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Electronic Supplementary Information

Cycloaddition of Epoxides and CO_2 Catalyzed by Bisimidazole-functionalized Porphyrin Cobalt(III) Complexes

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1. Characterization data of intermediate catalysts.

Dipyrromethane (a): ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 7.55 (br, 2H, −NH−), 6.64 (m, 2H, pyrrole−H) , 6.30 (m, 2H, pyrrole−H) , 6.16 (s, 2H, pyrrole−H), 3.96 (s, 2H, $-CH_2-$).

2-(4-Bromobutoxy)benzaldehyde (b-o4): yield: 63%. ^{1}H NMR (300 MHz, $CDCl_3$): δ/ppm 10.50 (s, 1H, CHO), 7.83 (dd, J = 1.8, 7.5 Hz, 1H, Ar−H), 7.54 (t, J = 7.8 Hz, 1H, Ar−H), 7.03 (t, J = 7.5 Hz, 1H, Ar−H), 6.97 (t, J = 7.5 Hz, 1H, Ar−H), 4.13 (t, J = 8.1 Hz, 2H, $-O-CH_2-$), 3.51 (t, J = 8.1 Hz, 2H, $Br-CH_2-$), 2.13 − 2.01 (m, 4H, $-CH_2-$); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm; 189.56, 161.10, 135.91, 128.37, 124.80, 120.71, 112.30, 67.34, 33.17, 29.27, 27.65; ESI-MS (m/z): 257.0 $[M]^+$.

3-(4-Bromobutoxy)benzaldehyde (b-m4): yield: 68%. ^{1}H NMR (300 MHz, $CDCl_3$): δ/ppm 9.98 (s, 1H, CHO), 7.46 − 7.44 (m, 2H, Ar−H), 7.38 (t, J = 2.4 Hz, 1H, Ar−H), 7.19 − 7.15 (m, 1H, Ar−H), 4.06 (t, J = 6.6 Hz, 2H, $-O-CH_2-$), 3.50 (t, J = 6.6 Hz, 2H, $Br-CH_2-$), 2.11 − 1.96 (m, 4H, $-CH_2-$); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 192.85, 160.05, 138.41, 130.74, 124.32, 122.58, 113.21, 67.78, 34.02, 30.03, 28.41; ESI-MS (m/z): 257.0 $[M]^+$.

4-(4-Bromobutoxy)benzaldehyde (b-p4): yield: 68%. ^{1}H NMR (300 MHz, $CDCl_3$): δ/ppm 9.88 (s, 1H, CHO), 7.83 (d, J = 8.7 Hz, 2H, Ar−H), 6.98 (d, J = 8.7 Hz, 2H, Ar−H), 4.08 (t, J = 6.0 Hz, 2H, $-O-CH_2-$), 3.50 (t, J = 6.3 Hz, 2H, $Br-CH_2-$), 2.08 − 1.98 (m, 4H, $-CH_2-$); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 191.54, 164.55, 132.70, 130.57, 115.35, 67.89, 33.96, 28.94, 28.34; ESI-MS (m/z): 257.0 $[M]^+$.

2-((6-Bromohexyl)oxy)benzaldehyde (b-o6): yield: 64%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.52 (s, 1H, CHO), 7.84 (d, J = 9.0 Hz, 1H, Ar−H), 7.53 (t, J = 6.0 Hz,

1H, Ar−H), 7.04 − 6.96 (m, 2H, Ar−H), 4.09 (t, *J* = 6.0 Hz, 2H, −O−CH_2−), 3.43 (t, *J* = 6.7 Hz, 2H, Br−CH_2−), 2.04 − 1.88 (m, *J* = 6.1 Hz, 4H, −CH_2−), 1.56 − 1.54 (m, 4H, −CH_2−); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 189.74, 161.37, 135.88, 128.20, 124.79, 120.49, 112.39, 68.16, 33.69, 32.52, 28.87, 27.78, 25.22; ESI-MS (*m*/*z*): 284.8, 286.8 $[M]^+$.

3-((6-Bromohexyl)oxy)benzaldehyde (b-m6): yield: 60%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 9.97 (s, 1H, CHO), 7.45 − 7.43 (m, 2H, Ar−H), 7.38 (d, *J* = 2.4 Hz, 1H, Ar−H), 7.19 − 7.16 (m, 1H, Ar−H), 4.02 (t, *J* = 6.3 Hz, 2H, −O−CH_2−), 3.43 (t, *J* = 6.3 Hz, 2H, Br−CH_2−), 1.93 − 1.82 (m, 4H), 1.58 − 1.50 (m, 4H, −CH_2−); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 192.14, 159.62, 137.80, 130.01, 123.40, 121.93, 112.71, 68.02, 33.70, 32.64, 28.95, 27.88, 25.25; ESI-MS (*m*/*z*): 284.8, 286.8 $[M]^+$.

4-((6-Bromohexyl)oxy)benzaldehyde (b-p6): yield: 66%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 9.88 (s, 1H, CHO), 7.82 (d, *J* = 8.7 Hz, 2H, Ar−H), 6.98 (d, *J* = 8.7 Hz, 2H, Ar−H), 4.05 (t, *J* = 6.3 Hz, 2H, −O−CH_2−), 3.43 (t, *J* = 6.3 Hz, 2H, Br−CH_2−), 1.93 − 1.82 (m, 4H, −CH_2−), 1.54 − 1.50 (m, 4H, −CH_2−); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 180.76, 164.11, 131.97, 129.80, 114.71, 68.10, 33.69, 32.58, 28.86, 27.82, 25.18; ESI-MS (*m*/*z*): 284.8, 286.8 $[M]^+$.

2-((8-Bromooctyl)oxy)benzaldehyde (b-o8): yield: 54%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.51 (s, 1H, CHO), 7.83 (dd, *J* = 7.7, 1.8 Hz, 1H, Ar−H), 7.53 (dt, *J* = 8.4, 1.8 Hz, 1H, Ar−H), 7.03 − 6.96 (m, 2H, Ar−H), 4.08 (t, *J* = 6.6 Hz, 2H, −O−CH_2−), 3.41 (t, *J* = 6.6 Hz, 2H, Br−CH_2−), 1.89 − 1.81 (m, 4H, −CH_2−), 1.53 − 1.38 (m, 8H, −CH_2−); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 189.88, 161.52, 135.89,

128.23, 124.89, 120.48, 112.46, 68.42, 33.91, 32.72, 29.11, 29.03, 28.64, 28.04, 25.94; ESI-MS (*m*/*z*): 312.9, 314.9 $[M]^+$.

3-((8-Bromooctyl)oxy)benzaldehyde (b-m8): yield: 52%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 9.97 (s, 1H, CHO), 7.45 − 7.43 (m, 2H, Ar−H), 7.38 (d, *J* = 2.7, 1H, Ar−H), 7.19 − 7.15 (m, 1H, Ar−H), 4.01 (t, *J* = 6.6 Hz, 2H, −O−CH_2−), 3.41 (t, *J* = 6.6 Hz, 2H, Br−CH_2−), 1.89 − 1.81 (m, 4H, −CH_2−), 1.59 − 1.38 (m, 8H, −CH_2−) ; ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 192.18, 159.67, 137.76, 129.98, 123.33, 121.94, 112.71, 68.19, 33.93, 32.74, 29.11, 29.05, 28.64, 28.05, 25.88; ESI-MS (*m*/*z*): 312.9, 314.9 $[M]^+$.

4-((8-Bromooctyl)oxy)benzaldehyde (b-p8): yield: 49%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 9.88 (s, 1H, CHO), 7.82 (d, *J* = 8.7 Hz, 2H, Ar−H), 6.98 (d, *J* = 8.7 Hz, 2H, Ar−H), 4.04 (t, *J* = 6.6 Hz, 2H, −O−CH_2−), 3.41 (t, *J* = 6.9 Hz, 2H, Br−CH_2−), 1.89 − 1.77 (m, 4H, −CH_2−), 1.50 − 1.37 (m, 8H, −CH_2−); ^{13}C NMR (75 MHz, $CDCl_3$) *δ*/ppm 190.76, 164.20, 131.96, 129.78, 114.73, 68.32, 33.91, 32.73, 29.11, 28.99, 28.63, 28.04, 25.85. ESI-MS (*m*/*z*): 312.9, 314.9 $[M]^+$.

5,15-Di(2-(4-bromobutoxy)phenyl)porphyrin (c-o4): yield: 32%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.25 (s, 2H, *meso*−H), 9.34 (d, *J* = 2.4 Hz, 4H, *β*-pyrrole−H), 9.00 (d, *J* = 2.3 Hz, 4H, *β*-pyrrole−H), 8.07 (d, *J* = 7.5 Hz, 2H, Ar−H), 7.79 (t, *J* = 7.5 Hz, 2H, Ar−H), 7.44 − 7.35 (m, 4H, Ar−H), 3.98 − 3.93 (m, 4H, −O−CH_2−), 2.50 (t, *J* = 6.6 Hz, 2H, Br−CH_2−), 2.41 (t, *J* = 6.6 Hz, 2H, Br−CH_2−), 1.20 − 1.12 (m, 4H, −CH_2−), 0.93 − 0.77 (m, 4H, −CH_2−), – 3.09 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 158.59, 147.28, 145.16, 135.96, 131.32, 130.74, 130.55, 129.90,

119.81, 115.15, 111.99, 104.83, 67.10, 33.02, 28.42, 26.98; ESI-MS (*m*/*z*): 765.2 [M + H]$^+$.

5,15-Di(3-(4-bromobutoxy)phenyl)porphyrin (c-m4): yield: 41%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.38 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 9.12 (d, J = 5.1 Hz, 4H, β-pyrrole−H), 7.86 (d, J = 7.2 Hz, 2H, Ar−H), 7.82 (s, 2H, Ar−H), 7.69 (t, J = 7.8 Hz, 2H, Ar−H), 7.34 (dd, J = 2.1, 7.8 Hz, 2H, Ar−H), 4.21 (t, J = 6.3 Hz, 4H, −O−CH_2−), 3.53 (t, J = 6.6 Hz, 4H, Br−CH_2−), 2.18 − 2.03 (m, 8H, −CH_2−), – 3.14 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 157.42, 146.99, 145.20, 142.65, 131.73, 131.26, 127.78, 121.36, 118.77, 113.74, 105.45, 67.02, 33.53, 29.50, 27.96; ESI-MS (*m*/*z*): 765.2 [M + H]$^+$.

5,15-Di(4-(4-bromobutoxy)phenyl)porphyrin (c-p4): yield: 32%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.39 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 9.11 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 8.18 (d, J = 8.7 Hz, 4H, Ar−H), 7.33 (d, J = 8.7 Hz, 4H, Ar−H), 4.34 (t, J = 6.0 Hz, 4H, −O−CH_2−), 3.66 (t, J = 6.3 Hz, 4H, Br−CH_2−), 2.29 − 2.18 (m, 8H, −CH_2−), – 3.09 (s, 2H, N−H); ESI-MS (*m*/*z*): 765.2 [M + H]$^+$. Elemental Anal. Calcd for $C_{40}H_{36}Br_2N_4O_2$: C, 62.84; H, 4.75; N, 7.33. Found: C, 62.58; H, 4.44; N, 6.96.

5,15-Di(2-((6-bromohexyl)oxy)phenyl)porphyrin (c-o6): yield: 23%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.26 (s, 2H), 9.34 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 9.00 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 8.07 (d, J = 7.5 Hz, 2H, Ar−H), 7.78 (t, J = 7.5 Hz, 2H, Ar−H), 7.42 − 7.35 (m, 4H, Ar−H), 3.93 − 3.87 (m, 4H, −O−CH_2−), 2.42 (t, J = 6.9 Hz, 2H, Br−CH_2−), 2.32 (t, J = 6.9 Hz, 2H, Br−CH_2−), 1.02 − 0.24 (m, 16H,

−CH_2−), – 3.09 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 158.83, 147.35, 145.08, 135.91, 131.20, 130.84, 130.62, 129.82, 119.61, 115.31, 112.30, 104.70, 68.30, 33.25, 31.93, 28.41, 26.94, 24.47; ESI-MS (*m*/*z*): 821.2 $[M + H]^+$.

5,15-Di(3-((6-bromohexyl)oxy)phenyl)porphyrin (c-m6): yield: 23%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.31 (s, 2H, *meso*−H), 9.39 (d, *J* = 5.1 Hz, 4H, *β*-pyrrole−H), 9.14 (d, *J* = 4.8 Hz, 4H, *β*-pyrrole−H), 7.86 (d, *J* = 7.8 Hz, 2H, Ar−H), 7.83 (s, 2H), 7.69 (t, *J* = 7.8 Hz, 2H, Ar−H), 7.35 (dd, *J* = 1.8, 8.4 Hz, 2H, Ar−H), 4.19 (t, *J* = 6.3 Hz, 4H, −O−CH_2−), 3.42 (t, *J* = 6.6 Hz, 4H, −Br−CH_2−), 1.94 − 1.89 (m, 8H, −CH_2−), 1.58 − 1.52 (m, 8H), – 3.11 (s, 2H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 157.63, 147.02, 145.18, 142.61, 131.56, 131.05, 127.75, 121.27, 118.87, 114.01, 105.24, 67.95, 33.82, 32.65, 29.20, 27.94, 25.35; ESI-MS (*m*/*z*): 821.2 $[M + H]^+$.

5,15-Di(4-((6-bromohexyl)oxy)phenyl)porphyrin (c-p6): yield: 26%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.30 (s, 2H, *meso*−H), 9.39 (d, *J* = 4.6 Hz, 4H, *β*-pyrrole−H), 9.11 (d, *J* = 4.6 Hz, 4H, *β*-pyrrole−H), 8.18 (d, *J* = 8.4 Hz, 4H, Ar−H), 7.34 (d, *J* = 8.7 Hz, 4 H, Ar−H), 4.30 (t, *J* = 6.3 Hz, 4H, −O−CH_2−), 3.53 (t, *J* = 6.3 Hz, 4H, Br−CH_2−), 2.14 − 1.93 (m, 8H), 1.80 − 1.61 (m, 8H, −CH_2−), – 3.07 (s, 2H, N−H); ESI-MS (*m*/*z*): 821.2 $[M + H]^+$. Elemental Anal. Calcd for $C_{44}H_{44}Br_2N_4O_2$: C, 64.40; H, 5.40; N, 6.83. Found: C, 64.08; H, 5.07; N, 6.63.

5,15-Di(2-((8-bromooctyl)oxy)phenyl)porphyrin (c-o8): yield: 25%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.24 (s, 2H, *meso*−H), 9.34 (d, *J* = 4.6 Hz, 4H, *β*-pyrrole−H), 9.01 (d, *J* = 4.6 Hz, 4H, *β*-pyrrole−H), 8.08 (dd, *J* = 7.2, 1.5 Hz, 2H, Ar−H), 7.79 (ddd,

J = 8.5, 7.7, 1.2 Hz, 2H, Ar−H), 7.43 − 7.35 (m, *J* = 14.4, 7.8 Hz, 4H, Ar−H), 3.90 (t, *J* = 6.3 Hz, 4H, −O−CH_2−), 2.65 (t, *J* = 6.6 Hz, 4H, Br−CH_2−), 1.01 − 0.92 (m, 8H, −CH_2−), 0.35 − 0.28 (m, 12H, −CH_2−), 0.14 − 0.11(m, 4H, −CH_2−), – 3.08 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): *δ*/ppm 158.95, 147.37, 145.05, 135.88, 131.17, 130.88, 130.68, 129.81, 119.59, 115.36, 112.39, 104.61, 68.61, 33.57, 32.14, 28.53, 28.15, 27.75, 27.11, 25.16; ESI-MS (*m*/*z*): 875.2, 877.2 $[M + H]^+$.

5,15-Di(3-((8-bromooctyl)oxy)phenyl)porphyrin (c-m8): yield: 25%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.30 (s, 2H, *meso*−H), 9.38 (d, *J* = 4.2 Hz, 4H, *β*-pyrrole−H), 9.12 (d, *J* = 4.5 Hz, 4H, *β*-pyrrole−H), 7.86 − 7.82 (m, 4H, Ar−H), 7.68 (t, *J* = 7.8 Hz, 2H, Ar−H), 7.36 (dd, *J* = 7.8, 1.2 Hz, 2H, Ar−H), 4.17 (t, *J* = 6.9 Hz, 4H, −O−CH_2−), 3.39 (t, *J* = 6.9 Hz, 4H, Br−CH_2−), 1.91 − 1.81 (m, 8H, −CH_2−), 1.45 − 1.34 (m, 16H, −CH_2−), – 3.14 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): *δ*/ppm 157.70, 147.04, 145.19, 142.61, 131.54, 131.06, 127.73, 121.31, 118.91, 114.04, 105.22, 68.17, 33.98, 32.74, 29.34, 29.21, 28.66, 28.06, 26.01; ESI-MS (*m*/*z*): 875.2, 877.2 $[M + H]^+$.

5,15-Di(4-((8-bromooctyl)oxy)phenyl)porphyrin (c-p8)*:* yield: 19%. ^{1}H NMR (300 MHz, $CDCl_3$) *δ*/ppm 10.30 (s, 2H, *meso*−H), 9.39 (d, *J* = 4.7 Hz, 4H, *β*-pyrrole−H), 9.11 (d, *J* = 4.7 Hz, 4H, *β*-pyrrole−H), 8.18 (d, *J* = 8.4 Hz, 4H, Ar−H), 7.34 (d, *J* = 8.4 Hz, 4H, Ar−H), 4.29 (t, *J* = 5.9 Hz, 4H, −O−CH_2−), 3.48 (t, *J* = 6.9 Hz, 4H, Br−CH_2−), 2.16 − 1.82 (m, 8H, −CH_2−), 1.00 − 0.71 (m, 16H, −CH_2−), – 3.07 (s, 2H, N−H); ESI-MS (*m*/*z*): 875.2, 877.2 $[M + H]^+$. Elemental Anal. Calcd for $C_{48}H_{52}Br_2N_4O_2 \cdot 1/3CH_2Cl_2$: C, 64.14; H, 5.87; N, 6.19. Found: C, 64.54; H, 5.62; N,

5.87.

5,15-Di(2-(4-imidazolylbutoxy)phenyl)porphyrin (d-o4): yield: 64%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.26 (s, 2H, *meso*−H), 9.33 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 9.00 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 8.10 (d, J = 7.5 Hz, 2H, Ar−H), 7.79 (t, J = 7.8 Hz, 2H, Ar−H), 7.43 (t, J = 7.8 Hz, 2H, Ar−H), 7.33 (d, J = 8.4 Hz, 2H, Ar−H), 6.49 (s, 1H, imidazole−H), 6.36 (s, 1H, imidazole−H), 6.18 (s, 1H, imidazole−H), 5.80 (s, 1H, imidazole−H), 5.18 (s, 1H, imidazole−H), 4.61 (s, 1H, imidazole−H), 3.94 − 3.89 (m, 4H, −O−CH_2−), 2.50 – 2.35 (m, 4H, imidazole−CH_2−), 0.90 − 0.82 (m, 4H, −CH_2−), 0.69 − 0.62 (m, 4H, −CH_2−), – 3.05 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 158.57, 147.27, 145.14, 136.05, 135.85, 135.66, 131.42, 130.77, 130.45, 129.97, 128.27, 127.88, 119.88, 117.56, 117.29, 115.15, 111.97, 104.96, 67.61, 45.25, 45.18, 26.80, 26.71, 25.36; ESI-MS (m/z): 738.9 $[M]^+$.

5,15-Di(3-(4-imidazolylbutoxy)phenyl)porphyrin (d-m4): yield: 90%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.39 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 9.10 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 7.87 (d, J = 7.8 Hz, 2H, Ar−H), 7.80 (s, 2H, Ar−H), 7.69 (t, J = 7.8 Hz, 2H, Ar−H), 7.52 (s, 2H, imidazole−H), 7.34 (dd, J = 1.8, 8.4 Hz, 2H, Ar−H), 7.06 (s, 2H, imidazole−H), 6.94 (s, 2H, imidazole−H), 4.18 (t, J = 6.0 Hz, 4H, −O−CH_2−), 4.05 (t, J = 6.9 Hz, 4H, imidazole−CH_2−), 2.09 − 2.02 (m, 4H, −CH_2−), 1.92 − 1.85 (m, 4H, −CH_2−), – 3.14 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): δ/ppm 157.23, 146.93, 145.13, 142.55, 136.91, 131.60, 130.96, 129.29, 127.87, 127.77, 121.08, 118.61, 113.82, 105.24, 67.08, 46.53, 27.84, 26.13; ESI-MS (m/z): 738.9 $[M]^+$.

5,15-Di(4-(4-imidazolylbutoxy)phenyl)porphyrin (d-p4): yield: 87%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.40 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 9.10 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 8.17 (d, J = 8.7 Hz, 4H, Ar−H), 7.62 (s, 2H, imidazole−H), 7.31 (d, J = 8.1 Hz, 4H, Ar−H), 7.16 (s, 2H, imidazole−H), 7.06 (s, 2H, imidazole−H), 4.29 (t, J = 6.0 Hz, 4H, −O−CH_2−), 3.66 (t, J = 6.9 Hz, 4H, imidazole−CH_2−), 2.22 − 2.17 (m, 4H, −CH_2−), 2.02 − 1.97 (m, 4H, −CH_2−), – 3.09 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): δ/ppm 158.61, 147.42, 145.06, 137.18, 135.89, 133.88, 131.55, 130.97, 129.60, 118.84, 112.95, 105.19, 67.36, 46.86, 28.24, 26.47; ESI-MS (*m*/*z*): 738.9 $[M]^+$.

5,15-Di(2-((6-imidazolylhexyl)oxy)phenyl)porphyrin (d-o6): yield: 88%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.19 (s, 2H, *meso*−H), 9.32 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 9.00 (d, J = 5.1 Hz, 4H, β-pyrrole−H), 8.07 (t, J = 6.6 Hz, 2H, Ar−H), 7.79 (t, J = 7.8 Hz, 2H, Ar−H), 7.42 (t, J = 7.5 Hz, 2H, Ar−H), 7.35 (dd, J = 4.5, 8.4 Hz, 2H, Ar−H), 6.74 (s, 1H, imidazole−H), 6.69 (s, 1H, imidazole−H), 6.56 (s, 1H, imidazole−H), 6.38 (s, 1H, imidazole−H), 5.94 (s, 1H, imidazole−H), 5.52 (s, 1H, imidazole−H), 3.91 − 3.86 (m, 4H, −O−CH_2−), 2.48 (t, J = 7.2, 2H, imidazole−CH_2−), 1.85 (t, J = 7.2, 2H, imidazole−CH_2−), 0.96 – 0.86 (m, 8H, −CH_2−), 0.48 − (– 0.14) (m, 8H, −CH_2−), – 3.10 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 158.83, 158.67, 147.27, 144.98, 136.31, 135.99, 135.80, 135.55, 131.20, 130.94, 130.49, 130.41, 129.88, 128.66, 128.32, 119.77, 119.67, 118.05, 117.72, 115.37, 112.35, 112.28, 104.59, 104.53, 68.40, 68.20, 45.53, 45.03, 29.45, 28.18, 25.00, 24.75, 24.60; ESI-MS (*m*/*z*): 795.5 $[M + H]^+$.

5,15-Di(3-((6-imidazolylhexyl)oxy)phenyl)porphyrin (d-m6): yield: 92%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.39 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 9.10 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 7.86 (d, J = 7.2 Hz, 2H, Ar−H), 7.81 (s, 2H, Ar−H), 7.69 (t, J = 7.8 Hz, 2H, Ar−H), 7.45 (s, 2H, imidazole−H), 7.34 (dd, J = 2.4, 8.1 Hz, 2H, Ar−H), 7.04 (s, 2H, imidazole−H), 6.88 (s, 2H, imidazole−H), 4.17 (t, J = 6.3 Hz, 4H, −O−CH_2−), 3.93 (t, J = 7.2 Hz, 4H, imidazole−CH_2−), 1.91 − 1.26 (m, 16H, −CH_2−), – 3.13 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): δ/ppm 157.52, 146.97, 145.14, 142.53, 136.93, 131.56, 131.01, 129.27, 127.74, 121.22, 118.81, 118.65, 113.90, 105.22, 67.73, 46.73, 30.85, 29.05, 26.20, 25.55; ESI-MS (*m*/*z*): 795.5 $[M + H]^+$.

5,15-Di(4-((6-imidazolylhexyl)oxy)phenyl)porphyrin (d-p6): yield: 79%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.29 (s, 2H, *meso*−H), 9.38 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 9.10 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 8.18 (d, J = 9.0 Hz, 4H, Ar−H), 7.53 (s, 2H, imidazole−H), 7.31 (d, J = 8.7 Hz, 4H, Ar−H), 7.11 (s, 2H, imidazole−H), 6.97 (s, 2H, imidazole−H), 4.24 (t, J = 6.3 Hz, 4H, −O−CH_2−), 4.01 (t, J = 6.9 Hz, 4H, imidazole−CH_2−), 2.00 − 1.86 (m, 8H, −CH_2−), 1.73 − 1.62 (m, 8H, −CH_2−), – 3.08 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 158.82, 147.44, 145.01, 137.03, 135.83, 133.55, 131.48, 130.97, 129.35, 118.76, 112.98, 105.12, 67.81, 46.88, 30.98, 29.18, 26.32, 25.70; ESI-MS (*m*/*z*): 795.5 $[M + H]^+$.

5,15-Di(2-((8-imidazolyloctyl)oxy)phenyl)porphyrin (d-o8): yield: 92%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.22 (s, 2H, *meso*−H), 9.32 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 9.02 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 8.07 (dd, J = 6.0, 21.0 Hz, 2H,

Ar−H), 7.79 (t, J = 7.8 Hz, 2H, Ar−H), 7.43 − 7.35 (m, 4H, Ar−H), 7.03 (s, 1H, imidazole−H), 6.90 (s, 1H, imidazole−H), 6.86 (s, 2H, imidazole−H), 6.42 (s, 1H, imidazole−H), 6.19 (s, 1H, imidazole−H), 3.94 − 3.88 (m, 4H, −O−CH_2−), 2.85 (t, J = 7.2, 2H, imidazole−CH_2−), 2.54 (t, J = 7.2, 2H, imidazole−CH_2−), 1.00 − 0.88 (m, 8H, −CH_2−), 0.70 − (– 0.30) (m, 16H, −CH_2−), – 3.04 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): δ/ppm 158.88, 158.74, 147.38, 145.05, 136.65, 136.49, 136.01, 135.77, 131.18, 130.98, 130.48, 130.42, 129.88, 128.91, 128.80, 119.67, 119.61, 118.37, 118.22, 115.46, 115.44, 112.38, 112.25, 104.57, 68.64, 68.49, 46.02, 45.75, 30.00, 29.80, 28.35, 28.08, 27.88, 27.83, 27.57, 25.19, 25.08, 24.98, 24.82; ESI-MS (m/z): 851.2 $[M + H]^+$.

5,15-Di(3-((8-imidazolyloctyl)oxy)phenyl)porphyrin (d-m8): yield: 89%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.31 (s, 2H, *meso*−H), 9.39 (d, J = 4.8 Hz, 4H, β-pyrrole−H), 9.13 (d, J = 4.5 Hz, 4H, β-pyrrole−H), 7.85 (d, J = 7.2 Hz, 2H, Ar−H), 7.82 (s, 2H, Ar−H), 7.68 (t, J = 7.8 Hz, 2H, Ar−H), 7.42 (s, 2H, imidazole−H), 7.34 (d, J = 8.7 Hz, 2H, Ar−H), 7.02 (s, 2H, imidazole−H), 6.85 (s, 2H, imidazole−H), 4.18 (t, J = 6.3 Hz, 4H, −O−CH_2−), 3.87 (t, J = 6.9 Hz, 4H, imidazole−CH_2−), 1.92 − 1.68 (m, 8H, −CH_2−), 1.58 − 1.26 (m, 16H, −CH_2−), – 3.13 (s, 2H, N−H); ^{13}C NMR (101 MHz, $CDCl_3$): δ/ppm 157.65, 147.00, 145.16, 142.55, 136.90, 131.54, 131.04, 129.12, 127.73, 121.29, 118.88, 118.70, 114.01, 105.22, 68.10, 46.90, 30.91, 29.26, 29.14, 28.91, 26.37, 25.96; ESI-MS (m/z): 851.2 $[M + H]^+$.

5,15-Di(4-((8-imidazolyloctyl)oxy)phenyl)porphyrin (d-p8)*:* yield: 91%. ^{1}H NMR (300 MHz, $CDCl_3$) δ/ppm 10.30 (s, 2H, *meso*−H), 9.39 (d, J = 4.5 Hz, 4H, β-

pyrrole−H), 9.11 (d, J = 4.2 Hz, 4H, β-pyrrole−H), 8.17 (d, J = 8.7 Hz, 4H, Ar−H), 7.67 (s, 2H, imidazole−H), 7.52 (s, 2H, imidazole−H), 7.33 (d, J = 8.7 Hz, 4H, Ar−H), 6.96 (s, 2H, imidazole−H), 4.27 (t, J = 6.6 Hz, 4H, −O−CH_2−), 3.98 (t, J = 6.9 Hz, 4H, imidazole−CH_2−), 2.02 − 1.81 (m, 8H, −CH_2−), 1.65 − 1.42 (m, 16H, −CH_2−), – 3.07 (s, 2H, N−H); ^{13}C NMR (75 MHz, $CDCl_3$): δ/ppm 158.97, 147.50, 145.04, 137.02, 135.85, 131.95, 131.48, 130.98, 129.18, 118.78, 114.66, 113.04, 105.12, 68.17, 47.06, 31.05, 29.28, 29.07, 26.51, 26.11, 25.81; ESI-MS (m/z): 851.2 $[M + H]^+$.

[5,15-Di(2-(4-imidazolylbutoxy)phenyl)porphyrin] cobalt(II) (e-o4): yield: 95%. ESI-MS (m/z): 795.1 $[M]^+$.

[5,15-Di(3-(4-imidazolylbutoxy)phenyl)porphyrin] cobalt(II) (e-m4): yield: 97%. ESI-MS (m/z): 795.1 $[M]^+$.

[5,15-Di(4-(4-imidazolylbutoxy)phenyl)porphyrin] cobalt(II) (e-p4): yield: 90%. ESI-MS (m/z): 795.1 $[M]^+$.

[5,15-Di(2-((6-imidazolylhexyl)oxy)phenyl)porphyrin] cobalt(II) (e-o6): yield: 96%. ESI-MS (m/z): 851.5 $[M]^+$.

[5,15-Di(3-((6-imidazolylhexyl)oxy)phenyl)porphyrin] cobalt(II) (e-m6): yield: 91%. ESI-MS (m/z): 851.5 $[M]^+$.

[5,15-Di(4-((6-imidazolylhexyl)oxy)phenyl)porphyrin] cobalt(II) (e-p6): yield: 87%. ESI-MS (m/z): 851.5 $[M]^+$.

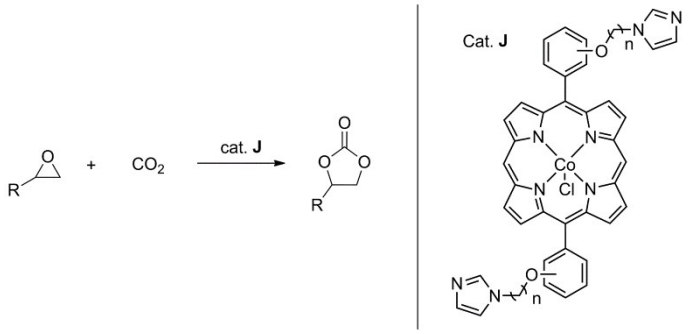
[5,15-Di(2-((8-imidazolyloctyl)oxy)phenyl)porphyrin] cobalt(II) (e-o8): yield: 97%. ESI-MS (m/z): 907.2 $[M]^+$.

[5,15-Di(3-((8-imidazolyloctyl)oxy)phenyl)porphyrin] cobalt(II) (e-m8): yield:

98%. ESI-MS (*m*/*z*): 907.2 $[M]^+$.

[5,15-Di(4-((8-imidazolyloctyl)oxy)phenyl)porphyrin] cobalt(II) (e-p8)*:* yield: 93%. ESI-MS (*m*/*z*): 907.2 $[M]^+$.

2. General procedure for the cycloaddition of epoxides and CO_2.[1,2]



All reactions were carried out in a dry 100 mL stainless steel autoclave equipped with a magnetic stir bar and merged into an oil bath. The required catalyst and epoxide were added to the reactor in turn. The reactor was charged with CO_2 and vented for three times, and then pressurized with CO_2 to needed pressure, and stirred at the requested temperature. After a proper time, the autoclave was cooled down to the room temperature and then vented slowly. The resulting mixture was analyzed by ^{1}H NMR to give the yield and the selectivity, except the PC yield that was determined by subtraction method.

3. General procedure for the kinetic investigations.[2,3]

To get the kinetic data, the reactions were performed under various temperatures. The required catalyst and ECH were added to the autoclave in turn. Several autoclaves were parallelized in oil baths. Then the reactions were commenced simultaneously and ceased after a requested time, respectively. To make sure the credibility of data, each reaction was repeated at least 3 times. The yields and

selectivities of chloromethyl carbonate (CMC) were measured by ^{1}H NMR spectroscopy analysis. All kinetic data at various temperatures were listed in Table S1–S12 respectively. The cycloaddition reactions are supposed as pseudo first order reaction depending on ECH concentration respectively. Therefore, the reaction rate constant k can be computed by equation $\ln(1 - x) = - kt + C$ (x = [CMC]) [S**1**]. The apparent activation energy E_a can be accounted according to the relationship between apparent rate constant and temperature using Arrhenius equation.

4. Kinetic data by J-*m*8 on cycloaddition of CO_2 and ECH.

Table S1. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*m*8** at 90 $^oC^a$

Entry	Time (h)	Yield^b (%)	Selectivity^b (%)
1	2	18.0 ± 0.2	> 99
2	3	35.1 ± 0.1	> 99
3	4	48.3 ± 0.5	> 99
4	5	62.3 ± 0.3	> 99
5	6	69.9 ± 0.6	> 99

^{a}Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}m8}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 90 ± 1 ^{o}C. ^{b}Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

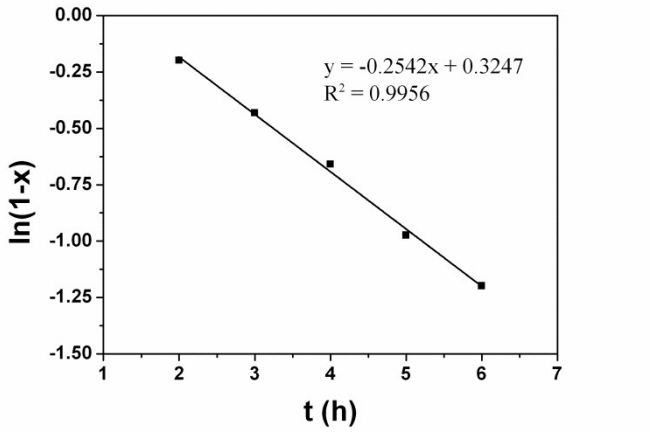


Fig. S1 Logarithmic plots of (1 – x) versus time by **J-*m*8** at 90 ^{o}C (x = [CMC]).

Table S2. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*m*8** at 100 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	32.8 ± 0.1	> 99
2	3	50.8 ± 0.4	> 99
3	4	67.6 ± 0.3	> 99
4	5	77.9 ± 0.6	> 99
5	6	86.2 ± 0.7	> 99

[a]Reaction conditions: catalyst (0.020mmol), [**J-*m*8**]$_0$/[ECH]$_0$ = 1/1000, no solvent, 2.0 MPa, T = 100 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

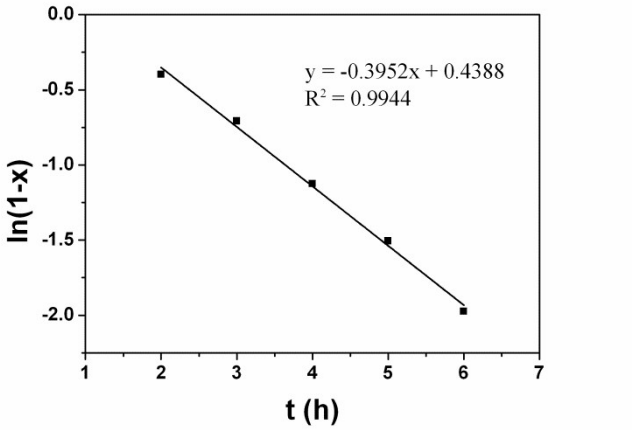


Fig. S2 Logarithmic plots of (1 – x) versus time by **J-*m*8** at 100 °C (x = [CMC]).

Table S3. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*m*8** at 110 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	48.0 ± 0.2	> 99
2	3	65.4 ± 0.4	> 99
3	4	84.2 ± 0.7	> 99
4	5	90.2 ± 0.8	> 99
5	6	94.4 ± 0.7	> 99

[a]Reaction conditions: catalyst (0.020mmol), [**J-*m*8**]$_0$/[ECH]$_0$ = 1/1000, no solvent, 2.0 MPa, T = 110 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

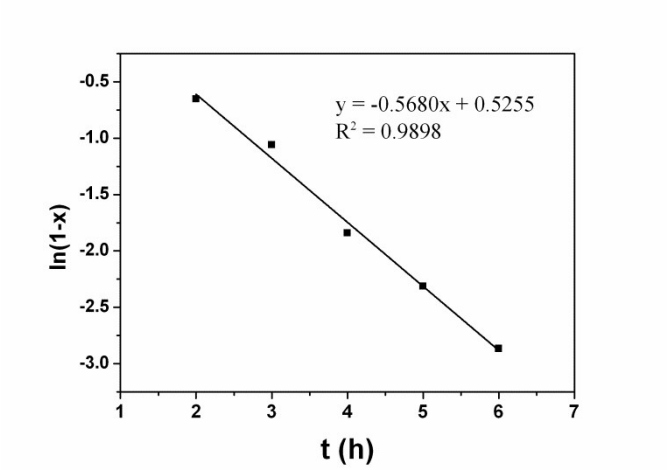


Fig. S3 Logarithmic plots of (1 – x) versus time by **J-*m*8** at 110 °C (x = [CMC]).

Table S4. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*m*8** at 120 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	65.4 ± 0.2	> 99
2	3	85.5 ± 0.2	> 99
3	4	92.6 ± 0.4	> 99
4	5	96.2 ± 0.6	> 99
5	6	99.0 ± 0.3	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}m8}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 120 ± 1 °C. [b]Yields and selectivities were determined by ^1H NMR spectrum of the reaction mixture.

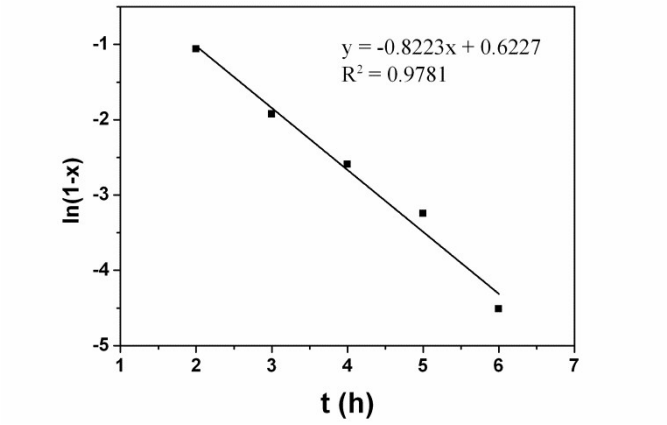


Fig. S4 Logarithmic plots of (1 – x) versus time by **J-*m*8** at 120 °C (x = [CMC]).

5. Kinetic data by J-*o*6 on cycloaddition of CO_2 and ECH.

Table S5. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*o*6** at 90 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	20.5 ± 0.1	> 99
2	3	34.8 ± 0.1	> 99
3	4	52.3 ± 0.3	> 99
4	5	66.7 ± 0.4	> 99
5	6	74.6 ± 0.3	> 99

[a]Reaction conditions: catalyst (0.020mmol), [**J-*o*6**]$_0$/[ECH]$_0$ = 1/1000, no solvent, 2.0 MPa, T = 90 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

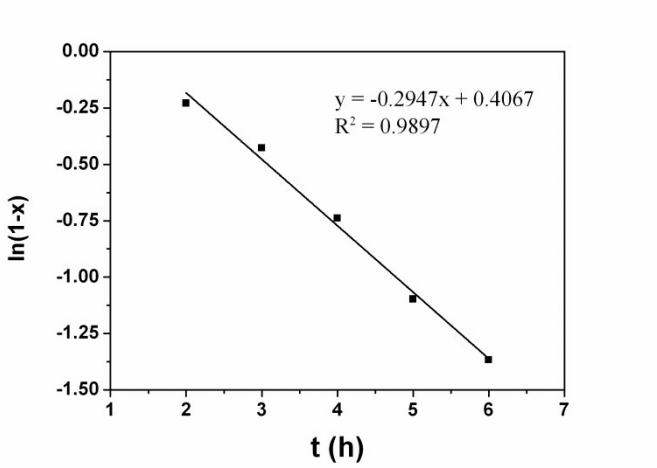


Fig. S5 Logarithmic plots of (1 – x) versus time by **J-*o*6** at 90 °C (x = [CMC]).

Table S6. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*o*6** at 100 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	40.5 ± 0.1	> 99
2	3	53.6 ± 0.5	> 99
3	4	72.8 ± 0.3	> 99
4	5	80.0 ± 0.4	> 99
5	6	85.7 ± 0.7	> 99

[a]Reaction conditions: catalyst (0.020mmol), [**J-*o*6**]$_0$/[ECH]$_0$ = 1/1000, no solvent, 2.0 MPa, T = 100 ±1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

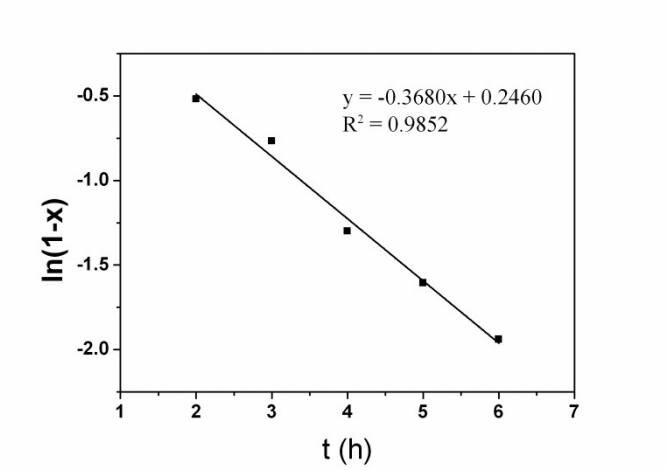


Fig. S6 Logarithmic plots of (1 – x) versus time by **J-*o*6** at 100 °C (x = [CMC]).

Table S7. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*o*6** at 110 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	43.5 ± 0.2	> 99
2	3	62.1 ± 0.1	> 99
3	4	76.3 ± 0.6	> 99
4	5	87.2 ± 0.5	> 99
5	6	91.7 ± 0.2	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}o6}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 110 ± 1 °C. [b]Yields and selectivities were determined by ^1H NMR spectrum of the reaction mixture.

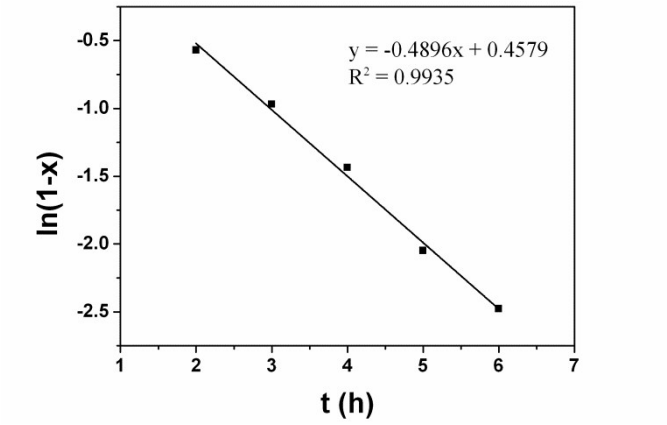


Fig. S7 Logarithmic plots of (1 – x) versus time by **J-*o*6** at 110 °C (x = [CMC]).

Table S8. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*o*6** at 120 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	71.3 ± 0.1	> 99
2	3	82.1 ± 0.5	> 99
3	4	91.0 ± 0.3	> 99
4	5	95.2 ± 0.6	> 99
5	6	97.5 ± 0.1	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}o6}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 120 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

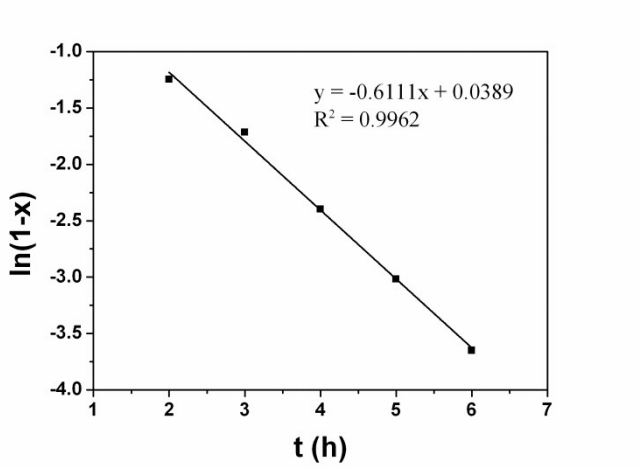


Fig. S8 Logarithmic plots of (1 – x) versus time by **J-*o*6** at 120 °C (x = [CMC]).

6. Kinetic data by J-*p*4 on cycloaddition of CO_2 and ECH.

Table S9. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*p*4** at 90 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	8.4 ± 0.1	> 99
2	3	15.7 ± 0.1	> 99
3	4	26.0 ± 0.3	> 99
4	5	34.8 ± 0.4	> 99
5	6	43.6 ± 0.4	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}p4}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 90 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

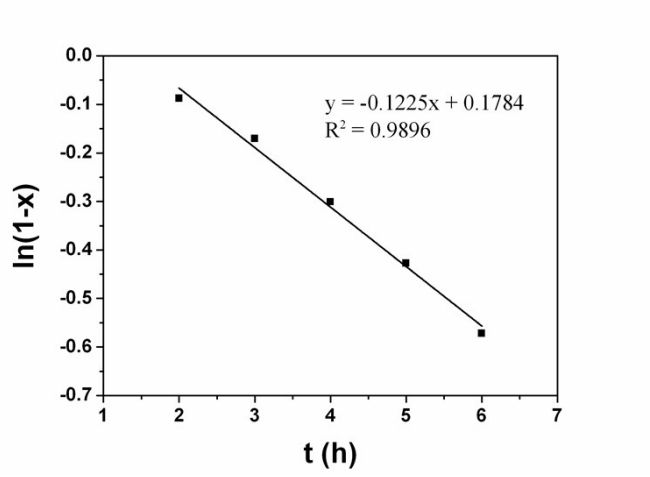


Fig. S9 Logarithmic plots of (1 – x) versus time by **J-*p*4** at 90 °C (x = [CMC]).

Table S10. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*p*4** at 100 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	20.6 ± 0.3	> 99
2	3	37.4 ± 0.6	> 99
3	4	50.8 ± 0.2	> 99
4	5	60.4 ± 0.5	> 99
5	6	69.7 ± 0.6	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}p4}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 100 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

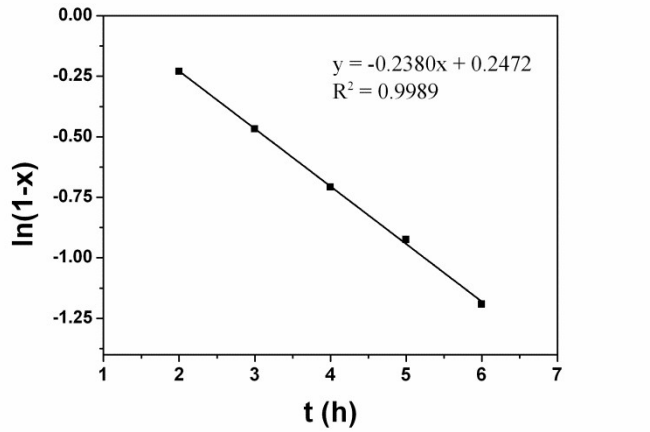


Fig. S10 Logarithmic plots of (1 – x) versus time by **J-*p*4** at 100 °C (x = [CMC]).

Table S11. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*p*4** at 110 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	43.7 ± 0.4	> 99
2	3	65.1 ± 0.6	> 99
3	4	74.8 ± 0.7	> 99
4	5	82.7 ± 0.5	> 99
5	6	89.0 ± 0.7	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}p4}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 110 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

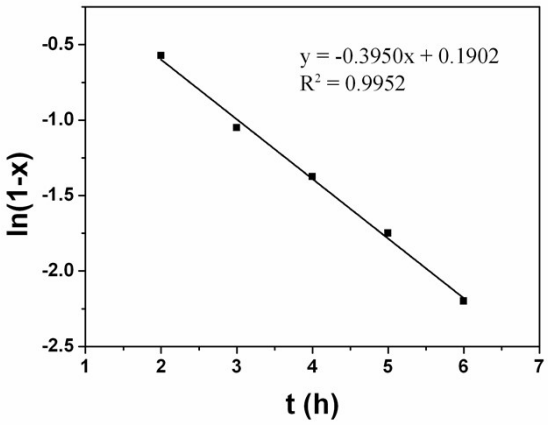


Fig. S11 Logarithmic plots of (1 – x) versus time by **J-*p*4** at 110 °C (x = [CMC])

Table S12. Effects of the reaction time on cycloaddition of CO_2 and ECH by **J-*p*4** at 120 °C[a]

Entry	Time (h)	Yield[b] (%)	Selectivity[b] (%)
1	2	52.5 ± 0.3	> 99
2	3	68.8 ± 0.2	> 99
3	4	82.0 ± 0.6	> 99
4	5	90.6 ± 0.7	> 99
5	6	94.3 ± 0.4	> 99

[a]Reaction conditions: catalyst (0.020mmol), $[\mathbf{J\text{-}p4}]_0/[ECH]_0$ = 1/1000, no solvent, 2.0 MPa, T = 120 ± 1 °C. [b]Yields and selectivities were determined by ^{1}H NMR spectrum of the reaction mixture.

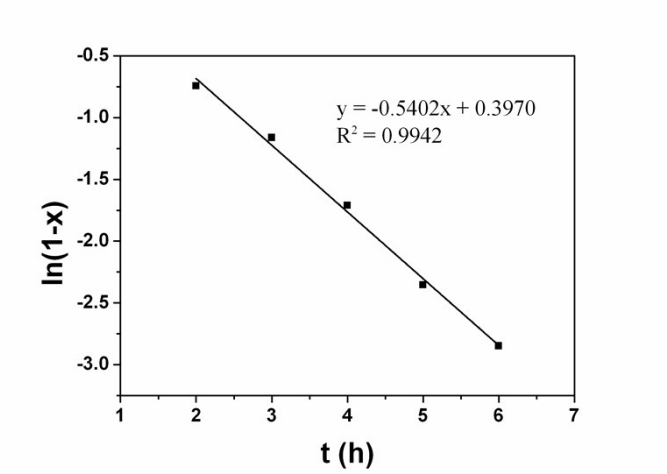
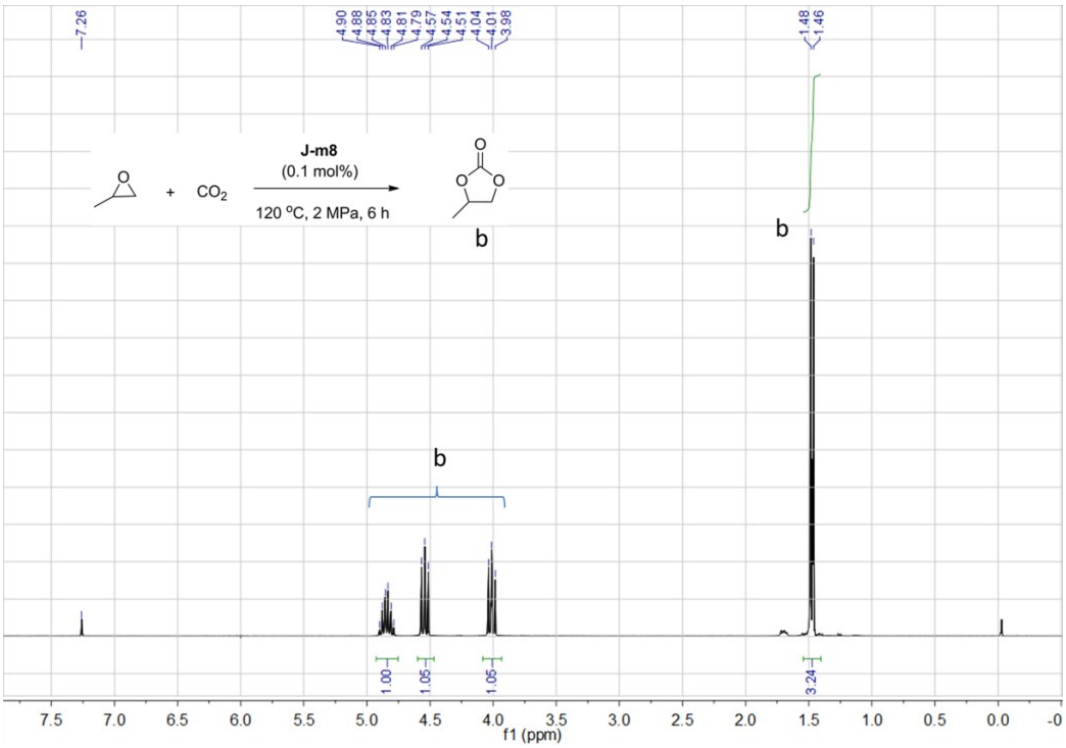
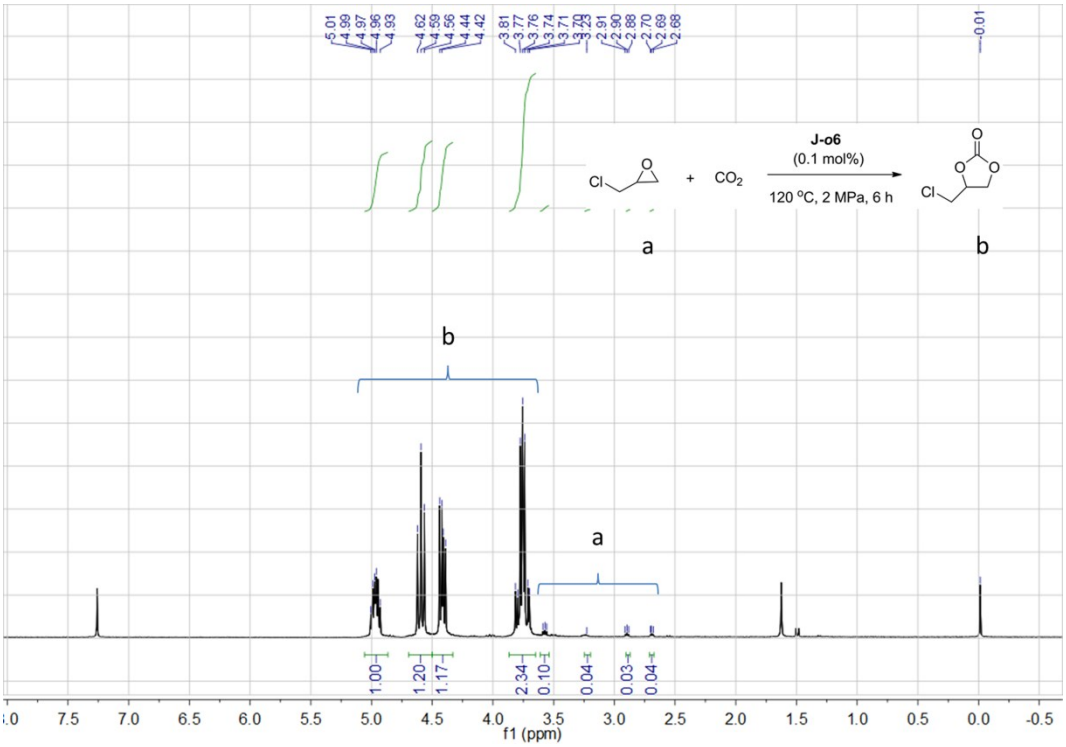


Fig. S12 Logarithmic plots of (1 – x) versus time by **J-*p*4** at 120 °C (x = [CMC]).

7. ^{1}H NMR and MS spectra of the substrates, products and selected catalysts

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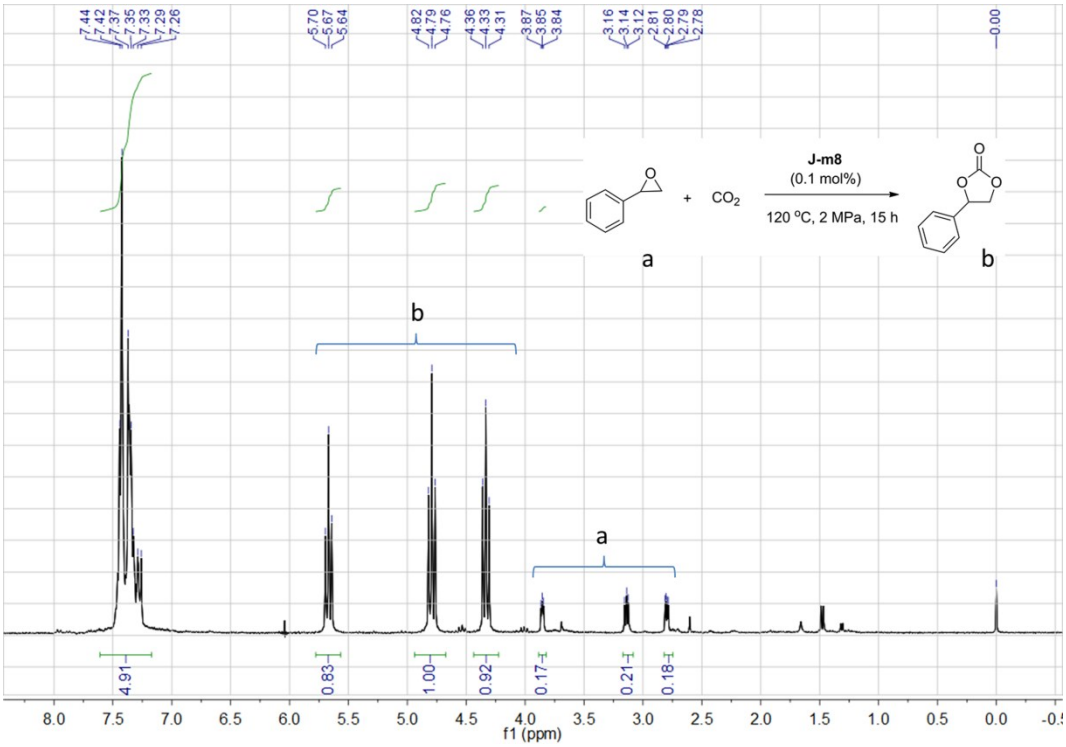
(0.1 mol%)
120 °C, 2 MPa, 6 h
a
b
f1 (ppm)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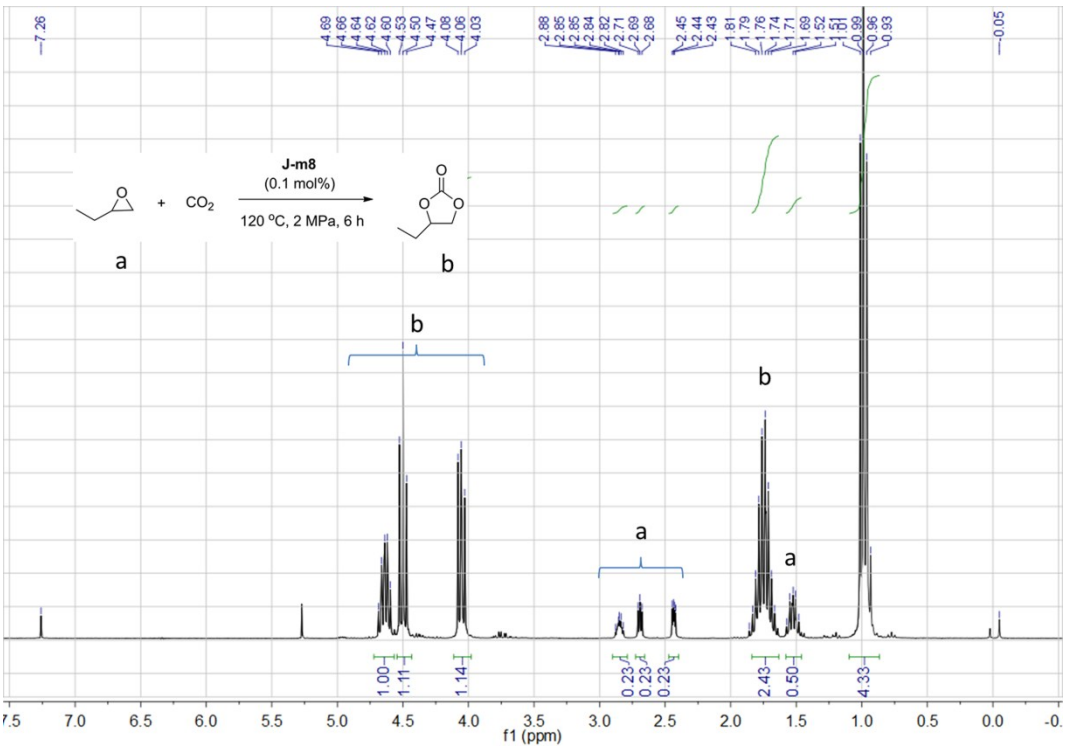
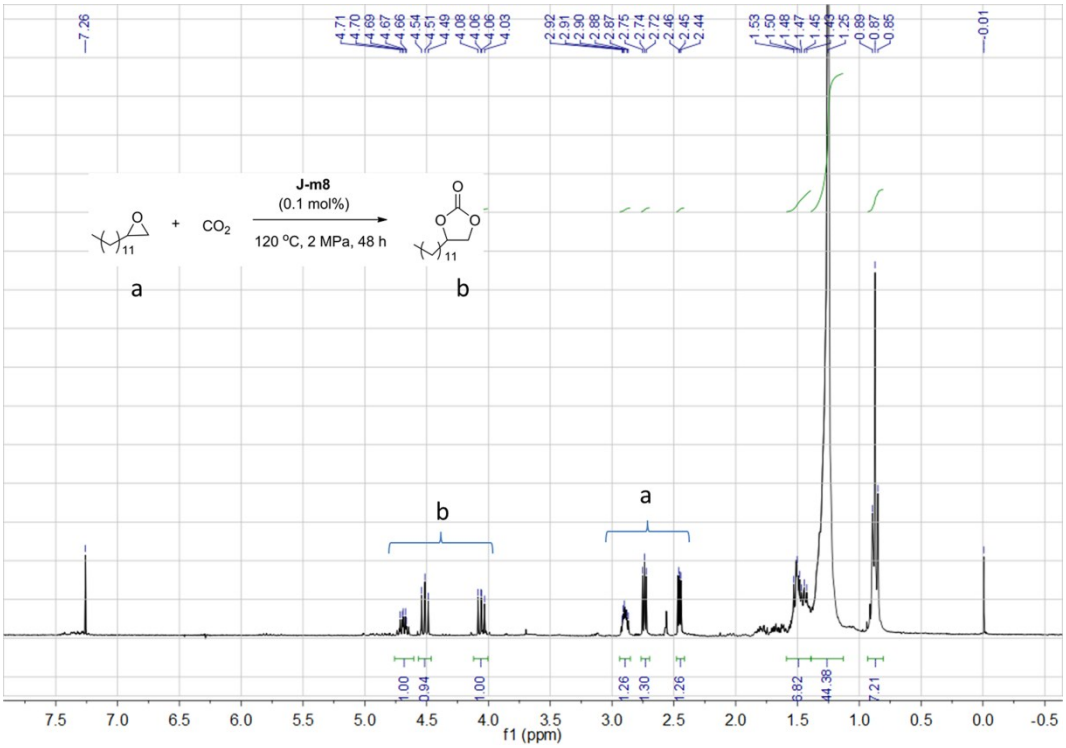
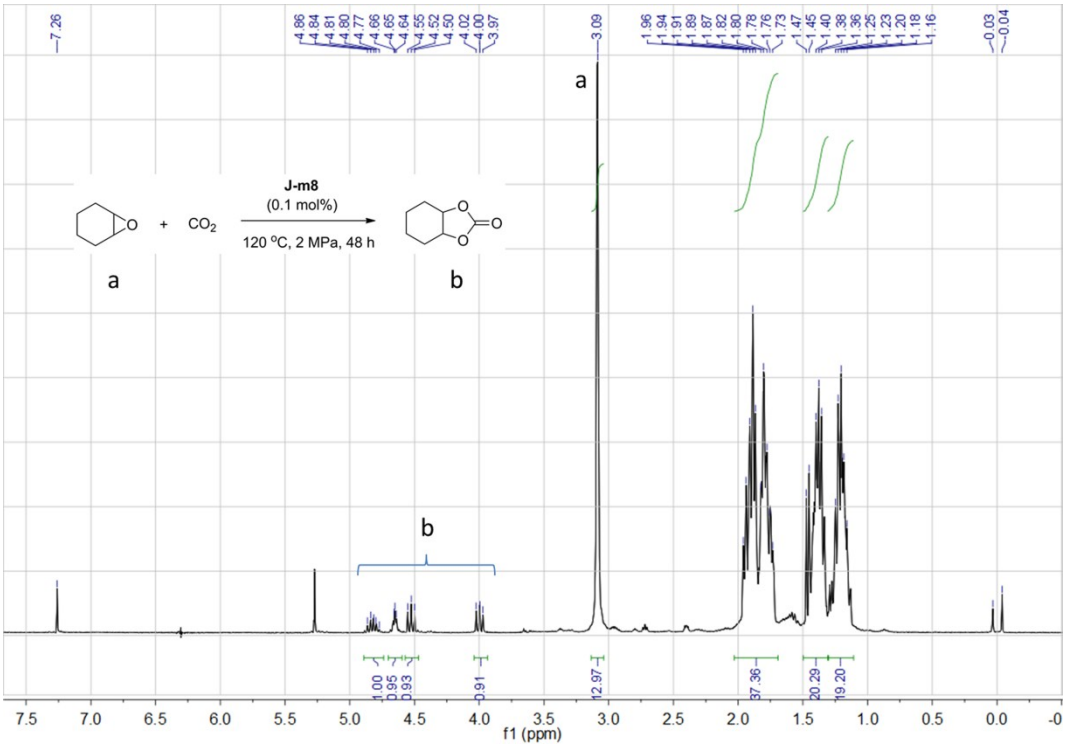
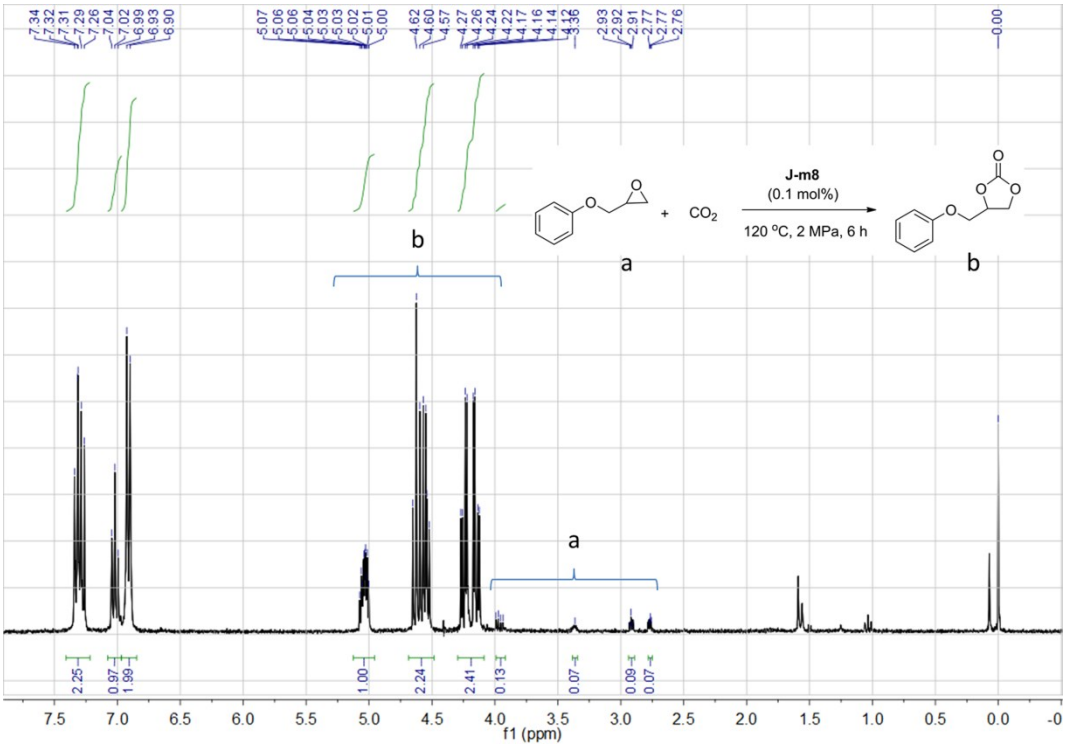
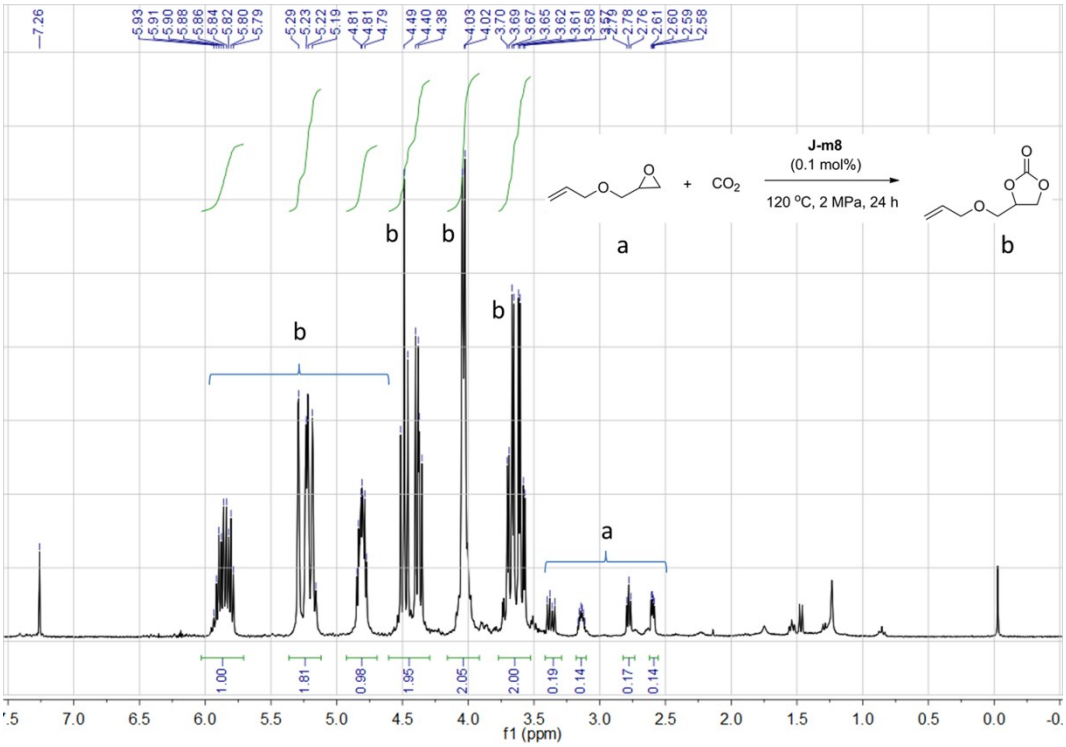
(0.1 mol%)
120 °C, 2 MPa, 15 h
a
b
f1 (ppm)


J-m8
(0.1 mol%)
120 °C, 2 MPa, 6 h
a
b
f1 (ppm)


J-m8
(0.1 mol%)
120 °C, 2 MPa, 48 h
a
b
f1 (ppm)


J-m8
(0.1 mol%)
120 °C, 2 MPa, 48 h
a
b
f1 (ppm)


J-m8
(0.1 mol%)
120 °C, 2 MPa, 6 h
a
b
f1 (ppm)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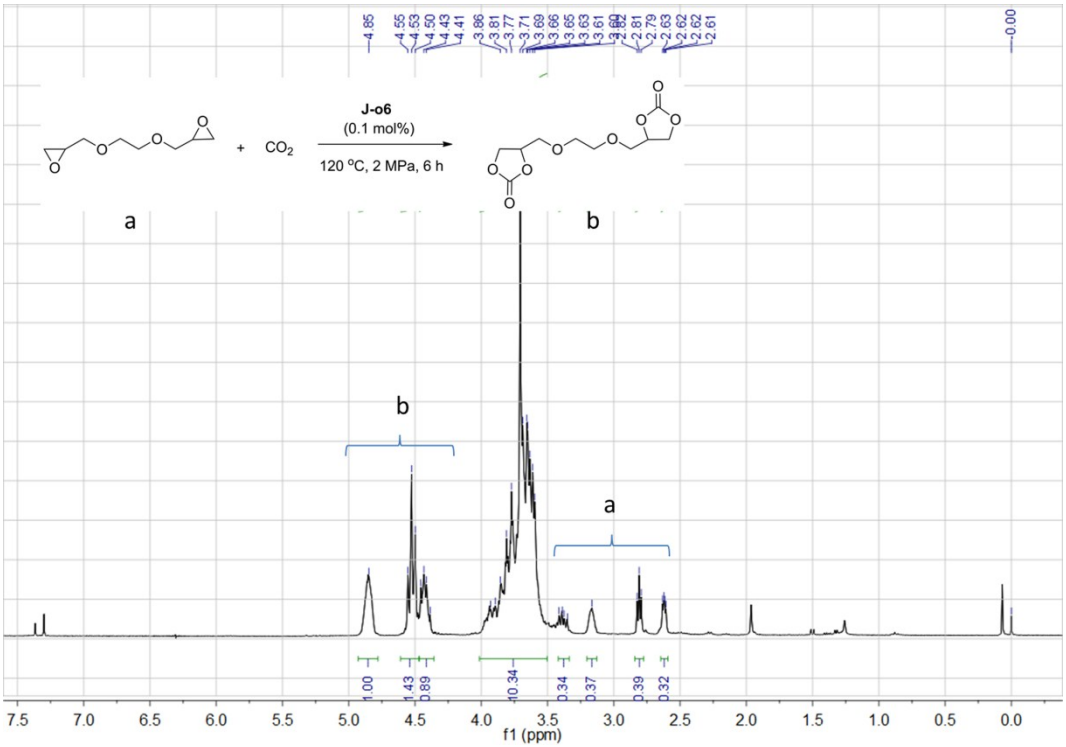
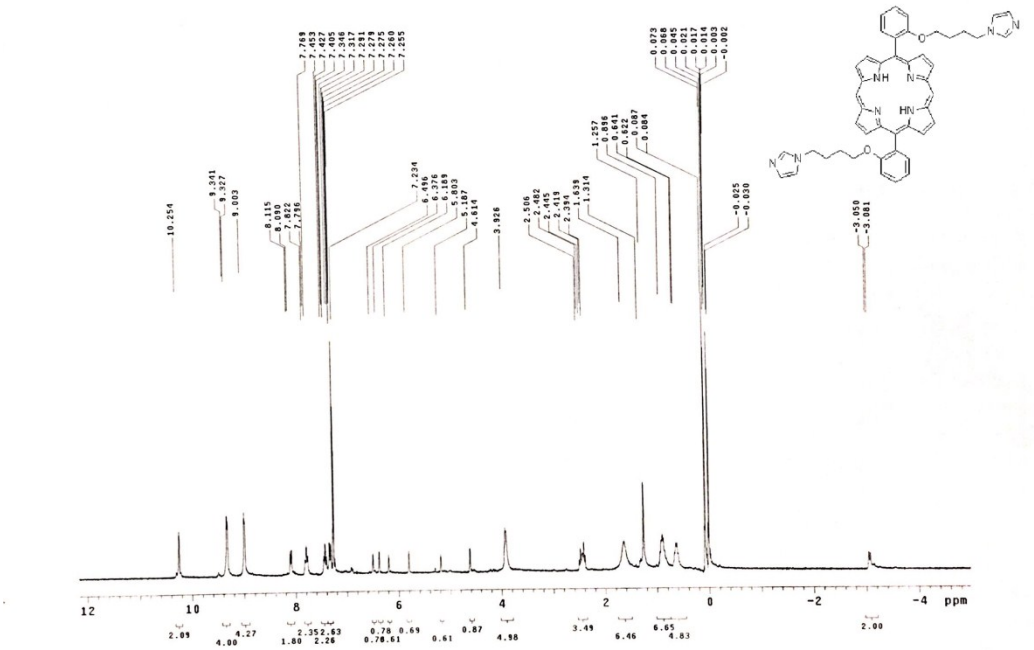
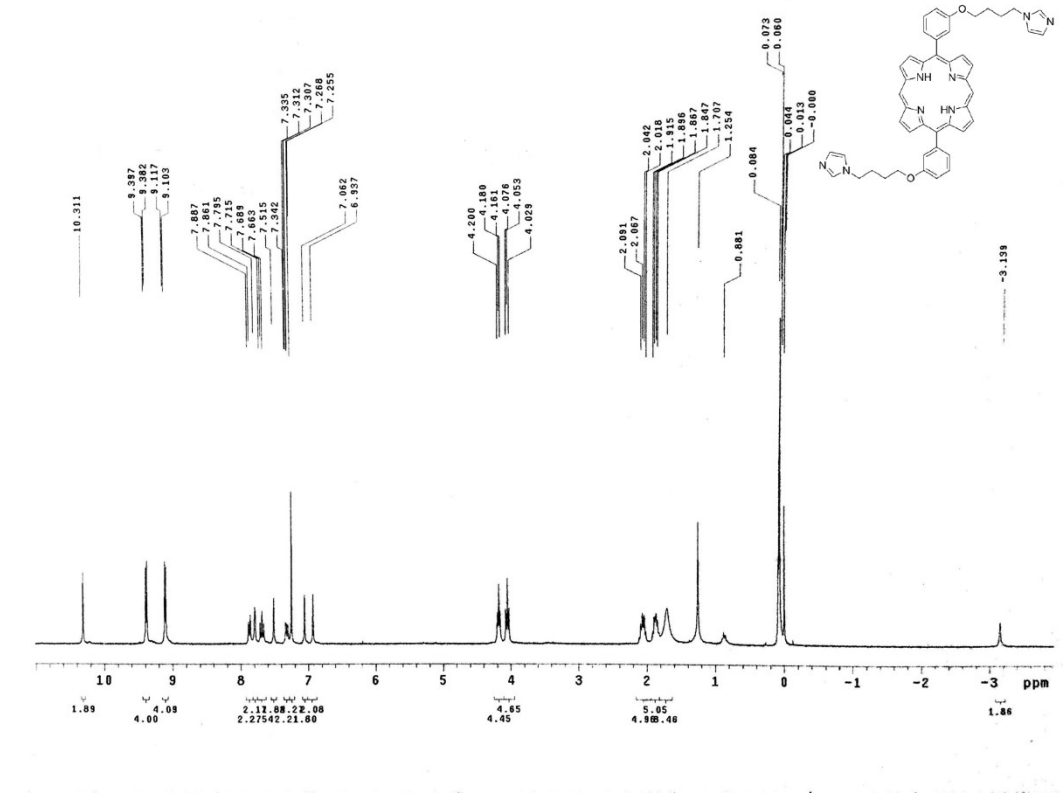
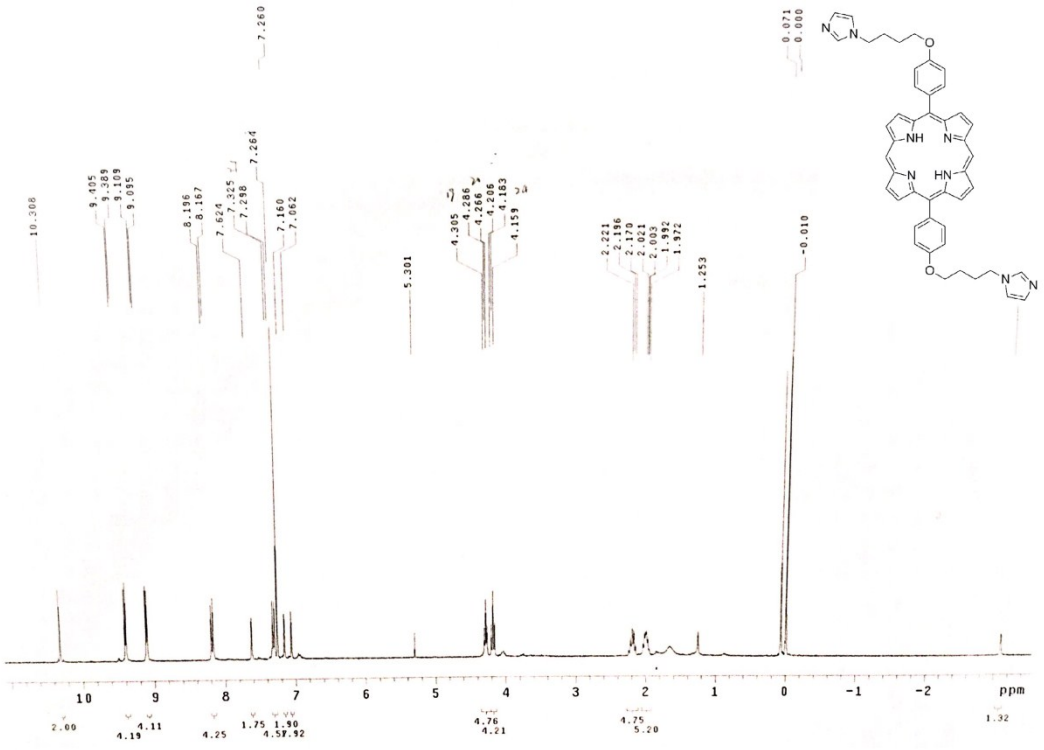
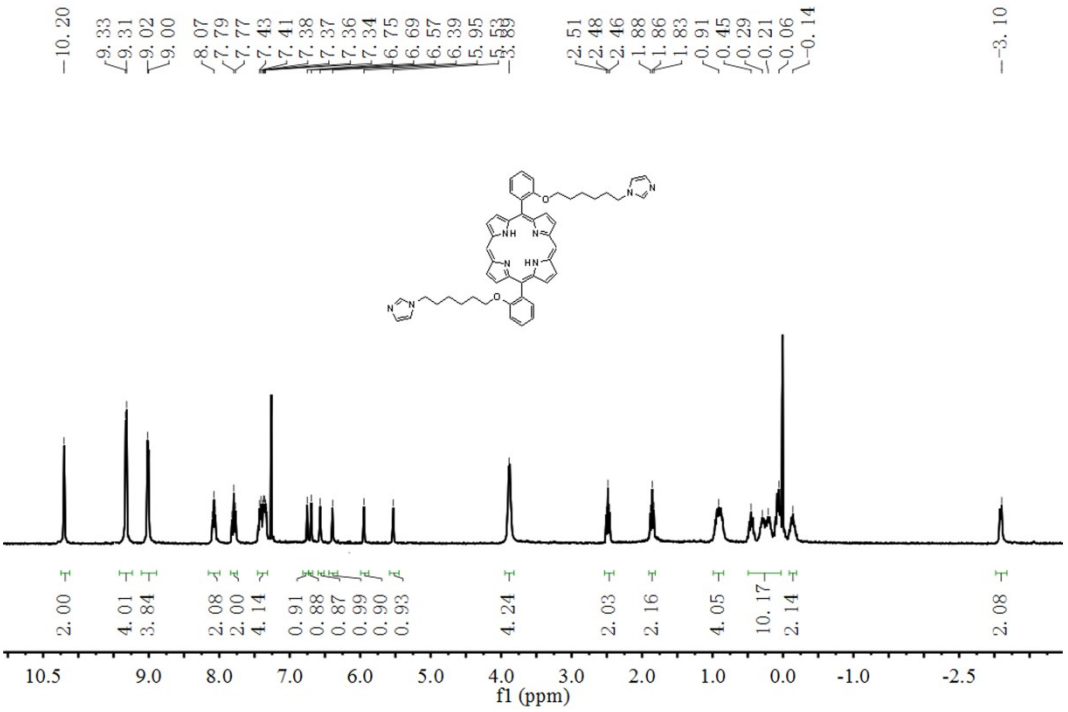
a
b
f1 (ppm)

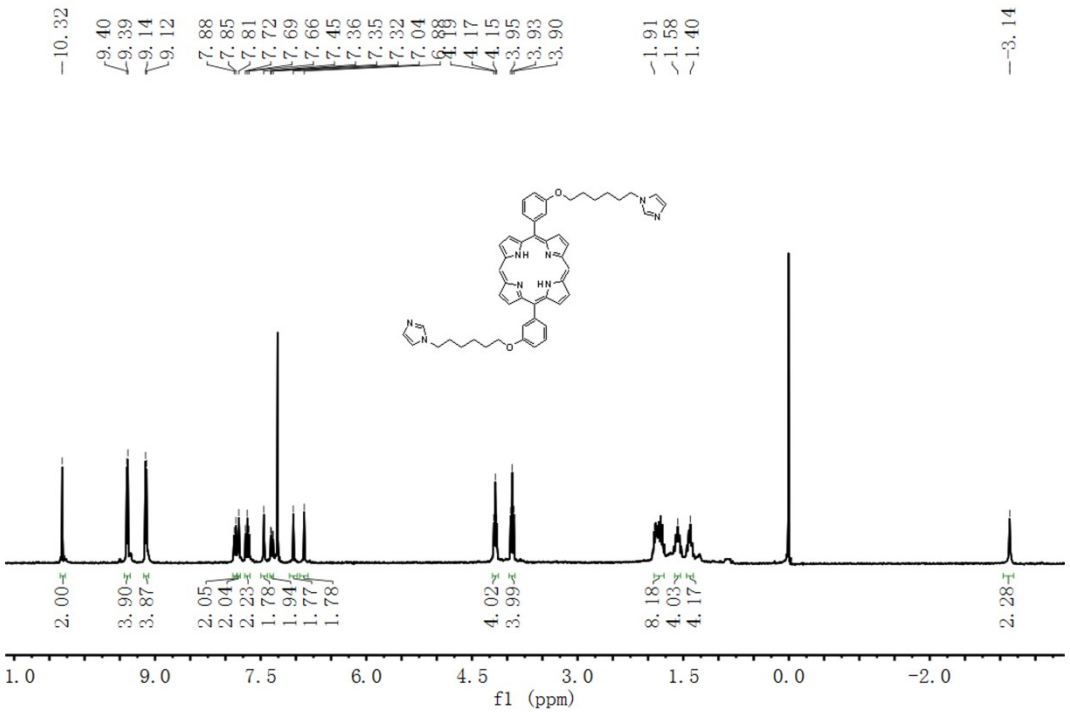

J-o6
(0.1 mol%)
120 °C, 2 MPa, 6 h
a
b
f1 (ppm)







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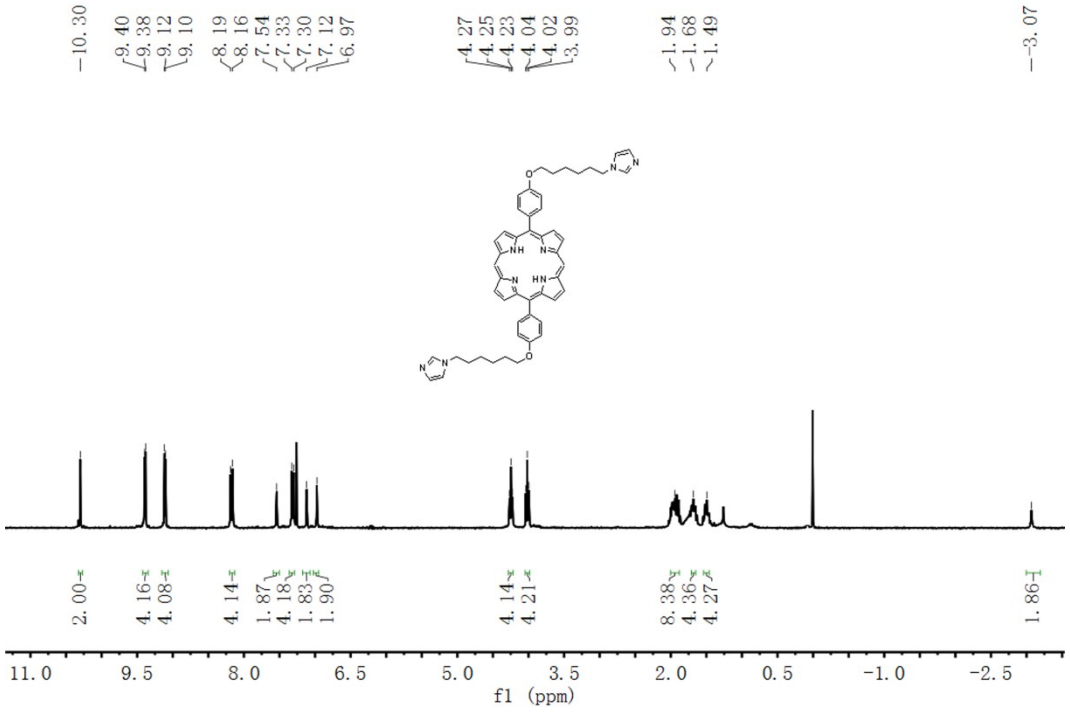
f1 (ppm)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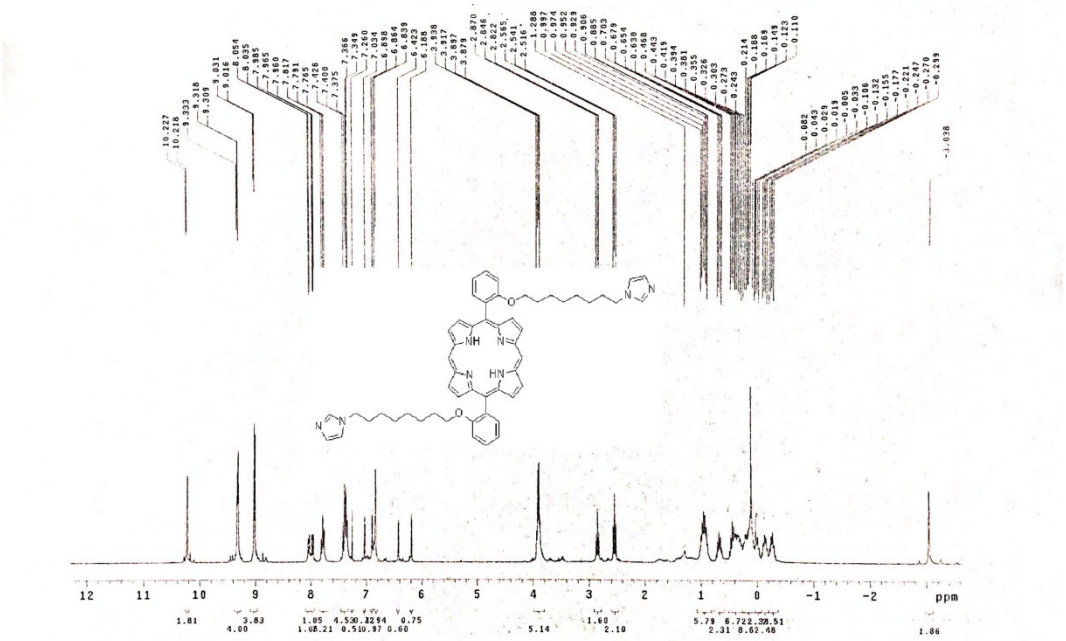

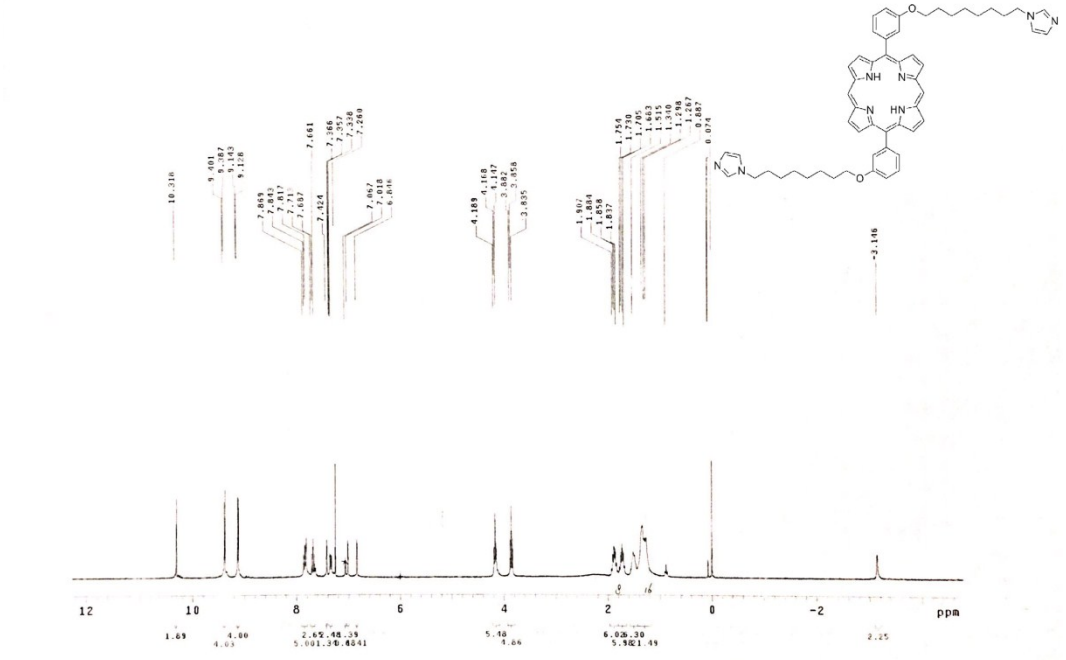

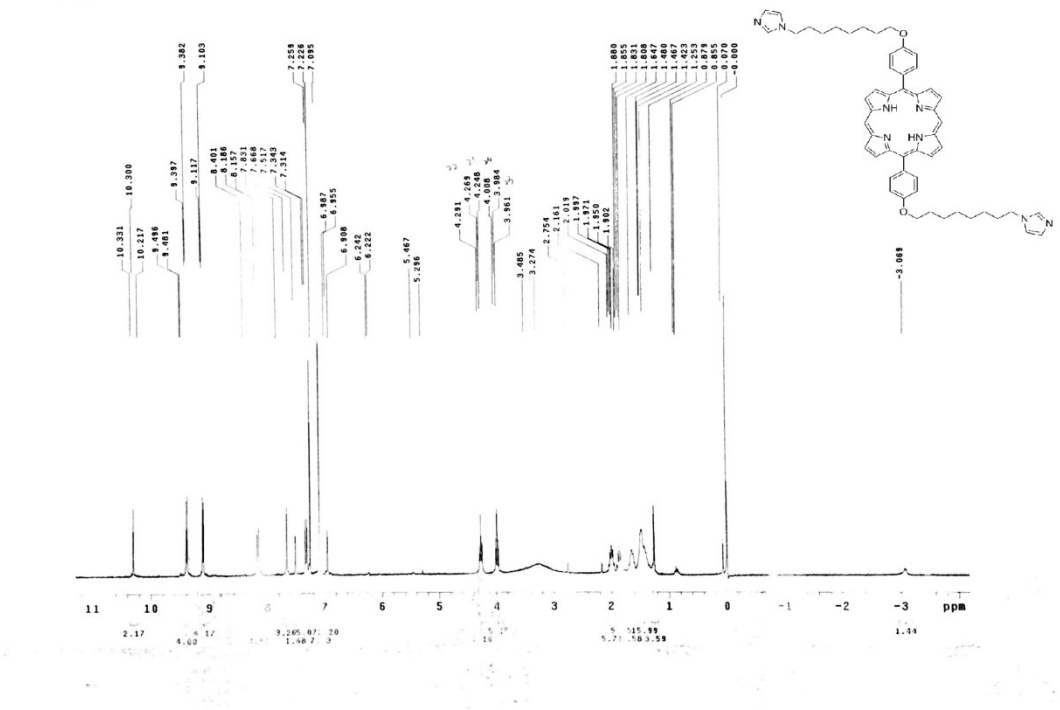

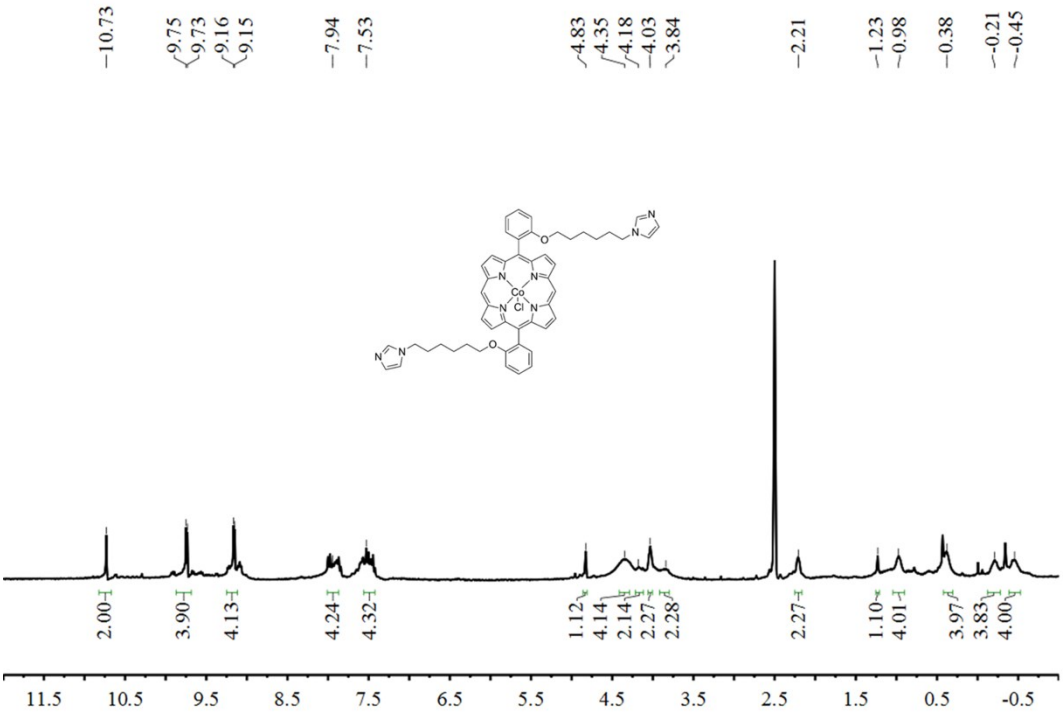

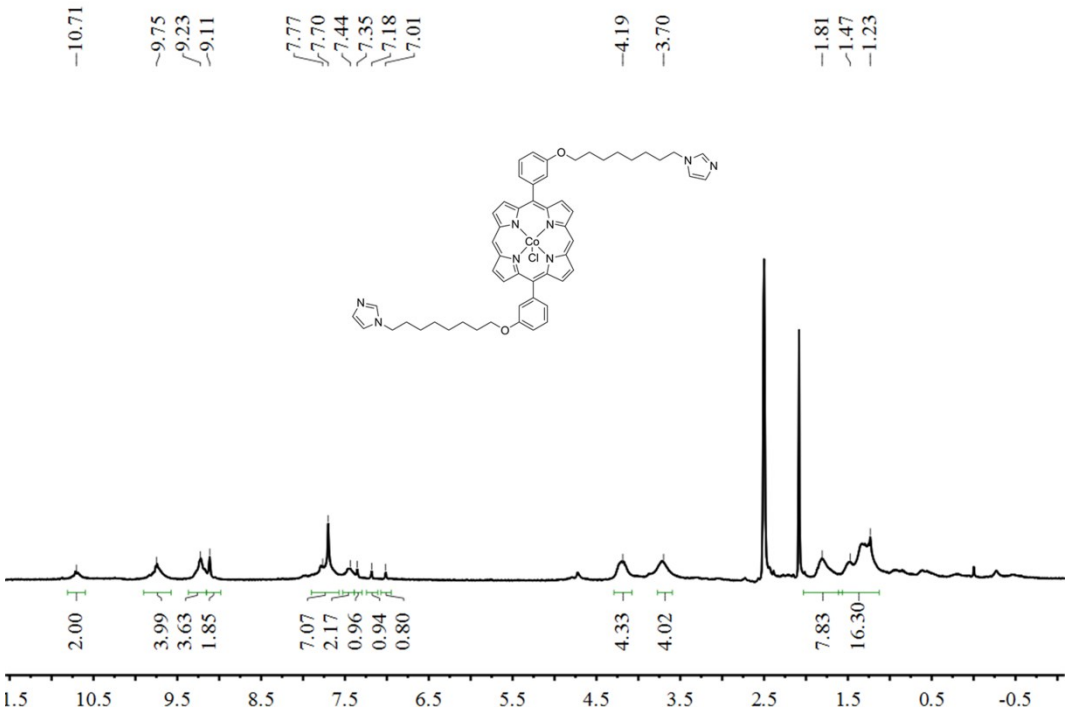
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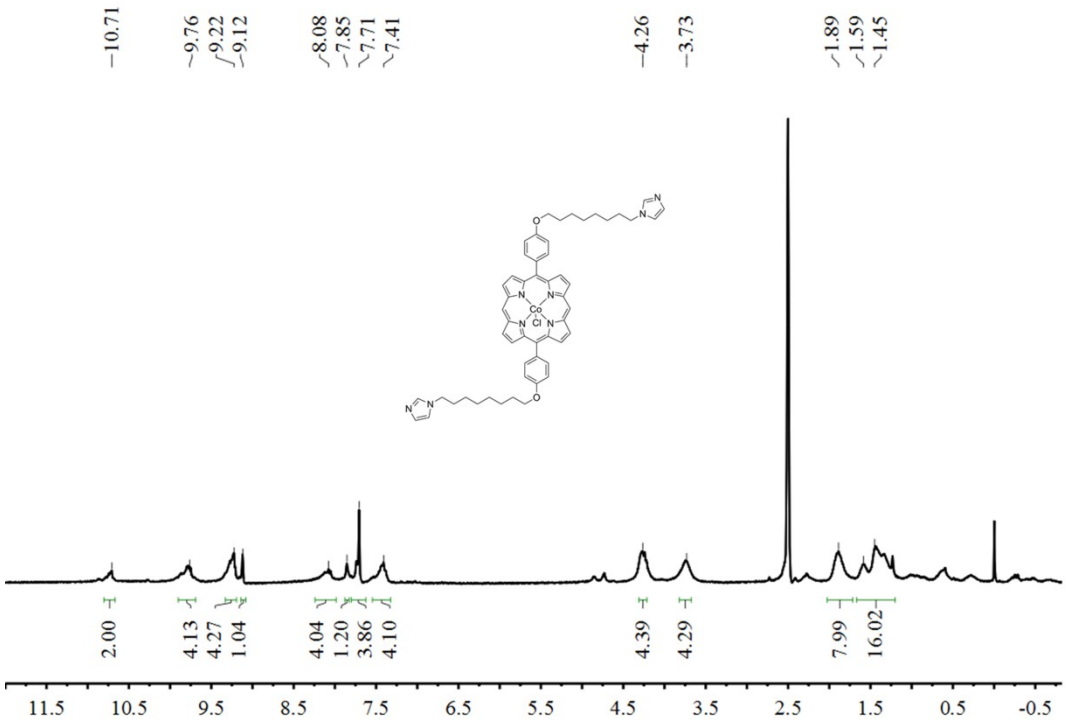
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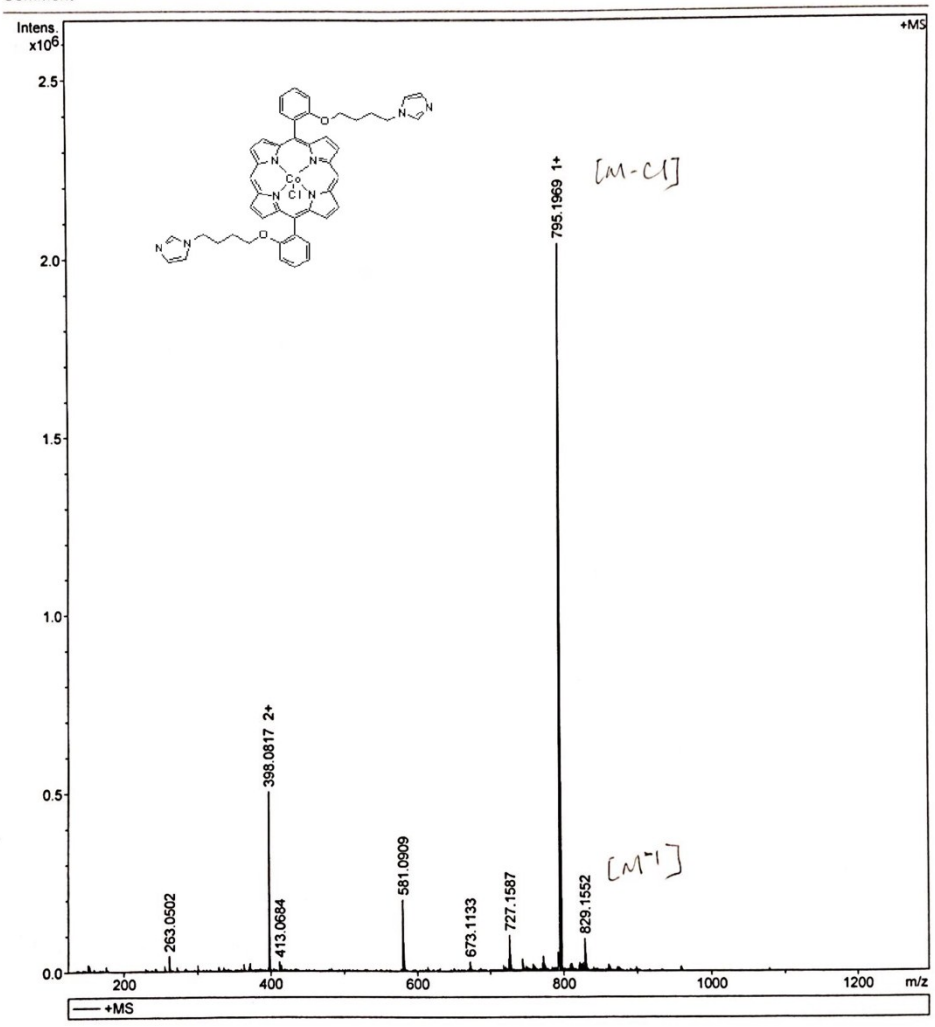

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Generic Display Report

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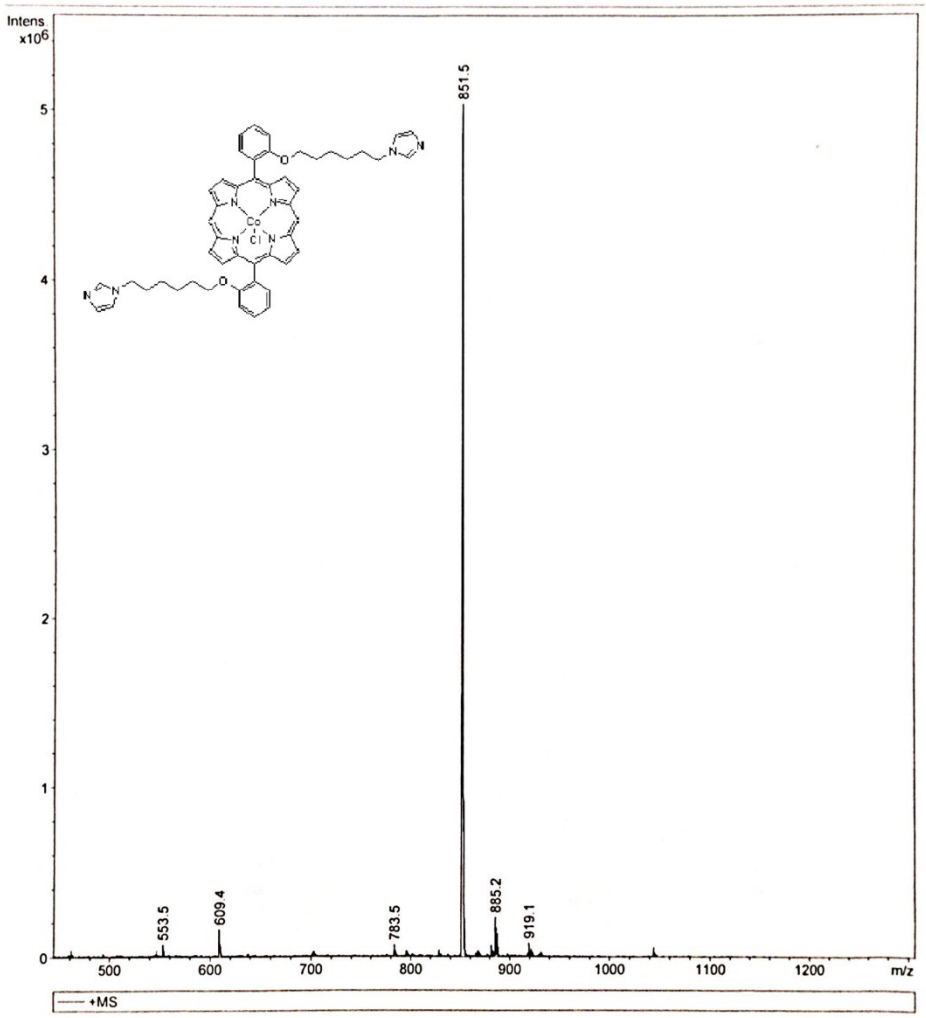

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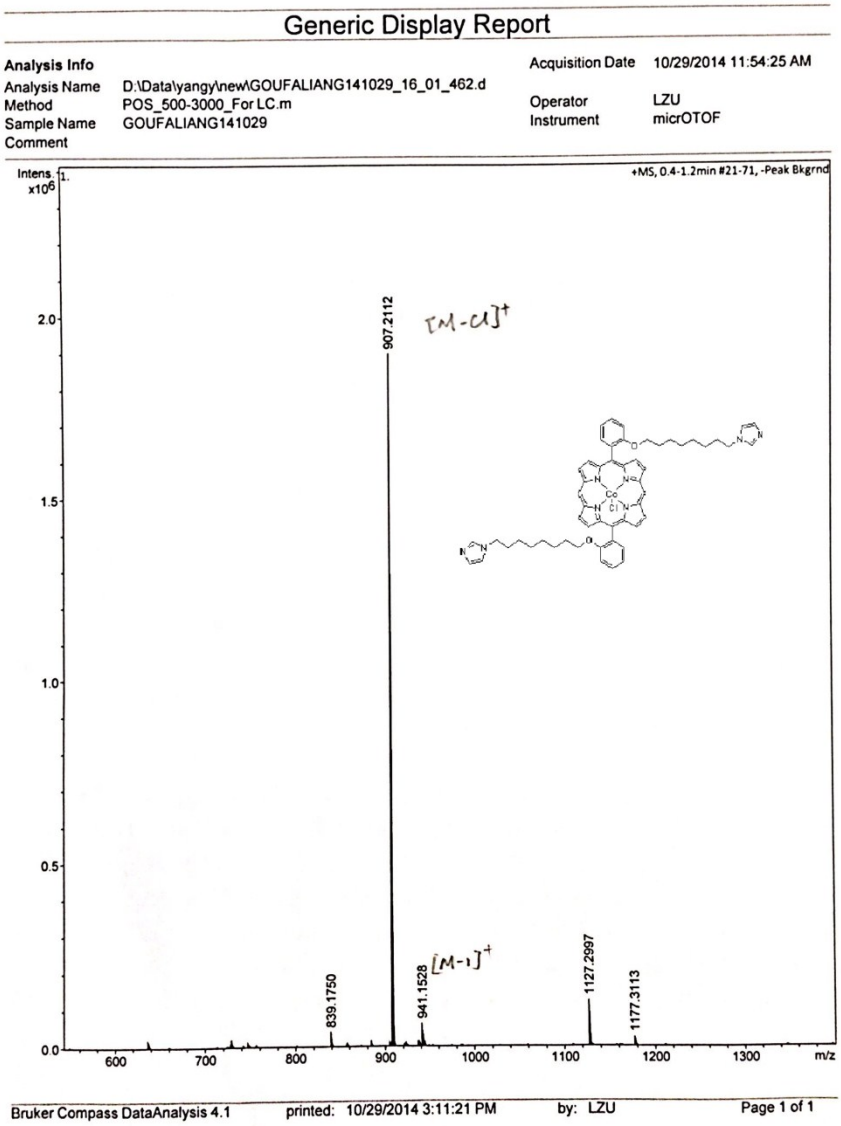

8. References

[1] L. Jin, H. Jing, T. Chang, X. Bu, L. Wang and Z. Liu, *J. Mol. Catal. A: Chem.*, 2007, **261**, 262.

[2] X. Jiang, F. Gou and H. Jing, *J. Catal.*, 2014, **313**, 159.

[3] B. Li, L. Zhang, Y. Song, D. Bai and H. Jing, *J. Mol. Catal. A: Chem.*, 2012, **363–364**, 26.