Supporting Information

Palladium-Catalyzed Selective Synthesis of 2-Allyltetrazoles

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Analytical data

***N*-cyanoindole (1j)**; colorless oil; ¹H NMR (300 MHz, CDCl₃) δ 6.72 (1H, d, *J* = 3.5 Hz), 7.25 (1H, d, *J* = 3.5 Hz), 7.34 (1H, td, *J* = 7.5, 1.0 Hz), 7.43 (1H, td, *J* = 7.5, 1.5 Hz), 7.62 (1H, dd, *J* = 7.5, 1.5 Hz), 7.65 (1H, dd, *J* = 7.5, 1.5 Hz); ¹³C NMR (75.4 MHz, CDCl₃) δ 107.49, 109.40, 111.33, 121.89, 124.00, 125.27, 126.02, 127.81, 136.71; IR (neat) 2246, 1533, 1456, 1315, 763, 744 cm⁻¹; HRMS (EI) Calcd for C₉H₆N₂ (M⁺) 142.0531. Found 142.0532.

2-methyl-*N*-cyanoindole (1k); colorless solid; ¹H NMR (300 MHz, CDCl₃) δ 2.43 (3H, s), 6.31 (1H, s), 7.22 (1H, td, *J* = 7.5, 1.0 Hz), 7.27 (1H, td, *J* = 7.5, 1.0 Hz), 7.45 (2H, d, *J* = 7.5 Hz); ¹³C NMR (75.4 MHz, CDCl₃) δ 12.36, 106.39, 106.83, 110.93, 120.78, 123.88, 124.05, 128.53, 135.98, 136.82; IR (KBr) 2241, 1598, 1458, 1355, 748 cm⁻¹; Anal. Calcd for C₁₀H₈N₂: C, 76.90; H, 5.16; N, 17.93. Found: C, 76.82; H, 5.38; N, 17.63; HRMS (EI) Calcd for C₁₀H₈N₂ (M⁺) 156.0687. Found 156.0687.

2-phenyl-*N*-cyanoindole (1l); yellow solid; ¹H NMR (300 MHz, CDCl₃) δ 6.76 (1H, s), 7.33 (1H, td, *J* = 7.5, 1.0 Hz), 7.40 (1H, td, *J* = 7.5, 1.0 Hz), 7.45-7.54 (3H, m), 7.62 (2H, m), 7.72 (2H, m); ¹³C NMR (75.4 MHz, CDCl₃) δ 106.91, 107.21, 111.29, 121.41, 124.26, 124.94, 127.34, 128.40, 128.85, 128.91, 129.35, 137.93, 139.28; IR (KBr) 2243, 1560, 1454, 1342, 767, 750, 692 cm⁻¹; Anal. Calcd for C₁₀H₈N₂: C, 76.90; H, 5.16; N, 17.93. Found: C, 76.82; H, 5.38; N, 17.63; HRMS (EI) Calcd for C₁₅H₁₀N₂ (M⁺) 218.0844. Found 218.0846.

3-methyl-*N*-cyanoindole (1m); colorless solid; ¹H NMR (300 MHz, CDCl₃) δ 2.28 (3H, d, *J* = 1.5 Hz), 6.97 (1H, d, *J* = 1.5 Hz), 7.32 (1H, td, *J* = 7.5, 1.0 Hz), 7.39 (1H, td, *J* = 7.5, 1.0 Hz), 7.56 (2H, br d, *J* = 7.5 Hz); ¹³C NMR (75.4 MHz, CDCl₃) δ 9.46, 107, 86, 111.31, 118.79, 119.91, 122.38, 123.57, 125.15, 128.96, 136.98; IR (KBr) 2239, 1614, 1577, 1458, 1213, 1103, 738 cm⁻¹; HRMS (EI) Calcd for C₁₀H₈N₂ (M⁺) 156.0687. Found 156.0690.

3-methoxycarbonyl-*N*-cyanoindole (1n); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 3.98 (3H, s), 7.43 (1H, td, $J = 7.5, 1.5$ Hz), 7.48 (1H, td, $J = 7.5, 1.5$ Hz), 7.62 (1H, dd, $J = 7.5, 1.5$ Hz), 7.91 (1H, s), 8.19 (1H, dd, $J = 7.5, 1.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 51.88, 106.15, 111.39, 115.01, 122.72, 125.18, 125.35, 126.27, 131.65, 136.95, 163.10; IR (KBr) 2254, 1712, 1564, 1274, 1215, 1018, 804, 769, 740 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{11}\text{H}_8\text{N}_2\text{O}_2$ (M^+) 200.0586. Found 200.0585.

4-methyl-*N*-cyanoindole (1o); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 2.53 (3H, s), 6.70 (1H, d, $J = 3.5$ Hz), 7.11 (1H, d, $J = 7.5$ Hz), 7.21 (1H, d, $J = 3.5$ Hz), 7.29 (1H, t, $J = 7.5$ Hz), 7.42 (1H, d, $J = 7.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 18.31, 107.84, 108.72, 112.28, 124.27, 125.23, 125.33, 127.48, 131.63, 136.52; IR (KBr) 2245, 1593, 1240, 1145, 744 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{10}\text{H}_8\text{N}_2$ (M^+) 156.0687. Found 156.0683.

5-methyl-*N*-cyanoindole (1p); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 2.45 (3H, s), 6.60 (1H, d, $J = 3.5$ Hz), 7.17 (1H, d, $J = 3.5$ Hz), 7.22 (1H, br d, $J = 8.0$ Hz), 7.40 (1H, br s), 7.47 (1H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 21.24, 107.67, 109.05, 110.85, 121.67, 126.02, 126.57, 127.98, 133.62, 134.84; IR (KBr) 2248, 1589, 1467, 1205, 796 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{10}\text{H}_8\text{N}_2$ (M^+) 156.0687. Found 156.0688.

5-methoxyl-*N*-cyanoindole (1q); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 3.88 (3H, s), 6.64 (1H, d, $J = 3.5$ Hz), 7.07 (1H, dd, $J = 8.5, 2.5$ Hz), 7.11 (1H, d, $J = 2.5$ Hz), 7.23 (1H, d, $J = 3.5$ Hz), 7.52 (1H, d, $J = 8.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.62, 104.11, 107.64, 109.18, 111.87, 114.33, 126.71, 128.61, 131.02, 156.85; IR (KBr) 2243, 1620, 1593, 1473, 1247, 802 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{10}\text{H}_8\text{N}_2\text{O}$ (M^+) 172.0637. Found 172.0640.

5-methoxycarbonyl-*N*-cyanoindole (1r); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 3.97 (3H, s), 6.82 (1H, dd, $J = 3.5, 1.0$ Hz), 7.34 (1H, d, $J = 3.5$ Hz), 7.67 (1H, d, $J = 8.5$ Hz), 8.15 (1H, dd, $J = 8.5, 1.5$ Hz), 8.40 (1H, d, $J = 1.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 52.31, 106.78, 109.92, 111.21, 124.23, 126.39, 126.58, 127.26, 127.60, 139.24, 166.61; IR (KBr) 2262, 1716, 1616, 1535, 1215, 1103, 754 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{11}\text{H}_8\text{N}_2\text{O}_2$ (M^+) 200.0586. Found 200.0592.

7-methyl-*N*-cyanoindole (1s); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 2.81 (3H, s), 6.71 (1H, d, $J = 3.5$ Hz), 7.17 (1H, d, $J = 8.0$ Hz), 7.23 (1H, d, $J = 3.5$ Hz), 7.27 (1H, d, $J = 8.0$ Hz), 7.49 (1H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 16.69, 109.43, 109.53, 109.76, 119.79, 123.11, 124.20, 127.33, 128.27, 134.65; IR (KBr) 2241, 1598, 1544, 1317, 1207, 781, 719 cm^{-1} ; Anal. Calcd for $\text{C}_{10}\text{H}_8\text{N}_2$: C, 76.90; H, 5.16; N, 17.94. Found: C, 77.12; H, 5.36; N, 17.67; HRMS (EI) Calcd for $\text{C}_{10}\text{H}_8\text{N}_2$ (M^+) 156.0687.

Found 156.0688.

5-nitro-*N*-cyanoindole (1t); colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 6.88 (1H, d, $J = 3.5$ Hz), 7.43 (1H, d, $J = 3.5$ Hz), 7.72 (1H, d, $J = 9.0$ Hz), 8.33 (1H, dd, $J = 9.0, 2.5$ Hz), 8.59 (1H, d, $J = 2.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 106.10, 110.27, 111.92, 118.45, 120.78, 127.87, 129.12, 139.74, 145.10; IR (KBr) 2250, 1587, 1533, 1348, 812 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_9\text{H}_5\text{N}_3\text{O}_2$ (M^+) 187.0382. Found 187.0381.

***N*-cyanocarbazole (1u)**; colorless solid; ^1H NMR (300 MHz, CDCl_3) δ 7.42 (2H, td, $J = 7.5, 1.0$ Hz), 7.53 (2H, td, $J = 7.5, 1.0$ Hz), 7.63 (2H, d, $J = 7.5$ Hz), 7.98 (2H, d, $J = 7.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 106.75, 111.47, 120.76, 124.10, 124.17, 127.56, 137.85; IR (KBr) 2239, 1602, 1446, 754 cm^{-1} ; Anal. Calcd for $\text{C}_{13}\text{H}_8\text{N}_2$: C, 81.23; H, 4.19; N, 14.57. Found: C, 81.35; H, 4.43; N, 14.37; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_8\text{N}_2$ (M^+) 192.0689. Found 192.0692.

3-allyl-2-(trimethylsilyl)-*N*-cyanoindole (1v); orange oil; ^1H NMR (500 MHz, CDCl_3) δ 0.50 (9H, s), 3.56 (2H, ddd, $J = 5.0, 2.0, 2.0$ Hz), 5.01 (1H, ddt, $J = 17.0, 2.0, 2.0$ Hz), 5.08 (1H, ddt, $J = 10.5, 2.0, 2.0$ Hz), 5.97 (1H, ddt, $J = 17.0, 10.5, 5.0$ Hz), 7.29 (1H, ddt, $J = 8.0, 7.5, 1.0$ Hz), 7.39 (1H, ddt, $J = 8.0, 7.5, 1.0$ Hz), 7.55 (1H, dt, $J = 7.5, 1.0$ Hz), 7.58 (1H, dt, $J = 8.0, 1.0$ Hz); ^{13}C NMR (125.6 MHz, CDCl_3) δ -0.18, 29.29, 109.19 (CN), 111.13, 116.03, 120.08, 123.50, 125.43, 129.32, 129.50, 135.89 (x2), 139.93; IR (neat) 2237, 1639, 1589, 1473, 1253, 993, 914, 844, 742 cm^{-1} ; Anal. Calcd for $\text{C}_{15}\text{H}_{18}\text{N}_2\text{Si}$: C, 70.57; H, 7.10; N, 10.97. Found: C, 70.67; H, 7.08; N, 11.10; HRMS (EI) Calcd for $\text{C}_{15}\text{H}_{18}\text{N}_2\text{Si}$ (M^+) 254.1239. Found 254.1250.

3-allyl-5-methoxy-2-(trimethylsilyl)-*N*-cyanoindole (1w); yellow solid; ^1H NMR (300 MHz, CDCl_3) δ 0.47 (9H, s), 3.49 (2H, ddd, $J = 5.5, 1.5, 1.5$ Hz), 3.83 (3H, s), 4.98 (1H, ddt, $J = 17.0, 1.5, 1.5$ Hz), 5.06 (1H, ddt, $J = 10.0, 1.5, 1.5$ Hz), 5.94 (1H, ddt, $J = 17.0, 10.0, 5.5$ Hz), 6.94 (1H, d, $J = 2.5$ Hz), 6.98 (1H, dd, $J = 8.5, 2.5$ Hz), 7.43 (1H, d, $J = 8.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ -0.19, 29.31, 55.83, 102.58, 109.45, 111.78, 114.42, 116.04, 129.17, 130.20, 134.46, 135.76, 136.91, 156.77; IR (KBr) 2289, 1637, 1612, 1525, 1458, 1250, 1238, 991, 904, 840, 794, 763 cm^{-1} ; Anal. Calcd for $\text{C}_{16}\text{H}_{20}\text{N}_2\text{OSi}$: C, 67.56; H, 7.08; N, 9.84. Found: C, 67.35; H, 7.20; N, 9.68; HRMS (EI) Calcd for $\text{C}_{16}\text{H}_{20}\text{N}_2\text{OSi}$ (M^+) 284.1344. Found 284.1346.

3-allyl-5-chloro-2-(trimethylsilyl)-*N*-cyanoindole (1x); brown oil; ^1H NMR (300 MHz, CDCl_3) δ 0.47 (9H, s), 3.47 (2H, ddd, $J = 5.5, 1.5, 1.5$ Hz), 4.96 (1H, ddt, $J = 17.0, 1.5, 1.5$ Hz), 5.07 (1H, ddt, $J = 10.0, 1.5, 1.5$ Hz), 5.91 (1H, ddt, $J = 17.0, 10.0, 5.5$ Hz), 7.32 (1H, dd, $J = 8.5, 2.0$ Hz), 7.46 (1H, d, $J = 8.5$ Hz), 7.48 (1H, d, $J = 2.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ -0.27, 29.15, 108.73, 112.15, 116.41, 119.83, 125.65,

128.73, 129.41, 130.62, 135.43, 137.88, 138.27; IR (neat) 2239, 1639, 1527, 1450, 1253, 993, 916, 846, 800, 763 cm^{-1} ; Anal. Calcd for $\text{C}_{15}\text{H}_{17}\text{ClN}_2\text{Si}$: C, 62.37; H, 5.93; N, 9.69; Cl, 12.27. Found: C, 62.21; H, 5.97; N, 9.52; Cl, 12.53; HRMS (EI) Calcd for $\text{C}_{15}\text{H}_{17}\text{ClN}_2\text{Si}$ (M^+) 288.0849. Found 288.0849.

2-allyl-5-(methoxycarbonyl)-2-(trimethylsilyl)-N-cyanoindole (1y); yellow solid; ^1H NMR (300 MHz, CDCl_3) δ 0.49 (9H, s), 3.56 (2H, br d, $J = 5.5$ Hz), 3.97 (3H, s), 4.96 (1H, br d, $J = 17.0$ Hz), 5.06 (1H, br d, $J = 10.5$ Hz), 5.96 (1H, ddt, $J = 17.0, 10.5, 5.5$ Hz), 7.57 (1H, d, $J = 8.5$ Hz), 8.08 (1H, dd, $J = 8.5, 1.0$ Hz), 8.24 (1H, br s); ^{13}C NMR (75.4 MHz, CDCl_3) δ -0.32, 28.98, 52.20, 108.51, 110.96, 116.30, 122.41, 125.84, 126.70, 129.23, 129.88, 135.56, 137.71, 142.52, 166.92; IR (KBr) 2239, 1714, 1641, 1608, 1593, 1438, 1311, 1251, 970, 927, 844, 759 cm^{-1} ; Anal. Calcd for $\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}_2\text{Si}$: C, 65.35; H, 6.45; N, 8.96. Found: C, 65.56; H, 6.41; N, 8.84; HRMS (EI) Calcd for $\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}_2\text{Si}$ (M^+) 312.1294. Found 312.1297.

3-allyl-5-(trifluoromethyl)-2-(trimethylsilyl)-N-cyanoindole (1z); orange oil; ^1H NMR (300 MHz, CDCl_3) δ 0.50 (9H, s), 3.55 (2H, ddd, $J = 5.5, 1.5, 1.5$ Hz), 4.96 (1H, ddt, $J = 17.0, 1.5, 1.5$ Hz), 5.08 (1H, ddt, $J = 10.0, 1.5, 1.5$ Hz), 5.94 (1H, ddt, $J = 17.0, 10.0, 5.5$ Hz), 7.63 (2H, m), 7.79 (1H, m); ^{13}C NMR (75.4 MHz, CDCl_3) δ -0.30, 29.06, 108.38, 111.61, 116.52, 117.72 (q, $^3J(\text{C}, \text{F}) = 4.0$ Hz), 122.31 (q, $^3J(\text{C}, \text{F}) = 3.4$ Hz), 124.41 (q, $^1J(\text{C}, \text{F}) = 272$ Hz), 126.29 (q, $^2J(\text{C}, \text{F}) = 32$ Hz), 129.24, 129.47, 135.37, 138.43, 141.55; IR (neat) 2243, 1639, 1616, 1535, 1450, 1323, 1255, 993, 918, 856, 815, 763 cm^{-1} ; Anal. Calcd for $\text{C}_{16}\text{H}_{17}\text{F}_3\text{N}_2\text{Si}$: C, 59.60; H, 5.31; N, 8.68. Found: C, 59.53; H, 5.33; N, 8.38; HRMS (EI) Calcd for $\text{C}_{16}\text{H}_{17}\text{F}_3\text{N}_2\text{Si}$ (M^+) 322.1112. Found 322.1111.

2-allyl-5-(dimethylamino)tetrazole (2a); yellow oil; ^1H NMR (300 MHz, CDCl_3) δ 3.06 (6H, s), 5.02 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.34 (1H, ddt, $J = 17.0, 1.0, 1.0$ Hz), 5.35 (1H, ddt, $J = 10.0, 1.0, 1.0$ Hz), 6.04 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 38.63, 55.03, 120.08, 130.29, 170.04; IR (neat) 1595, 1427, 1186, 989, 952 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_6\text{H}_{11}\text{N}_5$ (M^+) 153.1014. Found 253.1020.

2-allyl-5-(morpholino)tetrazole (2b); yellow oil; ^1H NMR (300 MHz, CDCl_3) δ 3.44 (4H, t, $J = 5.0$ Hz), 3.79 (4H, t, $J = 5.0$ Hz), 5.01 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.33 (1H, br d, $J = 17.5$ Hz), 5.34 (1H, d, $J = 10.5$ Hz), 6.01 (1H, ddt, $J = 17.5, 10.5, 6.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 46.87, 55.16, 66.12, 120.33, 130.04, 169.50; IR (neat) 1556, 1454, 1276, 1118, 937 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_8\text{H}_{13}\text{N}_5\text{O}$ (M^+) 195.1120. Found 195.1118.

2-(3-phenyl-2-propenyl)-5-(morpholino)tetrazole (2c); slightly yellow solid, mp 80-

81 °C; ^1H NMR (300 MHz, CDCl_3) δ 3.48 (4H, t, $J = 5.0$ Hz), 3.82 (4H, t, $J = 5.0$ Hz), 5.19 (2H, dd, $J = 6.5, 1.5$ Hz), 6.37 (1H, dt, $J = 16.0, 6.5$ Hz), 6.72 (1H, br d, $J = 16.0$ Hz), 7.25-7.41 (5H, m); ^{13}C NMR (75.4 MHz, CDCl_3) δ 46.88, 54.83, 66.13, 120.82, 126.67, 128.39, 128.59, 135.52, 169.53; IR (KBr) 1564, 1456, 1278, 1112, 977, 765, 696 cm^{-1} ; Anal. Calcd for $\text{C}_{14}\text{H}_{17}\text{N}_5\text{O}$: C, 61.98; H, 6.32; N, 25.81. Found: C, 61.84; H, 6.48; N, 25.76; HRMS (EI) Calcd for $\text{C}_{14}\text{H}_{17}\text{N}_5\text{O}$ (M^+) 271.1433. Found 271.1429.

2-allyl-5-(1-cyano-2-phenylethenyl)tetrazole (2d); slightly yellow oil; ^1H NMR (300 MHz, CDCl_3) δ 5.25 (2H, br d, $J = 6.0$ Hz), 5.43 (1H, br d, $J = 17.0$ Hz), 5.43 (1H, br d, $J = 10.5$ Hz), 6.11 (1H, ddt, $J = 17.0, 10.6, 6.0$ Hz), 7.50 (3H, m), 7.97 (2H, m), 8.31 (1H, s).

2-(allyltetrazolyl)-2-cyanopropane (2e); yellow oil; ^1H NMR (300 MHz, CDCl_3) δ 1.85 (6H, s), 5.20 (2H, br d, $J = 6.0$ Hz), 5.37 (1H, br d, $J = 17.0$ Hz), 5.40 (1H, br d, $J = 10.5$ Hz), 6.07 (1H, ddt, $J = 17.0, 10.5, 6.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 26.80, 31.34, 55.56, 121.26, 121.57, 129.22, 166.44; IR (neat) 2250, 1496, 1186, 991, 941 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_8\text{H}_{12}\text{N}_5$ ($[\text{M}+\text{H}]^+$) 178.1092. Found 118.1123.

2-allyl-5-(4-nitrophenyl)tetrazole (2f); slightly yellow solid, mp 96-98 °C; ^1H NMR (300 MHz, CDCl_3) δ 5.28 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.43 (1H, br d, $J = 17.0$ Hz), 5.44 (1H, br d, $J = 10.0$ Hz), 6.13 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz), 8.33 (4H, s); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.69, 121.42, 124.18, 127.63, 129.40, 133.20, 148.83, 163.39; IR (KBr) 1604, 1519, 1350, 995, 935 cm^{-1} ; Anal. Calcd for $\text{C}_{10}\text{H}_9\text{N}_5\text{O}_2$: C, 51.94; H, 3.92; N, 30.29. Found: C, 52.01; H, 4.12; N, 30.26.

2-allyl-5-(3,5-dinitrophenyl)tetrazole (2g); yellow solid, mp 71-73 °C; ^1H NMR (300 MHz, CDCl_3) δ 5.27 (2H, ddd, $J = 6.5, 1.5, 1.5$ Hz), 5.47 (1H, ddt, $J = 17.0, 1.0, 1.0$ Hz), 5.48 (1H, ddt, $J = 10.0, 1.0, 1.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.0, 6.5$ Hz), 9.11 (1H, t, $J = 2.0$ Hz), 9.30 (2H, d, $J = 2.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 56.03, 119.72, 121.85, 126.55, 129.01, 131.00, 149.00, 161.72; IR (neat) 1635, 1595, 1556, 1519, 1346, 989, 918 cm^{-1} ; Anal. Calcd for $\text{C}_{10}\text{H}_8\text{N}_6\text{O}_4$: C, 43.48; H, 2.91; N, 30.42. Found: C, 43.54; H, 3.13; N, 30.14.

2-allyl-5-(phenoxy)tetrazole (2h); yellow oil; ^1H NMR (300 MHz, CDCl_3) δ 5.07 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.36 (1H, br d, $J = 17.0$ Hz), 5.37 (1H, br d, $J = 10.0$ Hz), 6.03 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz), 7.21 (3H, m), 7.36 (2H, m); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.97, 119.04, 121.17, 125.26, 129.35, 129.73, 154.37, 170.79; IR (neat) 1593, 1514, 1488, 1209, 1024, 989, 941, 769, 748 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{10}\text{H}_{10}\text{N}_4\text{O}$ (M^+) 202.0855. Found 202.0855.

2-allyl-5-(4-toluenesulfonyl)tetrazole (2i); yellow solid, mp 86-88 °C; ^1H NMR (300 MHz, CDCl_3) δ 2.43 (3H, s), 5.23 (2H, ddd, $J = 6.5, 1.0, 1.0$ Hz), 5.40 (1H, br d, $J = 17.0$ Hz), 5.41 (1H, br d, $J = 10.5$ Hz), 6.03 (1H, ddt, $J = 17.0, 10.5, 6.5$ Hz), 7.36 (1H, d, $J = 8.0$ Hz), 7.99 (2H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 21.69, 56.40, 122.36, 128.34, 128.75, 130.14, 135.25, 146.27, 166.51; IR (KBr) 1593, 1344, 1305, 1161, 941 cm^{-1} ; Anal. Calcd for $\text{C}_{11}\text{H}_{12}\text{N}_4\text{O}_2\text{S}$: C, 50.22; H, 4.71; N, 21.13; S, 12.13. Found: C, 49.99; H, 4.58; N, 21.20; S, 11.97; HRMS (EI) Calcd for $\text{C}_{11}\text{H}_{12}\text{N}_4\text{O}_2\text{S}$ (M^+) 264.0681. Found 264.0682.

N-(2-allyltetrazolyl)indole (2j); colorless solid, mp 62-63 °C; ^1H NMR (300 MHz, CDCl_3) δ 5.23 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.44 (1H, br d, $J = 10.5$ Hz), 5.45 (1H, br d, $J = 17.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.5, 6.0$ Hz), 6.73 (1H, d, $J = 3.5$ Hz), 7.24 (1H, td, $J = 7.5, 1.0$ Hz), 7.51 (1H, td, $J = 7.5, 1.0$ Hz), 7.64 (1H, dd, $J = 7.5, 1.0$ Hz), 7.88 (1H, d, $J = 3.5$ Hz), 8.33 (1H, d, $J = 7.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.69, 106.87, 113.58, 121.03, 121.09, 122.00, 123.82, 124.95, 129.46, 129.78, 134.60, 161.79; IR (neat) 1647, 1568, 1454, 1211, 1028, 987, 937, 767, 746 cm^{-1} ; Anal. Calcd for $\text{C}_{12}\text{H}_{11}\text{N}_5$: C, 63.98; H, 4.92; N, 31.09. Found: C, 63.74; H, 5.00; N, 30.81; HRMS (EI) Calcd for $\text{C}_{12}\text{H}_{11}\text{N}_5$ (M^+) 225.1014. Found 225.1022.

2-methyl-N-(2-allyltetrazolyl)indole (2k); colorless oil; ^1H NMR (300 MHz, CDCl_3) δ 2.65 (3H, s), 5.27 (2H, br d, $J = 6.0$ Hz), 5.44 (1H, br d, $J = 17.0$ Hz), 5.45 (1H, br d, $J = 10.0$ Hz), 6.15 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz), 6.43 (1H, s), 7.17 (1H, td, $J = 7.5, 1.0$ Hz), 7.22 (1H, td, $J = 7.5, 1.0$ Hz), 7.51 (1H, dd, $J = 7.5, 1.0$ Hz), 7.99 (1H, d, $J = 7.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 14.89, 55.70, 105.52, 112.44, 119.65, 121.08, 121.74, 122.47, 129.07, 129.42, 136.46, 136.76, 161.26; IR (neat) 1647, 1569, 1539, 1456, 1220, 1037, 987, 937, 788, 748 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$ (M^+) 239.1171. Found 239.1169.

2-phenyl-N-(2-allyltetrazolyl)indole (2l); colorless oil; ^1H NMR (300 MHz, CDCl_3) δ 5.16 (2H, br d, $J = 6.0$ Hz), 5.27 (1H, br d, $J = 16.5$ Hz), 5.34 (1H, br d, $J = 10.0$ Hz), 5.99 (1H, ddt, $J = 16.5, 10.0, 6.0$ Hz), 6.81 (1H, s), 7.25-7.32 (7H, m), 7.63-7.69 (2H, m); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.68, 106.77, 111.73, 120.72, 120.90, 122.15, 123.55, 127.88, 128.21, 128.56, 128.98, 129.24, 131.86, 138.32, 140.52, 160.66; IR (neat) 1604, 1539, 1454, 987, 937, 806, 761, 744, 698 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{18}\text{H}_{15}\text{N}_5$ (M^+) 301.1327. Found 301.1335.

3-methyl-N-(2-allyltetrazolyl)indole (2m); slightly yellow solid, mp 38-40 °C; ^1H NMR (300 MHz, CDCl_3) δ 2.34 (3H, d, $J = 1.0$ Hz), 5.20 (2H, br d, $J = 6.0$ Hz), 5.42 (1H, br d, $J = 10.5$ Hz), 5.43 (1H, br d, $J = 17.0$ Hz), 6.12 (1H, ddt, $J = 17.0, 10.5, 6.0$ Hz), 7.24 (1H, br t, $J = 7.5$ Hz), 7.34 (1H, br t, $J = 7.5$ Hz), 7.57 (1H, br d, $J = 7.5$ Hz),

7.64 (1H, br s), 8.28 (1H, dd, $J = 7.5, 1.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 9.53, 55.58, 113.51, 116.06, 119.01, 120.92, 121.48, 122.04, 123.75, 129.54, 130.52, 134.84, 161.78; IR (neat) 1612, 1566, 1454, 989, 939, 788, 744 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$ (M^+) 239.1171. Found 239.1171.

3-methoxycarbonyl-*N*-(2-allyltetrazolyl)indole (2n); colorless solid, mp 98-99 °C; ^1H NMR (300 MHz, CDCl_3) δ 3.93 (3H, s), 5.25 (2H, ddd, $J = 6.5, 1.0, 1.0$ Hz), 5.46 (1H, br d, $J = 10.5$ Hz), 5.47 (1H, br d, $J = 17.0$ Hz), 6.13 (1H, ddt, $J = 17.0, 10.5, 6.5$ Hz), 7.36 (1H, td, $J = 7.5, 1.5$ Hz), 7.41 (1H, td, $J = 7.5, 1.5$ Hz), 8.22 (1H, dd, $J = 7.5, 1.5$ Hz), 8.33 (1H, dd, $J = 7.5, 1.5$ Hz), 8.56 (1H, s); ^{13}C NMR (75.4 MHz, CDCl_3) δ 51.38, 56.00, 112.09, 113.77, 121.60, 121.79, 123.67, 124.81, 127.14, 129.17, 130.91, 135.03, 161.13, 164.59; IR (KBr) 1706, 1610, 1560, 1433, 1209, 993, 947, 779, 752 cm^{-1} ; Anal. Calcd for $\text{C}_{14}\text{H}_{13}\text{N}_5\text{O}_2$: C, 59.35; H, 4.62; N, 24.72. Found: C, 59.06; H, 4.77; N, 24.64; HRMS (EI) Calcd for $\text{C}_{14}\text{H}_{13}\text{N}_5\text{O}_2$ (M^+) 283.1069. Found 283.1068.

4-methyl-*N*-(2-allyltetrazolyl)indole (2o); slightly yellow solid, mp 35-36 °C; ^1H NMR (300 MHz, CDCl_3) δ 2.57 (3H, s), 5.23 (2H, ddd, $J = 6.0, 1.5, 1.5$ Hz), 5.44 (1H, br d, $J = 10.0$ Hz), 5.45 (1H, br d, $J = 17.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz), 6.76 (1H, d, $J = 3.5$ Hz), 7.05 (1H, d, $J = 7.0$ Hz), 7.27 (1H, t, $J = 7.5$ Hz), 7.88 (1H, d, $J = 3.5$ Hz), 8.17 (1H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 18.56, 55.69, 105.31, 111.12, 121.07, 122.35, 123.87, 124.34, 129.49, 129.52, 130.48, 134.38, 161.86; IR (neat) 1612, 1566, 1454, 989, 939, 788, 744 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$ (M^+) 239.1171. Found 239.1167.

5-methyl-*N*-(2-allyltetrazolyl)indole (2p); colorless solid, mp 50-51 °C; ^1H NMR (300 MHz, CDCl_3) δ 2.46 (3H, s), 5.23 (2H, ddd, $J = 6.5, 1.5, 1.5$ Hz), 5.44 (1H, br d, $J = 10.0$ Hz), 5.45 (1H, br d, $J = 17.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.0, 6.5$ Hz), 6.65 (1H, dd, $J = 3.5, 1.0$ Hz), 7.18 (1H, br dd, $J = 8.0, 1.0$ Hz), 7.43 (1H, br s), 7.84 (1H, d, $J = 3.5$ Hz), 8.20 (1H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 21.33, 55.69, 106.55, 113.23, 120.87, 121.08, 124.97, 125.27, 129.53, 130.06, 131.42, 132.92, 161.88; IR (neat) 1647, 1568, 987, 939, 802 cm^{-1} ; Anal. Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$: C, 65.25; H, 5.47; N, 29.26. Found: C, 65.32; H, 5.58; N, 29.06; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$ (M^+) 239.1171. Found 239.1170.

5-methoxy-*N*-(2-allyltetrazolyl)indole (2q); colorless solid, mp 53-54 °C; ^1H NMR (300 MHz, CDCl_3) δ 3.86 (3H, s), 5.22 (2H, br d, $J = 6.0$ Hz), 5.43 (1H, br d, $J = 10.0$ Hz), 5.44 (1H, br d, $J = 17.0$ Hz), 6.13 (1H, ddt, $J = 17.0, 10.0, 6.0$ Hz), 6.65 (1H, d, $J = 3.5$ Hz), 6.98 (1H, dd, $J = 9.0, 2.5$ Hz), 7.10 (1H, d, $J = 2.5$ Hz), 7.85 (1H, d, $J = 3.5$ Hz), 8.21 (1H, d, $J = 9.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.62, 55.65, 103.11, 106.64, 113.14, 114.31, 121.04, 125.44, 129.49, 129.54, 130.50, 155.48, 161.74; IR

(neat) 1615, 1574, 1028, 940, 807 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{15}\text{N}_5\text{O}$ (M^+) 255.1120. Found 255.1121.

5-methoxycarbonyl-*N*-(2-allyltetrazolyl)indole (2r); colorless solid, mp 141-142 $^{\circ}\text{C}$; ^1H NMR (300 MHz, CDCl_3) δ 3.93 (3H, s), 5.26 (2H, ddd, $J = 6.0, 1.0, 1.0$ Hz), 5.45 (1H, br d, $J = 10.5$ Hz), 5.46 (1H, br d, $J = 17.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.5, 6.0$ Hz), 6.81 (1H, d, $J = 3.5$ Hz), 7.94 (1H, d, $J = 3.5$ Hz), 8.05 (1H, dd, $J = 8.5, 1.5$ Hz), 8.35 (1H, d, $J = 8.5$ Hz), 8.38 (1H, d, $J = 1.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 51.97, 55.86, 107.67, 113.29, 121.37, 123.58, 124.07, 125.17, 126.32, 129.32, 129.48, 137.04, 161.44, 167.55; IR (KBr) 1697, 1612, 1571, 1442, 1245, 1197, 985, 937, 763 cm^{-1} ; Anal. Calcd for $\text{C}_{14}\text{H}_{13}\text{N}_5\text{O}_2$: C, 59.35; H, 4.62; N, 24.72. Found: C, 59.26; H, 4.61; N, 24.69; HRMS (EI) Calcd for $\text{C}_{14}\text{H}_{13}\text{N}_5\text{O}_2$ (M^+) 283.1069. Found 283.1069.

5-nitro-*N*-(2-allyltetrazolyl)indole (2s); colorless solid, mp 117-118 $^{\circ}\text{C}$; ^1H NMR (300 MHz, CDCl_3) δ 5.27 (2H, br d, $J = 6.5$ Hz), 5.47 (1H, br d, $J = 10.0$ Hz), 5.49 (1H, br d, $J = 17.0$ Hz), 6.14 (1H, ddt, $J = 17.0, 10.0, 6.5$ Hz), 6.87 (1H, d, $J = 3.5$ Hz), 8.02 (1H, d, $J = 3.5$ Hz), 8.22 (1H, br d, $J = 9.0$ Hz), 8.39 (1H, d, $J = 9.0$ Hz), 8.55 (1H, s); ^{13}C NMR (75.4 MHz, CDCl_3) δ 56.08, 108.17, 113.73, 117.62, 119.20, 121.61, 128.04, 129.07, 129.34, 137.25, 143.26, 160.95; IR (KBr) 1614, 1573, 1515, 1338, 933, 902, 744 cm^{-1} ; Anal. Calcd for $\text{C}_{12}\text{H}_{10}\text{N}_6\text{O}_2$: C, 53.33; H, 3.72; N, 31.09. Found: C, 53.28; H, 3.69; N, 31.23; HRMS (EI) Calcd for $\text{C}_{12}\text{H}_{10}\text{N}_6\text{O}_2$ (M^+) 270.0865. Found 270.0870.

7-methyl-*N*-(2-allyltetrazolyl)indole (2t); colorless oil; ^1H NMR (300 MHz, CDCl_3) δ 2.23 (3H, s), 5.25 (2H, d, $J = 6.5$ Hz), 5.41-5.44 (2H, m), 6.12 (1H, ddt, $J = 17.0, 10.0, 6.5$ Hz), 6.71 (1H, d, $J = 3.5$ Hz), 7.04 (1H, d, $J = 7.5$ Hz), 7.13 (1H, t, $J = 7.5$ Hz), 7.33 (1H, d, $J = 3.5$ Hz), 7.51 (1H, d, $J = 7.5$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 19.74, 55.93, 106.25, 119.06, 121.48, 121.77, 122.17, 126.09, 128.96, 129.17, 130.06, 135.16, 162.06; IR (neat) 1591, 1548, 987, 941, 785, 721 cm^{-1} ; HRMS (EI) Calcd for $\text{C}_{13}\text{H}_{13}\text{N}_5$ (M^+) 239.1171. Found 239.1172.

***N*-(2-allyltetrazolyl)carbazole (2u)**; colorless solid, mp 79-81 $^{\circ}\text{C}$; ^1H NMR (300 MHz, CDCl_3) δ 5.32 (2H, d, $J = 6.0$ Hz), 5.47 (1H, d, $J = 10.5$ Hz), 5.48 (2H, d, $J = 17.0$ Hz), 6.20 (1H, ddt, $J = 17.0, 10.5, 6.0$ Hz), 7.37 (1H, t, $J = 7.5$ Hz), 7.54 (1H, td, $J = 8.0, 1.0$ Hz), 8.08 (1H, d, $J = 7.5$ Hz), 8.53 (1H, d, $J = 8.0$ Hz); ^{13}C NMR (75.4 MHz, CDCl_3) δ 55.81, 114.10, 119.91, 121.21, 122.13, 125.03, 126.87, 129.60, 138.35, 162.10; IR (KBr) 1595, 1554, 1002, 931, 746, 721 cm^{-1} ; Anal. Calcd for $\text{C}_{16}\text{H}_{13}\text{N}_5$: C, 69.80; H, 4.76; N, 25.44. Found: C, 69.95; H, 4.94; N, 25.32; HRMS (EI) Calcd for $\text{C}_{16}\text{H}_{13}\text{N}_5$ (M^+) 275.1171. Found 275.1168.

3-allyl-2-(trimethylsilyl)-*N*-(2-allyltetrazolyl)indole (2v); orange oil; ^1H NMR (300

MHz, CDCl₃) δ 0.21 (9H, s), 3.67 (2H, ddd, J = 5.5, 1.5, 1.5 Hz), 5.02-5.11 (2H, m), 5.26 (2H, br d, J = 6.5 Hz), 5.46 (1H, br d, J = 10.0 Hz), 5.48 (1H, br d, J = 17.0 Hz), 6.03 (1H, ddt, J = 17.5, 11.0, 5.5 Hz), 6.13 (1H, ddt, J = 17.0, 10.0, 6.5 Hz), 7.14-7.27 (2H, m), 7.58 (2H, m); ¹³C NMR (75.4 MHz, CDCl₃) δ 0.88, 29.90, 55.91, 111.36, 115.39, 119.28, 121.14, 121.56, 123.93, 127.79, 129.35, 129.95, 136.57, 137.15, 139.67, 162.08; IR (neat) 1637, 1544, 1249, 989, 914, 858, 742 cm⁻¹; Anal. Calcd for C₁₈H₂₃N₃Si: C, 64.17; H, 6.85; N, 20.35. Found: C, 64.05; H, 6.86; N, 20.75; HRMS (EI) Calcd for C₁₈H₂₃N₃Si (M⁺) 337.1722. Found 337.1715.

3-allyl-5-methoxy-2-(trimethylsilyl)-N-(2-allyltetrazolyl)indole (2w); orange oil; ¹H NMR (300 MHz, CDCl₃) δ 0.20 (9H, s), 3.63 (2H, ddd, J = 5.5, 1.5, 1.5 Hz), 3.83 (3H, s), 5.06 (2H, m), 5.24 (2H, br d, J = 6.5 Hz), 5.45 (1H, br d, J = 10.0 Hz), 5.47 (1H, br d, J = 17.0 Hz), 6.02 (1H, ddt, J = 17.5, 10.0, 5.5 Hz), 6.12 (1H, ddt, J = 17.0, 10.0, 6.5 Hz), 6.88 (1H, dd, J = 9.0, 2.5 Hz), 6.97 (1H, d, J = 2.5 Hz), 7.54 (1H, d, J = 9.0 Hz); ¹³C NMR (75.4 MHz, CDCl₃) δ 0.93, 29.92, 55.75, 55.84, 101.22, 112.27, 113.51, 115.37, 121.47, 127.46, 129.37, 130.64, 134.74, 136.99, 137.35, 155.08, 162.17 (C=N); IR (neat) 1614, 1548, 1249, 1224, 1114, 980, 912, 842, 765 cm⁻¹; HRMS (EI) Calcd for C₁₉H₂₅N₅OSi (M⁺) 367.1828. Found 367.1829.

3-allyl-5-chloro-2-(trimethylsilyl)-N-(2-allyltetrazolyl)indole (2x); brown oil; ¹H NMR (300 MHz, CDCl₃) δ 0.19 (9H, s), 3.61 (2H, ddd, J = 5.5, 2.0, 2.0 Hz), 5.03 (1H, ddt, J = 17.0, 1.5, 1.5 Hz), 5.07 (1H, ddt, J = 10.0, 1.5, 1.5 Hz), 5.25 (2H, br d, J = 6.5 Hz), 5.46 (1H, br d, J = 10.0 Hz), 5.48 (1H, br d, J = 17.0 Hz), 5.99 (1H, ddt, J = 17.0, 10.0, 5.5 Hz), 6.11 (1H, ddt, J = 17.0, 10.0, 6.5 Hz), 7.17 (1H, dd, J = 8.5, 2.0 Hz), 7.50 (1H, d, J = 8.5 Hz), 7.52 (1H, d, J = 2.0 Hz); ¹³C NMR (75.4 MHz, CDCl₃) δ 0.77, 29.71, 55.96, 112.48, 115.71, 118.76, 121.70, 124.03, 126.82, 127.04, 129.21, 131.17, 136.67, 138.02, 138.43, 161.74; IR (neat) 1637, 1546, 1442, 1249, 991, 916, 858, 842, 802, 763 (SiMe₃) cm⁻¹; HRMS (EI) Calcd for C₁₈H₂₂ClN₅Si (M⁺) 371.1335. Found 371.1333.

3-allyl-5-(methoxycarbonyl)-2-(trimethylsilyl)-N-(2-allyltetrazolyl)indole (2y); yellow oil; ¹H NMR (300 MHz, CDCl₃) δ 0.19 (9H, s), 3.69 (2H, ddd, J = 5.5, 1.5, 1.5 Hz), 3.91 (3H, s), 5.04 (1H, ddt, J = 17.0, 1.5, 1.5 Hz), 5.07 (1H, ddt, J = 10.0, 1.5, 1.5 Hz), 5.28 (2H, ddd, J = 6.5, 1.0, 1.0 Hz), 5.48 (1H, ddt, J = 10.0, 1.0, 1.0 Hz), 5.49 (1H, ddt, J = 17.0, 1.0, 1.0 Hz), 6.04 (1H, ddt, J = 17.0, 10.0, 5.5 Hz), 6.13 (1H, ddt, J = 17.0, 10.0, 6.5 Hz), 7.54 (1H, d, J = 8.5 Hz), 7.93 (1H, dd, J = 8.5, 1.5 Hz), 8.31 (1H, d, J = 1.5 Hz). ¹³C NMR (75.4 MHz, CDCl₃) δ 0.66, 29.52, 51.84, 56.01, 111.01, 115.67, 121.76, 121.96, 123.20, 125.15, 128.42, 129.14, 129.66, 136.79, 138.43, 142.10, 161.56, 167.65; IR (neat) 1716, 1606, 1544, 1434, 1269, 1244, 1091, 993, 908, 858, 842, 767 cm⁻¹; Anal. Calcd for C₂₀H₂₅N₅O₂Si: C, 60.73; H, 6.37; N, 17.70. Found: C,

60.55; H, 6.43; N, 17.39; HRMS (EI) Calcd for $C_{20}H_{25}N_5O_2Si$ (M^+) 395.1777. Found 395.1779.

3-allyl-5-(trifluoromethyl)-2-(trimethylsilyl)-*N*-(2-allyltetrazolyl)indole (2z); orange oil; 1H NMR (300 MHz, $CDCl_3$) δ 0.20 (9H, s), 3.68 (2H, ddd, $J = 5.5, 1.5, 1.5$ Hz), 5.04 (1H, ddt, $J = 17.0, 1.5, 1.5$ Hz), 5.08 (1H, ddt, $J = 10.0, 1.5, 1.5$ Hz), 5.28 (2H, br d, $J = 6.5$ Hz), 5.47 (1H, br d, $J = 10.0$ Hz), 5.49 (1H, br d, $J = 17.0$ Hz), 6.02 (1H, ddt, $J = 17.0, 10.0, 5.5$ Hz), 6.12 (1H, ddt, $J = 17.0, 10.0, 6.5$ Hz), 7.45 (1H, br d, $J = 8.5$ Hz), 7.62 (1H, d, $J = 8.5$ Hz), 7.83 (1H, br s); ^{13}C NMR (75.4 MHz, $CDCl_3$) δ 0.69, 29.63, 56.09, 111.73, 115.85, 116.96 (q, $^3J(C, F) = 3.6$ Hz), 120.59 (q, $^3J(C, F) = 3.6$ Hz), 121.87, 123.57 (q, $^2J(C, F) = 32$ Hz), 125.11 (q, $^1J(C, F) = 263$ Hz), 127.92, 129.17, 129.54, 136.65, 139.07, 141.05, 161.60; IR (neat) 1548, 1323, 1253, 1118, 860, 844, 815 cm^{-1} ; HRMS (EI) Calcd for $C_{19}H_{22}F_3N_5Si_2$ (M^+) 405.1596. Found 405.1596.

1r