Supporting Information
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Supporting Information

General Procedures.
All the reactions were carried out in a round-bottomed flask with an appropriate number of necks and side arms connected to a three-way stopcock and/or a rubber septum cap under an argon atmosphere. All vessels were first evacuated by rotary pump and then flushed with argon prior to use. Solution and solvent were introduced by hypodermic syringe through a rubber septum. During the reaction, the vessel was kept under a positive pressure of argon. Dry THF was freshly prepared by distillation from benzo phenone ketyl before use. Anhydrous CH₂Cl₂, DMF, ethanol, MeCN, benzene, and toluene were purchased from Kanto Chemical Co. Inc.

Infrared (IR) spectra were recorded on JASCO FT/IR-4100 spectrophotometer using 5 mm KBr plate. Wavelengths of maximum absorbance are quoted in cm⁻¹. ¹H NMR spectra were recorded on a Bruker AV-500 (500 MHz) in CDCl₃. Chemical shifts are reported in part per million (ppm), and signal are expressed as singlet (s), doublet (d), triplet (t), quartet (q), quintet (qn), sx (sextet), multiplet (m) and broad (br). ¹³C NMR spectra were recorded on a Bruker AV-500 (125 MHz) in CDCl₃. Chemical shifts are reported in part per million (ppm). High resolution mass (HRMS) spectra were recorded on a Thermo Scientific Exactive, Instrumental Analysis Division, Equipment Manager Center Creative Research Institution, Hokkaido University. Analytical thin layer chromatography (TLC) was performed using 0.25 mm E. Merck Silica gel (60F-254) plates. Reaction components were visualized phosphomolybdic acid or ninhydrin or p-anisaldehyde in 10% sulfuric acid in ethanol. Kanto Chem. Co. Silica Gel 60N (particle size 0.040–0.050 mm) was used for column chromatography.
Compound 1:
To a solution of thiourea S1 (2.0 g, 15.4 mmol) in THF (77 mL) were added K$_2$CO$_3$ (4.16 g, 30.8 mmol) and MeI (1.92 mL, 30.8 mmol) at room temperature. After being stirred for 3 h, the reaction was quenched with brine (80 mL). The organic layer was separated, and the aqueous layer was extracted with CH$_2$Cl$_2$ (100 mL x3). The combined organic layers were dried over anhydrous MgSO$_4$, filtered, and concentrated under reduced pressure. The crude isothiourea S2 was used for the next step without purification. To a solution of isothiourea S2 in THF (77 mL) were added Et$_3$N (4.29 mL, 30.8 mmol) and CbzOSu (4.22 g, 16.9 mmol) at room temperature. After being stirred for 12 h, the reaction was quenched with brine (100 mL). The organic layer was separated, and the aqueous layer was extracted with EtOAc (100 mL x3). The combined organic layers were dried over anhydrous MgSO$_4$, filtered, and concentrated under reduced pressure. The residue was purified by silica gel flash column chromatography (hexane/EtOAc = 10/1 to 4/1) to afford Cbz-isothiourea 1 (5.01 g, 14.0 mmol, 96%) as a white solid.

$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.40-7.30 (m, 5H), 5.19 (s, 2H), 3.61 (s, 2H), 2.41 (s, 3H), 1.27 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 156.25, 151.63, 135.40, 128.55, 128.40, 128.28, 67.75, 66.10, 59.47, 29.02, 15.10; IR (KBr): 3033, 2966, 2927, 2361, 1723, 1577, 1498, 1456, 1397, 1355, 1321, 1259, 1169, 1140, 1022, 891, 760, 698, 643, 596, 568, 443 cm$^{-1}$; HRMS (ESI, m/z): [M+H]$^+$ calcd for C$_{14}$H$_{19}$N$_2$O$_2$S, 279.1162; found, 279.1162.

**Typical Procedure**
To a solution of isothiourea 1 (100 mg, 0.359 mmol) in DCE (1.8 mL) were added BnNH$_2$ (39.2 $\mu$L, 0.718 mmol) and 1 M DCE solution of Tf$_2$NH (718 $\mu$L, 0.718 mmol) at 0 °C. After being stirred at 50 °C for 5 h, the reaction was quenched with 1 M NaOH. The mixture was extracted with CH$_2$Cl$_2$ (5 mL x3). The combined organic layers were washed with a saturated aqueous NaHCO$_3$ solution, dried over anhydrous MgSO$_4$, filtered, and concentrated under reduced pressure. The residue was purified by silica gel flash column chromatography (hexane/EtOAc = 1/2 to 0/1) to afford guanidine 3a (116 mg, 0.345 mmol, 96%) as yellow oil.
Compound 3a:

$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.45-7.25 (m, 10H), 7.05 (br-s, 1H), 5.17 (s, 2H), 4.48 (s, 2H), 3.58 (s, 2H), 1.30 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.16, 151.12, 138.01, 135.21, 128.65, 128.58, 128.55, 128.13, 127.60, 127.37, 67.73, 60.93, 58.63, 46.76, 29.70; IR (KBr): 3378, 3032, 2962, 2926, 2360, 2341, 1710, 1648, 1532, 1460, 1402, 1353, 1324, 1183, 1127, 1005, 913, 742, 697, 610, 442, 418 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{20}$H$_{24}$N$_3$O$_2$, 338.1869; found, 338.1863.

Compound 3b:

$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.43-7.33 (m, 5H), 6.58-6.45 (br-s, 1H), 5.16 (s, 2H), 3.85 (oct, $J = 6.5$ Hz, 1H), 3.50 (s, 2H), 1.25 (s, 6H), 1.20 (d, $J = 6.5$ Hz, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.16, 149.85, 135.43, 128.58, 128.45, 128.40, 128.34, 67.34, 60.98, 58.24, 43.93, 29.82, 22.73; IR (KBr): 3374, 2967, 2928, 2360, 1712, 1646, 1529, 1457, 1402, 1358, 1322, 1280, 1190, 1165, 1131, 1059, 988, 913, 765, 743, 698, 597, 576, 419 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{16}$H$_{24}$N$_3$O$_2$, 290.1862; found, 290.1863.

Compound 3c:

$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.43-7.30 (m, 5H), 6.60 (br-d, $J = 7.0$ Hz, 1H), 5.16 (s, 2H), 3.65-3.55 (m, 1H), 3.49 (s, 2H), 2.05-1.95 (m, 2H), 1.72-1.62 (m, 2H), 1.62-1.52 (m, 1H), 1.45-1.32 (m, 2H), 1.30-1.12 (m, 3H), 1.23 (m, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.13, 149.77, 135.41, 128.51, 128.31, 127.93, 67.21, 60.93, 58.18, 50.12, 32.85, 29.81, 25.61, 24.37; IR (KBr): 3853, 3734, 3648, 2929, 2854, 2360, 2342, 1710, 1645, 1539, 1455, 1400, 1353, 1321, 1184, 1124, 989, 913, 744, 697, 419 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{19}$H$_{28}$N$_3$O$_2$, 330.2175; found, 330.2176.
Compound 3e:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.50-7.35 (m, 5H), 7.02 (br-s, 1H), 5.17 (s, 2H), 3.76 (t, $J$ = 4.5 Hz, 2H), 3.56 (s, 2H), 3.41 (t, $J$ = 4.5 Hz, 2H), 1.23 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.20, 153.10, 135.27, 128.65, 128.54, 128.12, 67.69, 64.26, 60.67, 58.91, 46.01, 29.78; IR (KBr): 3853, 3734, 3648, 3628, 2923, 2360, 2342, 1715, 1645, 1540, 1456, 1398, 1353, 1323, 1185, 1132, 913, 744, 698, 443, 419 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{15}$H$_{21}$N$_3$O$_3$, 292.1653; found, 292.1656.

Compound 3f:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.45-7.30 (m, 5H), 5.20 (s, 2H), 3.59 (s, 2H), 3.40 (t, $J$ = 6.5 Hz, 4H), 1.85 (qn, $J$ = 6.5 Hz, 4H), 1.19 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.31, 152.45, 135.79, 128.56, 128.31, 127.95, 67.65, 62.08, 60.69, 49.40, 27.83, 25.35; IR (KBr): 3735, 3648, 2962, 2360, 2341, 1728, 1619, 1540, 1456, 1386, 1350, 1322, 1244, 1167, 1096, 1029, 991, 913, 744, 698, 616, 441, 418 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{17}$H$_{24}$N$_3$O$_2$, 302.1861; found, 302.1863.

Compound 3g:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.47 (d, $J$ = 7.5 Hz, 2H), 7.35-7.20 (m, 5H), 7.14 (t, $J$ = 7.5 Hz, 2H), 6.83 (t, $J$ = 7.5 Hz, 1H), 5.08 (s, 2H), 3.40 (s, 2H), 1.17 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 153.45, 146.55, 139.51, 135.31, 128.86, 128.69, 128.57, 128.13, 122.01, 118.51, 67.74, 62.31, 57.42, 29.93; IR (KBr): 3323, 2965, 2360 1707, 1649, 1597, 1556, 1456, 1386, 1350, 1322, 1244, 1167, 1096, 1029, 991, 913, 744, 698, 616, 441, 418 cm$^{-1}$; HRMS (ESI, $m/z$): [M+H]$^+$ calcd for C$_{17}$H$_{24}$N$_3$O$_2$, 302.1861; found, 302.1863.
1498, 1449, 1402, 1320, 1273, 1170, 1105, 1077, 988, 912, 752, 693, 508, 443, 418 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C₁₉H₂₂N₃O₂, 324.1706; found, 324.1707.

Compound 3h:

1H NMR (500 MHz, CDCl₃): δ 7.50 (d, J = 8.8 Hz, 2H), 7.45-7.35 (m, 5H), 6.84 (dt, J = 8.8, 4.0 Hz, 2H), 5.22 (s, 2H), 3.77 (s, 3H), 3.54 (s, 2H), 1.26 (s, 6H); 13C NMR (125 MHz, CDCl₃): δ 154.93, 153.4, 147.07, 135.33, 132.81, 128.69, 128.57, 128.13, 120.30, 114.16, 67.72, 62.03, 57.59, 55.49, 29.92; IR (KBr): 3326, 2926, 2360, 1705, 1646, 1596, 1556, 1511, 1456, 1402, 1354, 1323, 1276, 1240, 1172, 1103, 1035, 990, 913, 828, 744, 697, 578, 419 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C₂₀H₂₄N₄O₃, 354.1811; found, 354.1812.

Compound 3i

1H NMR (500 MHz, CDCl₃): δ 8.79 (br-s, 1H), 7.52 (d, J = 1.5 Hz, 1H), 7.50 (d, J = 9.0 Hz, 1H), 7.46-7.42 (m, 5H), 7.29 (t, J = 2.0 Hz, 1H), 7.04 (dd, J = 8.5, 2.0 Hz, 1H), 6.53 (t, J = 2.0 Hz, 1H), 5.33 (s, 2H), 3.91 (s, 2H), 1.42 (s, 6H); 13C NMR (125 MHz, CDCl₃): δ 153.29, 148.23, 135.28, 132.62, 131.53, 128.67, 128.55, 128.17, 128.04, 124.97, 116.08, 111.65, 111.32, 102.23, 67.78, 61.52, 57.71, 29.71; IR (KBr): 3327, 2965, 2360, 1705, 1638, 1589, 1559, 1482, 1455, 1402, 1354, 1323, 1276, 1183, 1147, 1098, 1058, 992, 912, 742, 697, 570, 419 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C₂₁H₂₃N₂O₂, 363.1813; found, 363.1816.
Compound 3j:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.58 (d, $J = 6.5$ Hz, 2H), 7.49 (d, $J = 3.5$ Hz, 2H), 7.38-7.25 (m, 9H), 7.26-7.20 (m, 2H), 6.01 (s, 1H), 5.14 (s, 2H), 3.68 (s, 2H), 1.38 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 159.60, 155.76, 152.02, 139.77, 135.79, 130.44, 128.77, 128.36, 127.97, 127.81, 127.26, 67.69, 57.88, 53.68, 28.08; IR (KBr): 3734, 3648, 2965, 2360, 2342, 1749, 1703, 1627, 1540, 1443, 1417, 1388, 1337, 1170, 1117, 1016, 913, 743, 696, 443, 419 cm$^{-1}$; HRMS (ESI, m/z): [M+H]$^+$ calcd for C$_{26}$H$_{27}$N$_4$O$_2$, 427.2126; found, 427.2129.

Compound 3k:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.48-7.35 (m, 4H), 7.35-7.25 (m, 6H), 5.24 (s, 2H), 5.00 (s, 2H), 4.94 (s, 1H), 3.59 (s, 2H), 1.25 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 150.42, 150.90, 137.72, 135.61, 128.60, 128.31, 128.12, 127.98, 127.83, 127.68, 76.00, 67.61, 57.59, 54.16, 27.67; IR (KBr): 3368, 2965, 2360, 2341, 1747, 1703, 1665, 1467, 1455, 1422, 1394, 1340, 1179, 1112, 1052, 913, 740, 697, 444, 419 cm$^{-1}$; HRMS (ESI, m/z): [M+H]$^+$ calcd for C$_{20}$H$_{24}$N$_3$O$_3$, 354.1811; found, 354.1812.

Compound 5f:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.51 (br-s, 1H), 7.40-7.25 (m, 10H), 5.16 (s, 2H), 4.37 (d, $J = 3.5$ Hz, 2H), 3.73 (t, $J = 7.5$ Hz, 2H), 3.40 (t, $J = 5.5$ Hz, 2H), 1.83 (qn, $J = 6.0$ Hz, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 154.68, 145.59, 139.18, 135.38, 128.66, 128.49, 128.11, 127.71, 126.96, 67.99, 45.82, 44.60, 43.39, 22.71 (one peak missing); IR (KBr): 3855, 37
Compound 4g:
To a solution of thiourea S1 (2.0 g, 15.4 mmol) in THF (77 mL) were added K$_2$CO$_3$ (4.16 g, 30.8 mmol) and MeI (1.92 mL, 30.8 mmol) at room temperature. After being stirred for 3 h, the reaction was quenched with brine (80 mL). The organic layer was separated, and the aqueous layer was extracted with CH$_2$Cl$_2$ (100 mL x3). The combined organic layers were dried over anhydrous MgSO$_4$, filtered and concentrated under reduced pressure. The crude isothiourea S2 was used for the next step without purification. To a solution of isothiourea S2 in THF (77 mL) were added Et$_3$N (4.29 mL, 30.8 mmol) and Boc$_2$O (3.54 mL, 22.7 mmol) at room temperature. After being stirred for 5 h, the reaction was quenched with saturated NaHCO$_3$ solution (100 mL). The organic layer was separated, and the aqueous layer was extracted with EtOAc (100 mL x3). The combined organic layers were dried over anhydrous MgSO$_4$, filtered, and concentrated under reduced pressure. The residue was purified by silica gel flash column chromatography (hexane/EtOAc = 10/1 to 4/1) to afford Boc-isothiourea 4g (3.24 g, 13.2 mmol, 96%) as a white solid.

$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 3.51 (s, 2H), 2.36 (s, 3H), 1.48 (s, 9H), 1.25 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 156.22, 150.67, 82.23, 65.41, 59.64, 28.97, 28.04, 15.01; IR (KBr): 2974, 2928, 2360, 2342, 1717, 1752, 1478, 1456, 1367, 1329, 1263, 1147, 1015, 969, 913, 894 856, 765, 644, 561, 458, 420 cm$^{-1}$; HRMS (ESI, m/z): [M+H]$^+$ calcd for C$_{11}$H$_{21}$N$_2$O$_5$S, 245.1317; found, 245.1318.

Compound 5g:
$^1$H NMR (500 MHz, CDCl$_3$): $\delta$ 7.40-7.30 (m, 5H), 7.16 (br-s, 1H), 4.47 (s, 2H), 3.50 (s, 2H), 1.48 (s, 9H), 1.30 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$): $\delta$ 152.55, 151.73, 138.06, 128.
56, 127.71, 127.34, 82.52, 59.01, 46.77, 29.72, 28.13; IR (KBr): 3853, 3734, 3648, 3628, 3368, 2971, 2360, 2342, 1703, 1644, 1539, 1456, 1375, 1286, 1158, 1059, 913, 742, 698, 669, 419 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C_{17}H_{26}N_{3}O_{2}, 304.2019; found, 304.2020.

**Compound 7:**

\(^1\)H NMR (500 MHz, CDCl₃): \(\delta\) 8.03 (d, \(J = 8.0, 1\)H), 7.68 (d, \(J = 8.0, 1\)H), 7.59 (td, \(J = 8.5, 1.5\) Hz, 1H), 7.42 (td, \(J = 8.5, 1.5\) Hz, 1H), 7.42-7.35 (m, 5H), 5.18 (s, 2H), 4.79 (s, 2H), 3.55 (s, 2H), 1.22 (s, 6H); \(^{13}\)C NMR (125 MHz, CDCl₃): \(\delta\) 153.20, 150.73, 148.24, 135.34, 134.61, 133.48, 130.55, 128.61, 128.47, 128.12, 128.03, 124.89, 67.55, 61.28, 58.69, 43.71, 29.82; IR (KBr): 3853, 3734, 3674, 3648, 3628, 3566, 2360, 2341, 1707, 1647, 1521, 1456, 1399, 1353, 1182, 913, 744, 669, 442, 418 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C_{20}H_{23}N_{4}O_{4}, 383.1718; found, 383.1714.

**Compound 8':**

\(^1\)H NMR (500 MHz, CDCl₃): \(\delta\) 7.50-7.40 (m, 5H), 5.30 (s, 2H), 3.84 (s, 2H), 1.46 (s, 6H); \(^{13}\)C NMR (125 MHz, CDCl₃): \(\delta\) 154.52, 151.88, 133.26, 129.47, 129.00, 128.93, 119.58 (q, \(J = 318.8\) Hz), 70.39, 58.03, 57.76, 27.35; IR (KBr): 3314, 2360, 1749, 1686, 1573, 1538, 1456, 1397, 1348, 1193, 1134, 1055, 912, 791, 742, 699, 616, 570, 513, 419 cm⁻¹; HRMS (ESI, m/z): [M+H]^+ calcd for C_{13}H_{18}N_{3}O_{2}, 248.1399; found, 248.1393.
Figure 1. NH$_3$•Ti$_2$NH (9) salt
Supplementary Figure 1. $^1$H NMR spectrum of 1
Supplementary Figure 2. $^{13}$C NMR spectrum of 1
Supplementary Figure 3. $^1$H NMR spectrum of 3a
Supplementary Figure 4. $^{13}$C NMR spectrum of 3a
Supplementary Figure 5. $^1$H NMR spectrum of 3b
Supplementary Figure 6. $^{13}$C NMR spectrum of 3b
Supplementary Figure 7. $^1$H NMR spectrum of 3c
Supplementary Figure 8. $^{13}$C NMR spectrum of 3c
Supplementary Figure 9. $^1$H NMR spectrum of 3e
Supplementary Figure 10. $^{13}$C NMR spectrum of 3e
Supplementary Figure 11. $^1$H NMR spectrum of 3f
Supplementary Figure 12. $^{13}$C NMR spectrum of 3f
Supplementary Figure 13. $^1$H NMR spectrum of 3g
Supplementary Figure 14. $^{13}$C NMR spectrum of 3g
Supplementary Figure 15. $^1$H NMR spectrum of 3h
Supplementary Figure 1. $^1$H NMR spectrum of 3h.
Supplementary Figure 17. $^1$H NMR spectrum of 3i
Supplementary Figure 18. $^{13}$C NMR spectrum of 3i
Supplementary Figure 19. $^1$H NMR spectrum of 3j
Supplementary Figure 20. $^{13}$C NMR spectrum of 3j
Supplementary Figure 21. $^1$H NMR spectrum of 3k
Supplementary Figure 22. $^{13}$C NMR spectrum of 3k
Supplementary Figure 23. $^1$H NMR spectrum of 5f
Supplementary Figure 24. $^{13}$C NMR spectrum of 5f
Supplementary Figure 25. $^1$H NMR spectrum of 4g
Supplementary Figure 26. $^{13}$C NMR spectrum of 4g
Supplementary Figure 27. $^1$H NMR spectrum of 5g
Supplementary Figure 28. $^{13}$C NMR spectrum of $5g$
Supplementary Figure 29. $^1$H NMR spectrum of 7
Supplementary Figure 30. $^{13}$C NMR spectrum of 7
Supplementary Figure 31. $^1$H NMR spectrum of 8'
Supplementary Figure 32. $^{13}$C NMR spectrum of $8'$