Supporting Information

for

Rhodium-catalyzed reductive carbonylation of aryl iodides to arylaldehydes with syngas

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*Beilstein J. Org. Chem.* **2020**, *16*, 645–656. doi:10.3762/bjoc.16.61

MS spectra of isotope-labeling experiments and characterization of products
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1. MS spectra of $^{13}$CO and D$_2$ in the isotope-labeling experiments
2. NMR data of the aromatic aldehyde products

1; Benzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.02 (s, 1H), 7.94 – 7.81 (m, 2H), 7.69 – 7.40 (m, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.35, 136.34, 134.41, 129.68, 128.94.

2; 2-Methylbenzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.26 (s, 1H), 7.79 (dd, $J$ = 7.6, 1.5 Hz, 1H), 7.47 (dd, $J$ = 7.5, 1.6 Hz, 1H), 7.36 (td, $J$ = 7.5, 1.6 Hz, 1H), 7.28 – 7.22 (m, 1H), 2.67 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.73, 140.53, 134.07, 133.58, 131.98, 131.70, 126.25, 19.52.

3; 3-Methylbenzaldehyde [2]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.97 (s, 1H), 7.74 – 7.61 (m, 2H), 7.47 – 7.33 (m, 2H), 2.42 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.53, 138.83, 136.39, 135.21, 129.94, 128.80, 127.14, 21.11.

4; 4-Methylbenzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.96 (s, 1H), 7.77 (d, $J$ = 8.1 Hz, 2H), 7.33 (d, $J$ = 7.8 Hz, 2H), 2.44 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 191.94, 145.49, 134.13, 129.71, 121.83.

5; 2-Methoxybenzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.45 (s, 1H), 7.80 (dd, $J$ = 7.7, 1.8 Hz, 1H), 7.52 (ddd, $J$ = 8.2, 7.4, 1.8 Hz, 1H), 7.08 – 6.90 (m, 2H), 3.90 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 189.62, 161.75, 135.83, 128.38, 124.80, 111.58, 55.53.

6; 3-Methoxybenzaldehyde [3]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.95 (s, 1H), 7.50 – 7.32 (m, 3H), 7.16 (dt, $J$ = 5.9, 2.9 Hz, 1H), 3.84 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.04, 160.05, 137.70, 129.94, 123.43, 121.40, 111.96, 55.36.

7; 4-Methoxybenzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.83 (s, 1H), 8.17 – 7.55 (m, 2H), 6.95 (d, $J$ = 8.7 Hz, 2H), 3.83 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.61, 164.44, 131.79, 129.77, 114.15, 55.41.

8; 2-Fluorobenzaldehyde [2]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.37 (d, $J$ = 0.8 Hz, 1H), 7.88 (td, $J$ = 7.4, 1.9 Hz, 1H), 7.61 (ddd, $J$ = 8.4, 7.3, 5.4, 1.9 Hz, 1H), 7.33 – 7.09 (m, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 187.12, 166.34, 162.92, 136.29, 128.64, 124.58, 116.45.

9; 3-Fluorobenzaldehyde [4]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.00 (d, $J$ = 1.9 Hz, 1H), 7.69 (dt, $J$ = 7.5, 1.3 Hz, 1H), 7.61 – 7.48 (m, 2H), 7.39 – 7.26 (m, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.82, 164.69, 161.38, 138.36, 130.74, 126.00, 121.52, 115.27.
10: 4-Fluorobenzaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.98 (s, 1H), 7.92 (dd, $J =$ 8.7, 5.4 Hz, 2H), 7.22 (t, $J =$ 8.5 Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.45, 168.16, 164.76, 132.91, 132.18, 116.30.

11: 2-Chlorobenzaldehyde [4]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.47 (d, $J =$ 0.8 Hz, 1H), 7.91 (dd, $J =$ 7.7, 1.8 Hz, 1H), 7.53 (ddd, $J =$ 8.0, 7.1, 1.8 Hz, 1H), 7.48 – 7.32 (m, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 189.67, 137.81, 135.03, 132.32, 130.49, 129.24, 127.18.

12: 3-Chlorobenzaldehyde [2]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.94 (s, 1H), 7.81 (dd, $J =$ 2.1, 1.5 Hz, 1H), 7.73 (dt, $J =$ 7.5, 1.4 Hz, 1H), 7.56 (ddd, $J =$ 8.0, 2.1, 1.2 Hz, 1H), 7.45 (t, $J =$ 7.8 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.81, 137.78, 135.40, 134.35, 130.38, 129.22, 127.98.

13: 4-Chlorobenzaldehyde [1]; Colorless solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.98 (s, 1H), 7.82 (d, $J =$ 8.5 Hz, 2H), 7.51 (d, $J =$ 8.4 Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.75, 140.81, 134.61, 130.80, 129.34.

14: 2-Bromobenzaldehyde [4]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.29 (d, $J =$ 0.7 Hz, 1H), 7.87 – 7.80 (m, 1H), 7.60 – 7.52 (m, 1H), 7.43 – 7.32 (m, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 191.55, 135.14, 133.67, 133.25, 129.63, 127.70, 126.88.

15: 3-Bromobenzaldehyde [5]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.92 (s, 1H), 7.95 (d, $J =$ 1.8 Hz, 1H), 7.77 (dt, $J =$ 7.6, 1.3 Hz, 1H), 7.73 – 7.65 (m, 1H), 7.39 (t, $J =$ 7.8 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.52, 137.78, 137.06, 132.05, 130.46, 128.22, 123.15.

16: 4-Bromobenzaldehyde [3]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.96 (s, 1H), 7.73 (d, $J =$ 8.5 Hz, 2H), 7.66 (d, $J =$ 8.5 Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.98, 135.01, 132.37, 130.90, 129.70.

17: 4-Biphenylcarboxaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.06 (s, 1H), 7.96 (d, $J =$ 8.3 Hz, 2H), 7.76 (d, $J =$ 8.3 Hz, 2H), 7.68 – 7.60 (m, 2H), 7.53 – 7.36 (m, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 191.84, 147.13, 139.65, 135.15, 130.21, 128.96, 128.42, 127.63, 127.31.

18: 4-tert-Butylbenzaldehyde [6]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.98 (s, 1H), 7.82 (d, $J =$ 8.4 Hz, 2H), 7.55 (d, $J =$ 8.4 Hz, 2H), 1.35 (s, 9H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.02, 158.41, 134.03, 129.66, 125.95, 35.32, 31.03.
19; 2-Naphthaldehyde [1]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.16 (s, 1H), 8.34 (s, 1H), 8.05 – 7.84 (m, 4H), 7.62 (dddd, \(J = 17.6, 8.2, 6.9, 1.4\) Hz, 2H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.23, 136.42, 134.5, 134.08, 132.61, 129.50, 129.08, 128.05, 127.07, 122.74.

20; 1-Naphthaldehyde [1]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.38 (s, 1H), 9.26 (dd, \(J = 8.6, 1.1\) Hz, 1H), 8.08 (dt, \(J = 8.2, 1.0\) Hz, 1H), 8.01 – 7.83 (m, 2H), 7.79 – 7.44 (m, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 193.45, 136.60, 135.19, 133.60, 131.27, 130.41, 128.97, 128.38, 126.86, 124.77.

21; 2,6-Dimethylbenzaldehyde [2]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.62 (s, 1H), 7.32 (t, \(J = 7.6\) Hz, 1H), 7.09 (d, \(J = 7.6\) Hz, 2H), 2.61 (s, 6H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 193.39, 140.99, 132.85, 132.30, 129.58, 20.34.

22; Mesitaldehyde [7]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.53 (s, 1H), 6.87 (s, 2H), 2.56 (s, 6H), 2.30 (s, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.76, 143.66, 141.31, 130.38, 129.82, 21.31, 20.33.

23; 2-Formylacetophenone; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.22 (s, 1H), 7.89 – 7.83 (m, 1H), 7.68 (dddd, \(J = 22.9, 6.0, 2.9\) Hz, 3H), 2.65 (d, \(J = 1.7\) Hz, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 200.91, 192.12, 140.55, 136.17, 132.95, 131.77, 129.60, 128.40, 28.76.

24; 3-Formylacetophenone; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.04 (s, 1H), 8.38 (t, \(J = 1.8\) Hz, 1H), 8.17 (dt, \(J = 7.8, 1.5\) Hz, 1H), 8.04 (dt, \(J = 7.6, 1.4\) Hz, 1H), 7.61 (t, \(J = 7.7\) Hz, 1H), 2.62 (s, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 196.76, 191.30, 137.68, 136.54, 133.56, 133.43, 129.38, 129.36, 26.53.

25; 4-Formylacetophenone [6]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.10 (s, 1H), 8.10 (d, \(J = 8.3\) Hz, 2H), 7.97 (d, \(J = 8.0\) Hz, 2H), 2.66 (s, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 197.20, 191.42, 140.97, 138.81, 129.57, 128.59, 26.74.

26; Piperonyl aldehyde [1]; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 10.30 (s, 1H), 7.16 (dd, \(J = 8.1, 1.7\) Hz, 1H), 7.14 (d, \(J = 1.7\) Hz, 1H), 6.62 (d, \(J = 8.1\) Hz, 1H), 5.99 (s, 2H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 186.81, 152.20, 151.48, 146.02, 128.14, 107.47, 105.06, 103.89.
27: 4-Acetamidobenzaldehyde [8]; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 9.91 (s, 1H), 8.00 (s, 1H), 7.89 – 7.79 (m, 2H), 7.71 (d, \( J = 8.4 \) Hz, 2H), 2.23 (s, 3H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 191.14, 168.86, 143.62, 132.14, 131.14, 119.22, 24.76.

28: 4-(Trifluoromethyl)benzaldehyde [1]; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.09 (s, 1H), 8.00 (dt, \( J = 7.9, 0.9 \) Hz, 2H), 7.80 (d, \( J = 8.1 \) Hz, 2H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 191.07, 138.63, 135.79, 135.36, 129.89, 126.11, 121.60, 117.99.

29: 3,5-Bis(trifluoromethyl)benzaldehyde [9]; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.13 (s, 1H), 8.34 (d, \( J = 1.8 \) Hz, 2H), 8.12 (d, \( J = 2.1 \) Hz, 1H). \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 189.06, 137.52, 132.78, 129.38, 127.49, 124.10.

30: 2,4-Bis(trifluoromethyl)benzaldehyde; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.04 (d, \( J = 0.5 \) Hz, 1H), 8.06 (d, \( J = 1.5 \) Hz, 1H), 7.90 (dd, \( J = 7.5, 0.5 \) Hz, 1H), 7.72 (dd, \( J = 7.5, 1.5 \) Hz, 1H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 189.42, 134.81, 134.80, 134.74, 133.42, 133.17, 129.59, 129.57, 129.56, 129.54, 129.95, 126.92, 126.88, 126.85, 125.22, 125.19, 125.16, 125.13, 124.91, 123.66, 122.76.

31: 4-Cyanobenzaldehyde [8]; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.08 (s, 1H), 7.98 (d, \( J = 8.2 \) Hz, 2H), 7.84 (d, \( J = 8.2 \) Hz, 2H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 190.56, 138.65, 132.82, 129.80, 117.57.

32: 2,4-Difluorobenzaldehyde; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.28 (s, 1H), 7.91 (td, \( J = 8.3, 6.5 \) Hz, 1H), 7.02 – 6.97 (m, 1H), 6.91 (ddd, \( J = 10.8, 8.6, 2.4 \) Hz, 1H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 185.64, 185.59, 168.04, 167.95, 166.55, 166.45, 165.98, 165.88, 164.47, 164.37, 130.74, 130.72, 130.66, 130.63, 121.12, 121.10, 121.06, 112.73, 112.70, 112.55, 112.52, 104.96, 104.76, 104.56.

33: 2,4-Dichlorobenzaldehyde; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 10.23 (d, \( J = 0.5 \) Hz, 1H), 7.74 (dd, \( J = 7.5, 0.5 \) Hz, 1H), 7.50 (d, \( J = 1.5 \) Hz, 1H), 7.41 (dd, \( J = 7.5, 1.5 \) Hz, 1H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 188.19, 135.58, 134.02, 131.52, 130.26, 130.11, 128.63.

34: 4-Chloro-3-fluorobenzaldehyde; \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta \) 9.92 (t, \( J = 0.5 \) Hz, 1H), 7.65 (ddd, \( J = 9.7, 8.0, 1.5, 0.5 \) Hz, 2H), 7.46 (dd, \( J = 7.4, 5.0 \) Hz, 1H); \( ^{13} \)C NMR (101 MHz, CDCl\(_3\)) \( \delta \) 190.35, 190.33, 159.21, 157.20, 134.98, 134.91, 129.87, 129.85, 127.87, 127.81, 126.08, 125.92, 116.24, 116.08.
35; 4-Bromo-3-fluorobenzaldehyde; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.92 (d, $J = 1.8$ Hz, 1H), 7.72 (t, $J = 7.2$ Hz, 1H), 7.60 – 7.45 (m, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 189.77, 160.71, 158.21, 137.20, 134.44, 126.39, 116.71, 116.50, 116.15, 115.92.

36; 2-Thiophene carbaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.95 (d, $J = 1.2$ Hz, 1H), 7.97 – 7.54 (m, 2H), 7.22 (dd, $J = 4.9$, 3.8 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 182.93, 143.96, 136.27, 135.06, 128.26.

37; 3-Thiophene carboxaldehyde [1]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.90 (d, $J = 0.8$ Hz, 1H), 8.11 (dd, $J = 2.9$, 0.8 Hz, 1H), 7.51 (dd, $J = 5.1$, 1.2 Hz, 1H), 7.35 (ddd, $J = 5.1$, 2.9, 0.8 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 184.81, 142.81, 136.65, 127.25, 125.11.

38; 2-Furaldehyde; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.63 (s, 1H), 7.67 (s, 1H), 7.23 (d, $J = 4.8$ Hz, 1H), 6.58 (dd, $J = 4.4$, 1.9 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 177.70, 152.80, 147.96, 112.45.

39; 3-Furaldehyde [10]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.89 (s, 1H), 8.06 (s, 1H), 7.44 (s, 1H), 6.72 (s, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 184.27, 151.28, 144.77, 128.50, 106.70.

40; 2-Pyridinecarboxaldehyde [3]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.09 (s, 1H), 8.81 (dt, $J = 4.8$, 1.3 Hz, 1H), 7.98 (dt, $J = 7.8$, 1.2 Hz, 1H), 7.91 (td, $J = 7.6$, 1.6 Hz, 1H), 7.57 (ddd, $J = 7.4$, 4.8, 1.4 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 193.20, 152.60, 150.02, 136.89, 127.70, 121.51.

41; 3-Pyridinecarboxaldehyde [11]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 10.04 (s, 1H), 8.99 (d, $J = 2.1$ Hz, 1H), 8.75 (dd, $J = 4.9$, 1.8 Hz, 1H), 8.08 (dt, $J = 7.9$, 2.0 Hz, 1H), 7.41 (dd, $J = 7.9$, 4.8 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 190.60, 154.55, 151.85, 135.58, 131.19, 123.87.

42; 4-Pyridinecarboxaldehyde [12]; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 9.98 (s, 1H), 8.77 (d, $J = 6.0$ Hz, 2H), 7.60 (d, $J = 6.0$ Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 191.29, 150.97, 141.15, 121.85.
3. NMR spectra of the aromatic aldehyde products

$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^13$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^{1}$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
1H NMR (CDCl₃, 400 MHz)

13C NMR (CDCl₃, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$t$-Bu-\[\begin{array}{c}
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18

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$\text{H NMR (CDCl}_3, 400 \text{ MHz)}$

$\text{13C NMR (CDCl}_3, 101 \text{ MHz)}$
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$24$

$^1$H NMR (CDCl$_3$, 400 MHz)

$24$

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$\text{^{1}H NMR (CDCl}_3, 400 \text{ MHz)}$

$\text{^{13}C NMR (CDCl}_3, 101 \text{ MHz)}$
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^3$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}C$ NMR (CDCl$_3$, 101 MHz)
$^{1}H$ NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^{1}$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
$^1$H NMR (CDCl$_3$, 400 MHz)

$^{13}$C NMR (CDCl$_3$, 101 MHz)
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