dried over sodium sulfate and the solvent was evaporated under reduced pressure to give 1-(4-chlorophenyl)-*N*-methylmethanamine as colorless oil (593 mg, 3.81 mmol, 79% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.30-7.23 (m, 4H), 3.71 (s, 2H), 2.43 (s, 3H), 1.31 (brs 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 138.7, 132.5, 129.4, 128.4, 55.3, 35.9. ESI-HRMS: Calcd for $C_8H_{11}ClN^+$ $[M+H]^+$: 156.05745. Found: 156.05693.

A solution of 1-(4-chlorophenyl)-*N*-methylmethanamine (381 mg, 2.45 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (666 mg, 2.02 mmol) in tetrahydrofuran (4.0 mL) was stirred at 50 ºC for 14 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 3) to afford methyl 2-(((4-chlorobenzyl)(methyl)carbamoyl)oxy)benzoate as colorless oil (567 mg, 1.70 mmol, 84% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 8.00-7.98 (m, 1H, rotamer A and B), 7.56-7.51 (m, 1H, rotamer A and B), 7.37-7.13 (m, 6H, rotamer A and B), 4.68 (s, 0.8H, rotamer B), 4.52 (s, 1.2H,

rotamer A), 3.83 (s, 1.2H, rotamer B), 3.80 (s, 1.8H, rotamer A), 3.07 (s, 1.8H, rotamer A), 2.97 (s, 1.2H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.1, 155.0, 154.3, 151.2, 151.0, 135.6, 133.6, 133.3, 131.5, 129.4, 129.0, 128.74, 128.66, 125.5, 124.1, 124.0, 123.6, 52.2, 51.9, 34.5, 34.1. ESI-HRMS: Calcd for $C_{17}H_{16}ClNNaO_4^+$ $[M+Na]^+$: 356.0660. Found: 356.0647.

Synthesis of methyl 2-(((4-bromobenzyl)(methyl)carbamoyl)oxy)benzoate (1j)

To a solution of 1-(bromomethyl)-4-bromobenzene (991 mg, 3.96 mmol) in tetrahydrofuran (5.0 mL), methylamine (40% solution in methanol) (5.0 mL) was added at room temperature. The reaction mixture was stirred at room temperature for 30 min. The solvent was removed in vacuo and crude residue was dissolved in ethyl acetate. The solution was washed with aqueous sodium hydroxide (2M) (10 mL), washed with brine (10 mL), dried over sodium sulfate and the solvent was evaporated under reduced pressure to give 1-(4-bromophenyl)-*N*-methylmethanamine as colorless oil (623 mg, 3.12 mmol, 79% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.46-7.43 (m, 2H), 7.19 (d, J = 8.4 Hz, 2H), 3.70 (s, 2H), 2.44 (s, 3H), 1.32 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 139.2, 131.4, 129.8, 120.7, 55.4, 36.0. ESI-HRMS: Calcd for $C_8H_{11}BrN^+$ $[M+H]^+$: 200.00694. Found: 200.00711.

A solution of 1-(4-bromophenyl)-*N*-methylmethanamine (484 mg, 2.42 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (668 mg, 2.02 mmol) in tetrahydrofuran (4.0 mL) was stirred at room temperature for 12 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 3) to afford methyl 2-(((4-bromobenzyl)(methyl)carbamoyl)oxy)benzoate (755 mg, 2.00 mmol, 99% yield as colorless oil (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 8.00-7.97 (m, 1H, rotamer A and B), 7.55-7.46 (m, 3H), 7.28-7.25 (m, 3H, rotamer A and B), 7.18 (d, J = 8.0 Hz, 0.6H, rotamer A), 7.13 (d, J = 8.4 Hz, 0.4H, rotamer B), 4.65 (s, 0.8H, rotamer B), 4.49 (s, 1.2H, rotamer A), 3.82 (s, 1.2H, rotamer B), 3.79 (s, 1.8H, rotamer A), 3.06 (s, 1.8H, rotamer A), 2.96 (s, 1.2H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.0, 154.9, 154.2, 151.1, 150.9, 136.0, 133.5, 131.6, 131.5, 131.4, 129.7, 129.2, 125.4, 124.0, 123.9, 123.6, 123.5, 121.3, 52.2, 51.9, 34.4, 34.1. ESI-HRMS: Calcd for $C_{17}H_{16}BrNNaO_4^+$ $[M+Na]^+$: 400.01549. Found: 400.01415. Anal. Calcd. for $C_{17}H_{16}BrNO_4$: C, 53.99; H, 4.26; N, 3.70. Found: C, 53.96; H, 4.35; N, 3.68.

Synthesis of methyl 2-(((4-hydroxyphenethyl)carbamoyl)oxy)benzoate (1l)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 91% Yield.

Colorless solid. ^{1}H-NMR (400 MHz, DMSO-d_6), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 9.18 (s, 1H, rotamer A and B), 7.88 (t, J = 6.4 Hz, 1H, rotamer A and B), 7.83 (dd, J = 8.0, 2.0 Hz, 1H, rotamer A and B), 7.61 (ddd, J = 8.0, 8.0, 2.0 Hz, 1H, rotamer A and B), 7.34 (ddd, J = 7.6, 7.6, 1.2 Hz, 1H, rotamer A and B), 7.17 (dd, J = 8.0, 0.8 Hz, 1H, rotamer A and B), 7.03 (d, J = 8.4 Hz, 2H, rotamer A and B), 6.69 (d, J = 8.4 Hz, 2H, rotamer A and B), 3.74 (s, 3H, rotamer A and B), 3.23-3.16 (m, 2H, rotamer A and B), 2.75 (t, J = 7.6 Hz, 0.2H, rotamer B), 2.66 (t, J = 7.2 Hz, 1.8H, rotamer A). ^{13}C-NMR (100 MHz, DMSO-d_6) δ (ppm): 165.2, 155.7, 154.0, 150.1, 133.6, 130.7, 129.5, 129.2, 125.4, 124.3, 124.0, 115.1, 52.0, 42.5, 34.5. ESI-HRMS: Calcd for $C_{17}H_{17}NNaO_5^+$ [M+Na]$^+$: 338.09989. Found: 338.10148. Anal. Calcd. for $C_{17}H_{17}NO_5$: C, 64.75; H, 5.43; N, 4.44. Found: C, 64.67; H, 5.47; N, 4.47.

Synthesis of methyl 2-(((3-methoxyphenethyl)carbamoyl)oxy)benzoate (1n)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). Quantitative Yield.

Colorless Solid. ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 8 : 2 ratio at 25 ºC), δ (ppm): 7.99 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.56 (ddd, J = 8.0, 8.0, 1.6 Hz, 1H, rotamer A and B), 7.32 - 7.25 (m, 2H, rotamer A and B), 7.17 (d, J = 8.4 Hz, 1H, rotamer A and B), 6.89 - 6.81 (m, 3H, rotamer A and B), 5.24 (brs, 0.8H, rotamer A), 4.87 (brs, 0.2H, rotamer B), 3.87 (s, 3H, rotamer A and B), 3.83 (s, 3H, rotamer A and B), 3.66 (d, J = 6.0 Hz, 0.4H, rotamer B), 3.56 (dt, J = 6.8, 6.8 Hz, 1.6H, rotamer A), 2.90 (t, J = 6.8 Hz, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 159.8, 154.4, 150.6, 140.2, 133.5, 131.4, 129.7, 125.6, 124.1, 123.9, 121.1, 114.5, 111.9, 55.2, 52.1, 42.5, 36.0. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_5^+$ [M+Na]$^+$: 352.11554. Found: 352.11642.

Synthesis of methyl 2-(((3,4-dimethoxyphenethyl)carbamoyl)oxy)benzoate (1o)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 91% Yield.

Mp. 83.0 - 84.0 ºC (colorless powder, recrystallized from $CHCl_3$/hexane)

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 7.97 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.53 (ddd, J = 8.0, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.28 (ddd, J = 8.0, 7.6, 1.2, 1H, rotamer A and B), 7.14

(dd, *J* = 8.0, 1.2 Hz, 1H, rotamer A and B), 6.85-6.79 (m, 3H, rotamer A and B), 5.20 (brs, 0.9H, rotamer A), 4.80 (brs, 0.1H, rotamer B), 3.89 (s, 3H, rotamer A and B), 3.87 (s, 3H, rotamer A and B), 3.86 (s, 3H, rotamer A and B), 3.63 (brs, 0.2H, rotamer B), 3.52 (dt, *J* = 6.8, 6.4 Hz, 1.8H, rotamer A), 2.90 (brs, 0.2H, rotamer B), 2.86 (t, *J* = 6.8 Hz, 1.8H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 154.4, 150.7, 149.1, 147.8, 133.6, 131.5, 131.2, 125.6, 124.1, 123.9, 120.8, 112.1, 111.4, 56.0, 55.9, 52.1, 42.8, 35.7. ESI-HRMS: Calcd for $C_{19}H_{21}NNaO_6^+$ $[M+Na]^+$: 382.12611. Found: 382.12386. Anal. Calcd. for $C_{19}H_{21}NO_6$: C, 63.50; H, 5.89; N, 3.90. Found: C, 63.36; H, 5.94; N, 3.92.

Synthesis of methyl 2-(((4-(((trifluoromethyl)sulfonyl)oxy)phenethyl)carbamoyl)- oxy)benzoate (1p)

The solution of methyl 2-(((4-hydroxyphenethyl)carbamoyl)oxy)benzoate (425 mg, 1.35 mmol), pyridine (0.22 mL) in dichloromethane (3.2 mL) was added trifluoromethanesulfonic acid anhydride (0.27 mL) at 0 ºC and the mixture was stirred at 22ºC for 90 min. The reaction mixture was purified with silica gel column chromatography (eluent: ethyl acetate : hexane = 1 : 3 ~1 : 1) to afford Methyl 2-(((4-(((trifluoromethyl)sulfonyl)oxy)phenethyl)carbamoyl)oxy)benzoate (592 mg, 1.32 mmol, 98% yield) as colorless sticky oil.

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 7.97 (dd, *J* = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.54 (ddd, *J* = 7.6, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.36 (d, *J* = 8.4, 2H, rotamer A and B), 7.29 (ddd, *J* = 7.6, 7.6, 0.8 Hz, 1H, rotamer A and B), 7.23 (d, *J* = 8.4 Hz, 2H, rotamer A and B), 7.14 (d, *J* = 8.0 Hz, 1H, rotamer A and B), 5.26 (t, *J* = 6.0 Hz, 0.9H, rotamer A), 4.92 (brs, 0.1H, rotamer B), 3.86 (s, 3H, rotamer A and B), 3.64 (brs, 0.2H, rotamer B), 3.53 (dt, *J* = 6.8, 6.8 Hz, 1.8H, rotamer A), 3.00 (brs, 0.2H, rotamer B), 2.94 (t, *J* = 6.8 Hz, 1.8H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 154.5, 150.6, 148.3, 139.4, 133.7, 131.5, 130.7, 125.7, 124.1, 123.8, 121.5, 118.7 (q, *J* = 319 Hz), 52.1, 42.4, 35.4. ESI-HRMS: Calcd for $C_{18}H_{16}F_3NNaO_7S^+$ $[M+Na]^+$: 470.04918. Found: 470.04716.

Synthesis of methyl 2-(((2-(naphthalen-1-yl)ethyl)carbamoyl)oxy)benzoate (1r)

The solution of 2-(naphthalen-1-yl)acetonitrile (540 mg, 3.23 mmol) in tetrahydrofuran (4.0 mL) was slowly added 7.3 mL of BH_3-THF complex (1.1 M solution in tetrahydrofuran) at room temperature and the reaction mixture was refluxed for 3 hours. The reaction mixture was added methanol (4.0 mL) and refluxed for 30 min. Then, 4 mL of aqueous hydrogen chloride (2M) was added and the reaction mixture was heated at 50 ºC for 30 min. The reaction mixture was added 50 mL of water and the whole was washed with 100 mL of dichloromethane. The water layer was basified with aqueous sodium hydroxide (2M) and extracted with EtOAc (100 mL x2). The organic phase was dried over sodium sulfate and the solvent was

evaporated under reduced pressure to give crude oil which contains 2-(naphthalen-1-yl)ethanamine (543 mg). The crude product was used in next step without any further purification.

The mixture of the crude oil (543 mg) and dimethyl 2,2'-(carbonylbis(oxy))dibenzoate (970 mg, 2.93 mmol) and dichloromethane (10 mL), was stirred at 20 ºC for 42 hrs. The reaction mixture was evaporated under reduced pressure to give crude oil. The crude mixture was purified with column chromatography (eluent: ethyl acetate : hexane = 1 : 4) to afford a colorless soild (652 mg, 1.87 mmol, 58% yield for 2 steps from 2-(naphthalen-1-yl)acetonitrile). Mp. 87.0 - 87.5 ºC (colorless powder, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25ºC), δ (ppm): 8.13 (d, J = 8.4 Hz, 1H, rotamer A and B), 7.97 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.88-7.85 (m, 1H, rotamer A and B), 7.77-7.75 (m, 1H, rotamer A and B), 7.56-7.40 (m, 5H, rotamer A and B), 7.28 (ddd, J = 8.0, 7.6, 1.2 Hz, 1H), 7.16 (dd, J = 8.0, 0.4 Hz, 1H), 5.32 (t, J = 6.0 Hz, 0.9H, rotamer A), 4.95 (brs, 0.1H, rotamer B), 3.84 (s, 3H, rotamer A and B), 3.80-3.76 (m, 0.2H, rotamer B), 3.67-3.62 (m, 1.8H, rotamer A), 3.46-3.37 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 154.5, 150.6, 134.7, 133.9, 133.6, 131.9, 131.5, 128.8, 127.4, 126.9, 126.2, 125.7, 125.6, 125.5, 124.1, 123.9, 123.6, 52.1, 42.0, 33.3. ESI-HRMS: Calcd for $C_{21}H_{19}NNaO_4^+$ $[M+Na]^+$: 372.12063. Found: 372.12134. Anal. Calcd. for $C_{21}H_{19}NO_4$: C, 72.19; H, 5.48; N, 4.01. Found: C, 72.24; H, 5.68; N, 4.00.

Synthesis of methyl 2-(((2-(naphthalen-2-yl)ethyl)carbamoyl)oxy)benzoate (1s)

The solution of 2-(naphthalen-2-yl)acetonitrile (745 mg, 4.45 mmol) in tetrahydrofuran (5.0 mL) was slowly added 10 mL of BH_3-THF complex (1.1 M solution in tetrahydrofuran) at room temperature and the reaction mixture was refluxed for 2.5 hours. The reaction mixture was added methanol (10 mL) and refluxed for 30 min. Then, 4 mL of aqueous hydrogen chloride (1M) was added and the reaction mixture was heated at 70 ºC for 90 min. The reaction mixture was added 20 mL of water and the whole was washed with 100 mL of chloroform. The water layer was basified with aqueous sodium hydroxide (2M) and extracted with chloroform (50 mL x 2). The organic phase was dried over sodium sulfate and the solvent was evaporated under reduced pressure to give crude oil which contains 2-(naphthalen-2-yl)ethanamine (717 mg). The crude product was used in next step without any further purification.

The mixture of the crude oil (717 mg) and dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (995 mg, 3.01 mmol) and dichloromethane (10 mL), was stirred at 20ºC for 19 hrs. The reaction mixture was evaporated under reduced pressure to give crude oil. The crude mixture was purified with column chromatography (eluent: ethyl acetate : hexane = 1 : 4) to afford a colorless soild (1062 mg, quantitative yield based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate)).

Mp. 61.0 - 63.0 ºC (colorless needle, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 8 : 2 ratio at 25 ºC), δ (ppm): 7.95 (dd, *J* = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.82-7.81 (m, 3H, rotamer A and B), 7.72 (s, 1H, rotamer A and B), 7.51 (ddd, *J* = 8.0, 7.6, 1.6, 1H, rotamer A and B), 7.48-7.43 (m, 2H, rotamer A and B), 7.39 (dd, *J* = 8.4, 1.6 Hz, 1H, rotamer A and B), 7.27 (ddd, *J* = 7.6, 7.6, 0.8 Hz, 1H, rotamer A and B), 7.12 (dd, *J* = 8.0, 0.8 Hz, 1H, rotamer A and B), 5.23 (t, *J* = 6.4 Hz, 0.8H, rotamer A), 4.89 (brs, 0.2H, rotamer B), 3.86 (s, 0.6H, rotamer B), 3.83 (s, 2.4H, rotamer A), 3.73 (d, *J* = 6.0 Hz, 0.4H, rotamer B), 3.63 (dt, *J* = 6.8, 6.4 HZ, 1.6H, rotamer A), 3.11 (brs, 0.4H, rotamer B), 3.07 (t, *J* = 6.8 Hz, 1.6H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 154.4, 150.6, 136.1, 133.6, 133.5, 132.3, 131.4, 128.3, 127.6, 127.5, 127.3, 127.2, 126.1, 125.6, 125.5, 124.1, 123.9, 52.1, 42.4, 36.1. ESI-HRMS: Calcd for $C_{21}H_{19}NNaO_4^+$ $[M+Na]^+$: 372.12063. Found: 372.12151.

Synthesis of methyl 2-(((4-fluorophenethyl)carbamoyl)oxy)benzoate (1t)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 95% Yield.

Mp. 96.0 - 96.5 ºC (colorless powder, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 7.96 (d, *J* = 8.0 Hz, 1H, rotamer A and B), 7.53 (ddd, *J* = 8.0, 8.0, 1.2 Hz, 1H, rotamer A and B), 7.29 - 7.20 (m, 3H, rotamer A and B), 7.14 (d, *J* = 8.0 Hz, 2H, rotamer A and B), 7.01 (dd, *J* = 7.6, 7.6 Hz, 1H, rotamer A and B), 5.19 (s, 0.9H, rotamer A), 4.83 (s, 0.1H, rotamer B), 3.85 (s, 3H, rotamer A and B), 3.62 (brs, 0.2H, rotamer B), 3.50 (dt, *J* = 6.8, 6.8 Hz, 1.8H, rotamer A), 2.88 (t, *J* = 6.8 Hz, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 161.6 (d, *J* = 243 Hz), 154.4, 150.6, 134.3, 133.5, 131.4, 130.3 (d, *J* = 7 Hz), 125.6, 124.1, 123.9, 115.4 (d, *J* = 22 Hz), 52.0, 42.6, 35.2. ESI-HRMS: Calcd for $C_{17}H_{16}FNNaO_4^+$ $[M+Na]^+$: 340.09556. Found: 340.09745. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 64.35; H, 5.08; N, 4.41. Found: C, 64.45; H, 5.17; N, 4.48.

Synthesis of methyl 2-(((4-chlorophenethyl)carbamoyl)oxy)benzoate (1u)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 90% Yield.

Mp. 110.5 - 111.0 ºC (colorless powder, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 7.95 (dd, *J* = 7.6, 1.2 Hz, 1H, rotamer A and B), 7.52 (ddd, *J* = 7.6, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.27 (d, *J* = 8.4 Hz, 2H, rotamer A and B), 7.17 (d, *J* = 8.4Hz, 2H, rotamer A and B),

7.12 (d, *J* = 8.0 Hz, 1H), 5.31 (brs, 0.9H, rotamer A), 5.04 (brs, 0.1H, rotamer B), 3.83 (s, 3H, rotamer A and B), 3.58 (brs, 0.2H, rotamer B), 3.48 (dt, *J* = 6.8, 6.8 Hz, 1.8H, rotamer A), 2.85 (t, *J* = 6.8 Hz, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 154.4, 150.6, 137.1, 133.6, 132.3, 131.4, 130.2, 128.7, 125.6, 124.1, 123.9, 52.1, 42.4, 35.3. ESI-HRMS: Calcd for $C_{17}H_{16}ClNNaO_4^+$ $[M+Na]^+$: 356.06601. Found: 356.06738. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 61.18; H, 4.83; N, 4.20. Found: C, 61.11; H, 4.86; N, 4.22.

Synthesis of methyl 2-(((2-bromophenethyl)carbamoyl)oxy)benzoate (1w)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 99% Yield.

Colorless sticky oil. ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 9 : 1 ratio at 25 ºC), δ (ppm): 7.99 (d, *J* = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.58 (ddd, *J* = 8.0, 8.0, 0.8 Hz, 1H, rotamer A and B), 7.54 (dd, *J* = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.36 (dd, *J* = 7.6, 1.6 Hz, 1H, rotamer A and B), 7.31 - 7.28 (m, 2H, rotamer A and B), 7.18 (d, *J* = 8.4 Hz, 1H, rotamer A and B), 7.13 (ddd, *J* = 8.0, 8.0, 1.2 Hz, 1H, rotamer A and B), 5.31 (brs, 0.9H, rotamer A), 4.96 (brs, 0.1H, rotamer B), 3.88 (s, 3H, rotamer A and B), 3.68 (brs, 0.2H, rotamer B), 3.57 (dt, *J* = 6.8, 6.8 Hz, 1.8H, rotamer A), 3.12 (brs, 0.2H, rotamer B), 3.08 (t, *J* = 6.8 Hz, 1.8H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.3, 154.4, 150.6, 138.0, 133.5, 133.0, 131.4, 131.1, 128.3, 127.6, 125.6, 124.6, 124.1, 123.9, 52.1, 41.0, 36.2. ESI-HRMS: Calcd for $C_{17}H_{16}BrNNaO_4^+$ $[M+Na]^+$: 400.01549. Found: 400.01428.

Synthesis of methyl 2-(((3-bromophenethyl)carbamoyl)oxy)benzoate (1x)

Synthesized according to the synthetic procedure of **1a** (The yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate). 98% Yield.

Mp. 84.0 - 84.3 ºC (colorless hexagon shape crystal, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 8 : 2 ratio at 25 ºC), δ (ppm): 7.96 (dd, *J* = 7.6, 1.6 Hz, 1H, rotamer A and B), 7.52 (ddd, *J* = 7.6, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.41 (s, 1H, rotamer A and B), 7.37-7.35 (m, 1H, rotamer A and B), 7.27 (ddd, *J* = 7.6, 7.6, 0.8 Hz, 1H, rotamer A and B), 7.18-7.13 (m, 3H, rotamer A and B), 5.37 (t, *J* = 6.4 Hz, 0.8H, rotamer A), 5.10 (brs, 0.2H, rotamer B), 3.84 (s, 3H, rotamer A and B), 3.60 (dt, *J* = 6.4, 6.0 Hz, 0.4H, rotamer B), 3.48 (dt, *J* = 6.8, 6.8 Hz, 1.6H, rotamer A), 2.91 (brs, 0.4H, rotamer B), 2.85 (t, *J* = 6.8 Hz, 1.6H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 154.4, 150.6, 141.1, 133.6, 131.9, 131.4, 130.2, 129.6, 127.5, 125.6, 124.1, 123.9, 122.6, 52.1, 42.4, 35.6. ESI-HRMS: Calcd for $C_{17}H_{16}BrNNaO_4^+$

$[M+Na]^+$: 400.01549. Found: 400.01501.

Synthesis of methyl 2-((ethyl(phenethyl)carbamoyl)oxy)benzoate (1ac)

N-ethyl-2-phenylethanamine was synthesized according to the literature.[16S2]

The *N*-ethyl-2-phenylethanamine (790 mg, 5.29 mmol) and dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (1239 mg, 3.75 mmol) were dissolved in tetrahydrofuran (15 mL) and stirred at 20ºC for 23 hrs. The reaction mixture was evaporated under reduced pressure to give crude oil. The crude mixture was purified with column chromatography (eluent: ethyl acetate: hexane = 1 : 5) to afford colorless oil (1126 mg, 3.44 mmol, 92% yield).

Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed (approximately 1 : 1 ratio at 25 ºC), δ (ppm, 25ºC): 7.98-7.95 (m, 1H), 7.55-7.48 (m, 1H), 7.32-7.01 (m, 6H), 7.15 (dd, *J* = 8.0, 0.8 Hz, 0.5H), 7.02 (dd, *J* = 8.0, 1.2 Hz, 0.5H), 3.84 (s, 3H), 3.66 (t, *J* = 7.6 Hz, 1H), 3.52 (t, *J* = 8.0 Hz, 1H), 3.45 (q, *J* = 7.2 Hz, 1H), 3.34 (q, *J* = 7.2 Hz, 1H), 3.02 (t, *J* = 7.6 Hz, 1H), 2.95 (t, *J* = 8.0 Hz, 1H), 1.25 (t, *J* = 7.2 Hz, 1.5H), 1.19 (t, *J* = 7.2 Hz, 1.5H). The peaks of rotamers became broader and partially merged at 40ºC, δ (ppm, 40 ºC): 7.99 (d, *J* = 8.0 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 1H), 7.35-7.11 (m, 7H), 3.88 (s, 3H), 3.70 (brs, 1H), 3.60 (brs, 1H), 3.49 (brs, 1H), 3.41 (brs, 1H), 3.04 (brs, 2H), 1.27 (brs, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed. δ (ppm, 25 ºC): 165.4, 154.2 154.0, 151.1, 139.1, 133.4, 131.5, 128.95, 128.92, 128.58, 128.54, 126.42, 126.37, 125.38, 124.12, 124.03, 52.0, 49.7, 48.9, 43.07, 43.02, 35.3, 34.6, 13.9, 13.2.

ESI-HRMS: Calcd for $C_{19}H_{21}NNaO_4^+$ $[M+Na]^+$: 350.13628. Found: 350.13800.

Synthesis of methyl 2-((decyl(phenethyl)carbamoyl)oxy)benzoate (1ad)

The solution of phenethylamine (622 mg, 5.14 mmol), triethylamine (1.0 mL), DMF (1.0 mL) in tetrahydrofuran (10 mL) was added decanoyl chloride (1222 mg, 6.40 mmol) at 0ºC. The solution was stirred at 20ºC for 1.5 hr and quenched with ice water (10 mL). The whole was extracted with dichloromethane (50 mL x 2). The organic layer was dried over sodium sulfate and evaporated under reduced pressure to afford crude oil. The crude mixture was purified with column chromatography (eluent: ethyl acetate: hexane = 1 : 3) to afford colorless oil (1093 mg, 3.97 mmol, 77% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.32-7.17 (m, 5H), 5.60 (brs, 1H), 3.51 (q, *J* = 6.8 Hz, 2H), 2.81 (t, *J* = 6.8 Hz, 2H), 2.11 (t, *J* = 7.2 Hz, 2H), 1.60-1.56 (m, 2H), 1.29-1.26 (m, 12H), 0.88 (t, *J* = 7.2 Hz, 3H).

^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 173.2, 139.0, 128.8, 128.6, 126.5, 40.5, 36.8, 35.7, 31.9, 29.5, 29.4, 29.3, 25.8, 22.7, 14.1.

A solution of *N*-phenethyldecanamide (756 mg, 2.75 mmol) and lithium aluminum hydride (280 mg, 7.37

mmol) in tetrahydrofuran (10 mL) was refluxed for 20 hrs. Then the reaction solution was cooled to 0ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give methyl 2-((decyl(phenethyl)carbamoyl)oxy)benzoate as colorless oil (728 mg, quantitative yield). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.31-7.18 (m, 5H), 2.89-2.85 (m, 2H), 2.82-2.78 (m, 2H), 2.60 (t, J = 7.6 Hz, 2H), 1.47-1.44 (m, 2H), 1.25 (brs, 15H), 0.90-0.86 (m, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 140.2, 128.7, 128.5, 126.1, 51.3, 50.0, 36.5, 31.9, 31.6, 30.1, 29.61, 29.59, 29.4, 27.4, 22.7, 14.1.

The *N*-phenethyldecan-1-amine (604 mg, 2.31 mmol) and dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (731 mg, 2.21 mmol) were dissolved in tetrahydrofuran (13 mL) and stirred at 20ºC for 74 hrs. The reaction mixture was evaporated under reduced pressure to give crude oil. The crude mixture was purified with column chromatography (eluent: ethyl acetate: hexane = 1 : 6) to afford colorless oil (765 mg, 1.74 mmol, 79% yield). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately 1 : 1 ratio at 25ºC), δ (ppm): 7.99-7.96 (m, 1H), 7.56-7.49 (m, 1H), 7.32-7.20 (m, 6H), 7.14 (dd, J = 8.0, 1.2 Hz, 0.5H), 7.02 (dd, J = 8.0, 1.2 Hz, 0.5H), 3.85 (s, 1.5H), 3.84 (s, 1.5H), 3.66 (t, J = 7.6 Hz, 1H), 3.52 (t, J = 7.6 Hz, 1H), 3.38 (t, J = 7.6 Hz, 1H), 3.27 (t, J = 7.6 Hz, 1H), 3.02 (t, J = 7.6 Hz, 1H), 2.95 (t, J = 7.6 Hz, 1H), 1.68-1.59 (m, 2H), 1.30-1.26 (m, 14H), 0.89-0.86 (m, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$), observed at 60ºC, δ (ppm): 165.2, 151.2, 139.2, 133.0, 131.3, 128.8, 128.8, 128.4, 128.4, 126.2, 125.0, 124.2, 123.9, 51.7, 48.3, 31.7, 29.47, 29.47, 29.44, 29.44, 29.29, 29.29 29.1, 26.8, 22.5, 13.8. ESI-HRMS: Calcd for $C_{27}H_{37}NNaO_4^+$ $[M+Na]^+$: 462.26148. Found: 462.25986.

Synthesis of methyl 2-((isopropyl(4-nitrophenethyl)carbamoyl)oxy)benzoate (1af)

A stirring solution of 1-(2-bromoethyl)-4-nitrobenzene (475 mg, 2.06 mmol) in dry tetrahydrofuran (3.0 mL) was added 2.0 mL of isopropylamine at room temperature. The reaction mixture was stirred at room temperature (20 ºC) for 24 hrs. Then the whole was dissolved in 30 mL of dichloromethane and washed with 5 mL of aqueous sodium hydroxide (2M) to remove hydrogen bromide. The organic phase was dried over sodium sulfate and the solvent and isopropylamine were removed under reduced pressure to afford crude oil. The crude mixture was purified with silica-gel column chromatography (eluent: acetone: hexane=1 : 4) to afford *N*-(4-nitrophenethyl)propan-2-amine (known compound) as colorless oil (152 mg, 0.731 mmol, 35% yield).

A solution of *N*-(4-nitrophenethyl)propan-2-amine (133 mg, 0.638 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (461 mg, 1.40 mmol) in tetrahydrofuran (2.0 mL) was added to a 5-mL Biotage microwave bial with a Teflon coated stirring bar. The bial was sealed and heated at 100 ºC for 5

hrs. After cooling, the solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4) to afford methyl 2-((isopropyl(4-nitrophenethyl)carbamoyl)oxy)benzoate (218 mg, 0.563 mmol, 93% yield (based on *N*-(4-nitrophenethyl)propan-2-amine).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 8.14 (d, J = 8.0 Hz, 2H, rotamer A and B), 7.99 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.55 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.42 (d, J = 8.0 Hz, 2H, rotamer A and B), 7.29 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.17 (d, J = 8.0 Hz, 0.4H, rotamer B), 7.13 (d, J = 8.0 Hz, 0.6H, rotamer A), 4.52 (p, J = 6.8 Hz, 0.4 Hz, rotamer B), 4.32 (p, J = 6.8 Hz, 0.6 Hz, rotamer A), 3.86 (s, 1.2H, rotamer B), 3.85 (s, 1.8H, rotamer A), 3.58 (t, J = 7.6 Hz, 1.2H, rotamer A), 3.44 (t, J = 7.6 Hz, 0.8H, rotamer B), 3.19 (t, J = 7.6 Hz, 1.2H, rotamer A), 3.08 (t, J = 7.6 Hz, 0.8H, rotamer B), 1.29 (d, J = 6.8 Hz, 2.4H, rotamer B), 1.25 (d, J = 6.8 Hz, 3.6H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.0, 154.0, 153.8, 150.9, 147.2, 147.1, 146.5, 133.4, 131.4, 129.6, 125.3, 123.9, 123.7, 123.6, 51.9, 48.7, 48.2, 44.44, 44.36, 36.5, 35.6, 20.9, 20.3. ESI-HRMS: Calcd for $C_{20}H_{22}N_2NaO_6^+$ $[M+Na]^+$: 409.13701. Found: 409.13830.

Synthesis of methyl 2-(((3-phenylpropyl)carbamoyl)oxy)benzoate (1ag)

Synthesized according to the synthetic procedure of **1a**. 90% Yield (the yield is calculated based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate)).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 8 : 2 ratio at 25 ºC), δ (ppm): 7.99 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.56 (ddd, J = 8.0, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.37-7.18 (m, 7H, rotamer A and B), 5.20 (brs, 0.8H, rotamer A), 4.84 (brs, 0.2H, rotamer B), 3.88 (s, 3H, rotamer A and B), 3.43 (brs, 0.4H, rotamer B), 3.34 (dt, J = 6.8, 6.8 Hz, 1.6H, rotamer A), 2.75 (t, J = 6.8 Hz, 2H, rotamer A and B), 1.99-1.92 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 154.4, 150.6, 141.3, 133.4, 131.3, 128.35, 128.31, 125.8, 125.4, 124.0, 123.8, 52.0, 40.8, 32.8, 31.3. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_4^+$ $[M+Na]^+$: 336.12063. Found: 336.12164.

Synthesis of methyl 2-((methyl(3-phenylpropyl)carbamoyl)oxy)benzoate (1ah)

Methyl (3-phenylpropyl)carbamate was synthesized according to the literature. (reference 11)

A solution of methyl (3-phenylpropyl)carbamate (644 mg, 3.33 mmol) and lithium aluminum hydride (308 mg, 8.11 mmol) in tetrahydrofuran (20 mL) was stirred at 60 ºC for 12 hrs. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the

solution was filtered and the solvent was removed in vacuo to give crude oil, which contains *N*-methyl-3-phenylpropan-1-amine (352 mg). The amine was used directly in the next step without further purification.
^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.25 (m, 2H), 7.19-7.15 (m, 3H), 2.67-2.58 (m, 4H), 2.42 (s, 3H), 1.84-17.77 (m, 2H), 1.15 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 142.1, 128.3, 128.2, 125.7, 51.6, 36.5, 33.6, 31.5. ESI-HRMS: Calcd for $C_{10}H_{16}N^+$ [M+H]$^+$: 150.12773. Found: 150.12814.
A solution of *N*-methyl-3-phenylpropan-1-amine (277 mg, 1.85 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (505 mg, 1.53 mmol) in tetrahydrofuran (5.0 mL) was stirred at 60 ºC for 2 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4 ~ 1 : 3) to afford methyl 2-((methyl(3-phenylpropyl)carbamoyl)oxy)benzoate (480 mg, 1.47 mmol, 96% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))) as colorless oil.
^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.97 (dd, *J* = 7.6, 1.6 Hz, 1H, rotamer A and B), 7.52 (dd, *J* = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.30-7.12 (m, 7H, rotamer A and B), 3.83 (s, 3H, rotamer a and B), 3.52 (t, *J* = 7.6 Hz, 0.8 H, rotamer B), 3.41 (t, *J* = 7.6 Hz, 1.2H, rotamer A), 3.11 (s, 1.8H, rotamerA), 3.00 (s, 1.2H, rotamer B), 2.72-2.66 (m, 2H, rotamer A and B), 2.08-1.92 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.2, 154.5, 154.4, 151.3, 151.1, 141.6, 141.4, 133.4, 131.4, 128.4, 128.31, 128.26, 128.2, 125.9, 125.8, 125.3, 124.1, 124.0, 123.8, 123.7, 52.0, 49.12, 49.06, 34.9, 34.5, 33.0, 32.9, 29.5, 29.0. ESI-HRMS: Calcd for $C_{19}H_{21}NNaO_4^+$ [M+Na]$^+$: 350.13628. Found: 350.13699. Anal. Calcd. for $C_{19}H_{21}NO_4$: C, 69.71; H, 6.47; N, 4.28. Found: C, 69.83; H, 6.67; N, 4.36.

Synthesis of methyl 2-((isopropyl(3-phenylpropyl)carbamoyl)oxy)benzoate (1ai)

To the mixture was sodium borohydride (429 mg, 11.3 mmol) and dichloromethane (10 mL), acetic acid (2.0 mL) was added at 0 ºC. The mixture was stirred at room temperature for 30 min to form sodium triacetoxyborohydride. The solution was added 3-phenylpropan-1-amine (803 mg, 5.94 mmol, 1.1 eq), acetone (302 mg, 5.20 mmol) dichloromethane (5 mL) and stirred at room temperature for 27 hrs. To the reaction solution, ethyl acetate (20 mL) was added and the amine compounds are back-extracted in aqueous hydrogen chloride (1M) (20 mL). The water layer was basified with aqueous sodium hydroxide and extracted with ethyl acetate (30 mL x 2). The organic layer was dried over sodium sulfate and the solvent was removed under reduced pressure to give crude oil. The crude oil was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 2) to afford *N*-isopropyl-3-phenylpropan-1-amine as colorless oil (453 mg, 2.55 mmol, 49% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.25 (m, 2H), 7.19-7.15 (m, 3H), 2.77 (h, J = 6.4 Hz, 1H), 2.67-2.61 (m, 4H), 1.84-1.77 (m, 2H), 1.03 (d, J = 6.4 Hz, 6H), 0.98 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 142.1, 128.3, 128.2, 125.7, 48.6, 47.1, 33.8, 32.0, 23.0. ESI-HRMS: Calcd for $C_{12}H_{20}N^+$ $[M+H]^+$: 178.15903. Found: 178.16008.

A solution of *N*-isopropyl-3-phenylpropan-1-amine (404 mg, 2.28 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (665 mg, 2.01 mmol) in tetrahydrofuran (4.0 mL) was stirred at 50 ºC for 20 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4) to afford methyl 2-((isopropyl(3-phenylpropyl)carbamoyl)oxy)benzoate (603 mg, 1.70 mmol, 85% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.96-7.95 (m, 1H, rotamer A and B), 7.53-7.49 (m, 1H, rotamer A and B), 7.29-7.11 (m, 7H, rotamer A and B), 4.44-4.37 (m, 0.4H, rotamer B), 4.27-4.21 (m, 0.6H, rotamer A), 3.82 (s, 3H, rotamer A and B), 3.33 (t, J = 8.0 Hz, 1.2H, rotamer A), 3.25 (t, J = 8.0 Hz, 0.8H, rotamer B), 2.69-2.63 (m, 2H, rotamer A and B), 2.12-2.02 (m, 1.2H, rotamer A), 2.00-1.94 (m, 0.8H, rotamer B), 1.26 (d, J = 6.8 Hz, 2.4H, rotamer B), 1.20 (d, J = 6.8 Hz, 3.6H, rotamer A). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.4, 154.0, 151.0, 150.9, 141.6, 141.4, 133.32, 133.27, 131.4, 128.3, 128.2, 125.8, 125.7, 125.2, 124.1, 124.03, 123.98, 52.0, 48.6, 48.3, 43.2, 43.1, 33.4, 31.7, 31.1, 21.0, 20.3. ESI-HRMS: Calcd for $C_{21}H_{25}NNaO_4^+$ $[M+Na]^+$: 378.16758. Found: 378.16572. Anal. Calcd. for $C_{21}H_{25}NO_4$: C, 70.96; H, 7.09; N, 3.94. Found: C, 70.82; H, 7.18; N, 4.00.

Synthesis of methyl 2-((butyl(3-phenylpropyl)carbamoyl)oxy)benzoate (1aj)

A stirring solution of 3-phenylpropylamine (706 mg, 5.22 mmol), triethylamine (1.00 mL) in dichloromethane (10 mL) was added butyryl chloride (548 mg, 5.14 mmol) at 0ºC. The reaction mixture was stirred under air for 1 hour at 20 ºC. Then the solution was quenched by 20 mL of water and extracted with 20 mL of dichloromethane. The organic layer was washed with water (10 mL), aqueous hydrogen chloride (1M, 10 mL), and brine (10 mL). The organic phase was dried over sodium sulfate and the solvent was removed under reduced pressure to afford *N*-(3-phenylpropyl)butyramide (known compound) (1026 mg, 5.00 mmol, 97 % yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.25 (m, 2H), 7.20-7.16 (m, 3H), 5.75 (brs, 1H), 3.27 (q, J = 7.2 Hz, 2H), 2.64 (t, J = 7.6 Hz, 2H), 2.10 (t, J = 7.6 Hz, 2H), 1.83 (p, J = 7.6 Hz, 2H), 1.62 (sextet, J = 7.2 Hz, 2H), 0.93 (t, J = 7.6 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 173.0, 141.5, 128.5, 128.4,

126.0, 30.1, 38.7, 33.4, 31.3, 19.2, 13.8. ESI-HRMS: Calcd for $C_{13}H_{19}NNaO^+$ $[M+Na]^+$: 228.13589. Found: 228.13678.

A solution of *N*-(3-phenylpropyl)butyramide (737 mg, 3.59 mmol) and lithium aluminum hydride (255 mg, 6.71 mmol) in tetrahydrofuran (20 mL) was stirred at 60 ºC for 14 hrs. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil, which contains *N*-(3-phenylpropyl)butan-1-amine (734 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.25 (m, 2H), 7.19-7.15 (m, 3H), 2.67-2.56 (m, 6H), 1.85-1.78 (m, 2H), 1.49-1.42 (m, 2H), 1.37-1.28 (m, 2H), 1.11 (brs, 1H), 0.91 (t, J = 7.2 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 142.2, 128.3, 128.2, 125.7, 49.7, 49.6, 33.7, 32.3, 31.8, 20.4, 14.0. ESI-HRMS: Calcd for $C_{13}H_{22}N^+$ $[M+H]^+$: 192.17468. Found: 192.17518.

A solution of *N*-(3-phenylpropyl)butan-1-amine (511 mg, 2.67 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (711 mg, 2.15 mmol) in tetrahydrofuran (6.0 mL) was stirred at 50 ºC for 22 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 4) to afford methyl 2-((butyl(3-phenylpropyl)carbamoyl)oxy)benzoate (728 mg, 1.97 mmol, 92% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))). ^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed (approximately 1 : 1 ratio at 25 ºC), δ (ppm): 7.96 (dd, J = 8.0, 1.6 Hz, 1H), 7.53-7.49 (m, 1H), 7.29-7.12 (m, 7H), 3.82 (s, 3H), 3.49-3.29 (m, 4H), 2.71-2.65 (m, 2H), 2.09-1.93 (m, 2H), 1.71-1.55 (m, 2H), 1.41-1.29 (m, 2H), 0.96-0.91 (m, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.3, 154.33, 154.25, 151.08, 151.03, 141.7, 141.5, 133.3, 131.4, 128.34, 128.29, 128.25, 128.20, 125.9, 125.8, 125.2, 124.02, 123.98, 52.0, 47.8, 47.6, 47.4, 47.3, 33.1, 33.0, 30.7, 30.1, 30.0, 29.5, 20.0, 19.9, 13.78, 13.76. ESI-HRMS: Calcd for $C_{22}H_{27}NNaO_4^+$ $[M+Na]^+$: 392.18323. Found: 392.18311. Anal. Calcd. for $C_{22}H_{27}NO_4$: C, 71.52; H, 7.37; N, 3.79. Found: C, 71.68; H, 7.36; N, 3.82.

Synthesis of methyl 2-(((4-nitrobenzyl)(3-phenylpropyl)carbamoyl)oxy)benzoate (1ak)

The mixture of 1-(bromomethyl)-4-nitrobenzene (1107 mg, 5.12 mmol), 3-phenylpropan-1-amine (1374 mg, 10.2 mmol, 2 eq.), triethylamine (1.0 mL) in diethylether/dichloromethane (15 mL, 2:1 ratio) was stirred at room temperature for 14 hrs. The reaction was quenched with water (20 mL) and the whole was extracted with dichloromethane (30 mL x 2). The organic phase was dried over sodium sulfate and the

solvent was evaporated under reduced pressure to give crude oil. The crude oil was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 1) to afford *N*-(4-nitrobenzyl)-3-phenylpropan-1-amine as pale brown oil (1116 mg, 4.13 mmol, 81% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 8.18-8.15 (m, 2H), 7.47 (d, J = 8.4 Hz, 2H), 7.29-7.26 (m, 2H), 7.20-7.17 (m, 3H), 3.88 (s, 2H), 2.70-2.65 (m, 4H), 1.89-1.81 (m, 2H), 1.39 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 148.3, 147.0, 141.9, 128.6, 128.34, 128.33, 125.8, 123.6, 53.2, 48.9, 33.5, 31.6.

A solution of *N*-(4-nitrobenzyl)-3-phenylpropan-1-amine (949 mg, 3.51 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (994 mg, 3.01 mmol) in tetrahydrofuran (6.0 mL) was stirred at 50ºC for 54 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 4) to afford methyl 2-(((4-nitrobenzyl)(3-phenylpropyl)carbamoyl)oxy)benzoate as colorless oil (1097 mg, 2.45 mmol, 81% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 8.23-8.17 (m, 2H, rotamer A and B), 8.02-7.97 (m, 1H, rotamer A and B), 7.58-7.50 (m, 3H, rotamer A and B), 7.32-7.08 (m, 7H, rotamer A and B), 4.79 (s, 0.8H, rotamer B), 4.62 (s, 1.2H, rotamer A), 3.84 (s, 3H, rotamer A and B), 3.48 (t, J = 7.6 Hz, 1.2H, rotamer A), 3.39 (t, J = 7.6 Hz, 0.8H, rotamer B), 2.69-2.64 (m, 2H, rotamer A and B), 2.09-1.93 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 164.9, 155.1, 154.2, 151.1, 150.9, 147.3, 145.3, 145.1, 141.3, 141.1, 133.6, 131.5, 128.5, 128.4, 128.2, 128.1, 126.1, 125.9, 125.7, 124.0, 123.9, 123.8, 123.72, 123.65, 52.0, 50.6, 47.6, 47.2, 33.0, 32.9, 29.6, 29.0. ESI-HRMS: Calcd for $C_{25}H_{24}N_2NaO_6^+$ $[M+Na]^+$: 471.15266. Found: 471.15012. Anal. Calcd. for $C_{25}H_{24}N_2O_6$: C, 66.95; H, 5.39; N, 6.25. Found: C, 67.04; H, 5.56; N, 6.21.

Synthesis of methyl 2-((methyl(3-(*p*-tolyl)propyl)carbamoyl)oxy)benzoate (1al)

The mixture of 3-(*p*-tolyl)propanoic acid (1125 mg, 6.85 mmol) and thionyl chloride (5.0 mL) was stirred at 60ºC for 1 hr. Then thionyl chloride was removed under reduced pressure to give crude oil of 3-(p-tolyl)propanoyl chloride. The crude compound was dissolved in dichloromethane (10 mL) and slowly dropped to 10 mL of methylamine (40% solution in methanol) at 0ºC. The reaction mixture was stirred at 0ºC. After 5 min, the solvent was removed under reduced pressure to give crude oil. The crude product was purified by column chromatography (eluent: dichloromethane) to afford *N*-methyl-3-(p-tolyl)propanamide (1159 mg, 6.54 mmol, 95% yield) as a colorless soild.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.09 (s, 4H), 5.32 (brs, 1H), 2.92 (t, J = 7.6 Hz, 2H), 2.77 (d, J = 4.8 Hz, 3H), 2.44 (t, J = 7.6 Hz, 2H), 2.31 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 172,8, 137.8, 135.6,

129.1, 128.1, 38.5, 31.3, 26.2, 20.9. ESI-HRMS: Calcd for $C_{11}H_{15}NNaO^+$ $[M+Na]^+$: 200.10459. Found: 200.10188.

A solution of *N*-methyl-3-(p-tolyl)propanamide (849 mg, 4.79 mmol) and lithium aluminum hydride (450 mg, 11.9 mmol) in tetrahydrofuran (20 mL) was stirred at 60ºC for 22 hrs. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil, which contains *N*-methyl-3-(*p*-tolyl)propan-1-amine (768 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.08 (s, 4H), 2.63-2.58 (m, 4H), 2.42 (s, 3H), 2.31 (s, 3H), 1.82-1.75 (m, 2H), 1.27 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 139.0, 135.1, 128.9, 128.2, 51.6, 36.5, 33.1, 31.6, 20.9. ESI-HRMS: Calcd for $C_{11}H_{18}N^+$ $[M+H]^+$: 164.14338. Found: 164.14504.

A solution of *N*-methyl-3-(*p*-tolyl)propan-1-amine (656 mg, 4.02 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (1196 mg, 3.62 mmol) in tetrahydrofuran (10 mL) was stirred at 60 ºC for 14 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 3) to afford methyl 2-((methyl(3-(*p*-tolyl)propyl)carbamoyl)oxy)benzoate (1165 mg, 3.41 mmol, 94% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.95 (dd, J = 7.6, 1.6 Hz, 1H, rotamer A and B), 7.50 (ddd, J = 7.6, 7.6, 1.6 Hz, 1H, rotamer A and B), 7.24 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.16-7.07 (m, 5H, rotamer A and B), 3.82 (s, 3H, rotamer A and B), 3.49 (t, J = 7.6 Hz, 0.8H, rotamer B), 3.34 (t, J = 7.6 Hz, 1.2H, rotamer A), 3.10 (s, 1.8H, rotamer A), 3.00 (s, 1.2H, rotamer B), 2.68-2.61 (m, 2H, rotamer A and B), 2.30 (s, 3H, rotamer A and B), 2.05-1.89 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.1, 154.4, 154.3, 151.2, 151.0, 138.4, 138.2, 135.2, 135.1, 133.3, 131.3, 128.9, 128.04, 127.99, 125.2, 124.0, 123.9, 123.7, 123.6, 51.9, 49.01, 48.95, 34.8, 34.4, 32.4, 32.3, 29.5, 29.0, 20.8. ESI-HRMS: Calcd for $C_{20}H_{23}NNaO_4^+$ $[M+Na]^+$: 364.15193. Found: 364.15223. Anal. Calcd. for $C_{20}H_{23}NO_4$: C, 70.36; H, 6.79; N, 4.10. Found: C, 70.47; H, 6.99; N, 4.17.

Synthesis of methyl 2-(((3-(3,4-dimethoxyphenyl)propyl)(methyl)- carbamoyl)oxy)benzoate (1am)

3-(3,4-dimethoxyphenyl)-*N*-methylpropanamide was synthesized according to the literature. (reference 17)

A solution of 3-(3,4-dimethoxyphenyl)-*N*-methylpropanamide (669 mg, 3.00 mmol) and lithium aluminum hydride (307 mg, 8.09 mmol) in tetrahydrofuran (15 mL) was stirred at 50 ºC for 16 hrs. Then the reaction

solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was evaporated to give crude oil. The oil was dissolved in aqueous hydrogen chloride (1M) (20 mL) and the solution was washed with dichloromethane (10 mL). Then the water layer was basified with aqueous sodium hydroxide (2M) (20 mL) and extracted with ethyl acetate (20 mL). The organic phase was washed with brine (10 mL), dried over sodium sulfate and evaporated to give crude oil, which contains 3-(3,4-dimethoxyphenyl)-*N*-methylpropan-1-amine (386 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 6.81-6.78 (m, 1H), 6.73-6.71 (m, 2H), 3.87 (s, 3H), 3.85 (s, 3H), 2.60 (t, J = 7.2 Hz, 2H), 2.43 (s, 3H), 1.83-1.76 (m, 2H), 1.33 (brs, 1H).

A solution of crude mixture which contains 3-(3,4-dimethoxyphenyl)-*N*-methylpropan-1-amine (368 mg), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (670 mg, 2.03 mmol) in tetrahydrofuran (4.0 mL) was stirred at 50ºC for 44 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 2) to afford methyl 2-(((3-(3,4-dimethoxyphenyl)propyl)(methyl)carbamoyl)oxy)benzoate as colorless oil (509 mg, 1.31 mmol, 44% yield for two steps (based on 3-(3,4-dimethoxyphenyl)-*N*-methylpropanamide)).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.96 (dd, J = 7.6, 1.6 Hz, 1H, rotamer A and B), 7.52 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.26 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.15 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 6.81-6.75 (m, 3H, rotamer A and B), 3.86 (s, 3H, rotamer A and B), 3.85 (s, 3H, rotamer A and B), 3.83 (s, 3H, rotamer A and B), 3.51 (t, J = 7.2 Hz, 0.9H, rotamer B), 3.41 (t, J = 7.2 Hz, 1.1H, rotamer A), 3.12 (s, 1.8H, rotamer A), 3.01 (s, 1.2H, rotamer B), 2.68-2.61 (m, 2H, rotamer A and B), 2.07-1.90 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.2, 154.5, 154.3, 151.3, 151.1, 148.8, 147.23, 147.16, 134.3, 134.1, 133.4, 131.4, 125.3, 124.1, 124.0, 123.8, 123.7, 120.0, 111.7, 111.6, 111.3, 55.84, 55.75, 51.9, 49.1, 49.0, 34.9, 34.5, 32.5, 32.4, 29.5, 29.2. ESI-HRMS: Calcd for $C_{21}H_{25}NNaO_6^+$ $[M+Na]^+$: 410.15741. Found: 410.15576. Anal. Calcd. for $C_{21}H_{25}NO_6$: C, 65.10; H, 6.50; N, 3.62. Found: C, 64.77; H, 6.51; N, 3.57.

Synthesis of methyl 2-(((3-(4-methoxyphenyl)propyl)(methyl)carbamoyl)- oxy)benzoate (1an)

The mixture of 3-(4-methoxyphenyl)propanoic acid (1232 mg, 6.84 mmol) and thionyl chloride (7.0 mL) was stirred at 60 ºC for 23 hrs. Then thionyl chloride was removed under reduced pressure to give crude oil of 3-(4-methoxyphenyl)propanoyl chloride. The crude compound was slowly dropped to 10 mL of

methylamine (40% solution in methanol) at 0ºC. The reaction mixture was stirred at 0 ºC. After 5 min, 10 mL of water was added and the whole was extracted with 50 mL of dichloromethane. The organic layer was washed with aqueous sodium bicarbonate (2M) (10 mL) and dried over sodium sulfate. The solvent was removed under reduced pressure to afford *N*-methyl-3-(4-methoxyphenyl)propanamide (1267 mg, 6.56 mmol, 96% yield) as colorless oil.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.12-7.09 (m, 2H), 6.84-6.80 (m, 2H), 5.44 (brs, 1H), 3.78 (s, 3H), 2.90 (t, J = 7.6 Hz, 2H), 2.76 (d, J = 4.8 Hz, 3H), 2.43 (t, J = 7.6 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 172.8, 158.0, 132.9, 129.2, 113.9, 55.2, 38.7, 30.9, 26.2. ESI-HRMS: Calcd for $C_{11}H_{15}NNaO_2^+$ $[M+Na]^+$: 216.09950. Found: 216.10057.

A solution of 3-(4-methoxyphenyl)-*N*-methylpropanamide (556 mg, 2.87 mmol) and lithium aluminum hydride (229 mg, 6.03 mmol) in tetrahydrofuran (15 mL) was stirred at 60ºC for 4 hrs. Then the reaction solution was cooled to 0ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil, which contains 3-(4-methoxyphenyl)-*N*-methylpropan-1-amine (424 mg). The amine was used directly in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.12-7.08 (m, 2H), 6.84-6.81 (m, 2H), 3.78 (s, 3H), 2.62-2.57 (m, 4H), 2.42 (s, 3H), 1.81-1.74 (m, 2H), 1.18 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 157.7, 134.2, 129.2, 113.7, 55.2, 51.6, 36.5, 32.7, 31.8. ESI-HRMS: Calcd for $C_{11}H_{18}NO^+$ $[M+H]^+$: 180.13829. Found: 180.13787.

A solution of 3-(4-methoxyphenyl)-*N*-methylpropan-1-amine (359 mg, 2.00 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (588 mg, 1.78 mmol) in tetrahydrofuran (5.0 mL) was stirred at 50ºC for 14 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 4) to afford methyl 2-(((3-(4-methoxyphenyl)propyl)(methyl)carbamoyl)oxy)benzoate (601 mg, 1.68 mmol, 94% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.96 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.51 (ddd, J = 8.0, 8.0, 1.6 Hz, 1H, rotamer A and B), 7.25 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 7.16-7.12 (m, 3H, rotamer A and B), 6.84-6.80 (m, 2H, rotamer A and B), 3.82 (s, 3H, rotamer A and B), 3.76 (s, 3H, rotamer A and B), 3.49 (t, J = 7.6 Hz, 0.8H, rotamer B), 3.39 (t, J = 7.6 Hz, 1.2H, rotamer A), 3.11 (s, 1.8H, rotamer A), 3.00 (s, 1.2H, rotamer B), 2.66-2.60 (m, 2H, rotamer A and B), 2.04-1.88 (m, 2H, rotamer A and B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.1, 157.74, 157.67, 154.4, 154.3, 151.2, 151.1, 133.6, 133.4, 131.3, 129.1, 129.0,

125.2, 124.1, 123.9, 123.8, 123.6, 113.69, 113.66, 55.1, 51.9, 49.0, 48.9, 34.9, 34.5, 32.0, 31.9, 29.6, 29.2. ESI-HRMS: Calcd for $C_{20}H_{23}NNaO_5^+$ $[M+Na]^+$: 380.14684. Found: 380.14441. Anal. Calcd. for $C_{20}H_{23}NO_5$: C, 67.21; H, 6.49; N, 3.92. Found: C, 67.02; H, 6.62; N, 3.87.

Synthesis of methyl 2-((methyl(2-phenoxyethyl)carbamoyl)oxy)benzoate (1ao)

A mixture of phenol (1372 mg, 14.6 mmol), potassium carbonate (1822 mg, 13.2 mmol), potassium iodide (106 mg) in acetone (10 mL) was added methyl 2-bromoacetate (1695 mg, 10.15 mmol) under stirring at 25 ºC. The slurry was stirred at 25 ºC for 45 hours. Then the reaction was quenched with water (20 mL) and the whole was extracted with ethyl acetate (30 mL x 2). The organic phase was washed with brine, dried over sodium sulfate and the solvent was removed under reduced pressure to afford crude oil. The oil was purified by silica-gel column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6) to afford *N*-methyl-2-phenoxyacetamide (known compound) (1636 mg, 9.08 mmol, 89% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.34-7.29 (m, 2H), 7.04-7.00 (m, 1H), 6.92-6.89 (m, 2H), 6.65 (brs, 1H), 4.49 (s, 2H), 2.91 (d, J = 4.8 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.8, 157.1, 129.7, 122.0, 114.6, 67.3, 25.7.

A solution of *N*-methyl-2-phenoxyacetamide (680 mg, 4.12 mmol) and lithium aluminum hydride (352 mg, 9.28 mmol) in tetrahydrofuran (20 mL) was stirred at 50 ºC for 3.5 hrs. Then the reaction solution was cooled to 0ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was removed in vacuo to give crude oil. The oil was dissolved in aqueous hydrogen chloride (1M) (20 mL). The solution was washed with ethyl acetate (20 mL) to remove non-basic organic compounds. The water layer was basified with aqueous sodium hydroxide (2M) (20 mL) and extracted with dichloromethane (30 mL x 2). The organic phase was dried over sodium sulfate and the solvent was evaporated under reduced pressure to give *N*-methyl-2-phenoxyethanamine as colorless oil (422 mg, 2.79 mmol, 68% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.25 (m, 2H), 6.96-6.89 (m, 3H), 4.06 (t, J = 5.2 Hz, 2H), 2.96 (t, J = 5.2 Hz, 2H), 2.49 (s, 3H), 1.75 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 158.8, 129.4, 120.8, 114.5, 66.9, 50.8, 36.3.

A solution of *N*-methyl-2-phenoxyethanamine (360 mg, 2.38 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (573 mg, 1.74 mmol) in tetrahydrofuran (2.8 mL) was stirred at 50 ºC for 4 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 6 ~ 1 : 2) to afford methyl 2-((methyl(2-phenoxyethyl)carbamoyl)oxy)benzoate (524 mg, 1.59 mmol, 91% yield (based on dimethyl 2,2'-(carbonylbis(oxy))dibenzoate))).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.98 (dd, J = 8.0, 1.6 Hz, 1H, rotamer A and B), 7.53 (ddd, J = 8.0, 8.0, 1.6 Hz, 1H, rotamer A and B), 7.31-7.26 (m, 3H, rotamer A and B), 7.15 (dd, J = 7.6, 7.6 Hz, 1H, rotamer A and B), 6.98-6.93 (m, 3H, rotamer A and B), 4.29 (t, J = 5.6 Hz, 0.9H, rotamer B), 4.21 (t, J = 5.2 Hz, 1.1H, rotamer A), 3.88 (t, J = 5.6 Hz, 0.9H, rotamer B), 3.81 (s, 1.3H, rotamer B), 3.78 (s, 1.7H, rotamer A), 3.75 (t, J = 5.2 Hz, 1.1H, rotamer A), 3.30 (s, 1.7H, rotamer A), 3.17 (s, 1.3H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.3, 165.1, 158.54, 158.50, 154.7, 154.2, 151.1, 151.0, 133.5, 131.6, 131.5, 129.5, 125.4, 124.1, 124.0, 123.68, 123.65, 121.0, 114.4, 66.3, 52.0, 51.9, 49.2, 48.8, 36.6, 36.5. ESI-HRMS: Calcd for $C_{18}H_{19}NNaO_5^+$ $[M+Na]^+$: 352.11554. Found: 352.11588. Anal. Calcd. for $C_{18}H_{19}NO_5$: C, 65.64; H, 5.81; N, 4.25. Found: C, 65.78; H, 5.97; N, 4.28.

Synthesis of methyl 2-((methyl(3,3,3-triphenylpropyl)carbamoyl)oxy)benzoate (1ap)

A solution of 3,3,3-triphenylpropanoic acid (1229 mg, 4.06 mmol) in $SOCl_2$ (4.0 mL) was stirred at 60 ºC for 1.5 hrs. Then the solvent was removed under reduced pressure to afford pale yellow solids. The solids were dissolved in 5 mL of dichloromethane and added dropwise to a solution of methylamine (40% solution in MeOH) (3.0 mL) under stirring at 0ºC and stirred for 5 min. Then 30 mL of aqueous hydrogen chloride (0.3M) was added and the whole was extracted with dichloromethane (30 mL x 2). The organic phase was washed with saturated aqueous sodium bicarbonate (5 mL) and dried over sodium sulfate. The solvent was removed in vacuo to afford *N*-methyl-3,3,3-triphenylpropanamide as colorless oil (1266 mg, 4.01 mmol, 99%).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.33-7.22 (m, 15H), 4.73 (brs, 1H), 3.57 (s, 2H), 2.46 (d, J = 4.8 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 171.2, 146.3, 129.2, 128.1, 126.4, 56.3, 48.6, 26.3. ESI-HRMS: Calcd for $C_{22}H_{21}NNaO^+$ $[M+Na]^+$: 338.15154. Found: 338.15127.

A solution of *N*-methyl-3,3,3-triphenylpropanamide (642 mg, 2.04 mmol) and lithium aluminum hydride (271 mg, 7.14 mmol) in tetrahydrofuran (15 mL) was refluxed for 3 days. Then the reaction solution was cooled to 0 ºC and quenched with large amount of sodium sulfate decahydrate and ethyl acetate. Then the solution was filtered and the solvent was washed with aqueous hydrogen chloride (1M) (10 mL). Then the organic layer was evaporated under reduced pressure to afford crude solid. The solid was recrystallized from dichloromethane/n-hexane to give colorless cocrystals of *N*-methyl-3,3,3-triphenylpropan-1-aminium chloride and dichloromethane (2 : 1 ratio) (284 mg). The filtrate was purified by column chromatography (eluent: methanol/dichloromethane) to give *N*-methyl-3,3,3-triphenylpropan-1-aminium chloride (57 mg). The whole was dissolved in dichloromethane and washed with aqueous sodium hydroxide (2M) (10 mL),

dried over sodium sulfate and the solvent was removed to give *N*-methyl-3,3,3-triphenylpropan-1-amine as colorless oil (261 mg, 0.866 mmol, 42% yield).

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.29-7.15 (m, 15H), 2.80-2.76 (m, 2H), 2.37-2.33 (m, 2H), 2.31 (s, 3H), 1.06 (brs, 1H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 147.2, 129.0, 127.8, 126.9, 55.7, 49.1, 40.6, 36.6. ESI-HRMS: Calcd for $C_{22}H_{24}N^+$ $[M+H]^+$: 302.19033. Found: 302.19007.

A solution of *N*-methyl-3,3,3-triphenylpropan-1-amine (226 mg, 0.748 mmol), dimethyl 2,2'-(carbonylbis(oxy))dibenzoate) (360 mg, 1.09 mmol) in tetrahydrofuran (3.0 mL) was stirred at 50 ºC for 15 hrs. The solvent of the reaction mixture was evaporated under reduced pressure to give a crude oil. The crude product was purified by column chromatography (eluent: ethyl acetate : *n*-hexane = 1 : 8 ~ 1 : 4) to afford methyl 2-((methyl(3,3,3-triphenylpropyl)carbamoyl)oxy)benzoate as colorless oil (313 mg, 0.652 mmol, 87% yield (based on *N*-methyl-3,3,3-triphenylpropan-1-amine)).

^{1}H-NMR (400 MHz, $CDCl_3$), two rotamers (A and B) with respect to the amide bond were observed (approximately A : B = 6 : 4 ratio at 25 ºC), δ (ppm): 7.99 (d, J = 7.6 Hz, 1H, rotamer A and B), 7.55-7.52 (m, 1H, rotamer A and B), 7.35-7.15 (m, 17H, rotamer A and B), 3.85 (s, 1.7H, rotamer A), 3.80 (s, 1.3H, rotamer B), 3.22-2.92 (m, 5.7H, rotamer A and B), 2.88 (s, 1.3H, rotamer B). ^{13}C-NMR (100 MHz, $CDCl_3$), two rotamers with respect to the amide bond were observed, δ (ppm): 165.2, 154.6, 154.2, 151.4, 151.1, 146.81, 146.75, 133.6, 133.5, 131.6, 131.5, 129.0, 128.9, 128.0, 126.04, 125.98, 125.4, 124.2, 124.0, 123.9, 123.6, 55.3, 55.2, 52.0, 47.6, 47.0, 38.2, 37.5, 35.0.

ESI-HRMS: Calcd for $C_{31}H_{29}NNaO_4^+$ $[M+Na]^+$: 502.19888. Found: 502.19652.

III. Cyclization reactions

A typical procedure: Synthesis of isoindolin-1-one (2a)

To a solution of methyl 2-((benzylcarbamoyl)oxy)benzoate (282 mg, 0.988 mmol) in dry dichloromethane (4.94 ml, 0.2 M), trifluoromethanesulfonic acid (0.88 mL, 10 eq) was added at 0 ºC. The mixture was stirred at 20 ºC under argon atmosphere for 1 hr. Then the mixture was quenched with 20 mL of ice water and the whole was extracted with dichloromethane (50 mL x 2). The organic layer was dried over sodium sulfate and the solvent was evaporated to give a crude oil mixture. The crude product was purified by column chromatography (eluent: ethyl acetate: chloroform = 1 : 2) to afford isoindolin-1-one (74.1 mg, 0.557 mmol, 56% yield) as colorless oil.

^{1}H-NMR (400 MHz, $CDCl_3$), *d* (ppm): 7.99 (brs, 1H), 7.87 (d, J = 7.6 Hz, 1H), 7.57 (ddd, J = 8.0, 6.8, 1.2 Hz, 1H), 7.50-7.46 (m, 2H), 4.46 (s, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) *d* (ppm): 172.2, 143.7, 132.2, 131.7, 127.9, 123.6, 123.1, 45.8. ESI-HRMS: Calcd for $C_8H_7NNaO^+$ $[M+Na]^+$: 156.04198. Found: 156.04153.

Synthesis of 2-methylisoindolin-1-one (2b)

Synthesized according to the synthetic procedure of **2a**. 80% Yield (from **1b**). Mp. 94.0 - 96.0 ºC (colorless needles, recrystallized from $CHCl_3$/hexane) ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.83 (d, J = 7.6 Hz, 1H), 7.52 (ddd, J = 7.6, 7.6, 1.2 Hz, 1H), 7.46-7.42 (m, 2H), 4.37 (s, 2H), 3.20 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.5, 140.9, 132.8, 131.1, 127.9, 123.5, 122.5, 51.9, 29.4. ESI-HRMS: Calcd for $C_9H_9NNaO^+$ $[M+Na]^+$: 170.05764. Found: 170.05792. Anal. Calcd. for C_9H_9NO: C, 73.45; H, 6.16; N, 9.52. Found: C, 73.39; H, 6.35; N, 9.37.

Synthesis of 2-benzylisoindolin-1-one (2c)

Synthesized according to the synthetic procedure of **2a**. 83% Yield (from **1c**). Mp. 87.0 - 88.0 ºC (colorless needles, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.89 (d, J = 7.2 Hz, 1H), 7.51 (ddd, J = 7.2, 7.2, 1.2 Hz, 1H), 7.46 (dd, J = 7.2, 7.2 Hz, 1H), 7.37 (d, J = 7.2 Hz, 1H), 7.35-7.28 (m, 5H), 4.80 (s, 2H), 4.26 (s, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.5, 141.2, 137.1, 132.7, 131.4, 128.8, 128.2, 128.1, 127.7, 123.9, 122.8, 49.4, 46.4. ESI-HRMS: Calcd for $C_{15}H_{13}NNaO^+$ $[M+Na]^+$: 246.08894. Found: 246.08935. Anal. Calcd. for $C_{15}H_{13}NO$: C, 80.69; H, 5.87; N, 6.27. Found: C, 80.84; H, 6.11; N, 5.97.

Synthesis of 2-isopentylisoindolin-1-one (2d)

Synthesized according to the synthetic procedure of **2a**. 92% Yield (from **1d**). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.83 (dd, J = 7.2, 1.6 Hz, 1H), 7.53-7.49 (m, 1H), 7.46-7.42 (m, 2H), 4.37 (s, 2H), 3.64 (t, J = 7.2 Hz, 2H), 1.68-1.60 (m, 1H), 1.58-1.52 (m, 2H), 0.96 (d, J = 6.4 Hz, 6H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.3, 141.0, 133.0, 131.0, 127.9, 123.5, 122.5, 49.7, 40.6, 37.1, 25.8, 22.4. ESI-HRMS: Calcd for $C_{13}H_{17}NNaO^+$ $[M+Na]^+$: 226.12024. Found: 226.12059.

Synthesis of 2-cyclobutylisoindolin-1-one (2e)

Synthesized according to the synthetic procedure of **2a**. 92% Yield (from **1e**). Mp. 54.0 - 56.0 ºC (colorless plates, recrystallized from $CHCl_3$/hexane) ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.83 (dd, J = 7.2, 1.2 Hz, 1H), 7.53 (ddd, J = 7.2, 7.2, 1.2 Hz, 1H), 7.47-7.43 (m, 2H), 4.96 (m, 1H), 4.46 (s, 2H), 2.32-2.25 (m, 4H), 1.83-1.75 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 167.8, 141.0, 133.2, 131.1, 127.9, 123.6, 122.7, 46.5, 46.3, 28.7, 15.1. ESI-HRMS: Calcd for $C_{12}H_{13}NNaO^+$ $[M+Na]^+$: 210.08894. Found: 210.08913. Anal. Calcd. for $C_{12}H_{13}NO$: C, 76.98; H, 7.00; N, 7.48. Found: C, 76.80; H, 6.99; N, 7.25.

Synthesis of 2,4-dimethylisoindolin-1-one (2g)

Synthesized according to the synthetic procedure of **2a**. 10% Yield (from **1g**). White solids. ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.66 (d, J = 7.2 Hz, 1H), 7.36 (dd, J = 7.6, 7.6 Hz, 1H), 7.30 (d, J = 7.6 Hz, 1H), 4.28 (s, 2H), 3.21 (s, 3H), 2.34 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 169.0, 139.9, 132.6, 132.2, 132.0, 128.2, 121.1, 51.3, 29.5, 17.5. ESI-HRMS: Calcd for $C_{10}H_{11}NNaO^+$ $[M+Na]^+$: 184.07329. Found: 184.07391.

Synthesis of 2,6-dimethylisoindolin-1-one (2h)

Method 1 (Entry 8): To a solution of methyl 2-((methyl(4-methylbenzyl)carbamoyl)oxy)benzoate (574.8 mg, 1.83 mmol) in dichloromethane (9.2 ml, 0.2 M), trifluoromethanesulfonic acid (1.63 mL, 10 eq.) was added at 0 ºC. The mixture was stirred at 24 ºC under argon atmosphere for 1 hr. Then the mixture was quenched with 50 mL of ice water and the whole was extracted with dichloromethane (40 mL x 2). The organic layer was dried over sodium sulfate and the solvent was evaporated to give a crude oil mixture. The crude product was purified by column chromatography (eluent: ethyl acetate: dichloromethane = 1 : 6 ~ 1 : 1) to afford methyl 2-((methylcarbamoyl)oxy)benzoate (26.4 mg, 0.126 mmol, 7% yield) and trace amount of 2,6-dimethylisoindolin-1-one in complex mixture of products (13.0 mg, at most 4% yield).

Method 2 (Entry 9): To a solution of methyl 2-((methyl(4-methylbenzyl)carbamoyl)- oxy)benzoate (202.0 mg, 0.645 mmol) in dichloromethane (3.2 ml, 0.2 M), trifluoromethanesulfonic acid (0.29 mL, 5 eq.) was added at 0 ºC. The mixture was stirred at 24 ºC under argon atmosphere for 1 hr. Then the mixture was quenched with 20 mL of ice water and the whole was extracted with dichloromethane (30 mL x 2). The organic layer was dried over sodium sulfate and the solvent was evaporated to give a crude oil mixture. The crude product was purified by column chromatography (eluent: ethyl acetate: dichloromethane = 1 : 6 ~ 1 : 1) to afford 2,6-dimethylisoindolin-1-one (32.1 mg, 0.199 mmol, 31%) as white solids.

^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.55 (s, 1H), 7.25-7.20 (m, 2H), 4.23 (s, 2H), 3.10 (s, 3H), 2.35 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.7, 138.1, 137.9, 132.9, 132.0, 123.7, 122.2, 51.7, 29.4, 21.2. ESI-HRMS: Calcd for $C_{10}H_{11}NNaO^+$ $[M+Na]^+$: 184.07329. Found: 184.07364.

Synthesis of 6-chloro-2-methylisoindolin-1-one (2i)

Synthesized according to the synthetic procedure of **2a**. 76% Yield (from **1i**). Mp. 101.5 - 103.0 ºC (colorless plates, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.79 (d, J = 2.0 Hz, 1H), 7.48 (dd, J = 8.0, 2.0 Hz, 1H), 7.36 (d, J = 8.0 Hz, 1H), 4.35 (s, 2H), 3.19 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 167.3, 139.1, 134.7, 134.3, 131.3, 123.9, 123.8, 51.7, 29.6. ESI-HRMS: Calcd for $C_9H_8ClNNaO^+$ $[M+Na]^+$: 204.01866. Found: 204.01767. Anal. Calcd. for C_9H_8ClNO: C, 59.52; H, 4.44; N, 7.71. Found: C, 59.83; H, 4.57; N, 7.71.

Synthesis of 6-bromo-2-methylisoindolin-1-one (2j)

Synthesized according to the synthetic procedure of **2a**. 79% Yield (from **1j**). Mp. 103.0 - 105.0 ºC (colorless needles, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.95 (d, J = 1.8 Hz, 1H), 7.63 (dd, J = 8.0, 1.8 Hz, 1H), 7.31 (d, J = 8.0 Hz. 1H), 4.33 (s, 2H), 3.19 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 167.1, 139.5, 134.9, 134.1, 126.7, 124.1, 122.1, 51.7, 29.5. ESI-HRMS: Calcd for $C_9H_8BrNNaO^+$ $[M+Na]^+$: 247.96815. Found: 247.96715. Anal. Calcd. for C_9H_8BrNO: C, 47.82; H, 3.57; N, 6.20. Found: C, 47.80; H, 3.60; N, 6.12.

Synthesis of 6-methoxy-3,4-dihydroisoquinolin-1(2*H*)-one (2n-1) and 8-methoxy-3,4-dihydroisoquinolin-1(2*H*)-one (2n-2)

Synthesized according to the synthetic procedure of **2a**. **2n-1**: 83% Yield (from **1n**). Mp. 141.0 - 143.0 ºC (colorless powder, recrystallized from EtOAc/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 8.00 (d, J = 8.8 Hz, 1H), 7.06 (brs, 1H), 6.85 (dd, J = 8.8, 2.0 Hz, 1H), 6.71 (s, 1H), 3.85 (s, 3H), 3.56 (dt, J = 6.4, 2.8 HZ, 2H), 2.95 (t, J = 6.4 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 166.7, 162.5, 141.0, 130.0, 121.8, 112.4, 112.3, 55.3, 40.1, 28.7. ESI-HRMS: Calcd for $C_{10}H_{11}NNaO_2^+$ $[M+Na]^+$: 200.06820. Found: 200.06788. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 67.78; H, 6.26; N, 7.90. Found: C, 67.82; H, 6.20; N, 7.89. **2n-2**: 14% Yield (21 mg, 0.12 mmol, from 0.832 mmol of **1n**). Mp. 148.0 - 149.0 ºC (colorless cube, recrystallized from EtOAc/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 7.36 (dd, J = 8.4, 7.6 Hz, 1H), 6.89 (d, J = 8.4 Hz, 1H), 6.80 (dd, 7.6, 0.8 Hz, 1H), 6.79 (brs, 1H), 3.93 (s, 3H), 3.46 (dt, J = 6.4, 3.6 Hz, 2H), 2.92 (t, J = 6.4 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.2, 160.0, 142.0, 132.6, 119.5, 117.6, 110.7, 56.1, 39.7, 30.1. ESI-HRMS: Calcd for $C_{10}H_{11}NNaO_2^+$ $[M+Na]^+$: 200.06820. Found: 200.06849. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 67.78; H, 6.26; N, 7.90. Found: C, 67.57; H, 6.25; N, 7.82.

Synthesis of 6,7-dimethoxy-3,4-dihydroisoquinolin-1(2*H*)-one (2o)

Synthesized according to the synthetic procedure of **2a**. 95% Yield (from **1o**). Mp. 158.0 - 159.0 ºC (colorless plate, recrystallized from EtOAc/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 7.57 (s, 1H), 6.74 (brs, 1H), 6.68 (s, 1H), 3.934 (s, 3H), 3.930 (s, 3H), 3.57 (dt, J = 6.8, 2.8 Hz, 2H), 2.93 (t, J = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 166.5, 152.1, 148.0, 132.6, 121.4, 110.1, 109.5, 56.1, 56.0, 40.4, 28.0. ESI-HRMS: Calcd for $C_{11}H_{13}NNaO_3^+$ $[M+Na]^+$: 230.07876. Found: 230.07913. Anal. Calcd. for $C_{11}H_{13}NO_3$: C, 63.76; H, 6.32; N, 6.76. Found: C, 63.54; H, 6.24; N, 6.73.

Synthesis of 1-oxo-1,2,3,4-tetrahydroisoquinolin-7-yl trifluoromethanesulfonate (2p)

Synthesized according to the synthetic procedure of **2a**. 35% Yield (from **1p**). Mp. 107.0 - 108.0 ºC (colorless needle, recrystallized from $CHCl_3$/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 7.97 (d, J = 2.8 Hz, 1H), 7.37 (dd, J = 8.4, 2.8 Hz, 1H), 7.33 (dd, J = 8.4, 0.4 Hz, 1H), 7.19 (brs, 1H), 3.61 (dt, J = 6.8, 3.2 Hz, 2H), 3.04 (t, J = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 164.6, 148.5, 139.1, 131.2, 129.4, 124.9, 120.8, 118.7 (q, J = 319 Hz), 39.8, 27.7. ESI-HRMS: Calcd for $C_{10}H_8F_3NNaO_4S^+$ $[M+Na]^+$: 318.00183. Found: 318.00418. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 40.68; H, 2.73; N, 4.74. Found: C, 40.67; H, 2.73; N, 4.74.

Synthesis of 2,3-dihydrobenzo[f]isoquinolin-4(1*H*)-one (2r)

Synthesized according to the synthetic procedure of **2a**. 92% Yield (from **1r**). Mp. 222.0 - 223.0 ºC (colorless plate, recrystallized from $CHCl_3$/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 8.17 (d, J = 8.4 Hz, 1H), 8.07-8.03 (m, 1H), 7.91-7.87 (m, 1H), 7.82 (d, J = 8.4 Hz, 1H), 7.60-7.56 (m, 2H), 7.14 (brs, 1H), 3.73 (dt, J = 6.8, 1.2 Hz, 2H), 3.41 (t, J = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 167.0, 136.8, 135.2, 130.3, 128.8, 127.6, 127.1, 126.6, 126.1, 124.3, 123.9, 39.7, 24.2. ESI-HRMS: Calcd for $C_{13}H_{11}NNaO^+$ $[M+Na]^+$: 220.07329. Found: 220.07317. Anal. Calcd. for $C_{13}H_{11}NO$: C, 79.16; H, 5.62; N, 7.10. Found: C, 78.97; H, 5.73; N, 7.09.

Synthesis of 3,4-dihydrobenzo[h]isoquinolin-1(2*H*)-one (2s)

Synthesized according to the synthetic procedure of **2a**. 96% Yield (from **1s**). Mp. 160.0 - 162.0 ºC (colorless powder, recrystallized from $CHCl_3$/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 9.40 (d, J = 8.8 Hz, 1H), 7.88 (d, J = 8.4 Hz, 1H), 7.79 (dd, J = 8.0, 0.4 Hz, 1H), 7.55 (ddd, J = 8.8, 6.8, 1.2 Hz, 1H), 7.45 (ddd, 8.0, 6.8, 1.2 Hz, 1H), 7.42 (brs, 1H), 7.27 (d, J = 8.4 Hz, 1H), 3.49 (dt, J = 6.4, 3.2 Hz, 2H), 3.04 (t, J = 6.4 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 167.4, 140.1, 133.2, 132.7, 131.6, 128.2, 127.8, 126.7, 125.6, 125.4, 123.8, 39.2, 30.3. ESI-HRMS: Calcd for $C_{13}H_{11}NNaO^+$ $[M+Na]^+$: 220.07329. Found: 220.07237.

Synthesis of 7-fluoro-3,4-dihydroisoquinolin-1(2*H*)-one (2t)

Synthesized according to the synthetic procedure of **2a**. 88% Yield (from **1t**). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.76 (dd, J = 9.2, 2.8 Hz, 1H), 7.14-7.20 (m, 2H), 6.17 (brs, 1H), 3.57 (dt, J = 6.8, 3.2 Hz, 2H), 2.98 (t, J = 6.0 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.7, 161.6 (d, J = 244 Hz), 134.4 (d, J = 3 Hz), 130.7 (d, J = 7 Hz), 128.8 (d, J = 7 Hz), 118.9 (d, J = 22 Hz), 114.2 (d, J = 22 Hz), 39.9, 27.3. Anal. Calcd. for C_9H_8FNO: C, 65.45; H, 4.88; N, 8.48. Found: C, 65.24; H, 5.03; N, 8.37. MS (ESI+): 188 ($[M+Na]^+$).

Synthesis of 7-chloro-3,4-dihydroisoquinolin-1(*2H*)-one (2u)

Synthesized according to the synthetic procedure of **2a**. 88% Yield (from **1u**). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 8.05 (d, *J* = 2.0 Hz, 1H), 7.41 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.28 (brs, 1H), 7.18 (d, *J* = 8.0 Hz, 1H), 3.61 - 3.57 (m, 2H), 2.98 (t, *J* = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 165.5, 137.2, 133.1, 132.1, 130.5, 128.8, 127.9, 40.0, 27.7. ESI-HRMS: Calcd. for $C_9H_8ClNNaO^+$ ($[M+Na]^+$): 204.0187. Found: 204.0192.

Synthesis of 5-bromo-3,4-dihydroisoquinolin-1(2*H*)-one (2w)

Synthesized according to the synthetic procedure of **2a**. 75% Yield (from **1w**). Mp. 182.0 - 183.0 ºC (colorless plate, recrystallized from $CHCl_3$/*n*-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), *δ* (ppm): 8.05 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.69 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.23 (t, *J* = 8.0, 8.0 Hz, 1H), 7.09 (brs, 1H), 3.59 (dt, *J* = 6.8, 3.2 Hz, 2H), 3.10 (t, *J* = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) *δ* (ppm): 165.6, 138.5, 136.0, 130.9, 128.1, 127.3, 122.9, 39.4, 28.2. ESI-HRMS: Calcd for $C_9H_8BrNNaO^+$ $[M+Na]^+$: 247.96815. Found: 247.96735. Anal. Calcd. for $C_9H_8BrNO_2$: C, 47.82; H, 3.57; N, 6.20. Found: C, 47.67; H, 3.48; N, 6.12.

Synthesis of 6-bromo-3,4-dihydroisoquinolin-1(2*H*)-one (2x-1) and 8-Bromo-3,4-dihydroisoquinolin-1(2*H*)-one (2x-2)

Synthesized according to the synthetic procedure of **2a**. **2x-1**: 73% Yield (from **2x**). Mp. 178.0 - 180.0 ºC (colorless needle, recrystallized from $CHCl_3$/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), *δ* (ppm): 7.92 (d, *J* = 8.4 Hz, 1H), 7.49 (dd, *J* = 8.4, 1.6 Hz, 1H), 7.40 (s, 1H), 6.94 (brs, 1H), 3.58 (dt, *J* = 6.4, 3.6 Hz, 2H), 2.98 (t, *J* = 6.4 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) *δ* (ppm): 165.8, 140.7, 130.4, 130.2, 129.7, 127.8, 126.8, 40.0, 28.1. ESI-HRMS: Calcd for $C_9H_8BrNNaO^+$ $[M+Na]^+$: 247.96815. Found: 247.96870.

2x-2: 19% Yield (from **2x**). Mp. 104.0 - 106.0 ºC (colorless powder, recrystallized from $CHCl_3$/n-hexane). ^{1}H-NMR (400 MHz, $CDCl_3$), *δ* (ppm): 7.60 (dd, *J* = 7.6, 1.2 Hz, 1H), 7.22 (dd, *J* = 7.6, 7.6 Hz, 1H), 7.18 (ddd, *J* = 7.6, 1.2, 0.4 Hz, 1H), 7.07 (brs, 1H), 3.49 (dt, *J* = 6.4, 4.0 Hz, 2H), 2.98 (t, *J* = 6.4 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) *δ* (ppm): 164.3, 142.2, 134.2, 131.9, 127.9, 126.7, 122.6, 39.5, 30.2. ESI-HRMS: Calcd for $C_9H_8BrNNaO^+$ $[M+Na]^+$: 247.96815. Found: 247.96827. Anal. Calcd. for $C_9H_8BrNO_2$: C, 47.82; H, 3.57; N, 6.20. Found: C, 47.83; H, 3.67; N, 6.09.

Synthesis of 2-ethyl-3,4-dihydroisoquinolin-1(2*H*)-one (2ac)

Synthesized according to the synthetic procedure of **2a**. 93% Yield (from **1ac**). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$), *δ* (ppm): 8.05 (ddd, *J* = 7.6, 1.2, 0.4 Hz, 1H), 7.37 (ddd, 7.6, 7.6, 1.6 Hz, 1H), 7.29

(dddd, *J* = 7.6, 7.6, 1.2, 0.8 Hz, 1H), 7.13 (ddd, *J* = 7.6, 0.8, 0.4 Hz, 1H), 3.59 (q, *J* = 7.2 Hz, 2H), 3.51 (t, *J* = 6.8 Hz, 2H), 2.95 (t, *J* = 6.8 Hz, 2H), 1.19 (t, *J* = 7.2 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 163.9, 137.9, 131.4, 129.6, 128.0, 126.9, 126.8, 45.4, 42.1, 28.1, 12.7. ESI-HRMS: Calcd for $C_{11}H_{13}NNaO^+$ $[M+Na]^+$: 198.08894. Found: 198.08831.

Synthesis of 2-decyl-3,4-dihydroisoquinolin-1(2*H*)-one (2ad)

Synthesized according to the synthetic procedure of **2a**. 89% Yield (from **1ad**). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 8.07 (ddd, *J* = 7.6, 1.2, 0.4 Hz, 1H), 7.39 (ddd, 7.6, 7.2, 1.2 Hz, 1H), 7.32 (ddd, *J* = 7.6, 7.2, 1.2 Hz, 1H), 7.15 (d, *J* = 7.2 Hz, 1H), 3.55 (t, *J* = 7.2 Hz, 2H), 3.54 (t, *J* = 6.8 Hz, 2H), 2.97 (t, *J* = 6.4 Hz, 2H), 1.62 (dt, *J* = 7.2 Hz, 2H), 1.33-1.27 (m, 14H), 0.87 (t, *J* = 6.8 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 164.1, 137.9, 131.3, 129.7, 128.1, 126.9, 126.7, 47.5, 46.0, 31.8, 29.57, 29.56, 29.4, 29.3, 28.2, 27.7, 27.0, 22.6, 14.1. ESI-HRMS: Calcd for $C_{19}H_{29}NNaO^+$ $[M+Na]^+$: 310.21414. Found: 310.21365.

Synthesis of 2-isopropyl-7-nitro-3,4-dihydroisoquinolin-1(2*H*)-one (2af)

Synthesized according to the synthetic procedure of **2a**. 68% Yield (from **1af**). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$), δ (ppm): 8.91 (d, *J* = 2.4 Hz, 1H), 8.24 (dd, *J* = 8.4, 2.8 Hz, 1H), 7.37 (d, *J* = 8.4 Hz, 1H), 5.09 (h, 6.8 Hz, 1H), 3.51 (t, *J* = 6.8 Hz, 2H), 3.06 (t, *J* = 6.8 Hz, 2H), 1.23 (d, *J* = 6.8 Hz, 6H).^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 161.6, 147.5, 144.6, 131.5, 128.0, 125.8, 123.7, 44.3, 38.4, 28.5, 19.6. ESI-HRMS: Calcd for $C_{12}H_{14}N_2NaO_3^+$ $[M+Na]^+$: 257.08966. Found: 257.08687.

Synthesis of 2,3,4,5-tetrahydro-benzo[c]azepin-1-one (2ag)

Synthesized according to the synthetic procedure of **2a**. <40% Yield (46.6 mg of crude product which contains **2ag** was obtained from 1.22 mmol of **1ag**). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.73 (d, *J* = 7.2 Hz, 1H), 7.43 (dd, *J* = 7.2, 7.2 Hz, 1H), 7.36 (dd, *J* = 7.6, 7.2 Hz, 1H), 7.21 (d, *J* = 7.6 Hz, 1H), 6.69 (brs, 1H), 3.15 (q, *J* = 6.4 Hz, 2H), 2.89 (t, *J* = 7.2 Hz, 2H), 2.08 - 2.01 (m, 2H). [1]

Synthesis of 2-methyl-2,3,4,5-tetrahydro-1*H*-benzo[*c*]azepin-1-one (2ah)

Synthesized according to the synthetic procedure of **2a**. 81% Yield (from **1ah**). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.66 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.35 (ddd, *J* = 7.6, 7.6, 1.6 Hz, 1H), 7.32-7.28 (m, 1H), 7.12 (dd, *J* = 7.2, 0.8 Hz, 1H), 3.21 (t, *J* = 6.4 Hz, 2H), 3.18 (s, 3H), 2.77 (t, *J* = 7.2 Hz, 2H), 2.08-2.01 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 171.1, 137.2, 136.2, 130.6, 128.3, 128.1, 126.8, 47.9, 34.4, 29.9, 28.7. ESI-HRMS: Calcd for $C_{11}H_{13}NNaO^+$ $[M+Na]^+$: 198.08894. Found: 198.08922.

Synthesis of 2-isopropyl-2,3,4,5-tetrahydro-1*H*-benzo[*c*]azepin-1-one (2ai)

Synthesized according to the synthetic procedure of **2a**. 80% Yield (from **1ai**). Mp. 89.5 - 90.5 ºC (colorless solid, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.67 (dd, J = 6.8, 1.6 Hz, 1H), 7.37-7.28 (m, 2H), 7.12 (dd, J = 6.8, 1.2 Hz, 1H), 5.06-4.96 (m, 1H), 3.11 (t, J = 6.8 Hz, 2H), 2.78 (t, J = 6.8 Hz, 2H), 1.97 (p, J = 6.8 Hz, 2H), 1.22 (d, J = 6.8 Hz, 6H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 170.6, 137.1, 136.5, 130.5, 128.7, 128.0, 126.8, 44.4, 39.3, 31.3, 30.0, 20.7. ESI-HRMS: Calcd. for $C_{13}H_{17}NNaO^+$ $[M+Na]^+$: 226.12024. Found: 226.11952. Anal. Calcd. for $C_{13}H_{17}NO$: C, 76.81; H, 8.43; N, 6.89. Found: C, 76.49; H, 8.40; N, 6.86.

Synthesis of 2-butyl-2,3,4,5-tetrahydro-1*H*-benzo[*c*]azepin-1-one (2aj)

Synthesized according to the synthetic procedure of **2a**. 87% Yield (from **1aj**). Colorless oil.
^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.65 (dd, J = 7.2, 1.6 Hz, 1H), 7.34 (ddd, J = 7.2, 7.2, 1.6 Hz, 1H), 7.30 (ddd, J = 7.2, 7.2, 1.6 Hz, 1H), 7.11 (dd, J = 7.2, 1.6 Hz, 1H), 3.56 (t, J = 7.6 Hz, 2H), 3.18 (t, J = 6.8 Hz, 2H), 2.77 (t, J = 6.8 Hz, 2H), 2.02 (p, J = 6.8 Hz, 2H), 1.67-1.60 (m, 2H), 1.41 (sextet, J = 7.6 Hz, 2H), 0.97 (t, J = 7.6 Hz, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 170.7, 137.1, 136.4, 130.4, 128.4, 128.0, 126.7, 47.0, 46.1, 30.9, 30.1, 29.9, 20.2, 13.8. ESI-HRMS: Calcd for $C_{14}H_{19}NNaO^+$ $[M+Na]^+$: 240.13589. Found: 240.13493. Anal. Calcd. for $C_{14}H_{19}NO$:C, 77.38; H, 8.81; N, 6.45. Found: C, 76.99; H, 8.70; N, 6.39.

Synthesis of 2-(4-nitrobenzyl)-2,3,4,5-tetrahydro-1*H*-benzo[*c*]azepin-1-one (2ak)

Synthesized according to the synthetic procedure of **2a**.
92% Yield (from **1ak**). Colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 8.23-8.19 (m, 2H), 7.73 (dd, J = 8.0, 1.6 Hz, 1H), 7.57-7.54 (m, 2H), 7.42-7.33 (m, 2H), 7.15 (dd, J = 6.8, 0.8 Hz, 1H), 4.88 (s, 2H), 3.23 (t, J = 6.4 Hz, 2H), 2.77 (t, J = 7.2 Hz, 1.94-1.87 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 171.5, 147.4, 145.7, 137.2, 135.3, 131.2, 128.8, 128.7, 128.4, 127.1, 123.9, 50.0, 46.2, 30.1, 29.1. ESI-HRMS: Calcd for $C_{17}H_{16}N_2NaO_3^+$ $[M+Na]^+$: 319.10531. Found:319.10728. Anal. Calcd. for $C_{17}H_{16}N_2O_3$: C, 68.91; H, 5.44; N, 9.45. Found: C, 68.76; H, 5.53; N, 9.39.

Synthesis of 2,8-dimethyl-2,3,4,5-tetrahydro-1*H*-benzo[*c*]azepin-1-one (2al)

Synthesized according to the synthetic procedure of **2a**. 98% Yield (from **1al**). Mp. 85.0 - 86.0 ºC (colorless needles, recrystallized from $CHCl_3$/hexane). ^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.47 (s, 1H), 7.15 (dd, J = 7.6, 1.2 Hz, 1H), 7.01 (d, J = 7.6 Hz, 1H), 3.20 (t, J = 6.4 Hz, 2H), 3.17 (s, 3H), 2.73 (t, J =

6.8 Hz, 2H), 2.35 (s, 3H), 2.02 (p, *J* = 6.8 Hz, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 171.4, 136.5, 136.1, 134.2, 131.3, 128.9, 128.1, 48.0, 34.5, 29.5, 28.7, 20.9.
ESI-HRMS: Calcd for $C_{12}H_{15}NNaO^+$ $[M+Na]^+$: 212.10459. Found: 212.10465. Anal. Calcd. for $C_{12}H_{15}NO$: C, 76.16; H, 7.99; N, 7.40. Found: C, 76.12; H, 8.05; N, 7.38.

Synthesis of 7,8-dimethoxy-2-methyl-2,3,4,5-tetrahydro-1H-benzo[c]azepin-1-one (2am)

Synthesized according to the synthetic procedure of **2a**. 88% Yield (from **1am**). Mp. 96.0 - 97.0 ºC (colorless needles, recrystallized from CH_2Cl_2/hexane).
^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.23 (s, 1H), 6.62 (s, 1H), 3.91 (s, 3H), 3.90 (s, 3H), 3.23 (t, *J* = 6.8 Hz, 2H), 3.17 (s, 3H), 2.72 (t, *J* = 7.2 Hz, 2H), 2.08-2.01 (m, 2H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 171.3, 150.5, 147.6, 130.8, 128.2, 111.7, 111.2, 56.0, 55.9, 48.3, 34.7, 29.9, 29.1. ESI-HRMS: Calcd for $C_{13}H_{17}NNaO_3^+$ $[M+Na]^+$: 258.11006. Found: 258.10883. Anal. Calcd. for $C_{13}H_{17}NO_3$: C, 66.36; H, 7.28; N, 5.95. Found: C, 66.16; H, 7.13; N, 5.96.

Synthesis of 4-methyl-3,4-dihydrobenzo[f][1,4]oxazepin-5(2H)-one (2ao)

Synthesized according to the synthetic procedure of **2a**. 73% Yield (from **1ao**). Colorless oil.
^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.80 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.39 (ddd, *J* = 8.0, 7.6, 1.6 Hz, 1H), 7.14 (ddd, *J* = 7.6, 7.6, 1.2 Hz, 1H), 6.98 (dd, *J* = 8.0, 1.2 Hz, 1H), 4.38 (t, *J* = 5.2 Hz, 2H), 3.51 (t, *J* = 5.2 Hz, 2H), 3.21 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 168.4, 153.7, 132.6, 130.9, 127.1, 123.3, 121.2, 72.4, 48.4, 35.3. ESI-HRMS: Calcd for $C_{10}H_{11}NNaO_2^+$ $[M+Na]^+$: 200.06820. Found: 200.06829. Anal. Calcd. for $C_{10}H_{11}NO_2$: C, 67.78; H, 6.26; N, 7.90. Found: C, 67.41; H, 6.26; N, 7.84.

Synthesis of 2-methyl-5,5-diphenyl-2,3,4,5-tetrahydro-1H-benzo[c]azepin-1-one (2ap)

Synthesized according to the synthetic procedure of **2a**. 88% Yield (from **1ap**). Mp. 228.0 - 230.0 ºC (colorless cubes, recrystallized from $CHCl_3$/hexane).
^{1}H-NMR (400 MHz, $CDCl_3$) δ (ppm): 7.73 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.36 (ddd, = 7.6, 7.6, 1.2 Hz, 1H), 7.29-7.24 (m, 5H), 7.19-7.15 (m, 2H), 7.10-.07 (m, 4H), 6.75 (dd, *J* = 8.0, 0.8 Hz, 1H), 3.42 (t, *J* = 6.4 Hz, 2H), 3.13 (t, *J* = 6.4 Hz, 2H), 2.53 (s, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ (ppm): 170.8, 146.3, 142.9, 137.5, 129.9, 129.2, 128.9, 128.4, 128.0, 127.3, 126.2, 55.9, 47.6, 39.7, 33.9. ESI-HRMS: Calcd for $C_{23}H_{21}NNaO^+$ $[M+Na]^+$: 350.15154. Found: 350.15365. Anal. Calcd. for $C_{23}H_{21}NO$: C, 84.37; H, 6.46; N, 4.28. Found: C, 84.04; H, 6.56; N, 4.33.